

# 5kW All-in-one the Hybrid Inverter User Manual

## Important Notice







In order to protect the legitimate rights and interests of users, please read our operating procedures and safety instructions carefully before using this equipment. Please operate the equipment according to the operating procedures and safety instructions.

Once using this device, you are deemed to have read, understood, endorsed and accepted all terms and contents of the device's operating procedures and safety instructions. The user is committed to being responsible for his or her own actions and all consequences arising therefrom.




The User undertakes to use the device solely for legitimate purposes and agrees to these Terms and any relevant national policies or guidelines.

In the process of using this equipment, please strictly observe and implement the requirements including but not limited to the operating procedures and safety instructions. All personal injury, accident, property damage, legal disputes and other adverse events that cause conflicts of interest caused by violations of the use instructions or force majeure indicated by the safety instructions are the responsibility and loss of the user. Our company will We do not assume any responsibility.

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	<b>Caution!</b> Failure to observe a warning indicated in this manual may result in injury.
	Danger of high voltage and electric shock!
	Refer to the operating instructions
	Signals danger due to electrical shock and indicates the time(5 minutes)to allow after the inverter has been turned off and disconnected to ensure safety in any installation operation.
	Danger of hot surface!
	Protective earth

## Installation Risk Notification

 Warning	Wear protective gloves when handling equipment by hand to prevent cuts from sharp objects.
 Attention	Make sure the cable label is correct before connecting the cable.
 Dangerous	Construction operation of high-voltage lines may cause fire or electric shock. The area through which the AC cable is connected and routed must comply with local regulations and specifications.



Please carry out construction in accordance with relevant construction safety regulations and standards to avoid safety accidents. The person who is in charge of this product must undergo strict training, master the correct installation method of the system and various safety precautions before proceeding with the equipment.

The installation location should avoid the location of low-lying water accumulation and should be kept at a safe distance from the surrounding fire-explosive facilities and underground pipelines. The installation location should be away from open flames, high temperature, dust and corrosive environment. The protection grade of the selected product enclosure should be compared with the installation environment adapt.

The installation position strength must meet the requirements, all fixing bolts should be tightened, otherwise there is a risk of falling and dumping. Install the selected cables, terminals and other components to meet the current requirements. Before and after installation, ensure that all wiring related to the charging equipment is tight, well insulated, wired correctly, no wear and crush damage, otherwise there is a risk of fire and electric shock.

Before powering on the device, be sure to confirm that the device is well grounded to avoid electric shock. If any part is damaged during installation, it should be repaired and replaced in time to avoid using with damaged.

## Operation and maintenance risk notification

 Dangerous	There is dangerous voltage in the equipment when the system is running, and non-professionals should not operate and maintain it.
 Dangerous	Before the maintenance of system clean 、 electrical connection 、 ground connection , be sure to cut off power . Otherwise, there is a risk of electric shock and fire.

Equipment operation and maintenance must comply with electrical safety operating procedures, otherwise there is a risk of fire and electric shock.

The personnel responsible for the operation and maintenance of this product must have the qualifications of high voltage and alternating current, etc., and must undergo strict training, master the correct operation method of the system and various safety precautions, and then carry out various operations of the equipment, otherwise there may be risk of electric shock.

The energy storage equipment shall not be maintained when the power is not disconnected, otherwise there will be risk of electric shock.

It is strictly forbidden to wear conductive objects such as watches, bracelets, rings, etc. on the wrist during operation.

Do not dismantle or modify the charging facilities and wiring without authorization, otherwise it may cause fire or electric shock.

There shall be no flammable and combustible materials around the energy storage equipment, and the operation and maintenance personnel shall clean up in time, otherwise there is a fire risk.

## Use risk notification

Do not use the system in the event of equipment failure. Do not operate without authorization when the equipment is abnormal.

Please strictly follow the operating procedures and instructions on the energy storage equipment, and must comply with the industry's safety regulations, otherwise there will be electric shock and fire risks.

Accidents such as fires, flooding of energy storage facilities, etc. it is strictly forbidden to be close to energy storage equipment. Please inform personnel familiar with equipment and emergency treatment methods for emergency treatment.

## Modification record

The Document version A00 (2019.03.04)

*The First release*

The Document version A01 (2019.05.07)

1.2 Modify Working Mode

2.3.2 Add electrical connection diagram

3.1 Update pictures of APP

3.6.2 Note about Battery Lower Limit SOC

4.2 Add Software upgrade

5.3 Update Trouble Shooting

The Document version A02 (2019.06.03)

2.2.2 Update Figure2-2

2.3.2.4 Update Communication cable connection

The Document version A03 (2019.06.22)

2.3.2 Electrical Connection

Update Figure 2-13

The Document version A04 (2019.08.17)

4.2 Software upgrade

*The PCU software name is changed to "PCU5KSL.bin"*

*The DSP software name is changed to "DSP5KSL.bin"*

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## 1 SUMMARY

The 5kW Hybrid Inverter all-in-one inverter (hereinafter referred to as the Hybrid Inverter) can realize Hybrid Inverter for photovoltaic charging, DC terminal battery charging and discharging, and AC terminal grid-connected applications.

This chapter describes the model, composition and configuration and working principle of the Hybrid Inverter.

### 1.1 The description of type

Take 5kW power as an example for model description.

Hybrid Inverter model: SMT-5K-TL-LV

The model description is shown below:

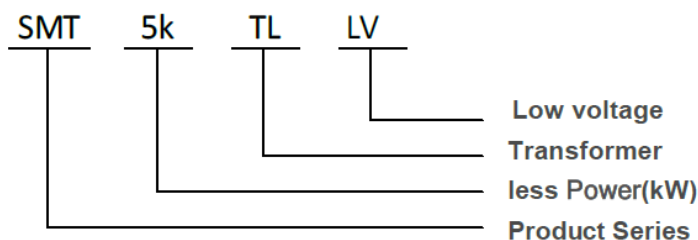


Figure1-1 5kW Hybrid Inverter all-in-one model description

### 1.2 Compose and Operating Principle

The Hybrid Inverter is composed of a power unit (battery charging and discharging circuit, photovoltaic lifting and lowering voltage circuit, inverter circuit, auxiliary power source, filter circuit), system control unit, and system monitoring unit (including a system communication unit), etc.

This product generally applies to solar storage system, the system is mainly composed of PV panel, battery, hybrid inverter, local load, grid etc.

By dint of EMS, it can realize the functions for PV grid-connected, supplying local load from PV, charging battery from PV, charging local load from PV+battery, charging battery from grid.

These five core functions are designed to ensure high effective PV generation, reliable supply for local load, long service life of battery, etc.



## Mode 1: General mode (Default)

### Self-Consumption

1. If PV is sufficient, PV supply power to the load priority, then charge battery, feeding into grid with surplus power. (Figure1-5)
2. When PV is insufficient, batteries and grid supply power to the load together. (Figure1-6)
3. Anti-backflow default disenablenemt.

Typical application scenarios:

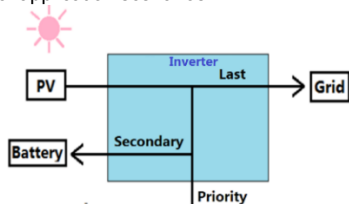


Figure1-5

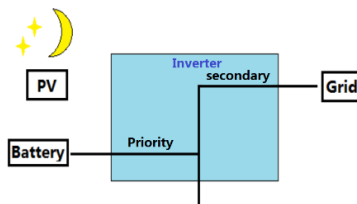


Figure1-6

## Mode 2: Battery mode

### Battery backup

1. PV and grid supply power to load and charge batteries together. (Figure1-7)
2. When the Grid is normal, the battery SOC is always in full state.
3. Batteries discharge only when the grid is abnormal.
4. Anti-backflow default enablement.

Typical application scenarios:

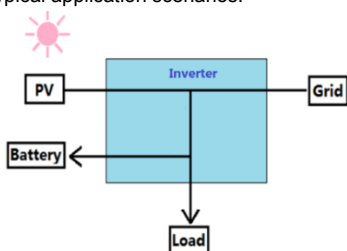


Figure1-7

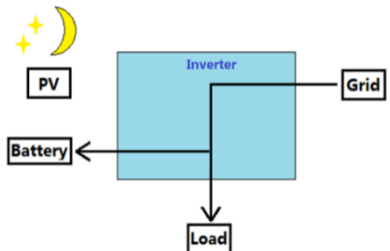


Figure1-8(Grid is normal)

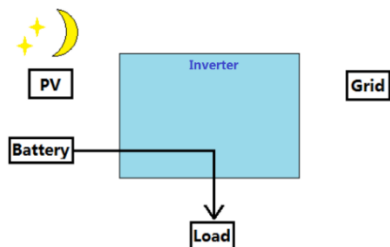


Figure1-9(Grid is abnormal)

### Mode 3: Microgrid mode

#### Suitable for non-grid scenarios

1. PV and battery constitute a off-grid system.
2. If PV is sufficient, PV supply power to the load priority, then charge battery. ( Figure1-10)
3. When PV is insufficient, Batteries supply power to the load.( Figure1-11)

Typical application scenarios:

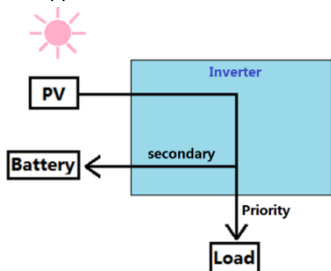


Figure1-10

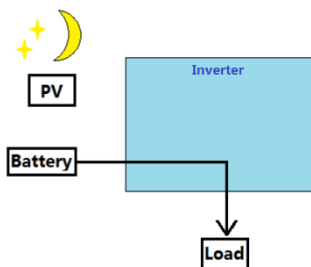


Figure1-11

### Mode 4: Custom mode

According to the difference of electricity price, a day can be divided into four periods: tip, peak, flat and valley.

1. In the valley level, the grid and PV charge the batteries.
2. In the Flat level, when the PV is sufficient, the battery can be charged.
3. In the tip and peak level, the battery discharges supply the load.

Typical application scenarios:

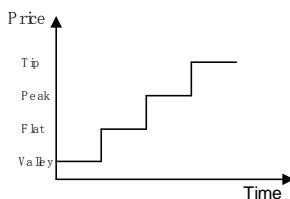


Figure1-12

In Valley Time Period :

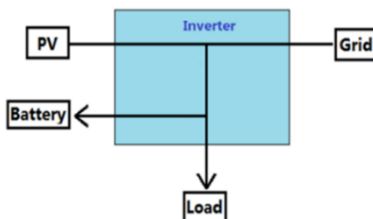


Figure1-13



In Flat Time Period: :

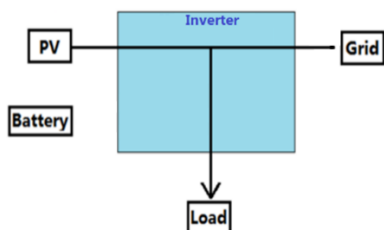


Figure1-14 PV is insufficient

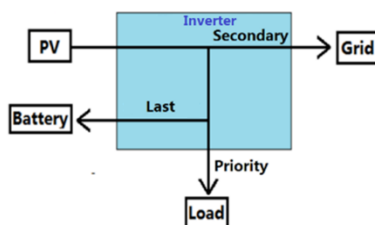


Figure1-15 PV is sufficient

In Tip and Peak Time Period:

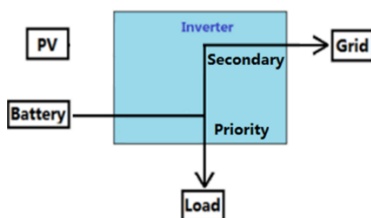


Figure1-16 PV is insufficient

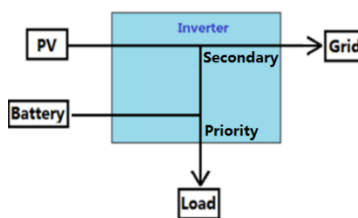


Figure1-17 PV is sufficient

## 2 INSTALLATION

This chapter describes the installation and wiring of the Hybrid Inverter. Please strictly follow the instructions in this chapter to install and wire connection.

### 2.1 Safety regulations

The Hybrid Inverter has high voltage and large current inside. To ensure personal safety, the following regulations should be observed at all times. The Hybrid Inverter can only be installed by personnel who have received training in the Hybrid Inverter and have a good knowledge of the Hybrid Inverter. During the installation process, always observe the safety precautions and local safety regulations before the catalogue of this manual.

Do not operate or maintain the inside of the system during thunderstorms or wet weather to prevent electric shock. If operating inside the Hybrid Inverter, make sure the system is not powered. If hybrid inverter is equipped with anti-theft lock, please be sure of key in safekeeping.

## 2.2 Installation preparation

### 2.2.1 Unpacking inspection

Only when the goods arrive at the installation site can the unpacking box be allowed to be inspected. The inspection is completed by the customer's representative and the supplier's representative. Unpack the package, review the check list .

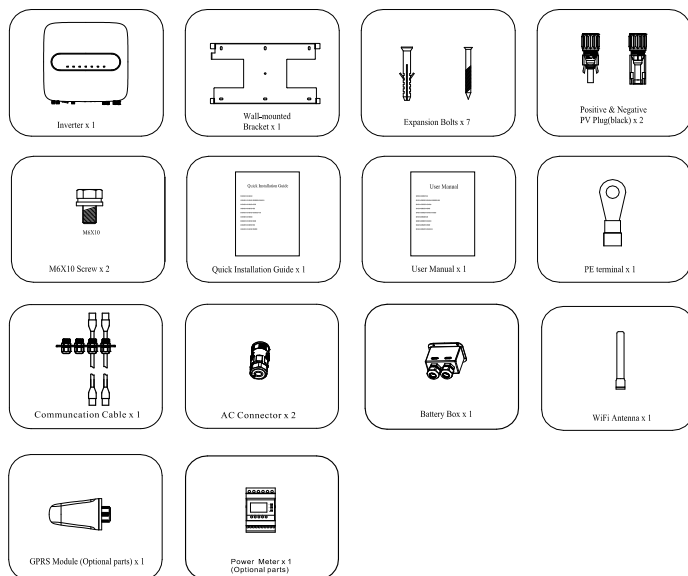


Figure2.1 Packing list

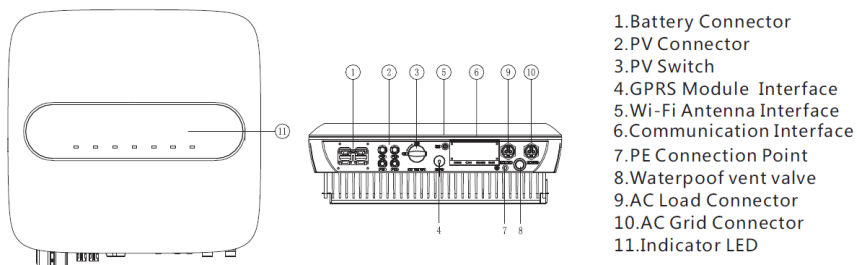


Figure2.2 The Hybrid Inverter Overview

## 2.2.2 Cable and Air switch preparation

Serial	Cable Name	Recommended model	cross-sectional area (mm <sup>2</sup> )	Color of cable	Cable OD (mm)
1	PV side DC positive and negative input	UL1015 12AWG	3.31	Red, Black	4.00±0.15
2	Battery side DC positive and negative input	UL10269 4AWG	16-25	Red, Black	10.00±0.30
3	AC output	UL1015 10AWG	4~6	Red, Black Yellow-Green	4.60±0.20

Note: Be sure of all cables' withstand voltage、temperature-resistance equaling to or better than the recommended model, and complying with relevant regulation of electrical industry.

Selection of switch

Table 2-2

Recommended DC switch		
	PV(option)	Battery(option)
Rated voltage	≥580V DC	≥58V DC
Rated current	11A	125A

Table 2-3

Recommended AC switch		
	AC Load	AC Grid
Rated voltage	≥250V AC	≥250V AC
Rated current	25A	25A

## 2.2.3 Installation Kit

1. Electric drill (drilling bit:  $\varnothing 8\text{mm}$ )
2. Screwdriver (Phillips screwdriver: M3、M6; Flat head screwdriver: M3)
3. Wire stripper(4~6mm<sup>2</sup> )
4. Wire crimper 1 (Model: H4TC0001; Manufacturer: Amphenol)
5. Wire crimper 2( OT terminal, 4~6 mm<sup>2</sup> )
6. Open-end wrench( Model: H4TW0001; manufacturer: Amphenol)
7. Multimeter

## 2.2.4 Installation requirements

### 1. Wall bracket Installation

- 1) It is necessary to ensure that the installation position is flat and the thickness of the whole wall exceeds 100mm.
- 2) Ensure the installation wall is vertical to the ground. If it is sloping, tilt angle is only allowed to be less than  $15^\circ$ .
- 3) Ensure installation wall is solid enough to meet the requirements of load bearing for hybrid inverter.
- 4) The mounting position is supposed to avoid direct sunlight.

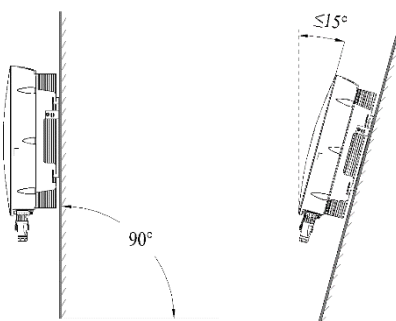


Figure 2-3 Perpendicularity requirement

### 2. Installation space requirements

Product installation position, leave 300 mm of space for maintenance and heat dissipation left, right and front

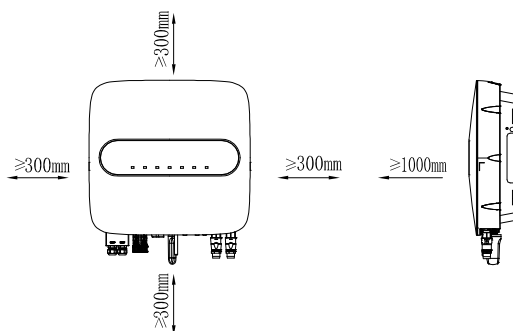


Figure 2-4 Mounting distance

## 2.3 Installation

### 2.3.1 Mounting

STEP 1 : Mark mounting hole on the wall Drill hole with 8mm diameter of bit. Ensure a depth of 80mm.

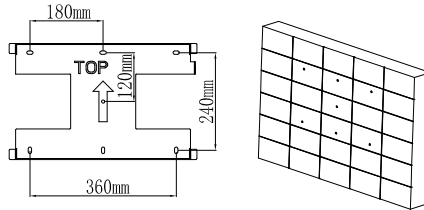


Figure 2-5

STEP 2: Hammer expansion tube into the wall Mount bracket on the wall , keep aligned with the holes.

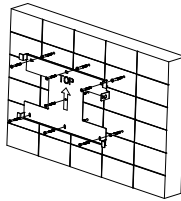


Figure 2-6

STEP 3: Mount the Sermatec hybrid inverter on the bracket.

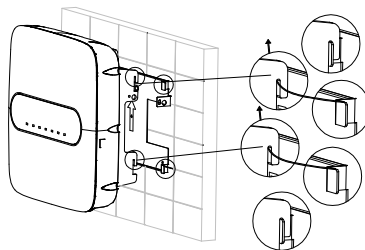


Figure 2-7

STEP 4: Secure the inverters with M6 screw on the right side.

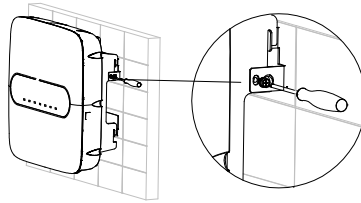


Figure 2-8

STEP 5: Install anti-theft lock if necessary( Option, equipped by user).

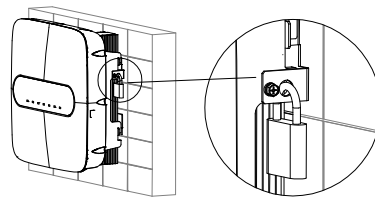


Figure 2-9

## 2.3.2 Electrical Connection

Hybrid Inverter System connection Diagram

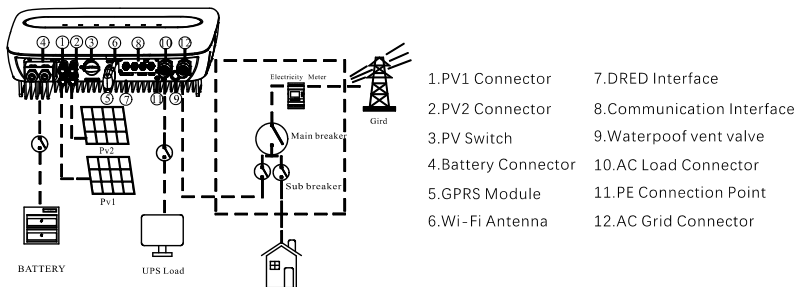


Figure 2-10 Hybrid Inverter System connection Diagram

For AU/EN:

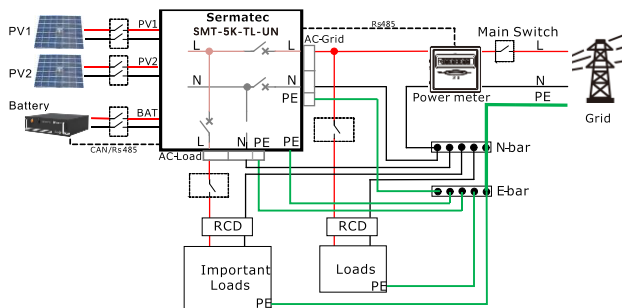


Figure 2-11

For Other Countries:

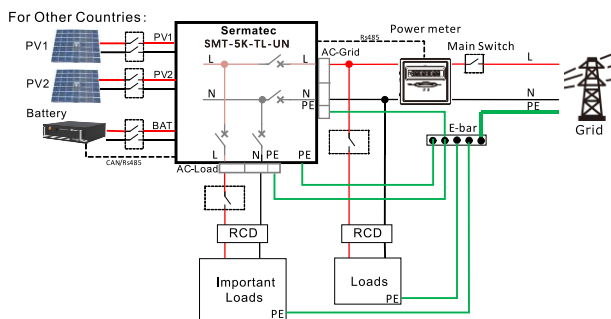


Figure 2-12

Power Meter connection diagram:

Recommended DC Switch		
	PV (option)	Battery (option)
Rated Voltage	$\geq 580\text{VDC}$	$\geq 58\text{VDC}$
Rated Current	11A	125A
Recommended AC Switch		
	AC Load	AC Grid
Rated Voltage	$\geq 250\text{VAC}$	$\geq 250\text{VAC}$
Rated Current	25A	25A

The Power Meter connection diagram:

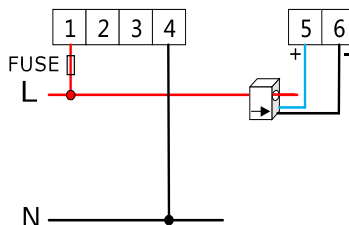


Figure 2-13 (Acrel Single phase Meter)



Dangerous

- 1) Make sure all switches are at closed position before electrical connection.
- 2) Only qualified installation person can implement installation of AC and DC input cable.

---

## 1. Connect PV cable



Attention

It is strictly prohibited to connect positive pole (PV1+, PV2+, BAT+) and negative (PV1-, PV2-, BAT-) reversely or incorrectly. Otherwise it would affect normal operation, or even cause damage and other serious consequence.

The length of external cable to PV side and battery side is suggested to be less than 30m.

PV array should not be connected to the grounding conductor.

The minimum insulation resistance to ground of PV panels must exceed 40k, there is a risk of shock hazard if the requirement of minimum resistance is not met.

---

STEP 1: Check and verify PV rotary switch is at OFF position.

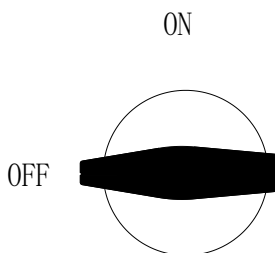


Figure 2-14

STEP 2: Follow the requirement to crimp and connect H4 connector to cable which you can find from installation kits.

Crimp the H4 connector to the cable as required.



## PV Connectionsteps:

PV cable size: 4~6mm<sup>2</sup>

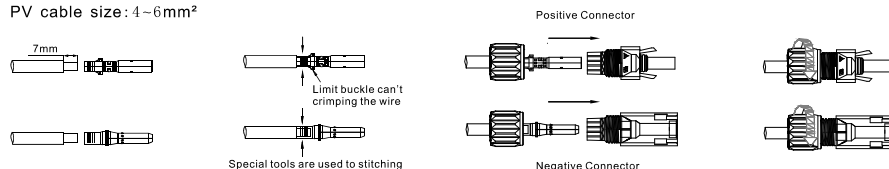


Figure 2-15

STEP 3: Use multimeter to measure PV side voltage and verify correct polarity , ensure open-circuit voltage is less than 580V.

Hybrid Inverter System connection Diagram

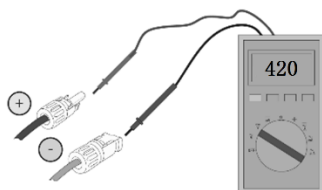


Figure 2-16 PV Polarity check

STEP 4: Use multimeter to measure Battery side voltage and verify correct polarity , ensure open-circuit voltage is less than 60V.

## 2. Connect BAT cable



Attention

Make sure that the installation location meets the following conditions:

The area is completely water proof.

The floor is flat and level.

Batteries should not be connected to the grounding conductor.

The ambient temperature is within the range from 0° C to 50° C.

The temperature and humidity is maintained at a constant level.

---

There is minimal dust and dirt in the area.

Batteries need to comply with local regulations.

Suggestion: If the battery is to be installed indoor, for details please refer to battery Manufacture' s user manual.

Suggestion: Batteries must be installed with a distance to each other, details please refer to battery manufacture' s user manual.

As for the number of cells used, it will be decided by customer' s choice, the choice must comply with the followed requirement : the voltage is 40-60V.

---

STEP 1: Connect positive and negative terminals to the corresponding interfaces

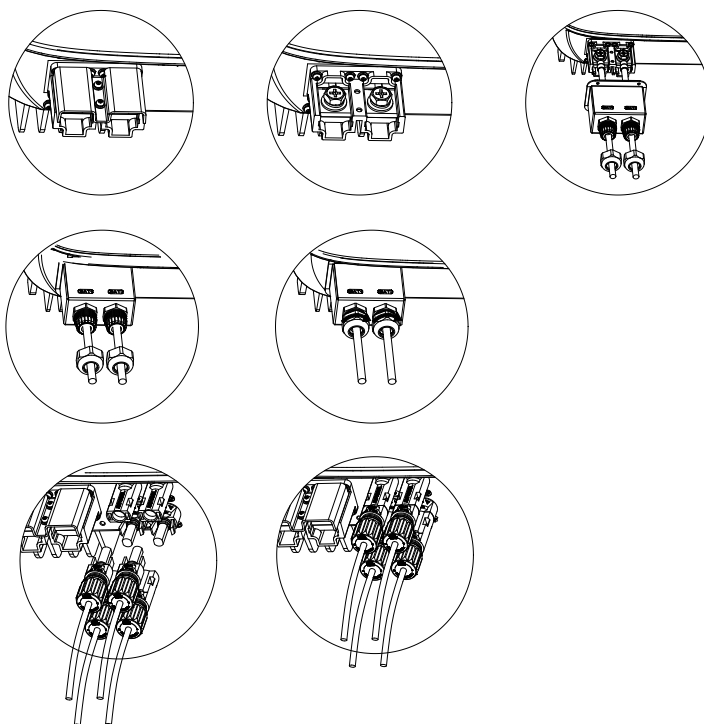


Figure 2-17 DC terminals connection

STEP 2: Use multimeter to measure Battery side voltage and verify correct polarity , ensure open-circuit voltage is less than 60V.

### 3. AC output cable connection



#### Attention

PE cable should be connected properly and reliably , otherwise it would affect normal operation, even cause product damage and serious consequences.

Both PE ground terminal in the connector and ground point on enclosure can be earthed simultaneously.

Don' t reversely connect PV input cable and battery input cable to interfaces ! Otherwise it will affect normal operation.

Don' t reversely connect AC load connector and AC Grid connector, AC load cable and AC Grid cable! Otherwise it will affect normal operation.

STEP 1: The connector and cable are required to be reliably connected as shown below.

Order of connection is L (Red), N (Black), , PE

Cable sectional area 6 mm<sup>2</sup>, stripping length 6mm

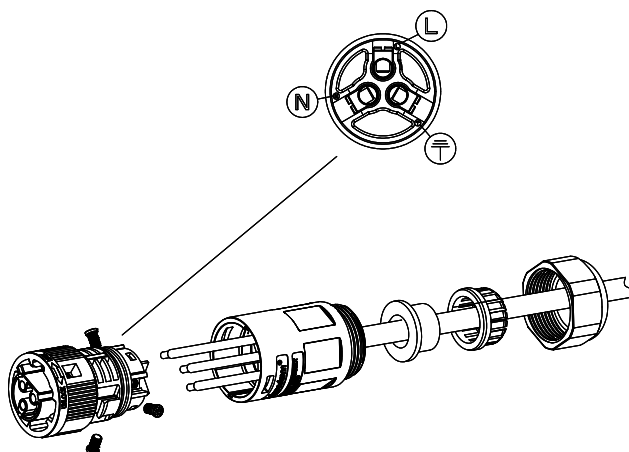


Figure 2-19

STEP 2: Measure grid voltage by multimeter, ensure grid voltage is less than high limit of voltage required by all national grid standard

STEP 3: Connect connector to AC Load interface and grid interface , rotate and lock them.

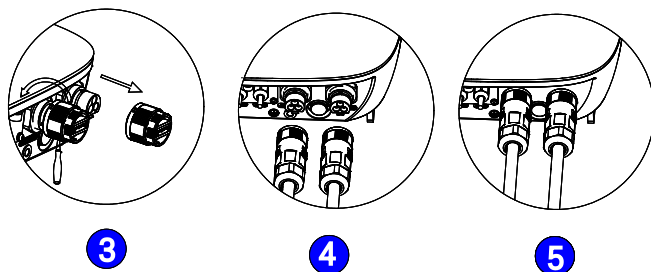


Figure 2-20

Note: Do not connect reverse the load side connector and the grid side connector.

STEP 4: PE Installation

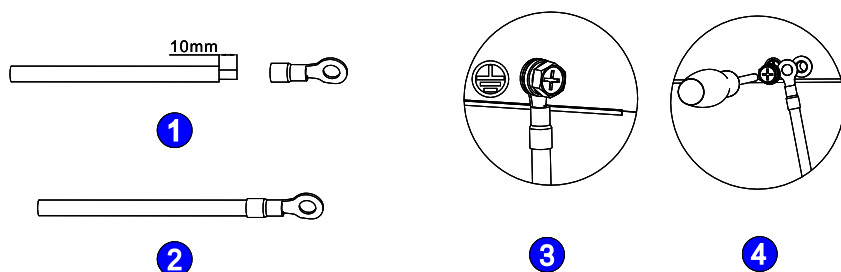


Figure 2-21

#### 2.3.2.4. Communication cable connection

STEP 1: Remove the waterproof cover plate that comes with the Hybrid Inverter

STEP 2: Plug the wire connector of the waterproof cover plate in the accessory into the corresponding interface of the Hybrid Inverter.

STEP 3: Fix firmly by screw.

STEP 4: Screw up water-proof cylinder, connect the cable from “RS485” interface to the interface of Power Meter, connect the cable from “To battery” interface to BMS interface in battery ( default length of cable is 3m)

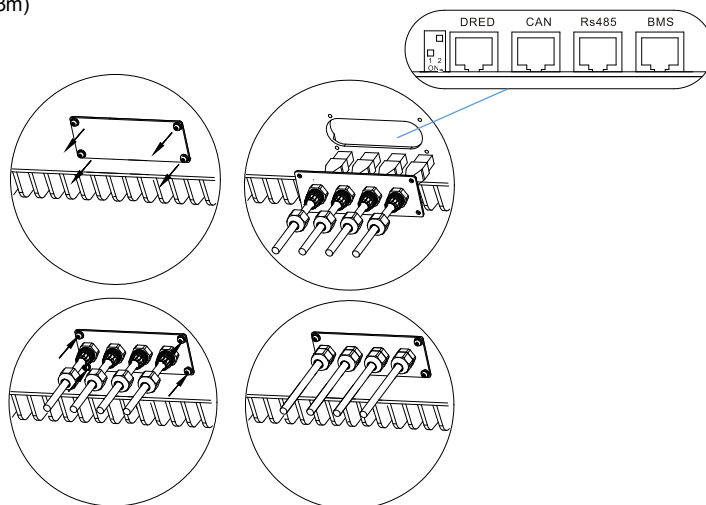


Figure 2-22 Communication cable connection diagram

DRED , Power Meter and BMS Connection:

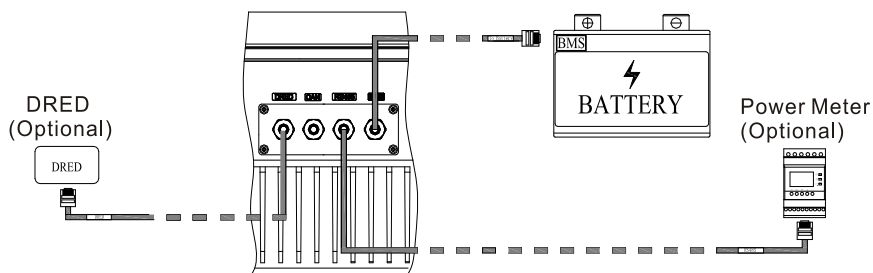
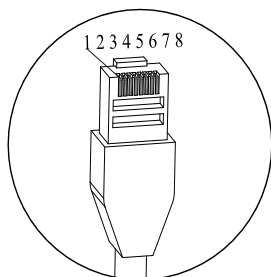


Figure 2-23

The RJ45 socket pin assignments for DRED , Power Meter and BMS as follows:





DRED		
PIN	Signal Name	Cable Color
1	DRM 1/5	Orange-white
2	DRM 2/6	Orange
3	DRM 3/7	Green-white
4	DRM 4/8	Blue
5	RefGen	Blue-white
6	Com/DRM0	Green
7	N/A	Brown-white
8	N/A	Brown

RS485		
PIN	Signal Name	Cable Color
1	NC	Orange-white
2	NC	Orange
3	485B_B	Green-white
4	COM	Blue
5	COM	Blue-white
6	485B_A	Green
7	485B_B	Brown-white
8	485B_A	Brown

BMS		
PIN	Signal Name	Cable Color
1	485A_B	Orange-white
2	485A_A	Orange
3	COM	Green-white
4	CAN_H	Blue
5	CAN_L	Blue-white
6	COM	Green
7	485A_A	Brown-white
8	485A_B	Brown

Figure 2-24

If you need to use DRED function, please put the left dip switch to the upper position.

The State of dip switch	Function
	DRED Enable
	DRED Disable

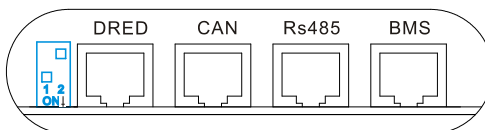


Figure 2-25

The inverter shall detect and initiate a response to all supported demand response commands, demand response modes are described as follows:

Table 2-4

Mode	Requirement
DRM 0	Operate the disconnection device
DRM 1	Do not consume power
DRM 2	Do not consume at more than 50% of rated power
DRM 3	Do not consume at more than 75% of rated power AND Source reactive power if capable
DRM 4	Increase power consumption(subject to constraints from other active DRMs)
DRM 5	Do not generate power
DRM 6	Do not generate at more than 50% of rated power
DRM 7	Do not generate at more than 75% of rated power AND Sink reactive power if capable.
DRM 8	Increase power generation(subject to constraints from other active DRMs)

## 5.GPRS Module(Optional) and Wi- Fi Antenna Connection

If the user selects the GPRS module, remove the dust cover plate of the GPRS module interface and install the GPRS module.

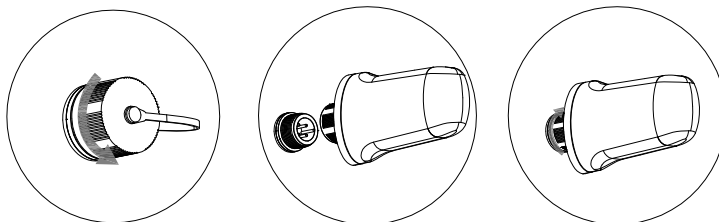


Figure 2-26

The GPRS socket pin assignments as follows:

PIN	Signal Name
1	VCC
2	GND
3	485A
4	485B

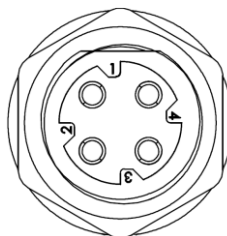


Figure 2-27

Install the antenna to the antenna interface

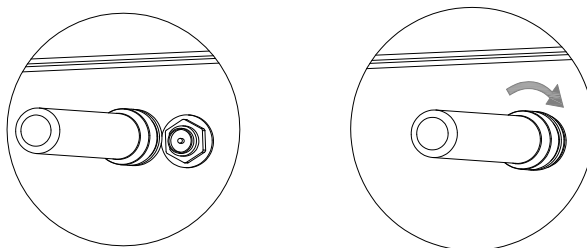


Figure 2-28 WIFI antenna diagram

## 2.4 Installation check

After the Hybrid Inverter is installed, be sure to check the installation according to the following table!

Table 2-5 Installation checking list

Check item	Serie	Check content
Installation	1	Check whether the Hybrid Inverter installation is vertical and stable.
	2	Check that all bolts are tight (especially pay attention to the electrical connection), whether the flat washers and spring washers are complete, and whether they are installed in reverse.
	3	Check whether the reserved distance below the Hybrid Inverter meets the requirements.
	4	Check whether the accessories are complete and the cable is intact and not damaged.
Electrical connection	1	Check PV cable polarity, ensure they are connected properly.
	2	Ensure PV rotating switch is at OFF position
	3	Check load connector 、 grid connector whether are connected properly.
	4	Check if ground point on enclosure is earthed reliably.
	5	Check the AC and DC connectors whether are reliably connected.
	6	Check that the model specifications of the incoming and outgoing cable are correct.



Check item	Serie	Check content
	7	Check that all cable connections are secure and reliable
	8	Check whether or not the color of AC cables are standardized , with complete security identity.
	9	Check that the cables are neat and that the cable ties are in compliance with the process specifications.

## 3 Sun mate APP

Build connection by dint of socket protocol interaction, and realize near operation. User can remotely monitor detailed running information like generating capacity、 system data、 fault alarm by APP, and send command、 set parameters at same time.

### 3.1 Software acquisition

For Android users, You can download our APP “ Sun Mate” from diverse Android store or download directly from our website([www.sermatec.com.cn](http://www.sermatec.com.cn)).

For IOS users , Please download APP from AppStore by searching “Sun Mate”.

### 3.2 Connect to internal Wi-Fi:

1.Find Wi-Fi name from the label on the inverters, and connect to Wi-Fi by initial password “gsstes123456”. (Figure 3-1)

STEP 1: Language Setting

- a. Tap the bottom on the top left of screen, enter APP sidebar (Figure 3-2)

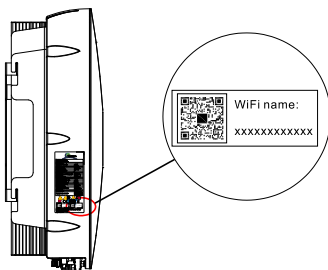


Figure 3-1

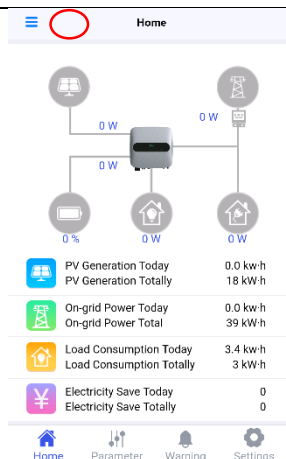


Figure 3-2

b. Tap language setting at bottom of interface to switch language you want.

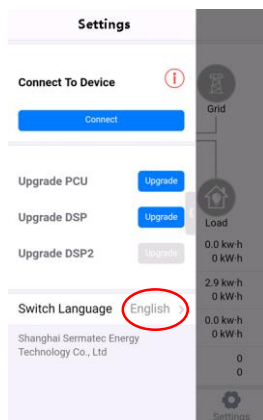


Figure 3-3

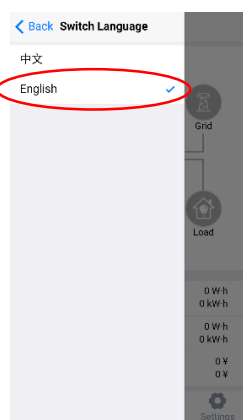


Figure 3-4

STEP 2: After properly connected, open APP sidebar, tap “connect” bottom, if pop up “Connection successful”, which indicate proper connection between APP and inverters;  
If pop up “ Connection fail”, which means you should check the issue between APP and inverter WIFI, try to reconnect.

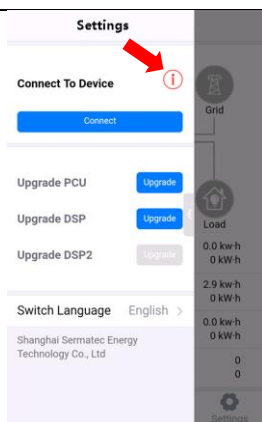


Figure 3-5 Connection Fail

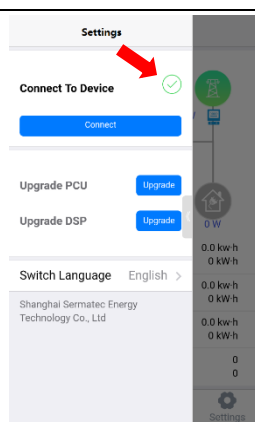


Figure 3-6 Connection Successful

### 3.3 Home Page

On App home page , You can visually see the system running condition 、 each unit running condition、 running power, display cumulative generating capacity、 energy to grid、 load consumption and power savings.

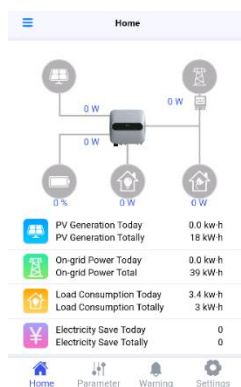


Figure 3-7 Home page

## 3.4 Parameter

Tap "Parameter" at the navigation bar to see actual operating parameter in each unit, which include PV input、PV generating curve、on-grid curve、battery parameters、local load、load curve and the other basic info.

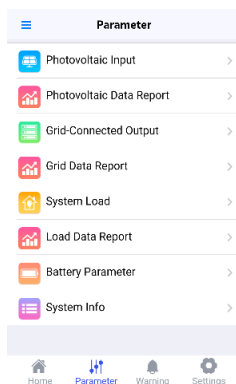


Figure 3-8 Parameter list

### 3.4.1 PV parameters

PV parameters include PV voltage,PV current,PV power. (Figure 3-8)

PV line chart displays daily,monthly,annual PV generating capacity. (Figure 3-9)

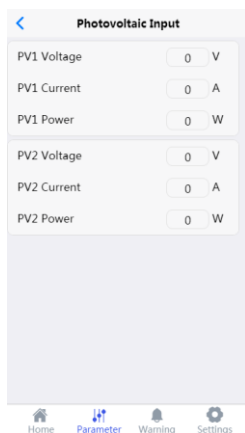


Figure 3-9 PV parameters

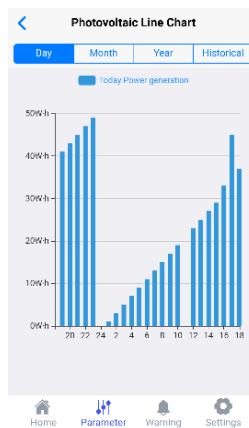


Figure 3-10 PV curve

### 3.4.2 Grid data and Grid report form

Grid data include system active power、system reactive power、system apparent power、line voltage、phase voltage、Phase current、grid frequency、power factor.



Figure 3-11 Grid data

Grid report form shows daily、monthly、annual and historical grid power generation in the way of chart column.

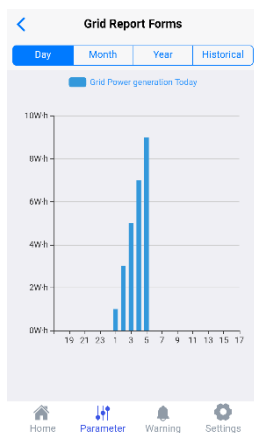


Figure 3-12 Grid report form

### 3.4.3 The actual data of local load and Load report form

The actual data of local loads include active power、reactive power、apparent power、frequency、power factor、phase current、phase voltage.



Figure 3-13 Local load parameters

Load report form shows daily、monthly、annual and historical load power generation in the way of chart column.

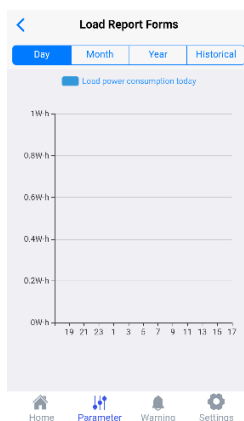


Figure 3-14 Local load report form

### 3.4.4 Battery parameters

Battery parameters include voltage, current, temperature, SOC, SOH, Max charge current, Max discharge current, battery status etc.

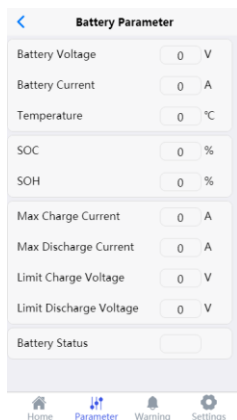


Figure 3-15 Battery Parameters

### 3.4.5 System information

Systems info includes: Battery factory, Device type, SN code, and PCU, DSP, APP Version.

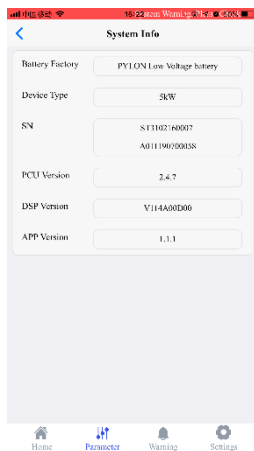


Figure 3-16 system information

## 3.5 Warning

Warning include battery fault message、system fault message info.

After App is connected, a rolling captions will be popped up at the top of APP interface with red background when it occurs fault;

No fault no rolling captions.

You can tap the rolling captions to directly read fault message.

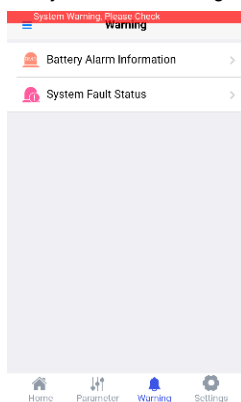


Figure 3-17 App warning page

### 3.5.1 Battery Alarm information

Battery Alarm information displays fault running condition of battery

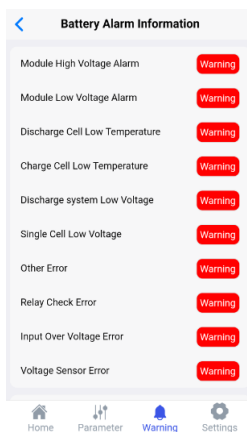


Figure 3-18 BMS Alarm Information



### 3.5.2 System Fault Status

System fault status is for alarm of abnormal running condition.

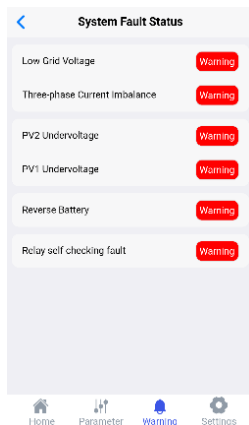


Figure 3-19 System Fault Status

## 3.6 Settings

In setup interface, you can set command mode、working mode、working parameters for hybrid system.

In the setting interface, click "issue parameters" and enter the confirmation password "sermatec2015".

### 3.6.1 Working Parameter Settings

Working parameter settings include grid standard、battery protocol; Choose the parameters you want to set, click "Send Parameters" bottom to finish setting.

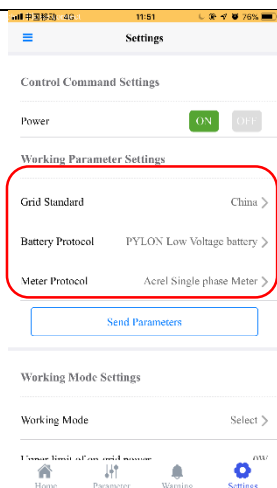


Figure 3-20 Working Parameters Settings

### 3.6.2 Working Mode Settings

You can set Working Mode which includes General Mode、Battery Mode、Micro-grid Mode、and Battery Lower Limit SOC, Anti-backflow function enabled or disabled.

**Note :**

- 1.Battery Lower Limit SOC can be set to a minimum of 10%,but when the inverter is running off-grid, Battery Lower Limit SOC is 20% default.
- 2.Anti-backflow function is disabled by default, and the user can enable this function when connecting the power meter.

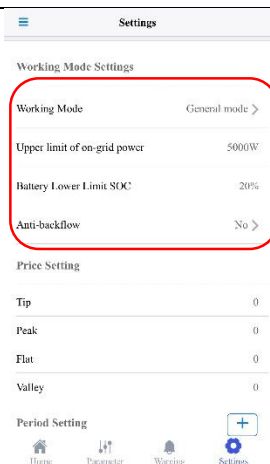


Figure 3-21

Table3-1 Working Mode

Parameter	Comment	
Working Mode	General Mode	<b>Self-Consumption</b> If PV is sufficient,PV supply power to the load priority, then charge battery,feeding into grid with surplus power. When PV is insufficient,grid and batteries supply power to the load together. Anti-backflow default disable.
	Battery Mode	<b>Battery backup</b> PV and grid supply power to load and charge batteries together. When the grid is normal,the battery SOC is always in full state, batteries discharge only when the grid is abnormal. Anti-backflow default enable.
	Micro-grid Mode	<b>Non-grid scenarios</b> PV and battery constitute a off-grid system. If PV is sufficient,PV supply power to the load priority, then charge battery. when PV is insufficient, batteries supply power to the load.
	Custom Mode	In the valley level, the grid and PV charge the batteries. In the Flat level, when the PV is sufficient, the battery can be charged. In the tip and peak level, the battery discharges supply the load.

### 3.6.3 Price Setting

Setting on-grid tariffs for each period (tip, peak, flat, valley).

Settings

Price Setting

Tip	1.2
Peak	1
Flat	0.8
Valley	0.6

Period Setting

+

Period	Start time	End time
--------	------------	----------

Send Parameters

Figure 3-22

### 3.6.4 Period Setting

Time of period must cover whole day 24h(00:00-23:59) without overlap.

Settings

Period Setting

+

Period	Start time	End time
Valley	0:00	4:00
Peak	4:00	10:00
Valley	10:00	14:00
Peak	15:00	19:00
Tip	19:00	22:00
Peak	22:00	23:00
Valley	23:00	24:00

Send Parameters

Home

Parameter

Warning

Settings

Figure 3-23

### 3.6.5 Control Command Settings

Click “power” button to send a power-on command;

Before sending a power-on command, ensure that working mode、working parameters have matched the current system state, and make sure they have been sent to the inverter.

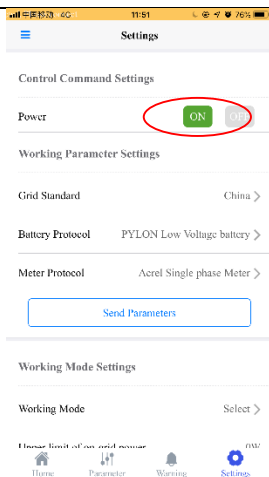


Figure 3-24 Control Command Settings

### 3.6.6 Change WIFI password

You can change WIFI password here, length of 8-16 bit.

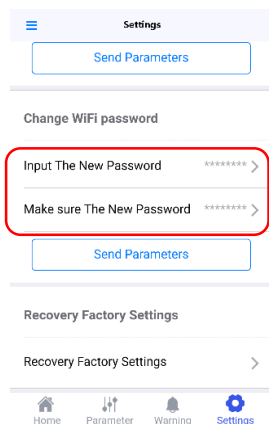


Figure 3-25 Change WIFI password

## 4 System Commissioning

This Chapter is the instructions for commissioning after installation.

During the process of commissioning , complying to the safe regulation is necessary.

### 4.1 Commissioning



**Dangerous**

Please contact operation personnel to implement commissioning.

Please take off metal items like ring, bracelet, watch etc. which would cause short circuit. During the process, pay attention to high voltage danger, avoid personal injury and property loss. Ensure well-grounded and installation check before commissioning .

#### 4.1.1 Check before commissioning

Operation personnel is required to strictly check the items in figure 4 showed below. **Dangerous**

Table4-1 Checking List

Checking Sequence	Checking Content	Checking Standard	Remark
1	Check to ensure the condition of DC air switch	Switch Off	PV、BAT
2	Check to ensure the condition of PV rotatory switch	Switch Off	PV
3	Use multimeter to measure PV switch voltage, ensure the voltage is less than 600V		
4	Use multimeter to measure BAT input switch voltage, ensure voltage is less than 60V		
5	Check to ensure the condition of AC air switch	Switch Off	Grid 、 Load
7	Check to power battery communication is normal	Normal	RS485 (option)
8	Check to ensure battery communication is normal	Normal	Battery BMS
9	Check to ensure grid and loads work normally	Normal	Grid、 Load

## 4.1.2 Power On-Off

STEP 1: Close PV rotatory switch、PV input switch(option)、BAT input switch、AC side switch、Load side switch;

STEP 2: Run “Sun mate” App, connect to WIFI in the inverter, check if there is abnormal warning at warning interface; You can refer to chapter 3 《Sun mate APP 3.2》 for more details.

STEP 3: If there is no warning , select **Grid standard** (your country)、**Battery protocol** , then click “**Sending Parameters**” ; Please refer to Chapter 3 《Sun mate APP 3.6.2 》 for more details.

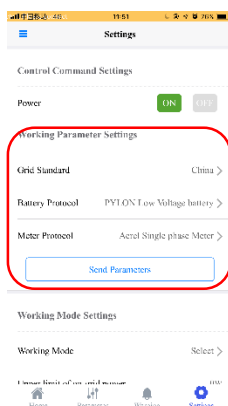


Figure 4-1 Grid Standard、Battery Protocol Selection

STEP 4: Set working mode as “**General mode**”, “Upper limit of on-grid power” is 5000W, “Battery Low limit SOC” is 20%, “Anti-backflow” disenable.

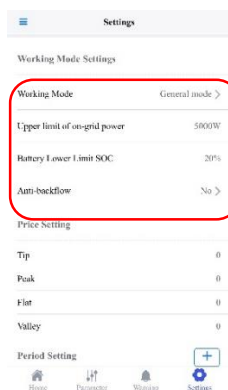


Figure 4-2 Working Parameters Setting

STEP 5: Price setting(Figure 4-3).

STEP 6: Period setting(Figure 4-4).

STEP 7: Tap “Send Parameters” (Figure 4-5).

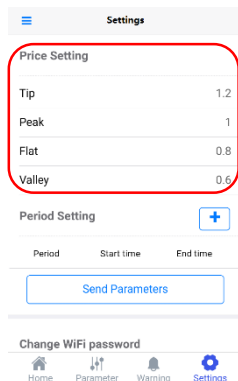


Figure 4-3

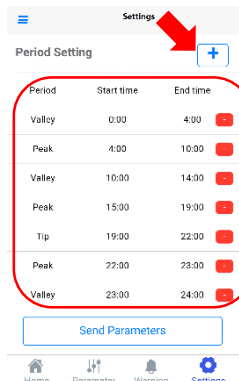


Figure 4-4

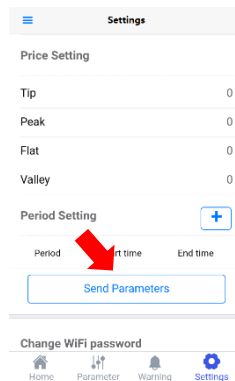


Figure 4-5

STEP 8: Tap “ON”, check and observe grid data in parameters interface for 3 minutes , normal active power indicates successful start-up .

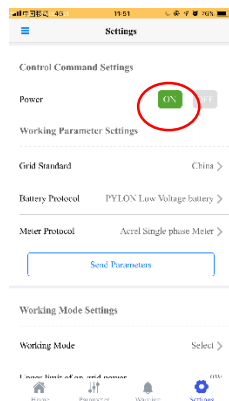


Figure 4-6 Start-up

STEP 9: Check and observe battery parameters 、 PV input data , etc. for 5-10 minutes, you can get information of PV generating capacity、 electricity savings, etc. on the home page.

STEP 10: To stop running the inverter for standby state by tapping “OFF”;

If you want to start the inverter, just tap “ON”.



## 4.2 Software upgrade

### 4.2.1 Andrio System

1.Place the software on the specified path. "Local /Internal storage/Download"

The software name is changed to "PCU5KSL.bin" and "DSP5KSL.bin".

2.The mobile phone connect WiFi of the device.

3.Open "Sun Mate" APP. Tap "Connect". ( Figure 4-8)

Note :You can refer to chapter 3 《Sun mate APP 3.2》 for more details.

4.Tap "Upgrade" . Enter the confirmation password "sermatec2015" The software will be upgraded. ( Figure 4-9, Figure 4-10, Figure 4-11)

5. The system will restart automatically after the software upgrade is completed.WiFi needs to be reconnected.

6. Check the version of the software. (Figure 4-12)

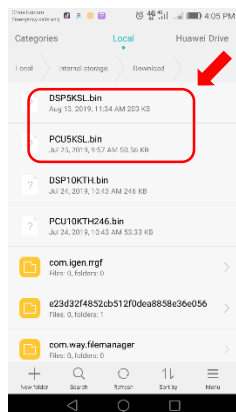


Figure 4-7

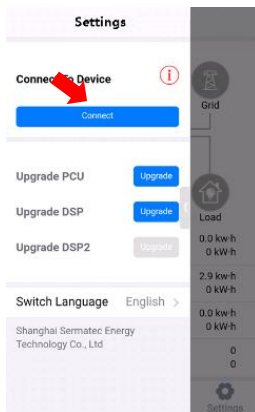


Figure 4-8

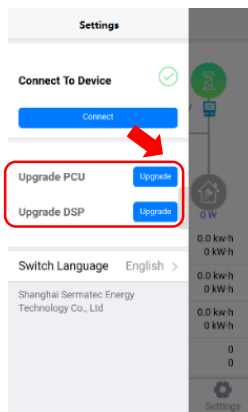


Figure 4-9

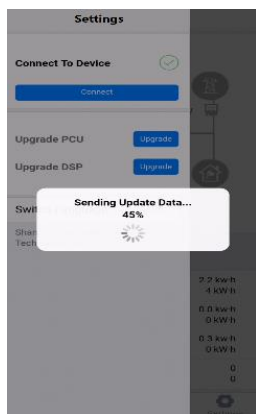


Figure 4-10

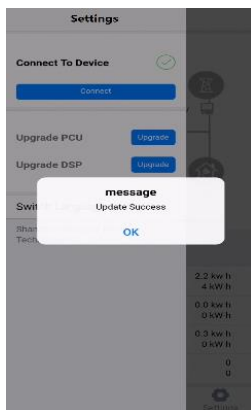


Figure 4-11

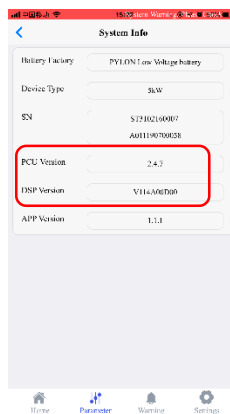


Figure 4-12

## 4.2.2 IOS System

1. Open "Sun Mate" APP, tap the button on the top left of screen, enter APP sidebar (Figure 4-13).  
Make sure the file name is gray (Figure 4-15), if it is blue, you need to tap the delete button (Figure 4-14), then close the APP.
2. The software name is changed to "PCUKSL.bin" and "DSPKSL.bin".
3. Upgrade file can be imported into APP by mailbox. (Figure 4-16, Figure 4-17)
4. The mobile phone connects to the device's WiFi. Open "Sun Mate" APP, tap the button on the top left of screen, enter APP sidebar, tap "Connect".  
Note: You can refer to chapter 3 《Sun mate APP 3.2》 for more details.
5. Tap "Upgrade". The software will be upgraded. (Figure 4-18, Figure 4-19)
6. The system will restart automatically after the software upgrade is completed. WiFi needs to be reconnected.
7. Check the version of the software. (Figure 4-20)

39

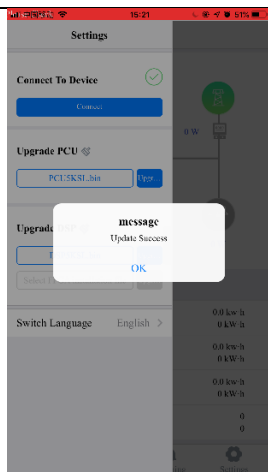


Figure 4-19



Figure 4-20

## 5 Product Maintenance

This Chapter mainly introduce routine maintenance、trouble shooting.



### Dangerous

1.You will be obliged to implement product maintenance complying to the safe regulations.

The personnel to implement internal operation of inverters must be trained and qualified with sufficient knowledge of electrical system.

3. It is required to implement power down before system clean、confirming reliability of electrical connection、ground connection , etc.

STEPS to power down

a. Run APP, execute power-off command, please refer to Chapter 4.1.2

b. Sequentially disconnect

①PV side switch,

②battery side switch,

③PV rotatory switch on the inverter,

④AC grid side switch

⑤ AC load side switch.

### 5.1 Routine Maintenance
















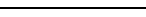




Table5-1

Checking Content	Checking Method	Maintenance Period
System Clean	Periodic inspection for cooling fin, clean out dust	Once in six months to one year
System running status	1.Observe physical appearance of inverter to determine whether it is damaged or deformed. 2.If there is any noisy from the inverter during the operation. 3.During the operation, check and ensure all parameters are set properly.	Once in six months.

Electrical Connection	1. Check if the cable connections are loosen. 2. Check if cables are damaged , especially for bus cable. 3. Check if there are signs of cuts on coat contacted with metal's surface. 4. Check if the cylinders on unused DC input terminal and unused GPRS interface are tightened .	Half a year after first commissioning . Once half a year to one year afterward.
Grounding reliability	Check if grounding cable is grounded firmly.	

## 5.2 LED Status

Table5-2

Display item	Status	Corresponding state description
SYSTEM		On: System is active and on-grid
		Blink: System is active and off-grid
		Off: System is standby
BACK-UP		On: AC-Load is active and normal
		Blink: AC-Load is active and overload
		Off: AC-Load is off
SOLAR		On: All PV is normal
		Blink: One PV is normal
		Off: All PV is abnormal
BATTERY		On: Battery is normal
		Blink: Voltage of battery is low
		Off: Battery is abnormal
GRID		On: Consuming electricity
		Blink: Generating electricity
		Off: Grid is abnormal
WIFI		On: Wi-Fi connection succeeded
		Blink: Wi-Fi is waiting for connection
		Off: Wi-Fi is not active
FAULT		On: Fault has occurred
		Off: No fault

## 5.3 Trouble Shooting

Table5-3

Error message	Fault cause	Solution
Grid locking failed	Abnormal frequency or voltage of grid	Shut down and turn on when the power grid is normal.
AC Output Short Circuit	Short circuit of the load or grid	Shut down and check the circuit, restart after troubleshooting.
Output Leakage Current Failure	Abnormal electrical connection	Shut down and check the circuit, restart after troubleshooting.
	Leakage current of load exceeds standard.	Make sure leakage current of load meets the standard.
Output Overload	The output current exceeds the limit value due to too large load power.	1.Please check load power, resistive load is not more than 10kW(Each phase is not more than 3.3kW). Inductive load is not more than 3kW(Each phase is not more than 1kW). 2.Auto-recover within 10 minutes after fault elimination.
Inverter Soft Start Failure	Inverter Damage	1.Occasional failures can be automatic recovery. 2.The Inverter cannot be automatic recovery, , shut down and turn on when the power grid is normal.If it still can't be self-recovery, please contact the service.
Low Grid Frequency	The frequency of grid is lower than lower limit	Check power grid, resume to work when go back to permitted range of grid frequency
High Frequency Grid	Frequency of grid is higher than upper limit	Check power grid, resume to work when go back to permitted range of grid frequency
Low Grid Voltage	The voltage of the grid is lower than lower limit	Check power grid, resume to work when go back to permitted range of grid voltage.
High Grid Voltage	The voltage of the grid is higher than upper limit	Check power grid, resume to work when go back to permitted range of grid voltage.
PV2 Under voltage	PV2 Without voltage	Makesure the PV2 connection is normal and the switch is closed.
	The voltage of PV2 is lower than lower limit	Check PV2 configuration, increase PV2 open-circuit voltage.
PV2 Over voltage	The voltage of PV2 is higher than upper limit	Check PV2 configuration, reduce PV open-circuit voltage.
PV1 Under voltage	PV1 Without voltage	Makesure the PV1 connection is normal and the switch is closed.
	The voltage of PV1 is lower than lower limit	Check PV1 configuration, increase PV2 open-circuit voltage.

PV1 Over voltage	The voltage of PV2 is higher than upper limit	Check PV1 configuration, reduce PV1 open-circuit voltage.
Reverse PV2	PV2 positive and negative poles reversed connected	Check cable connection, resume to work when go back to normal.
Reverse PV1	PV1 positive and negative poles reversed connected	Check cable connection, resume to work when go back to normal.
Bus software soft fault	Inverter Damage	1.Occasional failures can be automatic recovery. 2.The Inverter cannot be automatic recovery, shut down and turn on when the power grid is normal.If it still can't be auto-recover,please contact the distributor.
Bus hardware fault	Inverter Damage	1.Occasional failures can be automatic recovery. 2.The Inverter cannot be automatic recovery,shut down and turn on when the power grid is normal.If it still can't be auto-recover,please contact the distributor.
DC Bus Capacitor Under voltage	Inverter Damage	1.Occasional failures can be automatic recovery. 2.The Inverter cannot be automatic recovery,shut down and turn on when the power grid is normal.If it still can't be automatic recovery,please contact the service.
DC Bus Capacitor Over voltage	Inverter Damage	1. Occasional failures can be automatic recovery. 2.The Inverter cannot be automatic recovery, shut down and turn on when the power grid is normal.If it still can't be auto-recover,please contact the service.
DC Bus Voltage Imbalance	The load is a half wave load.	1.Occasional failures can be automatic recovery. 2.Please shut down if the inverter cannot be automatic recovery, makesure the load is not a half wave load,the inverter is still failure,please contact the service.
	Inverter Damage	
The SOC of the battery is lower than the limit to stop discharging.	Low Battery	1.Short time failure is normal,waiting for PV or grid charging 2.It is recommended to turn off the inverters when there is no PV or power grid for a long time.Turn on when PV or grid is normal.



		3.User Chooses “General Mode”, When the PV power is maximum, it can only be used for load.Batteries can't be recharged. We recommend that users reduce load or use "Battery mode".
Battery charge/discharge over current	Inverter Damage	1.Occasional failures can be automatic recovery. 2.The Inverter cannot be self-recovery, shut down and turn on when the power grid is normal.If it still can't be automatic recovery,please contact the service.
	Load current exceeds the rated range of inverter	reduce load
The grid side and load side connectors are connected in reverse	Connector Installation Errors on Grid Side and Load Side	Grid side connectors and load side connectors are installed in the correct position
Battery Overvoltage	Battery DC voltage is higher than the upper limit	Check battery configuration, reduce battery open-circuit voltage
Battery Under Voltage (EOD)	Battery DC voltage is lower than lower limit	Check battery configuration, increase battery open-circuit voltage
Positive bus Insulation impedance fault	Insulation impedance is less than limit value	Make sure the insulationimpedance of PV module is greater than 33k $\Omega$ .
Negative bus Insulation impedance fault	Insulation impedance is less than limit value	Make sure the insulationimpedance of PV module is greater than 33k $\Omega$ .
PV bus software soft start fault	Inverter Damage	1.Occasional failures can be self-recovery 2.The Inverter cannot be auto-recover, shut down and restart .If it still can't be auto-recover, please contact the service.
PV1 bus hardware soft start fault	Inverter Damage	1.Occasional failures can be self-recovery 2.The Inverter cannot be auto-recover, shut down and restart .If it still can't be auto-recover, please contact the service.
Relay self checking fault	Internal relay cannot be disconnected or closed	shut down and restart .If it still can't be auto-recover,please contact the service.
Relay self checking fault	Internal relay cannot be disconnected or closed	Shut down and restart .If it still can't be auto-recover,please contact the service.
IGBT A/B/C temperature sensor fault	Actual ambient temperature is too low	No operation required.When the temperature rises, it will recover by itself.
	Temperature sensor failure	shut down and restart .If it still can't be auto-recover, please contact the distributor.

IGBTA/B/C temperature too high	there are obstruction or shelter around installation position.	Check if there are any obstruction or shelter around installation position.
	There are heat sources around, cause ambient temperature to be too high.	Keep away from heat sources and reduce ambient temperature.If it still can't be recover after temperature is reduce. Shut down and restart .If it still can't be auto- recover, please contact the distributor.
	Temperature sensor failure	shut down and restart .If it still can't be automatic recovery,please contact the service.

## 6 Technical Parameters

Table6-1

technical parameters	parameters
<b>PV Input (DC)</b>	
Maximum PV array power	6000
Vmax PV (V)	580
Rated voltage (V)	360
Maximum input current	11/11
Isc PV	14/14
MPPT voltage range	125-550
Number of MPPT trackers	2
Max. inverter backfeed current to the array(A)	12
<b>Battery input and output</b>	
Battery voltage range (V)	40-58
Rated battery voltage (V)	48
Rated charging/ discharging power	4200/4600
Maximum charging/discharging current	70/100
BMS communication interface	CAN/RS485
Reverse polarity protection	YES
<b>Grid Input/Output parameters</b>	
Grid rated apparent power (VA)	5000 (*)
Grid rated voltage (V)	220/230Va.c.
Grid connection	1/N/PE
Grid rated frequency (Hz)	50/60

Grid rated current (A)	20
Grid maximum current (A)	20.9
Power factor range	0.8 ahead~0.8 behind
Total harmonic distortion (THD, rated power)	<3%
Max output fault current (A)	NO
<b>Load Output (With Battery)</b>	
Rated power (VA)	4600
Rated voltage (V)	220/230Va.c.
Electrical connection	1/N/PE
Rated frequency (Hz)	50/60
Maximum current	21.7
Rated current (A)	22.8
Peak power (W) duration @ Ta=25° C	Support power mode、Overpower 5 kw (30min)、6kw(5min)
UPS switch time (S)	<0.5
Total harmonic distortion THD (Linear load)	<3%
Max output fault current (A)	NO
Efficiency	
MPPT Efficiency (%)	99.9
Europe Efficiency (%)	97
Max Efficiency (%)	97.8
Battery charge/discharge efficiency (%)	97.6/96
Power consumption	
Standby Self consumption (W)	<25
Standard	
Safety	IEC62109-1-2 / IEC62040
EMC	EN61000-6-1/EN61000-6-2/EN61000-6-3/EN61000-6-4/IEC 62920
Certification	NB/T 32004/AS/NZS 4777.2/ VDE0126-1-1/ENA ERG83/2
<b>Environment limit</b>	
Ingress protection (IP) rating	IP 65

Protective class	class I
Operating temperature range	-25°C...+60°C (>+45°C, derating)
Altitude (M)	<2000
Storage temperature range (°C)	-20 to +60
Noise emission (dB)	<30
Overvoltage category	DC II ; AC III
<b>Dimensions and Weight</b>	
Dimensions (W*H*D) (mm)	516 (W) *525.6 (H) *151.7 (D)
Weight (kg)	28kg
Cooling concept	Natural-cooling
Isolation type	Transformerless
Communication	WIFI, GPRS (optical), RS485.
Display	LED
Warranty (Years)	5

**Notes:** “ \* ” South African grid connection standard 4600w