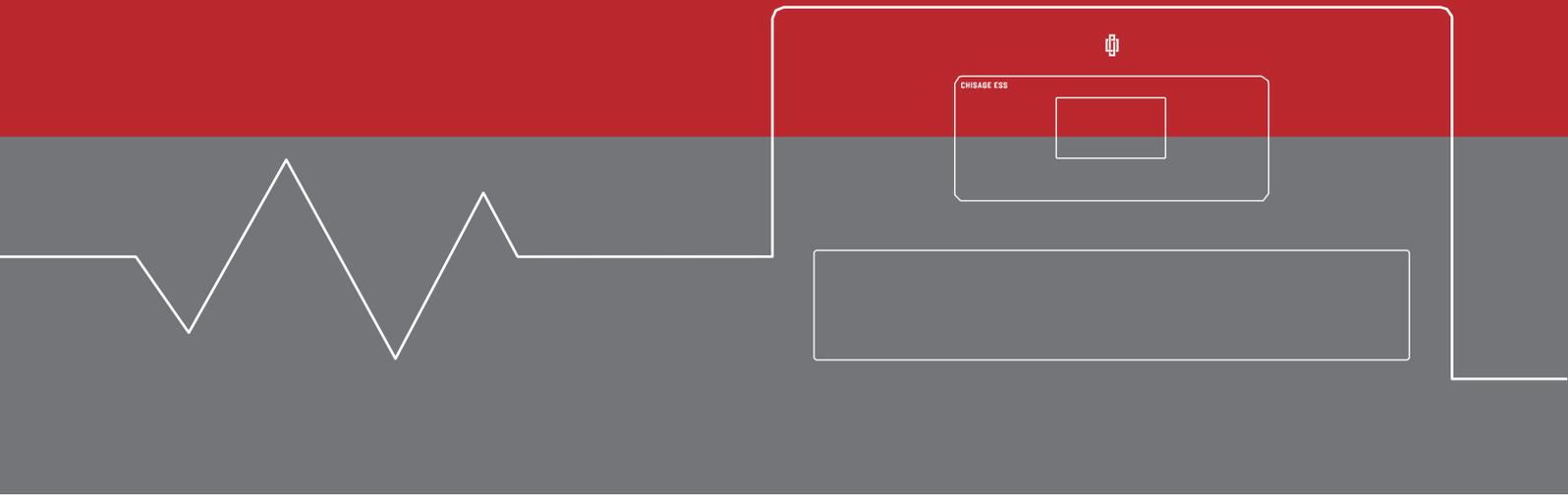


User Manual

Hybrid Invert-
er-Merc-20/25/29.9/30/35
/40/50/60G1-HE



CHISAGE ESS

🔍 www.chisageess.com

Contents

Cautions	1
1 General Introduction	2
1.1 General Description	2
1.2 Key Features and Performance	2
1.3 Product Overview	3
1.4 Product Size	5
1.5 System structure	6
1.6 Inverter parameter	7
2 Installation Instructions	8
2.1 Installation preparation	8
2.1.1 Installation Notes Reiterated	8
2.1.2 Installation environment, space requirements	8
2.1.3 Installation tool preparation	9
2.1.4 Checking Package Contents	9
2.2 Introduction of equipment terminal	12
2.3 Wall mount	15
2.4 Battery wiring work	17
2.4.1 Battery Power Cable Wiring	17
2.4.2 Battery communication cable connection	17
2.5 Power grid, load, GEN wiring	18
2.6 Photovoltaic wiring	19
2.7 CT wiring	22
2.8 Meter connection	23
2.9 Ground connection	23
2.10 WIFI connection	24
2.11 Stand-alone operation system diagram	24
3 Display and setup	25
3.1 Run data display instructions	25
3.1.1 Photovoltaic data	27
3.1.2 Battery data	29
3.1.3 Inverter data	31
3.1.4 Grid data	31
3.1.5 Load data	32
3.2 Run parameter setting	33
3.2.1 Battery parameter setting	33
3.2.2 Grid parameter setting	37
3.2.3 GEN port function settings	38
3.2.4 CT transformation ratio setting	40
3.2.5 Safety setting	40
3.2.6 Operating Mode Settings	42
3.2.7 System Setup	43
3.3 Events Display	43

3.4 Device Info.....	44
4 Operation and maintenance.....	45
4.1 Trial run.....	45
4.1 Stand-alone operation and logic description.....	45
4.1.1 Enter working mode to set path.....	46
4.1.2 Sell First.....	46
4.1.3 Zero Ex To Grid port.....	46
4.1.4 Zero Ex To CT.....	46
4.1.5 Time curve mode.....	47
4.2 Parallel operation and logical explanation.....	47
4.2.1 Set entry path description.....	47
4.2.2 Parallel operation logic.....	48
4.2.3 Parallel system wiring diagram.....	49
4.3 Example of five parallel inverter.....	52
4.3.1 Grid and load connection.....	52
4.3.2 Parallel cable connection and check.....	52
4.3.3 ON-Grid startup parallel.....	53
4.3.4 Off-grid startup parallel.....	54
4.3.5 Shut down the Inverter.....	54
4.4 Fault alarm and handling.....	54
4.5 Product routine maintenance suggestions.....	59
4.5.1 Routine inspection.....	59
4.5.2 Monthly inspection.....	59
4.5.3 Quarterly inspection.....	59
5 Transportation and storage.....	60
5.1 Product Shipping Requirements.....	60
5.1.1 Logistics.....	60
5.1.2 Unloading and handling.....	60
5.2 Product storage environment requirements.....	60
6 Legal Notices.....	61
7 Attachments.....	62
Network port definition description.....	62
CT size and model.....	64
Hybrid Inverter data.....	64

Cautions

- Before using this product, please read the instruction manual carefully.
- Non-professionals should not disassemble the machine, wrong reassembly may cause electric shock or fire. If you need maintenance or repair, please contact the after-sales service center.
- For your safety, please disconnect all power and cables of this equipment before maintenance or cleaning.
- Note: Non-professionals are not allowed to install this device and battery.
- In order to ensure the best working condition of this device, please select the appropriate cable size correctly.
- Please try to avoid using metal tools near the battery. If you must use it, please be careful. Dropping the tool may cause sparks or short circuits on the battery or other electrical components, or even cause an explosion.
- When disconnecting the AC or DC terminals, please strictly follow the installation steps. For details, please refer to the "Installation" section of this manual.
- Grounding Instructions - This equipment should be connected to a permanently grounded wiring system. Be sure to follow local requirements and regulations when installing this equipment.

Do not short-circuit the AC output and DC input, and do not connect the mains when short-circuited.

1 General Introduction

This manual mainly introduces product information, functional operation, equipment installation and maintenance guidelines. This brochure does not cover all information related to photovoltaics.

1.1 General Description

This product, a photovoltaic energy storage integrated system (an integrated energy conversion unit is designed for DC/AC power conversion in combined photovoltaic and energy storage systems), uses power electronic control technology. It enables coordinated control of both photovoltaic and battery storage outputs to stabilize power fluctuations from photovoltaic cells. Through energy storage conversion, it delivers AC power that meets standard requirements for powering loads.

1.2 Key Features and Performance

This product is a hybrid inverter that integrates photovoltaic power generation with energy storage to deliver high power output and a stable AC power. It is specifically designed to support both residential and industrial hybrid systems, making it suitable for self-consumption setups and battery backfeed applications. To fulfill different requirements, the inverter can function in both grid-connected and off-grid modes, and multiple units can be connected in parallel to meet the demands of larger industrial systems.

The hybrid inverter incorporates advanced digital control technology, optimizing control performance and enhancing system reliability.

Key features include:

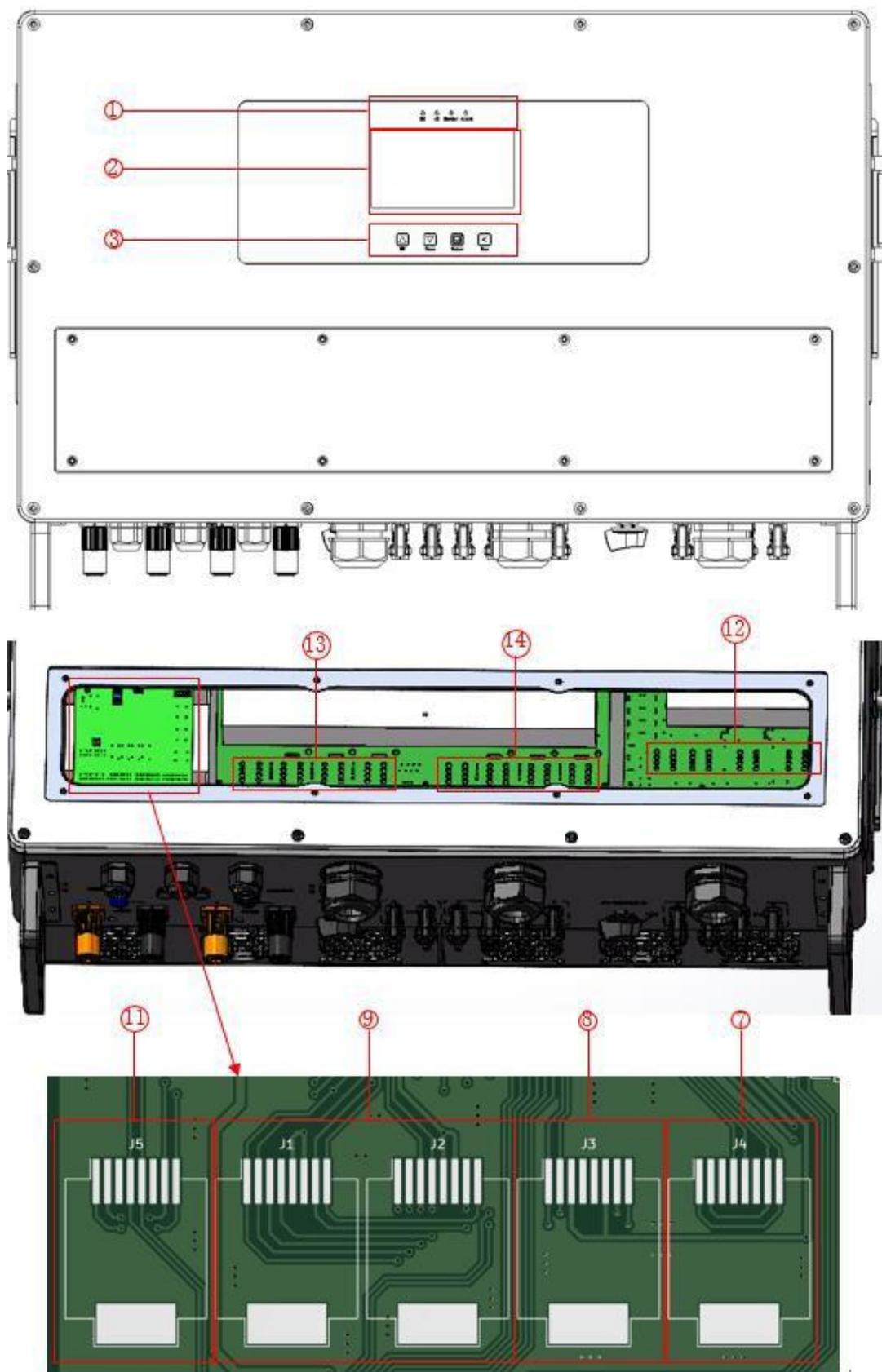
- Intelligent management system and multiple operating modes to meet diverse customer requirements.
- High scalability, supports parallel operation with inverters of different power ratings and also it can support up to 20 inverters in parallel operation.
- Grid-connected and off-grid mode switching offers strong overload capacity by tolerating 110% overload for up to 2 hours and supporting 100% unbalanced loads.
- Large color touchscreen, supports remote monitoring & control, updates via computer & smartphone. Operational settings for inverter and battery can be adjusted directly through the touchscreen.
- IP65 protection, compact, lightweight, and easy to install.
- Five MPPT (Maximum Power Point Tracking) inputs, flexible module configuration.
- Dedicated AC input for diesel generators, supports energy storage from diesel generators.
- Interfaces for smart load and AC coupling make it suitable for various applications.
- PV arc fault detection and built-in lightning protection for photovoltaic inputs.
- Reactive power regulation capability.
- Comprehensive safety features including over-temperature, over-current, short-circuit, anti-islanding, and other protections, ensuring safe, stable, and reliable system operation.

1.3 Product Overview

The appearance of this product and its various descriptions are shown in Figure 1.1 and Table 1.1 below.

Table 1.1 Description of product components

No.	Definition	Description
1	Indicator light	
2	LCDdisplay screen	
3	Function buttons	
4	Battery forced start button	
5	PV input knob	
6	Battery input interface	
7	ModBUS interface	
8	Meter-485 interface	
9	Parallel communication interface	
10	CT and other port	
11	BMS interface	
12	Grid switch	
13	Load interface	
14	Gen interface	
15	PV input interface	With 5 MPPT
16	WIFI interface	



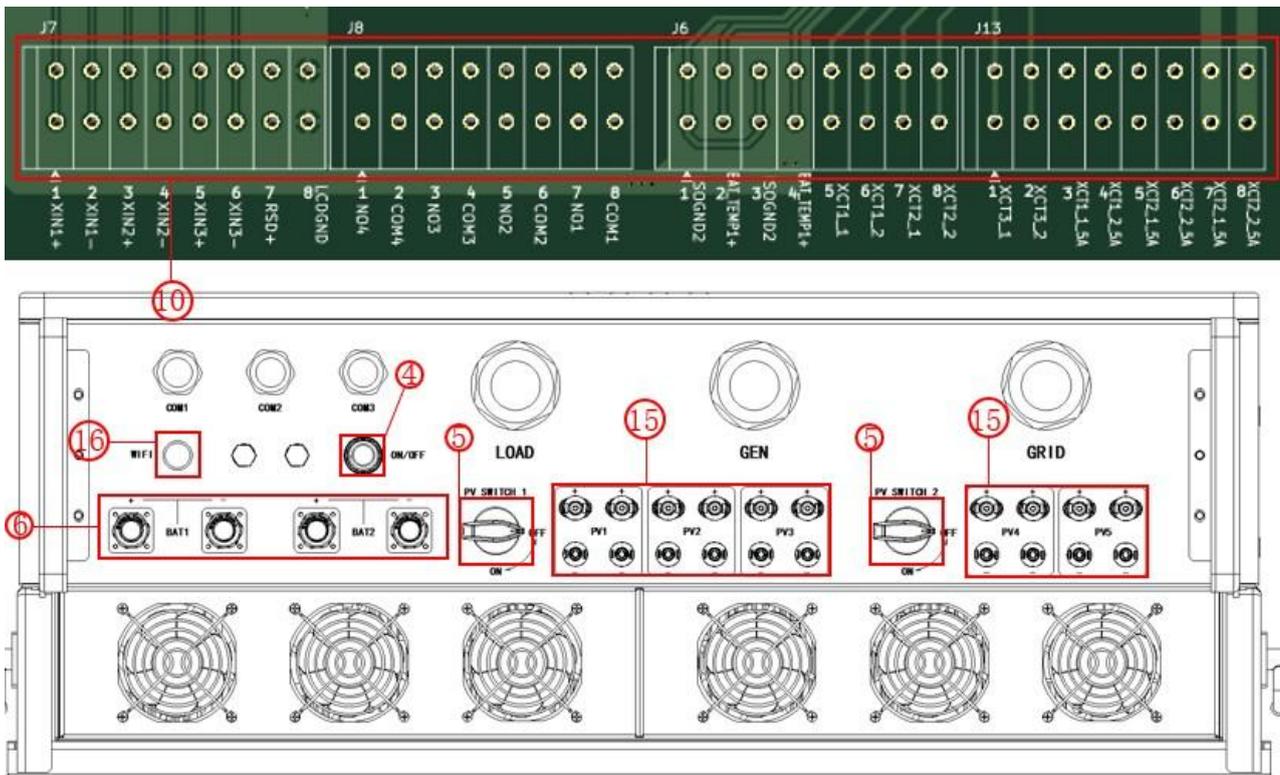
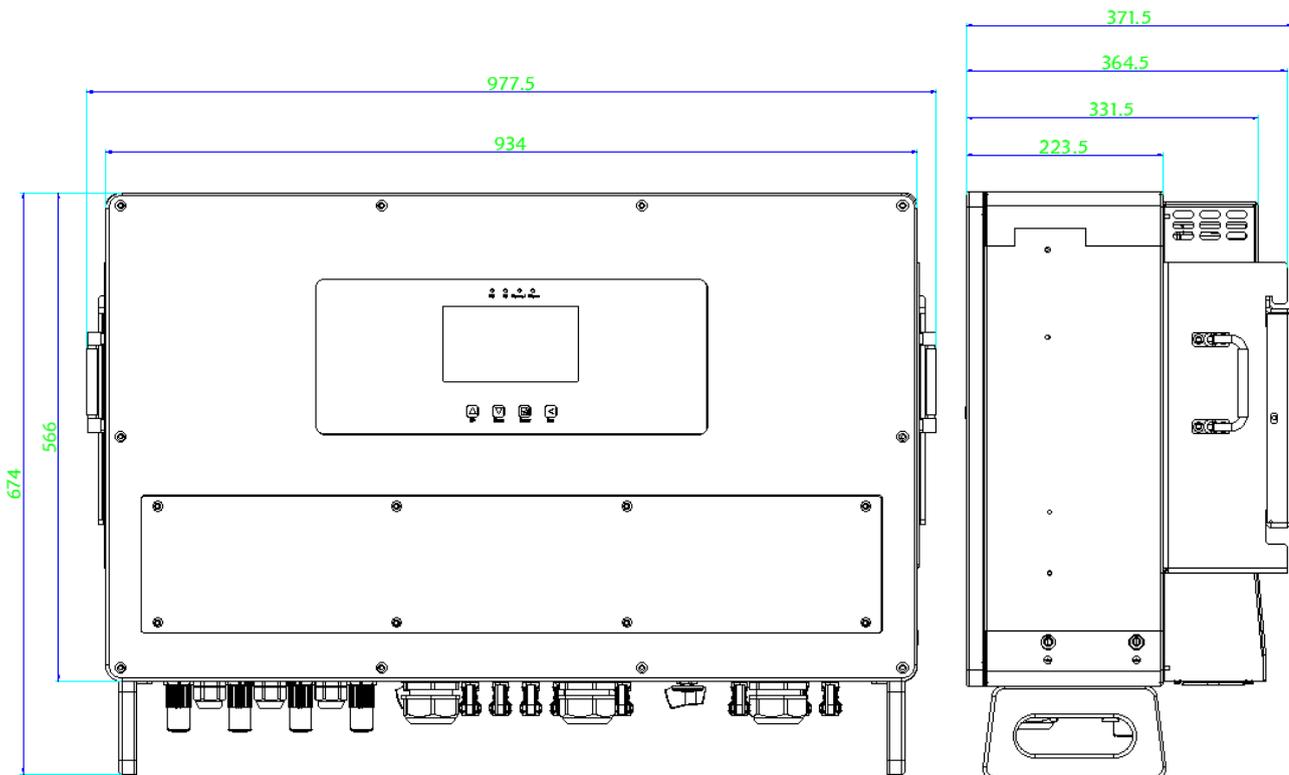
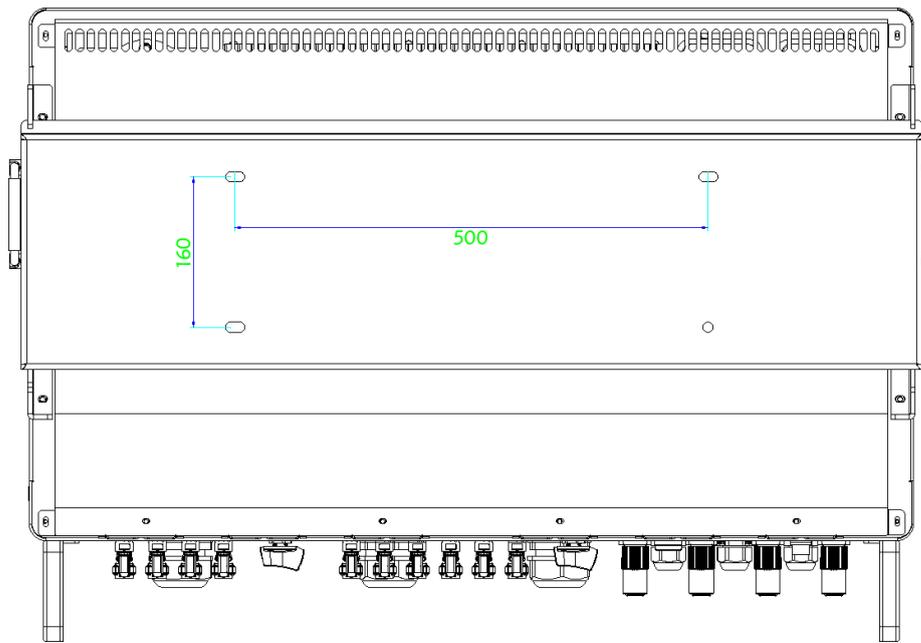


Figure 1.1 Overview of Hybrid Inverter Appearance

1.4 Product Size





- Size (W*H*D)(mm): 665*976*371
- Weight (kg): 109.3

1.5 System structure

As shown in Figure 1.2, it shows the basic application of the solar-storage integrated machine, and its complete operating system also includes: diesel generators, power grids, and photovoltaic modules. Depending on your requirements, other possible system architectures are available from your system integrator. The device can power a variety of appliances in a home or office environment, including motor-type appliances such as refrigerators and air conditioners

SOLAR HYBRID C&I SYSTEM

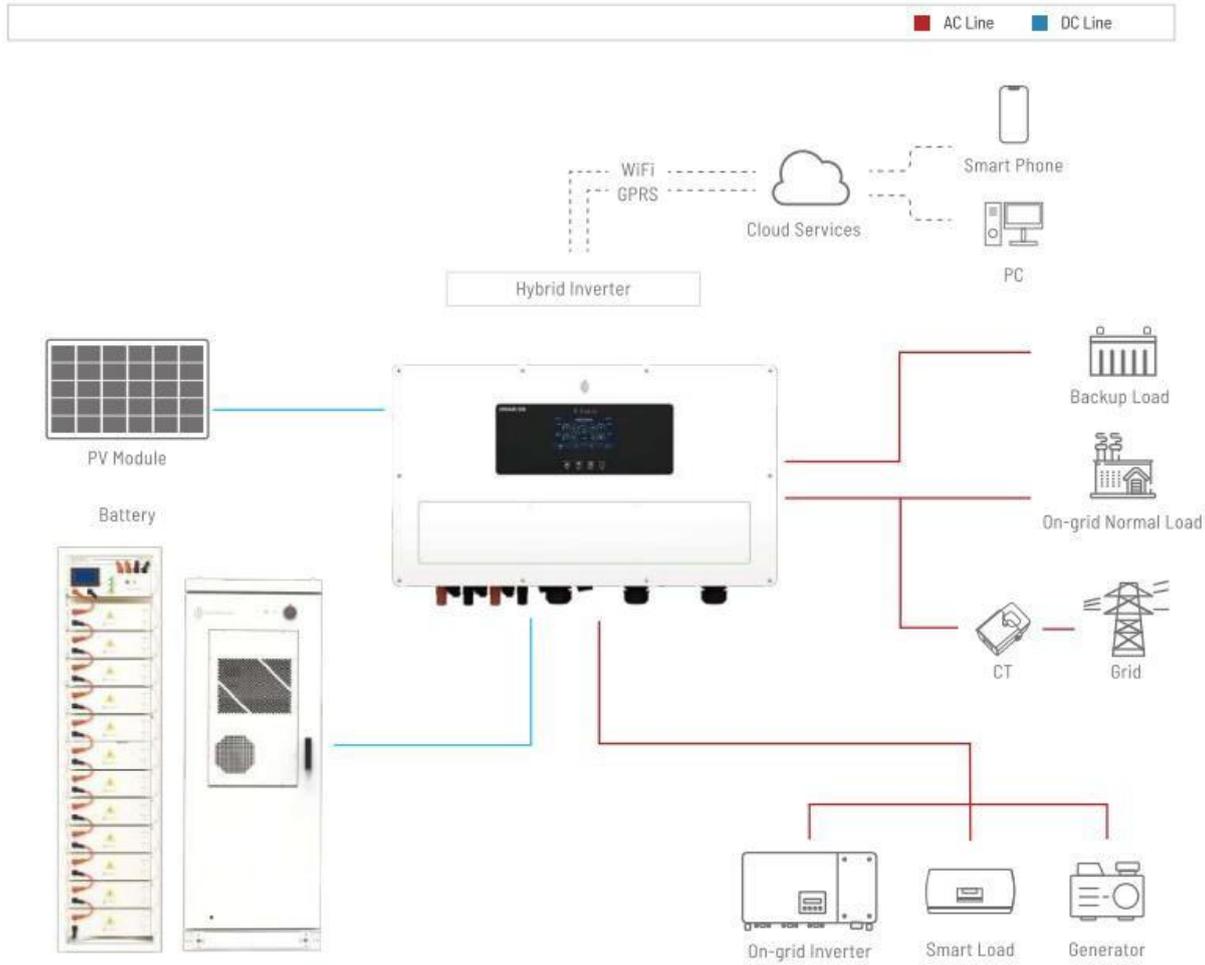


Figure 1.2 Complete operation system of hybrid inverter

1.6 Inverter parameter

The detailed technical specifications of this equipment are detailed in the annex.

2 Installation Instructions

2.1 Installation preparation

2.1.1 Installation Notes Reiterated

This device is designed for outdoor use IP65 , please ensure that the installation site meets the following conditions:

- out of direct sunlight.
- Not in areas where highly flammable materials are stored.
- Not in potentially explosive area.
- Do not expose directly to cold air.
- Keep away from TV antennas or antenna cables.

2.1.2 Installation environment, space requirements

To ensure the normal operation of the hybrid inverter, please install the equipment in a controlled environment. At the same time, in order to avoid overheating of the energy storage converter module, please keep the storage device ventilated smoothly. The ventilation holes and fans must not be blocked by sundries. The installation site must meet the following conditions:

- 1 Close to the power supply, easy to distribute power.
- 2 Clean and dust-free environment.
- 3 The altitude does not exceed 2000m, if it exceeds, the relevant national standards need to be installed for derating.
- 4 The ambient temperature is $-45\sim 60^{\circ}\text{C}$.
- 5 No corrosive, explosive and insulating gas and conductive dust, and keep away from heat sources.
- 6 No vibration and bumps, and the vertical inclination does not exceed 5%.
- 7 If the energy storage converter module operates in an air-conditioned environment around 20°C , it will improve reliability and prolong service life.

Consider the following points before choosing an installation location:

- For installation, please choose a vertical wall with strong load-bearing capacity, suitable for installation
- Install this inverter at the line of sight level so that the LCD display can be read at any time.
- The ambient temperature should be between -45°C and 60°C to ensure the best operation.
- Please install the equipment in a position with sufficient distance reserved, as shown in figure2.1 to ensure sufficient heat dissipation and enough space to remove the cable. For proper air

circulation to dissipate heat, leave a gap of approximately 500mm. Lateral 500mm, upper and lower 500mm, and anterior outflow of 500mm.

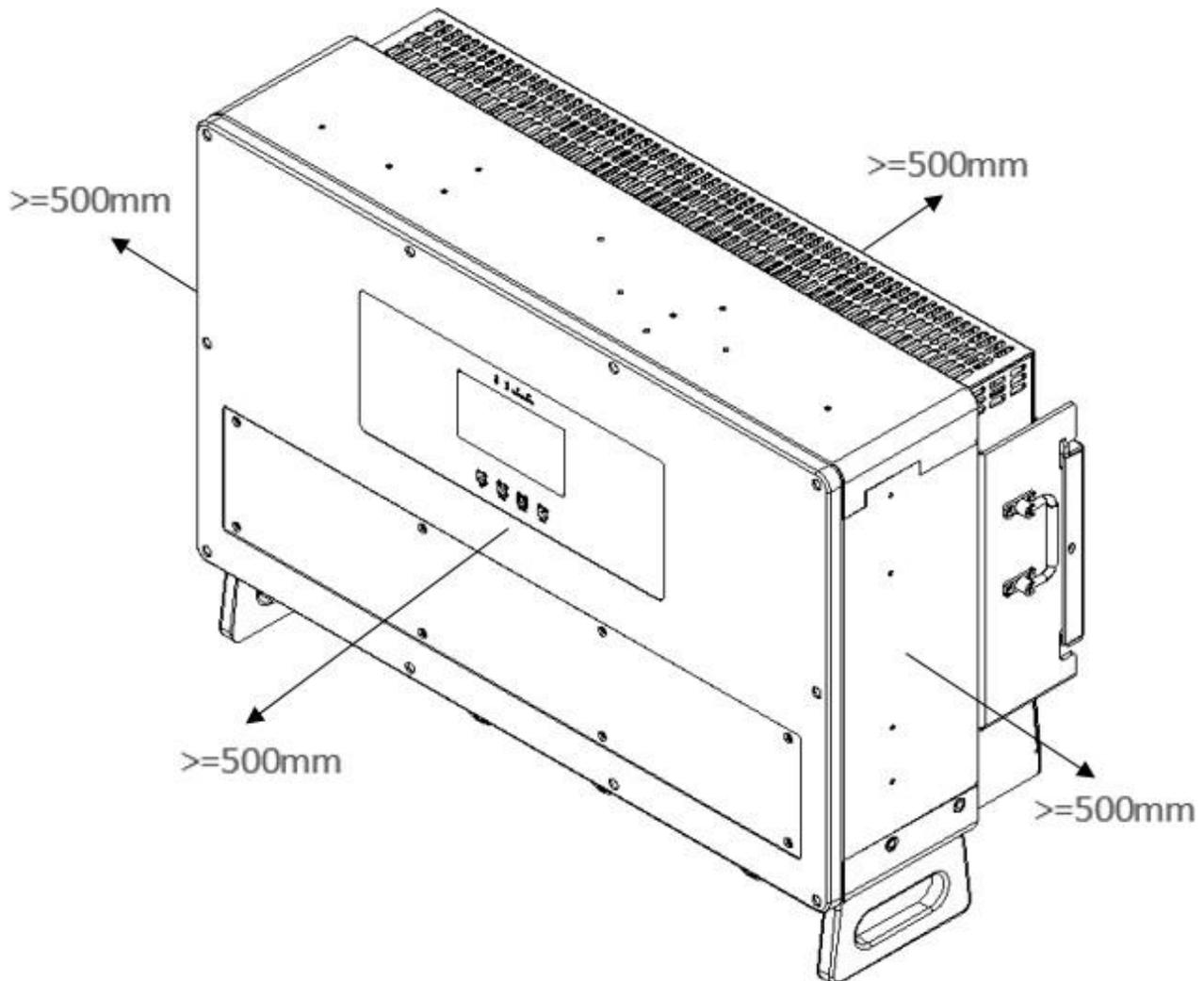


Figure 2.1 recommended reserved distance around the equipment

2.1.3 Installation tool preparation

Phillips screwdriver (specification: PH2, moderate length), socket (for M4, M8, M10 hexagonal screws).

2.1.4 Checking Package Contents

Before installation, please inspect the equipment and ensure that the packaging is not damaged. The package you received should contain the items shown in Figure 2.2 and listed in Table 2.1.

Table 2.1 Product list details

No.	Item name/specification	Quantity	Remarks
1	Inverter this equipment	1	
2	User manual	1	Place it in the box
3	Shipment inspection report	1	
4	M1.9501.0Y001.02 mounting bracket	1	
5	Hardware/screws/stainless steel built-in expansion screws, hexagonal internal expansion bolts,M10*80	4	For securing the chassis
6	Allen stainless steel combination screws M6X16	4	For fixing small enclosures
7	Allen stainless steel combination screws M4X12	4	For fixing large enclosures
8	Wi-Fi Stick	1	Shipped with the shipment
9	Current sensor/CTK160702 300A/5A class 1	3	
10	Communication cable/cat5e super 5 category 2m	1	
11	CAN parallel wire/twisted pair shielded wire 2m	1	For parallel operation
12	PV input connector/MC4/line end female end/H4CFD2TMS/nut with pin	10	
13	PV input connector/MC4/line-end male/H4CMD2TMS/nut with pin	10	
14	CHNT DTSU666 Smart Meter	1	Optional
15	Battery Temperature Sensor/NTC Temperature Sensor B3950 10K thermistor, stainless steel waterproof probe 3 meters long	1	Optional
16	Certificate	1	
17	Warranty card	1	
18	PE transparent bag/transparent ziplock bag 160*320	3	Assembly accessories, accessories, etc
19	Excipients / environmental protection / desiccant / 5g / pack	3	Packed in a box
20	L-shaped 3mm hexagon wrench	1	Optional
21	T-shaped 8mm hexagon wrench	1	
22	Battery input plug connector accessory	1	two sets of batteries

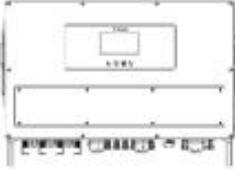
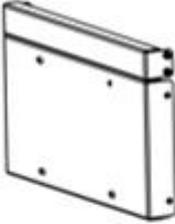
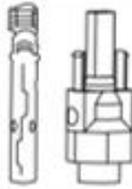
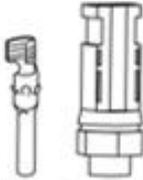
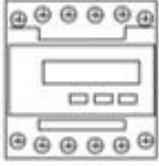
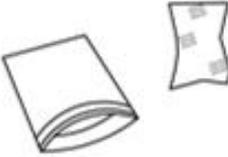
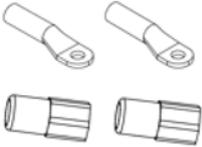
 <p>Hybrid Inverter X1</p>	<p>User manual</p> <p>User manual X1</p>	<p>Shipment inspection report</p> <p>Shipment inspection report X1</p>	<p>Certificate of approval</p> <p>Certificate of approval X1</p>
<p>Warranty Card</p> <p>Warranty Card X1</p>	 <p>Wallmounting basket X1</p>	 <p>Stainless steel anti-collision bolt M8X80 X4</p>	 <p>Allen stainless steel combination screws M6X16 X4</p>
 <p>PV input connector/ MC4 line end male/H4CMD2TMS/ with pin nut X3</p>	 <p>PV input connector/ MC4 line end female/H4CFD2TMS/ with pin nut X3</p>	 <p>Wifi-stick X1</p>	 <p>Allen stainless steel combination screws M4X12 X4</p>
 <p>Communication cable X 2m</p>	 <p>Can parallel line X 2m</p>	 <p>(Optional) NTC Battery Temperature Sensor X1</p>	 <p>(Optional) Sainless steel screws /hexagonal stainless steel combination screws M3X12 X4</p>
 <p>(Optional) Smart Meter X1</p>	 <p>Self-sealing bags x5 Desiccant x3</p>	 <p>(Optional) L-shaped 3mm hexagon wrench X1</p>	 <p>Sensor Clamp X3</p>
 <p>Battery Plug connectors accessories X1</p>			

Figure 2.2 Product list details

2.2 Introduction of equipment terminal

The function of the keys near the LCD is shown in figure 2.3. The function of the connection socket and through hole at the bottom of the equipment is shown in figure 2.4. the function of the button and knob on the side of the equipment is shown in figure 2.5. the internal and external interface board of the equipment is shown in figure 2.6. the corresponding terminal function is shown in Table 2.2.

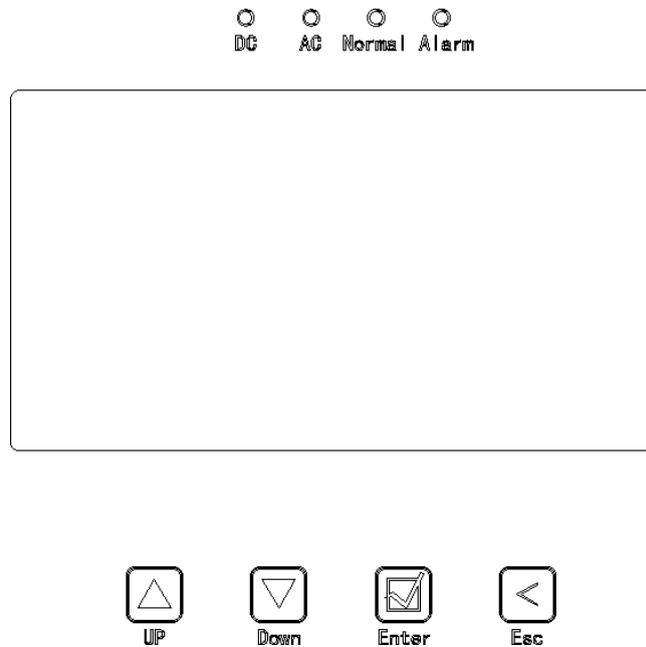


Figure 2.3 key definition near LCD

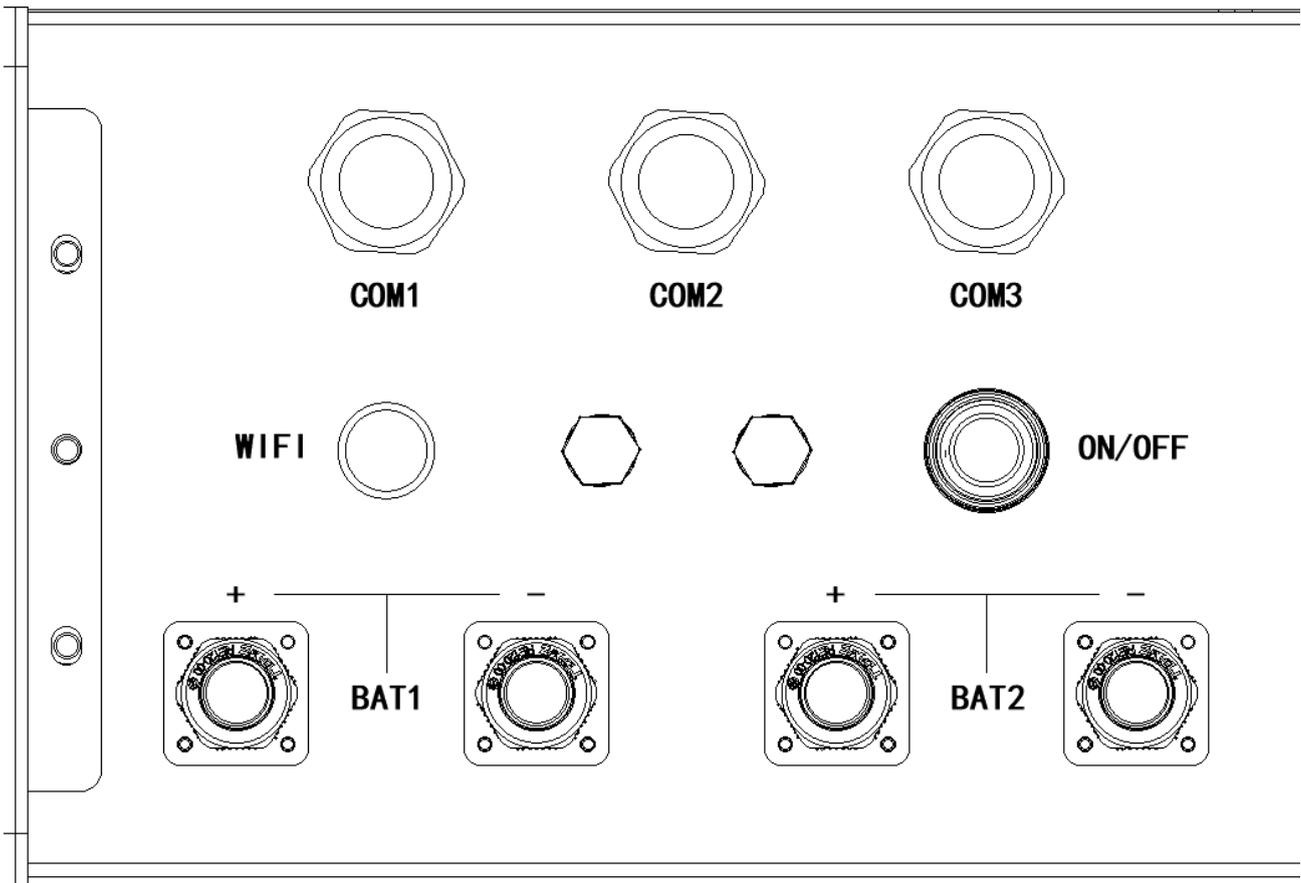


Figure 2.4 Definition of equipment communication interface, start button and battery input terminal

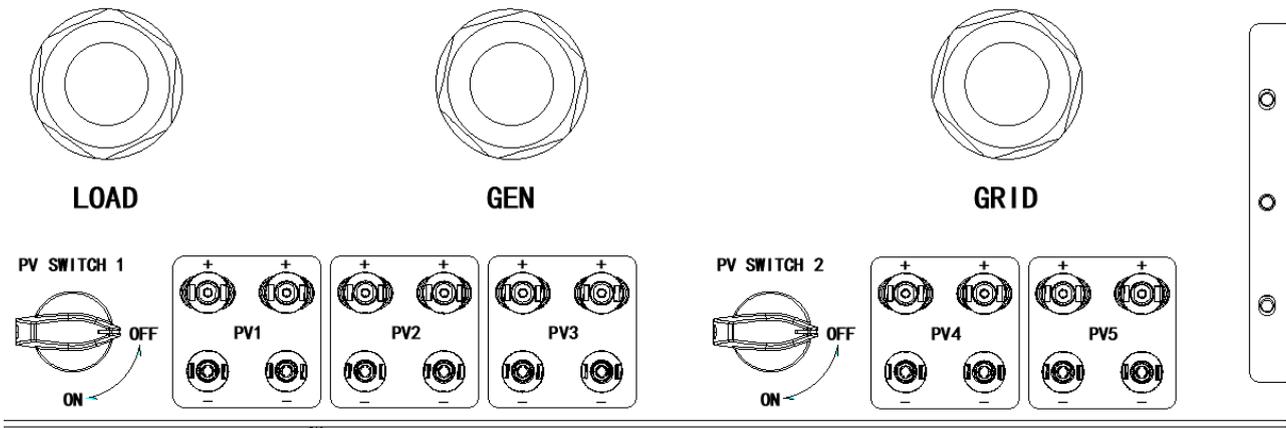


Figure 2.5 Definition of equipment AC interface, PV switch and PV input terminal

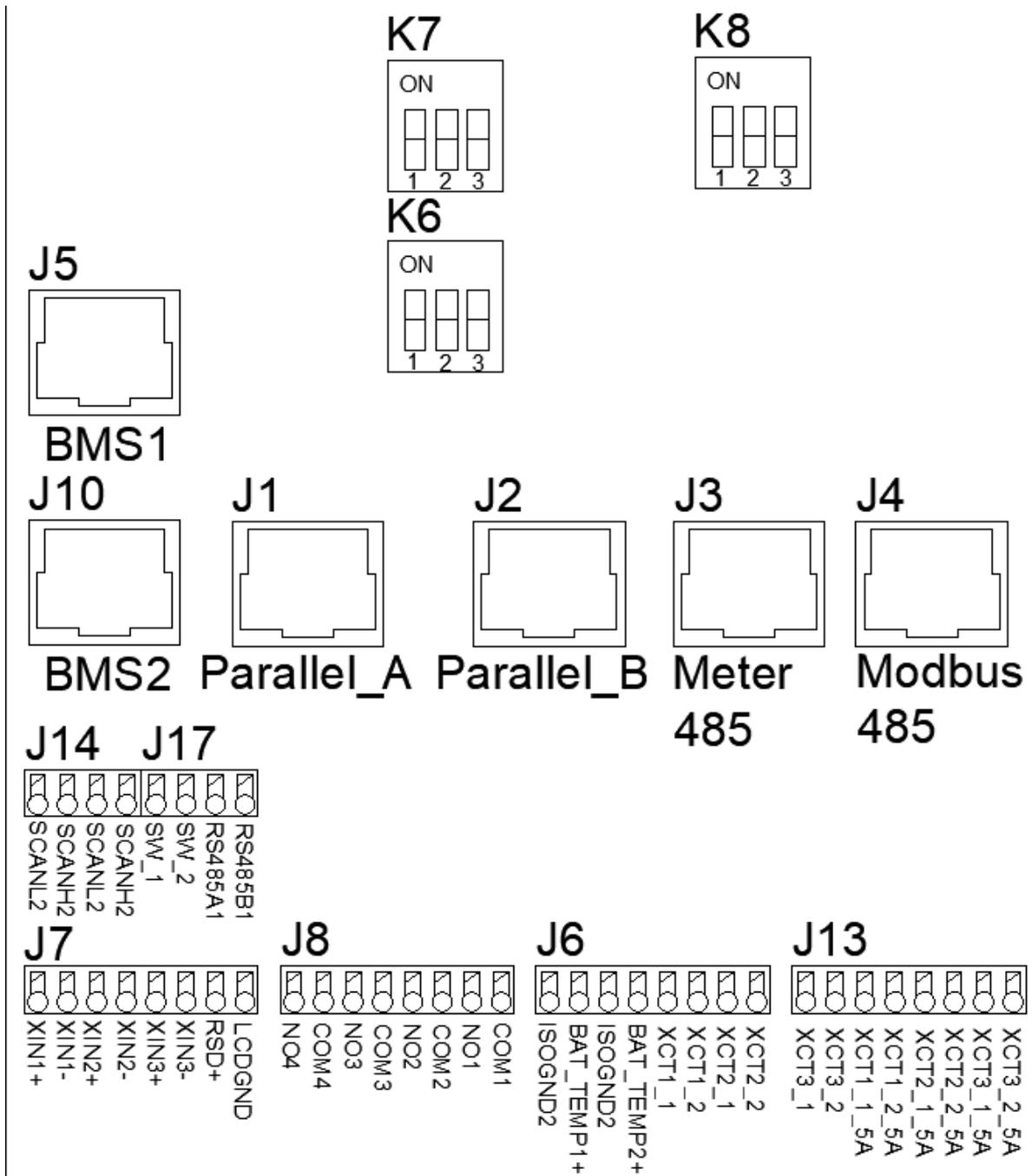


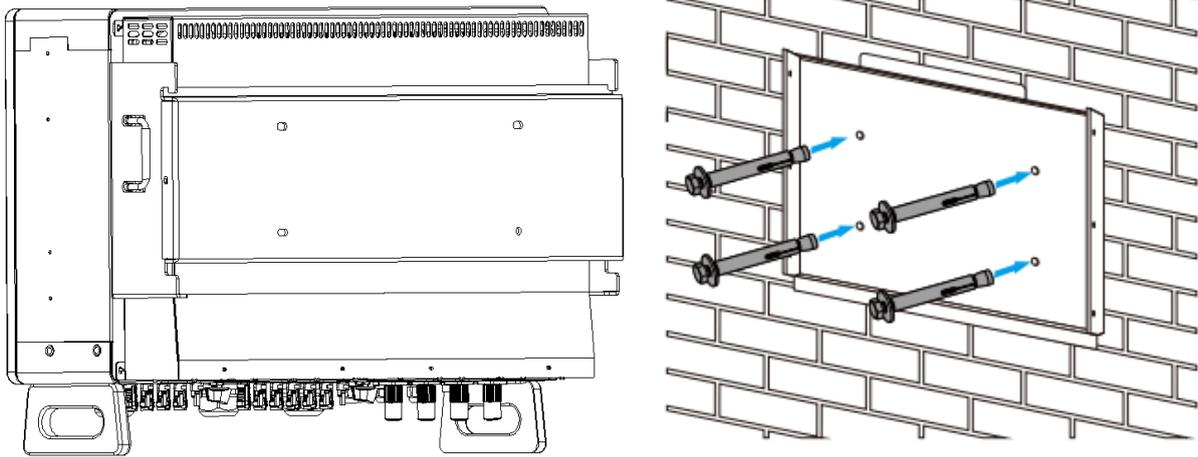
Figure 2.6 Schematic diagram of the internal and external interface board of the device

Table 2.2 definition of device internal external interface board

Pin	1	2	3	4	5	6	7	8
J7	IN1+	IN1-	IN2+	IN2-	IN3+	IN3-	RSD+	RSD-
Function	Reserve for spare						12V+Output	12V+GND
J8	NO4	COM4	N03	COM3	NO2	COM2	NO1	COM1
Function	Reserve for spare		Grid relay control		Gen adjustment control		Gen start control	
J6	BAT-TEMP1+	ISOGND2	BAT-TEMP2+	ISOGND2	XCTA-1	XCTA-2	XCTB-1	XCTB-2
Function	Battery temperature sampling input1		Battery temperature sampling input2		External A-phase CT1 sampling input		External B-phase CT2 sampling input	
J13	XCTC-1	XCTC-2	XCTA-1-5A	XCTA-2-5A	XCTB-1-5A	XCTB-2-5A	XCTC-1-5A	XCTC-2-5A
Function	External C-phase CT3 sampling input		External A-phase CT1 sampling input		External B-phase CT2 sampling input		External C-phase CT3 sampling input	
J14	SCANL2	SCANH2	SCANL2	SCANH2				
Function	Parallel CAN communication		Parallel CAN communication					
J17	PV C	PV C	RS485A1	RS485B1				
Function	PV control		Meter communication					
J5	NC	NC	NC	CANH2	CANL2	NC	RS485A3	RS485B3
Function				BMS1-CAN communication			BMS-485 communication	
J10	NC	NC	NC	CANH4	CANL4	NC	RS485A3	RA485B3
Function				BMS2-CAN communication			BMS-485 communication	
J1	CANH1	CANL1	SNY-01	SNY-02	ISOGND1	ISOGND1	CAN-SMH	CAN-SML
Function	Parallel synchronous communication							
J2	CANH1	CANL1	SNY-01	SNY-02	ISOGND1	ISOGND1	CAN-SMH	CAN-SML
Function	Parallel synchronous communication							
J3	RS485B1	RS485A1	ISOGND2	NC	NC	ISOGND2	RS485A1	RS485B1
Function	Meter communication						Meter communication	
J4	NC	NC	NC	RS485B2	RS485A2	NC	RS485A4	RS485B4
Function				Reserve background monitoring communications			EMS monitoring	

2.3 Wall mount

Warm reminder, the equipment chassis is very heavy, please take it out carefully!



• Figure 2.7 Drilling location diagram

- Select the recommended drill bit (as shown in Figure 2.7 below) and drill 4 holes at the wall markings, 82-90 mm deep;
- Use a suitable hammer to push the expansion bolts through the back cover and into the holes, fix the back cover to the bolts on the wall, and tighten the screw heads of the expansion bolts;
- Carry the device and hold it, making sure the device is aligned with the large bracket on the rear cover, and fix the device to the rear cover plate that has been fixed on the wall;
- Ensure that the four bolt holes on the side of the device and the rear cover are aligned, and tighten the four bolts on the side of the device and the rear cover to complete the installation.

2.4 Battery wiring work

For safe operation and compliance, a separate DC circuit breaker is required between the battery and this device. In some applications, a switchgear may not be required, but a disconnect circuit breaker is still required. For the required fuse or circuit breaker specifications, please select according to actual needs.

2.4.1 Battery Power Cable Wiring

For your safety and efficient operation of the equipment, please connect the battery with a suitable cable to reduce the risk of injury. You can also refer to the recommended cable shown in Table 2.3.

Table 2.3 Recommended cable example

Load power	Cable size	Cable size mm ²	Torque value
25 kW	4AWG	25	24.5Nm
30 kW	4AWG	25	24.5Nm
36 kW	4AWG	25	24.5Nm
40 kW	4AWG	25	24.5Nm
50 kW	4AWG	25	24.5Nm
60 kW	4AWG	25	24.5Nm



All wiring must be carried out by professionals!

Please select the appropriate battery cable and bolt, find the "Battery end hole" in the schematic diagram of "Figure 2.8 Definition Diagram of Socket Terminal at the Bottom of Equipment", and insert the cable into the correct through hole. Tips: Please pay attention to the positive +, negative - corresponding wiring. Use a suitable screwdriver to unscrew the bolt, install the battery cable terminal, and then use the screwdriver to tighten the bolt to ensure that the bolt is tightened, the torque is 24.5Nm, clockwise, to ensure that the polarity of the battery and inverter is correctly connected.

2.4.2 Battery communication cable connection

As shown in Figure 2.8, connect the BMS of BAT_PACK to the J5 and J9 network ports in the figure. The definition of the communication connection line is shown in Table 2.2.

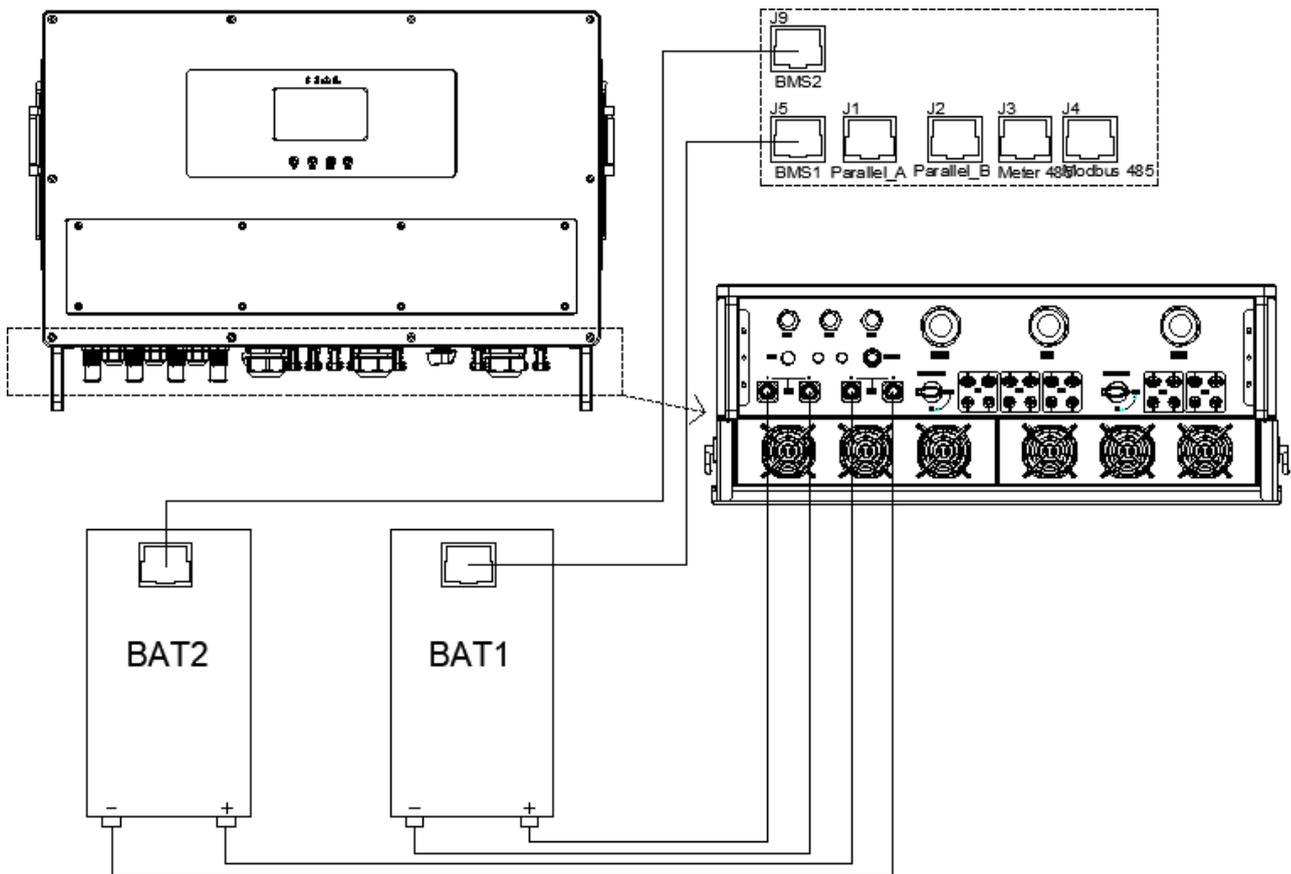


Figure 2.8 Schematic diagram of battery communication connection

2.5 Power grid, load, GEN wiring

Before connecting to the grid, please install a separate AC circuit breaker between the device and the grid. In addition, it is recommended to install an AC circuit breaker between the standby load and the device. This ensures that the inverter can be safely disconnected during maintenance and fully protected from overcurrent. The recommended AC circuit breaker is 250A. The recommended AC cable size is AWG0 (1/0), each with 53.5mm² cable.

There are three terminal blocks marked with "Grid", "Load" and "GEN". Please do not connect the input and output connectors by mistake. In addition, the GEN port can be connected to the oil generator, smart load or AC coupling unit (grid-connected inverter). After the actual wiring is completed, you need to set the corresponding interface type on the LCD. For details on the setting method, see Chapter 3, Oil Generator Port Settings.

All wiring must be performed by qualified personnel. Using the appropriate cable for AC input connection is very important for the safe and efficient operation of the system. To reduce the risk of injury, please use the correct recommended cable as shown in Figure 2.9 below.



Please make sure that the AC side power supply is open before connecting.

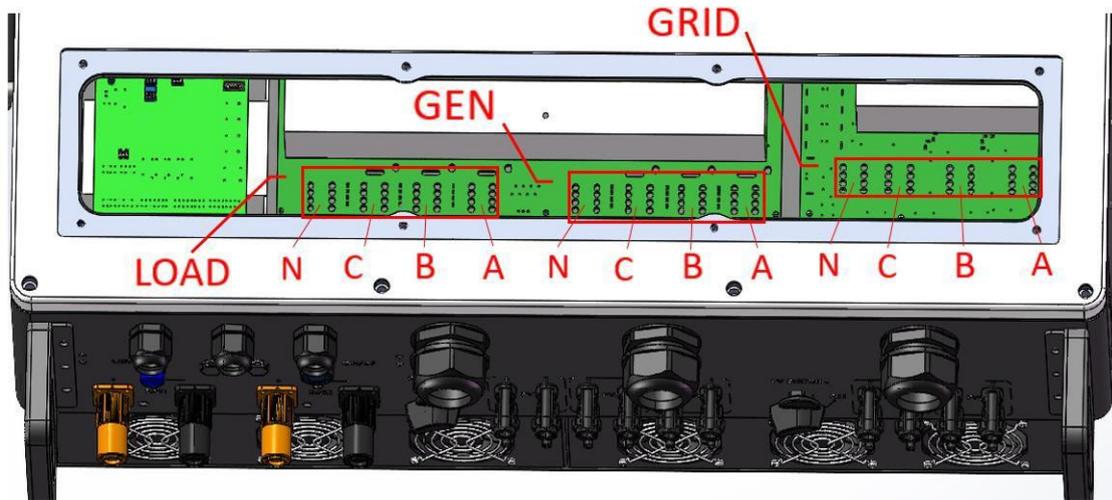


Figure 2.9 connection of power grid, load and generator

Follow these steps to connect the Grid grid, Load load, and Gen generator ports:

- Be sure to turn off the AC circuit breaker or isolation switch before connecting the power grid, load, and generator.
- Remove the bolts, insert the wires according to the polarity marked on the terminal, and tighten the terminal screws to ensure the connection is complete.
- Then insert the AC output wire according to the polarity marked on the terminal and tighten the terminal. Be sure to also connect the corresponding N wire and PE wire to the relevant terminals to ensure that the wires are firmly connected.
- Electrical appliances such as air conditioners need at least 2-3 minutes to restart because they need enough time to balance the refrigerant gas in the loop. If a power shortage occurs and recovers within a short period of time, it will cause damage to the equipment you are connected to. To prevent such damage, check whether the air conditioner manufacturer is equipped with a delay function before installation. Otherwise, this equipment will trigger an overload failure and cut off the output to protect your equipment, but sometimes it will still cause internal damage to the air conditioner.

2.6 Photovoltaic wiring

Before connecting the photovoltaic module, install a separate DC circuit breaker between the device and the photovoltaic assembly. Connecting photovoltaic modules with appropriate cables is very important for the safe and efficient operation of the system. To reduce the risk of injury, the recommended cable size is 12AWG, each 4mm² cable.

To avoid any failure, do not connect any photovoltaic components that may leak to the device. For example, a grounded photovoltaic module can cause current leakage to the device. Photovoltaic junction boxes with surge protection are required. Otherwise, when the photovoltaic module is struck

by lightning, the equipment will be damaged.



When using photovoltaic modules, make sure that there is no grounding.

Photovoltaic module selection instructions: When selecting suitable photovoltaic modules, please be sure to consider the following parameters as shown in Table 2.8:

- 1) The open circuit voltage (Voc) of the photovoltaic module shall not exceed the maximum open circuit voltage of the photovoltaic array photovoltaic storage integrated machine;
- 2) The open circuit voltage (Voc) of the photovoltaic module should be higher than the minimum starting voltage of the photovoltaic storage integrated machine.

Table 2.4 description of photovoltaic module selection

Item	20~30KW	36~40KW	50~60KW
PV Input Voltage		800V (160V~1000V)	
MPPT Range		200V~850V	
No. of MPPT Tracker	3	4	5
No. of String Per MPPT Tracker	2+2+2	2+2+2+2	2+2+2+2+2

• Photovoltaic module wiring

- 1 Turn off the main AC circuit breaker of the power grid.
- 2 Close the DC circuit breaker.
- 3 Assemble the photovoltaic input connector as shown in Figure 2.10 at the bottom of the device.



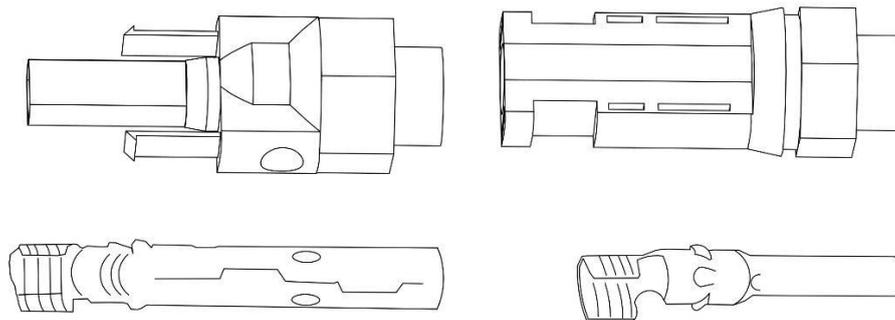
Safety tips: Do not ground the positive or negative electrode of the photovoltaic panel device, otherwise it will seriously damage the inverter.



Safety tip: Before connecting, please ensure that the polarity of the output voltage of the photovoltaic panel device is consistent with the "DC+" and "DC-" symbols.



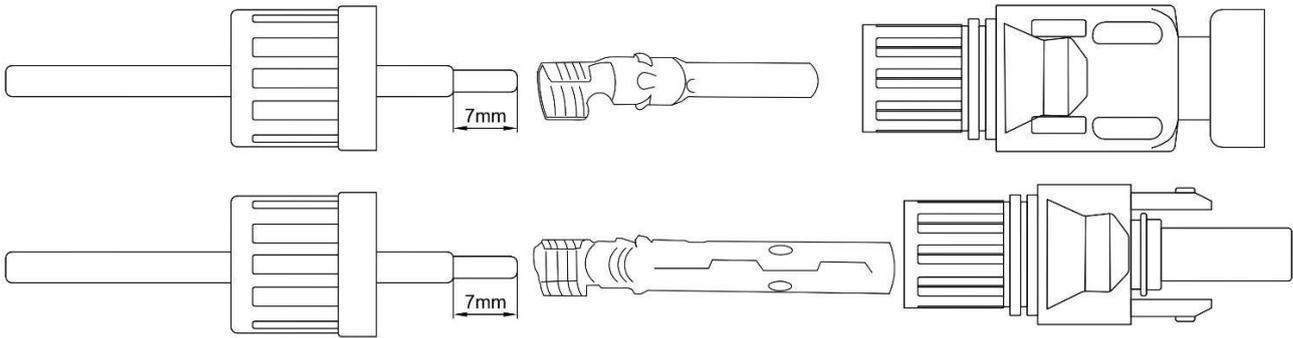
Safety tip: Select a qualified DC cable: 4~6mm² 12~10AWG single cable .
 Safety tip: Before connecting the inverter, ensure that the open circuit voltage of the photovoltaic panel device is within 1000V



• Figure 2.10 Photovoltaic input connector: DC+ connector left DC-Connector right

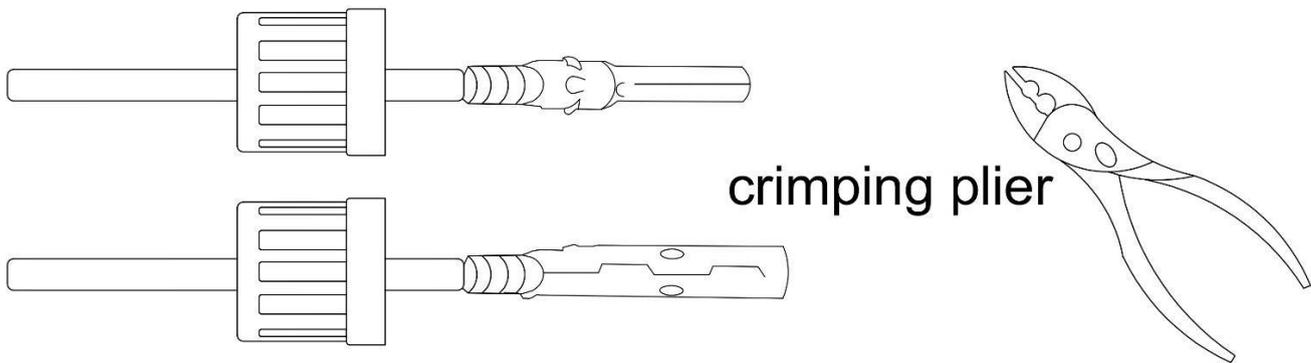
The steps for assembling DC connectors are as follows:

1. Peel off the DC line about 7mm and remove the connector cover nut see figure 2.11 .



1) Figure 2.11 Connector cover nut

2. Crimp the metal terminal with crimping pliers, as shown in figure 2.12.



2) Figure 2.12 Crimping clamp crimping metal terminal

3) Insert the stylus into the top of the connector and screw the cover nut to the top of the connector. figure 2.13 .

4) Finally, insert the photovoltaic DC connector into the positive and negative input of the Hybrid inverter, as shown in figure 2.14.

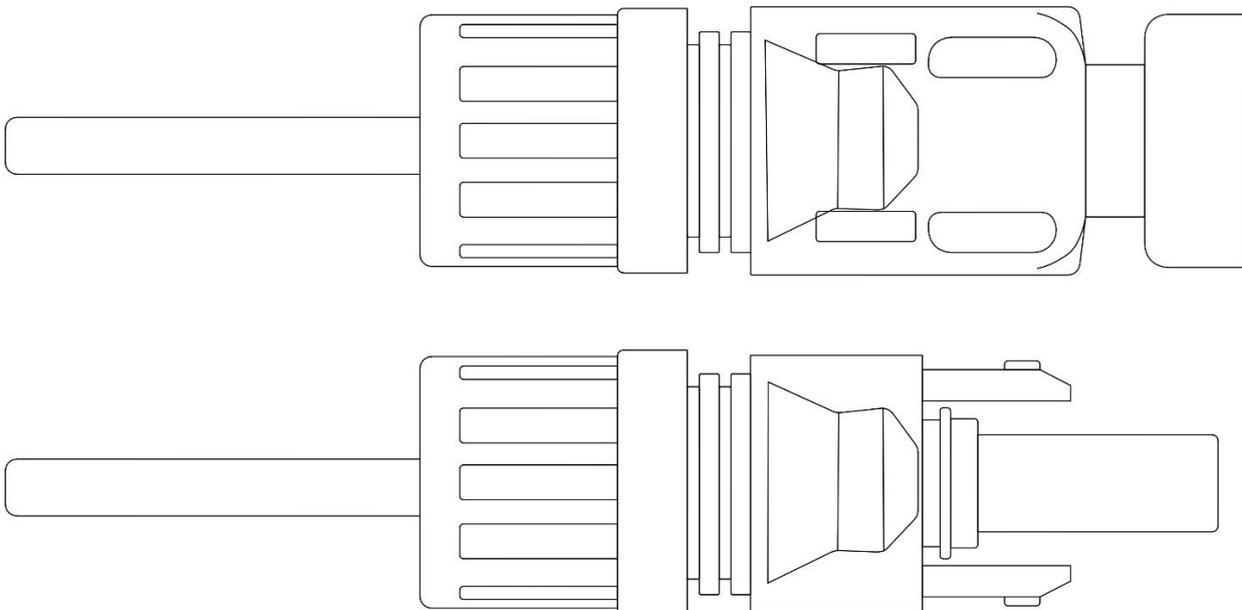


Figure 2.13 Stylus inserted into the top of the connector

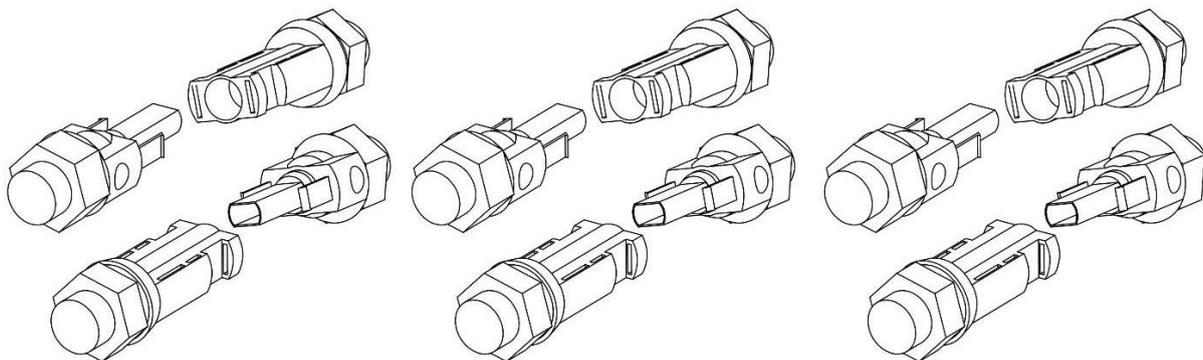


Figure 2.14 The DC connector is inserted into the positive and negative input of the hybrid inverter equipment.



Warning: sunlight on the panel will generate voltage, high voltage series may be life-threatening. Therefore, before connecting the photovoltaic DC input line, the solar panels need to be blocked by opaque materials, and the DC switch should be turned off, otherwise the high voltage of the equipment may be life-threatening.

2.7 CT wiring

In the power grid cable, as shown in Figure 2.15, three current transformers are passed through the three phases, with the direction arrow of the transformer facing the device side. The sampling line of the transformer (CTK160702-300A/5A) reaches the J13 sampling terminal of the internal interface board through the COM3 through-hole of the device. At the same time, the J6 terminal is connected to the battery temperature sampling signal line. If the current transformer used is 300A/50mA, the transformer sampling lines of L1, L2, and L3 are connected to the XCT1_1/2, XCT2_1/2, and XCT3_1/2 ports of the J6 and J13 sampling terminals.

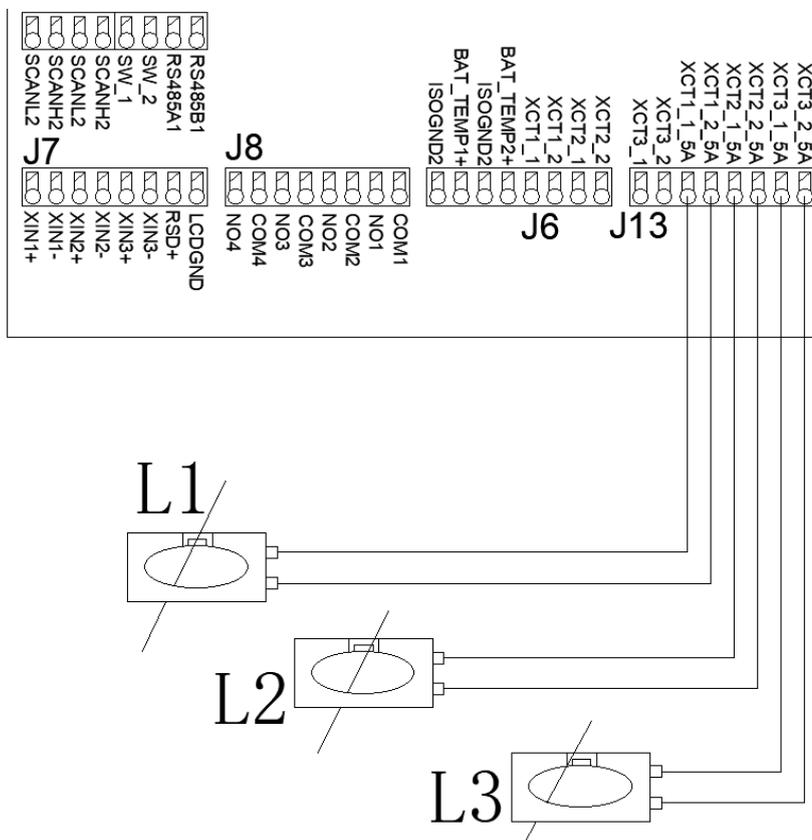


Figure 2.15 schematic diagram of external CT wiring and battery temperature sampling wiring

2.8 Meter connection

The wiring diagram is shown in Figure 2.16. The solid line on the left indicates that CHNT DTSU666 is connected.

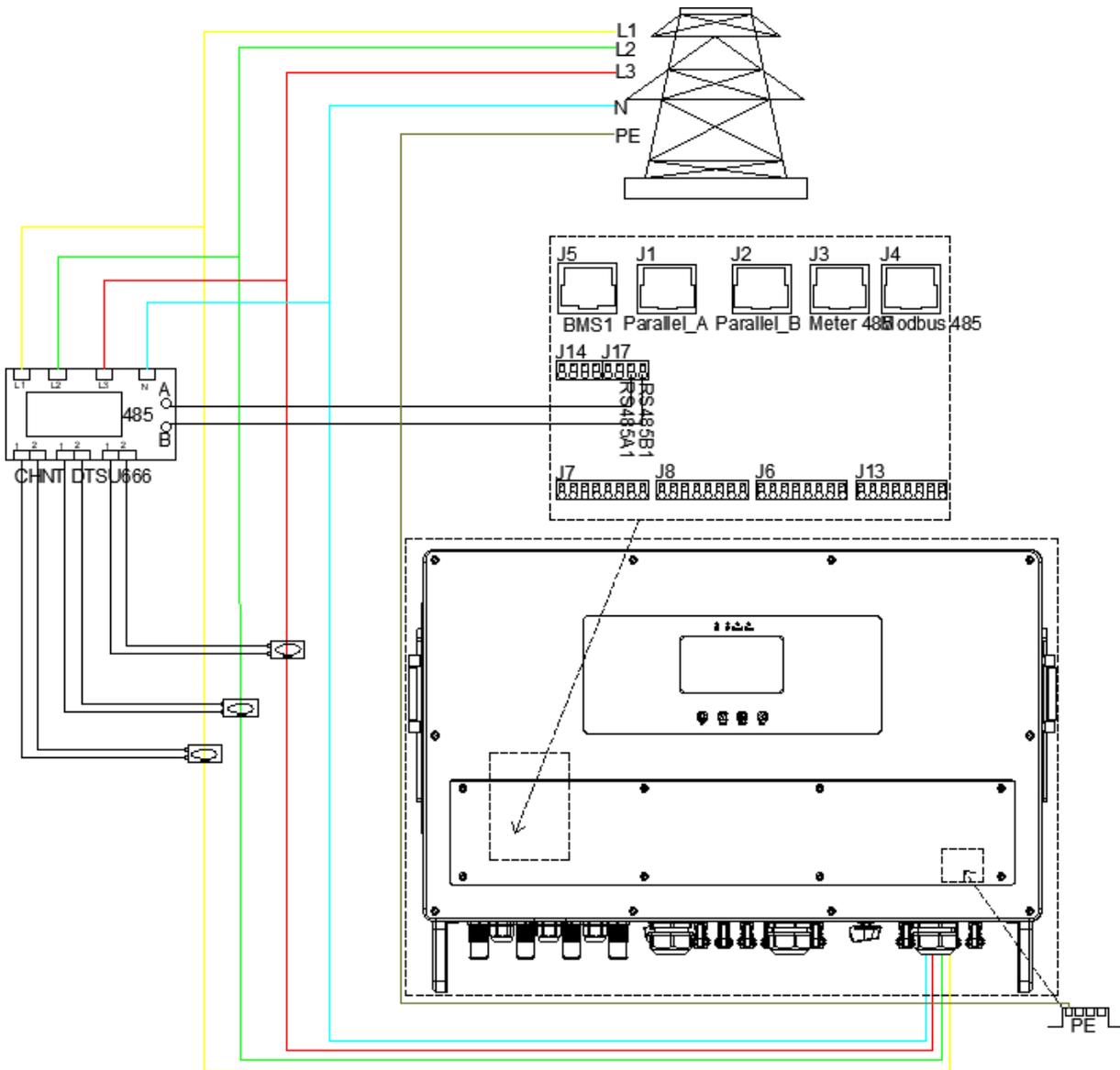


Figure 2.16 Meter wiring diagram

2.9 Ground connection

The grounding wire should be connected to the grounding plate on the power grid side to prevent electric shock. In the bolt hole of the "grounding mark" in "Figure 2.17 Definition of the socket.



terminal at the bottom of the device";

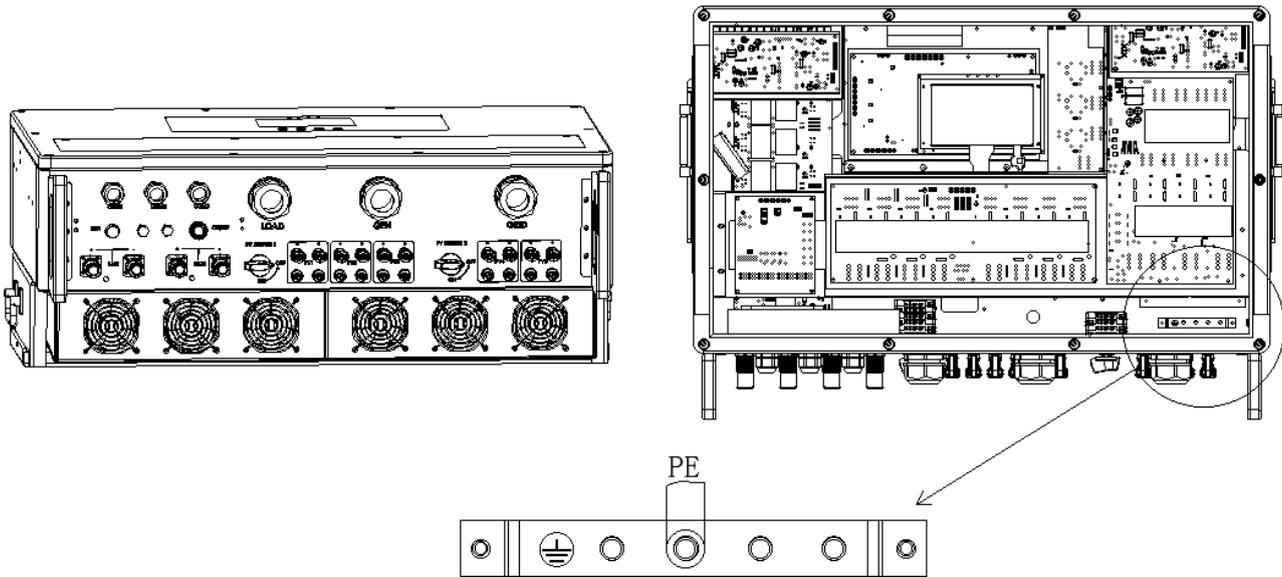


Fig. 2.17 Schematic diagram of equipment grounding

2.10 WIFI connection

For the configuration of Wi-Fi, please refer to the schematic wiring of Wi-Fi socket, and refer to the user manual of WIFI socket for details.

2.11 Stand-alone operation system diagram

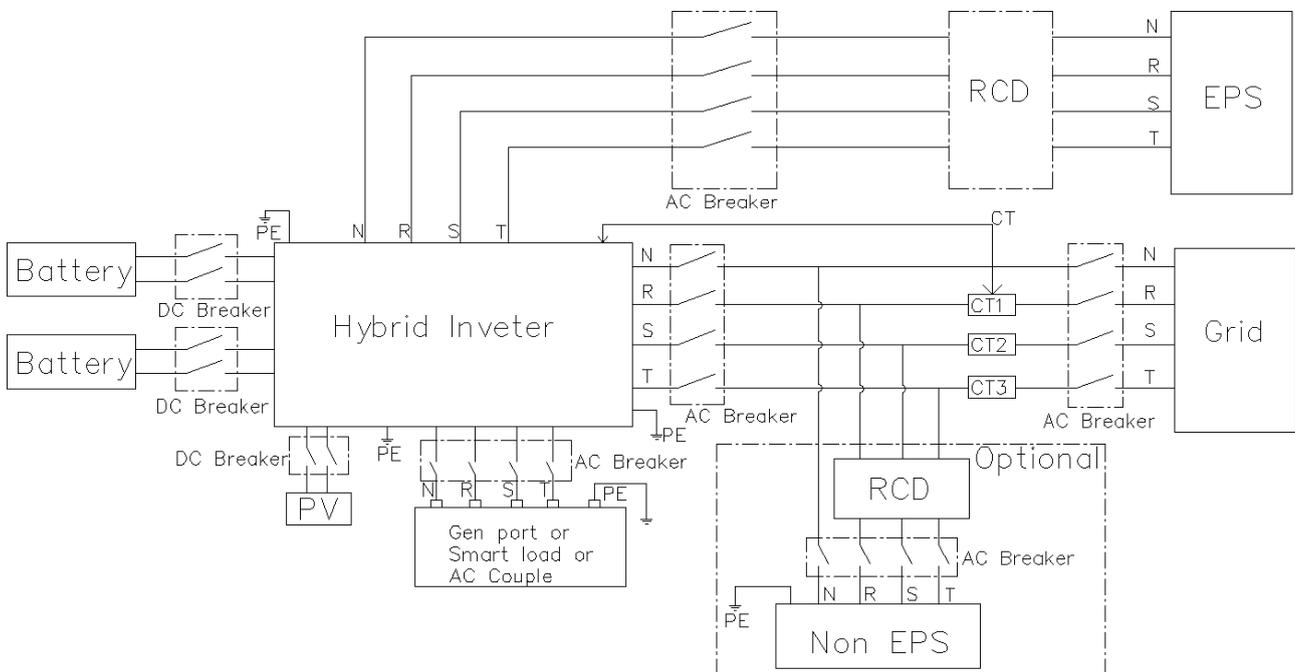


Figure 2.18 schematic diagram of stand-alone wiring

3 Display and setup

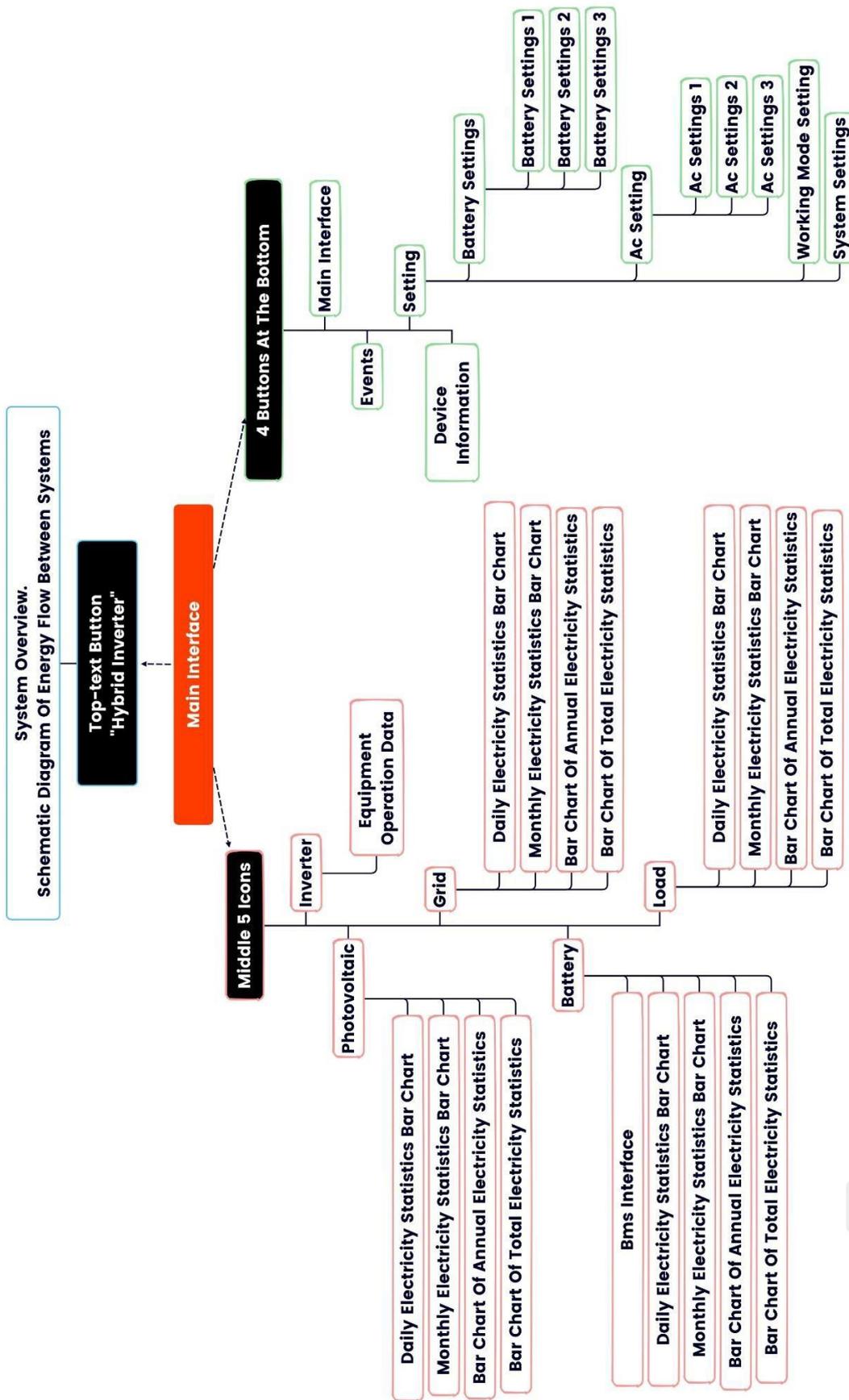
3.1 Run data display instructions

Note: All LCD passwords are 888888

The topology of the LCD screen is shown in Figure 3.1, and the main interface is shown in Figure 3.2A. The main screen displays information including solar energy, grid, load and battery. It also shows the direction of energy flow by dots, so the system information is displayed vividly on the main screen, and the photovoltaic power and load power are always positive. Negative grid power means that it is connected to the grid, and positive means it is obtained from the grid. The negative pole of the battery power supply is charged, and the positive pole is discharged. The bottom icons are "Home", "Setting", "Events", "DeviceInfo".



Figure3.2A LCD Main interface



自由王国

Figure3.1 LCD Topology structure diagram

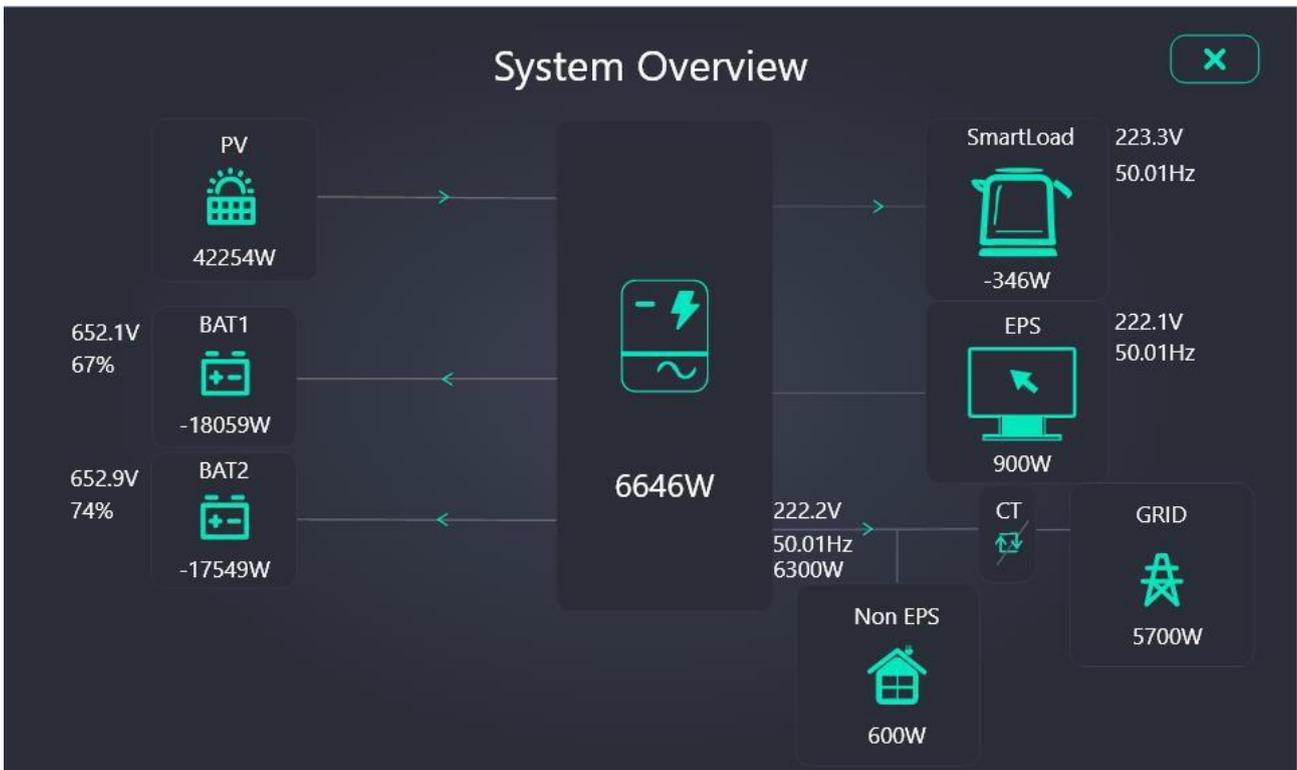


Figure3.2B System Overview

3.1.1 Photovoltaic data

Click the photovoltaic panel icon on the panel of the main interface to view its annual, monthly, daily, and current electricity statistics, as shown in Figure 3.3~3.6 below. The meaning of “Stage” on the left side of the interface is shown in Table 3.1. Click DEL on this interface to delete all photovoltaic power statistics. Click the arrow on the right side of the interface to view the data of other dates.

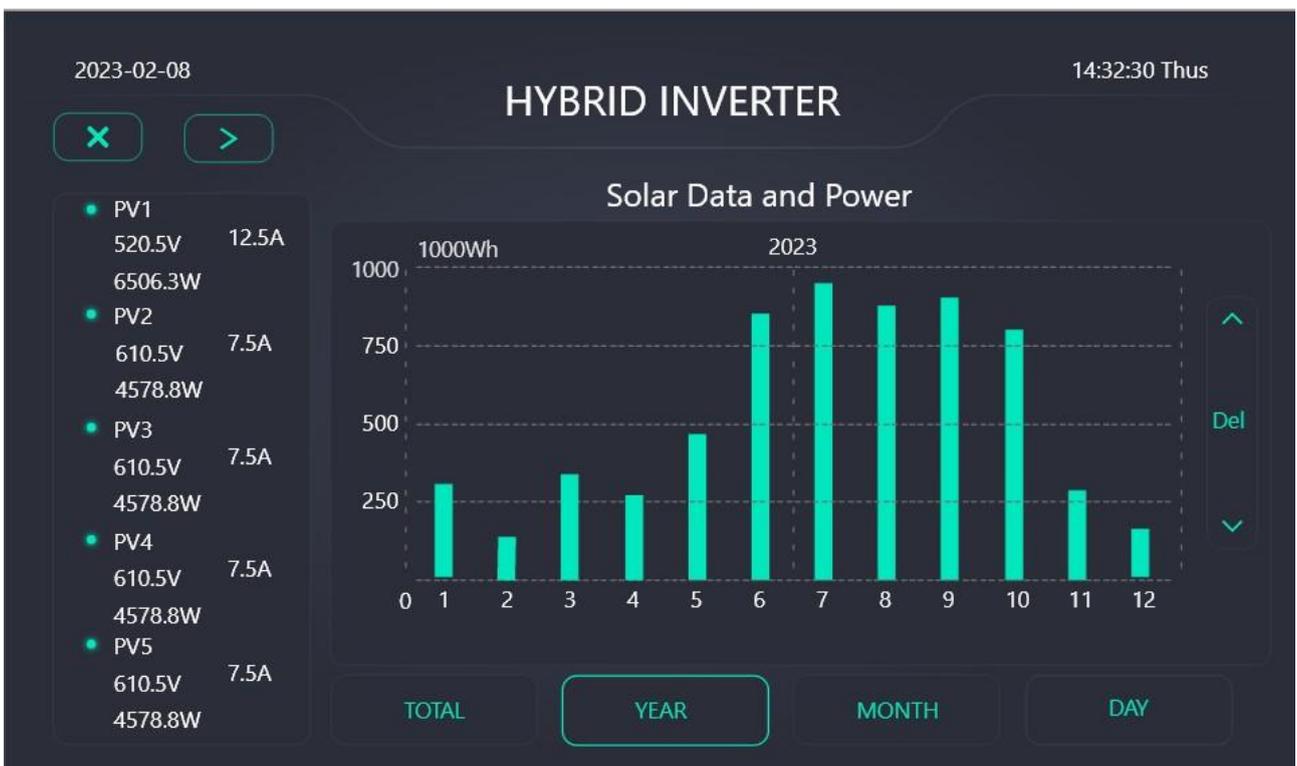


Figure 3.3 Annual Statistical Data of Photovoltaic Power Generation

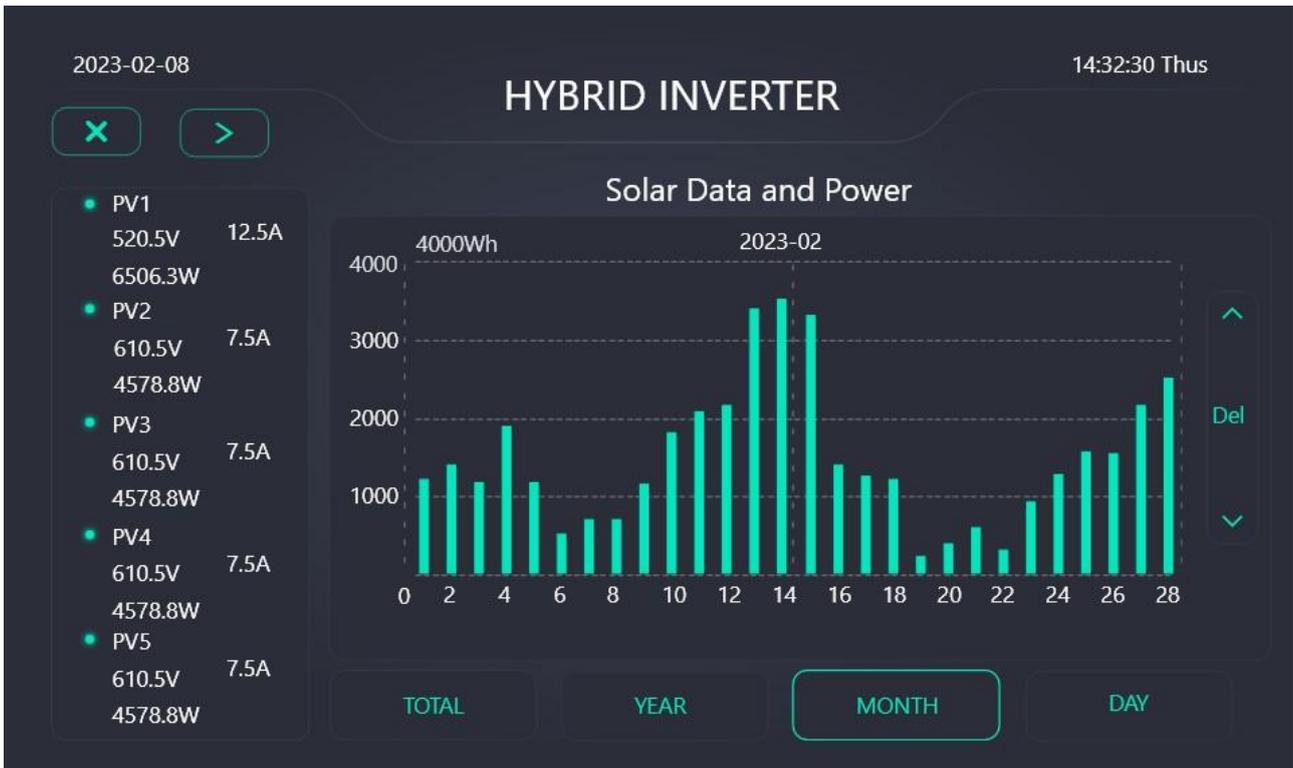


Figure 3.4 Monthly Statistical Data of Photovoltaic Power Generation

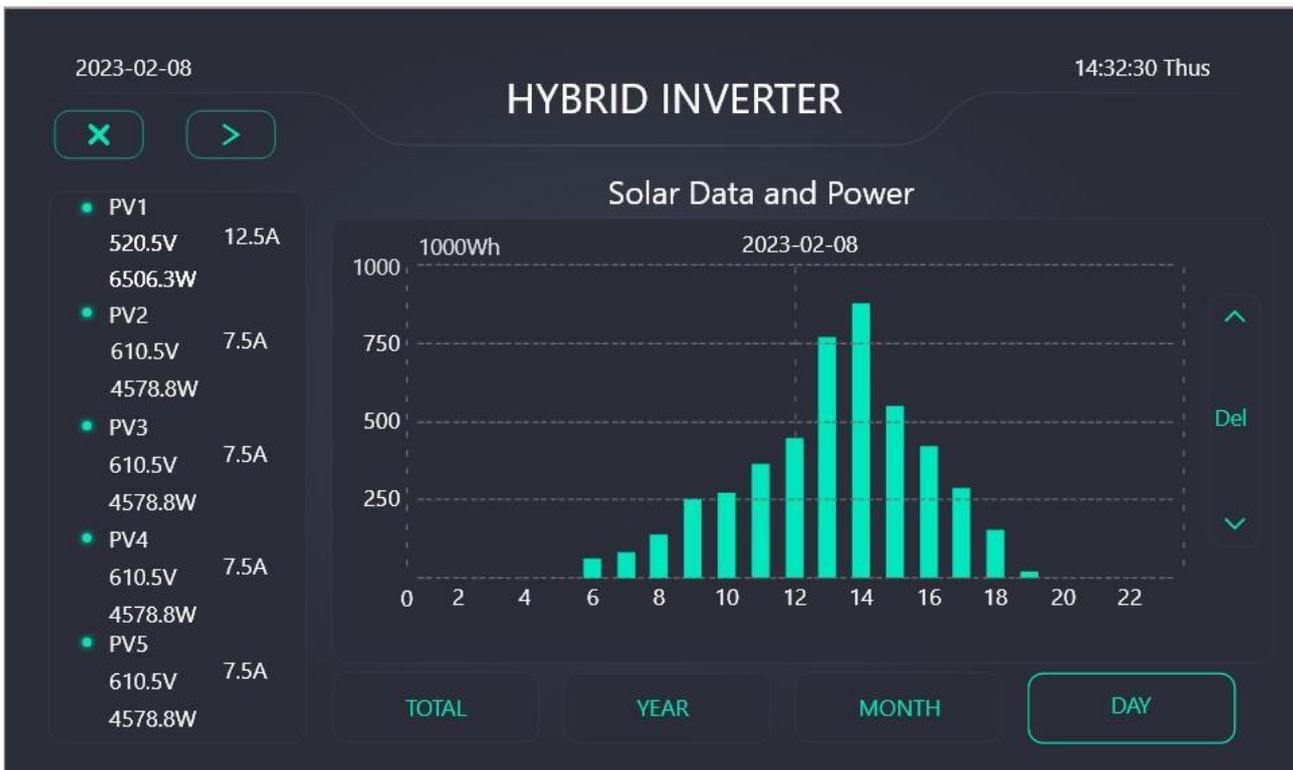


Figure 3.5 Daily statistical data of photovoltaic power generation

Table3.1 PV stage illustrate

Stage	Number	Illustrate
PV Stage	101~201	Shutdown
	98	Standby
	30	Normal working

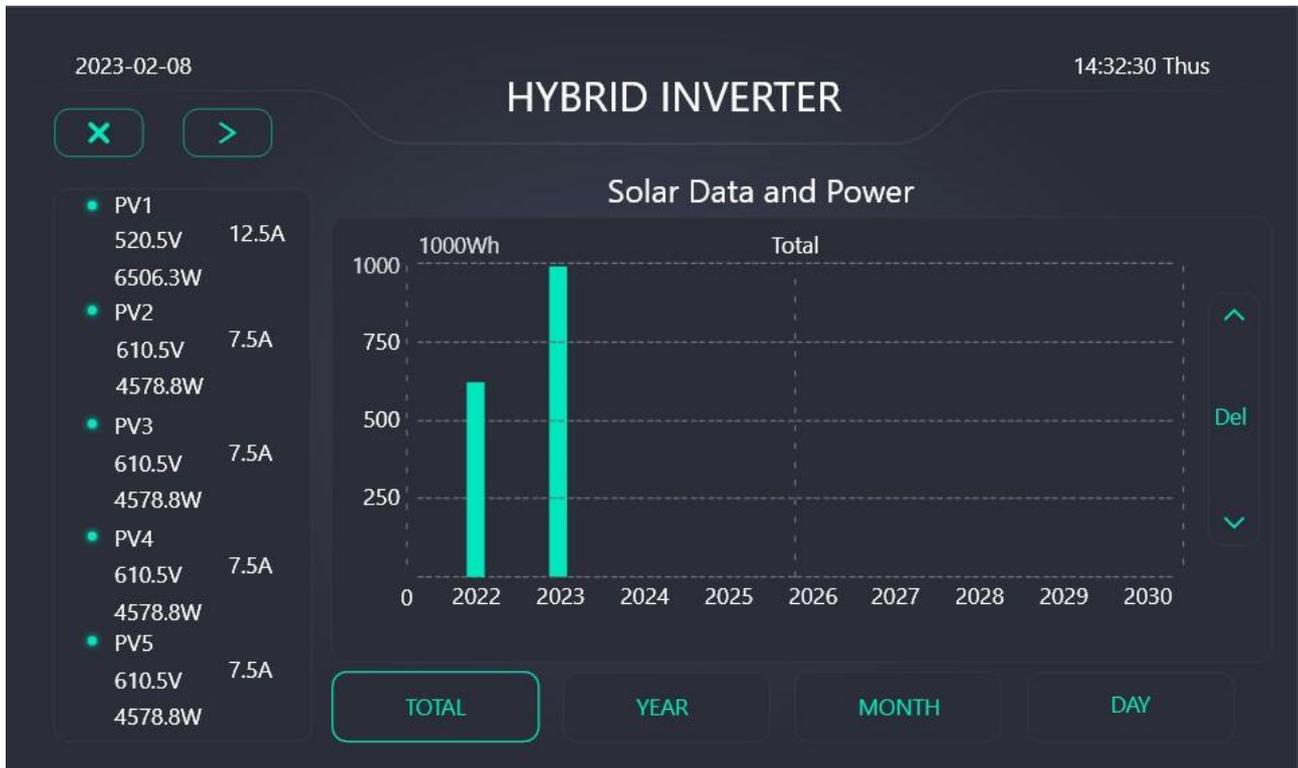


Figure 3.6 All measurement data of photovoltaic power generation

3.1.2 Battery data

Click the battery icon on the main interface to view its annual, monthly, daily, and current power statistics. Click "Chg" in the upper right corner to view charging or discharging power statistics, as shown in Figure 3.7A. The meaning of Stage on the left side of the interface is shown in Table 3.2. Click DEL on this interface to delete all battery power statistics. Click the arrow on the right side of the interface to view data for other dates. Click the arrow button in the upper left corner to switch the interface to view battery request charge and discharge information and battery status, as shown in Figure 3.7B.

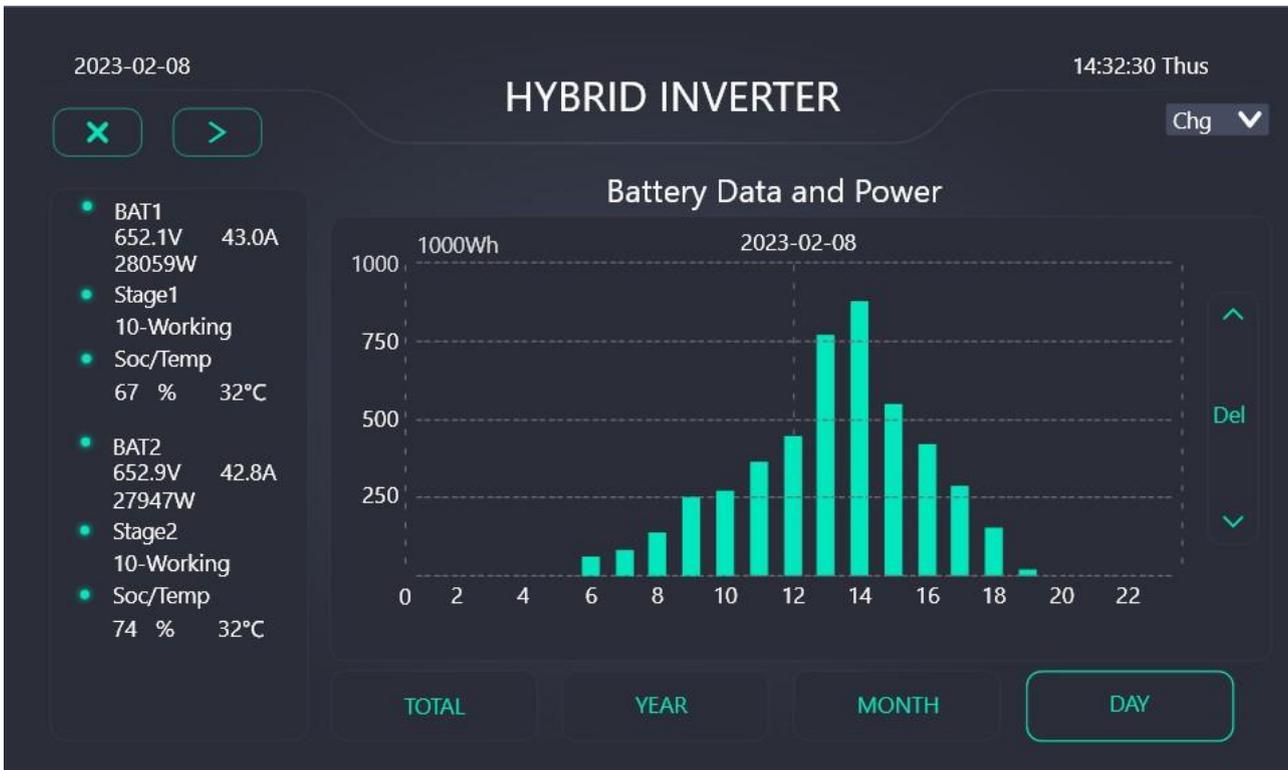


Figure 3.7A Statistical diagram of battery power data, etc.

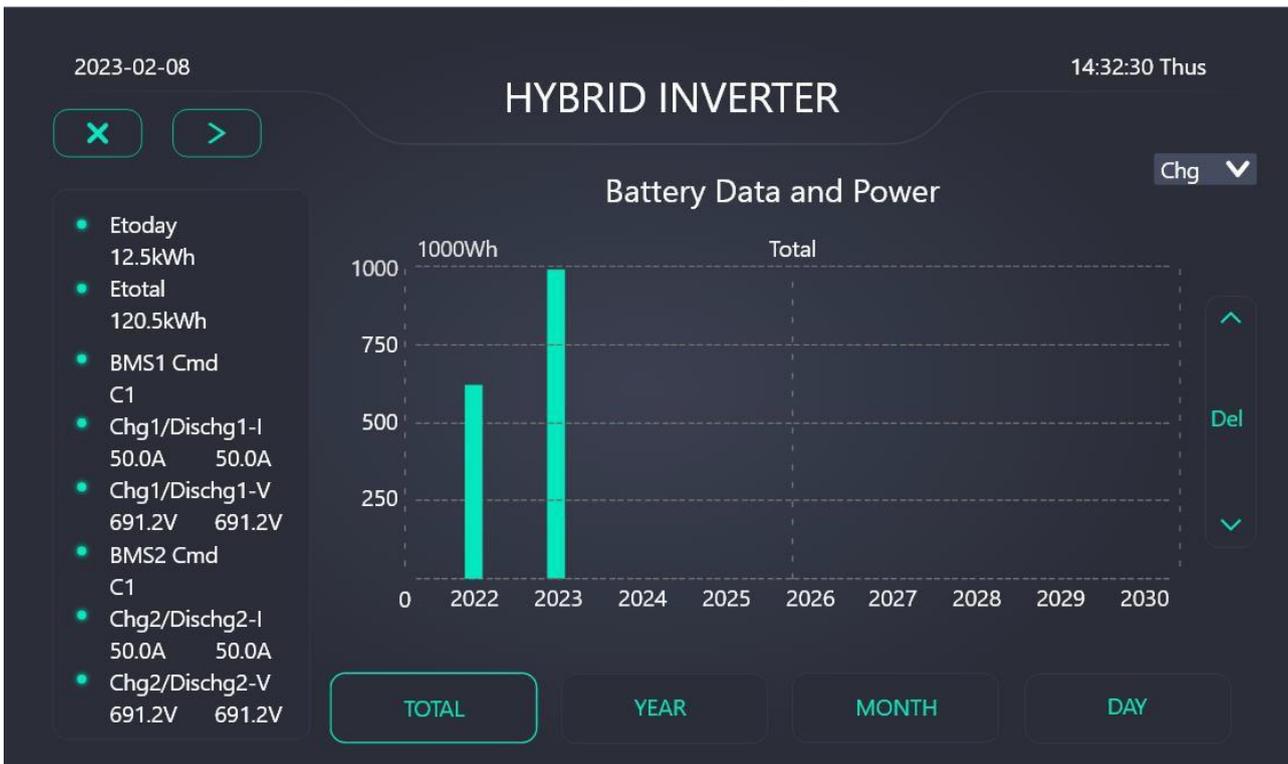


Figure 3.7B Battery information diagram

Table 3.2 DC stage description

Stage	Number	Illustrate
DC Stage	102~129	Protect shutdown
	101	Shutdown

201	
231	
89	Standby
10	Normal off-grid operation

3.1.3 Inverter data

Click the middle inverter icon on the main interface to view the running data, as shown in Figure 3.8 below. The meaning of Stage on the right side of the interface is shown in Table 3.3

Table 3.3 INV-Stage illustrate

Stage	Number	Illustrate
INV Stage	102~129	Protect shutdown
	101	
	201	Shutdown
	231	
	90	Wait for DC to power on
	89	Standby
	30	Normal grid-connected operation
	10	Normal off-grid operation



Figure 3.8 Schematic diagram of inverter operation data

3.1.4 Grid data

Click the grid icon on the main interface to view its annual, monthly, daily, and current electricity statistics, as shown in Figure 3.9 below. Click DEL on this interface to delete all grid electricity

statistics. Click the arrow on the right side of the interface to view the data of other dates.

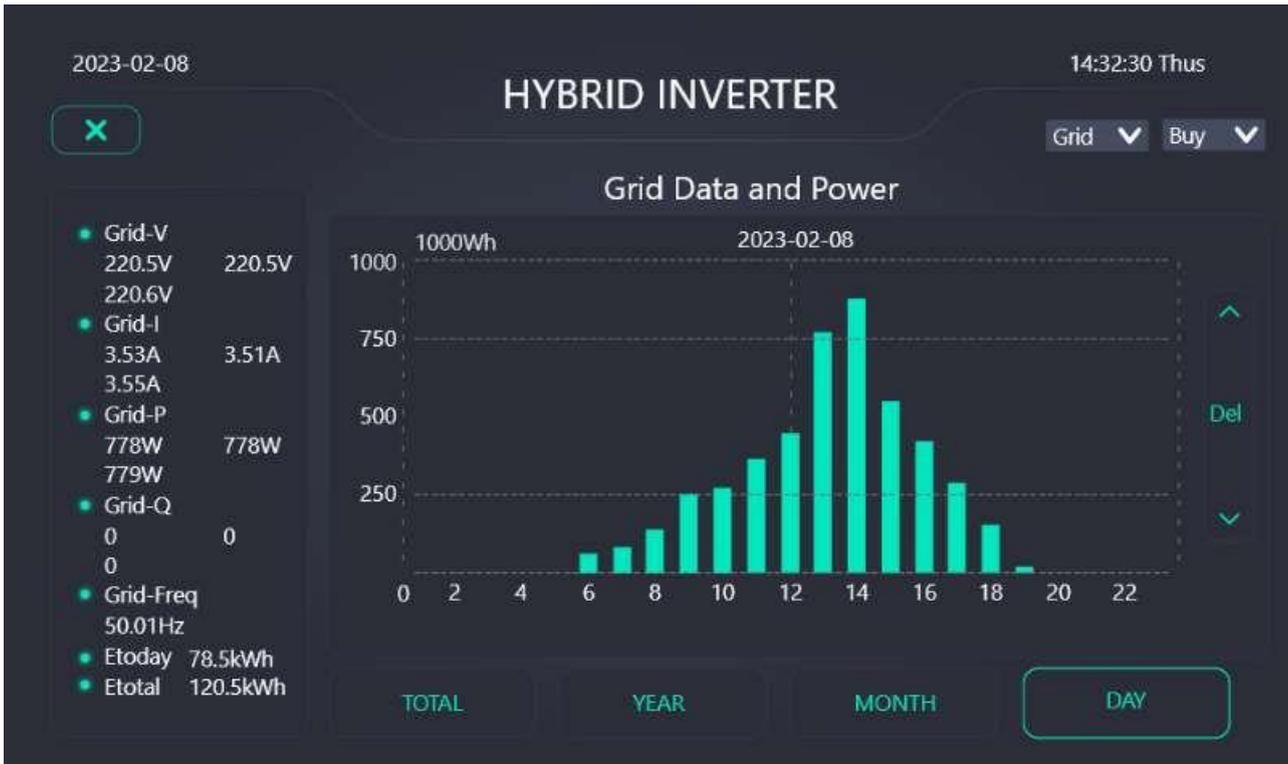


Figure 3.9 Statistics of power grid electricity data

3.1.5 Load data

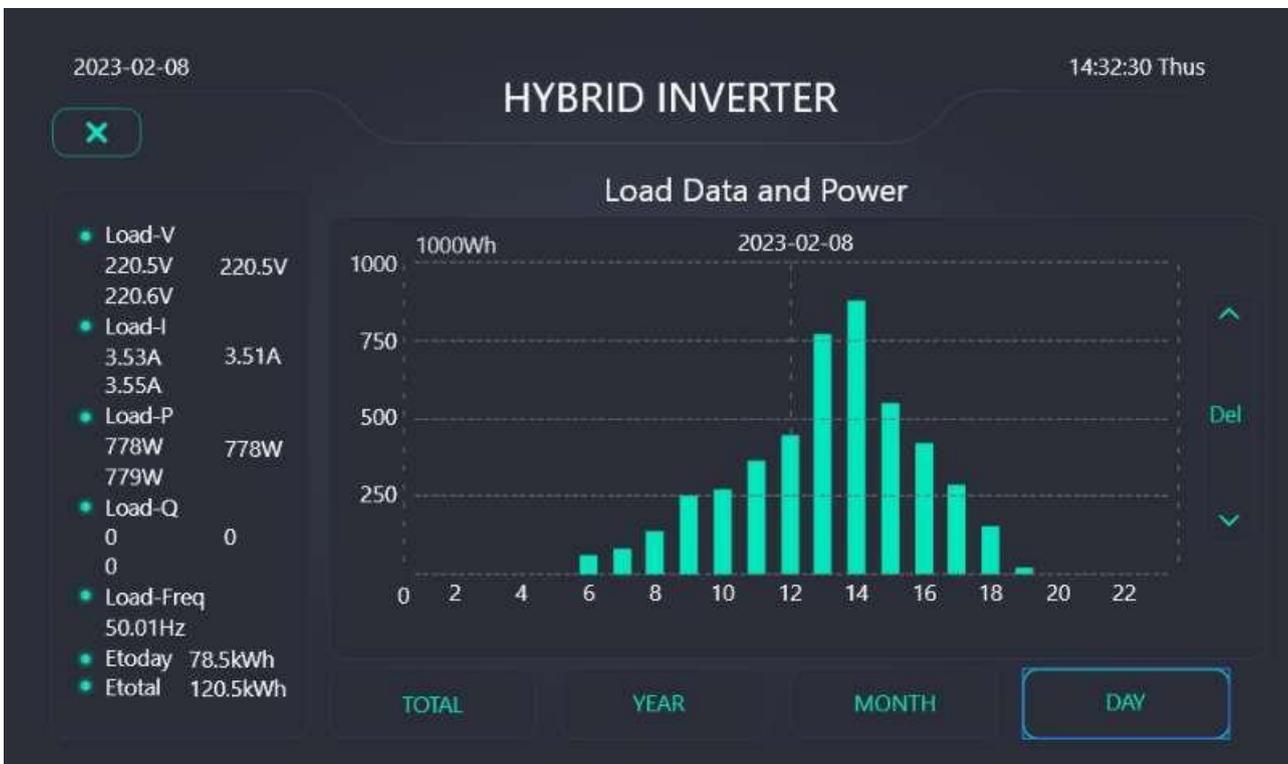


Figure 3.10 Load power data and other statistics

Click the load icon on the main interface to view its annual, monthly, daily, and current electricity statistics, as shown in Figure 3.10 below. Click DEL on this interface to delete all load power statistics.

Click the arrow on the right side of the interface to view the data of other dates.

3.2 Run parameter setting

Note again: the password is 888888 when setting the LCD of this device.

Click the "Settings" icon on the main interface to enter the system setting interface, as shown in Figure 3.11, from left to right are "Battery Settings", "Grid Settings", "Professional Settings", and "System Settings".

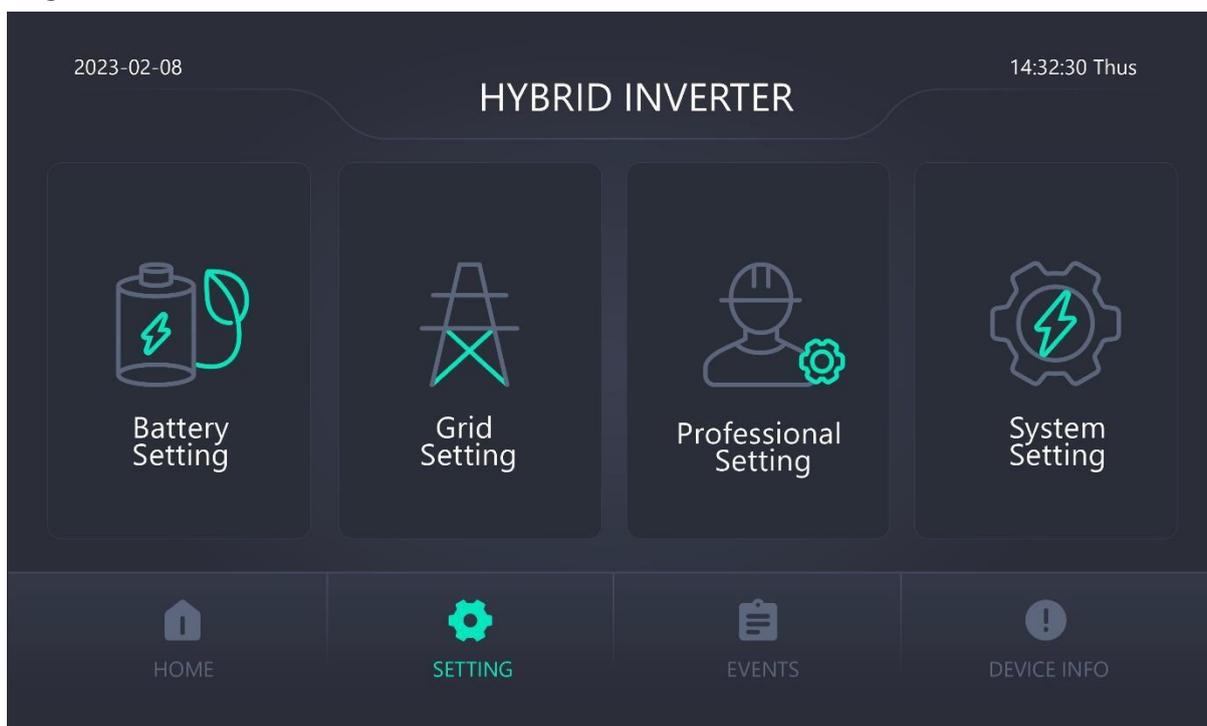


Figure 3.11 System setting interface

3.2.1 Battery parameter setting

Click "Battery Settings" to set battery-related parameters, as shown in Figure 3.12~Figure 3.14, "Battery Settings1~3", divided into 3 parts.

- a. The first part, battery Setting 1, is the battery setting: you can set the upper and lower limits of the voltage, the maximum charge and discharge current of battery 1 and the upper and lower limits of the voltage, the maximum charge and discharge current of battery 2;

"Bat1 cap AH", "Bat2 cap AH": Tell the hybrid inverter to know the size of your two battery packs.

"Battery charge and discharge current setting": For AGM and Flooded, we recommend using Ah battery size x 20%= charge/discharge current. For lithium batteries, we recommend Ah battery size x 50%= charge/discharge amps. For GEL lead-acid batteries, follow factory recommendations.

Bat Mode: Select one of "Lithium", "Use Bat V" or "Use Bat %" for all the setting. This will affect ②,③ in that Figure 3.12 and Figure 3.13 settings below.

- b. Part ② is the maintenance setup for lithium batteries or battery SOC control

- **Lithium Mode:** This is BMS protocol. Please reference the document Approved Battery;

- **Shutdown**, If the SOC is below this setting, the inverter will shut down.
- **Low Bat**, If the SOC is below this setting, the inverter will alarm.
 - **TempCorrEn**, When this option is checked, the temperature compensation of the float or average charge in ④ will take effect.
 - **CirEn**, Battery CAN communication is able to look for signal enable. When the battery communication mode is set to CAN on the System setting screen in Figure 3.18, please tick this setting. When you want to control the lithium battery with voltage mode, you can remove this check mark.
 - **BatActEn**, The automatic battery activation function is enabled. After this option is selected, the device will automatically activate the battery when the battery is protected.

c、Part ③ deals with maintenance settings when battery voltage is controlled, Parameters can be set as required. it means:

- **Shutdown**, If the battery voltage is below this setting, the inverter will shut down.
- **Low Bat**, If the battery voltage is below this setting, the inverter will alarm.
- **Restart**, The device will resume operation when the battery voltage reaches the set value and the AC output will resume.
- NO.④⑤ in that figure, 3.12, Other battery maintenance settings. According to the setting values of different voltage types in Table 3.1, the default value of temperature compensation coefficient **TempCoF/E is -3**. Professional installers use, if you do not know, you can choose not to modify the default.
- Battery Setting2、3: The interface is for power grid and engine power, voltage, upper limit of charging and discharging current, battery operation mode, time curve operation mode, etc. If you are not clear, you can choose default without modification.

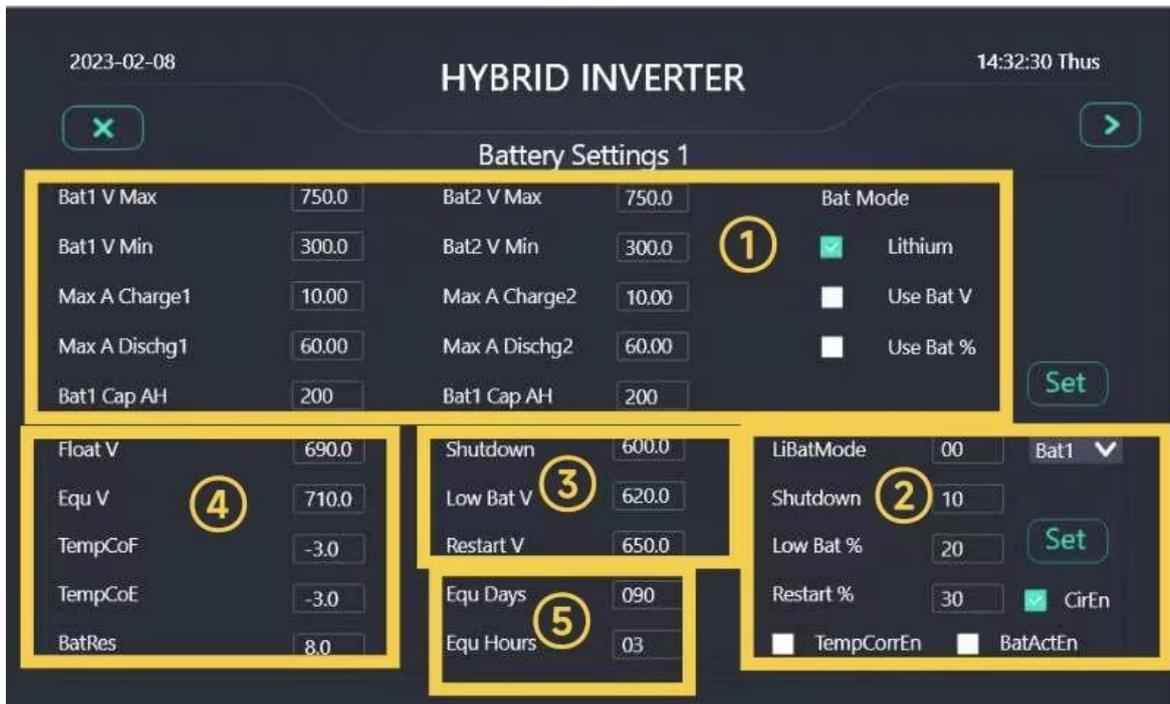


Figure 3.12 Battery Setting 1 Interface

Table 3.1 Recommended settings for different batteries

Battery Type	Absorption stage	Float stage	Torque value Per 3hours per 30 days
AGM (or PCC)	14.2V(14.2*nV)	14.4V(14.4*n V)	14.2V(14.2*n V)
GEL	14.1V(14.1*n V)	14.4V(14.4*n V)	
WET	14.1V(14.1*n V)	14.4V(14.4*n V)	14.7V(14.7*n V)
LITHIUM	According to its BMS decision		

When setting battery Settings 2, please note whether the battery Mode is SOC control mode or voltage control mode (battery Settings 1 Bat Mode set check box)

- **Dischg Pmax-W:** The maximum power that the battery can discharge.
- **Stop Dischg SOC-%:** The SOC value of the battery stops discharging. If the SOC is lower than this value, the battery will no longer discharge.
- **AC Chg SOCmax-%:** The maximum SOC value of battery charging, above which the battery SOC will no longer be charged with the grid or gen. When the “General Stop Chg SOC-%” is higher than this value, the PV will continue to be charged to the minimum value of the Disable SOC.
- **General Stop Chg SOC-%:** The minimum SOC value of the battery charge, AC and photovoltaic side are no longer charged.
- **Dischg Vmin-V:** Minimum battery discharge voltage. If the battery voltage is lower than this

value, the battery will not discharge.

- **Chg Vmax-V:** Maximum battery charging voltage. If the battery voltage is higher than this value, the battery will not be charged.
- **Chg Imax-A:** The maximum current allowed when the battery is charged.
- **Gen Stop SOC-%:** When no Grid, the battery SOC value is higher than this value, the Gen will automatically stop.
- **Gen Start SOCmax-%:** When no Grid and the battery SOC value is lower than this value, the Gen will automatically start for charging the battery.
- **Gen Stop Vol-V:** When no Grid, the battery voltage value is higher than this value, the Gen will automatically stop.
- **Gen Start Vol-V:** When no Grid and the battery voltage value is lower than this value, the Gen will automatically start for charging the battery.
- **Chg Imax - A:** the maximum current value of the battery when charging.



Figure 3.13 Battery Setting 2 Interface



Figure 3.14 Battery Setting 3 Interface

3.2.2 Grid parameter setting

Click "Grid Setting" to set grid related parameters, as shown in Figure 3.15, You can set the meter or CT access type, meter model and communication address, CT ratio, voltage frequency upper and lower limits, GEN interface type, inverter voltage amplitude, Grid voltage amplitude range, Grid frequency range, Grid power limit value, Gen port access type, smart load and AC coupling device function Settings.



Figure 3.15 AC Setting 1

3.2.3 GEN port function settings

When the GEN port can be connected to the Gen, intelligent load or AC coupling unit grid-connected inverter , it is necessary to change the GEN interface type in the setting to the corresponding type. The setting path is shown in Figure 3.16 below. Click GenPortType to select the Gen interface type as Generator, Smart loads or AC Couple. Please select according to the actual wiring.



Figure 3.16 AC Setting 2

- When selecting the generator connected to the GEN interface, please confirm that the control line of the generator is also connected to the J8 terminal NO1\COM1 (generator start control) in the schematic diagram of the internal external interface board of the device as shown in Figure 2.6, select Generator as Generator for GenPort Type in the power grid setting interface of Figure 3.16, and select Gen Mode at the same time. Select Model-PQ for the operating mode. At this time, when the power grid is cut off and the battery voltage or SOC is lower than the battery discharge voltage or SOC setting value, the generator will automatically start to power the system.
- When selecting the smart load connected to the GEN interface, select GenPortType as Smartloads in the grid setting interface in Figure 3.16, and the Gen relay will be turned on at this time, and the GEN interface will supply power to the smart load for output.

StartPower: The smart load is set to the power settings. When the photovoltaic power is greater than the setting of this settings, the inverter will power the smart load power.

Off Soc%: When the battery SOC% is lower than the set value, the inverter will stop supplying power to the Smart load.

On Soc%: When the battery SOC% is higher than the set value, the inverter will start supplying power to the Smart load.

Off Vol V: When the battery voltage is lower than the set value, the inverter will stop supplying power to the Smart load.

On Vol V: When the battery voltage is higher than the set value, the inverter will start supplying power to the Smart load.

- When selecting the AC Couple connected to the GEN interface, select AC Couple as GenPortType in the grid setting interface in Figure 3.16, and then AC Couple and the grid supply power to the system together.

Couple Fre Hz: AC couple frequency setting.

Off Soc%: When the battery SOC% is higher than the set value, the AC couple will not participate in the system power supply.

On Soc%: When the battery SOC% is lower than the set value, the AC couple and the inverter are connected to the grid to supply power to the system.

Off Vol V: When the battery voltage is higher than the set value, the AC couple does not participate in the system power supply. .

On Vol V: When the battery voltage is lower than the set value, the AC couple and the inverter are connected to the grid to supply power to the system.

Only Bat En:When the battery is working, the system will always power the Smart Load.

OnGrid Always on:When the inverter is working On grid, the system will always power the Smart Load.

Gen Pmax kW:This value is the maximum power value of the external Gen, and the system will regulate the system according to this value.

Gen Signal En:Output Gen signal control enablement, including power on and off and speed control control.

Gen Mode:Select according to different generator and inverter operation modes. Most devices select MODE2-VF. If the main interface does not show that the generator is involved in the system operation, please switch to MODE1-PQ. It is recommended to select PQ.



Figure 3.17 Intelligent Load and CT Ratio Setting Path

3.2.4 CT transformation ratio setting

Click the CT Ratio data box in the grid setting interface in Figure 3.15 to set the CT transformation ratio. When the model of transformer is 300A:5A, the interface value shall be filled with 300. If the transformer is 150A:5A, the value should be 150.

The value is very important. The wrong setting will affect the normal operation of the equipment. If you are not sure, please keep the default or contact us.

3.2.5 Safety setting

Figure 3.18 AC setting interface 3, mainly for safety setting. Specific function Settings are defined as follows:



Figure 3.18 AC setting interface 3

- **Safety Standard:** Grid standard, see Table 3.2 .Grid standard code list will be updated from time to time, please refer to the actual product.

Table3.2 Grid standard code

Number	Area description	Grid standard code
0	Generic standard	Generic standard
1	Pakistan	IEC61727/PK
2	Pakistan	NRS/ZA
3	Germany.	VDE4105/DE
4	Germany.	EN50549
5	Poland	EN50549-PL
6	Italy	CEIO-21/IT

- **Reactive Power Type:** Reactive power compensation type. ①The reactive power is directly set. ②Fixed power factor at fixed. ③By active power-power factor curve. ④Reactive power-voltage amplitude curve (local grid standard). ⑤According to reactive power-voltage amplitude curve (common standard).
 - **Reactive Power set directly:**The reactive power is set directly. When this type is selected, Please enter the value in *Reactive Power VA*.
 - **Fixed power factor:**Fixed power factor.When this type is selected. Please enter the power factor value in *Power factor set*.
 - **Active power-PF curve:**By active power-power factor curve, When this type is selected, Please enter the power factor and the rate of active power rising in *Power factor set* and *Rising Rate of active power*. Note: The higher the speed setting, the slower the rise.
 - **Reactive Power-Vol curve:** Reactive power-voltage amplitude curve abide by local grid standard.

- **Reactive Power-Vol curve:** Reactive power-voltage amplitude curve abide by Universal standard. Please set the following parameters as required: *Starting point of Q-U%*, *Rising length of Q-dU%*. For example, As shown in the figure 3.19, QU curve when power factor is 0.9, From the power factor of 0.9, we can calculate the maximum reactive power as 43.59%* apparent power) .

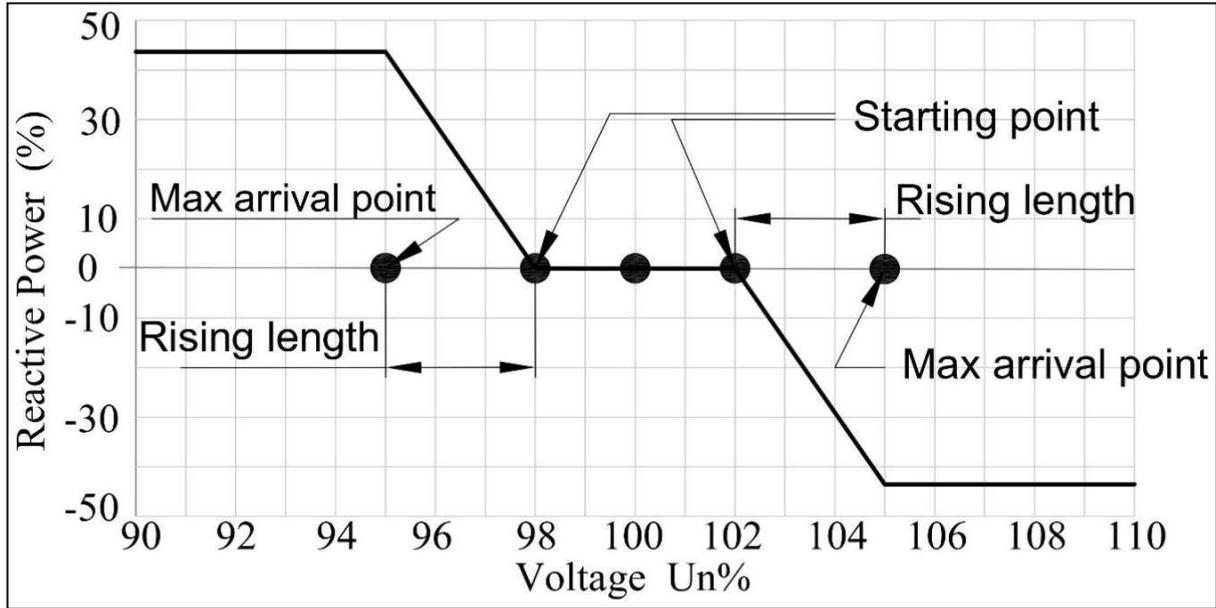


Figure 3.19 QU curve when power factor is 0.9

- **Starting point of QC:** Starting point of capacitive reactive power.
- **Starting point of QL:** Starting point of inductive reactive power.
- **MAX arrival point of QC:** MAX arrival point of capacitive reactive power.
- **MAX arrival point of QL:** MAX arrival point of inductive reactive power.
- **Safety Time Enable:** The safety time is enabled. After the system is powered off, the connection time for the device to restart is 12 seconds. Time after tick is 70s.
- **Filtering Set:** Filter setting.
- **TimeConst of Filt:** Reactive filter time constant. The default value is 120.

3.2.6 Operating Mode Settings

Click "Professional Setting" to select equipment operation mode, parallel operation quantity and address during parallel operation, Inv address of each equipment shall be set differently and cannot be repeated, for example, equipment AInv is 1 and equipment BInv can be set to 3 , as shown in Figure 3.20. For details about the operation logic, see Operation and Maintenance.

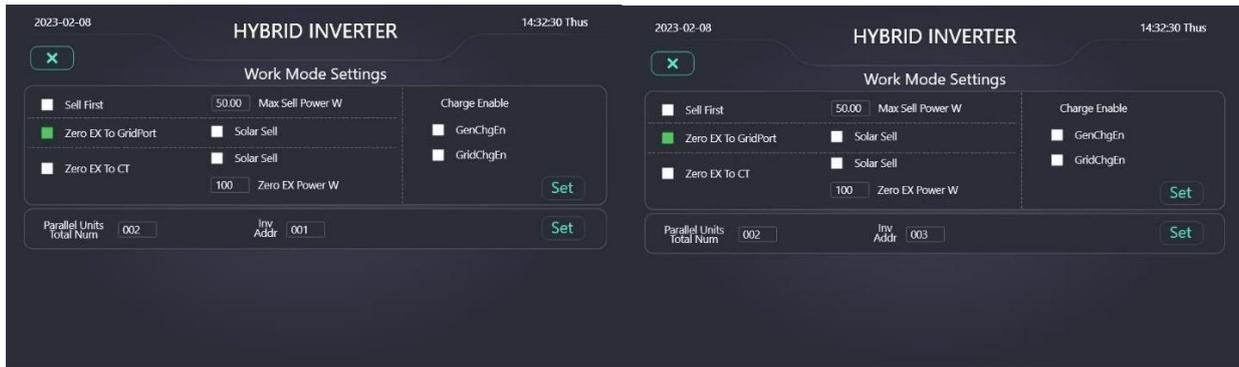


Figure 3.20 Working mode setting interface

3.2.7 System Setup

Click "System Setting" to set relevant parameters of the system, as shown in Figure 3.21, including device time, LCD address, device serial number, read firmware status, BMS address, etc.

Click on the BMS PORT list to select the battery brand you are using. If multiple devices are used in parallel with one battery set, please tick BatShareEn. If the lithium battery uses CAN communication, tick CirEn in Battery Settings page 1. If you want to use voltage mode to control the battery, untick CirEn.

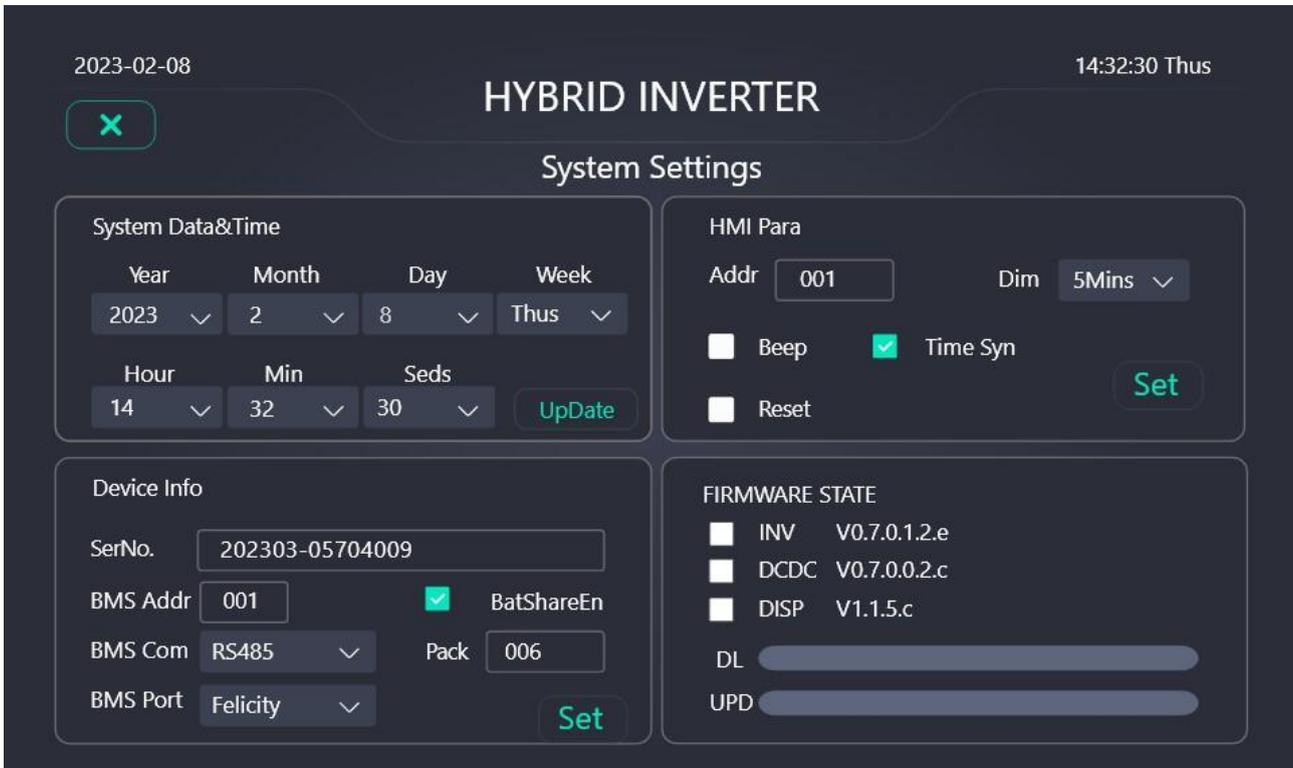


Figure 3.21 System Setting Interface

3.3 Events Display

Click the "History" icon on the main interface to view all the running status and other information of

the equipment, as shown in Figure 3.22. When the equipment runs abnormally, you can view this event record. For detailed handling opinions, please refer to "Table 4.2 Equipment Alarm Information and Handling Methods" in Section 4 Operation and Maintenance.



Figure 3.22 Historical Information Interface

3.4 Device Info

Click the "DeviceInfo" icon on the main interface to view the equipment serial number, BMS communication protocol, BMS communication address, INV/DCDC software version, LCD software version HMI and other status information, as shown in Figure 3.23.



Figure 3.23 Equipment Information Interface

4 Operation and maintenance

4.1 Trial run

When the device and other device cables such as batteries are properly installed and connected, start the device by following the following steps: The LED flashing signal definition and LCD key definition are described in Table 4.1: Hold down UP and ENTER at the same time to restart the LCD.

- Turn on the power supply of grid, battery, photovoltaic switch, the LCD will light up.
- Select a meter or CT and set its address based on the actual used. If neither is used, select None .The setting position is on AC Setting1 on the LCD screen.
- Select a Grid standard based on the actual power grid usage. If no corresponding standard is available, select the general standard. The setting position is on AC Setting1 on the LCD screen.
- Select the battery control mode based on the actual use of the battery.This setting is located in the LCD battery device screen Batttery Setting1.When the system is not connected to the battery, but is connected to the PV or power grid, in this case, the system can still work without selecting Bat Mode.
- Press the ON/OFF button to turn on the device.The round button located on the right side of the housing.
- For details about the operating mode, see descriptions of the single machine Operating Mode.

Table 4.1 Definition of LCD keys

	LED definition	Instructions
DC	The green light continues to shine.	Pv connection normal
AC	The green light continues to shine.	Power grid connection normal
Normal	The green light continues to shine.	Normal inverter operation
Alarm	Red light flashing	Fault or warning
ESC		Exit setting
UP		Go to the previous option
DOWN		Go to the next option
ENTER		ENTER certainty

4.1 Stand-alone operation and logic description

When the stand-alone operation, The K6 dialing code on the internal and external interface board of the device needs to be opened, set ON, as shown in Figure 4.1. K8 and K7 remain closed.

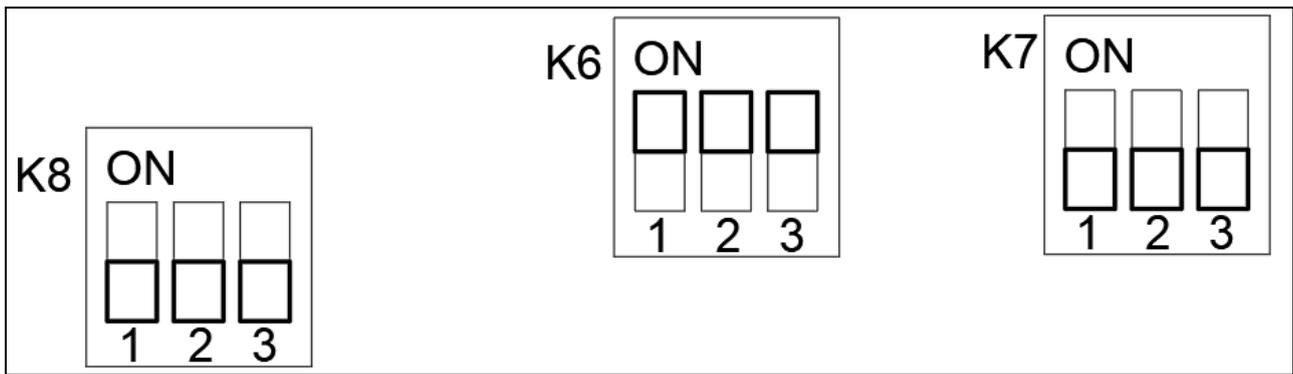


Figure 4.1 Schematic diagram of DIP terminal ON

4.1.1 Enter working mode to set path



Figure 4.2 schematic diagram of entering the working mode

4.1.2 Sell First

In the sell first mode, when the battery power is higher than the set value, this mode allows the hybrid inverter to sell the excess battery power to the grid. By default, photovoltaic power can also sell to grid.

4.1.3 Zero Ex To Grid port

Zero Ex to grid port mode: This mode uses the grid port of the machine as the grid port and keeps the output of this grid port at zero.

4.1.4 Zero Ex To CT

Zero CT mode: This mode uses CT as a grid port and keeps the output of this grid port zero.

4.1.5 Time curve mode

Power grid peak regulation. Click on the home page to set "SETTING", click on the battery setting "BatterySetting" graph in the settings interface, you can enter the battery parameter setting interface, click the next page, check "TimeofUse" on the "BatterySetting3" page, and set the time curve related parameters, as shown in figure 4.3 below, you can choose the three time curve operation modes of "SOC-%", "Power-W" or "Bat-V" in the drop-down box.

The hybrid inverter in this mode operates according to the set time period and the corresponding allowable conditions, and the battery discharge power will be limited to the set value. If the load power exceeds the allowable value, photovoltaic will be used as a supplement. If it still can not meet the load demand, then increase the grid power to meet the load demand. At the same time, if time and conditions permit, you can also check "Gen rechargeable" or "grid rechargeable" in the working mode interface to charge the battery using the power grid or Gen.



Figure 4.3 Schematic diagram of setting time curve

4.2 Parallel operation and logical explanation

During parallel operation, the internal external interface board of the first device and the last device placed as shown in Figure 4.1, K6 dials need to be turned on, K8 and K7 remain closed. For example, in the grid-connected parallel wiring diagram of Figure 4.5, for the placement of twenty devices, K6 dials of 1# and 20# need to be turned on, and K6 dials of 2#~19# do not need to be turned on.

4.2.1 Set entry path description

Click "Setting", display at screen on the home page, and click "Professional Setting" in the setting interface to enter the working mode setting interface and select the address setting of the device, as

shown in figure 4.4.



Figure 4.4 Enter the parameter setting diagram of the parallel machine and the address setting of the three machines

4.2.2 Parallel operation logic

When multiple parallel machines are connected, first connect the communication network lines ports Parallel_A and Parallel_B and CAN communication lines port CAN2HandCAN2L of the parallel equipment to form a ring connection system, then set the address parameters of each module respectively after power-on, as shown in figure 1.1. set the number of parallel machines "ParallelUnitsTotalNum", inverter address "InvAddr" can only be odd , and recommended starting from 1 can not be repeated. The hybrid inverter module of InvAddr=1 will be defined as the host by the system, and the hybrid inverter module whose InvAddr is odd will be defined as the slave.

In this mode, all hybrid inverters will run synchronously according to the scheduling of the host, so when powering up, the boot keys of all slaves should be pressed first, and finally the boot keys of the mainframe should be pressed, so that the host can automatically identify the slave state in the merging system, which is conducive to logic and power regulation when power is turned on and connected to the grid. If there is an individual slave failure or communication interruption in the normal operation, the host will automatically identify and withdraw the slave from the whole parallel system and re-regulate the power. When the fault slave returns to normal, the host will automatically identify and merge the slave into the system and re-regulate the power.

All the working modes of the parallel system are the same as those of the stand-alone machine. It should be noted that the parallel machine only needs a set of external CT, which is connected to the municipal power trunk line, and the sampling signal is connected to the CT input port of the host computer.

4.2.3 Parallel system wiring diagram

See Figure 4.5 for grid-connected parallel wiring diagram and Figure 4.6 for off-grid parallel wiring diagram. When connected to the mains, generator or AC coupling device, grid-connected operation is required, and wiring is required according to Figure 4.5; when neither the grid nor the generator is connected, off-grid parallel operation is required, and wiring is required according to Figure 4.6;

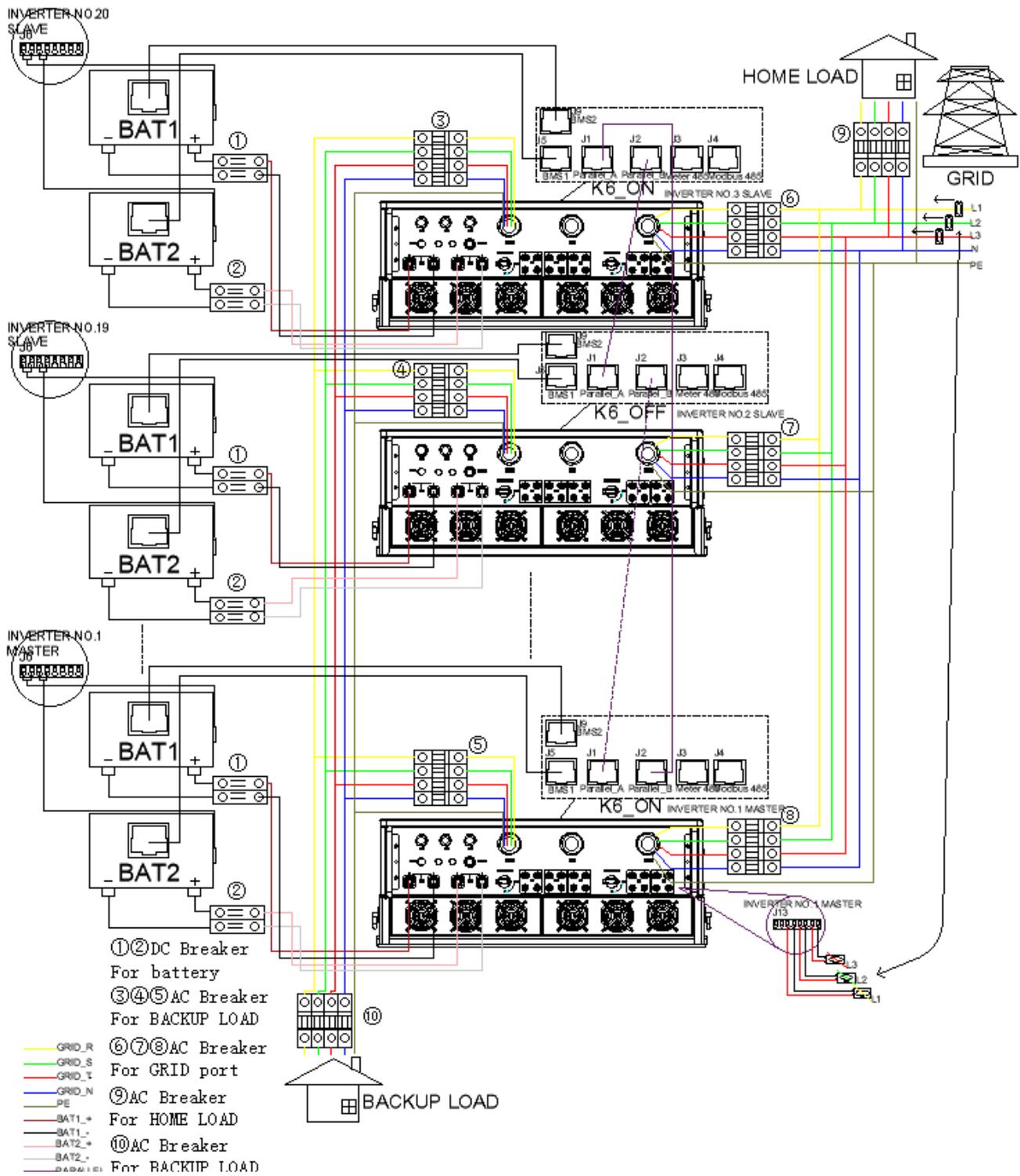


Figure 4.5 On-grid parallel wiring diagram

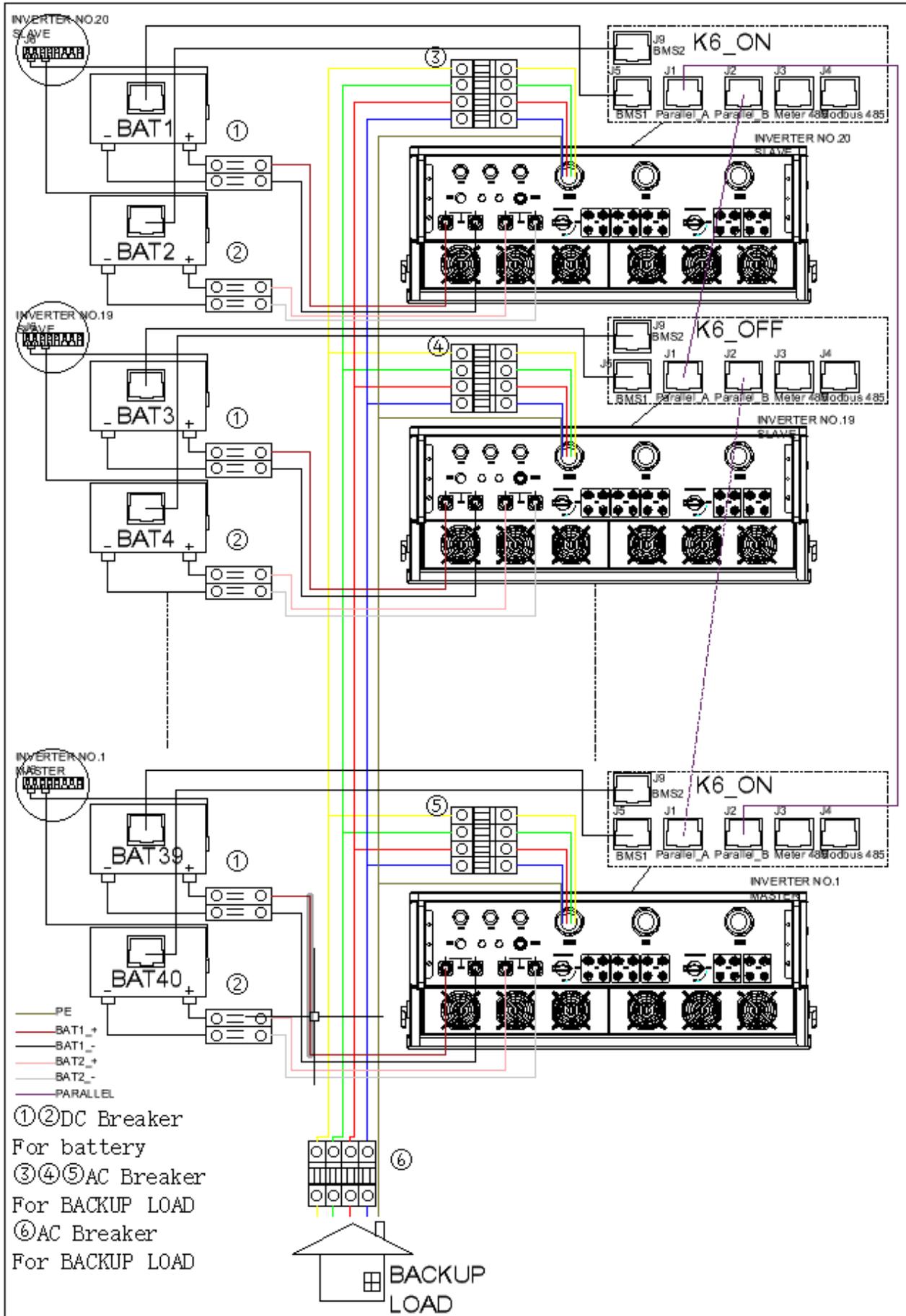


Figure 4.6 Off-grid parallel wiring diagram

4.3 Example of five parallel inverter

4.3.1 Grid and load connection

Figure 4.7 below shows the connection diagram of five inverters (No. 1, 3, 5, 7, 9). K0 is the main circuit breaker of the power grid. K11, K13, K15, K17, K19 are load circuit breakers, K1 is the load circuit breaker. K02 is a home load circuit breaker.

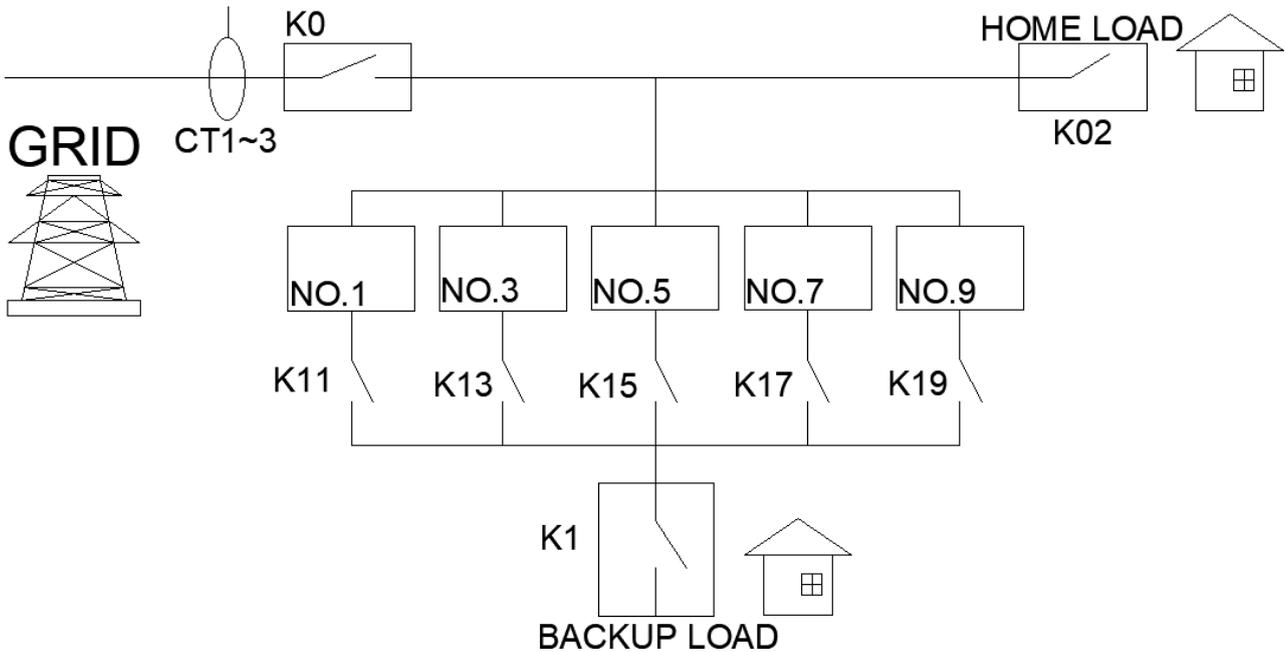


Figure 4.7 The connection diagram of five inverters

4.3.2 Parallel cable connection and check

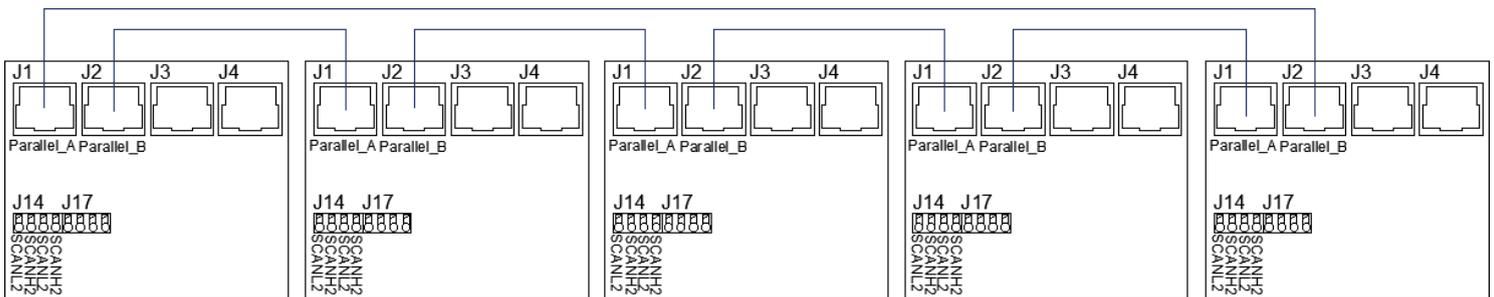


Figure 4.8 Parallel cable connection

Step 1:

a) Check whether the cable connection is correct as shown in Figure 4.7 (for BMS connection, CT or ammeter connection, battery connection, and ground cable connection, refer to the previous chapter.)

Check whether the positive and negative batteries are consistent.

b) Please check whether the parallel cable connection is correct as shown in Figure 4.8.

c) Please turn on the K6 DIP switches placed on the first and last inverters, and turn off the others;

Step 2:

a) Open the main circuit breaker K0 of the power grid;

b) Check whether the same-phase voltage difference between the mains input terminal of each inverter and the main circuit breaker K0 side is close to 0; if everything is connected normally, proceed to the next step;

Step 3:

a) Keep the battery disconnected and the load circuit breakers (K11, K13, K15, K17, K19) disconnected;

b) Check whether the LCD display is on and whether the grid voltage and frequency displayed on the grid data page are normal;

c) Device address setting, see 4.1.1 Setting interface for setting path, set the host address to 1, and the slave address to 3, 5, 7, 9;

d) Battery sharing setting, if the same group of batteries are used, please check BatShareEn in the system settings, and set the BMS communication method and communication address;

e) CT or meter setting, please select the metering method used by the system in AC Settings1, if all are used, please select None;

f) Battery control mode selection, please select SOC control, voltage control or lithium battery control mode according to the actual battery type used in Battery Setting1. If the battery is not connected, it can run without selection;

g) Close the circular button on the left front of the inverter housing (the order is to close slave 3#5#7#9# first, and master 1# last);

h) After waiting for the grid relay to close, check whether the voltage on the load page of the main interface of the screen is normal. Click the inverter icon in the middle of the main interface of each device to check whether the INV Stage is 30-Working;

i) Check the in-phase voltage difference between the grid input port and the load output port of each inverter to ensure that all voltage differences of each inverter are close to zero; if everything is connected normally, proceed to the next step.

Step 4:

a) Check the connection between the load output port and the load circuit breaker (K11, K13, K15, K17, K19), and check the connection between the load circuit breaker (K11, K13, K15, K17, K19) and the total load circuit breaker K1;

b) Open the load circuit breakers (K11, K13, K15, K17, K19);

c) If all the load circuit breakers are open, the connection check is complete; disconnect the load circuit breaker, disconnect the round button, and disconnect all grid circuit breakers;

4.3.3 ON-Grid startup parallel

a) Before starting the grid connection, make sure that all lines have been checked correctly;

b) Close the main grid circuit breaker K0;

- c) Check whether the grid interface voltage and frequency of each inverter are normal;
- d) Close all battery circuit breakers and check whether the battery interface voltage of each inverter is normal. If it is a lithium battery or SOC control mode, you can check whether the SOC value next to the battery icon on the main interface is displayed correctly;
- e) Press the round button on the left front of all slaves;
- f) Press the round button on the left front of the master;
- g) After waiting for the grid relay to close, check whether the load page voltage on the main interface of the screen is normal, click the inverter icon in the middle of the main interface of each device, and check whether the INV Stage is 30-Working;
- h) Close all load circuit breakers (K11, K13, K15, K17, K19);
- i) Close the main load circuit breaker to supply power, and the operation is completed.

4.3.4 Off-grid startup parallel

- a) Before starting up the inverter off-grid, make sure that all circuits have been checked correctly;
- b) Close all battery circuit breakers and check whether the voltage on the battery interface of each inverter is normal. If it is a lithium battery or SOC control mode, check whether the SOC value next to the battery icon on the main interface is displayed correctly;
- c) Close all load circuit breakers (K11, K13, K15, K17, K19);
- d) Press the round button on the front left of all slaves;
- e) Press the round button on the front left of the host;
- f) Check whether the voltage on the load page on the main interface of the screen is normal. Click the inverter icon in the middle of the main interface of each device to check whether the INV Stage is 10-Working;
- g) Close the total load circuit breaker to supply power, and the operation is completed.

4.3.5 Shut down the Inverter

- a) Turn off total load circuit breaker K1
- b) Turn off all load circuit breakers (K11, K13, K15, K17, K19).
- c) Release the round button on the side of the host
- d) Release all round buttons on the side of the slaves
- e) Turn off the grid circuit breaker K0 and all battery circuit breakers
- f) The system exits from operation.

4.4 Fault alarm and handling

If the device fails to start, click the Events icon on the home screen to view historical alarms and rectify faults one by one. Through the analysis of the above methods, determine the cause of the fault, and then determine the appropriate solution according to the field conditions. Table 4.2 lists the device alarm information and handling methods.

- Periodically check whether the wiring of each part of the inverter is firm and loose, especially

carefully check the fan, power module, input terminal, output terminal, and grounding.

- Once the alarm stops, do not start immediately, should find out the cause and repair the restart, check should be strictly in accordance with the inverter maintenance manual prescribed steps.
- Operators must be specially trained to identify the causes of general failures and be able to troubleshoot them, such as skilfully replacing fuses, components and damaged circuit boards. Personnel without training are not allowed to operate the equipment.
- If there is an accident that is not easy to exclude or the cause of the accident is unclear, a detailed record of the accident should be made and the inverter manufacturer should be notified in time for solution.

Table 4.2 Device alarm information and handling methods

Number	Warning	Handling Suggestions
W01	Insulation_Warning	1.Please check that the ground wire is connected correctly; 2.Seek help from us, if you cannot return to normal.
W02	Comm_LCD_Lose_Warning	1.Please Check the communication line between the LCD and the control board; 2.Seek help from us, if you cannot return to normal.
W03	LVRT_Fault_Warning	Grid voltage fluctuation,the equipment records this event.
W04	Fan_Faultt_Warning	1.Please check the fan outside the enclosure for foreign objects; 2.Restart the equipment, please contact us if you still fail.
W05	PV1 low voltage warning	1.Please check the PV1 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~ 800) V; 2.At present, the light is weak, and the actual photovoltaic power is low; 3.Please contact us or PV supplier again.
W06	PV2 low voltage warning	1.Please check the PV2 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~ 800) V; 2.Please contact us or PV supplier again. 3.Please contact us or PV supplier again.
W07	PV3 low voltage warning	1.Please check the PV3 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~ 800) V; 2.Please contact us or PV supplier again. 3.Please contact us or PV supplier again.
W08	PV4 low voltage warning	1.Please check the PV4 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~ 800) V; 2.Please contact us or PV supplier again. 3.Please contact us or PV supplier again.
W09	PV5 low voltage warning	1.Please check the PV5 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~ 800) V; 2.Please contact us or PV supplier again. 3.Please contact us or PV supplier again.
W10	Battery1 low voltage warning	1.Please check whether the battery1 voltage is too low; 2. Check whether the battery1 voltage lower limit on the battery1 setting page is higher than the actual battery1. The minimum battery1 voltage setting value is between (160 ~ 850) V; 3.Check whether the maximum discharge current on the battery1 page exceeds the maximum battery1 operating current; 4.Please contact us or battery suppliers if you are alert again.
W11	Battery2 low voltage warning	1.Please check whether the battery2 voltage is too low; 2. Check whether the battery2 voltage lower limit on the battery2 setting page is higher than the actual battery2. The minimum battery2 voltage setting value is between (160 ~ 850) V; 3.Check whether the maximum discharge current on the battery2 page exceeds the maximum battery2 operating current; 4.Please contact us or battery suppliers if you are alert again.
W12	ACgrid low voltage warning	1.Please check whether the grid voltage is too low; 2.Check whether the lower limit of AC voltage is too high on the AC setting page. The minimum grid voltage setting value is between (198 ~ 220) V. 3.Please contact us if you are alert again.
W13	ACgen low voltage warning	1.Please check whether the gen voltage is too low; 2.Check whether the lower limit of Gen voltage is too high on the AC setting page. The minimum gen voltage setting value is between (198 ~ 220) V. 3.Please contact us if you are alert again.
W14	AC_Volt_Unbalance_Warning	The AC voltage amplitude is unbalanced 1.Please check the AC wiring of the equipment and restart after errors; 2.If the restart failed and reported the error again, please contact us.
W15	AC_PLL_Warning	Failed to detect the output phase lock after power-on 1.Please check the AC wiring of the equipment and restart after errors; 2.If the restart failed and reported the error again, please contact us.

W16	Power_Derate_Warning	The equipment is output derated due to environmental influence, records this event.
W17	Heatsink_LoTemp_Warning	Low temperature warning due to environmental influences
W18	BMS Communication Warning	1.Please check whether the BMS communication cable is well connected; 2.If you still alert, please contact us.
W19	Grid voltage_Fault	1.The output voltage is not within the equipment setting range, and it may be caused by the device stop; 2.If you still alert, please contact us.
W20	grid_GridPhhaseSeque_Fault	1.Check the device wiring and the equipment of each power supply normally; restart the device; 2.If you still alert, please contact us.
W21	AC_Freq_Fault	1.Please check the grid frequency range value in the equipment system; 2.Please check whether the grid wiring is correct; 3.If you still alert, please contact us.
W22	gen_voltage_Fault	1.The output voltage is not within the equipment setting range, and it may be caused by the device stop; 2.If you still alert, please contact us.
W23	Gen_GridPhhaseSeque_Fault	1.Please check whether the gen wiring is correct; 2.Restart the equipment, please contact us if you still fail.
W24	GEN_Freq_Fault	1.Please check the gen frequency range value in the equipment system; 2.Please check whether the gen wiring is correct; 3.If you still alert, please contact us.
W25	Load low voltage warning	1.Please check whether the load line wiring is correct; 2.Please check the range of AC voltage; 3.Restart the equipment, please contact us if you still fail.
W26	PV5_VoltHigh_warning	1.Please check the PV5 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~ 800) V; 2.Please contact us or PV supplier again.
W27	PV4_VoltHigh_warning	1.Please check the PV4 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~ 800) V; 2.Please contact us or PV supplier again.
W28	PV3_VoltHigh_warning	1.Please check the PV3 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~ 800) V; 2.Please contact us or PV supplier again.
W29	PV2_VoltHigh_warning	1.Please check the PV2 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~ 800) V; 2.Please contact us or PV supplier again.
W30	PV1_VoltHigh_warning	1.Please check the PV1 voltage range in the equipment system settings. The PV voltage setting value is between (160 ~800) V; 2.Please contact us or PV supplier again.
W31	Bat1_VoltHigh_warning	1.Please check whether the battery1 voltage is too high; 2.Please check whether the upper limit of the battery1 voltage range in the equipment system is too low. The highest battery1 voltage setting value is between (160 ~ 850) V; 3. Please contact us or battery suppliers if you are alert again.
W32	Bat2_VoltHigh_warning	1.Please check whether the battery2 voltage is too high; 2.Please check whether the upper limit of the battery2 voltage range in the equipment system is too low. The highest battery2 voltage setting value is between (160 ~ 850) V; 3. Please contact us or battery suppliers if you are alert again.
F01	DC Inversed Failure	1.Please check whether the positive and negative batteries are reversed; 2.If you still alert, please contact us.
F02	Insulation_Failure	1.Please check that the ground wire is connected correctly 2.Seek help from us, if you cannot return to normal.
F03	EEPROM_Read_Failure	Restart the equipment, please contact us if you still fail.
F04	EEPROM_Write_Failure	Restart the equipment, please contact us if you still fail.

F05	DC soft start Failure	1.Please check whether the battery voltage is normal; 2.Please check whether the battery voltage setting value of the device is normal, The battery voltage setting value is between (160 ~ 850) V; 3. Please contact us or battery suppliers if you are alert again.
F06	Tz_Dc_OverCurr_Fault	1.Please check the battery current limit value in the equipment system; 2.Please check whether the PV and battery wiring of the equipment are normal; 3.Cut off all power soure and wait for 2 minutes to discharge the inverter.Open all power circuit breakers and restart the device; 4.If the restart failed and alarmed again, please contact us.
F07	DC_OverCurr_Failure	1.Please check the battery current limit value in the equipment system; 2.Please check whether the PV and battery wiring of the equipment are normal; 3. Cut off all power soure and wait for 2 minutes to discharge the inverter.Open all power circuit breakers and restart the device; 4. If the restart failed and alarmed again, please contact us.
F08	AuxPowerBoard_Failure	Restart the equipment, please contact us if you still fail.
F09	IGBT_Failure	Restart the equipment, please contact us if you still fail.
F11	AC_Main Contactor_Failure	Restart the equipment, please contact us if you still fail.
F12	AC_Slave Contactor_Failure	Restart the equipment, please contact us if you still fail.
F13	Tz_Ac_OverCurr_Fault	1.Please check whether the backup load power is within the range; 2.Restart and check whether it is normal; 3.Seek help from us, if you cannot return to normal.
F14	AC_OverCurr_Failure	1.Please check whether the backup load power is within the range; 2.Restart and check whether it is normal; 3.Seek help from us, if you cannot return to normal.
F15	GFCI_Failure	1.Please check the wiring of the equipment and restart after errors; 2.If the restart failed and reported the error again, please contact us.
F16	Tz_COM_OC_Fault	1.Please check whether the backup load power is within the range; 2. Restart and check whether it is normal; 3.Seek help from us, if you cannot return to normal.
F17	BusUnbalance_Fault	Restart the equipment, please contact us if you still fail.
F18	Load_voltage_Fault	1.Please check whether the load line wiring is correct; 2.Please check the range of AC voltage; 3.Restart the equipment, please contact us if you still fail.
F19	Grid_Overload_Fault	1.Please check whether the backup load power is within the range; 2.Restart and check whether it is normal; 3.Seek help from us, if you cannot return to normal.
F20	Gen_Overload_Fault	1.Please check whether the backup load power is within the range; 2.Restart and check whether it is normal; 3.Seek help from us, if you cannot return to normal.
F21	DC_VoltHigh_Fault	Restart the equipment, please contact us if you still fail.
F22	DC_VoltLow_Fault	Restart the equipment, please contact us if you still fail.
F23	AC_BackFeed_Fault	Restart the equipment, please contact us if you still fail.
F24	Heatsink_HiTemp_Fault	Overhigh temperature alarm
F25	PV1 arc Failure	1.Please check the wiring of the equipment and restart after errors; 2.If the restart failed and reported the error again, please contact us.
F26	PV1 Inversed Failure	1.Please check PV1 terminal is correct; 2.If you still alert, please contact us.
F27	PV2 Inversed Failure	1.Please check PV2 terminal is correct; 2.If you still alert, please contact us.
F28	PV3 Inversed Failure	1.Please check PV3 terminal is correct; 2.If you still alert, please contact us.
F29	PV4 Inversed Failure	1.Please check PV4 terminal is correct; 2.If you still alert, please contact us.

F30	PV5 Inversed Failure	1.Please check PV5 terminal is correct; 2.If you still alert, please contact us.
-----	----------------------	---

4.5 Product routine maintenance suggestions



- ◆ Ensure that all the switches on the DC side and AC side of the hybrid inverter, battery components, and AC power distribution cabinet are turned off.
- ◆ After the hybrid inverter is turned off, some components of the inverter still have residual voltage. Please wait at least 5 minutes before maintaining the inverter to prevent electric shock!

4.5.1 Routine inspection

- Check whether the temperature of each circuit breaker of the inverter is too high during the daily peak load generally not more than 90°C .
- Check whether the ambient temperature of the inverter is too high for example, ventilate and dissipate the inverter when the temperature is too high .
- The values of inverter, box transformer voltage, current and power are compared during daily peak load.
- Daily check whether the inverter sound is normal.
- Check fault records daily to see if new faults occur.

4.5.2 Monthly inspection

- Check the wiring of each part of the inverter regularly every month, whether it is firm, whether it is loose, and check whether the fan, power module, and terminal block are burned or heated.
- When the inverter needs to be started and stopped, strictly follow the instructions provided by the manufacturer.
- Operators through professional training, no violations of rules and regulations.

4.5.3 Quarterly inspection

- Tighten the screws on the AC and DC sides of the inverter every six months.
- Dust the inverter once every three months.
- In hot weather, open the inverter room vent for ventilation and heat dissipation.

5 Transportation and storage

5.1 Product Shipping Requirements

5.1.1 Logistics

- The company's inverter is delivered by a professional logistics company, and the logistics company will communicate with the dealer before delivery. Pay attention to accurately grasp the location and contact person of the delivery point, plan the delivery route, and preferably have an alternate route.
- The logistics drivers are very professional. No alcohol, drugs, or phone calls are allowed during driving. The drivers will stop to contact the distributor and consignee before arriving at the destination. Pay attention to communicating in advance, it is best not to disturb the driver halfway and distract the driving attention.
- The type of transport vehicle must be selected according to the actual road conditions. If it is too large, it may exceed the limit and cannot pass, or an unexpected situation may occur.

5.1.2 Unloading and handling

- You must have a special equipment operation certificate to drive a forklift, and you must pay attention to the inspection, and remember to prohibit unlicensed operation.
- Handlers must be equipped with relevant PPE.
- If there is no delivery point for forklift unloading, the pallet can only be removed on the logistics vehicle, and 4 people cooperate to unload one set each time.

5.2 Product storage environment requirements

If the inverter is not put into use immediately, it must be stored as required.

- Pack the inverter in its original packaging, retain the desiccant, and seal it with tape.
- The storage temperature should be kept at $-40^{\circ}\text{C}\sim+70^{\circ}\text{C}$. the relative humidity should be kept at $5\%\text{RH}\sim95\%\text{RH}$.
- Store in a clean and dry place, and prevent the erosion of dust and water vapor.
- Inverters with an outer packaging size of $740*610*390$ width×height×depth can be stacked up to 4 layers. When stacking, please place the inverter carefully to avoid personal injury or equipment damage caused by the equipment falling over. Please place it upward first, and it is forbidden to invert it.

- Periodic inspection is required during storage. If insects and rats are found to bite, the packaging materials need to be replaced in time.
- After long-term storage, the inverter needs to be inspected and tested by professionals before it can be put into use.

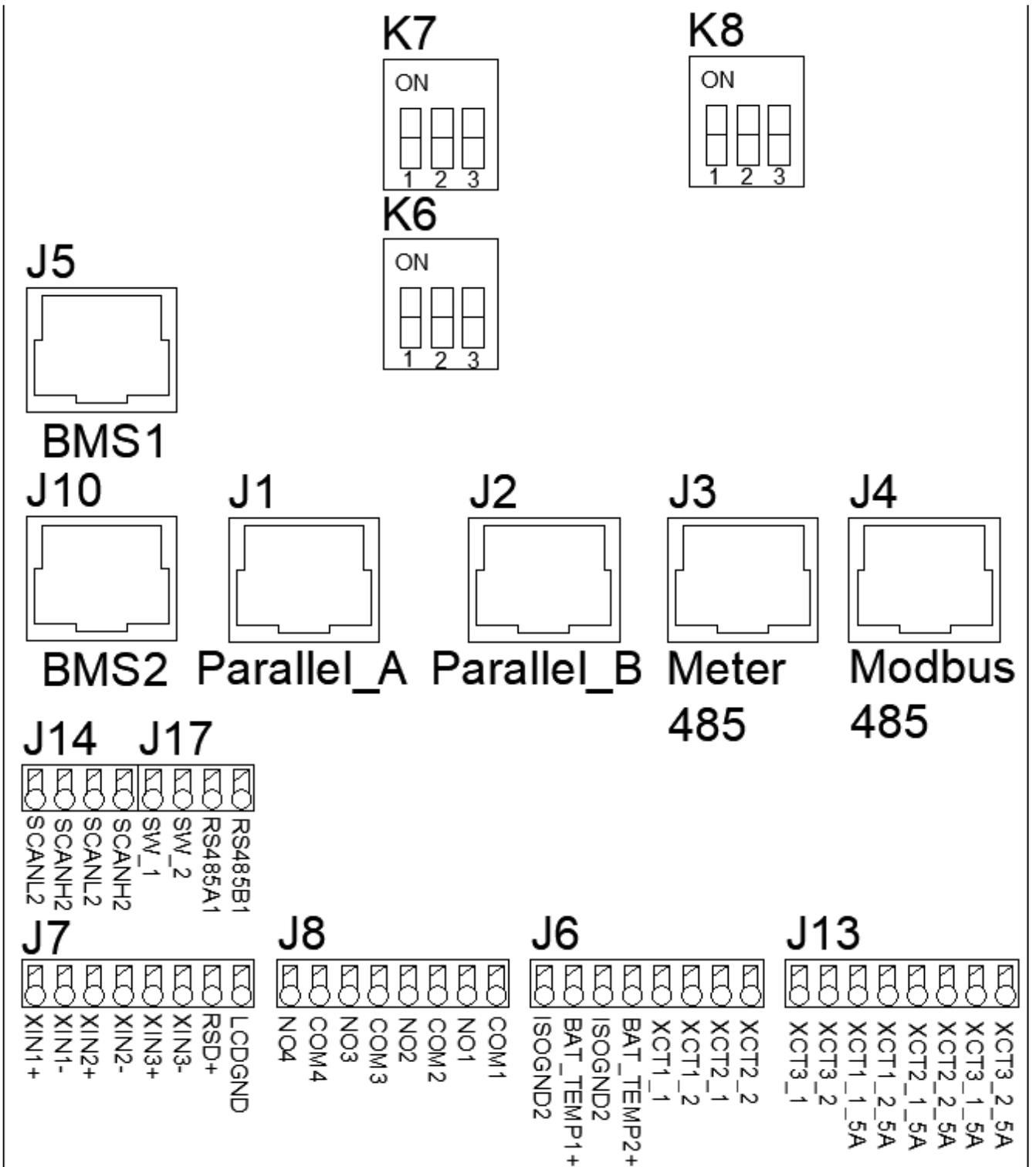
6 Legal Notices

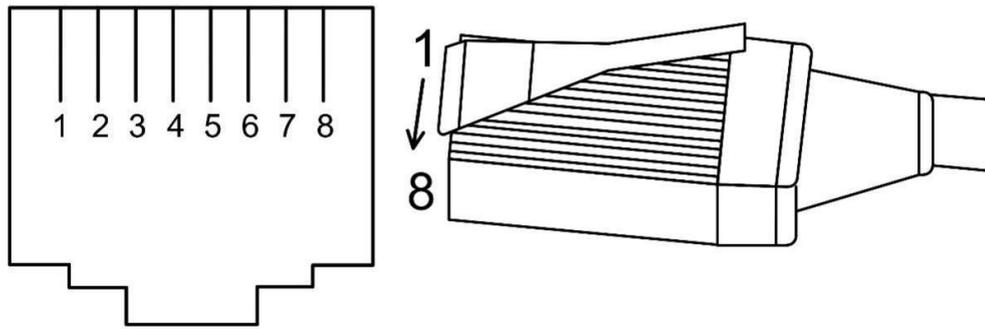
In addition to the above product warranty, national and local laws and regulations govern the power connection of the product including breach of implied terms and warranties . The company hereby declares that the terms and conditions of the product and the policy cannot and can only legally exclude all liability within a limited scope.

7 Attachments

Network port definition description

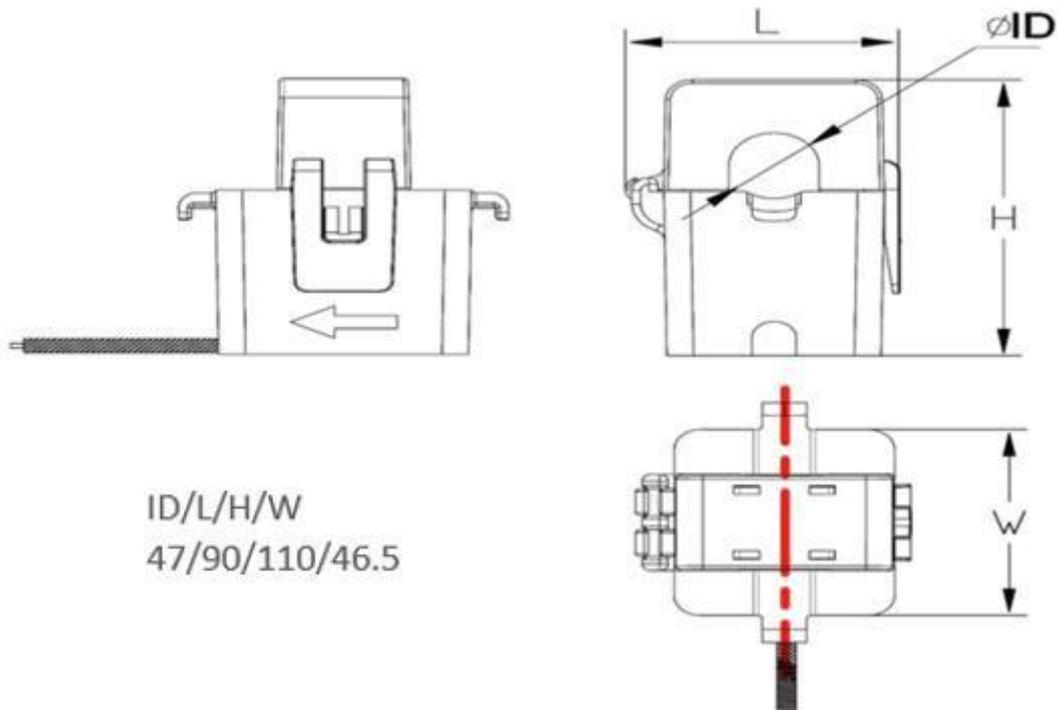
Pin	1	2	3	4	5	6	7	8
J7	IN1+	IN1-	IN2+	IN2-	IN3+	IN3-	RSD+	Terminal PIN
Function	Reserve for spare						12V+Output	12V+GND
J8	NO4	COM4	N03	COM3	NO2	COM2	NO1	COM1
Function	Reserve for spare		Grid relay control		Gen adjustment control		Gen start control	
J6	BAT-TEMP1+	ISOGND2	BAT-TEMP2+	ISOGND2	XCTA-1	XCTA-2	XCTB-1	XCTB-2
Function	Battery temperature sampling input1		Battery temperature sampling input2		External A-phase CT1 sampling input		External B-phase CT2 sampling input	
J13	XCTC-1	XCTC-2	XCTA-1-5A	XCTA-2-5A	XCTB-1-5A	XCTB-2-5A	XCTC-1-5A	XCTC-2-5A
Function	External C-phase CT3 sampling input		External A-phase CT1 sampling input		External B-phase CT2 sampling input		External C-phase CT3 sampling input	
J14	SCANL2	SCANH2	SCANL2	SCANH2				
Function	Parallel CAN communication		Parallel CAN communication					
J17	PV C	PV C	RS485A1	RS485B1				
Function	PV control		Meter communication					
J5	NC	NC	NC	CANH2	CANL2	NC	RS485A3	RJ45PIN
Function				BMS1-CAN communication			BMS-485 communication	
J10	NC	NC	NC	CANH4	CANL4	NC	RS485A3	RA485B3
Function				BMS2-CAN communication			BMS-485 communication	
J1	CANH1	CANL1	SNY-01	SNY-02	ISOGND1	ISOGND1	CAN-SMH	CAN-SML
Function	Parallel synchronous communication							
J2	CANH1	CANL1	SNY-01	SNY-02	ISOGND1	ISOGND1	CAN-SMH	CAN-SML
Function	Parallel synchronous communication							
J3	RS485B1	RS485A1	ISOGND2	NC	NC	ISOGND2	RS485A1	RS485B1
Function	Meter communication						Meter communication	
J4	NC	NC	NC	RS485B2	RS485A2	NC	RS485A4	RS485B4
Function				Reserve background monitoring communications			EMS monitoring	





CT size and model

CTK160702 300A:5A



Hybrid Inverter data

Product type	Merc-20G1-HE	Merc-25G1-HE	Merc-29.9G1-HE	Merc-30G1-HE	Merc-35G1-HE	Merc-40G1-HE	Merc-50G1-HE	Merc-60G1-HE
Battery Input Data								
Battery Type	Lead-acid or Li-ion							
Battery Voltage Range	160~800V							
Max. Charging Current	40A	50A	30/30A	30/30A	35/35A	40/40A	50/50A	60/60A
Max. Discharging Current	40A	50A	30/30A	30/30A	35/35A	40/40A	50/50A	60/60A
Charging Curve	3 Stage/Equalization							
External Temperature Sensor	Yes							
charging Strategy for Li-ion battery	Self-Adaption to BMS							
PV string Input Data								
Max. DC Input Power	30000W	37500W	44850W	45000W	52500W	60000W	75000W	90000W
Vmax PV	900V							
MPPT Range	150V~850V							
Start-up Voltage	180V							
PV Input Current	3*(18+18)A			4*(18+18)A			5*(18+18)A	

Max. PV ISC	3*(27.5+27.5)A			4*(27.5+27.5)A			5*(27.5+27.5)A		
No. of MPPT Tracker	3			4			5		
No. of String Per MPPT Tracker	2+2+2			2+2+2+2			2+2+2+2+2		
AC Output Data									
Rated AC Output Power and UPS Power	20000W	25000W	29900W	30000W	36000W	40000W	50000W	60000W	
Max. AC Output Power	22000VA	27500VA	29900VA	33000 VA	38500 VA	44000 VA	55000 VA	66000 VA	
Peak Power (off grid)	1.5 times of rated power, 10S								
AC Output Rated Current	30.3A/29 A	37.9A/36. 2A	45.4A/43. 4A	45.5A/43. 5A	53.1A/50. 8A	60.7A/50. 8A	75.8A/72. 5A	90.9A/87 A	
Max. AC Current	33.3A/31. 9A	41.7A/39. 8A	45.4A/43. 4A	50A/47.9 A	58.4A/55. 8A	66.7A/63. 6A	83.4A/79. 8A	100A/95.8 A	
Max. continuous AC Passthrough	100			200					
Output Frequency and Voltage	50/60Hz.380/400Vac(Three phase);								
Grid Type	Three phase								
Current Harmonic Distortion	THD<3%(Linear load <1.5%)								
Efficiency									
Max. Efficiency	97.6%	97.6%	97.6%	97.6%	97.6%	97.6%	97.6%	97.6%	
Euro Efficiency	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	
MPPT Efficiency	99 %	99 %	99 %	99 %	99 %	99 %	99 %	99 %	
Protection									
PV Arc Fault Detection	Integrated (Optional)								
PV Input Lightning Protection	Integrated								
Anti-islanding Protection	Integrated								
PV String Input Reverse Polarity Protection	Integrated								
Insulation Resistor Detection	Integrated								
Residual Current Monitoring Unit	Integrated								
Output Over Current Protection	Integrated								
Output Shorted Protection	Integrated								
Output Over Voltage Protection	DC Type II/AC Type III								
Certification and Standards									
Grid Regulation	CEI 0-21,VDE-AR-N 4105,NRS 097,IEC61727,G99,G98,VDE 0126-1-1,RD 1699,C10-11								
EMC/Safety Regulation	IEC/EN 62109-1 IEC/EN 62109-2,IEC/EN 61000-6-1,IEC/EN 61000-6-2, IEC/EN 61000-6-3, IEC/EN 61000-6-4								
General Data									
Operating Temperature Range	-45~60°C, >45°C Derating								
Cooling	Smart cooling								
Noise	≤65dB(A)								
Communication with BMS	CAN								
Weight(kg)	109.3								
Size (mm)WxHxD	976W*665H*371D								
Protection Degree	IP65								
Installation Style	Wall-mounted								
Warranty	5 years								
Max operation altitude	2000m								
Relative humidity	0~100%(Non-condensation)								

Version No.2.3 18/8/2025

Zhejiang Chisage New Energy Technology Co., Ltd.

 Tel: +86 150 5749 1826

 Email: info@chisagess.com

 Web: www.chisagess.com

 Add: No.1828, Fuqing South Road, Panhuo Street, Yinzhou District, Ningbo City,
Zhejiang Province, China 315000
