User Manual

Hybrid 6.5KW
INVERTER / CHARGER

Version: 1.0

Table Of Contents

ABOUT THIS MANUAL

Purpose

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

Scope

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

SAFETY INSTRUCTIONS

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

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
2. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
3. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
4. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
5. **CAUTION** – Only qualified personnel can install this device with battery.
6. **NEVER** charge a frozen battery.
7. For optimum operation of this inverter/charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter/charger.
8. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
9. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
10. Fuses are provided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
12. NEVER cause AC output and DC input short-circuited. Do NOT connect to the mains when DC input short circuits.
13. **Warning!!** Only qualified service persons are able to service this device. If errors persist after following troubleshooting table, please send this inverter/charger back to local dealer or service center for maintenance.

INTRODUCTION

This is a multi-function inverter, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support in a single package. The comprehensive LCD display offers user-configurable and easy-accessible button operations such as battery charging current, AC or solar charging priority, and acceptable input voltage based on different applications.

Features

- Pure sine wave
- Power factor range: 0.9 lead- 0.9 lag
- Battery independent design
- Enhance MPPT solar charge controller up to 9000 WATTS
- Maximum Solar Charge Current 120A
- Compatible with Lithium ion battery
- Reserved communication port for BMS
- Communication Interface USB/RS232/RS485/CAN/Dry contact
- User-friendly 4.3" HMI LCD
- Built-in Wi-Fi for mobile monitoring (App is available) and support OTA firmware
- Programmable multiple operation modes: Grid-tie, off-grid and grid-tie with backup
- PV, Grid and Battery energies generation and consumption data available
- Dual output for smart load management
- Increased feed power to 8000W
- Feeding power into Grid
- Parallel operation up to 9 units
- Built-in 2 MPP trackers
- Maximum PV input current 22Ax2
- External CT sensor to guarantee 100% self-consumption
- Built-in anti-dust kit

Basic System Architecture

This hybrid PV inverter can provide power to connected loads by utilizing PV power, utility power and battery power.

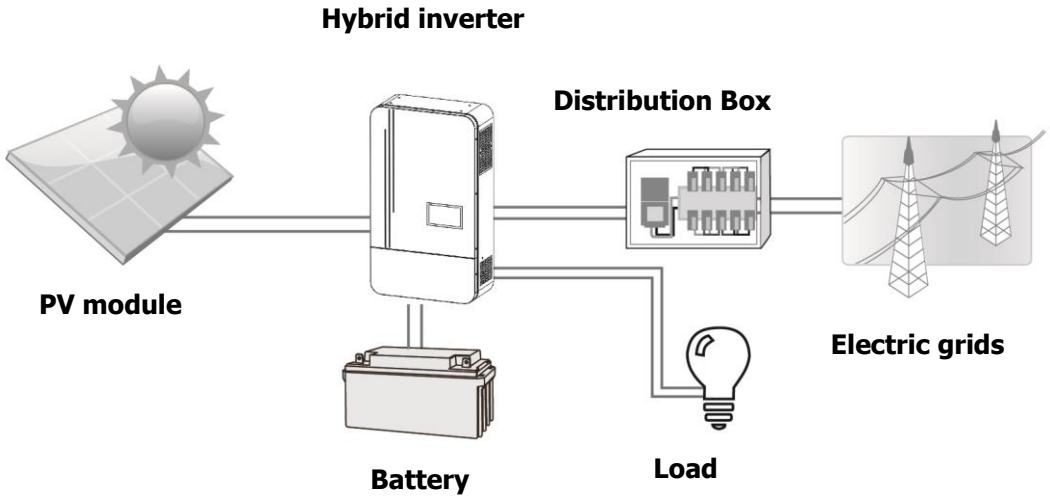
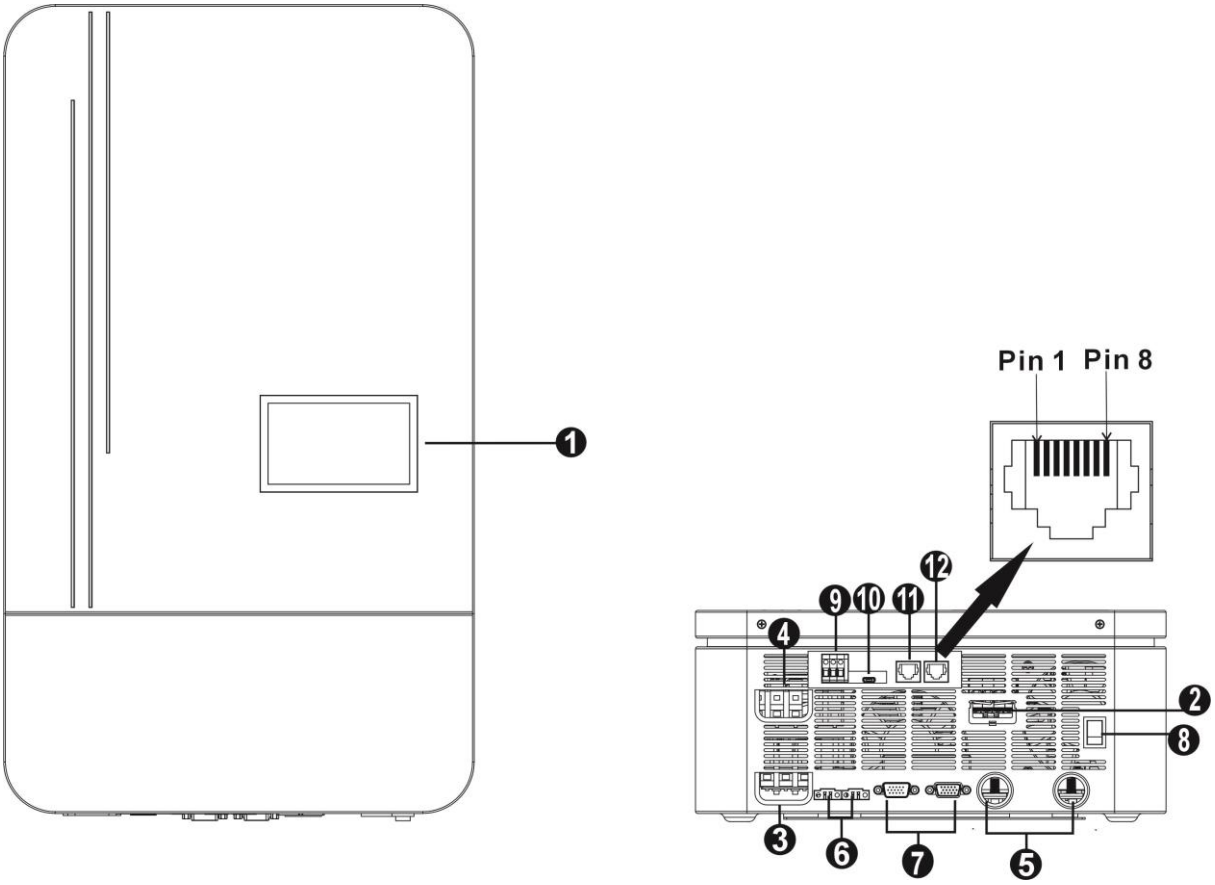


Figure 1 Basic hybrid PV System Overview

Depending on different power situations, this hybrid inverter is designed to generate continuous power from PV solar modules (solar panels), battery, and the utility. When MPP input voltage of PV modules is within acceptable range (see specification for the details), this inverter is able to generate power to feed the grid (utility) and charge battery. **Never connect the positive and negative terminals of the solar panel to the ground.** See Figure 1 for a simple diagram of a typical solar system with this hybrid inverter.

Product Overview



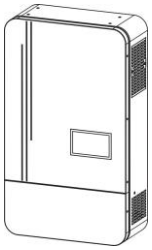
NOTE: For parallel installation and operation, please check *Appendix I.*

1. Touchable HMI LCD screen
2. PV connectors
3. AC input connectors
4. AC output connectors (Load connection)
5. Battery connectors
6. Current sharing port (optional)
7. Parallel communication port (optional)
8. Power switch
9. Dry contact
10. USB communication port
11. RS-232 communication port
12. BMS communication port: CAN, RS-485, or RS-232

INSTALLATION

Unpacking and Inspection

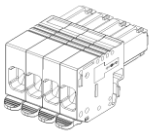
Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items inside of package:


Inverter


Software CD


User manual


Communication cable

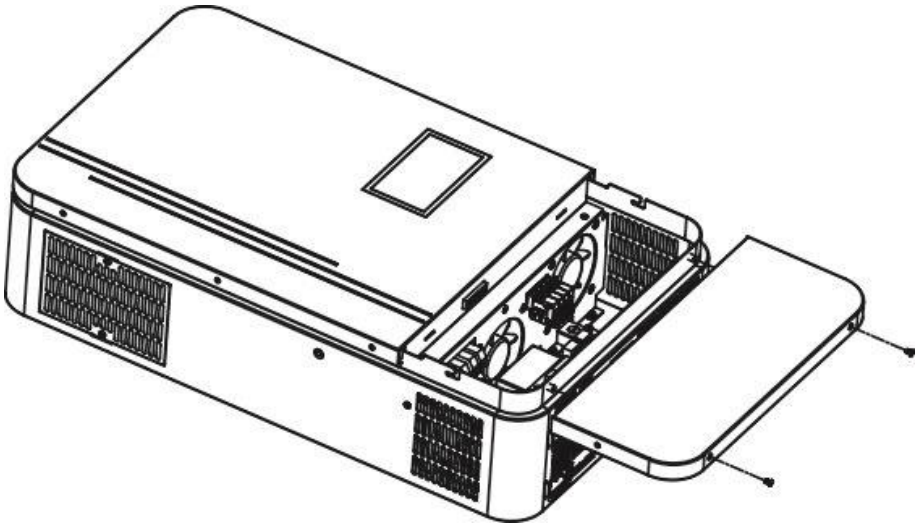

PV terminals


Parallel communication Cable (Optional)


Current sharing cable (Optional)

Preparation

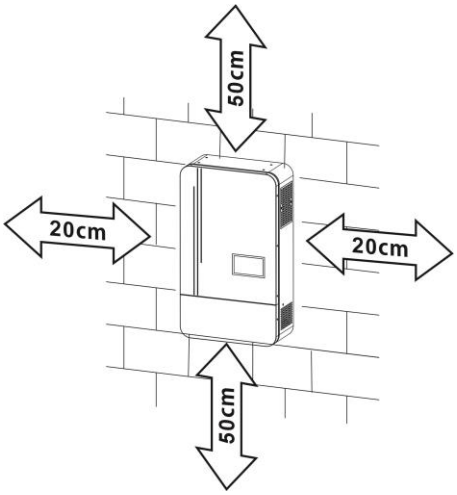
Before connecting all wirings, please take off bottom cover by removing four screws as shown below.



Mounting the Unit

Consider the following points before selecting where to install:

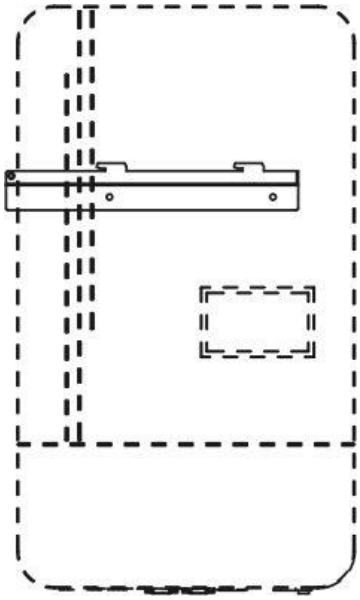
- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface.
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- The ambient temperature should be between -10°C and 50°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.
- Be sure to keep other objects and surfaces as shown in the right diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.



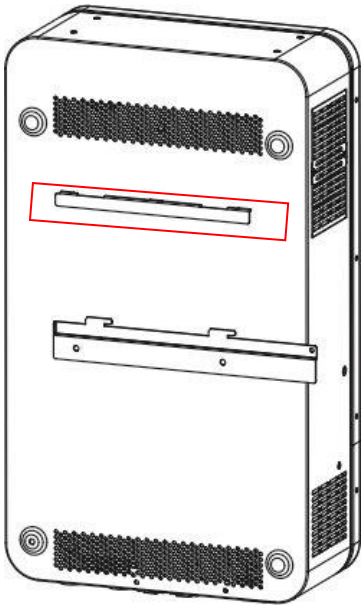
SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.

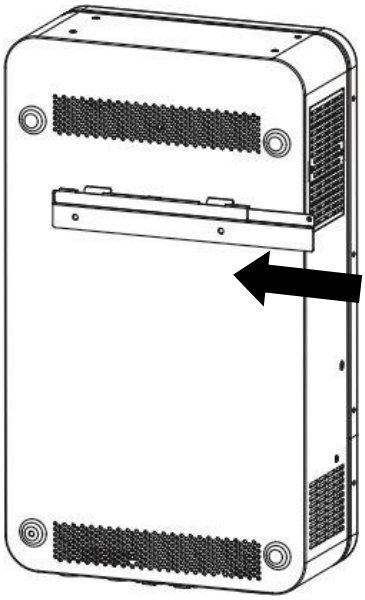
Mount the unit to the wall

Step 1: Please fix the mounting bracket  on the wall with screws. Please refer to the dotted line diagram below for the actual installation position of the bracket.

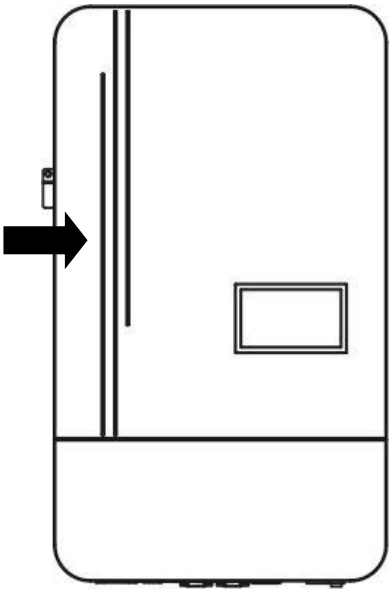


Step 2: Align the groove on the rear side of the inverter with the bracket rail and slide the inverter along the groove direction to install the unit from left to right (follow the arrows below).





Groove on the rear side of the inverter.

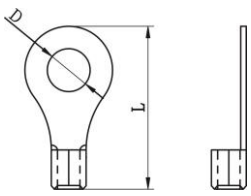


Front side of the inverter

Battery Connection

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

Ring terminal:



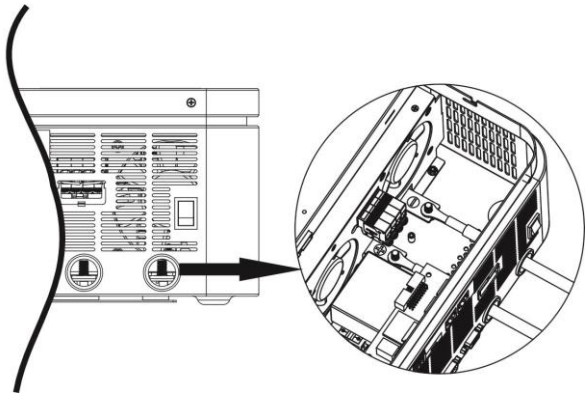
WARNING! All wiring must be performed by a qualified personnel.
WARNING! It is very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable and terminal size as below.

Recommended battery cable and terminal size:

Model	Typical Amperage	Battery Capacity	Wire Size	Ring Terminal			Torque Value
				Cable mm^2	Dimensions		
					D (mm)	L (mm)	
6.5K	150A	200AH	1*2AWG or 2*6AWG	28	6.4	42.7	2~3 Nm

Please follow below steps to implement battery connection:

1. Assemble battery ring terminal based on recommended battery cable and terminal size.
2. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the nuts are tightened with torque of 2-3 Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring terminals are tightly screwed to the battery terminals.



⚠	**WARNING: Shock Hazard** Installation must be performed with care due to high battery voltage in series.

⚠	**CAUTION!!** Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur. **CAUTION!!** Do not apply anti-oxidant substance on the terminals before terminals are connected tightly. **CAUTION!!** Before making the final DC connection or closing DC breaker**,** be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

AC Input/Output Connection

CAUTION!! Before connecting to AC input power source, please install a **separate** AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input.

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

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

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

Suggested cable requirement for AC wires

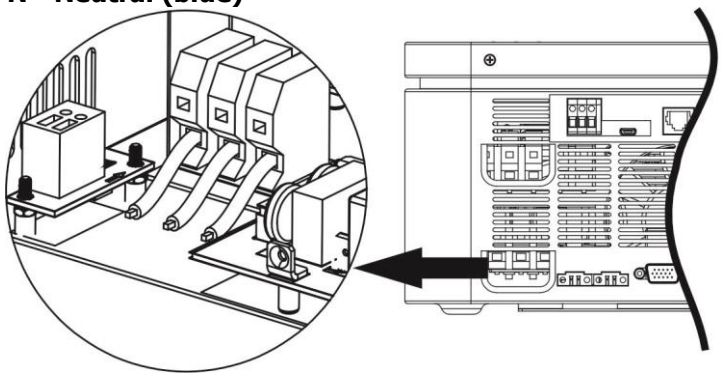
Model	Gauge	Torque Value
6.5KW	8 AWG	1.4~ 1.6 Nm

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

1. Before making AC input/output connection, be sure to open DC protector or disconnector first.
2. Remove insulation sleeve 10mm for eight conductors. And shorten phase L and neutral conductor 3mm.

3. Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws. Be sure to connect PE protective conductor (⏚) first.

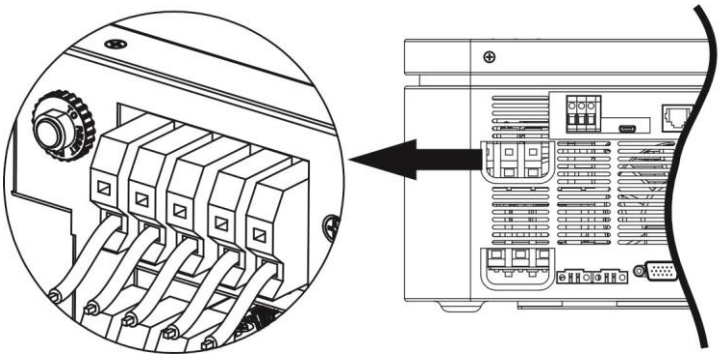
   ⏚**→Ground (yellow-green)**
   L→LINE (brown or black)
   N→Neutral (blue)



⚠	**WARNING:** Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

4. Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws. Be sure to connect PE protective conductor (⏚) first.

   ⏚**→Ground (yellow-green)**
   L1→LINE (brown or black)
   N1→Neutral (blue)
   L2→LINE (brown or black)
   N2→Neutral (blue)



5. Make sure the wires are securely connected.

CAUTION: Important
Be sure to connect AC wires with correct polarity. If L and N wires are connected reversely, it may cause utility short-circuited when these inverters are worked in parallel operation.

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

PV Connection

CAUTION: Before connecting to PV modules, please install **separately** a DC circuit breaker between inverter and PV modules.

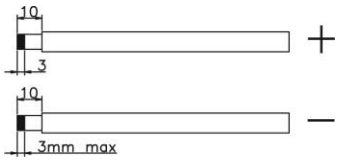
WARNING! All wiring must be performed by a qualified personnel.
WARNING! Please switch off the inverter before you connect PV modules. Otherwise, it will damage the inverter.
WARNING! It's very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below.

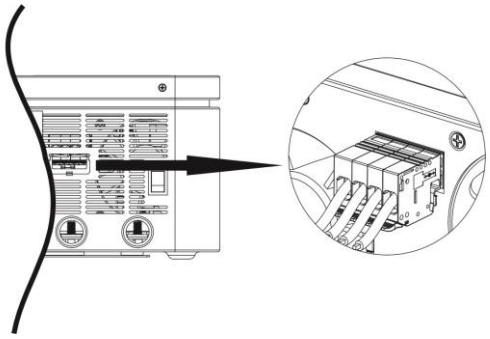
Model	Typical Amperage	Cable Size	Torque
6.5KW	22A*2	12AWG	2.0~2.4Nm

PV Module Selection:
When selecting proper PV modules, please be sure to consider below parameters:
1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.

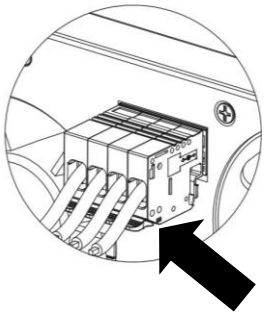
Solar Charging Mode	
INVERTER MODEL	**6.5KW**
Max. PV Power	9000W
Max. PV Array Open Circuit Voltage	500 Vdc
PV Array MPPT Voltage Range	120~430Vdc
MPP Number	2
Max. PV Current	22A*2

Please follow below steps to implement PV module connection:
1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.





3. If pulling the PV terminal out of the inverter, please press and hold the following button.



Recommended PV module Configuration

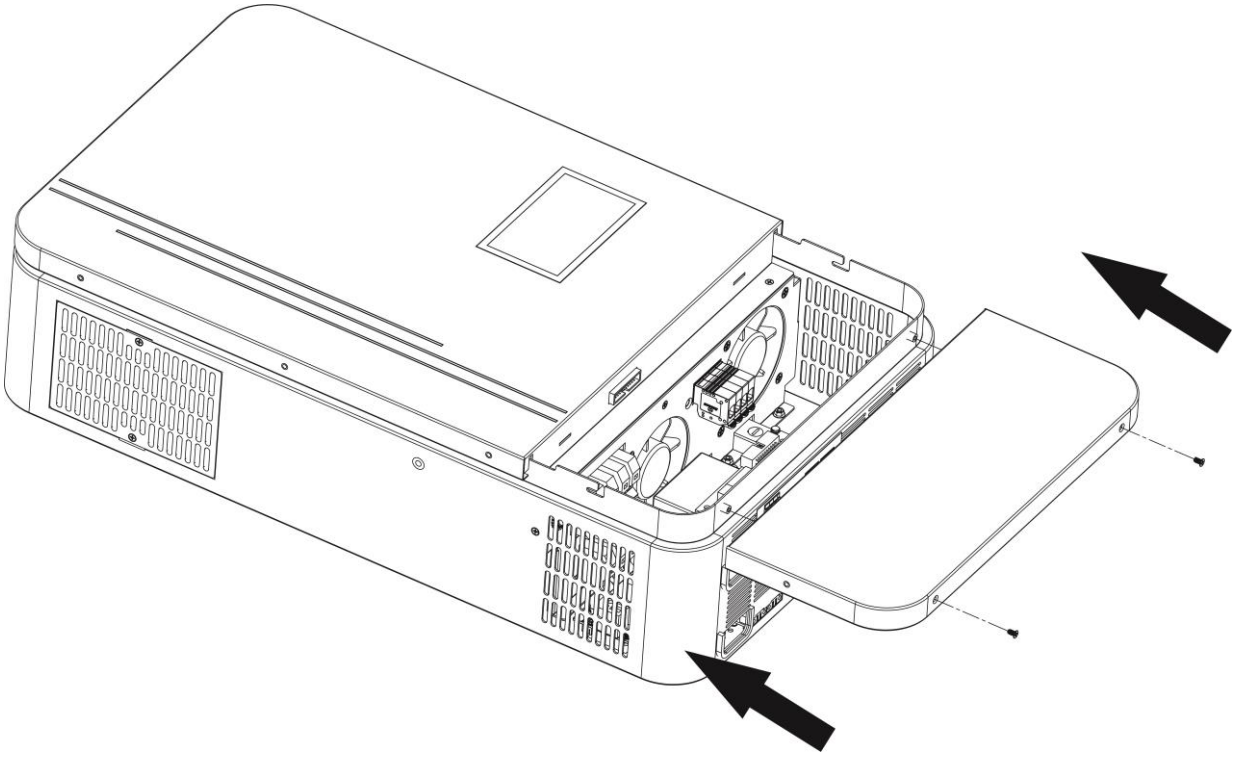
Solar Panel Spec (reference)	**Solar input 1**	**Solar input 2**	**Q'ty of panels**	**Total input power**
-250Wp -Vmp:30.7Vdc -Imp:8.3A -Voc:37.7Vdc -Isc:8.4A -Cells:60	Min in series:4pcs,per input; max in series:12pcs,per input			
	4pcs in series	X	4pcs	1000W
	X	4pcs in series	4pcs	1000W
	12pcs in series	X	12pcs	3000W
	X	12pcs in series	12pcs	3000W
	6pcs in series	6pcs in series	12pcs	3000W
	6pcs in series ,2 strings	X	12pcs	3000W
	X	6pcs in series ,2 strings	12pcs	3000W
	8pcs in series	8pcs in series	16pcs	4000W
	8pcs in series ,2 strings	X	16pcs	4000W
	X	8pcs in series ,2 strings	16pcs	4000W
	9pcs in series	9pcs in series	18pcs	4500W
	9pcs in series ,2 strings	X	18pcs	4500W
	X	9pcs in series ,2 strings	18pcs	4500W
	10pcs in series ,1 strings	10pcs in series ,1 strings	20pcs	5000W
	10pcs in series ,2 strings	X	20pcs	5000W
	X	10pcs in series ,2 strings	20pcs	5000W
	12pcs in series ,1 strings	12pcs in series ,1 strings	24pcs	6000W
	12pcs in series ,2 strings	X	24pcs	6000W
	X	12pcs in series ,2 strings	24pcs	6000W
	7pcs in series ,2 strings	7pcs in series ,2 strings	28pcs	7000W
	8pcs in series ,2 strings	8pcs in series ,2 strings	32pcs	8000W
	9pcs in series ,2 strings	9pcs in series ,2 strings	36pcs	9000W

Solar Panel Spec (reference)	**Solar input 1**	**Solar input 2**	**Q'ty of panels**	**Total input power**
-630Wp -Vmp:41.6Vdc -Imp:15.16A -Voc:48.8Vdc -Isc:16.62A	X	4pcs in series	4pcs	2520W
	X	5pcs in series	5pcs	3150 W
	X	6pcs in series	6pcs	3780W
	X	7pcs in series	7pcs	4410W
	X	8pcs in series	8pcs	5040W
	X	9pcs in series	9pcs	5670W
	5pcs in series	5pcs in series	10pcs	6300W
	6pcs in series	6pcs in series	12pcs	7560W
	7pcs in series	7pcs in series	14pcs	8820W
	8pcs in series	7pcs in series	15pcs	9450W

Solar Panel Spec (reference) - 585Wp - Vmp: 43.3Vdc - Imp: 13.52A - Voc: 52.4Vdc - Isc: 14.00A	**Solar input 1**	**Solar input 2**	**Q'ty of panels**	**Total input power**
	X	4pcs in series	4pcs	2340W
	X	5pcs in series	5pcs	2925 W
	X	6pcs in series	6pcs	3510W
	X	7pcs in series	7pcs	4095W
	X	8pcs in series	8pcs	4680W
	X	9pcs in series	9pcs	5265W
	5pcs in series	5pcs in series	10pcs	5850W
	6pcs in series	6pcs in series	12pcs	7020W
	7pcs in series	7pcs in series	14pcs	8190W
	8pcs in series	8pcs in series	16pcs	9360W

Final Assembly

After connecting all wirings, please put bottom cover back by screwing two screws.



Communication Connection

Serial Connection

Please use supplied communication cable to connect to inverter and PC. Insert bundled CD into a computer and follow on-screen instruction to install the monitoring software. For the detailed software operation, please check user manual of software inside of CD.

Wi-Fi Connection

Wi-Fi module can enable wireless communication between hybrid inverters and monitoring platform. Users have complete and remote monitoring and controlling experience for inverters when combining Wi-Fi module with Energy-Mate APP, available for both iOS and Android based device. All data loggers and parameters are saved in iCloud. For quick installation and operation, please refer to Appendix IV - The Wi-Fi Operation Guide for details.

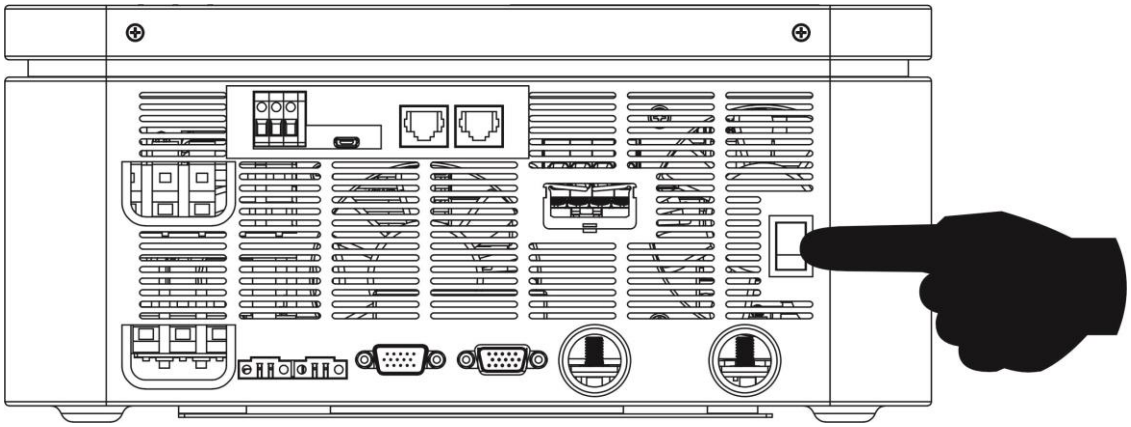
Dry Contact Signal

There is one dry contact (3A/250VAC) available on the rear panel. It could be used to deliver signal to external device when battery voltage reaches warning level.

Unit Status	Condition			Dry contact port: 	
				NC & C	NO & C
Power Off	Unit is off and no output is powered.			Close	Open
Power On	Output is powered from Utility.			Close	Open
	Output is powered from Battery or Solar.	Program 01 set as SUB	Battery voltage < Low DC warning voltage	Open	Close
			Battery voltage > Setting value in Program 21 or battery charging reaches floating stage	Close	Open
		Program 01 set as SBU	Battery voltage < Setting value in Program 20	Open	Close
			Battery voltage > Setting value in Program 21 or battery charging reaches floating stage	Close	Open

OPERATION

Power ON/OFF



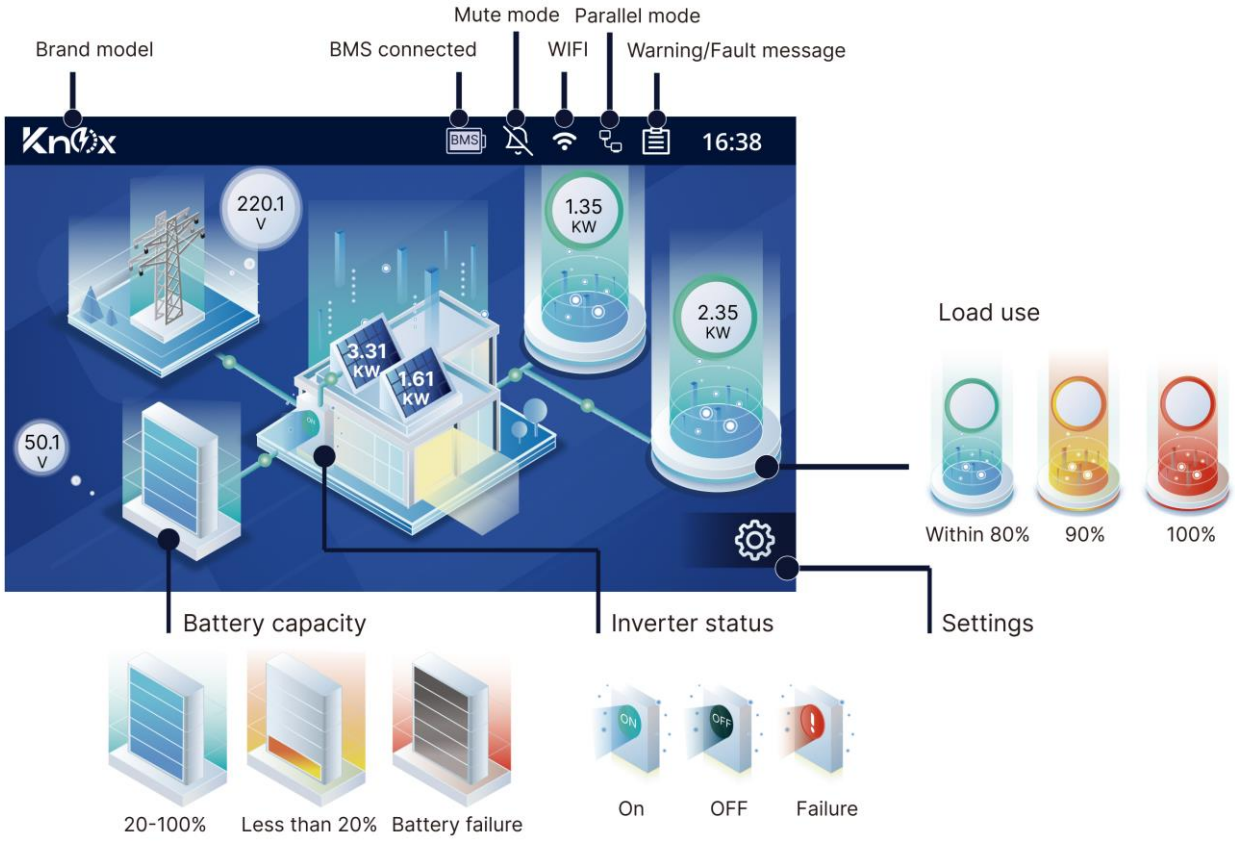
Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch to turn on the unit.

Operation and Display Panel

Displays the overall information of the inverter with a touchable 4.3" HMI LCD. Clear visualization of the inverter's operating status and energy flow. Making it easy to understand the inverter's current operational mode.

Home page

- **Top Menu Bar:** provides essential system information with Brand Model, BMS Connection Status, Parallel Status, Wi-Fi connection Status, Mute Status, Warning/Fault Messages, and shows the current time.
- **Center of the screen:** provides a real-time overview of energy distribution, including the Solar, Grid, Battery, and Load use. Arrows indicate the direction of energy flow and the working status.



Basic information

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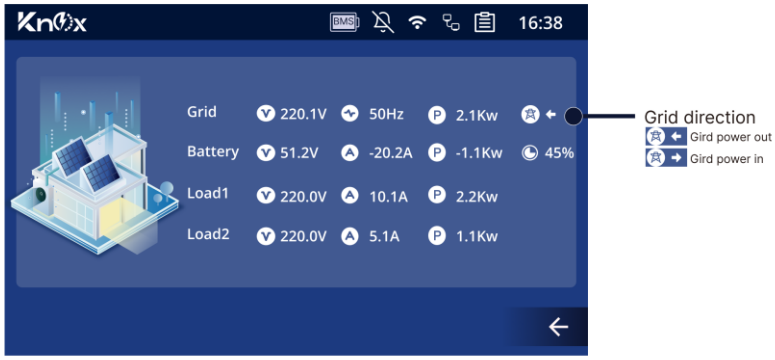
<td> 
</td>
<td>Tap the Mains, Battery, Load 1, and Load 2 icons to view details including grid voltage, frequency, grid power in， grid power out; battery voltage, charge/discharge current, power, and state of charge (SOC); and output voltage, current, and power for Loads 1 and 2.</td>
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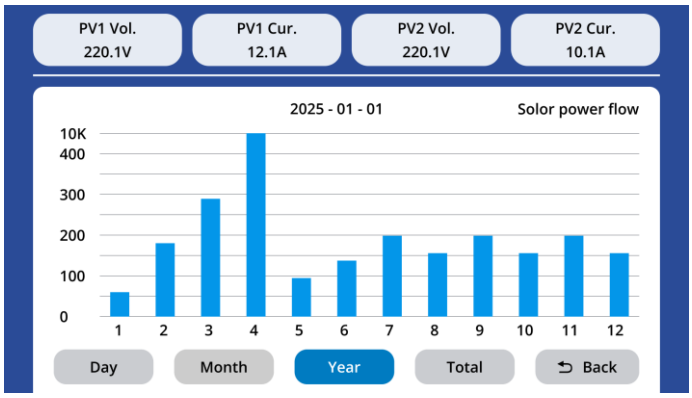
<td> 
</td>
<td>Touch the PV icon to view real-time PV1 voltage, PV1 current, PV2 voltage, and PV2 current. A graph will also display daily, monthly, and yearly PV power statistics.</td>
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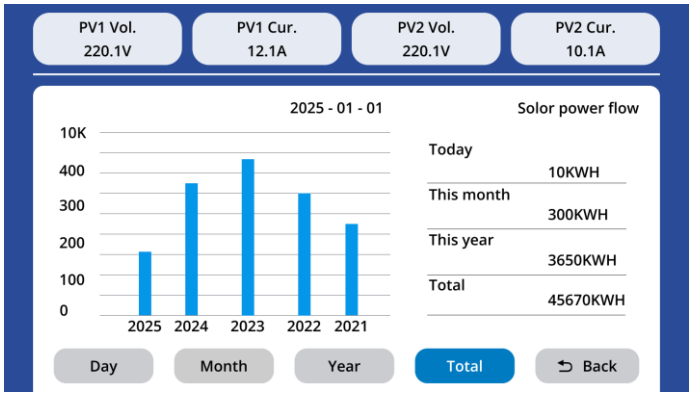
<td> 
</td>
<td>Touch Total to view historical PV data. The central area shows a power generation graph, while daily, monthly, yearly, and total statistics are shown on the right.</td>
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LCD settings

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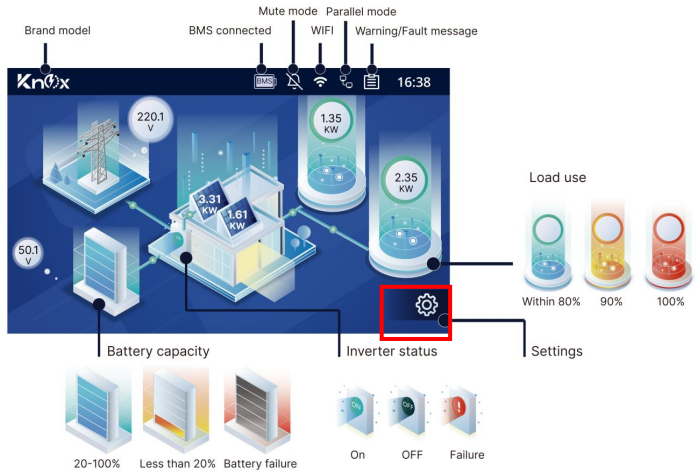
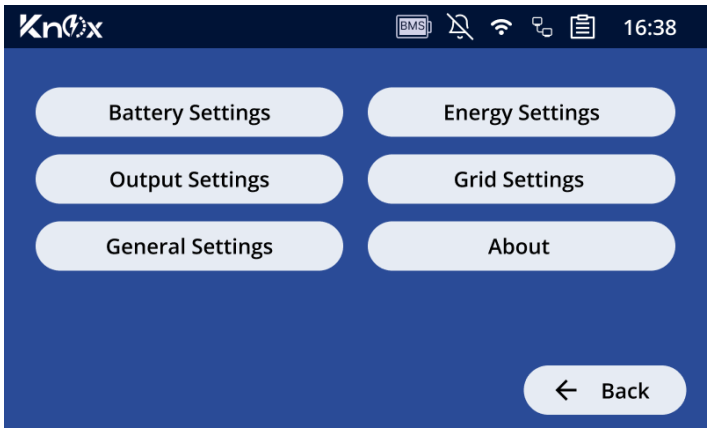
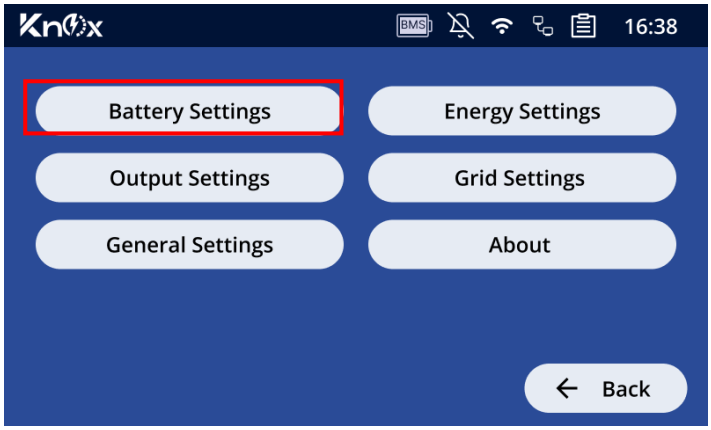
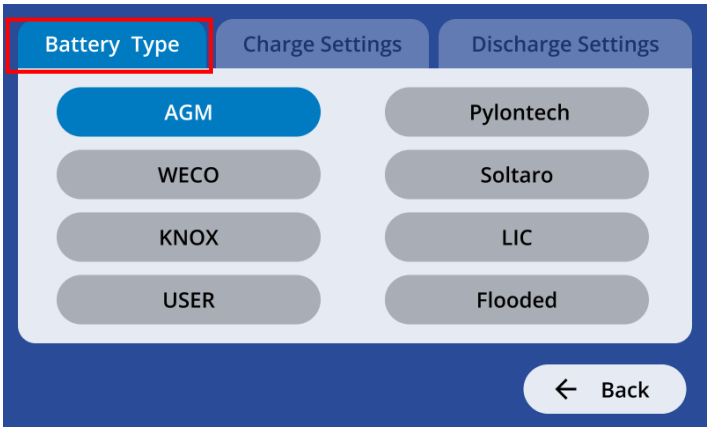
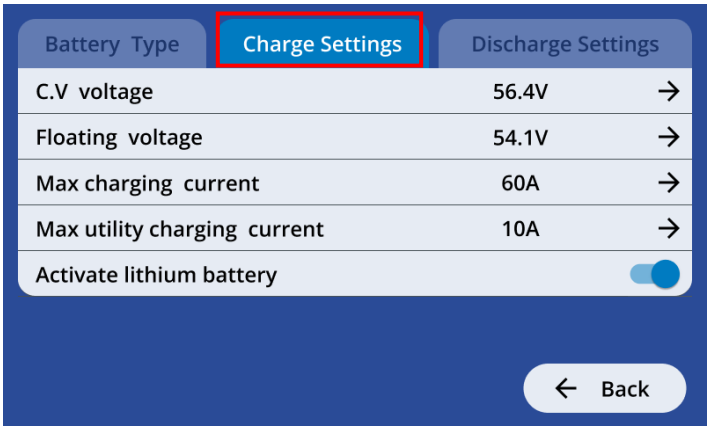
<td> 
</td>
<td>Touch  to do the LCD setting.</td>
</tr>
<tr>
<td> 
</td>
<td>The next page allows you to configure battery settings, system energy settings, output, output settings, grid settings, general settings, and system information via the "About" section.</td>
</tr>
</table>

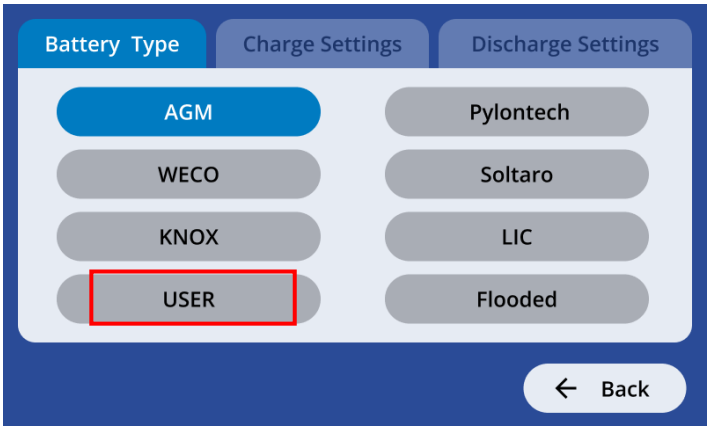
Battery Settings

<table>
<tr>
<td> 
</td>
<td>Touch 

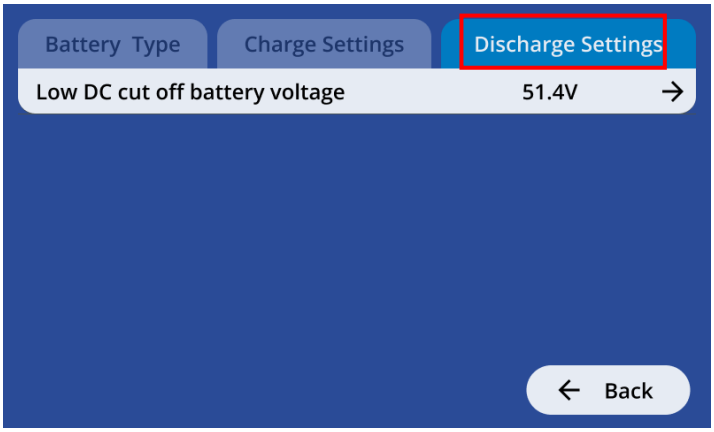
to jump to the battery setting interface, where you can categorize and set up the battery type, charge setting and discharge setting.</td>
</tr>
</table>

<table>
<tr>
<td> 
</td>
<td>The default battery type is AGM. For Pylontech, WECO, Soltaro, KNOX, or LIC batteries, a BMS communication cable is required. Charging voltage and current are then determined by the BMS and cannot be user-adjusted.</td>
</tr>
<tr>
<td> 
</td>
<td>For user-defined settings, charging voltage, current, etc., are configurable. However, after connecting to a BMS, C.V. voltage, floating voltage, and maximum charging current are set by the BMS and cannot be changed by the user.

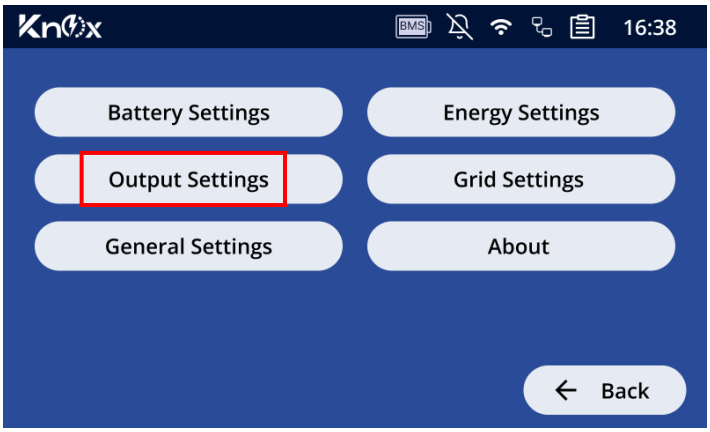
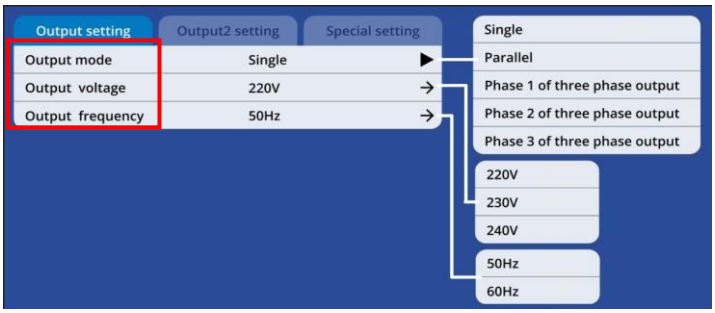
Configurable ranges:
C.V. and Floating Voltage:
48V - 60V (0.1V increments)
Maximum Charging Current:
10A - 120A (10A increments)
Maximum Utility Charging Current:
2A, 10A - 120A

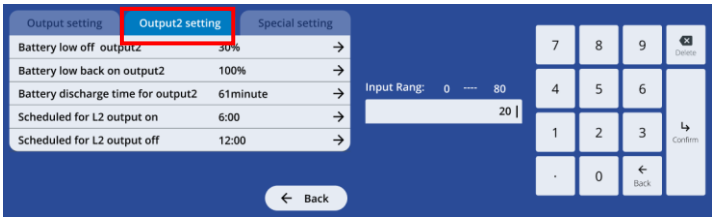
Lithium Battery Activation: Enabling this option will activate the lithium battery when Power on.</td>
</tr>
<tr>
<td> 
</td>
<td>When battery type is USER mode, setting range of low DC cutoff battery voltage: 40.8V ~ 52V, adjustment step: 0.1V.

After low DC cutoff battery voltage is connected to BMS, the setting range is from 0% to 80%.</td>
</tr>
</table>

Output Settings

	Touch  to set up output rated voltage, rated frequency, single/parallel output, L2 output control and output restart under specific conditions.
	**Output setting** **Output mode:** ● **Single:** single operation ● **Parallel:** parallel operation ● **Phase X of three phase output:** Set to three-phase S operation, where X represents one of the three phases. **NOTE:** This setting can only be available in standby mode (switch off) **Output voltage selections**: 220V, 230V, 240V **Output frequency selections:** 50Hz, 60Hz



Output 2 setting

Battery low off output 2

Under the condition that the second way is enabled (disabled by default), if the battery voltage is lower than this set value, the L2 output will be disabled.

The setting range is from 40.8V to 52.0V and the setting step is 0.1V.

After connecting to BMS, the setting range is from 0% to 95%, the setting step is 5%.

Battery low back on output2

Under the condition that the second way is enabled, if the battery voltage is higher than this set value, the L2 output will be enabled. The setting range is from 40.8V to 60.0V and the setting step is 0.1V.

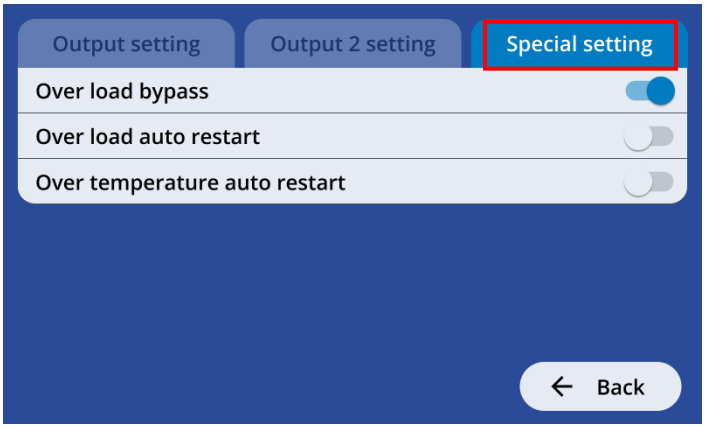
After connecting to BMS, the setting range is from 5% to 95%, the setting step is 5%.

Battery discharge time for output 2

In the Battery mode, the setting range of the second-way discharge time is 0 ~ 999 and it will be turned off when greater than 995.

Scheduled for L2 output on:00:00~24:00

Scheduled for L2 output off:00:00~24:00



Special setting

Over load bypass

If it is set to enabled, the inverter will switch to mains mode when it is subject to over load in the battery mode

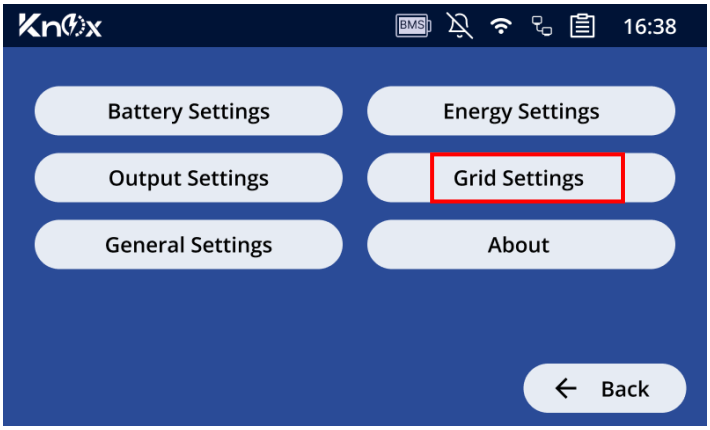
Over load auto restart

If it is set to enabled, it will automatically restart 3 times when an overload occurs.

Over temperature auto restart

If it is set to enabled, it will automatically restart 3 times when an over temperature occurs.

Grid Settings



Touch Grid Settings to set the width ranges of input and feeder.

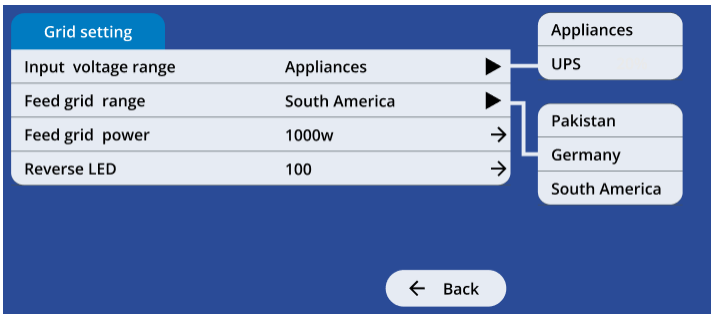
Input voltage range:

Appliances: accept input grid voltage range of 90~280VAC

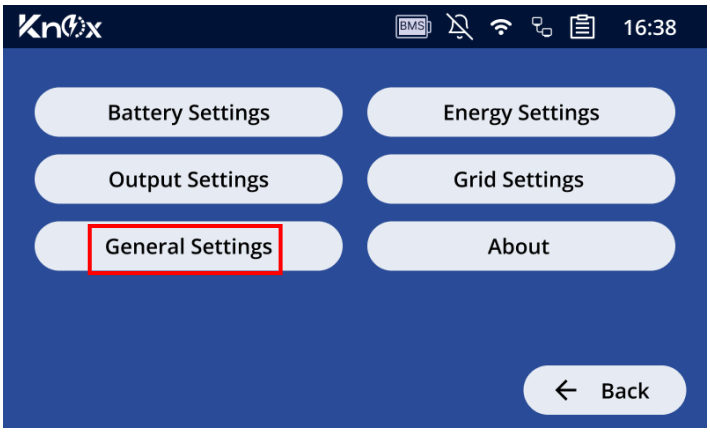
UPS: Accept input grid voltage range of 170~280VAC

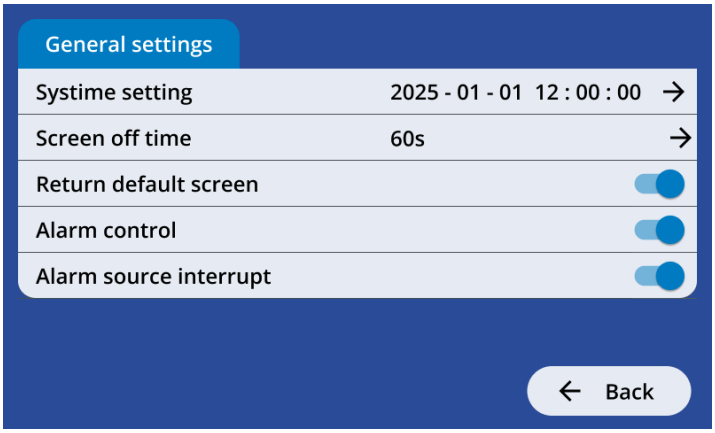
Feed grid range:

Pakistan: Acceptable feeder voltage range is 184~264.5VAC and the feeder frequency is

	47.5~51.5Hz Germany: Acceptable feeder voltage range is 195.5~253VAC and the feeder frequency is 49~51Hz South America: Acceptable feeder voltage range is 184~264.5VAC and the feeder frequency is 57~62Hz **Feed grid power Limit:** Feed grid the maximum power. **Reverse LED:** When the meter Reverse light is on, adjust this parameter and the setting range is 0~300.

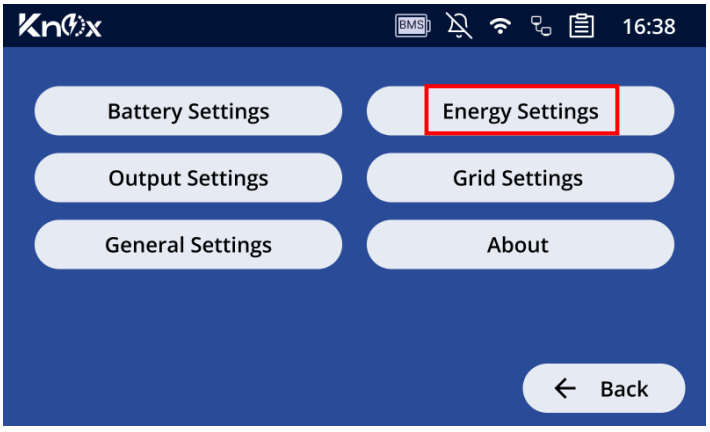
General Settings

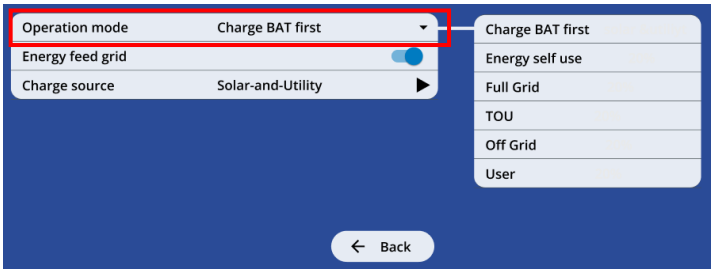




Touch General Settings to enter the general settings, where you can set up System Time, Screen off time, Mute and Return to the Default Interface Time.

Energy settings



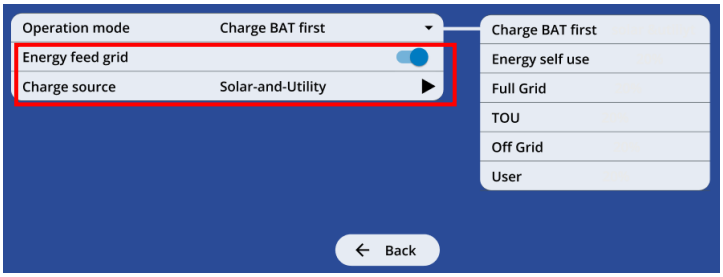


Touch Energy Settings to categorize and set up the operation mode and the grid energy feedback and other functions in each mode.

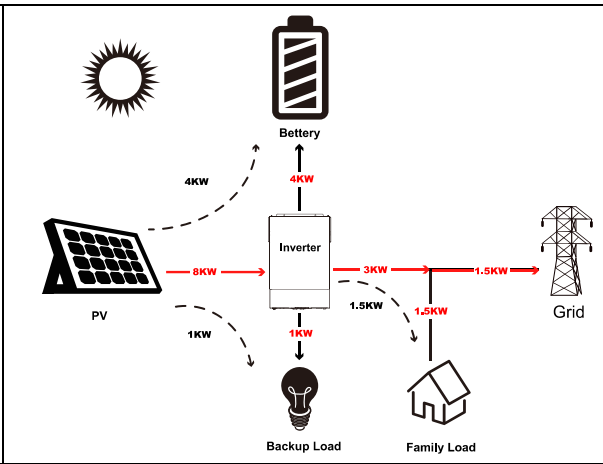
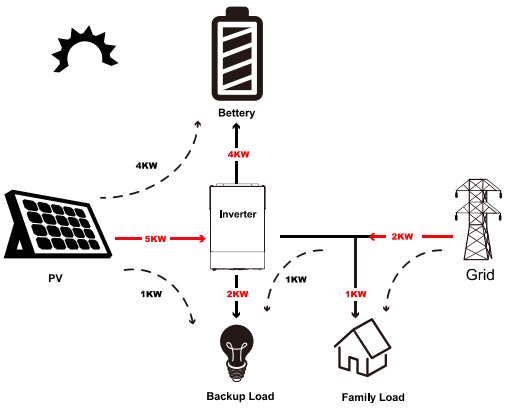
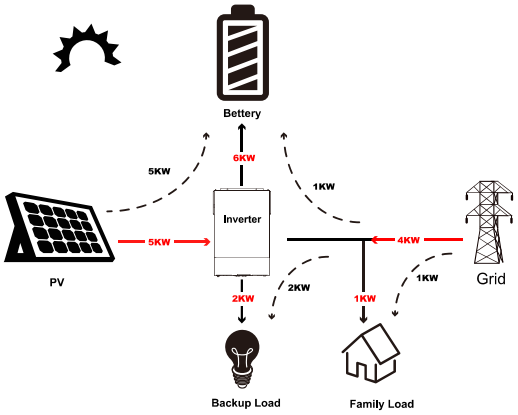
(Charge BAT First mode by default)
There are six main working modes for the energy storage system: Charge BAT first, Energy Self Use, Off-Grid, TOU, Full-Grid and User.

Charge BAT first operation mode

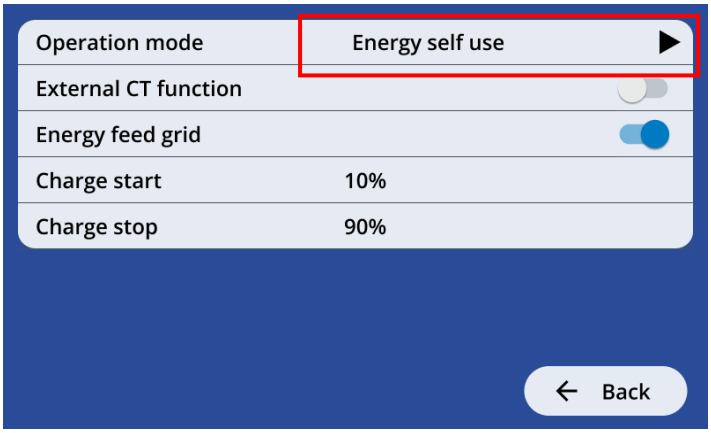
Applicable scenario: It prioritizes battery charging during periods of sufficient PV generation and stable grid power. This stored energy is then used to power loads during outages. Any excess PV energy after battery charging is used to power loads directly or fed to the grid. However, if grid power is unavailable, PV energy is first used to power loads, with any surplus then used for battery charging.

	**Energy feed grid:** If it is set to enabled, solar energy is allowed to feed into the grid, otherwise solar energy is not allowed to feed into the grid **Charge source:** **Solar first:** Set this option to solar power first. When there is no solar power, the utility will supply power. **Solar and Utility:** Solar and Utility supply power together. **Only solar:** Allow solar power only

Schematic diagram of charge priority

When PV generation exceeds the combined power demand of battery charging and loads, the excess energy first charges the battery. Any remaining energy then powers backup loads, with any further surplus fed to the grid and supporting family loads.	
When PV generation is less than the combined power demand of battery charging and loads, the PV output first charges the battery, then supplies backup loads. The grid covers any remaining backup and family load demands.	
When PV generation is insufficient to charge the battery, the PV output is only used for battery charging. The grid then charges the battery and supplies power to the backup and family loads.	

Energy self-use operation mode



Energy self use operation mode

Applicable scenario: ideal for areas with high electricity costs and minimal or no feed-in tariffs (FITs). Excess PV energy is stored in a battery, which then powers loads during periods of low or zero PV generation (e.g. Nighttime). This increases PV self-consumption and household energy independence, resulting in savings the expenditure of electricity consumption.

External CT function:

If it is set to enabled, turn on the external CT function, otherwise turn off this function.

Energy feed grid:

If it is set to enabled, solar energy is allowed to feed into the grid, otherwise solar energy is not allowed to feed into the grid.

NOTE: After enabling external CT, the energy feed grid will be disabled by default and user setting is not allowed.

Charge start:

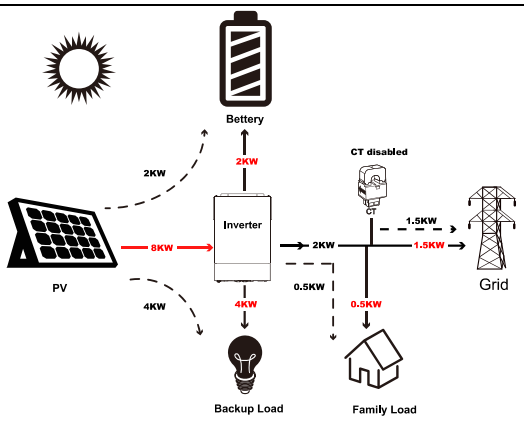
The setting range is 5%~95% when battery is connected BMS, and 44.0V~51.0V when no battery is connected BMS.

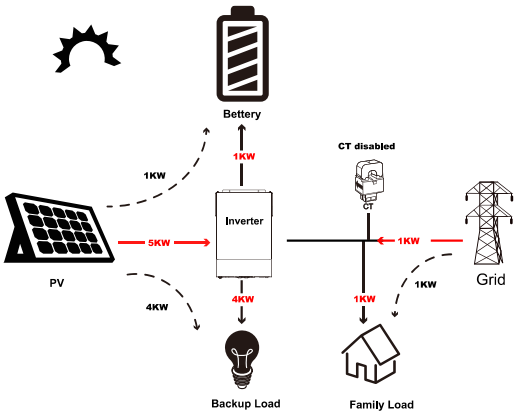
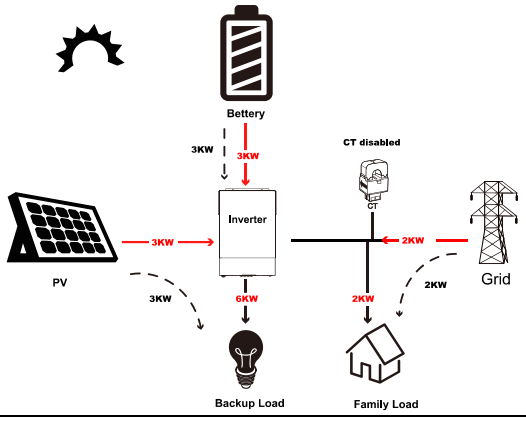
Charge stop:

The setting range is 10%~100% when battery is connected BMS, and 48.0V~58.0V when no battery is connected BMS.

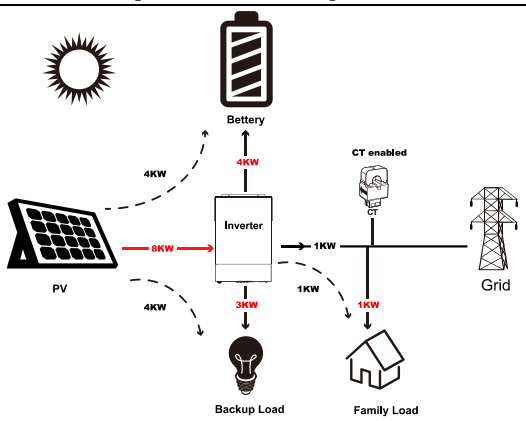
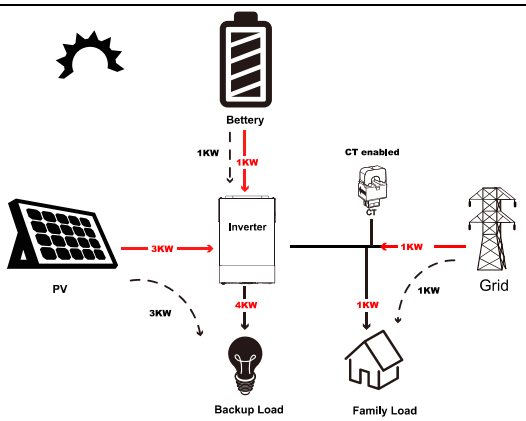
Schematic diagram of maximum spontaneous self-generation (CT is disabled)

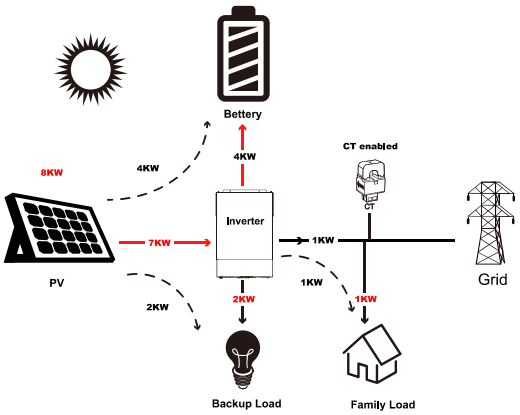
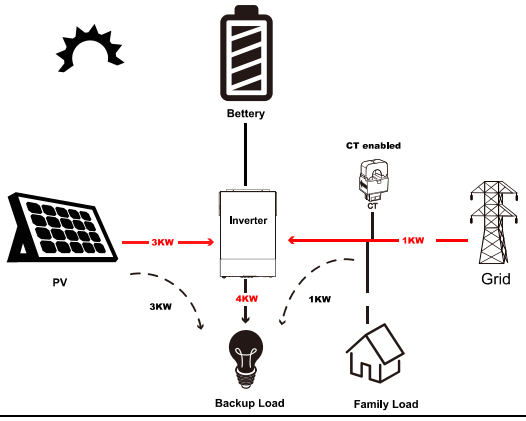
When PV generation exceeds the combined power demand of battery charging and backup load demands, power is first supplied to backup loads, then to battery charging. If grid feed-in is enabled, excess power is fed to the grid; otherwise, it is not



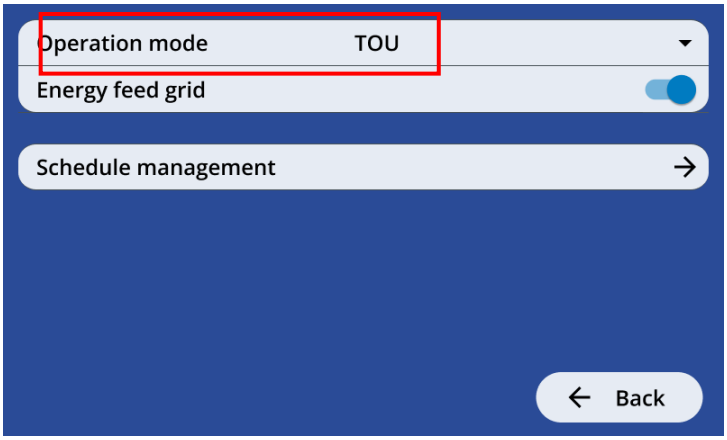
When PV generation less than the combined power demand of battery charging and backup load demands, power is first supplied to backup loads, then to battery charging. If grid feed-in is enabled, the Grid power will charge the battery and supply power to family load.	
When PV output is insufficient to meet backup load demand, the available PV power is used only for backup loads. The battery then supplements backup loads, and the grid powers family loads.	

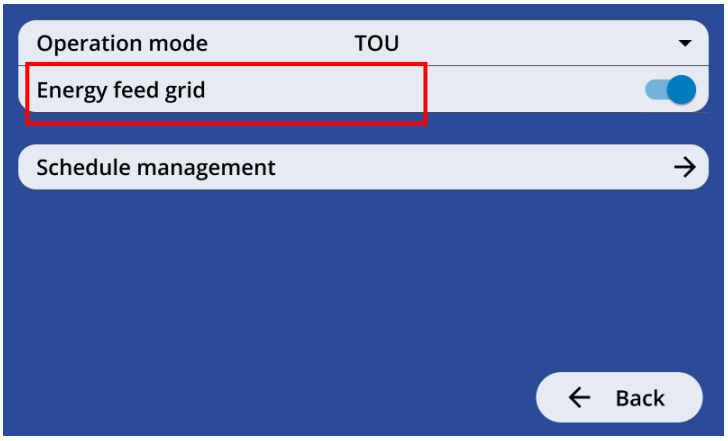
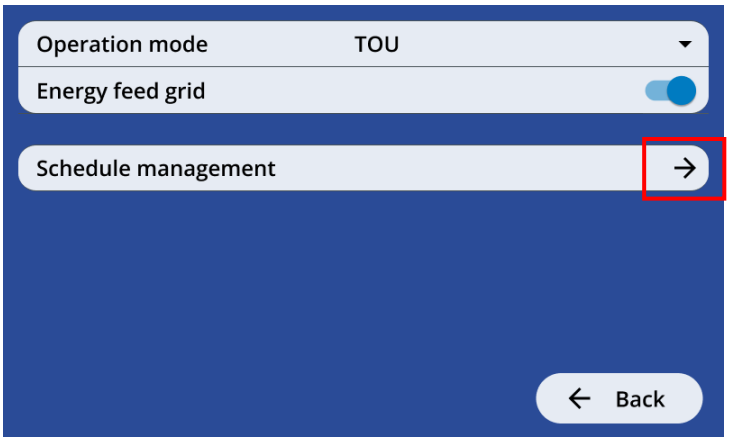
Schematic diagram of maximum spontaneous self-generation (CT is enabled)

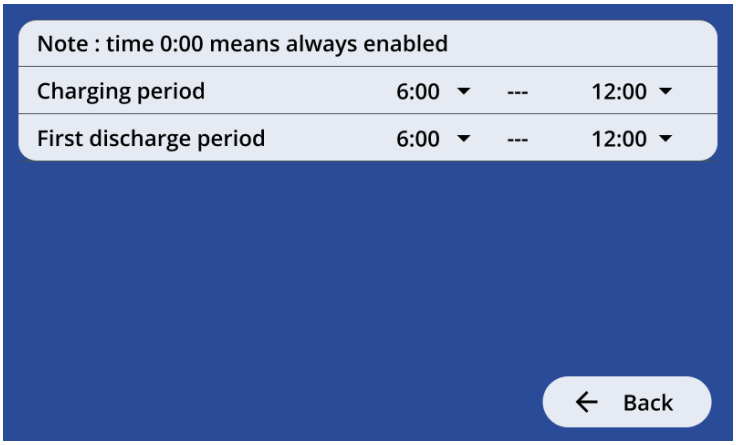
When PV generation exceeds the combined power demand of battery charging and backup load, power is first supplied to the backup load and then used to charge the battery. The excessive PV energy will power the family load.	
When PV generation is less than the backup load, the available PV power is used only for the backup load. The Grid powers the remaining backup load and family load.	

When high PV output exceeding battery charging and backup load needs, power first goes to backup loads, then to battery charging. Any remaining power is used for household loads. If the external CT is enabled, excess PV energy is **Not** fed to the grid.	
When both PV and battery power are low, and PV generation is less than the backup load demand, the PV power is entirely dedicated to the backup load. The grid then supplies the remaining backup load power and all household load power.	

TOU operation mode

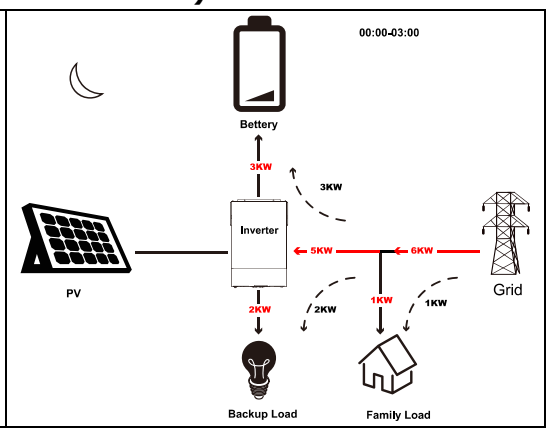
	**TOU operation mode** Applicable scenario: ideal for locations with significant electricity price differences between peak and off-peak hours, this Time-of-Use (TOU) mode allows users to manually set charging and discharging windows. The system maximizes battery charging during low-cost periods (e.g., overnight) and limits discharging to high-cost periods, minimizing electricity expenses. During charging periods, grid charging is enabled. During discharging periods, the battery powers loads. Unless explicitly set to discharge, the battery remains inactive outside designated discharge windows; PV and grid power directly supply loads. However, the battery will discharge at any time if the grid power fails.

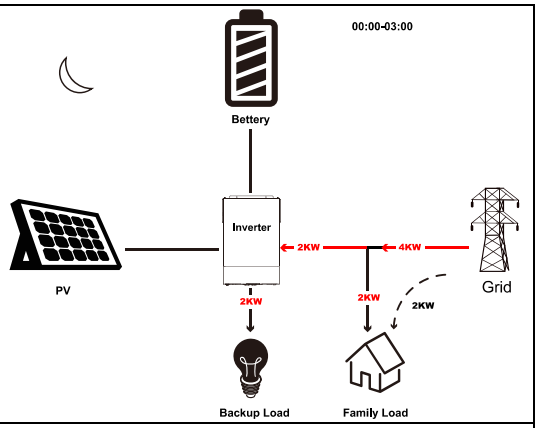
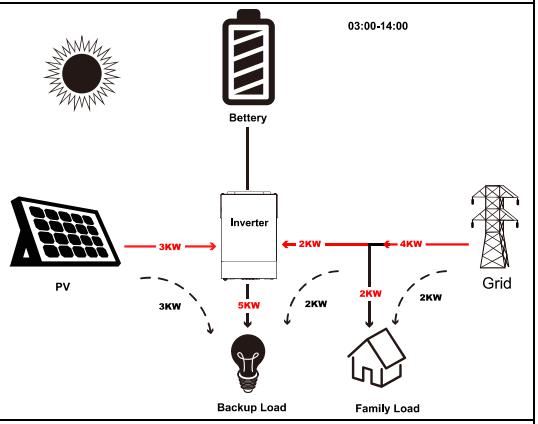
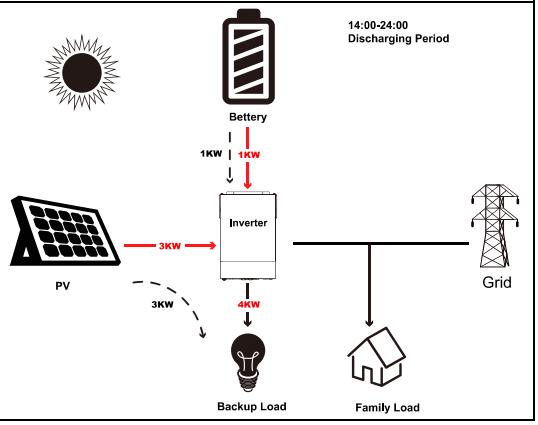
<table>
<tr>
<td> 
</td>
<td>Energy feed grid
If it is set to enabled, solar energy is allowed to feed into the grid, otherwise solar energy is not allowed to feed into the grid</td>
</tr>
<tr>
<td> 


</td>
<td>Click on the → arrow button of Schedule management to enter the schedule management interface (Setting to 00:00 means always ENABLE)
Charging period
Setting range: 00:00-24:00
First discharge period
Setting range: 00:00-24:00</td>
</tr>
</table>

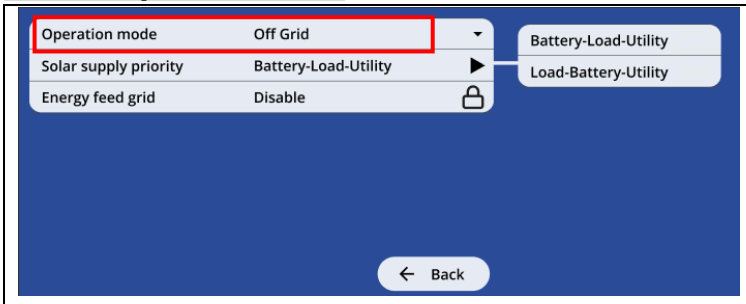
Schematic diagram of TOU

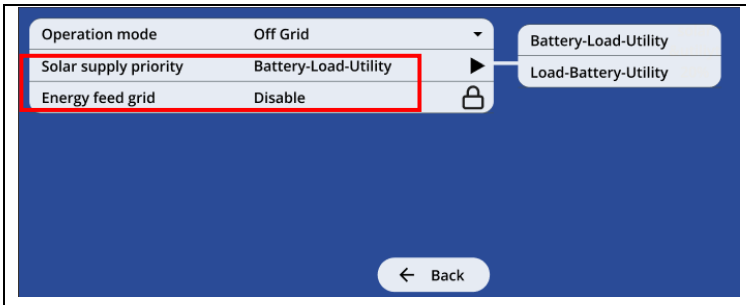
(charging window 00:00~03:00, discharging window 14:00~24:00)

<table>
<tr>
<td>During the charging period, If the battery SOC is empty, the battery is charged by the grid, and the Grid powers to family and backup load.</td>
<td> 
</td>
</tr>
</table>

During the charging period, If the battery SOC is full, the battery will stop charging. The Grid power will provide power to family load and backup load.	
During non-charging and discharging periods, the family load and backup load are powered by the grid and PV. If PV generation exceeds demand, excess power charges the battery.	
During discharge periods, backup loads are powered by the battery and available PV energy. If grid power is enabled, it will also supply household loads.	

Off Grid operation mode

	**Off Grid operation mode** Applicable scenario: Suitable for off-grid or unstable grid scenarios, this system stores PV energy in a battery to power loads during periods of low or no solar generation. Battery charging is prioritized before supplying power to loads. A configurable setting prioritizes either battery charging or load power from solar energy.



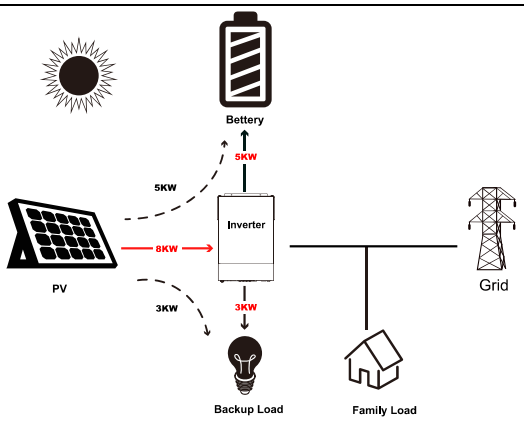
Battery-Load-Utility: Solar power is used to charge the battery first

Load-Battery-Utility: Solar power is used to power the loads first.

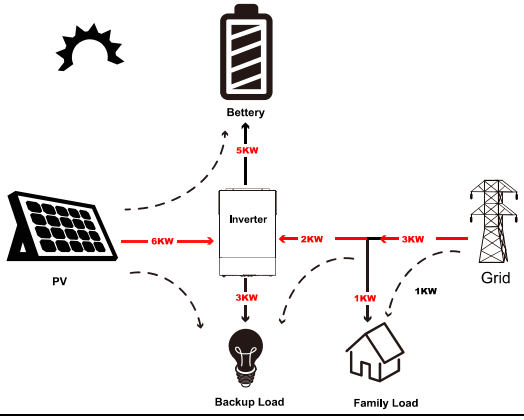
Energy feed grid: If it is set to enabled, solar energy is allowed to feed into the grid, otherwise solar energy is not allowed to feed into the grid.

Schematic diagram- Off Grid

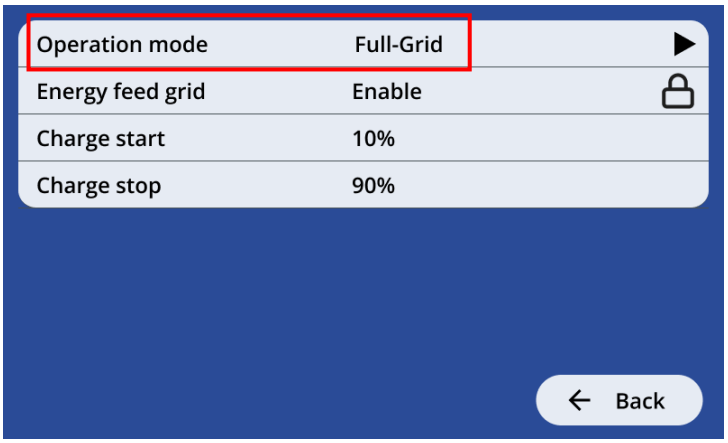
Under strong sunlight, PV power is used for battery charging and backup loads, with a selectable priority for either. Excess PV energy is neither fed to the grid nor used for family loads; those loads are powered by the grid.



With weak sunlight, PV energy is used for battery charging and backup loads, with a configurable priority setting. Any shortfall in meeting the charging or backup load requirements is covered by grid power, which also supplies family loads.

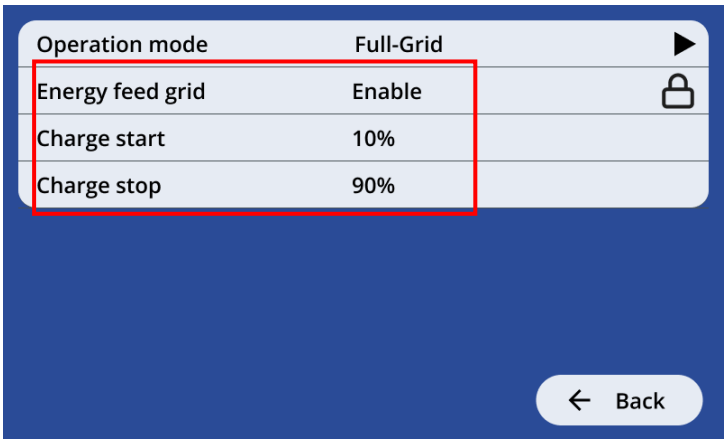


Full-Grid operation mode



Full-Grid operation mode

Applicable scenario: Suitable for high-electricity-cost areas, this system prioritizes backup loads. If PV generation exceeds backup load needs, excess power is fed to the grid up to the inverter's maximum capacity. Even if PV generation is insufficient to fully power backup loads, those loads are still prioritized, and any remaining PV power is fed to the grid up to the inverter's maximum capacity.



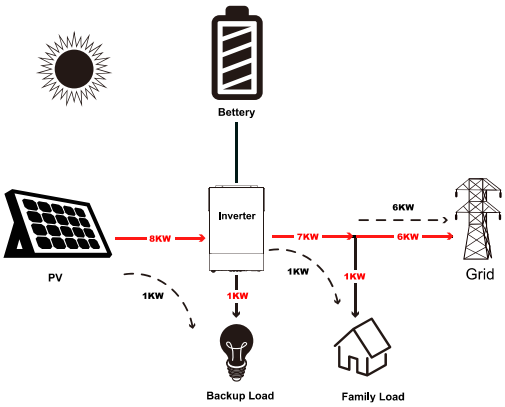
Energy feed grid:
If it is set to enabled, solar energy is allowed to feed into the grid, otherwise solar energy is not allowed to feed into the grid

Charge start:
The setting range is 5%~95% when battery is connected BMS, and 44.0V~51.0V when no battery is connected BMS.

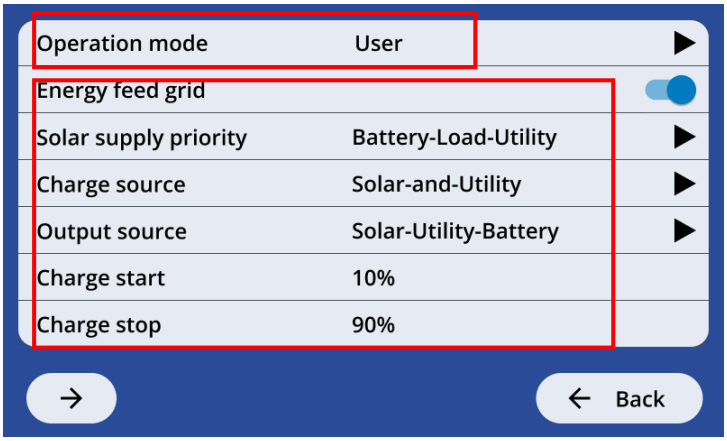
Charge stop:
The setting range is 10%~100% when battery is connected BMS, and 48.0V~58.0V when no battery is connected BMS.

Schematic Diagram - full Grid

In Full Grid mode, backup loads are powered by PV energy. Any excess PV energy is fed into the grid.



User operation mode



User operation mode

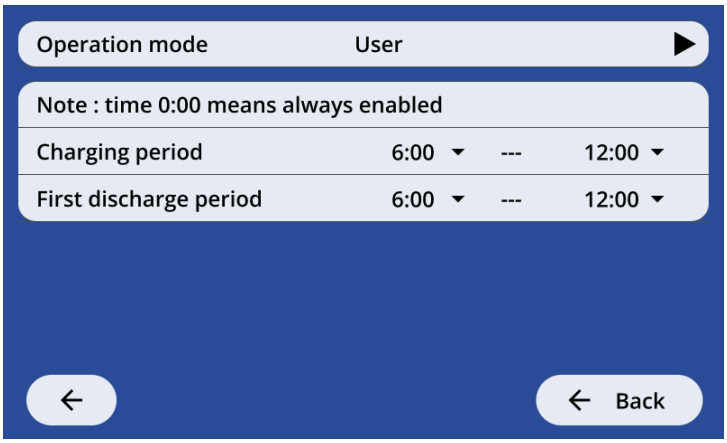
Energy feed grid:
A simple on/off switch to allow or prevent excess solar energy from being fed into the electrical grid.

Solar supply priority: This setting determines the order in which solar energy is used:

- Battery-Load-Utility: Battery charging is prioritized, then loads, and finally any excess goes to the utility grid.
- Load-Battery-Utility: Loads are prioritized, then battery charging, and finally excess to the grid.

Charge source :

- Solar-first：Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.



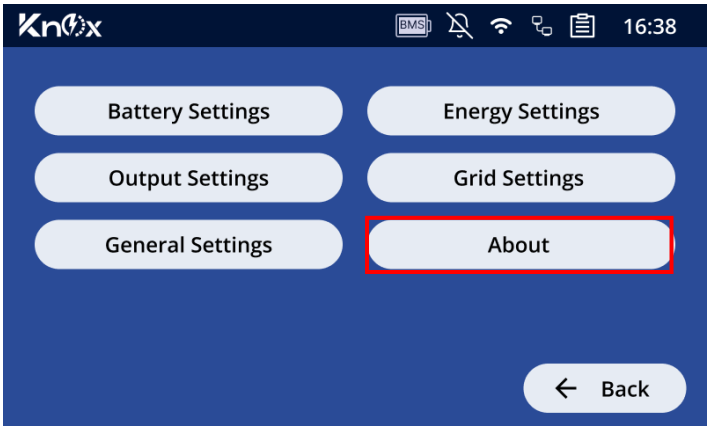
- Solar-and-Utility: Solar energy and utility will charge battery at the same time.
- Only-solar：Solar energy will be the only charger source no matter utility is available or not.

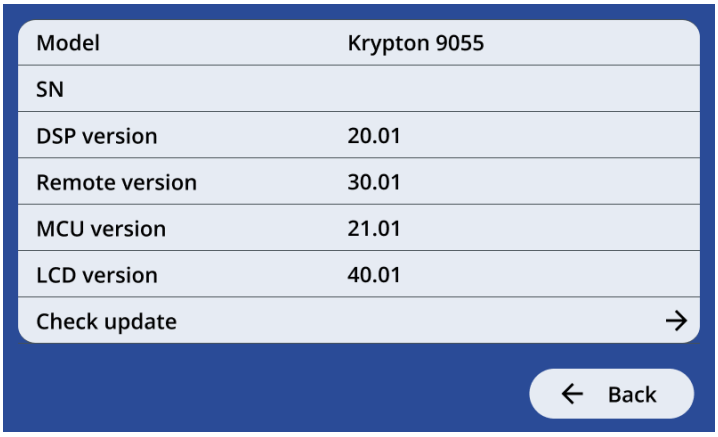
Output source :

- Solar-Utility-Battery：Solar energy provides power to the loads as first priority.If solar energy is not sufficient to power all connected loads, Utility energy will supply power to the loads at the same time.
- Solar -Battery-Utility：Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point "charge start"or solar and battery is not sufficient.

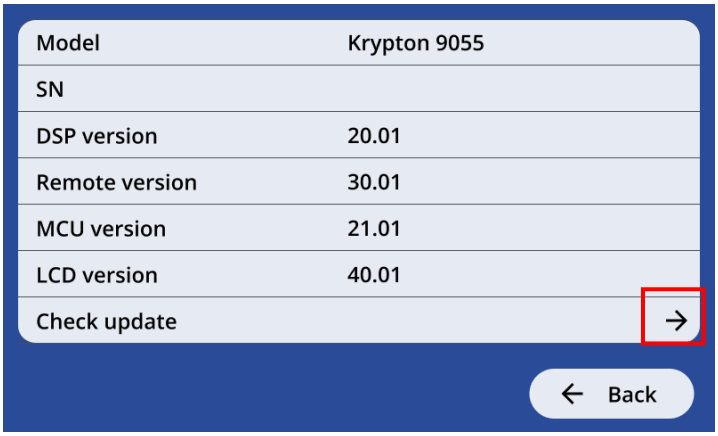
Charge start and Charge stop: Suitable for Solar -Battery-Utility mode, The battery voltage or SOC is lower higher than "Charge start" setting, The battery starts charging. The battery voltage or SOC is higher than "Charge stop" setting, The battery stops charging and start discharge.

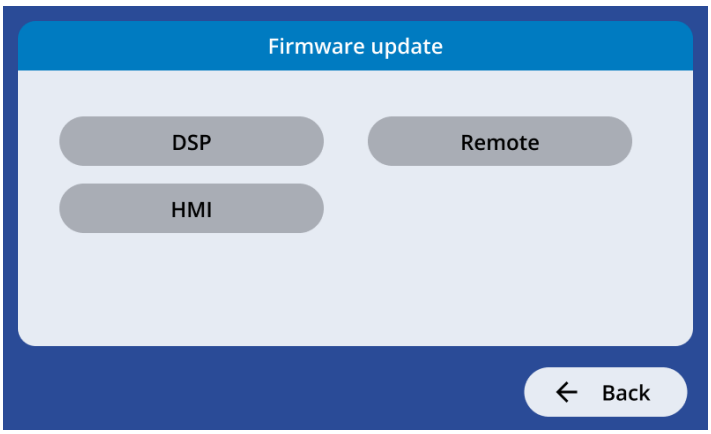
About





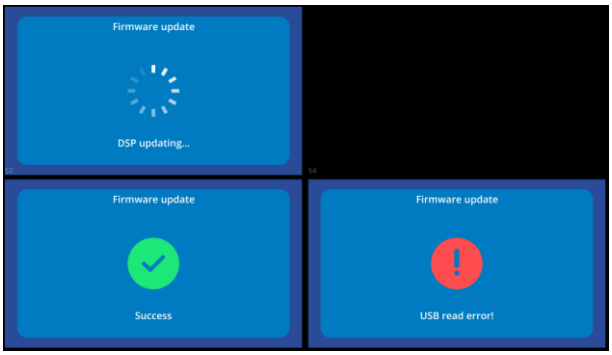
Model: brand and model
SN: serial number
DSP version: version number of DSP
Remote version: version number of Remote
MCU version: version number of MCU
LCD version: version number of LCD
Check update: check whether there is to-be-updated content





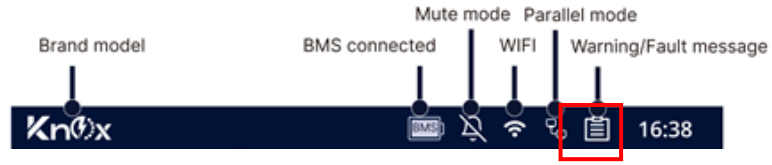
Check update:
Connect the USB flash drive with the upgrade file, click on Check Update →, and select the program DSP or Remote or HMI subject to update.

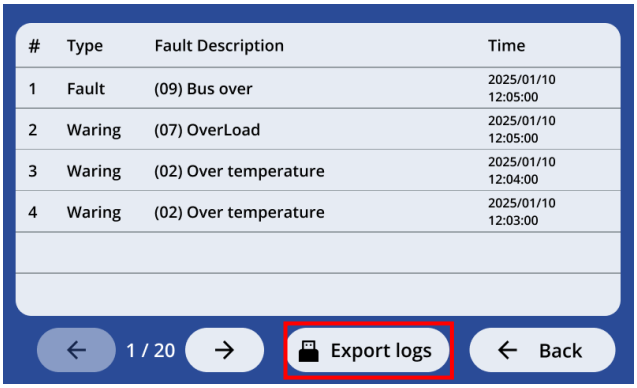
Note: The USB flash drive is in FAT32 format, the DSP upgrade file name is dsp.hex, the Remote upgrade file name is mcu.hex, the HMI upgrade file name is XRD_TFT, the file name is all lower case, and all files are placed in the root directory of the USB flash drive.

	The upgrade information will be displayed during upgrading, and the screen cannot be operated at this time. When the upgrade is completed, the upgrade result will be displayed, and you can return to the home page by clicking on the screen icon.

Record and warning/fault code display

Touch the record or warning icon in the top menu bar. Then, click "Export logs" to save the logs to a connected USB flash drive. The flash drive must be formatted as FAT32 with an MBR partition.





Faults Reference Code

Fault code	**Fault Event**
2	Over Temperature
3	Battery VOL high
5	Output short circuited
6	AC-out VOL too high
7	Overload
8	BUS VOL exceed upper limit
9	BUS soft start timeout
10	PV overcurrent
11	PV overvoltage
12	DCDC overcurrent
51	INV OverCurrent
52	BUS voltage too low
53	INV Soft Fail
55	INV output overvoltage
57	CUR sensor failed
58	AC-out VOL too low
60	Negative power flow detected

71	Parellel FW uncompatible
72	Output sharing fault
80	CAN lost
81	HOST lost
82	SYN lost
83	Battery VOL different
84	VOL/FREQ different
85	AC input CUR unbalanced
86	Output setting different
99	Mcu not normal

Warning Code	Warn Event
1	Fan Lock
2	Over temperature
4	Battery low
7	OverLoad
10	Output derating
12	Battery open
61	BMS Commcation loss
60	BAT stop charge/discharge
62	BMS pack abnormal
69	Battery stop charging
70	Battery force charging
71	Battery stop discharging

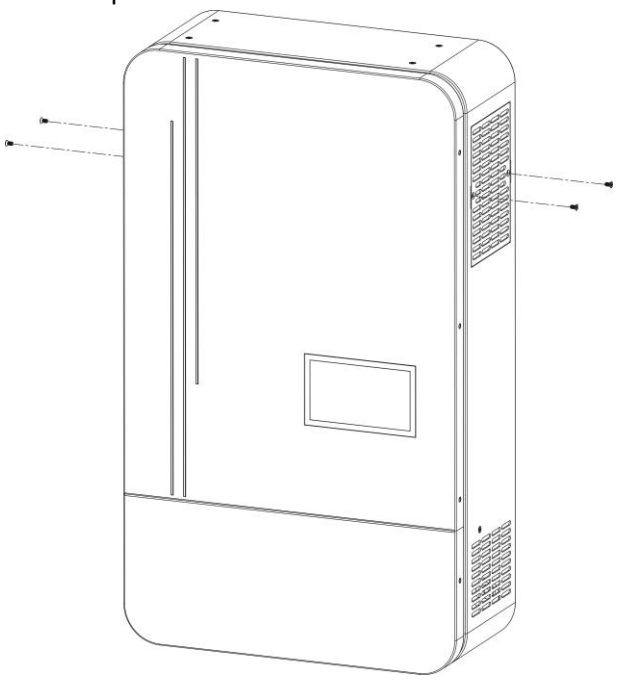
CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT

Overview

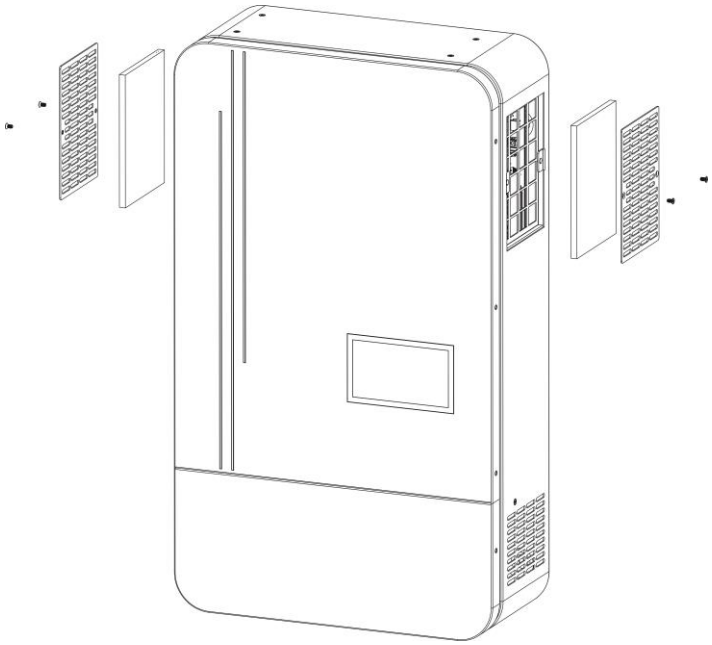
Every inverter is already installed with anti-dusk kit from factory. This kit also keeps dusk from your inverter and increases product reliability in harsh environment.

Clearance and Maintenance

Step 1: Remove the screws on the top of the inverter.



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



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

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

SPECIFICATIONS

MODEL	**6.5KW**
RATED OUPUT POWER	6500W
PV INPUT (DC)	
Max. PV Power	**9000W** **(PV1 + PV2: 4500W + 4500W)** **(PV1 or PV2: 7000W)**
Max. PV Array Open Circuit Voltage	500 VDC
PV Input Voltage Range	120 VDC~500 VDC
MPPT Range @ Operating Voltage	120 VDC~430 VDC
Max. PV Array Short Circuit Current	22A + 22A
Number of MPP Tracker	2
GRID-TIE OPERATION	
GRID OUTPUT (AC)	
Nominal Output Voltage	220/230/240 VAC
Feed-in Grid Voltage Range	184 ~ 264.5 VAC @ Pakistan regulation 195.5~253 VAC @Germany regulation 184 ~ 264.5 VAC @South America regulation
Feed-in Grid Frequency Range	47.5~51.5Hz @ Pakistan regulation 49~51Hz @Germany regulation 57~62Hz @South America
Nominal Output Current	30.44A
Rated Feed-in Grid Power	8000W
Power Factor Range	>0.99
Maximum Conversion Efficiency (DC/AC)	96%
OFF-GRID, HYBRID OPERATION	
GRID INPUT	
Acceptable Input Voltage Range	90 - 280 VAC or 170 - 280 VAC
Frequency Range	50 Hz/60 Hz (Auto sensing)
Transfer Time	< 10ms (For UPS) < 20ms (For Home Appliances) < 50ms (For parallel operation)
Rating of AC Transfer Relay	40A
BATTERY MODE OUTPUT (AC)	
Nominal Output Voltage	220/230/240 VAC
Rated Power	6500W
Output Waveform	Pure Sine Wave
Nominal Output Current	28.27
Efficiency (DC to AC)	93%
BATTERY & CHARGER	
Nominal DC Voltage	48 VDC
Maximum Charging Current (from Grid)	120A
Maximum Charging Current (from PV)	120A
Maximum Charging Current	120A
GENERAL	
Dimension, D X W X H (mm)	140 x 295 x 468
Net Weight (kgs)	13.5
INTERFACE	
Parallel-able	Yes
External Safety Box (Optional)	Yes
Communication	RS232/Dry-Contact/WiFi
ENVIRONMENT	
Humidity	0 ~ 90% RH (No condensing)
Operating Temperature	-10°C to 50°C

TROUBLE SHOOTING

Problem	LCD/ Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	HMI and buzzer will be active for 3 seconds and then complete off.	The battery voltage is too low (<1.91V/Cell)	1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	1. The battery voltage is far too low. (<1.4V/Cell) 2. Battery polarity is connected reversed.	1. Check if batteries and the wiring are connected well. 2. Re-charge battery. 3. Replace battery.
Mains exist but the unit works in battery mode.	HMI shows grid voltage is 0V	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	Grid not exist	Insufficient quality of AC power. (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)
When the unit is turned on, internal relay is switched on and off repeatedly.	Battery open	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on.	Over-load	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Output short circuited	Output short-circuited.	Check if wiring is connected well and remove abnormal load.
	Over Temperature	Internal temperature of inverter component	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Battery VOL high	Battery is over-charged.	Return to repair center.
		The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.
	Fan locked	Fan warninging	Replace the fan.
	AC-out VOL too low./ AC-out VOL too high	Output abnormal (Inverter voltage below than 190Vac or is higher than 260Vac)	1. Reduce the connected load. 2. Return to repair center
	BUS soft start timeout / BUS VOL exceed upper limit / INV Soft Fail / CUR sensor failed	Internal components failed.	Return to repair center.
	PV overcurrent	PV current is too high	Restart the unit, if the error happens again, please return to repair center.
	DCDC overcurrent	DC/DC over current or surge.	
	INV OverCurrent	Over current or surge.	
	BUS voltage too low.	Bus voltage is too low.	
	Output sharing fault	Output voltage is unbalanced.	
	PV overvoltage	Solar input voltage is more than 500V.	

Appendix I: Parallel function

1. Introduction

This inverter can be used in parallel with two different operation modes.

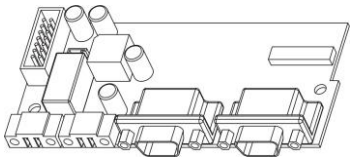
1. Parallel operation in single phase is with up to 9 units. The supported maximum output power is 54KW/54KVA.
2. Maximum 9 units work together to support three-phase equipment. Maximum seven units support one phase.

NOTE: If this unit is bundled with share current cable and parallel cable, this inverter is default supported parallel operation. You may skip section 3. If not, please purchase parallel kit and install this unit by following instruction from professional technical personnel in local dealer.

WARNING: Please make sure all output N wires of each inverter should be connected always. Otherwise, it will cause fault in error.

2. Package Contents

In parallel kit, you will find the following items in the package:



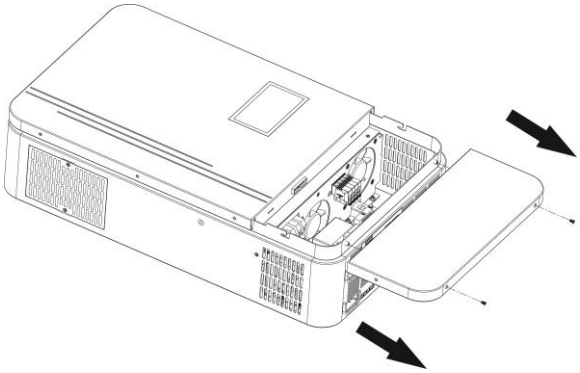
Parallel board

Parallel communication cable

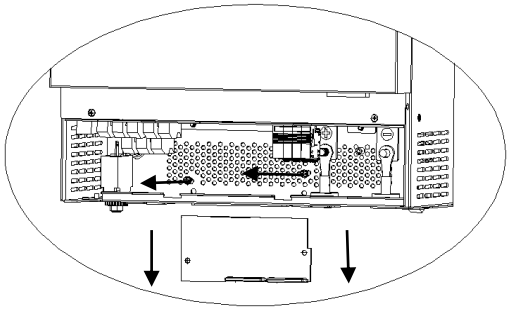
Current sharing cable

3. Parallel board installation

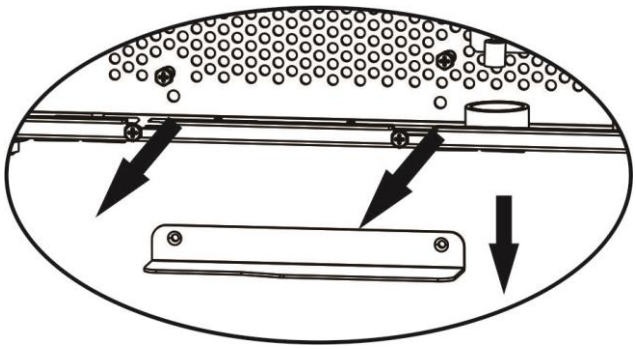
Step 1: Remove wire cover by unscrewing all screws.



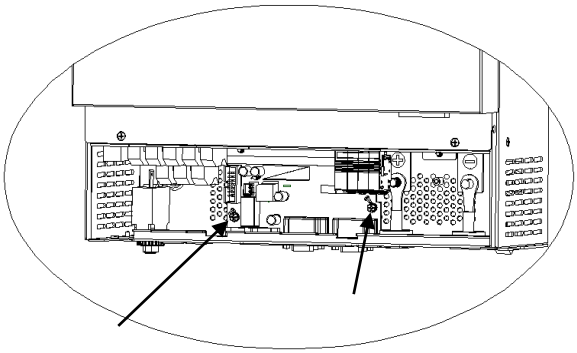
Step 2: Remove two screws as below chart and remove 2-pin and 14-pin cables. Take out the board under the communication board.



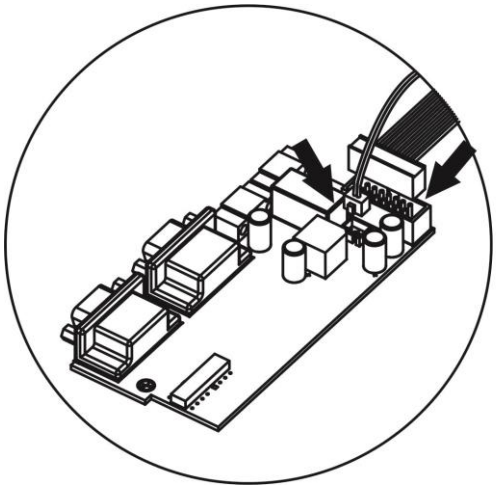
Step 3: Remove two screws as below chart to take out cover of parallel communication.



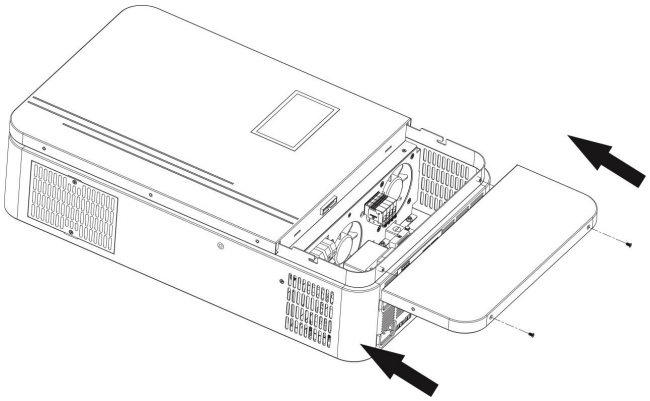
Step 4: Install new parallel board with 2 screws tightly.



Step 6: Connect 2-pin to original position.



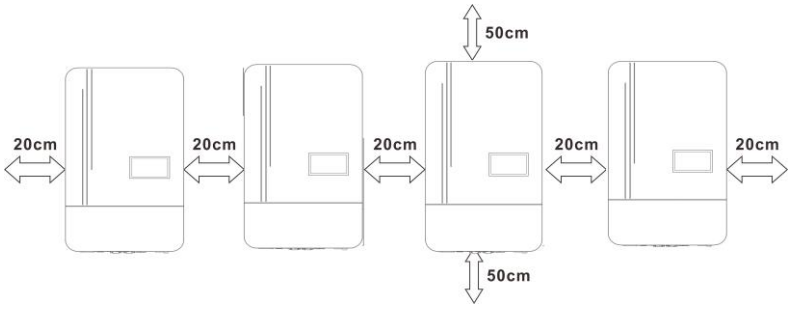
Step 7: Put communication board back to the unit.



Step 8: Put wire cover back to the unit. Now the inverter is providing parallel operation function.

4. Mounting the Unit

When installing multiple units, please follow below chart.



NOTE: For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

5. Wiring Connection

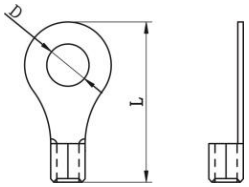
NOTICE: It's requested to connect to battery for parallel operation.

The cable size of each inverter is shown as below:

Recommended battery cable and terminal size for each inverter:

Model	Wire Size	Ring Terminal			Torque value
		Cable mm^2	Dimensions		
			D (mm)	L (mm)	
6.5KW	1*2AWG or 2*6AWG	28	6.4	42.7	2~ 3 Nm

Ring terminal:



WARNING: Be sure the length of all battery cables is the same. Otherwise, there will be voltage difference between inverter and battery to cause parallel inverters not working.

Recommended AC input and output cable size for each inverter:

Model	AWG no.	Torque
6.5KW	8 AWG	1.4~1.6Nm

You need to connect the cables of each inverter together. Take the battery cables for example: You need to use a connector or bus-bar as a joint to connect the battery cables together, and then connect to the battery terminal. The cable size used from joint to battery should be X times cable size in the tables above. "X" indicates the number of inverters connected in parallel.
Regarding AC input and output, please also follow the same principle.

WARNING!! Make sure all output N wires of each inverter must be connected all the time. Otherwise, it will cause inverter fault in error.

CAUTION!! Please install the breaker at the battery and AC input side. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of battery or AC input. The recommended mounted location of the breakers is shown in the figures in 5-1 and 5-2.

Recommended breaker specification of battery for each inverter:

Model	1 unit*
6.5KW	170A/70VDC

*If you want to use only one breaker at the battery side for the whole system, the rating of the breaker should be X times current of 1 unit. "X" indicates the number of inverters connected in parallel.

Recommended breaker specification of AC input with single phase:

Model	2 units	3 units	4 units	5 units	6 units	7 units	8 units	9 units
6.5KW	80A/ 230VAC	120A/ 230VAC	160A/ 230VAC	200A/ 230VAC	240A/ 230VAC	280A/ 230VAC	320A/ 230VAC	360A/ 230VAC

Note1: Also, you can use 50A for only 1 unit and install one breaker at its AC input in each inverter.
Note2: Regarding three-phase system, you can use 4-pole breaker directly and the rating of the breaker should be compatible with the phase current limitation from the phase with maximum units

Recommended battery capacity

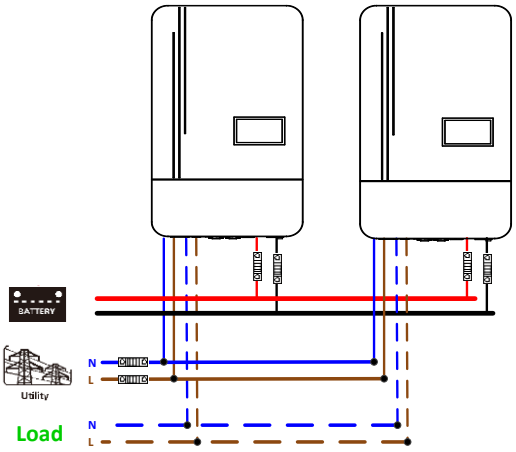
Inverter parallel numbers	2	3	4	5	6	7	8	9
Battery Capacity	400AH	600AH	800AH	1000AH	1200AH	1400AH	1600AH	1800AH

WARNING! Be sure that all inverters will share the same battery bank. Otherwise, the inverters will transfer to fault mode.

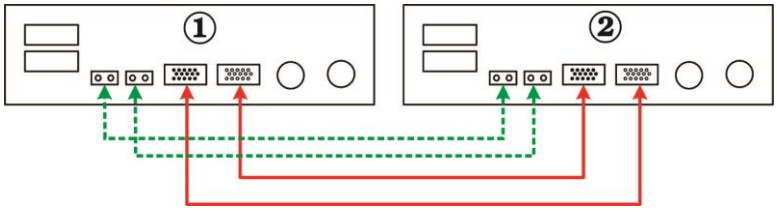
5-1. Parallel Operation in Single phase

Two inverters in parallel:

Power Connection

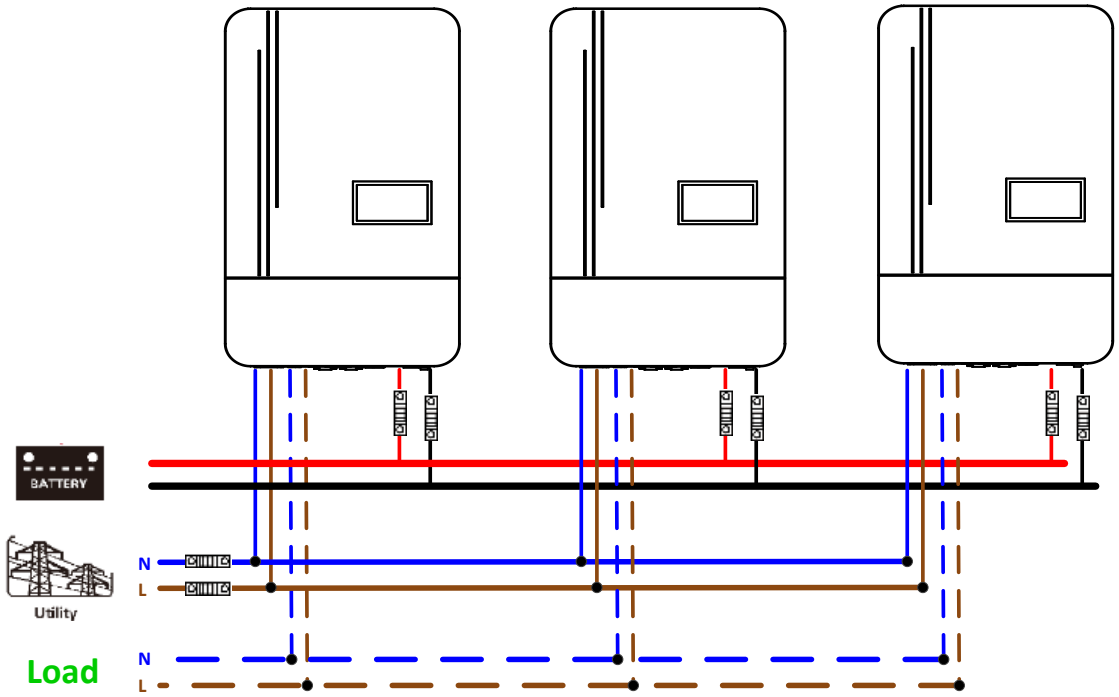


Communication Connection

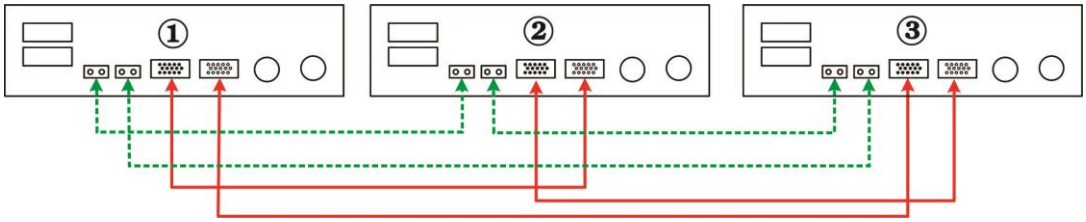


Three inverters in parallel:

Power Connection

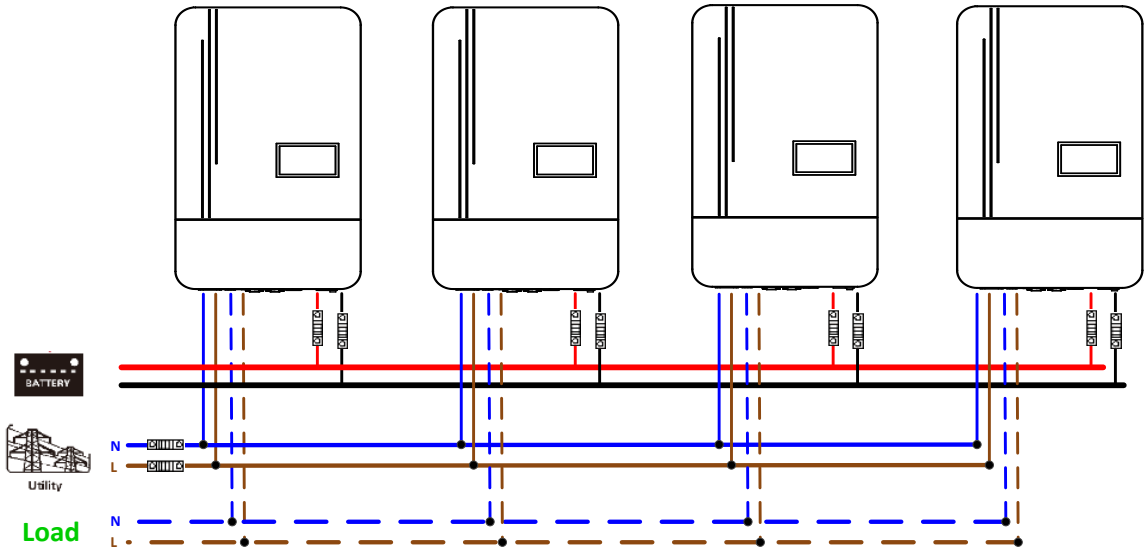


Communication Connection

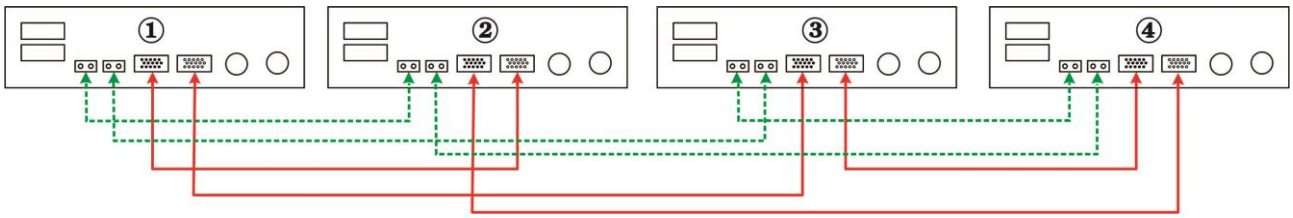


Four inverters in parallel:

Power Connection

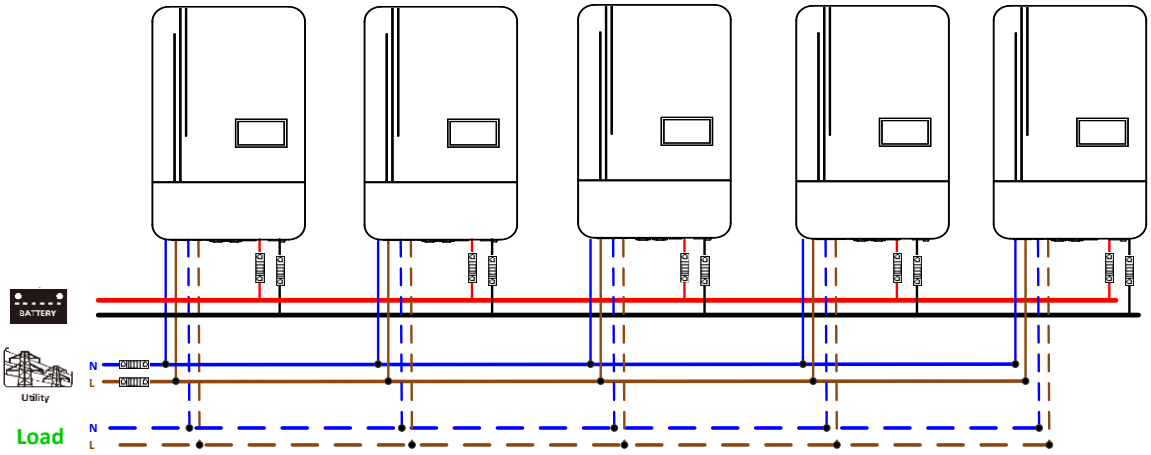


Communication Connection

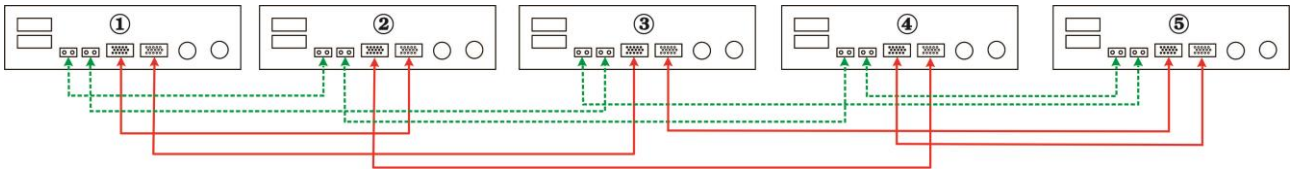


Five inverters in parallel:

Power Connection

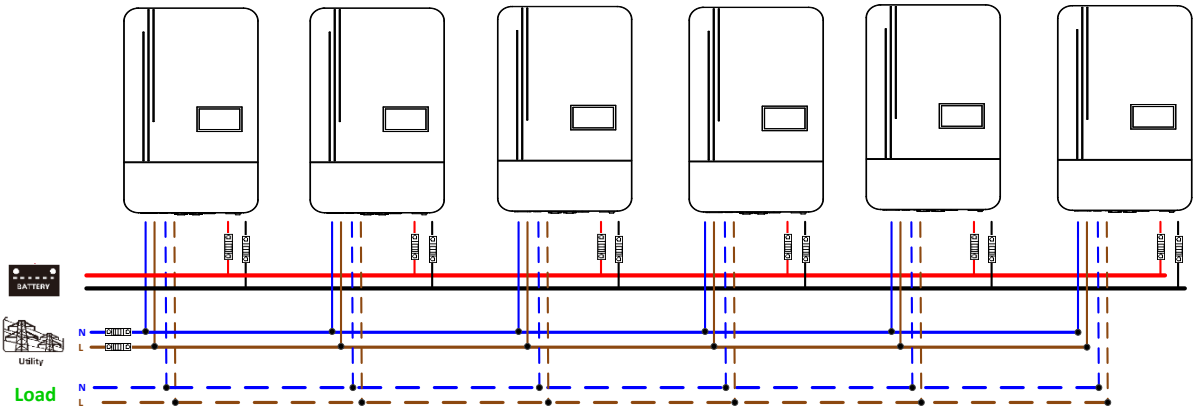


Communication Connection

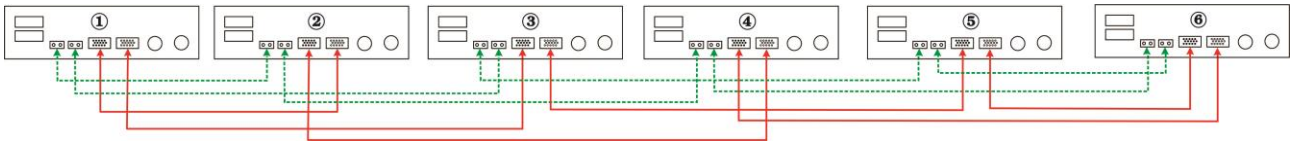


Six inverters in parallel:

Power Connection

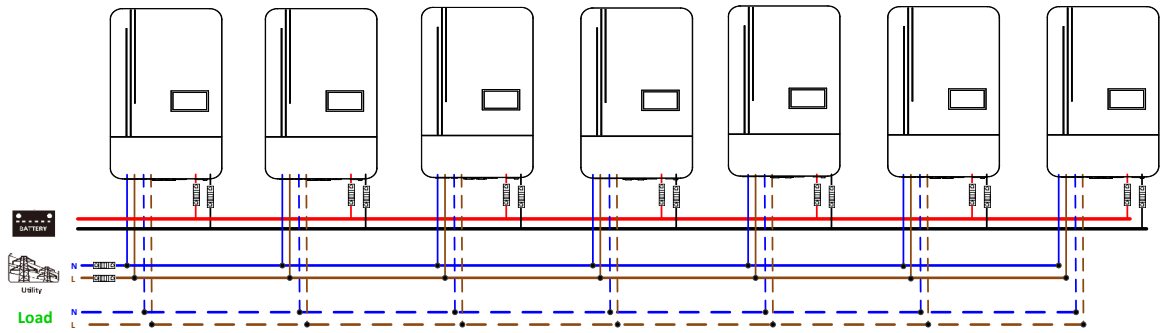


Communication Connection

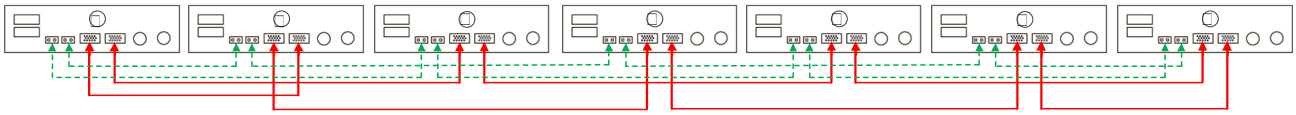


Seven inverters in parallel:

Power Connection

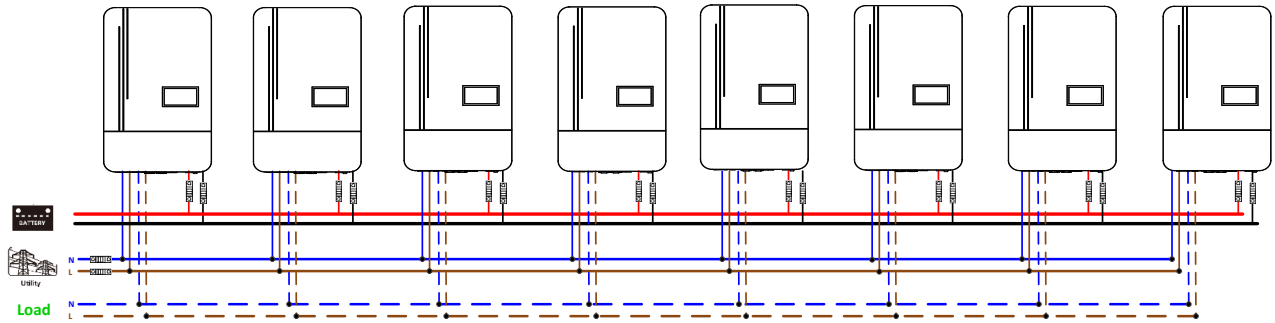


Communication Connection

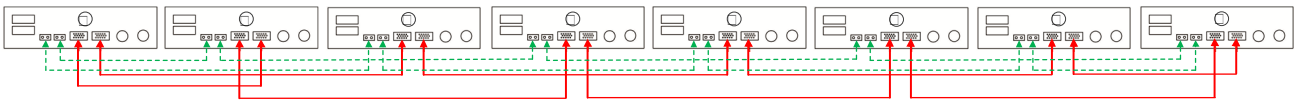


Eight inverters in parallel:

Power Connection

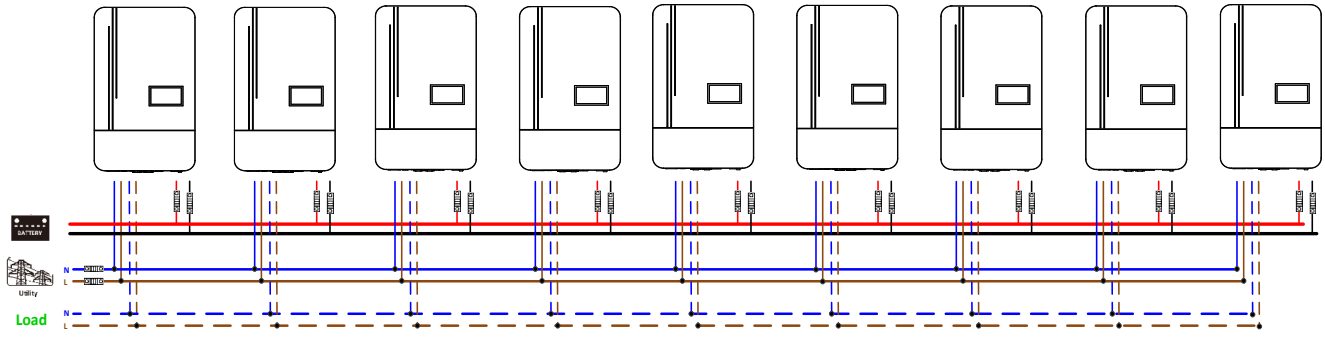


Communication Connection

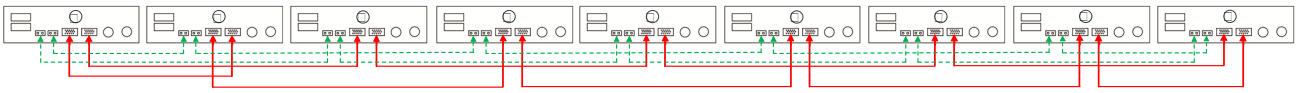


Nine inverters in parallel:

Power Connection



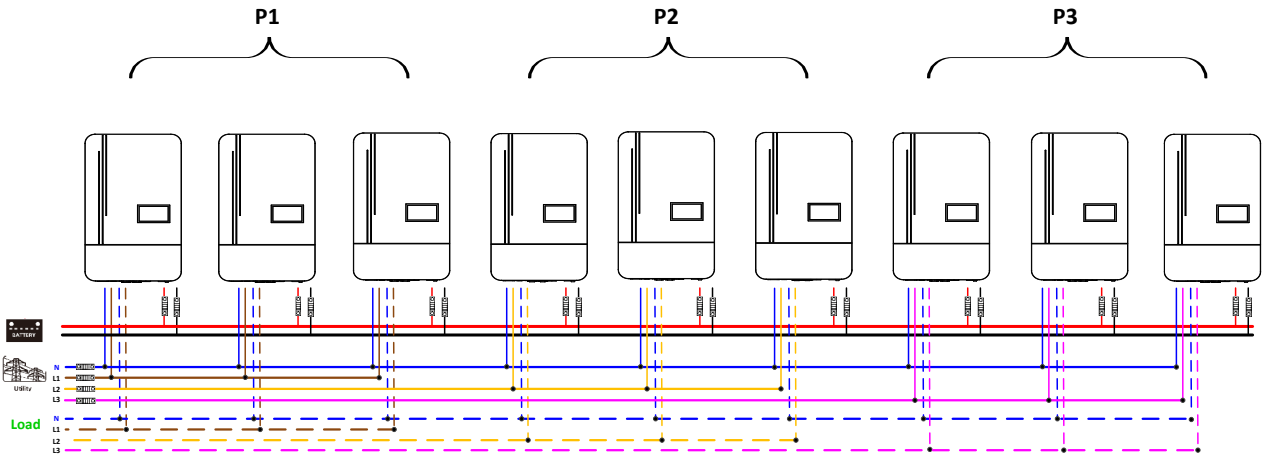
Communication Connection



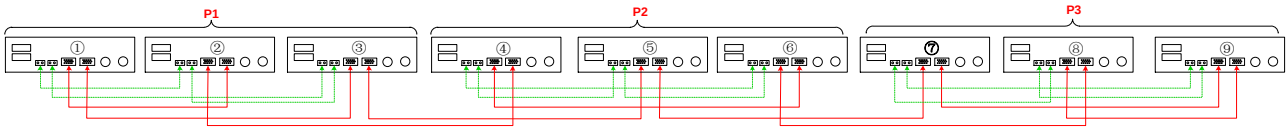
5-2. Support 3-phase equipment

Three inverters in each phase:

Power Connection

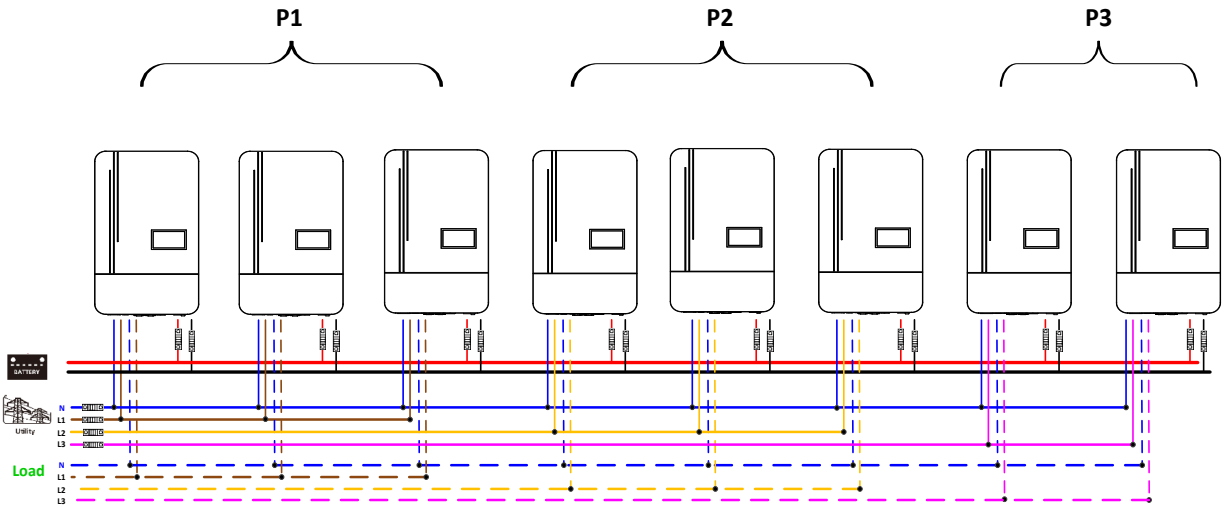


Communication Connection

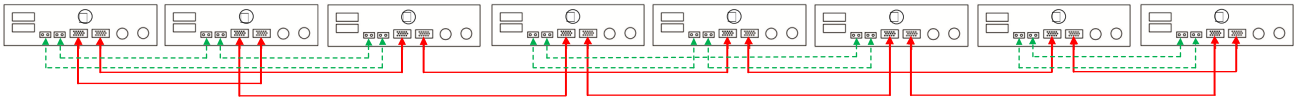


Three inverters in one phase, three inverters in second phase and two inverter for the third phase:

Power Connection

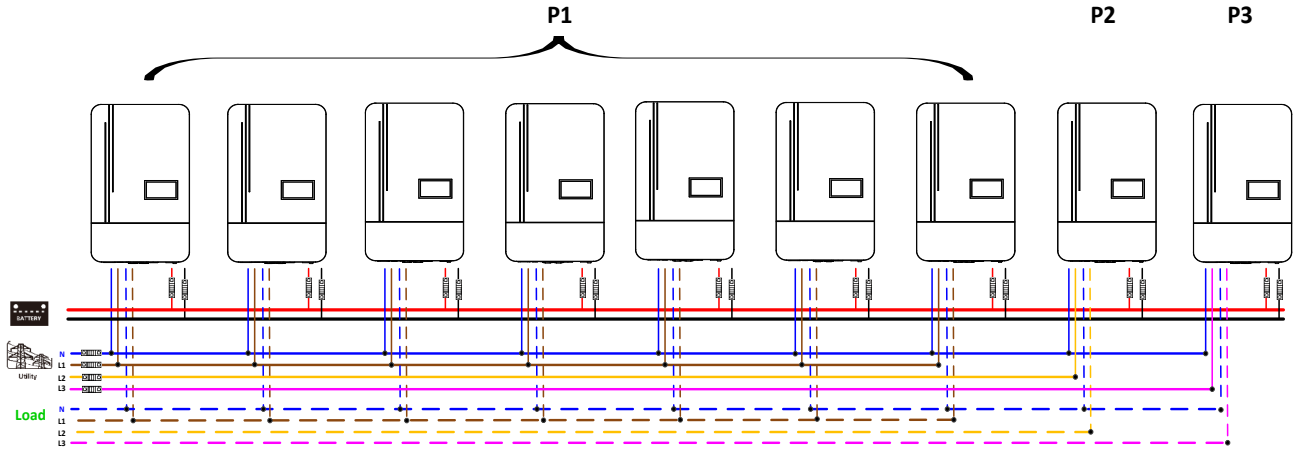


Communication Connection



Seven inverters in one phase and one inverter for the other two phases:

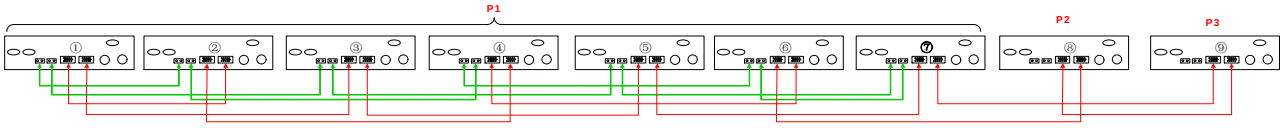
Power Connection



Note: It's up to customer's demand to pick 7 inverters on any phase.

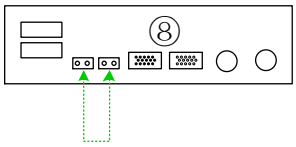
P1: L1-phase, P2: L2-phase, P3: L3-phase.

Communication Connection



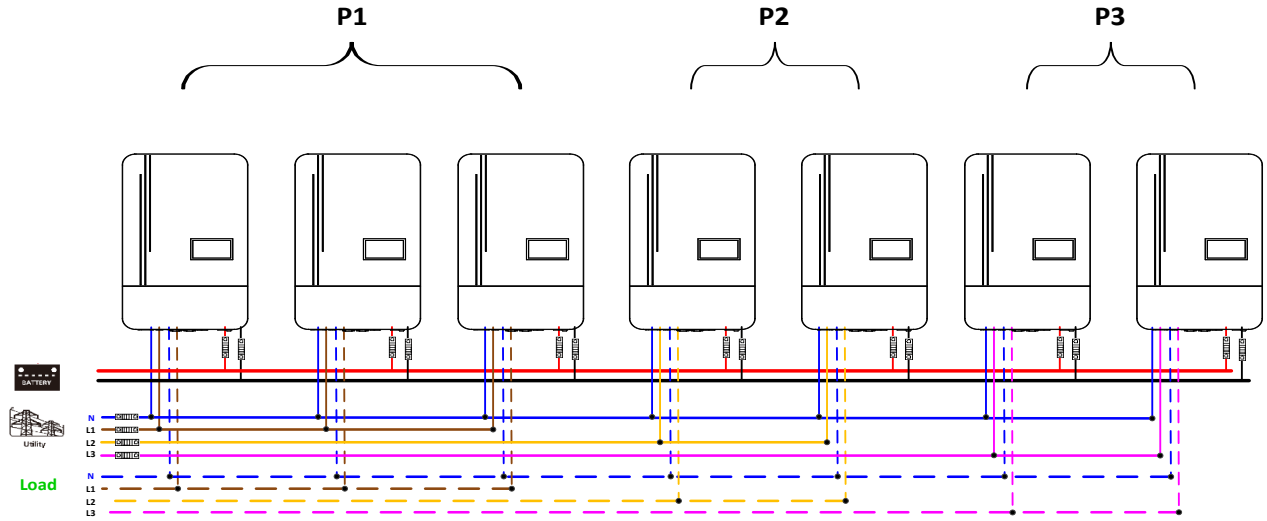
Note: If there is only one unit in one phase, this unit doesn't need to connect the current sharing cable.

Or you connect it like as below:

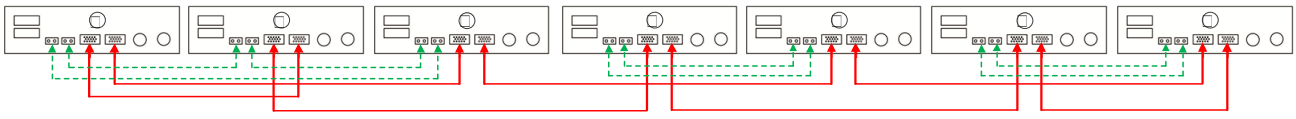


Three inverters in one phase, two inverters in second phase and two inverters for the third phase:

Power Connection

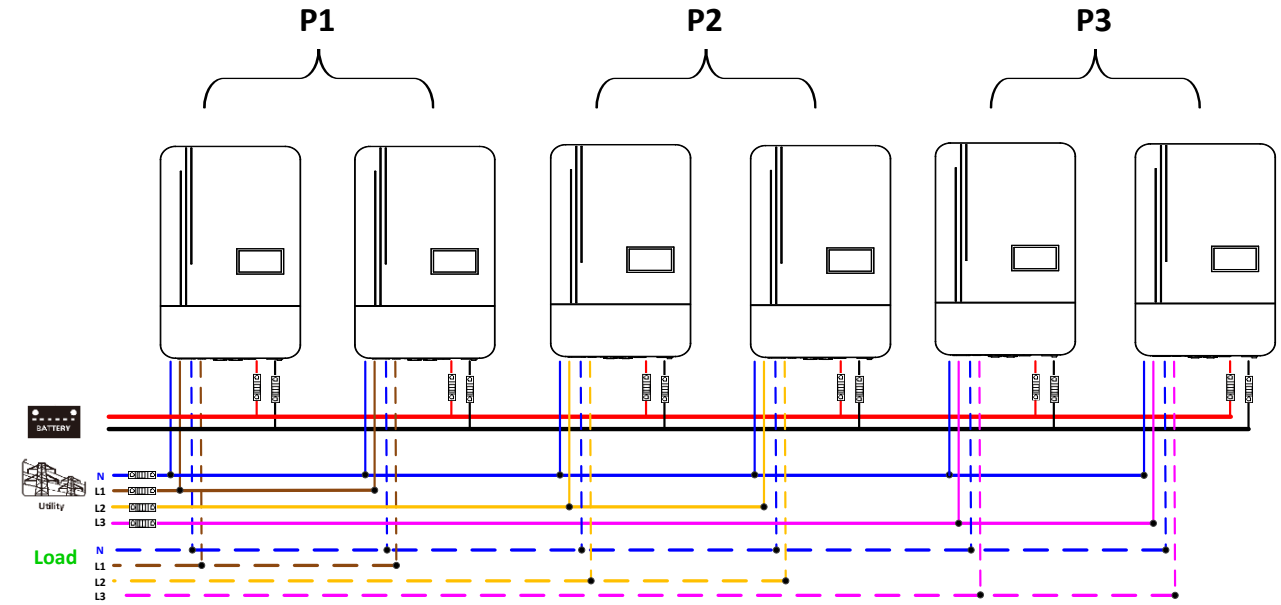


Communication Connection

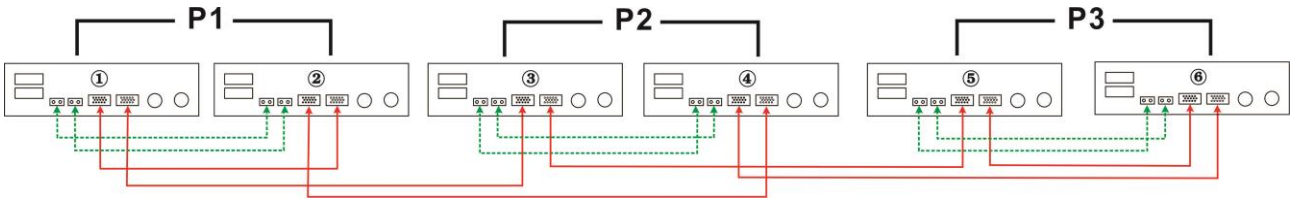


Two inverters in each phase:

Power Connection

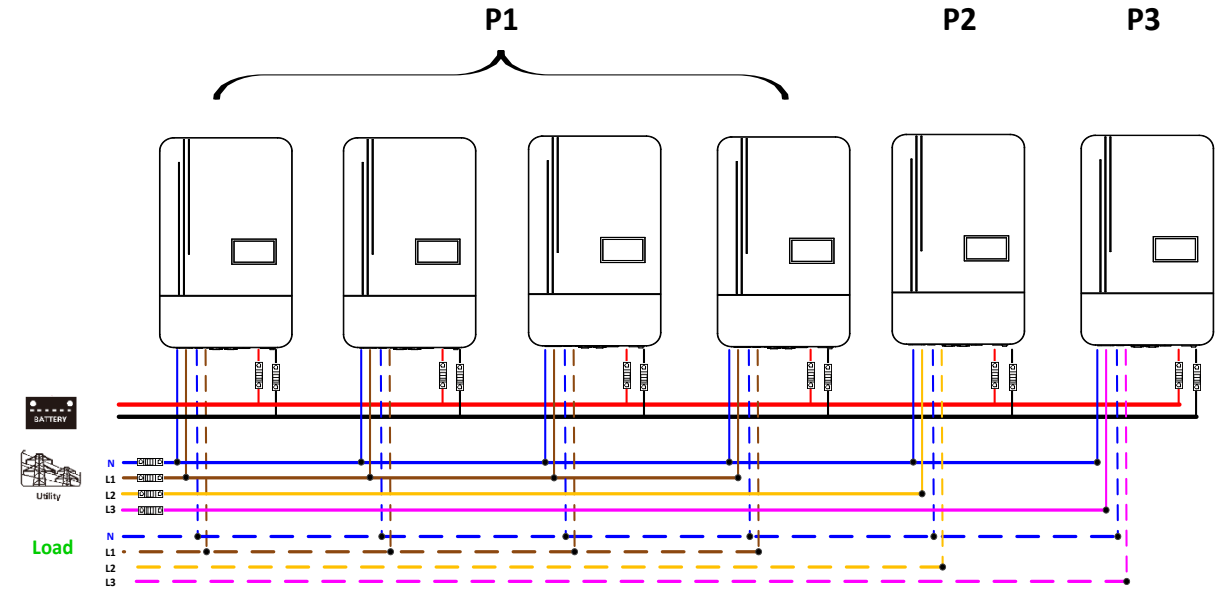


Communication Connection

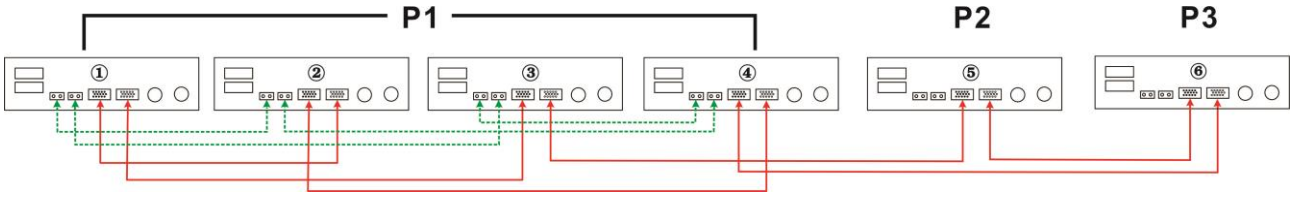


Four inverters in one phase and one inverter for the other two phases:

Power Connection

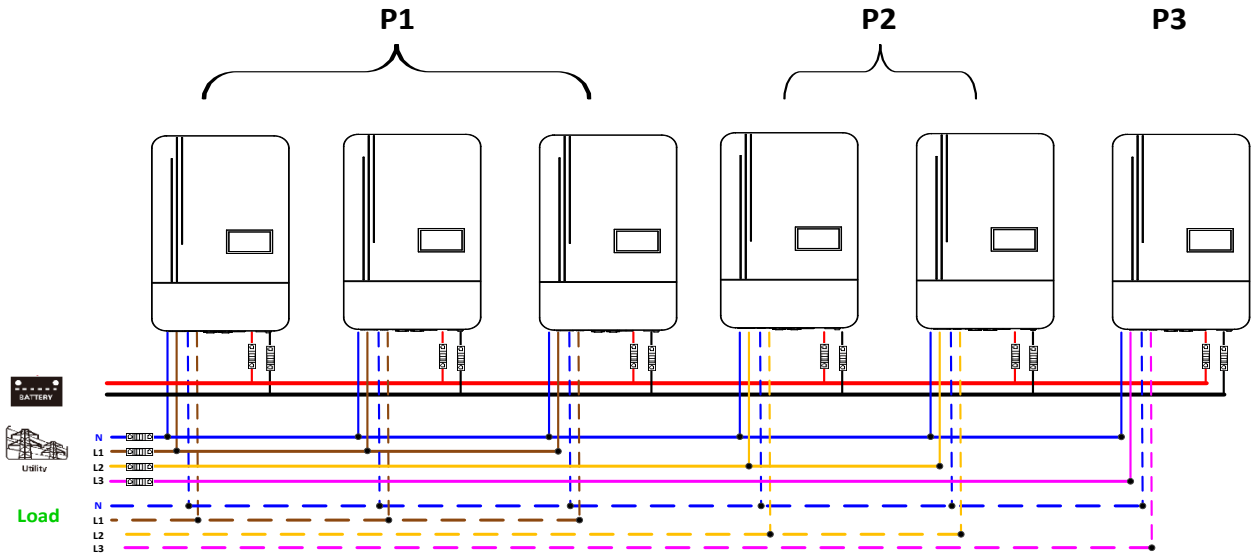


Communication Connection

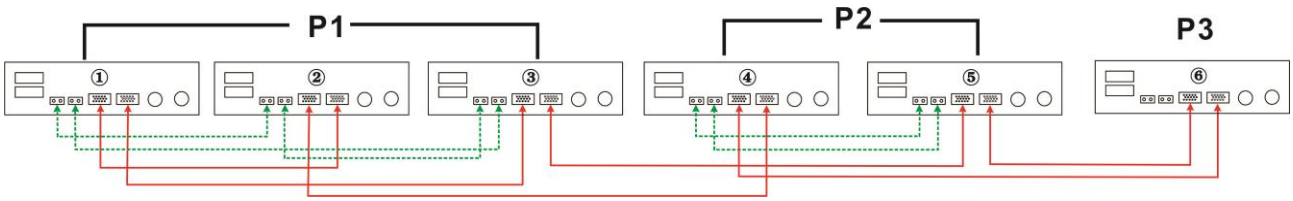


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

Power Connection

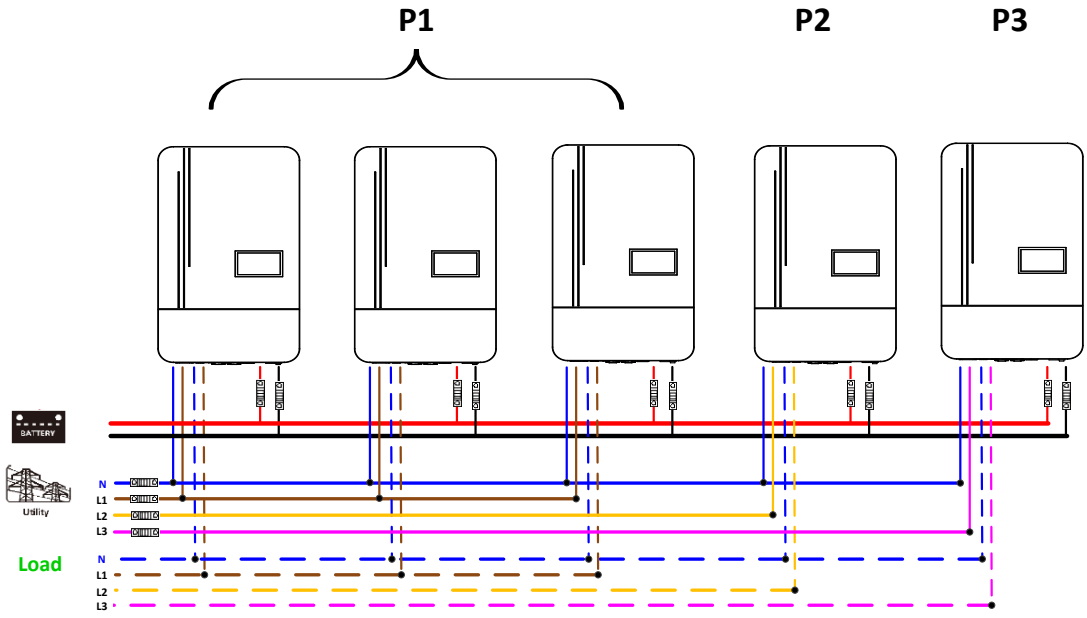


Communication Connection

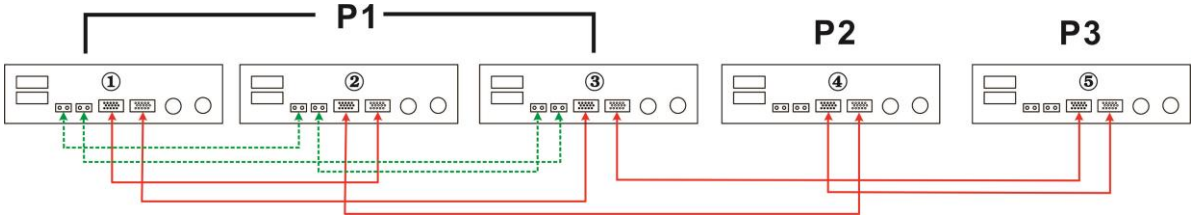


Three inverters in one phase and only one inverter for the remaining two phases:

Power Connection

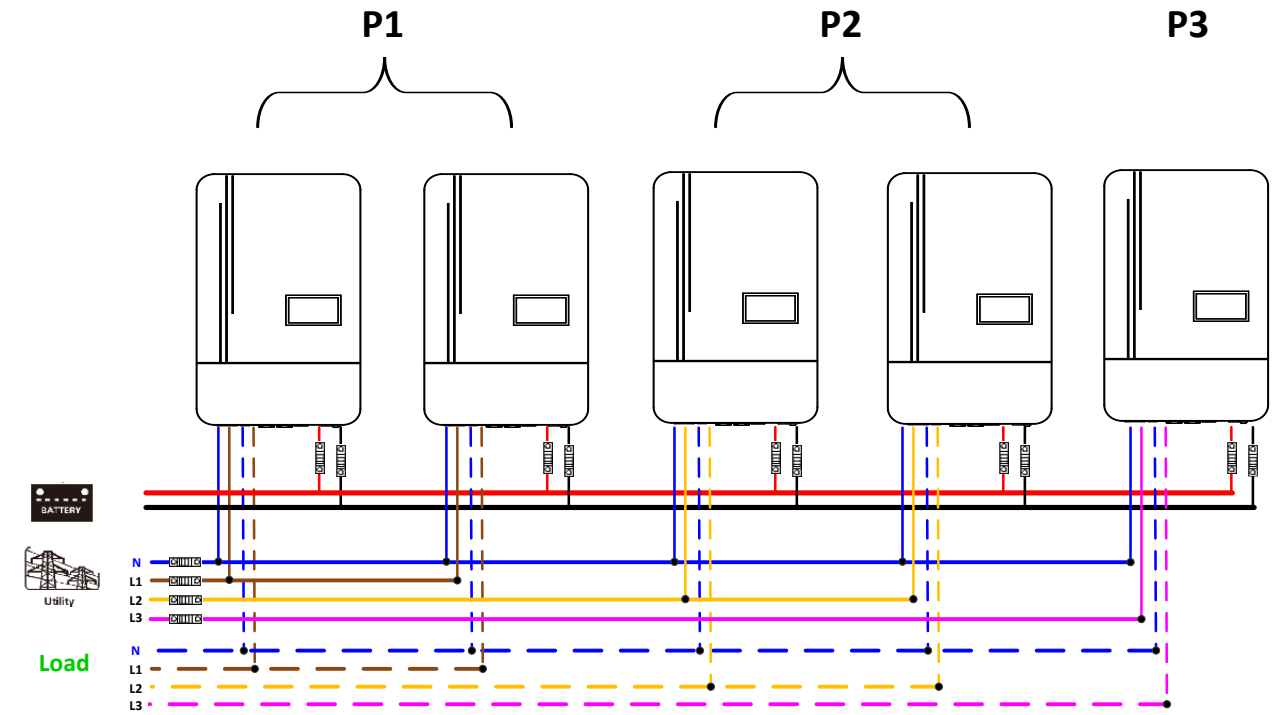


Communication Connection

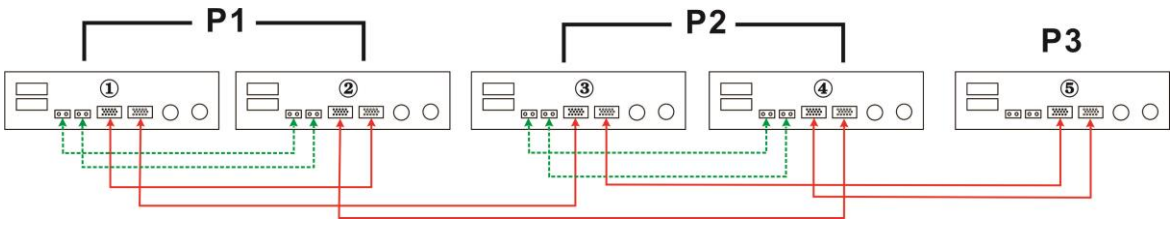


Two inverters in two phases and only one inverter for the remaining phase:

Power Connection

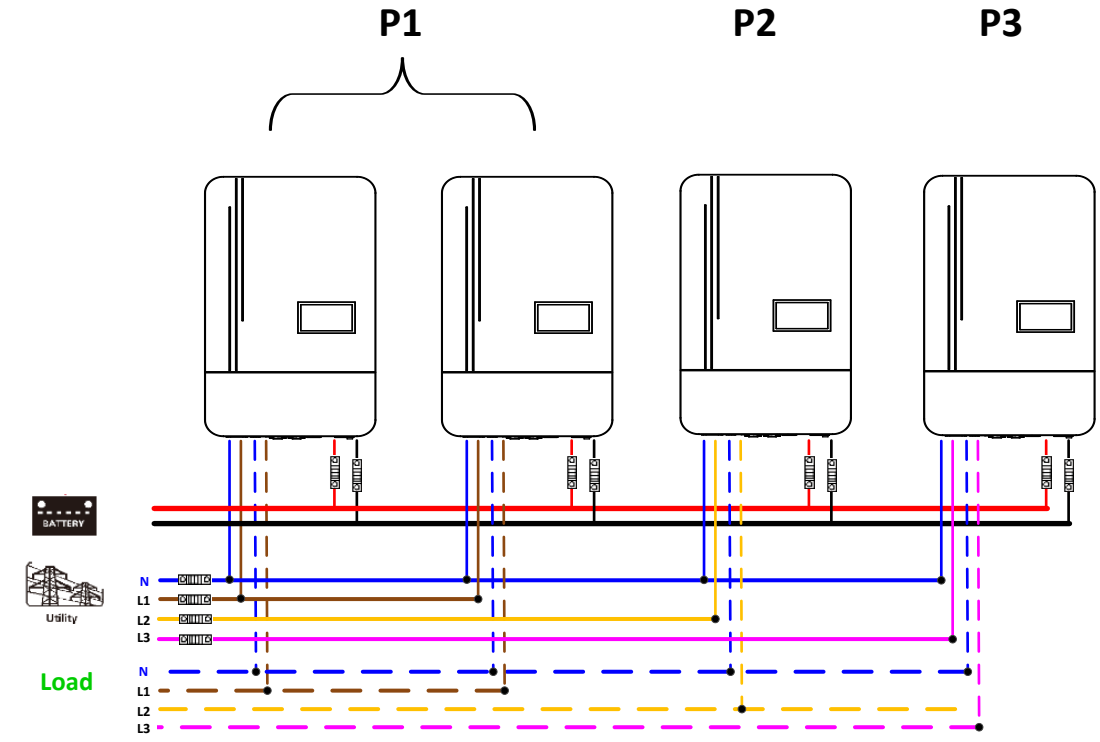


Communication Connection

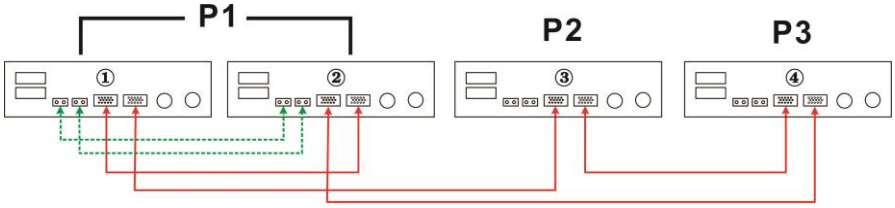


Two inverters in one phase and only one inverter for the remaining phases:

Power Connection

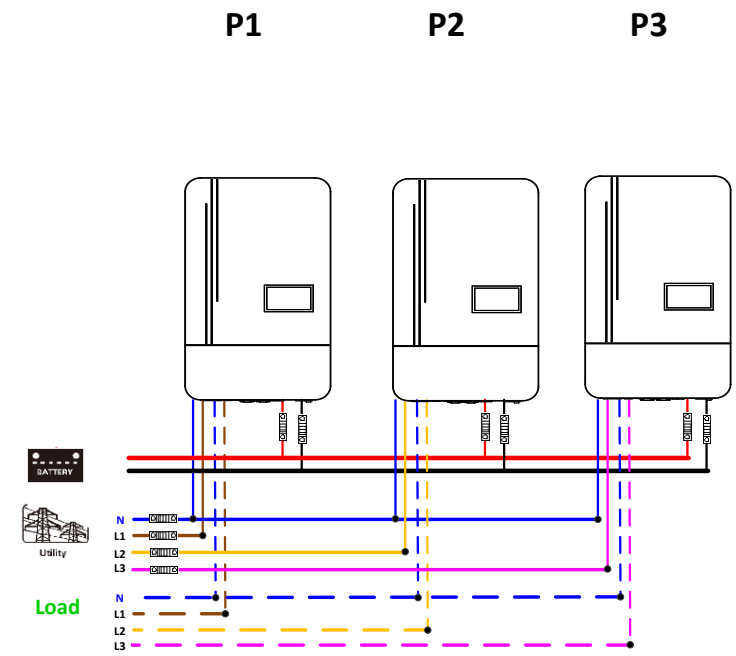


Communication Connection

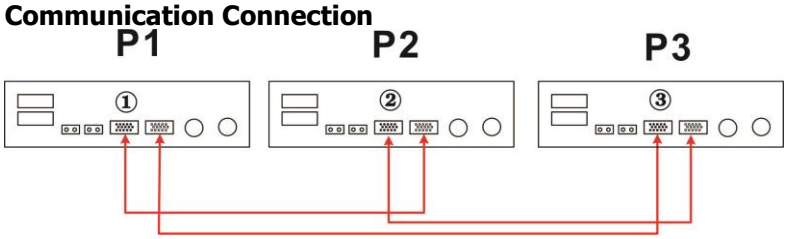


One inverter in each phase:

Power Connection



Communication Connection



WARNING: Do not connect the current sharing cable between the inverters which are in different phases. Otherwise, it may damage the inverters.

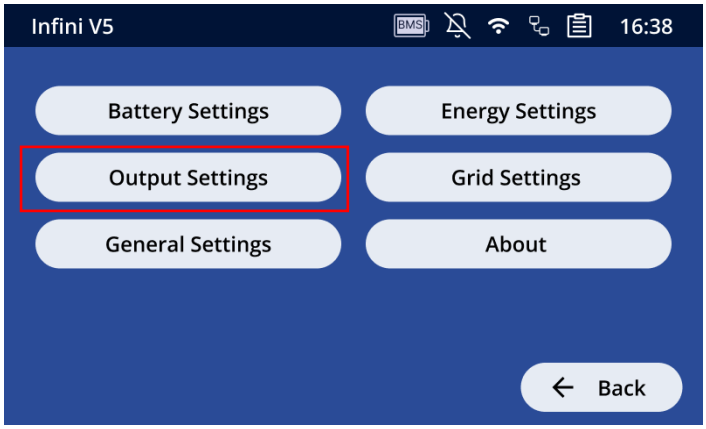
6. PV Connection

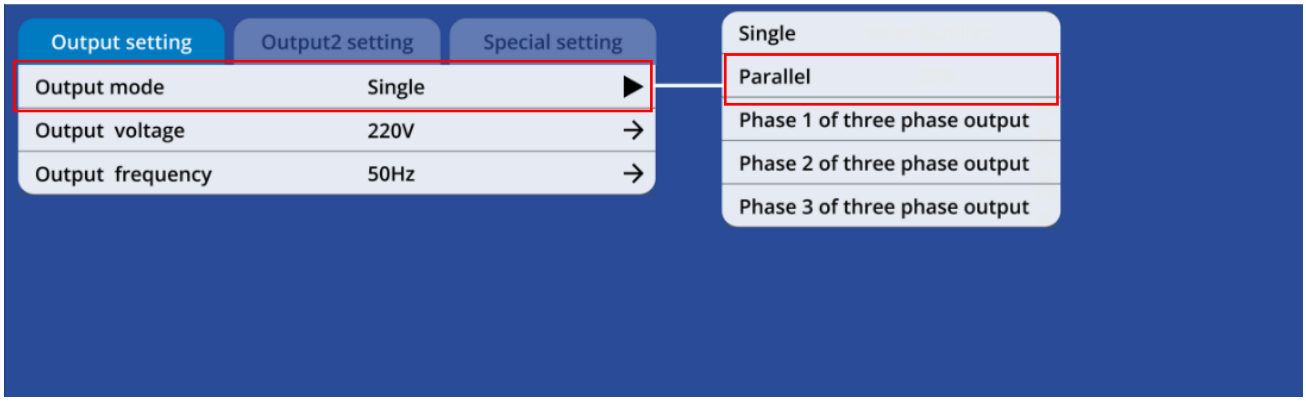
Please refer to user manual of single unit for PV Connection.

CAUTION: Each inverter should connect to PV modules separately.

6. LCD Setting and Display

Parallel mode can be set according to the steps: Output setting→Output mode→ Parallel.





Program	Description	Selectable option	
Output Setting	AC output mode *This setting is only available when the inverter is in standby mode (Switch off).	Single	When the units are used in parallel with single phase, please select "Parallel" in program Output Setting AC output mode.
		Parallel	It is required to have at least 3 inverters or maximum 9 inverters to support three-phase equipment. It's required to have at least one inverter in each phase or it's up to four inverters in one phase. Please select "Phase1" in program AC output mode for the inverters connected to L1 phase, "phase2" in program AC output mode for the inverters connected to L2 phase and "Phase3" in program AC output mode for the inverters connected to L3 phase. Be sure to connect share current cable to units which are on the same phase. Do NOT connect share current cable between units on different phases. Besides, power saving function will be automatically disabled.
		Phase 1	
		Phase 2	
		Phase 3	

Fault code display:

Fault Code	Fault Event
Negative power flow detected	Power feedback protection
FW Different	Firmware version inconsistent
Current sensor failure.	Current sharing fault
CAN lost	CAN fault
HOST lost	Host loss
SYN lost	Synchronization loss
Par-bat fault	Battery voltage detected different
VOL/FREQ different	AC output current unbalance
Output setting different	AC output mode setting is different

7.Trouble shooting

Situation		Solution
Fault Code	Fault Event Description	
Negative power flow detected	Current feedback into the inverter is detected.	1. Restart the inverter. 2. Check if L/N cables are not connected reversely in all inverters. 3. For parallel system in single phase, make sure the sharing are connected in all inverters. For supporting three-phase system, make sure the sharing cables are connected in the inverters in the same phase, and disconnected in the inverters in different phases. 4. If the problem remains, please contact your installer.
Parellel FW uncompatible	The firmware version of each inverter is not the same.	1. Update all inverter firmware to the same version. 2. Check the version of each inverter via LCD setting and make sure the CPU versions are same. If not, please contact your installer to provide the firmware to update. 3. After updating, if the problem still remains, please contact your installer.
CUR sensor failed	The output current of each inverter is different.	1. Check if sharing cables are connected well and restart the inverter. 2. If the problem remains, please contact your installer.
CAN lost	CAN data loss	1. Check if communication cables are connected well and restart the inverter. 2. If the problem remains, please contact your installer.
HOST lost	Host data loss	
SYN lost	Synchronization data loss	
Battery VOL different	The battery voltage of each inverter is not the same.	1. Make sure all inverters share same groups of batteries together. 2. Remove all loads and disconnect AC input and PV input. Then, check battery voltage of all inverters. If the values from all inverters are close, please check if all battery cables are the same length and same material type. Otherwise, please contact your installer to provide SOP to calibrate battery voltage of each inverter. 3. If the problem still remains, please contact your installer.
VOL/FREQ different	AC input voltage and frequency are detected different.	1. Check the utility wiring conncetion and restart the inverter. 2. Make sure utility starts up at same time. If there are breakers installed between utility and inverters, please be sure all breakers can be turned on AC input at same time. 3. If the problem remains, please contact your installer.

Output setting different	AC output mode setting is different.	1. Switch off the inverter and check LCD "Output mode setting". 2. For parallel system in single phase, make sure no 3P1, 3P2 or 3P3 is set on "Output mode setting". For supporting three-phase system, make sure no "PAL" is set on "Output mode setting". 3. If the problem remains, please contact your installer.

Appendix II: BMS Communication Installation

1. Introduction

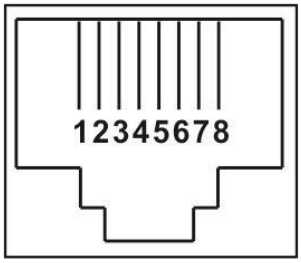
If connecting to lithium battery, it is recommended to purchase a custom-made RJ45 communication cable. Please check with your dealer or integrator for details.

This custom-made RJ45 communication cable delivers information and signal between lithium battery and the inverter. This information is listed below:

- Re-configure charging voltage, charging current and battery discharge cut-off voltage according to the lithium battery parameters.
- Have the inverter start or stop charging according to the status of lithium battery.

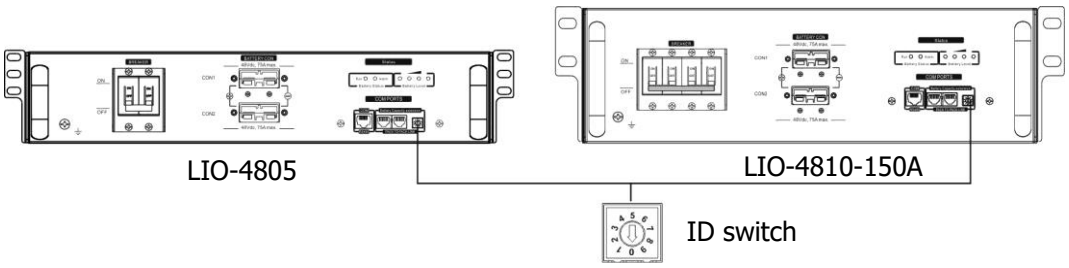
2. Pin Assignment for BMS Communication Port

	Definition
PIN 1	RS232TX
PIN 2	RS232RX
PIN 3	RS485B
PIN 4	NC
PIN 5	RS485A
PIN 6	CANH
PIN 7	CANL
PIN 8	GND

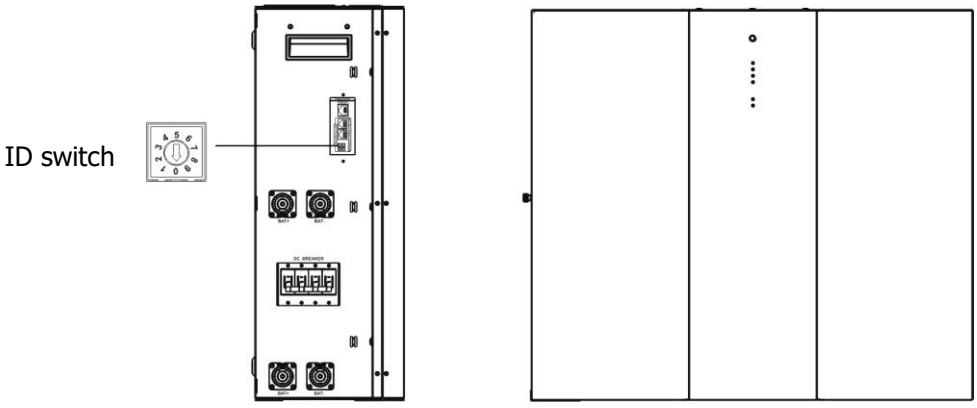


3. Lithium Battery Communication Configuration

LIO-4805/LIO-4810-150A



ESS II-4810



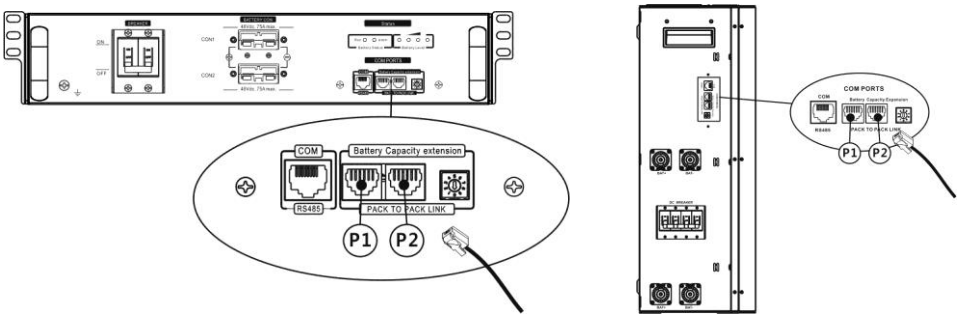
ID Switch indicates the unique ID code for each battery module. It's required to assign a unique ID to each battery module for normal operation. We can set up the ID code for each battery module by rotating the PIN number on the ID switch. From number 0 to 9, the number can be random; no particular order. Maximum 10 battery modules can be operated in parallel.

4. Installation and Operation

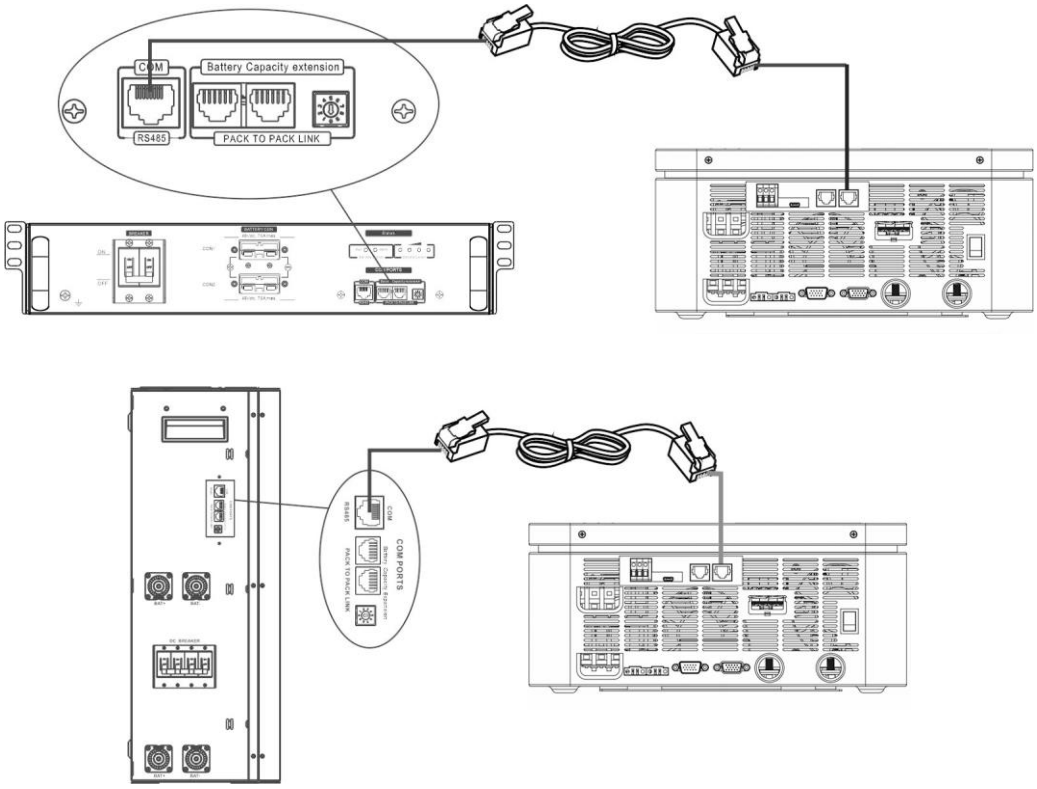
LIO-4805/LIO-4810-150A/ESS II-4810

After ID no. is assigned for each battery module, please set up LCD panel in inverter and install the wiring connection as following steps.

Step 1: Use supplied RJ11 signal cable to connect into the extension port (P1 or P2).



Step 2: Use supplied RJ45 cable (from battery module package) to connect inverter and Lithium battery.

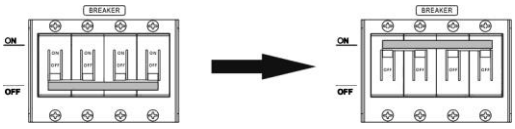


*** For multiple battery connection, please check battery manual for the details.**

Note for parallel system:

1. Only support common battery installation.
2. Use custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set this inverter battery type to "LIB" in LCD. Others should be "USE".

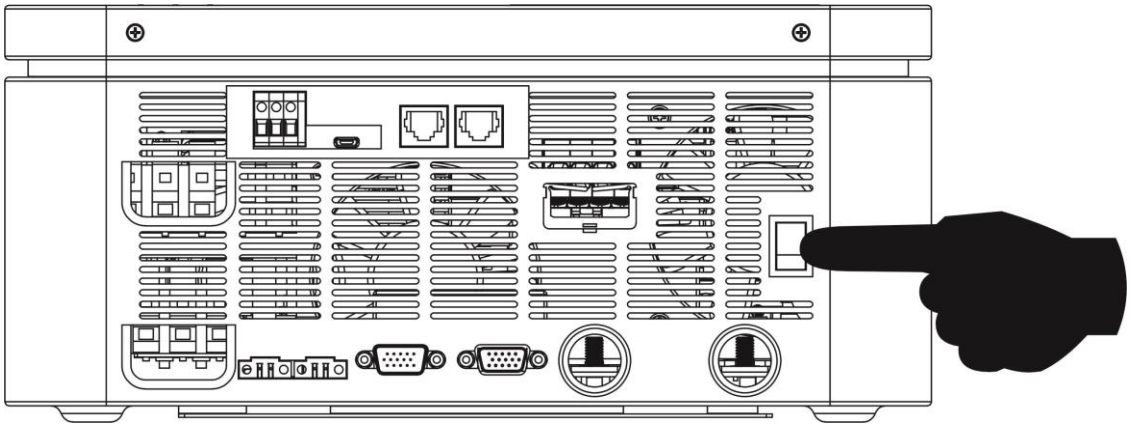
Step 3: Turn the breaker switch "ON". Now, the battery module is ready for DC output.



Step 4: Press Power on/off button on battery module for 5 secs, the battery module will start up.

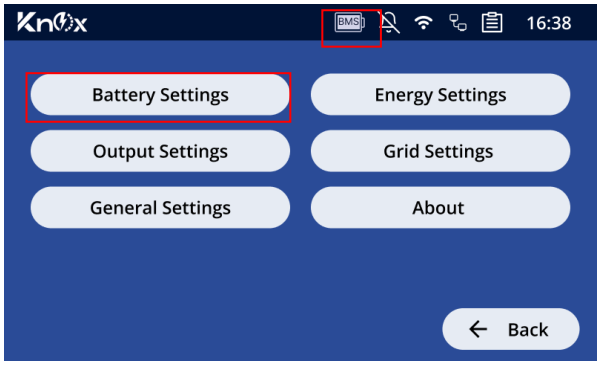
*If the manual button cannot be approached, just simply turn on the inverter module. The battery module will be automatically turned on.

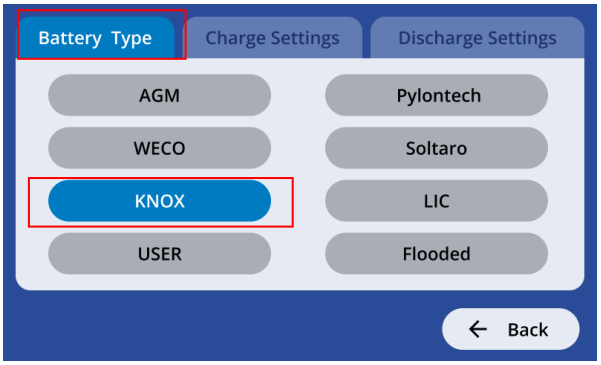
Step 5: Turn on the inverter.



Step 6. Be sure to select battery type as "KNOX" in battery Setting.

If communication between the inverter and battery is successful, The BMS icon will display.





5. Code Reference

Related information code will be displayed on LCD screen. Please check inverter LCD screen for the operation.

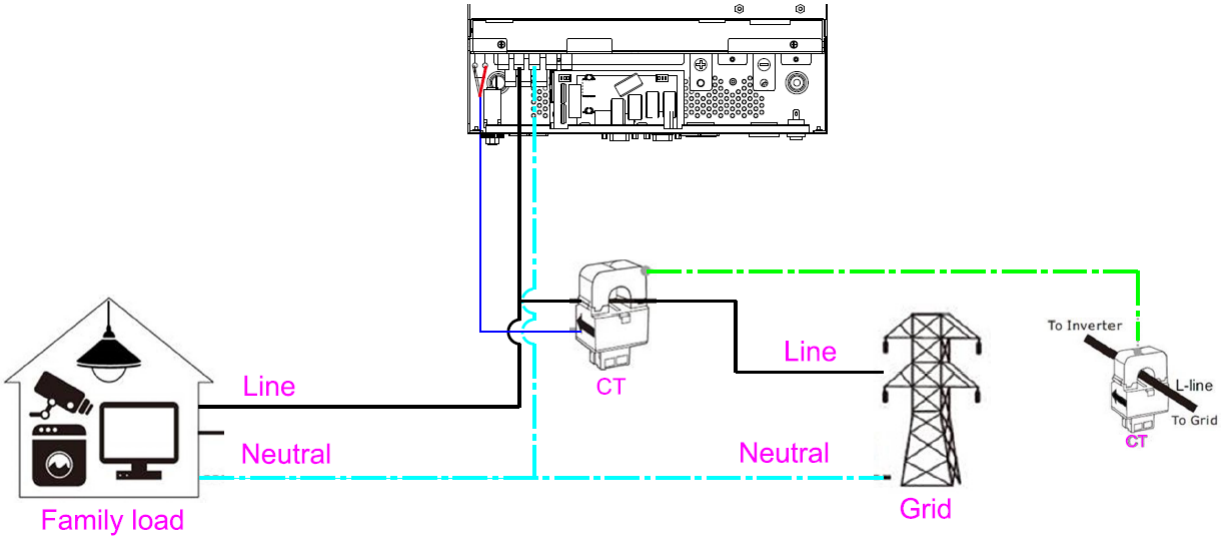
Warning Code	Description
BMS Communication loss	Communication lost (only available when the battery type is not set as "AGM", "Flooded", or "User-Defined"). ● After the battery is connected, communication signal is not detected for 3 minutes, the buzzer will beep. After 10 minutes, the inverter will stop charging and discharging to the lithium battery. Communication loss occurs after the inverter and battery are connected successfully, buzzer beeps immediately.
BAT stop charge/discharge	If battery status is not allowed to charge and discharge, the communication between the inverter and battery is successful.
The battery stops charging	If battery status is not allowed to charge after the communication between the inverter and battery is successful.
Battery force charging	If the battery status must be charged after the communication between the inverter and battery is successful.
The battery stops discharging	If battery status is not allowed to discharge, the communication between the inverter and battery is successful.

Appendix III: The CT Operation Guide

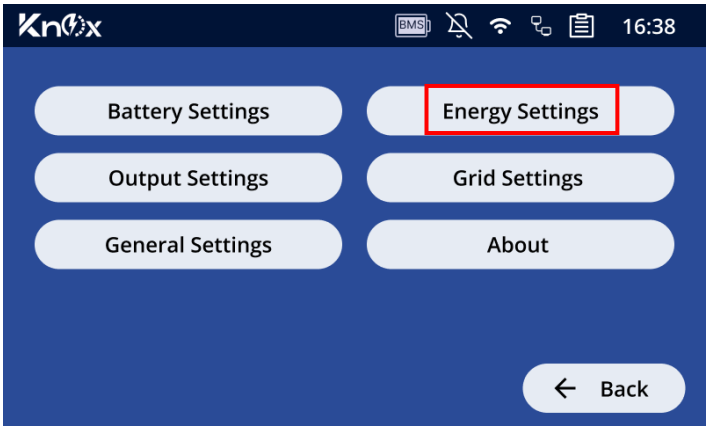
With CT connected, solar inverter can be easily integrated into the existing household system. It's to arrange self-consumption via CT to control power generation and battery charging of the inverter. Please purchase it separately if it's required.

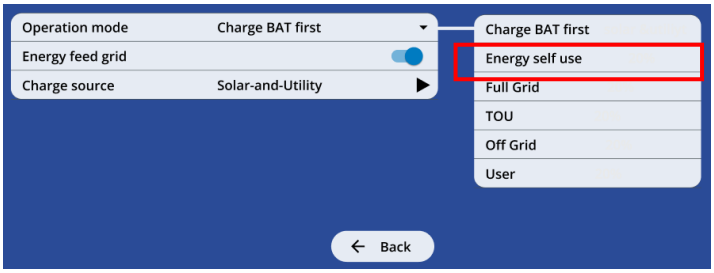
1. Single commissioning

Step 1. Power off the inverter and connect the external CT by using the tool accessory to install on the spring terminal block. Be noted the mark of current flow direction on the CT should point to the Inverter and the polarity on connecting CT wires on the terminal block should be followed as "L+" vs red wire and "L-" vs white wire.



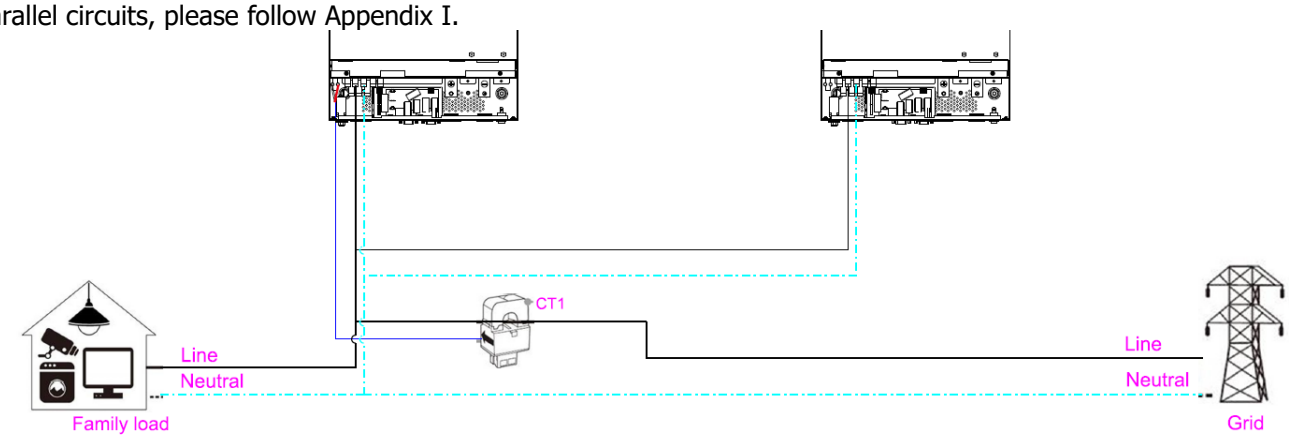
Step 2: Power on the inverter
Step 3: Enter Operation mode setting and select "Energy self-use" mode on the inverter with CT sensor connected, and set CT function to "enable".





2. Parallel commissioning

Step 1. Power off the inverter and connect the CT sensor according to the wiring diagram below. For other parallel circuits, please follow Appendix I.



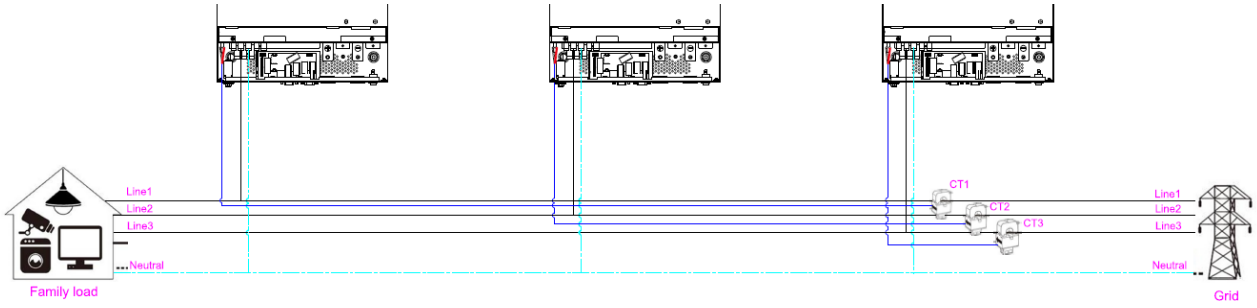
Step 2: Power on each inverter.

Step 3: Enter LCD setting on the inverter with CT sensor connected and set CT function to "enable". Same as single phase setting

IMPORTANT ATTENTION:
If applying CT function during parallel operation, it only needs **one inverter** from parallel system connected to CT sensor. Be sure to enable #67 external CT function on the one inverter with CT connected and set up "Disable" on the remaining inverters. Otherwise, it will cause CT function not working during parallel operation.

3. Three-phase commissioning

Step 1. Power off the inverter and connect the CT sensor according to the wiring diagram below. For other parallel circuits, please follow Appendix I.



Step 2: Power on each inverter.

Step 3: Enter LCD setting on the inverter with CT sensor connected and set CT function to "enable". Same as single phase setting

IMPORTANT ATTENTION:
If applying CT function during three-phase operation, it is required to have **one CT sensor connected to inverter in each phase.** Be sure to enable #67 external CT function on the one inverter with CT connected and set up "Disable" on the remaining inverters for this phase. Otherwise, it will cause CT function not working during parallel operation.

Appendix IV: The Wi-Fi Operation Guide

1. Introduction

Wi-Fi module can enable wireless communication between solar inverters and the monitoring platform. Users can remotely monitor and control their inverters when they combine the Wi-Fi module with KNOXHYBRID APP. The App uses the Wi-Fi chip to provide remote monitoring data services, which is beneficial for the daily data monitoring of the inverter, querying the real-time data in the device, sending commands from the device, and operating the device remotely. The app is available for both iOS and Android.

2. Knox APP

2-1. Download and install APP

Please find "KNOXHYBRID" APP from Apple® store or Google® Play Store. Install this APP in your mobile phone.

Or scan the following QR code with your smart phone and download KNOXHYBRID APP.

(Android system) (iOS system)

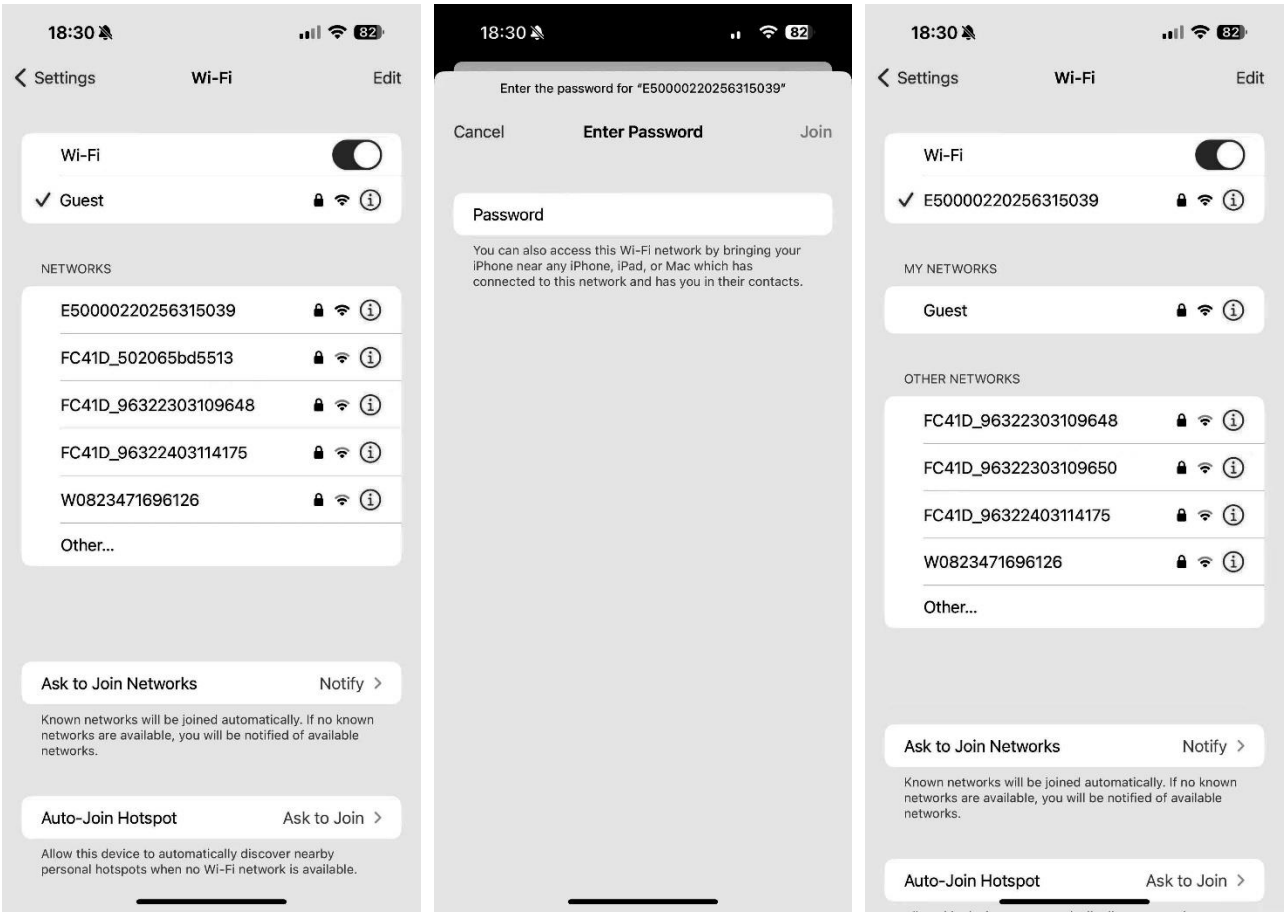
2-2. Initial Setup

Use the KNOXHYBRID app to configure the Wi-Fi module's network via local Wi-Fi or Bluetooth.

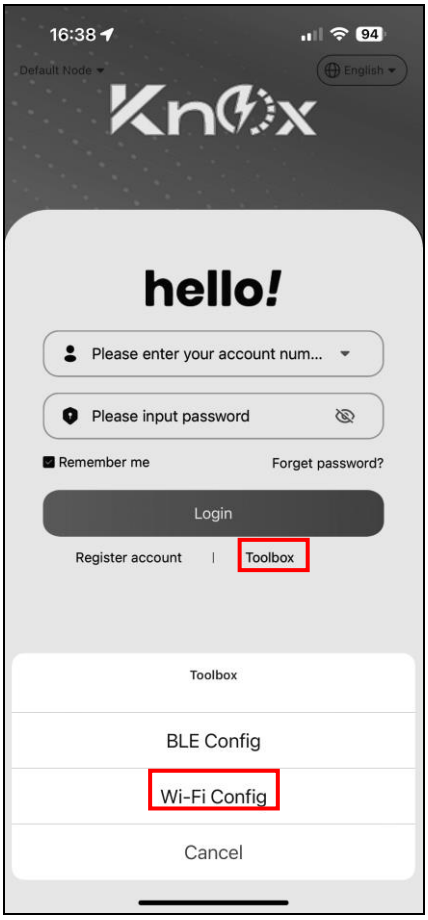
Local Wi-Fi Configuration

If you have configured the network through Bluetooth, please skip this section.

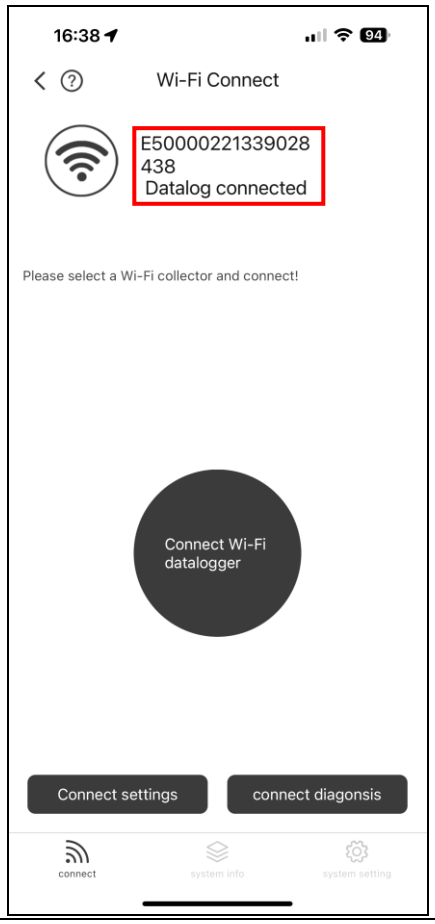
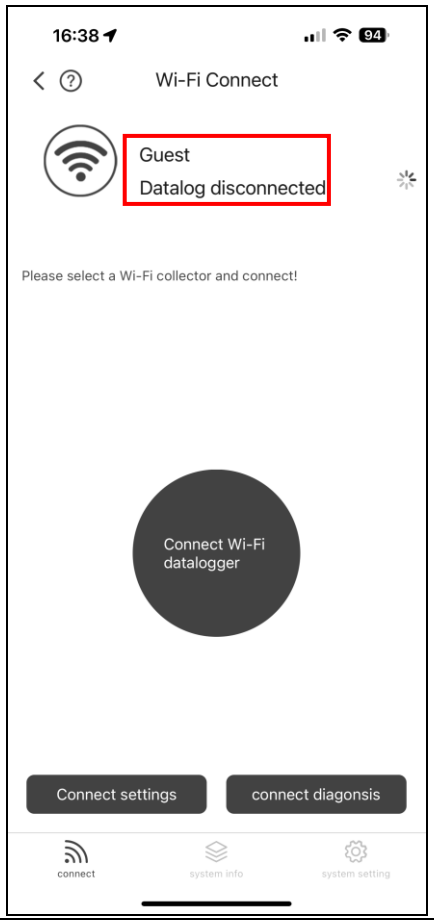
- Turn on the unit.
- Open the Wi-Fi settings on your smartphone.
- Connect your smartphone to the Wi-Fi module (the module's PN number is 18 digits).
- The default password is 12345678



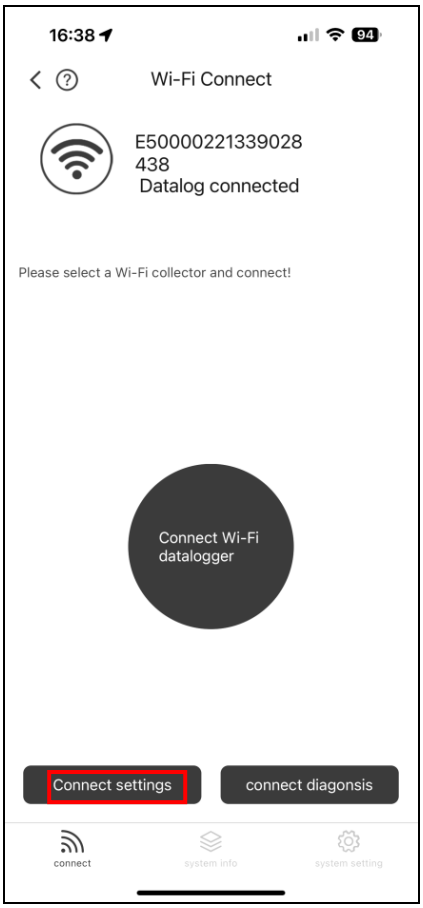
- After a successful Wi-Fi connection, open the KNOXHYBRID app on your phone. On the login page, select "Toolbox," then "Wi-Fi Config" to access the Wi-Fi configuration settings.

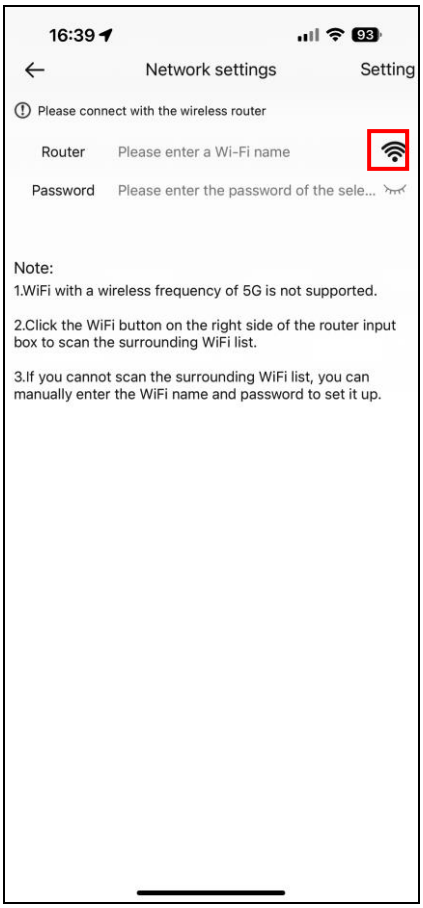


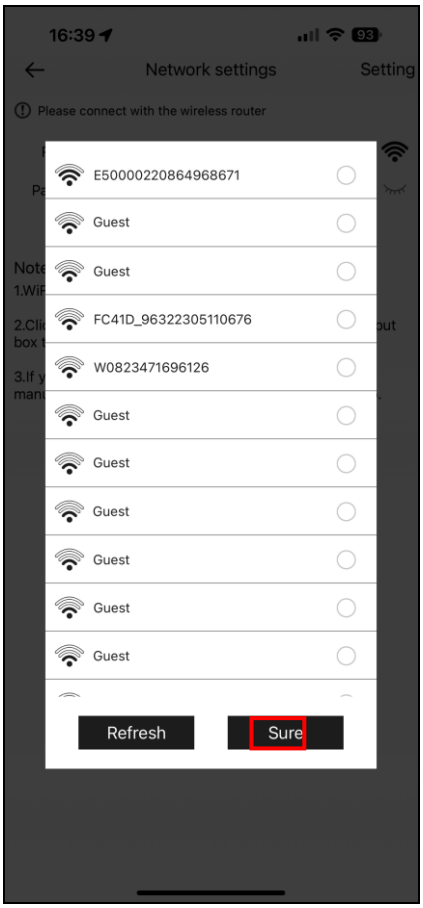
- After entering the Wi-Fi configuration page, please note that the connected Wi-Fi name **must** be the **same as your Wi-Fi module PN number**, and the status **must** be **connected**. If not, please return to the login page, connect your smart phone to the Wi-Fi module, and re-enter the Wi-Fi configuration page.

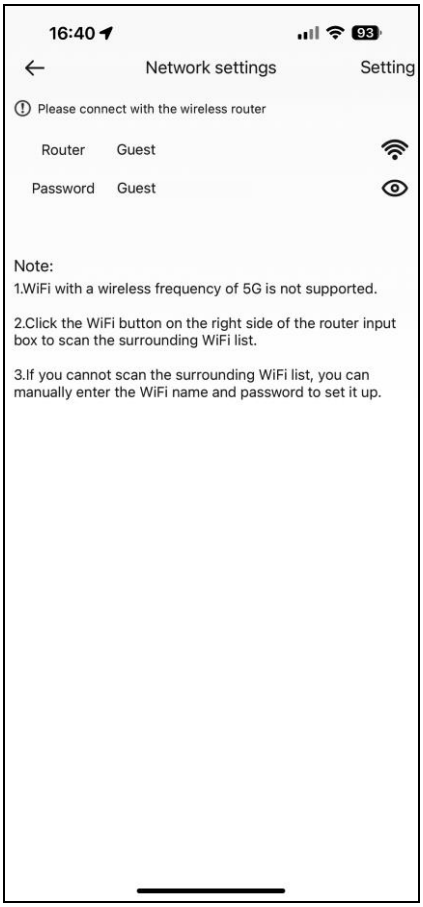
The Wi-Fi module connection is **successfully**	The Wi-Fi module connection **failed**
You can proceed to the next step to configure the network.	Please return to the login page, connect your smart phone to the Wi-Fi module, and re-enter the Wi-Fi configuration page.
	

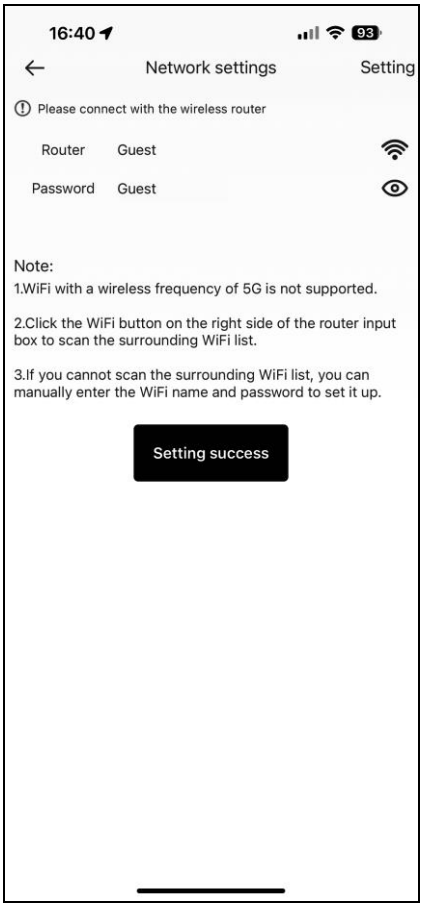
- Click "Connect settings" to manually enter the router name or click to choose the router name. Then, enter the router password and click the "Setting" to complete the setting.
  The Wi-Fi module only could connect the router at **2.4GHz**.



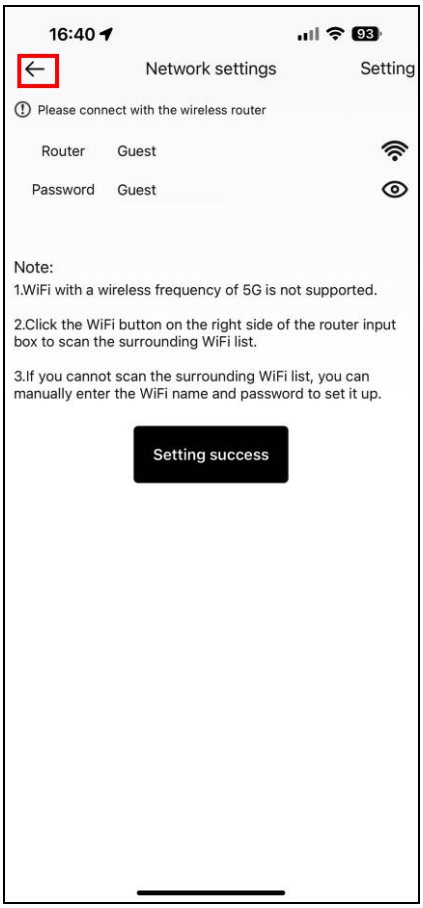


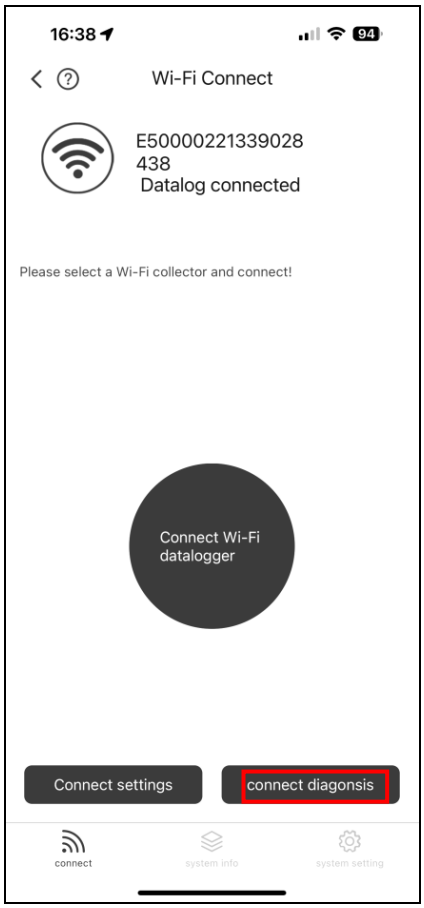




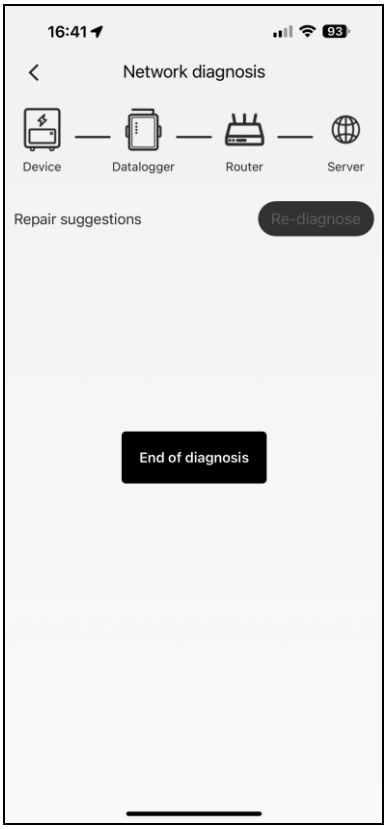


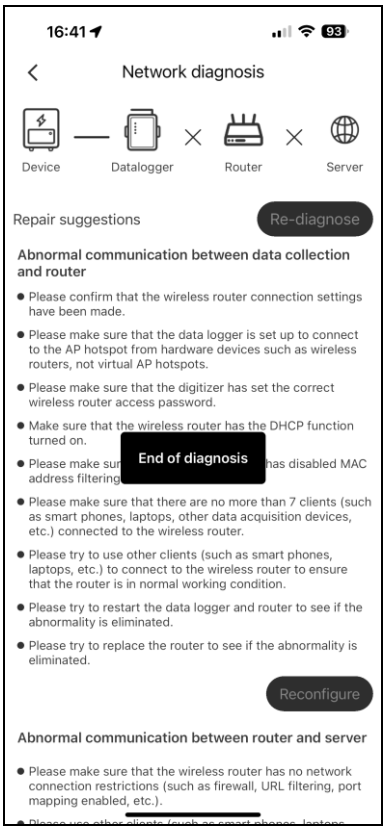
- Click ← to return to the Wi-Fi configuration page. Click "Connect diagnosis" to check the connection status.



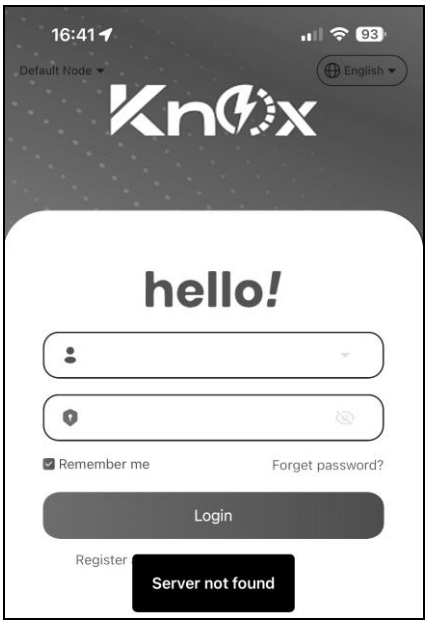


The configuration is **successfully**	The configuration **failed**
Green lines between device, datalogger, router, and server.	Red crosses between device, datalogger, router, and server. Please refer to APP instructions to re-configure.





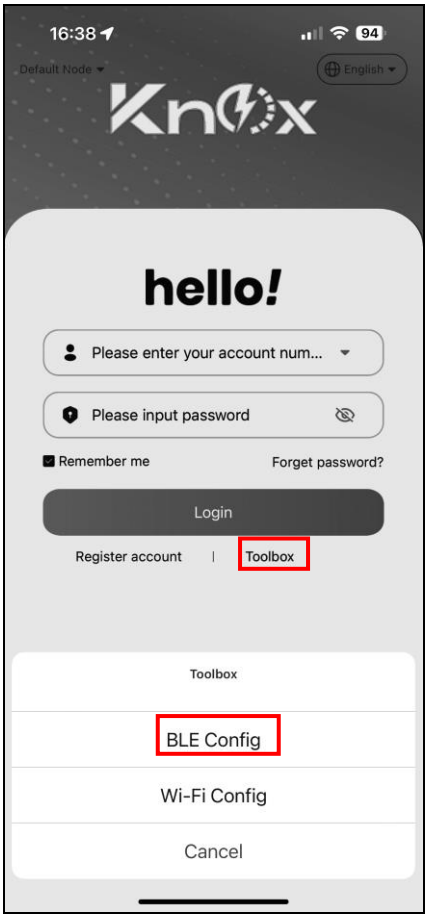
- After configuring Wi-Fi, please **forget** the Wi-Fi module on your smartphone to avoid automatic reconnection and unable to access the network. The login page will prompt "Server not found".



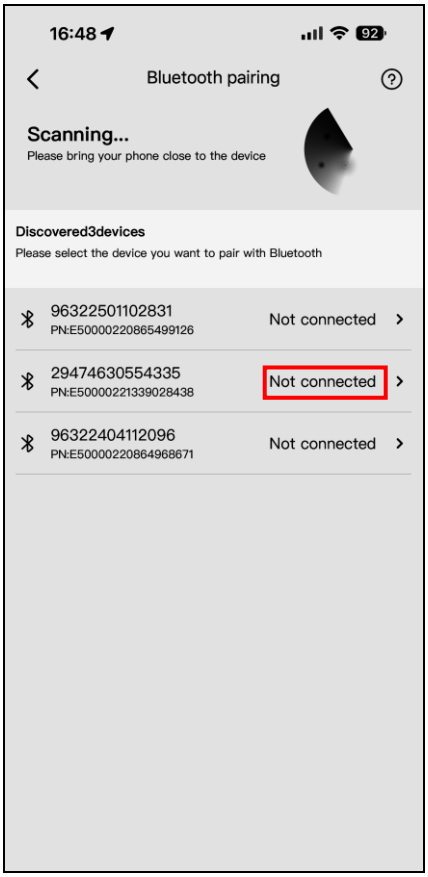
Bluetooth Configuration

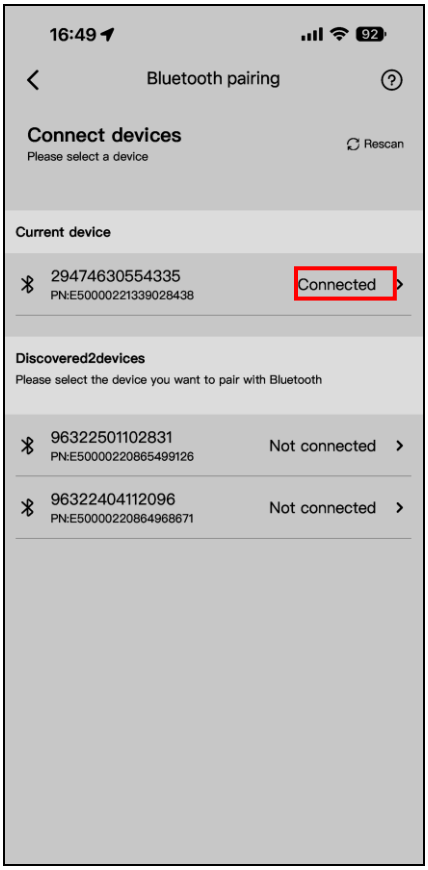
If you have configured the network through Wi-Fi, please skip this section.

- Turn on the unit.
- Open the Bluetooth from your smart phone.
- Click the KNOXHYBRID APP installed in the phone to enter the login page. Then, click the "Toolbox" and choose "BLE Config" to enter the Bluetooth configuration page.

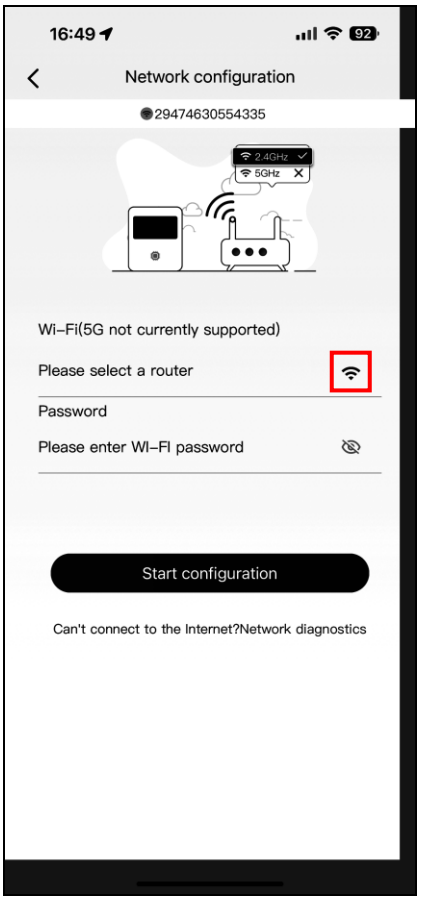


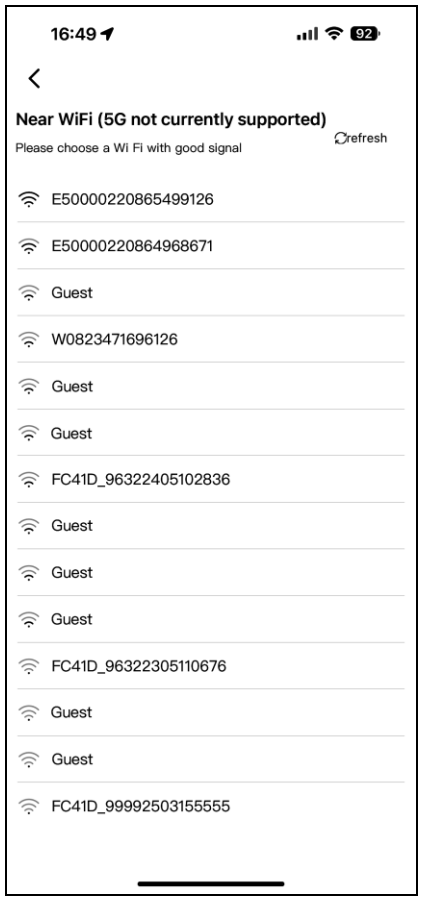
- Connect your smartphone to the Wi-Fi module through Bluetooth.

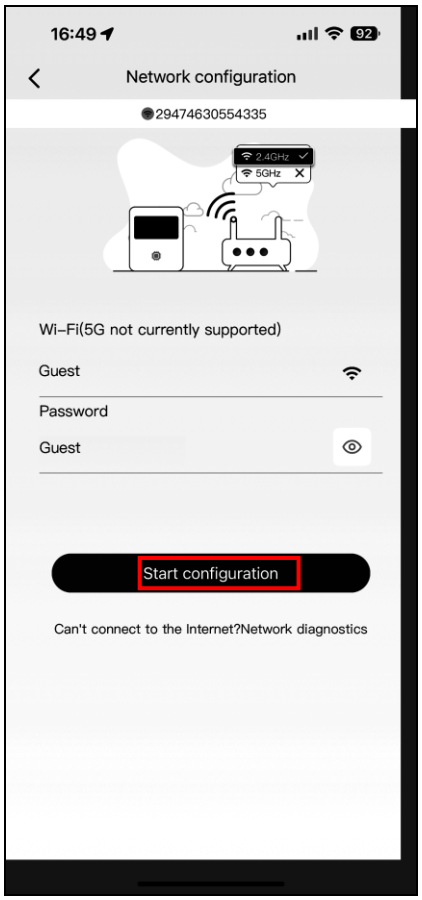


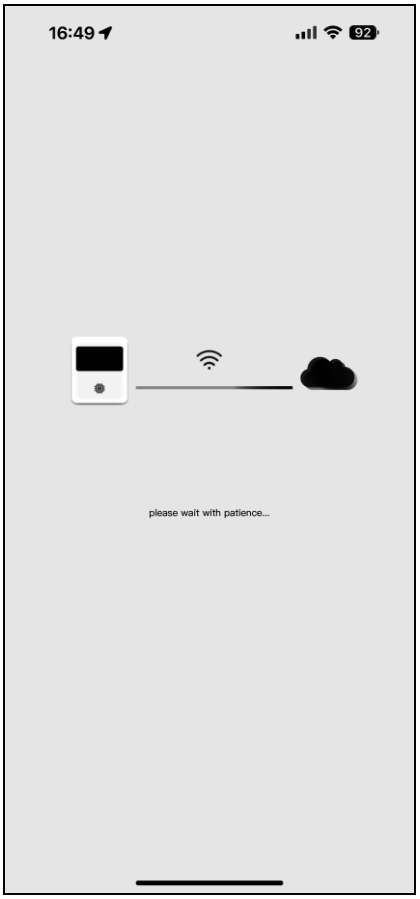


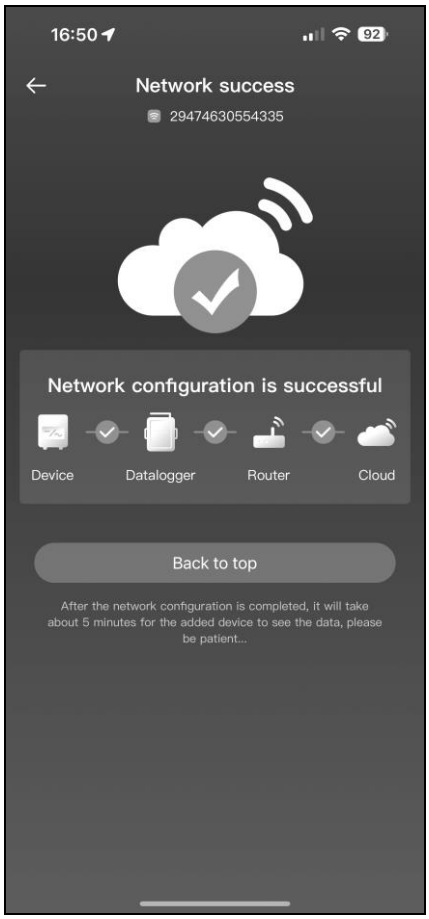
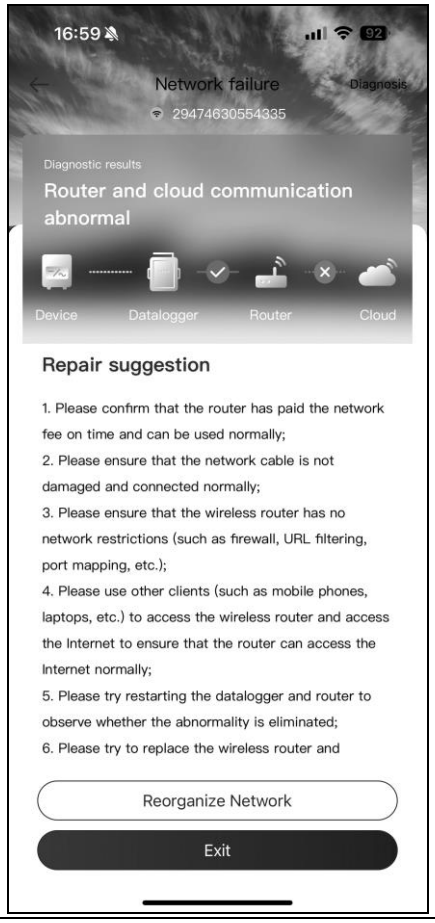
- Manually enter the router name or click  to choose the router name, enter the router password, and then click the "Setting" to complete the setting. Click "Start configuration" to check the connection status. The Wi-Fi module only could connect the router at **2.4GHz**.



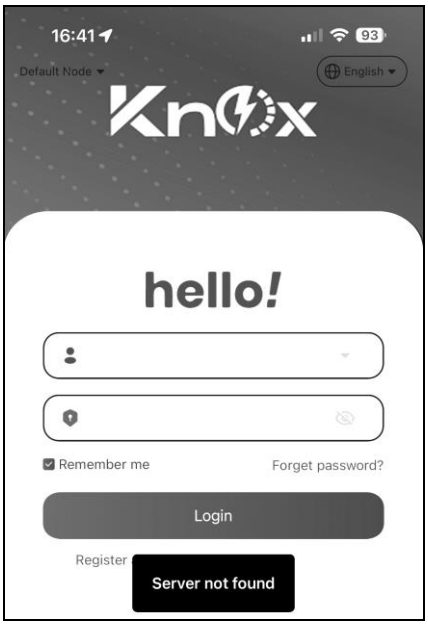






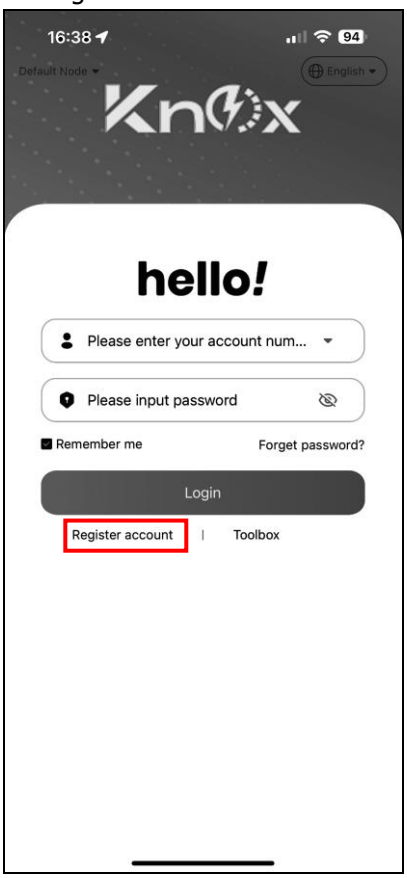
The configuration is **successfully**	The configuration **failed**
Green lines between device, datalogger, router, and server. 	Red crosses between device, datalogger, router, and server. Please refer to APP instructions to reconfigure. 

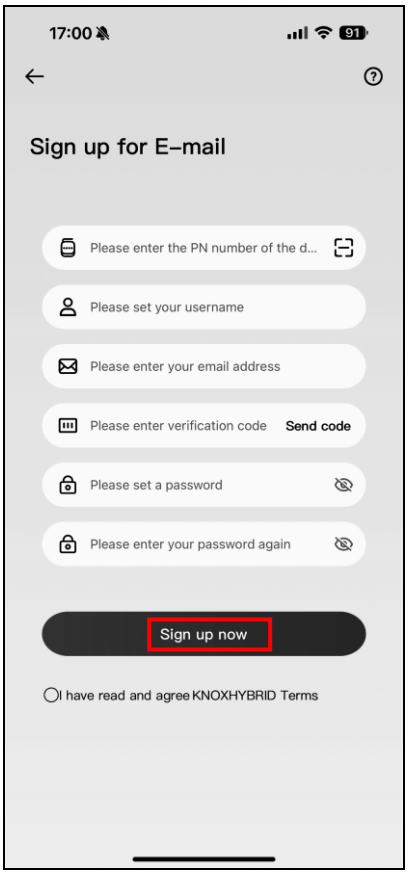
- After configuring Bluetooth, please **disconnect** the Wi-Fi module from your smartphone's Bluetooth settings to prevent automatic reconnection and unable to access the network. The login page will prompt "Server not found".

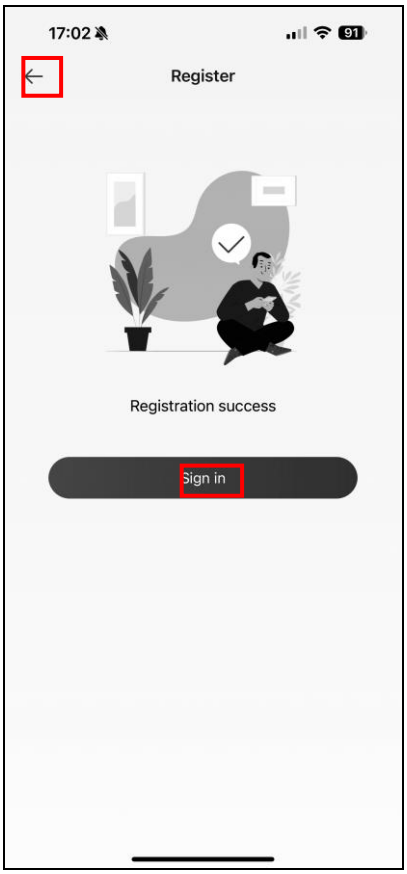


2-3 Registration and login

- Connect your smart phone to the router.
- Registration at first time.
- Click the "Register" to enter registration page and fill in the information. Once registration is complete, click "Sign in" or click ← to return to the home page. Then, enter the registered username and password to log in.

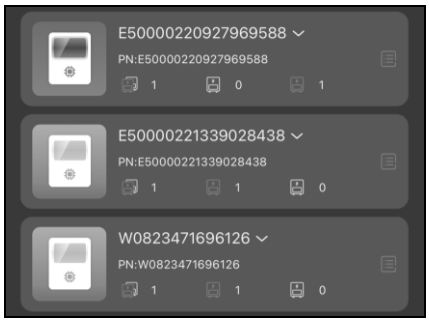






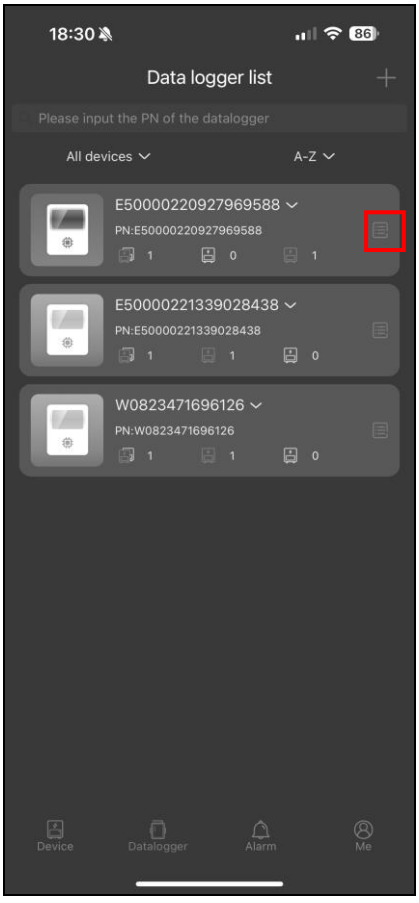
2-4 Datalogger

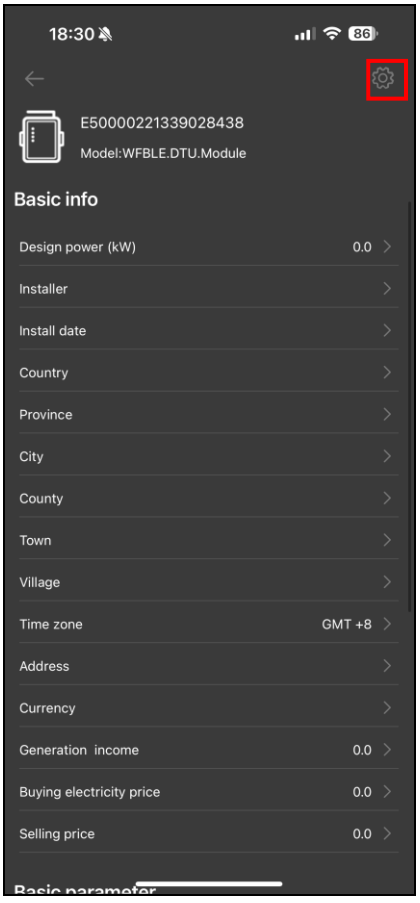
- After login, the default Home page will appear.
- Choose Datalogger page to see the Wi-Fi module list.
  - Gray icon means Wi-Fi module is offline. Please refer to 2-2 Initial Setup to choose local Wi-Fi or Bluetooth configure Wi-Fi module network.
  - Green icon means Wi-Fi module is online.

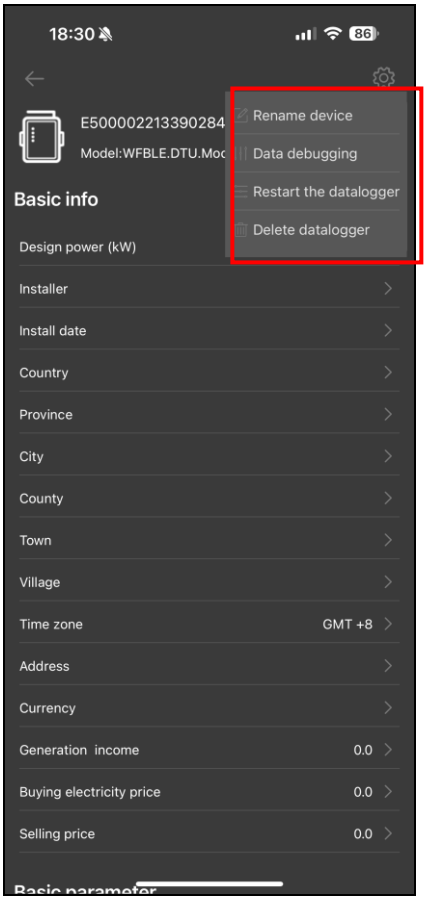


- Click  to see the Wi-Fi module information.

- Click  to rename device, data debugging, restart the datalogger, and delete datalogger.
  - Rename device: rename the Wi-Fi module name.
  - Data debugging: send RS232 commands to the inverter in hexadecimal format.
  - Restart the datalogger: restart the Wi-Fi module.
  - Delete datalogger: delete the Wi-Fi module. The inverter information in the device page will **also be deleted**. Once deleted, you **can** add datalogger under another account.

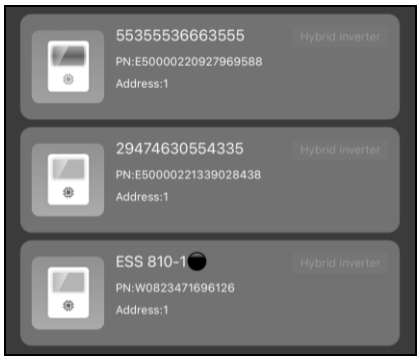






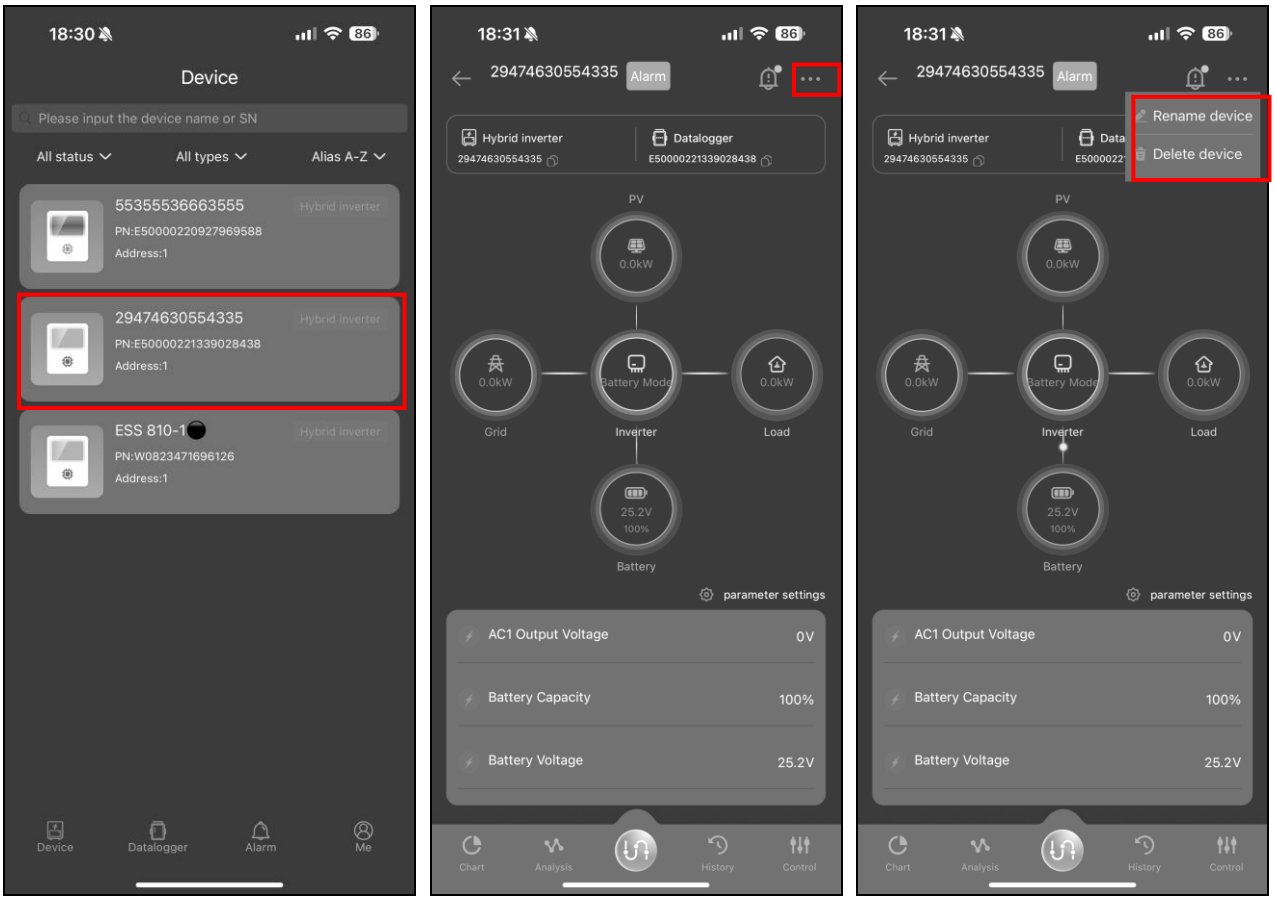
2-5 Device

- Choose Device page to see the inverter list.
  - Gray icon means inverter is offline.
  - Green icon means inverter is online and no warnings and faults.
  - Yellow icon means inverter is online and has a warning.
  - Red icon means inverter is online and has a fault.

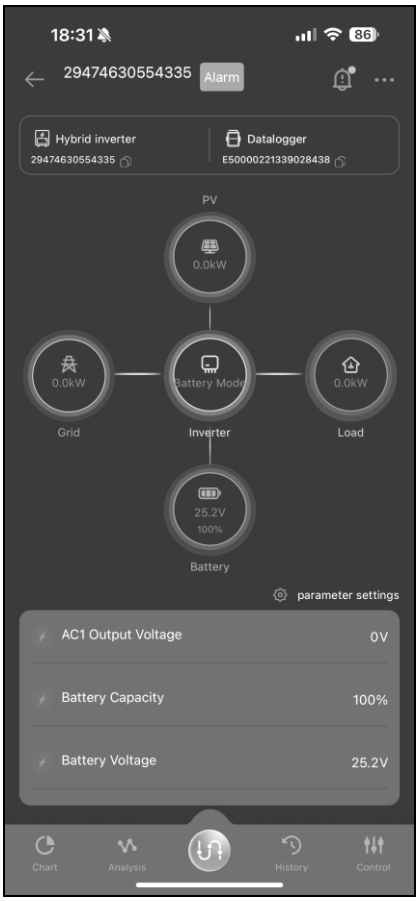


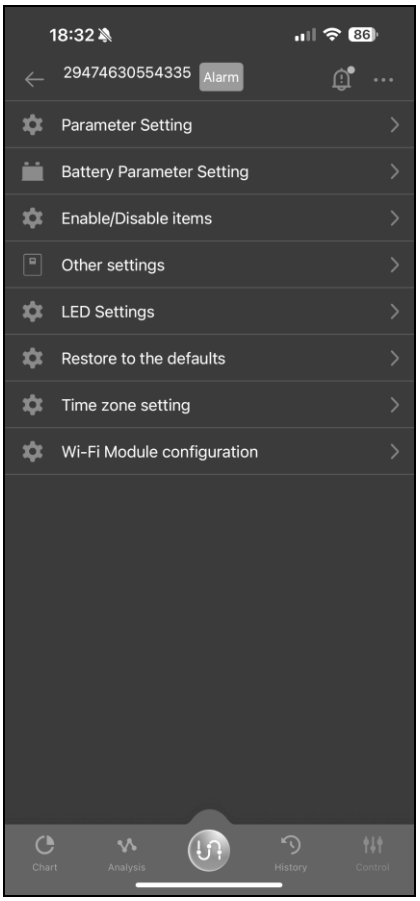
- Click  to see the inverter information.

- Click  to rename device or delete device.
  - Rename device: rename the inverter name.
  - Delete device: delete the inverter. The Wi-Fi module information in the datalogger page will **not be deleted**. Even if deleted, you **cannot** add Wi-Fi module under another account.

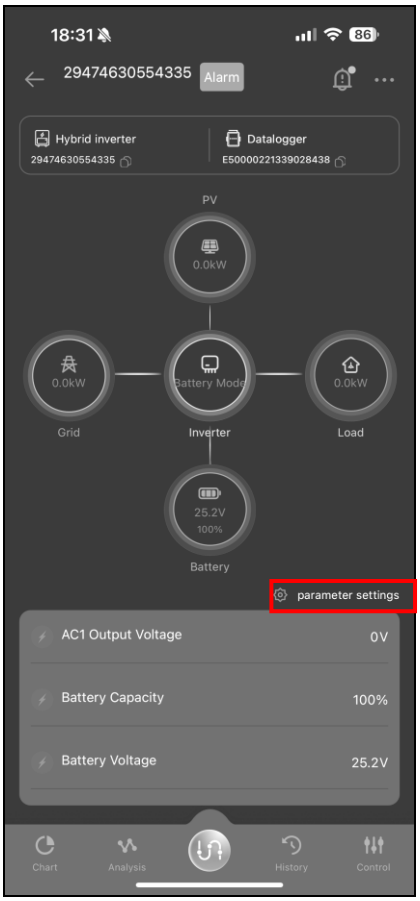


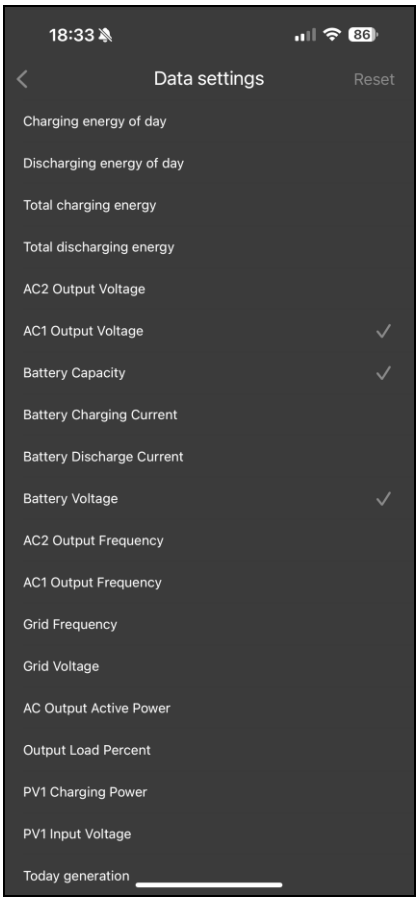
- Click "Control" to enter setting parameters page. The setting items on the parameter page will be different based on different models.

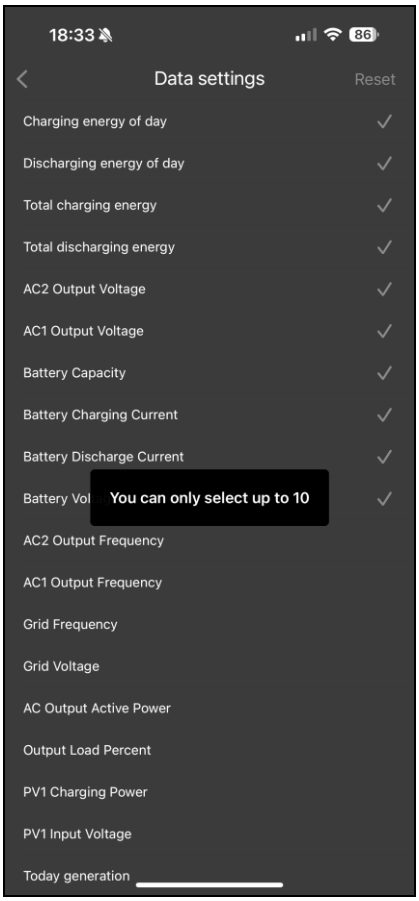




- Click "  " to see the inverter real-time data. Click "parameter settings" to choose data you want to see on the real time page. You can choose up to **10 data**.







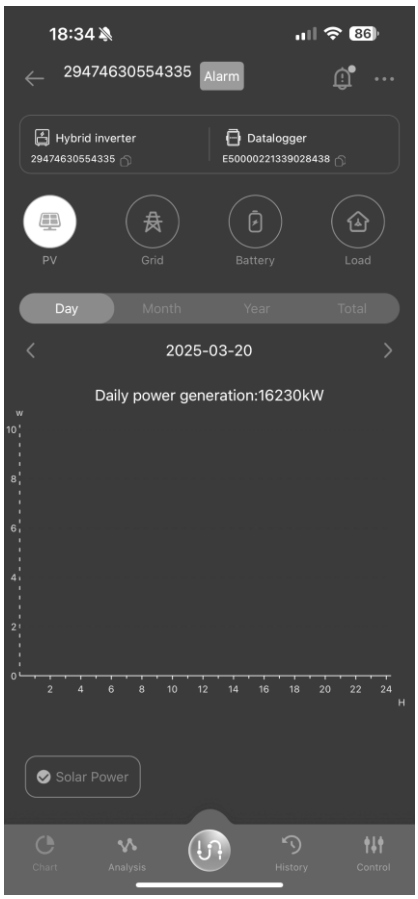
- Click “Chart” to see the inverter solar, grid, battery and load power per hour, day, month and year.

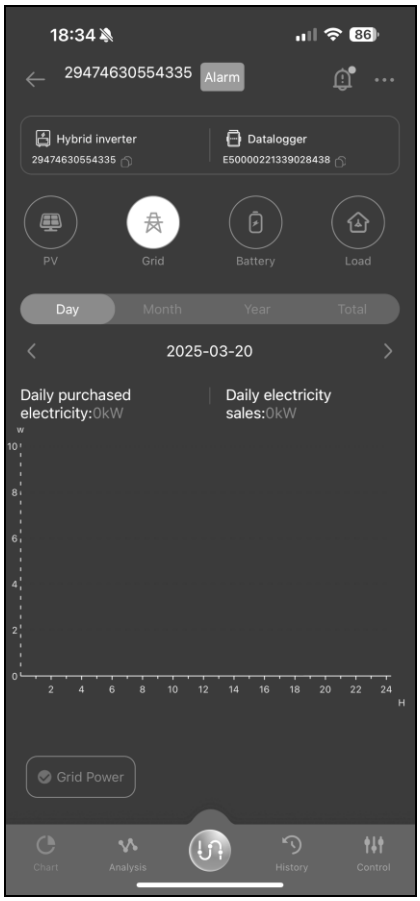
  Day: Click the button to query the hourly power generation data of the current day.

  Month: Click the button to query the daily power generation data of the current month.

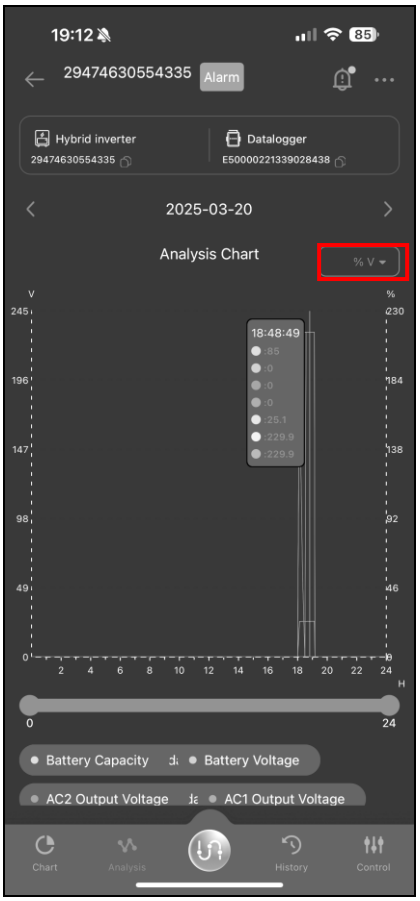
  Year: Click the button to query the monthly power generation data of the current year.

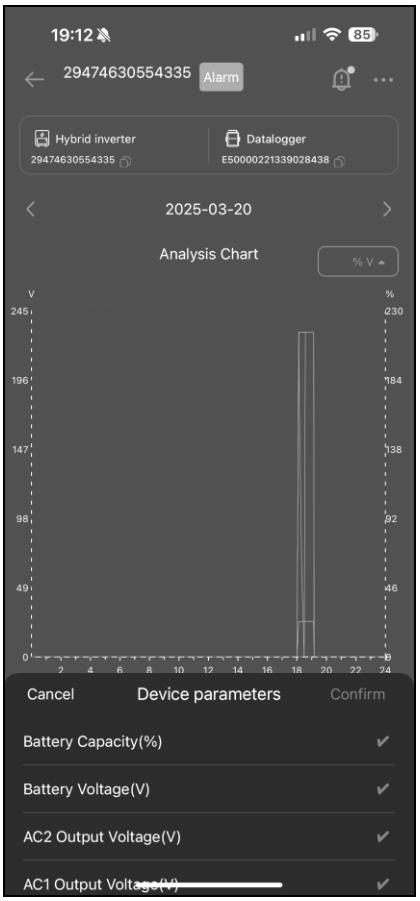
  Total: Click the button to query the annual power generation data.



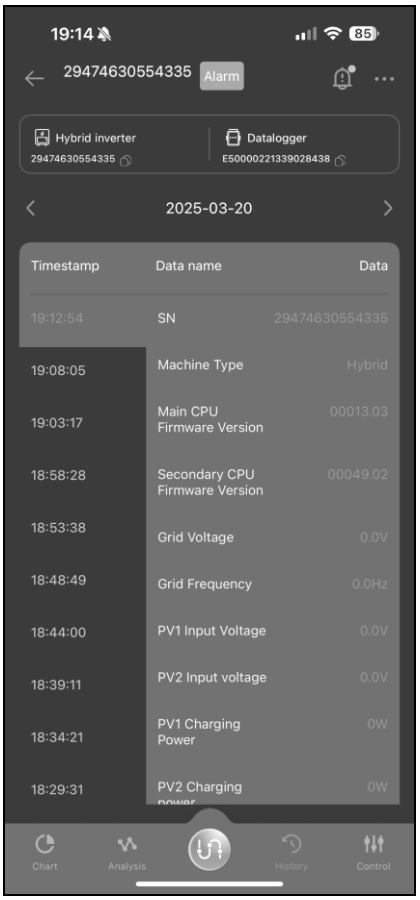


- Click “Analysis” to see the inverter data per hour. Click “SelectedXTerm” to choose the data you want to compare. You can choose up to **2 different units** such as energy (kWh) and current (A).

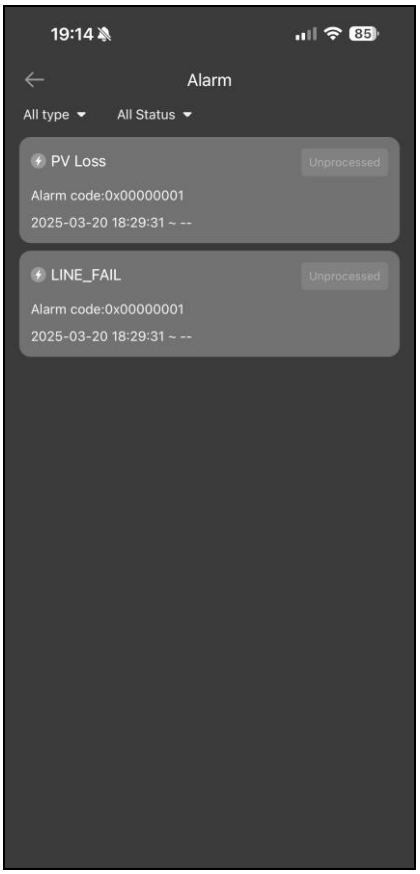




- Click “History” to see the inverter history.



- Click "  " to see the inverter warning and fault.



2-6 Alarm

- Choose Alarm page to see the warning and fault list of all inverters.

2-7 Me

- Choose Me page to see account information and app version.
- Click "Username" to modify nick name and password, and check if the mail has been bound. If the mail is bound, you can retrieve password through mail.
- Click "Theme Change" to modify app background, "Language" to change language and check app is the latest version.