SOSEN INNOVATION
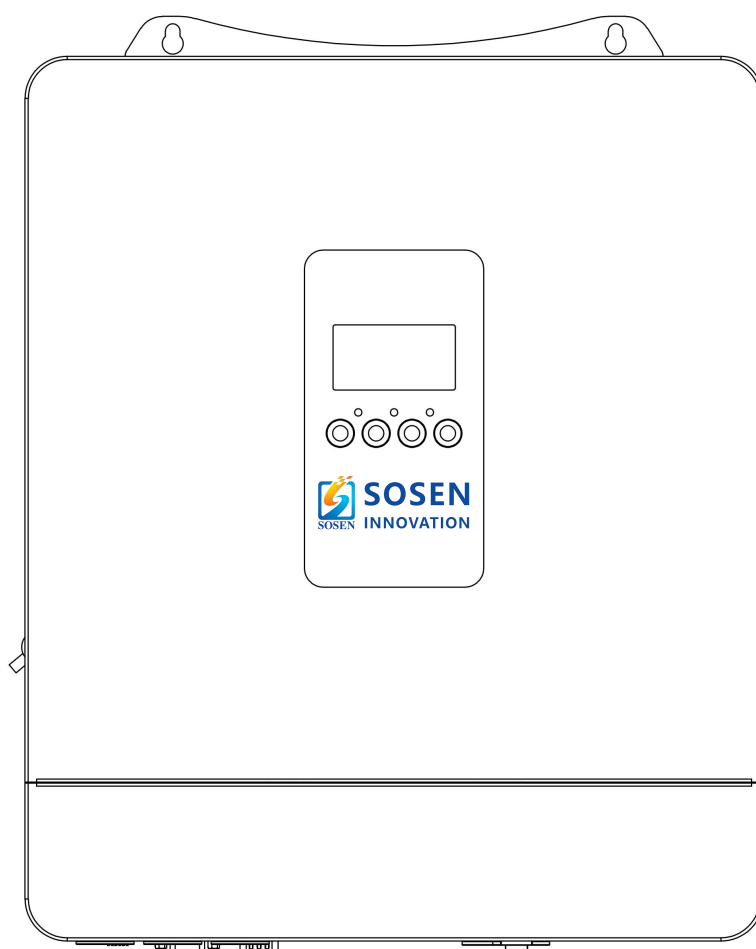
OFF-grid Single Phase Hybrid Inverter

SSA-HL5K-P1US

User Manual

Please read this manual before use and follow its guidance.
Keep this manual for future reference.

Version: 1.1
2024.12.02

CONTENTS

1 ABOUT THIS MANUAL

1.1 Purpose

This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installations and operations. Keep this manual for future reference.

1.2 Scope

This manual provides safety and installation guidelines as well as information on tools and wiring.

2 SAFETY INSTRUCTIONS

⚠️ **This chapter contains important safety and operating instructions. Read and keep this manual for future reference.**

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.

2. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.

3. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.

4. To reduce risk of electric shock, disconnect all wires before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.

5. **CAUTION** – Only qualified personnel can install this device with battery.

6. **NEVER** charge a frozen battery

7. For optimum operation of this inverter/charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter/charger.

8. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.

9. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.

10. One piece of 150A fuse is provided as over-current protection for the battery supply

11. GROUNDING INSTRUCTIONS -This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter

12. **NEVER** cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.

13. **WARNING:** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this inverter/charger back to local dealer or service center for maintenance.

14. **WARNING:** Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline, poly crystalline with class A-rated and CIGS modules. To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter.
For example, grounded PV modules will cause current leakage to the inverter. When using CIGS modules, please be sure NO grounding

15. **CAUTION:** It's requested to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

3 INTRODUCTION

This is a multi-function inverter/charger, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support with portable size. Its comprehensive LCD display offers user-configurable and easy-accessible button operation such as battery charging current, AC/solar charger priority, and acceptable input voltage based on different applications.

3.1 Features

- Pure sine wave inverter
- Configurable battery charging current based on applications via LCD setting
- Configurable AC/Solar Charger priority via LCD setting
- Compatible to mains voltage or generator power
- Auto restart while AC is recovering
- Overload/ Over temperature/ short circuit protection
- Smart battery charger design for optimized battery performance

3.2 Basic System Architecture

The following illustration shows basic application for this inverter/charger. It also includes following devices to have a complete running system:

- Generator or Utility
- PV modules

Consult with your system integrator for other possible system architectures depending on your requirements.

This inverter can power all kinds of appliances in home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioner

Solar power

Generator

Utility

External Battery packs

Home Applicances
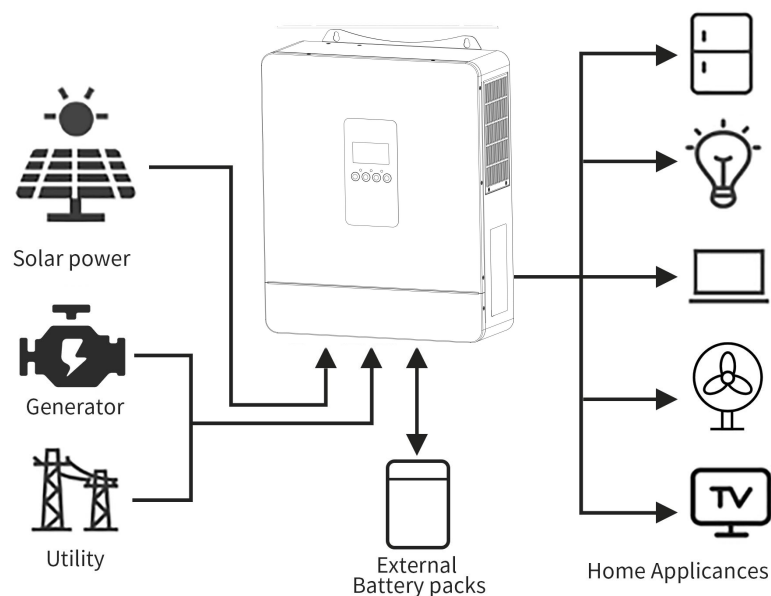
Hybrid Power System

3.3 Product Overview
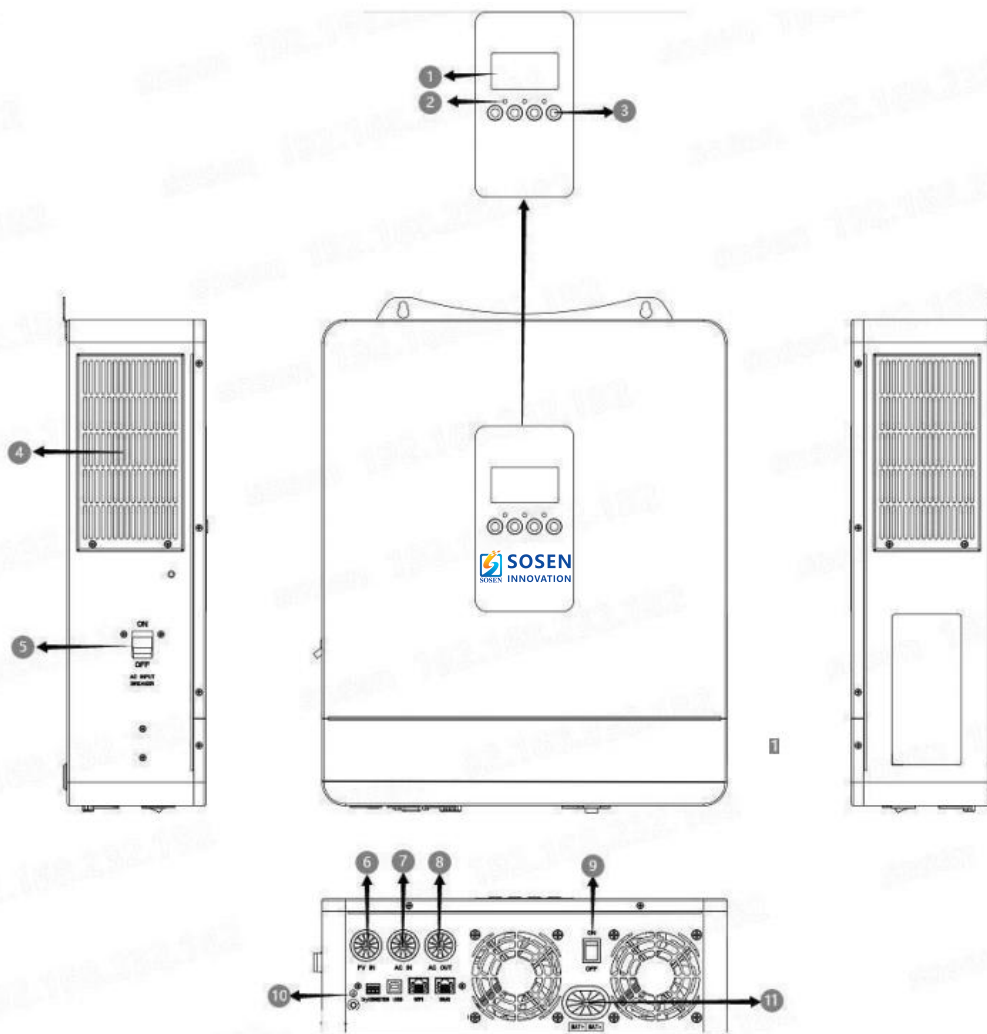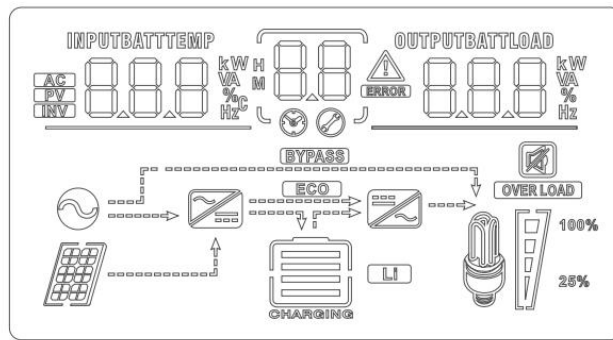
Overall diagram of the inverter

1. LCD display
2. Status indicator
3. Function buttons

4. Anti-dust kit
5. AC input breaker
6. PV input
7. AC input
8. AC output
9. Power on/off switch
10. Communication ports

11. Battery input

4 INSTALLATION

4.1 Unpacking and Inspection

Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items inside of package:

- The inverter x 1
- User manual x 1

4.2 Preparation

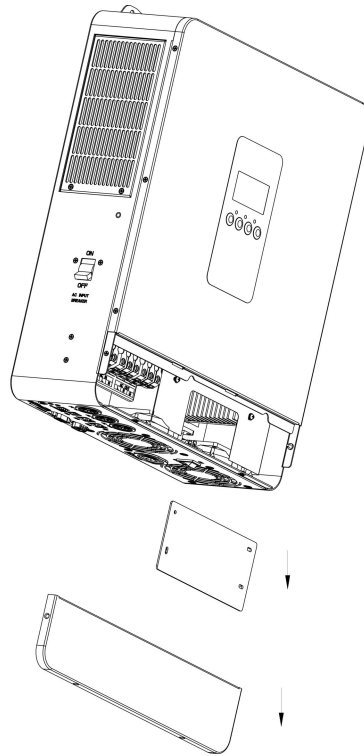Before connecting all wires, please take off bottom cover by removing two screws as shown below.

Diagram of the bottom of the inverter

4.3 Mounting the Unit

Consider the following points before selecting where to install:

1. Do not mount the inverter on flammable construction materials.

2. Mount on a solid surface.

3. Install this inverter at eye level in order to allow the LCD display to be read at all times.

4. For proper air circulation to dissipate heat, allow a clearance of approx. 20 m to the side and approx. 50 cm above and below the unit.

5.The ambient temperature should be between 0°C and 55°C to ensure optimal operation.

6.The recommended installation position is to be adhered to the wall vertically.

7. Install the unit by screwing two screws. It's recommended to use M4 or M5 screws.
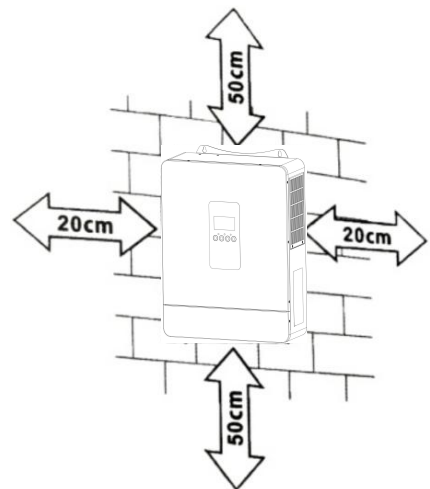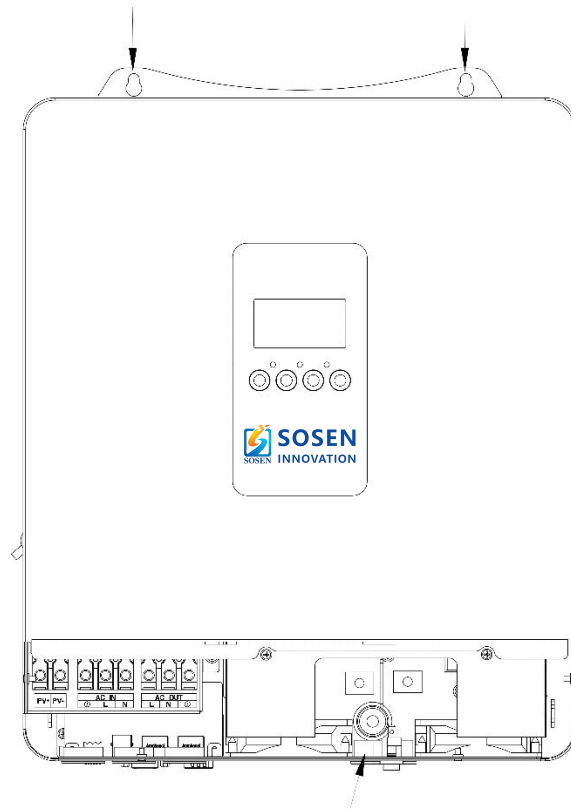
Inverter expansion screw fixing diagram

⚠ **SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.**

4.4 Battery Connection

CAUTION: For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or disconnect device between battery and inverter. It may not be requested to have a disconnect device in some applications, however, it's still requested to have over-current protection installed. Please refer to typical amperage in below table as required fuse or breaker size.

WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable as below.

Recommended battery cable size:

| Model	Wire Size	Cable (mm²)	Torque value
SSA-HL5K-P1US	2AWG	35	2 Nm

Please follow below steps to implement battery connection:

1.Remove insulation sleeve 18 mm for positive conductors.

2.Remove insulation sleeve 18 mm for negative conductors.

3.Fix strain relief plate to the inverter by supplied screws as shown in below chart.

4.It is recommended that the length of the battery connection cable be limited to 0.5meters.

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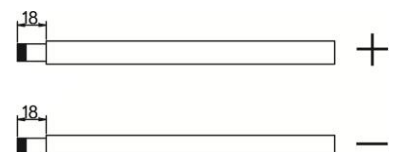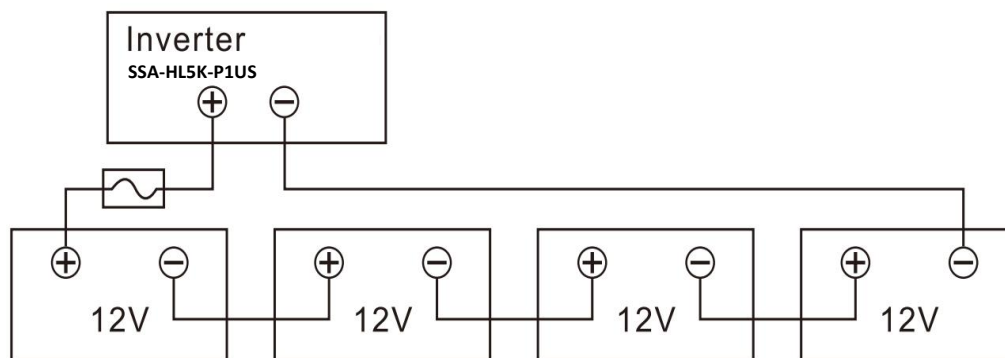
4.Insert the battery wires flatly into battery connectors of inverter and make sure the bolts are tightened with torque of 2 Nm in clockwise direction. Make sure polarity at both the battery and the inverter/charge is correctly connected and conductors are tightly screwed into the battery terminals.

Recommended tool: #2 Pozi Screwdriver
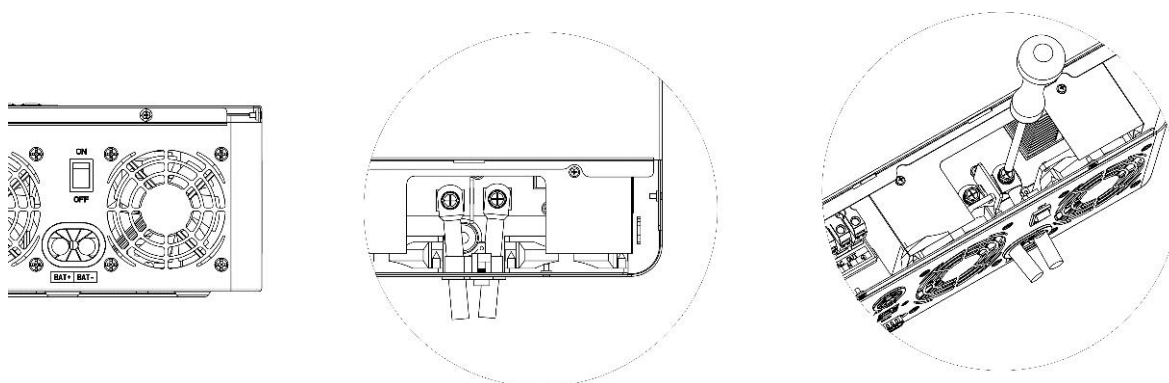
Inverter battery installation diagram

⚠	**WARNING: Shock Hazard** Installation must be performed with care due to high battery voltage in series.
⚠	**CAUTION!!** Before implementing the final DC connection or tuning on DC breaker/disconnector, be sure positive (+) cable must be connected to positive (+) port and negative (-) cable must be connected to negative (-) port.

4.5 AC Input/Output Connection

CAUTION!! Before connecting to AC input power source, please install a separate AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input. The recommended spec of AC breaker is 63A for 5KVA.

CAUTION!! There are two terminal blocks with "IN" and "OUT" markings. Please do NOT mis-connect input and output connectors.

WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

Model	Gauge	Cable (mm²)	Torque Value
SSA-HL5K-P1US	**7AWG**	**10**	**1.2 Nm**

Please follow below steps to implement AC input/output connnection：

1.Remove insulation sleeve 10mm for six conductors.
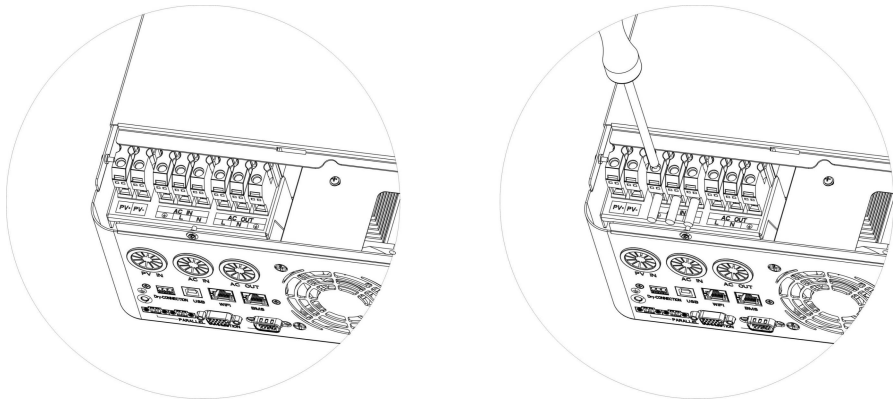2.And shorten phase L and neutral conductor N 3 mm.
Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws. Be

sure to connect PE protective conductor (⏚) first.
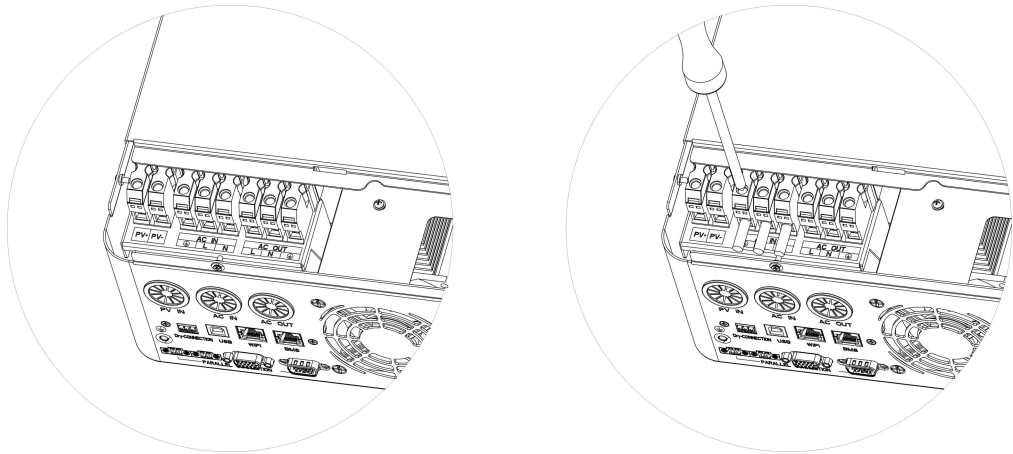
Inverter AC OUT installation diagram

⚠	**WARNING:** Be sure that grid is disconnected before attempting to connect AC input cables to the unit.

⏚ **PE→Ground (yellow-green)**

L→LINE (brown or black)
N→Neutral (blue)

⚠	Make sure the wires are securely connected.If the live wire and the neutral wire are connected incorrectly, a short circuit will occur when the inverter is in parallel mode.
⚠	**CAUTION:** Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check manufacturer of air conditioner if it's equipped with time-delay function before installation. Otherwise, this inverter/charger will trig overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

4.6 PV Connection

CAUTION: Before connecting to PV modules, please install separately a DC circuit breaker between inverter and PV modules. Otherwise, short circuit may occur when the inverter is working in parallel.

WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below.

Model	Wire Size	Cable (mm²)	Torque value
SSA-HL5K-P1US	10AWG	5	1.5 Nm

WARNING: Because this inverter is non-isolated, only three types of PV modules are acceptable:
single crystalline, poly crystalline with class A-rated and CIGS modules.

To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter. When using CIGS modules, please be sure NO grounding.

CAUTION: It's requested to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

PV Module Selection:

When selecting proper PV modules, please be sure to consider below parameters:

1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.

2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.

| Model	SSA-HL5K-P1US
Max. PV Array Open Circuit Voltage	500Vdc
PV Array MPPT Voltage Range	120Vdc~450Vdc

Take 250Wp PV module as an example. After considering above two parameters, the recommended module configurations are listed as below table.

Solar Panel Spec. (reference) - 250Wp - Vmp: 30.1Vdc - Imp: 8.3A - Voc: 37.7Vdc - Isc: 8.4A - Cells: 60	Solar input (Min in serial: 6 pcs, max. in serial: 13 pcs)	Q'ty of panels	Total input power
	6 pcs in serial	6	1500W
	8 pcs in serial	8	2000w
	12pcs in serial	12	3000w
	13 pcs in serial	13	3250w
	8 pieces in serial and 2 sets in parallel	16	4000w

PV Module Wire Connection

Please follow below steps to implement PV module connection：

1. Remove insulation sleeve 10 mm for positive and negative conductors.

2. Suggest to put bootlace ferrules on the end of positive and negative wires with a proper crimping tool

3. Check correct polarity of wire from PV modules and PV input connectors. Then,connect positive pole(+) of connection wire to positive pole(+) of PV input connector. Connect negative pole (-)of connection wire to negative pole(-) of PV input connector. Screw two wires tightly in clockwise direction.
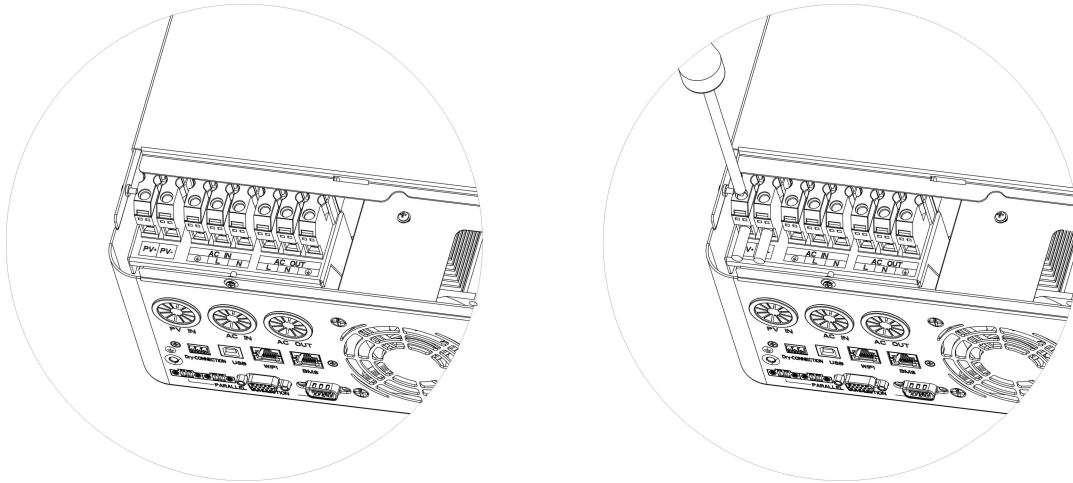
PV Module Wire installation diagram of the inverter

4.7 Finally Assembly

After connecting all wires, please put bottom cover back by screwing screws as shown below.
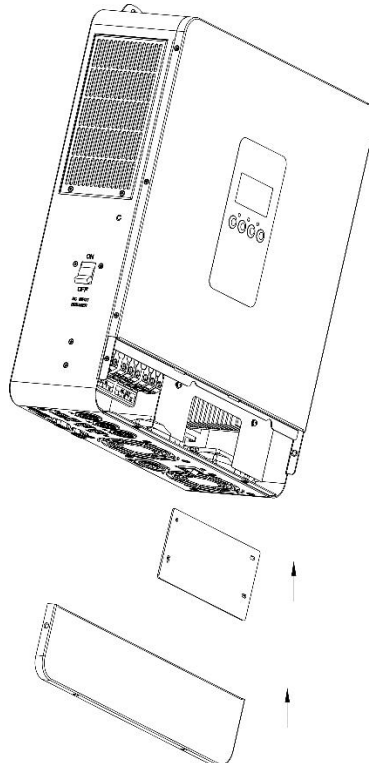
5 OPERATION

5.1 Power ON/OFF

Side view of unit
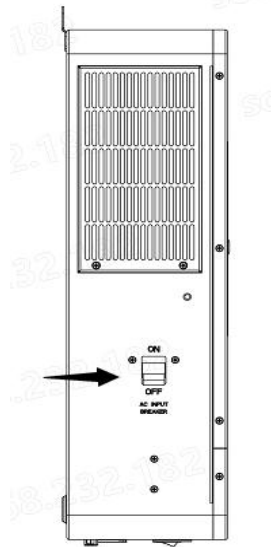
This is an AC input switch to control the grid input(located on the button of the case).

5.2 Operation and Display Panel

The operation and display panel, shown in below chart, is on the front panel of the inverter. It includes three indicators,four function buttons and a LCD display, indicating the operating status and input/output power information.
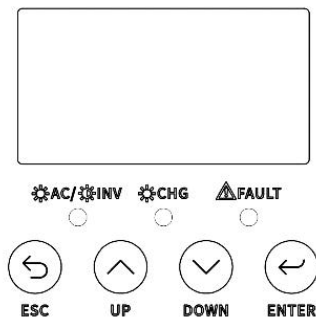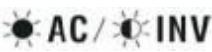
ESC	To exit setup mode
UP	To go to previous item
DOWN	To go to next item
ENTER	To confirm the selection in setting mode or enter setting mode

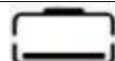### LED Indicator Functions：

LED indicator			Message
☀AC/☀INV	Green	Solid on	Output is powered by grid in the line mode
		Flashing	Output is powered by battery or PV in battery mode
☀CHG	Yellow	Solid on	Battery is fully charged
		Flashing	Battery is charging
⚠FAULT	Red	Solid on	Fault occurs in the inverter
		Flashing	Warning condition occurs in the inverter

5.3 LCD Display Icons
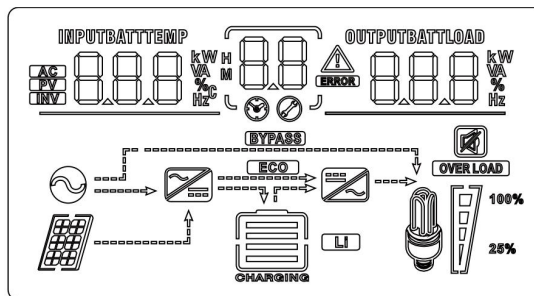
Icon	Function Description
Input Source Information	
AC	Indicates the AC input
PV	Indicates the PV input
INPUTBATT 8.8.8 kW VA %°C Hz	Indicates input voltage, input frequency, PV voltage, charge current, charge power, battery voltage
Configuration Program and Fault information	
88 ⊘	Indicates the setting programs.
88 ⚠ ERROR	Indicates the warning and fault codes. Warning: 8.8 ⚠ Flashing with warning code. Fault: 8.8 ERROR Lighting with fault code.
Output Information	
OUTPUTBATTLOAD 8.8.8 kW VA % Hz	Indicates output voltage, output frequency, output power, load voltage and discharge current
Battery Information	
CHARGING	Indicates battery level by 0-24%，25-49%，50-74%，75-100% in battery mode and charging status in line mode

In AC model, it will present battery charging status

Status	Battery voltage	LCD display
Constant current mode/constant voltage mode	< 2V/cell	Four bars will flash in turns
	2~2.083V/cell	Bottom bar will be on and other three bars flash in turns
	2.083 ~ 2.167V/cell	Bottom two bars will be on and other two bars flash in turns
	> 2.167 V/cell	Bottom three bars will be on and the top bar will flash
Float charge mode，Batteries are full charged		Four bars will be on

In battery mode, it will present battery capacity		
Load percentage	Battery voltage	LCD Display
Load>50%	< 1.85V/cell	
	1.85V/cell ~ 1.933V/cell	
	1.933V/cell ~ 2.017V/cell	
	> 2.017V/cell	
Load < 50%	< 1.892V/cell	
	1.892V/cell ~ 1.975V/cell	
	1.975V/cell ~ 2.058V/cell	
	> 2.058V/cell	

Load Information				
OVER LOAD	Indicates overload			
(lamp icon 100%/25%)	Indicates the load level by 0~24%，25~50%，50%~75%,75%-100%			
	0%~24%	25%~49%	50%~74%	75%~100%

Mode Operation Information	
(grid icon)	Indicates unit connects to the grid.
(PV panel icon)	Indicates unit connects to the PV panel.
BYPASS	Indicates load is powered by grid power.
(charger icon)	Indicates the load charger circuit is working
(inverter icon)	Indicates the DC/AC inverter circuit is working

Mute Operation	
(mute icon)	Indicates unit alarm is disabled

5.3.1 LCD Display page

Under normal circumstances, the indicator has 15 pages. Press the query button UP/DOWN to switch the interface, which will display the information of PV, AC input/output voltage, battery voltage, battery charging/discharging power, and inverter software version etc. If there is an alarm, the alarm information page will be displayed; if the inverter is faulty, the fault code page will be displayed. By default, the main panel displays fault information. When there is no fault or alarm in the inverter, the main page displays voltage and rate information by default.

Display Page 1(main display page)**:** Display the inverter input frequency and output voltage, as shown in Figure 1-1.

Figure 1-1 display page 1

Display Page 2 : Display the PV input and output voltage, as shown in Figure 1-2.
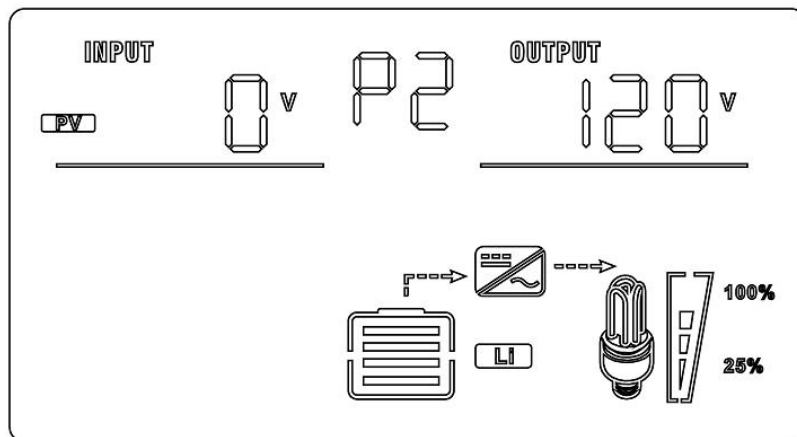
Figure 1-2 display page 2

Display Page 3 : Display the inverter PV input current and output voltage ,as shown in Figure 1-3.
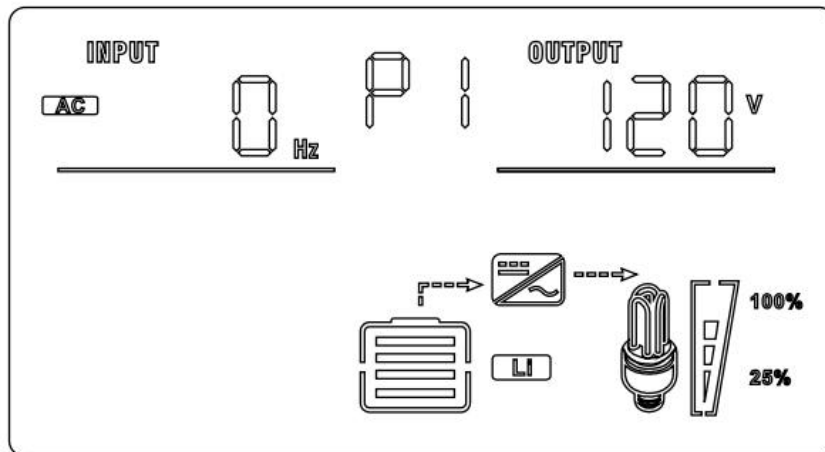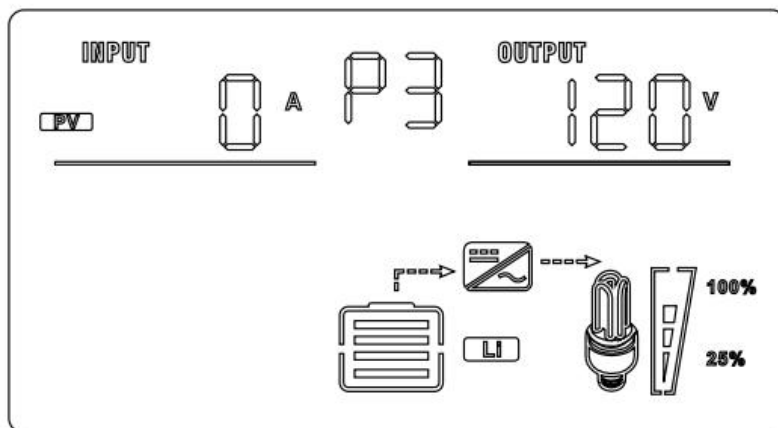

Figure 1-3 display page 3

Display Page 4 : Display the inverter PV input power and output voltage, as shown in Figure1-4.

Figure 1-4 display page 4

Display Page 5 : Battery information, display the battery charging current and output voltage , as shown in Figure 1-5.

Figure 1-5 display page 5

Display Page 6 : Battery information, display the battery charging power and output voltage , as shown in Figure 1-6.

Figure 1-6 display page 6

Display Page 7 : Battery information,display the battery voltage and output voltage, as shown in Figure 1-7.

Figure 1-7 display page 7

Display Page 8 : Battery information,display the battery voltage and output frequency, as shown in Figure 1-8.
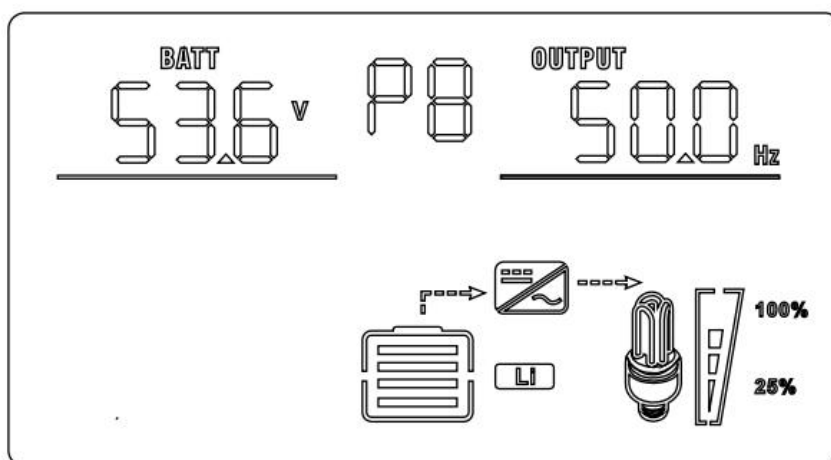
Figure 1-8 display page 8

Display Page 9 : Battery Information, display the battery voltage and load percentage, as shown in Figure 1-9.
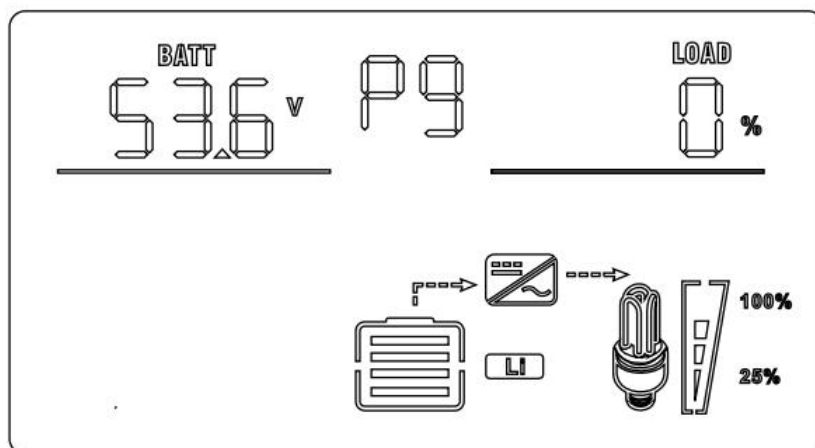
Figure 1-9 display page 9

Display Page 10 : The upper left corner displays the battery voltage, and upper right corner displays the output power capacity, as shown in Figure 1-10.
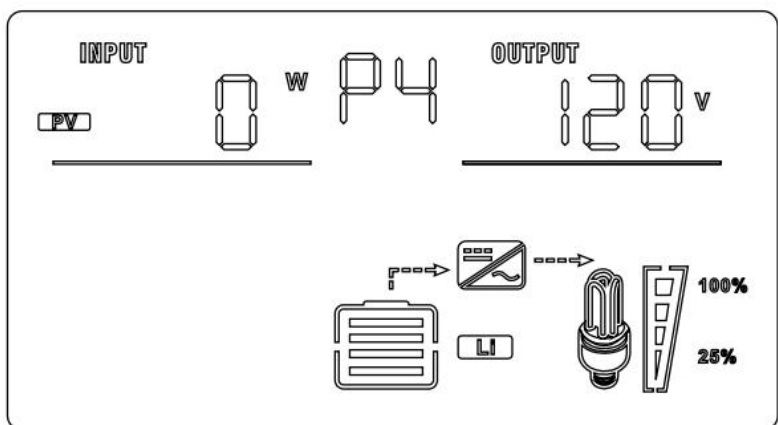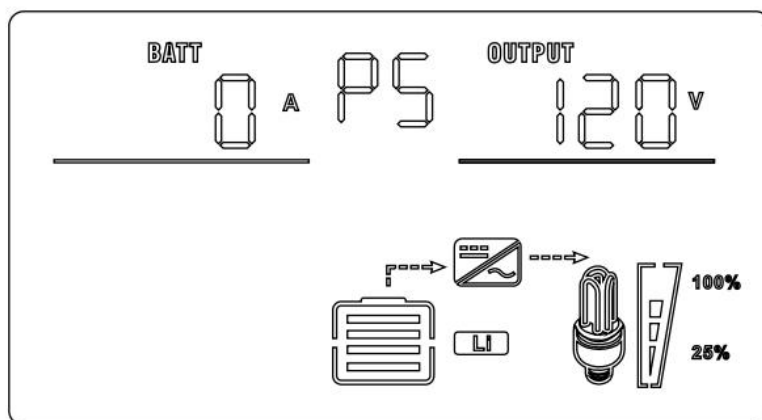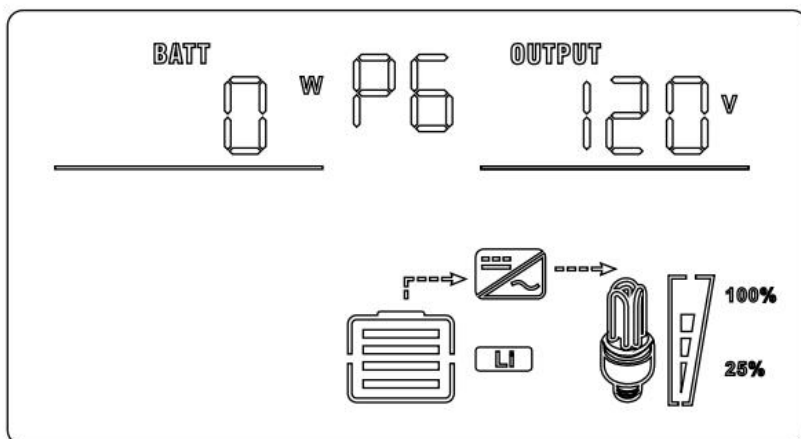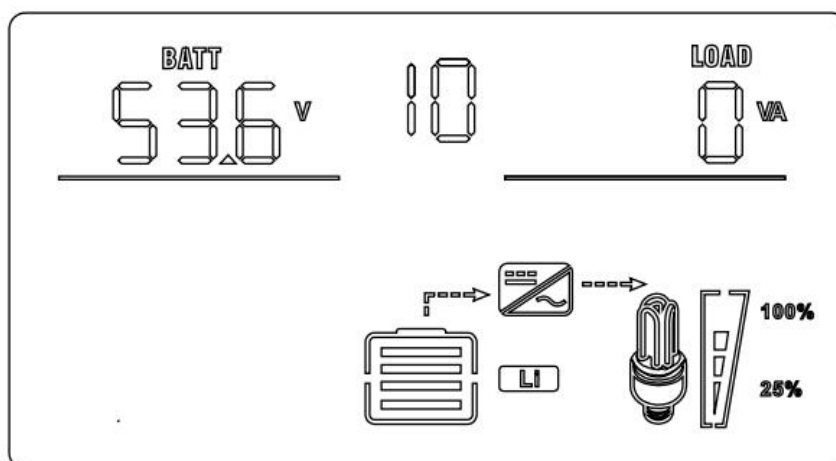
Figure 1-10 display page 10

Display Page 11 : Battery information, display the battery voltage and output power, as shown in Figure 1-11.
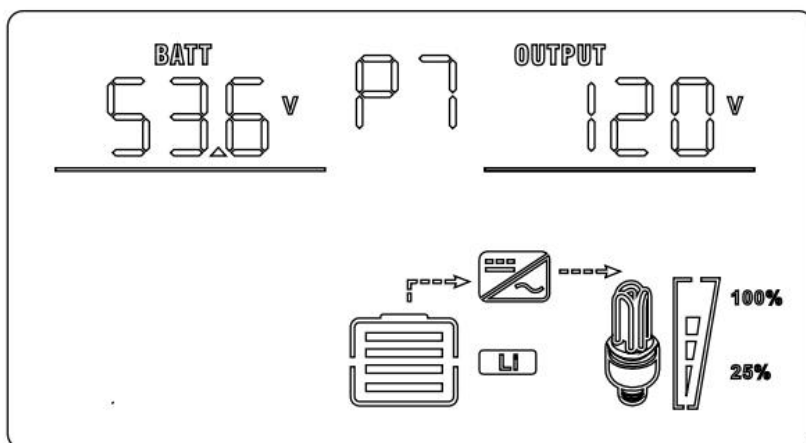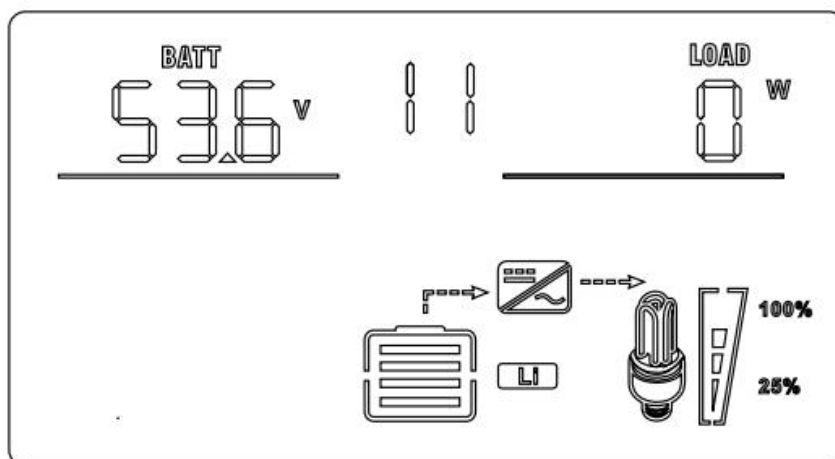
Figure 1-11 display page 11

Display Page 12 : Battery information,the upper left corner displays the battery voltage, and the upper right corner displays the battery discharging current, as shown in Figure 1-12.
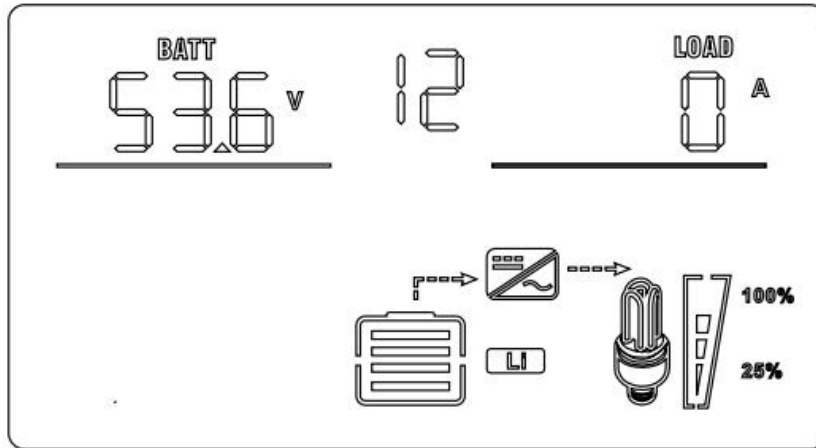
Figure 1-12 display page 12

Display Page 13 : Software version displays the inverter system software version, as shown in Figure 1-13.
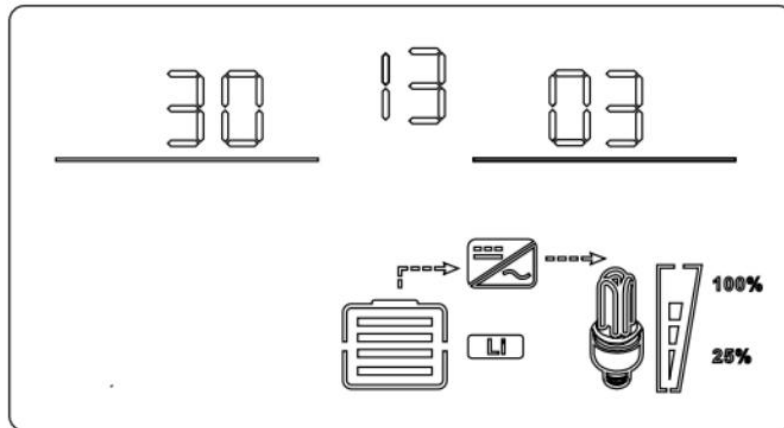
Figure 1-13 display page 13

Display Page 14 : Lithium battery temperature, SOC; when the BMS communication successfully, the upper left corner displays BMS temperature information; the upper right corner displays BMS SOC information,as shown in Figure 1-14.If the BMS communication fails, this page is not available.
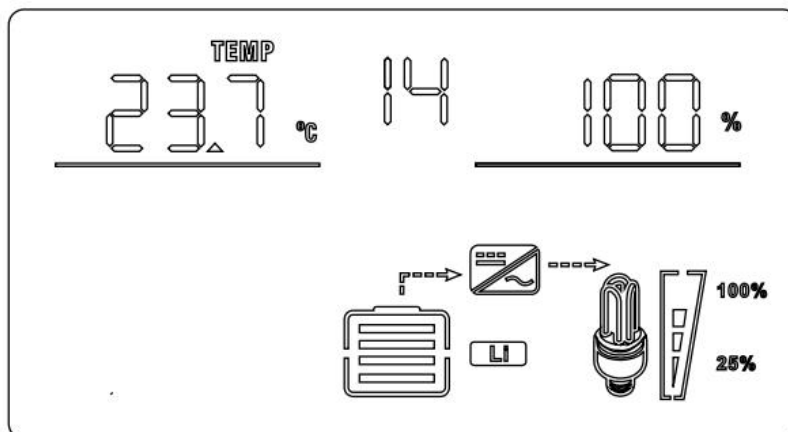
Figure 1-14 Display page 14
(battery temperature, SOC information of lithium battery)

Display Page 15 : After the successful BMS communication , the upper left corner shows the maximum battery voltage value that the battery charge is allowed to reach,and the upper right corner shows the maximum allowable charging current of the battery,as shown in Figure 1-15. If the BMS communication fails, this page is not available.(These two parameters are automatically set by the lithium battery BMS according to the battery's own conditions, and have nothing to do with the inverter parameters).
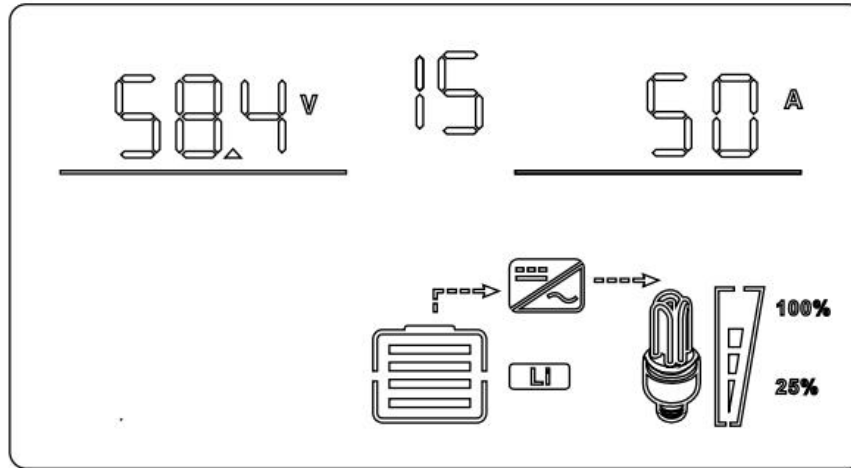
Figure 1-15 display page 15

Display Page : These are the information displayed when the machine is in standby mode.
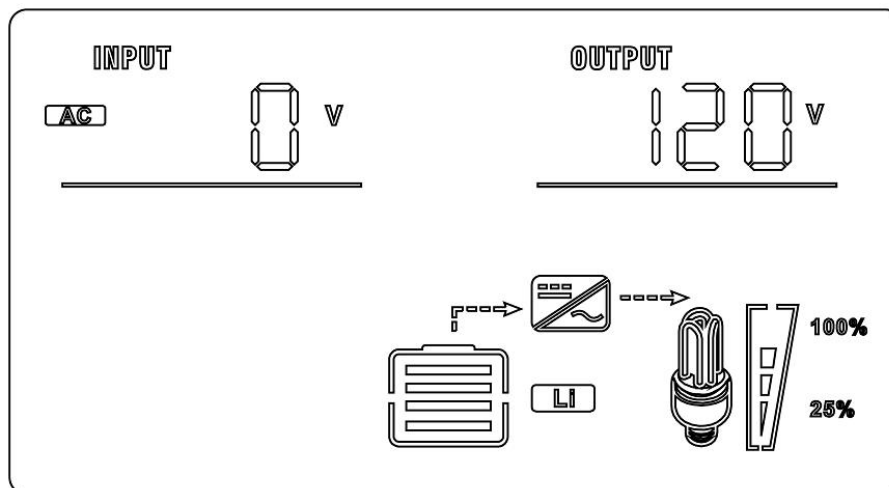
5.4 LCD setting

LCD display information switching is achieved by pressing the "UP" or "Down" button. The optional information switching commands are as follows:

Press and hold the button for 3 seconds and the device will enter the setting mode. Press the "UP" or "Down" key to select the setting item. Then press the "ENTER" button to confirm the selection or press the ESC button to exit.

Setting Programs:

Program	Description	Selectable option	
00	Exit setting mode	[00] ESC	Escape
01	Output source priority: To configure load power source priority	[01] UTL	Utility will provide power to the loads as first priority. Solar and battery energy will provide power to the loads only when utility power is not available.
		[01] SOL	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, Utility energy will supply power to the loads at the same time. The battery will provide energy in any of the following conditions -Solar and mains power unavailable -Solar power is low and mains power is not available
		[01] SBU	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 12.

02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	[02] 60A (default)	Setting range is from 10-100A
05	Battery type	[05] AGM (default)	Constant voltage charging voltage is 56.4V, float charging voltage is 54V.
		[05] USE	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
		[05] FLD	Flooded, Constant voltage charging voltage is 58.4V, float charging voltage is 54V.
06	Auto restart when overload occurs	[06] LRD(default)	Restart disable
		[06] LRE	Restart enable
07	Auto restart when over temperature occurs	[07] TRD(default)	Restart disable
		[07] TFE	Restart enable
09	Output frequency	[09] 60HZ(default)	When utility power is available, the device automatically adapts to the utility frequency. When utility power is unavailable, the output frequency can be set.
		[09] 50Hz	
10	Output voltage	[10] 120V(default)	Setting range is from 100V to 120V
11	Maximum utility charging current Note: If setting value in program 02 is smaller than that in program in 11, the inverter will apply charging current from program 02 for utility charger.	[11] 30A(default)	Setting range is from 10 to 80A
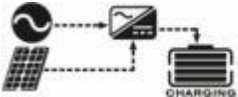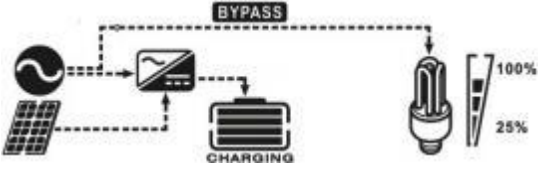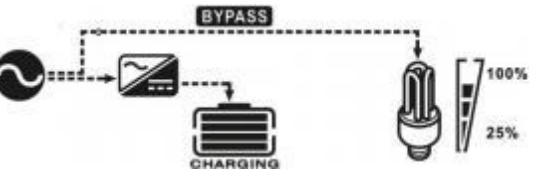
12	Setting voltage point back to utility source when selecting "SBU priority" in program 01.	[12] 46V(default)	Setting range is from 44V to 51V
13	Setting voltage point back to battery mode when selecting "SBU priority" in program 01.	[13] 54V (default)	Setting range is from 48-58V
16	Charger source priority: To configure charger source priority	[16] CUT	Utility will charge battery as first priority. Solar energy will charge battery only when utility power is not available.
		[16] CSO	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.
		[16] SNU(default)	Solar energy and utility will charge battery at the same time.
		[16] OSO	Solar energy will be the only charger source no matter utility is available or not.
		If this inverter/charger is working in Battery mode, only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient.	
18	Alarm control	[18] BON(default)	Alarm on
		[18] BOF	Alarm off
19	Auto return to default display screen	[19] ESP(default)	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.
		[19] REP	If selected, the display screen will stay at latest screen user finally switches.

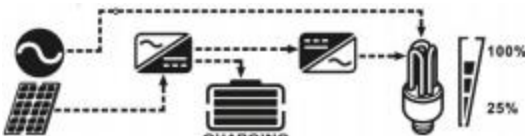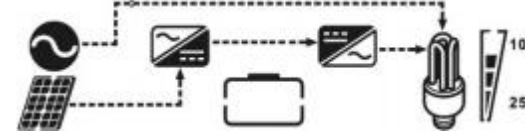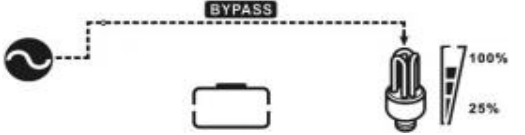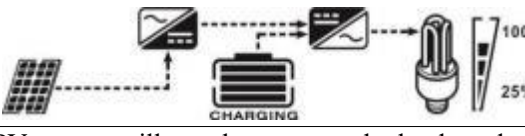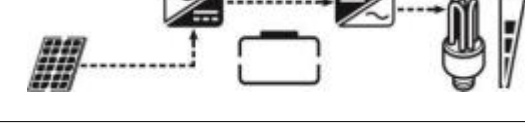| 20	Backlight control	[20] LON(default)	Backlight on
		[20] LOF	Backlight on
22	Beeps while primary source is interrupted	[22] AON(default)	Alarm on
		[22] AOF	Alarm on
23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	[23] BYD(default)	Bypass disable
		[23] BYE	Bypass enable
25	Record Fault code	[25] FEN(default)	Record enable
		[25] FDS	Record disable
26	Bulk charging voltage (C.V voltage)	[26] 56.4V (default)	If self-defined is selected in program 5, this program can be set up.Setting range is from 48.0V to58.4V.Increment of each click is 0.1V.
27	Floating charging voltage	default setting: 54V	If self-defined is selected in program 5, this program can be set up.Setting range is from 48.0V to 58.4V.Increment of each click is 0.1V.
29	Low DC cut-off voltage:	default setting: 42V	If self-defined is selected in program 5, this program can be set up. Setting range is from 42.0V to 48.0V.Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.
30	Battery equalization If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	EDS(default)	Battery equalization disable (default)
		[30] EEN	Battery equalization
31	Battery equalization voltage	[31] 58.4V(default)	Setting range is from 48.0V to 59.0V.Increment of each click is 0.1V.

33	Battery equalized time	[33] 60 mins(default)	Setting range is from 5mins to 900mins. Increment of each click is 5mins.
34	Battery equalized timeout	[34] 120 min(default)	Setting range is from 5mins to 900mins. Increment of each click is 5mins.
35	Equalization interval	[35] 30 day(default)	Setting range is from 0~90 days Increment of each click is 1 day.
36	Equalization activated immediately	[36] ADS(disable default)	If equalization function is enabled in program 30, this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "E9" . If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 35 setting. At this time, " E9 " will not be shown in LCD main page.
		[36] AEN	Enable
37	Discharge alarm SOC Settings	[37] 15%(Disable)	When the capacity is below the specified value, the SOC alarm is triggered (valid when BMS communication is normal).
38	Discharge cut-off SOC setting	[38] 5%(default)	When the capacity is below the specified value,the discharge stops (valid when BMS communication is normal).
39	Charging cut-off SOC setting	[39] 100%(default)	When the capacity is greater than the specified value, the charging stops (valid when BMS communication is normal).
40	Switch inverter output SOC setting	[40] 10%(default)	When the capacity is greater than the specified value, switch to inverter output mode (valid when BMS communication is normal).
41	Switch utility SOC setting	[41] 10%(default)	When the capacity is below the specified value, switch to utility (valid when BMS communication is normal).

5.5 Operating Mode Description

Operation mode	Operation mode	LCD display
Standby mode /Power save mode Note: *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output. *Power save mode:In power save mode, when the load power is lower than 50W or the load cannot be detected, the inverter without AC output.	No output is supplied by the unit but it still can charge batteries.	Charging by utility and PV energy Charging by utility Charging by PV energy No charging
Fault mode Note: *Fault mode: Errors are caused by inside circuit error or external reasons, such as over temperature, output short circuited and so on.	PV energy and utility can charge batteries.	Charging by utility and PV energy. Charging by utility Charging by PV energy No charging
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by utility and PV energy Charging by utility.

Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	If "solar first" is selected as output source priority and solar energy is not sufficient to provide the load, solar energy and the utility will provide the loads and charge the battery at the same time.
		If "solar first" is selected as output source priority and battery is not connected, solar energy and the utility will provide the loads.
		Power from utility.
Battery Mode	The unit will provide output power from battery and PV power.	Power from battery and PV energy
		PV energy will supply power to the loads and charge battery at the same time.
		Power from battery only.
Solar mode	The unit will provide output power from PV power.	Power from PV energy only.

5.6 Battery Equalization Description

Equalization function is added into charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top. Equalization also helps to remove sulfate crystals that might have built up on the plates. If left unchecked, this condition, called sulfation, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize battery periodically.

How to Apply Equalization Function

You must enable battery equalization function in monitoring LCD setting program 30 first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in program 35.

2. Active equalization immediately in program 36.

When to Equalize
In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.
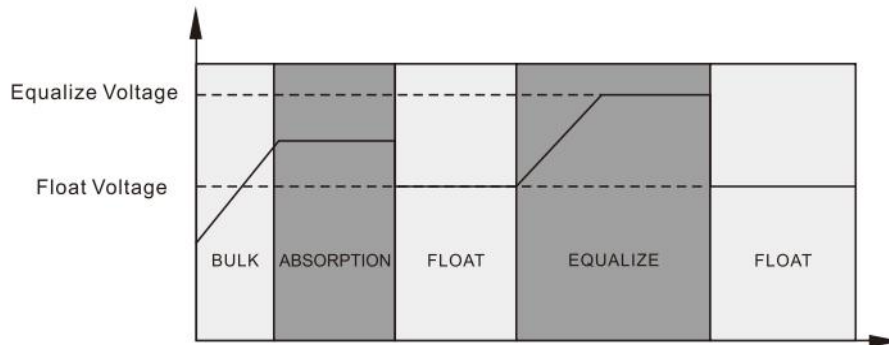

Equalize charging time and timeout
In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalized time is arrived.
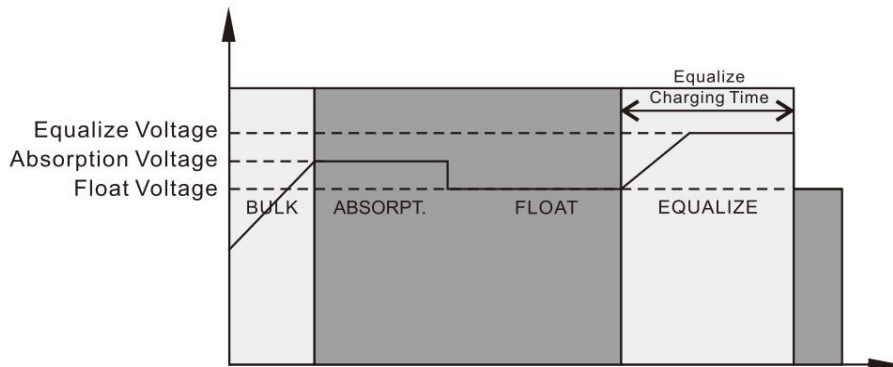
However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.
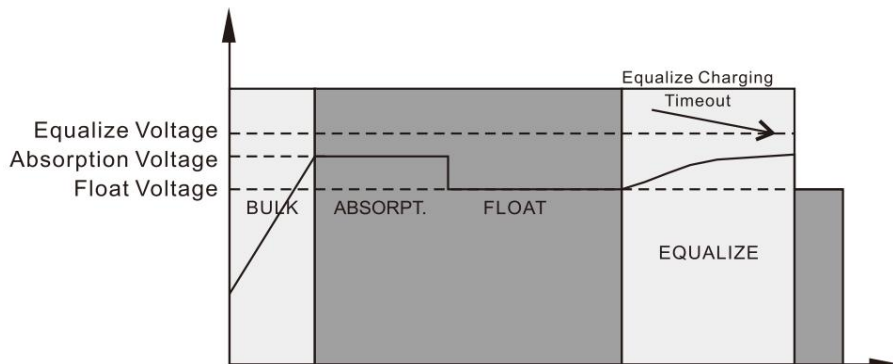
5.7 Fault Code

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off	01
02	Over temperature or NTC is not connected well.	02
03	Battery voltage is too high	03
04	Battery voltage is too low	04
05	Output short circuited or over temperature is detected by internal converter components.	05
06	Output voltage is too high.	06
07	Overload time out	07
08	Bus voltage is too high	08
09	Bus soft start failed	09
51	Over current or surge	51
52	Bus voltage is too low	52
53	Inverter soft start failed	53
55	Over DC voltage in AC output	55
57	Current sensor failed	57
58	Output voltage is too low	58
59	PV voltage is over limitation	59

5.8 Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	01
02	over-temperature	None	02
03	Battery is over-charged	Beep once every second	03
04	Low battery	Beep once every second	04
07	Overload	Beep once every 0.5 second	07 OVER LOAD
10	Output power derating	Beep twice every 3 seconds	10
15	PV energy is low.	Beep twice every 3 seconds	15
16	High AC input (>280VAC) during BUS soft start	None	16
E9	Battery equalization	None	E9

6 OTHER FUNCTION

6.1 Dry contact signal

This dry contact could be used to deliver signal to external device when battery voltage

reaches warning level.

1.In normal,NC-C close,NO-C open
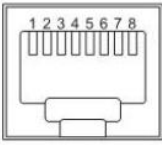
2.When battery voltage reach to low voltage disconnect point,NO-C close,NC-C open,at this

time, the NO-C point can drive the resistive load of 125VAC/0.5A and 30VDC/2A
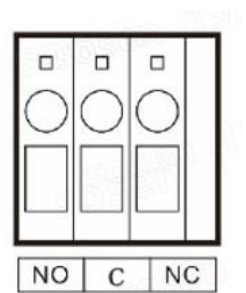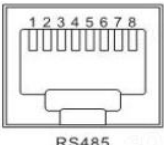
6.2 Communication Connection

Provide two communication interfaces: one for WIFI and the other for direct communication with lithium battery

BMS.Below chart show RJ45 Pins definition:

WIFI communication port:RJ 45
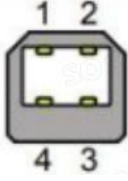
Pin	Definition	description
1	TXD232	WIFI send port
2	RXD232	WIFI receive Port
3	NC	
4	VCC	power supply
5	NC	
6	NC	
7	NC	
8	GND	Ground

BMS port:RJ45

Pin	Definition	description
1	RS485B	485B communication interface
2	RS485A	485A communication interface
3	NC	
4	CAN-BUS+	CAN+ communication interface
5	CAN-BUS-	CAN-communication interface
6	NC	
7	NC	
8	NC	

6.3 USB communication

This is a USB communication port through which you can communicate with the optional host software. To use this port, you need to install the corresponding USB-to-serial port chip CH340T driver on the computer.

Pin	Definition	description
1	VCC	power supply(External power supply from USB cable)
2	D-	USB communication interface
3	D+	USB communication interface
4	GND	Ground interface

7 CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT

7.1 Overview

Every inverter is already installed with anti-dusk kit from factory. Inverter will automatically detect this kit and activate internal thermal sensor to adjust internal temperature. This kit also keeps dusk from your inverter and increases product reliability in harsh environment.

7.2 Clearance and Maintenance
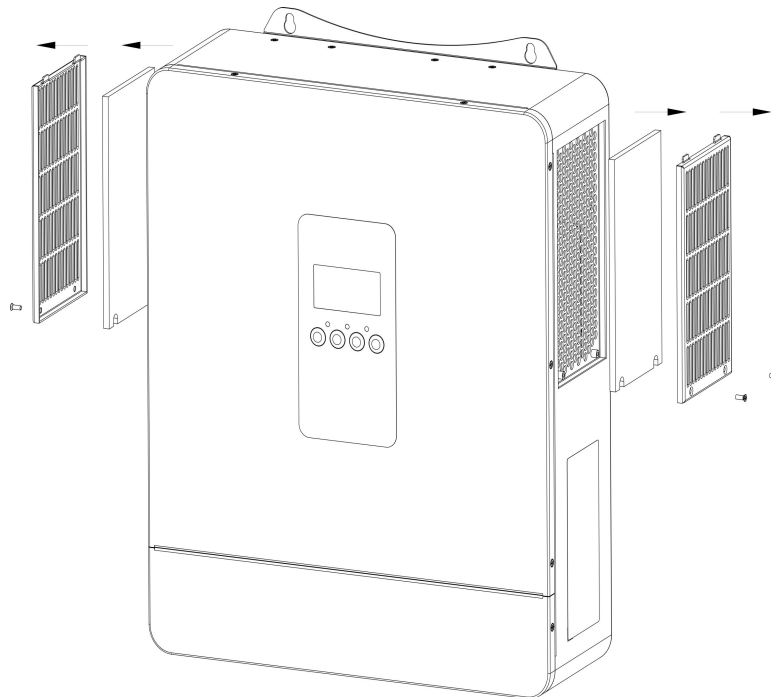
Step 1: Please loosen the screw in counterclockwise direction on the top of the inverter.

Step 2: Then, dustproof case can be removed and take out air filter foam as shown in below chart.

Step 3: Clean air filter foam and dustproof case. After clearance, re-assemble the dust-kit back to the inverter.

NOTICE: The anti-dust kit should be cleaned from dust every one month.

8 SPECIFICATIONS

Model	SSA-HL5K-P1US
Line Mode	
`Nominal Input Voltage	110/120Vac
Input Voltage Range	(90Vac~140Vac)±2%
Nominal Input Frequency	50Hz/60Hz (Auto detection)
Low Loss Frequency	40± 1Hz
Low Loss Return Frequency	42± 1Hz
High Loss Frequency	65± 1Hz
High Loss Return Frequency	63± 1Hz
Low Loss Voltage	90Vac±7V (Appliances)
Low Loss Return Voltage	95Vac±7V (Appliances)
High Loss Voltage	140Vac±7V
High Loss Return Voltage	135Vac±7V
Max AC Input Voltage	150Vac
Output Short Circuit Protection	Circuit Breaker
Max. Efficiency (Line Mode)	92%
Maximum bypass overload current	63A
Inverter Mode	
Output Voltage Waveform	Pure Sine Wave
Rated Output Power(W)	5000W
PF	1
Output Voltage(Vac)	120Vac±5%
Frequency (Hz)	50Hz/60Hz
Peak Efficiency	92%
Overload Protection	0.2S@≥200%; 5s@≥130% load; 10s@105%~130% load;
Peak Power	10000VA
Motor load capacity	4HP
Output Short Circuit Protection	Yes
Bypass breaker current	63A
Rated battery voltage	48V
Battery voltage range	40.0Vdc~60Vdc ± 0.6Vdc
Save power mode	load≤50W
AC Output	
Rated power(W)	5000W
Apparent power(VA)	5000VA
Max. Output current (A)	41.7A
THDI	< 3%
Rated voltage	120Vac
Frequency	50Hz/60Hz
Utility Charging	
Battery type	Lithium/Lead-acid
Max. charging current	40A
Charging current error range	± 5Adc
Charging Voltage range	40–58.4Vdc
Short Circuit Protection	Breaker&fuse
breaker current	63A
MPPT Solar Charging	
Maximum PV Array Open Circuit	500Vdc

Voltage	
MPPT Voltage Range	120-450Vdc
Start-up Voltage	150Vdc +/- 10Vdc
Battery voltage range	40-60Vdc
Max. PV Array Power	5500W
Max. PV input current	22A
PV charging current range	100A
Charging Short Circuit protection	fuse
Max. Combined charging current (PV+AC)	
Max. Combined charging current	100A
Charging Algorithm	3-Step
Charging voltage	Flooded battery (58.4Vdc) AGM/Gel battery (56.4Vdc)
Floating Charging Voltage	54.0Vdc
Charging Curve	
General Specifications	
EMC certificate levels	EN61000
Operating Temperature Range	-10°C ~ 55°C
Storage temperature	-25°C ~ 60°C
Humidity	5% to 95% Relative Humidity (Non-condensing)
Noise	≤60dB
Thermal Methods	Fan cooling
Communication	USB/RS485/RS232(WiFi)/Dry contact
Dimension (L*W*D)	441mm*350mm*124.5mm
Weight (kg)	14

[1]:The inverter battery output is as follows: 3000W at 55°C; 4000W at 50°C; 5000W at 40°C.

[2]:If the inverter's output power exceeds the derating limit within this temperature range, the inverter will shut down due to over-temperature protection. Users must wait for the temperature to drop and simultaneously reduce the load before restarting the inverter.

[3]:There may be some deviation in ambient temperature sampling, leading to a few degrees of variation in the temperature points for derating.

9 TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	LCD/LEDs and buzzer will be active for 3 seconds and then complete off.	The battery voltage is too low(<1.91V/Cell)	1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	1. The battery voltage is far too low. (<1.4V/Cell) 2. Internal fuse tripped.	1. Contact repair center for replacing the fuse. 2. Re-charge battery. 3. Replace battery.
Mains exist but the unit works in battery mode.	Input voltage is displayed as 0 on the LCD and green LED is flashing.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is flashing.	Insufficient quality of AC power.(Shore or Generator)	1. Check if AC wires are too thin or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS/Appliance)
	Green LED is flashing	Set "Solar First" as the priority of output source	Change output source priority to Utility first.
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on.	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
		Temperature of internal converter component is over 120°C.	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 02	Internal temperature of inverter component is over 100°C.	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 03	Battery is over-charged.	Return to repair center.
		The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.
	Fault code 01	Fan fault	Replace the fan.
	Fault code 06/58	Output abnormal (Inverter voltage below than 95Vac or is higher than 135Vac)	1. Reduce the connected load. 2. Return to repair center
	Fault code 08/09/53/57	Internal components failed.	Return to repair center.

	Fault code 51	Over current or surge.	Restart the unit, if the error happens again, please return to repair center.
	Fault code 52	Bus voltage is too low.	
	Fault code 55	Output voltage is unbalanced.	
	Fault code 59	PV input voltage is beyond the specification.	Reduce the number of PV modules in series.

Appendix: Approximate Back-up Time Table

Model	Load(VA)	Backup Time @ 48Vdc 100Ah (min)	Backup Time @ 48Vdc 200Ah (min)
5KW	500	490	1030
	1000	214	490
	1500	126	322
	2000	89	217
	2500	72	172
	3000	61	146
	3500	52	113
	4000	40	90
	4500	35	80
	5000	32	72

Note: Backup time depends on the quality of the battery, age of battery and type of battery. Specifications of batteries may vary depending on different manufacturers.