User Manual

PhG-P5~10K0LNA-M
Smart Split-phase Hybrid Inverter

PhaseGreen

Version: V2.1

Issue Date: 2023

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Version History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Version V2.1

- 10kW inverter PV input: 13kW changed to 15kW
- 10kW inverter Battery Max. charge Current： 210A changed to 190A

Version V2.0

- Added 10K INVERTER
- Added PARALLEL
- Added AC COUPLE
- Added Advanced Mode Operation Guide
- Added APP grid compliance parameters interface settings
- Update and add some technical parameters.

Version 1.1

- Update and add some technical parameters.
- Update the product nameplate.
- Formatted the document.
- Added some installation diagram.
- Added detailed installation guidance on CT and WIFI.

Version 1.0

- This issue is used for first office application (FOA).

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About This manual

Overview

This document describes the PhG-P5K0LNA-M, and PhG-P10K0LNA-M (PhG-P for short) in terms of their installation, electrical connections, commissioning and troubleshooting. Before installing and operating the PhG-P, ensure that you are familiar with the features, functions, and safety precautions provided in this document.

Intended Audience

This document is applicable to:

- Installers
- Users
- Sales

Symbol Conventions

The symbols that may be found in this document are defined as follows:

Symbol	Description
⚠ DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. Notice is used to address practices not related to personal injury
🕮 NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

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1 Safety Precautions

Read the manual carefully and operate in accordance with the safety precautions. Refer to local safety regulations on items not covered in this manual. Electrical installation, maintenance must be performed by professional / qualified personnel.

1.1 General Safety

Declaration

Before installing, operating, and maintaining the equipment, read this document and observe all the safety instructions on the equipment and in this document.

The "NOTICE", "WARNING", and "DANGER" statements in this document do not cover all the safety instructions. They are only supplements to the safety instructions. PhaseGreen will not be liable for any consequence caused by the violation of general safety requirements or design, production, and usage safety standards.

Ensure that the equipment is used in environments that meet its design specifications. Otherwise, the equipment may become faulty, and the resulting the equipment malfunction, component damage, personal injuries, or property damage are not covered under the warranty.

Follow local laws and regulations when installing, operating, or maintaining the equipment. The safety instructions in this document are only supplements to local laws and regulations.

PhaseGreen will not be liable for any consequences of the following circumstances:

- Equipment damage due to force majeure, such as storms, earthquakes, ire, floods, and debris flows
- Damage caused during transportation by the customer
- Damage caused by storage conditions that do not meet the requirements specified in related documents
- Operation beyond the conditions specified in this document
- Installation or use in environments that cannot meet relevant international, national, or local standards
- Unauthorized modifications to the product or software code or removal of the product
- Failure to follow the operation instructions and safety precautions on the product and in this document
- Damage to the hardware or data of the equipment due to customer's negligence, improper operation, or intentional damage

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- System damage caused by improper operations of a third party or customer, including those in transportation, installation, and adjustment, alteration, or removal of identification marks

General Requirements

⚠ DANGER

Do not work with power on during installation.

- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, and performing outdoor installation) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- After installing the equipment, remove idle packing materials such as cartons, foam, plastics, and cable ties from the equipment area.
- In the case of a fire, immediately leave the building or the equipment area, and turn on the fire alarm bell or make an emergency call. Do not enter the building on fire in any case.
- Do not scrawl, damage, or block any warning label on the equipment.
- Tighten the screws to the specified torque using tools when installing the equipment.
- Understand the components and functioning of a grid-tied PV power system and relevant local standards.
- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches cannot be exposed to an outdoor environment for a long period of time.
- Do not open the host panel of the equipment.
- You shall not reverse engineer, decompile, disassemble, adapt, add code to the device software or alter the device software in any other way, research the internal implementation of the device, obtain the device software source code, infringe on PhaseGreen's intellectual property, or disclose any device software performance test results.

Personal Safety

- If there is a probability of personal injury or equipment damage during operations on the equipment, immediately stop the operations, report the case to the supervisor, and take feasible protective measures.

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- Use tools correctly to avoid hurting people or damaging the equipment.
- Do not touch the energized equipment, as the enclosure is hot.

1.2 Personnel Requirements

- Personnel who plan to install or maintain PhaseGreen equipment must receive thorough training, understand all necessary safety precautions, and be able to correctly perform all operations.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will operate the equipment, including operators, trained personnel, and professionals, should possess the local national required qualifications in special operations such as high-voltage operations, working at heights, and operations of special equipment.
- Only professionals or authorized personnel are allowed to replace the equipment or components (including software).

NOTE

- Professionals: personnel who are trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, and maintenance
- Trained personnel: personnel who are technically trained, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Operators: operation personnel who may come in contact with the equipment, except trained personnel and professionals

1.3 Electrical Safety

Grounding

- For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.
- Do not damage the ground conductor.
- Do not operate the equipment in the absence of a properly installed ground conductor.

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- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is securely grounded.

General Requirements

DANGER

Before connecting cables, ensure that the equipment is intact. Otherwise, electric shocks or fire may occur.

- Ensure that all electrical connections comply with local electrical standards.
- Obtain approval from the local electric utility company before using the equipment in grid-tied mode.
- Ensure that the cables you prepared meet local regulations.
- Use dedicated insulated tools when performing high-voltage operations.

AC and DC Power

DANGER

Do not connect or disconnect power cables with power on. Transient contact between the core of the power cable and the conductor will generate electric arcs or sparks, which may cause fire or personal injury.

- Before making electrical connections, switch off the disconnector on the upstream device to cut off the power supply if people may contact energized components.
- Before connecting a power cable, check that the label on the power cable is correct.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.

Cabling

- When routing cables, ensure that a distance of at least 30 mm exists between the cables and heat-generating components or areas. This prevents damage to the insulation layer of the cables.
- Bind cables of the same type together. When routing cables of different types, ensure that they are at least 30 mm away from each other.

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- Ensure that the cables used in a grid-tied PV power system are properly connected and insulated and meet specifications.

1.4 Installation Environment Requirements

- Ensure that the equipment is installed in a well-ventilated environment.
- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

1.5 Mechanical Safety

Drilling Holes

When drilling holes into a wall or floor, observe the following safety precautions:

- Wear goggles and protective gloves when drilling holes.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings that have accumulated inside or outside the equipment.

Moving Heavy Objects

- Be cautious to avoid injury when moving heavy objects.

< 18 kg (< 40 lbs) | 18-32 kg (40-70 lbs) | 32-55 kg (70-121 lbs) | > 55 kg (> 121 lbs)

- When moving the equipment by hand, wear protective gloves to prevent injuries.

1.6 Commissioning

When the equipment is powered on for the first time, ensure that professional personnel set parameters correctly. Incorrect settings may result in inconsistency with local certification and affect the normal operation of the equipment.

1.7 Maintenance and Replacement

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DANGER

High voltage generated by the equipment during operation may cause an electric shock, which could result in death, serious injury, or serious property damage.

Prior to maintenance, power off the equipment and strictly comply with the safety precautions in this document and relevant documents.

- Maintain the equipment with sufficient knowledge of this document and using proper tools and testing equipment.
- Before maintaining the equipment, power it off and follow the instructions on the delayed discharge label to ensure that the equipment is powered off.
- Turn off the AC and DC switches of the PhG-P when maintaining the electric equipment or power distribution equipment connected the PhG-P.
- Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.
- If the equipment is faulty, contact your dealer.
- The equipment can be powered on only after all faults are rectified. Failing to do so may escalate faults or damage the equipment.

1.8 Storage

The following requirements should be met if the PhG-P is not put into use directly:

- Do not unpack the PhG-P.
- Keep the storage temperature at –40°C to +70°C and the humidity at 0%– 95% RH.
- The PhG-P should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- If the PhG-P has been long-term stored, inspections and tests should be conducted by qualified personnel before it is put into use.

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2 Product Introduction

2.1 Product overview

Functions

Smart Split-phase Hybrid Inverter PhG-P5/10K0LNA-M Series is a high-quality inverter which can convert the DC power generated by PV strings into AC power and store energy into battery or feeds the power into the Power Grid. The inverter can be used to optimize self-consumption, store in the battery for future use or feed the power into Public Grid. Work mode depends on PV energy and user's preference. It can provide power for emergency use during the grid lost by using the energy from battery and inverter (generated from PV)

Model

This manual document covers the following PhG-P Series product models:

- PhG-P5K0LNA-M
- PhG-P10K0LNA-M

Figure 2-1 Model description (using PhG-P5K0LNA-M as an example)

Table 2-1 Model description

Identifier	Description	Value
1	Product family name	PhG-P: PhaseGreen smart hybrid inverter
2	Power class	5K0: rated power of 5.0 kW 8K0: rated power of 8.0 kW
3	Support Low or High voltage battery	"L" or "H" means the inverter supported the input battery voltage range level is "Low" (40~60V) or "High" (125~600V)
4	NA	NA: "North America", means that the product can be used in USA

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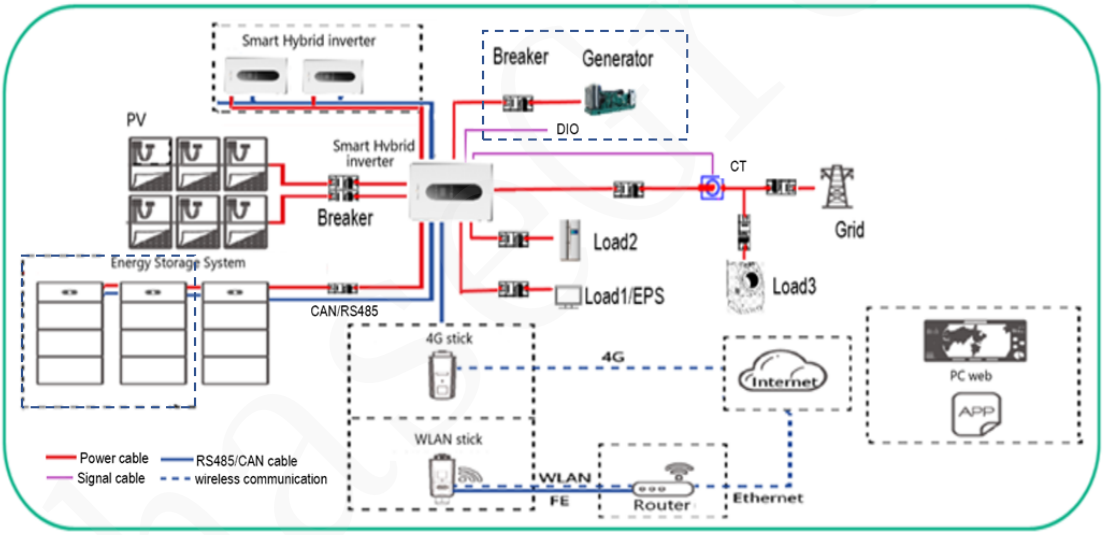
5	Series	M: means “M” series

Production Application

The PhG-P applies to residential PV energy storage system. Typically, a grid-tied system consists of PV strings, hybrid inverters, AC/DC breakers, and power distribution units. The smart hybrid inverter PhG-P Series are designed with 4 PV strings inputs and the input of the battery energy storage system and the generator. The smart hybrid inverter PhG-P Series provide two BACK-UP outputs (Load1/EPS (emergency power supply), Load2) for customer to choose based on the local rules. The inverter integrates the On/Off grid controller. It provides the convenience in installation and maintenance.

The smart hybrid inverter PhG-P Series Support multi-machine parallel connection. It is flexible for the user to configure larger capacity.

Figure 2-2 Production application (dashed boxes indicate optional components)



NOTE

For detailed operations of energy storage system in the application, please refer to the guides: **PhG-ESS-XX User Manual**

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2.2 Appearance and connect terminal

2.2.1 Appearance and connect terminals

Figure 2-3 Appearance and connect terminals

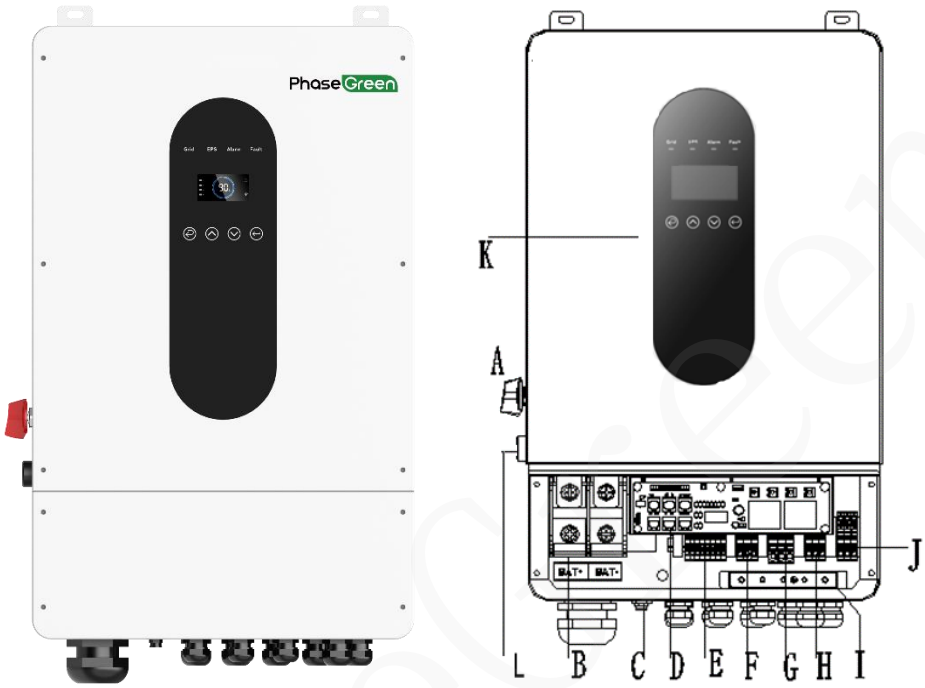

Table 2-2 Product interface description

Object	Description
A	PV(DC) Input Switch (for PV Power Supply Input On/Off)
B	BAT. Input
C	Wi-Fi
D	Type-C USB (for Upgrade) CAN1 / CAN2 / RS485 Meter CAN (RS485, BMS CAN) / CTL1 / CTL2
E	PV1~PV4 DC Input
F	Generator Input (AC)
G	Grid Input (AC)
H	AC LOAD1(EPS) Output (With PV, BAT. and Grid Power Supply)
I	PE Bar.
J	AC LOAD2 Output (With Grid Power Supply)
K	LCD (Setting Screen Panel)
L	RSD Button (for Hybrid Inverter Start-up or Standby)

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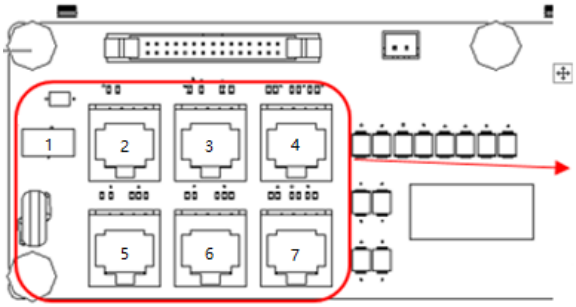
Figure 2-3 Appearance of communication port



1 TYPE-C UPDATE	2 CAN1	3 CAN2	4 RS485
	5 BMS-485 BMS-CAN	6 CT L2	7 CT L1

* Port Function

1. TYPE-C UPDATE: Update machine software locally on PC via USB-A port.

2/3. CAN1/CAN2: Communication interface for connecting inverters.

4. RS485: Read the internal data of inverter.

5. BMS-485/BMS-CAN: BMS communication for lithium batteries.

6/7. CT L2 / CT L1: For external grid side CT to detect current size.

NOTICE

Qualified electrician will be required for the installation.

Before installation, ensure the Battery input, PV input, AC output/Grid and BACK-UP output worked in the rated range. if the equipment works is not in the rated range, it could result in equipment damage or that the equipment is not working.

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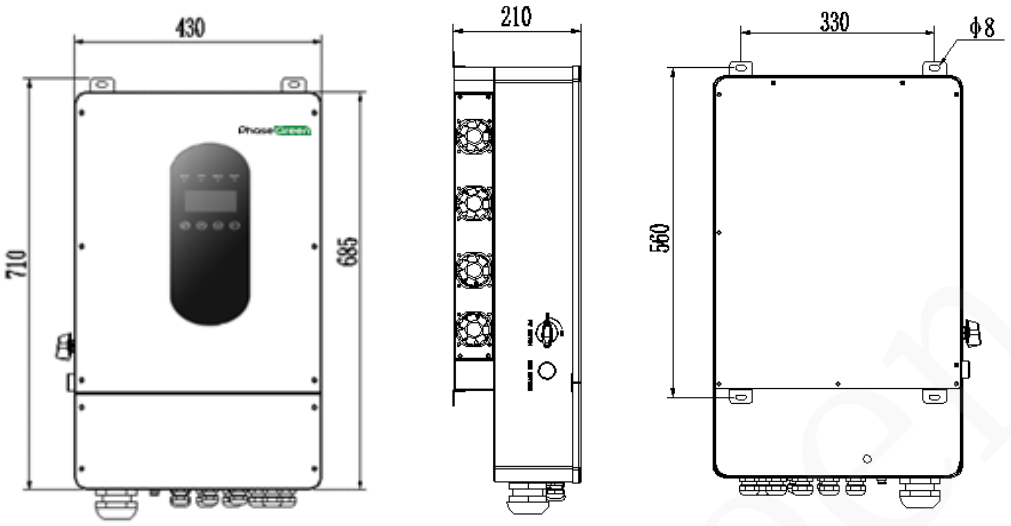
2.2.2 Dimension

Figure 2-4 Dimension of PhG-P



Front View **Left Side View** **Rear View**

2.3 Label Description

2.3.1 Enclosure Labels

Table 2-3 Enclosure label description

Symbol	Description
	Warning. Hot face -Hot surfaces. -To reduce the risk of burns. -Do not touch.
	Waring. Danger of high voltage and electric shock! -Both AC and DC voltage sources are terminated inside this equipment. -Each circuit must be individually dis-connected before servicing. -When the Photovoltaic array is exposed to light, it supplies a DC voltage to this equipment. -Disconnect all sources of supply before servicing. -When a ground fault is indicated. Normally grounded conductors may be ungrounded and energized or normally ungrounded conductors may be grounded.
	Warning. This symbol indicates that you should wait at least 5mins after disconnecting the inverter from the utility grid and from the PV panel before touching any inner parts. -Risk of electric shock from energy stored in capacitor.
	Caution! Failure to observe a warning indicated in this manual may result in injury. -Risk of electric shock, do not remove upper front cover. -No user serviceable parts inside. -Refer servicing to qualified service personnel.

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2.3.2 Product Nameplate

Figure 2-5 Nameplate (Using PhG-P8K0LNA-M as an example)

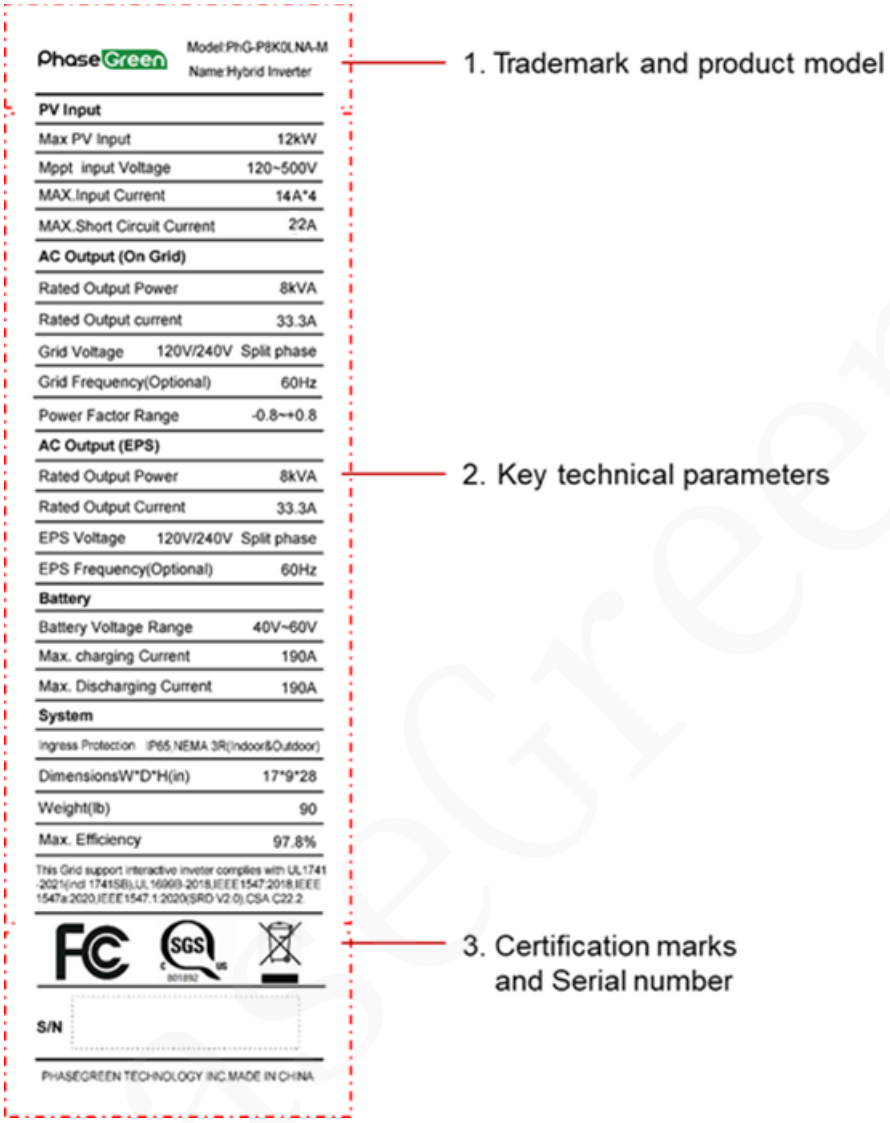

Table 2-4 Nameplate description

No.	Description	No.	Description
1	Trademark and product model	2	Key technical parameters
3	Certification marks and Serial Number		

NOTE

High voltage generated by the equipment during operation may cause an electric shock, which could result in death, serious injury, or serious property damage.

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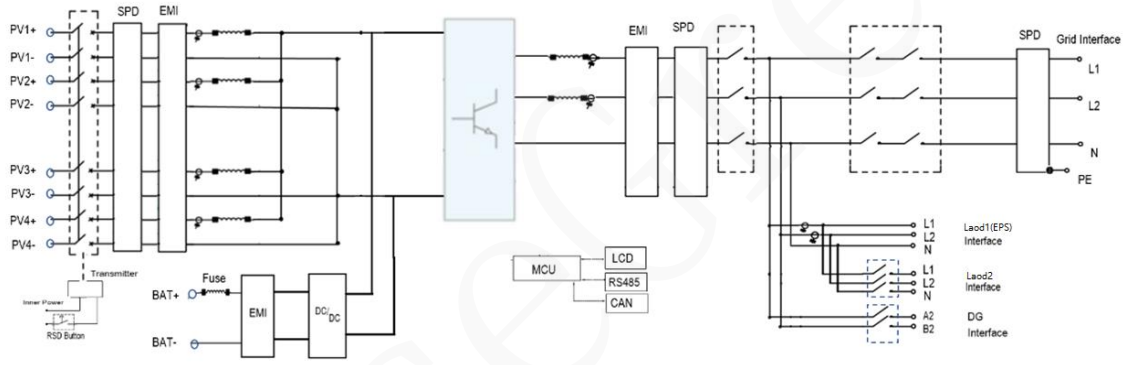
Prior to maintenance, power off the equipment and strictly comply with the safety precautions in this document and relevant documents.

2.4 Working Principles

2.4.1 Circuit Diagram

Four PV strings connect to the PhG-P, and their maximum power points are tracked by four maximum power point tracking (MPPT) circuits. The PhG-P converts DC power into three-phase AC power through an inverter circuit and provides the smart management on the energy of PV, Battery, and grid. The PhG-P provides two backup output and the input of the diesel generator. Surge protection is supported on both the DC and AC sides.

Figure 2-6 PhG-P inner conceptual diagram



2.4.2 System Diagram

Smart hybrid inverter PhG-P series is designed with two BACK-UP versions for customer to choose based on the local rules. Applies to the wiring rules that requires Neutral line of alternative supply must NOT be isolated or switched. Refer to following figures

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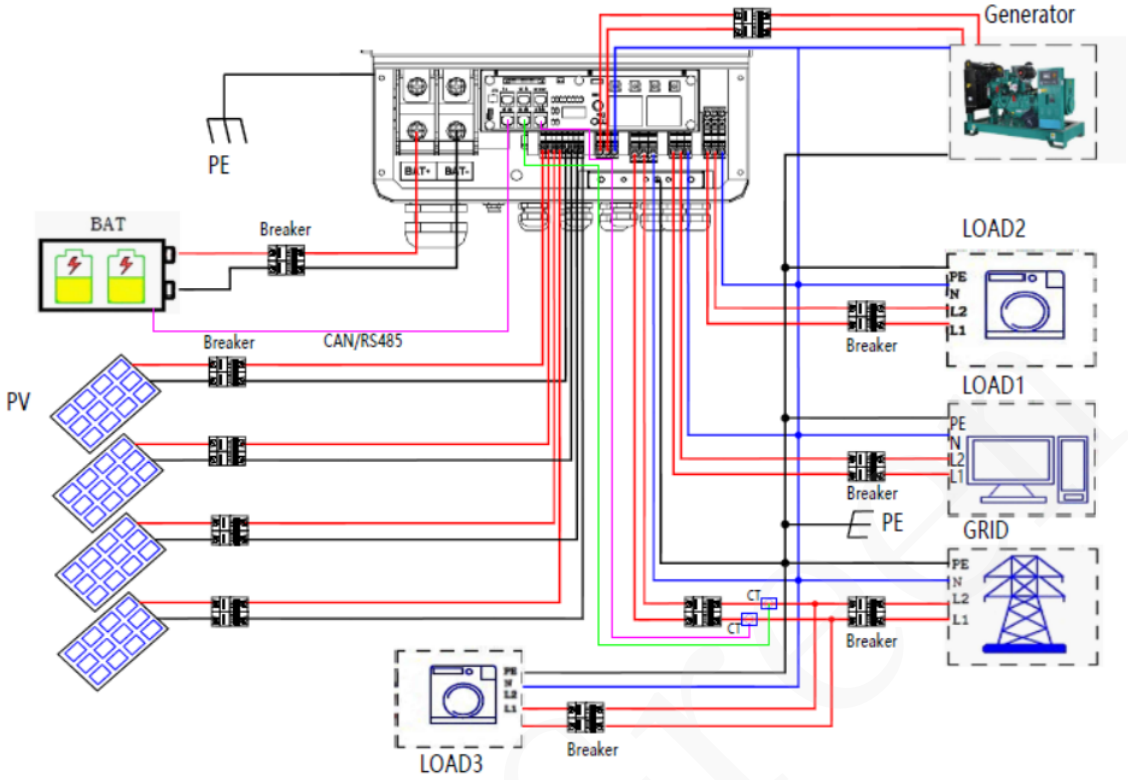
Figure 2-7-1 PhG-P system Diagram



NOTE

Please make the home loads within the “BACK-UP output rating” under BACK-UP mode, otherwise the inverter will shut down with an “overload fault” warning.

Please confirm with the mains grid operator whether there are any special regulations for grid connection.

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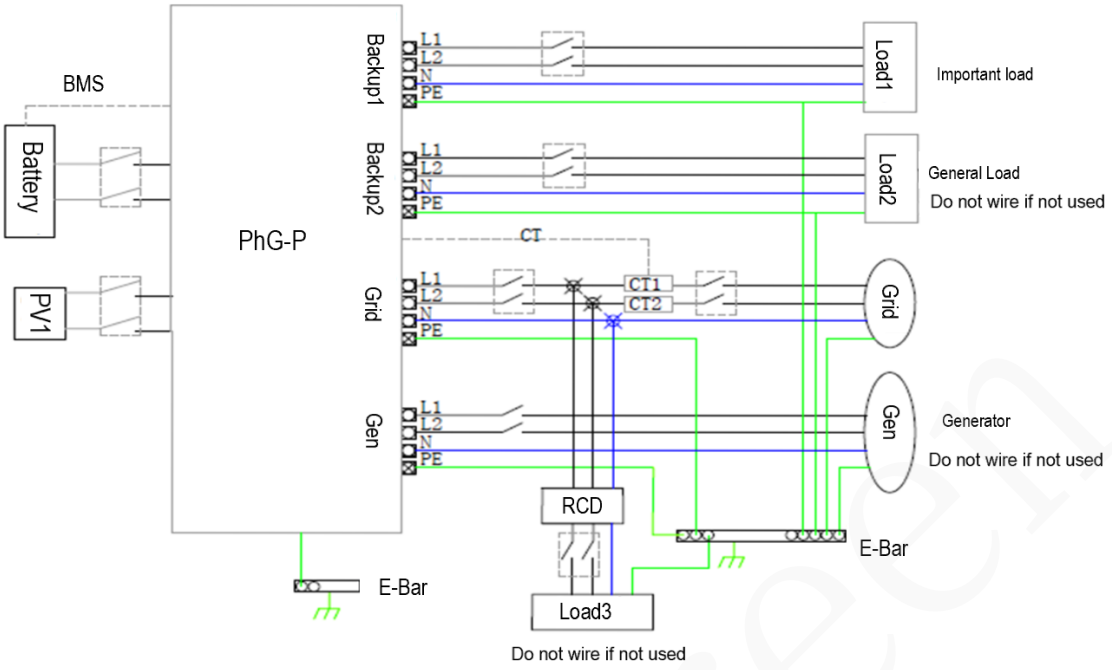
Figure 2-7-2 PhG-P system Diagram



2.5 Work Modes

Based on different requirements， the hybrid inverter provides multiple work modes such as Self-Use, Peak Shift(TOU) and Battery Priority.

Self-Use

- This mode applies to areas where the electricity price is high, or areas where the FIT(Feed-in-Tariff) subsidy is low or unavailable, or areas where the grid blackouts are frequent.
- In this mode, **Self-Use** is selected. Solar energy provides power to the loads as first priority, if solar energy is sufficient lo power all connected loads, solar energy excess power will be provided to charge battery, and then redundant power will be fed to grid. When PV power is insufficient or no PV power is generated at night, batteries discharge to supply power to the loads. If solar energy and battery are not sufficient to power all connected loads, utility energy (Main Grid) will supply power to the loads with solar energy at the same time. Self-Use improving the self-consumption rate of the PV system and the self-sufficiency rate of residential energy and reducing electricity costs.

Peak-Shift (TOU, Time-Of-Use)

- This mode applies to scenarios where the price difference between peak and off-peak hours is large.
- In this mode, **Peak-Shift** is selected. You can manually set the charge and discharge time segments. For example, you can allow the grid to charge batteries in low

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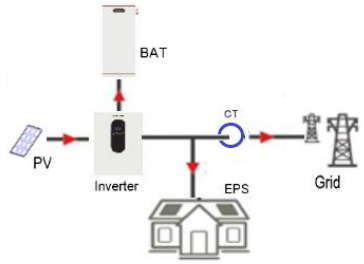
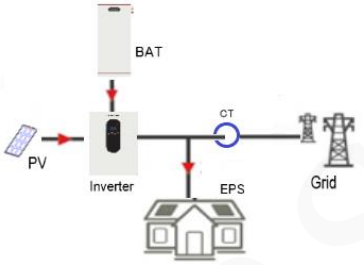
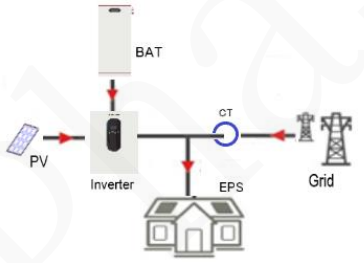
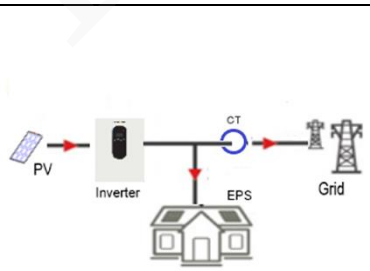
electricity price periods at night and discharge batteries during high electricity price periods, saving electricity fee. The charge from grid function must be enabled.

Battery Priority

- This mode applies to scenarios where the grid blackouts are frequent and maintain high capacity of battery.
- In this mode, **Batter Priority** is selected. Solar energy will charge battery as first priority, if solar energy is excess, the excess power will supply load. If there's still some extra energy, then the excess power will be fed to grid.

Table 2-5 Work modes of PhG-P

1.Work modes: Self-Use	
1. When PV, Grid, Battery is available	
	A. Solar energy provides power to the loads as first priority, if solar energy is Sufficient lo power all connected loads , solar energy excess power will provide to charge battery , and then redundant power will be fed to grid.
	B. 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 .
	C. Solar energy provides power to the loads as first priority, if solar energy and battery are not sufficient to power all connected loads, utility energy (Main Grid) will supply power to the loads with solar energy at the same time.
2.When PV, Grid is available (without battery)	
	A. Solar energy provides power to the loads as first priority, if solar energy is sufficient, the excess power will be feed to grid.

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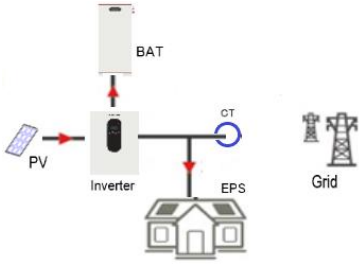
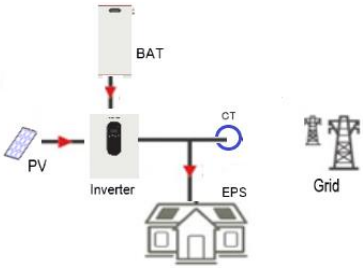
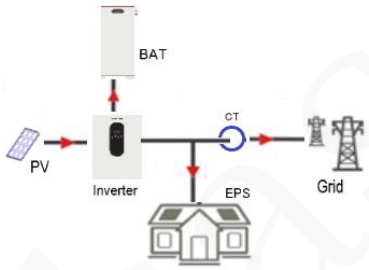
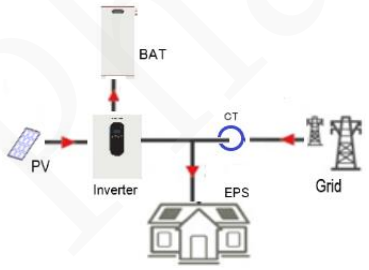
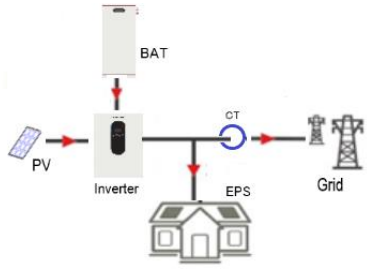
	B. Solar energy provides power to the loads as first priority, if solar energy is not sufficient to power all connected loads, Grid energy will supply power to the loads at the same time.
3.When PV. Battery is available (Grid is disconnected):	
	A. Solar energy provides power to the loads as first priority, if solar energy is sufficient to power all connected loads, solar energy will be provided to charge the Battery.
	B. Solar energy provides power to the loads as first priority, if solar energy is not sufficient to power all connected loads, battery energy and solar energy will supply power to the loads at the same time.
2.Work modes: Peak Shift	
1.When PV, Grid, Battery is available:	
	A. On charge time, solar energy will charge battery as first priority. The excess energy will supply power to the loads. If solar energy is sufficient to supply loads and charge battery, and if there's still some extra energy, then the excess power will be fed to grid.
	B. On charge time, solar energy will charge battery as first priority, then the excess solar energy will supply power to loads. If solar energy is not sufficient to charge battery and supply loads, grid will supply all the connected loads with solar energy together.
	C. On discharge time, solar energy provides power to the loads as first priority, if solar energy is sufficient to supply loads, and if there's still some extra energy from solar energy, then the excess power and battery will deliver the power to the grid at the same time.

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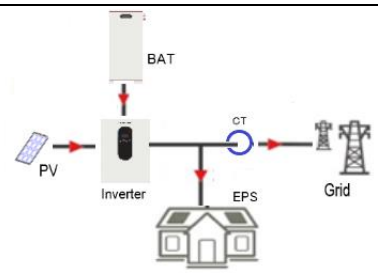
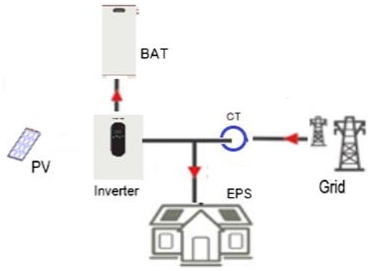
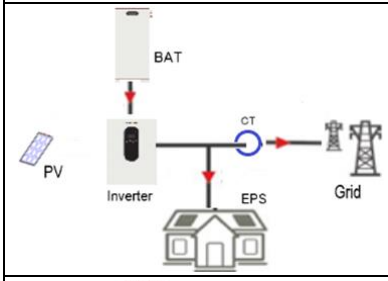
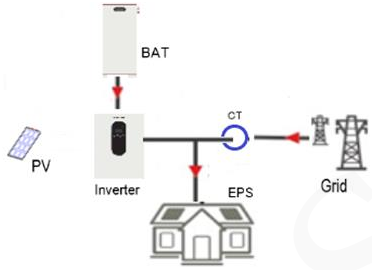
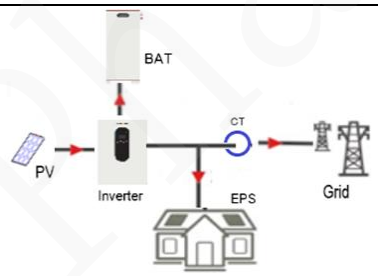
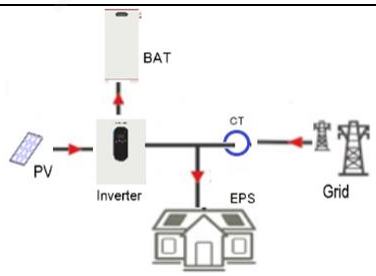
	D. In the period of no charge or discharge, the solar power supply loads at first priority, excess energy to the grid.
2.When Grid, Battery is available (PV is disconnected):	
	A. On charge time, grid will charge battery and supply power to the connected loads at the same time.
	B. On discharge time, if load power is less than battery power, battery will supply power to loads as first priority, the excess power will be fed to grid.
	C. On discharge time, if load power is more than battery power, battery and grid will supply power to the loads at the same time.
3.Work modes: Battery Priority	
1.When PV, Grid, Battery is available:	
	A. Solar energy will charge battery as first priority, if solar energy is excess, the excess power will supply load. If there's still some extra energy, then the excess power will be fed to grid
	B. Solar energy will charge battery as first priority, if solar energy is excess. the excess power will supply load. If solar energy is not sufficient to charge battery and supply loads, grid will supply power to loads.
2.When Grid, Battery is available (PV is disconnected):	

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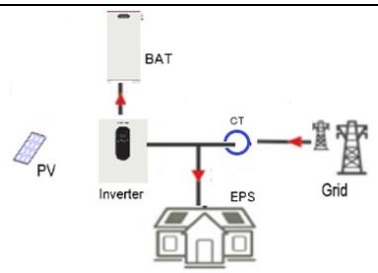	Grid will supply power to load and charge battery at the same time.

NOTICE

If set anti-Reverse function allowable, once on the work mode of Self-use, Peak shift, battery priority, the system will not feed power to grid.

2.6 Technical Parameters

Table 2-6 Technical Parameters of PhG-P

Technical Data	PhG-P 5K0LNA-M	PhG-P 6K0LNA-M	PhG-P 7K6LNA-M	PhG-P 8K0LNA-M	PhG-P 10K0LNA-M
PV Input					
MAX.DC Input Power(STC)	7,500 W	9,000 W	12,000 W	12,000 W	15,000W
MAX. DC System Voltage	500 V				
MPPT Operating Voltage Range	120 V – 500 V				
NO. of MPPT Tracker/String	4/1				
MAX. Input Current per MPPT	14 A				
Max. Short-circuit Current per MPPT	22 A				
Battery Input/Output					
Nominal Voltage	48 Vdc				
MAX. Charging/Discharging Current	120 A / 120 A	135 A / 135 A	190 A / 190 A	190 A / 190 A	190 A /210 A
Battery Voltage Range	40 – 58 Vdc(40-60V)				
MAX. Charge Voltage	58 Vdc				
Battery Type	Lithium Iron Phosphate and Lead Acid Battery				
Charging Strategy for Li-Ion Battery	Self-adaption to BMS				
AC Output (On-Grid)					
Rated Output Power	5,000 VA	6,000 VA	7,600 VA	8,000 VA	10,000 VA
Rated Voltage L-N/L1-L2	120 / 240 V (split-phase)				
Frequency	60 Hz（45 to 54.9 Hz / 55 to 65 Hz）				
Rated Output Current	20.8 A	25.0 A	31.7 A	33.3 A	41.7 A
Max. Output Current@240V	22.9 A	27.5 A	35.0 A	36.7 A	45.8 A
Power Factor	0.99, 0.8leading…0.8lagging				
THDi	< 2%				
EPS Output (Back-Up)					

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Technical Data	PhG-P 5K0LNA-M	PhG-P 6K0LNA-M	PhG-P 7K6LNA-M	PhG-P 8K0LNA-M	PhG-P 10K0LNA-M
Rated Power	5,000 VA	6,000 VA	7,600 VA	8,000 VA	10,000 VA
Rated Voltage L-N/L1-L2	120V / 240 V (split-phase)				
Frequency	50 Hz / 60 Hz (45 to 54.9 Hz / 55 to 65 Hz)				
Rated Output current(A)	20.8 A	25.0 A	31.7 A	33.3 A	41.7 A
Max. Output current(A)@240V	22.9 A	27.5 A	35.0 A	36.7 A	45.8 A
Automatic Switching Time	< 20 ms				
THDv	< 2%				
Overload Capability	125%, 60 S / 150%, 1 S				
Efficiency					
MAX. Efficiency	98.20%				
CEC Efficiency	97.2% (Peak 97.8%)				
General					
AC Input Conduit (Grid & GEN)	1 inch (M25x1.5 mm)				
AC Output Conduit (Load)	1 inch (M25x1.5 mm)				
PV Input Conduit (PV+ & PV-)	1 inch (M25x1.5 mm)				
Communication Interface Conduit (COM)	3/4 inch (M20x1.5 mm)				
BAT Input/Output Conduit	2 inch (M50x1.5 mm)				
Operating Temperature Range	. -25°C ~ +60 °C (-13 °F ~ 140 °F)				
Relative Operating Humidity	0 %RH ~ 95 %RH				
Max. Operating Altitude	13120 ft / 4000 m (Derating above 6560 ft / 2000m)				
Ingress Protection	IP65/NEMA 3R				
Weight	90 lb, 41 kg				
Dimension W*D*H	16.93*8.66*27.95 inch (430*220*710mm)				
Cooling	Fan				
Noise emission	< 38 dB				
Display	LCD				
Communication With BMS/Meter/EMS	RS485, CAN				
Supported communication interface	RS485, WiFi, 4G (optional)				
Self-consumption at night	< 2.5 W (with battery enabling < 5 W)				
Standard Compliance					
Safety	UL1741, UL1741SA, UL1699B, UL1998, CSA C22.2				
EMC	FCC Part 15 Class B				
Grid connection standards	IEEE 1547, HECO Rule 14H, CA Rule 21 Phase I, II, III				
Protection					
Grounding Detection	YES				
Arc Fault Circuit Interrupt Protection	YES				
Island Protection	YES				
Battery Reverse Polarity	YES				
Insulation Resistor Detection	YES				

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Technical Data	PhG-P 5K0LNA-M	PhG-P 6K0LNA-M	PhG-P 7K6LNA-M	PhG-P 8K0LNA-M	PhG-P 10K0LNA-M
Residual Current Monitoring Unit	YES				
Back-up Output Short Protection	YES				
Terminal Temperature Detection	YES				
Output Over Voltage Protection	YES				
Output Over Current Protection	YES				
Output Under Voltage Protection	YES				

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3 Installation

3.1 Checking before Installation

Before unpacking the inverter, check the outer packing materials for damage, such as holes and cracks, and check the inverter model. If any damage is found or the inverter model is not what you requested, do not unpack the package and contact your supplier as soon as possible.

3.2 Packing List

Open the package and take out the product, please check the accessories first. The packing list shown as below. If any damage is found or any component is missing, contact your supplier.

Figure 3-1 Packing list

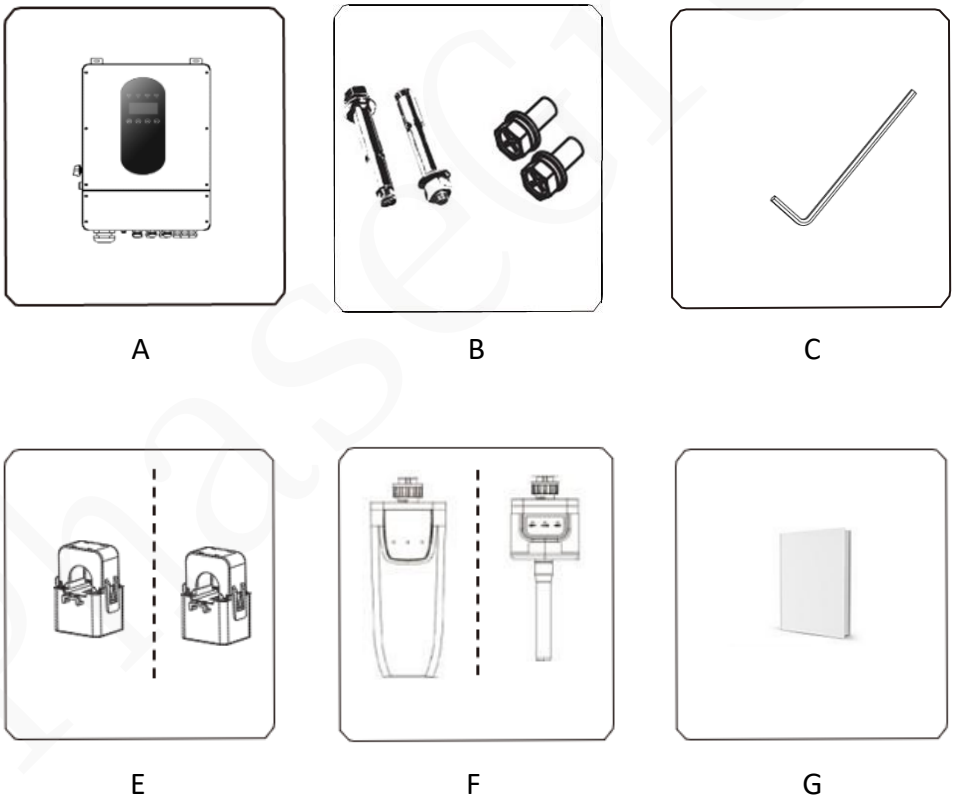

Table 3-1 Packing list description

Object	Description
A	Inverter
B	Expansion screws and pan-head screws
C	Allen Wrench

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D	CT
E	Wi-Fi module (Optional)
F	GPRS module (Optional)
G	User manual (Optional) . or Soft-Paper

3.3 Mounting

3.3.1 Environment Requirements

PhG-P hybrid inverter Series inverter is designed for outdoor installation (IP65). Make sure the installation site meets the following conditions:

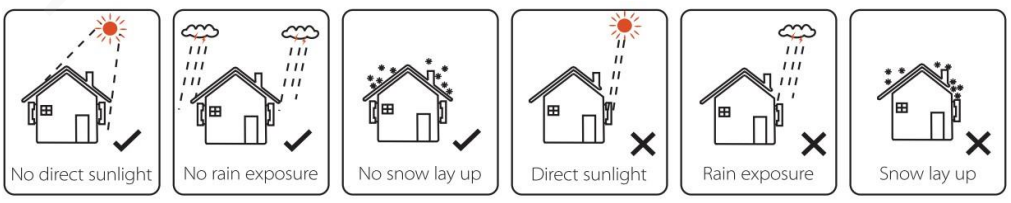
- The PhG-P is protected to IP65 and can be installed indoors or outdoors.
- Not in direct sunlight.
- Not in areas where highly Flammable materials are stored.
- Not in potential explosive areas.
- Not in the cool air directly.
- Not near the television antenna or antenna cable.
- Not higher than altitude of about 2000m.
- Not in environment of precipitation or humidity (> 95%).
- Under good ventilation condition.
- The ambient temperature in the range of -25℃ to +60℃.
- The slope of the wall should be within ± 5°.
- The wall hanging the inverter should meet conditions below:

  1. Solid brick/concrete, or strength equivalent mounting surface.

  2. Inverter must be supported or strengthened if the wall's strength isn't enough (such as wooden wall, the wall covered by thick layer of decoration)

  Please **AVOIDE** direct sunlight, rain exposure, snow laying up during installation and operation.

Figure 3-2 PhG-P installation Environment Requirements



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3.3.2 Space Requirement

Reserve enough space around the PhG-P to ensure sufficient space for installation and heat dissipation.

Figure 3-3 PhG-P Installation Space Requirement

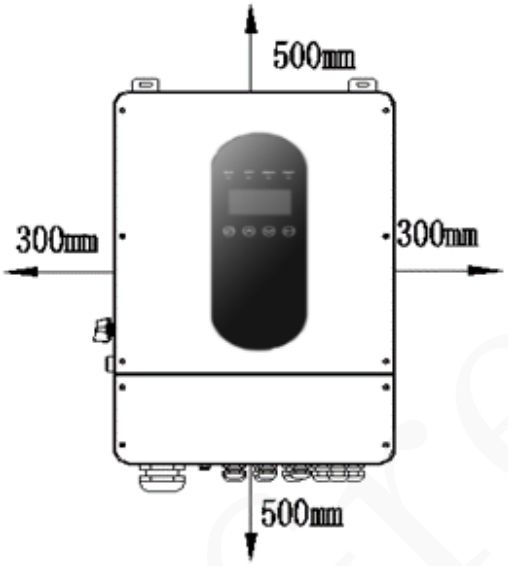

Table 3-2 Installation Space Requirement

Position	Min. size
Left	300mm
Right	300mm
Top	500mm
Bottom	500mm
Front	1000mm

When installing multiple PhG-P, install them in horizontal mode if sufficient space is available and install them in triangle mode if no sufficient space is available.

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Figure 3-4 Horizontal installation (recommended)

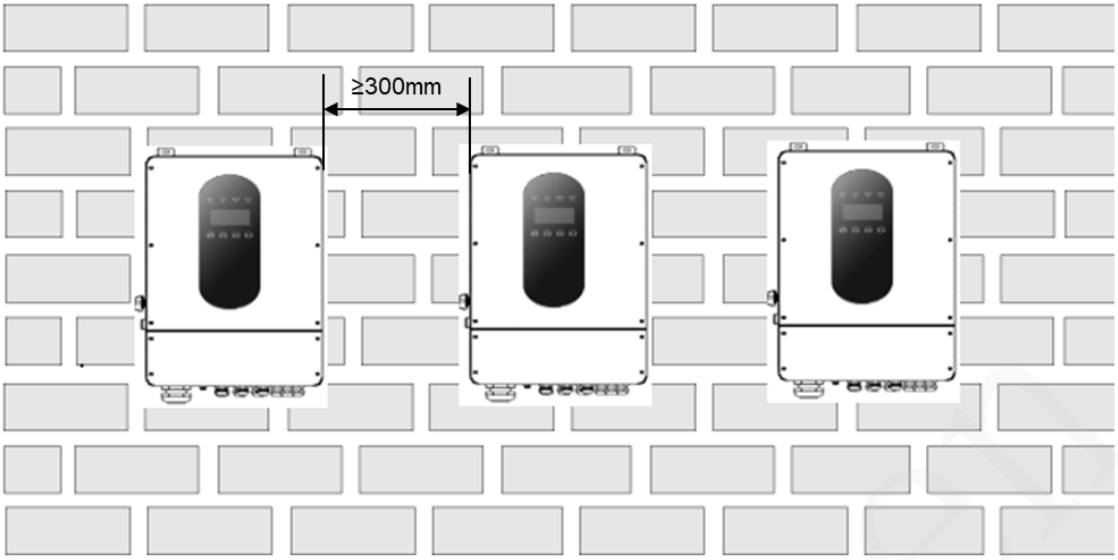
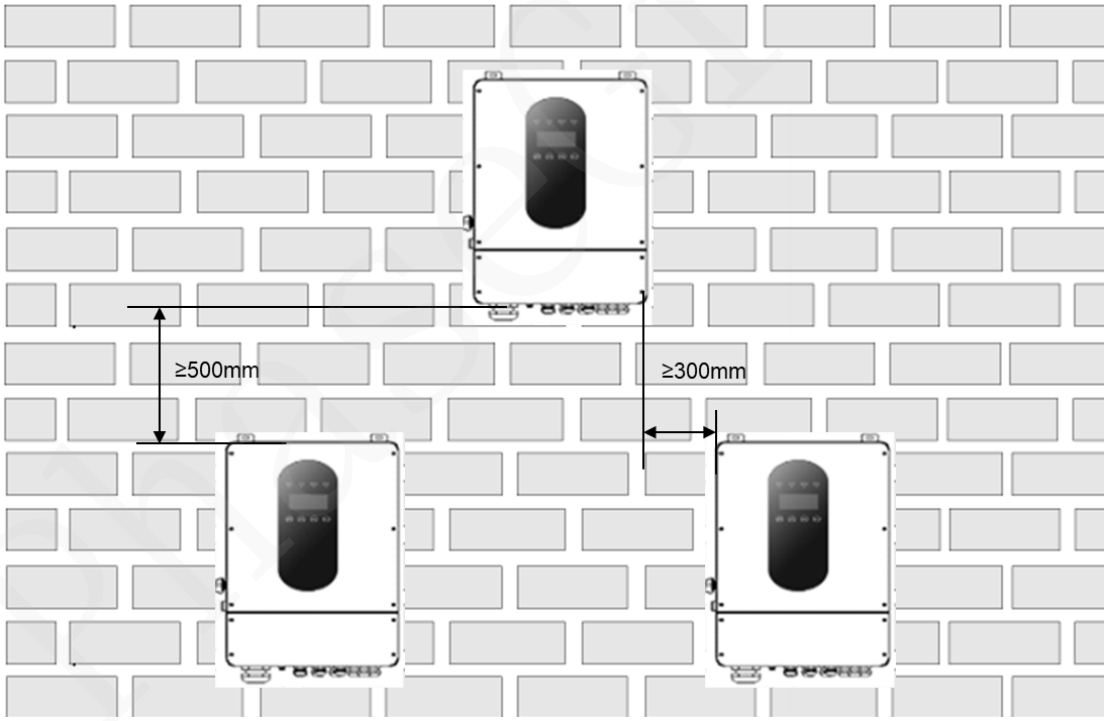


Figure 3-5 Staggered installation (recommended)



3.3.3 Tools for installation

Tools required for installation, please refer to the following table.

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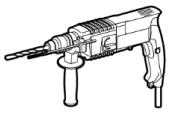
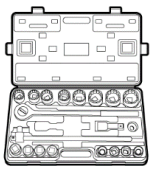
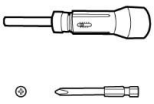
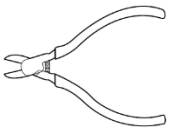
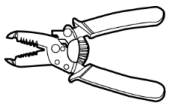
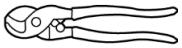
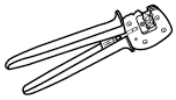
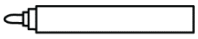
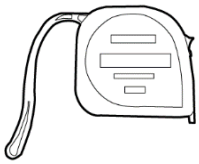
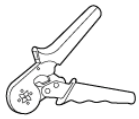
Table 3-3 Tools required for installation

 Hammer drill	 Socket wrench set	 Torque screwdriver	 Diagonal pliers
 Wire stripper	 Removal wrench	 Rubber Hammer	 Utility knife
 Cable cutter	 Crimping tool	 Multimeter	 Vacuum cleaner
 Marker	 Measuring tape	 Bubble or digital level	 Cord end terminal crimper
 Heat shrink tubing	 Heat gun	 Hydraulic	
 Safety gloves	 Safety goggles	 Dust mask	 Safety shoes

3.3.4 Mount the Inverter

Structure Requirements

- The mounting structure where the PhG-P is installed must be fireproof.
- Do not install the PhG-P on flammable building materials.

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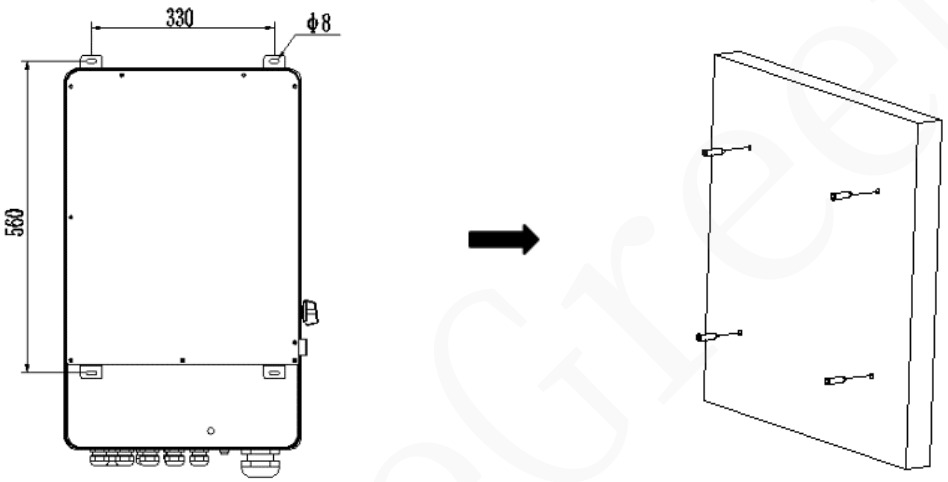
- The PhG-P is heavy. Ensure that the installation surface is solid enough to bear the weight load.
- In residential areas, do not install the PhG-P on drywalls or walls made of similar materials which have a weak sound insulation performance because the noise generated by the PhG-P is noticeable.

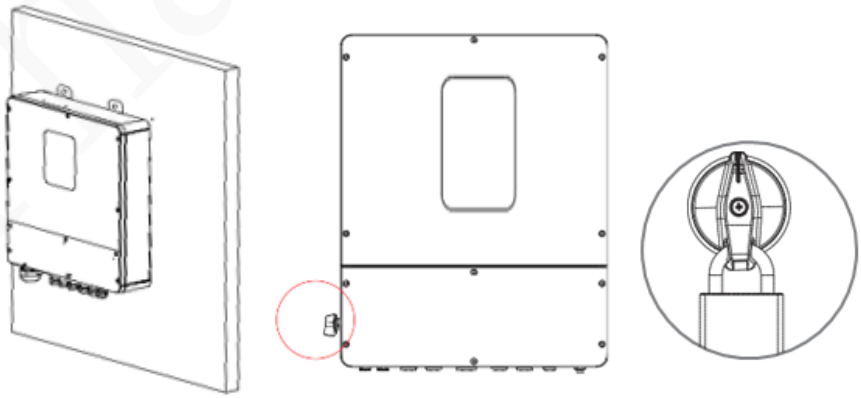
Step 1: Drill 4 holes in the wall according to the following distance dimensions, 50~60mm depth. Then use a proper hammer to fit the expansion bolt into the holes.

Figure 3-6 Drill holes



Step 2: Lift up the inverter and align the hole of the inverter with the expansion bolt, Fix the inverter on the wall.

Figure 3-7 Fix inverter on the wall



Step 3: Tighten the nut of expansion bolt, and install an anti-theft lock on DC switch of the inverter

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NOTICE

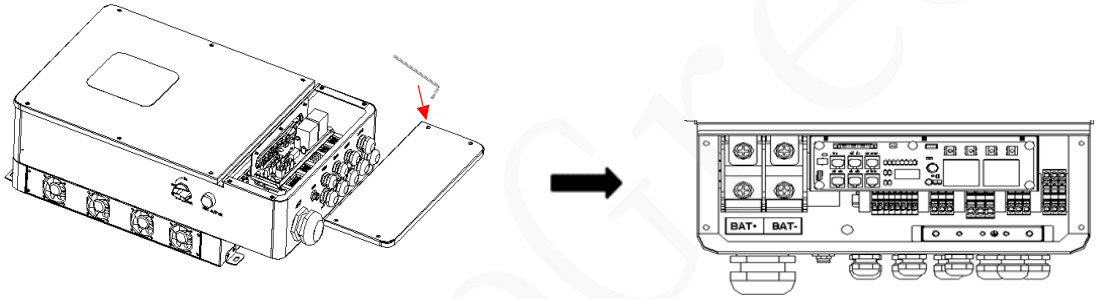
Prepare an anti-theft lock suitable for the lock hole diameter (Φ6 mm) by yourself. Ensure that the lock can be installed successfully.

Outdoor waterproof lock is recommended.

Keep the key to the anti-theft lock properly.

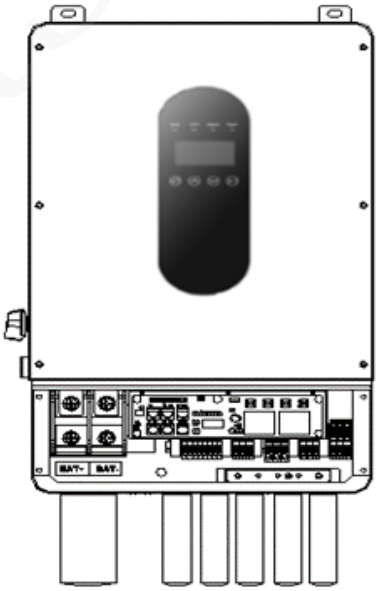
Step 4: Remove the cover screws by Allen Wrench and remove the cover. Remove the waterproof cover by a flat blade screwdriver. Wiring box conduit plugs, Conduit plugs are provided for 1 inch conduit fittings. If used conduit fitting is not 1 inch, an appropriate conduit adaptor should be used.

Figure 3-8 Remove the cover



Step 5: Pass the corresponding conduit and fasten the joint.

Figure 3-9 Install conduit



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4 Electrical Connections

4.1 Connection Preparation

Figure 4-1 Ph-P Cable Connections Diagram

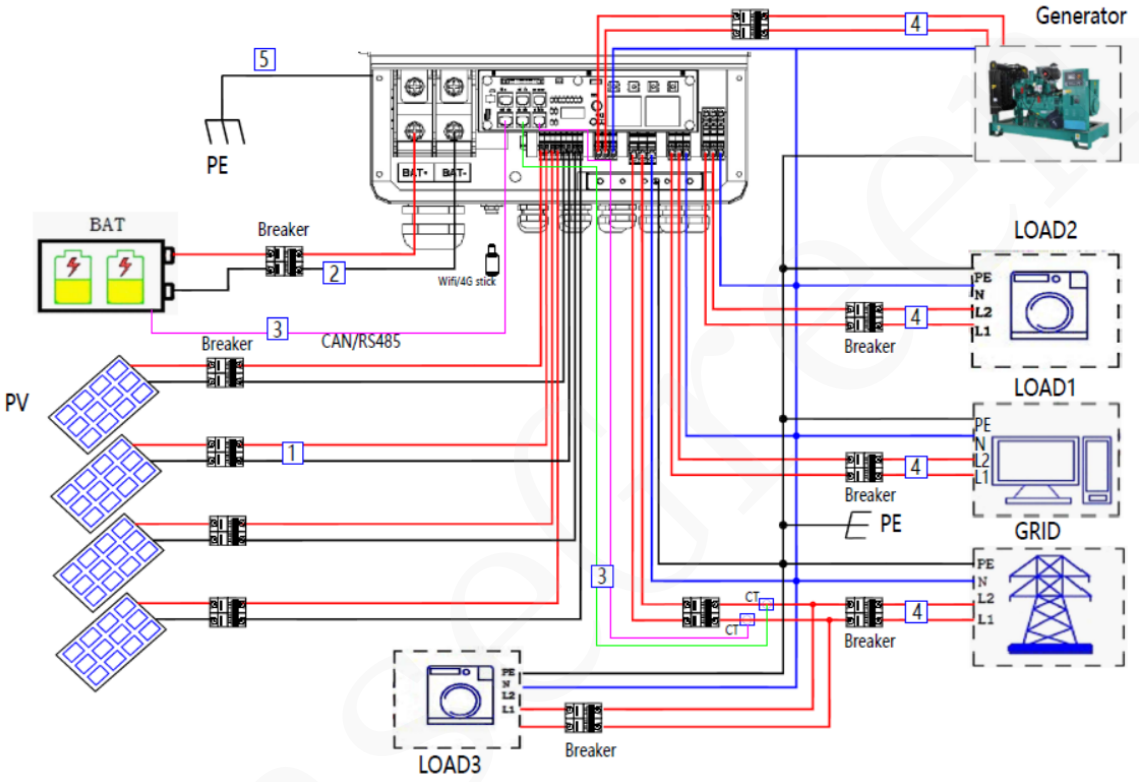

Table 4-1 Cable description

No.	Name	Type
1	DC input power cable	Common outdoor PV cable in the industry
2	Battery cable	
3	Signal cable	Outdoor shielded twisted pair
4	AC output power cable	Outdoor copper cable
5	PE cable	outdoor copper-core PE cable

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4.2 Connecting the PE cable

Important Notes

DANGER

Ensure that the PE cable is securely connected. Otherwise, electric shocks may occur.

Do not connect the N wire to the enclosure as a PE cable. Otherwise, electric shocks may occur.

Procedure

Step 1 Crimp OT terminals.

Choose the 8 AWG or 10AWG wire to connect with the OT terminal.

NOTICE

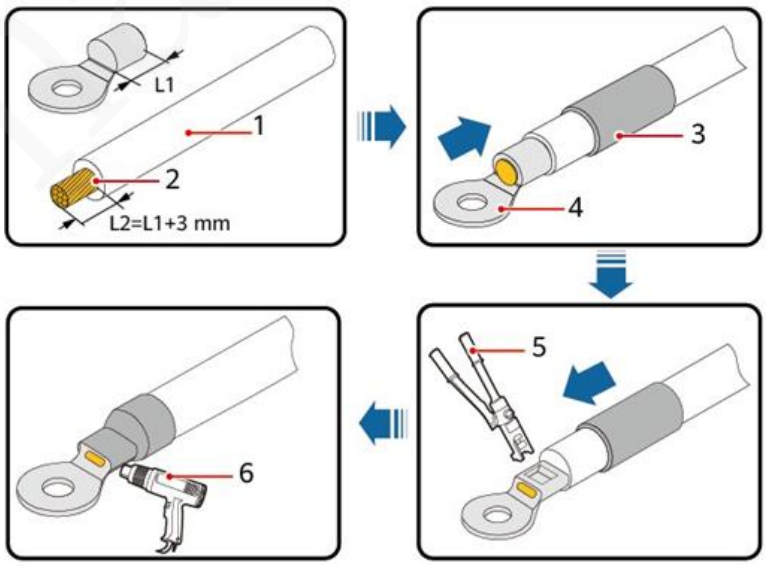
Avoid scratching the core wire when stripping a cable.

The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wires completely. The core wires must contact the OT terminal closely.

Wrap the wire crimping area with heat shrink tubing or PVC insulation tape. The heat shrink tubing is used as an example.

When using a heat gun, protect devices from being scorched.

Figure 4-2 Crimping an OT terminal



(1) Cable (2) Core (3) Heat shrink tubing

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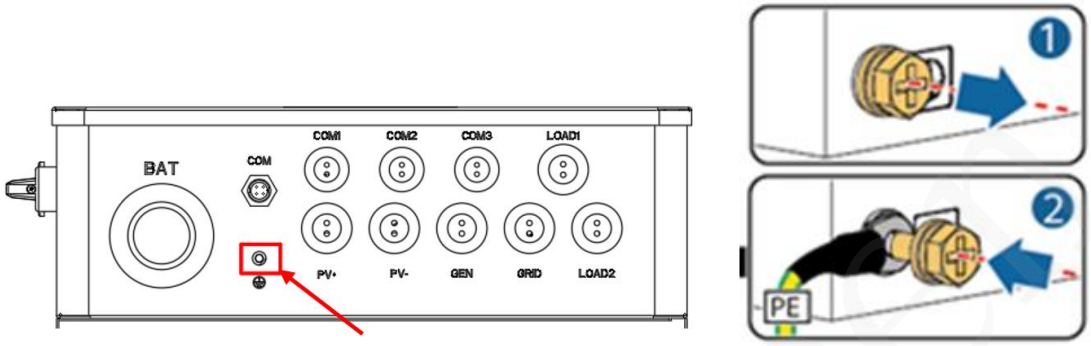
(4) OT terminal (5) Crimping tool (6) Heat gun

Step 2 Connect the PE cable.

Figure 4-3 Connecting the PE cable



4.3 PV connection

Hybrid inverter PhG-P can be connected with 4 strings of PV modules. Select PV modules with excellent function and reliable quality and also pay attention to that the open-circuit voltage of module arrays connected in series should be <Max. DC input voltage; operating voltage should be conformed to MPPT voltage range.

⚠ WARNING

PV module voltage is very high, which already achieve dangerous voltage range, please comply with electric safety rules when connecting.

Please do not make PV positive pole or negative pole ground!

Please ensure that the DC switch is set to OFF.

NOTE

The following requirements of PV modules need to be applied for each input range.

Please do not make PV positive pole or negative pole ground!

In order to save cable and reduce the DC loss, we suggest installing the inverter near PV modules.

Step1. Wiring.

Choose the 12 AWG or 10AWG wire to connect with the cold-pressed terminal.

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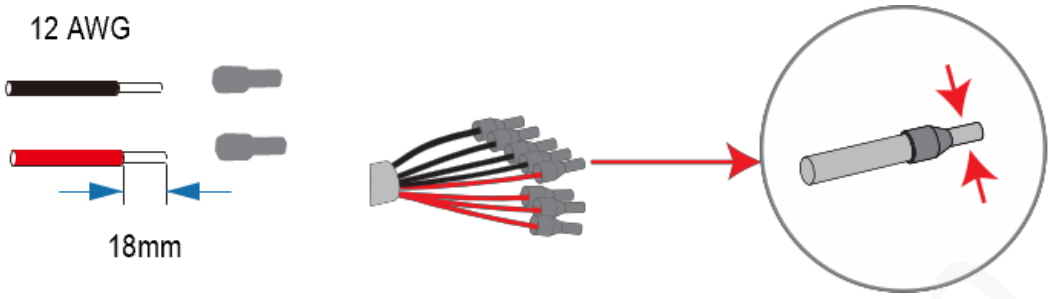
Remove 18mm of insulation from the end of wire.

Figure 4-4 Wiring



Step2. Cross the PV cables through the PV port(**PV+ , PV -**), and Connect PV cables to PV terminals.

Figure 4-5 PV port(**PV+ , PV -**)

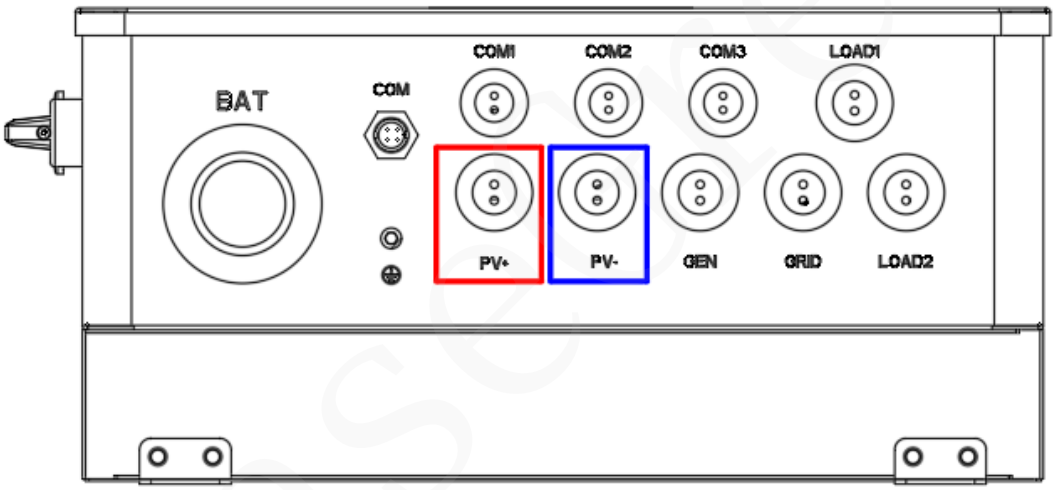
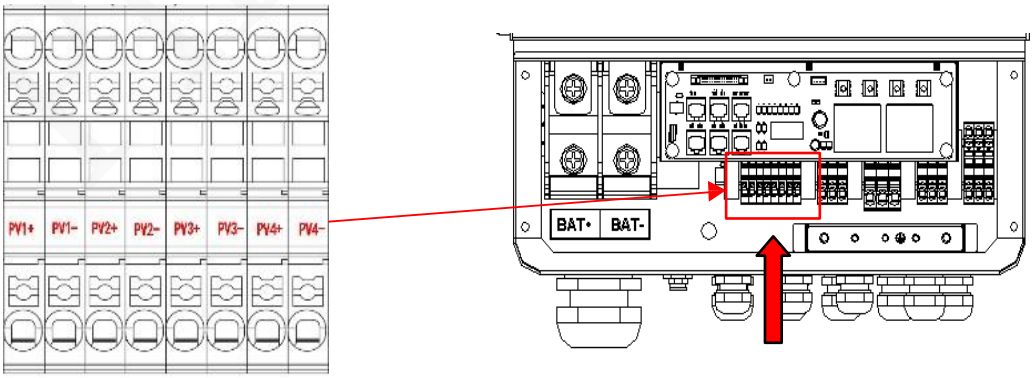


Figure 4-6 Connect to PV terminals



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4.4 Grid and CT Connection

Step1. Check the grid voltage.

1） Check the grid voltage and compare with the permissive voltage range (Please refer to technical data).

2） Disconnect the hybrid inverter PhG-P from all the phases and secure against re-connection.

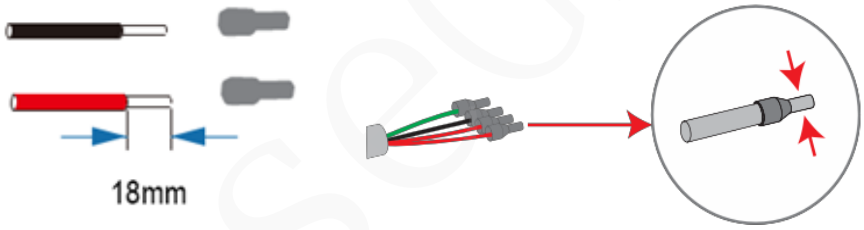
Step2. Grid cables choose

Please refer to the following table to choose the right cable.

Model	PhG-P5K0LNA-M	PhG-P8K0LNA-M
Cable	10AWG	8AWG

Step3. Make the wire to connect with the cold-pressed terminal. (Remove 18mm of insulation from the end of wire.)

Figure 4-7 Make the grid wire



Step4. Cross the grid cables through the CT(Optional)

CT is used for monitoring the power usage for entire house, at the meantime, inverter will also need the data from CT to achieve the Export Control Function.

The CT Appearance

1	2	3
		

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CT connection

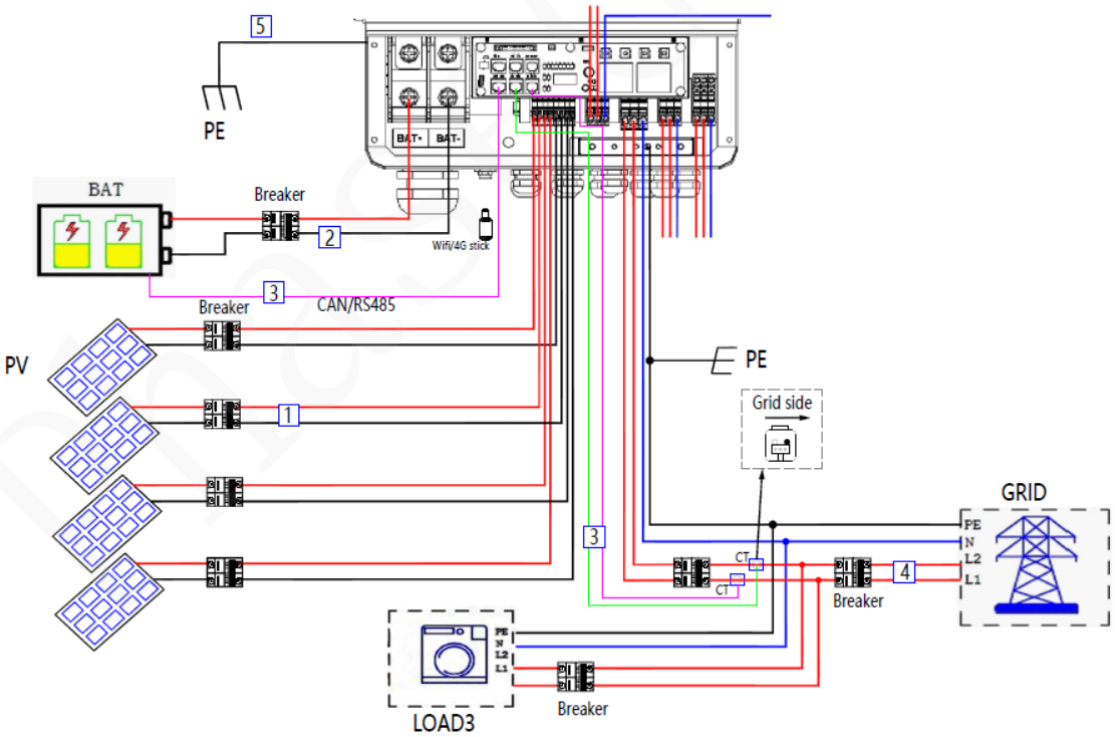
S1	S2	S3
		
Open the CT Circle	Cross the grid cables through the CT	Use 2 cable ties to Fix the CT

NOTE

Ensure that the distance between CT and the grid cable end is within 1.8m.

The CT arrow points to the grid side, otherwise the inverter display data will be wrong, or the machine can't be used normally.

Fig 4-8 CT connection diagram



Step5. Cross this end of Grid Cables through the grid port(Grid) and CT Signal Cables through the COM3 port.

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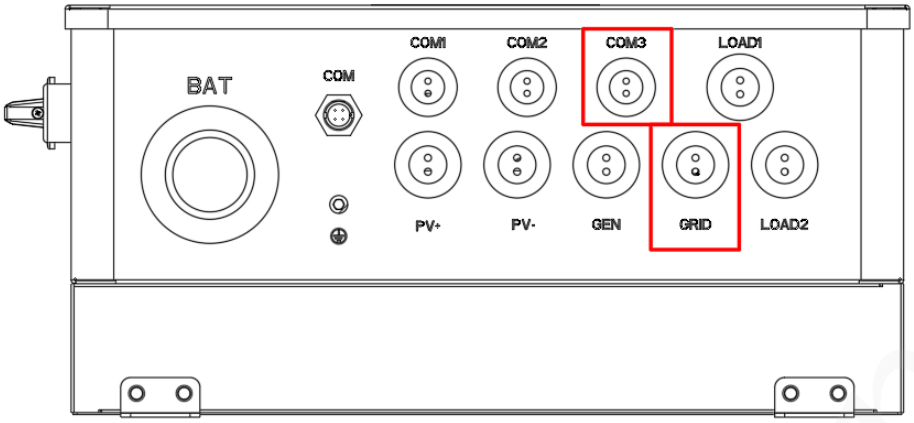
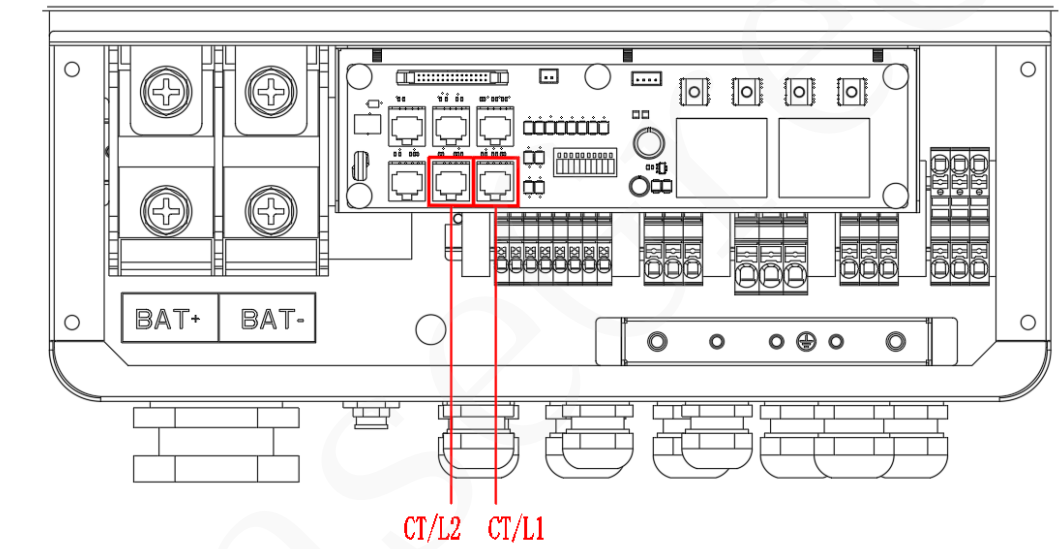
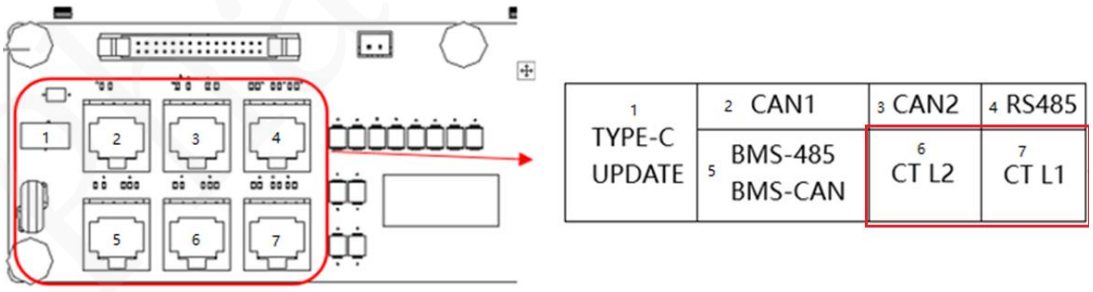
Figure 4-9 Grid Port



Step 6. Connect the end of the CT signal cables to CT terminals.





Step 7. Connect the end of the Grid Cables to Grid terminals.

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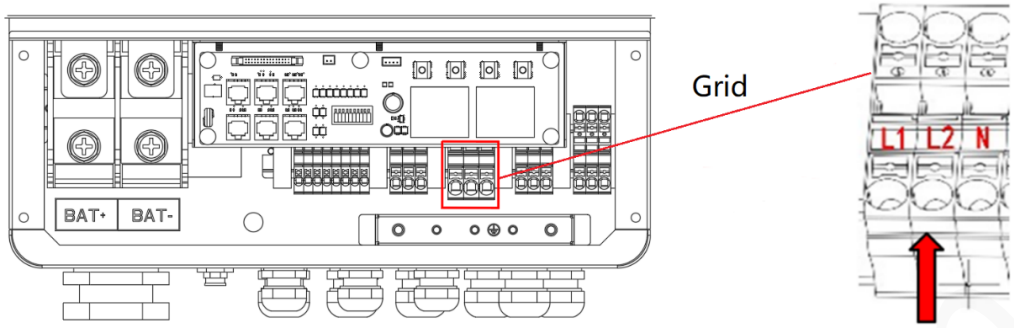
Figure 4-10 Grid Terminals



4.5 GEN Connection (Optional)

Step1. Check the grid voltage.

1） Check the grid voltage and compare with the permissive voltage range (Please refer to technical data).

2） Disconnect the hybrid inverter PhG-P from all the phases and secure against re-connection.

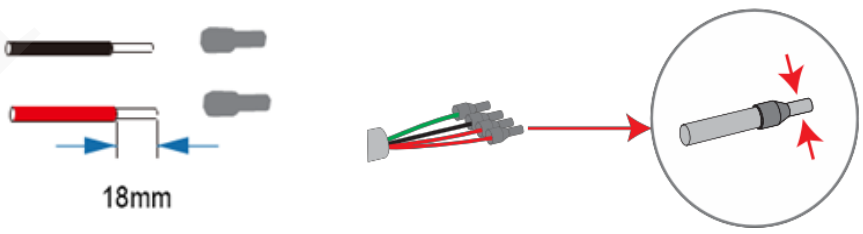
Step2. GEN cables choose

Please refer to the following table to choose the right cable.

Model	PhG-P5K0LNA-M	PhG-P8K0LNA-M
Cable	10AWG	8AWG

Step3. Make the wire to connect with the cold-pressed terminal. (Remove 18mm of insulation from the end of wire.)

Figure 4-11 Make the grid wire



Step4. Cross the GEN cables through the grid port, Connect GEN cables to GEN terminals.

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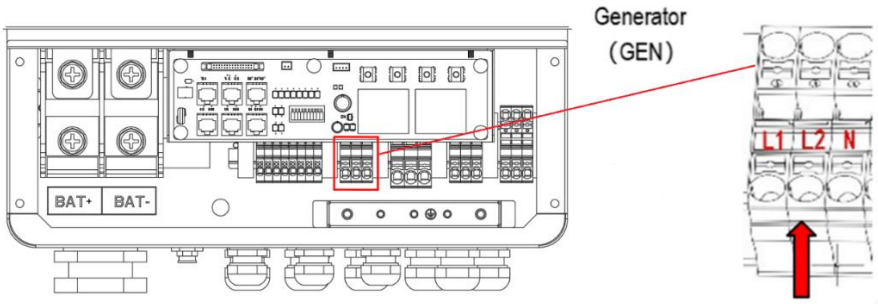
Figure 4-12 GEN terminals



4.6 Battery Connection(Optional)

Charging & discharging system of Hybrid series inverter is designed for 48V lithium battery. Before choosing battery, please note the maximum voltage of battery should not be exceed 60V and the battery communication should be compatible with Hybrid inverter.

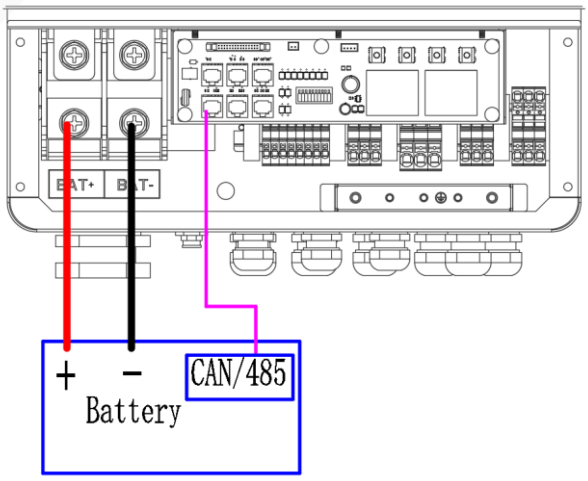
Battery breaker

Before connecting to battery, please install a no-polarized DC breaker to make sure inverter can be securely disconnected during maintenance. Please refer to the following table.

Model	PhG-P5K0LNA-M	PhG-P8K0LNA-M
DC Breaker	160A DC	250A DC

Battery connection diagram

Figure 4-13 Battery connection diagram



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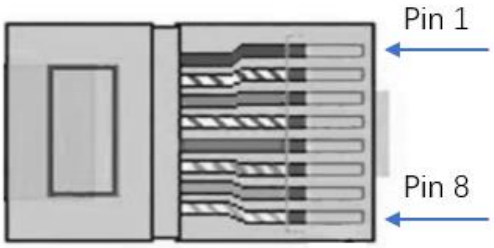
BMS PIN Definition

Communication interface between inverter and battery is through RS485 or CAN with a RJ45 connector.



Item	PIN	1	2	3	4	5	6	7	8
CAN	Definition	X	X	X	BMS_CANH	BMS_CANL	X	X	X
RS485	Definition	X	X	X	X	X	GND	BMS_485A	BMS_485B

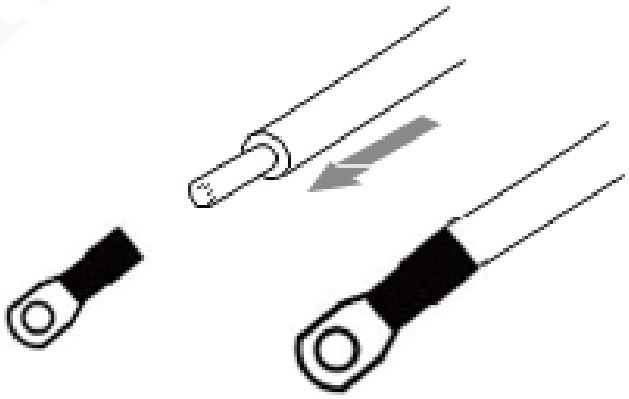
Note: When using RS485 protocol, please note that PIN2 must be disconnected!

NOTE

The battery communication can only work when the battery BMS is compatible with the inverter.

Battery Power Cable Connection:

Step1. Choose the 2 AWG wires and strip the cable to 15mm. Select two O-terminals with an aperture of M8. Insert the stripping line into the O-terminal and clamp it with a crimping clamp.



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Step2. Cross the battery power cable through the battery port in the inverter. Connect battery cable to battery terminal tightly.

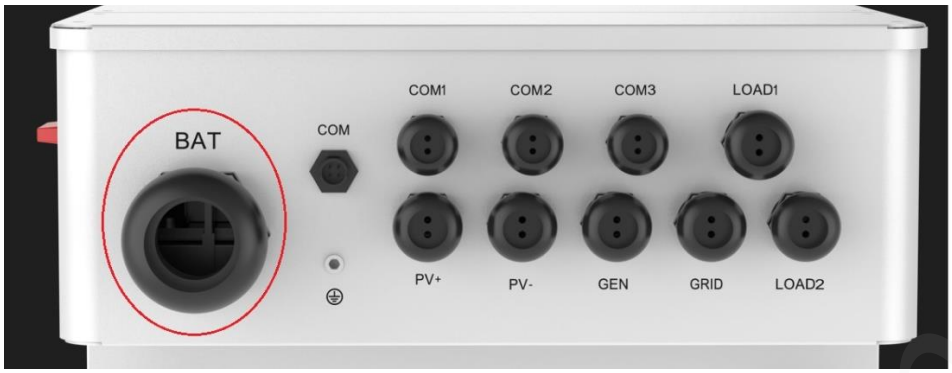
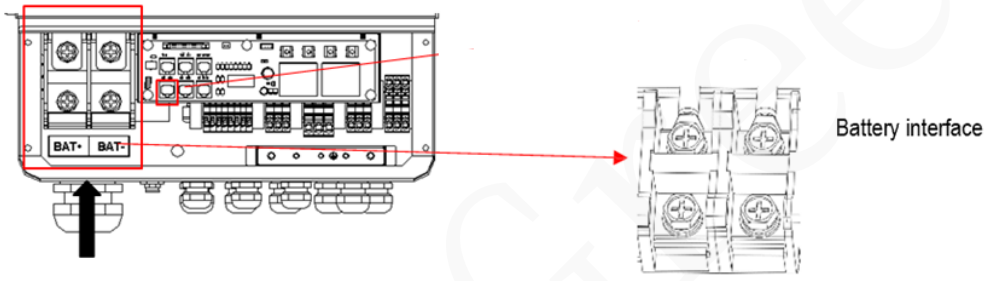


Figure 4-14 Battery Interface



NOTE

The battery communication can only work when the battery BMS is compatible with the inverter.

Positive and negative lines are not allowed to reverse.

Step3. Cross the battery communication cable through the COM1 port in the inverter. Connect battery BMS communication cable to BMS485/CAN 485 terminal tightly.

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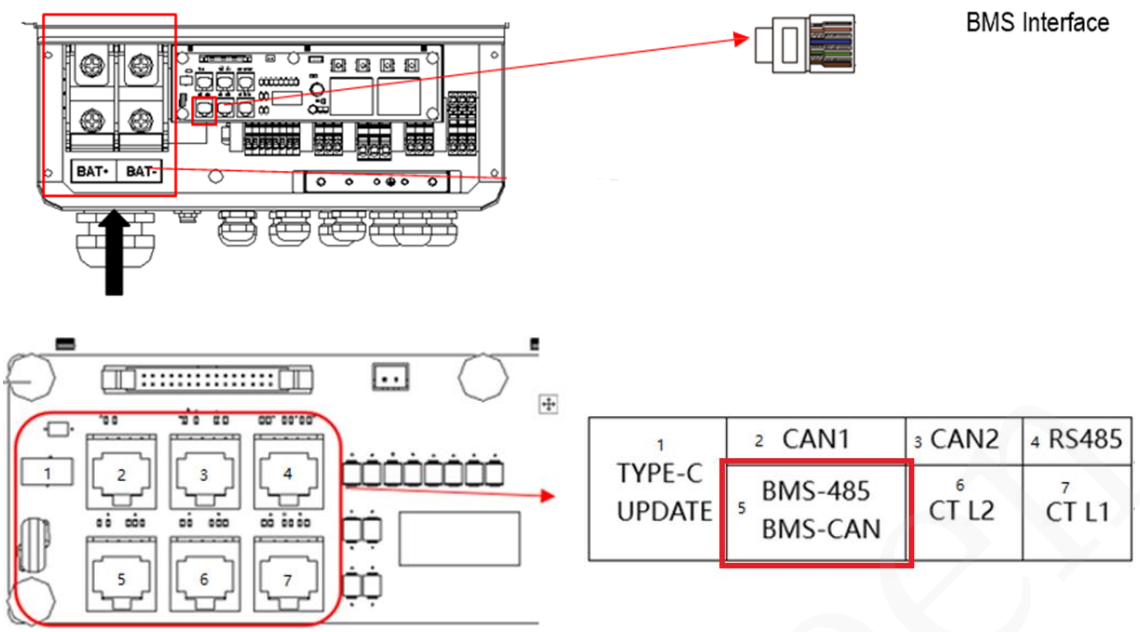


4.7 Load1 and Load2 Connection

Inverter has On and Off grid function, the inverter will deliver output power through AC port when the grid is on, and it will deliver output power through back-up port when the grid is off.

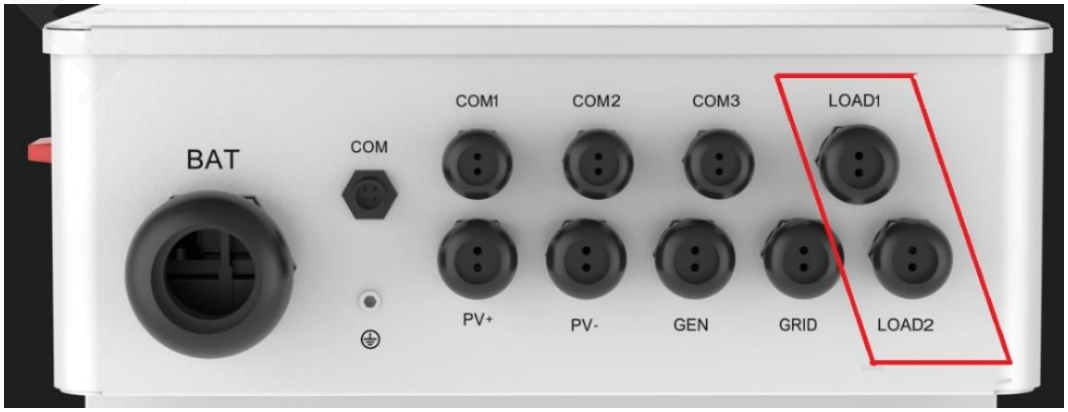
Auto & Manual

BACK-UP1(Load1) function can be achieved automatically or manually according to user's wishes.

BACK-UP2(Load2) function can only be triggered automatically.

Load1 port: important load(EPS).

Load2 port: When the battery capacity is not sufficient, the load on this interface will be disconnected.



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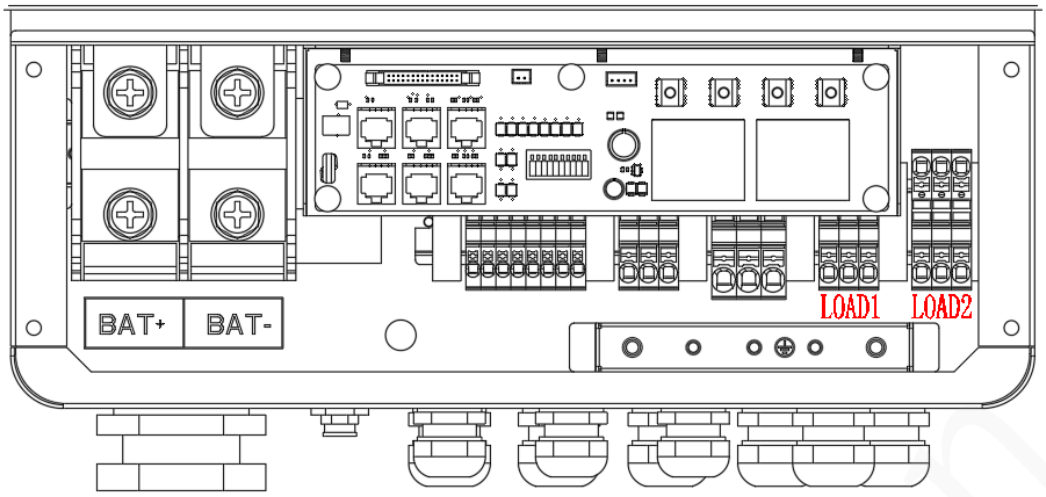
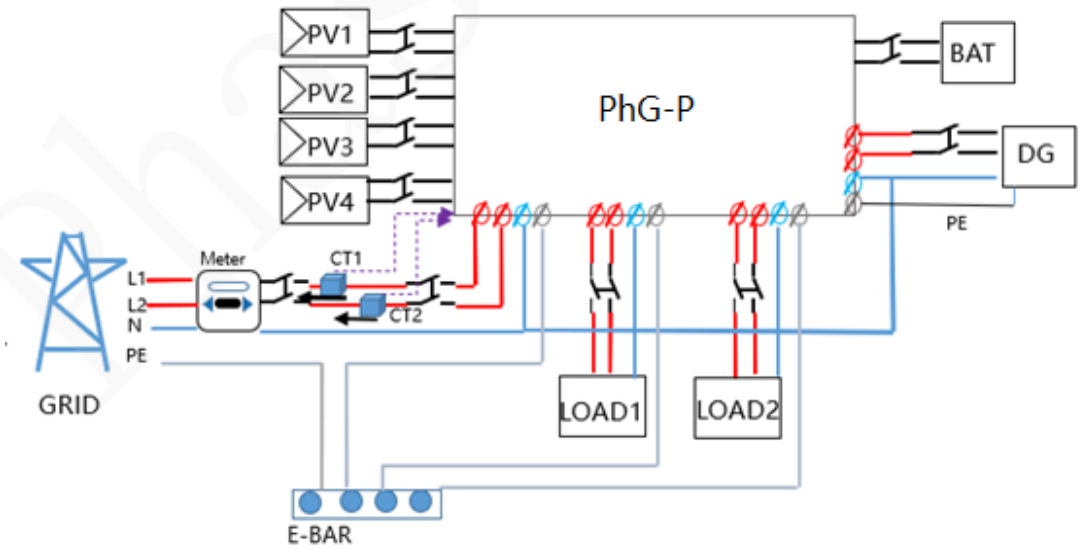


For the PhG-P inverter, the standard residential PV energy solution installation typically consists of the connection of the inverter with both PV panels and batteries. In case of systems not connected to the batteries, the Back-Up function is strongly not advised to use. It shall not cover the standard warranty and be liable for any consequences arising from users not following this instruction.

Hybrid inverter is able to supply overload output at its “Back-Up”. For details, please refer to the technical parameters of inverter. And the inverter has self-protection dreading at high ambient temperature.

For complicated application, or Special load, please contact the installer or after-sales.

Figure 4-15 Load Connection



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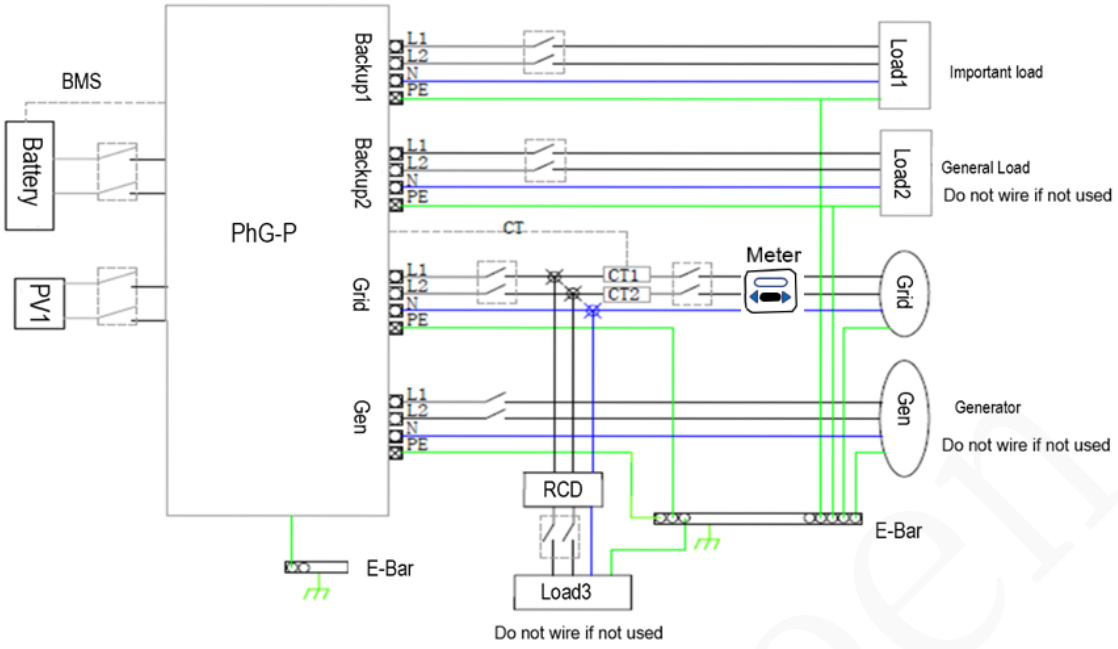

NOTE

In case of discrepancies between wiring mode of local policy and the operation guide above, especially for the wiring of neutral line, grounding and RCD, please contact us before any operation!

Off-Grid Function

When using the off-grid function, please add off-grid AC breaker in off-grid output cable to ensure safety.

Model	PhG-P5K0LNA-M	PhG-P8K0LNA-M
Micro-breaker	32A AC	40A AC

NOTE

The absence of AC breaker on back-up side will lead to inverter damage if an electrical short circuit happens on back-up side.

Step1. Choose the right BACK-UP wires.

Please refer to the following table to choose the right cable.

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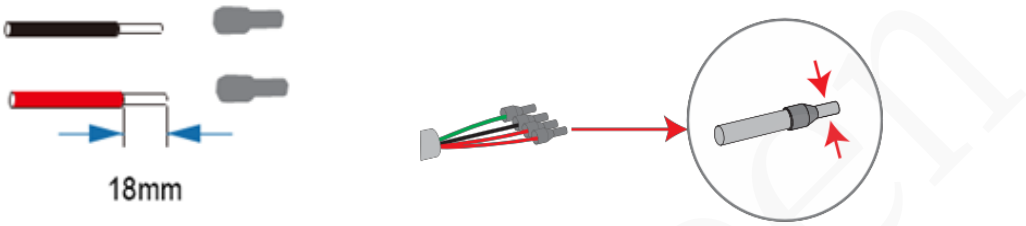
Model	PhG-P5K0LNA-M	PhG-P8K0LNA-M
Cable	10AWG	8AWG

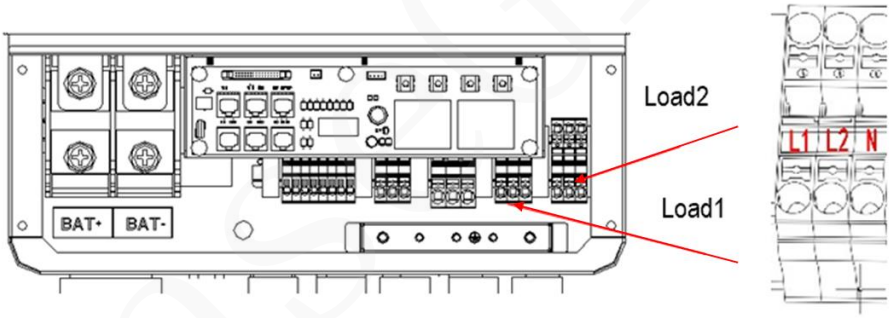
Step2. Make the wire to connect with the cold-pressed terminal. (Remove 18mm of insulation from the end of wire.)

Figure 4-16 Make Off-Grid Connection Wire



Step3. Connect the cables to the BACK-UP: Load1 and Load2 port of the inverter.

Figure 4-17 Connect Load Cables



Requirements for BACK-UP load

⚠ WARNING

Make sure the BACK-UP load power rating is within BACK-UP output rating range, otherwise the inverter will shut down with an “over load” warning.

When an “over load” is appeared, adjust the load power to make sure it is within the BACK-UP output power range, then turn the inverter turn on again.

For the nonlinear load, please make sure the inrush power should be within the BACK-UP output power range.

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Below table shows some common feasible loads for you reference

Table 4-2 reference of common feasible loads

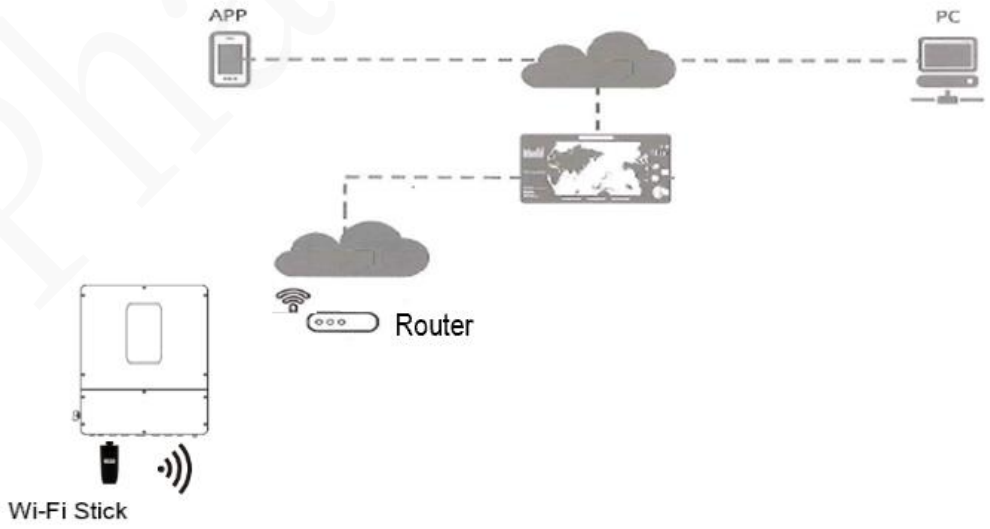
Type	Power		Common equipment	Example		
	Start	Rated		Equipment	Start	Rated
Resistive load	R 1	R 1	Incandescent lamp, TV	100W Incandescent lamp	100VA (W)	100VA (W)
Capacitive load	R 2	R 1.5	Fluorescent lamp	40W Fluorescent lamp	80VA (W)	60VA (W)
Inductive load	R 3~5	R 2	Fan, Fridge	150W Fridge	450-750VA (W)	300VA (W)

4.8 Wi-Fi Stick Connection (optional)

Hybrid inverter provides a Wi-Fi port which can collect data from inverter and finish the transmission the data through the router to the cloud server. If you use the Wi-Fi communication, please ensure the router support Wi-Fi nearby. (Purchase the Wi-Fi stick product from supplier if needed)

4.8.1 Wi-Fi communication Diagram

Fig 4-18 Wi-Fi communication Diagram



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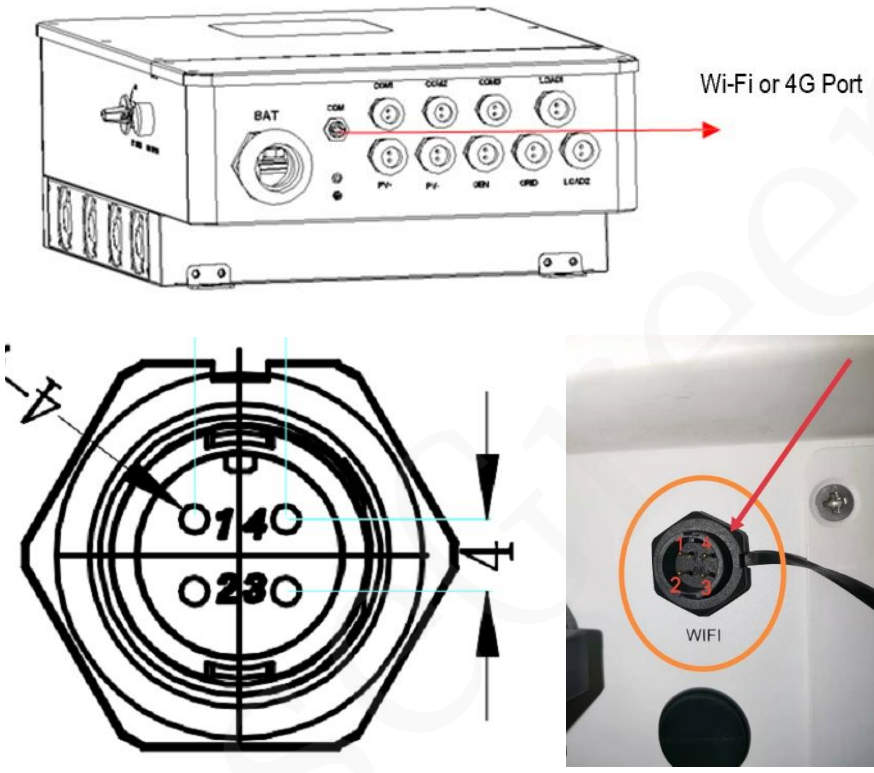
4.8.2 Wi-Fi Connection

Step1. Plug Wi-Fi stick into “Wi-Fi” port at the bottom of the inverter.

Step2. Build the connection between the inverter and router.

Step3. Create a user account online. (Please refer the Wi-Fi user manual for more details).

Fig 4-19 Wi-Fi Port Diagram in inverter



Pin	Description	Name	Type	Definition
1	Power	VCC	POWER	+5VDC
2	Signal A	A	I/O	RS485_A
3	Signal B	B	I/O	RS485_B
4	Power Ground	GND	GND	GND

4.9 4G Stick Connection (optional)

Hybrid inverter support 4G communication which can collect data from inverter and finish the transmission the data through the GPRS mobile network to the cloud server. If you use the 4G communication, please prepare a standard SIM card. When installing the

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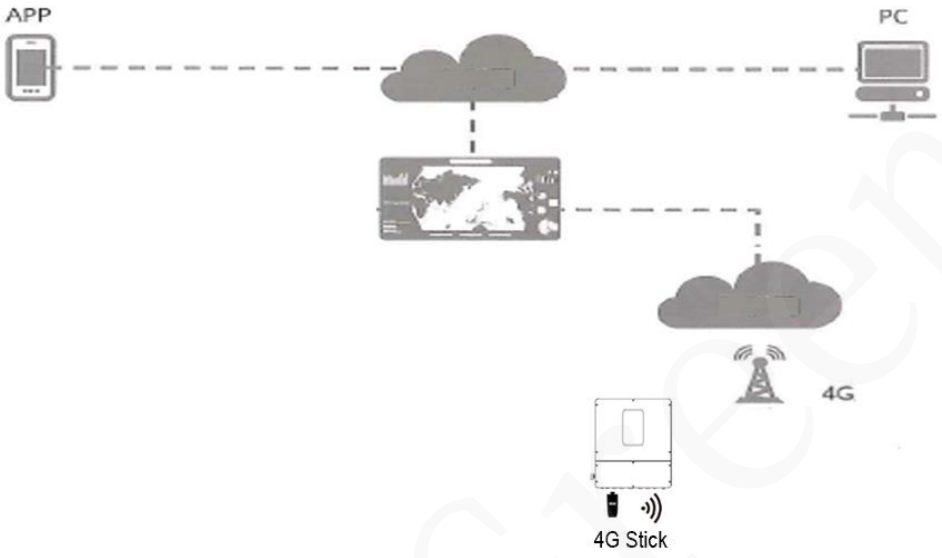
SIM card, determine its installation direction based on the silk screen and arrow on the card slot.

4.9.1 4G connection Diagram

Fig 4-20 4G communication Diagram

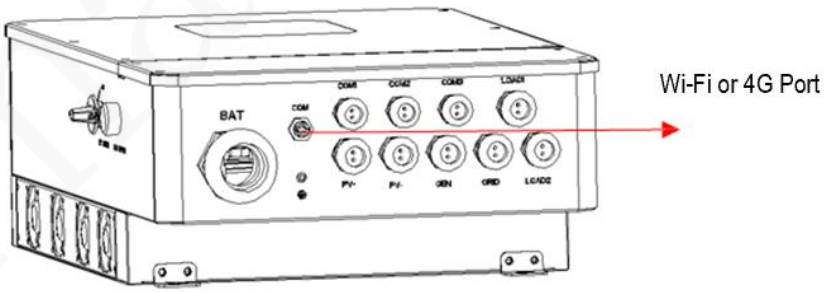


4.9.2 4G stick Connection

Step1. Plug 4G stick into “COM“ port at the bottom of the inverter.

Step2. Create a user account online. (Please refer the 4G Stick user manual for more details).

Fig 4-21 Wi-Fi or 4G port



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5 Commissioning

5.1 Checking Before Power-On

Table 5-1 Checklist

No.	Item	Acceptance Criterion
1	PhG-P inverter installation	The PhG is installed correctly and securely.
2	Wi-Fi stick or 4G stick	The Wi-Fi stick or 4G stick is installed correctly and securely.
3	Cable routing	The cables are routed properly as required by the customer.
5	Reliable grounding	The PE cable is connected correctly and securely.
6	Switch	DC switches and all the switches connecting to the PhG-P are OFF.
7	Cable connection	The AC output power cable, DC input power cables, battery cable, and signal cable are connected correctly and securely
8	Unused terminals and ports	Unused terminals and ports are locked by watertight caps.
9	Installation environment	The installation space is proper, and the installation environment is clean and tidy.

5.2 PhG-P hybrid inverter power-on

Important Notes

NOTICE

Before turning on the AC switch between the PhG-P and the power grid, check that the AC voltage is within the specified range using a multimeter.

Procedure

Step 1 If a battery is connected, turn on the battery switch.

Step 2 Turn on the AC switch between the PhG-P and the power grid.

Step 3 Turn on the DC switch (if any) between the PV string and the PhG-P.

Step 4 Press Down the **RSD BUTTON** at the left side of the PhG-P(see the following picture).

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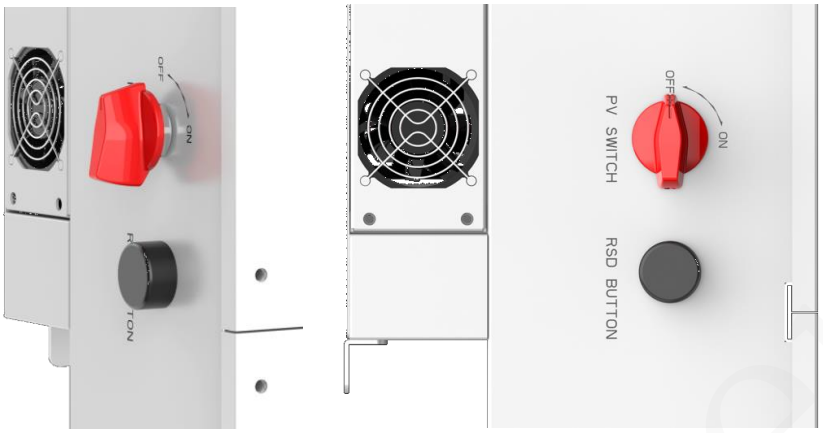
Step 5 Turn on the **PV SWITCH** at the left side of the PhG-P(see the following picture).

Fig 5-1 RSD BUTTON and PV SWITCH at the left side of the Inverter(PhG-P)



Step 6 Wait for about 1 minute and observe the LED indicators and LCD display to check its running status.

5.3 Display and instructions of system

5.3.1 Control Panel

Fig 5-2 Control Panel

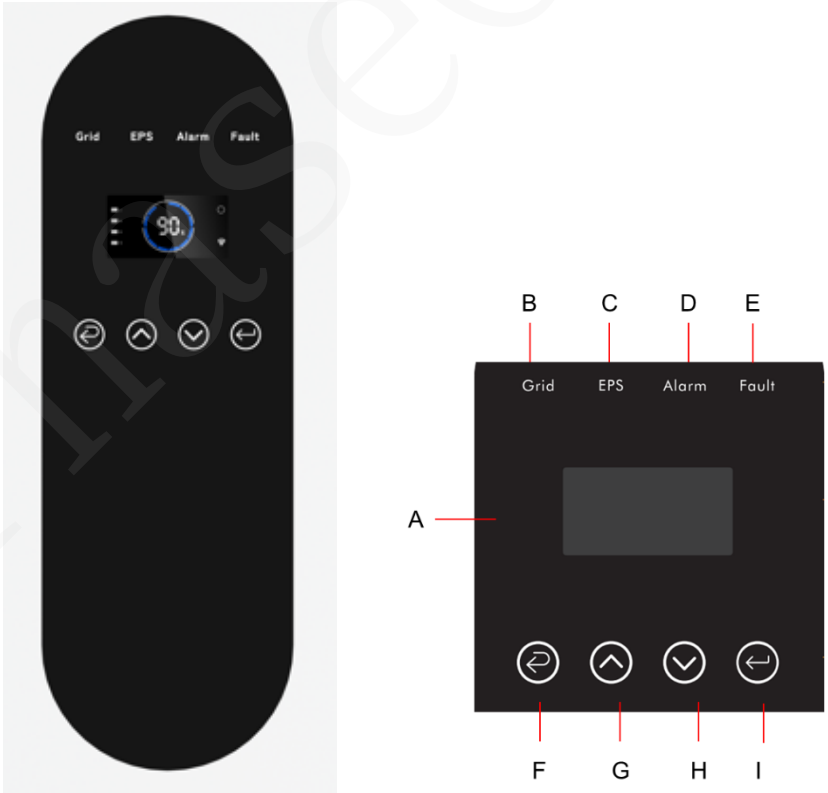


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Table 5-2 Control Panel Description

Object	Name	Description
A	LCD	Display the information of the inverter.
B	Indicator LED	"Grid", lit in green: The inverter is in grid mode. Off: The inverter is in not in grid mode.
C		"EPS", lit in green: The inverter is in off-grid mode. Off: The inverter is in not in off-grid mode.
D		"Alarm", lit in Yellow: The inverter is in Warning. Off: The inverter has no Inverter Warning
E		"Fault", lit in red: The inverter is in fault status. Off: The inverter has no errors.
F	Function Button	Esc: Return from current interface or function.
G		Up: Move cursor to upside or increase value.
H		Down: Move cursor to downside or decrease value.
I		Enter: Confirm the selection.

5.3.2 Instructions for LED Indicator

Table 5-3 Instructions for LED Indicator

Item	Grid (Green)	EPS (Green)	Alarm (Yellow)	Fault (Red)
Initialization	off	off	off	off
Stand-by	off	off	off	off
Grid mode	on	off	off	off
Off-Grid	off	on	off	off
Bypass of Mains	off	on	on	off
Fault	off	off	off	on

5.3.3 Instructions for the menu

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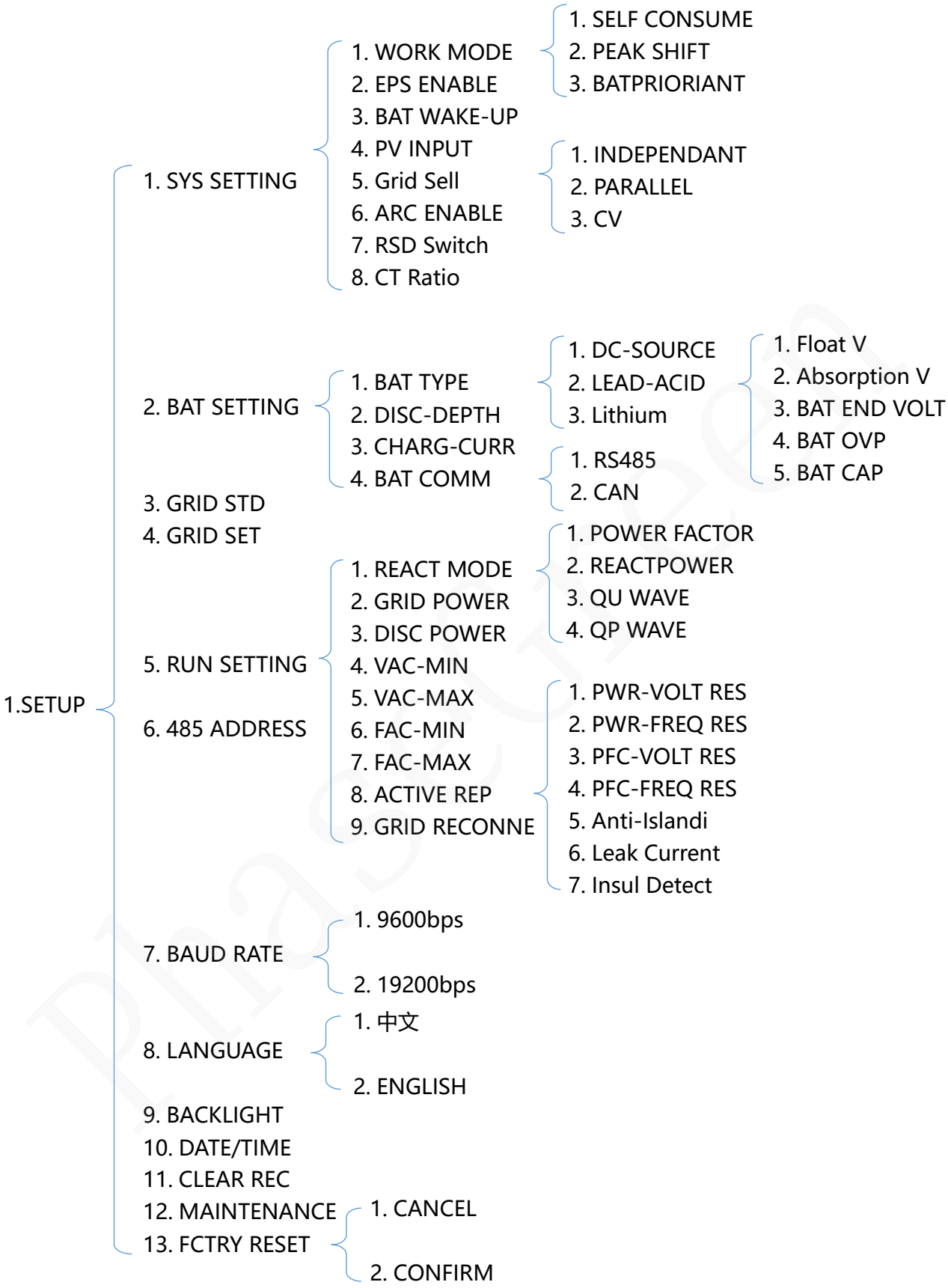

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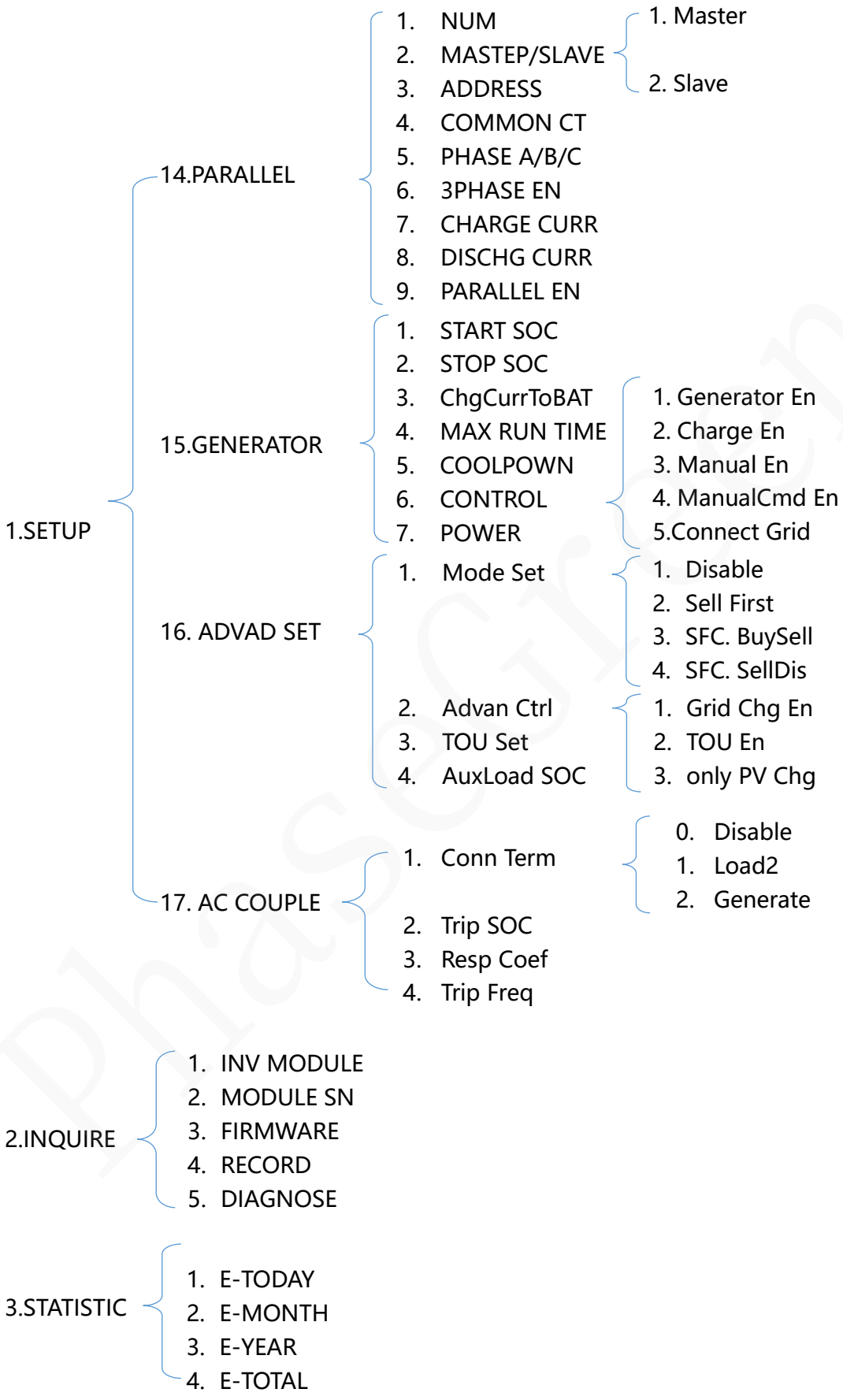

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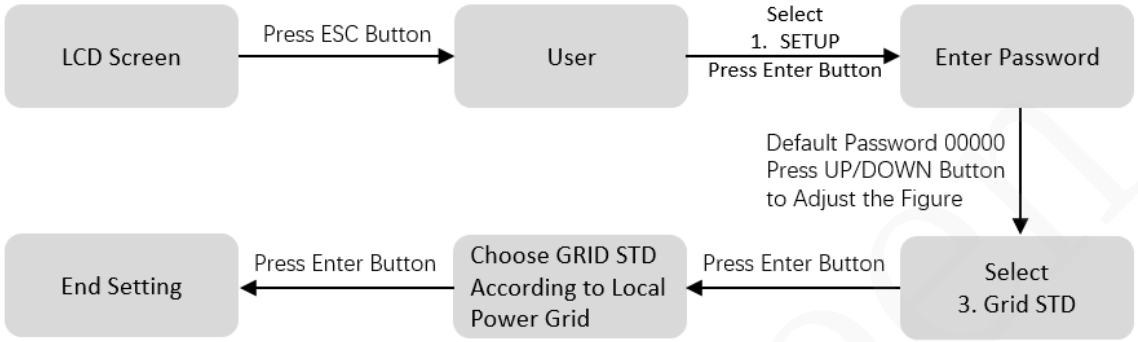
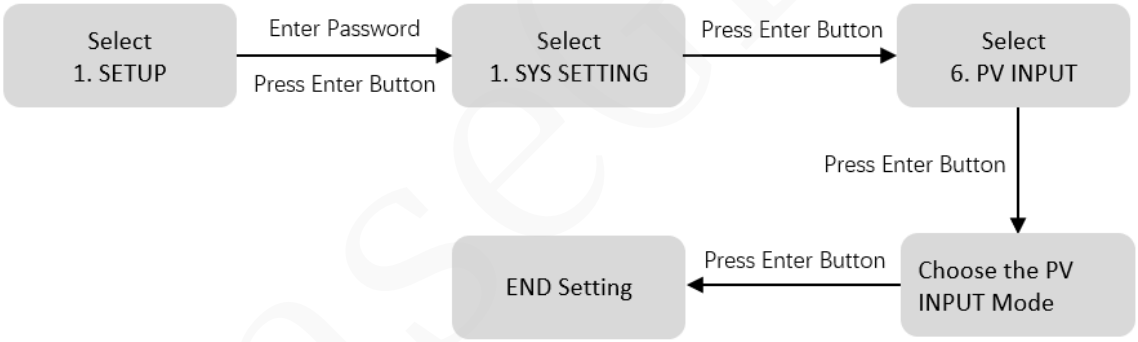
Setting Example (Flow Diagram):

Example: Before selecting the mode, you can set it up according to the local Power Grid Mode, PV Input Mode and Battery Mode.

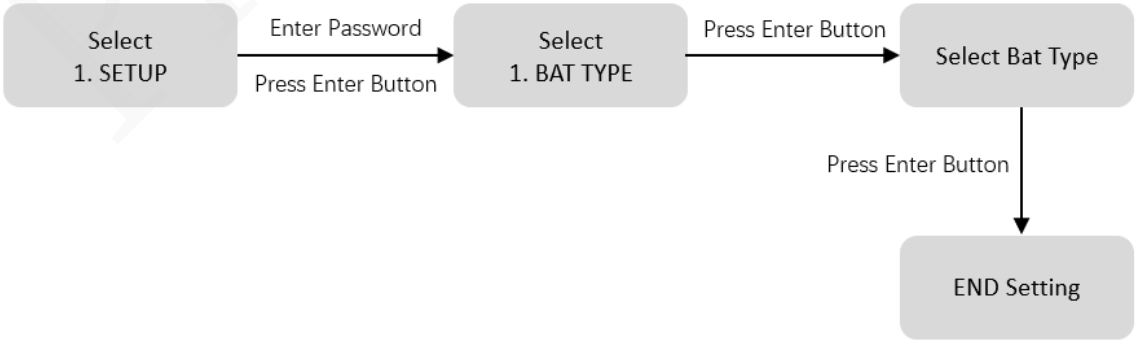
GRID MODE



PV INPUT MODE



BATTERY MODE



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6 LCD Operation

6.1 LCD Interface

6.1.1 Error information

Interface	Description
ERROR NO. 🔒 **02:** Bat Disconnect **27:** BMS Comm. fail	Numbers represent error codes and text is error information. Refer to Chapter 9 for contents. **NOTE:** When there is a lock mark 🔒 in the upper right corner of the screen, you cannot turn the page, you need to press Enter to unlock it first.

6.1.2 System setting 1

Interface	Description
SYSTEM1 **STATE:** SELF CSM **GRID:** US-CA **PV I/P:** PARALL	**State:** Setting of the whole inverter working mode. Including: SELF CONSUME, PEAK SHIFT and BAT PRIORITY. Refer to Chapter 2.5 for specific contents. **Grid standard:** Displays the grid standard actually set. **PV input mode:** The display value is the setting value of PV input type, including: INDEPENDANT, PARALLEL, CV. Settings and explanations are provided in section 6.2.4.6.

6.1.3 System setting 2

Interface	Description
SYSTEM2 **BMS Com:** CAN **Anti-Reve:** DISA **DOD:** 80%	**BMS Com:** Battery Management System communication mode Including CAN or RS485. **Anti-Reverse:** Displays Whether Inverter isn't allowed to generate electricity to the Grid. Including: DISABLE, ENABLE The Settings are described in section 6.2.6. **DOD:** Depth of battery discharge. When the battery discharge exceeds the DOD parameter, the inverter generates a low voltage or under voltage alarm, and the battery stops discharging.

6.1.4 System setting 3

Interface	Description
SYSTEM3 **EPS ENABLE:** ENAB	**EPS ENABLE:** When the Grid and PV are powered off, Enable the battery to supply power to the load, default option is enable.

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6.1.5 PV1 Input display interface

Interface	Description
PV1 **INPUT VOLT:** 0.0V **CURR:** 0.00A **POWER:** 0W	PV1 input real-time voltage PV1 input real-time current PV1 input real-time power.

6.1.6 PV2 Input display interface

Interface	Description
PV2 **INPUT VOLT:** 0.0V **CURR:** 0.00A **POWER:** 0W	PV2 input real-time voltage PV2 input real-time current PV2 input real-time power.

6.1.7 PV3 Input display interface

Interface	Description
PV2 **INPUT VOLT:** 0.0V **CURR:** 0.00A **POWER:** 0W	PV3 input real-time voltage PV3 input real-time current PV3 input real-time power.

6.1.8 PV4 Input display interface

Interface	Description
PV2 **INPUT VOLT:** 0.0V **CURR:** 0.00A **POWER:** 0W	PV4 input real-time voltage PV4 input real-time current PV4 input real-time power.

6.1.9 DC Voltage interface

Interface	Description
DC VOLTAGE **VpBUS+:** 235.0V **VnBUS -:** 235.0V **LeakCur:** 0mA	**VpBUS+:** Real-time voltage of bus capacitor of the inverter. **VnBUS-:** Real-time voltage of bus capacitor of the inverter. **LeakCurr:** Real-time leak current of the inverter.

6.1.10 Battery interface

Interface	Description
BATTERY **VOLT:** 0.0V **CURR:** 0.0A **STA:** C, D, F	Battery real-time voltage Battery real-time current **STA:** Battery status **C :** Indicates that the battery is rechargeable (From the BMS) **D :** Indicates that the battery can discharge (From the BMS) **F :** The battery requests a forcible charge (From the BMS)

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6.1.11 Battery Type interface

Interface	Description
BATTERY INFO **TYPE:** Lithium **TEMP:** 26℃ **SOC:** 30%	**TYPE:** Battery type:(lead-acid, lithium battery) **TEMP:** Battery temperature. **SOC:** Percentage of battery capacity from the BMS

6.1.12 Battery Current interface

Interface	Description
BMS PRMETER **CHAR VOL:** 0.0V **CHARGE:** 50A **DISCHA:** 50A	**CHAR VOL:** Battery charging or discharging voltage. **CHARGE:** Battery charging current. **DISCHA:** Battery discharging current.

6.1.13 Grid-Connected

Interface	Description
GRID **GRID FREQ:** 0.00Hz **L1:** 0.0V 0.0A **L2:** 0.0V 0.0A	**GRID FREQ:** Grid real-time frequency. **L1:** Gird-phase L1 real-time voltage. CT real-time current **L2:** Gird-phase L2 real-time voltage. CT real-time current **CT:** Current sensor accessories

6.1.14 INV(INVERTER Output information)

Interface	Description
INV **INV FREQ:** 0.00Hz **L1:** 0.0V 0.0A **L2:** 0.0V 0.0A	**INV FREQ:** Grid real-time frequency. **L1:** INV - L1 real-time voltage. INV -L1 real-time current. **L2:** INV - L2 real-time voltage. INV -L2 real-time current.

6.1.15 LOAD

Interface	Description
LOAD **L1:** 0.0V 0.0A **L2:** 0.0V 0.0A	**L1:** Load -L1 real-time voltage. Load -L1 real-time current. **L2:** Load -L2 real-time voltage. Load -L2 real-time current.

6.1.16 ON GRID POWER

Interface	Description
POWER **GRID L1:** 0.0W **GRID L2:** 0.0W	**GRID L1:** Grid -L1 power. **GRID L2:** Grid -L2 power.

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6.1.17 INV POWER

Interface	Description
POWER **INV L1:** 0.0W **INV L2:** 0.0W	**INV L1:** INV- L1 power. **INV L2:** INV- L2 power.

6.1.18 LOAD POWER PER

Interface	Description
LOAD POWER PER **L1:** 0W 0% **L2:** 0W 0%	**L1:** Load-phase L1 power percentage. **L2:** Load-phase L2 power percentage.

6.1.19 POWER

Interface	Description
POWER **PV :** 0W **BAT:** 0W	**PV :** PV power. **BAT:** Battery power.

6.1.20 Temperature

Interface	Description
TEMPERATURE **INVER:** 0℃ **DCDC:** 0℃ **INSIDE:** 0℃	**INVER:** DC/AC temperature. **DCDC:** DC/DC temperature. **INSIDE:** Internal ambient temperature.

6.1.21 State

Interface	Description
STATE SYS: **STANDBY** **INV:** STANDBY **DCDC:** STANDBY	**System information:** Display complete inverter status information, including: **Initialization, Standby, PV** grid connection, **Grid** connection of battery, Hybrid power supply, Fault, Service, Self -check, Off-gird, grid, INV to PFC , Charging enables, Discharge enables, Force charge enable, etc. **INV:** Displays the inverter status information. **DCDC:** Displays charging and discharging status information

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6.2 Setting

6.2.1 State

Interface	Description
USER **1: SETUP** **2: INQUIRE** **3: STATISTIC**	**SETUP:** Press Enter to user settings interface. **INQUIRE:** Query inverter model, serial number, software version. **STATISTIC:** View inverter run statistics.

6.2.2 SET Password

Interface	Description
PASSWORD **INPUT:** XXXXX	Enter the password required for setting. The default password is "**00000**". Press the Up or Down keys to adjust the number, press the Enter key to move the cursor forward, and press the ESC key move the cursor backward.

6.2.3 Setup

Interface	Description
SETUP **1: SYS SETTING** **2: BAT SETTING** **3: GRID STD** **4: GRID SET** **5: RUN SETTING** **6: 485 ADDRESS** **7: BAUD RATE** **8: LANGUAGE** **9: BACKLIGHT** **10: DATE/TIME** **11: CLEAR REC** **12: PASSWORD** **13: MAINTENANCE** **14: FCTRY RESET**	This interface is used for various information inquiry options. Press the Up/Down button to make the corresponding selection. Press Enter button to enter the selected menu. Press ESC button return to the user interface. (Refer to 6.2.1). There are 14 options in total.

6.2.4 System setting

6.2.4.0 System setting

Interface	Description
SYS SETTING **1: WORK MODE** **2: EPS ENABLE** **3: BAT WAKE-UP** **4: GRID SET** **5: REMOTE CTRL** **6: START DELAY** **7: PV INPUT** **8: Anti Reverse**	This interface is used to access system information. Press Up/Down button to move corresponding options. Press Enter to enter the selected menu. Press ESC button to return to the setting interface. There are 8 options in total.

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6.2.4.1 Work mode

Interface	Description
WORK MODE **1: SELF CONSUME** **2: PEAK SHIFT** **3: BAT PRIORITY**	This interface is used to select the working mode. Press ESC button return to setting interface. (Refer to 2.5)

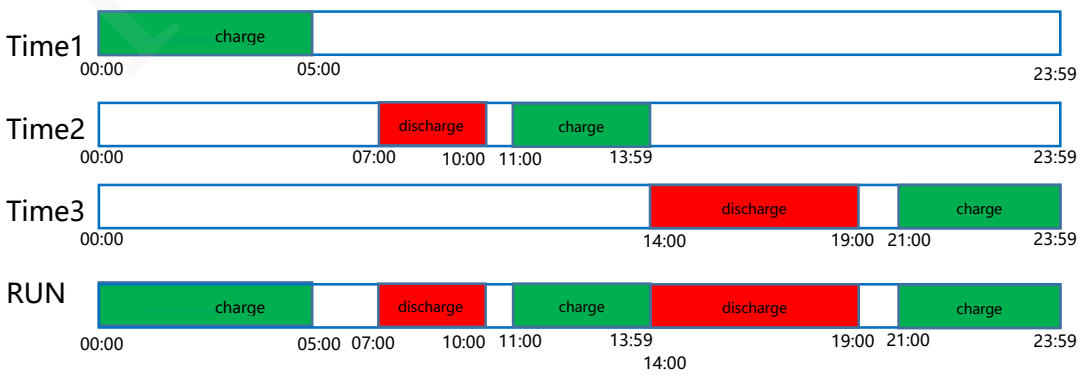
6.2.4.1.1 Peak shift work time

Interface	Description
WORK MODE 1: SELF CONSUME **2: PEAK SHIFT** 3: BAT PRIORITY	**WORK MODE** This interface is used to select the working mode. Press ESC button return to setting interface. (Refer to 2.2). Select the peak shift mode, you also need to set the charge and discharge time It's allowed to set Three charging and discharging periods. When setting the time, ensure that the time of the inverter is the local time. Press Enter to enter the next menu.
WORKTIME 1: TIME 1 2: TIME 2 3: TIME 3 CHAG START1 00:00 CHARGE END1 00:02 DISC START1 00:03 DISCHA END1 23:59	**WORK TIME** This parameter is set for one day. If the specified time conflicts, the first time is used as the main time perform. If the three time ranges do not conflict, the three time ranges are executed in sequence. **TIME X** This interface is used to adjust the time of peak load shifting. Press Up/Down button to move the corresponding options. Press Enter to enter the selected menu. Press Esc button to return to the working mode interface.

WORKTIME*

1)The maximum allowable setting time is 24h(one day), It is allowed to set six different charging and discharging states within 24h.(time1 twice,time2 twice,time3 twice), The inverter runs repeatedly every day according to the set time.

2) The inverter executes according to the settings of time1, time2 and time3 in the order of time. The following figure is an example。Different time periods do not overlap.



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3）If you want to set a continuous charging time from the first night to the next morning. For example, you want charge battery form first day 21:00pm to next day 5:00am, divide this time period into two time periods (21:00~23:59, 00:00~05:00), and select two charging time periods from Time1, Time2 and Time3 and set them.

6.2.4.2 EPS enable

Interface	Description
EPS ENABLE 1: DISABLE **2: ENABLE**	When the Grid and PV are powered off, Enable the battery to supply power to the load, default option is “ENABLE”.

6.2.4.3 Battery wake-up

Interface	Description
WAKE-UP EN **1: DISABLE** 2: ENABLE	When the battery is low and the battery relay has been disconnected, the inverter will send instructions to the battery forcibly sucking relay by BMS, and the inverter will charge. The default option is disabled. (Partial lithium battery support) If you want to use this feature, please consult the battery brand supported by the dealer. Use it only when the battery is too low.

6.2.4.4 REMOTE CTRL

Interface	Description
REMOTE CTRL **1: DISABLE** **2: ENABLE**	Reserved

6.2.4.5 START DELAY

Interface	Description
START-UP DELAY **INPUT:** 60 **UNIT:** SEC	Reserved

6.2.4.6 PV INPUT MODE

Interface	Description

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INPUT MODE **1. INDEPENDENT** **2. PARALLEL** **3. CV**	Setup of PV Input mode. **INDEPENDENT:** The default Settings **PARALLEL:** This feature is for test use only, not customer use. **CV:** This feature is for test use only, not customer use. The factory setting by default is Independent. When parallel input is set to be independent mode, PV power will be imbalanced.

6.2.4.7 Anti-Reverse

Interface	Description
Anti-Reverse **1. DISABLE** 2. ENABLE	**Anti-Reverse:** Whether Inverter isn't allowed to generate electricity to the Grid. The default option is Disable.

6.2.4.8 ARC ENABLE

Interface	Description
-ARC- **1.DISABLE** 2.ENABLE	Enable or disable arc pull function detection. The default option is Disable.

6.2.4.9 BUTT ENABLE

Interface	Description
Anti-Reverse **1. DISABLE** 2. ENABLE	When the button is enabled, the button will take effect. After powering on, press the button to run the inverter. If the button is not pressed, the button will not take effect when the machine is disabled in standby.

6.2.5 BAT SETTING

6.2.5.0 BAT SETTING

Interface	Description
BAT SETTING **1. BAT TYPE** **2. DISC-DEPTH** **3. CHARG-CURR** **4. BAT-COMM**	This interface is used to select battery parameters. Press Up/Down button to move corresponding options; Press Enter button to enter the selected menu; Press ESC button to return to setting interface.

6.2.5.1 BAT TYPE

Interface	Description
BAT TYPE **1. DC-SOURCE** **2. LEAD-ACID** **3. Lithium**	This interface is used to select battery type. Press Up/Down button to move corresponding options. Press Enter button to enter the selected menu. Select the LEAD-ACID, enter button to enter LEAD-ACID interface; Set 1 to test and disable the setting.

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6.2.5.1.1 Lead-acid battery parameter

Interface	Description
LEAD-ACID **1. CHARG-VOLT** **2. BAT END VOLT** **3. BAT OVP** **4. BAT CAP**	**LEAD-ACID** This interface is used to select LEAD-ACID battery parameter. Press Up/Down button to move corresponding options. Press Enter button to enter the selected menu; 1. Charge voltage 2. BAT end voltage 3. BAT over voltage 4. BAT Capacity
CHARGE-VOLT **INPUT:** 55.0 **UNIT:** V	**CHARGE VOLT** This interface is used to set the lead acid battery charging voltage. （The input value ranges as recommended by the battery manufacturer）
Interface	**Description**
BAT END VOLT **INPUT:** 043.0 **UNIT:** V **BAT OVP** **INPUT:** 058.0 **UNIT:** V **BAT CAP** **INPUT:** 0100 **UNIT:** AH	**BAT END VOLT** This interface is used to set the lead-acid battery discharging voltage. Discharge cut-off voltage, as recommended by the battery manufacturer. **BAT OVP** This interface is used to set the lead acid battery Charge protection voltage. Charge protection voltage, as recommended by the battery manufacturer. **BAT CAP** This interface is used to set the lead acid Battery capacity. It is related to the input power. The battery capacity setting will affect the maximum charging current, for example, set 100Ah, the maximum charging current is 100A*0.2=20A

6.2.5.2 DISC-DEPTH

Interface	Description
DISC DEPTH **Grid DOD:** 080% **OFF Grid DOD:** 080 **Return:** 020%	Grid DOD/ OFF Grid DOD: When the battery discharge is higher than the set parameter, the inverter generates a battery low voltage alarm. Return: When a low-voltage alarm is generated, the alarm is cleared if the battery charge is higher than the specified amount.

6.2.5.3 BAT-COMM

Interface	Description
BAT-COMM 1. RS485 **2. CAN**	This interface is used to select battery communication BMS type. Press Up/Down button to move corresponding options; Press Enter button to enter the selected menu. The default option is CAN.

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6.2.6 Grid STD(Standard)

6.2.6.1 Grid STD(Standard)

Interface	Description
GRID STD **1. AU** **2. AU-W** **3. NZ** **4. UK** **5. PK** **6. KR** **7. PHI** **8. CN** **9. US-CA** **10. THAIL** **11. ZA** **12. CUSTOM** **13. POL** **14. EN** **15. VDE4105**	This interface is used to select Grid standard. Press Up/Down button to move corresponding options; Press Enter button to enter the selected menu. **1: AU-(Australia):** 240V/415V/50Hz **2: AU-W(Western Australia):** 240V/415V/50Hz **3: NZ-(New Zealand):** 240V/415V /50Hz **4: UK-(United Kingdom):** 230V/50HZ **5: PK-(Pakistan):** 230V/50HZ **6: KR-(Korea):** 220V/380V/60Hz **7: PHI-(Philippines):** 110V/220V/60HZ **8: CN-(China):** 220V/380V/50HZ **9: US-CA-(America):** 120V/240V, 208V, 240V, 60Hz **10: THAIL-(Thailand):** 220/380V/50HZ **11: ZA-(South Africa):** 230/50HZ **12: CUSTOM:** User defined **13: POL-(Poland):** 230V/380V/50HZ **14: EN50549-(Europe):** 217V/220V/240V 380V/400V 50HZ/60HZ **15: VDE4105-(Germany):** 230V/380V/50Hz If the country used is not one of the above options, consult the distributor.

6.2.6.2 Grid Set

Interface	Description
GRID SET **1.220V single** **2:120/240V** **3:120/208V** **4:120V single**	220V single：220V Single-phase electric. 120/240V：120/240V Bipolar electric. 120/208V：120/208V Bipolar electric. 120V single：120V Single-phase electric.

6.2.7 RUN SETTING

6.2.7.0 RUN SETTING

Interface	Description

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RUN SETTING **1. REACT MODE** **2. GRID POWER** **3. DISC POWER** **4. CHAG POWER** **5. PV POWER** **6. VAC-MIN** **7. VAC-MAX** **8. FAC-MIN** **9. FAC-MAX** **10. ACTIVE REP.**	This interface is used to select run setting. Press Up/Down button to move corresponding options. Press Enter button to enter the selected menu. Factory default Settings. Please consult the distributor for modification

6.2.7.1 REACT MODE

Interface	Description
RUN SETTING **1. REACT MODE** **2. GRID POWER** **3. DISC POWER** **REACT MODE** 1. POWER FACTOR 2. REACT POWER 3. QU WAVE 4. QP WAVE **POWER FACTOR** INPUT: C1.00 **REACT POWER** INPUT: +00%	This interface is used to select react mode. Press Up/Down button to move corresponding options; Press Enter button to enter the selected menu. POWER FACTOR REACT POWER QU WAVE (Reserved) QP WAVE (Reserved) **POWER FACTOR** The input value should range between L0.80 and L0.99 or C0.8 and C1.00. **REACT POWER** Active power adjustment.

6.2.7.2 GRID POWER

Interface	Description
GRID PERCENT INPUT: 100%	The input value is power percent of grid.

6.2.7.3 DISC POWER

Interface	Description
DISC PERCENT INPUT: 100%	The input value is power percent of battery discharge.

6.2.7.4 CHAG POWER

Interface	Description
CHAG PERCENT INPUT: 100%	The input value is power percent of battery charge.

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6.2.7.5 PV POWER

Interface	Description
PV PERCENT INPUT: 100%	The input value is power percent of PV.

6.2.7.6 VAC-MIN

Interface	Description
GRID VOLT LOW **INPUT:** 176 **UNIT:** V	The input value of Grid low voltage. (This is valid only if the grid standard is "custom")

6.2.7.7 VAC-MAX

Interface	Description
GRID VOLT HIGH **INPUT:** 270 **UNIT:** V	The input value of Grid high voltage. (This is valid only if the grid standard is "custom)

6.2.7.8 FAC-MIN

Interface	Description
GRID FREQ LOW **INPUT:** 42.0 **UNIT:** Hz	The input value of Grid low frequency. (This is valid only if the grid standard is "custom”)

6.2.7.9 FAC-MAX

Interface	Description
GRID FREQ HIGH **INPUT:** 58.0 **UNIT:** Hz	The input value of Grid high frequency. (This is valid only if the grid standard is "custom”)

6.2.7.10 ACTIVE REF.

Interface	Description
ACTIVE Type **1.PWR-VOLT RES** **2.PWR-FREQ RES** **3.PFC-VOLT RES** **4.PFC-FREQ RES** **5.ACTIVEISLAND** **6.Leack Current** **7.Insulation Detection**	1.PWR-VOLT RES: Generation voltage response. When the grid voltage is abnormal, the active power is limited, and the function is enabled when required by the national grid standard. 2.PWR-FREQ RES: Generation frequency response. When the power grid frequency is abnormal, the active power will be limited, and the function will be enabled if required by the national power grid standard. 3.PFC-VOLT RES: Charge voltage response. When the grid voltage is abnormal, the charging power will be

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	limited, and the function will be enabled if required by the nati onal grid standards. 4.PFC-FREQ RES: Charge frequency response. When the power grid frequency is abnormal, the charging pow er will be limited, and the function will be enabled if required by the national power grid standard. 5.Anti-Island: Anti-Islanding(The default option is enable) When the grid goes down, inverter will detect the loss of pow er and disconnect from the grid within milliseconds. It prevent s your solar panels from feeding electricity into a downed pow er line. 6.Leak Current: Leak current detect (The default option is enab le). 7.Insul detect: Insulation detect (The default option is enable). When the insulation detection function is enabled in the grid-connected state, the insulation detection is performed once a day when the photovoltaic energy comes in, and the inverter s witches to the By-pass band load. If the inverter is off-grid, the output will be disconnected during insulation detect andthe lo ad will stop working.

6.2.8 485 Address

6.2.8.0 485 Address

Interface	Description
485 ADDRESS **INPUT: 1**	This interface is used to select 485 Address.

6.2.9 RS485 BAUD RATE

6.2.9.0 BAUD RATE

Interface	Description
SELECT **1. 2400 bps** **2. 4800 bps** **3. 9600 bps**	This interface is used to select baud rate. The default BAUD Rate is set to 9600 bps

6.2.10 LANGUAGE

6.2.10.0 LANGUAGE

Interface	Description
LANGUAGE **1.Chinese** **2.English**	This interface is used to select language. The default language is set to English

6.2.11 BACKLIGHT

6.2.11.0 BACKLIGHT

Interface	Description

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LIGHT TIME **INPUT:** 20 **UNIT:** SEC	This screen is used to set the screen light time.

6.2.12 DATE/TIME

6.2.12.0 DATE/TIME

Interface	Description
DATE/TIME **DATE:** 2021-12-25 **TIME:** 22:30:00 **WEEK:** Saturday	This interface is used to set date and time.

6.2.13 CLEAR REC

6.2.13.0 Clear history

Interface	Description
DEL REC **1. CANCEL** **2. CONFIRM**	This interface is used to clear operation history.

6.2.14 PASSWORD

6.2.14.0 PASSWORD

Interface	Description
PASSWORD **OLD:** XXXXX **NEW:** XXXXX **CONFIRM:** XXXXX	This interface is used to set password. The Default Password is **00000**

6.2.15 MAINTENANCE

6.2.15.0 MAINTENANCE

Interface	Description
PASSWORD **INPUT:** XXXXX	Reserved

6.2.16 FCTRY RESET

6.2.16.0 FACTORY RESET

Interface	Description

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FACTORY RESET **1. CANCEL** **2. CONFIRM**	This interface is used to reset the inverter.

6.2.17 PARALLEL

*Please read **Chapter Parallel System Setting** for more details.

Interface	Description
RUN SETTING **1.NUM** **2.MASTEP/SLAVE** **3.ADDRESS** **4.COMMON CT** **5.PHASE A/B/C** **6.3PHASE EN** **7.CHARGE CURR** **8.DISCHG CURR** **9.PARALLEL EN**	This interface is used to select run setting. Press Up/Down button to move corresponding options; Press Enter button to enter the selected menu.

6.2.17.1 NUM

Interface	Description
PARALLEL NUM INPUT: 2	**This operation is used to select the number of parallel machines.**

6.2.17.2 MASTEP/SLAVE

Interface	Description
Master/Slave 1.Master 2.Slave	This interface is used for paralleling, and the inverter is selected as the master or slave.

6.2.17.3 ADDRESS

Interface	Description
Parallel Addr INPUT: 1	This interface is used to select the parallel address, the host address is set to 1 by default, there is a slave, and the slave is set to 2; If there are two slaves, the slaves are set to 2 and 3 respectively; the address settings of each inverter cannot be the same.

6.2.17.4 COMMON CT

Interface	Description

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COMMONM CT 1.DISABLE 2.ENABLE	Enable or disable CT sharing.

6.2.17.5 PHASE A/B/C

Interface	Description
Phase A/B/C 1.A 2.B 3.C	This interface is used to select the output phase of the device when three phases are used. (Reserved function).

6.2.17.6 3PHASE EN

Interface	Description
3PHASE EN 1.DISABLE 2.ENABLE	Enable or disable group 3 phase enable.

6.2.17.7 CHARGE CURR

Interface	Description
Charge Curr INPUT: 0100 UNIT: A	This interface is used to select the parallel charging current.

6.2.17.8 DISCHG CURR

Interface	Description
Discharge Curr INPUT: 0100 UNIT: A	This interface is used to select the parallel discharge current.

6.2.17.9 PARALLEL EN

Interface	Description
Parallel EN 1.DISABLE 2.ENABLE	Start or disable the parallel function.

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6.2.18 GENERATOR

*Please read Chapter GEN Connection (Optional) for more details.

Interface	Description
GENERATOR 1.START SOC 2.STOP SOC 3.ChgCurrToBAT 4.MAX RUN TIME 5.COOLDOWN 6.CONTROL 7.POWER	1. This interface is used to select run setting. 2. Press Up/Down button to move corresponding options; 3. Press Enter button to enter the selected menu.

6.2.18.1 START SOC

Interface	Description
STRART SOC INPUT: 020%	This interface is used to set the minimum battery capacity when starting the generator.

6.2.18.2 STOP SOC

Interface	Description
STOP SOC INPUT: 030%	This interface is used to set the maximum battery capacity when the generator is turned off (START SOC＜STOP SOC).

6.2.18.3 ChgCurrToBAT

Interface	Description
Chg Curr to BAT INPUT: 030 UNIT: A	This interface is used to set the battery charging current when the generator is used.

6.2.18.4 MAX RUN TIME

Interface	Description

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MAX RUN TIME INPUT: 10.0 UNIT: hours	This interface is used to set the maximum running time of the generator.

6.2.18.5 COOLDOWN

Interface	Description
COOL DOWN TIME INPUT: 02.0 UNIT: hours	This interface is used to set the cooling time.

6.2.18.6 CONTROL

Interface	Description
GEN CONTROL 1.Generator En 2.Charge En 3.Manual En 4.ManualCmd En 5.Connect Grid	Tis interface shows Generator CONTROL 1. Enable control of the Generator function. 2. Generator Charge Enable control 3. If the user wants the Generator to be controlled manually, Enable it. If the user wants the Generator to be automatically controlled to start and stop through the dry contact, Please ban dragons(The default is AutoCtrl En). Manual En should be opposed to AutoCtrl En。 4. The on/off command in manual control mode , 5. Connect the diesel Generator to the grid input port.

6.2.18.7 POWER

Interface	Description
POWER INPUT: 08.0 UNIT: KW	This interface is used to set the diesel generator power.

6.2.19.0 ADVAN SET

6.2.19.1 ADVAN SET

Interface	Description

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ADVANH SET 1.Mode Set 2.Advance Ctrl 3.TOU Set 4.Auxload Soc	This interface displays advanced mode settings. 1.->Inverter working mode setting. 2.->Inverter related function control. See 6.2.19.3Advan Ctrl for details. 3.->Time of use setting. See 6.2.19.4 Time of use for details. 4.-> Used to set the SOC of the switch LOAD 2 (only if the battery is present).

6.2.19.2 Mode Set

Interface	Description
Mode Set 1.Disable 2.Sell First 3.SFC.BuySell 4.SFC.SellDis	On this page, select the advanced mode you need to enable. If selected, the mode will be enabled.

6.2.19.3 Advance Ctrl

Interface	Description
ADVAN CONTROL 1.Grid Chg En 2.TOU En 3.Only PVChg	1.->Global control, whether the power grid can charge the battery. 2.->Whether TIME OF USE is enabled 3.->The battery is charged only by PV, and cannot be charged by the grid.

6.2.19.4 TOU Set

Interface	Description
SLOT 1.Slot 1 2.GridChg 1 Star: 00:00 End: 00:00 Power: 00.0KW SOC: 0%	1.->From the start time to the end time, charge the battery with the written Power to the written SOC. If GridChg is enabled, allow the grid to charge. 2.->In the slot section, control the grid to charge the battery.

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6.2.19.5 Auxload SOC

Interface	Description
Auxload SOC SOC on: 0% SOC off: 0%	SOC on:The SOC value of the battery enabled by load 2 . SOC off:The SOC value of the battery disabled by load 2 . (SOC on> SOC off)

6.3 INQUIRE

Interface	Description
INQUIRE **1. INV MODULE** **2. MODULE SN** **3. FIRMWARE** **4. RECORD** **5. DIAGNOSE**	Press Up/Down button to move corresponding options. Press Enter button to jump to the selected menu. Press ESC button to return to other interface.

6.3.1 INV MODULE

Interface	Description
MODEL **MODEL:** 8K	This interface shows inverter model.

6.3.2 MODULE SN

Interface	Description
S / N **GUID: XXXXXXXXXXXX** **SN: FXXXXXXXXXX**	This interface shows module SN.

6.3.3 FIRMWARE

Interface	Description
FIRMWARE **ARM:** V1.XX.XX **DSP:** V1.XX.XX XXXXXX XXXXXX	This interface shows Software version.

6.3.4 RUNNING RECORDS

Interface	Description
REC(01) **02:** Bat Disconnect **UP:** 12-25 20:00 **DOWN:** 12-26 23:00	This interface show running recorders.

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6.3.5 DIAGNOSE

Interface	Description
DIAGNOSE 000000 000000 000000 000000 000000 000000	Factory internal us

6.4 STATISTIC

Interface	Description
STAT. **1. TIME STAT.** **2. CONNE.TIMES** **3. PEAK POWER** **4. E-TODAY** **5. E-MONTH** **6. E-YEAR** **7. E-TOTAL**	This interface shows inverter operation statistic. 1. Inverter operation and Grid-connection time statistic. 2. Inverter Grid-connection times statistic. 3. Displays power peak in history and for the day. 4. Displays statistic for the day (kWh). 5. Displays statistic for the month (kWh). 6. Displays statistic for the year (kWh). 7. Displays statistic of the inverter (kWh).

Note:

1. E-TODAY/MONTH/YEAR/TOTAL→INPUT→PV/GRID(Consume)/BATD(Battery discharge) →OUTPUT→BatC(Battery charge)/GRID(Generation)/CNSUM(Load consume)

2. If the inverter shut down before 24:00 on that day, and the day statistic will not be stored.

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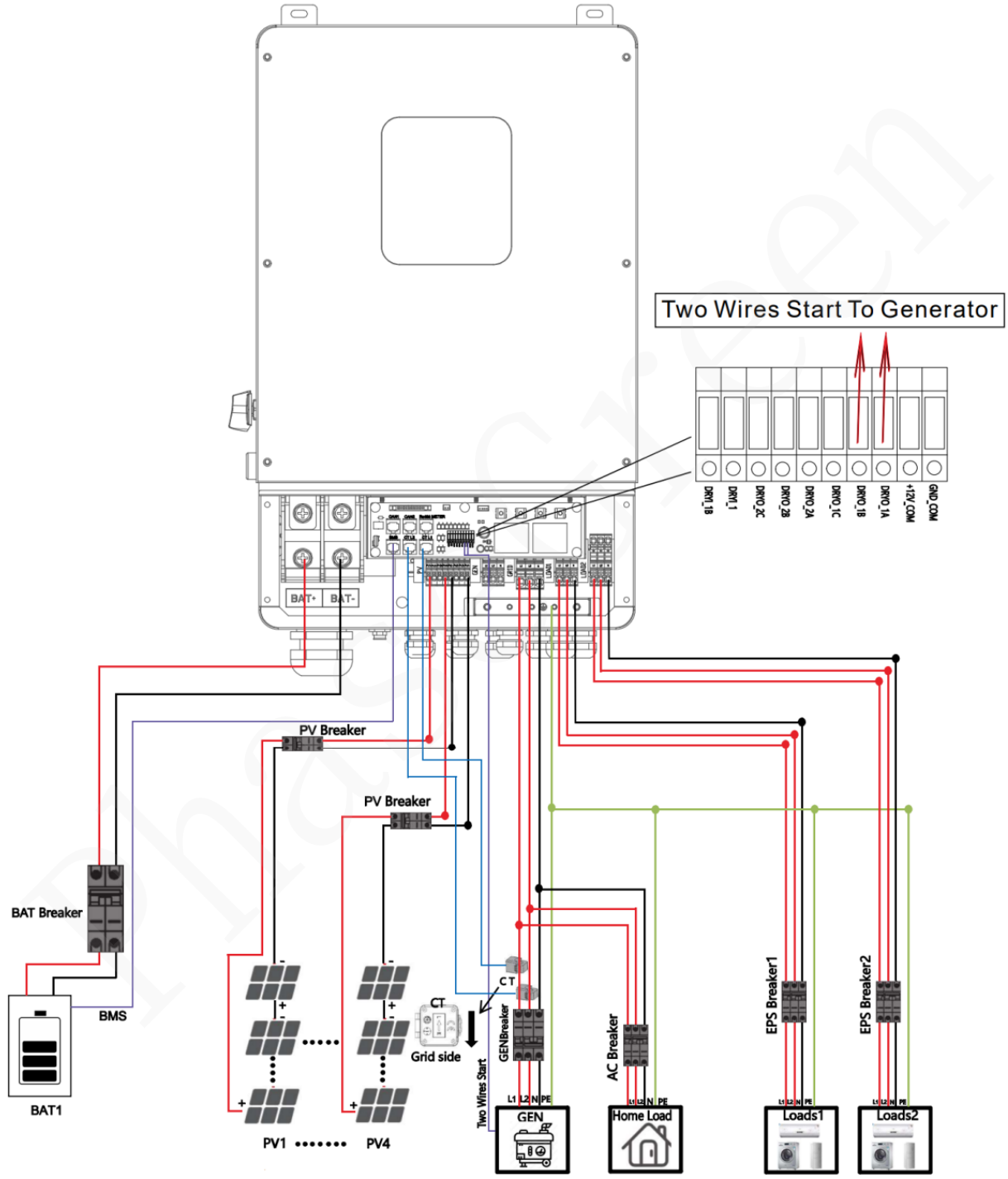
7 Generator Use Operation Guide

7.1 Generator Use Diagram

The Generator is connected to the grid port of the inverter. The connecting cable shall be covered with CT. It is used in some off gird situations. The system diagram is as follows.



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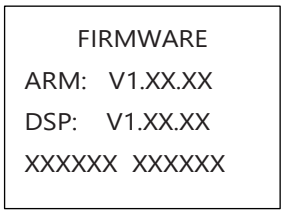
7.2 Generator Operation Notes

1) The two wires start signal **DRYO_1A** and **DRYO_1B** of the Generator is used to automatically control the start and stop of the Generator.

2)Make sure the inverter units software version support Generator function. **USER**->**INQUIRE**->**FIRMWARE**



3) When the generator is used in inverter parallel situation, the two wires start signal is only needed to be connected to the master unit. The wiring and the setting of the Generator should be exactly same.

4)Please check the diagram above.

7.3 Generator Setting

The Generator setting page can be visited in the following steps in the screen:

USER->**SETUP**->**PASSORD CHECK**->**Generator**

7.3.1 Setting

Interface	Description
Generator. 1.START SOC. 2.STOP SOC 3.ChgCurrToBAT 4.MAX RUN TIME 5.COOLDOWN 6.CONTRL 7.POWER	This interface shows Generator setting. 1. When the SOC of battery is lower than the setpoint， the Generator drycontact is enabled and Generator Manual operation is disabled, the connected Generator will be started. 2. When the SOC of battery is higher than the setpoint， the Generator drycontact is enabled and Generator Manual operation is disabled, the connected Generator will be stopped(START SOC＜STOP SOC). 3. It indicates the maximum current that the inverter charges the battery from Generator. 4. It indicates the longest time Generator can run in one day, when time is up, the Generator will be turned off. The value 240 means 24hours in which state the Generator will not be shut down all the time. The unit is 0.1 hour. **5.** It indicates the waiting time of the Generator to restart after it has reached the running time.The unit is 0.1 hour. 6. Refer to 11.3.2 **CONTRL.** 7. Rated power of Generator.

7.3.2 CONTRL

Interface	Description

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GEN CONTROL 1.Generator En 2.Charge En 3.Manual En 4.ManualCmd En 5.Connect Grid	This interface shows Generator CONTRL. 1. Enable control of the Generator function. 2. Generator Charge Enable control 3. If the user wants the Generator to be controlled manually, Enable it. If the user wants the Generator to be automatically controlled to start and stop through the dry contact, Please ban dragons(The default is AutoCtrl En). Manual En should be opposed to AutoCtrl En。 4. The on/off command in manual control mode , 5. Connect the diesel Generator to the grid input port.

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8 Inverter Parallel Guide

Multiple inverters can be installed together to deliver more power. When AC loads are present, all units effectively share the load. The system diagram is as follows.

8.1 Parallel Operation Notes

1) Make sure all the units in parallel are with the same software version.

USER->INQUIRE->FIRMWARE

Interface	Description
FIRMWARE **ARM:** V1.XX.XX **DSP:** V1.XX.XX XXXXXX XXXXXX	This interface shows Software version.

2) Please check the diagram above .The common batteries use is supported on default for maximizing the system efficiency. The BMS cable should be connected to the master inverter.

3) Connect the loads of the two inverters together first. It should be noted that the grid power line and the load line of the two inverters should be roughly the same length.

4) Make sure the CT Limiter sensor is installed properly. If the load is connected outside the inverter, user need to choose common ct and make sure the CT ratio is right(the default 90A ct ratio is 1:1000, no need to change). The common ct is only needed to be connected to the master inverter. Please install CT on every unit's incoming electrical service wires on L1 and L2 when choosing independent ct .

5) Please check the master and slaver's setting by screen and make sure all the setting are same.

8.2 Split phase(120/240Vac)parallel connection diagram

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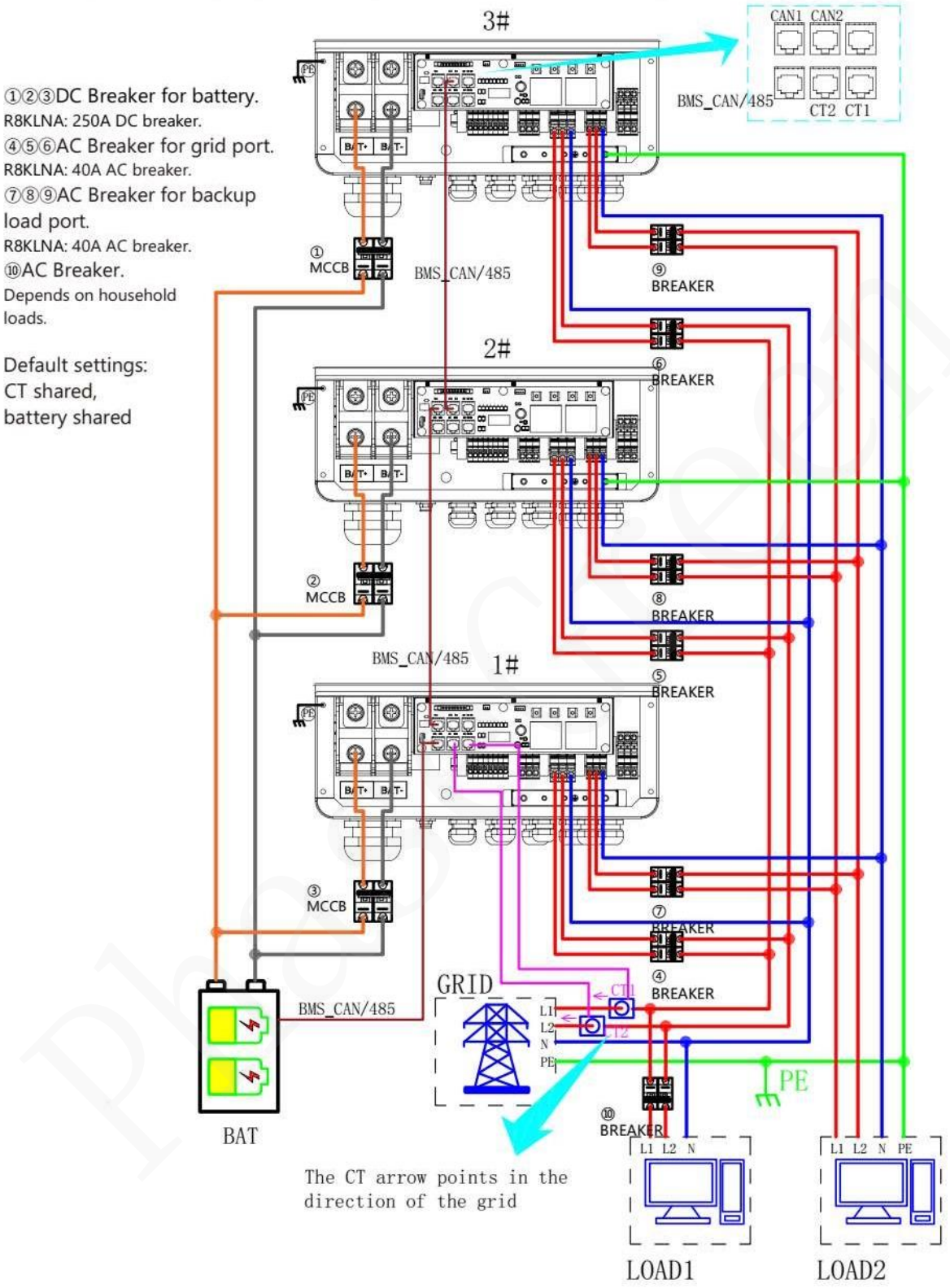
Fig 8-1 parallel connection diagram



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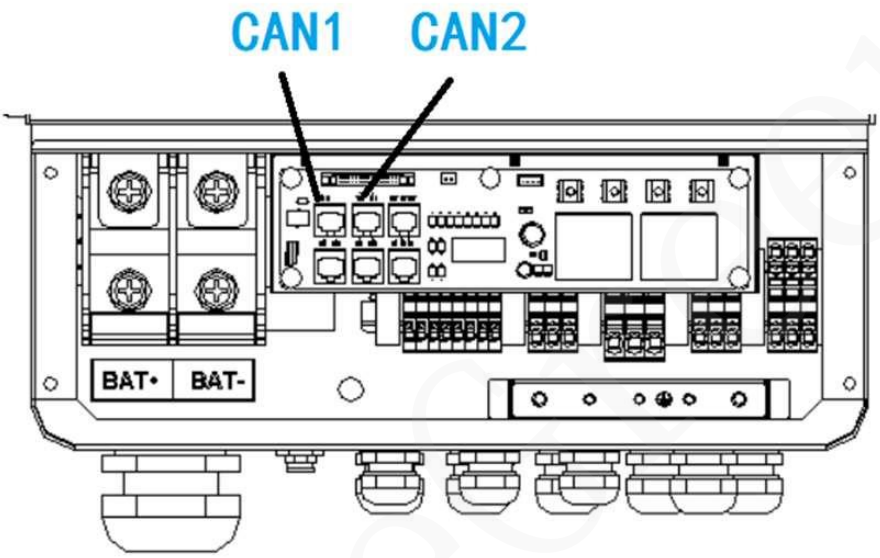
8.3 Parallel Communication Cable Connection

For parallel communication ,CAT 5 cables are needed. The units should be connected hand by hand.

When using common batteries, BMS cable needs to be connected to the master unit. The inverter shares the BMS information by inter-unit parallel communication cable.

Fig 8-2 Parallel Communication Cable Connection



8.4 Parallel System Setting

The parallel setting page can be visited in the following steps in the screen:

USER->1. SETUP->PASSORD CHECK->15.parallel

Interface	Description
Parallel **1.NUM** **2.MASTER/SLAVER** **3.ADDRESS** **4.COMMON CT** **5.PHASE A/B/C** **6.3PHASE EN** **7.DISCHARGE CURR** **8.CHARGE CURR** **9.PARALLEL EN**	This interface shows parallel setting. 1. Total numbers of the inverters. 2. In a parallel system,the master unit broadcasts the bms and other information to the slavers. Make sure only one unit is configued as master. 3. Local unit address(1-8). 4. Common CT Enable 5. Local phase of unit for three-phase installation. (reserved function) 6. Enable or disable group 3 phase enable. 7. DISCHARGE CURR, Total battery discharge current command, only be settable in master unit in parallel mode. 8. CHARGE CURR, Total battery charge current command, only be settable in master unit in parallel mode. 9. PARALLEL EN,Enable/Disable the parallel function

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8.5 Parallel Error information

Interface	Description
ERROR NO. **11:parallel fail**	A parallell warning may occur because of the following reasons: 1. Wrong setup of the parallel num. 2. Wrong inter-unit parallel communication cable. 3. Wrong setup of the unit address.

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9 AC Couple

Introduction

The hybrid inverter can support AC Couple function to retrofit exsiting grid tied PV inverter or micro inverters system.

In a stand-alone offgrid system or during grid outage, the hybrid inverter of the system will maintain the stand-alone system's voltage and frequency to allow the PV inverter or micro inverters to continue powering the load or charging the battery, and automatically adjust the frequency upwards from 60 Hz rated frequency to as much as the 64.5 Hz trip frequency to make to prevent the excess power of the PV inverter or micro inverters from overcharging the battery(Frequency Shift Power Control (FSPC) technology). The PV inverter or micro inverters(IEEE 1547-compliant inverters) will incrementally reduce its output power(Freq/Watt compliant inverters) or disconnect itself from the hybrid inverter.

The PV inverter or micro inverters can be connected to the hybrid inverter's generator terminal or load2 terminal. Please notice that the generator can not be used with AC Coupled PV inverters or micro inverters at the same time because of the possible uncontrolled feedback power to the generator.

9.1 Diagram

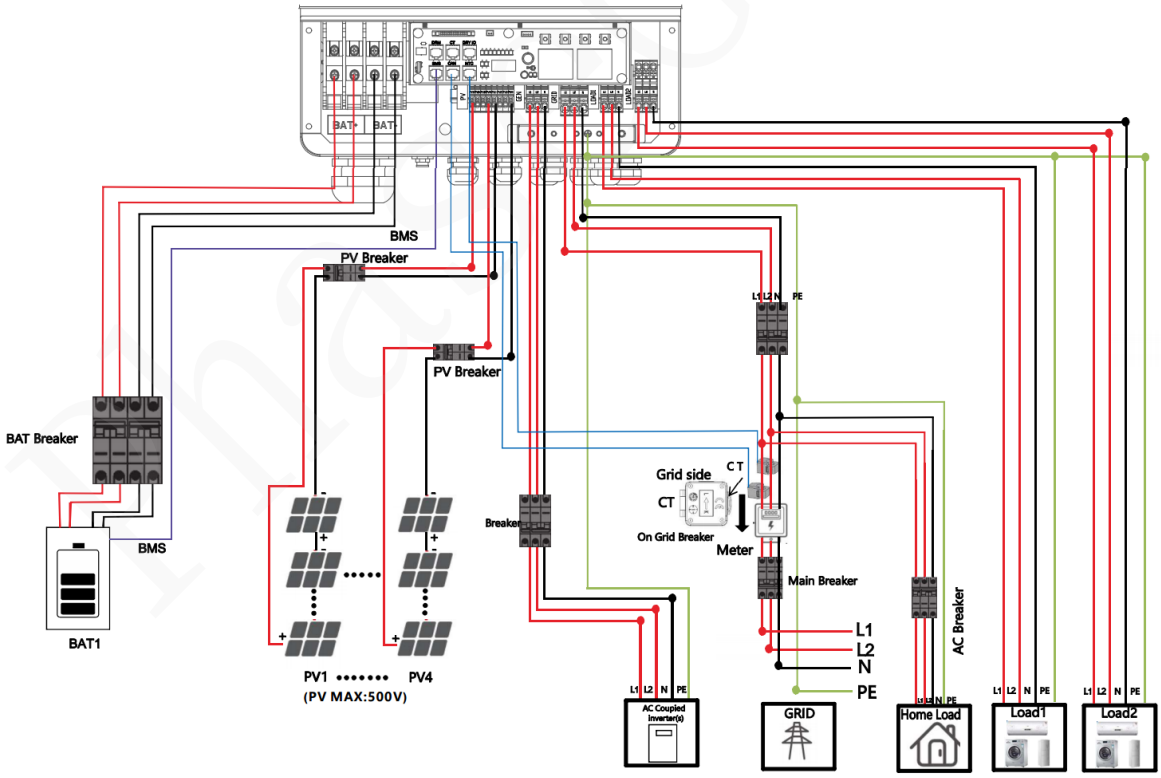

Fig 9-1 Generator Terminal

In the occasion without generator use, we recommend the user to use the generator terminal to be connected. The power of PV inverters or micro inverters can be measured by the internal sensor of the hybrid inverter.

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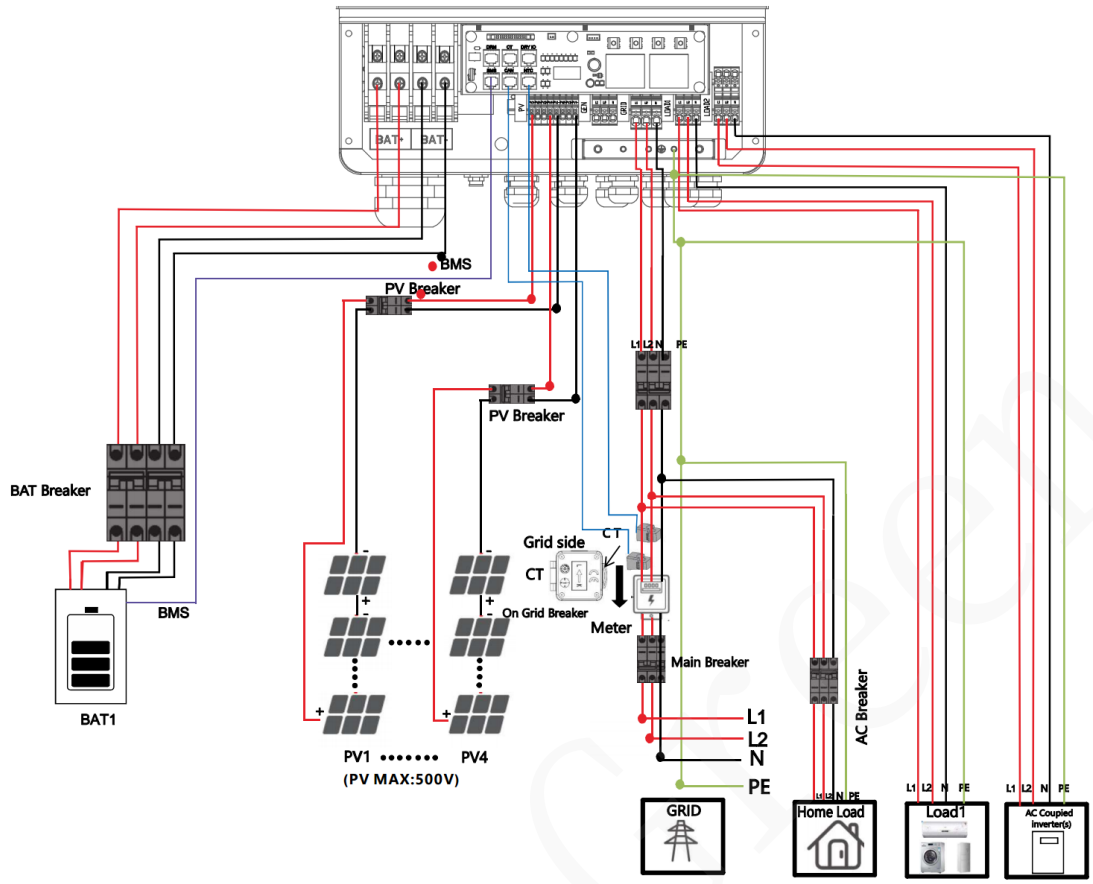

Fig 9-2 Load2 Terminal

In the occasion with generator use, we recommend the user to use the load2 terminal to be connected. The hybrid inverter may not able to show the load power correctly in this case.The hybrid inverter will automatically switch off the AC Coupled inverters while the generator needs to be used.

9.2 AC Couple Function Setting

The Advanced Mode Settings page can be accessed through the following steps on the screen:

USER->SETUP->PASSORD CHECK->AC Couple SET

Interface	Description
AC Couple SET -- >1.Conn Term 2.Trip SOC 3.Resp Ceof 4.Trip Freq	This interface displays AC Couple mode settings. 1. ->Connection mode setting. 2. ->When the battery SOC > the setting value, the PV inverter or micro inverters will be cut off. 3.->This setting is used to increase or decrease delay in the frequency steps between the rated frequency and trip frequency. 4.->The Trip Freq. In US, it is 65Hz by default.

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10 Advanced Mode Operation Guide

10.1 Advanced Mode Introduction

The hybrid inverter can be programmed to control how and when to use grid power.The Advcanced mode allow management of flexible loads and time-of-use billing.

There are three advanced mode available: **Sell First Mode,Limited Consumption Mode** and **Zero Export Mode.**

Sell First Mode: In this mode the anti-reflux setting is automatically disabled.
The users can use this mode to sell back surplus solar power to grid. If time of use is enabled, the battery power can also be sold to grid.

Limited Consumption Mode: In this mode, the ct limiters are used to sense the grid power flow direction. The hybrid inverter can be choosed to sell power or not sell power to grid. There is a **CT Limit Power** parameter available in this mode.When the battery is needed to discharge to reduced the load consumption,the grid will cover the parameter set part consumption firstly and the battery discharges energy to makes up the rest part.Other conditions are similar to SELF CONSUME working mode.

Zero export Mode: In this mode, the ct limiters should be installed in the input of the inverter's grid port. The hybrid inverter will not sell power to grid. The user can use **Zero export power** parameter to ensure the inverter won't feed back power to grid.

There are also some attributes of these mode: **Global Grid Charge Enable**, **Pv Charge Only**, **Bat Charge On Priority** , **Time-of-use Enable** and **6 Time-of-use Slots.** The time slots parameters are shown in as below:

	Grid Charge	Gen Charge	Start Time		End Time		Bat Power	Bat SOC
Time Slot1	√		1 h	0 m	8 h	0 m	8000 W	50 %
Time Slot2			8 h	0 m	9 h	0 m	8000 W	100 %
Time Slot3	√		9 h	0 m	13 h	0 m	8000 W	100 %
Time Slot4			13 h	0 m	19 h	0 m	8000 W	15 %
Time Slot5	√		19 h	0 m	20 h	0 m	8000 W	100 %
Time Slot6	√		20 h	0 m	1 h	0 m	8000 W	100 %

Global Grid Charge Enable: It is a high level control attribute of grid charge enable. If time of use function is disabled, this attribute is used to judge whether or not to charge the battery by grid. If time of use function is enabled ,the battery can be charged by grid only when the time slot grid charge attribute is enabled.
Pv Charge Only: If user don't want to use grid to charge the battery in any time ,please enable this attribute.
Bat Charge On Priority :If there will be a storm or other emergency, user can use this attribute to adjust the power distribution priority. If this attribute is disabled ,the solar power will cover the load on priority by default.
6 Time-of-use Slots : There are 6 slots which can be programmed. If grid charge/generator charge is enable, the grid is used to power the load and charge the battery to target SOC at specific bat power attribute value.

10.2 Advanced Mode Setting

See **6.2.19.0 ADVAN SET**

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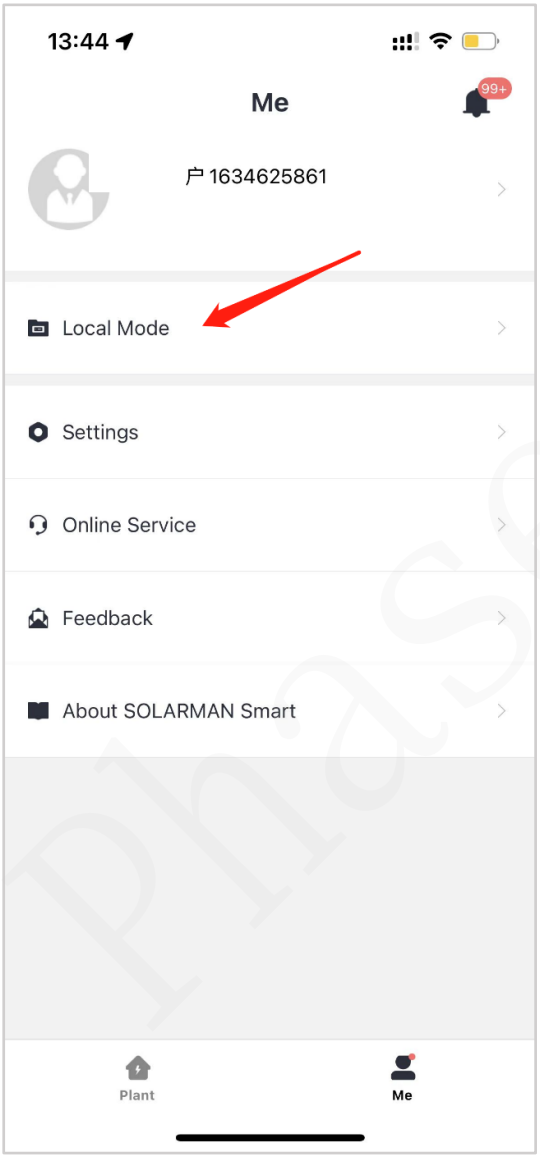
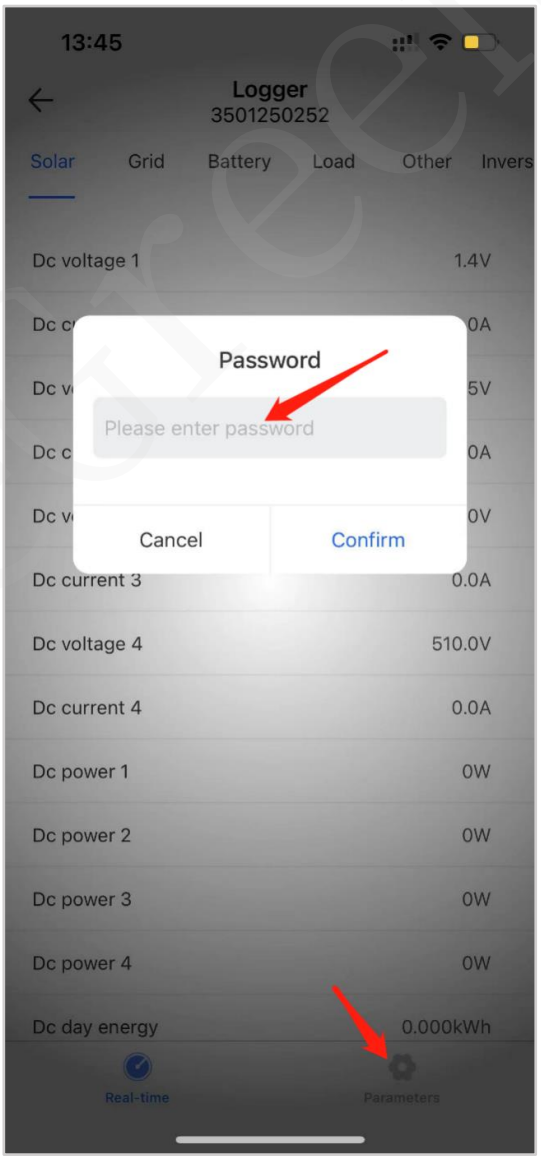
11 APP grid compliance parameters interface settings

11.1 grid compliance parameters setting interface of mobile APP

11.1.1 Step of entering interface parameter settings

Interface setting: Enter solarman APP using WIFI dongle > My > Local mode > Scan the QR code of the data stick > Enter the local mode interface > Parameters > Enter the password (00000) > UL parameters.





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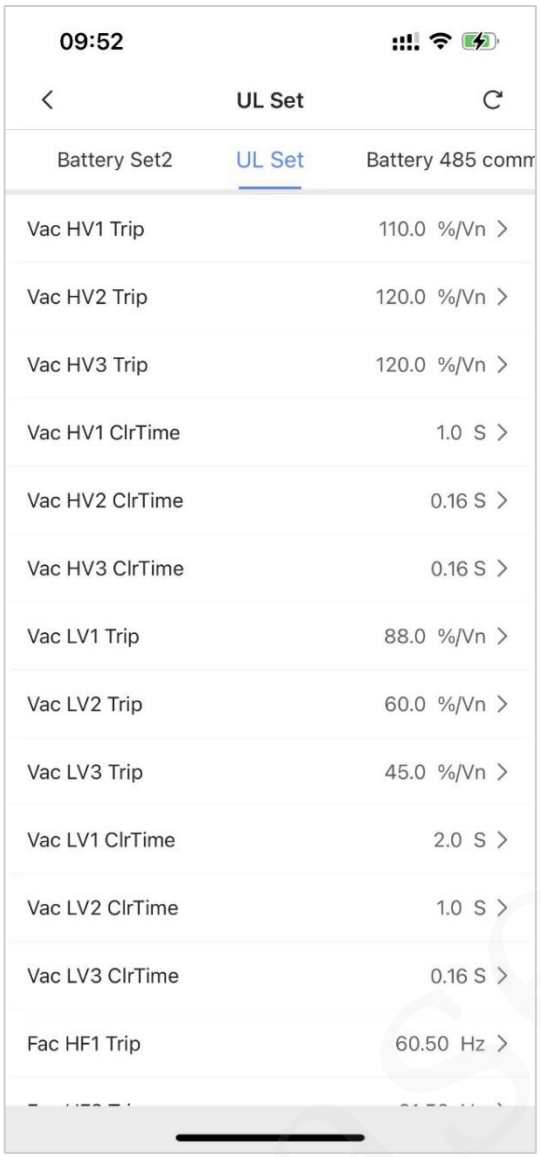
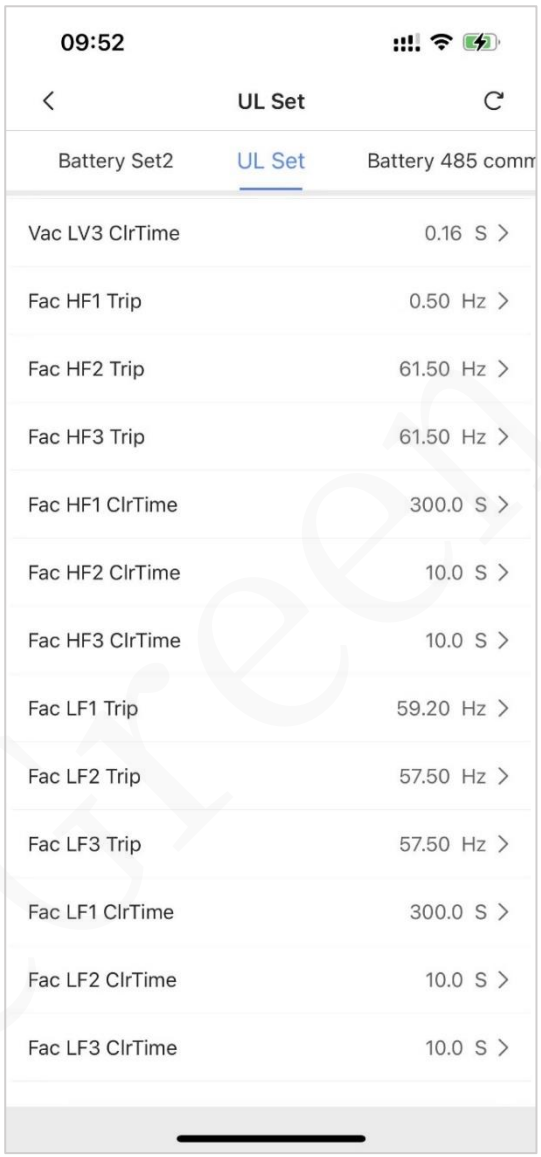
11.1.2 Display interface





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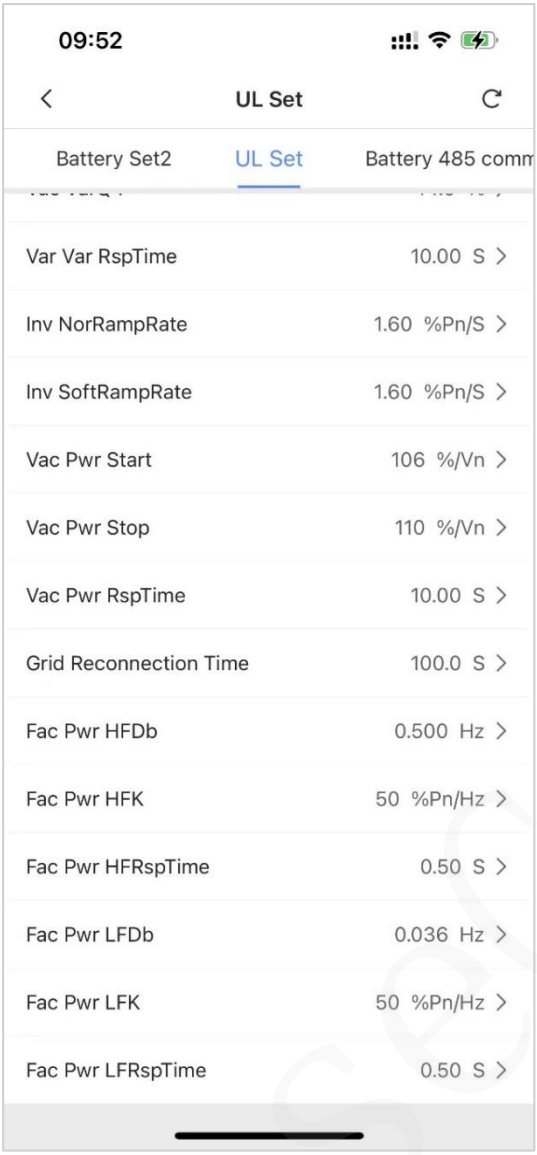

11.2 Parameters description

11.2.1 Over/under-voltage protection point/time

Interface	Description
L/HVRT Vac HV3 Trip 130%/Vn Vac HV3 ClrTime 0.1S Vac HV2 Trip 120%/Vn Vac HV2 ClrTime 0.1S Vac HV1 Trip 120%/Vn Vac HV1 ClrTime 13.0S Vac LV1 Trip 80%/Vn Vac LV1 ClrTime 20S Vac LV2 Trip 50%/Vn Vac LV2 ClrTime 2.0S Vac LV3 Trip 50%/Vn Vac LV3 ClrTime 0.1S	HV means high voltage trip protection. LV means low voltage trip protection. Vn stands for the rated voltage of the local grid. In US, Vn stands for 120V for split phse. If the user needs to use over-voltage and under-voltage protection, he can find the corresponding parameters in the above mobile APP interface according to the table on the left and set them by himself.

Puerto Rico Grid Compliance Settings:

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Interface	Description
L/HVRT Vac HV3 Trip 120%/Vn Vac HV3 ClrTime 0.16S Vac HV2 Trip 120%/Vn Vac HV2 ClrTime 0.16S Vac HV1 Trip 110%/Vn Vac HV1 ClrTime 1.0S Vac LV1 Trip 88%/Vn Vac LV1 ClrTime 2.0S Vac LV2 Trip 60%/Vn Vac LV2 ClrTime 1.0S Vac LV3 Trip 40%/Vn Vac LV3 ClrTime 0.16S	If the user needs to use over-voltage and under-voltage protection, he can find the corresponding parameters in the above mobile APP interface according to the table on the left and set them by himself. Vn stands for the rated voltage of the local grid. In US, Vn stands for 120V for split phse.

11.2.2 Over/under-frequency protection point/time

Interface	Description
L/HFRT Fac HF3 Trip 67.00Hz Fac HF3 ClrTime 4.0S Fac HF2 Trip 62.00Hz Fac HF2 ClrTime 0.1S Fac HF1 Trip 61.20Hz Fac HF1 ClrTime 4.0S Fac LF1 Trip 47.05Hz Fac LF1 ClrTime 1.0S Fac LF2 Trip 46.50Hz Fac LF2 ClrTime 300S Fac LF3 Trip 45.00Hz Fac LF3 ClrTime 3.0S	HF means over-frequency trip protection. LF means under-frequency trip protection. If the user needs to use over-frequency and under-frequency protection, he can find the corresponding parameters in the above mobile phone APP interface according to the table on the left and set them by himself.

Puerto Rico Grid Compliance Settings:

Interface	Description
L/HFRT Fac HF3 Trip 61.50Hz Fac HF3 ClrTime 10.0S Fac HF2 Trip 61.50Hz Fac HF2 ClrTime 10.0S Fac HF1 Trip 60.50Hz Fac HF1 ClrTime 300.0S Fac LF1 Trip 59.20Hz Fac LF1 ClrTime 300.0S Fac LF2 Trip 57.50Hz Fac LF2 ClrTime 10.0S Fac LF3 Trip 57.50Hz Fac LF3 ClrTime 10.0S	If the user needs to use over-frequency and under-frequency protection, he can find the corresponding parameters in the above mobile phone APP interface according to the table on the left and set them by himself.

11.2.3 frequency-active power (freq-watt) mode parameters

Interface	Description

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L/HVRT Fac Pwr HFDb 0.5Hz Fac Pwr HFK 50%Pn/Hz Fac Pwr HFRspTime 0.50S Fac Pwr LFDb 0.036Hz Fac Pwr LFK 50%Pn/Hz Fac Pwr LFRspTime 0.50S	HFDb:Over frequency dead band. HFK:Over frequency PF curve. HFRspTime:Over frequency response time. LFDb:Under frequency dead band. LFK:Under frequency PF curve. LFRspTime:Under frequency response time. When the user needs to set the over-frequency and under-frequency dead zone, he can find the corresponding parameters in the above mobile phone APP interface according to the table on the left and set them by himself. Pn:Active power output in percent of nameplate.

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12 Fault diagnosis and solutions

The inverter is easy to maintain. When you encounter the following problems, please refer to the Solutions below, and contact the local distributor if the problem remains unsolved. The following table lists some of the basic problems that may occur during the actual operation as well as their corresponding basic solutions.

Fault diagnosis table

Content	Codes	Explaination	Solutions
DischgOverCur	00	Battery discharge over current. When the battery is loaded, the load is too large.	Nothing need to do, Wait one minute for the inverter to restart. Check whether the load is in compliance with the specification. Cut off all the power and shut down all the machines; disconnect the load and plug in to restart machines, then check
Over Load	01	The load power is greater than other power(PV,BAT).	Check whether the load is in compliance with the maximum power of the machine. Cut off all the power and shut down all the machines; disconnect the load and plug in to restart machines, then check whether the load is short circuited if the fault has been eliminated. Contact customer service if error warning continues.
BatDisconnect	02	Battery Disconnect. (Battery voltage not identified)	Check whether the battery is connected. Check if battery wiring port is open circuited. Contact customer service if error warning continues.
Bat Under Vol	03	Battery voltage low that normal range.	Checking System Settings, If so, power off and restart. Check if the grid power down. If so, waitting for the grid power up, the inverter will automatically charge. Contact customer service if error warning continues.
Bat Low capacity	04	Bat Low capacity	Battery Low that setting capacity.(SOC<100%-DOD)
Bat Over Vol	05	The battery voltage is greater than the Inverter maximum voltage.	Checking System Settings, If so, power off and restart. Contact customer service if error warning continues.
Gird low vol	06	Grid voltage is abnormal	Check if the grid is abnormal. Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
Grid over vol	07		
Grid low freq	08	Grid Frequency is	Check if the grid is abnormal.

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Grid overFreq	09	abnormal.	Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
gfci over	10	Inverter GFCI exceeds standard.	Check PV string for direct or indirect grounding phenomenon. Check peripherals of machine for current leakage. Contact the local inverter customer service if fault remains unremoved.
bus under vol	13	BUS voltage is lower than normal.	Check the input mode setting is correct. Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
bus over vol	14	BUS voltage is over maximum value..	Check the input mode setting is correct. Restart the inverter and wait until it functions normally.
Inv over cur	15	The inverter current exceeds the normal value.	Restart the inverter and wait until it functions normally.
Chg over cur	16	Battery charge current over than the Inverter maximum voltage.	Restart the inverter and wait until it functions normally.
Bus vol osc	17	Bus voltage instability.	Check the input and output mode setting is correct. Restart the inverter and wait until it functions normally.
Inv under vol	18	INV voltage is abnormal	Check if the INV voltage is abnormal. Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
Inv over vol	19		
InvFreqAbnor	20	INV frequency is abnormal	Check if the INV frequency is abnormal. Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
igbt temp high	21	The inverter temperature is higher than the allowed value	Cut off all the power of the machine and wait one hour, then turn on the power of the machine.
bat over temp	23	Battery temperature is higher than the allowed value.	Disconnect the battery and reconnect it after an hour.

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bat UnderTemp	24	Battery temperature is low than the allowed value.	Check the ambient temperature near the battery to see if it meets the specifications.
BMS comm.fail	27	Communication between lithium battery and inverter is abnormal.	Check the cable, crystal, Line sequence. Checking the Battery switch.
Fan fail	28	Fan fail	Check whether the Inverter temperature is abnormal. Check whether the fan runs properly.(If you can see it)
Grid Phase err	30	The grid fault phase.	(1) Check power grid wiring
Arc Fault	31	PV Arc Fault	Check Photovoltaic panels, PV wire. Contact customer service if error warning continues.
bus soft fail	32	The inverter may be damaged	Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
inv soft fail	33		
bus short	34		
inv short	35		
fan fault	36	Fan fault.	Check whether the Inverter temperature is abnormal. Check whether the fan runs properly.(If you can see it)
PV iso low	37	PV iso low	Check if the PE line is connected to the inverter and is connected to the ground. Contact customer service if error warning continues.
Bus Relay Fault	38	The inverter may be damaged	Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
Grid Relay Fault	39		
EPS rly fault	40		
Gfci fault	41		
Selftest fail	44		
System fault	45		
Current DCover	46		
Voltage DCover	47		

Note: If an error occurs that is not listed in the table, Please Contact customer service.

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