



# User Manual

for 5G Series Grid Inverter



## Applicable models

Solis-185K-EHV-5G-US

Solis-255K-EHV-5G-US

Solis-125K-EHV-5G-US-PLUS

Solis-185K-EHV-5G-US-PLUS

Solis-255K-EHV-5G-US-PLUS

# Important notes

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- 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 Solis 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.
- Solis accepts no liability for customers' failure to comply with the instructions for correct installation and will not be held responsible for upstream or downstream systems Solis equipment has supplied.
- The customer is fully liable for any modifications made to the system; therefore, any hardware or software modification, manipulation, or alteration not expressly approved by the manufacturer shall result in the immediate cancellation of the warranty.
- Given the countless possible system configurations and installation environments, it is essential to verify adherence to the following:
  - There is sufficient space suitable for housing the equipment.
  - Airborne noise produced depending on the environment.
  - Potential flammability hazards.
- Solis 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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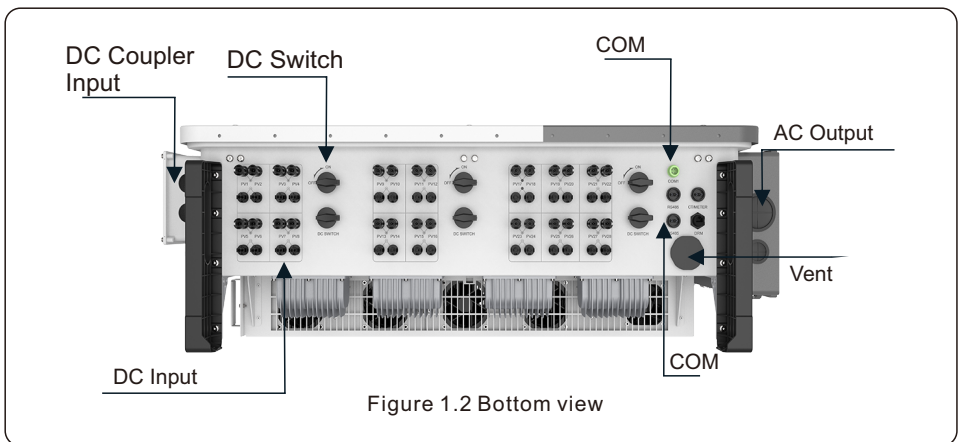
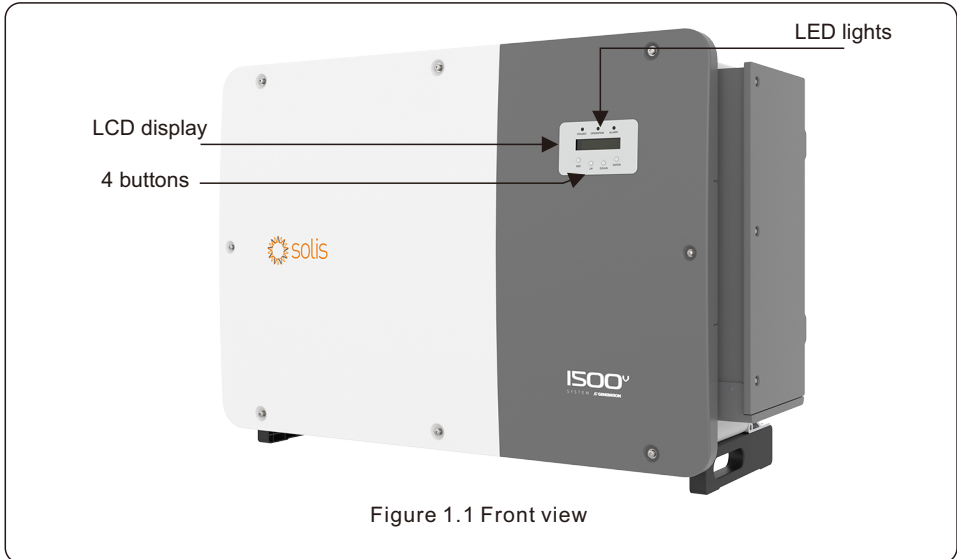
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## 1.1 Product Description

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 into the power distribution grid.

This manual covers the three phase inverter models listed below:

**Solis-185K-EHV-5G-US, Solis-255K-EHV-5G-US, Solis-125K-EHV-5G-US-PLUS, Solis-185K-EHV-5G-US-PLUS, Solis-255K-EHV-5G-US-PLUS**



## 1.2 Front Panel Display

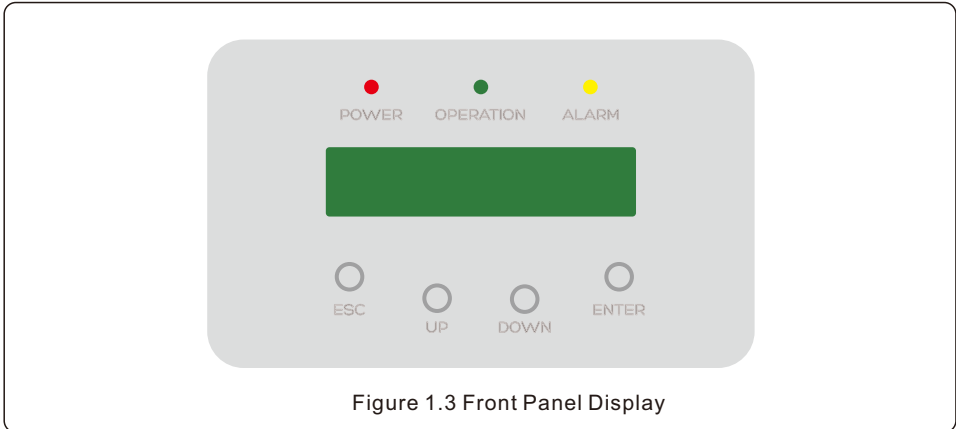


Figure 1.3 Front Panel Display

## 1.3 LED Status Indicator Lights

There are three LED status indicator lights on the front panel of the inverter.

- **POWER LED (red)** indicates the power status of the inverter.
- **OPERATION LED (green)** indicates the operation status.
- **ALARM LED (yellow)** indicates the alarm status.

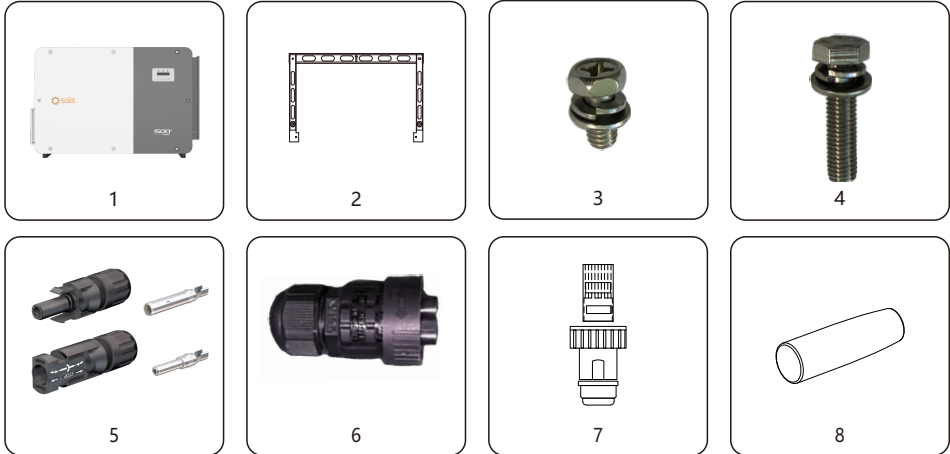
Light	Status	Description
● POWER	ON	The inverter detects DC power.
	OFF	No DC power or low DC power.
● OPERATION	ON	The inverter is operating properly.
	OFF	The inverter has stopped producing power.
	FLASHING	The inverter is initializing  Updating software
● ALARM	ON	Alarm or fault condition is detected.
	OFF	No fault or alarm is detected.

Figure 1.4 Status Indicator LED

## 1.4 Unpacking

The inverter ships with all accessories in one carton.

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

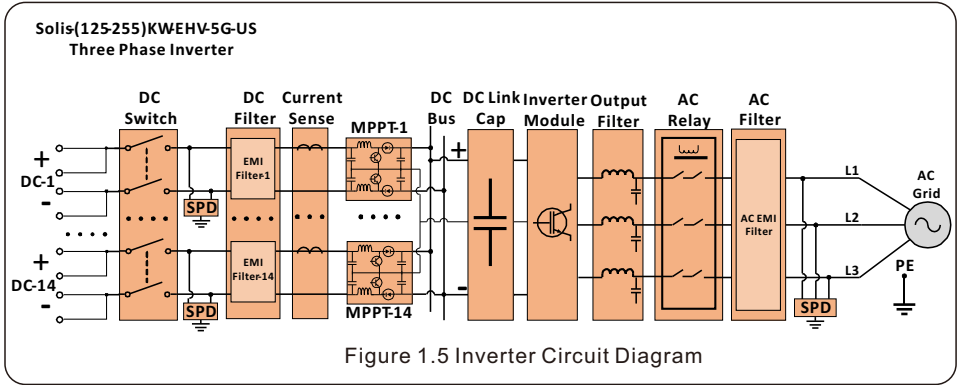


Part #	Description	Quantity	Remarks
1	Inverter	1	
2	Mounting Bracket	1	
3	Fastening screw	2	Hexagon bolt M6*12
4	Fastening screw, hex nut and flat gasket	4	Hexagon bolt M10*40
5	DC connector	18,24,28	Staubli Electrical Connectors AG PV-KBT4-EVO 2/6I-UR PV-KST4-EVO 2/6I-UR
6	2 pin port	3	
7	RJ45 connector	1	
8	Handle	4	

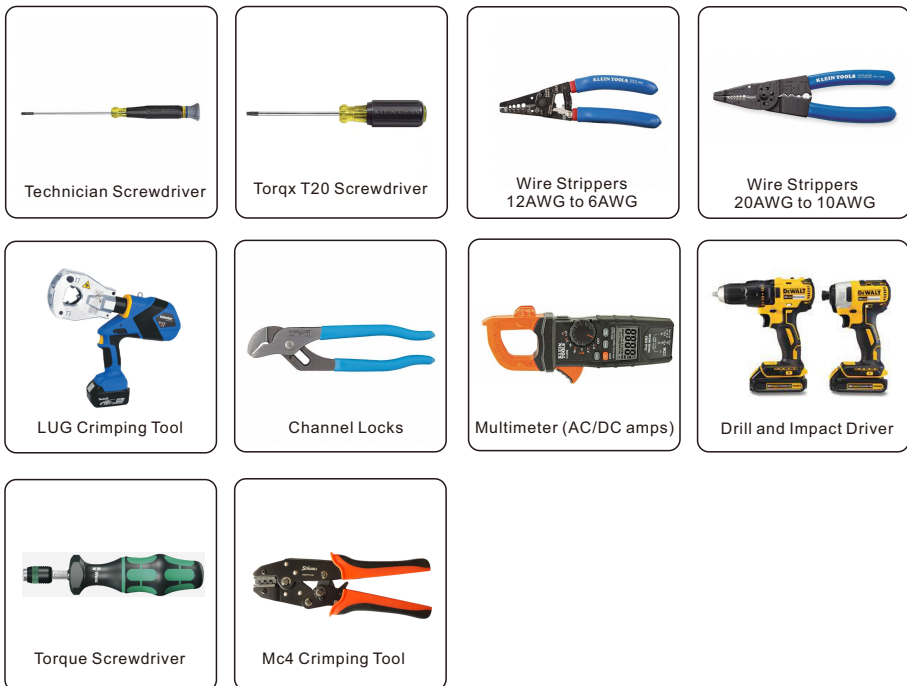
Inverter packing list



## 1.5 Inverter Circuit Diagram



## 1.6 Tools Required for Installation



## 1.7 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 40~176°F and humidity should be between 0 to 95%, non-condensing.
- Do not stack more than two (2) inverters high on a single pallet.
- 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.



**DO NOT STACK  
MORE THAN 2 HIGH**

## 1.8 Notice for Disposal

This product shall not be disposed of with household waste. They should be segregated and brought to an appropriate collection point to enable recycling and avoid potential impacts on the environment and human health. Local rules in waste management shall be respected .



**SAVE THESE INSTRUCTIONS – This manual contains important instructions for Models Solis-185K-EHV-5G-US, Solis-255K-EHV-5G-US, Solis-185K-EHV-5G-US-PLUS and Solis-255K-EHV-5G-US-PLUS, 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.



**CAUTION**

Risk of electric shock from energy stored in the inverter's capacitors. Do not remove cover until 20 minutes have passed after disconnecting all sources of supply, and this can only be performed 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 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.
5. The inverter can only be used for industrial applications.

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, see power down instruction on page 38 Section 6.2.

### 2.4 Protection Circuitry and Controls

To meet relevant codes and standards, the Solis U.S. three phase inverter line is equipped with protective circuitry and controls. These include Arc Fault Circuit Interrupter (AFCI) and Anti-Islanding Protection.

#### **Arc Fault Circuit Interrupter AFCI:**

Edition 2011 of the National Electrical Code®, Section 690.11, requires that all PV plants attached to a building are fitted with a means of detecting and interrupting serial electric arcs in the PV wiring and array. An electric arc with a power of 300W or greater must be interrupted by the AFCI in the time specified by UL 1699B. A triggered AFCI fault may only be reset manually. After clearing the source of the fault, the AFCI can be deactivated via the inverter front panel interface.

#### **Anti-Islanding Protection:**

Anti-Islanding is a condition where the inverter cease to produce power 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 inverter's operating in parallel and the grid.



**NOTE**

For additional installation details, watch the installation video in the link below [\(568\) Solis-\(215-255\)K-EHV-5G inverter Installation video - YouTube](#)

## 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.



**CAUTION, HOT SURFACE**

- The temperature of the inverter heat-sink can reach 167°F.

- The ambient temperature and relative humidity should meet the following requirements.



Max.: +80°C  
+140°F



Min.: -30°C  
-22°F



Max. RH: 100%  
(non-condensing)

- The load bearing structure shall meet the following requirements.



Made of non-inflammable materials



Max. load bearing capacity  $\geq 4$  times of inverter weight



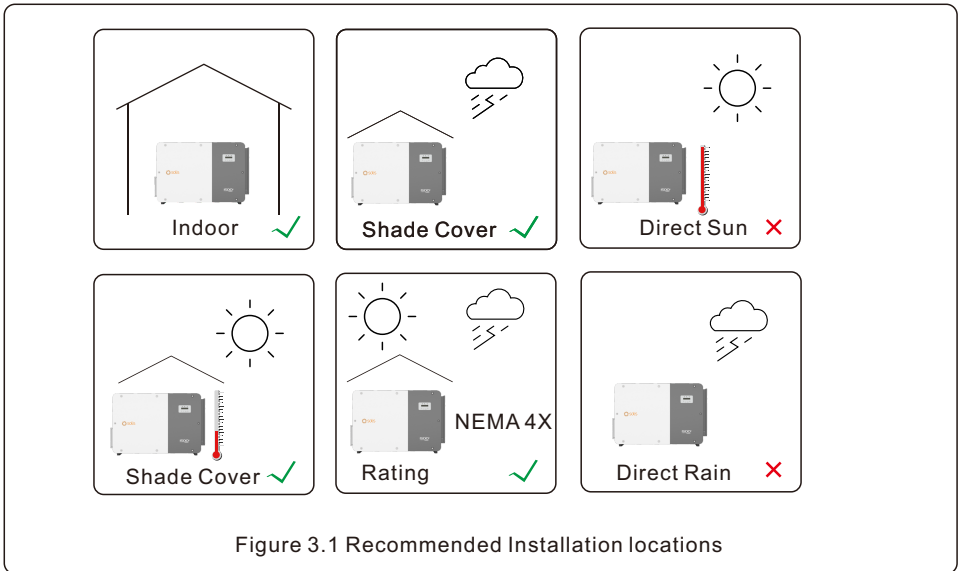
- If multiple inverters are installed on site, a minimum clearance of 32 inches should be kept between each inverter and all other mounted equipment. The bottom of the inverter should be at least 24 inches above of the ground or floor (see Figure 3.2 and 3.3).
- The LED status indicator lights and the 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.



**NOTE**

Nothing should be stored on or placed against the inverter.

### 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 10) 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.

#### 3.1.2.3 Avoiding direct sunlight

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

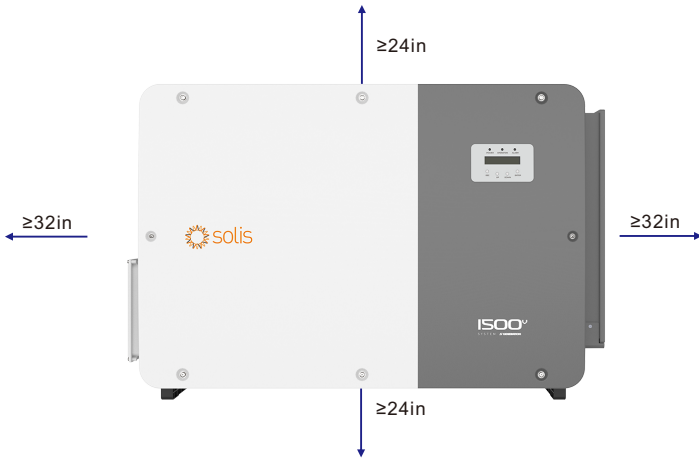


Figure 3.2 Clearance distances requirement for the inverter

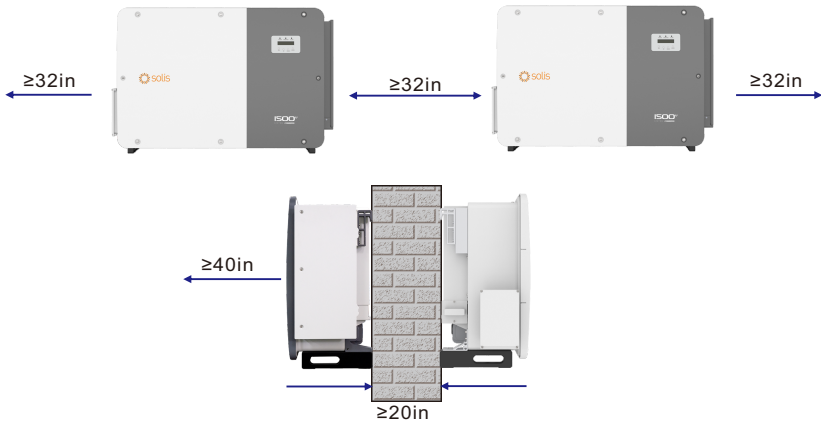


Figure 3.3 Distances required between inverters when multiple inverters are installed

### 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

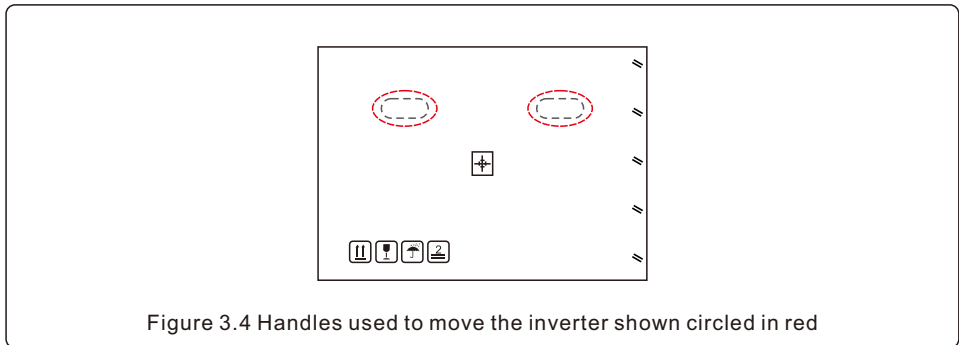
Do not install in a living area where the prolonged presence of people or animals is expected. Depending on where the inverter is installed (for example: the type of surface around the inverter, the general properties of the room, etc.) and the quality of the electricity supply, the sound level from 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 around 249lb (see Figure 3.4).



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 3.5).



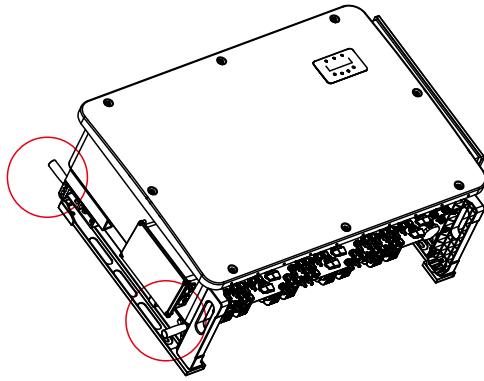


Figure 3.5 Inverter handles



**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. When installers are carrying the inverter, please use 4 handles to secure safety. Lifting force of each handle shall not exceed 1.5 times of the inverter weight.

In case of using hoisting to lift the inverter, fix the hoisting cable to the hanger shown in the graph. Please make a reasonable selection of hoisting equipment considering the inverter weight of 113kg/249lb.

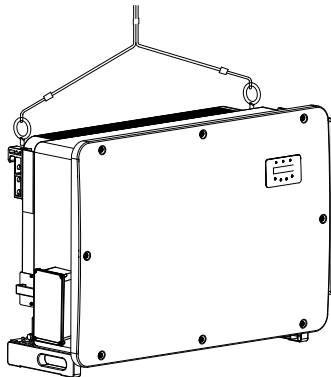


Figure 3.6 Hoisting sketch

## 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 3.7.

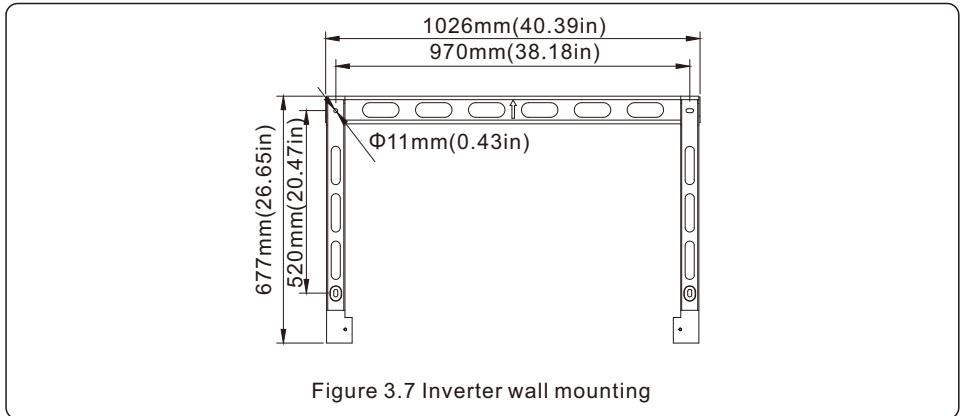


Figure 3.7 Inverter wall mounting

### 3.3.1 Wall mounting

Inverter shall be mounted vertically. The steps to mount the inverter are listed below.

1. Refer to Figure 3.7, 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 3.6 in.
2. Make sure the bracket is horizontal, and the mounting holes are marked correctly. Drill the holes into wall at your marks.
3. Use the suitable mounting screws to attach the bracket on the wall.
4. Lift the inverter and hang it on the bracket, and then slide down to make sure they match perfectly.

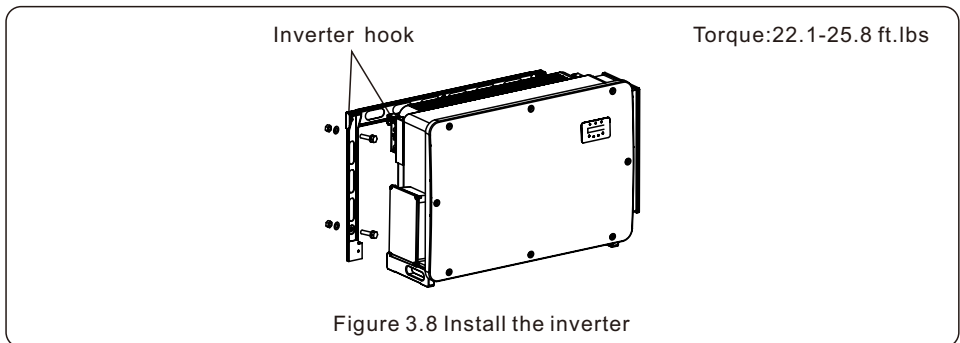
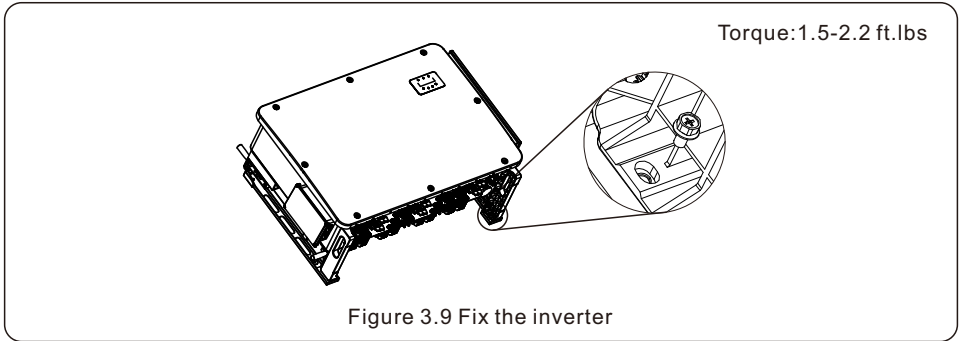


Figure 3.8 Install the inverter

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



## 3.4 Electrical Connections

Inverter design uses PV style quick-connect terminal. The top cover does not need be opened during DC electrical connection. The labels located the bottom of the inverter are described below in table 3.1. All electrical connections are suitable for local and national standard.

Cable	Connection	Cable size	Torque
DC terminal	PV strings	12-10 AWG	NA
Ground terminal	AC ground	2-4/0 AWG	7.4-8.9 ft.lbs
Grid terminal	Grid	1/0 AWG-600 MCM (Max 600MCM)	17-21 ft.lbs
RS-485 terminal	Communication cable	20-18 AWG	0.44 ft.lbs
COM terminal	Wi-Fi/Cellular stick	NA	NA
DC surge protection device	NA	NA	NA

Table 3.1 Electrical connection specification

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

1. Switch the Grid Supply Main Switch (AC) OFF and LOTO the AC Switch.
2. Switch the DC Switch OFF.
3. Connect the inverter to the grid.
4. Assemble PV connector and connect to the Inverter.

## 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:

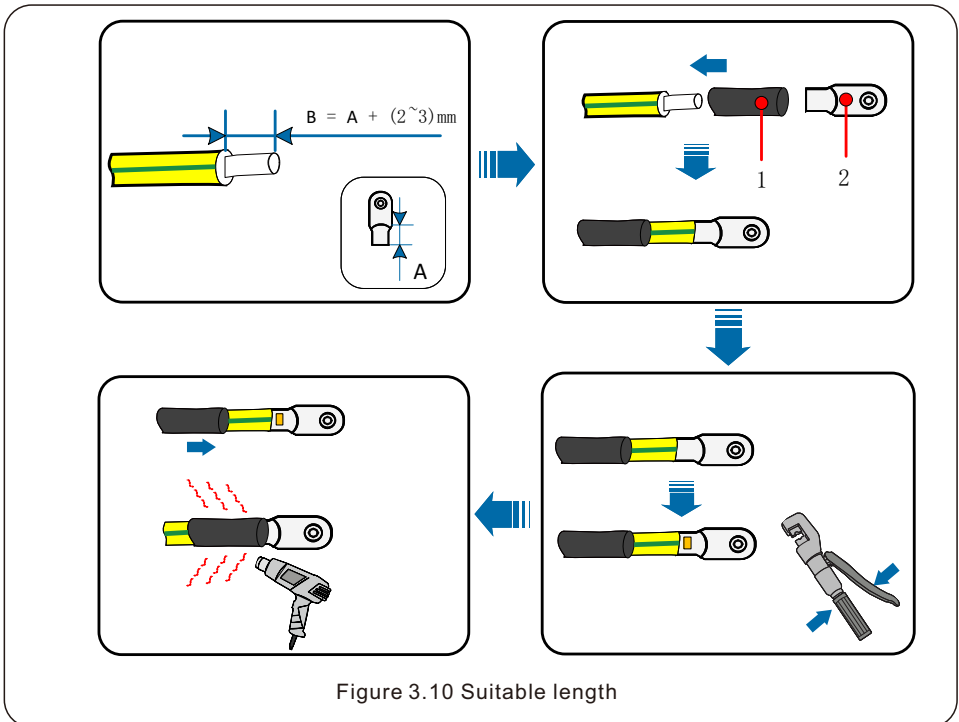
1. Prepare the grounding cable: recommend to use the outdoor copper-core cable.  
Cable ampacity of the ground conductor should be more than half the ampacity ratings of AC phase L1,L2,L3 conductors.
2. Prepare OT terminals: M10.



**NOTE**

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.





**NOTE**

B (insulation stripping length) is 2mm~3mm longer than A (OT cable terminal crimping area) .

4. Insert the stripped wire into the OT terminal crimping area and use the hydraulic clamp to crimp the terminal to the wire.



**NOTE**

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 7.4-8.9 ft.lbs.

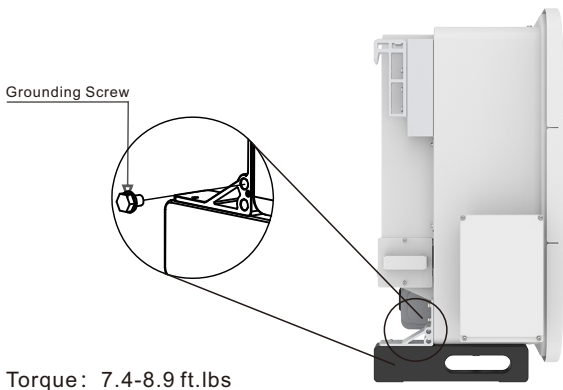


Figure 3.12 Fixed cable



**NOTE**

To reduce corrosion, apply silicone or paint to the screw after ground cable has been installed.

## 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.



**WARNING**

Please use the original DC MC4 terminals, otherwise the unqualified DC connectors may cause damages to the inverter.



**NOTE**

The inverter has a DC fuseless design with internal overcurrent protection. It is not needed to install any external DC string fuses or DC circuit breakers. If customers want to have redundant protection, they can choose to install external DC overcurrent protection devices with  $\geq 1.56$  times of the string  $I_{sc}$ . External DC overcurrent protection devices shall comply with UI1741.

Please see table 3.1 for acceptable wire size for DC connections. Wire must be copper only. The steps to assemble the DC connectors are listed as follows:

1. Strip off the DC wire for about 7mm, Disassemble the connector cap nut.
2. Insert the wire into the connector cap nut and contact pin.

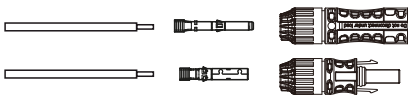


Figure 3.13 Disassemble the Connector Cap nut

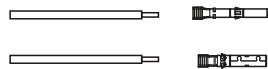


Figure 3.14 Insert the Wire into the Connector Cap nut and contact pin

3. Crimp the contact pin to the wire using a proper wire crimper.
4. Insert metal connector into top of connector, and tighten nut with torque 3-4 Nm.

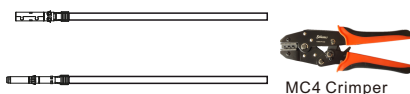


Figure 3.15 Crimp the contact pin to the wire



Figure 3.16 Connector with Cap nut Screwed on

5. Measure the DC voltage of each PV string with multimeter, confirm the polarity of PV strings are correct (see figure 3.17), and ensure each string voltage is in range of inverter operation.

Connect DC connector with inverter until hearing a slight clicking sound indicating successful connection. (see figure 3.18)

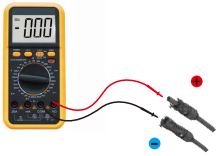


Figure 3.17 Multimeter measurement

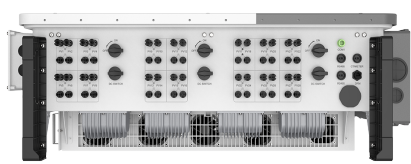


Figure 3.18 Connect the DC Connectors to the Inverter

Cable type	Traverse area (mm <sup>2</sup> )		Outside diameter of cable (mm)
	Range	Recommended value	
PV Wire UL 4703 Listed	4.0~6.0 (12~10AWG)	4.0 (12AWG)	5.5~9.0



**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.

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 10 “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.
- Short circuit current of all strings connected to a single MPPT must not exceed the Max. Short Circuit rating of MPPT input. (see section 10 “Specifications” for Max. Short Circuit Current ).

## 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 10 “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.

## 3.4.3 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 bonded to the ground.  
The neutral wire is not necessary for the installation.

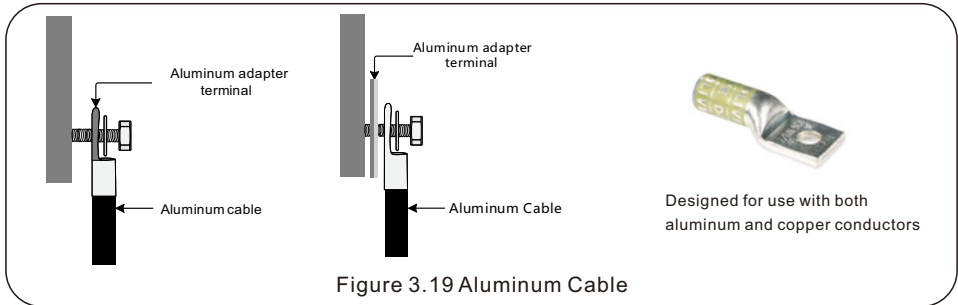
### Over-Current Protection Device (OCPD) for the AC side


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 (The OCPD shall comply with National Electrical Code®, ANSI/NFPA 70 or the Canadian Electrical Code® CSA C22.1):




## 3.4.3.1 Aluminum Cable Requirements

When Aluminum cable is selected, use copper to aluminum adapter terminal to avoid direct contact between the copper bar and the aluminum cable. When using aluminum/copper wire rated lug, no additional adapters are required.



**NOTE**  

 Direct contact between the copper bar and the aluminum cable will cause electro mechanical corrosion and impair the reliability of the electrical connection

**NOTE**  

 Inverter OCPD must be selected in accordance with National Electrical Code® ANSI/NFPA 70 or the Canadian Electrical Code® CSA C22.1. Operating ambient temperature and humidity must be factored and considered when selecting OCPD for the inverter output.

Inverter	Rated voltage(VAC)	Max. output current (Amps)	Current for protection device (A)
Solis-185K-EHV-5G-US	600	178.0	250
Solis-255K-EHV-5G-US	800	184.0	250
Solis-125K-EHV-5G-US-PLUS	600	132.3	175-200
Solis-185K-EHV-5G-US-PLUS	600	178.0	250
Solis-255K-EHV-5G-US-PLUS	800	184.0	250

Table 3.2 Rating of grid OCPD

### 3.4.3.2 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 10 "Specifications".

### 3.4.3.3 Wiring procedure



**CAUTION**

RISK OF ELECTRIC SHOCK. Prior to starting the wiring procedure, ensure that the three-pole circuit breaker is switched off and are LOTO.



**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.



**NOTE**

The DC switch of inverter only disconnects the PV without locking function. When installing and using this equipment, an additional disconnect means with a lock function is required.

Cable specification		AC Phase L1-L3 wire	Ground wire
Conductor gage AWG/ (mm <sup>2</sup> )	Range	2/0- 600kcmil (70~300)	1-2/0 (35~50)
	Recommended	300kcmil (150)	2/0 (50)
Conduit diameter Inch/ (mm)	Range	1-3" (26~92)	Same Conduit
	Recommended	2" (50.8)	Same Conduit



**NOTE**

Cable ampacity of ground wire should be more than half of cable ampacity of AC phase L1,L2,L3 wire.

1. Strip the end of AC cable insulating jacket about 12 inch then strip the end of each wire.

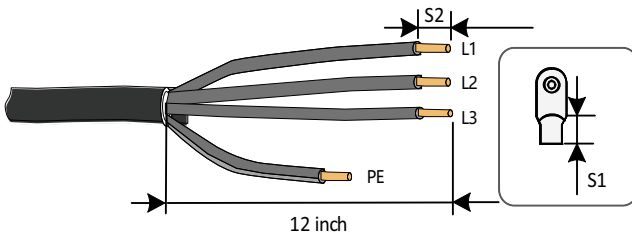


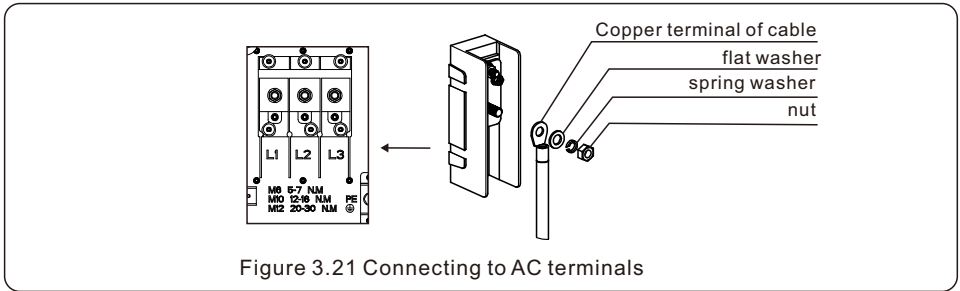
Figure 3.20 Strip AC cable



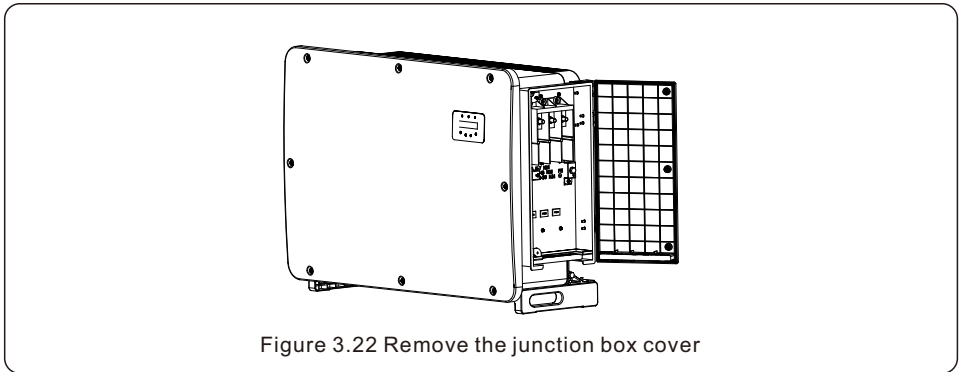
**NOTE**

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

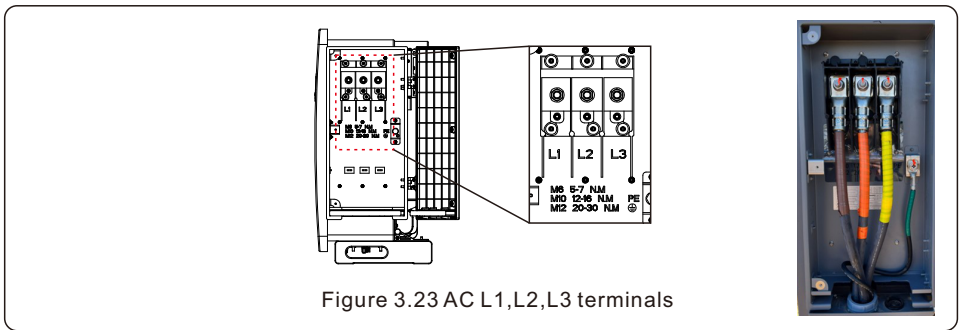
2. Strip the insulation of the wire past the cable crimping area of the OT terminal, then use a hydraulic crimp tool to crimp the terminal. The crimped portion of the terminal must be insulated with heat shrinkable tube or insulating tape.



- 3. LOTO the AC breaker disconnect to ensure it does not close unexpectedly.
- 4. Remove the 3 screws on the inverter junction box and open the junction box cover.



- 5. Insert the cable through the nut, sheath, and AC terminal cover. Connect the cable to the AC terminal block and tighten the nuts using a torque socket wrench. The torque is 17-21 ft.lbs.



There are 5 communication terminals on the inverters.  
COM1 is a 4-pin connector reserved for WiFi/Cellular datalogger.  
2xRS485 ports are for RS485 communication between inverters.  
DRM port is for DRM connection.  
Meter/CT port is reserved for further development.

## 4.1 RS485 communication connection

### Monitoring system for multiple inverters

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

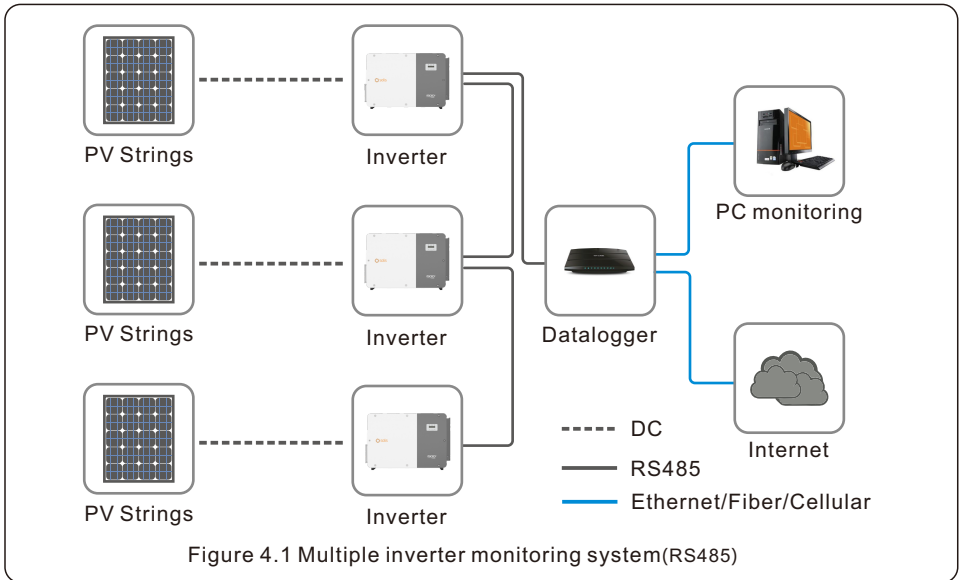


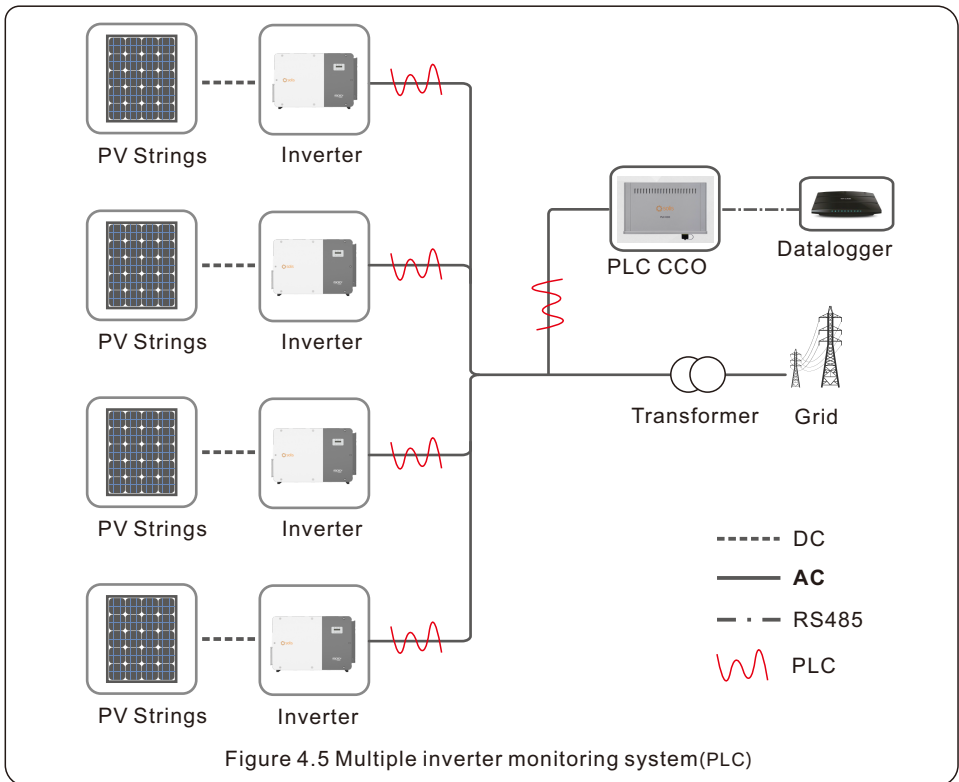


Figure 4.3 RS485 Cable assembly



Figure 4.4 RS485 Inverter cable connection

## 4.2 PLC ( Power Line Communication) connection



## 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 7.5 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.

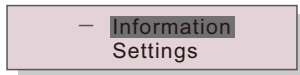


Figure 5.1

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.

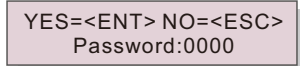


Figure 5.2

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

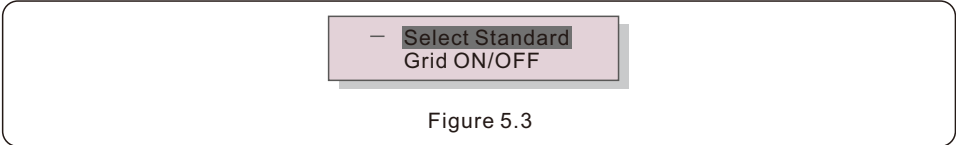


Figure 5.3

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

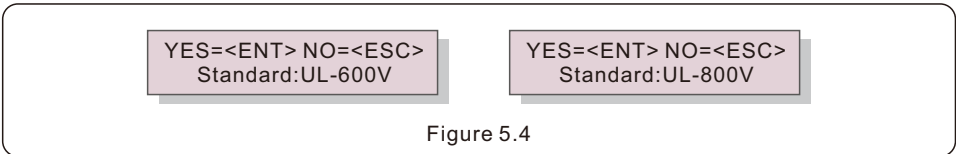


Figure 5.4

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 125K/185K in U.S. and Canada.

UL-800V, R21P3-800, ISONE800 are available for 255K in U.S. and Canada.

UL-600V is set as default standard that complies with IEEE-1547-2018 standard requirements. R21P3-600 is setting that complies with Rule 21 standard requirements.

ISONE600 is setting that complies with ISO New England standard requirements.

UL-800V is set as default standard that complies with IEEE-1547-2018 standard requirements. R21P3-800 is setting that complies with Rule 21 standard requirements.

ISONE800 is setting that complies with ISO New England standard requirements.

## 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.



## 5.4 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. Visually inspect the MC4 connector and make sure that the metal pin is correctly installed inside the MC4 housing.

### 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.



**WARNING**

Input voltages higher than the maximum value accepted by the inverter (see “Specifications” in section 10) 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. Verify the voltage is “floating”(slowly discharging toward 0V), not a consistent voltage to ground. Make sure you notice the units of the measurement. mV is not the same as V.

## 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). PH A to PH B, PH B to PH C and PH C to PH A.
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 10 “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.

## 6.1 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 switches **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 voltage 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 **WAITING**. 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. Press The **ENT** key to enter internal menus.
2. Navigate to **Advance Settings**.
3. Authorized Technicians will use the Password **0010** to enter the Advance Settings menu.
4. Enter the Advance Settings menu and scroll down to **Grid OFF/ON**.
5. Use the arrow keys to choose **GRID OFF**.
6. Technician will see the Green Operation LED go dark. The inverter may indicate a GRID OFF alarm and the technician may see a Yellow Alarm LED illuminate. The RED Power LED will stay lit until dc power is removed.
7. Turn off the AC Service Switch (or OCPD Device) to the OFF position.
8. Wait approximately 30 seconds and Switch the DC switches OFF.
9. 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.

In normal operation, LCD screen alternatively shows inverter power and operation status (see Figure 7.1). The screen can be scrolled manually by pressing the UP/DOWN keys. Pressing the ENTER key gives access to Main Menu.

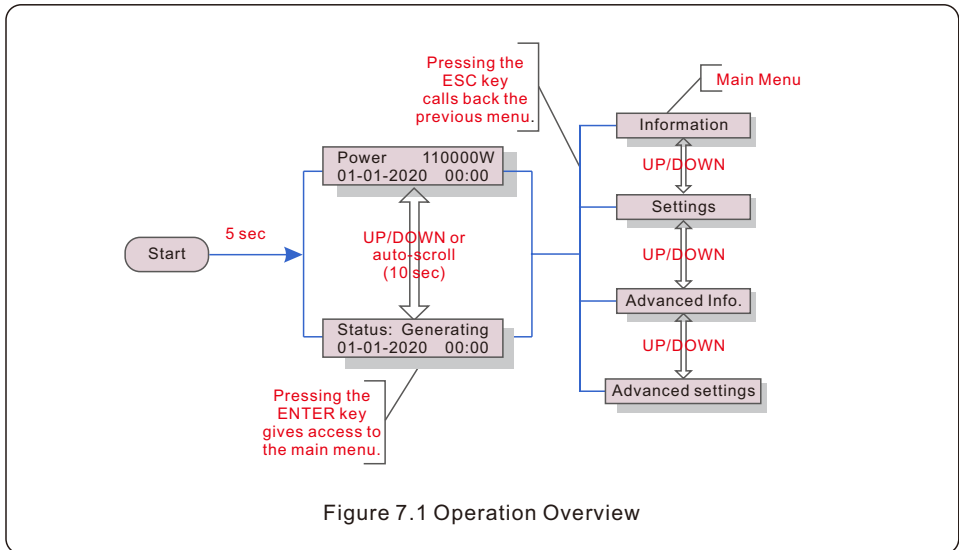


Figure 7.1 Operation Overview

## 7.1 Main Menu

There are four submenus in the Main Menu (see Figure 7.1):

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

## 7.2 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.

Display	Duration	Description
V_AB: +000.0V I_A: +00.0A	5 sec	V_AB: Shows output voltage between phase A and phase B. I_A: Shows output current of phase A.
V_BC: +000.0V I_B: +00.0A	5 sec	V_BC: Shows output voltage between phase B and phase C. I_B: Shows output current of phase B.
V_CA: +000.0V I_C: +00.0A	5 sec	V_CA: Shows output voltage between phase C and phase A. I_C: Shows output current of phase C.
Status: Waiting Power: 0000W	5 sec	Status: Shows instant status of the Inverter. Power: Shows instant output power value.
Rea_Power: 000000Var App_Power: 000000VA	5 sec	Rea_Power: Shows the reactive power of the inverter. App_Power: Shows the apparent power of the inverter.
Grid Frequency F_Grid 00.00Hz	5 sec	F_Grid: Shows the grid's frequency value.
Total Energy 0000000 kwh	5 sec	Total generated energy value.
This Month: 0000kwh Last Month: 0000kwh	5 sec	This Month: Total energy generated this month. Last Month: Total energy generated last month.
Today: 0000.0kwh Yesterday: 0000.0kwh	5 sec	Today: Total energy generated today. Yesterday: Total energy generated yesterday.
Inverter SN 00000000000000	5 sec	Display serial number of the inverter.

Table 7.1 Information list

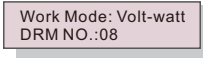
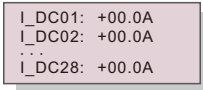
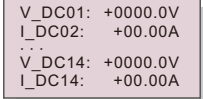
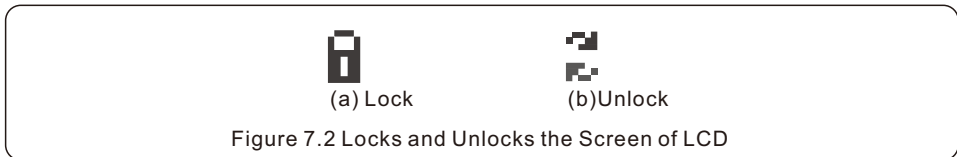
Display	Duration	Description
	5 sec	Work Mode: Shows current working mode. DRM NO.: Shows DRM Number.
	5 sec	I_DC01 : Shows string 01 current value. I_DC02 : Shows string 02 current value. ... I_DC28 : Shows string 28 current value.
	5 sec	V_DC01 : Shows MPPT 01 voltage value. I_DC01 : Shows MPPT 01 current value. ... V_DC14 : Shows MPPT 14 voltage value. I_DC14 : Shows MPPT 14 current value.

Table 7.2 Information list

## 7.2.1 Lock Screen

Pressing the ESC key returns to the Main Menu. Pressing the ENTER key locks (Figure 7.2(a)) or unlocks (Figure 7.2 (b)) the screen.



## 7.3 Settings

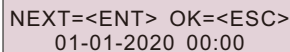
The following submenus are displayed when the Settings menu is selected:

### 1.Set Time

### 2.Set Address

#### 7.3.1 Set Time

This function allows time and date setting. When this function is selected, the LCD will display a screen as shown in Figure 7.3.



NEXT=<ENT> OK=<ESC>  
01-01-2020 00:00

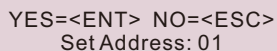
Figure 7.3 Set Time

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.

#### 7.3.2 Set Address

This function is used to set the address when multiple inverters are connected to a single datalogger.

The address number can be assigned from "01" to "99" (see Figure 7.4). The default address number of Solis Three Phase Inverter is "01". The first inverter in the string MUST have the address set to "01" in order to be able to report to SolisCloud.



YES=<ENT> NO=<ESC>  
Set Address: 01

Figure 7.4 Set Address

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.

## 7.4 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:

```
YES=<ENT> NO=<ESC>
Password:0010
```

Figure 7.5 Enter password

The default password is "0010". Please press "down" to move the cursor, press "up" to select the number.

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

### 7.4.1 Alarm Message

The display shows the 100 latest alarm messages (see Figure 7.6). Screens can be scrolled manually by pressing the UP/ DOWN keys. Press the ESC key to return to the previous menu.

```
Alm000: OV-G-V
T: 00-00 00:00 D: 0000
```

Figure 7.6 Alarm Message

### 7.4.2 Running Message

This function is for maintenance person to get running message such as internal temperature, Grid Standard, Firmware version and inverter serial number.

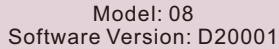
Screens can be scrolled manually by pressing the UP/DOWN keys.

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



## 7.4.3 Version

The screen shows the model version of the inverter. And the screen will show the software version by pressing the UP and DOWN at the same time. (see Figure 7.7).

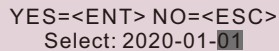


Model: 08  
Software Version: D20001

Figure 7.7 Model Version and Software Version

## 7.4.4 Daily Energy

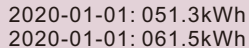
The function is for checking the energy generation for a specific date.



YES=<ENT> NO=<ESC>  
Select: 2020-01-01

Figure 7.8 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.



2020-01-01: 051.3kWh  
2020-01-01: 061.5kWh

Figure 7.9 Daily energy

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

## 7.4.5 Monthly Energy

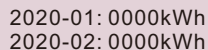
The function is for checking the energy generation for a specific month.



YES=<ENT> NO=<ESC>  
Select: 2020-01

Figure 7.10 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.




2020-01: 0000kWh  
2020-02: 0000kWh

Figure 7.11 Monthly energy

## 7.4.6 Yearly Energy

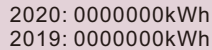
The function is for checking the energy generation for a specific year.



```
YES=<ENT> NO=<ESC>
Select: 2020
```

Figure 7.12 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.



```
2020: 0000000kWh
2019: 0000000kWh
```

Figure 7.13 Yearly energy

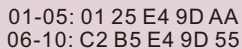
Press UP/DOWN key to move one date from another.

## 7.4.7 Daily Records

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

## 7.4.8 Communication Data

The screen shows the internal data of the Inverter (see Figure 7.14), which is for service technicians only.

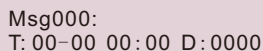


```
01-05: 01 25 E4 9D AA
06-10: C2 B5 E4 9D 55
```

Figure 7.14 Communication Data

## 7.4.9 Warning Message

The display shows the 100 latest warning messages (see Figure 7.15). 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 7.15 Warning Message

## 7.5 Advanced Settings - Technicians Only



### NOTE

To access to this area is for fully qualified and accredited technicians only. Please follow 7.4 to enter password to access this menu.

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

1. **Select Standard**
2. **Switch 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. **Fan Test**
13. **DSP Update**
14. **Compensation Set**
15. **I/V Curve**

### 7.5.1 Selecting Standard

This function is used to select the grid's reference standard.

Selecting the "User-Def" standard will allow for a custom grid standard setting to be set.

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

→ OV-G-V1: 660V  
OV-G-V1-T: 0.6S

Figure 7.16 UL-600V

YES=<ENT> NO=<ESC>  
Standard:UL-800V

→ OV-G-V1: 880V  
OV-G-V1-T: 0.6S

Figure 7.17 UL-800V

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

# 7. Normal operation

Setting value	600V Rated (L-L)	600V Rated (L-N)	800V Rated (L-L)	800V Rated (L-N)
Vup-Limit1	660<V<720	381<V<415	880<V<960	508<V<553
Time1	1S	1S	1S	1S
Vup-Limit2	V≥720	V≥415	V≥960	V≥553
Time2	0.16S	0.16S	0.16S	0.16S
Vdw-Limit1	360≤V<528	207≤V<304	480≤V<704	276≤V<405
Time1	2S	2S	2S	2S
Vdw-Limit2	V<360	V<207	V<480	V<276
Time2	0.16S	0.16S	0.16S	0.16S
Fup-Limit1	60.5Hz < F < 62Hz	60.5Hz < F < 62Hz	60.5Hz < F < 62Hz	60.5Hz < F < 62Hz
Time1	2S	2S	2S	2S
Fup-Limit2	F > 62Hz	F > 62Hz	F > 62Hz	F > 62Hz
Time2	0.16S	0.16S	0.16S	0.16S
Fdw-Limit1	57Hz < F < 59.5Hz	57Hz < F < 59.5Hz	57Hz < F < 59.5Hz	57Hz < F < 59.5Hz
Time1	2S	2S	2S	2S
Fdw-Limit2	57Hz < F	57Hz < F	57Hz < F	57Hz < F
Time2	0.16S	0.16S	0.16S	0.16S

Table 7.2 Baseline Inverter Settings

OV-G-V1: 660---720V	OV-G-F1: 61-66Hz
OV-G-V1-T: 1.00---13.00S	OV-G-F1-T: 180---1000S
OV-G-V2: 660---780V	OV-G-F2: 61.8-66Hz
OV-G-V2-T: 0.12S	OV-G-F2-T: 0.16---1000S
UN-G-V1: 30---528V	UN-G-F1: 50-59Hz
UN-G-V1-T: 2.00---50.00S	UN-G-F1-T: 180---1000S
UN-G-V2: 30---300V	UN-G-F2: 50-57Hz
UN-G-V2-T: 0.16---21.00S	UN-G-F2-T: 0.16---1000S
Startup-T: 10-600S	Restore-Hz: 59-61Hz

Table 7.3 Setting ranges for User-Def (600V for 125K and 185K)

OV-G-V1: 880---960V	OV-G-F1: 61-66Hz
OV-G-V1-T: 1---13S	OV-G-F1-T: 180---1000S
OV-G-V2: 880---1040V	OV-G-F2: 61.8-66Hz
OV-G-V2-T: 0.12S	OV-G-F2-T: 0.16---1000S
UN-G-V1: 40---704V	UN-G-F1: 50-59Hz
UN-G-V1-T: 2---50S	UN-G-F1-T: 180---1000S
UN-G-V2: 40---400V	UN-G-F2: 50-57Hz
UN-G-V2-T: 0.16---21S	UN-G-F2-T: 0.16---1000S
Startup-T: 10-600S	Restore-T: 59-61Hz

Table 7.4 Setting ranges for User-Def (800V for 255K)



**NOTE**

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

## 7.5.2 Switch ON/OFF

### 7.5.2.1 Grid ON/OFF

This function is used to start up or stop the power generation of Solis Three Phase Inverter.



Figure 7.18 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.

### 7.5.2.2 24H-Var Switch

This function is used to disable or enable the reactive power compensation at night.

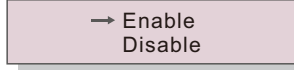


Figure 7.19 Set 24H-Var Switch

Press UP/DOWN to select and press to Enter to save the setting.  
Press the ESC to return to the previous menu.

## 7.5.3 Clear Energy

Clear Energy can reset the history yield of inverter



**NOTE**

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

## 7.5.4 Reset Password

This function is used to set the new password for menu “Advanced info.” and “Advanced information” .

```
YES=<ENT> NO=<ESC>  
Password: 0000
```

Figure 7.20 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.

## 7.5.5 Power Control

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

There are 6 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**
6. **Max Power Choose**

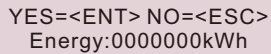


**NOTE**

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

## 7.5.6 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.



```
YES=<ENT> NO=<ESC>
Energy:0000000kWh
```

Figure 7.21 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.

## 7.5.7 Special Settings



### NOTE

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

## 7.5.8 STD Mode Settings



### NOTE

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. 3Tau Settings
6. Power Priority
7. Initial Settings
8. Voltage PCC Set

## 7.5.8.1 Working Mode Set

There are TWO situations with different grid standards selected.

### 7.5.8.1.1 With UL Standard selected

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.

#### 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.



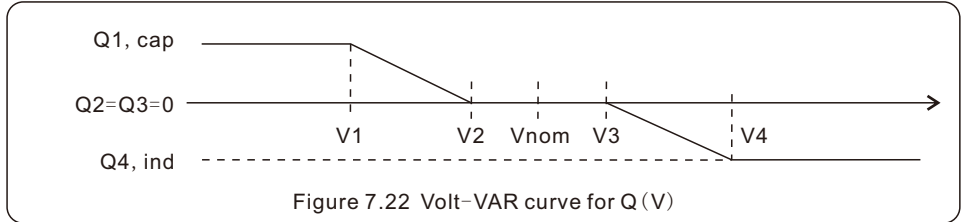
#### **NOTE**

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.



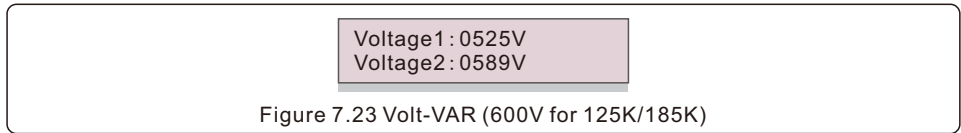
Default Settings for UL1741SA:

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

Rated 600V Grid

V1:(480-600V) Default 552V    V2: (480-660V) Default 580V

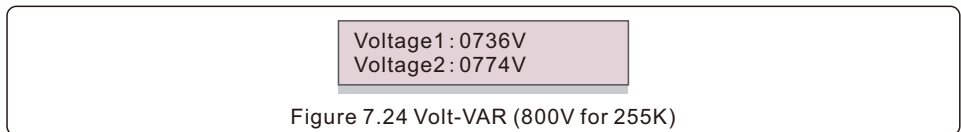
V3:(600-720V) Default 620V    V4: (600-720V) Default 642V



Rated 800V Grid

V1:(640-800V) Default 736V    V2: (640-880V) Default 774V

V3:(800-960V) Default 826V    V4: (800-960V) Default 856V



## 4.Fixed-PF

Description: Inverter will output power with fixed power factor.

Setting Range: -0.8 to +0.8

Default value is PF = 1

YES=<ENT> NO=<ESC>  
Power Factor: +1.00

Figure 7.25 Fixed-PF

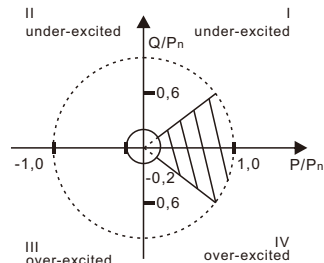


Figure 7.26 PF Range

## 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.



### NOTE

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.



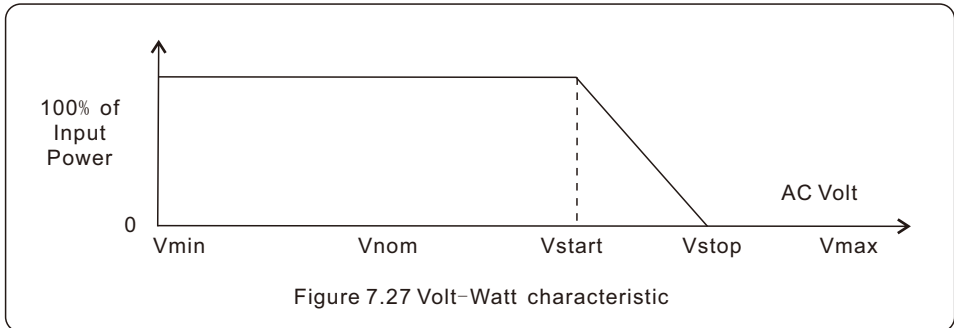
### NOTE

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

## 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.



Default Settings for UL1741SA:

Rated 600V Grid

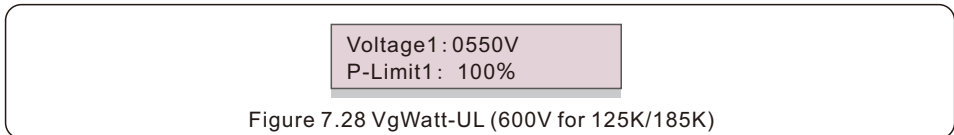
V1:less than V2

V2:less than Vstart

V3 (Vstart): (599-719V) Default 660V

V4 (Vstop): (660-779V) Default 719V

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

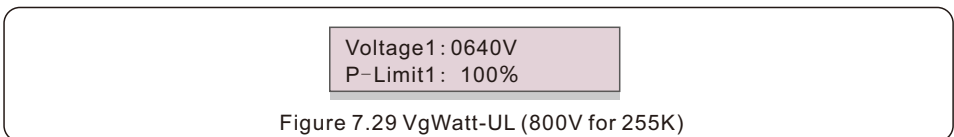


Rated 800V Grid

V1:(640-800V) Default 736V V2: (800-960V) Default 848V

V3:(800-960V) Default 880V V4: (800-960V) Default 920V

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



# 7. Normal operation

## 7.5.8.1.2 With Rule21 Standard selected

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.

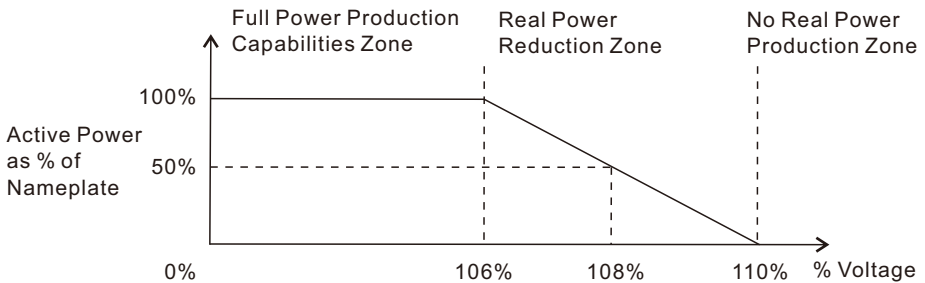


Figure 7.30 Volt-Watt characteristic

Default Settings for Rule21 Standards:

Rated 600V Grid

V1: less than Vstart

V2 (Vstart): (599-719V) Default 636V

V3 (Vstop): (660-779V) Default 660V

V4: larger than Vstop

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

Rated 800V Grid

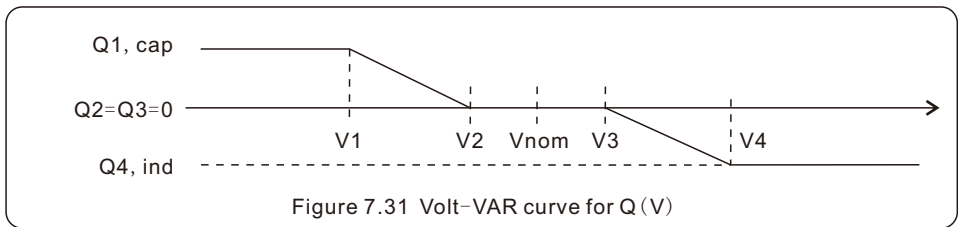
V1:(640-800V) Default 736V V2: (800-960V) Default 848V

V3:(800-960V) Default 880V V4: (800-960V) Default 920V

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

### 3. Volt-Var

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



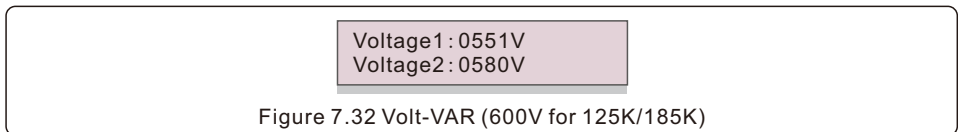
Default Settings for Rule21 Standard:

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

Rated 600V Grid

V1:(478-600V) Default 551V V2: (478-600V) Default 580V

V3:(600-719V) Default 618V V4: (600-719V) Default 640V



# 7. Normal operation

Rated 800V Grid

V1:(640-800V) Default 736V    V2: (800-960V) Default 848V

V3:(800-960V) Default 880V    V4: (800-960V) Default 920V

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

Voltage1 : 0796V  
Voltage2 : 0880V

Figure 7.33 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

YES=<ENT> NO=<ESC>  
Power Factor: +1.00

Figure 7.34 Fixed-PF

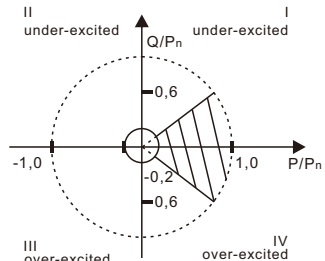


Figure 7.35 PF Range

## 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.



### NOTE

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.



### NOTE

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.



### NOTE

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

## 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.

YES=<ENT> NO=<ESC>  
Work Mode: V-Q & V-P

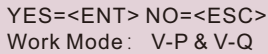
Figure 7.36 Work Mode

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.



```
YES=<ENT> NO=<ESC>
Work Mode: V-P & V-Q
```

Figure 7.37 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

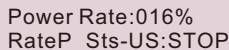
### 7.5.8.2 Power Rate Limit

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.



```
Power Rate:016%
RateP_Sts-US:STOP
```

Figure 7.38 Power Rate Limit



### 7.5.8.3 Freq Derate Set

This setting is applicable when UL Standards are selected.

There are 5 derate modes in this manual. When operating under standard UL 1741 limits, Modes 00 to 03 are disabled. Mode 04 is used for UL 1741SA frequency derating setting. Mode 08 is used for RULE 21 Freq-Watt setting. This sets the (f) start and (f) stop point.

#### Mode 04:

Derate Mode: 04  
OV-F-Start: 60.20Hz

Figure 7.39 Freq Derate Set

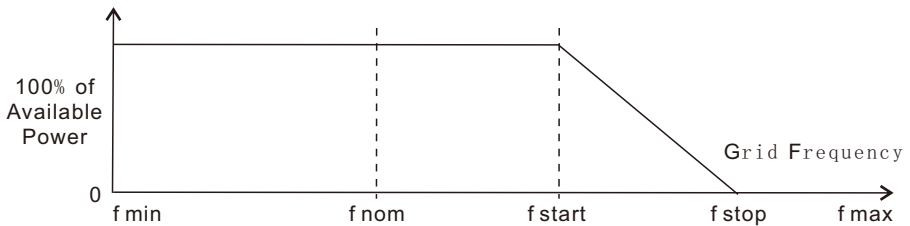


Figure 7.40 Freq-Watt characteristic

Over frequency load shedding Fstart range 60~62Hz, default setting 60.2Hz

Fstop 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.

## 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: 60.50Hz  
WGradient: 040%

Figure 7.41 Freq-Watt (1)

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.

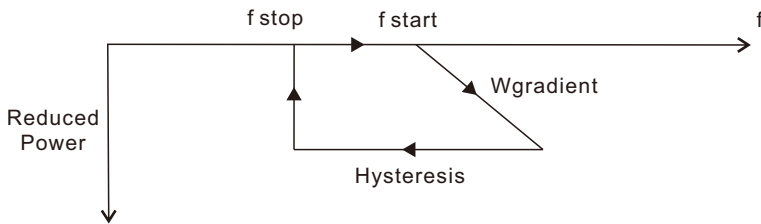


Figure 7.42 Freq-Watt (2)



### NOTE

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

#### 7.5.8.4 10mins Voltage Set

This function is disabled and not used for the US.

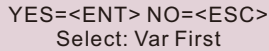


### NOTE

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

## 7.5.8.5 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 7.43 Power Priority

Two options are available: Watt First and Var First.

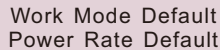


### NOTE

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

## 7.5.8.6 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 7.44 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.



### NOTE

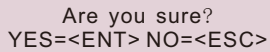
This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

## 7.5.9 Restore Settings

There are 5 items in initial setting submenu.

Restore setting could set all item in 7.5.7 special setting to default.

The screen shows as below:



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

Figure 7.45 Restore Settings

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

Press the ESC key to return the previous menu.

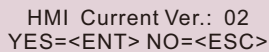
## 7.5.10 HMI Update



### NOTE

This section is applicable to maintenance personnel only.

Selecting “HMI Update” displays the sub-menu shown below:



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

Figure 7.46

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

HMI Update should not be performed unless the update tool with USB stick containing HMI firmware is connected to the inverter. Performing this function without proper tools will result in the HMI going blank and not coming back on.

Press the ESC key to return to the previous menu.

## 7.5.11 Restart HMI

The function is used for restarting the HMI. By pressing and holding ESC+DOWN+ENTER for ten seconds will manually reset the HMI screen.



### NOTE

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

## 7.5.12 FAN Test



**NOTE**

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 7.47

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.

## 7.5.13 DSP Update

The function is used for updating the DSP firmware.

DSP Update should not be perform unless the update tool with USB stick containing DSP firmware is connected to the inverter. Performing this function without proper tools will result in inverter malfunction .



**NOTE**

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

## 7.5.14 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 7.48 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.



**NOTE**

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

## 7.5.15 I/V Curve

This function is used to scan the I/V characteristic curves of each PV strings.

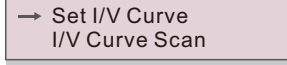


Figure 7.49 I/V Curve

### 7.5.15.1 Set I/V Curve

This setting can set the scanning voltage start point and the voltage interval.

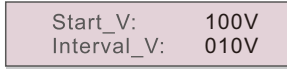


Figure 7.50 Set I/V Curve

Start\_V: The start voltage of the I/V scan. (Adjustable from 100V-1400V)

Interval\_V: The scanning voltage interval. (Adjustable from 001V-100V)

In total, 60 data points can be scanned.

The max scanning range is from 100-1450V.

### 7.5.15.2 I/V Curve Scan

Press "ENT" to start the I/V curve scan.

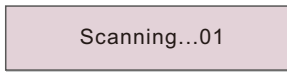


Figure 7.51 I/V Curve Scan (1)

After it is completed, the screen will display "Scan OK" and then enter the following section.

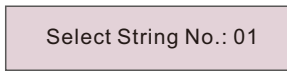


Figure 7.52 I/V Curve Scan (2)

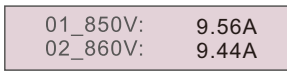


Figure 7.53 I/V Curve Scan (3)

## 7.6 AFCI function

Solis inverters have the built-in Type 1 Photovoltaic DC Arc-Fault Circuit-Protection which can detect the arc fault on the DC circuit and shut down the inverter to prevent a fire disaster.

### 7.6.1 Enable the AFCI function

The AFCI function can be enabled in the following.

Path: Advanced Setting -> Password: 0010 ->Special Settings -> AFCI Set -> AFCI ON/OFF -> ON

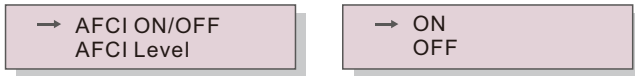


Figure 7.54 Set AFCI



#### Warning

The "AFCI Level" is reserved for Solis technicians ONLY. Do not change the sensitivity otherwise it will lead to frequent false alarms or malfunctions. Solis is not responsible for any further damages caused by unauthorized modifications.

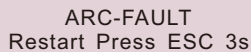


#### NOTE

The setting corresponds to the current status as well which can be used to inspect the ON/OFF state of the AFCI function.

### 7.6.2 Arc Fault

During the normal operation, if an DC arc is detected, the inverter will shut down and give out the following alarm:

The image shows a rectangular alarm message box with a light purple background and a grey shadow. The text inside reads 'ARC-FAULT' on the first line and 'Restart Press ESC 3s' on the second line.

ARC-FAULT  
Restart Press ESC 3s

Figure 7.55 Arc Fault

Installer needs to thoroughly inspect the DC circuit to ensure all the cables are correctly fastened.

Once the DC circuit issue has been fixed or it is confirmed to be OK, press "ESC" for 3s and wait for the inverter to restart.

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 or vacuum cleaner.



**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.

## 8.1 Anti-PID Function

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

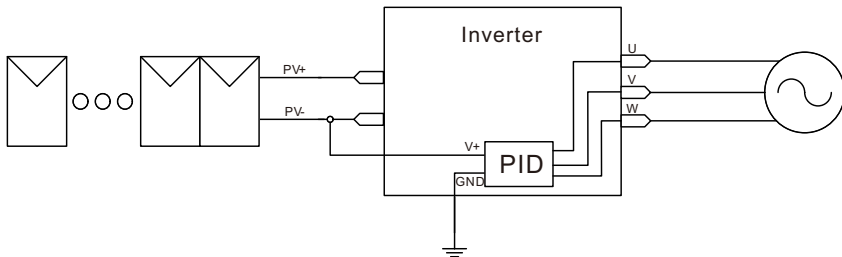


Figure 8.1

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





**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 20 minutes before you do other operations.

## 8.2 Fan Maintenance

If the fan doesn't work properly, the inverter will not be cooled effectively and it may affect the operation of the inverter.

Instructions below describe the necessary steps to replace a damaged or broken fan.

1. Turn off the "Grid ON/OFF switch on the inverter LCD.
2. Disconnect the AC power.
3. Turn the DC switches to "OFF" position
4. Wait for at least 15 minutes.
5. Remove the 2 screws on the fan plate.
6. Pull out the fan module slowly and unplug the power plug of the fan after pulling out around 150mm.
7. Clean and replace the broken fan.
8. Connect the electrical wire and reinstall the fan. Restart the inverter.

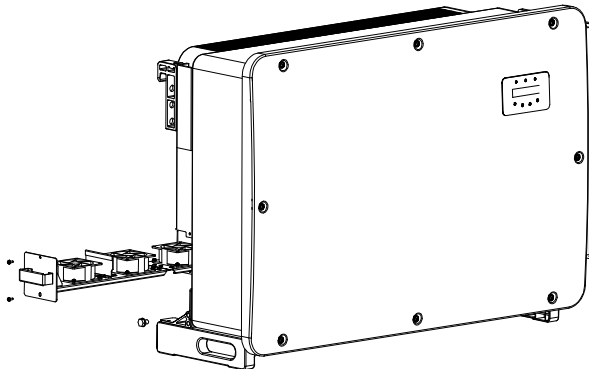


Figure 8.2

The inverter is designed in accordance with the most important international grid-tie standards and safety and electromagnetic compatibility requirements. Before delivering to the customer, the inverter has been subjected to several tests to ensure its optimal operation and reliability.

In case of failure, the LCD screen will display an alarm message. In this case, the inverter may stop feeding into the grid. The failure descriptions and their corresponding alarm messages are listed in Table 9.1:

Alarm Message	Failure description	Solution
No power	Inverter no power on LCD	<ol style="list-style-type: none"> <li>1. Check PV input connections</li> <li>2. Check if the DC input voltage higher than 620V</li> <li>3. Check if PV+/- is reversed</li> </ol>
LCD show initializing all the time	Can not start-up	<ol style="list-style-type: none"> <li>1. Check if the connector on main board or power board are fixed.</li> <li>2. Check if the DSP connector to power board are fixed.</li> </ol>
OV-G-V01/02/03/04	Over grid voltage	<ol style="list-style-type: none"> <li>1. Resistant of AC cable is too high. Change bigger size grid cable</li> <li>2. Adjust the protection limit if it's allowed by electrical company.</li> </ol>
UN-G-V01/02	Under grid voltage	<ol style="list-style-type: none"> <li>1. Use user define function to adjust the protection limit if it's allowed by electrical company.</li> </ol>
OV-G-F01/02	Over grid frequency	
UN-G-F01/02	Under grid frequency	
G-IMP	High grid impedance	
NO-GRID	No grid voltage	<ol style="list-style-type: none"> <li>1. Check connections and grid switch.</li> <li>2. Check the grid voltage inside inverter terminal.</li> </ol>
OV-DC01/02/03/04	Over DC voltage	<ol style="list-style-type: none"> <li>1. Reduce the module number in series</li> </ol>
OV-BUS	Over DC bus voltage	<ol style="list-style-type: none"> <li>1. Check inverter inductor connection</li> <li>2. Check driver connection</li> </ol>
UN-BUS01/02	Under DC bus voltage	
GRID-INTF01/02	Grid interference	<ol style="list-style-type: none"> <li>1. Restart inverter</li> <li>2. Change power board</li> </ol>
OV-G-I	Over grid current	
IGBT-OV-I	Over IGBT current	
DC-INTF OV-DCA-I	DC input overcurrent	<ol style="list-style-type: none"> <li>1. Restart inverter</li> <li>2. Identify and remove the string to the fault MPPT</li> <li>2. Change power board</li> </ol>
IGFOL-F	Grid current tracking fail	<ol style="list-style-type: none"> <li>1. Restart inverter or contact installer.</li> </ol>
IG-AD	Grid current sampling fail	
OV-TEM	Over Temperature	<ol style="list-style-type: none"> <li>1. Check inverter surrounding ventilation.</li> <li>2. Check if there's sunshine direct on inverter in hot weather.</li> </ol>

Alarm Message	Failure description	Solution
INI-FAULT	Initialization system fault	1.Restart inverter or contact installer.
DSP-B-FAULT	Comm. failure between main and slave DSP	
12Power-FAULT	12V power supply fault	
PV ISO-PRO 01/02	PV isolation protection	1.Remove all DC input, reconnect and restart inverter one by one. 2.Identify which string cause the fault and check the isolation of the string.
ILeak-PRO 01/02/03/04	Leakage current protection	1.Check AC and DC connection 2.Check inverter inside cable connection.
RelayChk-FAIL	Relay check fail	1.Restart inverter or contact installer.
DCinj-FAULT	High DC injection current	
AFCI self-detection (model with AFCI module)	AFCI module self-detect fault	1.Restart inverter or contact technician.
Arcing protection (model with AFCI module)	Detect arc in DC circuit	1. Check inverter connection whether arc exists and restart inverter.
Reve-DC	One of the DC string is reversely connected	1. 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.
Screen OFF with DC applied	Inverter internally damaged	1.Do not turn off the DC switches as it will damage the inverter. 2.Please wait for the solar irradiance reduces and confirm the string current is less than 0.5A with a clip-on ammeter and then turn off the DC switches. 3.Please note that any damages due to wrong operations are not covered in the device warranty.

Table 9.1 Fault message and description



**NOTE**

Before grid connection, if the string has negative current, it means the voltage between the two strings of one MPPT is unbalanced. One of two string may have more PV panels than another one.



**NOTE**

If the inverter displays any alarm message as listed in Table 9.1; please turn off the inverter (refer to Section 6.2 to stop your inverter) and wait for 15 minutes before restarting it (refer to Section 6.1 to start your inverter). If the failure persists, please contact your local distributor or the service center. Please keep ready with you the following information before contacting us.

1. Serial number of Solis Three Phase Inverter;
2. The distributor/dealer of Solis Three Phase Inverter (if available);
3. Installation date.
4. The description of problem (i.e. the alarm message displayed on the LCD and the status of the LED status indicator lights. Other readings obtained from the Information submenu (refer to Section 6.2) will also be helpful.);
5. The PV array configuration (e.g. number of panels, capacity of panels, number of strings, etc.);
6. Your contact details.

# 10. Specifications

Model	Solis-185K-EHV-5G-US
Max. DC input voltage (Volts)	1500
Rated DC voltage (Volts)	950
Start-up voltage (Volts)	500
MPPT voltage range (Volts)	570...1500
Full load MPPT voltage range (Volts)	860...1300
Max. input current (Amps)	14x26
Max short circuit input current (Amps)	14x40
MPPT number/Max input strings number	14/28
Rated output power (Watts)	185000
Max. output power (Watts)	185000
Max. apparent output power (VA)	185000
Rated grid voltage (Volts)	3/PE~600
Rated output current (Amps)	178.0
Power Factor (at rated output power)	>0.99 (0.8 leading - 0.8 lagging)
THDi (at rated output power)	<3%(at rated output power)
Rated grid frequency (Hertz)	60
Max. efficiency	98.7%
CEC efficiency	98.3%
Surge Protection	DC Type II / AC Type II
Integrated AFCI (DC arc-fault circuit protection)	YES
Integrated PID recovery	YES
Dimensions (W*H*D)	1170x770x384 (mm) / 46.1x30.3x15.1 (inch)
Weight	113kg / 249lb
Topology	Transformerless
Self consumption (night)	< 2W
Operating ambient temperature range	-13...140°F / -25...+60°C
Storage environment	-40...176°F / -40...+80°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), UL 1699B CAN/CSA C22.2 107.1-1,Rule 21 Phase II&III
DC connection	MC4 connectors
AC connection	OT Terminal connectors (Max.300mm <sup>2</sup> )
Display	LCD,2x20Z
Communication connections	RS485, Optional: PLC
Warranty	5 years standard (extend to 20 years)

# 10. Specifications

Model	Solis-255K-EHV-5G-US
Max. DC input voltage (Volts)	1500
Rated DC voltage (Volts)	1080
Start-up voltage (Volts)	500
MPPT voltage range (Volts)	570...1500
Full load MPPT voltage range (Volts)	860...1300
Max. input current (Amps)	14x26
Max short circuit input current (Amps)	14x40
MPPT number/Max input strings number	14/28
Rated output power (Watts)	255000
Max. output power (Watts)	255000
Max. apparent output power (VA)	255000
Rated grid voltage (Volts)	3/PE~800
Rated output current (Amps)	184.0
Power Factor (at rated output power)	>0.99 (0.8 leading - 0.8 lagging)
THDi (at rated output power)	<3%(at rated output power)
Rated grid frequency (Hertz)	60
Max. efficiency	99.0%
CEC efficiency	98.3%
Surge Protection	DC Type II / AC Type II
Integrated AFCI (DC arc-fault circuit protection)	YES
Integrated PID recovery	YES
Dimensions (W*H*D)	1170x770x384 (mm) / 46.1x30.3x15.1 (inch)
Weight	113kg / 249lb
Topology	Transformerless
Self consumption (night)	< 2W
Operating ambient temperature range	-13...140°F / -25...+60°C
Storage environment	-40...176°F / -40...+80°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), UL 1699B CAN/CSA C22.2 107.1-16,Rule 21 Phase II&III
DC connection	MC4 connectors
AC connection	OT Terminal connectors (Max.300mm <sup>2</sup> )
Display	LCD,2x20Z
Communication connections	RS485, Optional: PLC
Warranty	5 years standard (extend to 20 years)

# 10. Specifications

Model	Solis-125K-EHV-5G-US-PLUS
Max. DC input voltage (Volts)	1500
Rated DC voltage (Volts)	950
Start-up voltage (Volts)	500
MPPT voltage range (Volts)	570...1500
Full load MPPT voltage range (Volts)	860...1300
Max. input current (Amps)	9x30
Max short circuit input current (Amps)	9x50
MPPT number/Max input strings number	9/18
Rated output power (Watts)	125000
Max. output power (Watts)	137500
Max. apparent output power (VA)	137500
Rated grid voltage (Volts)	3/PE~600
Rated output current (Amps)	132.3
Power Factor (at rated output power)	>0.99 (0.8 leading - 0.8 lagging)
THDi (at rated output power)	<3%(at rated output power)
Rated grid frequency (Hertz)	60
Max. efficiency	98.6%
CEC efficiency	98.3%
Surge Protection	DC Type II / AC Type II
Integrated AFCI (DC arc-fault circuit protection)	YES
Integrated PID recovery	YES
Dimensions (W*H*D)	1170x770x384 (mm) / 46.1x30.3x15.1 (inch)
Weight	109kg / 240lb
Topology	Transformerless
Self consumption (night)	< 2W
Operating ambient temperature range	-13...140°F / -25...+60°C
Storage environment	-40...176°F / -40...+80°C
Relative humidity	0~100%
Ingress protection	Type 4X
Noise emission	≤65dB(A)
Cooling concept	Intelligent redundant cooling
Max.operation altitude	13120ft / 4000m
Compliance	UL1741, UL1741SA, UL1741SB, Rule21, UL 1998 IEEE 1547,FCC Part 15 (Class A & B), UL1699B CAN/CSA C22.2 107.1-1,Rule 21 Phase II&III
DC connection	MC4 connectors
AC connection	OT Terminal connectors (Max.300mm <sup>2</sup> )
Display	LCD,2x20Z
Communication connections	RS485, Optional: PLC
Warranty	5 years standard (extend to 20 years)

# 10. Specifications

Model	Solis-185K-EHV-5G-US-PLUS
Max. DC input voltage (Volts)	1500
Rated DC voltage (Volts)	950
Start-up voltage (Volts)	500
MPPT voltage range (Volts)	570...1500
Full load MPPT voltage range (Volts)	860...1300
Max. input current (Amps)	12x30
Max short circuit input current (Amps)	12x50
MPPT number/Max input strings number	12/24
Rated output power (Watts)	185000
Max. output power (Watts)	185000
Max. apparent output power (VA)	185000
Rated grid voltage (Volts)	3/PE~600
Rated output current (Amps)	178.0
Power Factor (at rated output power)	>0.99 (0.8 leading - 0.8 lagging)
THDi (at rated output power)	<3%(at rated output power)
Rated grid frequency (Hertz)	60
Max. efficiency	98.7%
CEC efficiency	98.3%
Surge Protection	DC Type II / AC Type II
Integrated AFCI (DC arc-fault circuit protection)	YES
Integrated PID recovery	YES
Dimensions (W*H*D)	1170x770x384 (mm) / 46.1x30.3x15.1 (inch)
Weight	113kg / 249lb
Topology	Transformerless
Self consumption (night)	< 2W
Operating ambient temperature range	-13...140°F / -25...+60°C
Storage environment	-40...176°F / -40...+80°C
Relative humidity	0~100%
Ingress protection	Type 4X
Noise emission	≤65dB(A)
Cooling concept	Intelligent redundant cooling
Max.operation altitude	13120ft / 4000m
Compliance	UL1741, UL1741SA, UL1741SB, Rule21, UL 1998 IEEE 1547,FCC Part 15 (Class A & B), UL1699B CAN/CSA C22.2 107.1-1,Rule 21 Phase II&III
DC connection	MC4 connectors
AC connection	OT Terminal connectors (Max.300mm <sup>2</sup> )
Display	LCD,2x20Z
Communication connections	RS485, Optional: PLC
Warranty	5 years standard (extend to 20 years)

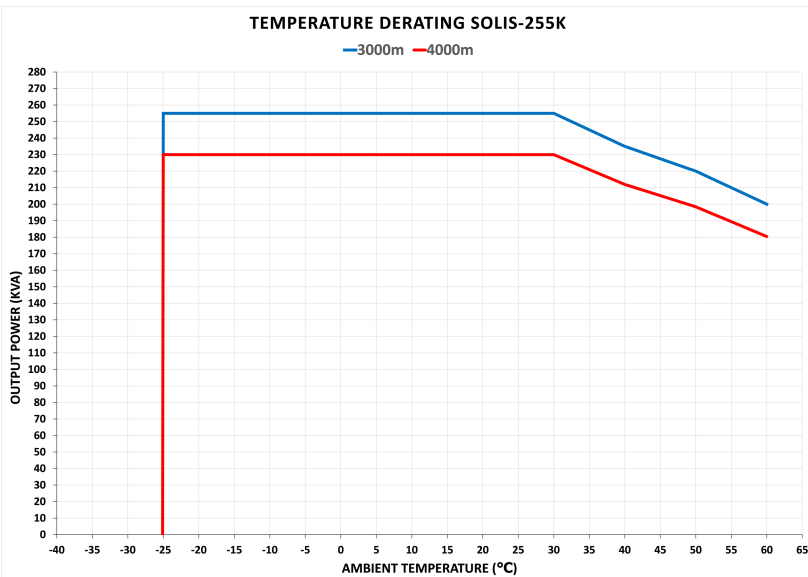


# 10. Specifications

Model	Solis-255K-EHV-5G-US-PLUS
Max. DC input voltage (Volts)	1500
Rated DC voltage (Volts)	1080
Start-up voltage (Volts)	500
MPPT voltage range (Volts)	570...1500
Full load MPPT voltage range (Volts)	860...1300
Max. input current (Amps)	12x30
Max short circuit input current (Amps)	12x50
MPPT number/Max input strings number	12/24
Rated output power (Watts)	255000
Max. output power (Watts)	255000
Max. apparent output power (VA)	255000
Rated grid voltage (Volts)	3/PE~800
Rated output current (Amps)	184.0
Power Factor (at rated output power)	>0.99 (0.8 leading - 0.8 lagging)
THDi (at rated output power)	<3%(at rated output power)
Rated grid frequency (Hertz)	60
Max. efficiency	99.0%
CEC efficiency	98.3%
Surge Protection	DC Type II / AC Type II
Integrated AFCI (DC arc-fault circuit protection)	YES
Integrated PID recovery	YES
Dimensions (W*H*D)	1170x770x384 (mm) / 46.1x30.3x15.1 (inch)
Weight	113kg / 249lb
Topology	Transformerless
Self consumption (night)	<2W
Operating ambient temperature range	-13...140°F / -25...+60°C
Storage environment	-40...176°F / -40...+80°C
Relative humidity	0~100%
Ingress protection	Type 4X
Noise emission	≤65dB(A)
Cooling concept	Intelligent redundant cooling
Max.operation altitude	13120ft / 4000m
Compliance	UL1741, UL1741SA, UL1741SB, Rule21, UL 1998 IEEE 1547,FCC Part 15 (Class A & B), UL1699B CAN/CSA C22.2 107.1-16,Rule 21 Phase II&III
DC connection	MC4 connectors
AC connection	OT Terminal connectors (Max.300mm <sup>2</sup> )
Display	LCD,2x20Z
Communication connections	RS485, Optional: PLC
Warranty	5 years standard (extend to 20 years)

Parts	Torque
Cover screws	1.5-1.7 ft.lbs
Ground screws (Cover)	4.4-5.9 ft.lbs
Ground screws (Internal)	7.4-8.9 ft.lbs
AC terminals	17-21 ft.lbs

## 11.1 Temperature Derating

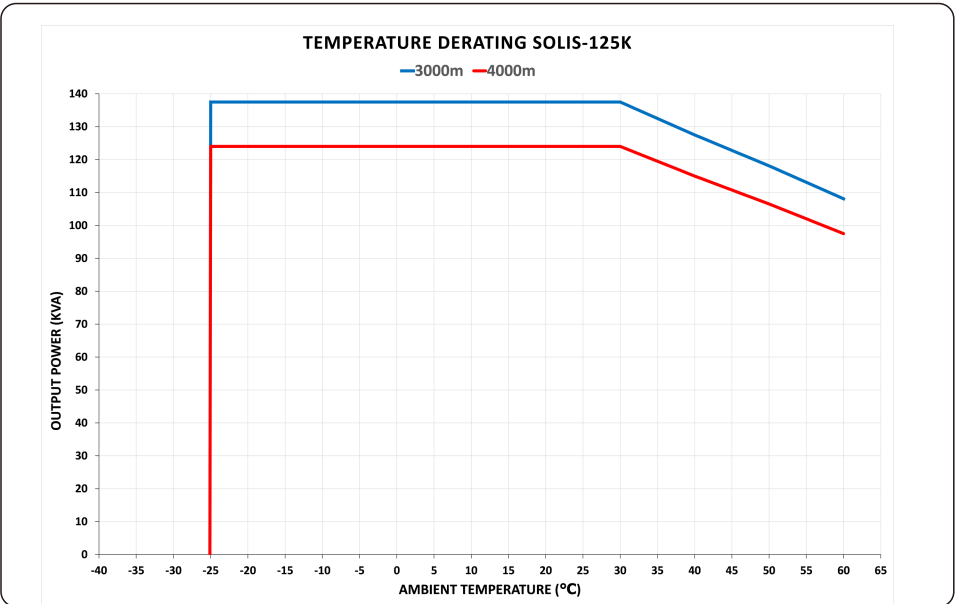
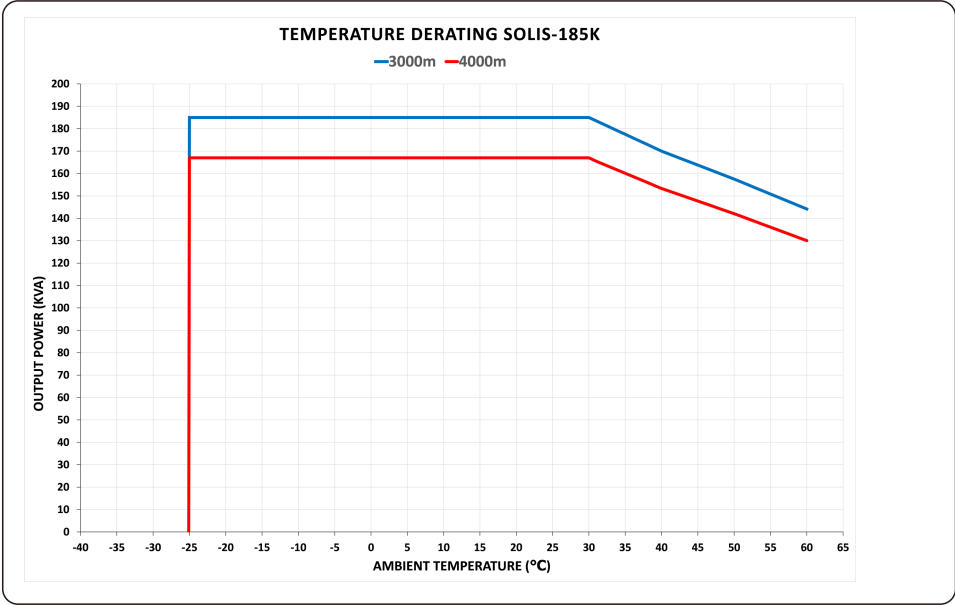


**Comments:**

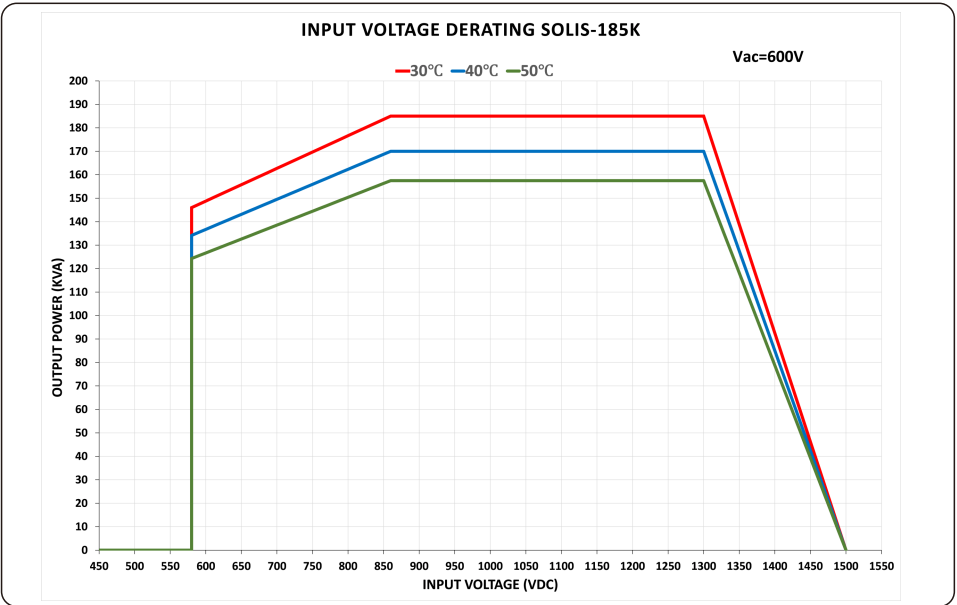
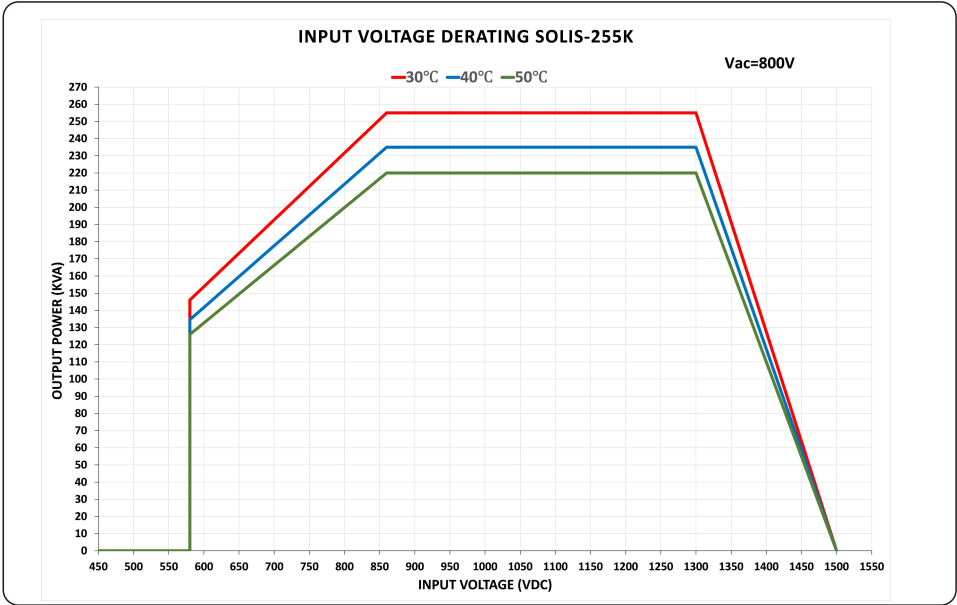
A thermal sensor inside the inverter is calibrated to determine ambient temperature.

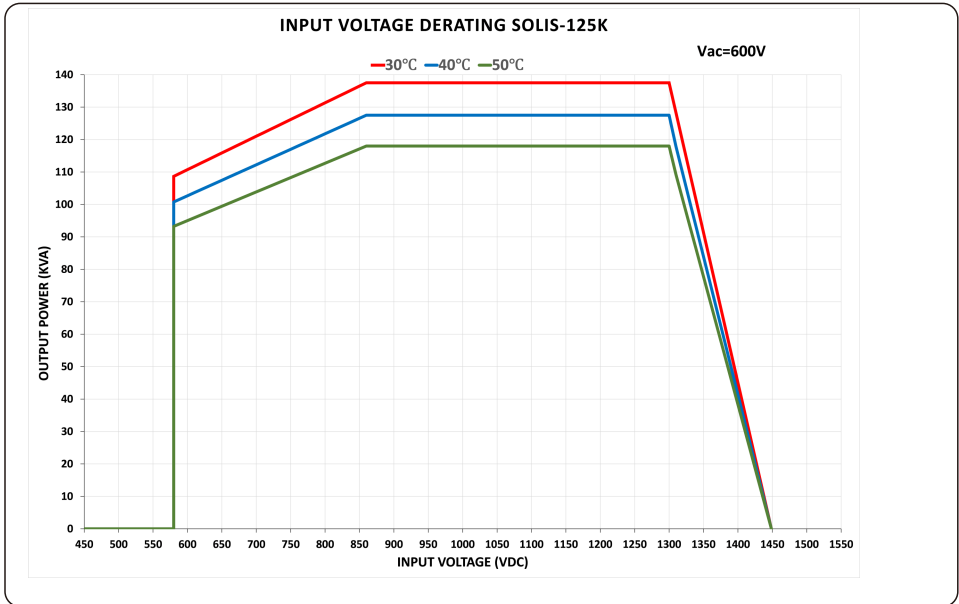
All inverters will begin a sloped derate at 30°C ending at 78% output power at 60°C.

Temperatures above 60°C and below -25°C will derate to 0% output power.

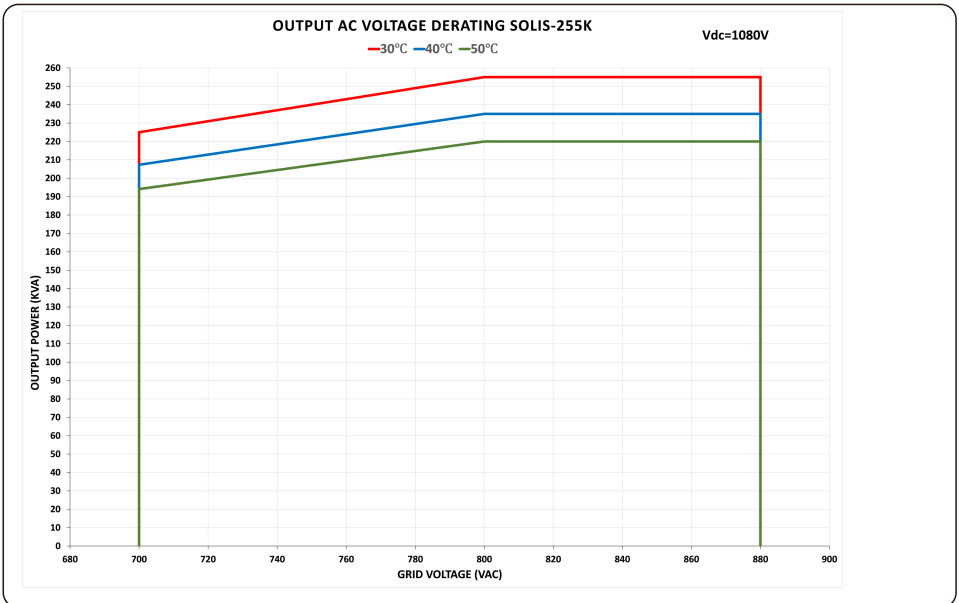


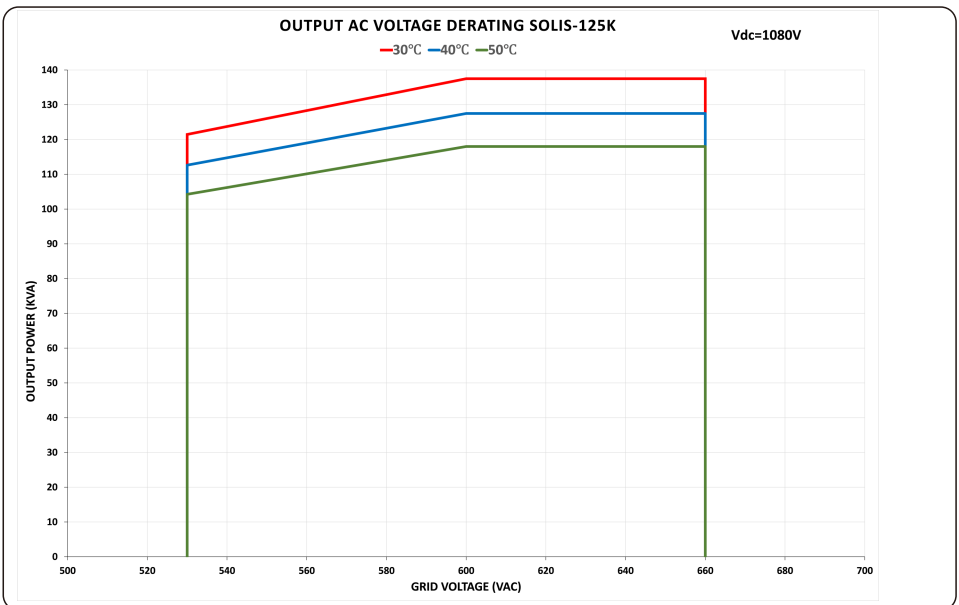
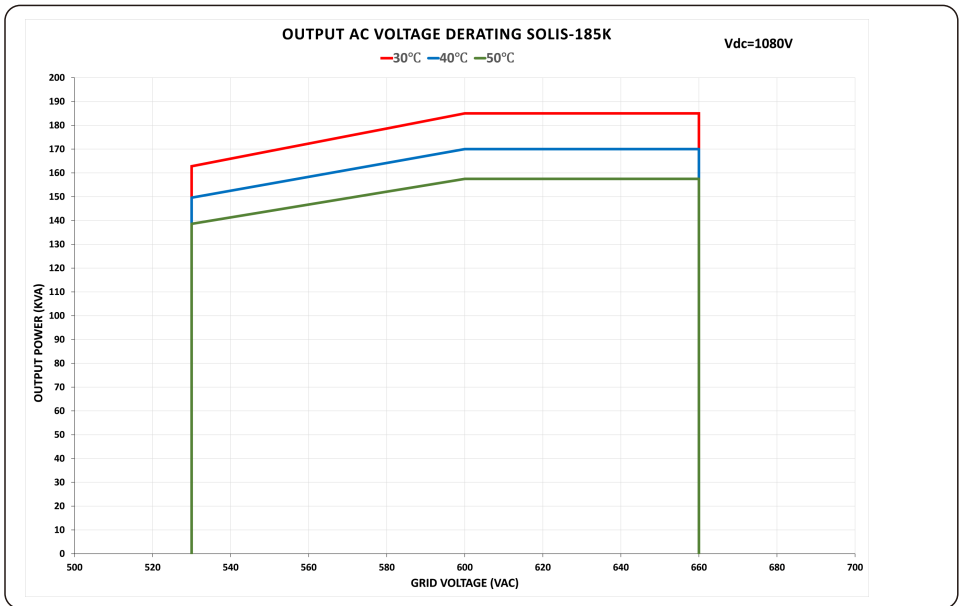
## 11.2 Input Voltage Derating



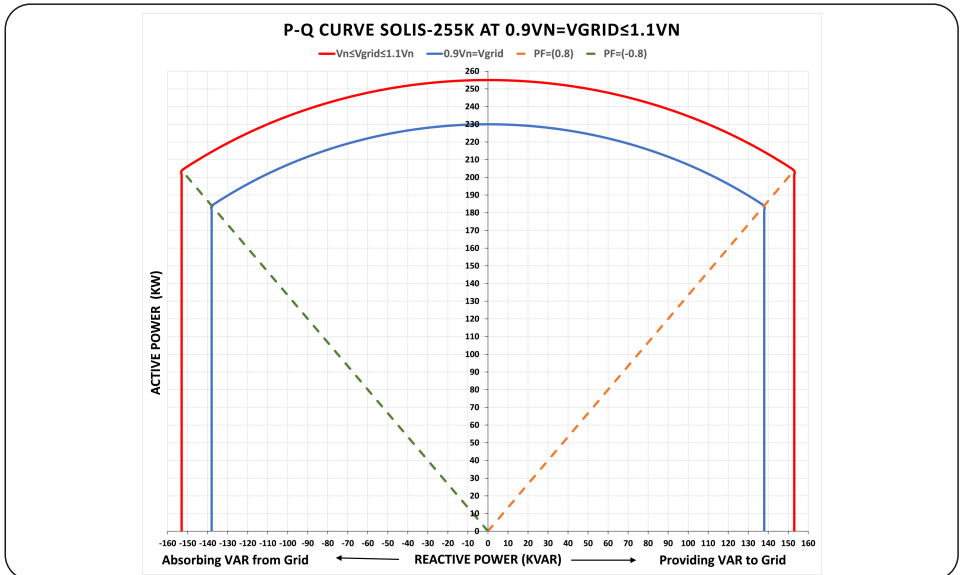
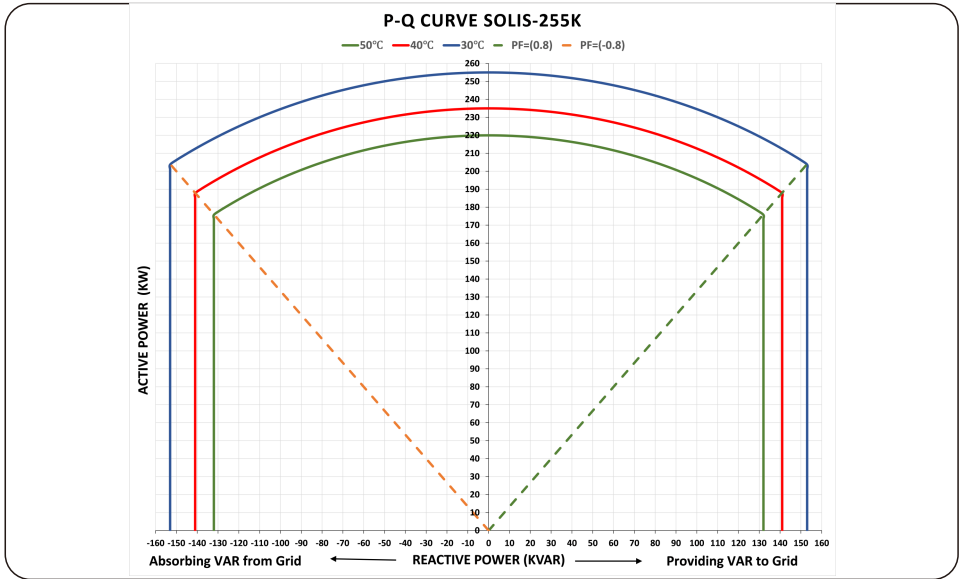


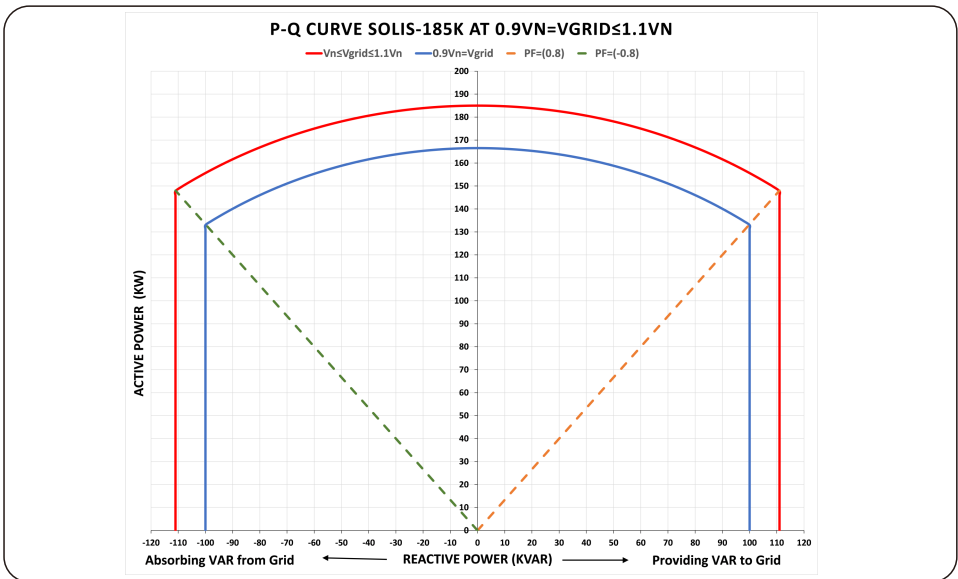
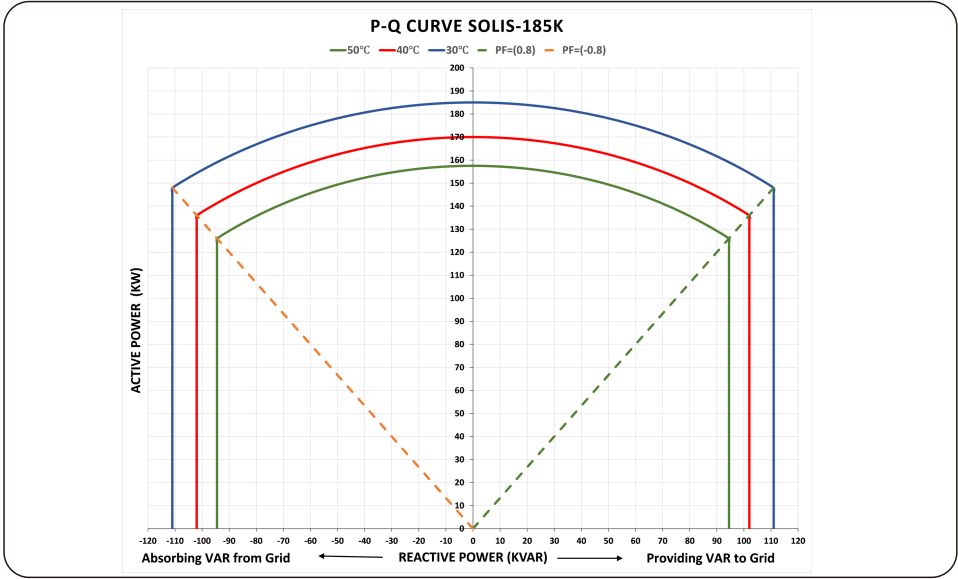
## 11.3 Output Voltage Derating



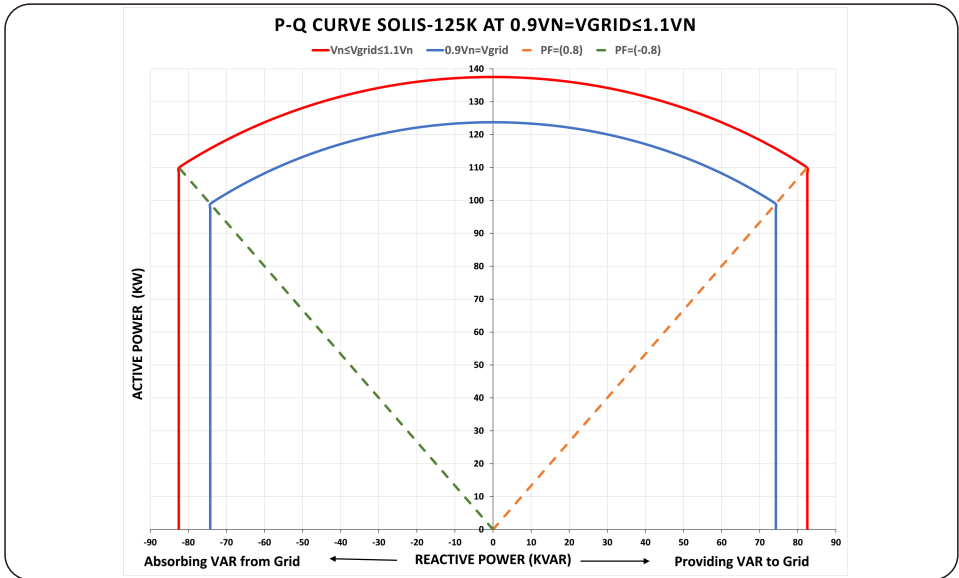
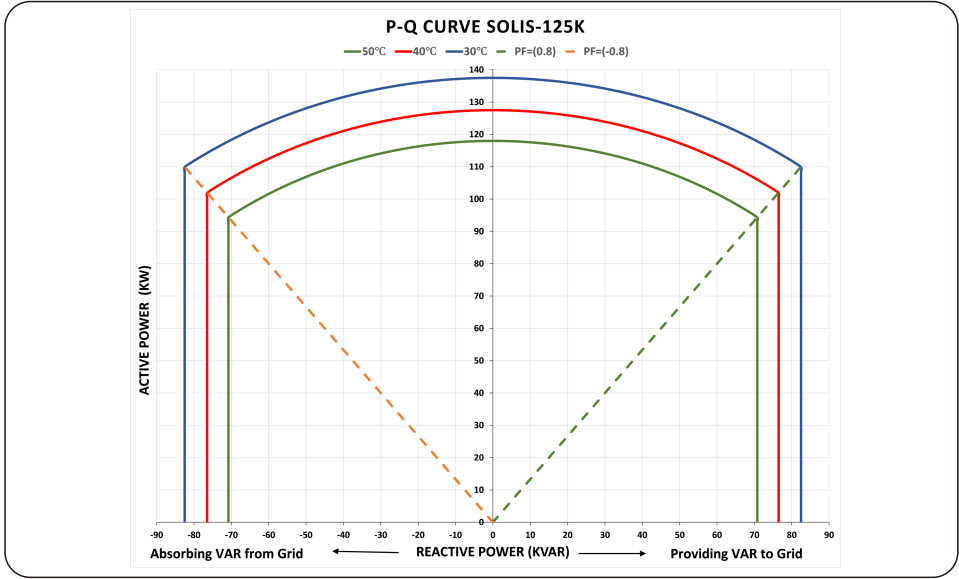


## 11.4 P-Q Capabilities at Nominal Output Power









## 11.5 Default Grid Setting for UL-600-18

Parameter	Range	Default	Description
OV-G-V01 L-L	660-720 V	660 V	Set grid over-voltage protection 01 value L-L
OV-G-V01 L-N	381-415.7 V	381 V	Set grid over-voltage protection 01 value L-N
OV-G-V01-T	1-13 S	13 S	Grid over-voltage protection 01 trip time
OV-G-V02 L-L	660-780 V	720 V	Set grid over-voltage protection 02 value L-L
OV-G-V02 L-N	381-450.3 V	415.7 V	Set grid over-voltage protection 02 value L-N
OV-G-V02-T		0.12 S	Grid over-voltage protection 02 trip time
OV-G-V03 L-L	660-780 V	720 V	Set grid over-voltage protection 03 value L-L
OV-G-V03 L-N	381-450.3 V	415.7 V	Set grid over-voltage protection 03 value L-N
OV-G-V03-T		0.12 S	Grid over-voltage protection 03 trip time
UN-G-V01 L-L	30-528 V	528 V	Set grid under-voltage protection 01 value L-L
UN-G-V01 L-N	17.32-304.8 V	304.8 V	Set grid under-voltage protection 01 value L-N
UN-G-V01-T	2-50 Sec.	21 S	Grid under-voltage protection 01 trip time
UN-G-V02 L-L	30-300 V	300 V	Set grid under-voltage protection 02 value L-L
UN-G-V02 L-N	17.32-173.2 V	173.2 V	Set grid under-voltage protection 02 value L-N
UN-G-V02-T	0.16-21 S	2 S	Grid under-voltage protection 02 trip time
UN-G-V03 L-L	30-300 V	300 V	Set grid under-voltage protection 03 value L-L
UN-G-V03 L-N	17.32-173.2 V	173.2 V	Set grid under-voltage protection 03 value L-N
UN-G-V03-T	0.16-21 S	2 S	Grid under-voltage protection 03 trip time
OV-G-F01	61-66 Hz	61.2 Hz	Set grid over-frequency protection 01 value
OV-G-F01-T	180-1000 S	300 S	Set grid over-frequency protection 01 trip time
OV-G-F02	61.8-66 Hz	62 Hz	Set grid over-frequency protection 02 value
OV-G-F02-T	0.16-1000 S	0.16 S	Set grid over-frequency protection 02 trip time
UN-G-F01	50-59 Hz	58.5 Hz <sup>1</sup>	Set grid under-frequency protection 01 value
UN-G-F01-T	180-1000 S	300 S	Set grid under-frequency protection 01 trip time
UN-G-F02	50-57 Hz	56.5 Hz	Set grid under-frequency protection 02 value
UN-G-F02-T	0.16-1000 S	0.16 S	Set grid under-frequency protection 02 trip time
Reconnection Voltage L-L	528-570 630-636 V	550.2-630 V	Set grid recovery voltage range after grid fault L-L
Reconnection Voltage L-N	304.8-329.1 V 363.7-367.2 V	317.7-363.7 V	Set grid recovery voltage range after grid fault L-N
Reconnection Time after Fault	0-600 S	300 S	Set reconnection time after a fault is cleared

## 11.5 Default Grid Setting for UL-600-18

Parameter	Range	Default	Description
Ramp-up Slew Rate	0-100%	100%	Set Ramp-up power slew rate during start-up
Reconnect Slew Rate	0.10-100%	0.33%V	Set Ramp-up power slew rate during reconnect
Volt Watt P3Tau	0.5-60 S	10 S	Set power rise time for Volt Watt condition
Volt Var Q3Tau	1-90 S	5 S	Set reactive power rise time for Volt Var condition
OV Frequency derate F-start	60.017-61 Hz	60.2Hz	Set OV start frequency for power derate
OV Frequency derate droop	2-5 %	5 %	Set OV frequency derate droop slope
OV Frequency derate response	0.2-10 S	5 S	Set OV frequency derate response time
UN Frequency derate F-start	59-59.98 Hz	59.8 Hz	Set UN start frequency for power derate
UN Frequency derate droop	2-5 %	5 %	Set UN frequency derate droop slope
UN Frequency derate response	0.2-10 S	5 S	Set UN frequency derate response time
Volt-Watt	Enabled/ Disabled	Enabled	Set Volt - Watt function
V1 L-L	240-360 V.	300 V	Set grid voltage V1 limit for Volt-Watt control
P1	0-100 % Pn	100% Pn	Set power P1 for Volt-Watt control
V2 L-L	360-480 V	420 V	Set grid voltage V2 limit for Volt-Watt control
P2	0-100 % Pn	100% Pn	Set power P2 for Volt-Watt control
V3 L-L	630-654 V	636 V	Set grid voltage V3 limit for Volt-Watt control
P3	0-100 % Pn	100% Pn	Set power P3 for Volt-Watt control
V4 L-L	636-660 V	660 V	Set grid voltage V4 limit for Volt-Watt control
P4	0-100 % Pn	20% Pn	Set power P4 for Volt-Watt control
Volt-Var	Enabled/ Disabled	Enable	Set Volt-Var function
V1 L-L	462-618 V	552 V	Set grid voltage V1 limit for Volt-Var control
Q1	0-60% Sn	+44% Sn	Set reactive power Q1 for Volt-Var control
V2 -L-L	552-630 V	588 V	Set grid voltage V2 limit for Volt-Var control
Q2	-60-60% Sn	0% Sn	Set reactive power Q2 for Volt-Var control
V3 L-L	470-648 V	612 V	Set grid voltage V3 limit for Volt-Var control
Q3	-60-60% Sn	0% Sn	Set reactive power Q3 for Volt-Var control
V4 L-L	582-738 V	648 V	Set grid voltage V4 limit for Volt-Var control
Q4	-60-0% Sn	-44% Sn	Set reactive power Q4 for Volt-Var control
Fixed PF	-0.8 -+0.8	1	Set Fixed Power Factor limit
Reactive Power	-60 -60 %	0%	Set Reactive Power level

## 11.6 Default Grid Setting for UL-800-18

Parameter	Range	Default	Description
OV-G-V01 L-L	880-960 V	880 V	Set grid over-voltage protection 01 value L-L
OV-G-V01-T	1-13 S	13 S	Grid over-voltage protection 01 trip time
OV-G-V02 L-L	880-1040 V	960 V	Set grid over-voltage protection 02 value L-L
OV-G-V02-T		0.12 S	Grid over-voltage protection 02 trip time
OV-G-V03 L-L	880-1040 V	960 V	Set grid over-voltage protection 03 value L-L
OV-G-V03-T		0.12 S	Grid over-voltage protection 03 trip time
UN-G-V01 L-L	40-704 V	704 V	Set grid under-voltage protection 01 value L-L
UN-G-V01-T	2-50 Sec.	21 S	Grid under-voltage protection 01 trip time
UN-G-V02 L-L	40-400 V	400 V	Set grid under-voltage protection 02 value L-L
UN-G-V02-T	0.16-21 S	2 S	Grid under-voltage protection 02 trip time
UN-G-V03 L-L	40-400 V	400 V	Set grid under-voltage protection 03 value L-L
UN-G-V03-T	0.16-21 S	2 S	Grid under-voltage protection 03 trip time
OV-G-F01	61-66 Hz	61.2 Hz	Set grid over-frequency protection 01 value
OV-G-F01-T	180-1000 S	300 S	Set grid over-frequency protection 01 trip time
OV-G-F02	61.8-66 Hz	62 Hz	Set grid over-frequency protection 02 value
OV-G-F02-T	0.16-1000 S	0.16 S	Set grid over-frequency protection 02 trip time
UN-G-F01	50-59 Hz	58.5 Hz1	Set grid under-frequency protection 01 value
UN-G-F01-T	180-1000 S	300 S	Set grid uvder-frequency protection 01 trip time
UN-G-F02	50-57 Hz	56.5 Hz	Set grid uvder-frequency protection 02 value
UN-G-F02-T	0.16-1000 S	0.16 S	Set grid uvder-frequency protection 02 trip time
Reconnection Voltage L-L	704-760 V 840-848 V	733.6-840 V	Set grid recovery voltage range after grid fault L-L
Reconnection Time after Fault	0-600 S	300 S	Set reconnection time after a fault is cleared

## 11.6 Default Grid Setting for UL-800-18

Parameter	Range	Default	Description
Ramp-up Slew Rate	0-100%	100%	Set Ramp-up power slew rate during start-up
Reconnect Slew Rate	0.10-100%	0.33%V	Set Ramp-up power slew rate during reconnect
Volt Watt P3Tau	0.5-60 S	10 S	Set power rise time for Volt Watt condition
Volt Var Q3Tau	1-90 S	5 S	Set reactive power rise time for Volt Var condition
OV Frequency derate F-start	60.017-61 Hz	60.2Hz	Set OV start frequency for power derate
OV Frequency derate droop	2-5 %	5 %	Set OV frequency derate droop slope
OV Frequency derate response	0.2-10 S	5 S	Set OV frequency derate response time
UN Frequency derate F-start	59-59.98 Hz	59.8 Hz	Set UN start frequency for power derate
UN Frequency derate droop	2-5 %	5 %	Set UN frequency derate droop slope
UN Frequency derate response	0.2-10 S	5 S	Set UN frequency derate response time
Volt-Watt	Enabled/ Disabled	Enabled	Set Volt - Watt function
V1 L-L	320-480 V.	400 V	Set grid voltage V1 limit for Volt-Watt control
P1	0-100 % Pn	100% Pn	Set power P1 for Volt-Watt control
V2 L-L	480-640 V	560 V	Set grid voltage V2 limit for Volt-Watt control
P2	0-100 % Pn	100% Pn	Set power P2 for Volt-Watt control
V3 L-L	840-872 V	848 V	Set grid voltage V3 limit for Volt-Watt control
P3	0-100 % Pn	100% Pn	Set power P3 for Volt-Watt control
V4 L-L	848-880 V	880 V	Set grid voltage V4 limit for Volt-Watt control
P4	0-100 % Pn	20% Pn	Set power P4 for Volt-Watt control
Volt-Var	Enabled/ Disabled	Enable	Set Volt-Var function
V1 L-L	616-824 V	736 V	Set grid voltage V1 limit for Volt-Var control
Q1	0-60% Sn	+44% Sn	Set reactive power Q1 for Volt-Var control
V2 -L-L	736-840 V	784 V	Set grid voltage V2 limit for Volt-Var control
Q2	-60-60% Sn	0% Sn	Set reactive power Q2 for Volt-Var control
V3 L-L	760-864 V	816 V	Set grid voltage V3 limit for Volt-Var control
Q3	-60-60% Sn	0% Sn	Set reactive power Q3 for Volt-Var control
V4 L-L	776-984 V	864 V	Set grid voltage V4 limit for Volt-Var control
Q4	-60-0% Sn	-44% Sn	Set reactive power Q4 for Volt-Var control
Fixed PF	-0.8 -+0.8	1	Set Fixed Power Factor limit
Reactive Power	-60 -60 %	0%	Set Reactive Power level

## 11.7 Product Certificate of Compliance



# Certificate of Compliance

<b>Certificate:</b> 80042699	<b>Master Contract:</b> 273488
<b>Project:</b> 80101842	<b>Date Issued:</b> 2022-08-15
<b>Issued to:</b> Ginlong Technologies Co., Ltd. No.57, Jintong Road, Xiangshan Ningbo, Zhejiang, 130 315712 CHINA	
<b>Attention:</b> Ruyi Pan	

*The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only*



Issued by: *Magic Zhang*  
Magic Zhang

**PRODUCTS**

CLASS 5311 09 - POWER SUPPLIES - Distributed Generation Power Systems Equipment  
 CLASS 5311 89 - POWER SUPPLIES - Distributed Generation Power Systems Equipment - Certified to U.S. Standards

Transformerless Grid Support Utility Interactive PV Inverter, Models Solis-255K-EHV-5G-US, Solis-185K-EHV-5G-US, Solis-255K-EHV-5G-US-PLUS, Solis-185K-EHV-5G-US-PLUS and Solis-125K-EHV-5G-US-PLUS. Wall mounted, permanently connected.


Notes:  
 For details related to rating, size, configuration, etc., reference should be made to the CSA Certification Record, Certificate of Compliance, Annex A or the Descriptive Report.

**APPLICABLE REQUIREMENTS**

CSA-C22.2 No.107.1-16	-	Power Conversion Equipment
*UL Std.No. 1741-Third Edition	-	Inverters, Converters, Controllers and Interconnection System Equipment For Use With Distributed Energy Sources (Third Edition, Dated September 28, 2021)
**UL 1699B	-	Photovoltaic (PV) DC Arc-Fault Circuit Protection

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## 11.7 Product Certificate of Compliance



<b>Certificate:</b> 80042699		<b>Master Contract:</b> 273488
<b>Project:</b> 80101842		<b>Date Issued:</b> 2022-08-15

\*\*UL1741 CRD - (First Edition, Revision Dated August 22, 2018)  
Non-Isolated EPS Interactive PV Inverters Rated Less Than 30Kva  
(Dated April 26, 2010)


\*Note: Conformity to UL 1741(Third Edition, Dated September 28, 2021) includes compliance with applicable requirements of IEEE 1547-2003 (R2008), IEEE 1547a-2014, IEEE 1547.1-2005(R2011), IEEE 1547.1a-2015. Grid support function is verified according to UL 1741 Supplement SA8-SA18 with the SRDs of California Electric Rule 21, and also verified according to UL 1741 Supplement SB and IEEE 1547.1-2020 with the SRDs of IEEE 1547-2018 and IEEE 1547a-2020. While the grid support function evaluated according to IEEE 1547.1-2020, the interoperability is verified with IEEE 2030.5-2018 communication protocol.

\*\*Note: The functional safety has been evaluated according to applicable requirement of UL 1998-Edition 3 as required by the product standard.

Notes:

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Products certified under Class C531109 have been certified under CSA's ISO/IEC 17065 accreditation with the Standards Council of Canada (SCC). [www.scc.ca](http://www.scc.ca)



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## 11.7 Product Certificate of Compliance



### *Supplement to Certificate of Compliance*

**Certificate:** 80042699

**Master Contract:** 273488

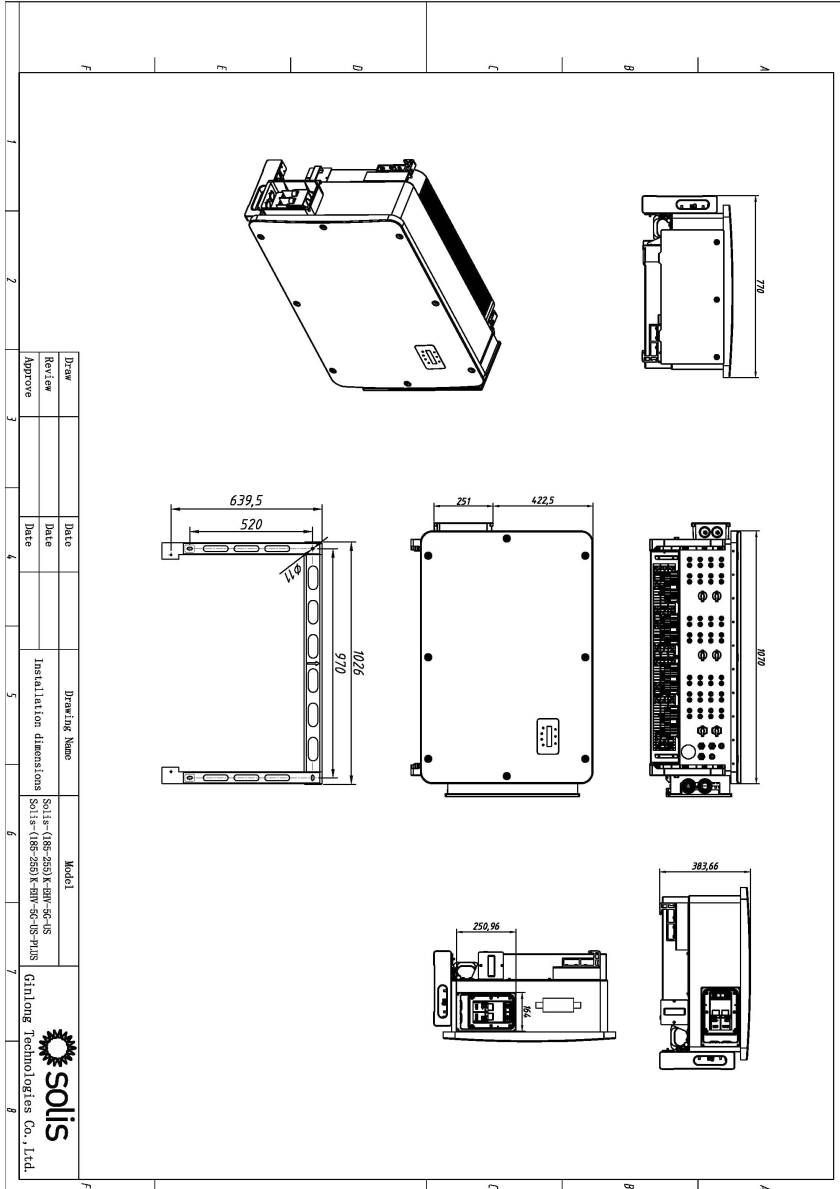
*The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.*

#### **Product Certification History**

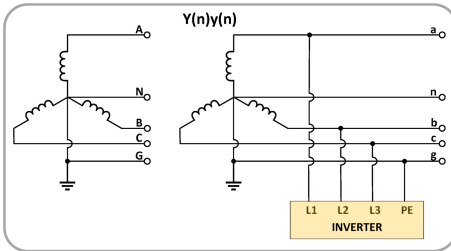
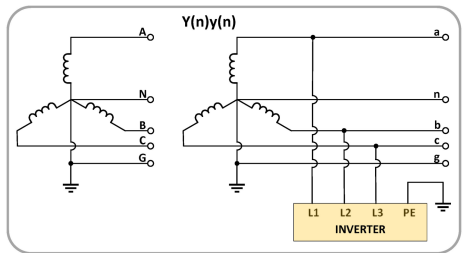
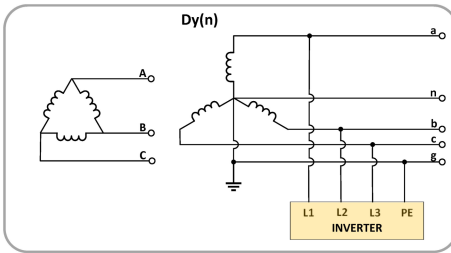
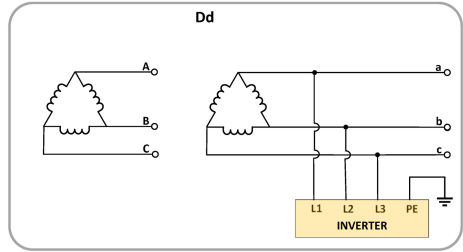
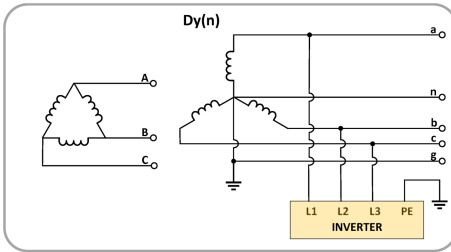
<b>Project</b>	<b>Date</b>	<b>Description</b>
80101842	2022-08-15	Update the report 80042699 to add models Solis-125K-EHV-5G-US-PLUS and evaluate the Grid support function to comply with UL 1741 Supplement SB according to IEEE 1547.1-2020 with SRDs IEEE 1547-2018 and IEEE 1547a-2020 for all models.
80072246	2021-06-30	Update the report 80042699 to add models Solis-255K-EHV-5G-US-PLUS and Solis-185K-EHV-5G-US-PLUS, and meet requirements of UL 1699B Photovoltaic (PV) DC Arc-Fault Circuit Protection (First Edition, Revision Dated August 22, 2018) for all models. (C/US)
80046894	2020-11-04	Update the report 80042699 to include requirements of UL1741CRD Grid Support Utility Interactive Interoperability Optional Functions: Prevent Enter Service and Limit Active Power (CA Rule 21, Phase 3, functions 2 and 3) (Dated October 22, 2019) for Transformerless Grid Support Utility Interactive PV Inverter, Models Solis-255K-EHV-5G-US and Solis-185K-EHV-5G-US.
80042699	2020-09-15	Transformerless Grid Support Utility Interactive PV Inverter, Models Solis-255K-EHV-5G-US and Solis-185K-EHV-5G-US. (C/US)



## 11.8 Mechanical Dimension Drawing



## 11.9 Medium Voltage Transformer Winding Configuration



Compatible Transformer Winding Configuration				
Y(n)y(n)	Dy(n)	Dd	Y(n)d	Inverter Model
YES	YES	YES	NO	Solis-125K-EHV-5G-US-PLUS
YES	YES	YES	NO	Solis-185K-EHV-5G-US Solis-185K-EHV-5G-US-PLUS
YES	YES	YES	NO	Solis-255K-EHV-5G-US Solis-255K-EHV-5G-US-PLUS

Manufacturer: Ginlong Technologies Co.,Ltd., Ningbo, Zhejiang, P.R.China

Toll-free: 866.438.8408 | Email: [sales@ginlong.com](mailto:sales@ginlong.com) | [ussales@solisinverters.com](mailto:ussales@solisinverters.com)  
[usservice@solisinverters.com](mailto:usservice@solisinverters.com)

Web: [www.ginlong.com](http://www.ginlong.com) | [www.ginlong.com/us](http://www.ginlong.com/us)

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.

