



User Manual

Commercial Energy Storage
Three Phase High Voltage
Hybrid Inverter



Applicable Models:

S6-EH3P30K03-NV-YD-H-US
S6-EH3P30K03-LV-YD-H-US
S6-EH3P40K04-NV-YD-H-US
S6-EH3P50K04-NV-YD-H-US
S6-EH3P60K04-NV-YD-H-US

Important Notes

- Product specifications are subject to change without notice . Every attempt has been made to make this document complete , accurate and up-to-date . Individuals reviewing this document and installers or service personnel are cautioned , however, that 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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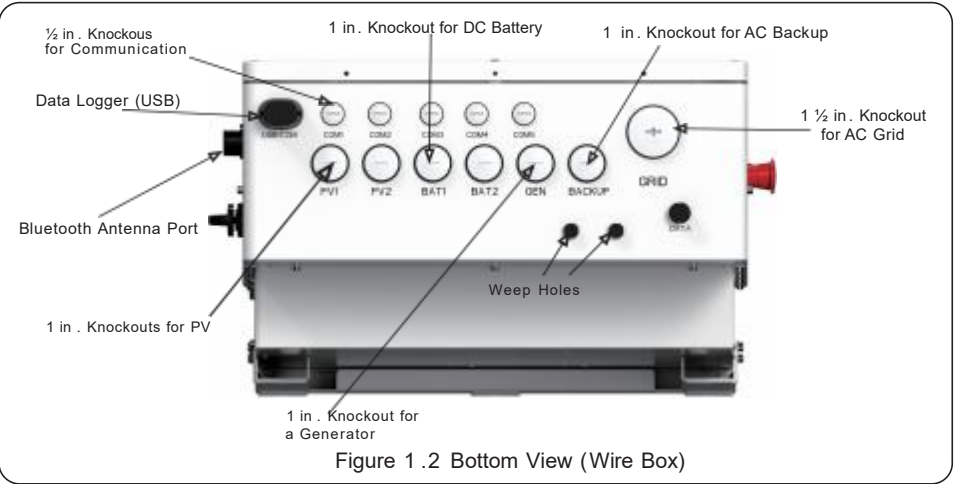
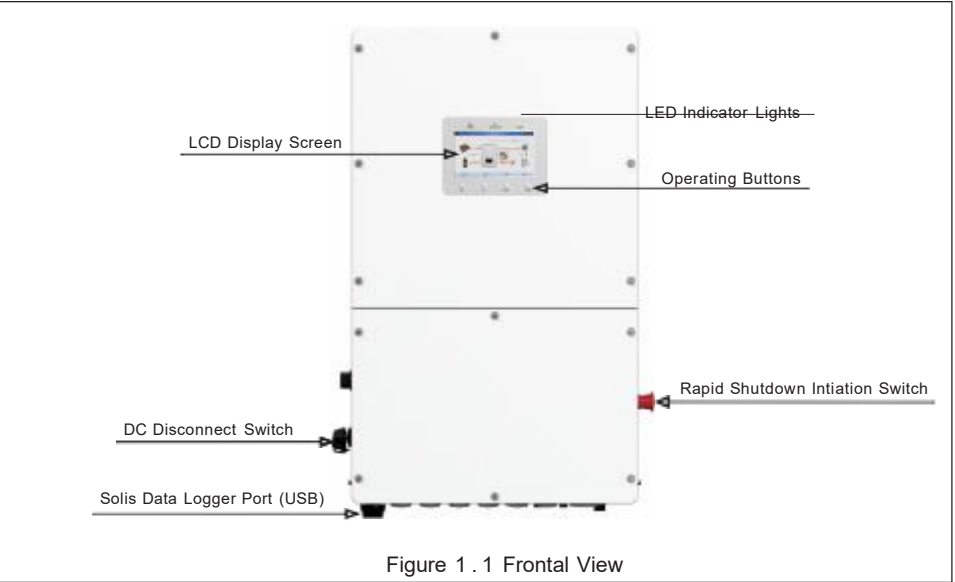
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1. Introduction

1.1 Inverter Description

This Solis hybrid inverter series is designed for commercial solar plus energy storage applications where the power grid is 480V, 240V, 220V or 208V three phase . The inverter is able to maximize self-consumption while also providing backup power whenever grid power is lost . It can also utilize peak-shaving and time charging modes . The inverter is able to connect directly to a generator as well . The Solis S6 series consists of the following inverter models: 30kW, 40kW, 50kW, 60kW, and 30kW-LV (LV = “Low Voltage” 240V, 220V or 208V) .



1. Introduction

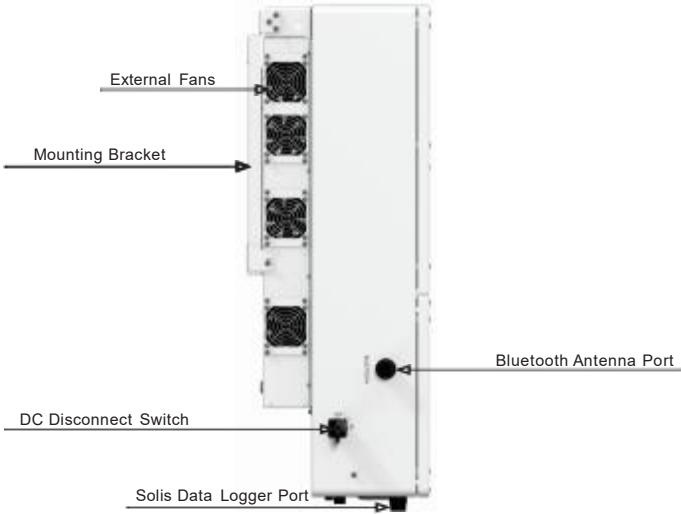


Figure 1.3 Right Side View

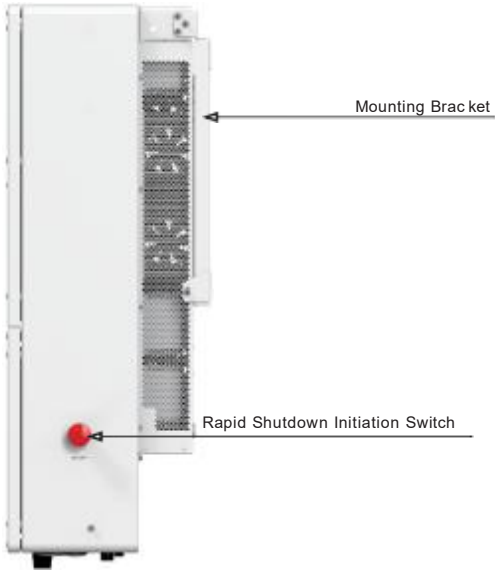
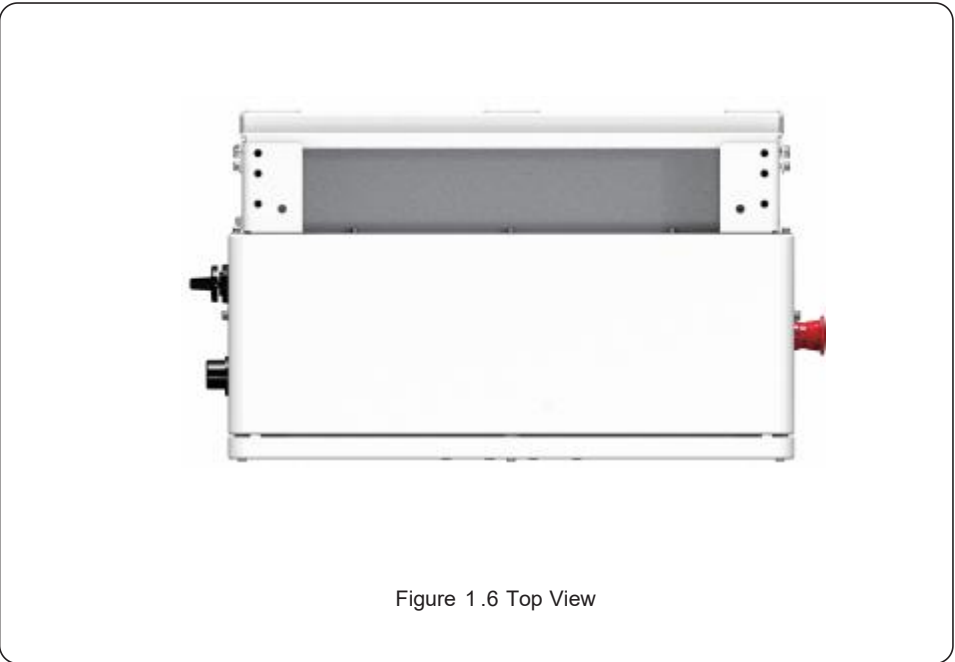
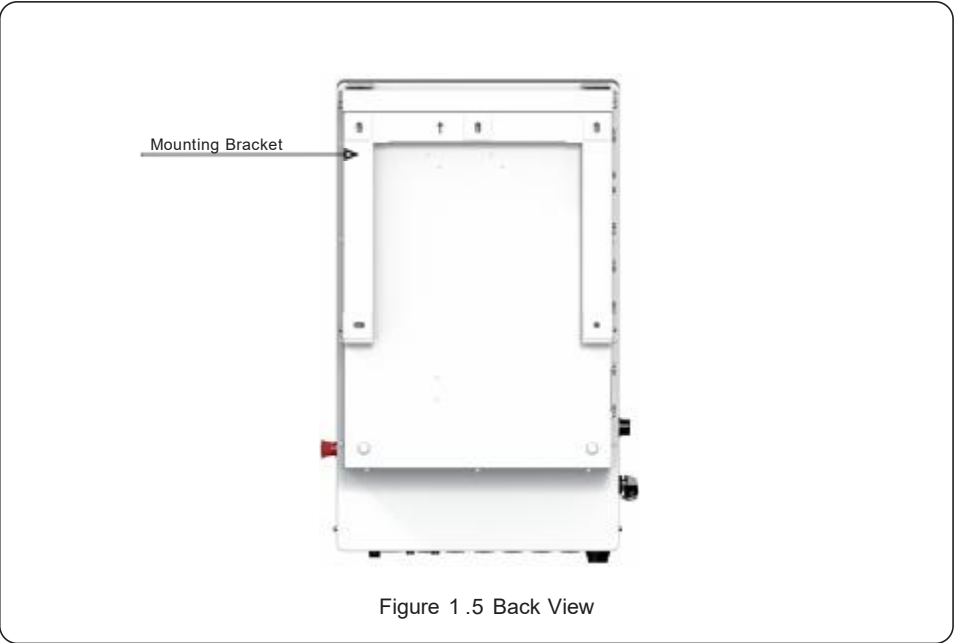


Figure 1.4 Left Side View













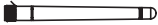
1. Introduction



1. Introduction

1.2 Components Included with the Inverter

If any of these items are missing , please contact your local Solis distributor or the Solis service team .

 Inverter x1	 Back plate x1	 Fastening screw x4	 Expansion Bolt x5	 Quick Installation Manual x1
 OT terminals x13	 CAN cable(3m) x1	 Handle x2	 Energy Meter	 CT x3
 RJ45 connector x11	 S2-WL-ST Stick x1	 Bluetooth Antenna x1		



NOTE
CT default length is 4m , and the it cannot be extended.

1.3 Tools Required for Inverter Installation

 Technician Screwdriver	 Torqx T20 Screwdriver	 Wire Strippers 12AWG to 6AWG	 Wire Strippers 20AWG to 10 AWG	 LUG Crimping Tool
 Channel Locks	 Multimeter (AC/DC amps)	 Hex Screw Tip	 Torque Screwdriver	 Smart Phone (for commissioning)

1. Introduction

1.4 Inverter Storage

- If the inverter is not installed immediately, please abide by the storage instructions and environmental conditions listed 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 -22~ 158. F and humidity should be between 0 to 100%, non-condensing.
- Do not stack more than two (2) inverters high on a single pallet. Do not stack more than 2 pallets high.
- Keep the box(es) away from corrosive materials to avoid damage to the inverter enclosure.
- Inspect the packaging regularly. If packaging is damaged (wet, pest damages, etc.), repackage the inverter immediately.
- Store inverters on a flat, hard surface -- not inclined or upside down.
- Do not remove the desiccant packet that is included with the inverter. It is included to ensure that any residual moisture is absorbed quickly.
- 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.
- Perform an annual visual inspection of the inverter box for signs of damage.
- If the inverter has been removed from the box and then replaced, put desiccant packets in the inverter wire box to ensure the internal components stay dry.
- Do not store the inverter outside or in a place that does not have environmental controls.



**DO NOT STACK
MORE THAN 2 HIGH**

2. Safety & Warning

2.1 Safety

The following types of safety instructions and general information appear in this document as described below:

**DANGER**

"Danger" indicates a hazardous situation which if not avoided, will result in death or serious injury.

**WARNING**

"Warning" indicates a hazardous situation which if not avoided, could result in death or serious injury.

**CAUTION**

"Caution" indicates a hazardous situation which if not avoided, could result in minor or moderate injury.

**NOTE**

"Note" provides tips that are valuable for the optimal operation of your product.

**WARNING: Risk of fire**

Despite careful construction, electrical devices can cause fires.

- Do not install the inverter in an area containing flammable materials or gases.
- Do not install the inverter in a potentially explosive atmosphere.

2.2 General Safety Instructions

**WARNING**

Only devices in compliance with SELV (EN 60950) may be connected to the RS485 and USB interfaces.

**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**

Do not touch any internal parts until 5 minutes after disconnection from the utility grid, PV array, and battery.

2. Safety & Warning



WARNING

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

The DC OCPD shall be installed per local requirements. All photovoltaic source and output circuit conductors shall have isolators that comply with the NEC Article 690, Part II.

All Solis three phase inverters feature an integrated DC disconnect switch.



CAUTION

Risk of electric shock, do not remove the cover. There are no serviceable parts inside, refer servicing to qualified and accredited service technicians.



CAUTION

The PV conductors are energized with high voltage DC when the PV modules are exposed to sunlight.



CAUTION

The surface temperature of the inverter can reach up to 75 °C (167 °F). To avoid risk of burns, do not touch the surface of the inverter while it is operating. The inverter must be installed out of direct sunlight exposure.



NOTE

PV modules used with inverter must have an IEC 61730 Class A rating.



WARNING

Operations must be accomplished by a licensed electrician or a person authorized by Solis.



WARNING

Installer must wear personal protective equipment during the entire installation process in case of electrical hazards.



WARNING

The AC Backup Port of the inverter cannot be connected to the grid.



WARNING

Please refer to the product manual of the battery before installation and configuration to the inverter.



Systems using this product shall be designed and built in accordance with the NEC & local electrical codes & standards.

2 . Safety & Warning

2.3 Notice for Use

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

- 1 . Permanent installation is required.
- 2 . The electrical installation must be compliant with all local and national regulations & standards .
- 3 . The inverter must be installed according to the instructions stated in this manual .
- 4 . The inverter must be installed according to the inverter technical specifications .

2.4 Notice for Disposal

This product shall not be disposed of with household waste . It must be segregated and brought to an appropriate disposal facility to ensure proper recycling.

This it to be done in order to avoid negative impacts on the environment and human health . The inverter contains materials that should not end up in a landfill .

Local waste management rules shall be observed and respected.



2. Safety & Warning

2.5 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) & 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. After five arc fault detections in 24 hours, an AFCI-induced shutdown will be triggered. If this event occurs, the inverter must be manually reset. After clearing the source of the fault, the inverter can be powered back on and allowed to resume normal operation.

Anti-Islanding Protection:

Anti-Islanding is a condition where the inverter ceases 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 inverters operating in parallel and the grid.



NOTE:

All Solis inverters come with AFCI and Anti-Islanding protections integrated and enabled by default. The settings cannot be disabled or modified.

3 . Overview

3.1 LCD Display Screen and Indicator Lights



#	Name	Description
1	Power LED	This LED is always red when the inverter has adequate AC or DC voltage . This LED does not indicate any problems .
2	Operation LED	This LED is always green when the inverter is operating normally and producing AC power.
3	Alarm LED	This LED is will light up yellow any time the inverter has an alarm code .
4	PV Icon	Represents PV power being generated in DC kW.
5	Battery Icon	Represents the battery connected to the inverter charging and discharging in DC kW and state-of-charge (SOC)
6	Inverter Icon	Represents the Solis hybrid inverter in the system .
7	Building Icon	Represents the grid-side building load consumption & power being exported to or imported from the grid in AC kW.
8	Backup Icon	Represents backup load consumption on the backup-side of the system in AC kW.
9	Generator Icon	Represents generator power being produced in AC kW.
10	Meter Icon	Represents the energy meter monitoring the consumption power & import/export power to/from the grid in AC kW.
11	Grid Icon	Represents the grid and power being imported from/exported to the utility (grid) in AC kW.

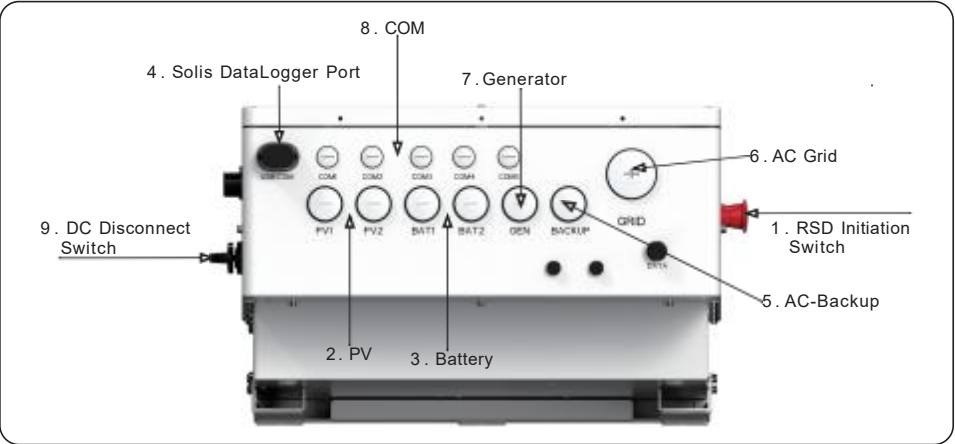


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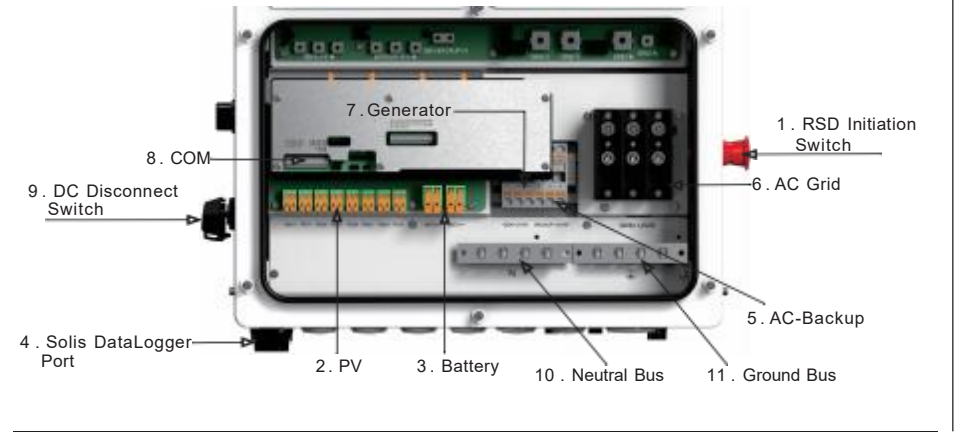
The screen will turn off after a few minutes to conserve energy. Press any button to wake the screen up. Press the Enter button to access the main menu .

3 . Overview

3.2 Inverter Wire Box and Connection Points



Name	Description
1. RSD Initiation Switch	Sends a PLC signal through the PV strings to the Rapid Shutdown (RSD) receivers located in the PV array. Transmitter is optional and brand of it will vary .
2. PV	Conduit and PV conductors should be connected here
3. Battery	Conduit for battery conductors should be connected here
4. Solis Logger Port	Port (USB) for connecting Solis data loggers only
5. AC-Backup	Conduit for AC conductors to backup loads panel should be connected here
6. AC-Grid	Conduit for AC conductors to the main service panel should be connected here
7. Generator (GEN)	Conduit for AC conductors to a generator
8. Communication (COM)	RS 485 and CAN communication cables should use these knockouts and terminals
9. DC Disconnect Switch	Disconnects DC power to the inverter power train . Prevents inverter operation .
10. Neutral Bus Bar	Common bus bar for all neutral conductors to terminate (not grounded)
11. Ground Bus Bar	Common bus bar for all ground conductors to terminate



4. Operating Modes

4.1 PV-Only

4.1.1 Grid-Tie PV String Inverter

For areas with seasonal power outages , such as concentrated in a certain month of the year and daily power outages lasting 1-2 hours , they operate as off grid machines during non outage periods .

Only the PV load function of the energy storage machine can meet the short-term load requirements of customers under this working condition; At the same time , it also takes into account the feasibility of adding batteries in the future to cope with potential power shortage needs . This function only supports single machine use and can be restored within 30 seconds after the first overload ;

Second overload , recover in 3 minutes; Third overload , recover within 10 minutes;

Fourth overload , recover within 10 minutes; Fifth overload , recover within 10 minutes;

If the fault is reported again after 5 times , manual restart is required.

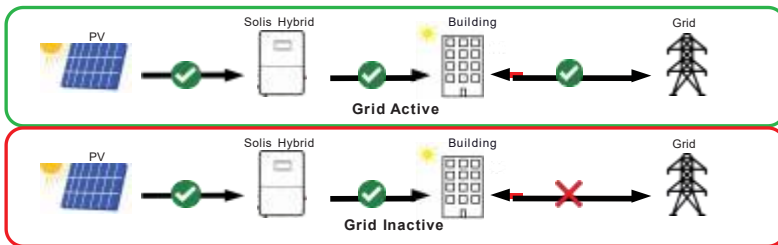


Figure 4.1 Solis S6 hybrid as a grid-tie PV string inverter

4.1.2 Export Power Control

The inverter offers the ability to manage export power. During the system commissioning process , export power control can be enabled. An export power limitation can then be set to the desired kW value . The inverter will then regulate how much power gets sold back to the utility company.

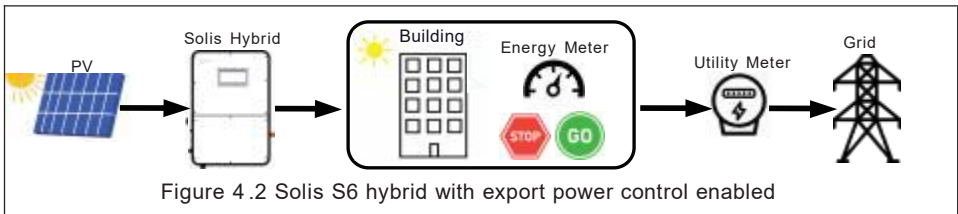


Figure 4.2 Solis S6 hybrid with export power control enabled

Each Solis hybrid comes with an energy meter, which gets installed externally to the inverter.

The energy meter uses three CTs for three-phase , which measure the power being consumed and imported by the building. The hybrid uses the data from this meter to determine whether or not it needs to curtail the PV power to meet the export power limitation . Export power control can be enabled with or without a battery being installed.

Zero-Net Export

The inverter can be set to not export any active power to the utility. This does not end up being zero export as there is some power that leaks back to the utility each time there is a change in load demand. However, the *net import/export* will be near zero kWh each day when programmed for zero export.

NOTE:

The external energy meter must be installed to have visibility of export/ import and power consumption . Without the meter, the inverter will still function , but with limited capabilities .

Export power control is not possible without the energy meter being installed.

4. Operating Modes

4.2 Energy Storage

4.2.1 Overview of Energy Storage Modes

The S6 hybrid is capable of providing AC power to loads using PV and battery power in the event of a grid failure. This is known as **backup power**. The amount of backup power that each S6 hybrid model can provide is equal to the amount of on-grid power that it can provide. For example, an 60K model can provide up to 60kW of continuous backup power.

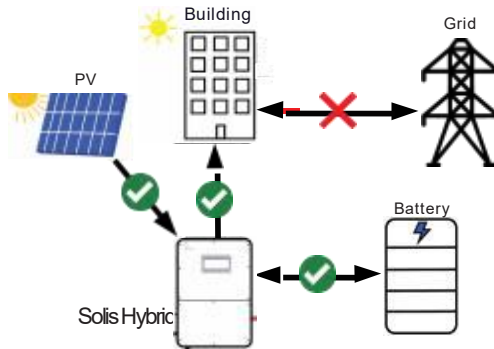


Figure 4.3 Backup power with Solis S6 hybrid

If the primary purpose of the energy storage system is to store as much of the PV power as possible so that it can be used later to offset the consumption of grid power, this is known as **energy arbitrage**. *Time-of-use*, *self-consumption*, and *peak-shaving* are all examples of **energy arbitrage**. Typically, the battery will cycle daily as it charges with PV during the day and then discharges in the evening to cover building load demand.

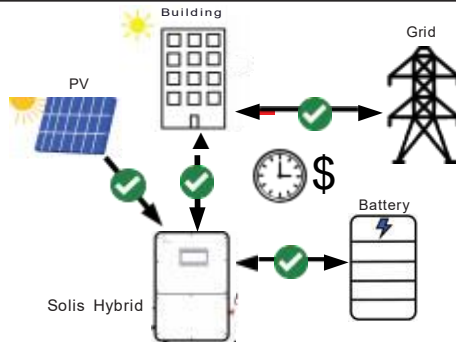


Figure 4.4 Energy arbitrage with Solis S6 hybrid

The S6 hybrid can also operate in an entirely remote system where there is no grid present at all. This is called **off-grid** mode. It is very similar to backup in that the inverter will supply AC power to loads with PV and battery power only. However, backup mode is only for grid-connected systems.



NOTE:

The inverter is able to provide off-grid/backup power with only PV and no battery. However, the load consumption must remain less than the available PV power or else an overload fault will occur and the system will shutdown for five minutes.

4. Operating Modes

4.2.2 Energy Arbitrage

The S6 hybrid inverter has multiple operating modes which can be programmed so that the performance of the system is tailored to the specific needs of each individual system owner. The backup power function of the inverter can be enabled or disabled independently of the energy arbitrage modes: (1) Self-Use (2) Selling first (3) Off grid (4) Peak-Shaving (Professional Setting)

Self-Use Mode

Self-Use is the default energy storage mode . PV power will always supply the building loads first . Any excess PV power gets stored in the battery. If the battery is fully charged , the remaining power can be exported if the system is configured to allow it . If not, the PV power will be curtailed.

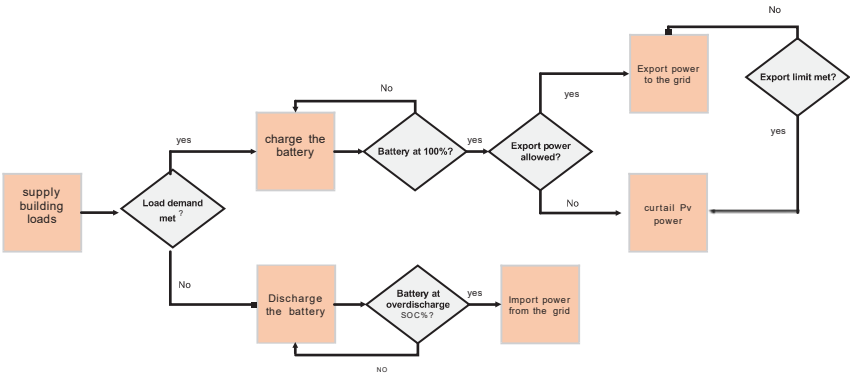


Figure 4 .5 Self-Use Mode logic diagram

Selling first Mode

This mode can be thought of as export priority mode . The system will first supply the loads with PV power and then it will seek to export the excess PV power, up to the set limit . Once the limit is reached , the remaining power will be stored in the battery. If the battery is fully charged , the PV will at that point be curtailed. This mode is for those who receive an equal rate for power exported or who have a much higher ratio of PV power generated to power consumed.

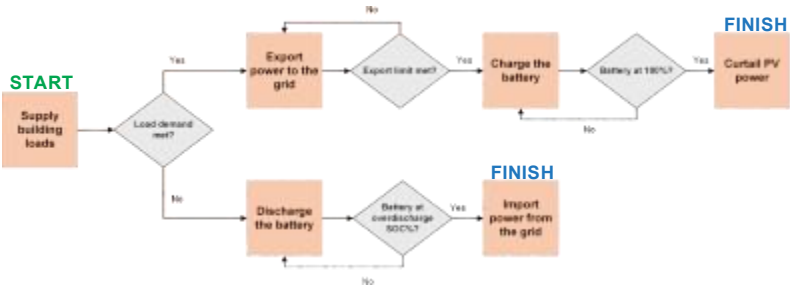


Figure 4 .6 Selling first Mode logic diagram

4. Operating Modes

Off-Grid Mode

There is a dedicated mode specifically for off-grid remote systems which are not electrically connected to the grid at all , such as a standalone building. This mode is not to be confused with backup , which occurs only for grid-tied systems . The logic for Off-Grid mode is the same as Self-Use mode . However, there is no export power control and a generator is often used in place of the grid to supplement the PV & batteries . When the generator is turned on by the inverter thePV production is temporarily suspended as to not backfeed the generator. The inverter will use generator power to supply the loads and recharge the battery. For single inverter, battery is recommended to be connected to the inverter. For parallel system (≥ 2 inverters) , the inverters must have batteries connected in order to provide power in an off-grid system . The inverter cannot operate in an off-grid system with PV only for parallel system .

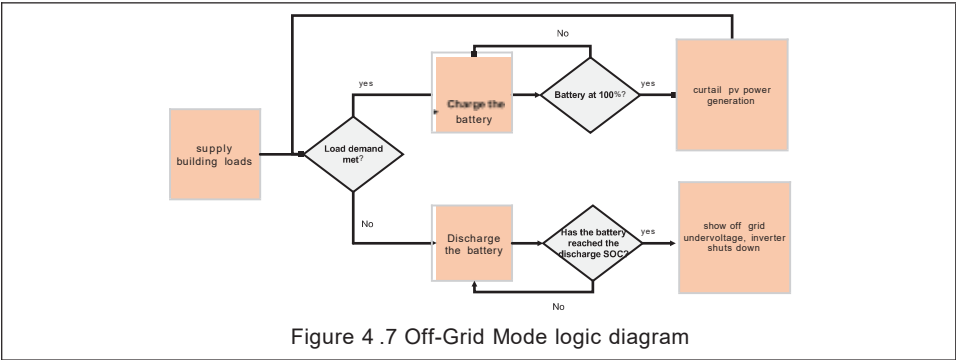



Figure 4.7 Off-Grid Mode logic diagram



NOTE:

To utilize off-grid mode , the inverter must not be connected to the grid at all . There cannot be any conductors landed in the grid terminals .

Peak-Shaving Mode

Peak-shaving mode is ideal for those who pay a variable rate for energy based on the amount of consumed power (kw) . This mode limits the power imported from the grid. The inverter will only discharge the battery when the power imported from the grid exceeds a specified amount (kW) .

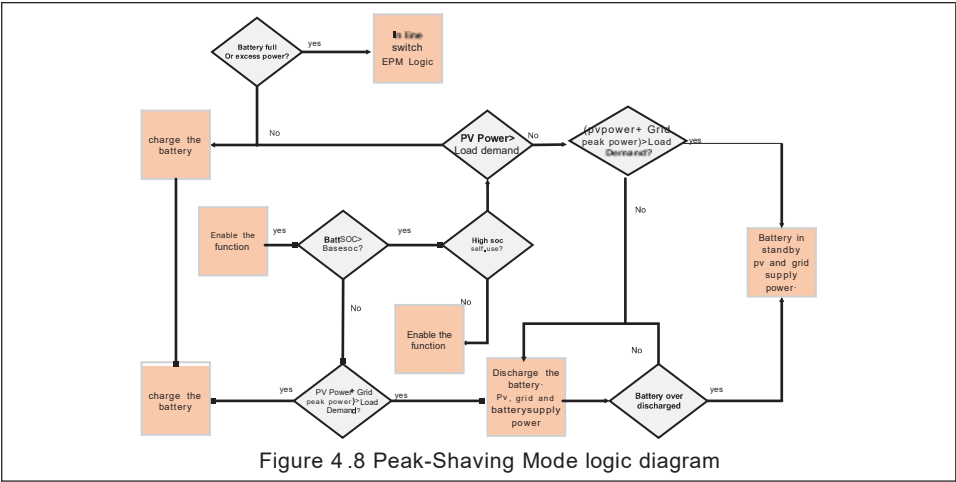


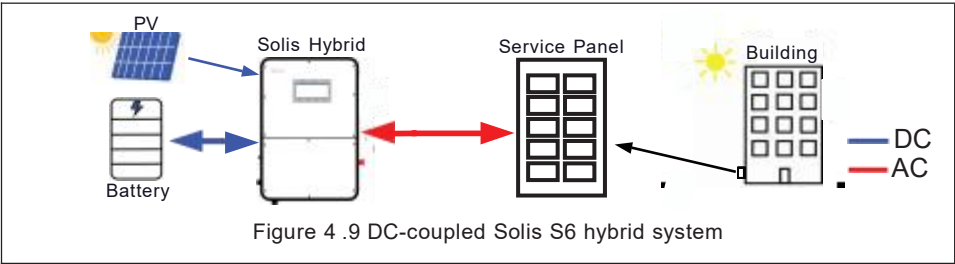
Figure 4.8 Peak-Shaving Mode logic diagram

4. Operating Modes

4.3 DC Coupling vs AC Coupling

4.3.1 DC-Coupling

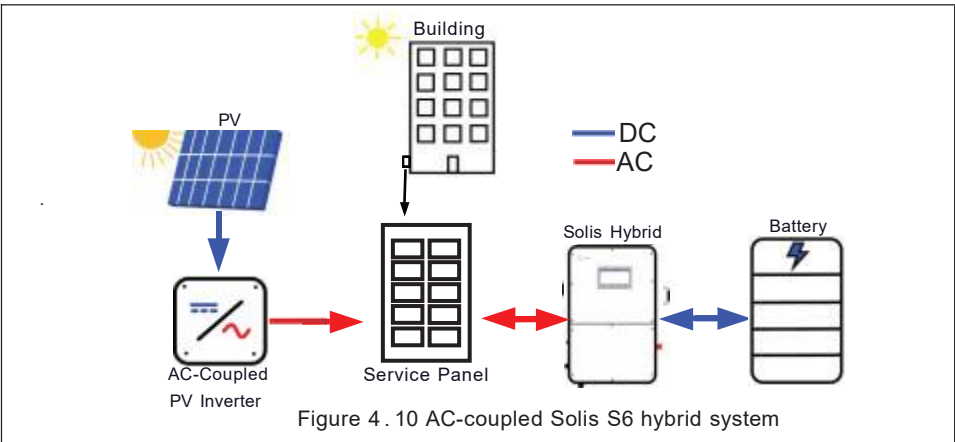
DC-coupling is the recommended configuration for this inverter. This is because DC-coupling allows the full potential of this inverter to be utilized , maximizing the efficiency of the PV-to-battery charging. In a DC-coupled system , the PV also gets connected to the inverter in addition to the battery. The inverter will charge the battery directly with DC power from the PV. Typically, DC-coupling is done when additional PV is being added or when the system is new and being installed with energy storage .



The next section explains how the S6 hybrid can be AC-coupled. The next several sections following it will all focus on DC-coupling methods .

4.3.2 AC coupling at grid side

The Solis S6 hybrid can be DC-coupled or AC-coupled to a building to add energy storage . In an AC-coupled the energy storage is connected to the AC-side of the system . Typically, the battery and Solis hybrid pairing get connected in parallel with an existing PV system . The battery will charge with PV power from the existing PV system . When AC-coupling with the S6 hybrid , new PV can either be added or not be added to the S6 hybrid , it is up to the system designer. The hybrid would just need to be installed with a compatible high-voltage battery and then be connected to the home load center in parallel with the existing PV system .

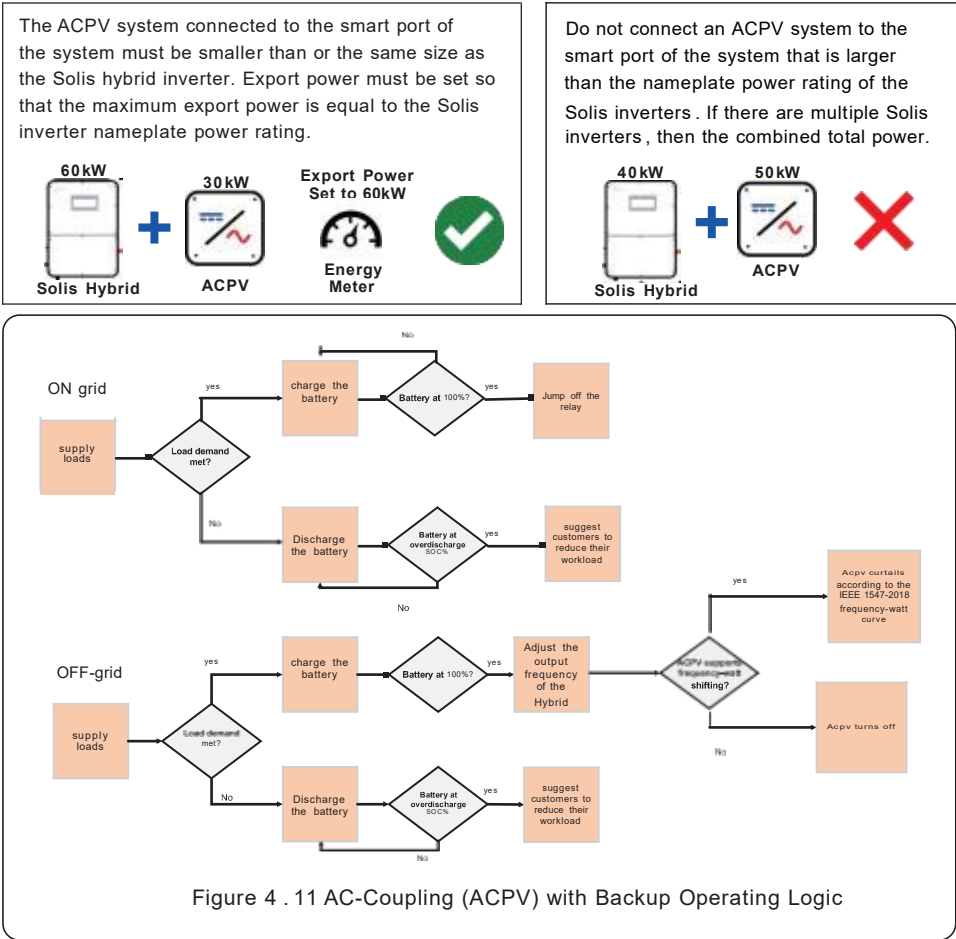


The ability to be AC-coupled makes the Solis S6 hybrid ideal for system retrofits . The hybrid can be installed in place of the old PV inverter but with energy storage added.

4. Operating Modes

4.3.3 AC-Coupled at Smart Port

An existing PV system can be AC-coupled to the smart port side so that it can be supported when the grid is down . It should be noted that AC coupled PV inverter power must < solis hybrid rated power. The acronym “ACPV” will be used to generically describe any existing PV system that will be AC-coupled with the energy storage and backup . This is to distinguish it from “PV”, which is connected on the DC-side of the S6 energy storage system alternatively. The breaker for the ACPV system will need to be relocated into the backup load center so that it can remain energized during a grid outage . If ACPV is to be connected on the smart port , it is recommendedto be mindful of grid-side consumption when the system is connected to the grid , not in smart port . If the load consumption on the grid-side is higher than the inverter nameplate power rating whilethe grid is present, an overload alarm could occur. This is when the total PV power going to the loads from both the Solis and the ACPV system exceeds the Solis nameplate power rating.



4. Operating Modes

Frequency Shifting

There is no direct communication between the Solis S6 hybrid and the AC-coupled PV system . The inverter uses frequency-shifting to modulate the output of the ACPV system . The inverter uses the frequency-watt curve outlined in the IEEE 1547-2018 standard. When in backup mode , the S6 hybrid will begin to shift the AC frequency when it detects that the power supplied by all of the PV, including the ACPV, is greater than the power demanded (consumed) . This change in frequency will be detected by the ACPV system . If the ACPV system also supports the IEEE 1547-2018 frequency-watt curve , then its output power will reduce according to that curve . If the ACPV system does not support frequency-watt , then it will shut off as the frequency shifts and then turn back on once the S6 hybrid corrects the frequency.



NOTE:

The maximum output power of the existing PV inverter must be less than the maximum output power of the Solis hybrid inverter. AC coupling can be done on either the grid side or the backup side . However, if it is on the backup side , then the max. output power of the existing PV inverter must be less than the maximum output power of the Solis hybrid inverter.

4.4 Backup Power Inverter Paralleling

Up to six hybrid inverters can be installed together in parallel on the backup side of the system . The backup ports of each inverter would terminate in separate overcurrent protection devices within the backup load center.

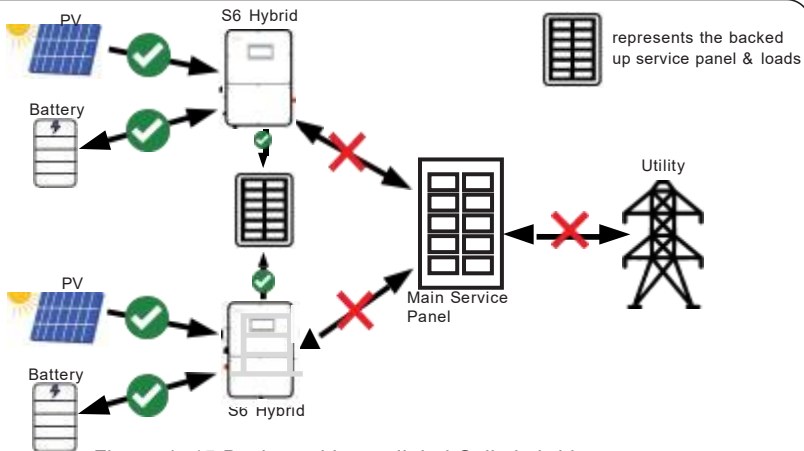


Figure 4 . 15 Backup with paralleled Solis hybrids

It should first be determined what the maximum continuous current needs to be in order to meet the energy demand of the home . Up to six S6 hybrid inverters can be installed in parallel with PV and batteries to provide continuous backup power. For example , three 60kW hybrids in parallel can provide up to 216 .6A (72 .2A x 3) of power to the loads in backup mode .

For a system with backup , the average daily power consumed should be less than or equal to the average daily PV power produced on any given day of the year. Otherwise , an overload condition may occur , causing the system to go down temporarily. The chart in Figure 4 . 16 shows how much continuous backup power can be produced depending on how many inverters are installed in parallel and what size they are .

4. Operating Modes

Solis Model	Total Maximum Continuous Backup Current					
	1 unit	2 units	3 units	4 units	5 units	6 units
30kW	36A	72A	108A	144A	180A	216A
30kW (208V)	72.2A	144.4A	216.6A	288.8A	361A	433.2A
40kW	48.1A	96.2A	144.3A	192.4A	240.5A	288.6A
50kW	60.1A	120.2A	180.3A	240.4A	300.5A	360.6A
60kW	72.2A	144.4A	216.6A	288.8A	361A	433.2A

Figure 4. 16 Backup power chart based on Solis model and number of paralleled units

Passthrough Power & Surge Capacity

There will be times when the loads on the backup side consume more power than the inverter is able to provide with PV and battery power. The **passthrough power** is the amount of power that the can pass through the inverter from the grid to the loads even if the inverter is off.

The **surge capacity** is how much power the inverter can generate for a small amount of time , usually one hundred milliseconds to ten seconds maximum . Each Solis model has different ratings for passthrough power and surge capacities . Installing multiple inverters in parallel increases the surge capacity and passthrough power.

The chart in Figure 4. 13 shows the surge capacities and passthrough power ratings for each model . The surge capacity for 10 Second is 150% of the rated continuous output current . For example , $72.2A \times 150\% = 108.8A$ for 100 milliseconds . The surge capacity for 10 seconds is 150% of the rated continuous output current .

Solis Model	600s Surge Current	60s Surge Current	10s Surge Current	2s Surge Current
30kW	43.32A	50.54A	54.15A	57.76A
30kW (208V)	86.64A	101.84A	108.3A	115.54A
40kW	57.72A	67.34A	72.15A	76.96A
50kW	72.12A	84.14A	90.15A	96.16A
60kW	86.64A	101.84A	108.3A	115.54A

Figure 4. 13 Pass Through Power and Surge Capacity



Case 1 : Inverter offline or failed

If the inverter goes offline for a soft fault the passthrough power is the power that goes from the grid through the inverter to the loads connected to the backup side of the system .

Case 2: Insufficient battery/PV power

At night when there is no PV and the battery is drained the passthrough power is how much power can get to the loads from the grid directly through the inverter but not from PV or battery.

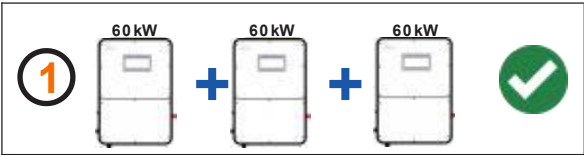
Figure 4. 14 Passthrough Power Cases

4. Operating Modes

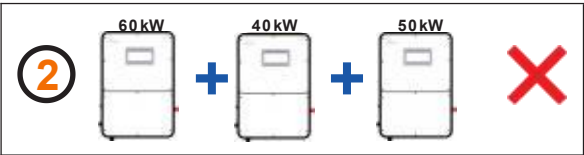
4.4. 1Paralleling Limitations and Restrictions

There are a few limitations to installing multiple inverters in parallel for backup power. Please note that these caveats do not apply when only paralleling on the grid-side . The restrictions shown below are only with respect to paralleling the backup-sides together. All inverters in the same system must be on the same firmware version . Please install one Solis data logger per inverter.

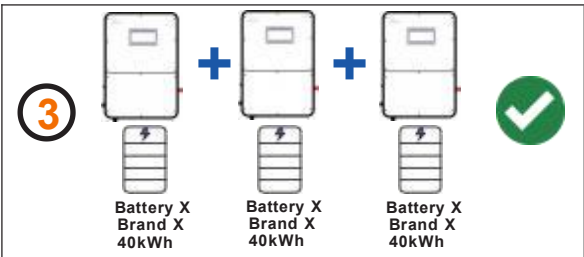
1. Paralleled inverters must be the same size (model number) .



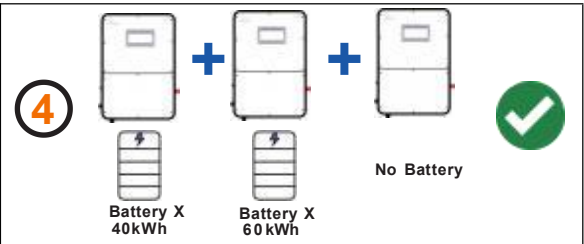
2. Do not parallel inverters that are different sizes (model numbers) .



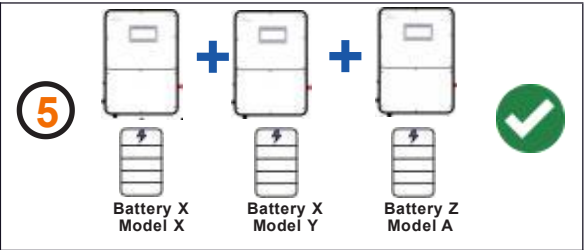
3. Paralleled inverters must have the same capacity (kWh) , brand , and model of battery connected.



4. Support different capacities , but the capacity difference should be within 50% range . To ensure balanced charging and discharging in parallel , it is recommended that the battery capacity be consistent .



5. Support different brands .



NOTE:
Please follow these guidelines to maintain the warranty status of the inverter.

4. Operating Modes

4.4.2 Power Control System (PCS)

The Solis S6 hybrid inverter is UL 3141 PCS certified. This means that the inverter is able to regulate the current and limit the loading on the bus bars and conductors. The PCS can limit the power flow as to not exceed any busbar rating limits. With PCS, the 120% rule for breaker sizing becomes irrelevant, you can go up to the busbar rating. For the S6-EH3P30K-NV-YD-H-US model, the maximum controlled current on the busbar is 72.2A (60kW).



S6-EH3P(30-60) K-NV-YD-H-US
Solis Hybrid Inverter



Eastron SDM630 MCT V2
Energy Meter



Eastron ESCT-T24
Split-Core CTs

Figure 4.17 Components of a Solis commercial PCS system



NOTE:

Every S6 hybrid comes with a meter and set of Eastron Split-Core CTs. The Rogowski Coils are optional accessory components that must be purchased separately.

Solis Power Control System (PCS) Operating Modes

1. Unrestricted Mode: This mode should be used when PCS is not required. The system is permitted to charge the batteries with grid power and can discharge-export battery power to the grid. This mode is enabled by default.



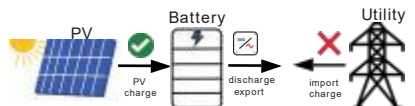
2. Import Only Mode: The system is permitted to charge the battery with grid power but is prohibited from discharge-exporting battery power to the grid.



3. Export Only Mode: The system is permitted to discharge-export battery power to the grid but prohibits the use of grid power to charge the battery.



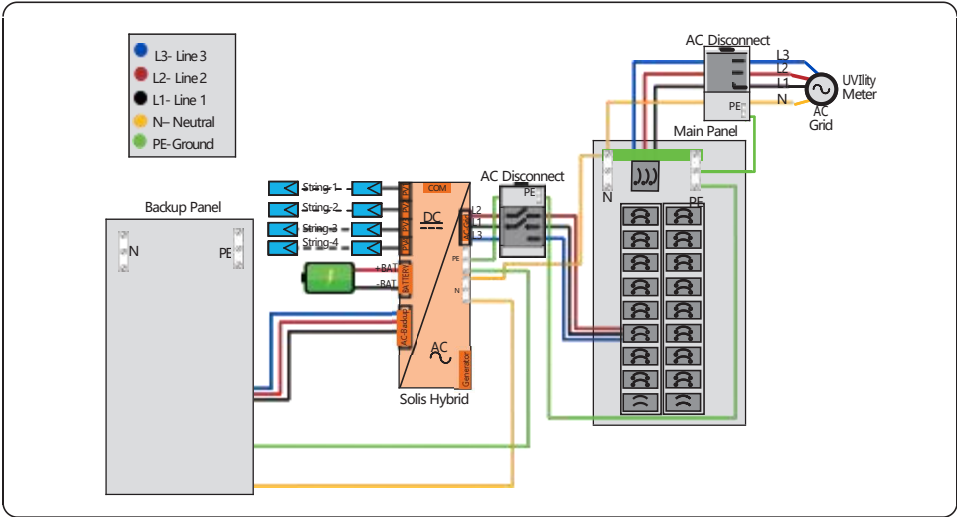
4. No Exchange Mode: The system is only permitted to charge with PV power and can only discharge to cover loads. The system is prohibited from discharging battery power to the grid.



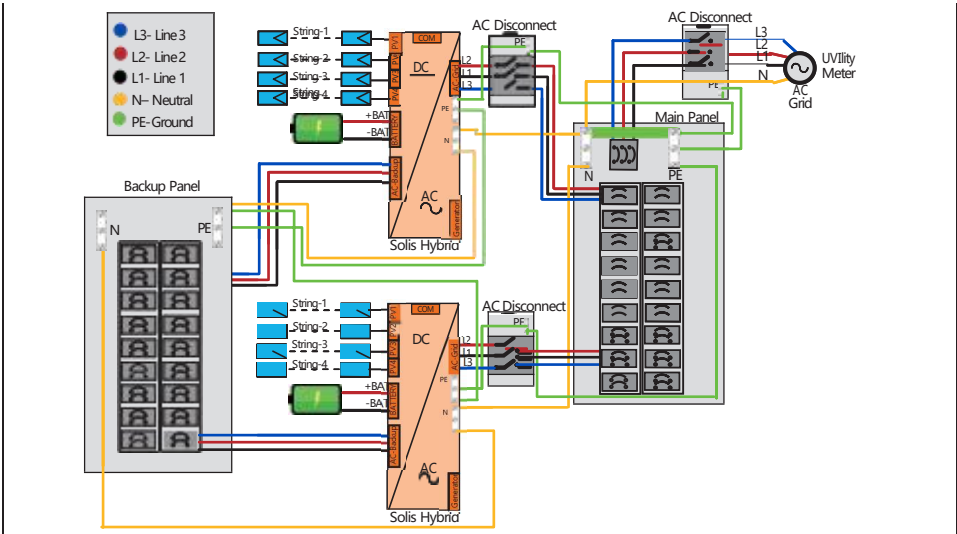
4. Operating Modes

4.5 Wiring Diagrams

4.5.1 Backup System with One Solis Hybrid Inverter



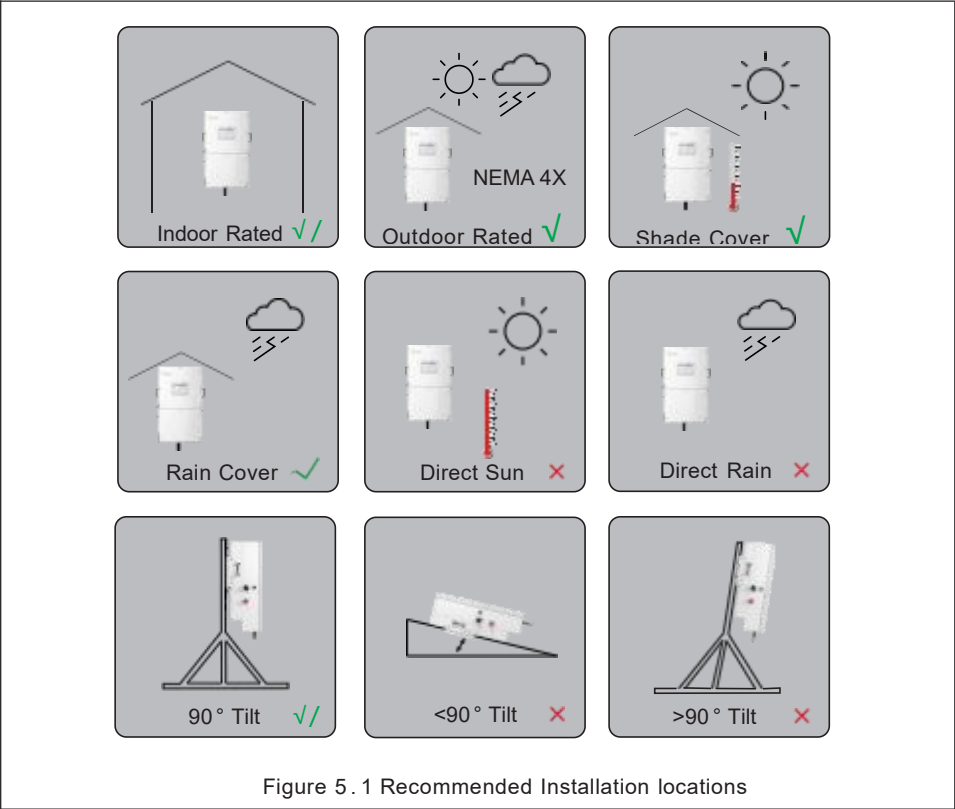
4.5.2 Backup with Multiple Solis Hybrid Inverters



5 . Installation

5.1 Select a Location to Install the Inverter

When selecting a location for the inverter, the following criteria should be considered :
Exposure to direct sunlight may cause output power derating due to overheating
It is recommended to avoid installing the inverter in direct sunlight . The ideal location is one where the ambient temperature does not exceed 40 ° C (140 ° F)
It is also recommended to install the inverter somewhere the rain and snow will not land directly on it . The ideal installation location is on a north-facing wall under an eave .



WARNING: Risk of Fire

- Despite careful installation , electrical equipment can cause fires .
- Do not install the inverter in an area that contains flammable materials , liquids, or gases .
 - Do not install the inverter in a potentially explosive environment .
 - The structure on which the inverter is being mounted must be fireproof .



5. Installation

5.1.4 Avoiding direct sunlight

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

Direct exposure to sunlight could cause:

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

5.1.5 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.

5.1.6 Flammable substances

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

5.1.7 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.

5.2 Inverter Handling

Please review the instruction below for handling the inverter:

1 . The red circle below denotes the carrying handle cutout on the inverter box . Push in the cutouts on both ends of the box to form handles for moving the inverter.

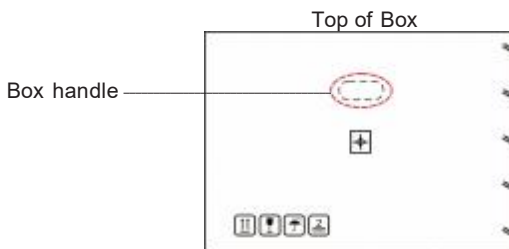


Figure 5.2 Handles for moving the inverter shown circled in red - one per side

- 2 . Two people are required to carry and move the inverter while it is in the box .
- 3 . When removing the inverter from the box , two people must use the handles integrated into the heat sink.
- 4 . When setting the inverter down , do it slowly and gently. This ensures that the internal components and the outer chassis do not take any damage . Do not drop the inverter on any side from a height greater than 4 inches from the ground or it will cause damage .

5 . Installation

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

WARNING: Risk of Shock



- Despite careful installation , electrical devices present a shock hazard.
- Install the equipment out of reach of children if children may be present .
 - Ensure that the equipment covers are always in place whenever the equipment is not being serviced.
 - Never service live equipment . Always turn the equipment off first . Use a multimeter to verify that conductor voltages are zero .



CAUTION: Hot Surface

- The temperature of the inverter heat sink can reach 167。 F. Do not touch the heat sink while the inverter is operating.

The ambient temperature and relative humidity of the installation environment must meet the following requirements:

Maximum Temperature



140°F
60°C

Minimum Temperature



-13°F
-25°C

Max. Relative Humidity



100%
Non-Condensing

Maximum Altitude



13,123 feet
4,000 meters

Figure 5.3 Installation environment conditions

Load bearing structure requirements:



Made of nonflammable materials

Max . load bearing capacity ≥ 4
times of inverter weight



Figure 5.4 Load bearing structure

5.2.1 Clearances

- If multiple inverters are installed on site, a minimum clearance of 31.5 inches should be kept between each inverter and all other mounted equipment. The bottom of the inverter should be at least 20 inches above of the ground or floor (see Figure 5.5 on page 23).
- The LED status indicator lights 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.

5.2.2 Consult technical data

- Consult the technical specifications sections at the end of this manual for additional environmental condition requirements (temperature range, altitude, etc.)

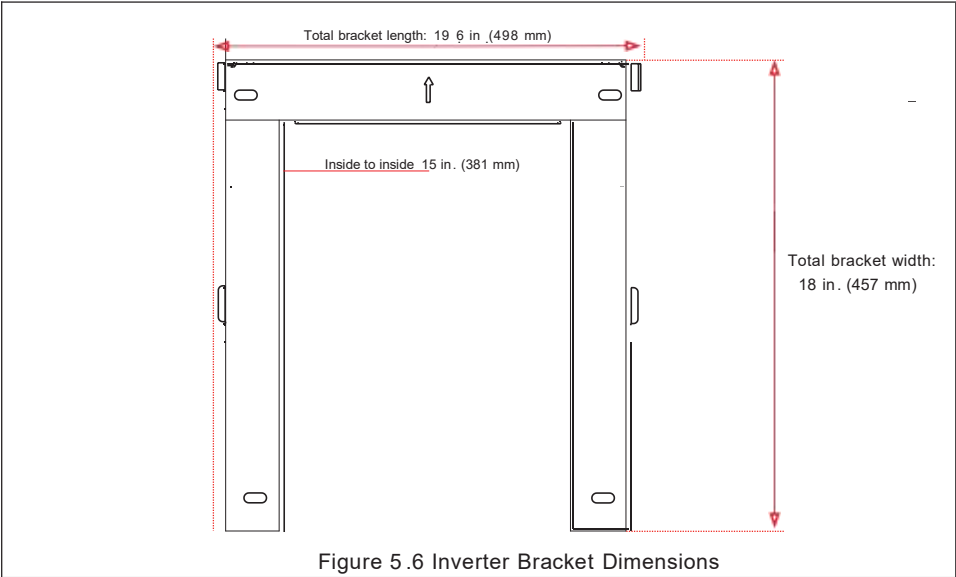
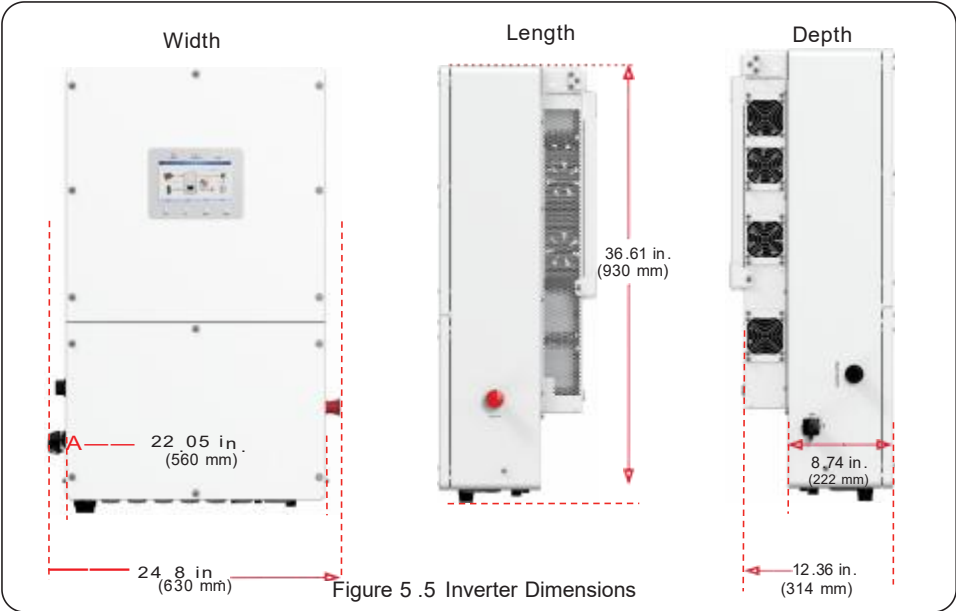
5.2.3 Angle of installation

- This model of Solis inverter must be mounted vertically (90° degrees not greater or less than 90° degrees straight up).

5. Installation

5.3 Inverter Dimensions

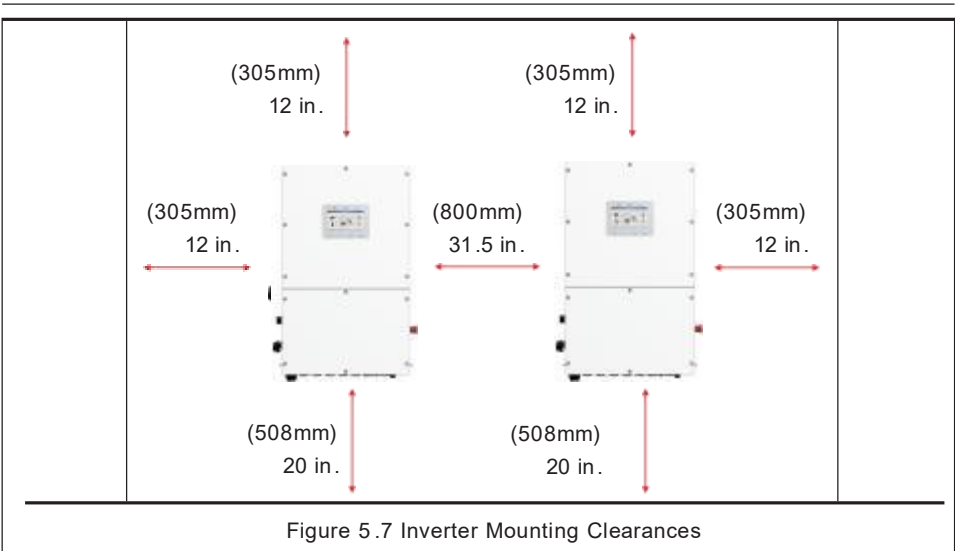
5.3.1 Dimensions of S6-EH3P(30-60)K-NV-YD-H-US Inverter Models



5 . Installation

5.4 Mounting the Inverter

- Mount the inverter on a wall or structure capable of bearing the weight of the machine
- The inverter must be mounted upright on a vertical structure with a tilt of 90 ° . A tilt greater or less than 90 ° may cause the inverter output power to derate .
- To prevent overheating , be sure that the inverter has adequate air flow around it . A minimum clearance of 31 .5 inches (800mm) should be kept between inverter & other equipment .
20 inches (508mm) of clearance between the bottom of the inverter and the ground.



- Visibility of the LCD screen should be considered. Ideally, the screen would be at eye-level .
- Adequate ventilation around the inverter must be provided .



NOTE:
Nothing should be stored directly on top , underneath , or against the inverter .

- When the inverter is mounted on the wall , it sticks out approximately one foot .
- Keep this in mind when selecting the installation location for the inverter .
The exact dimensions of the inverter and the mounting bracket are on the next page .

Once a suitable location has been found according to Figures 5.3 and 5.4 , use figures 5.6 and 5.7 to mount the bracket to the wall . You may drill additional holes in the bracket if you need to you need to . The steps for mounting the inverter are listed below:

1. Place the bracket on the wall or inverter rack . The arrow in the middle of the bracket points up . With a pencil or marker, mark the mounting holes . Fasten the bracket to the wall . **If you are mounting the inverter to a wall , be sure the fasteners go into studs .**

5. Installation



NOTE:

The inverter must be mounted vertically at a 90° angle .

Four fasteners must be used to ensure the bracket does not come off the wall . At least two must embed in a wall stud to bear the inverter weight .

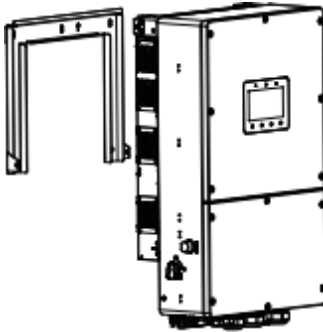


Figure 5.8 Wall mount bracket

2. Lift up the inverter and align the back two hooks on the heat sync with the two tabs on the inverter mounting bracket . Lower the inverter hooks down onto the mounting bracket tabs and ensure the hooks have a solid bite before releasing the inverter. Then install the two set screws that are included with the inverter for stabilization .

Inverter handles

1. The inverter comes with two black handles that are removable and only required for safely lifting the inverter.
2. The position of handrails installation as the red mark in figure 3.3 .
3. Whenever lifting the inverter or setting it down , do so slowly and gently. This ensures that the internal components and the outer chassis do not take any damage .
4. Two people are required to remove the inverter as it is very heavy. Be sure to use the black handles .
5. Remove the handles by unscrewing them once the inverter has been mounted.



Figure 5.9 Inverter handle

5. Installation



NOTE:

The inverter must be mounted vertically at a 90° angle.

Four fasteners must be used to ensure the bracket does not come off the wall. At least two must embed in a wall stud to bear the inverter weight.

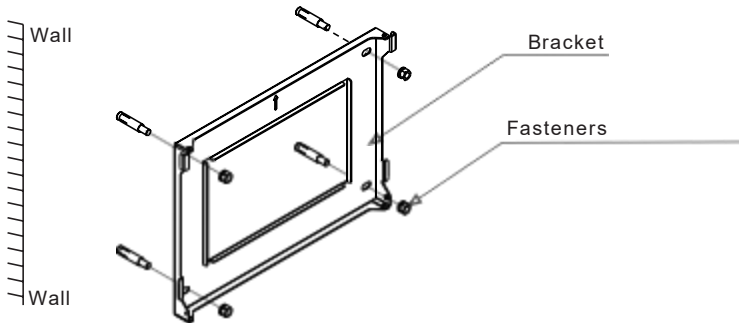


Figure 5. 10 Fix the bracket to the wall

2. Lift up the inverter and align the back two hooks on the heat sync with the two tabs on the inverter mounting bracket. Lower the inverter hooks down onto the mounting bracket tabs and ensure the hooks have a solid bite before releasing the inverter. Then install the two set screws that are included with the inverter for stabilization.

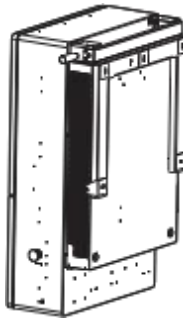


Figure 5. 11 Inverter on mounting bracket and set screws



WARNING:

The inverter is very heavy. Please use proper lifting techniques to avoid potential injury. It is recommended that two people lift the inverter together.

5 . Installation

5.5 Inverter Wiring Overview

	Purpose	Connection Points
PV Cables	PV DC connection to the inverter	From the PV array to the DC+ and DC- terminals in the inverter
Battery Cables	Battery DC connection to the inverter	From the battery (+) and (-) terminals to the inverter BAT+ and BAT- terminals
AC Grid Cables	Inverter AC connection to the main service panel	From the OCPD in the main service panel to the AC-GRID L1/ L2/ L3 terminals
AC Backup Cables	Inverter AC connection to the backup sub panel	From the backup service panel OCPD to the inverter AC-BACKUP L1/L2/L3 terminals
Ground & Neutral Cables	Grounding & neutral conductors for the system	From the main service panel ground bar and neutral bar to the ground bar inside the inverter wire box
Meter RS 485 cable	Communication between inverter & meter	From meter to terminal Meter_A and Meter_B . For more details , refer to figure 4 .2 .2 Installing the energy meter
Battery CAN cable	Communication between the inverter & the battery	From battery to terminal CAN-L and CAN-H . For more details , refer to figure 4 .2 .3 Installing the battery
Generator Cables	AC conductors for the generator	From the generator output terminals to the inverter GEN terminals , neutral bar, and ground bar

Figure 5 . 12 System Cable Connections



Conductor, conduit , and overcurrent protection device sizing shall be done in accordance with the NEC and local electrical codes & standards .

The Operating Modes section 4.7 of this manual contains wire diagrams that show how the equipment interconnects . Please use the wire diagrams when planning the conduit paths & determining the wire number and size requirements .

5. Installation

5.6 Equipment Grounding and Neutrals

Within the inverter wire box there is a ground bar for the equipment grounding conductors to terminate. All equipment grounding conductors (EGCs) must be terminated in this bar. If there is not enough terminal space for all of the EGCs, please use a multi-port connector to provide additional terminals.



Figure 5.13 Internal Grounding Conductor Terminal Location

Steps for connecting grounding and neutral conductors to the ground and neutral bus bars:

1. Strip $\frac{1}{2}$ inch of insulation off the end of the ground conductor.
2. Use a Phillips #2 screwdriver to loosen the terminal screw in the ground bar
3. Insert the stripped end of the grounding conductor into the now open terminal.
4. Tighten the screw until snug, be careful not to over tighten and strip the screw, Use a torque of 275LB-IN.
5. Give the conductor a gentle tug test.

There is also an external terminal on the chassis of inverter for a grounding conductor to connect



Figure 5.14 Internal Neutral Conductor Terminal Location




IMPORTANT:

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

5 . Installation

5.7 PV Cable Installation



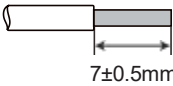
DANGER:

Before installing the PV cables , be sure that the PV array is disconnected.
Use a multimeter to verify that the PV string voltages are 0V before proceeding.
If rapid shutdown is being used , then under 30Vdc per string is safe .

Please verify the following before connecting the PV strings to the inverter:

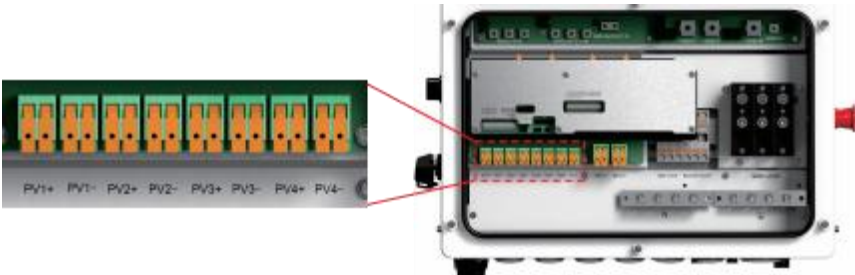
- Ensure the DC voltage of the PV strings will not exceed the maximum DC input voltage (1000Vdc) . Violating this condition will void the inverter warranty .
- Ensure the polarity of the PV strings are correct (ex: positive is positive) .
- Ensure the PV string voltages going to the same MPPT are equal or within 10VDC .
- Ensure the PV resistance to ground is higher than 20K ohms .
- Ensure that the Isc of the strings will not exceed the maximum DC input current .

Select a suitable DC cable and strip the wires out by 7±0.5mm . Please refer to the table below for specific specifications .



Cable type	Cross section (mm2)	
	Range	Recommended value
Industry generic PV cable	4.0 ~ 6.0 (12 ~ 10AWG)	4.0 (12AWG)

Note: Each MPPT has two PV string inputs. PV1 , PV2 , PV3 , & PV4 are separate MPTTs .



- 1 . Strip ½ inch of sheath off the ends of each PV cable .
- 2 . Pull up on the orange lever above the PV terminal , this opens the terminal gate .
- 3 . Insert the end of the PV cable into the now open terminal .
- 4 . Release the orange level and the terminal gate will clamp down on the PV cable .
- 5 . Give the PV cable a gentle tug test to ensure that the connection is tight .
- 6 . If the connection feels loose , repeat steps 1-5 again but push the cable deeper into the terminal before releasing the lever .

Figure 5 . 15 PV Cable Connection

5. Installation

CAUTION:

If the DC conductors are accidentally connected in reverse or if the inverter is not working properly, do NOT turn off the DC switch . Otherwise , it may cause a DC arc and damage to the inverter or a fire .

The steps for corrective actions are as follows:

*Use a DC amp clamp multimeter to measure the DC string current .

* If the current is above 0.5A , please wait for the irradiance on the PV array to diminish until the current drops below 0.5A.

*Once the current is below 0.5A , you are allowed to open the DC switch and and then disconnect the PV strings from the inverter.

* In order to completely eliminate the potential for failure , leave the PV strings disconnected until the cause of the reverse polarity is corrected.



5.8 Rapid Shutdown

5.8.1 Integrated Rapid Shutdown

Important Note

The inverter can be ordered with an internal rapid shutdown transmitter. This transmitter brand must match the receivers that are being installed with the PV modules . **Not abiding by this will void the inverter warranty.**



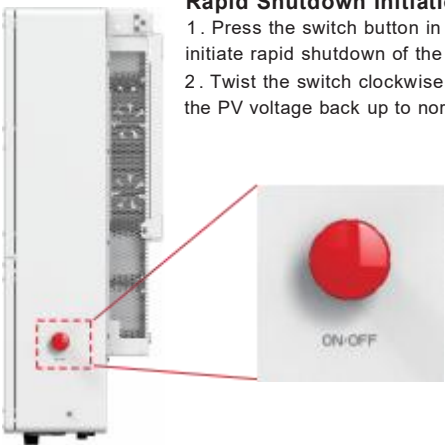
How the inverter achieves module-level rapid shutdown:

The internal transmitter generates a PLC signal when it receives AC power. This signal travels up the PV strings to the receivers that are connected to the PV modules . When the receivers get this signal , they turn on and allow the string voltage to ramp up . When the receivers lose this signal , they turn off. When the receivers are off, each PV module only puts out less than 1VDC.

The red “Rapid Shutdown (RSD E-Stop) switch disables the internal transmitter

Rapid Shutdown Initiation Process

1. Press the switch button in to turn off the internal transmitter. This will initiate rapid shutdown of the PV (ramps the PV voltage down)
2. Twist the switch clockwise to turn the transmitter back on . This will brings the PV voltage back up to normal .



Note:

Rapid shutdown will only initiate if receivers have been installed in the PV array connecting to the PV modules directly.

Without the receivers , inverter can achieve shutdown ,but can’t achieve RSD function .

Figure 5. 16 Rapid shutdown initiation switch and process

5. Installation

Additional Details About Rapid Shutdown

1. With rapid shutdown receivers installed, the PV string voltages should be very low. Depending on the receiver type, you should be measure between 0.6 and 0.7Vdc per module. Example: x10 modules = 6V-7V for the whole string
2. If the PV string voltages are low, check that the AC breaker is turned on so that the inverter is getting AC voltage and that the rapid shutdown switch is popped out. Give the switch a twist clockwise to verify that is popped out.
3. The DC switch does not have to be turned on for the receivers to get the PLC signal from the internal transmitter. However, if an external DC switch is installed, ensure that it is turned on or else the receivers will not be able to get the PLC signal from the transmitter.



IMPORTANT:

Consult the manual(s) of the rapid shutdown equipment supplier. These manuals must also be followed carefully to ensure normal operation.

Please see the [Compatibility Sheet](#) for details on which internal transmitter options are currently available for the Solis S6 hybrid inverter.

5.8.2 Photovoltaic Rapid Shutdown System (PVRSS) Certification

The Solis S6 hybrid is PVRSS-certified with several brands that manufacture rapid shutdown equipment. The certification includes the inverter, the PLC transmitter, and the receivers. The transmitter is located within the inverter, the receivers are installed with the PV modules. To avoid violating the PVRSS certification, the same brand of receivers must be installed as the internal transmitter. (Ex: Tigo transmitter with Tigo TS4-A-F receivers). There can be no mixing of different brands without violating both the PVRSS certification and the rapid shutdown equipment warranty. For this reason, please be sure to check the Compatibility Sheet and only install equipment that is matched under the same brand. The only exception to this is Midnite Solar receivers, which can be used with either Tigo or APS transmitters.

Solis S6 Hybrid Inverter



Rapid Shutdown
PLC Transmitter



Rapid Shutdown
PLC Receiver



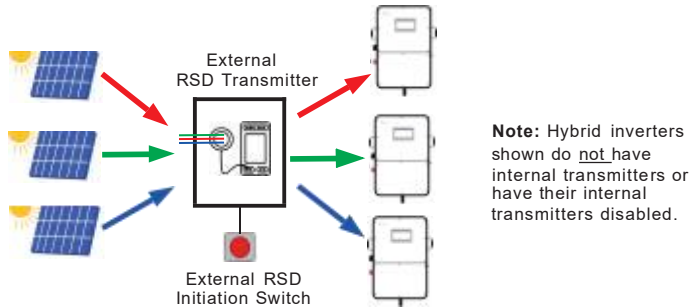
Figure 5.17 Components Listed in a Photovoltaic Rapid Shutdown System (PVRSS) Certification

Batteries and PV modules are not listed (specified) in the PVRSS certification. The transmitter can come integrated inside of the inverter, but it must be ordered with the correct internal transmitter. Alternatively, the transmitter can be installed externally in a separate enclosure.

5. Installation

5.8.3 Multiple Inverters with One External Transmitter

If multiple inverters will be installed in parallel, it is ideal to use a single external rapid shutdown transmitter. This prevents cross-talk from occurring because there will only be one transmitter for all of the PV strings in the system. Run all of the strings through the external rapid shutdown enclosure first and then to each inverter. Cores can handle up to 10 strings each. Some transmitters allow for, two cores to be connected, meaning up to 20 strings can be supported by one external transmitter.



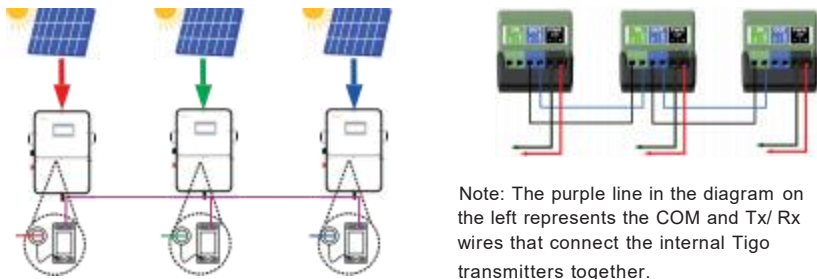
5. 18 Multiple Inverters with a Single External RSD Transmitter

5.8.4 Cross-Talk

Cross-talk occurs when competing PLC signals sent from different transmitters reach the same RSD receivers. This causes the receivers to randomly cycle on and off at various times. Cross-talk must be avoided at all costs. If multiple transmitters must be used, then it is important to keep the PV leads going from each inverter to the arrays separated by one foot minimum. Tigo transmitters can be physically wired together in a daisy-chain. Be sure to understand what kind of cross-talk protection the transmitter uses so that the system can be designed to eliminate any chance of cross-talk happening. If an external rapid shutdown transmitter is going to be used and the inverter has an integrated transmitter, then the integrated transmitter must be disabled to prevent cross-talk.

5.8.5 Multiple Inverters with Multiple Integrated Tigo Transmitters

Tigo transmitters can be daisy-chained together with two wires. This allows the transmitters to synchronize such that cross-talk between transmitters is eliminated. With this type of installation, an external RSD transmitter box is not required. Link the internal transmitters together so that the PLC signals become synchronized. Engaging the RSD initiation switch on the inverter wire box will initiate rapid shutdown for all of the inverters.



5. 19 Multiple Inverters with Multiple Internal Tigo Transmitters

5. Installation

5.8.6 External Rapid Shutdown

If the inverter is being installed where it is inaccessible to first responders , an external rapid shutdown switch must be installed somewhere it is accessible .

Steps for Installing an External Rapid Shutdown Initiation Switch

1. Install the external RSD switch and run two wires between it and the inverter
2. Remove the red jumper from the RSD_IN and RSD_OUT terminals (see Figure 5.15)
3. Connect one end of the two wires to the RSD_IN and RSD_OUT terminals
4. Connect the other end of the two wires to the external RSD switch

Note: the RSD switch on the inverter wire box will still initiate rapid shutdown . Be sure the transmitter is on by giving the switch a clockwise twist when you are ready to energize the system .



IMPORTANT:

Installing module-level power electronics (MLPE) not listed on Compatibility List will void the inverter warranty and the MLPE warranties .



NOTE:

Only remove the jumper when installing an external rapid shutdown switch. In all other cases, do not remove the jumper, as it may cause the inverter to stop.

The external rapid shutdown initiation switch is sold separately. Please contact your local supplier for help with procurement.

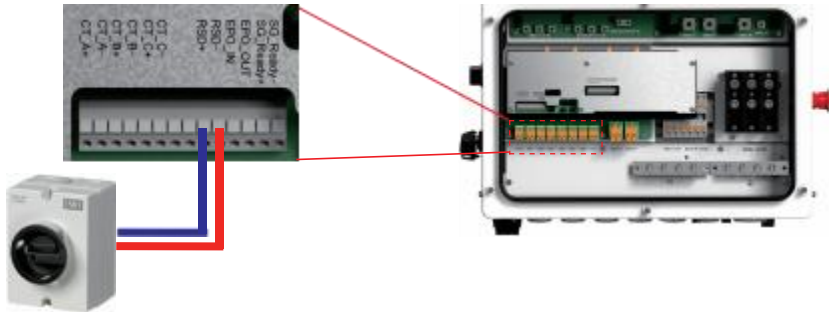


Figure 5.20 External RSD Initiation Switch

5 . Installation

5.9 Battery Installation



DANGER:

Before installing the battery cables , be sure that the battery is turned off.
Use a multimeter to verify that the battery voltage is 0Vdc before proceeding.
Consult the battery product manual for instructions on how to turn it off.



NOTE:

The condition for battery fully charging:
For this series of product , the compatible battery voltage should from 150-800V , but if you want the battery fully charging , you should know the condition(as the below table) for that. When the battery voltage between 400V-500V , the charging current can reach to the maximum value: 70A , and when battery voltage between 500V-800V , the single channel charging capacity can reach to the 35KW. For an example . for 50K model , two batteries charging power can reach to 55kw (1 . 1 times of rated output power) in total.

S6-EH3P(30-60) K-NV-YD-H-US			
NO.	Battery voltage(V)	Battery Current(A)	Battery Power(KW)
1	150	30	4.5
2	200	38	7.6
3	300	54	16.2
4	400	70	28
5	500	70	35
6	550	64	35
7	600	58	35
8	700	50	35
9	800	44	35

- 1 . The battery (+) and (-) cables shall only be connected to the inverter BAT terminals .
- 2 . Run the cables into the wire box . Strip ½ inch off the ends of each cable .
- 3 . Pull up on the orange plastic levers to open the battery terminals
- 4 . Insert the ends of the battery conductors into the open terminals
- 5 . Pull down on the orange plastic levers to close the battery terminals
- 6 . Give the cables a gentle tug test to ensure they are secure

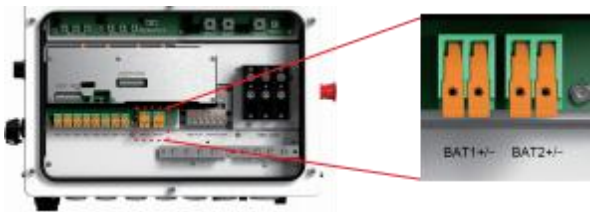


Figure 5.21 Battery Cable Connection

5 . Installation

Battery Compatibility

This inverter only works with specific battery models . Please consult the Battery Compatibility table on page 54 for which battery models this inverter will support . **Installing a battery that is not on the list will void the inverter warranty.** The inverter has two battery inputs and so can connect to two battery stacks at the most , unless the battery allows for paralleling stacks .

Black Start

In a situation where there is no grid and no PV, the inverter is able to use the battery to black start . However, not all compatible batteries support this function . Be sure to consult the battery manual to determine if it is able to support black start without a start-up signal from the inverter.



NOTE:
Before connecting the battery, please carefully read the product manual of the battery and perform the installation exactly as the battery manufacturer specifies in the manual



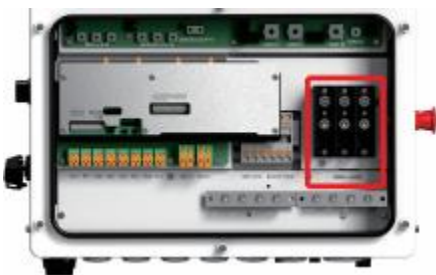
NOTE:
The largest cable size that will fit in the battery terminals is 4 AWG. Only copper conductors can be connected to the battery terminals .

5. 10 AC Wiring

5. 10. 1 AC Terminals



Generator and AC Backup



AC Grid

Figure 5 .22 AC output terminals

The inverter has two AC outputs: (1) to a backup service panel and (2) to the main service panel which is connected directly to the utility. When utility power is lost , the Grid-side of the inverter shuts off. The Backup-side of the inverter stays energized as long as there is enough PV and battery power to support the loads on the Backup-side . The inverter can be connected to other S6 hybrids in parallel to provide additional support to the backup loads .

There is also a dedicated input for a gas generator. The maximum size of the generator is the same as the nameplate rating of the inverter. Example: 30kW inverter can have up to a 30kW generator.

5 . Installation



Generator (left 3 ports)
AC Backup (right 3 ports)



AC Grid

Figure 5.23 AC Grid , Backup and Generator terminals



DANGER

Before installing the AC cables , be sure that the breakers are turned off.
Use a multimeter to verify that the AC voltages are 0Vac before proceeding.
Do not connect the grid directly to the backup terminals .

Terminal	Ground/Neutral Bar	AC Grid
Max . Wire Size	0 AWG	0 AWG
Torque	31 N.m	15 N.m

5.10.2 Installing the AC conductors

Generator and AC Backup Conductors

1. Bring the AC cables for the generator and backup service panel into the inverter wire box .
2. Strip 13mm of insulation from the ends of each conductor.
3. Using a small flathead screwdriver push on the orange rectangular button above the terminal to open it . Push directly in the center of the button . Hold the screwdriver down to keep the terminal open .
4. Insert the end of the conductor into the open terminal . Let go of the screwdriver to close the terminal .
5. Give the conductors a gentle tug test to ensure they are secure .
6. If the wire feels loose , repeat steps 3-5 .
8. Connect the other ends of the AC cables to the generator and backup service panel ,
9. Keep the breakers OFF for now , turn them on when doing commissioning.

AC Grid Conductors

1. Bring the AC cables for the main service panel (grid) into the inverter wire box .
2. Strip 13mm of insulation from the ends of each conductor
3. Crimp R-type connectors onto the ends of each conductor
4. Remove the hex bolts from the terminals and then insert them into the O-ring connectors
5. Reinstall the hex bolts into the terminals . Use a torque wrench to tighten them to 7.5 N . m .
6. Give the conductors a gentle tug test to ensure they are secure
7. If the wire feels loose , repeat steps 3-6
8. Connect the other ends of the AC cables in the main service panel to a circuit breaker & neutral bus
9. Keep the breakers OFF for now , turn them on when doing commissioning.

5. Installation

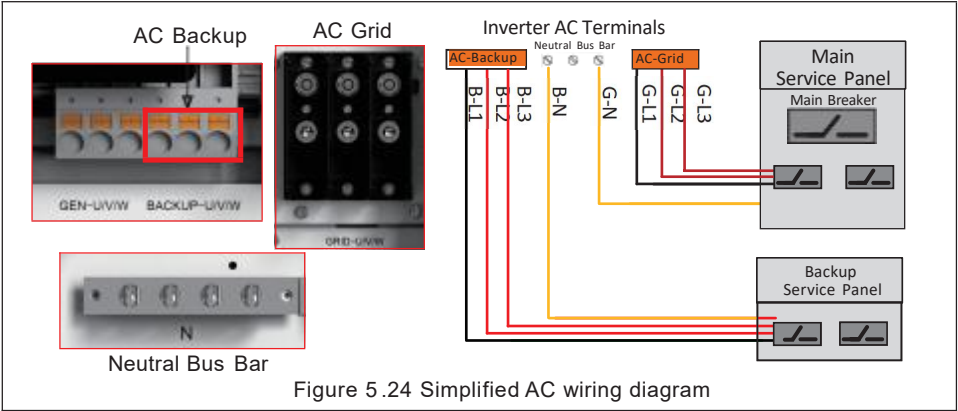


Figure 5.24 Simplified AC wiring diagram



CAUTION:
Do not run the generator when grid power is present . Do not connect the grid when the generator is running.

5. 10.3 CT Connection



CAUTION:
Make sure the AC cable is totally isolated from AC power before connecting the or CT.

The CT provided in the product box is compulsory for hybrid system installation . It can be used to detect the grid current direction and provide the system operating condition to hybrid inverter.

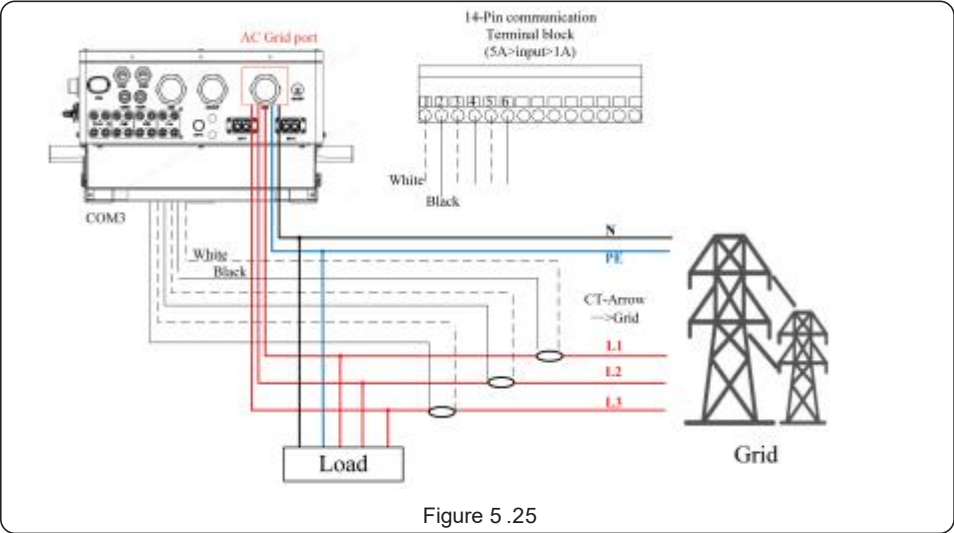
CT Model: ESCT-T50-300A/5A
CT Cable: Size – 2 .3mm2 , Length - 4m

Please install the CT on the hot line at the system grid connection point and the arrow on the CT needs to point to the grid direction .

Lead the CT wires through the COM3 port at the bottom of the inverter and connect the CT wires to the 14pin communication terminal block .

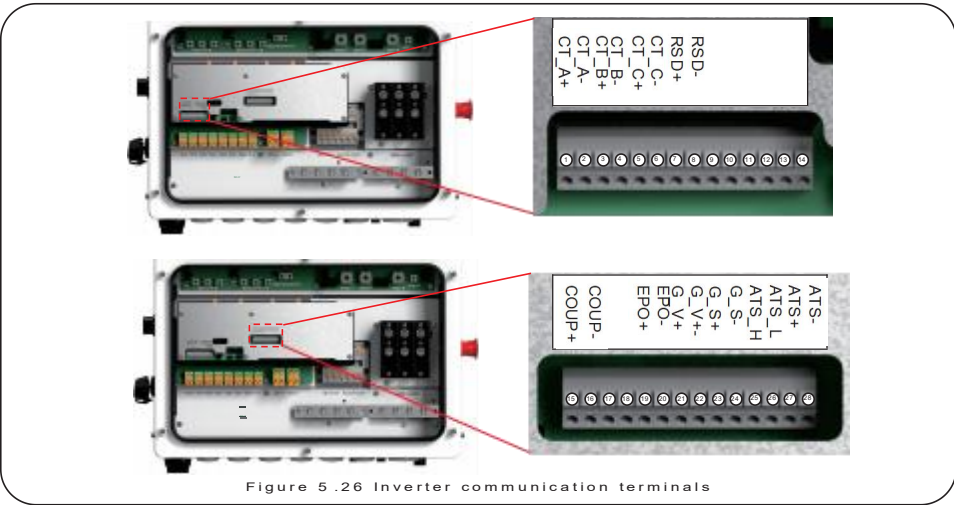
CT Wire	14 PIN Communication Terminal Block
White	Pin 1 (From Left to Right)
Black	Pin 2 (From Left to Right)
White	Pin 3 (From Left to Right)
Black	Pin 4 (From Left to Right)
White	Pin 5 (From Left to Right)
Black	Pin 6 (From Left to Right)

5. Installation



5.11 Inverter Communication

5.11.1 Communication Terminals Overview



There are two blocks each consisting of 14 pins for inverter communication . Also , there are nine RJ45 ports for communication . There are pins and ports for battery, RS485, meter CTs, external rapid shutdown, generator start/stop, emergency power off, and parallel inverter comms . The tables on the next page explain the purpose of each pin and port .

5 . Installation

Communication Block 1

NO.	Port	Function	Acceptable Wire Size Range
1	CT_A+	Phase A meter CT	22-16 AWG
2	CT_A-		
3	CT_B+	Phase B meter CT	
4	CT_B-		
5	CT_C+	Phase C meter CT	
6	CT_C-		
7	RSD+	RSD external interface , customer Can add switch controlRSD disconnected	
8	RSD-		
9	Reserved		
10	Reserved		
11	Reserved		
12	Reserved		
13	Reserved		
14	Reserved		

Communication Block 2

NO.	Port	Function	Acceptable Wire Size Range
15	COUP+	AC coupling	22-16 AWG
16	COUP-		
17	Reserved	Phase B meter CT	
18	Reserved		
19	EPO+	EMERGENCY STOP	
20	EPO-		
21	G_V+	Generator Control	
22	G_V+-		
23	G_S+		
24	G_S-		
25	ATS_H	Generator connected to the power grid , level signal D	
26	ATS_L		
27	ATS+	Generator connected to the power grid , dry contact DI	
28	ATS-		

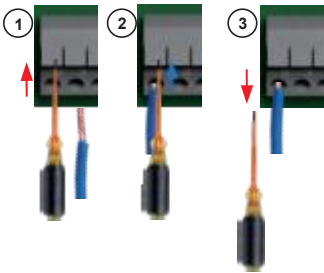
5 . Installation



Installing the communication wires:

First , strip ¼ inch off the end of the com wire .

- 1 . With a technician screwdriver push and hold the small grey block above the terminal hole to open the terminal .
- 2 . Insert the stripped com wire into the open terminal .
- 3 . Release pressure on the screwdriver and the terminal will clamp down on the wire .
- 4 . Finally, give the cable a gentle tug to ensure that it is firmly secured. If it is not, repeat steps 2-5 but push the wire deeper into the terminal before releasing the screwdriver.



5. 11.2 External Energy Meter Communication

The inverter comes with an energy meter that gets installed externally. The meter must be installed in order to have a fully-functioning system . If the meter is not installed , key functions such as export power control and default energy storage modes will not be available . It is possible for the system to function without the meter, but the capabilities will be limited. After installing the meter, in order to ensure correct wiring , please use a multimeter to measure the voltage of grid L1 and meter L1 . The voltage should be between 0-5V, and L2 should be the same . If it is not, please check switch L1 and L2 at the meter so that the phases are matched up .

5. 11.3 External Meter Terminal Connection (Optional)

If an external energy meter is preferred to be installed other than the provided CT, please contact Solis sales rep to order the smart meter and corresponding meter CTs . Run the Meter RS485 cable through one of the COM ports of the inverter and connect to the **Meter** port with an RJ45 connector.

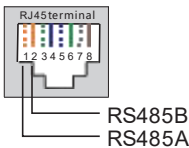


NOTE:

Pin definition of the Meter Terminal is following EIA/TIA 568B .

RS485A on Pin 1 and Pin4: Orange/white

RS485B on Pin 2 and Pin5: Orange



NOTE:

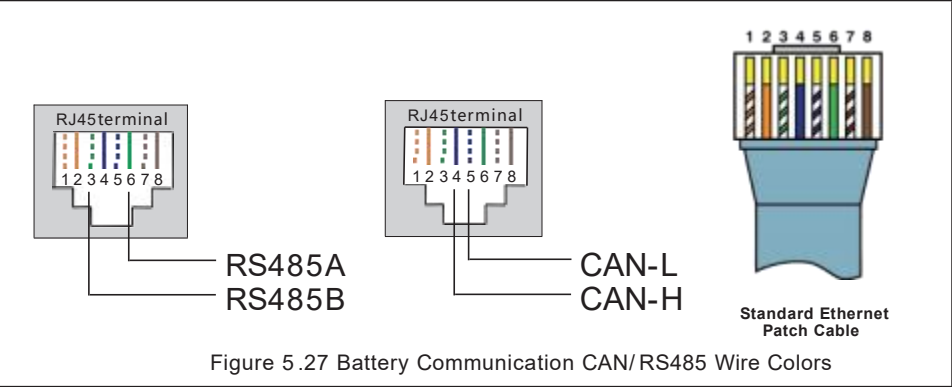
Compatible Smart Meter Pin Definition .

ESCT-T50-300A/5A– Pin 9 is RS485B & Pin 10 is RS485A

5 . Installation

5.11.4 Battery Communication Wiring Table

The BMS1 and BMS2 ports are for communication between the battery and the inverter. The Figure below shows which pins on the inverter are for battery communication: CAN-H, CAN-L , RS485A, and RS485B . A standard ethernet patch cable can be used to connect the battery to the inverter. If the battery has pins instead of an RJ45 port, please cut one end off a standard ethernet patch cable and then connect it to the battery according to the pinout shown in Figure 5.33 .



IMPORTANT:

Solis cannot guarantee normal operation with any battery that is not on the approved battery list . Please only install batteries from this list .

Installing a battery that is not on the list will void the inverter warranty.

Battery Manual and Battery Firmware

Please be sure to read through the battery manual for proper installation steps . The battery manual should be provided with the battery or it can be downloaded from the battery manufacturers website directly. It is very important to update the firmware of the battery during the installation and commissioning of the system . **Failing to update both the inverter and battery firmware will lead to communication issues** and the alarm codes like CAN_Comm_Fail & No-Battery.



NOTE:

Some alarm codes are being relayed from the battery. These alarms are caused by an issue with the battery itself. The troubleshooting section of this manual explains how to diagnose and treat each alarm . If the alarm says the battery is having a malfunction , please contact the battery manufacturer.

5. Installation

5.11.5 Parallel Inverter Communication

There are two RJ45 ports reserved for communication between Solis S6 hybrids only. The communication is CAN and is the ports are not able to be used for any other purpose besides daisy-chaining multiple Solis S6 hybrids together.

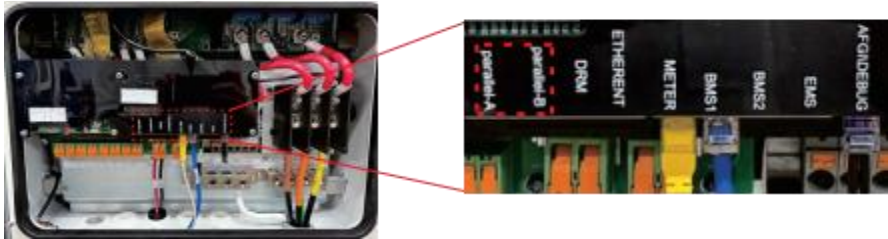


Figure 5.28 Inverter parallel inverter communication ports

Steps for connecting daisy-chaining inverters together:

Use a double-ended CAT5 ethernet cable . One should be included with the inverter.

- 1 . Plug one end of the cable into the Parallel-A port of the master inverter
- 2 . Plug the other end of the cable into the Parallel-B port of the slave inverter
- 3 . For three or more inverters set the DIP switches for the master and last slave in the chain to ON (left position) and the slaves in the middle to OFF (right position)
- 4 . For two inverters set the DIP switches of both master and slave to ON (left position)

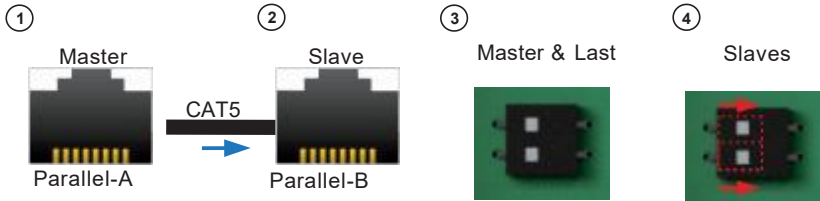


Figure 5.29 Inverter parallel ports and DIP switches

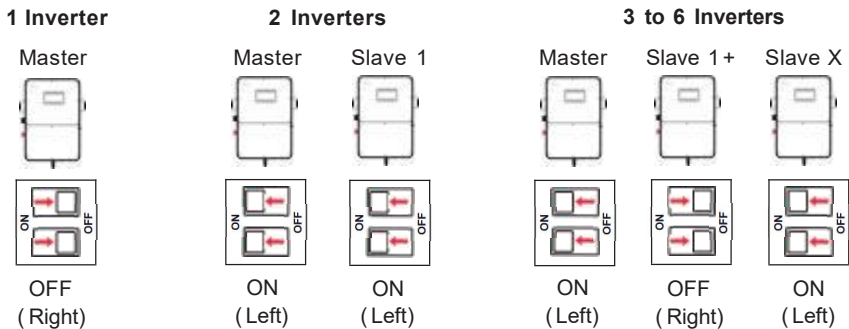


Figure 5.30 Inverter DIP switch settings

5 . Installation

5.11.6 Paralleling Guidelines

In order to ensure normal operation and the safety of the equipment , the following rules must be followed when paralleling mulitple inverters on the backup-side .

- 1. When connecting inverters in parallel , it is mandatory to match their sizes . For example , pair an 60KW inverter with another 60KW inverter. Do not parallel inverters of different sizes on the backup-side .
- 2. Before parallel connection , verify that both inverters are operating on the same firmware version . The inverters must never be on different versions of firmware .
- 3. Up to **six** hybrid inverters can be installed together in parallel on the backup side .
- 4. The energy meter and the data logger only need to be connected to the master. But to update the firmware , each inverter needs to have its own data logger connected to it .
- 5. All inverters in the system must be connected to the same ground point to eliminate the possibility of a voltage potential existing between inverter grounds .
- 6. Each inverter must have its own PV strings connected to it , as per the DC input PV specifications of the inverter. It is ok to have some inverters with only battery and no PV.
- 7. Each inverter must have the same brand , model , and size (kWh) battery connected to it The inverters cannot have different batteries or sizes (kWh) .
- 8. The inverter backup circuit breakers must be connected in a separate isolated load center that is not electrically connected to the grid.
- 9. The AC bypass switches for all inverters must all be in the same position always .
- 10. The parallel settings for each inverter must be configured prior to initiating operation .
- 11. Prior to initiating full system operation it is essential to verify that each inverter operates normally. Set each inverter one-by-one for single operation , ensure there are no alarms during operation , shut it down , and then go to the next inverter .

Note: These rules apply only to paralleling the backup ports of the inverters together. If the inverters are being paralleled on the grid-side only then these rules can be ignored.



NOTE:

The master inverter will manage the output power of the slave inverter. If the master inverter has a fault , the slave inverter will continue to operate unless the fault is critical. In parallel systems , when used off grid , the battery must be prioritized for connection to the host.

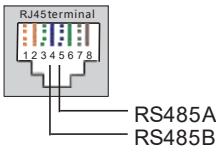
5.11.7 RS485 Port Connection (Optional)

If a 3rd party external device or controller needs to communicate with the inverter, the RS485 port can be used. Communication protocol is supported by Solis inverters . To acquire latest protocol document , please contact Solis local service team or Solis sales .Support Ethernet port for the moment , reserve EMS port .



NOTE:

Pin definition of the RS485 Port is following EIA/TIA 568B .
RS485A on Pin 5: Blue/White
RS485B on Pin 4: Blue



5. Installation

5. 11.8 Emergency Power Off (EPO)

An external emergency power off switch can be added to the system . There are two pins on the communication terminal block designated for such a switch .When this switch is engaged , the inverter will cease operating. This means that the voltages will be unaffected , but the currents (A) on all conductors will become zero . After installing an external switch , run a 2-core cable between it and the inverter. Connect the two cores from the switch to the EPO_IN and EPO_OUT ports of the inverter. Initiating EPO for the master will also initiate EPO for the slaves .

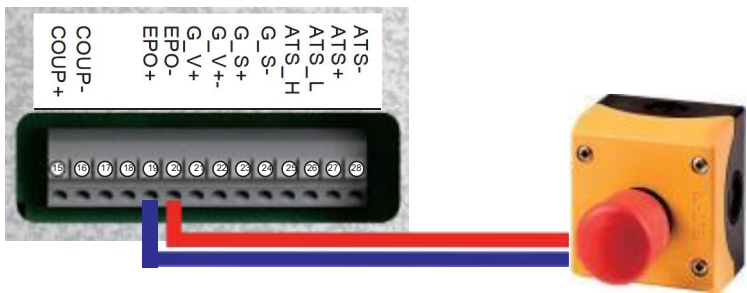


Figure 5.31 External emergency power off switch

5.11.9 Inverter Bluetooth Network

The Solis S6 hybrid generates a Bluetooth network which allows technicians to directly interface with the inverter using a smart phone or tablet . The accessory kit will include a Bluetooth antenna . Remove the black protective cap from the “Antenna” port on the bottom of the inverter. Attach the Bluetooth antenna to the port by rotating it *counter-clockwise* until it feels tight . Please note , the antenna simply extends the range of the inverter Bluetooth network from 3 feet to about 10 feet , but it is not required for the Bluetooth network to function normally. Please be sure to tighten the antenna until it feels snug.

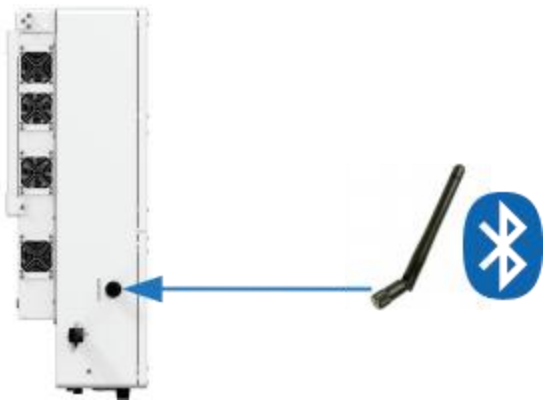


Figure 5.32 Bluetooth Antenna Port

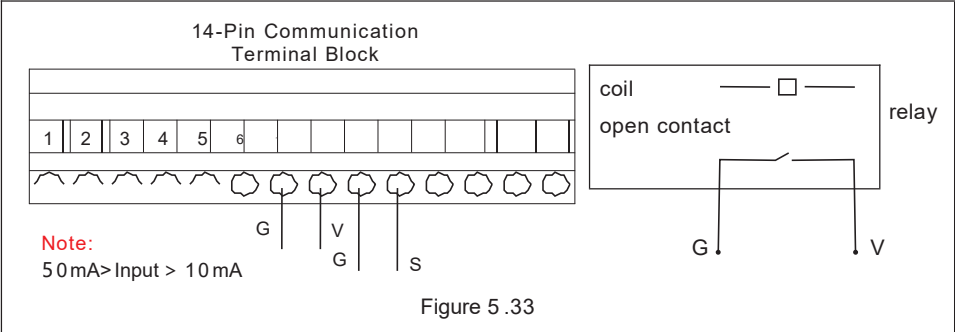
5. Installation

5.11.10 G-V Terminal Connection

The G-V terminal is a voltage-free dry contact signal for connecting with generator's NO relay to start up the generator when necessary.

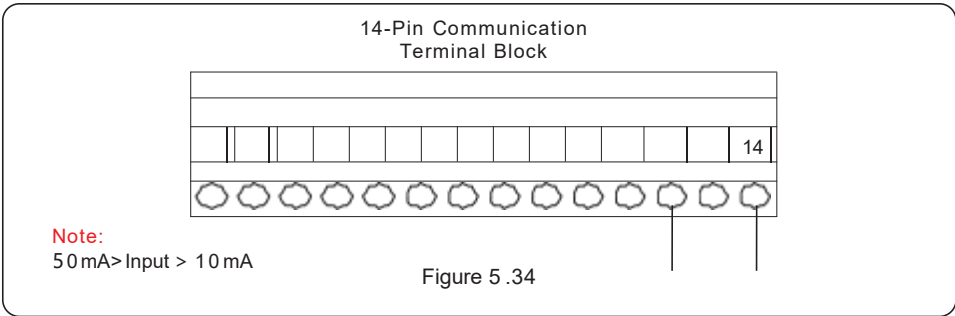
When generator operation is not needed , Pin7 and Pin8 is in open circuit .

When generator operation is needed , Pin7 and Pin8 is in short circuit .



5.11.11 ATS380V Terminal Connection

The ATS_DI logic is that when the dry contact is disconnected , the external level signal is low. The inverter is connected to the generator, and when the dry contact is closed , the external level signal is high (5V/ 12V) . At this time , the inverter is connected to the grid.



5.11.12 Diesel Generator Wiring

- 1.The backup PE must be directly connected to the PE copper bar of the power distribution box , rather than the inverter shell .
- 2.The generator itself needs to be grounded , connected to the electric box , and connected to the inverter generator port .
3. When the generator is working , disconnect the Grid breaker or leakage current protector on the side of the power box immediately.

5. Installation

5.11.13 Generator Communication Diagram

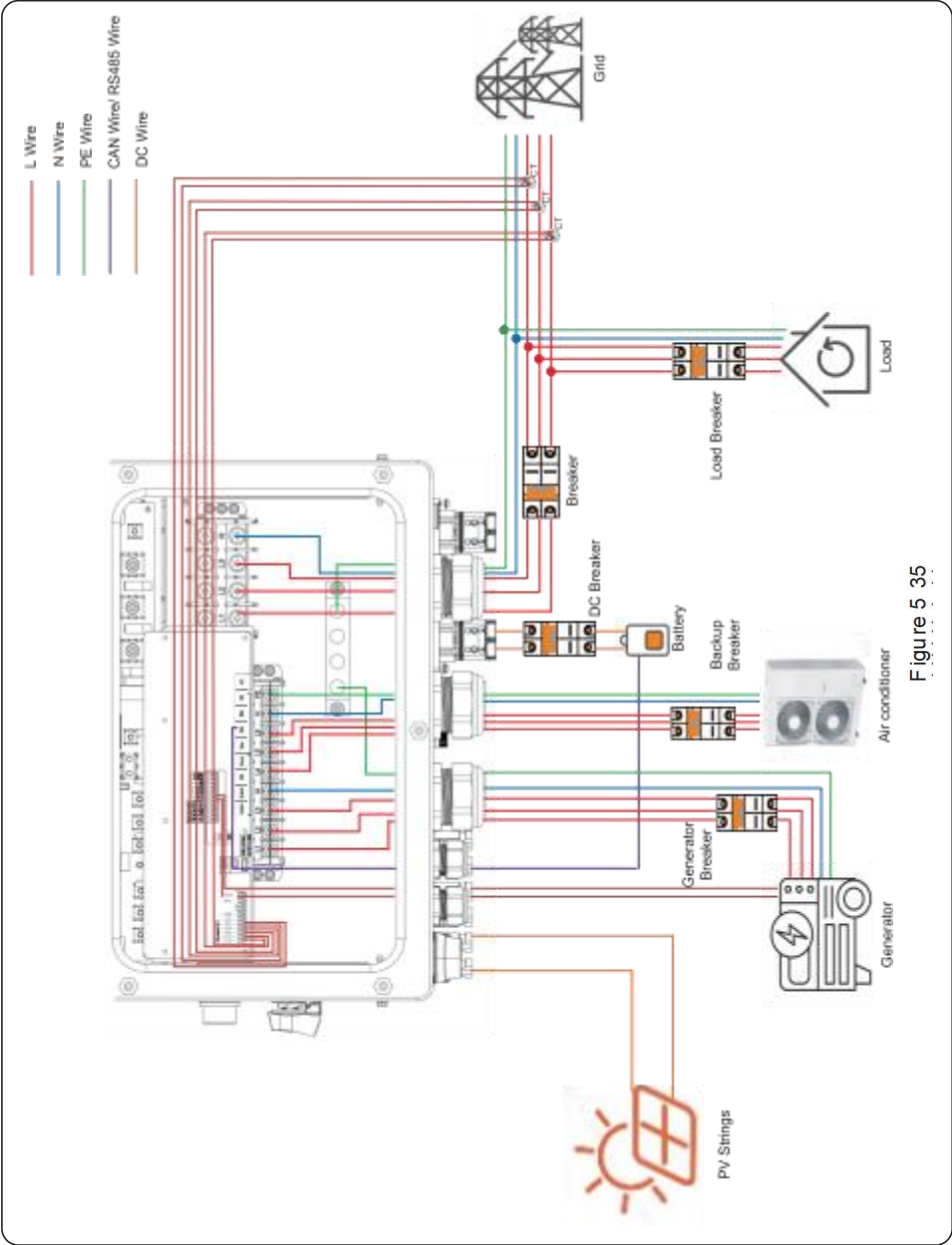


Figure 5.35

5. Installation

5.11.14 Generator Communication

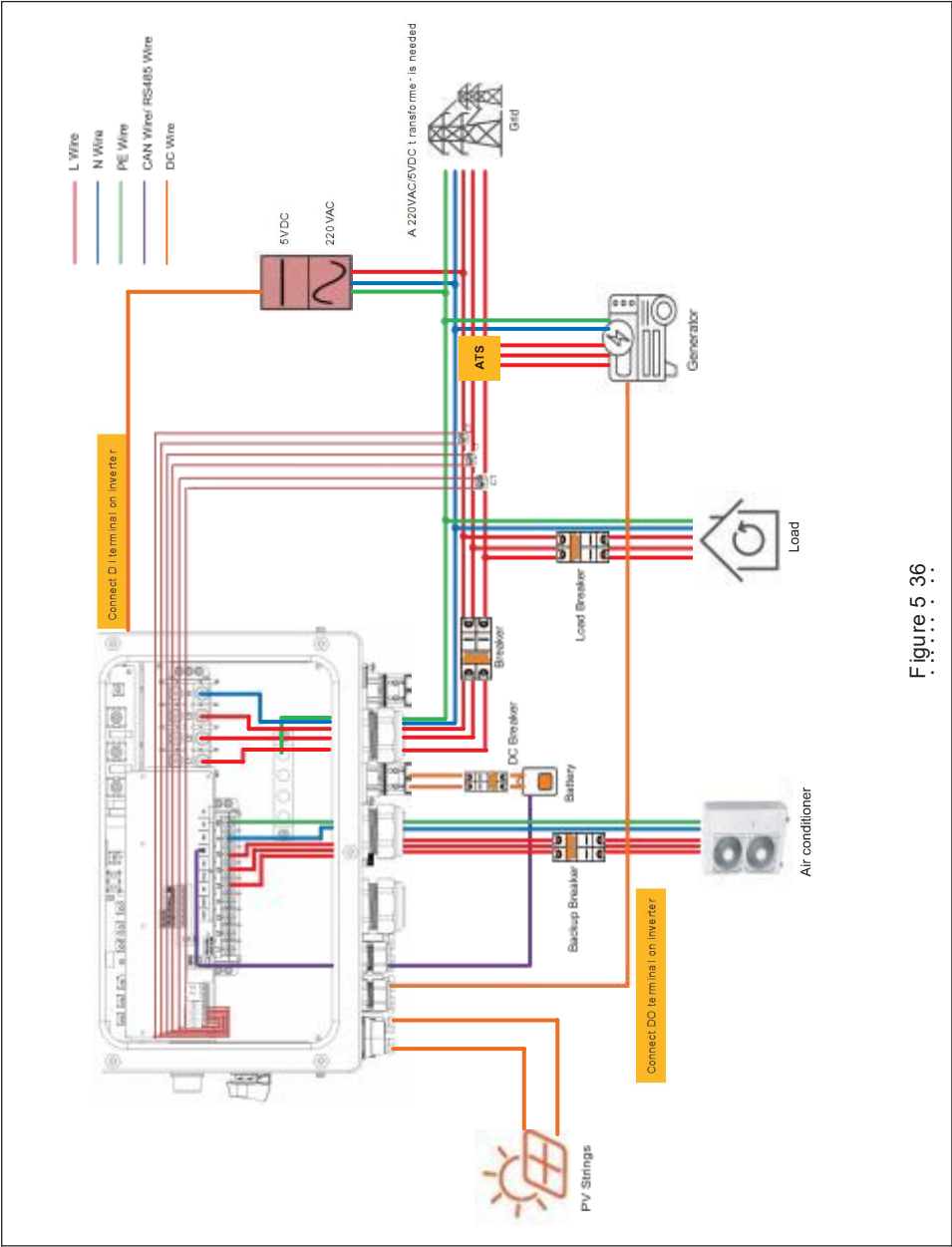


Figure 5-36

5 . Installation

5.12 Inverter Remote Monitoring

The inverter can be remotely monitored via WiFi , LAN or 4G Solis data logger. The USB type COM port at the bottom of the inverter can connect to different kinds of Solis data loggers to realize the remote monitoring on Soliscloud , the Solis monitoring platform . To install Solis data loggers , please refer to corresponding user manuals of Solis data loggers . The Solis data loggers are optional and can be purchased separately. A dust cover is provided with the inverter in case the port is not used.



WARNING:
The USB type COM port is only allowed to connect Solis data loggers . It is forbidden to be used for other purposes .

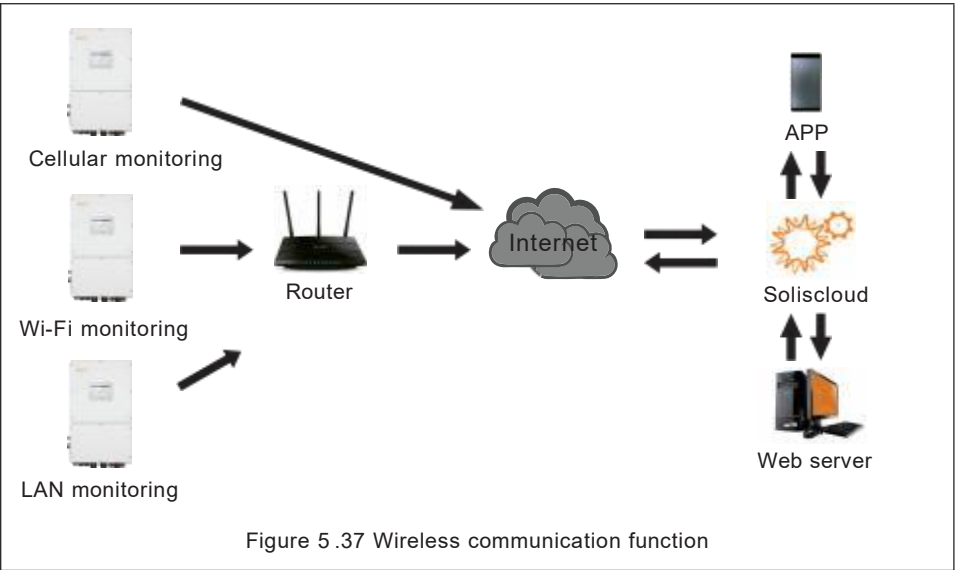


Figure 5.37 Wireless communication function

6. Commissioning

6.1 Pre-Commissioning Steps

- Visually inspect each piece of equipment in the system closely.
- Check all conduit and cable connection points to ensure they are tight.
- Verify that all system components have adequate space for ventilation.
- Follow each cable to ensure that they are all terminated in the proper places.
- Ensure that all warning signs and labels are affixed on the system equipment.
- Verify that the inverter is secured to the wall and is not loose or wobbly.
- Prepare a multimeter that can do both AC and DC amps
- Have an Android or Apple mobile phone with Bluetooth capability
- Install the Soliscloud app on the mobile phone if you do not have it already
There are three ways to download and install the latest app:
 1. You can visit **www.soliscloud.com**
 2. You can search "**Soliscloud**" in Google Play or App Store.
 3. You can scan this QR code to download **Soliscloud**.
- Register a new account with SolisCloud if you have not done so already. There are two account types available:



Organization: for installers, technicians, and any third-party that is not the direct owner of the home where the system is installed. This is for fleet management. Organization accounts are able to remotely control systems through SolisCloud.

Owner: for homeowners who typically only have a small number of sites and are only looking to monitor their system(s).

6.2 Commissioning Procedure

6.2.1 Commissioning Steps Overview

Once the equipment has been fully installed and an account for SolisCloud has been registered, the commissioning process can begin. This manual will explain steps 1 through 6. For steps 7 and 8, please see the manual for the Solis cellular data logger. The steps are the same for the other types of Solis data loggers. The inverter can be commissioned/configured through Bluetooth using the SolisCloud mobile Application or it can be configured through the LCD (HMI) screen. This manual will explain the steps for doing it both ways, but only one method is required to complete commissioning.

Step 1: Verify the DC and AC voltages

Step 2: Connect to the inverter with the SolisCloud app

Step 3: Update the inverter firmware

Step 4: Configure the initial settings: time, battery, meter, grid standard, work mode

Step 5: Configure optional settings: export power, AC-coupling, parallel, generator

Step 6: Turn the inverter on

Step 7: Connect a Solis logger

Step 8: Create a plant on SolisCloud

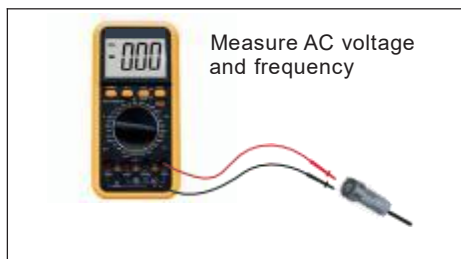
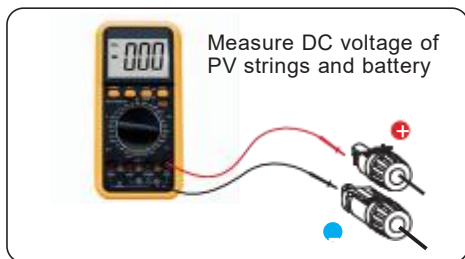


**Scan for the Solis cellular
data logger manual**

6. Commissioning

6.2.2 Power ON Procedure

Step 1 : With the DC switch off, energize the PV strings and then measure DC voltage of the PV strings to verify that the voltage and polarity are correct . Turn on the battery and check the battery voltage and polarity as well .



Step 2: Turn on the OCPD for the system and then measure the AC voltages line to line and line to neutral . The backup side of the system will be off until commissioning is complete .Turn the OCPD back off for now.

Step 3: Turn the DC switch on and then the OCPD(AC breaker) for the system . This inverter can be powered on by PV only, battery only and Grid only. When the inverter is powered on ,the five indicators will be lighted at once .

6.2.2 Power OFF Procedure

Step 1 : Turn off the AC breaker or AC disconnect switch to disable AC power to the inverter.

Step 2: Turn off the DC switch of the inverter.

Step 3: Turn off the battery breaker.

Step 4: Use a multimeter to verify that the battery and AC voltages are 0V.

6. Commissioning

6.3 HMI Screen Setting

6.3.1 HMI Quick Setting

If this is the first time the inverter has been commissioned, you will need to first go through the Quick Settings. Once this has been done, these settings can be changed later.

Inverter Time -> Meter Setting -> Grid Code -> Storage mode -> Battery Model



1. Inverter time:

Set inverter time and date, default follow the phone.

2. CT/Meter setting:

Select the CT or Meter Solis provide Eastron 3 phase meter, it is self-identifiable.

Set installation location: Grid side / Load side / Grid +PV inverter;

CT direction: When CT installed correctly, select "Forward"; when CT installed direction wrong, the sampling current of CT will be reversed when calculating the power, select "Reversal" to correct it.

Set CT ratio: default 60 (Solis provide ESCT-T50-300A/5A CT), if the user install their own CT, then need to set the CT ratio manually. If the system connected to Meter, then CT ratio need to be set on Meter.

3. Grid code:

Select grid code that meet the local regulations.

4. Storage mode:

ALL modes first priority is to use the available PV power to support loads. The different modes determine what the second priority, or use of the excess PV power, will be.

Self-use / Selling first / Off-grid are exclusive, the user could select only one mode.

5. Battery setting:

Select Battery connection method 1 Batt 1 DC / 1 Batt 2 DC / 2 Batt 1 DC; the connection method please refer to 3.13 Lithium battery wiring.

Select battery brand (if the connected battery is not on the list, please select "General_LiBat_HV").

Set Max charging/discharging current.

If there are two batteries and share the same settings, please tick the box of "Batt2 Settings follow Batt 1".

6 . Commissioning



Mode	Description
Self-use	<p>PV power flow priority sequence: loads > battery > grid.</p> <p>In this mode , the system stores excess PV power into the battery after the loads are supplied.</p> <p>If “Allow export” turned on , when the battery is charged full , or there is no battery, the excess PV power will be exported(sold)back to the grid.</p> <p>If the system is set to not export any power, then the inverter will curtail the PV power (derate the inverter output power) .</p>
Selling first	<p>PV power flow priority sequence: loads > grid > battery.</p> <p>In this mode , the system exports any excess PV power after the loads are supplied. If the export power quota has been met , then the remaining PV power will be stored in the battery.</p> <p>Notice: This mode should not be used if export power set to zero .</p>
Off grid	<p>PV power flow priority sequence: loads > battery.</p> <p>This mode only used when the system are not electrically connected to the grid at all . This mode is like Self-Use Mode , but the PV power will be curtailed if the PV power output is > battery power + load power</p>

Table 1 Description of modes

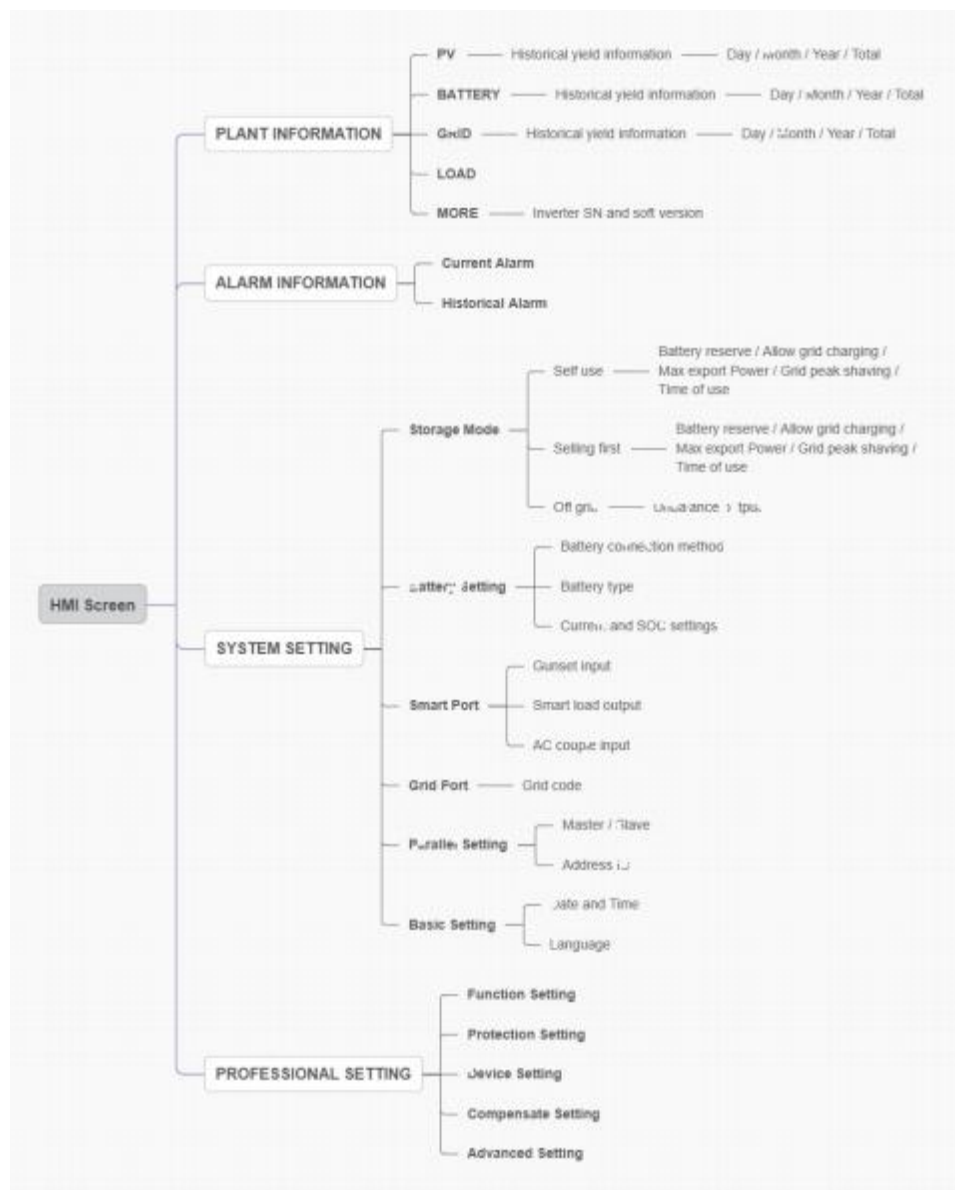
Under each mode , user could set other functions based on their requirements .

Settings	Description
Max export power	<p>Default: 1.1 times of rated power.</p> <p>Notice: if feed-in is not allowed , set Max export power to 0 .</p>
Export calibration	<p>Range : -500w-500w, default 20w, settable .</p> <p>To compensate the deviation of CT/ Meter in practical application .</p>
Grid peak shaving	<p>Default enable , default 2 times of rated power.</p> <p>Limit the power drawn from the grid to prevent from exceeding regulatory requirements or the power line capacity.</p> <p>It works only when the “battery reserve” turned on .</p>

Table 2 Description of mode settings

6. Commissioning

6.3.2 HMI screen operation system overview



6 . Commissioning

6.3.3 Detailed HMI Setting

Step 1: Enter Home page

After quick setting , press “ENTER”, the screen displays the home page .



The screen will be automatically turn off after being idle for a few minutes to save power, click any operation button “ESC”/“UP”/“DOWN”/ “ENTER”) to restart the screen , then press “Enter” into the main operation interface .

Step 2: Enter “SYSTEM SETTING” interface

Press“Down” button , then press “ENTER” into the “SYSTEM SETTING” interface .



6 . Commissioning

Step 3: Set “Storage Mode”

Use “UP” or “DOWN” key to select the desired mode, then press “ENTER”.

The Mode description please refer to 5.4 . 1 .



Settings	Description
Battery reserve	Range: 5~95% , default: 80% , settable . When battery SOC < set battery reserve SOC , battery will stop discharging .
Allow grid charging	Allow grid charging the battery when it enables . Notice: if “Allow Grid Charging” is turned on , the inverter will use grid power to charge the battery only under two circumstances: The battery drains to the Force Charge SOC. When PV power output can’t meet the set current value during the charge periods .
Max export power	Default: 1 . 1 times of rated power . Notice: if feed-in is not allowed , set Max export power to 0 .
Export calibration	Range : -500w-500w, default 20w, settable . To compensate the deviation of CT/Meter in practical application .
Grid peak shaving	Default enable , default 2 times of rated power . Limit the power drawn from the grid to prevent from exceeding regulatory requirements or the power line capacity . It works only when the “battery reserve” turned on .

Table 3 Description of storage mode settings

6 . Commissioning

Step 4: Set “Time of use” under each mode (Skip this step if no need)

Time of Use is for manual control of the battery charging/discharging. It is for customizing when the battery is allowed to charge and discharge power and at what rate , established by a current(amperage)setting.

- 1 . Charge period : battery charges with set current value until the charging cut-off voltage (settable) , checking the box to control whether enable this charging period.
- 2 . Discharge period : battery discharges with set current value until the discharging cut-off voltage (settable) , checking the box to control whether enable this discharging period.

STORAGE MODE

2024/01/01 12:00:00

Charge period

	Start	Stop	Current	SOC
<input checked="" type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input checked="" type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input checked="" type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input type="checkbox"/>	01 : 00	05 : 00	100A	50%

Discharge period

	Start	Stop	Current	SOC
<input checked="" type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input checked="" type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input checked="" type="checkbox"/>	01 : 00	05 : 00	100A	50%
<input type="checkbox"/>	01 : 00	05 : 00	100A	50%

...

6 . Commissioning

Step 5: Set “Battery Setting”



Settings	Description
Max charge current	Max charge current , settable .
Max discharge current	Max discharge current , settable .
Over discharge	Range: 5~40% , default 20% , when battery SOC < over discharge , it will stop discharging.
Recovery	Range: set Over discharge value +1% ~ set Over discharge value +20% ; when battery SOC > Recovery SOC , it will start charging , reserve the return difference value to avoid the battery repeatedly cross jump between charging and discharging.
Force charge	Range : set Over d ischarge va lue +1% ~ set Over d ischarge va lue +20%; when battery SOC > Recovery SOC, it w i l l start charging, reserve the return d ifference va lue to avo id the battery repeated ly cross jump between charging and d ischarging.
Max charge SOC	Charge cut-off SOC , battery stops charging when reach the Max . Charge SOC.

Table 4 Description of battery mode settings



NOTICE:

Force charge SOC < Over discharge SOC < Recovery SOC , otherwise the setting might be error.

6. Commissioning

Step 6: Set “Grid Port”

(Skip this step if grid code is already set in quick setting)

Select grid code that meet the local regulations .

Three level of Over-voltage / under-voltage / Over-frequency / under-frequency are default based on grid code , there is no need to set the parameters in manual .



Step 7: Set “Smart Port”

(Skip this step if the system is not connected to generators)

When it is connected to Generator, select “Gunset input”;

When it is connected to smart load like heat pump select “Smart load output”

When it is connected to Grid-tied inverter select “AC coupled”



Genset

The user need to input the “Genset rated power” by manual .

OFF: Generator stops charging SOC, settable, range:35~ 100% ;

ON: Generator start charging SOC; settable , range:1~95% ;

AC coupled :

OFF: Grid-tied inverter stops charging SOC , settable, range:35~ 100% ;

ON: Grid-tied inverter start charging SOC; settable , range:1~95% ;

6 . Commissioning

Step 8: Set parallel system

Set Master and Slave machine ,

Set Master ID as: 1

Slave machine ID as: 2

.Slave machine ID as: 3

..... and so on .



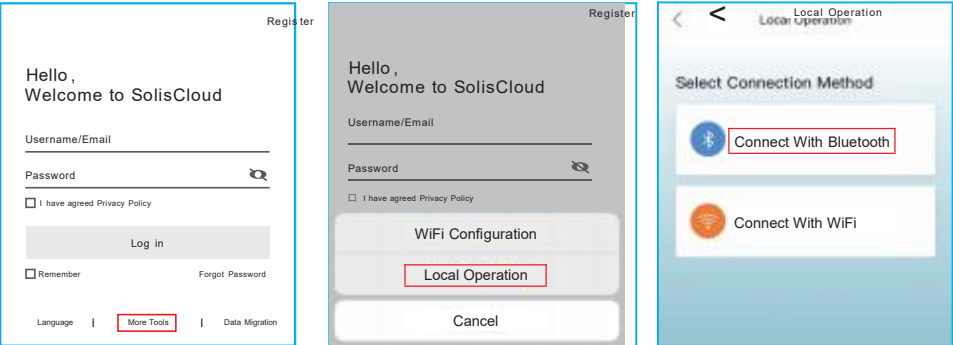
6 . Commissioning

6.4 Mobile Application Commissioning

6.4. 1 Log in the APP via Bluetooth

Step 1 : Connect with Bluetooth.

Turn on Bluetooth switch on your mobile phone and then open the Soliscloud APP.
Click “More Tools”->”Local Operation”->”Connect with Bluetooth”

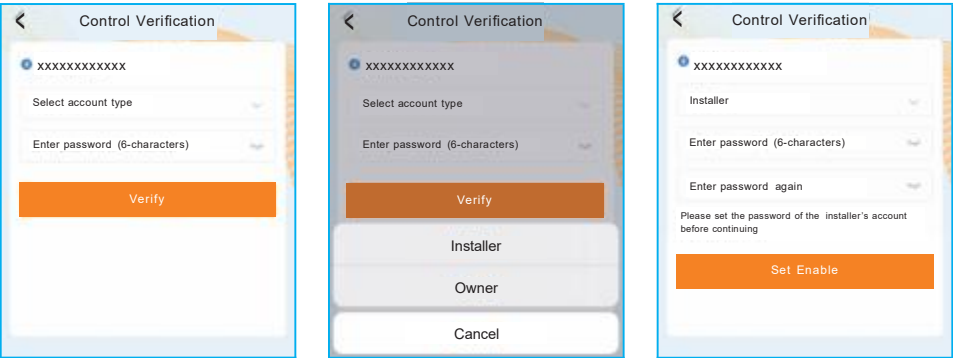


Step 2: Select the Bluetooth signal from the inverter. (Bluetooth Name: Inverter SN)



Step 3: Login account.

If you are the installer, please select the account type as Installer. If you are the plant owner, please select the account type as owner. Then set your own initial password for control verification . (The first log-in must be finished by installer in order to do the initial set up)



6 . Commissioning

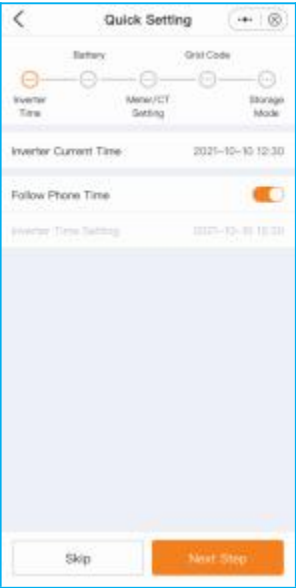
6.4.2 APP Quick Setting

If this is the first time the inverter has been commissioned , you will need to first go through the Quick Settings . Once this has been done , these settings can be changed later.

Inverter Time -> Meter Setting -> Grid Code -> Storage mode -> Battery Model

(1) Inverter time:

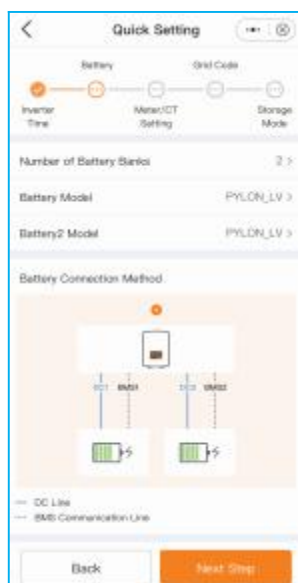
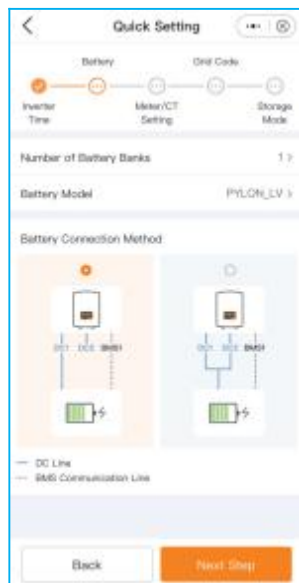
Set inverter time and date , tap the slider next to “Follow Phone Time”, then tap “Next step” at the bottom right corner.



6. Commissioning

(2) Battery:

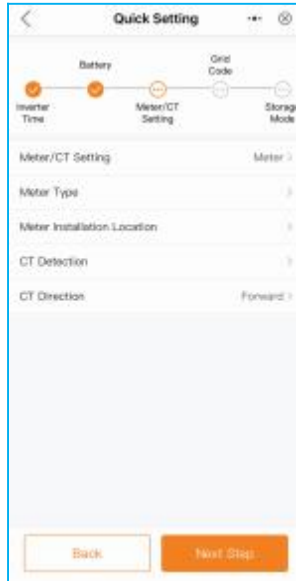
- Select number of battery banks 1-2
- Select battery model: if the connected battery brand is not on the list, please select "General_LiBat_HV"
- Select battery connection method.



6. Commissioning

(3)CT/Meter setting:

- Select CT or Meter;
- Set Meter type (Solis provide Eastron 3 phase meter, it is self-identifiable).
- Set Meter installation location: Grid side / Load side / Grid+PV inverter;
- Set CT ratio: default 60 (Solis provide ESCT-T50-300A/5A CT) , if the user install their own CT, then need to set the CT ratio manually. If the system connected to Meter, then CT ratio need to be set on Meter.
- CT direction: When CT installed correctly, select “Forward”; when CT installed direction wrong , the sampling current of CT will be reversed when calculating the power, select “Reversal” to correct it .

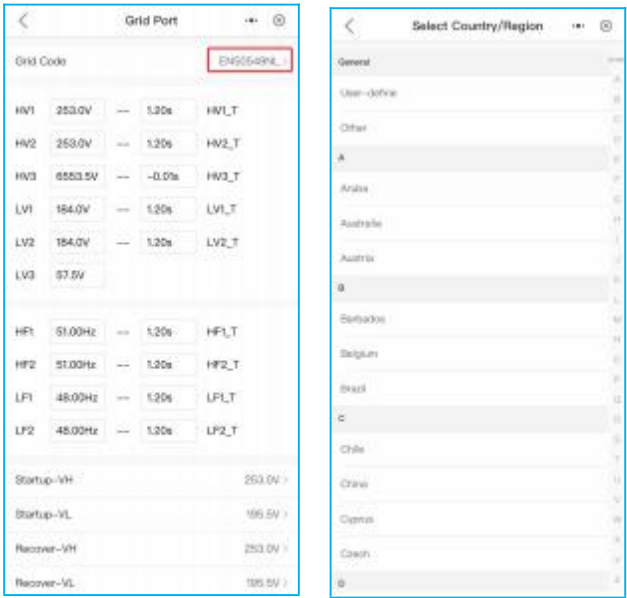


6 . Commissioning

(4)Grid code:

Select grid code that meet the local regulations .

Three level of Over-voltage / under-voltage / Over-frequency / under-frequency are default based on grid code , there is no need to set the parameters in manual .

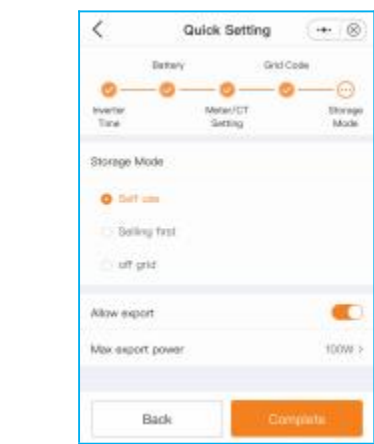


6 . Commissioning

(5)Storage mode:

ALL modes first priority is to use the available PV power to support loads . The different modes determine what the second priority, or use of the excess PV power, will be .

Self-use / Selling first / Off-grid are exclusive the user could select only one mode .



Settings	Description
Self-use	<p>PV power flow priority sequence: loads > battery > grid.</p> <p>In this mode , the system stores excess PV power into the battery after the loads are supplied. If the battery is charged full , or there is no battery, the excess PV power will be exported(sold)back to the grid.</p> <p>If the system is set to not export any power, then the inverter will curtail the PV power (derate the inverter output power) .</p>
Selling first	<p>PV power flow priority sequence: loads > grid > battery.</p> <p>In this mode , the system exports any excess PV power after the loads are supplied. If the export power quota has been met , then the remaining PV power will be stored in the battery.</p> <p>Notice: This mode should not be used if export power set to zero .</p>
Off grid	<p>PV power flow priority sequence: loads > battery .</p> <p>This mode only used when the system are not electrically connected to the grid at all . This mode is like Self-Use Mode , but the PV power will be curtailed if the PV power output is > battery power + load power .</p>

Table 5 Description of Storage modes

Once quick setting finished , tap “Complete”, the APP enter the homepage .

6 . Commissioning

6.4.3 Home Page of the Mobile App Inverter Interface

This screen display energy production and consumption , as well as its flow . It shows the following data:

- Today yield of PV
- Today Imported/Exported of Grid
- Today Charged/Discharged of Battery
- Today Consumption of Grid-side load
- Today Consumption of Back-up load
- Today GEN yield.

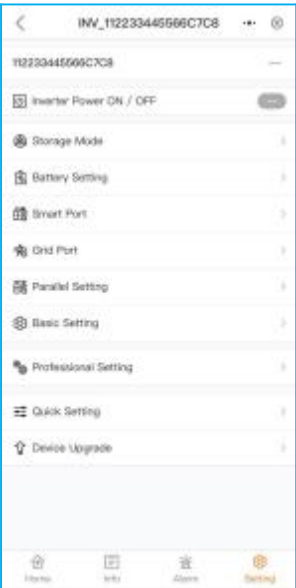
At the bottom of page are four sub menus: Home , Info , Alarm and Settings .



6 . Commissioning

6.4.4 Settings

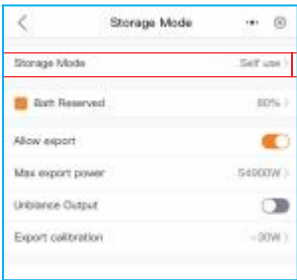
Under this page , the user could find quick setting and other detailed settings as follows:



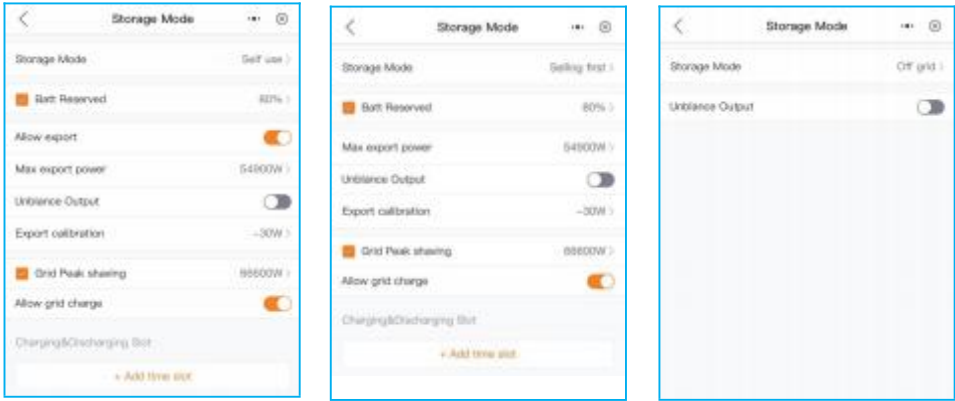
1. Storage mode

a . Select storage mode:

- Self-use / Selling first / Off-grid , these three modes are exclusive , the user could select only one mode . The modes definition could refer to 5.5.2"Quick setting"
- The Mode description please refer to 5 . 4 . 1 .



6 . Commissioning



Please notice:
“Allow export” can only be set in “Self use” mode;
“Add time slot” can only be set in grid-connected mode (Self use” mode and “ Selling first” mode).

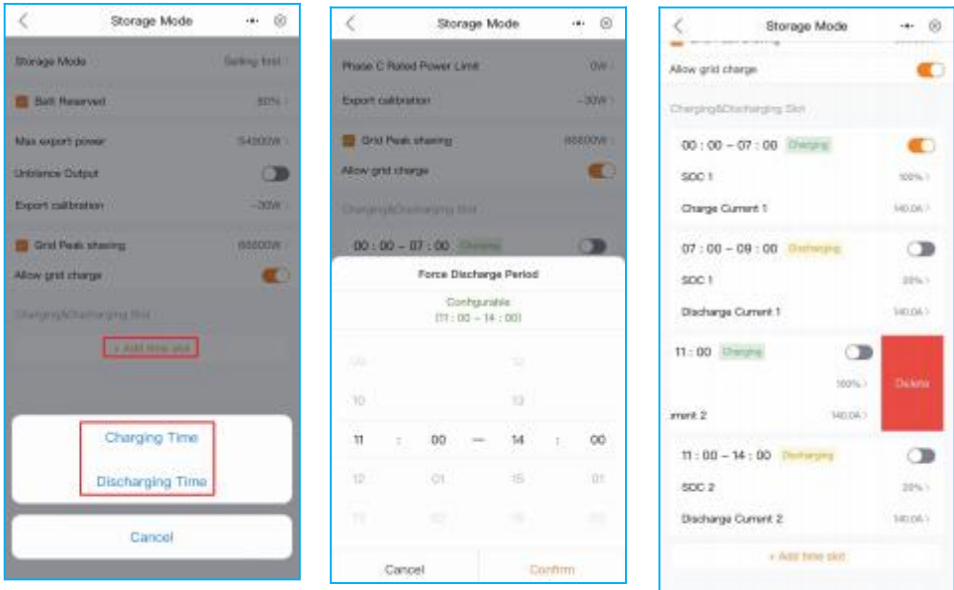
b. Set mode operations:

Settings	Description
Battery reserved	Range: 5~95% , default:80% , settable. When battery SOC < set battery reserve SOC , battery will stop discharging.
Allow export	When it enables , the system is allowed to export power to grid.
Max export power	Default: 1.1 times of rated power. Notice: If feed-in is not allowed , set Max export power to 0 .
Export calibration	Range : -500w-500w, default 20w, settable . To compensate the deviation of CT/ Meter in practical application .
Allow grid charging	Allow grid charging the battery when it enables . Notice: if “Allow Grid Charging” is turned on , the inverter will use grid power to charge the battery only under two circumstances: •The battery drains to the Force Charge SOC. •When PV power output can't meet the set current value during the charge periods .

Table 6 Set mode operations

6. Commissioning

c. Add time slot:



Charge SOC: battery charging stops when reach the set SOC;
Discharge SOC: battery discharging stops when reach the set SOC.



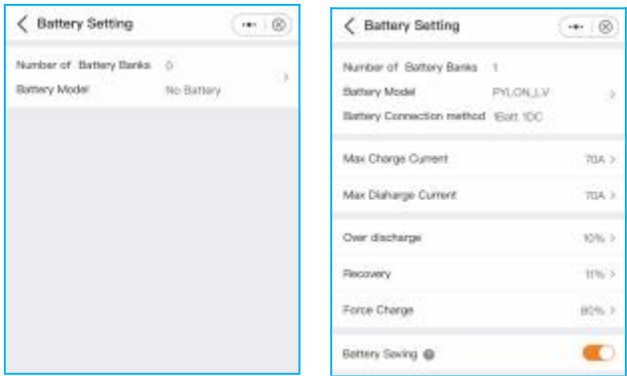
NOTICE:

- Slide the switch to on , the battery charge/discharge with set charge/ discharge current by following the set period
- Slide to the left of screen , the user could delete the current period setting.

6 . Commissioning


2. Battery setting

- a . Set “ Number of Battery Banks ” and “ Battery Model ”
- b. Set “Battery Connection Method ” : 1 Batt 1 DC / 1 Batt 2 DC / 2 Batt 1 DC;
- c. Set battery parameters



Settings	Description
Max charge current	Max charge current , settable .
Max discharge current	Max discharge current , settable .
Over d ischarge	Range : 5~40% , default 20% , when battery SOC < over discharge , it will stop discharging.
Recovery	Range : set Over discharge value +1% ~ set Over discharge value +20% ; when battery SOC > Recovery SOC , it will start charging , reserve the return difference value to avoid the battery repeatedly cross jump between charging and discharging.
Force charge	Range : 4 %~ set Over discharge value , when battery SOC < force charge SOC , the grid will charge the battery.

Table 7 Battery setting

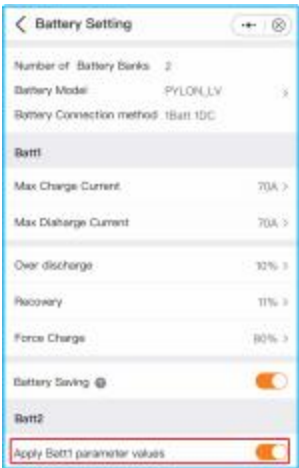


NOTICE:

Force charge SOC < Over discharge SOC < Recovery SOC , otherwise the setting might be error.

6 . Commissioning

d. If two battery banks share the same setting , then turn the “Apply Batt1 parameter values” on . It will match the settings of battery bank 1 automatically.



3. Smart port

Select smart port type

- When it is connected to Generator, select “Gunset input”;
- When it is connected to smart load like heat pump select “Smart load output”
- When it is connected to Grid-tied inverter , select “AC coupled”



Genset Rated Power: manual input .

OFF: Generator stops charging SOC , settable , range:35~ 100% ;

ON Generator start charging SOC; settable , range:1~95% ;

AC coupled :

OFF: Grid-tied inverter stops charging SOC , settable , range:35~ 100% ;

ON: Grid-tied inverter start charging SOC; settable , range:1~95% ;

6 . Commissioning

4. Grid port

Please refer to “5 .5 .2 APP Quick setting”

5. Parallel setting

When there are ≥ 2 inverters in parallel , turn the slider on

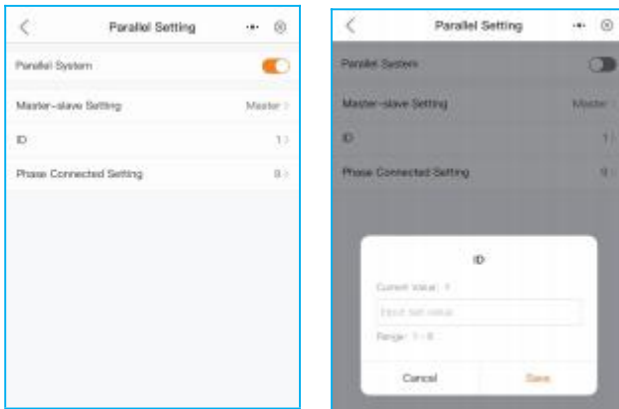
Set Master and Slave machine ,

Set Master ID as: 1

Slave machine ID as: 2

.Slave machine ID as: 3

..... and so on.



6. Basic setting

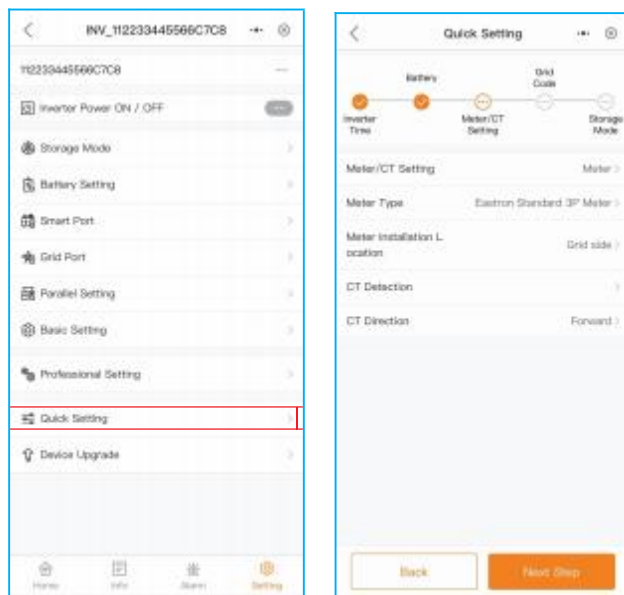
Set inverter time and date , tap the slider next to “Follow Phone Time”, then tap “Save”.

6. Commissioning

7. CT/Meter setting

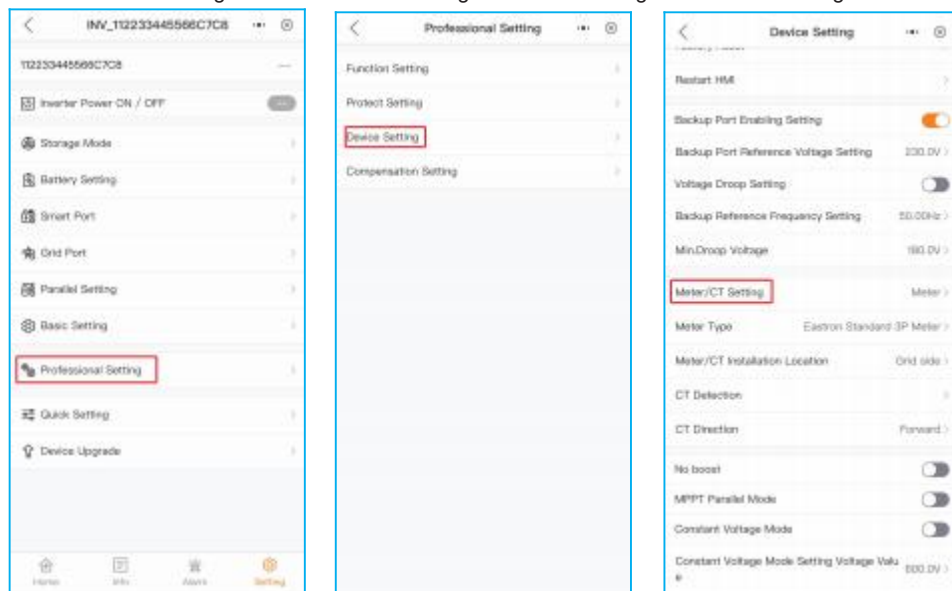
There are two ways for CT/Meter setting , detailed setting please refer to “5.5.2 APP Quick setting”.

Method 1 : Quick setting



6. Commissioning

Method 2: Setting --- Professional Setting -- Device Setting --Meter/CT Setting



6.4.5 Alarm

The alarm page can display the current alarm and the historical alarms .



6. Commissioning

6.4.6 Information

The use could Query information of PV / Battery / GRID / LOAD / INVERTER .

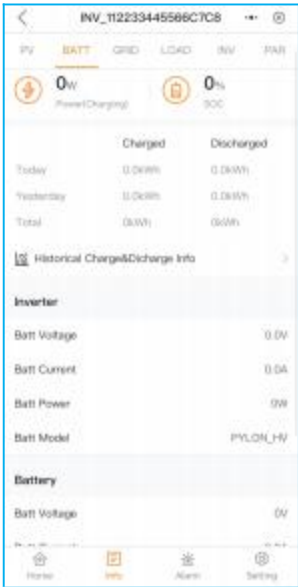
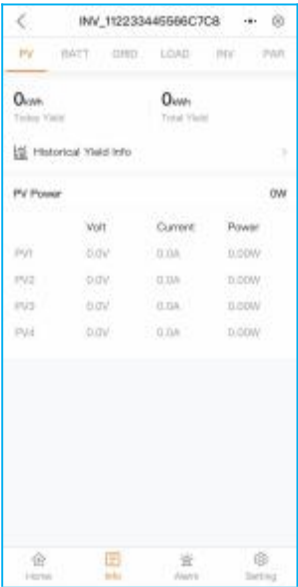
PV : it display each PV module Power/Voltage/Current , as well as historical yield information calculated by monthly / yearly / total , displayed with graphics;

BATT: it display battery Power/Voltage/Current/SOC/SOH/ Max .charging current / Max .discharging current , as well as historical battery charging and discharging information calculated by monthly / yearly / total , displayed with graphics;

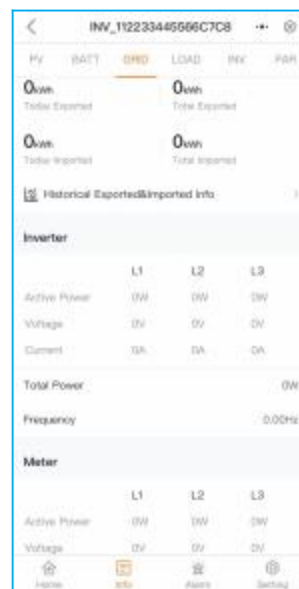
GRID: it display Active power / voltage/ current of L1/L2/L3 , as well as historical exported/imported information calculated by monthly / yearly / total , displayed with graphics;

LOAD: it displays power/voltage of grid load , power/voltage/current of backup load ;

INV: it displays inverter SN/model number, and software version .

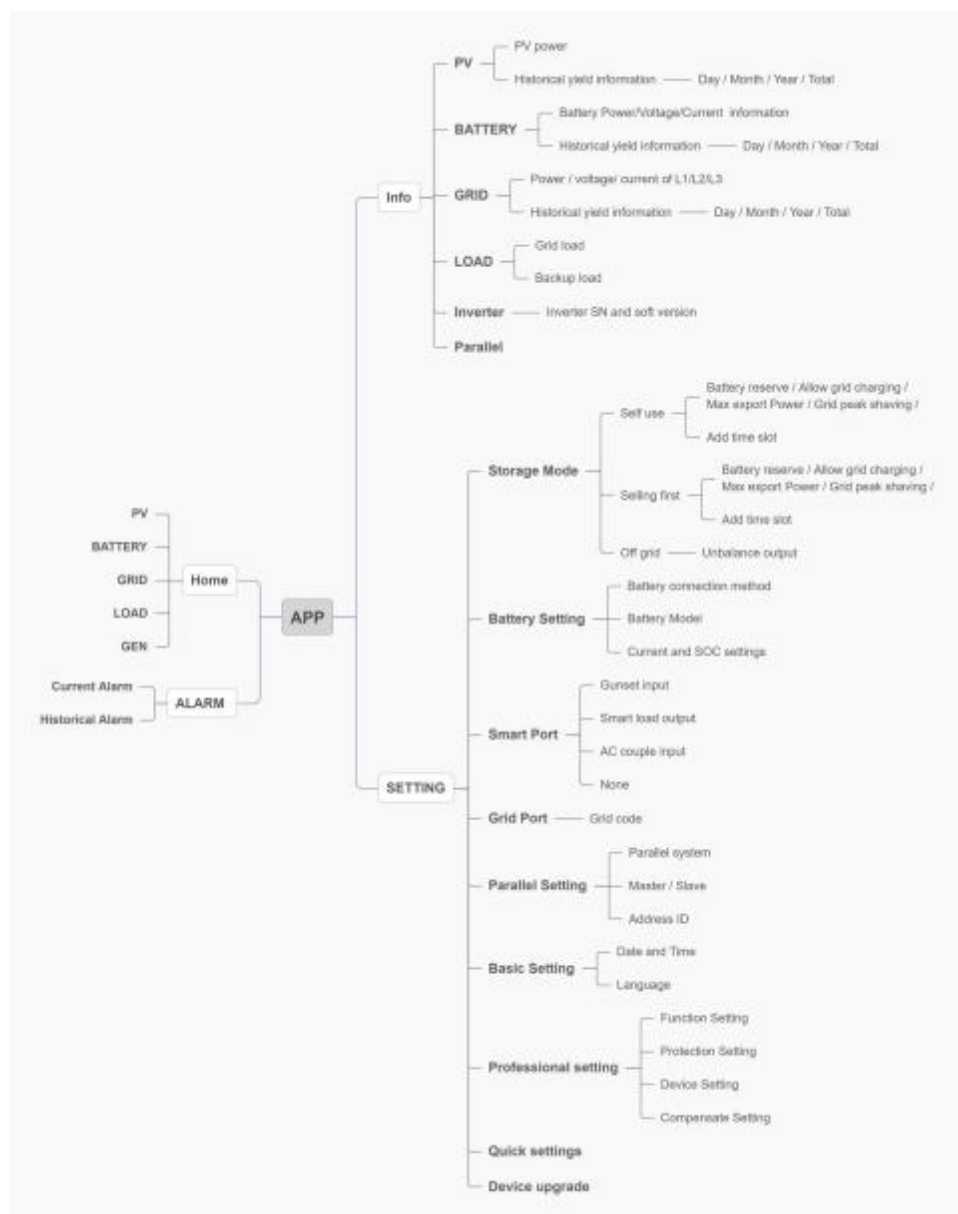


6. Commissioning



6. Commissioning

6.4.7 APP interface structure



6 . Commissioning

6.5 Post-Commissioning

Solis S6 Series inverter does not require any regular maintenance . However, cleaning the heatsink will help the inverter dissipate heat and increase the lifetime of inverter. The dirt on the inverter can be cleaned with a soft brush.



CAUTION:

Do not touch the surface when the inverter is operating. Some parts may be hot and could cause burns . Turn OFF the inverter and let it cool down before you do any maintenance or cleaning of inverter.

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



NOTE:

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

6.5. 1 Smart O&M

In order to improve our products and provide you with higher quality services , this device has a built-in data logging module for collecting relevant information during operation (such as power generation data , fault data)

Commitment:

- 1 . We will only collect , use and process your device information for the purpose of improving our products and services .
- 2 . We will take all reasonable and feasible measures to ensure that no irrelevant information is collected and we will protect your device information .
- 3 . We will not share , transfer or disclose the collected device information with any company, organization or individual .
- 4 . When we stop operating products or services , we will stop collecting your device information in a timely manner.
- 5 . If you do not want to provide such information , you can notify our company to turn off this function , which will not affect your normal use of other functions of the product .

The next section goes over how to troubleshoot the inverter if there are any issues with it . Please contact our after-sales support team if you need help with a faulty inverter or if you have any general questions about the inverter.

7. Troubleshooting

Solis US Technical Support Contact Information

Phone Number: +1(866)438-8408

Email: usservice@solisinverters.com

If you are having an issue with your system, please contact Solis Technical Support for assistance. If the inverter is having an issue, it will show it in one of the following ways: (1) the Inverter (circle) LED indicator light will flash orange. (2) the inverter status will be an alarm code (3) an alarm code will display on SolisCloud or (4) the inverter will simply be off. The next several pages explain how to troubleshoot each alarm code. If it is suspected that the issue is coming from the DC side of the system, it is recommended to turn the inverter off so that the PV strings can be more safely tested.

7.1 Inverter Shutdown Procedure

Step 1. Turn off the AC disconnect switch to disable AC power to the inverter

Step 2. Push in the RSD Initiation Switch and then turn off the DC switch of the inverter

Step 3. Turn off the battery breaker on the battery BMS

Step 4. Use a multimeter to verify that the battery and AC voltages are 0V. If RSD is being used, the PV string voltages should be at safety levels

7.2 Inverter Maintenance

Solis S6 hybrid inverter does not require any regular maintenance. However, keeping the heatsink clean will ensure the inverter is able to dissipate heat, increasing the life span of the inverter. Any grease smudges on the inverter chassis can be cleaned off with soap and water.



CAUTION:

Do not touch the surface of the inverter it is operating. Some parts may be hot and could cause a minor burn. Turn off the inverter (refer to Section 6.2) and let it cool down before you do any maintenance or cleaning of it.

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



Note:

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

The inverter has been designed in accordance with international standards for safety and electromagnetic compatibility requirements. Before being shipped from the manufacturing center, the inverter is subjected to multiple tests to ensure operation reliability.

If you are not able to resolve the alarm code using the troubleshooting steps, or if the alarm code you are seeing is not listed, please contact Solis US Technical support. Use the Bluetooth tool, go to the Info page and then to the Inverter tab. Scroll down and tap Alarm History and then screen shot or write down the alarms as well as the dates and times the alarms were recorded. Please also take note of the inverter model number, serial number, and internal transmitter type.

7. Troubleshooting

7.3 Inverter Alarm Codes

Message Name	Information Description	Troubleshooting Suggestion
Off	Control device to shutdown	1. Turn on the device in the ON/OFF Setting.
L mtByEPM	The device's output is under controlled	1. Confirm whether the inverter is connected to an external EPM/ meter to prevent reverse current . 2. Confirm whether the inverter is controlled by an external third-party device . 3. Confirm whether the power setting of the inverter power control is limited. 4. Verify settings in section 6.6 .7 and check your meter readings .
L mtByDRM	DRM Function ON	1. No need to deal with it .
L mtByTemp	Over temperature power limited	1. No need to deal with it, the device is in normal operation .
L mtByFreq	Frequency power limited	
L mtByVg	The device is in the Volt-Watt mode	1. Due to the requirements of local safety regulations , when the grid voltage is high , the Volt-watt working mode is triggered , which generally does not need to be dealt with . 2. Inverter factory test errors causing this mode to open , if you need to close , you can close this mode in LCD , set the process: Main menu → Advanced Settings → Password 0010 → STD mode settings → Working Mode → Working mode: NULL → Save and exit .
L mtByVar	The device is in the Volt-Var mode of operation	1. Due to the requirements of local safety regulations , when the grid voltage is high , the Volt-watt working mode is triggered , which generally does not need to be dealt with . 2. Inverter factory test errors causing this mode to open , if you need to close , you can close this mode in LCD , set the process: Main menu → Advanced Settings → Password 0010 → STD mode settings → Working Mode → Working mode: NULL → Save and exit .
L mtByUn Fr	Under frequency limit	1. No need to deal with it .
Standby	Bypass run	
StandbySynoch	Off grid status to On grid status	
GridTo Load	Grid to load	

7. Troubleshooting

Message Name	Information Description	Troubleshooting Suggestion
Surge Alarm	On-site grid surge	1. Grid side fault , restart the device . If it is still not eliminated , please contact the manufacturer's customer service .
OV-G-V01	Grid voltage exceeds the upper voltage range	1. Confirm whether the power grid is abnormal . 2. Confirm that the AC cable is properly connected . 3. Restart the system and check if the fault persists .
UN-G-V01	Grid voltage exceeds the lower voltage range	
OV-G-F01	Grid frequency exceeds the upper frequency range	
UN-G-F01	Grid frequency exceeds the lower frequency range	
G-PHASE	Unbalanced grid voltage	
G-F-GLU	Grid voltage frequency fluctuation	
NO-Grid	No grid	
OV-G-V02	Grid transient overvoltage	
OV-G-V03	Grid transient overvoltage	1. Restart the system , confirm if that the fault continues .
IGFOL-F	Grid current tracking failure	1. Confirm whether the power grid is abnormal . 2. Confirm that the AC cable is properly connected . 3. Restart the system and check if the fault persists .
OV-G-V05	Grid voltage RMS instantaneous overvoltage fault	
OV-G-V04	Grid voltage exceeds the upper voltage range	
UN-G-V02	Grid voltage exceeds the lower voltage range	
OV-G-F02	Grid frequency exceeds the upper frequency range	
UN-G-F02	Grid frequency exceeds the lower frequency range	
NO-Battery	Battery is not connected	1. Check on information page 1 – Verify the battery voltage is within standards . 2. Measure battery voltage at plug .
OV-Vbackup	Inverting overvoltage	1. Check whether the backup port wiring is normal 2. Restart the system , confirm that the fault continues .
Over-Load	Load overload fault	1. Backup load power is too large , or some inductive load startup power is too large , need to remove some backup load , or remove the inductive load on the backup .

7. Troubleshooting

Message Name	Information Description	Troubleshooting Suggestion
BatName-FAIL	Wrong battery brand selection	1. Confirm whether the battery model selection is consistent with the actual one.
CAN Fail	CAN Fail	1. Can failure is a failure of communication between inverter and battery. Check cable conditions. Check to ensure you have it plugged in on the CAN port of the battery and inverter. Check that you are using the right cable. Some batteries require a special battery from the battery manufacturer.
OV-Vbatt	Battery undervoltage detected	1. Verify battery voltage is within standards. Measure battery voltage at inverter connection point. Contact your battery manufacturer for further service.
UN-Vbatt	Battery overvoltage detected	1. Restart the system and check if the fault persists. If it is still not eliminated, please contact the manufacturer's customer service.
Fan Alarm	Fan alarm	1. Check if the internal fan is working correctly or jammed.
OV-DC01 (1020 DATA:0001)	DC 1 input overvoltage	1. Check if the PV voltage is abnormal 2. Restart the system, confirm that the fault continues
OV-DC02 (1020 DATA:0002)	DC 2 input overvoltage	
OV-BUS (1021 DATA:0000)	DC bus overvoltage	1. Restart the system, confirm that the fault continues.
UN-BUS01 (1023 DATA:0001)	DC bus undervoltage	
UNB-BUS (1022 DATA:0000)	DC bus unbalanced voltage	
UN-BUS02 (1023 DATA:0002)	Abnormal detection of DC bus voltage	
DC-INTF. (1027 DATA:0000)	DC hardware overcurrent (1, 2, 3, 4)	1. Check if the DC wires are connected correctly without loose connection.
OV-G-I (1018 DATA:0000)	A phase RMS value overcurrent	1. Confirm that the grid is abnormal. 2. Confirm that the AC cable connection is not abnormal. 3. Restart the system, confirm that the fault continues.
OV-DCA-I (1025 DATA:0000)	DC 1 average overcurrent	1. Restart the system, confirm that the fault continues.
OV-DCB-I (1026 DATA:0000)	DC 2 average overcurrent	
GRID-INTF. (1030 DATA:0000)	AC hardware overcurrent (abc phase)	

7. Troubleshooting

Message Name	Information Description	Troubleshooting Suggestion
DC Inj-FAULT (1037 DATA:0000)	The current DC component exceeds the limit	<ol style="list-style-type: none"> 1. Confirm that the grid is abnormal . 2. Confirm that the AC cable connection is not abnormal . 3. Restart the system , confirm that the fault continues .
IGBT-OV-I (1048 DATA:0000)	IGBT overcurrent	<ol style="list-style-type: none"> 1. Restart the system , confirm that the fault continues .
OV-TEM (1032 DATA:0000)	Module over temperature	<ol style="list-style-type: none"> 1. Check whether the surrounding environment of the inverter has poor heat dissipation . 2. Confirm whether the product installation meets the requirements .
RelayChk-FAIL (1035 DATA:0000)	Relay failure	<ol style="list-style-type: none"> 1. Restart the system , confirm that the fault continues .
UN-TEM (103A DATA:0000)	Low temperature protection	<ol style="list-style-type: none"> 1. Check the working environment temperature of the inverter. 2. Restart the system to confirm if the fault continues .
PV ISO-PRO01 (1033 DATA:0001)	PV negative ground fault	<ol style="list-style-type: none"> 1. Check whether the PV strings have insulation problems . 2. Check whether the PV cable is damaged.
PV ISO-PRO02 (1033 DATA:0002)	PV positive ground fault	
12Power-FAULT (1038 DATA:0000)	12V undervoltage failure	<ol style="list-style-type: none"> 1. Check current leakage to ground. Verify your grounding. Verify all wires are in good condition and not leaking current to ground.
ILeak-PRO01 (1034 DATA:0001)	Leakage current failure 01 (30mA)	
ILeak-PRO02 (1034 DATA:0002)	Leakage current failure 02 (60mA)	
ILeak-PRO03 (1034 DATA:0003)	Leakage current failure 03 (150mA)	
ILeak-PRO04 (1034 DATA:0004)	Leakage current failure 04	
ILeak_Check (1039 DATA:0000)	Leakage current sensor failure	
GRID-INTF02 (1046 DATA:0000)	Power grid disturbance 02	<ol style="list-style-type: none"> 1. Confirm whether the grid is seriously distorted. 2. Check whether the AC cable is connected reliably.
OV-Vbatt-H/ OV-BUS-H (1051 DATA:0000)	Battery overvoltage hardware failure / VBUS	<ol style="list-style-type: none"> 1. Check if the battery circuit breaker is tripping. 2. Check if the battery is damaged.

7. Troubleshooting

Message Name	Information Description	Troubleshooting Suggestion
OV-ILLC (1052 DATA:0000)	LLC hardware overcurrent	1. Check whether the backup load is overloaded. 2. Restart the system , confirm that the fault continues .
INI-FAULT (1031 DATA:0000)	AD zero drift overlink	1. Restart the system , confirm that the fault continues .
DSP-B-FAULT (1036 DATA:0000)	The master-slave DSP communication is abnormal	
AFCI-Check (1040 DATA:0000)	AFCI self-test failure	
ARC- FAULT (1041 DATA:0000)	AFCI failure	1. Verify connections are tight within your PV system . Arc fault settings can be changed in advanced settings if further adjustment is necessary.

NOTE:



If the inverter displays any alarm messages listed in Table 7.1, please turn off the inverter and wait for 5 minutes before restarting it . If the alarm persists , please contact Solis after-sales service +1(866)438-8408 or email usservice@solisinverters.com

If you have any technical problems with the hybrid system , please contact Solis after-sales service . We recommend gathering the following information before making contact in order to get a quicker resolution .

Item	Supplemental Information
Inverter serial number (SN)	Serial number can be found on the spec label
Inverter Firmware Version	A six character number that can be found in the information section of the inverter interface page - requires Bluetooth connection
Alarm history	Codes found in the Inverter section of the interface
DC voltages	Use a multimeter to measure the voltages
Detailed description of the problem	Frequency of the occurrence and any other relevant details about the issue
Battery serial number and Firmware version	Consult the battery product manual to determine how to collect this information
Is the system reporting to SolisCloud?	Yes/ No - if yes , what is the site ID?
Take pictures showing all the cable connections in the system (Videos preferred)	If this is possible , it will help us to troubleshoot

7. Troubleshooting

7.4 Inverter Firmware

Solis inverters have a few different types of firmware that should all be on the latest version . If one site has several inverters installed , they should all be on the same versions to prevent errors .

Solis Inverter Firmware Types:

DSP: Digital Signal Processor

HMI: Human-Machine-Interface

AFCI: Arc-Fault-Circuit Interruption

To check which version the inverter is currently on , first connect to the inverter with Bluetooth . Go to the Information tab and be sure that you are on the Inverter tab. Scroll to the bottom and look for the DSP and HMI versions . The AFCI and SolisHub current versions can only be upgraded remotely with the assistance of Solis Technical Support . However, new AFCI and SolisHub firmware versions are released far less frequently than DSP and HMI . It is likely that the inverter does not need to have AFCI and SolisHub firmware upgraded , but best to check with Solis Support .

There are two methods of updating the inverter firmware: (1) remotely (2) locally with Bluetooth ,

7.4.1 Remote Firmware Updating

The inverter firmware can be updated remotely but only if the inverter has a Solis data logger connected directly to it . The logger must also be connected to the internet . Once that has been done , please call or email Solis after-sales-service to request the firmware be updated remotely .

Please note: Only Solis Tech Support can update inverters remotely .

7.4.2 Local Firmware Updating Through Bluetooth

The recommended method for updating the inverter firmware is locally using the SolisCloud Bluetooth tool . The steps for this process can be found on pages 61-62 (Step 3 of Commissioning) . It is highly advisable to upgrade the inverter firmware during the commissioning process before configuring the settings .



IMPORTANT:

If there are multiple inverters in parallel , please connect one data logger to each inverter to ensure that firmware can be updated remotely . Slave firmware cannot be updated through a logger connected to the master .
All inverters in the same system must be on the same firmware version .

8 . Technical Specifications

8 . 1 30kW and 40kW Models

Technical Data	S6-EH3P30K-NV-YD-US	S6-EH3P40K-NV-YD-US
Input DC (PV side)		
Max Usable PV Input Power	60kW	80kW
Recommended Max PV array size	59.8kW	79.8kW
Max . input voltage	1000V	
Rated voltage	600V	
Start-up voltage	180V	
MPPT voltage range	150-850V	
Full load MPPT voltage range	360-850V	
Max . input current	40A/40A/40A	40A/40A/40A/40A
Max . short circuit current	65A/65A/65A	65A/65A/65A/65A
MPPT number/ Max input strings number	3/6	4/8
Max input power per MPPT	24kW (600V x 40A)	
Battery		
Battery Type	Li-ion	
Battery Voltage range	150 - 800V	
Max . charge / discharge power	33kW	44kW
Max . charge / discharge current	70A*2	
No . of Battery Input	2	
Max . charge/discharge power of each input	35kW	
Communication	CAN/ RS485	
Output AC(Grid side)		
Rated output power	30kW	40kW
Max . apparent output power	33kVA	44kVA
Rated grid voltage	3/(N)/PE , 480V	
Rated grid voltage range	304-540V	
Rated grid frequency	60Hz	
AC grid frequency range	55-65Hz	
Rated grid output current	36.1A	48.1A
Max . output current	39.7A	52.9A
Power Factor	> 0.99 (0.8 leading - 0.8 lagging)	
THDi	<3%	

8. Technical Specifications

Technical Data	S6-EH3P30K-NV-YD-US	S6-EH3P40K-NV-YD-US
Input AC (Grid side)		
Max . AC passthrough current	72.2A	96.2A
Rated input voltage	3/(N)/PE , 480V	
Rated input frequency	60Hz	
Input AC (Generator)		
Max . input power	30kW	40kW
Max . input current	36.0A	48.1A
Rated input voltage	3/(N)/PE , 480V	
Rated input frequency	60Hz	
Output AC(Back-up)		
Rated output power	30kW	40kW
Max . apparent output power	1.6 times rated power for 2 S	
Back-up switch time	< 10ms	
Rated output voltage	3/N/PE , 480V	
Rated frequency	60 Hz	
Max . imbalance power per phase	33% rated power	
THDv(@linear load)	<2%	
Efficiency		
Max . efficiency	97.8%	
CEC efficiency	97.0%	
MPPT Efficiency	99.9%	

8. Technical Specifications

Technical Data	S6-EH3P30K-NV-YD-US	S6-EH3P40K-NV-YD-US
Protection		
Ground fault detection	Yes	
Residual (leakage) current detection	Yes	
Integrated AFCI	Yes	
DC reverse-polarity protection	Yes	
PV DC switch	Yes	
Bypass box	Optional	
Rapid Shutdown NEC 2017	Integrated SunSpec-certified Transmitter	
Compatible RSD Receivers	See MLRSD Compatibility Sheet	
Protection class/Over voltage category	I/II	
General data		
Dimensions(W/ H/ D)	22 "x36 .6 "x12 .6 " (560x930x320mm)	
Weight	187 .4 lbs (85kg)	
Topology	Transformerless	
Self consumption (Night)	<35W	
Operation temperature range	-25°C ~ +60°C	
Relative humidity	0-95%	
Ingress protection	TYPE 4X	
Noise emission	<65 dB (@<40°C , full load)	
Cooling concept	Intelligent redundant fan-cooling	
Max .operation altitude	8202ft (2500m)	
Grid connection standard	IEEE1547-2018 , UL 1741 SB, California Rule 21 , Hawaii Rule 14H , NEC 690 . 12-2020 , CAN/CSA C22 .2107 . 1-1	
Safety/ EMC standard	UL 1699B , UL 1998 , UL 1741 PCS , FCC Part15Class B	
Features		
Interface	LCD indicator lights ,Bluetooth/APP	
Monitoring platform	SolisCloud (modbus map and API sharing available upon request)	
Revenue grade meter	Integrated ANSI C12 .20 option	
Communication	CAN , RS485-115200 , Ethernet, optional:Wi-Fi, cellular, LAN	
Warranty	5 years (extendable to 20 years)	

8 . Technical Specifications

8.2 50kW and 60kW Models

Technical Data	S6-EH3P50K-NV-YD-US	S6-EH3P60K-NV-YD-US
Input DC (PV side)		
Max Usable PV Input Power	96kW	96kW
Recommended Max PV array size	96kW	96kW
Max . input voltage	1000V	
Rated voltage	600V	
Start-up voltage	180V	
MPPT voltage range	150-850V	
Full load MPPT voltage range	450-850V	
Max . input current	40A/40A/40A/40A	
Max . short circuit current	65A/65A/65A/65A	
MPPT number/ Max input strings number	4/8	
Max input power per MPPT	24kW (600V x 40A)	
Battery		
Battery Type	Li-ion	
Battery Voltage range	150 - 800V	
Max . charge / discharge power	55kW	60kW
Max . charge / discharge current	70A*2	
No . of Battery Input	2	
Max . charge/discharge power of each input	35kW	
Communication	CAN/ RS485	
Output AC(Grid side)		
Rated output power	50kW	60kW
Max . apparent output power	55kVA	60kVA
Rated grid voltage	3(N)/PE , 480V	
The grid voltage range	304-460V	
Rated grid frequency	60Hz	
AC grid frequency range	55-65Hz	
Rated grid output current	60 .1A	72 .2A
Max . output current	66 .1A	72 .2A
Power Factor	> 0.99 (0.8 leading - 0.8 lagging)	
THDi	<3%	

8 . Technical Specifications

Technical Data	S6-EH3P50K-NV-YD-US	S6-EH3P60K-NV-YD-US
Input AC (Grid side)		
Max . AC passthrough current	120 .2A	144 .4A
Rated input voltage	3/(N)/PE , 480V	
Rated input frequency	60Hz	
Input AC (Generator)		
Max . input power	50kW	60kW
Max . input current	60 .1A	72 .2A
Rated input voltage	3/N/PE , 480V	
Rated input frequency	60Hz	
Output AC(Back-up)		
Rated output power	50kW	60kW
Max . apparent output power	1 .6 times rated power for 2 S	
Back-up switch time	< 10ms	
Rated output voltage	3/(N)/PE , 480V	
Rated frequency	60Hz	
Max . imbalance power per phase	33% rated power	
THDv(@linear load)	<2%	
Efficiency		
Max . efficiency	97 .8%	
CEC efficiency	97 .0%	
MPPT Efficiency	99 .9%	

8. Technical Specifications

Technical Data	S6-EH3P50K-NV-YD-US	S6-EH3P60K-NV-YD-US
Protection		
Ground fault detection	Yes	
Residual (leakage) current detection	Yes	
Integrated AFCI	Yes	
DC reverse-polarity protection	Yes	
PV DC switch	Yes	
Bypass box	Optional	
Rapid Shutdown NEC 2017	Integrated SunSpec-certified Transmitter	
Compatible RSD Receivers	See MLRSD Compatibility Sheet	
Protection class/Over voltage category	I/II	
General data		
Dimensions(W/ H/ D)	22 "x36 .6 "x12 .6 " (560x930x320mm)	
Weight	187 .4 lbs (85kg)	
Topology	Transformerless	
Self consumption (Night)	<35W	
Operation temperature range	-25°C ~ +60°C	
Relative humidity	0-95%	
Ingress protection	TYPE 4X	
Noise emission	<65 dB (@<40°C , full load)	
Cooling concept	Intelligent redundant fan-cooling	
Max .operation altitude	8202ft (2500m)	
Grid connection standard	IEEE1547-2018 , UL 1741 SB, California Rule 21 , Hawaii Rule 14H , NEC 690 . 12-2020 , CAN/CSA C22 .2107 . 1-1	
Safety/ EMC standard	UL 1699B , UL 1998 , UL 1741 PCS , FCC Part15Class B	
Features		
Interface	LCD indicator lights ,Bluetooth/APP	
Monitoring platform	SolisCloud (modbus map and API sharing available upon request)	
Revenue grade meter	Integrated ANSI C12 .20 option	
Communication	CAN , RS485-115200 , Ethernet, optional:Wi-Fi, cellular, LAN	
Warranty	5 years (extendable to 20 years)	

8 . Technical Specifications

8.3 30 kW 208V Model

Technical Data	S6-EH3P30K-LV-YD-US
Input DC (PV side)	
Max Usable PV Input Power	60kW
Recommended Max PV array size	60kW
Max . input voltage	1000V
Rated voltage	600V
Start-up voltage	180V
MPPT voltage range	150-850V
Full load MPPT voltage range	360-850V
Max . input current	40A/40A/40A
Max . short circuit current	60A/60A/60A
MPPT number/ Max input strings number	3/6
Max input power per MPPT	24kW (600V x 40A)
Battery	
Battery Type	Li-ion
Battery Voltage range	150 - 800V
Max . charge / discharge power	33kW
Max . charge / discharge current	70A*2
No. of Battery Input	2
Max . charge/discharge power of each input	33kW
Communication	CAN/RS485
Output AC(Grid side)	
Rated output power	26 kW (208V) , 27.5kW (220V) , 30kW (240V)
Max . apparent output power	26 kVA (208V) , 27.5kVA (220V) , 30 kVA (240V)
Rated grid voltage	3/(N)/PE , 208V / 220V / 240V
The grid voltage range	176-265V
Rated grid frequency	60Hz
AC grid frequency range	55-65Hz
Rated grid output current	72.2A
Max . output current	72.2A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)
THDi	<3%

8. Technical Specifications

Technical Data	S6-EH3P30K-LV-YD-US
Input AC (Grid side)	
Max . AC passthrough current	144 .4A
Rated input voltage	3/(N)/PE , 208V / 220V / 240V
Rated input frequency	60 Hz
Input AC (Generator)	
Max . input power	26 kW (208V) , 27 .5 kW (220V) , 30 kW (240V)
Max . input current	72 .2A
Rated input voltage	3/(N)/PE , 208V / 220V / 240V
Rated input frequency	60Hz
Output AC(Back-up)	
Rated output power	26 kW (208V) , 27 .5 kW (220V) , 30 kW (240V)
Max . apparent output power	1 .6 times rated power for 2 S
Back-up switch time	< 10ms
Rated output voltage	3/ N/ PE , 208V / 220V / 240V
Rated frequency	60 Hz
Max . imbalance power per phase	33% rated power
THDv(@linear load)	<2%
Efficiency	
Max . efficiency	97 .8%
CEC efficiency	97 .0%
MPPT Efficiency	99 .9%

8. Technical Specifications

Technical Data	S6-EH3P30K-LV-YD-US
Protection	
Ground fault detection	Yes
Residual (leakage) current detection	Yes
Integrated AFCI	Yes
DC reverse-polarity protection	Yes
PV DC switch	Yes
Bypass box	Optional
Rapid Shutdown NEC 2017	Integrated SunSpec-certified Transmitter
Compatible RSD Receivers	See MLRSD Compatibility Sheet
Protection class/Over voltage category	I/II
General data	
Dimensions(W/ H/ D)	22 "x36 .6 "x12 .6 " (560x930x320mm)
Weight	187 .4 lbs (85kg)
Topology	Transformerless
Self consumption (Night)	<35W
Operation temperature range	-25°C ~ +60°C
Relative humidity	0-95%
Ingress protection	TYPE 4X
Noise emission	<65 dB (@<40°C , full load)
Cooling concept	Intelligent redundant fan-cooling
Max .operation altitude	8202ft (2500m)
Grid connection standard	IEEE1547-2018 , UL 1741 SB, California Rule 21 , Hawaii Rule 14H, NEC 690 . 12-2020 , CAN/CSA C22 .2107 . 1-1
Safety/EMC standard	UL 1699B , UL 1998 , UL 1741 PCS, FCC Part15Class B
Features	
Interface	LCD indicator lights ,Bluetooth/APP
Monitoring platform	SolisCloud (modbus map and API sharing available upon request)
Revenue grade meter	Integrated ANSI C12 .20 option
Communication	CAN , RS485-115200 , Ethernet, optional:Wi-Fi , cellular, LAN
Warranty	5 years (extendable to 20 years)

9. Appendix

9.1 Default Setting for IEEE1547-2018 (UL-480V-18)

Parameter	Adjustment Range (p.u.)	Default (p.u.)	Description
OV-G-V01	$1.10 < V \leq 1.21$	1.10 p.u.	Set grid over-voltage protection 01 value
OV-G-V01-T	0.1-13 S	13 S	Grid over-voltage protection 01 trip time
OV-G-V02	$1.20 < V \leq 1.30$	1.20 p.u.	Set grid over-voltage protection 02 value
OV-G-V02-T	0.1-5 S	0.16 S	Grid over-voltage protection 02 trip time
UN-G-V01	$0.5 \leq V < 0.88$	0.88 p.u.	Set grid under-voltage protection 01 value
UN-G-V01-T	2.0-50 Sec.	21 S	Grid under-voltage protection 01 trip time
UN-G-V02	$0.45 \leq V < 0.70$	0.5 p.u.	Set grid under-voltage protection 02 value
UN-G-V02-T	0.16-21 S	2 S	Grid under-voltage protection 02 trip time
UN-G-V03	$0.050 < V < 0.5$	0.5 p.u.	Set grid under-voltage protection 03 value
UN-G-V03-T	0.16-21 S	2 S	Grid under-voltage protection 03 trip time
OV-G-F01	$60.5 < F < 66 \text{ Hz}$	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	$61.2 < F < 66 \text{ Hz}$	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	$50 < F < 59 \text{ Hz}$	58.5 Hz	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	$50 < F < 58 \text{ Hz}$	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	$0.88 \leq V \leq 0.95$ $1.05 \leq V \leq 1.06$	0.917 p.u. 1.05 p.u.	Set grid recovery voltage range after grid fault
Reconnection Frequency	$59 \leq F \leq 59.9$ $60.1 \leq F \leq 61$	59.5 Hz 60.1 Hz	Set grid recovery frequency range after grid fault
Reconnection Time after Fault	0-600 S	300 S	Set reconnection time after a fault is cleared
Ramp-up Slew Rate	0.10-100%	100%W/S	Set Ramp-up power slew rate during start-up
Reconnect Slew Rate	0.10-100%	0.33%W/S	Set Ramp-up power slew rate during reconnect

9. Appendix

Parameter	Adjustment Range (p.u.)	Default (p.u.)	Description
Volt Watt P3Tau	0.5-60 S	10 S	Set the time to ramp up to 90% of the new active power target in response to the change in voltage
Volt Var Q3Tau	1-90 S	5 S	Set the time to ramp up to 90% of the new reactive power target in response to the change in voltage
Dead Band-OF	60.017-61 Hz	60.036Hz	Set OV frequency start dead band for power derate
Droop-OF	2-5 %	5 %	Set OV frequency derate droop slope
Response Time	0.2-10 S	5 S	Set frequency derate response time
Dead Band-UF	59-59.983 Hz	59.964 Hz	Set UN frequency start dead band for power derate
Droop-UF	2-5 %	5 %	Set UN frequency derate droop slope
Droop Pmin	0-100 %	0 %	Set frequency droop P minimum
Volt-Watt	Enabled/ Disabled	Enabled	Set Volt - Watt function
V1	Hybrid: 0.40≤V≤1.00 Grid-tied: 0.90≤V≤1.30	Hybrid: 0.5 p.u. Grid-tied: p.u.	Set grid voltage V1 limit for Volt-Watt control
P1	0-100 % Pn	100% Pn	Set power P1 for Volt-Watt control
V2	Hybrid: 0.60≤V≤1.05 Grid-tied: 1.00≤V≤1.35	Hybrid: 0.7 p.u. Grid-tied: p.u.	Set grid voltage V2 limit for Volt-Watt control
P2	0-100 % Pn	100% Pn	Set power P2 for Volt-Watt control
V3	1.05≤V≤1.09	1.06 p.u.	Set grid voltage V3 limit for Volt-Watt control
P3	0-100 % Pn	100% Pn	Set power P3 for Volt-Watt control
V4	1.06≤V≤1.10	1.10 p.u.	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	0.77≤V≤1.03	0.92 p.u.	Set grid voltage V1 limit for Volt-Var control
Q1	0-60% Sn	+44% Sn	Set reactive power Q1 for Volt-Var control
V2	0.92≤V≤1.05	0.98 p.u.	Set grid voltage V2 limit for Volt-Var control
Q2	-60-60% Sn	0% Sn	Set reactive power Q2 for Volt-Var control
V3	0.95≤V≤1.08	1.02 p.u.	Set grid voltage V3 limit for Volt-Var control
Q3	-60-60% Sn	0% Sn	Set reactive power Q3 for Volt-Var control
V4	0.97≤V≤1.23	1.08 p.u.	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

9. Appendix

9.2 Default Setting for California Rule 21 (R21P3-24A)

Parameter	Adjustment Range (pu)	Default (pu)	Description
OV-G-V01	$1.10 \leq V \leq 1.21$	$1.10V_n$	Set grid over-voltage protection 01 value
OV-G-V01-T	$0.1 \leq t \leq 13$ S	13 S	Grid over-voltage protection 01 trip time
OV-G-V02	$1.20 \leq V \leq 1.30$	$1.20V_n$	Set grid over-voltage protection 02 value
OV-G-V02-T	$0.1 \leq t \leq 5$ S	0.16 S	Grid over-voltage protection 02 trip time
UN-G-V01	$0.05 \leq V \leq 0.88$	$0.88V_n$	Set grid under-voltage protection 01 value
UN-G-V01-T	$2.0 \leq t \leq 50$ S	21 S	Grid under-voltage protection 01 trip time
UN-G-V02	$0.05 \leq V \leq 0.70$	$0.5V_n$	Set grid under-voltage protection 02 value
UN-G-V02-T	$0.16 \leq t \leq 21$ S	2 S	Grid under-voltage protection 02 trip time
UN-G-V03	$0.05 \leq V \leq 0.50$	$0.5V_n$	Set grid under-voltage protection 03 value
UN-G-V03-T	$0.16 \leq t \leq 21$ S	2 S	Grid under-voltage protection 03 trip time
OV-G-F01	$60.5 \leq f \leq 66$ Hz	61.2 Hz	Set grid over-frequency protection 01 value
OV-G-F01-T	$180 \leq t \leq 1000$ S	300 S	Set grid over-frequency protection 01 trip time
OV-G-F02	$61.2 \leq f \leq 66$ Hz	62 Hz	Set grid over-frequency protection 02 value
OV-G-F02-T	$0.16 \leq t \leq 1000$ S	0.16 S	Set grid over-frequency protection 02 trip time
UN-G-F01	$50 \leq f \leq 59$ Hz	58.5 Hz	Set grid under-frequency protection 01 value
UN-G-F01-T	$180 \leq t \leq 1000$ S	300 S	Set grid under-frequency protection 01 trip time
UN-G-F02	$50 \leq f \leq 58$ Hz	56.5 Hz	Set grid under-frequency protection 02 value
UN-G-F02-T	$0.16 \leq t \leq 1000$ S	0.16 S	Set grid under-frequency protection 02 trip time
Reconnection Voltage	$0.88 \leq V \leq 0.95$ $1.05 \leq V \leq 1.06$	$0.917V_n$ $1.05V_n$	Set grid recovery voltage range after grid fault
Reconnection Frequency	$59 \leq f \leq 59.9$ $60.1 \leq f \leq 61$	59.5Hz 60.1Hz	Set grid recovery frequency range after grid fault
Reconnection Time after Fault	$0 \leq t \leq 600$ S	300 S	Set reconnection time after a fault is cleared
Ramp-up Slew Rate	0.10-100%	100%Pn/S	Set Ramp-up power slew rate during start-up
Reconnect Slew Rate	0.10-100%	0.33%Pn/S	Set Ramp-up power slew rate during reconnect

9. Appendix

Parameter	Adjustment Range (pu)	Default (pu)	Description
Volt Watt P3Tau	$0.5 \leq t \leq 60$ S	10 S	Set the time to ramp up to 90% of the new active power target in response to the change in voltage
Volt Var Q3Tau	$1 \leq t \leq 90$ S	5 S	Set the time to ramp up to 90% of the new reactive power target in response to the change in voltage
Dead Band-OF	$60.017 \leq f \leq 61$ Hz	60.036Hz	Set OF frequency start dead band for power derate
Droop-OF	2-5 %	5 %	Set OF frequency derate droop slope
Response Time	$0.2 \leq t \leq 10$ S	5 S	Set frequency derate response time
Dead Band-UF	$59 \leq f \leq 59.983$ Hz	59.964 Hz	Set UF frequency start dead band for power derate
Droop-UF	2-5 %	5 %	Set UF frequency derate droop slope
Droop Pmin	0-100 %	0 %	Set frequency droop P minimum
Volt-Watt	Enabled/ Disabled	Enabled	Set Volt - Watt function
V1	Hybrid: $0.40 \leq V \leq 1.00$ Grid-tied: $0.90 \leq V \leq 1.30$	Hybrid: 1.00Vn Grid-tied: 1.00Vn	Set grid voltage V1 limit for Volt-Watt control
P1	0-100 % Pn	100% Pn	Set power P1 for Volt-Watt control
V2	Hybrid: $0.60 \leq V \leq 1.05$ Grid-tied: $1.00 \leq V \leq 1.35$	Hybrid: 1.00Vn Grid-tied: 1.00Vn	Set grid voltage V2 limit for Volt-Watt control
P2	0-100 % Pn	100% Pn	Set power P2 for Volt-Watt control
V3	$1.05 \leq V \leq 1.09$	1.06Vn	Set grid voltage V3 limit for Volt-Watt control
P3	0-100 % Pn	100% Pn	Set power P3 for Volt-Watt control
V4	$1.06 \leq V \leq 1.10$	1.10Vn	Set grid voltage V4 limit for Volt-Watt control
P4	0-100 % Pn	Hybrid: 0%Pn Grid-tied: 0%Pn	Set power P4 for Volt-Watt control
Volt-Var	Enabled/ Disabled	Enable	Set Volt-Var function
V1	$0.77 \leq V \leq 1.03$	0.92Vn	Set grid voltage V1 limit for Volt-Var control
Q1	0-60% Sn	+30% Sn	Set reactive power Q1 for Volt-Var control
V2	$0.92 \leq V \leq 1.05$	0.97Vn	Set grid voltage V2 limit for Volt-Var control
Q2	-60-60% Sn	0% Sn	Set reactive power Q2 for Volt-Var control
V3	$0.95 \leq V \leq 1.08$	1.03Vn	Set grid voltage V3 limit for Volt-Var control
Q3	-60-60% Sn	0% Sn	Set reactive power Q3 for Volt-Var control
V4	$0.97 \leq V \leq 1.23$	1.07Vn	Set grid voltage V4 limit for Volt-Var control
Q4	-60-0% Sn	-30% Sn	Set reactive power Q4 for Volt-Var control
Fixed PF	-0.8 -+0.8	1.0	Set Fixed Power Factor limit
Reactive Power	-60 -60 %	0%	Set Reactive Power level

9. Appendix

9.3 Frequently Asked Questions

Q1: Why I have "CAN Fail" Alarm on the inverter?

A: "CAN Fail" indicates the CAN communication between inverter and battery is lost.

Please double check if your CAN cable is correctly connected and if your battery is power on.

Q2: Why I have "BATName-Fail" Alarm on the inverter ?

A: Please check in the "Battery Setting->Battery Model" setting and confirm you selected the correct battery option as the nameplate of your battery module.

Q3: Why I have "MET-SLT-Fail" Alarm on the inverter?

A: Please check in the "Meter Setting->Meter Type" setting and confirm you selected the correct meter option corresponding to your smart meter.

Q4: Why the power values on the screen are fluctuating very fast?

A: If your loads are changing drastically, the inverter will adjust its power accordingly. If you confirm the loads are stable while the inverter power is changing very fast, please double check your meter CT's direction and make sure the arrow is towards grid.

Q5: Why I have "OV-ILLC" Alarm on the inverter ?

A: OV-ILLC indicates there is an overcurrent issue on the internal LLC circuit. It could be transient status during extreme condition such as overload. If it happens constantly or too frequent and the extreme conditions have been excluded, please contact Solis service team.

Q6: Why I have "OV-BATT-H" Alarm on the inverter ?

A: OV-BATT-H indicates over voltage issue on the hardware of battery circuit. It could be caused by high battery voltage at full SOC, battery suddenly switching off, etc. If it happens constantly or too frequent and the extreme conditions have been excluded, please contact Solis service team.

Q7: Why I have "No-Battery" Alarm on the inverter?

A: Please double check if the battery power cables have been correctly connected and the battery breaker (on battery or external) has been turn on. If you don't want to connect the battery for now, please select the "No battery" option in "Battery Setting->Battery Model" to prevent the alarm to show up.

9. Appendix

9.4 FCC Instructions

This device complies with part 15 of the FCC Rules . Operation is subject to the following two conditions:

(1) This device may not cause harmful interference , and (2) this device must accept any interference received , including interference that may cause undesired operation .



FCC WARNING:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment .



Note:

This equipment has been tested and found to comply with the limits for a Class B digital device , pursuant to part 15 of the FCC Rules . These limits are designed to provide reasonable protection against harmful interference in a residential installation . This equipment generates uses and can radiate radio frequency energy and , if not installed and used in accordance with the instructions , may cause harmful interference to radio communications . However, there is no guarantee that interference will not occur in a particular installation . If this equipment does cause harmful interference to radio or television reception , which can be determined by turning the equipment off and on , the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna .
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help .

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .

This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

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If you encounter any problems with the inverter, please take note of the inverter serial number and then contact us using the phone number or email listed above .



**SunSpec
Certified**



**Compliant with CA Rule 21 & HECO Rule 14H
Certified to UL 1741 SA and UL 1741 SB
Certified to UL Std. No . 1741-Second Edition
& CSA-C22 .2 No. 107. 1-16**