



Solis Three Phase Inverter

125K1 **Installation and Operation Manual**

For U.S.

Ver 1.0.1

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Please adhere to the actual products in case of any discrepancies in this user manual.

Please record the serial number of your inverter and quote this when you contact us.

Ginlong Technologies Co., Ltd.

Important notes

- Product specifications are subject to change without notice. Every attempt has been made to make this document complete, accurate and up-to-date. Individuals reviewing this document and installers or service personnel are cautioned, however, that Ginlong reserves the right to make changes without notice and shall not be responsible for any damages, including indirect, incidental or consequential damages caused by reliance on the material presented including, but not limited to, omissions, typographical errors, arithmetical errors or listing errors in the material provided in this document.
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 - There is sufficient space suitable for housing the equipment.
 - Airborne noise produced depending on the environment.
 - Potential flammability hazards.
- Ginlong will not be held liable for defects or malfunctions arising from:
 - Improper use of the equipment.
 - Deterioration resulting from transportation or particular environmental conditions.
 - Performing maintenance incorrectly or not at all.
 - Tampering or unsafe repairs.
 - Use or installation by unqualified persons.
- This product contains lethal voltages and should be installed by qualified electrical or service personnel having experience with lethal voltages.

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1. Introduction

1.1 Product Description

Solis Three Phase Transformerless Grid Support Utility Interactive PV Inverters convert DC power from the photovoltaic(PV) array into alternating current(AC) power that can satisfy local loads as well as feed the power distribution grid.

This manual covers the three phase inverter model listed below:

Solis-125K1-EHV-5G

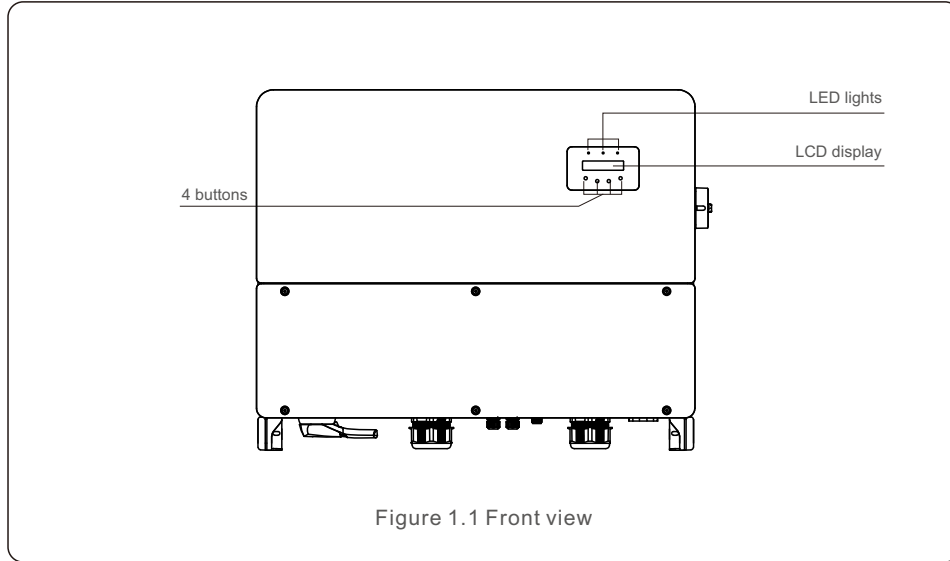


Figure 1.1 Front view

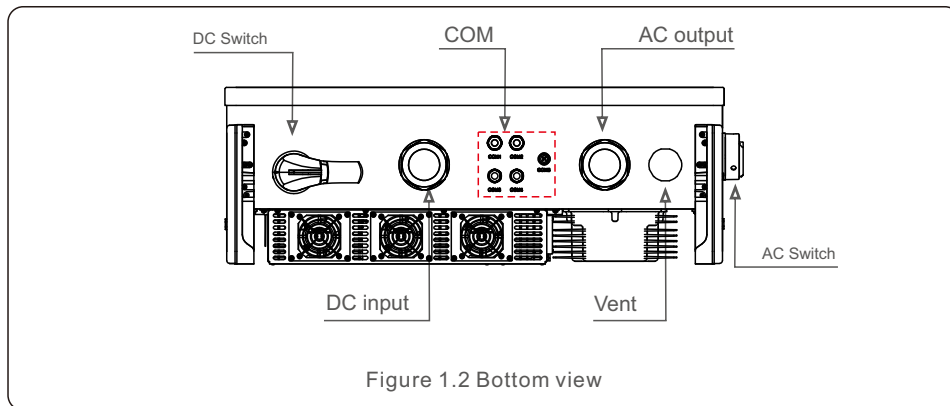


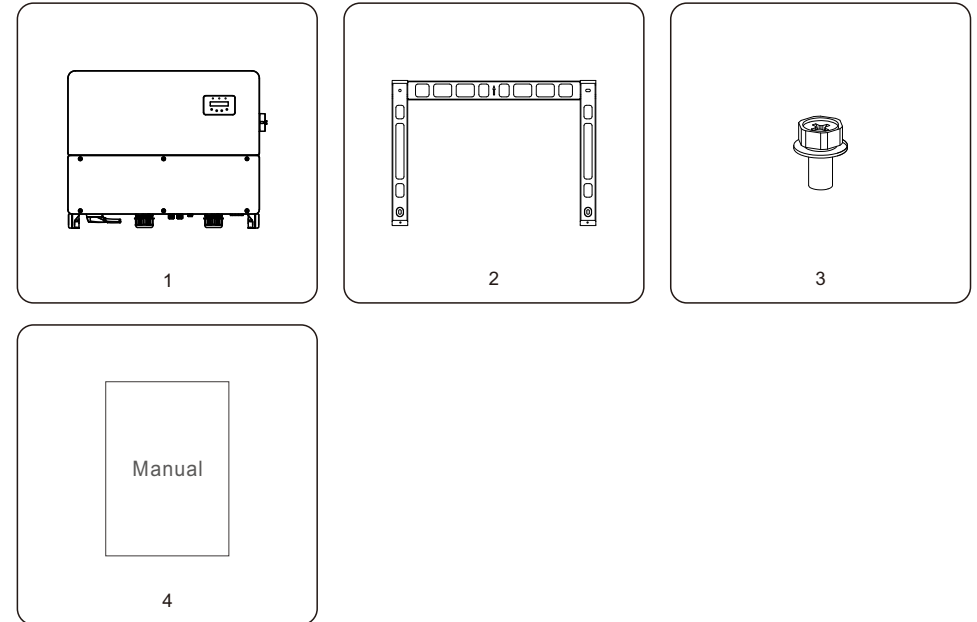
Figure 1.2 Bottom view

1. Introduction

1.2 Unpacking and storage

The inverter ships with all accessories in one carton.

When unpacking, please verify all the parts listed below are included:



Part #	Description	Number	Remarks
1	Inverter	1	
2	Back plate	1	
3	Fastening screw	2	Hexagon bolt M6*12
4	User manual	1	

Inverter packing list

1. Introduction

1.2.1 Storage

If the inverter is not installed immediately, storage instructions and environmental conditions are below:

- Use the original box to repackage the inverter, seal with adhesive tape with the desiccant inside the box.
- Store the inverter in a clean and dry place, free of dust and dirt. The storage temperature must be between -40 and 158 °F (-40 - 70°C) and humidity should be between 0 to 100%, non-condensing.
- Do not stack more than two (2) inverters high on a single pallet. Do not stack more than 2 pallets high.
- Keep the box(es) away from corrosive materials to avoid damage to the inverter enclosure.
- Inspect the packaging regularly. If packing is damaged (wet, pest damages, etc.), repackage the inverter immediately.
- Store inverters on a flat, hard surface -- not inclined or upside down.
- After 100 days of storage, the inverter and carton must be inspected for physical damage before installing. If stored for more than 1 year, the inverter needs to be fully examined and tested by qualified service or electrical personnel before using.
- Restarting after a long period of non-use requires the equipment be inspected and, in some cases, the removal of oxidation and dust that has settled inside the equipment will be required.



Figure 1.3

2. Important Safety Instruction

SAVE THESE INSTRUCTIONS – This manual contains important instructions for Models Solis-125K1-EHV-5G that shall be followed during installation and maintenance of the inverter.

2.1 Safety symbols

Safety symbols used in this manual, which highlight potential safety risks and important safety information, are listed below:



WARNING

Symbol indicates important safety instructions, which if not correctly followed, could result in serious injury or death.



NOTE

Symbol indicates important safety instructions, which if not correctly followed, could result in damage to or the destruction of the inverter.



CAUTION, RISK OF ELECTRIC SHOCK

Symbol indicates important safety instructions, which if not correctly followed, could result in electric shock



CAUTION, HOT SURFACE

Symbol indicates safety instructions, which if not correctly followed, could result in burns.

2.2 General safety instructions



WARNING

Do not connect PV array positive (+) or negative (-) to ground – doing so could cause serious damage to the inverter.



WARNING

Electrical installations must be done in accordance with local and national electrical safety standards.



WARNING

To reduce the risk of fire, branch circuit over-current protective devices (OCPD) are required for circuits connected to the Inverter.



CAUTION

The PV array (solar panels) supplies a DC voltage when exposed to light.

2. Important Safety Instruction



CAUTION

Risk of electric shock from energy stored in the inverter's capacitors. Do not remove cover until five (5) minutes after disconnecting all sources of supply have passed, and this can only be done by a service technician. The warranty may be voided if any unauthorized removal of cover occurs.



CAUTION

The inverter's surface temperature can reach up to 75°C (167°F). To avoid risk of burns, do not touch the surface when the inverter is operating. Inverter must be installed out of the reach of children.



WARNING

The inverter can only accept a PV array as a DC input. Using any other type of DC source could damage the inverter.

2.3 Notice for use

The inverter has been constructed according to applicable safety and technical guidelines. Use the inverter in installations that meet the following requirements ONLY:

- 1). The inverter must be permanently installed.
- 2). The electrical installation must meet all the applicable regulations and standards.
- 3). The inverter must be installed according to the instructions stated in this manual.
- 4). The system design must meet inverter specifications.

To start-up the inverter, the Grid Supply Main Switch (AC) must be turned on, BEFORE the DC Switch is turned on. To stop the inverter, the Grid Supply Main Switch (AC) must be turned off before the DC Switch is turned off.

2.4 Protection Circuitry and Controls

To meet relevant codes and standards, the Solis three phase inverter line is equipped with protective circuitry and controls.

Anti-Islanding Protection:

Islanding is a condition where the inverter continues to produce power even when the grid is not present. Circuitry, along with firmware, has been designed to determine if the grid is present by adjusting the output frequency of the inverter. In the case of a 60Hz resonant system where the inverter is partially isolated from the grid, the inverter programming can detect if there is a resonant condition or if the grid is actually present. It can also differentiate between inverters operating in parallel and the grid.

3. Installation

3.1 Environmental considerations

3.1.1 Select a location for the inverter

When selecting a location for the inverter, consider the following:



WARNING: Risk of fire

Despite careful construction, electrical devices can cause fires.

- Do not install the inverter in areas containing highly flammable materials or gases.
- Do not install the inverter in potentially explosive atmospheres.

- The temperature of the inverter heat-sink can reach 167°F (75°C).
- The inverter is designed to work in an ambient temperature range between -13°F to 140°F (-25 - 60°C).
- If multiple inverters are installed on site, a minimum clearance of 20in should be kept between each inverter and all other mounted equipment. The bottom of the inverter should be at least 20in above of the ground or floor (see Figure 3.1).
- The LED status indicator lights and the LCD located on the inverter's front panel should not be blocked.
- Adequate ventilation must be present if the inverter is to be installed in a confined space.

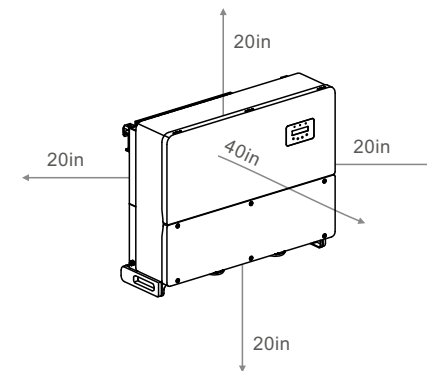


Figure 3.1 Distances required between inverters

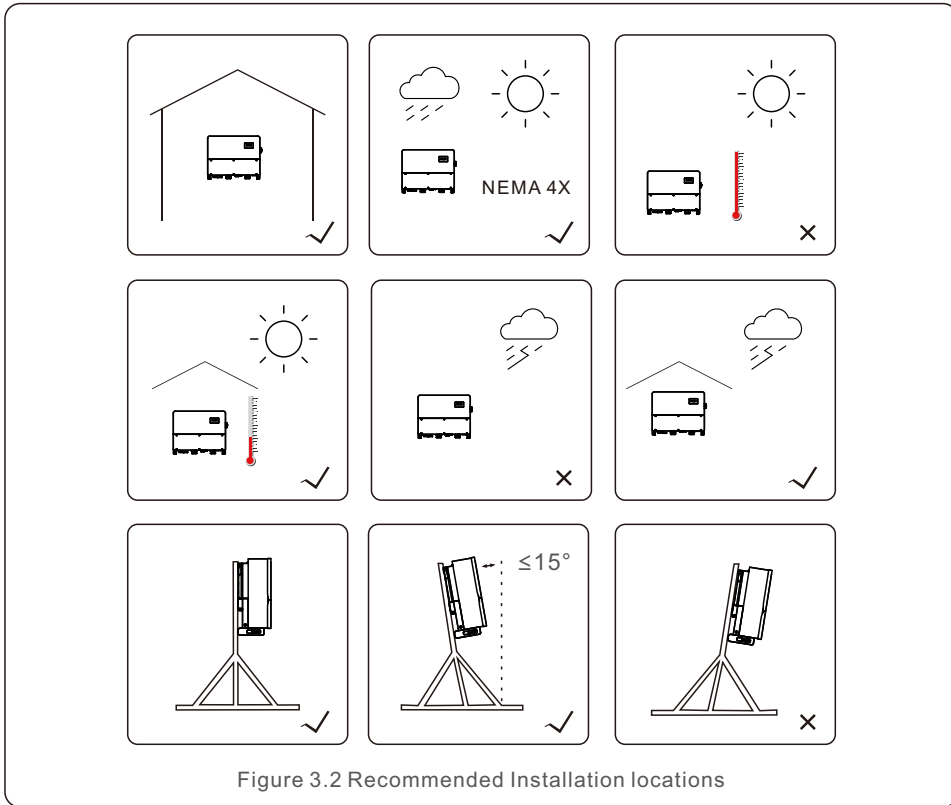


NOTE

Nothing should be stored on or placed against the inverter.

3. Installation

3.1.1.1 Examples of correct and incorrect installations



3.1.2 Other environmental considerations

3.1.2.1 Consult technical data

Consult the specifications section (section 9) for additional environmental conditions (protection rating, temperature, humidity, altitude, etc.).

3.1.2.2 Vertical wall installation

This model of Solis inverter should be mounted vertically (90 degrees or backwards 15 degrees) .

3. Installation

3.1.2.3 Avoiding direct sunlight

Installation of the inverter in a location exposed to direct sunlight should be avoided.

Direct exposure to sunlight could cause:

- Power output limitation (with a resulting decreased energy production by the system).
- Premature wear of the electrical/electromechanical components.
- Premature wear of the mechanical components (gaskets) and user interface.

3.1.2.4 Air circulation

Do not install in small, closed rooms where air cannot freely circulate. To prevent overheating, always ensure that the air flow around the inverter is not blocked.

3.1.2.5 Flammable substances

Do not install near flammable substances. Maintain a minimum distance of three (3) meters (10 feet) from such substances.

3.1.2.6 Living area

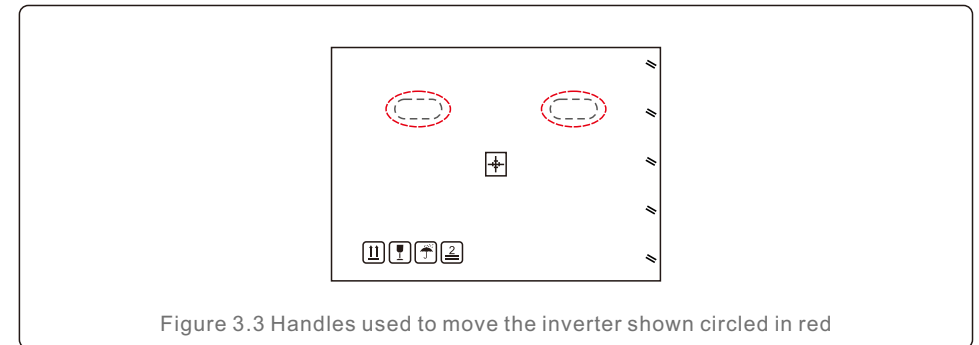
Do not install in a living area where the prolonged presence of people or animals is expected. Depending on where the inverter is installed (for example: the type of surface around the inverter, the general properties of the room, etc.) and the quality of the electricity supply, the sound level from the inverter can be quite high.

3.2 Product handling

Please review the instruction below for handling the inverter:

1. The red circles below denote cutouts on the product package.

Push in the cutouts to form handles for moving the inverter (see Figure 3.3).



2. Two people are required to remove the inverter from the shipping box. Use the handles integrated into the heat sink to remove the inverter from the carton (see Figure 3.4).

3. Installation

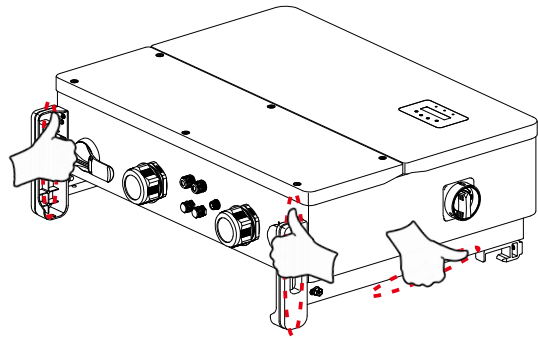


Figure 3.4 Inverter handles



WARNING

Due to the weight of the inverter, contusions or bone fractures could occur when incorrectly lifting and mounting the inverter. When mounting the inverter, take the weight of the inverter into consideration. Use a suitable lifting technique when mounting.

3.3 Mounting the Inverter

The inverter can be mounted to the wall or metal array racking. The mounting holes should be consistent with the size of the bracket or the dimensions shown in Figure 3.5.

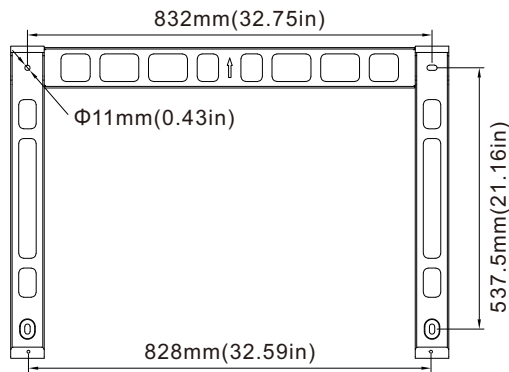


Figure 3.5 Inverter wall mounting

3. Installation

3.3.1 Wall mounting

Refer to figure 3.6 and figure 3.7 Inverter shall be mounted vertically.

The steps to mount the inverter are listed below.

1. Refer to Figure 3.6, drill holes for mounting screws based on the hole diameter of bracket using a precision drill keeping the drill perpendicular to the wall. Max depth is 90mm.
2. Make sure the bracket is horizontal. And the mounting holes (in Figure 3.6) are marked correctly. Drill the holes into wall at your marks.
3. Use the suitable mounting screws to attach the bracket on the wall.

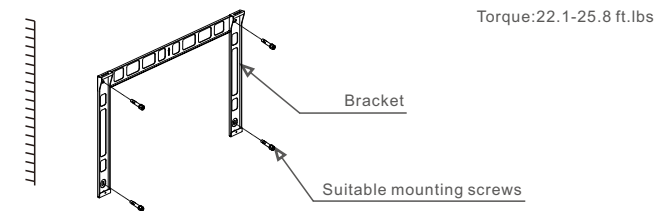


Figure 3.6 Inverter wall mounting

4. Lift the inverter and hang it on the bracket, and then slide down to make sure they match perfectly.

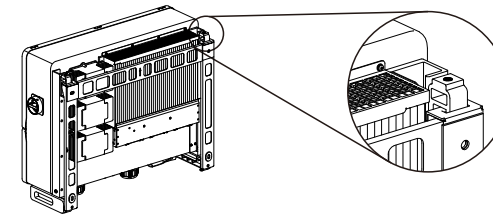


Figure 3.7 Install the inverter

5. Use screws in the packaging to fix the inverter to the mount bracket.

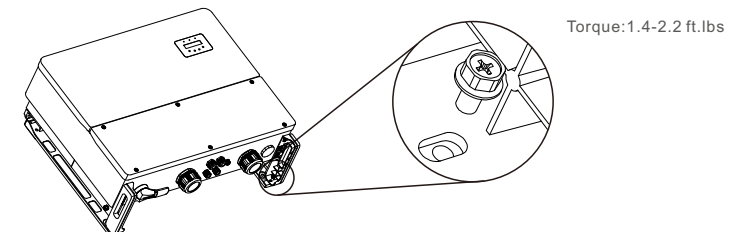


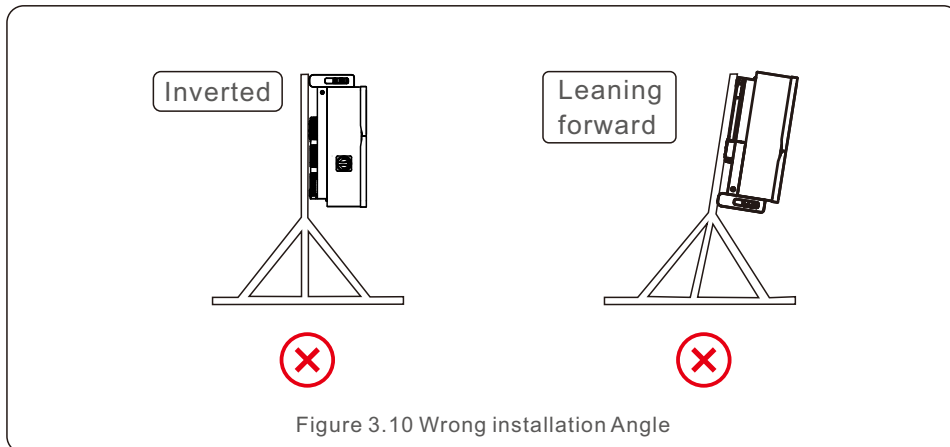
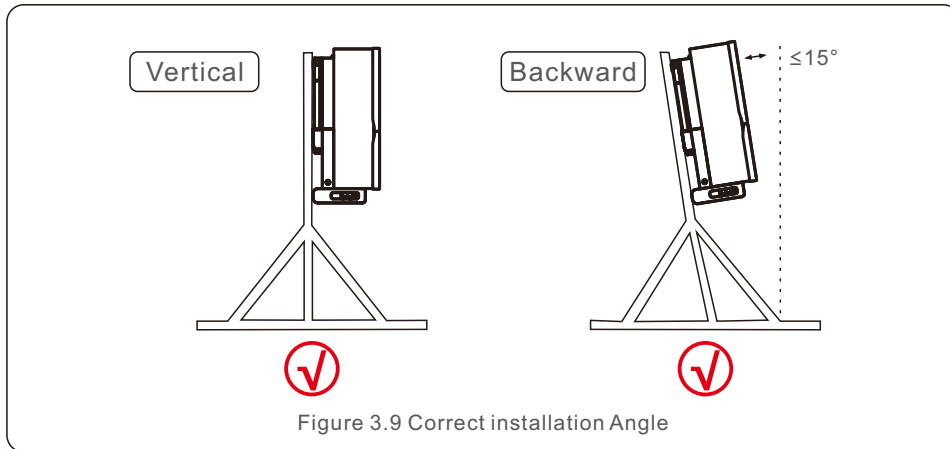
Figure 3.8 Fix the inverter

3. Installation

3.3.2 Rack mounting

The steps to mounted to the rack are listed below:

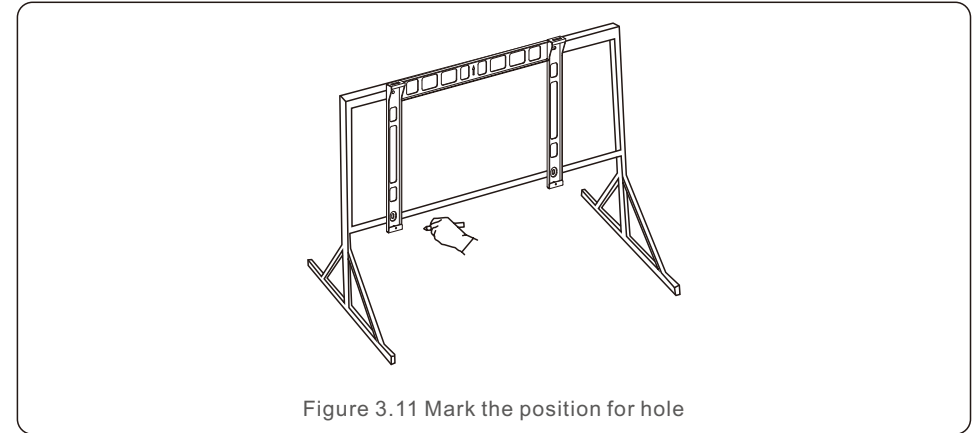
1. Select a location for the inverter
 - With an NEMA4X protection rating, the inverter can be installed both outdoors and indoors.
 - When the inverter is running, the temperature of the chassis and heat sink will be higher, Do not install the inverter in a location that you accidentally touch.
 - Do not install the inverter in a place where it is stored in a flammable or explosive material.
2. Installation angle
 - Please install the inverter vertically. If the inverter cannot be mounted vertically, it may be tilted backward to 15 degrees from vertical.



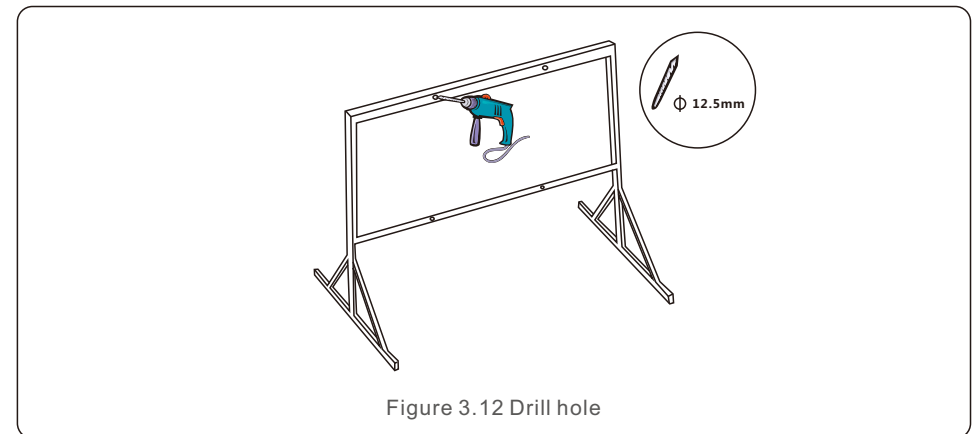
3. Installation

3. Install mounting plate

- 1) Remove the bracket and fasteners from the packaging. Mark the position for hole, drilling according to the hole positions of the bracket.



- 2) Drill the marked holes. It is recommended to apply anti-corrosive paint at the hole for corrosion protection.



3. Installation

3) Align the mounting plate with the holes, Insert the combination bolt (M10X40) through the mounting plate into the hole. Secure the bracket to the metal frame firmly with the supplied fastener. Torque the nut to 30Nm-35Nm (22.13 ft.lbs-25.82 ft.lbs).

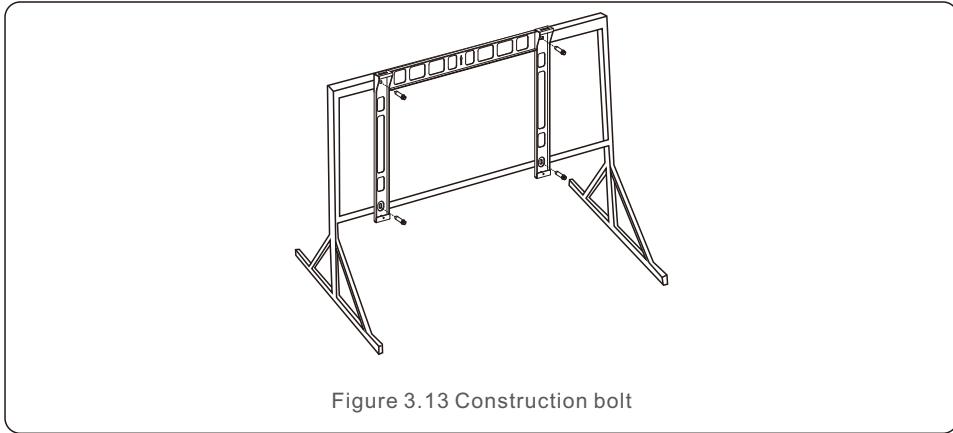


Figure 3.13 Construction bolt

4) Lift the inverter above the bracket and then slide down to make sure they match perfectly.

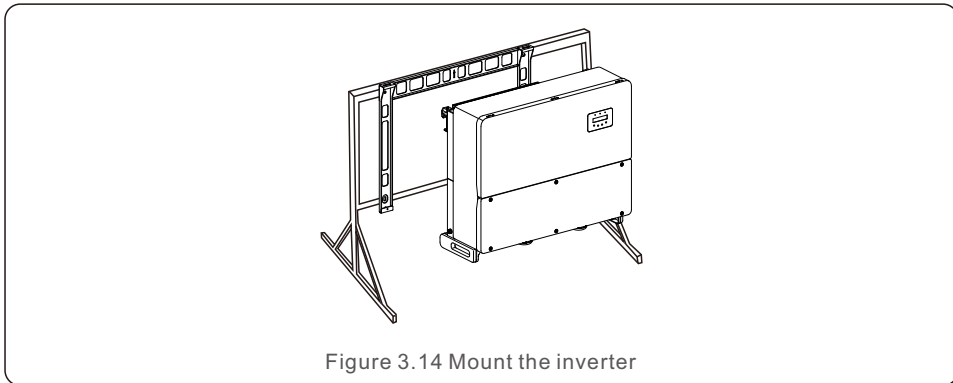


Figure 3.14 Mount the inverter

3. Installation

3.4 Electrical Connections

The inverter is designed with a wiring box at the bottom. Before the electrical connection, it requires the cover for the bottom wiring box to be removed. Table 3.1 describes the information about the components in the wiring box. All wiring must meet the local or national standards.

Parts	Connection	Cable size	Torque
DC terminal	PV String	12 AWG (Max185mm ²) (Recommend 70mm ²)	7.4-14.7 ft.lbs
Ground terminal	AC Ground	6 AWG (Max185mm ²) (At least 1/2 of AC Grid)	7.4-14.7 ft.lbs
Grid terminal	AC Grid	2 AWG (Max185mm ²) (Recommend 70mm ²)	7.4-14.7 ft.lbs
RS-485 terminal	Communication cable	24-15AWG	1.2-1.5 ft.lbs
RJ45 terminal	Communication cable	Network cable	NA
COM terminal	Wi-Fi/Cellular stick	NA	NA
DC surge protection device	NA	NA	NA

Table 3.1 Electrical connection

The electrical connection of the inverter must follow the steps listed below:

1. Switch the Grid Supply Main Switch (AC) OFF.
2. Switch the DC Isolator OFF.
3. Connect the AC wires.
4. Connect the DC wires.

3. Installation

3.4.1 Grounding

To effectively protect the inverter, two grounding methods must be performed.
Connect the AC grounding cable (Please refer to section 3.4.3)
Connect the external grounding terminal.

To connect the grounding terminal on the heat sink, please follow the steps below:

- 1) Prepare the grounding cable: recommend to use the outdoor copper-core cable. The grounding wire should be at least half size of the hot wires.
- 2) Prepare OT terminals: M10.



Important:

For multiple inverters in parallel, all inverters should be connected to the same ground point to eliminate the possibility of a voltage potential existing between inverter grounds.

- 3) Strip the ground cable insulation to a suitable length(see Figure 3.15).

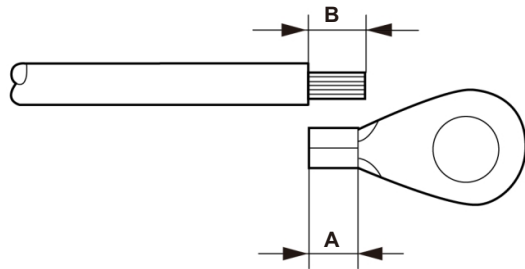


Figure 3.15 Suitable length



Important:

B (insulation stripping length) is 0.08in~0.12in longer than A (OT cable terminal crimping area) 0.08in~0.12in.

3. Installation

- 4) Insert the stripped wire into the OT terminal crimping area and use the hydraulic clamp to crimp the terminal to the wire (see Figure 3.16).

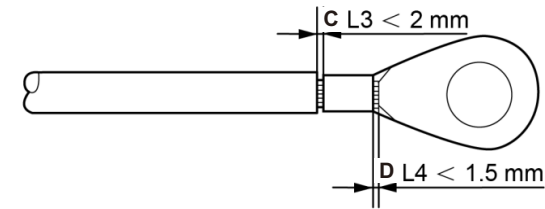


Figure 3.16 Strip wire



Important:

After crimping the terminal to the wire, inspect the connection to ensure the terminal is solidly crimped to the wire.

- 5) Remove the screw from the heat sink ground point.
- 6) Connect the grounding cable to the grounding point on the heat sink, and tighten the grounding screw, Torque is 7.4-14.7 ft.lbs(see figure 3.17).

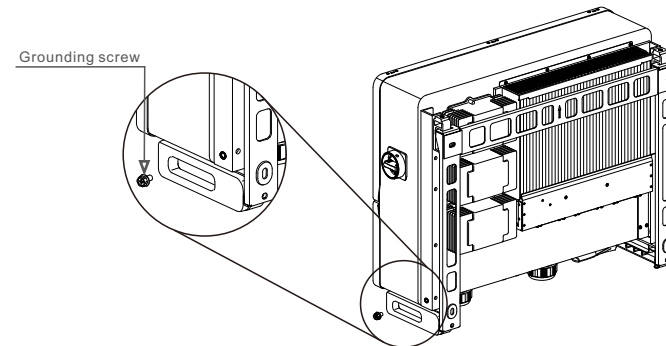


Figure 3.17 Fixed cable



Important:

For improving anti-corrosion performance, after ground cable installed, apply silicone or paint.

3. Installation

3. Installation

3.4.2 Connect PV side of inverter



WARNING

Before connecting the inverter, make sure the PV array open circuit voltage is within the limit of the inverter. Otherwise, the inverter could be damaged.



WARNING

DO NOT connect the PV array positive or PV array negative cable to ground. This can cause serious damage to the inverter!



WARNING

MAKE SURE the polarity of the PV array output conductors matches the DC- and DC+ terminal labels before connecting these conductors to the terminals of the inverter.



Please use appropriate DC cable for PV system.

1. Measure the PV voltage of the DC inputs with multimeter, verify DC input cable polarity.
2. Strip the DC cables insulating layer with a proper length.

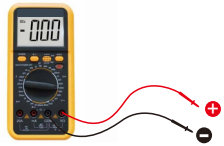


Figure 3.18 Multimeter measurement

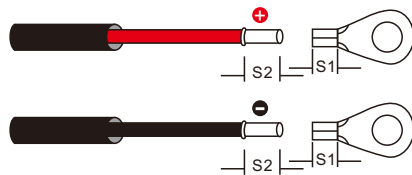


Figure 3.19 Multimeter measurement



NOTE:

S2 (insulation stripping length) is 0.08in~0.12in longer than S1. (OT cable terminal crimping area)

3. Strip the insulation of the wire past the cable crimping area of the OT terminal, then use a hydraulic crimp tool to crimp the terminal. The crimped portion of the terminal must be insulated with heat shrinkable tube or insulating tape.

4. Insert the cable through the nut, sheath, and DC terminal cover. Connect the cable to the DC terminal block in turn, using a socket wrench. Tighten the screws on the terminal block. The torque is 7.4-14.7 ft.lbs.

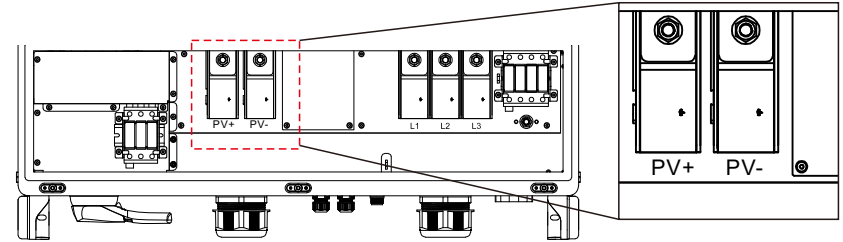


Figure 3.20 wiring

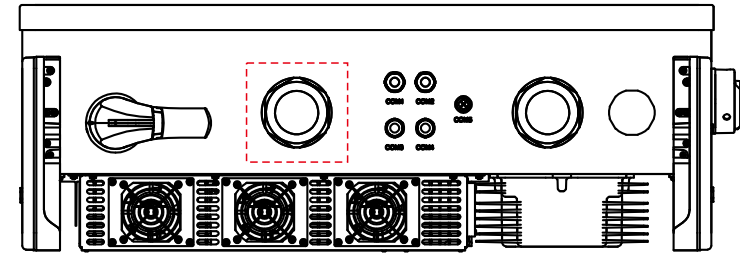


Figure 3.21 Connect the DC Connectors to the Inverter



Caution:

If DC inputs are accidentally reversely connected or inverter is faulty or not working properly, it is NOT allowed to turn off the DC switch as it will damage the inverter and even leads to a fire disaster.

The correct actions are:

- *Use a clip-on ammeter to measure the DC string current.
- *If it is above 0.5A, please wait for the solar irradiance reduces until the current decreases to below 0.5A.
- *Only after the current is below 0.5A, you are allowed to turn off the DC switches and disconnect the PV strings.

Please note that any damages due to wrong operations are not covered in the device warranty.

3. Installation

Requirements for the PV modules per MPPT input:

- All PV modules must be of the same type and power rating.
- All PV modules must be aligned and tilted identically.
- The open-circuit voltage of the PV array must never exceed the maximum input voltage of the inverter, even at the coldest expected temperature. (see Section 9 “Specifications” for input current and voltage requirements)
- Each string connected to a single MPPT must consist of the same number of series-connected PV modules.

3.4.2.1 DC connection high voltage danger notice



CAUTION
RISK OF ELECTRIC SHOCK

Do not touch an energized DC conductor. There are high voltages present when PV modules are exposed to light causing a risk of death due to an electric shock from touching a DC conductor!

Only connect the DC cables from the PV module to the inverter as described in this manual.



CAUTION
POTENTIAL DAMAGE TO THE INVERTER DUE TO OVERVOLTAGE

The DC input voltage of the PV modules must not exceed the maximum rating of the inverter. (see Section 9 “Specifications”)

Check the polarity and the open-circuit voltage of the PV strings before connecting the DC cables to the inverter.

Confirm proper string length and voltage range before connecting DC cable to the inverter.

3. Installation

3.4.3 Connect grid side of inverter



WARNING
An over-current protection device must be used between the inverter and the grid.

- 1). Connect the three (3) AC conductors to the three (3) AC terminals marked “L1”, “L2” and “L3”. Refer to local code and voltage drop tables to determine the appropriate wire size and type.
- 2). Connect the grounding conductor to the terminal marked “PE” (protective earth, the ground terminal).



NOTE
The AC output neutral is not bounded to the ground.
The neutral wire is not necessary for the installation.

Over-Current Protection Device (OCPD) for the AC side

To protect the inverter's AC connection line, we recommend installing a device for protection against over-current and leakage, with the following characteristics noted in Table 3.2:



NOTE
Use AL-CU transfer (bi-metallic) terminal or anti-oxidant grease with aluminum cables and terminals.

Inverter	Rated voltage(V)	Max output current (Amps)	Current for protection device (A)
Solis-125K1-EHV-5G	600	120	150(265A Max)

Table 3.2 Rating of grid OCPD

3.4.3.1 Connecting the inverter to the utility grid

All electrical installations must be carried out in accordance with the local standards and the National Electrical Code® ANSI/NFPA 70 or the Canadian Electrical Code® CSA C22.1. The AC and DC electric circuits are isolated from the enclosure. If required by section 250 of the National Electrical Code®, ANSI/NFPA 70, the installer is responsible for grounding the system.

The grid voltage must be within the permissible range. The exact operating range of the inverter is specified in Section 9 “Specifications”.

3. Installation

3.4.3.2 Wiring procedure



CAUTION
RISK OF ELECTRIC SHOCK. Prior to starting the wiring procedure, ensure that the three-pole circuit breaker is switched off and cannot be reconnected.



NOTE
Damage or destruction of the inverter's electronic components due to moisture and dust intrusion will occur if the enclosure opening is enlarged.



CAUTION
Risk of fire if two conductors are connected to one terminal. If a connection of two conductors to a terminal is made, a fire can occur. NEVER CONNECT MORE THAN ONE CONDUCTOR PER TERMINAL.



NOTE
Use M10 crimp terminals to connect to the inverter AC terminals.

The steps to assemble the AC grid terminals are listed as follows:

1. Strip the end of AC cable insulating jacket about 300mm then strip the end of each wire.

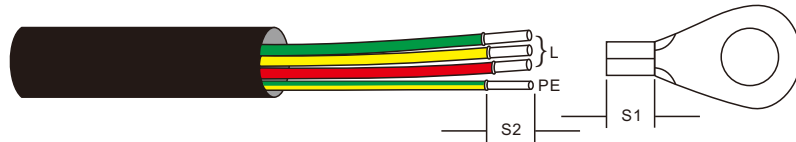


Figure 3.22 Strip AC cable



NOTE:
S2 (insulation stripping length) is 2mm-3mm longer than S1. (OT cable terminal crimping area)

2. Strip the insulation of the wire past the cable crimping area of the OT terminal, then use a hydraulic crimp tool to crimp the terminal. The crimped portion of the terminal must be insulated with heat shrinkable tube or insulating tape.



NOTE:
If choosing aluminum alloy cable, you must use copper aluminum transfer terminal or an anti-oxidant grease in order to avoid direct contact between copper bar and Aluminum alloy cable. (Please select a copper aluminum transfer terminal based on your cable specification).

3. Installation

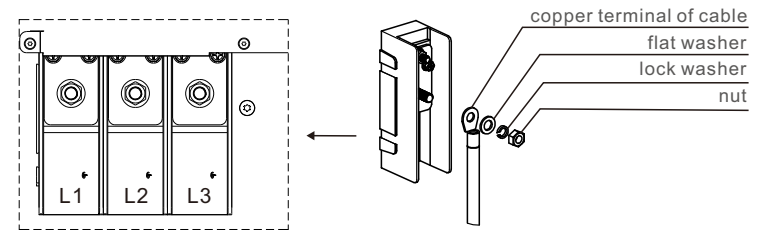


Figure 3.26 AC terminal installation

3. Leave the AC breaker disconnected to ensure it does not close unexpectedly.
4. Remove the 6 screws on the inverter junction box and remove the junction box cover .

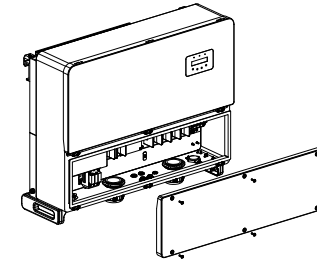


Figure 3.24 Remove the junction box cover

5. Insert the cable through the nut, sheath, and AC terminal cover. If using conduit, remove plastic nut to expose hole for conduit connection. Connect the cable to the AC terminal block. Tighten the screws on the terminal block. The torque is 7.4-14.7 ft.lbs.

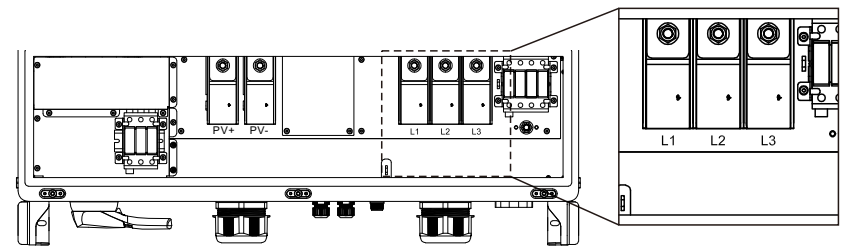


Figure 3.25 wiring

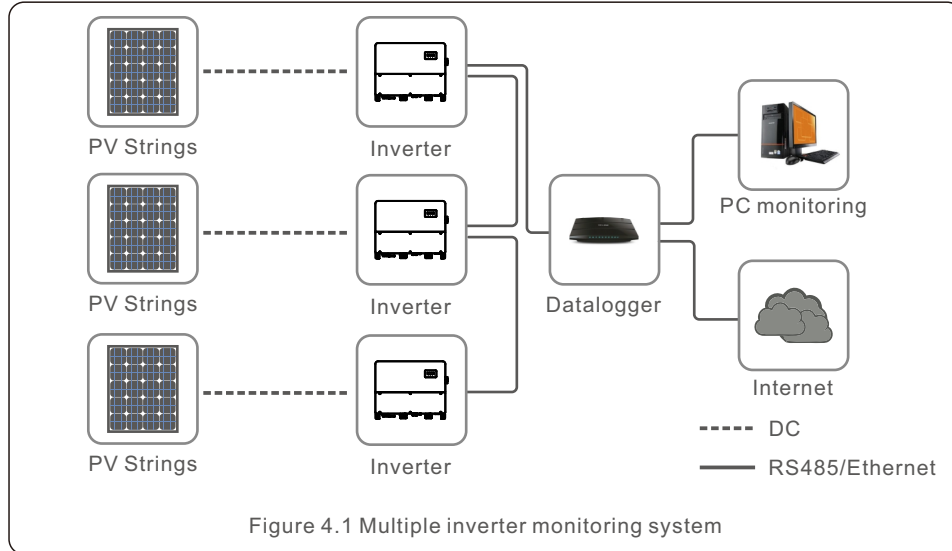
4. Comm. & Monitoring

4. Comm. & Monitoring

There are 5 communication terminals on Solis 125kW inverter. COM1 is a 4-pin connector reserved for WiFi/Cellular datalogger. COM2 and COM3 are RS485 connection between inverters and both RJ45 and Terminal block are provided for use. COM4 and COM5 are the Ethernet connection via RJ45.

Monitoring system for multiple inverters

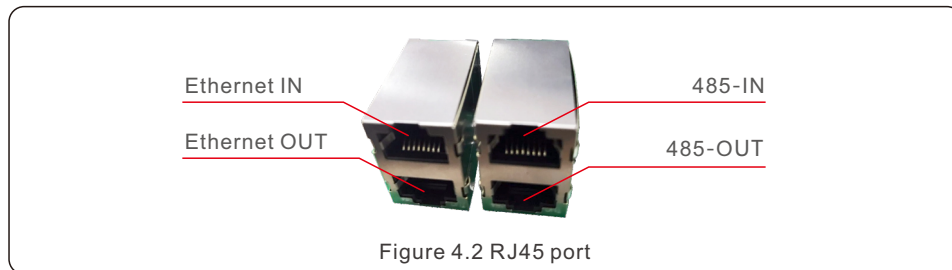
Multiple inverters can be monitored through RS-485 and Ethernet daisy chain configuration.



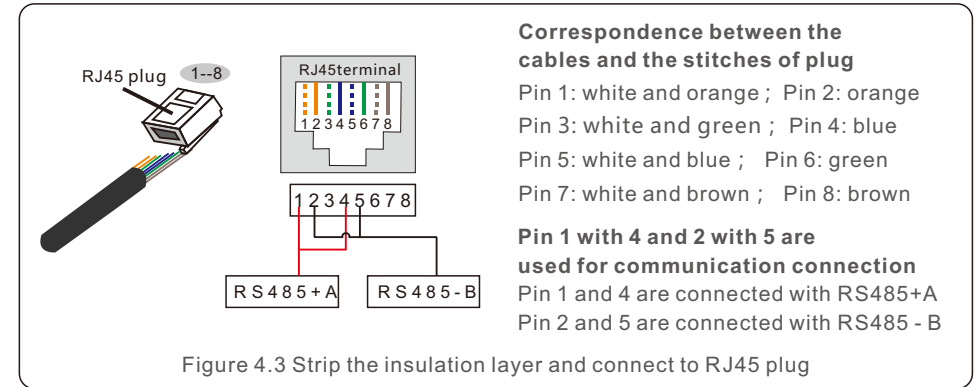
4.1 RS485 communication

RS-485 communication uses MODBUS RTU Standard and supports two connection methods: RJ45 connectors and Terminal board.

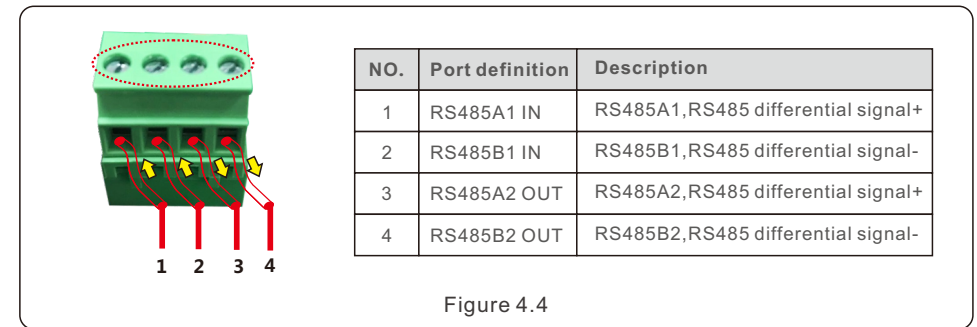
1. RS-485 communication through RJ45 connector (See figure 4.2). CAT 5E outdoor rated (cable outer diameter<9mm, internal resistance51.5 Q /1 Om) and shielded RJ45 connectors are recommended.



Use the network wire stripper to strip the insulation layer off the communication cable. Using the standard wire sequence referenced in TIA/EIA 568B, separate the wires in the cable. Use a network cable tool to trim the wire. Flatten the wire in the order shown in figure 4.3.



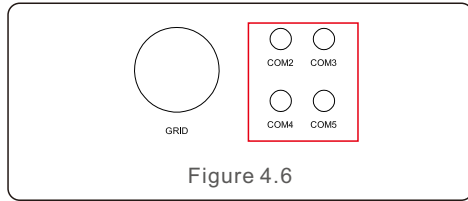
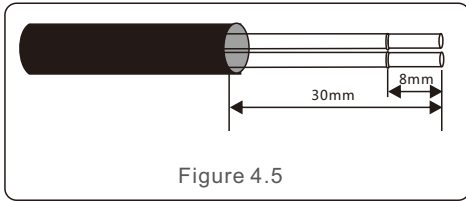
2. RS-485 communication through terminal board. The cross sectional area of the cable wire for terminal board connection should be 0.2-1.5mm. The outer diameter of the cable may be 5mm-10mm.



4. Comm. & Monitoring

Connection of Terminal board.

- a. Strip the insulation and shield to a suitable length. Use diagram below as a guide. (in Figure 4.5).
- b. Remove the cap nut from the waterproof cable glands labeled at the bottom of the inverter. Remove the plug from the fitting. (in Figure 4.6).



- c. Insert the cable through the cap nut for each port. COM2(RS485 IN) COM3(RS485 OUT).
- d. Pull down the terminal block on user interface board(See Figure 4.5).
- e. Firstly insert cable into terminal board, then tighten the screws (dotted area) clockwise with slotted screwdriver; if user need to pull out cable, screws rotates anticlockwise with slotted screwdriver(See Figure 4.5).
- f. Please insert terminal board into terminal block, then will be clamped automatically.

4.2 Ethernet communication

Use the RJ45 connectors to perform the Ethernet communication which supports the Solis Monitoring Platform and Modbus TCP protocol(Both By Default).



NOTE:

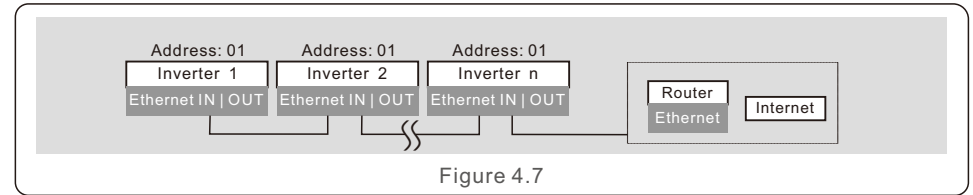
When creating daisy chain for Ethernet communication, **all inverters' slave address must be set to 01.**

CAT 5E outdoor rated (cable outer diameter<9mm, internal resistance≤1.5Ω/10m) and shielded RJ45 connectors are recommended.

The default setting of inverter Ethernet module is DHCP. If a static address is desired, please refer to the second point below.

Daisy chain is required for multiple inverter communication through ethernet as shown below.

4. Comm. & Monitoring



NOTE:

Laptop is required for onsite Ethernet communication commissioning.

If the router doesn't support automatic IP address, use an Ethernet cable to connect the Ethernet module and your laptop. Change the Laptop's IP address as 10.10.100.253 and then use a web browser to navigate to 10.10.100.254.

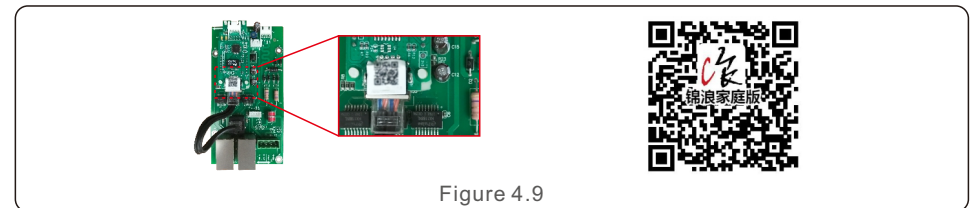
System	Device information	
Work mode	Type	Embedded Ethernet
Network	SN	1909583738
Manual	Firmware version	ME-121001-V1.0.6(20200612800)
Restart	Current tiom (Time zone)	Fri Nov 06 2020 16:14:31 GMT+0800
Reset	Working time	116 Second
Upgrade	Error	0

NOTE: Laptop IP Configuration

The laptop must be manually configured to set internal IP address to one in scope of the LAN module in the inverter. The process will vary depending on your operating system. Consult the documentation for your operating system to configure a static IP address for the laptop. Suggested IP address is 10.10.100.253.

1. Monitoring Platform Solis monitoring only(DHCP)

Connect in daisy chain configuration see Figure 4.7. Use the SN/QR code on the board to register the system on Solis monitoring website or APP. See APP for details.



2. Monitoring Platform Solis monitoring only(Static IP)

1. Connect laptop directly to Ethernet module with Ethernet cable.
2. Configure laptop IP address and navigate to 10.10.100.254 via web browser.
Enter username and password (admin,admin).
3. Select Network from left menu.
4. Select Use IP address below radio button.
Enter IP address, subnet mask and default gateway. Click Save.
5. Confirm by changing laptop to new IP address in range of inverter IP address and navigate to new inverter IP address.

3. Modbus TCP with DHCP

1. Connect laptop directly to Ethernet module with Ethernet cable.
2. Configure laptop IP address and navigate to 10.10.100.254 via web browser.
Enter username and password (admin,admin).
3. Select Work Mode from left menu. Change Work Mode to LOCAL and Protocol Type to MODBUS TCP
4. Connect inverters in daisy chain configuration see Figure 4.7. An IP address will be assigned by the DHCP server. Refer to router configuration pages to find assigned IP address.

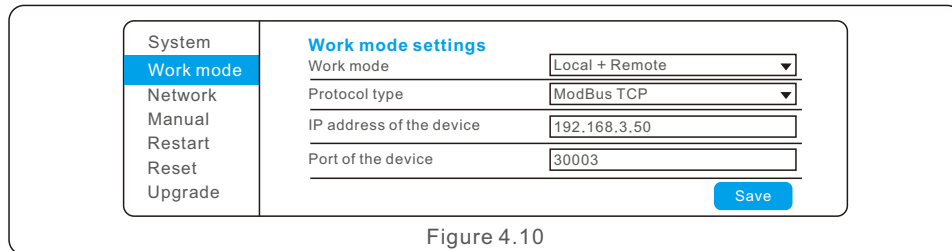


Figure 4.10

4. Modbus TCP with static IP

1. Connect laptop directly to Ethernet module with Ethernet cable.
2. Configure laptop IP address and navigate to 10.10.100.254 via web browser.
Enter username and password (admin,admin).
3. Select Work Mode from left menu. Change Work Mode to LOCAL and Protocol Type to MODBUS TCP
4. Select Network from left menu.
5. Select Use IP address below radio button.
Enter IP address, subnet mask and default gateway. Click Save.
6. Confirm by changing laptop to new IP address in range of inverter IP address and navigate to new inverter IP address.

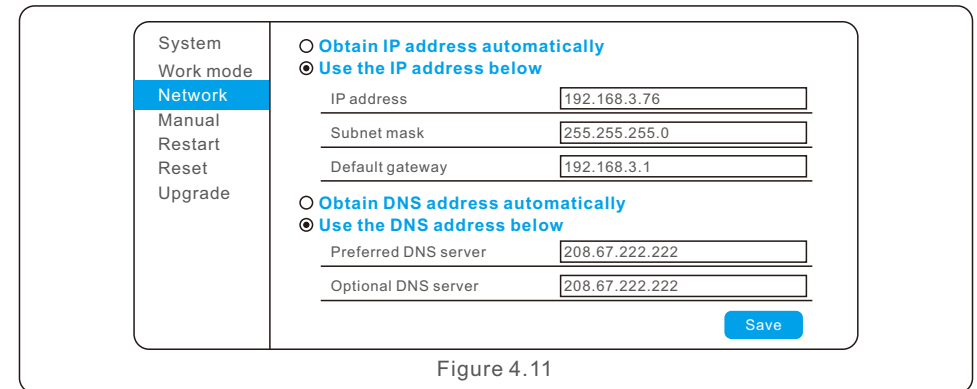


Figure 4.11

5. Ethernet Module LED Indicators

D1 Red LED: Indicator between module and inverter.

Constantly ON indicates normal connection.

Blinking indicates it is trying to connect.

OFF indicates connection failed.

Constantly ON but blinking sometimes indicates it is transferring data between inverter.

D2 Red LED: Indicator between module and server.

Constantly ON indicates normal connection.

Blinking indicates it is trying to connect.

OFF indicates connection failed.

Constantly ON but blinking sometimes indicates it is transferring data between the server.

D3 Green LED: Module power light.

Constantly ON indicates power supply normal.

OFF indicates power supply abnormal.

D1 and D2 slowly blinking alternately or slowly blinking synchronously indicates abnormal network issue.

D1 and D2 both OFF with D3 ON indicates the module is initializing.

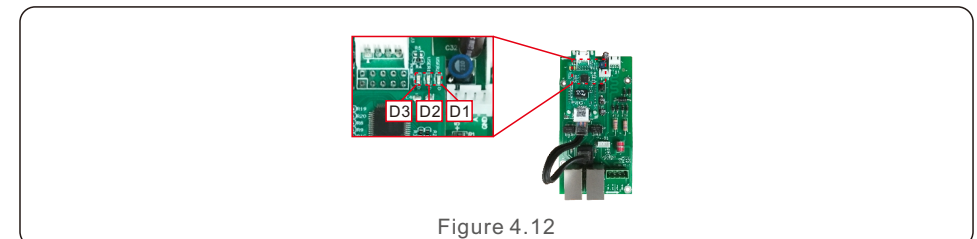


Figure 4.12

5. Commissioning

5.1 Selecting the appropriate grid standard

5.1.1 Verifying grid standard for country of installation

Solis inverters are used worldwide and feature preset standards for operating on any grid. Although the grid standard is set at the factory, it is essential the grid standard be verified for the country of installation before commissioning.

The menu for changing the grid standard or for creating a custom standard is accessible as described in Section 6.7 and below.



WARNING

Failure to set the correct grid standard could result in improper operation of the inverter, inverter damage or the inverter not operating at all.

5.2 Changing the grid standard

5.2.1 Procedure to set the grid standard



NOTE

This operation is for service technicians only. The inverter is customized according to the local grid standard before shipping. There should be no requirement to set the standard.



NOTE

The "User-Def" function can only be used by the service engineer. Changing the protection level must be approved by the local utility.

- 1). From the main screen on the display, select ENTER. There are 4 sub-menu options, use the UP/DOWN arrows to highlight ADVANCED SETTINGS. Press enter to select.



Figure 5.1

- 2). The screen will show that a password is required. The default password is "0010", press the DOWN key to move cursor, press the UP key to change the highlighted digit.



Figure 5.2

5. Commissioning

- 3). Use the UP/DOWN keys to highlight the SELECT STANDARD option. Press enter to select.



Figure 5.3

- 4). Select the grid standard for the country of installation.

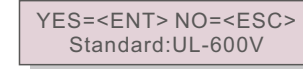


Figure 5.4

Press the UP or DOWN key to select the standard. Press the ENTER key to confirm the setting. Press the ESC key to cancel changes and return to the previous menu. UL-600V, R21P3-600, ISONE600 are available for U.S. and Canada markets.

5.3 Setting a custom grid standard



WARNING

- Failure to set the correct grid standard could result in improper operation of the inverter, inverter damage or the inverter not operating at all.
- Only certified personnel should set the grid standard.
- Only set the grid configuration that is approved by your location and national grid standards.

- 1). Please refer to section 6.7 "Advanced Settings" for procedures to create a custom grid configuration for User-Def menu option.

5. Commissioning

5.4 Preliminary checks



WARNING

High Voltage.
AC and DC measurements should be made only by qualified personnel.

5.4.1 DC Connections

Verify DC connections.

- 1). Lightly tug on each DC cable to ensure it is fully captured in the terminal.
- 2). Visually check for any stray strands that may not be inserted in the terminal.
- 3). Check to ensure the terminal screws are the correct torque.

5.4.2 AC Connections

Verify AC connections.

- 1). Lightly tug on each AC cable to ensure it is fully captured in the terminal.
- 2). Visually check for any stray strands that may not be inserted in the terminal.
- 3). Check to ensure the terminal screws are the correct torque.

5.4.3 DC configuration

Verify DC configuration by noting the number of panels in a string and the string voltage.

5.4.3.1 VOC and Polarity

Measure VOC, and check string polarity. Ensure both are correct and VOC is in specification.

5.4.3.1.1 Check string voltage

To measure the open circuit voltage (VOC) and polarity of the individual strings, perform the following steps:



WARNING

If there is a voltage difference between the parallel strings such as different string lengths, current will flow between the parallel strings.
Damage to equipment and/or injury to personnel may occur in this instance.

- 1). Connect the positive lead of the meter to the positive string cable of the string under test.
- 2). Connect the negative lead of the meter to the negative string cable of the string under test.

5. Commissioning

- 3). Measure the voltage present between the positive and negative wires of each string.
If the open circuit voltage of the string is near the maximum value accepted by the inverter, verify the string length. Low ambient temperatures cause an increase in the string voltage causing potential damage to the inverter.
- 4). Check the polarity of the string. All digital meters have a negative ("-") indicator that indicates when a voltage is negative; in this case a string connected in reverse polarity.



WARNING

Input voltages higher than the maximum value accepted by the inverter (see "Specifications" in Section 9) may damage the inverter.
Although Solis inverters feature reverse polarity protection, prolonged connection in reverse polarity may damage these protection circuits and/or the inverter.

5.4.3.2 Leakage to ground

Measure leakage to ground to check for a DC ground fault.

5.4.3.2.1 Detection of leakage to ground

Solis inverters are transformer-less and do not have an array connection to ground. Any measurement of a fixed voltage between ground and either the positive or negative string wiring indicates a leakage (ground fault) to ground and must be corrected prior to energizing the inverter or damage to the inverter may result.

To measure leakage to ground, perform the following steps:

- 1). Ensure that neither negative nor positive DC conductors are connected to the ground strip.
- 2). Measure each string positive connection to ground.
- 3). Measure each string negative connection to ground.
- 4). Measure each string negative connection to ground.
- 5). Verify the voltage is "floating", not a consistent voltage to ground.

Make sure you notice the units of the measurement. mV is not the same as V.

- 6). Do not connect the strings if a leakage to ground has been detected. Improper operation and damage to the inverter may result.

5. Commissioning

5.4.4 AC configuration

Verify AC configuration.

5.4.4.1 Measure VAC and frequency

Measure VAC and verify voltage is within local grid standards.

- 1). Measure each phase to ground (L-G).
- 2). Measure phases to the other phases in pairs (L-L). PHA to PH B, PH B to PH C and PH C to PHA.
- 3). If the meter is equipped, measure the frequency of each phase to ground.
- 4). Ensure each measurement is within local grid standards and the inverter specifications as noted in Section 9 "Specifications".

5.4.4.2 Phase rotation test

A phase rotation test is recommended to ensure the phases have been connected in the appropriate order. Solis inverters do not require a specific phase rotation connection. However, the local utility may require a specific phase rotation or a record of the phase configuration of the installation.

6. Normal operation

6.1 Start-up procedure

To start-up the inverter, it is mandatory that the steps below are followed in the exact order outlined.

- 1). Ensure the commissioning checks in Section 5 have been performed.
- 2). Switch the AC switch ON.
- 3). Switch the DC switch ON. If the PV array (DC) voltage is higher than the inverter's start-up voltage, the inverter will turn on. The red DC POWER LED and LCD will be continuously lit.
- 4). Solis inverters are powered from the DC side. When the inverter detects DC power that is within start-up and operating ranges, the inverter will turn on. After turn-on, the inverter will check internal parameters, sense and monitor AC voltage, hertz rate and the stability of the supply grid. During this period, the green OPERATION LED will flash and the LCD screen will show INITIALIZING. This tells the operator that the inverter is preparing to generate AC power.
- 5). After the locally mandated delay (300 seconds for IEEE-1547 compliant inverters), the inverter will start generating AC power. The green OPERATION LED will light continuously and the LCD screen will show GENERATING.



CAUTION

The inverter's surface temperature can reach up to 75°C (167° F). To avoid risk of burns, do not touch the surface when the inverter is in the operational mode. Additionally, the inverter must be installed out of the reach of children.

6.2 Shutdown procedure

To stop the inverter, it is mandatory that the steps below are followed in the exact order outlined.

- 1). Switch AC switch OFF.
- 2). Wait approximately 30 seconds (during this time, the AC side capacitors are dissipating energy). If the inverter has DC voltage above the start-up threshold, the red POWER LED will be lit. Switch the DC switch OFF.
- 3). Confirm all LED's switch OFF (~one (1) minute).

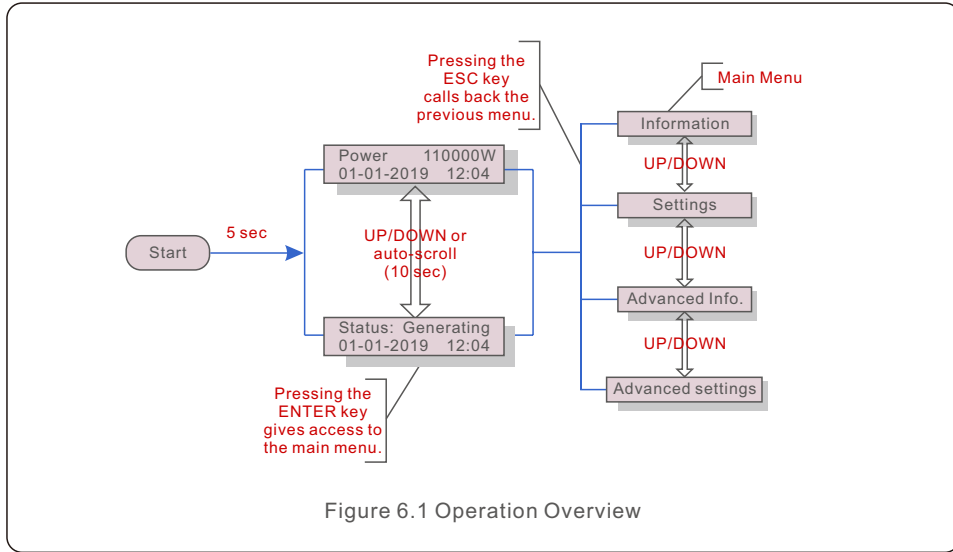


CAUTION

Although the inverter DC disconnect switch is in the OFF position and all the LED's are OFF, operators must wait five (5) minutes after the DC power source has been disconnected before opening the inverter cabinet. DC side capacitors can take up to five (5) minutes to dissipate all stored energy.

6. Normal operation

In normal operation, LCD screen alternatively shows inverter power and operation status (see Figure 6.1). The screen can be scrolled manually by pressing the UP/DOWN keys. Pressing the ENTER key gives access to Main Menu.



6.3 Main Menu

There are four submenus in the Main Menu (see Figure 6.1):

1. Information
2. Settings
3. Advanced Info.
4. Advanced Settings

6.4 Information

The Solis three Phase Inverter main menu provides access to operational data and information. The information is displayed by selecting "Information" from the menu and then by scrolling up or down.

6. Normal operation

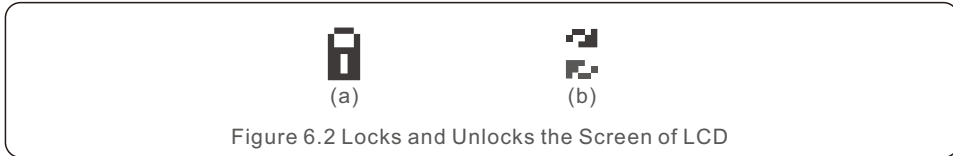
Display	Duration	Description
VPV_Total: 1000.0V IPV_Total: +99.0A	10 sec	VPV_Total: Shows input voltage total. IPV_Total: Shows input current total.
V_A: 345.7V I_A: 109.0A	10 sec	V_A: Shows the grid's voltage value. I_A: Shows the grid's current value.
V_C: 345.0V I_C: 109.8A	10 sec	V_C: Shows the grid's voltage value. I_C: Shows the grid's current value.
Status: Generating Power: 1488W	10 sec	Status: Shows instant status of the Inverter. Power: Shows instant output power value.
Rea_Power: 000Var App_Power: VA	10 sec	Rea_Power: Shows the reactive power of the inverter. App_Power: Shows the apparent power of the inverter.
Grid Frequency F_Grid 50.06Hz	10 sec	F_Grid: Shows the grid's frequency value.
Total Energy 0258458 kwh	10 sec	Total generated energy value.
This Month: 0123kwh Last Month: 0123kwh	10 sec	This Month: Total energy generated this month. Last Month: Total energy generated last month.
Today: 15.1kwh Yesterday: 13.5kwh	10 sec	Today: Total energy generated today. Yesterday: Total energy generated yesterday.
Inverter SN 00000000000000	10 sec	Display series number of the inverter.
Work Mode: Volt-watt DRM NO.:08	10 sec	Work Mode: Shows current working mode. DRM NO.: Shows DRM Number.

Table 6.1 Information list

6. Normal operation

6.4.1 Lock Screen

Pressing the ESC key returns to the Main Menu. Pressing the ENTER key locks (Figure 6.2(a)) or unlocks (Figure 6.2 (b)) the screen.



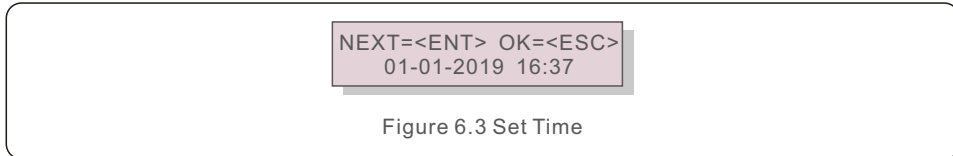
6.5 Settings

The following submenus are displayed when the Settings menu is selected:

- 1.Set Time
- 2.Set Address

6.5.1 Set Time

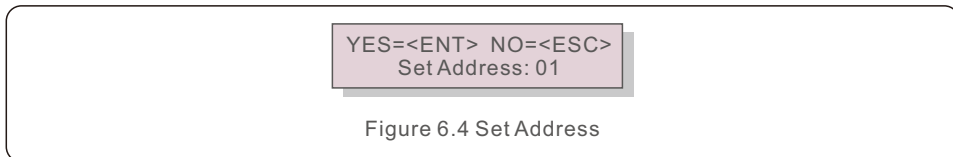
This function allows time and date setting. When this function is selected, the LCD will display a screen as shown in Figure 6.3.



Press the UP/DOWN keys to set time and data. Press the ENTER key to move from one digit to the next (from left to right). Press the ESC key to save the settings and return to the previous menu.

6.5.2 Set Address


This function is used to set the address when muti inverters are connected to three monitor. The address number can be assigned from "01"to "99"(see Figure 6.4). The default address number of Solis Three Phase Inverter is "01".



Press the UP/DOWN keys to set the address. Press the ENTER key to save the settings. Press the ESC key to cancel the change and return to the previous menu.

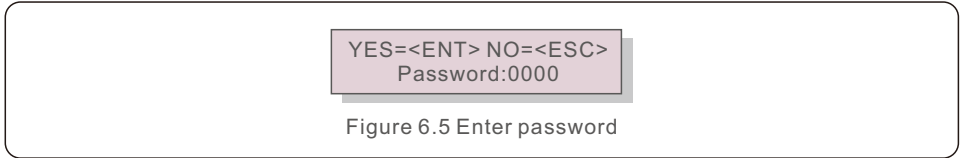
6. Normal operation

6.6 Advanced Info - Technicians Only



NOTE:
To access to this area is for fully qualified and accredited technicians only. Enter menu "Advanced Info." and "Advanced settings" (need password) .

Select "Advanced Info." from the Main Menu. The screen will require the password as below:



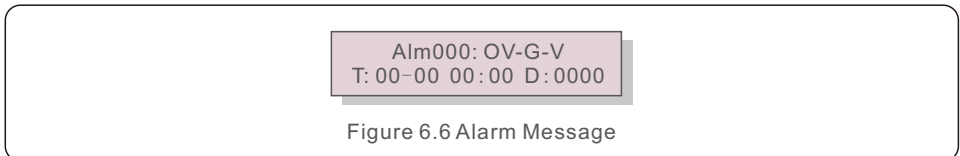
After enter the correct password the Main Menu will display a screen and be able to access to the following information.

- 1.Alarm Message
- 2. Running message
- 3.Version
- 4. Daily Energy
- 5. Monthly Energy
- 6. Yearly Energy
- 7. Daily Records
- 8.Communication Data
- 9. Warning Message

The screen can be scrolled manually by pressing the UP/DOWN keys. Pressing the ENTER key gives access to a submenu. Press the ESC key to return to the Main Menu.

6.6.1 Alarm Message

The display shows the 100 latest alarm messages (see Figure 6.6). Screens can be scrolled manually by pressing the UP/ DOWN keys. Press the ESC key to return to the previous menu.



6.6.2 Running Message

This function is for maintaince person to get running message such as internal temperature, Standard No.1,2,etc.

Screens can be scrolled manually by pressing the UP/DOWN keys.

6. Normal operation

6.6.3 Version

The screen shows the model version of the inverter. And the screen will show the software ver by pressing the UP and DOWN at the same time. (see Figure 6.7).



Model: 08
Software Version: D20001

Figure 6.7 Model Version and Software Version

6.6.4 Daily Energy

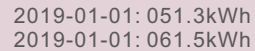
The function is for checking the energy generation for selected day.



YES=<ENT> NO=<ESC>
Select: 2019-01-01

Figure 6.8 Select date for daily energy

Press DOWN key to move the cursor to day, month and year, press UP key to change the digit. Press Enter after the date is fixed.



2019-01-01: 051.3kWh
2019-01-01: 061.5kWh

Figure 6.9 Daily energy

Press UP/DOWN key to move one date from another.

6.6.5 Monthly Energy

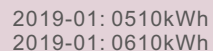
The function is for checking the energy generation for selected month.



YES=<ENT> NO=<ESC>
Select: 2019-01

Figure 6.10 Select month for monthly energy

Press DOWN key to move the cursor to day and month, press UP key to change the digit. Press Enter after the date is fixed.



2019-01: 0510kWh
2019-01: 0610kWh

Figure 6.11 Month energy

6. Normal operation

6.6.6 Yearly Energy

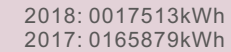
The function is for checking the energy generation for selected year.



YES=<ENT> NO=<ESC>
Select: 2019

Figure 6.12 Select year for yearly energy

Press DOWN key to move the cursor to day and year, press UP key to change the digit. Press Enter after the date is fixed.



2018: 0017513kWh
2017: 0165879kWh

Figure 6.13 Yearly energy

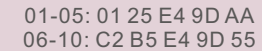
Press UP/DOWN key to move one date from another.

6.6.7 Daily Records

The screen shows history of changing settings. Only for maintenance personnel.

6.6.8 Communication Data

The screen shows the internal data of the Inverter (see Figure 6.14), which is for service technicians only.

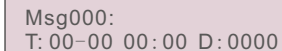


01-05: 01 25 E4 9D AA
06-10: C2 B5 E4 9D 55

Figure 6.14 Communication Data

6.6.9 Warning Message

The display shows the 100 latest warn messages (see Figure 6.15). Screens can be scrolled manually by pressing the UP/ DOWN keys. Press the ESC key to return to the previous menu.



Msg000:
T: 00-00 00:00 D: 0000

Figure 6.15 Warning Message

6. Normal operation

6.7 Advanced Settings - Technicians Only



NOTE:

To access this area is for fully qualified and accredited technicians only. Please follow 6.4 to enter password to access this menu.

Select Advanced Settings from the Main Menu to access the following options:

1. Select Standard
2. Grid ON/OFF
3. Clear Energy
4. Reset Password
5. Power Control
6. Calibrate Energy
7. Special Settings
8. STD. Mode Settings
9. Restore Settings
10. HMI Update
11. Restart HMI
12. Debug Parameter
13. Fan Test
14. DSP Update
15. Compensation Set

6.7.1 Selecting Standard

This function is used to select the grid's reference standard (see Figure 6.16).

YES=<ENT> NO=<ESC>
Standard:UL-600V

Figure 6.16

Selecting the "User-Def" menu will access to the following submenu (see Figure 6.17),

→ OV-G-V1: 400V
OV-G-V1-T: 1.0S

Figure 6.17

Below is the setting range for "User-Def". Using this function, the limits can be changed manually. (These voltage values are the phase voltage)

6. Normal operation

OV-G-V1: 300---480V	OV-G-F1: 50.2-63Hz
OV-G-V1-T: 0.01---9S	OV-G-F1-T: 0.01---9S
OV-G-V2: 300---490V	OV-G-F2: 51-63Hz
OV-G-V2-T: 0.01---1S	OV-G-F2-T: 0.01---9S
UN-G-V1: 173---336V	UN-G-F1: 47-59.5Hz
UN-G-V1-T: 0.01---9S	UN-G-F1-T: 0.01---9S
UN-G-V2: 132---319V	UN-G-F2: 47-59Hz
UN-G-V2-T: 0.01---1S	UN-G-F2-T: 0.01---9S
Startup-T: 10-600S	Restore-T: 10-600S

Table 6.2 Setting ranges for User-Def (L-N)



NOTE

The initial value of the User-Def standard is for reference only. It does not represent a correct value suitable for use.

Setting value	600V Rated (L-L)	600V Rated (L-N)
Vup-Limit1	660<V<720	381<V<415
Time1	1S	1S
Vup-Limit2	V≥720	V≥415
Time2	0.16S	0.16S
Vdw-Limit1	360≤V<528	207≤V<304
Time1	2S	2S
Vdw-Limit2	V<360	V<207
Time2	0.16S	0.16S
Fup-Limit1	60.5Hz < F < 62Hz	60.5Hz < F < 62Hz
Time1	2S	2S
Fup-Limit2	F > 62Hz	F > 62Hz
Time2	0.16S	0.16S
Fdw-Limit1	57Hz < F < 59.5Hz	57Hz < F < 59.5Hz
Time1	2S	2S
Fdw-Limit2	57Hz < F	57Hz < F
Time2	0.16S	0.16S

Table 6.3 Baseline Inverter Settings

6. Normal operation

6.7.2 Grid ON/OFF

This function is used to start up or stop the power generation of Solis Three Phase Inverter (see Figure 6.18).



Figure 6.18 Set Grid ON/OFF

Screens can be scrolled manually by pressing the UP/DOWN keys. Press the ENTER key to save the setting. Press the ESC key to return to the previous menu.

6.7.3 Clear Energy

Clear Energy can reset the history yield of inverter



These two functions are applicable by maintenance personnel only, wrong operation will prevent the inverter from working properly.

6.7.4 Reset Password

This function is used to set the new password for menu "Advanced info." and "Advanced information" (see Figure 6.19).



Figure 6.19 Set new password

Enter the right password before set new password. Press the DOWN key to move the cursor, Press the UP key to revise the value. Press the ENTER key to execute the setting. Press the ESC key to return to the previous menu.

6. Normal operation

6.7.5 Power Control

Active and reactive power can be set through power setting button.

There are 5 item for this sub menu:

1. Set output power
2. Set Reactive Power
3. Out_P With Restore
4. Rea_P With Restore
5. Select PF Curve



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6.7.6 Calibrate Energy

Maintenance or replacement could clear or cause a different value of total energy. Use this function could allow user to revise the value of total energy to the same value as before. If the monitoring website is used the data will be synchronous with this setting automatically. (see Figure 6.20).



Figure 6.20 Calibrate energy

Press the DOWN key to move the cursor, Press the UP key to revise the value. Press the ENTER key to execute the setting. Press the ESC key to return to the previous menu.

6.7.7 Special Settings



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. Normal operation

6.7.8 STD Mode Settings



This section is applicable to maintenance personnel only.

Selecting "STD Mode. Settings" displays the sub-menu shown below:

1. Working Mode Set
2. Power Rate Limit
3. Freq Derate Set
4. 10mins Voltage Set
5. Power Priority
6. Initial Settings
7. Voltage PCC Set

6.7.8.1 Working Mode Set

There are TWO situations with different grid standards selected.

6.7.8.1.1 With UL Standard selected



NOTE

The following modes are for "UL-600V".

Solis US version inverters have Seven working modes:

1. NULL
2. Volt-watt
3. Volt-Var
4. Fixed-PF
5. Reac-power
6. Power-PF
7. VgWatt-UL

Based on UL1741SA, working mode 1,3,4,7 can be used by grid operator.

6. Normal operation

1.NULL

Description: Inverter is not under any working mode.

2. Volt-Watt (Not Required)

Description: Inverter will change the active output power based on voltage change.

Note: This Setting is NOT required by UL1741SA Standards.



This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

3. Volt-Var (Default)

Description: Inverter will change the reactive output power based on voltage change.

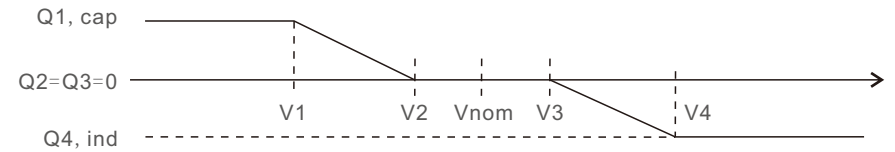


Figure 6.21 Volt-Var curve for Q (V)

Default Settings for UL1741SA:

Q1: (0-60%) Default +30% Q4: (-60%-0%) Default -30%

Rated 600V Grid

V1:(277-346V) Default 303V V2: (277-346V) Default 340V

V3:(346-415V) Default 349V V4: (346-415V) Default 381V

Voltage1 : 303V
Voltage2 : 340V

Figure 6.22 Volt-Var

6. Normal operation

4.Fixed-PF

Description: Inverter will output power with fixed power factor.

Setting Range: -0.8 to +0.8

Default value is PF = 1

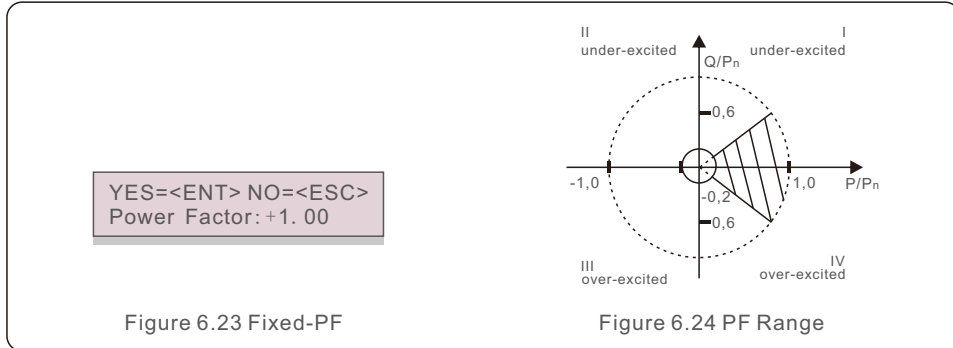



Figure 6.23 Fixed-PF

Figure 6.24 PF Range

5. Reac-power (Not Required)

Description: Inverter will generate reactive power based on changing output power.


Note: This Setting is NOT required by UL1741SA Standards.

 This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. P-factor (Not Required)

Description: Inverter will change power factor based on changing output power.

Note: This Setting is NOT required by UL1741SA Standards.

 This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. Normal operation

7.VgWatt-UL

Description: Inverter will change the active output power based on voltage change.

Note: This is the Volt-Watt Setting for UL1741SA Standards.

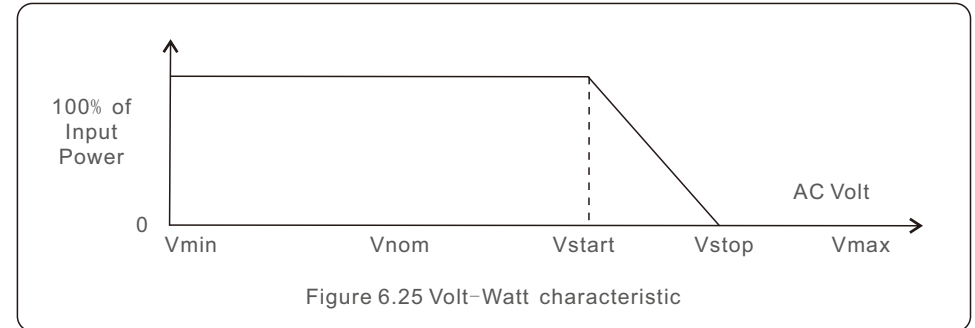


Figure 6.25 Volt-Watt characteristic

Default Settings for UL1741SA:

Rated 600V Grid

V1: less than V2

V2: less than Vstart

V3 (Vstart): (346-415V) Default 381V

V4 (Vstop): (381-450V) Default 415V

P1:100% P2:100% P3: 100% P4:0%

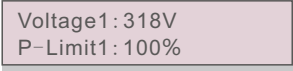


Figure 6.26 VgWatt-UL

6. Normal operation

6.7.8.1.2 With Rule21 Standard selected



NOTE

The following modes are for "R21P3-600".

Solis US version inverters have Ten working modes:

1. NULL
2. Volt-watt
3. Volt-Var
4. Fixed-PF
5. Reac-power
6. Power-PF
7. VgWatt-UL

Based on Rule21, working mode 1,2,3,4 can be used by grid operator.



NOTE

The other three working mode "P1-V-Watt", "P1-V-Var" and "P1-V-P&V-Q" are NOT applicable for settings.

1.NULL (Mode Reset)

Description: Inverter is not under any working mode.

2. Volt-Watt

Description: Inverter will change the active output power based on voltage change.

Note: This is the Volt-Watt Setting for Rule21 Standards.

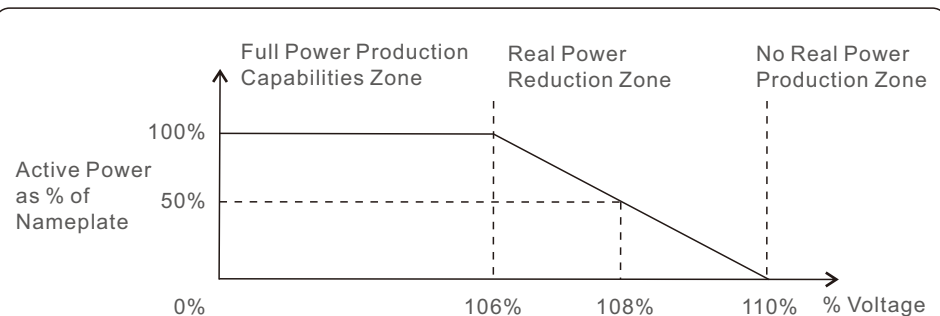


Figure 6.27 Volt-Watt characteristic

6. Normal operation

Default Settings for Rule21 Standards:

Rated 600V Grid

V1:less than Vstart

V2 (Vstart): (346-415V) Default 367V

V3 (Vstop): (381-450V) Default 381V

V4: larger than Vstop

P1:100% P2:100% P3: 0% P4:0%

3. Volt-Var

Description: Inverter will change the reactive output power based on voltage change.

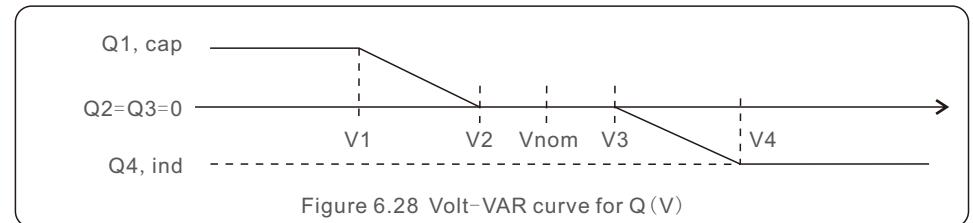


Figure 6.28 Volt-Var curve for Q (V)

Default Settings for Rule21 Standard:

Q1: (0-60%) Default +30% Q4: (-60%-0%) Default -30%

Rated 600V Grid

V1:(277-346V) Default 318V V2: (277-346V) Default 335V

V3:(346-415V) Default 357V V4: (346-415V) Default 370V

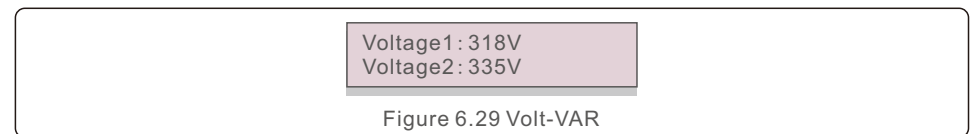


Figure 6.29 Volt-Var

4.Fixed-PF

Description: Inverter will output power with fixed power factor.

Setting Range: -0.8 to +0.8

Default value is PF = 1

6. Normal operation

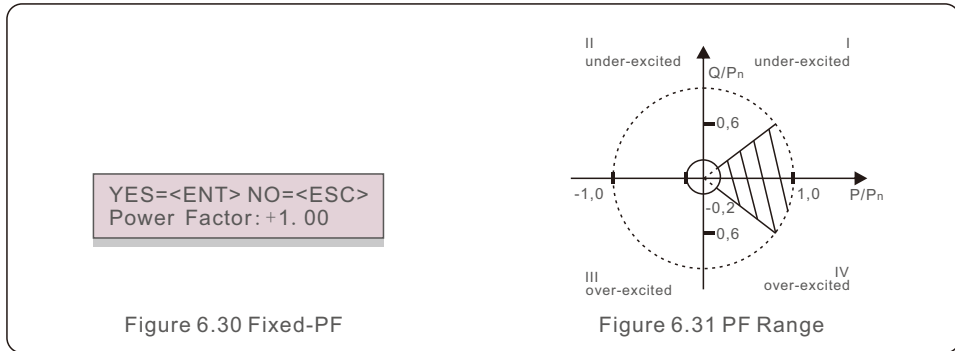


Figure 6.30 Fixed-PF

Figure 6.31 PF Range

5. Reac-power (Not Required)

Description: Inverter will generate reactive power based on changing output power.

Note: This Setting is NOT required by Rule21 Standards.



This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. P-factor (Not Required)

Description: Inverter will change power factor based on changing output power.

Note: This Setting is NOT required by Rule21 Standards.



This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

7. VgWatt-UL (Not Required)

Description: Inverter will change the active output power based on voltage change.

Note: This Setting is NOT required by Rule21 Standards.



This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. Normal operation

8. Enable both Volt-Var and Volt-Watt modes

Description: Rule21 requires both Volt-var and Volt-watt modes can be enabled.

To set both modes (Volt-var in high priority)

Step 1: Select and set Volt-watt mode at first.

Step 2: Enter "Working Mode" again and select and set Volt-var mode then.

Step 3: To check the priority, a new mode will appear as "V-Q & V-P" which indicates (Q) Volt-var is in high priority.

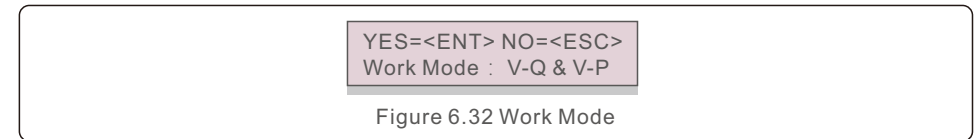


Figure 6.32 Work Mode

To set both modes (Volt-watt in high priority)

Step 1: Select and set Volt-var mode at first.

Step 2: Enter "Working Mode" again and select and set Volt-watt mode then.

Step 3: To check the priority, a new mode will appear as "V-P & V-Q" which indicates (P) Volt-watt is in high priority.

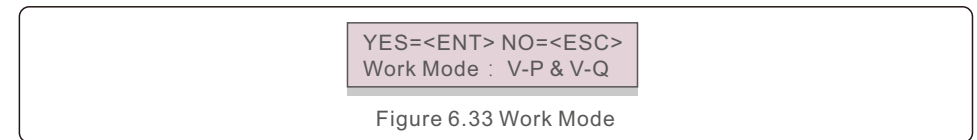


Figure 6.33 Work Mode

To reset dual-mode or exit the dual-mode situation

Step 1: Select "Null" mode at first.

Step 2: Enter "Working Mode" again. Redo above dual-mode setting steps to reset OR set other modes to exit dual-mode situation.

NOTE
To check the Volt-watt and Volt-var priority, simply enter the working modes. V-Q&V-P indicates Volt-Var First V-P&V-Q indicates Volt-Watt First

6. Normal operation

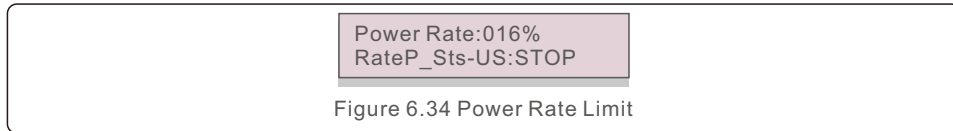
6.7.8.2 Power Rate Limit

This function is used for change Power Ramp-up rate. When inverter start up or input string MPPT changes, inverter power ramp-up rate is limited in this menu.

The default setting is stop (disable).

The setting range from 10% to 600%, means inverter power change rate per minute.

Values are not allowed to change. If they are set, they may not conform to the UL1741SA standard.



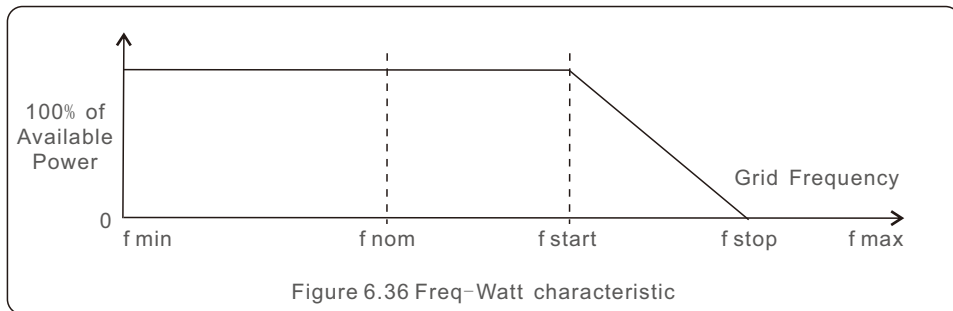
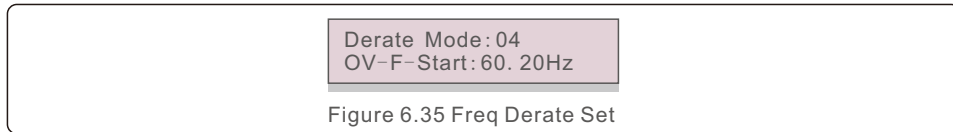
6.7.8.3 Freq Derate Set

This setting is applicable when UL Standards are selected.

There are 5 derate modes in this menu. When operating under standard UL-1741 limits, modes 00 to 03 are disabled. Mode 04 is used for UL1741SA frequency derating setting.

Mode 08 is used for RULE21 Freq-watt setting. This sets the f_{start} and f_{stop} point.

Mode 04 :



Over frequency load shedding F_{start} range 60~62Hz, default setting 60.2Hz

F_{stop} can set the scope: 61-64Hz, the default setting 62Hz.

Press the Enter key to select the mode or frequency.

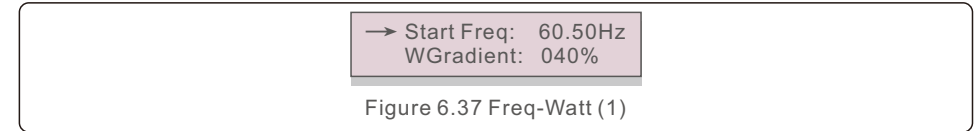
Press Up/Down to set. Press ESC to save the settings.

6. Normal operation

Mode 08 :

This setting is used to control real power based on the frequency excursion

This setting is applicable when Rule21 Standards are selected.

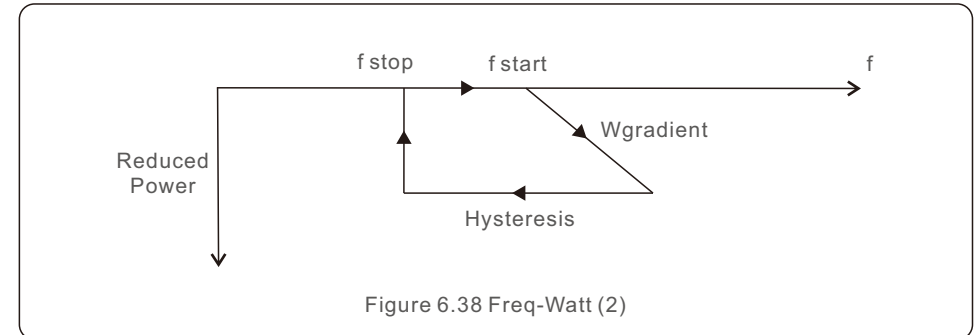


Start Freq: This is the frequency that active power reduction starts.

WGradient: This is the active power reduction rate in terms of the frequency.

Stop Freq: This is the frequency that stops the correction cycle.

Hysteresis: This indicates whether hysteresis is enabled.



This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. Normal operation

6.7.8.4 10mins Voltage Set

This function is disabled and not used for the US.



This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6.7.8.5 Power Priority

This setting is used to set the priority between Active Power Control (Watt) and Reactive Power Control (Var).

YES=<ENT> NO=<ESC>
Select: Var First

Figure 6.39 Power Priority

Two options are available: Watt First and Var First.



This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6.7.8.6 Initial Settings

In initial settings it will reset each work mode from 6.5.8.1 to 6.5.8.4 back to default.

Work Mode Default
Power Rate Default

Figure 6.40 Initial Settings

6.7.8.7 Voltage PCC Set

Set the voltage at the PCC point.

This setting is required by RULE 21 requirements.

PCC: Point of Common Coupling, the point where a Local EPS is connected to an Area EPS.



This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. Normal operation

6.7.9 Restore Settings

There are 5 items in initial setting submenu.

Restore setting could set all item in 6.5.7 special setting to default.

The screen shows as below:

Are you sure?
YES=<ENT> NO=<ESC>

Figure 6.41 Restore Settings

Press the Enter key to save the setting after setting grid off.

Press the ESC key to return the previous mean.

6.7.10 HMI Update



This section is applicable to maintenance personnel only.

Selecting "Updater" displays the sub-menu shown below:

HMI Current Ver.: 02
YES= <ENT> NO= <ESC>

Figure 6.42

Updater is for updating LCD firmware. Press the ENTER key to start the process.

Press the ESC key to return to the previous menu.

6.7.11 Restart HMI

The function is used for restart the HMI.



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. Normal operation

6.7.12 Debug Parameter



This section is applicable to maintenance personnel only.

Debug Parameter as shown as below:

```
→ S16DAT1: +0000
S16DAT2: +0000
S16DAT3: +0000
S16DAT4: +0000
S16DAT5: +0000
S16DAT6: +0000
S16DAT7: +0000
S16DAT8: +0000
```

Figure 6.43

Press the UP/DOWN keys to scroll through items. Press the ENTER key to select.
Press the DOWN key to scroll and press the UP key to change the value.
Press the ENTER key to save the setting.
Press the ESC key to cancel changes and return to the previous menu.

6.7.13 FAN Test



This section is applicable to maintenance personnel only.

Selecting "Fan Test" displays the sub-menu shown below:

```
Are you sure?
YES= <ENT> NO= <ESC>
```

Figure 6.44

Fan Test is a factory test function. Press the ENTER key to start the test.
Press the ESC key to return to the previous menu.

6. Normal operation

6.7.14 DSP Update

The function is used for update the DSP.



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6.7.15 Compensation Set

This function is used to calibrate inverter output energy and voltage. It will not impact the energy count for inverter with RGM.

Two sections are included: Power Parameter and Voltage Parameter.

The screen shows:

```
YES=<ENT> NO=<ESC>
Power para: 1.000
```

Figure 6.45 Power Rate Limit

Press the Down key to move the cursor.
Press the Up key to change the digit.
Please press the Enter to save the setting and press the ESC key to return to the previous menu.



This setting is used for grid operators, do not change this setting unless specifically instructed to.

7. Maintenance

Solis Three Phase Inverter does not require any regular maintenance. However, cleaning the dust on heat-sink will help the inverter to dissipate the heat and increase its life time. The dust can be removed with a soft brush.



CAUTION:

Do not touch the inverter's surface when it is operating. Some parts of the inverter may be hot and cause burns. Turn off the inverter (refer to Section 6.2) and wait for a cool-down period before any maintenance or cleaning operation.

The LCD and the LED status indicator lights can be cleaned with a damp cloth if they are too dirty to be read.



NOTE:

Never use any solvents, abrasives or corrosive materials to clean the inverter.

7.1 Anti-PID Function

Inverter integrates optional Anti-PID module and it can recover the PID effect during night thus protect the PV system from degradation.

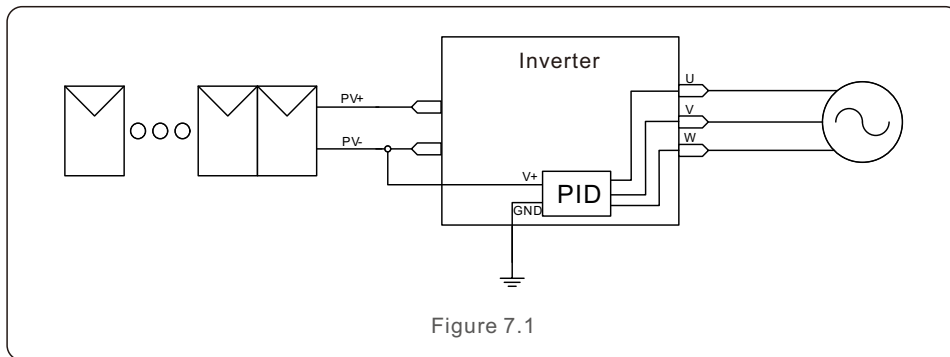


Figure 7.1

The Anti-PID module repairs the PID effect of the PV model at night. When operating, the inverter LCD screen displays "PID-repairing" information, and the red light is on. The Anti-PID function is always ON when AC is applied. If maintenance is required and turn off the AC switch can disable the Anti-PID function.



WARNING :

The PID function is automatic. When the DC bus voltage is lower than 260Vdc, the PID module will start creating 650 Vdc between PV- and ground. No need any control or settings

7. Maintenance



NOTE:

If you need to maintain the inverter at night, please turn off the AC switch first, then turn off the DC switch, and wait 5 minutes before you do other operations.

7.2 Fan Maintenance

If the fan does not work properly, the inverter will not be cooled effectively and it may affect the effective operation of the inverter .

Therefore, it is necessary to clean or replace a broken fan as follows:

1. Turn off the "Grid ON/OFF" switch on the inverter LCD.
2. Disconnect the AC power.
3. Turn the DC switch to "OFF" position.
4. Wait for 15 minutes at least.
5. Remove the 4 screws on the fan plate and pull out the fan assembly slowly.
6. Disconnect the fan connector carefully and take out the fan.

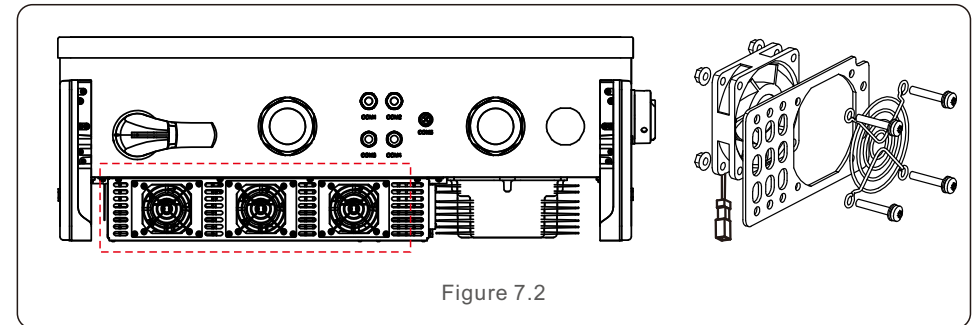


Figure 7.2

7. Clean or replace the fan. Assemble the fan on the rack.
8. Connect the electrical wire and reinstall the fan assembly. Restart the inverter.

7. Maintenance

7.3 Surge Protection Device Maintenance

If surge protection device is damaged, it will affect the safety of the inverter. It is necessary to replace it with a new lightning protection module.

1. Disconnect the AC power.
2. Turn the DC switch to "OFF" position.
3. Wait for 15 minutes at least.
4. If DC surge protection device is damaged, remove the 6 screws on the inverter cover and open the cover. If AC surge protection device is damaged, remove the 4 screws on the wiring box cover and open the wiring box cover.
5. Press and hold the spring clip on the upper and lower sides of the damaged surge protection module and remove it.(See Figure 7.3)
Insert the new lightning protection module in the correct position.

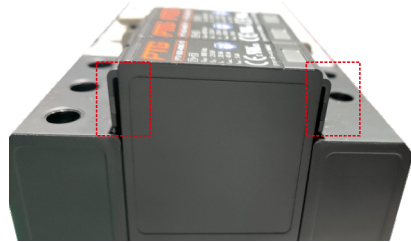


Figure 7.3



If the SPD fails or in malfunction. The inverter LCD will show "SPD-FAIL", please replace the SPD module accordingly

8. Troubleshooting

8.1 Current Alarm

8.1.1 Running messages

Running messages can be viewed on the screen including any current alarms.

8.2 Alarm History

8.2.1 Viewing alarm history

Refer to LCD Operation 6.6.8 for instructions on viewing Alarm History.

8.3 Error Messages

NOTE

The first step to clearing alarms as listed in Table 9, is to reset the inverter. To reset the inverter, turn off the inverter (refer to Section 6.2) and wait for five (5) minutes before restarting it (refer to Section 6.1). If the failure persists, please first contact your local distributor and then Ginlong Support Service.
If you need to contact Ginlong Support Service at <http://www.ginlong.com/>



Please have the following information available when contacting technical support:

- 1). Inverter serial number
- 2). The inverter distributor/dealer (if available)
- 3). Installation date
- 4). The description of problem (e.g., the alarm message displayed on the screen and the status of the screen status indicator lights. Other readings obtained from the Information sub menu (refer to Section 6.4) will also be helpful.)
- 5). PV array configuration (e.g. number of panels, panel capacity, number of strings, etc.)
- 6). Your contact details

8.3.1 Troubleshooting guide

Solis inverters are designed in accordance with international grid standards, safety standards and electromagnetic compatibility requirements. Before delivery to the customer, the inverter has been subjected to intensive testing to ensure its optimal operation and reliability.

In case of failure, the screen may display an alarm message, stop feeding energy into the grid or both. Typical failure descriptions and their corresponding alarm messages are listed in Table 9 on the following pages.

8. Troubleshooting

Alarms	Cause	Solution
No Information (Blank Screen)	<ul style="list-style-type: none"> • Input voltage low/missing • Polarity reversed • Main board damaged 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check PV connections • Check polarity • Check voltage >860V <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check voltage >860V • If DC voltage is "0" replace inverter
Initializing (Inverter stuck in this mode)	<ul style="list-style-type: none"> • Inverter is waiting for driving signal 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check PV connections • Check polarity • Check voltage >860V <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check voltage >860V • A cable may have been damaged or loosened in shipping replace inverter
OV-G-V: Over Grid Voltage	<ul style="list-style-type: none"> • Inverter detects grid voltage as too high 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check AC at the inverter • If AC measures high, adjust upper limit with permission from utility <p>Test – DC Switch ON, full power</p> <ul style="list-style-type: none"> • Check AC at inverter test points • Compare with LCD • If AC measures high, cables between inverter and interconnect are too small • Check ampacity and voltage drop calculations
UN-G-V: Under Grid Voltage	<ul style="list-style-type: none"> • Inverter detects grid voltage as too low 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check AC at the inverter test points • If AC measures low, adjust lower limit with permission from utility • Check LCD voltage reading, may be a bad measurement circuit <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check grid standard • Replace inverter
UN-BUS: DC BUS voltage is too low	<ul style="list-style-type: none"> • Inverter detects low DCV on internal bus 	<p>Test</p> <ul style="list-style-type: none"> • Measure DC and AC voltages • Compare with LCD • Replace Inverter • Internal damage • Wire came loose during shipping

8. Troubleshooting

Alarms	Cause	Solution
OV-G-F: Over Grid Frequency	<ul style="list-style-type: none"> • Inverter detects grid Frequency as too high 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check frequency at the inverter test points • If Frequency measures high, adjust upper limit with permission from utility • Check LCD reading, may be a bad measurement circuit <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check grid standard • Replace inverter
NO-GRID	<ul style="list-style-type: none"> • Inverter does not detect the grid 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check AC at the inverter test points • L-L, L-GND • Check LCD reading, may be a bad measurement circuit <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check grid standard • Replace inverter
OV-DC: DC voltage is too high	<ul style="list-style-type: none"> • Inverter detects High DCV 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check DC at the inverter test points • If DCV is high, too many panels in the string <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check LCD reading, may be a bad measurement circuit • Replace inverter
OV-BUS: DC BUS voltage is too high	<ul style="list-style-type: none"> • Inverter detects High DCV on internal bus 	<p>Test</p> <ul style="list-style-type: none"> • Measure DC and AC voltages • Compare with LCD • Replace Inverter • Internal damage • Wire came loose during shipping
Screen OFF with DC applied	<ul style="list-style-type: none"> • Inverter internally damaged 	<ul style="list-style-type: none"> • Do not turn off the DC switches as it may damage the inverter. • Please wait for sunset and confirm the string current is less than 0.5A with a clip-on ammeter and then turn off the DC switch. String current above 0.5A is under load. • Note: Damage due to wrong connections or fire caused by removing string wires under load is not covered in the device warranty.

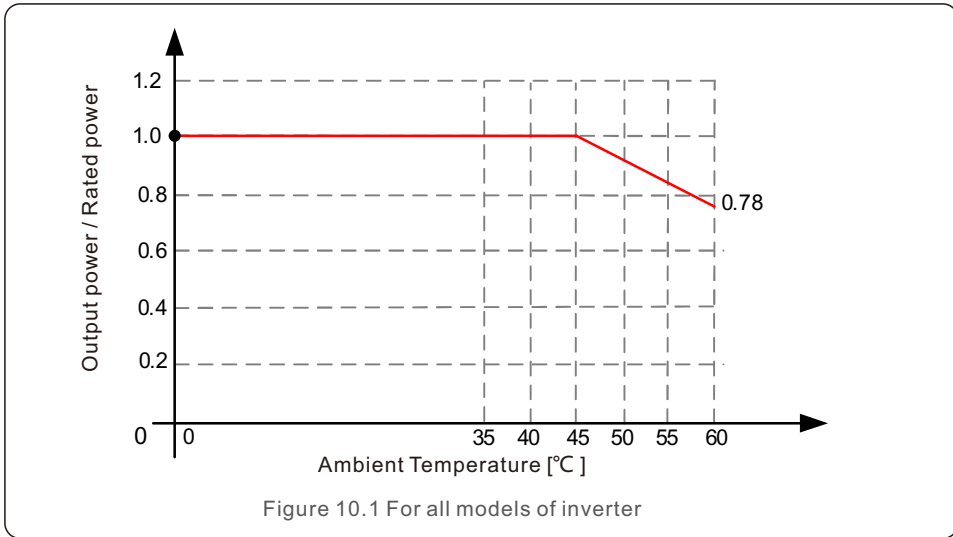
8. Troubleshooting

9. Specifications

Alarms	Cause	Solution
GRID-INTF: Grid unstable	<ul style="list-style-type: none"> Inverter detects grid instability, internal fault current high 	<p>Test – With DC Switch OFF</p> <ul style="list-style-type: none"> Measure AC voltage Test AC line for THD <p>Test – With DC Switch ON</p> <p>Test AC line for THD</p> <ul style="list-style-type: none"> Multiple inverters/turn one off Impedance matching adjustment or box Internal damage Wire came loose in shipping
INI-PRO: Initialization Protection	<ul style="list-style-type: none"> Master and Slave DSP have different values 	<p>Reset Inverter</p> <ul style="list-style-type: none"> DC switch OFF Wait until all lights/LCD turn off DC switch ON Replace inverter
TEM-PRO: Temperature Protection	<ul style="list-style-type: none"> Inverter detects high ambient temperature >60C 	<p>Inspect installation</p> <ul style="list-style-type: none"> Check heatsink for obstructions/ventilation Is inverter in direct sunshine Measure ambient temperature near inverter If temp is in range replace inverter
PV ISO PRO 01/02	<ul style="list-style-type: none"> Inverter detects low DC insulation resistance on the PV+ or PV- terminals 	<p>Inspect installation</p> <ul style="list-style-type: none"> Restart inverter Note weather conditions when alarm occurs Measure insulation resistance If normal, measure in SAME weather as alarm Physically check cables
Reve-DC	<ul style="list-style-type: none"> One of the DC string is reversely connected OR different number of modules are connected to the string inputs (Threshold varies between different conditions) 	<ul style="list-style-type: none"> Please check the inverters' PV string polarity, if there are strings reversely connected wait for the night when the solar irradiance is low and the PV string current down below 0.5A. Turn off the two DC switches and fix the polarity issue. If string polarity is correct, please confirm that all the PV strings have the same number of modules. If not, please modify the system configuration.
PV-MID-ISO	<ul style="list-style-type: none"> Inverter detects low DC insulation resistance on the middle connections of the PV strings (ie, MC4 connectors between modules) 	<p>Inspect installation</p> <ul style="list-style-type: none"> Restart inverter Physically check all the MC4 connectors, external DC switch.

Table 8.1 Fault messages and descriptions

Model	Solis-125K1-EHV-5G
Max. DC input voltage (Volts)	1500
Rated DC voltage (Volts)	950
Start-up voltage (Volts)	900
MPPT voltage range (Volts)	860...1450
Max. input current (Amps)	150
Max short circuit input current (Amps)	300
MPPT number/Max input strings number	1/1
Rated output power (Watts)	125000
Max. output power (Watts)	125000
Max. apparent output power (VA)	125000
Rated grid voltage (Volts)	3/PE~600
Max. output current (Amps)	120
Power Factor (at rated output power)	0.8leading~0.8lagging
THDi (at rated output power)	<3%
Rated grid frequency (Hertz)	60
Grid frequency range (Hertz)	59.5-60.5
Max. efficiency	99.1%
EU efficiency	98.6%
Dimensions (W*H*D)	942*733*311 (mm) / 37.1*28.9*12.2 (inch)
Weight	84kg / 185.2lb
Topology	Transformerless
Self consumption (night)	< 3W (without anti-PID)
Operating ambient temperature range	-13°F~140°F (-25°C~60°C)
Relative humidity	0~100%
Ingress protection	Type 4X
Noise emission	≤65dB(A)
Cooling concept	Intelligent redundant cooling
Max.operation altitude	13120ft / 4000m
Compliance	UL 1741, UL 1741SA, Rule 21, UL 1998, IEEE 1547, FCC Part 15 (Class A & B), CAN/CSA C22.2 107.1-16, Rule 21 Phaes II&III
DC connection	OT Terminal connectors(Max.185mm ²)
AC connection	OT Terminal connectors(Max.185mm ²)
Display	LCD, 2x20 Z
Communication connections	RS485, Ethernet, Optional: PLC
Warranty	10 years (extend to 20 years)



Comments:

A thermal sensor inside the inverter is calibrated to determine ambient temperature.
 All inverters will begin a sloped derate at 45°C ending at 78% output power at 60°C.

Parts	Torque
Cover screws	2.4-2.7 ft.lbs
Ground screws (Cover)	7.4-14.7 ft.lbs
Ground screws (Inverter)	7.4-14.7 ft.lbs
Grid terminals	7.4-14.7 ft.lbs

