

# **User Manual**

## **1KW/2KW/3KW INVERTER / CHARGER**

# Table Of Contents

<b>ABOUT THIS MANUAL .....</b>	<b>1</b>
Purpose.....	1
Scope.....	1
<b>SAFETY INSTRUCTIONS.....</b>	<b>1</b>
<b>INTRODUCTION .....</b>	<b>2</b>
Features.....	2
Basic System Architecture .....	2
Product Overview.....	3
<b>INSTALLATION .....</b>	<b>4</b>
Unpacking and Inspection.....	4
Preparation .....	4
Mounting the Unit.....	4
Battery Connection .....	5
AC Input/Output Connection.....	7
PV Connection .....	8
Final Assembly.....	9
Communication Connection.....	9
Dry Contact Signal .....	10
<b>OPERATION.....</b>	<b>11</b>
Power ON/OFF .....	11
Operation and Display Panel .....	11
LCD Display Icons .....	12
LCD Setting.....	14
Display Setting .....	22
Operating Mode Description .....	25
Fault Reference Code.....	27
Warning Indicator .....	27
<b>BATTERY EQUALIZATION .....</b>	<b>28</b>
<b>SPECIFICATIONS.....</b>	<b>30</b>
Table 1 Line Mode Specifications .....	30
Table 2 Battery Mode Specifications .....	31
Table 3 Charge Mode Specifications .....	32
<b>TROUBLE SHOOTING .....</b>	<b>34</b>
<b>Appendix I: Parallel function .....</b>	<b>35</b>
<b>Appendix II: Approximate Back-up Time Table .....</b>	<b>53</b>

# 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. Fuse is provided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
12. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
13. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this inverter/charger back to local dealer or service center for maintenance.

# INTRODUCTION

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

## Features

- Pure sine wave inverter
- Built-in MPPT solar charge controller
- Configurable input voltage range for home appliances and personal computers via LCD setting
- Configurable battery charging current based on applications via LCD setting
- Configurable AC/Solar Charger priority via LCD setting
- Compatible to mains voltage or generator power
- Auto restart while AC is recovering
- Overload/ Over temperature/ short circuit protection
- Smart battery charger design for optimized battery performance
- Cold start function
- Zero-transfer Time

## Basic System Architecture

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

- Generator or Utility.
- PV modules (option)

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

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

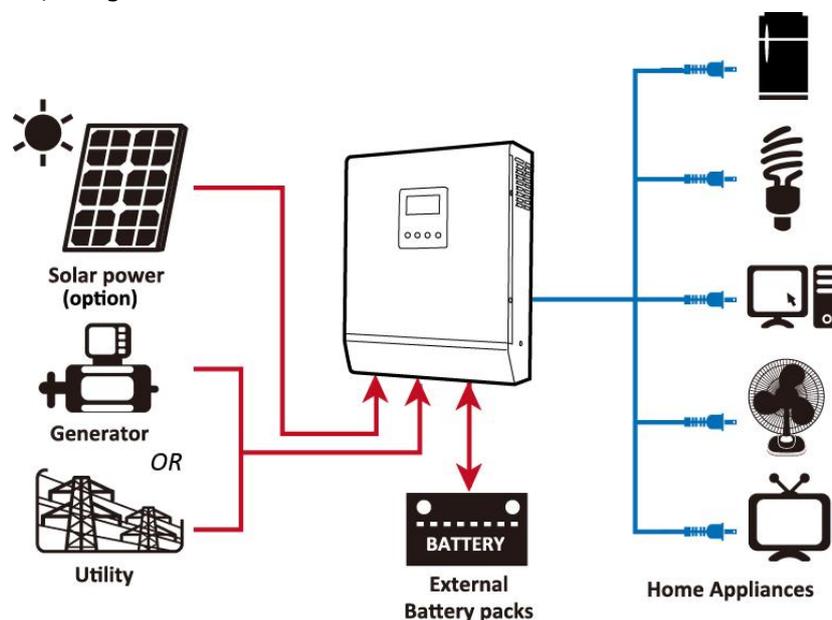
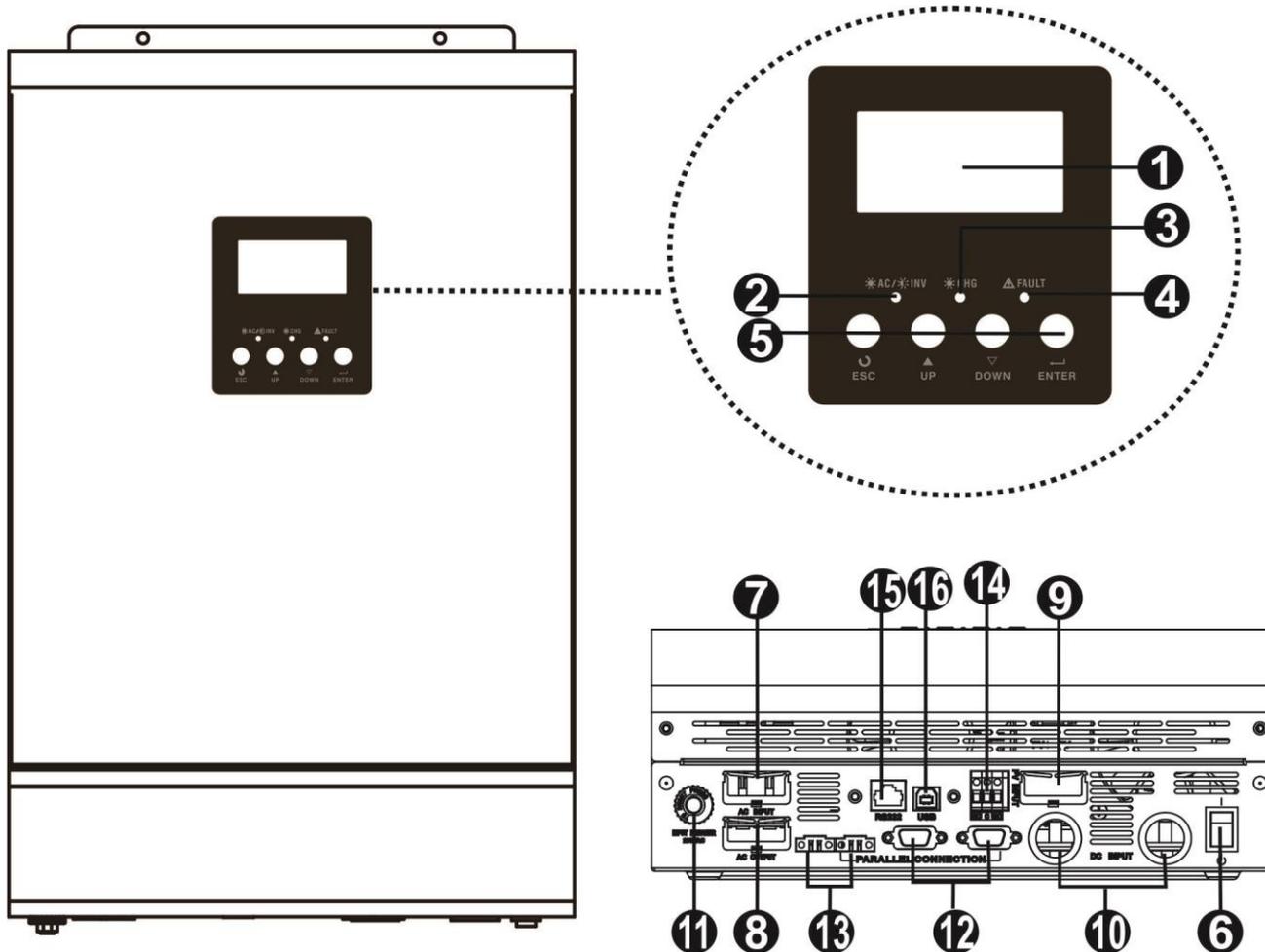


Figure 1 Hybrid Power System

## Product Overview



**NOTE:** For parallel model installation and operation, please check separate parallel installation guide for the details.

- |   |                                  |
|---|----------------------------------|
| 1. LCD display                            | 9. PV connectors                 |
| 2. Status indicator                       | 10. Battery connectors           |
| 3. Charging indicator                     | 11. Circuit breaker              |
| 4. Fault indicator                        | 12. Parallel communication cable |
| 5. Function buttons                       | 13. Current sharing cable        |
| 6. Power on/off switch                    | 14. Dry contact                  |
| 7. Grid connectors                        | 15. RS-232 communication port    |
| 8. AC output connectors (Load connection) | 16. USB communication port       |

# INSTALLATION

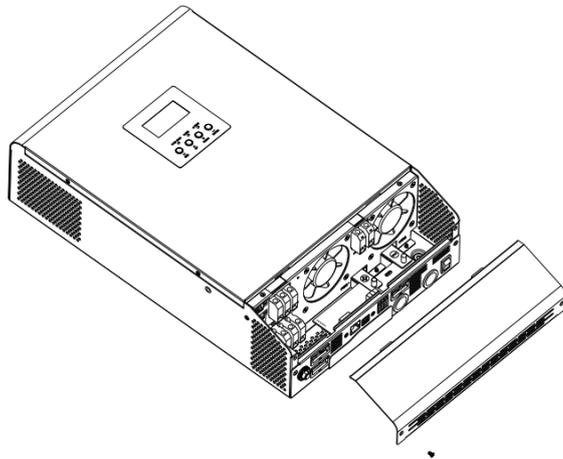
## Unpacking and Inspection

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:

- The unit x 1
- User manual x 1
- Communication cable x 2
- Software CD x 1

## Preparation

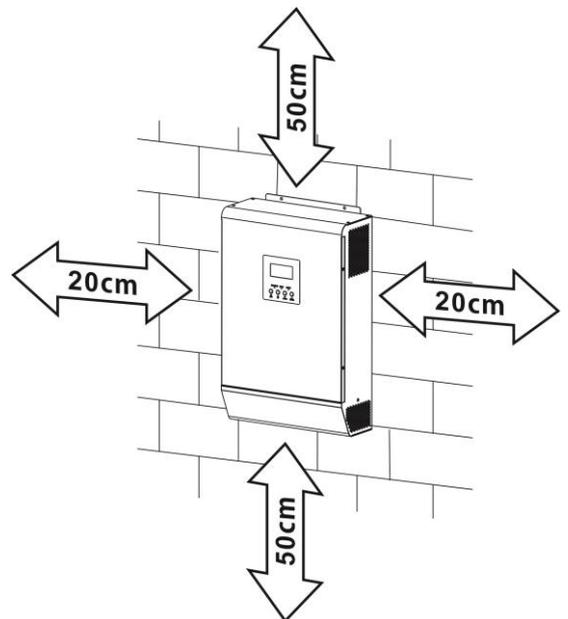
Before connecting all wirings, please take off bottom cover by removing two screws as shown below.



## Mounting the Unit

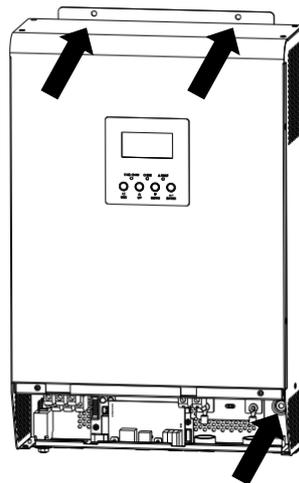
Consider the following points before selecting where to install:

- 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 0°C and 55°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.**

Install the unit by screwing three screws. It's recommended to use M4 or M5 screws.



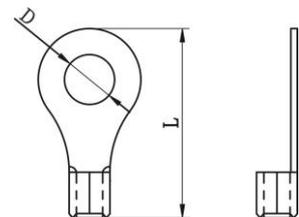
## Battery Connection

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

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

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

**Ring terminal:**

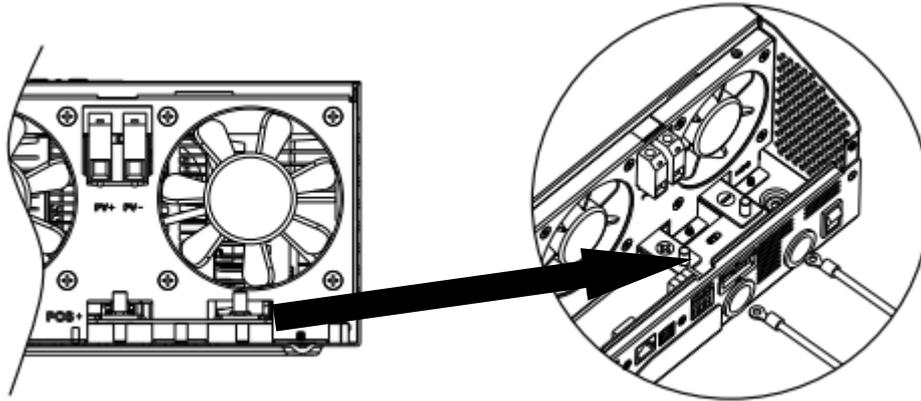


**Recommended battery cable and terminal size:**

Model	Maximum Amperage	Battery capacity	Wire Size	Ring Terminal			Torque value
				Cable mm <sup>2</sup>	Dimensions		
					D (mm)	L (mm)	
1KW	114A	200AH	1*4AWG	28	6.4	49.7	2~ 3 Nm
2KW	110A	200AH	1*4AWG	28	6.4	49.7	2~ 3 Nm
3KW	83A	200AH	1*4AWG	28	6.4	49.7	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. Connect all battery packs as units requires. It's suggested to connect at least 100Ah capacity battery.
3. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the bolts 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/disconnector, 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. The recommended spec of AC breaker is 50A for 5KVA.

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

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

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

### Suggested cable requirement for AC wires

Model	Gauge	Torque Value
1KW	14 AWG	1.4~ 1.6Nm
2KW	12 AWG	1.4~ 1.6Nm
3KW	10 AWG	1.4~ 1.6Nm

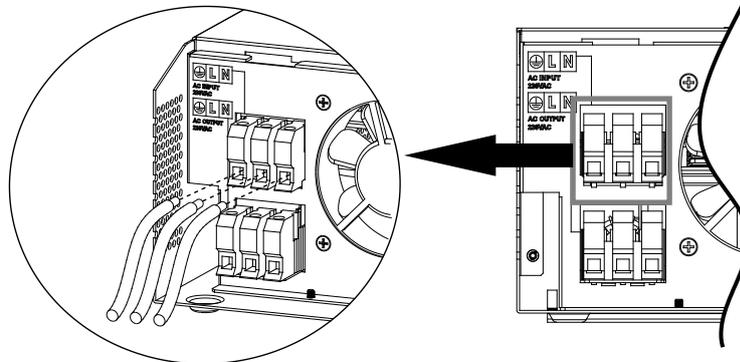
Please follow below steps to implement AC input/output connection:

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

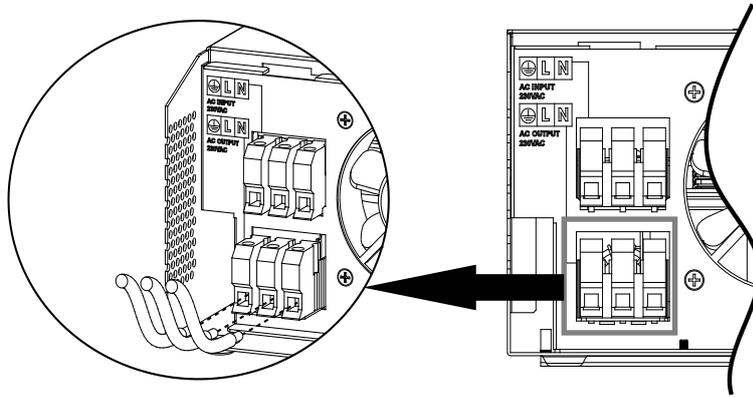
Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

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)**

L → **LINE (brown or black)**

N → **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!** 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	Cable Size	Torque
1KW	10 AWG	1.2~1.6 Nm
2KW	8 AWG	1.2~1.6 Nm
3KW	6 AWG	1.2~1.6 Nm

**PV Module Selection:**

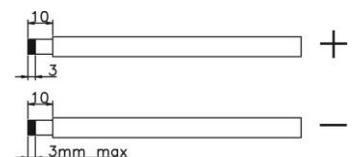
When selecting proper PV modules, please be sure to consider below parameters:

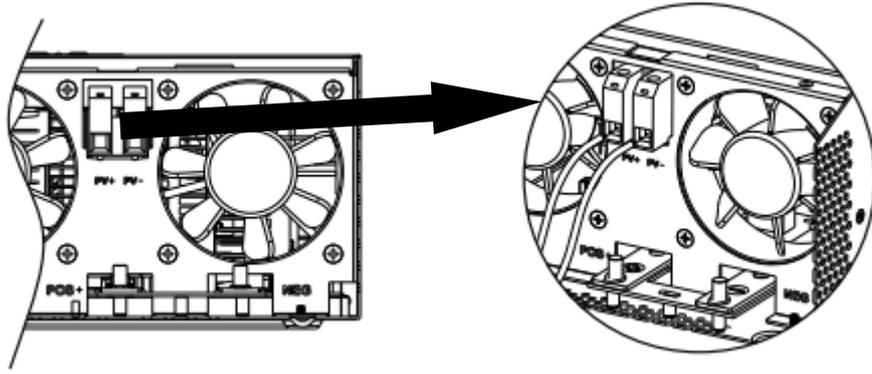
1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.

Solar Charging Mode			
INVERTER MODEL	1KW	2KW	3KW
Max. PV Array Open Circuit Voltage	145Vdc		
PV Array MPPT Voltage Range	15~115Vdc	30~115Vdc	60~115Vdc
Min. battery voltage for PV charge	8.5Vdc	17Vdc	34Vdc

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.

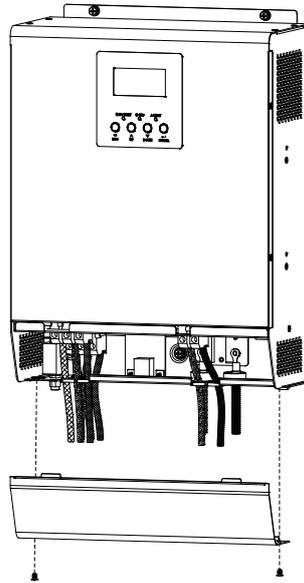




3. Make sure the wires are securely connected.

## Final Assembly

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



## Communication 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.

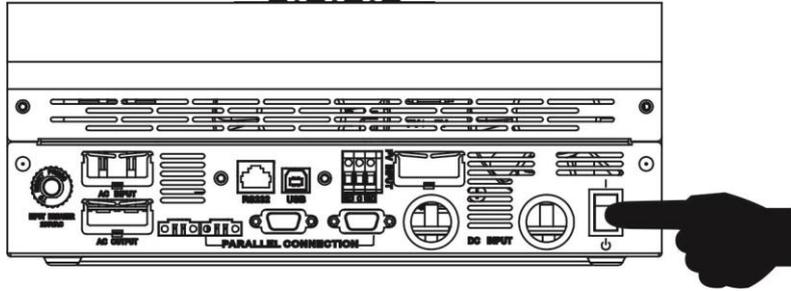
## Dry Contact Signal

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 Utility	Battery voltage < Low DC warning voltage	Open	Close
			Battery voltage > Setting value in Program 13 or battery charging reaches floating stage	Close	Open
	Output is powered from Battery or Solar.	Program 01 is set as SBU or Solar first	Battery voltage < Setting value in Program 12	Open	Close
Battery voltage > Setting value in Program 13 or battery charging reaches floating stage			Close	Open	

# OPERATION

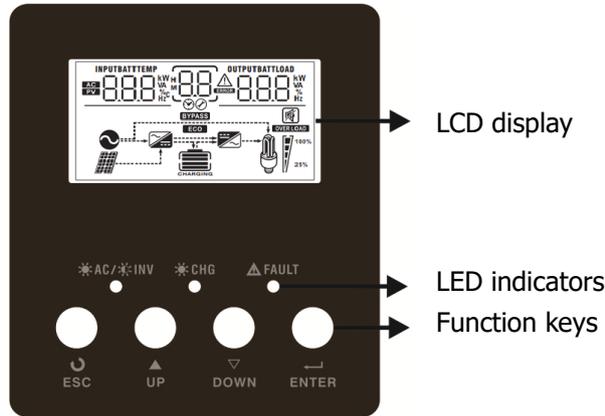
## Power ON/OFF



Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch (located on the button of the case) to turn on the unit.

## Operation and Display Panel

The operation and display panel, shown in below chart, is on the front panel of the inverter. It includes three indicators, four function keys and a LCD display, indicating the operating status and input/output power information.



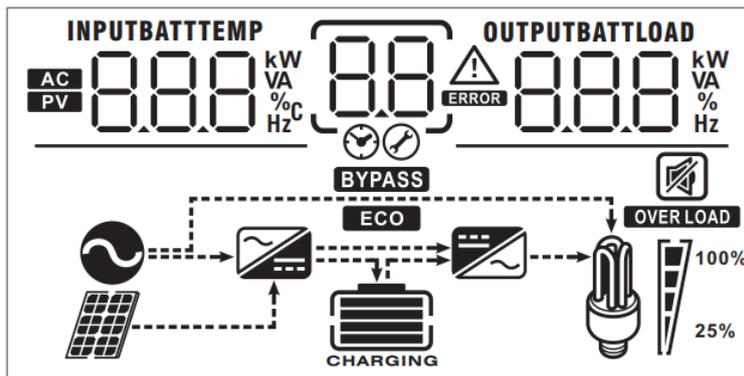
### LED Indicator

LED Indicator		Messages	
☀ AC / ☀ INV	Green	Solid On	Output is powered by utility in Line mode.
		Flashing	Output is powered by battery or PV in battery mode.
☀ CHG	Green	Solid On	Battery is fully charged.
		Flashing	Battery is charging.
⚠ FAULT	Red	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.

### Function Keys

Function Key	Description
ESC	To exit setting mode
UP	To go to previous selection
DOWN	To go to next selection
ENTER	To confirm the selection in setting mode or enter setting mode

# LCD Display Icons



Icon	Function description	
<b>Input Source Information</b>		
<b>AC</b>	Indicates the AC input.	
<b>PV</b>	Indicates the PV input	
<b>INPUTBATT</b> 888 kW VA %C Hz	Indicate input voltage, input frequency, PV voltage, battery voltage and charger current.	
<b>Configuration Program and Fault Information</b>		
88 ⌚	Indicates the setting programs.	
88 ⚠️ ERROR	Indicates the warning and fault codes.	
	Warning: 88 ⚠️ flashing with warning code. Fault: 88 ERROR lighting with fault code	
<b>Output Information</b>		
<b>OUTPUTBATTLOAD</b> 888 kW VA % Hz	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.	
<b>Battery Information</b>		
	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.	
In AC mode, it will present battery charging status.		
Status	Battery voltage	LCD Display
Constant Current mode / Constant Voltage mode	<2V/cell	4 bars will flash in turns.
	2 ~ 2.083V/cell	Bottom bar will be on and the other three bars will flash in turns.
	2.083 ~ 2.167V/cell	Bottom two bars will be on and the other two bars will flash in turns.
	> 2.167 V/cell	Bottom three bars will be on and the top bar will flash.
Floating mode. Batteries are fully charged.		4 bars will be on.

In battery mode, it will present battery capacity.

Load Percentage	Battery Voltage	LCD Display
Load > 50%	< 1.717V/cell	
	1.717V/cell ~ 1.8V/cell	
	1.8 ~ 1.883V/cell	
	> 1.883 V/cell	
50% > Load > 20%	< 1.817V/cell	
	1.817V/cell ~ 1.9V/cell	
	1.9 ~ 1.983V/cell	
	> 1.983	
Load < 20%	< 1.867V/cell	
	1.867V/cell ~ 1.95V/cell	
	1.95 ~ 2.033V/cell	
	> 2.033	

### Load Information

	Indicates overload.			
	Indicates the load level by 0-24%, 25-49%, 50-74% and 75-100%.			
	0%~24%	25%~49%	50%~74%	75%~100%

### Mode Operation Information

	Indicates unit connects to the mains.
	Indicates unit connects to the PV panel.
	Indicates inverter works in Bypass mode
	Indicates inverter works in ECO mode
	Indicates the utility charger circuit is working.
	Indicates the DC/AC inverter circuit is working.

### Mute Operation

	Indicates unit alarm is disabled.
--	-----------------------------------

## LCD Setting

After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" button to confirm the selection or ESC button to exit.

### Setting Programs:

Program	Description	Selectable option	
00	Exit setting mode	Escape 00 ESC	
01	Output source priority: To configure load power source priority	USB : Utility first (default) 01 USB	Utility will provide power to the loads as first priority. If Utility energy is unavailable, solar energy and battery provides power the loads.
		SUB: Solar first 01 SUB	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. Battery provides power to the loads only when solar and utility is not sufficient.
		SBU priority 01 SBU	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 12 or solar and battery is not sufficient.
02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	60A (default) 02 60 A	The setting range is from 10A to 140A and increment of each click is 10A.

05	Battery type	AGM (default) 05 AGM	Flooded 05 FLD
		User-Defined 05 USE	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
06	Auto restart when overload occurs	Restart disable (default) 06 LFD	Restart enable 06 LFE
07	Auto restart when over temperature occurs	Restart disable (default) 07 tFd	Restart enable 07 tFE
09	Output frequency	50Hz 09 50 Hz	60Hz (default) 09 60 Hz
10	Operation Logic	Automatically (default) 10 AUT	If selected and utility is available, inverter will work in line mode. Once utility frequency is unstable, inverter will work in bypass mode if bypass function is not forbidden in program 23.
		Online mode 10 ONL	If selected, inverter will work in line mode when utility is available.
		ECO Mode 10 ECO	If selected and bypass is not forbidden in program 23, inverter will work in ECO mode when utility is available.
11	Maximum utility charging current	2A 11 2A	10A 11 10A
		20A 11 20A	30A (default) 11 30A
		40A 11 40A	50A 11 50A
		60A 11 60A	
12	Setting voltage point back to utility source when selecting "SBU" (SBU priority) or "SUB" (Solar first) in program 01	Available options in 1KW model	
		11.0V 12 BATT 11.0v	11.3V 12 BATT 11.3v

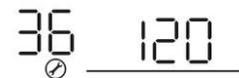
12	Setting voltage point back to utility source when selecting "SBU" (SBU priority) or "SUB" (Solar first) in program 01	11.5V (default) 	11.8V 		
		12.0V 	12.3V 		
		12.5V 	12.8V 		
		13.0V 	13.3V 		
		13.5V 	13.8V 		
		14.0V 	14.3V 		
		For 2KW model, the setting range is from 22.0V to 28.50V and increment of each click is 0.5V. The default setting is 23.0V.			
		For 3KW model, the setting range is from 44.0V to 57.0V and increment of each click is 1.0V. The default setting is 46.0V			
13	Setting voltage point back to battery mode when selecting "SBU" (SBU priority) or "SUB" (Solar first) in program 01	Available options in 1KW model			
		Battery fully charged 	12.0V 		
		12.3V 	12.5V 		

13	Setting voltage point back to battery mode when selecting "SBU" (SBU priority) or "SUB" (Solar first) in program 01	12.8V 	13.0V 
		13.3V 	13.5V (default) 
		13.8V 	14.0V 
		14.3V 	14.5V 
		14.8V 	15.0V 
		15.3V 	15.5V 
		15.8V 	16.0V 
		For 2KW model, the setting range is from 24.0V to 32.0V and increment of each click is 0.5V. The default setting is 27.0V.	
		Battery fully charged 	default setting: 27.0V 
		For 3KW model, the setting range is from 48.0V to 64.0V and increment of each click is 1.0V. The default setting is 54.0V.	
Battery fully charged 	default setting: 54.0V 		
16	Solar energy and utility setting: To configure solar energy priority for battery/load and utility charge battery	SbL: Solar energy for battery first UCB: Allow utility to charge battery (Default) 	Solar energy charges battery first and the utility is allowed to charge battery.

16	Solar energy and utility setting: To configure solar energy priority for battery/load and utility charge battery	SbL: Solar energy for battery first UdC: Not allow utility to charge battery SbL 16 UdC	Solar energy charge battery first and the utility is not allowed to charge battery.
		SLb: Solar energy for load first UCb: Allow utility to charge battery SLb 16 UCb	Solar energy provides power to the load first and the utility is allowed to charge battery.
		SLb: Solar energy for load first UdC: Not allow utility to charge battery SLb 16 UdC	Solar energy provides power to the load first and the utility is not allowed to charge battery.
18	Alarm control	Alarm on (default) 18 60N	Alarm off 18 60F
19	Auto return to default display screen	Return to default display screen (default) 19 ESP	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.
		Stay at latest screen 19 LEP	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) 20 LON	Backlight off 20 LOF
22	Beeps while primary source is interrupted	Alarm on (default) 22 AON	Alarm off 22 AOF
23	Bypass function:	Bypass Forbidden 23 bYF	If selected, inverter won't work in bypass/ECO modes.
		Bypass disable 23 bYD	If selected and power ON button is pressed on, inverter can work in bypass/ECO mode only if utility is available.
		Bypass enable (default) 23 bYE	If selected and no matter power ON button is pressed on or not, inverter can work in bypass mode if utility is available.

25	Record Fault code	Record enable 25 FEN	Record disable (default) 25 FdS
26	Bulk charging voltage (C.V voltage)	<p>1KW model default setting: 14.1V CU 26 BATT 14.1v</p> <p>2KW model default setting: 28.2V CU 26 BATT 28.2v</p> <p>3KW model default setting: 56.4V CU 26 BATT 56.4v</p> <p>If self-defined is selected in program 5, this program can be set up. Setting range is from 12.0V to 16.0V for 1KW model, from 24.0V to 32.0V for 2KW model and from 48.0V to 64.0V for 3KW model. Increment of each click is 0.1V.</p>	
27	Floating charging voltage	<p>1KW model default setting: 13.5V FLU 27 BATT 13.5v</p> <p>2KW model default to 27.0V FLU 27 BATT 27.0v</p> <p>3KW model default setting: 54.0V FLU 27 BATT 54.0v</p> <p>If self-defined is selected in program 5, this program can be set up. Setting range is from 12.0V to 16.0V for 1KW model, from 24.0V to 32.0V for 2KW model and from 48.0V to 64.0V for 3KW model. Increment of each click is 0.1V.</p>	
28	AC output mode *This setting is able to set up only when the inverter is in standby mode. Be sure that on/off switch is in "OFF" status	<p>Single: 28 OUTPUT 510</p> <p>Parallel: 28 OUTPUT PAL</p>	<p>When the units are used in parallel with single phase, please select "PAL" in program 28.</p> <p>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 refers to 5-2 for detailed information.</p>

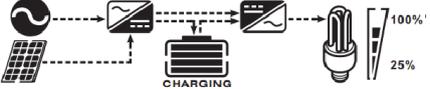
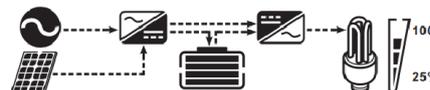
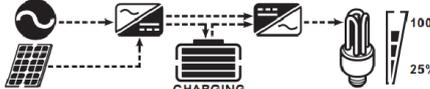
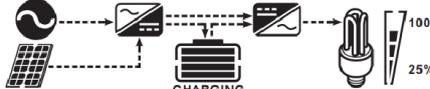
28	AC output mode *This setting is able to set up only when the inverter is in standby mode. Be sure that on/off switch is in "OFF" status	L1 phase: 28 <sup>OUTPUT</sup> 3P1	Please select "3P1" in program 28 for the inverters connected to L1 phase, "3P2" in program 28 for the inverters connected to L2 phase and "3P3" in program 28 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.
		L2 phase: 28 <sup>OUTPUT</sup> 3P2	
		L3 phase: 28 <sup>OUTPUT</sup> 3P3	
29	Low DC cut-off voltage	/1KW model default setting: 10.5V C04 29 <sup>BATT</sup> 10.5 v	
		2KW model default setting: 21.0V C04 29 <sup>BATT</sup> 21.0 v	
		3KW model default setting: 42.0V C04 29 <sup>BATT</sup> 42.0 v	
		If self-defined is selected in program 5, this program can be set up. Setting range is from 10.0V to 13.5V for 1KW model, from 20.0V to 27.0V for 2KW model and from 40.0V to 54.0V for 3KW model. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.	
32	Bulk charging time (C.V stage)	Automatically (Default): 32 <sup>AUT</sup>	If selected, inverter will judge this charging time automatically.
		5 min 32 <sup>5</sup>	If "User-Defined" is selected in program 05, this program can be set up. Setting range is from 5min to 900min. Increment of each click is 5min. Otherwise, Keeping auto-charging time.
		900 min 32 <sup>900</sup>	
If "USE" is selected in program 05, this program can be set up.			
33	Battery equalization	Battery equalization enable 33 <sup>EEN</sup>	Battery equalization disable (default) 33 <sup>EDS</sup>
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
34	Battery equalization voltage	1KW model default setting: 14.6V. E4 34 <sup>BATT</sup> 14.6 v	

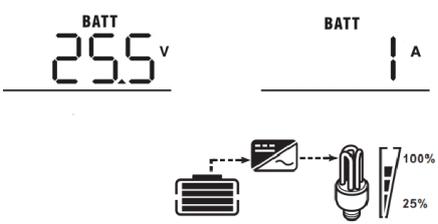
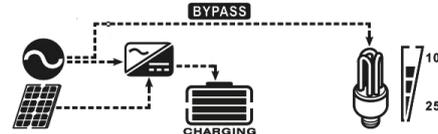
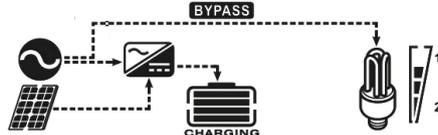
		1.4KW/2KW model default setting: 29.2V. 	
		2.6KW/3KW model default setting: 58.4V. 	
		Setting range is from 12.0V to16.0V for 1KW model, from 24.0V to 32.0V for 2KW model and from 48.0V to 64.0V for 3KW model. Increment of each click is 0.1V.	
35	Battery equalized time	60min (default) 	Setting range is from 5min to 900min. Increment of each click is 5min.
36	Battery equalized timeout	120min (default) 	Setting range is from 5min to 900 min. Increment of each click is 5 min.
37	Equalization interval	30days (default) 	Setting range is from 0 to 90 days. Increment of each click is 1 day
39	Equalization activated immediately	Enable 	Disable (default) 
		If equalization function is enabled in program 33, this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "E9". If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 37 setting. At this time, "E9" will not be shown in LCD main page.	

## Display Setting

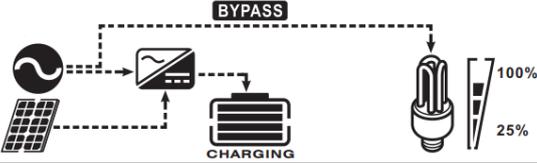
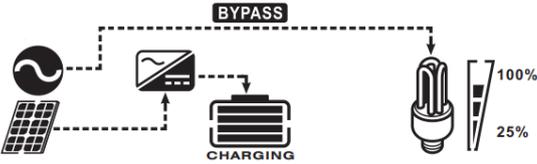
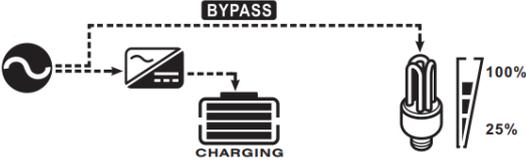
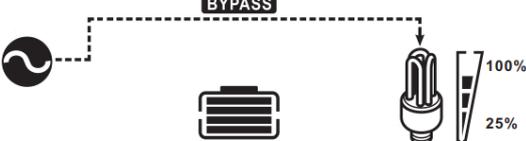
The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: input voltage, input frequency, PV voltage, MPPT charging current, MPPT charging power, battery voltage, output voltage, output frequency, load percentage, load in VA, load in Watt, DC discharging current, main CPU Version and second CPU Version.

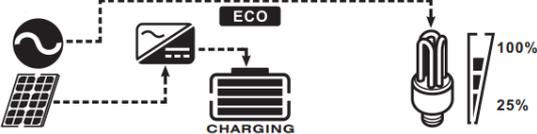
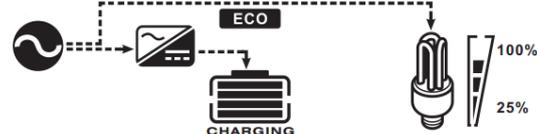
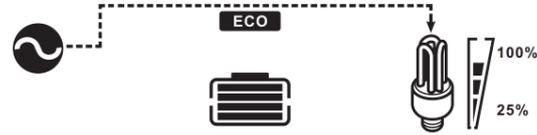
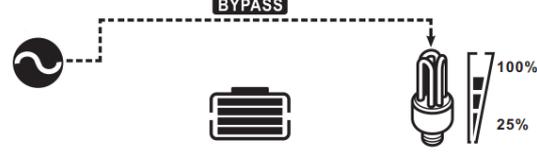
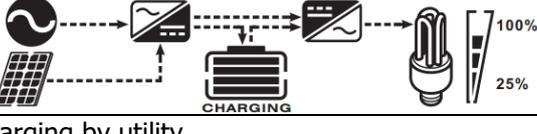
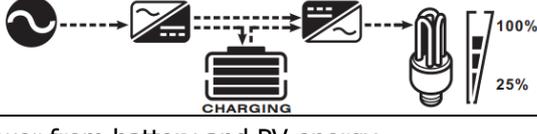
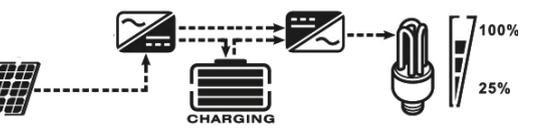
Selectable information	LCD display
Input voltage/Output voltage (Default Display Screen)	Input Voltage=120V, output voltage=120V 
Input frequency	Input frequency=60Hz 
PV voltage	PV voltage=60V 
Charging current	charging current=50A 
PV power	PV power = 500W 
Battery voltage and output voltage	Battery voltage=25.5V, output voltage=120V 

Output frequency	<p>Output frequency=60Hz</p> <p>BATT 25.5<sup>v</sup>      OUTPUT 60.0<sup>Hz</sup></p> 
Load percentage	<p>Load percent=70%</p> <p>BATT 25.5<sup>v</sup>      LOAD 70<sup>%</sup></p> 
Load in VA	<p>When connected load is lower than 1kVA, load in VA will present xxxVA like below chart.</p> <p>BATT 25.5<sup>v</sup>      LOAD 350<sup>VA</sup></p>  <p>When load is larger than 1kVA (<math>\geq 1\text{kVA}</math>), load in VA will present x.xkVA like below chart.</p> <p>BATT 25.5<sup>v</sup>      LOAD 150<sup>kVA</sup></p> 
Load in Watt	<p>When load is lower than 1kW, load in W will present xxxW like below chart.</p> <p>BATT 25.5<sup>v</sup>      LOAD 350<sup>W</sup></p>  <p>When load is larger than 1kW (<math>\geq 1\text{kW}</math>), load in W will present x.xkW like below chart.</p> <p>BATT 25.5<sup>v</sup>      LOAD 150<sup>kW</sup></p> 

<p>Battery voltage/DC discharging current</p>	<p>Battery voltage=25.5V, discharging current=1A</p> 
<p>Main CPU version checking</p>	<p>Main CPU version 00014.04</p> 
<p>Secondary CPU version checking</p>	<p>Secondary CPU version 00003.03</p> 

# Operating Mode Description

Operation mode	Description	LCD display
<p>Standby mode</p> <p><b>Note:</b></p> <p>*Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.</p>	<p>No output is supplied by the unit but it still can charge batteries.</p>	<p>Charging by utility and PV energy.</p> 
		<p>Charging by utility.</p> 
		<p>Charging by PV energy.</p> 
		<p>No charging.</p> 
<p>Bypass Mode</p>	<p>The unit will provide output power from the utility. PV energy and utility can charge batteries.</p>	<p>Charging by utility and PV energy.</p> 
		<p>Charging by PV</p> 
		<p>Charging by utility</p> 
		<p>No charging</p> 

<p>ECO Mode</p>	<p>The unit will provide output power from the utility. PV energy and utility can charge batteries.</p>	<p>Charging by utility and PV energy.</p>  <p>Charging by PV</p>  <p>Charging by utility</p>  <p>No charging</p> 
<p>Fault mode Note: *Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.</p>	<p>Utility can bypass.</p>	<p>No charging and Bypass</p>  <p>No charging</p> 
<p>Line Mode</p>	<p>The unit will provide output power from the mains. It will also charge the battery at line mode.</p>	<p>Charging by utility and PV energy.</p>  <p>Charging by utility.</p> 
<p>Battery Mode</p>	<p>The unit will provide output power from battery and PV power.</p>	<p>Power from battery and PV energy.</p>  <p>Power from battery only.</p> 

## Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off.	
02	Over temperature	
03	Battery voltage is too high	
04	Battery voltage is too low	
05	Output short circuited or over temperature is detected by internal converter components.	
06	Output voltage is too high.	
07	Overload time out	
08	Bus voltage is too high	
09	Bus soft start failed	
50	PFC over current	
51	Over current or surge	
52	Bus voltage is too low	
53	Inverter soft start failed	
55	Over DC voltage in AC output	
56	Battery connection is open	
57	Current sensor failed	
58	Output voltage is too low	

## Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	
02	Over temperature	None	
03	Battery is over-charged	Beep once every second	
04	Low battery	Beep once every second	
07	Overload	Beep once every 0.5 second	 <b>OVER LOAD</b>
10	Output power derating	Beep twice every 3 seconds	
E9	Battery equalization	None	
bP	Battery is not connected	None	

# BATTERY EQUALIZATION

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

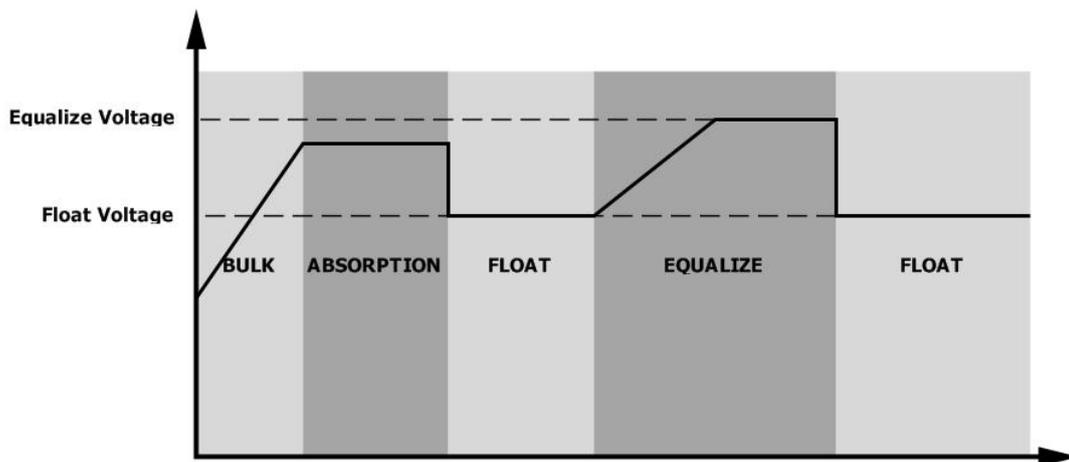
- **How to Apply Equalization Function**

You must enable battery equalization function in monitoring LCD setting program 33 first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in program 37.
2. Active equalization immediately in program 39.

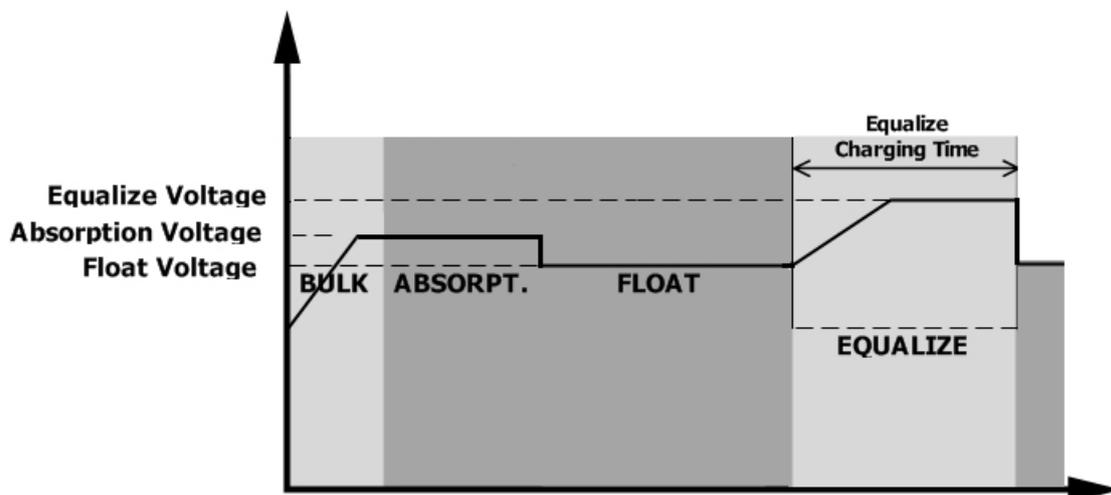
- **When to Equalize**

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

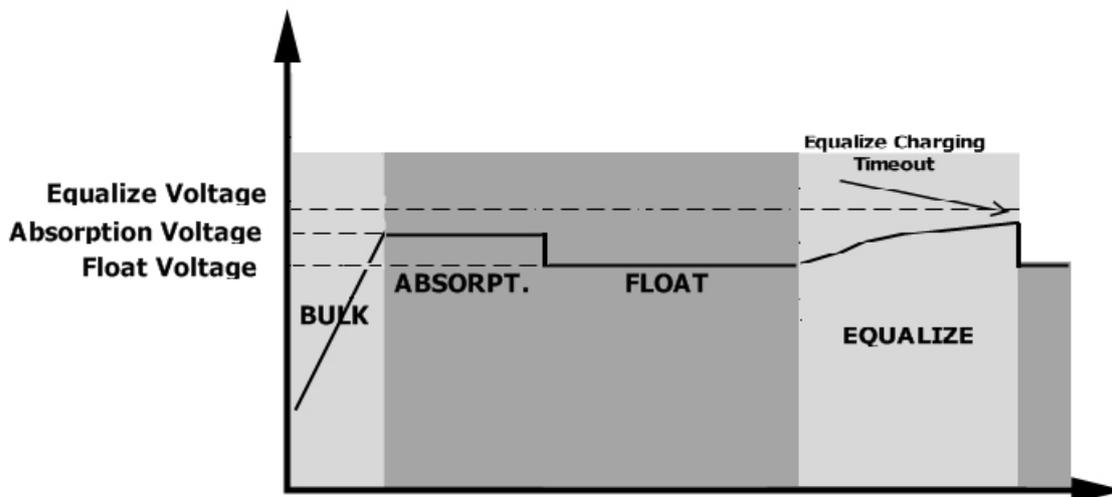


- **Equalize charging time and timeout**

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalized time is arrived.



However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.



# SPECIFICATIONS

Table 1 Line Mode Specifications

INVERTER MODEL	1KW	2KW	3KW
<b>Input Voltage Waveform</b>	Sinusoidal		
<b>Nominal Input Voltage</b>	120Vac		
<b>Low Loss Voltage</b>	95Vac±3V		
<b>Low Loss Return Voltage</b>	100Vac±3V		
<b>High Loss Voltage</b>	140Vac±3V		
<b>High Loss Return Voltage</b>	135Vac±3V		
<b>Max AC Input Voltage</b>	150Vac		
<b>Nominal Input Frequency</b>	60Hz / 50Hz (Auto detection)		
<b>Low Loss Frequency</b>	56(46)±1Hz		
<b>Low Loss Return Frequency</b>	57(46.5)±1Hz		
<b>High Loss Frequency</b>	64(54)±1Hz		
<b>High Loss Return Frequency</b>	63(53)±1Hz		
<b>Power Factor</b>	>0.98		
<b>Output Short Circuit Protection</b>	Line mode: Circuit Breaker Battery mode: Electronic Circuits		
<b>Peak Efficiency (Line Mode)</b>	88%	90%	92%
<b>Transfer Time</b>	Line mode←→Battery mode 0ms Inverter←→Bypass 4ms		

Table 2 Battery Mode Specifications

<b>INVERTER MODEL</b>	<b>1KW</b>	<b>2KW</b>	<b>3KW</b>
<b>Rated Output Power</b>	1KVA/1KW	2KVA/2KW	3KVA/3KW
<b>Output Voltage Waveform</b>	Pure Sine Wave		
<b>Output Voltage Regulation</b>	120Vac±5%		
<b>Output Frequency</b>	60Hz or 50Hz		
<b>Peak Efficiency</b>	87.5%	89.5%	91%
<b>Overload Protection</b>	5s@≥150% load; 10s@105%~150% load		
<b>Surge Capacity</b>	2* rated power for 5 seconds		
<b>Nominal DC Input Voltage</b>	12Vdc	24Vdc	48Vdc
<b>Operating Range</b>	40Vdc -16Vdc	40Vdc -32Vdc	40Vdc -64Vdc
<b>Cold Start Voltage</b>	11.5Vdc	23Vdc	46Vdc
<b>Low DC Warning Voltage</b> @ load < 50% @ load ≥ 50%	11.2Vdc 11.0Vdc	22.5Vdc 22.0Vdc	45.0Vdc 44.0Vdc
<b>Low DC Warning Return Voltage</b> @ load < 50% @ load ≥ 50%	11.7Vdc 11.5Vdc	23.5Vdc 23.0Vdc	47.0Vdc 46.0Vdc
<b>Low DC Cut-off Voltage</b> @ load < 50% @ load ≥ 50%	10.7Vdc 10.5Vdc	21.5Vdc 21.0Vdc	43.0Vdc 42.0Vdc
<b>High DC Recovery Voltage</b>	15Vdc	31Vdc	63Vdc
<b>High DC Cut-off Voltage</b>	16Vdc	32Vdc	64Vdc
<b>No Load Power Consumption</b>	<30W	<30W	<40W

Table 3 Charge Mode Specifications

Utility Charging Mode				
INVERTER MODEL	1KW	2KW	3KW	
<b>Charging Current</b> @ Nominal Input Voltage	Default: 30A, max: 60A			
<b>Bulk Charging Voltage</b>	<b>Flooded Battery</b>	14.6Vdc	29.2Vdc	58.4Vdc
	<b>AGM / Gel Battery</b>	14.1Vdc	28.2Vdc	56.4Vdc
<b>Floating Charging Voltage</b>	13.5Vdc	27Vdc	54Vdc	
<b>Overcharge Protection</b>	16.5Vdc	33Vdc	66Vdc	
<b>Charging Algorithm</b>	3-Step			
<b>Charging Curve</b>	<p>The graph plots Battery Voltage (per cell) on the left y-axis and Charging Current (%) on the right y-axis against Time on the x-axis. The voltage curve (black) rises linearly in the Bulk stage, plateaus in the Absorption stage, and then slightly drops in the Maintenance stage. The current curve (red) is constant in the Bulk stage, then decays exponentially in the Absorption stage, and remains very low in the Maintenance stage. Key voltage points are 2.43Vdc (2.35Vdc) and 2.25Vdc. Time intervals T0 and T1 are marked, with T1 = 10 * T0, minimum 10mins, maximum 8hrs.</p>			

Solar Charging Mode (MPPT type)			
INVERTER MODEL	1KW	2KW	3KW
<b>Rated Power</b>	1000W	2000W	4000W
<b>Maximum charging current</b>	80A		
<b>Solar Charging Efficiency</b>	82.0% max.	89.0% max.	94.0% max.
<b>Max. PV Array Open Circuit Voltage</b>	145Vdc		
<b>PV Array MPPT Voltage Range</b>	15~115Vdc	30~115Vdc	60~115Vdc
<b>Battery Voltage Accuracy</b>	+/-0.3%		
<b>PV Voltage Accuracy</b>	+/-5V		
<b>Charging Algorithm</b>	3-Step		
<b>Joint Utility and Solar Charging</b>			
<b>Max Charging Current</b>	140A		
<b>Default Charging Current</b>	60A		

Table 4 ECO/Bypass Mode Specifications

<b>Bypass Mode</b>			
<b>INVERTER MODEL</b>	<b>1KW</b>	<b>2KW</b>	<b>3KW</b>
<b>Input Voltage Waveform</b>	Sinusoidal		
<b>Low Loss Voltage</b>	85Vac±3V		
<b>Low Loss Return Voltage</b>	90Vac±3V		
<b>High Loss Voltage</b>	140Vac±3V		
<b>High Loss Return Voltage</b>	130Vac±3V		
<b>Nominal Input Frequency</b>	60Hz / 50Hz (Auto detection)		
<b>Low Loss Frequency</b>	56(46)±1Hz		
<b>Low Loss Return Frequency</b>	57(46.5)±1Hz		
<b>High Loss Frequency</b>	64(54)±1Hz		
<b>High Loss Return Frequency</b>	63(53)±1Hz		

Table 5 General Specifications

<b>INVERTER MODEL</b>	<b>1KW</b>	<b>2KW</b>	<b>3KW</b>
<b>SCC type</b>	<b>MPPT</b>		
<b>Parallel-able</b>	YES		
<b>Communication</b>	RS232 and USB		
<b>Safety Certification</b>	CE		
<b>Operating Temperature Range</b>	-10°C to 50°C		
<b>Storage temperature</b>	-15°C~ 60°C		
<b>Humidity</b>	5% to 95% Relative Humidity (Non-condensing)		
<b>Dimension (D*W*H), mm</b>	120x295x468		
<b>Net Weight, kg</b>	10	10.5	11

# TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	LCD/LEDs and buzzer will be active for 3 seconds and then complete off.	The battery voltage is too low (<1.91V/Cell)	1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	1. The battery voltage is far too low. (<1.4V/Cell) 2. 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.	Input voltage is displayed as 0 on the LCD and green LED is flashing.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is flashing.	Insufficient quality of AC power. (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)
	Green LED is flashing.	Set "Solar First" as the priority of output source.	Change output source priority to Utility first.
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on.	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
		Temperature of internal converter component is over 120°C. (Only available for 1-3KVA models.)	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 02	Internal temperature of inverter component is over 100°C.	
	Fault code 03	Battery is over-charged.	Return to repair center.
		The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.
	Fault code 01	Fan fault	Replace the fan.
	Fault code 06/58	Output abnormal (Inverter voltage below than 190Vac or is higher than 260Vac)	1. Reduce the connected load. 2. Return to repair center
	Fault code 08/09/53/57	Internal components failed.	Return to repair center.
	Fault code 50	PFC over current or surge.	Restart the unit, if the error happens again, please return to repair center.
	Fault code 51	Over current or surge.	
	Fault code 52	Bus voltage is too low.	
Fault code 55	Output voltage is unbalanced.		
Fault code 56	Battery is not connected well or fuse is burnt.	If the battery is connected well, please return to repair center.	

# Appendix I: Parallel function

## 1. Introduction

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

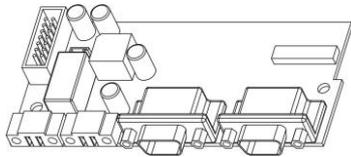
1. Parallel operation in single phase with up to 9 units. The supported maximum output power for 1KW model is 9KW/9KVA, for 2KW model is 36KW/36KVA and for 3KW model is 27KW/27KVA.
2. Maximum nine units work together to support three-phase or split phase equipment. Each phase should have at least one inverter and the remaining inverters can join in any phase. For 1KW model, the supported maximum output power is 9KW/9KVA and one phase can be up to 7KW/7KVA. For 2KW model, the supported maximum output power is 18KW/18KVA and one phase can be up to 14KW/14KVA. For 3KW model, the supported maximum output power is 27KW/27KVA and one phase can be up to 21KW/21KVA.

**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 the output neutral of each inverter is always connected when they are configured in parallel operation. Otherwise, it will damage the inverter.

## 2. Package Contents

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



Parallel board



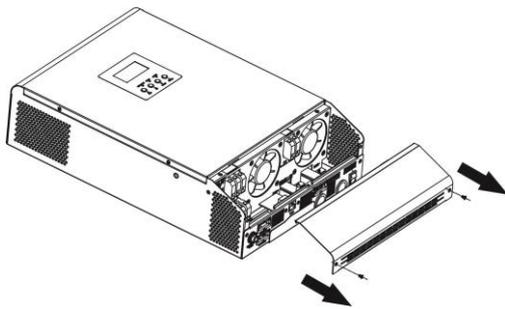
Parallel communication cable



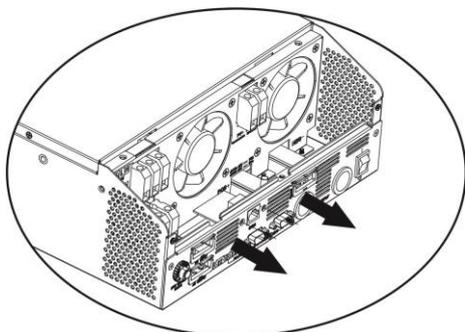
Current sharing cable

## 3. Parallel board installation

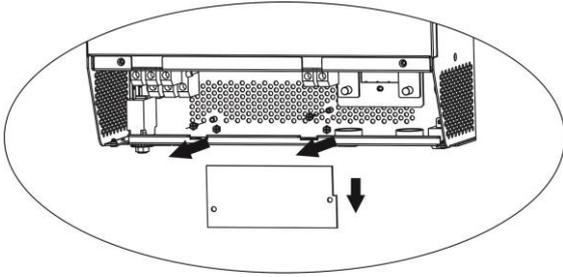
**Step 1:** Remove wire cover by unscrewing all screws.



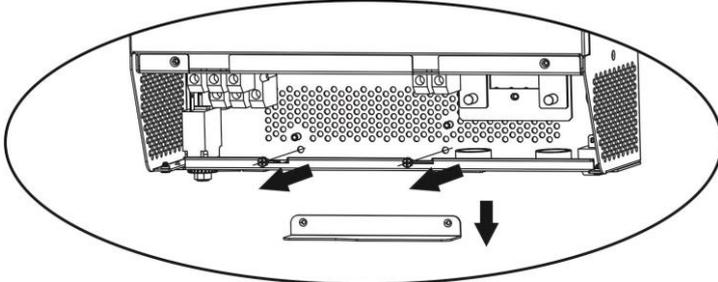
**Step 2:** Remove communication board by unscrewing two screws as below chart.



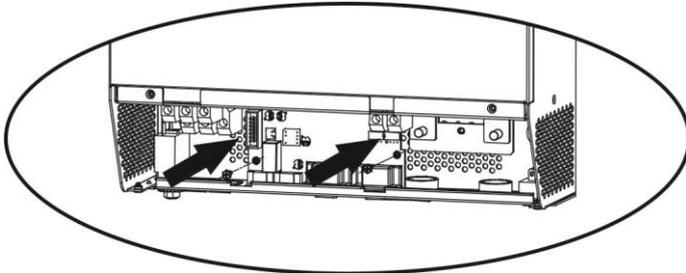
**Step 3:** Remove two screws as below chart and remove 2-pin and 14-pin cables. Take out the board under the communication board.



**Step 4:** Remove two screws as below chart to take out cover of parallel communication.



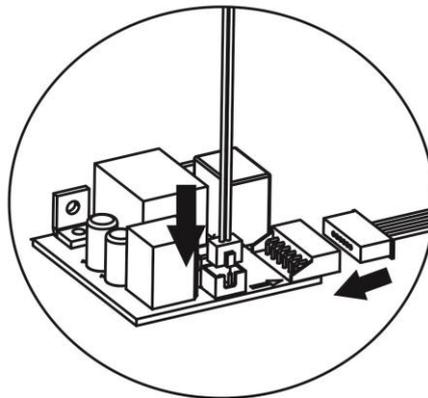
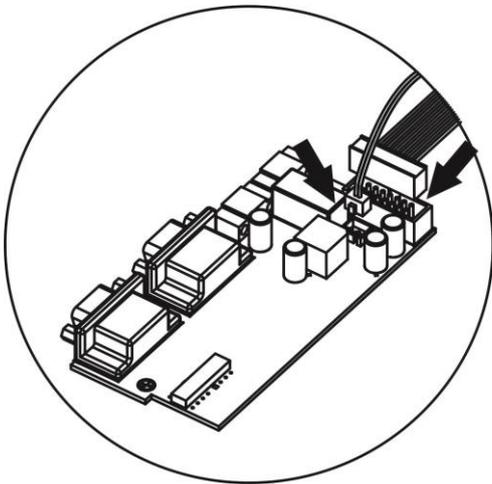
**Step 5:** Install new parallel board with 2 screws tightly.



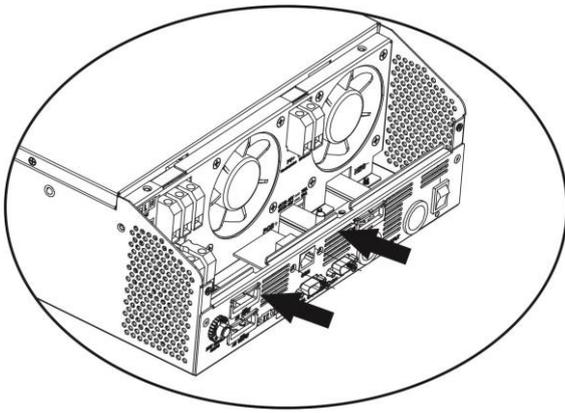
**Step 6:** Re-connect 2-pin and 14-pin to original position.

**Parallel board**

**Communication board**



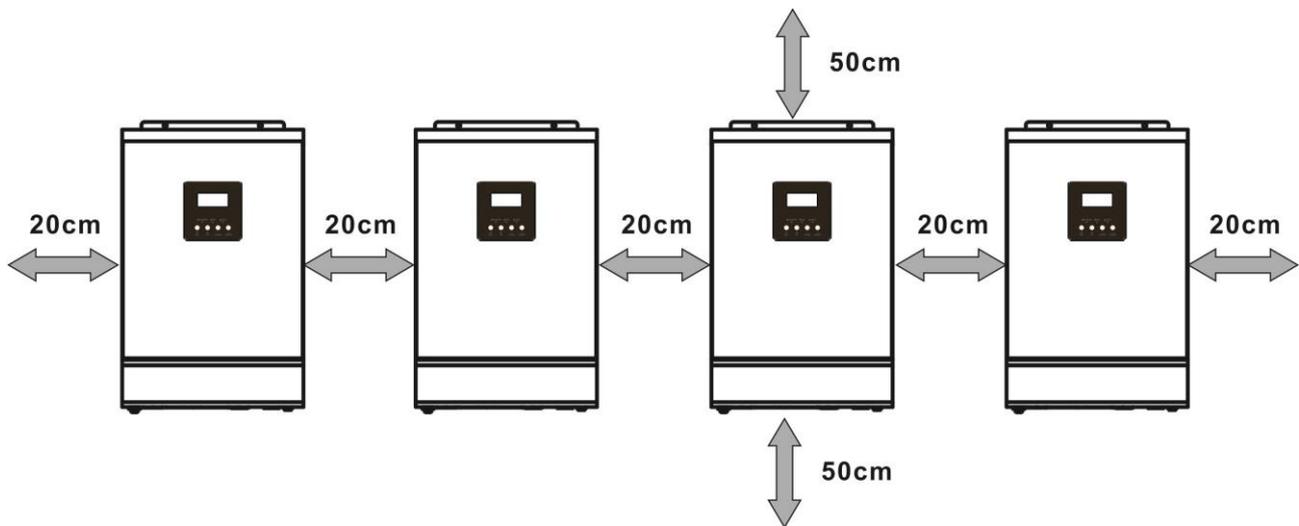
**Step 7:** Put communication board back to the unit.



**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.

#### 4. Wiring Connection

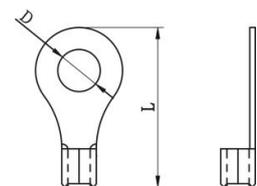
**NOTICE:** It's requested to connect to battery for parallel operation.

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 <sup>2</sup>	Dimensions		
			D (mm)	L (mm)	
1KW	1 *4AWG	28	6.4	49.7	2~ 3 Nm
2KW	1 * 4AWG	28	6.4	49.7	2~ 3 Nm
3KW	1 * 4AWG	28	6.4	49.7	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
1KW	14 AWG	1.4~1.6Nm
2KW	12 AWG	1.4~1.6Nm
3KW	10 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 code #72.

**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*
1KW	100A/80VDC
2KW	100A/80VDC
3KW	100A/80VDC

\*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
1KW	32A	48A	64A	80A	96A	112A	128A	144A
2KW	64A	96A	128A	160A	192A	224A	256A	288A
3KW	96A	144A	192A	240A	288A	336A	384A	432A

**Note1:** Also, you can use 16A breaker for 1KW model, 32A for 2KW model and 48A for 3KW model with 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**

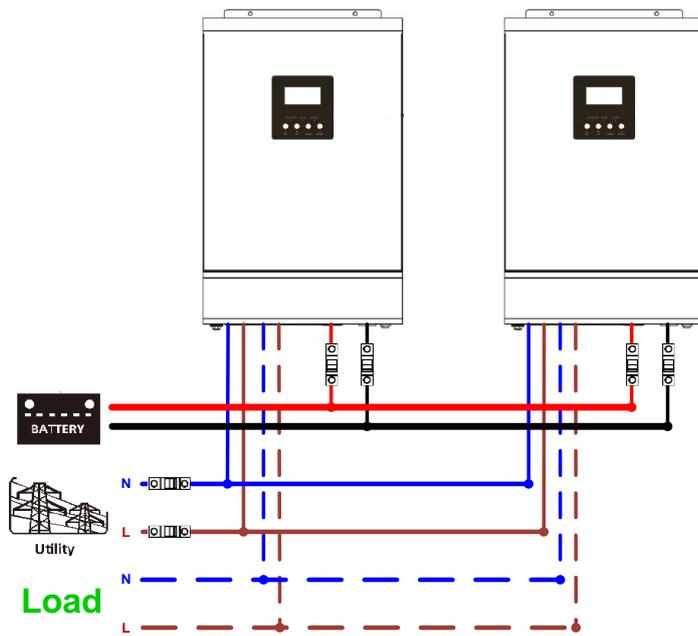
Inverter parallel numbers	2	3	4	5	6	7	8	9
Battery Capacity	400AH	600AH	800AH	1000AH	1200AH	1400AH	1600AH	1800AH

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

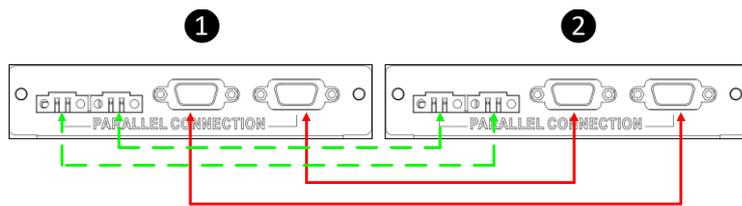
## 5-1. Parallel Operation in Single phase

Two inverters in parallel:

### Power Connection

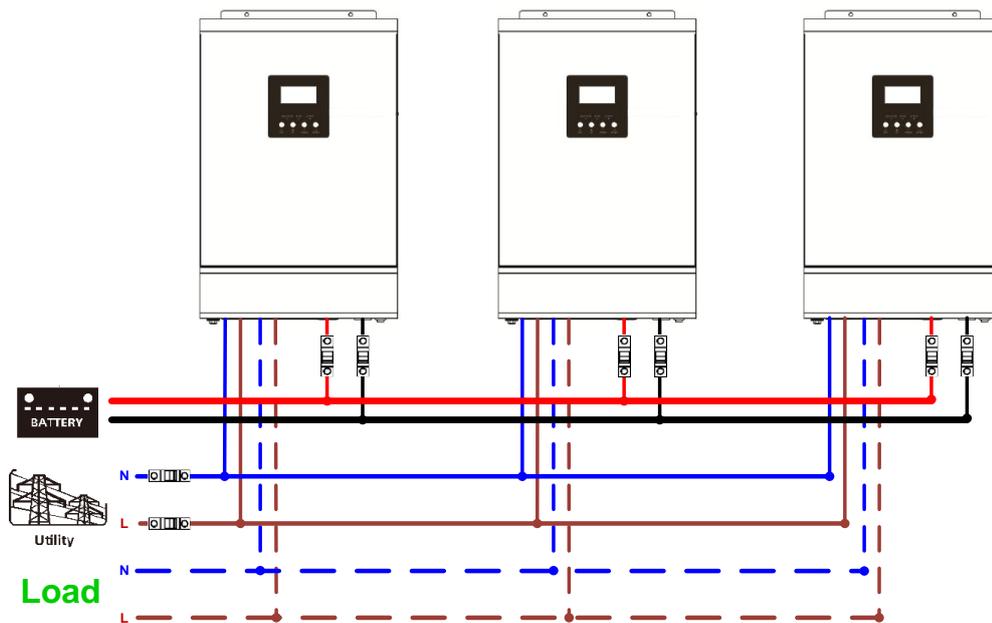


### Communication Connection

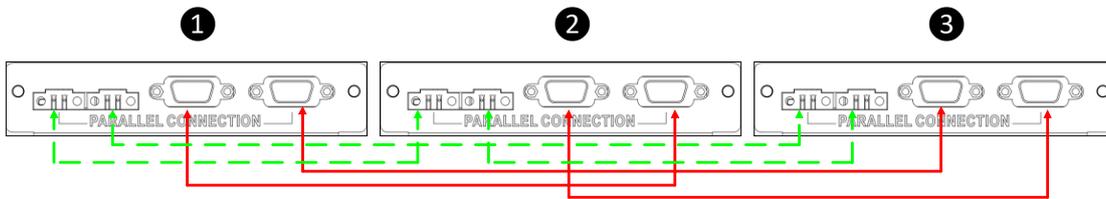


Three inverters in parallel:

### Power Connection

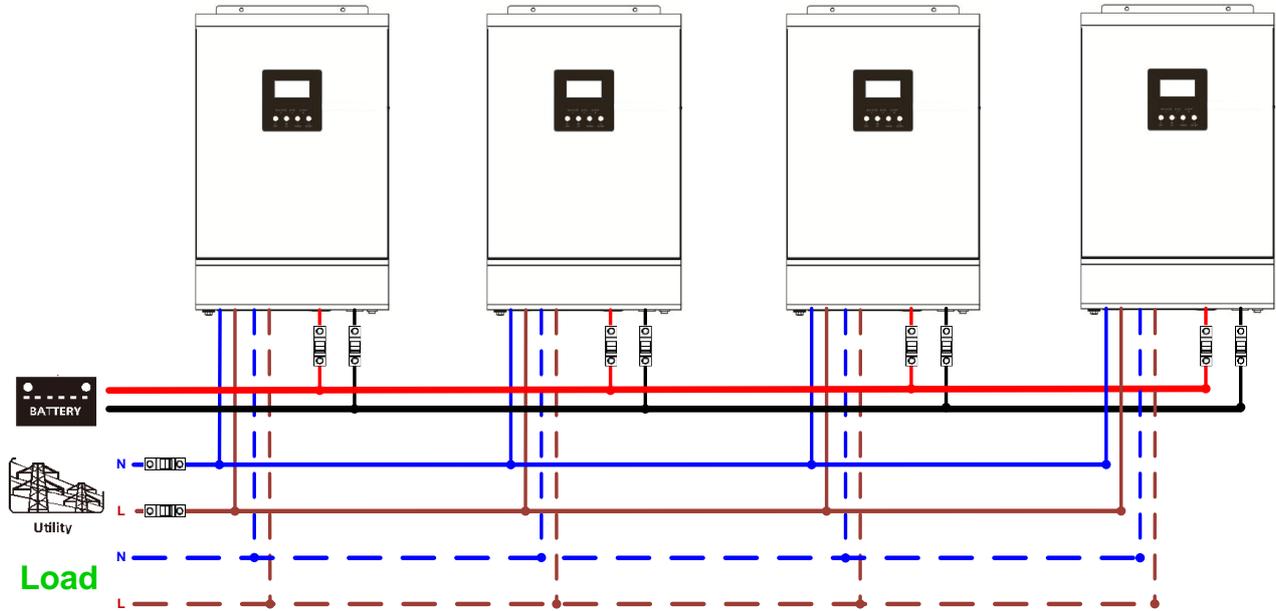


### Communication Connection

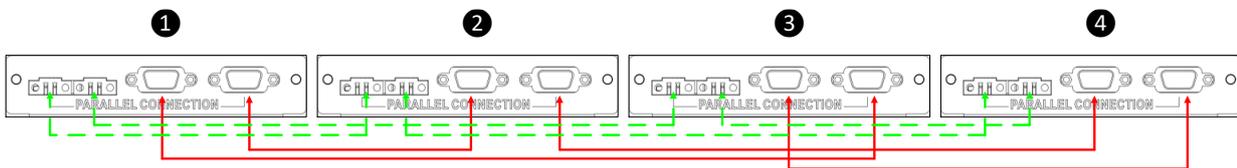


Four inverters in parallel:

### Power Connection

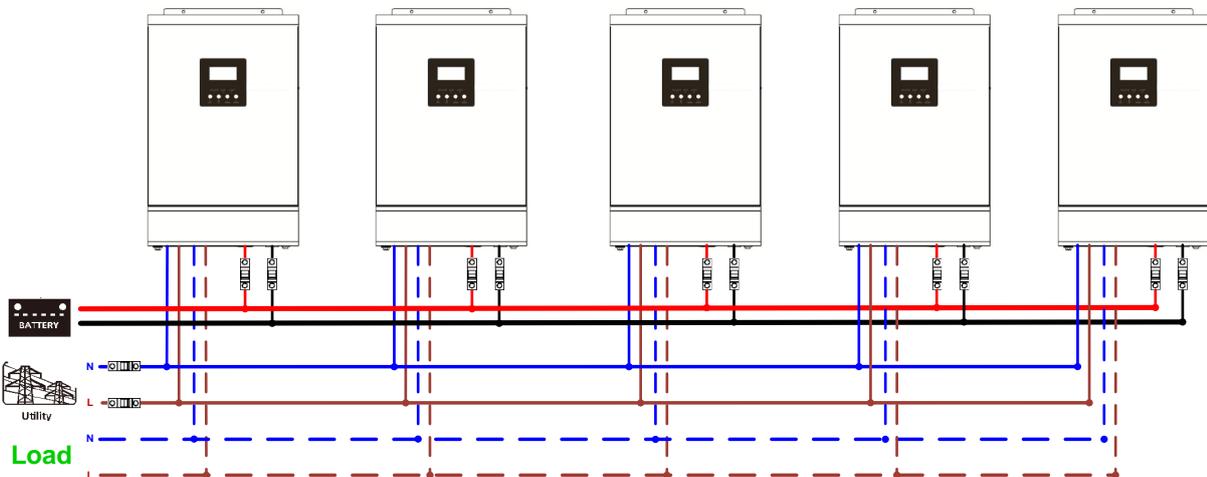


### Communication Connection

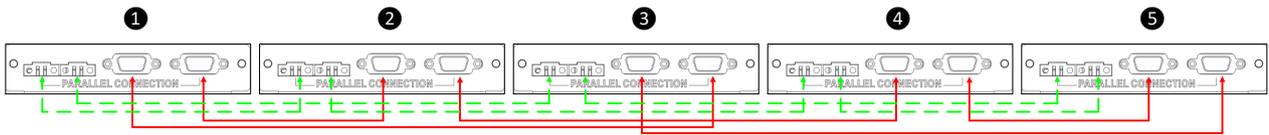


Five inverters in parallel:

### Power Connection

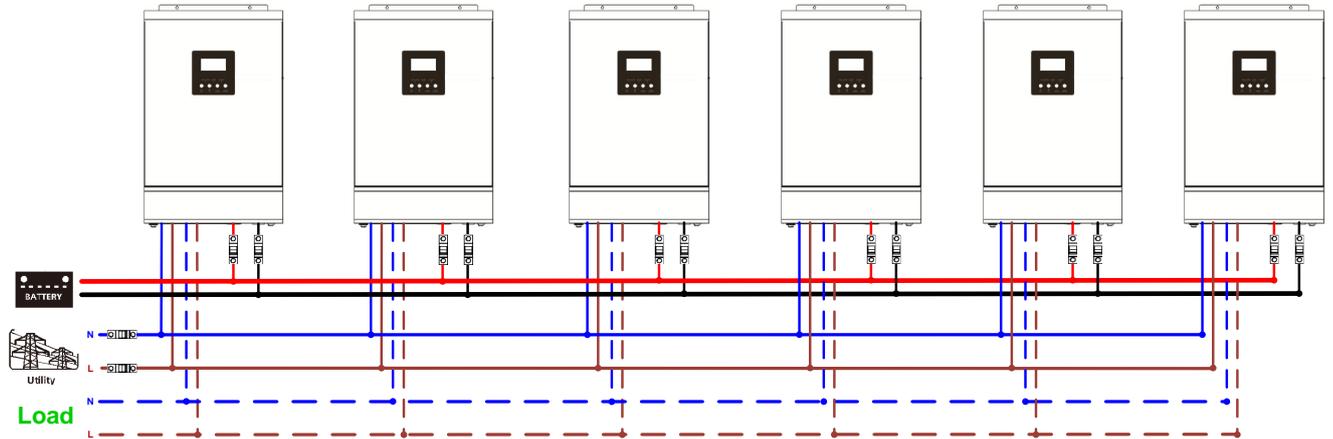


## Communication Connection

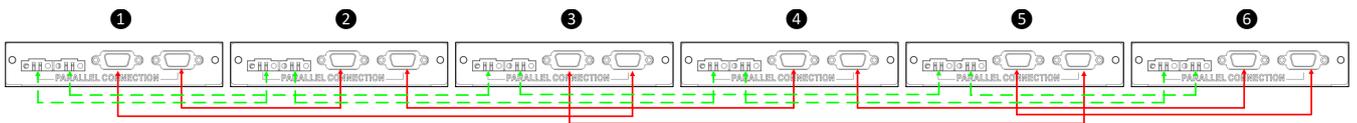


Six inverters in parallel:

## Power Connection

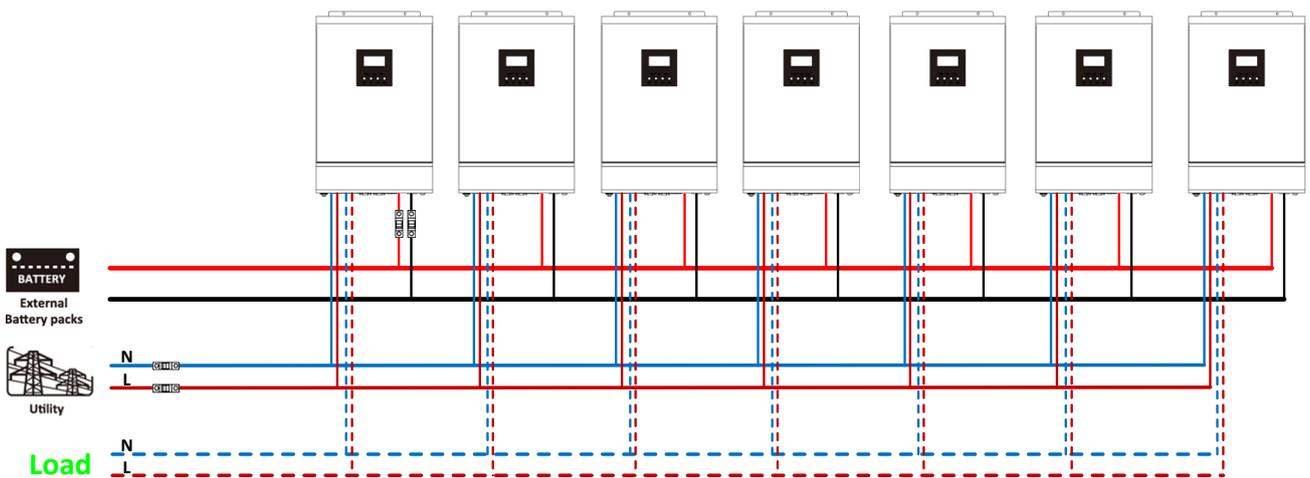


## Communication Connection



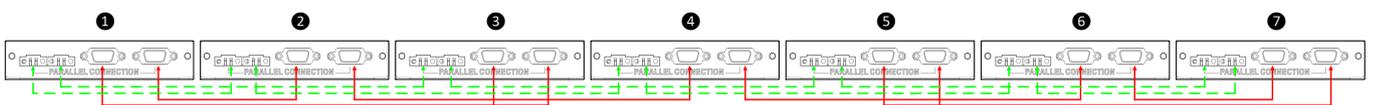
Seven to nine inverters in parallel:

## Power Connection

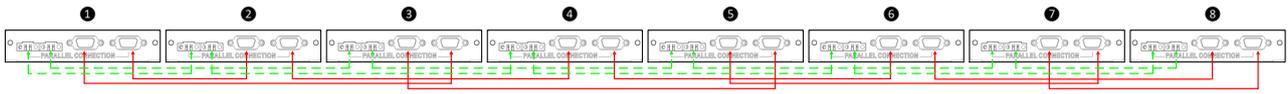


## Communication Connection

➤ Seven inverters in parallel



➤ Eight inverters in parallel



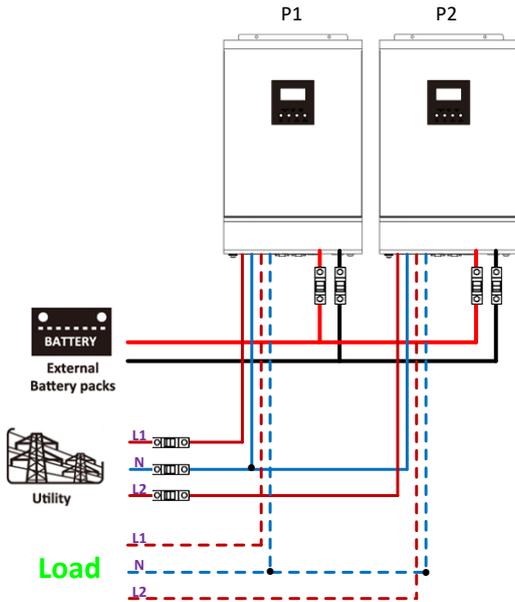
➤ Nine inverters in parallel



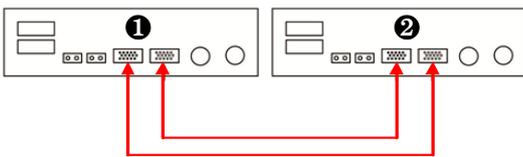
## 5-2. Support 2-phase equipment

Two inverters in each phase:

### Power Connection

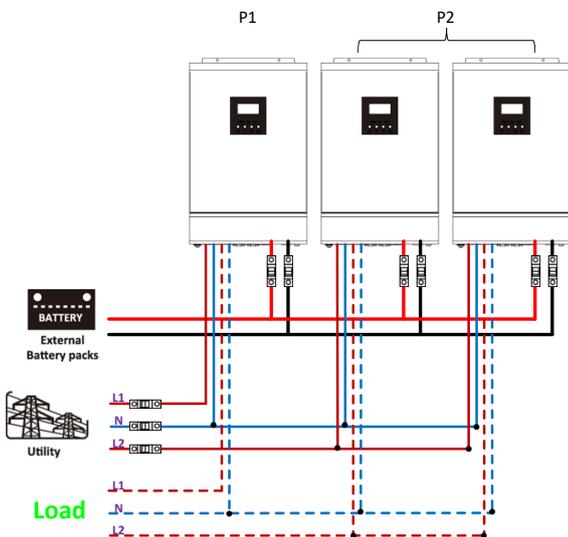


### Communication Connection

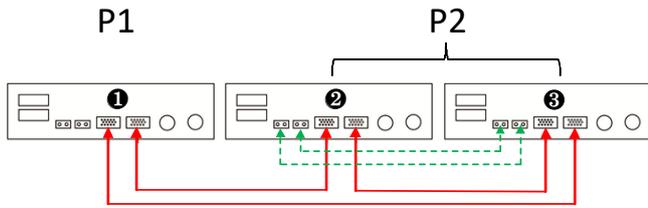


Two inverters in one phases and one inverter for the remaining phase:

### Power Connection



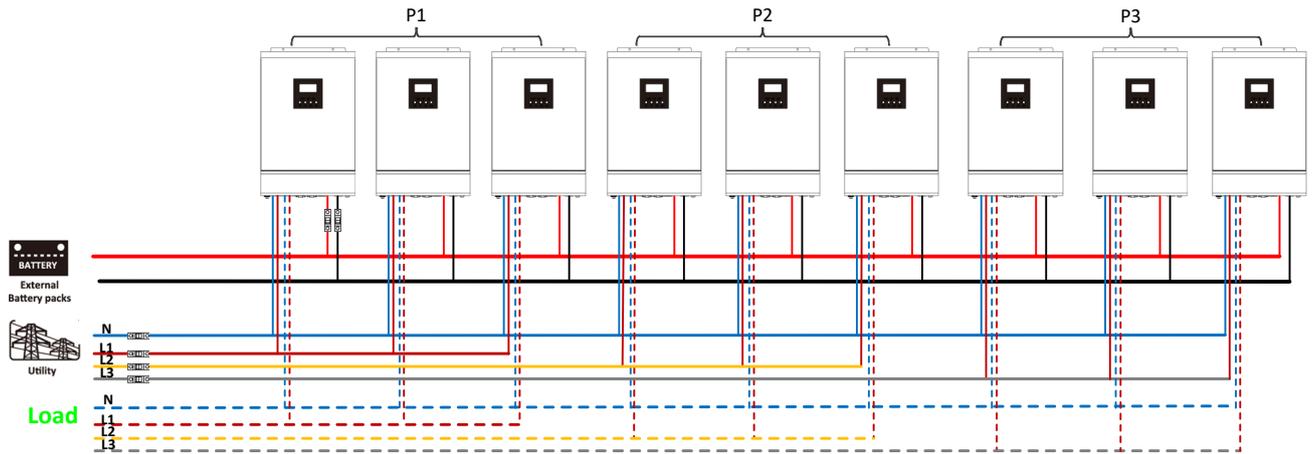
### Communication Connection



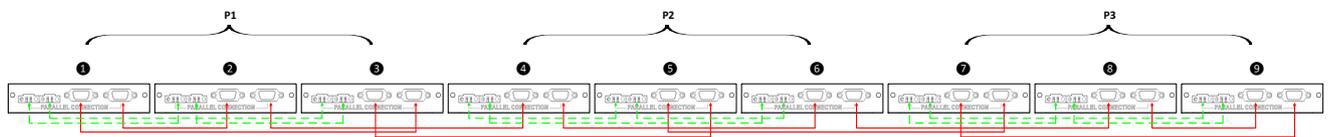
### 5-3. Support 3-phase equipment

Three inverters in each phase:

### Power Connection

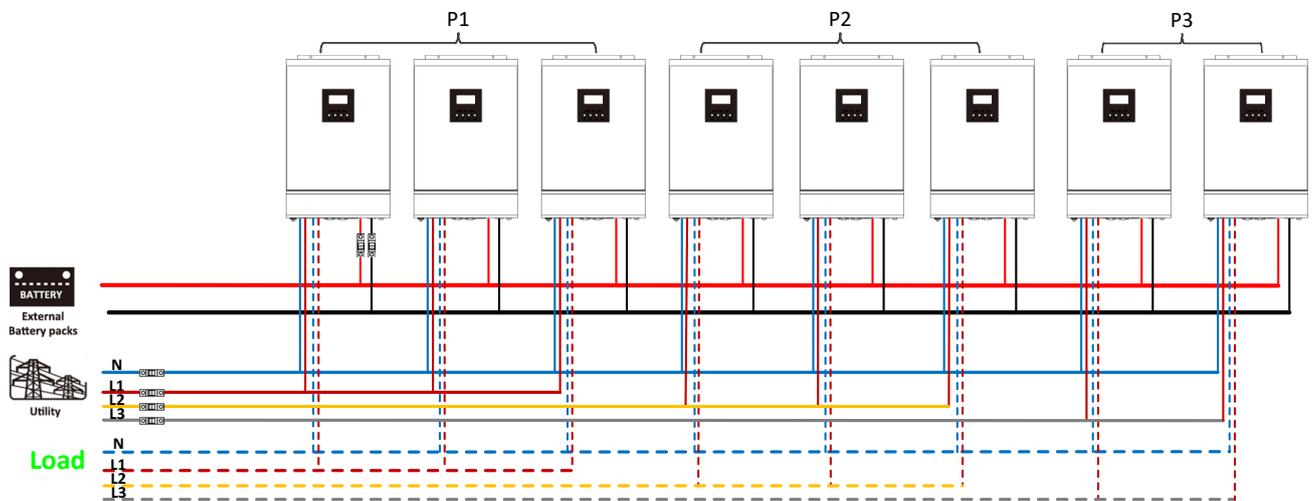


### Communication Connection

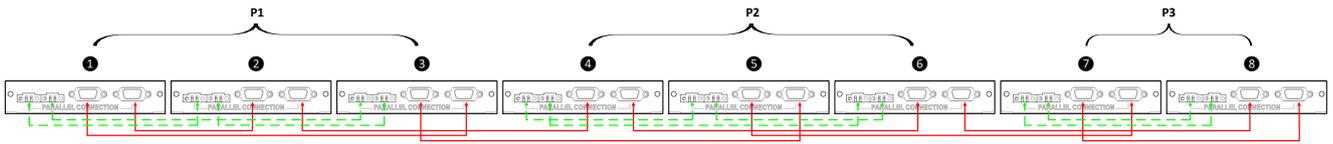


Three inverters in one phase, three inverters in second phase and two inverter for the third phase:

### Power Connection

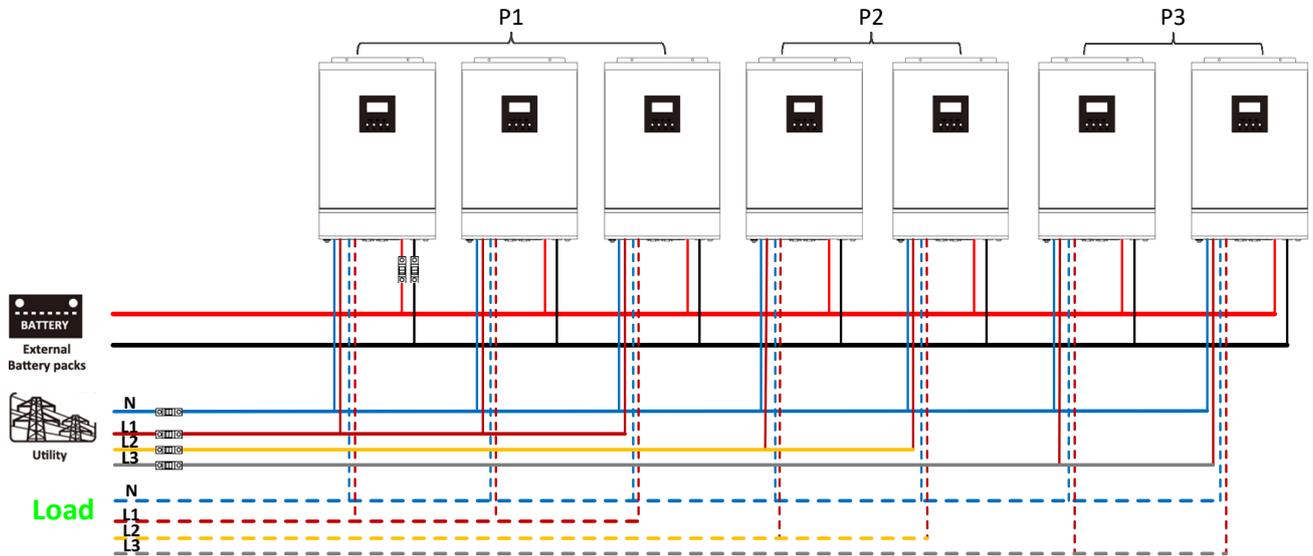


## Communication Connection

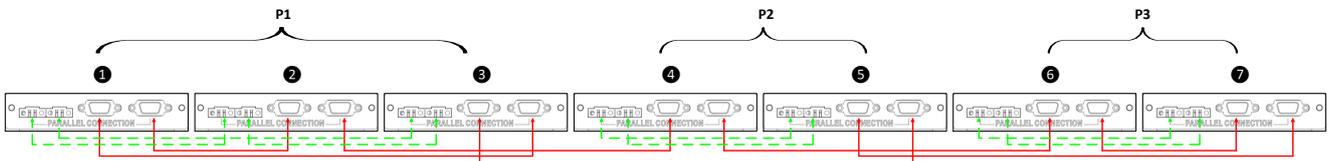


Three inverters in one phase, two inverters in second phase and two inverters for the third phase:

## Power Connection

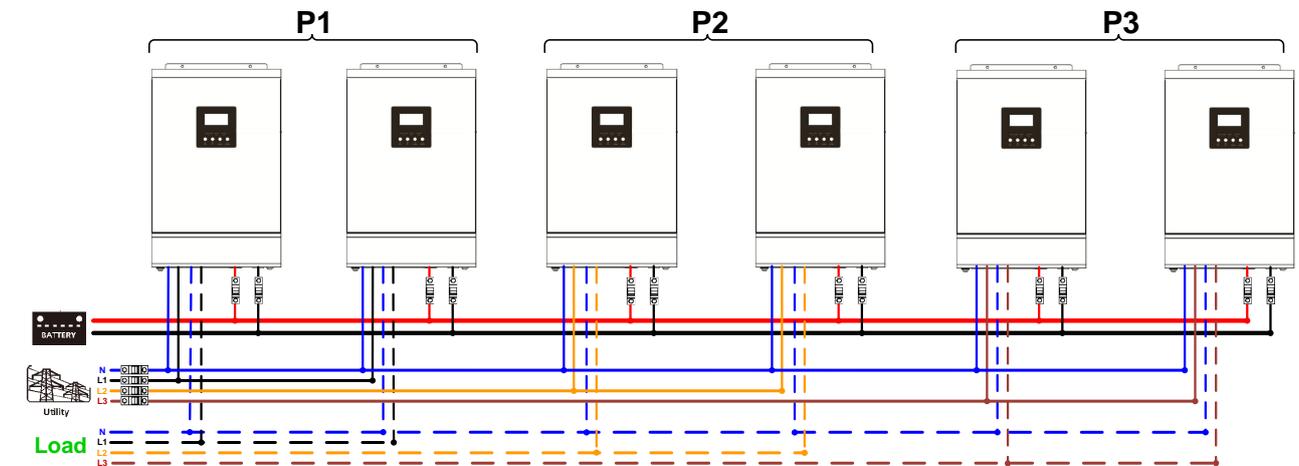


## Communication Connection

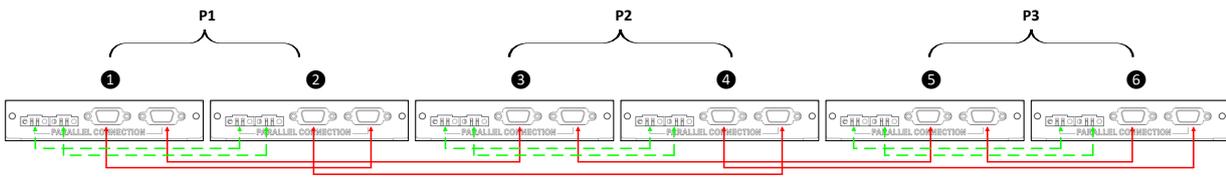


Two inverters in each phase:

## Power Connection

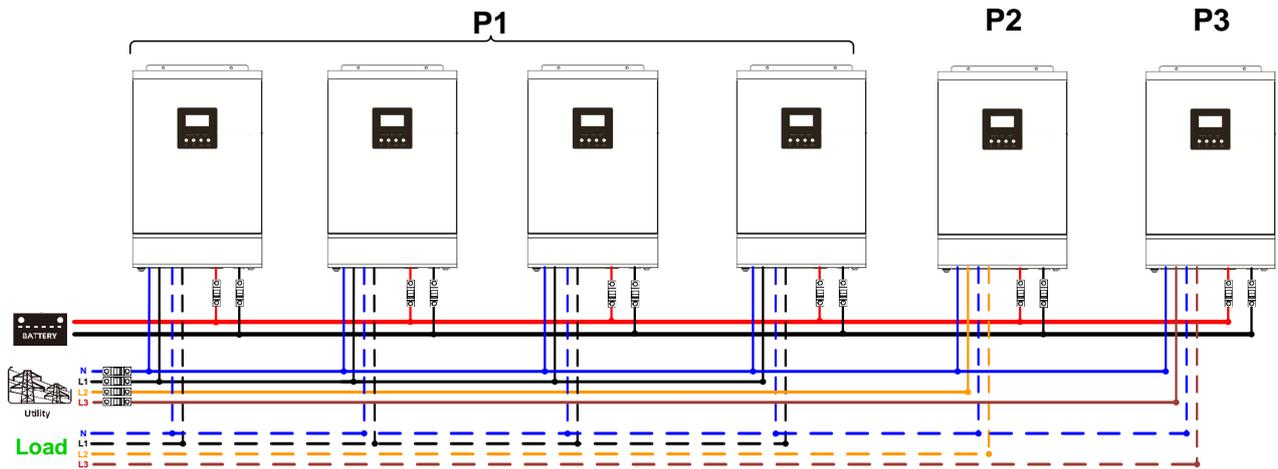


### Communication Connection

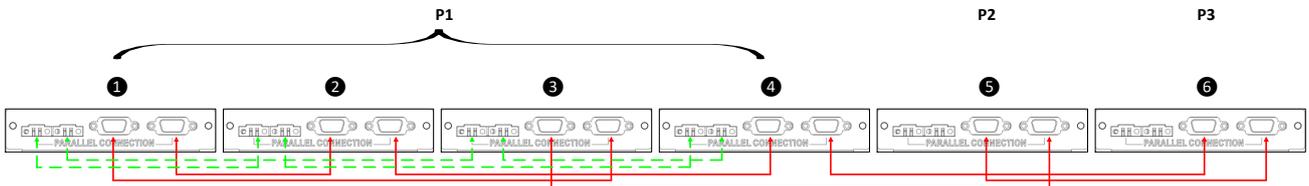


Four inverters in one phase and one inverter for the other two phases:

### Power Connection

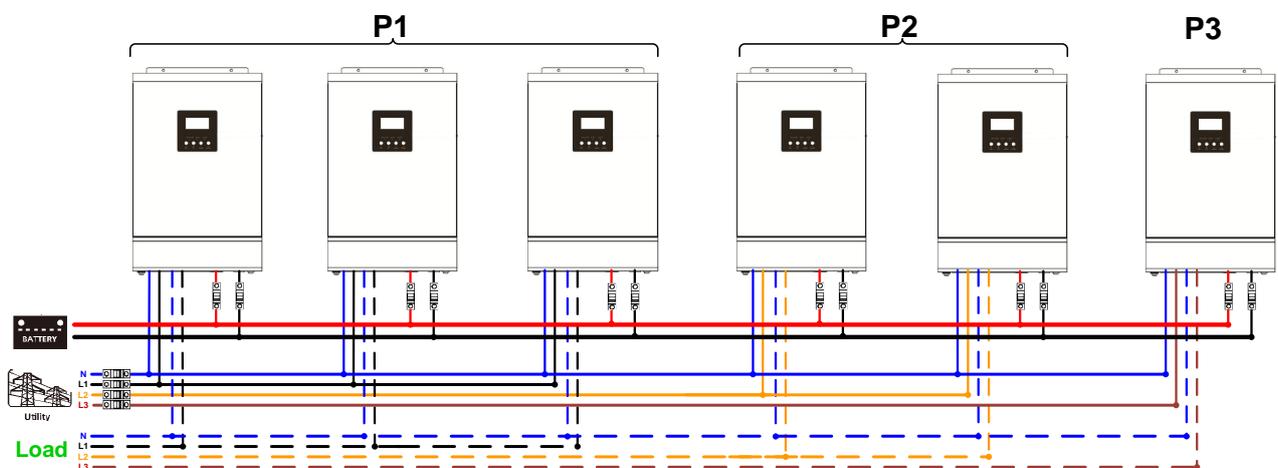


### Communication Connection

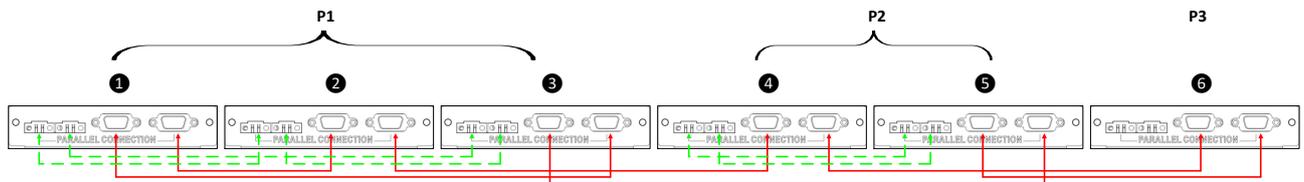


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

### Power Connection

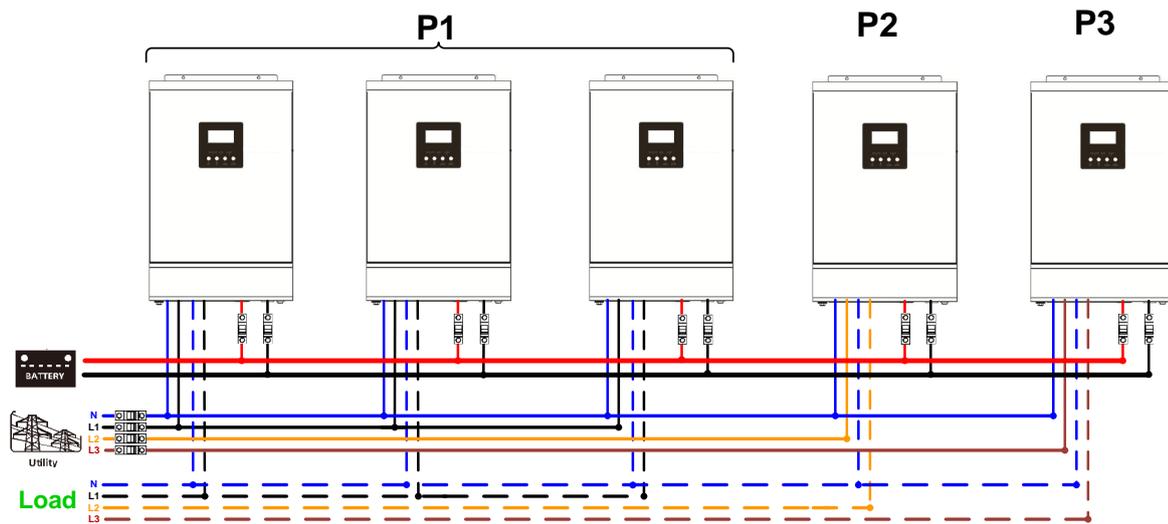


### Communication Connection

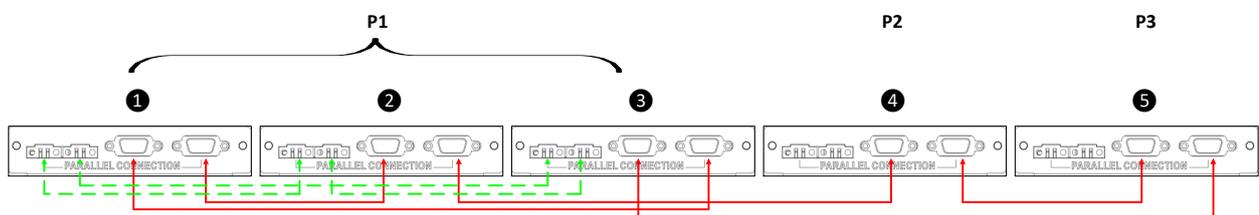


Three inverters in one phase and only one inverter for the remaining two phases:

### Power Connection

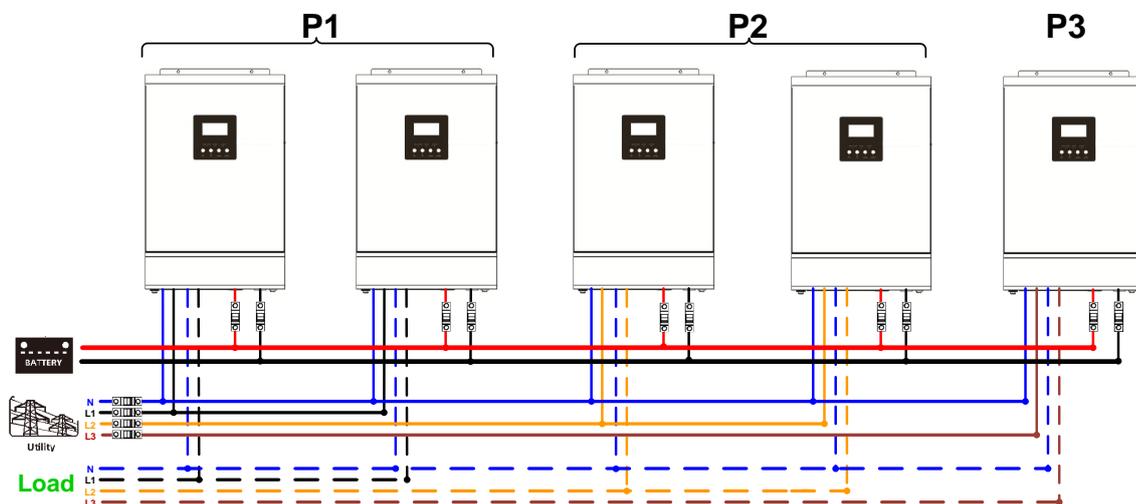


### Communication Connection

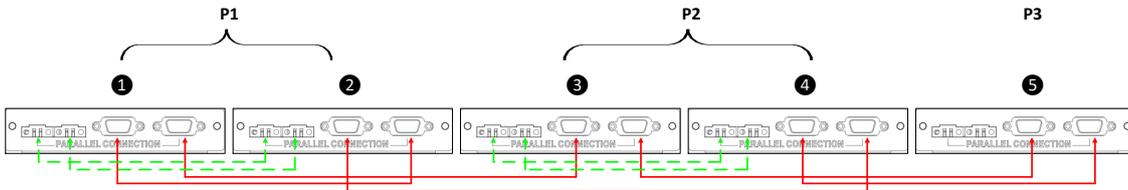


Two inverters in two phases and only one inverter for the remaining phase:

### Power Connection

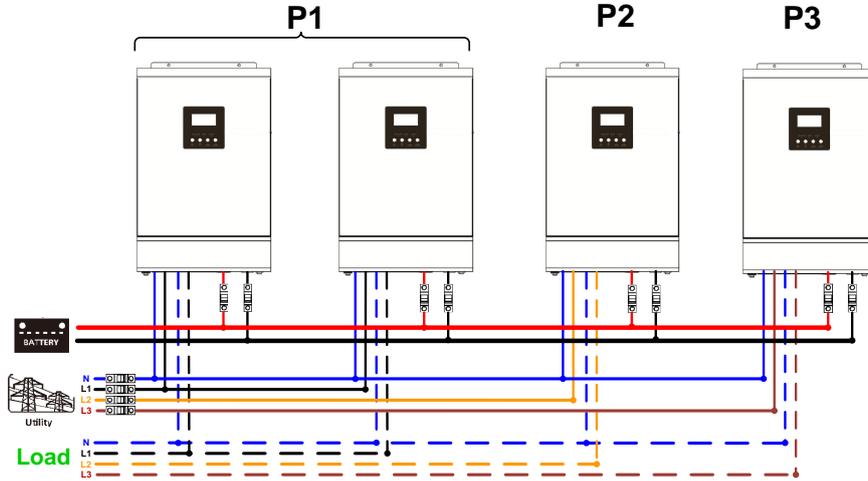


## Communication Connection

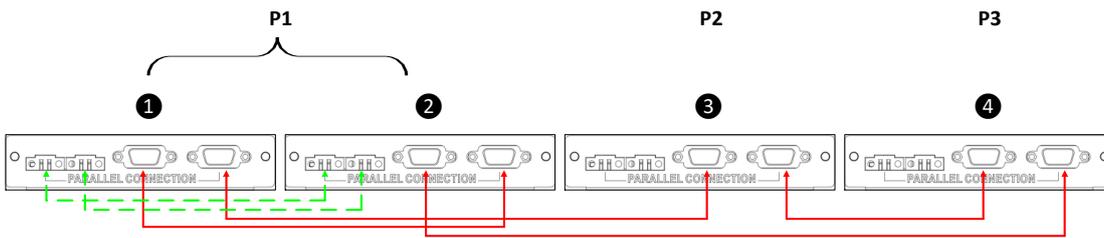


Two inverters in one phase and only one inverter for the remaining phases:

## Power Connection

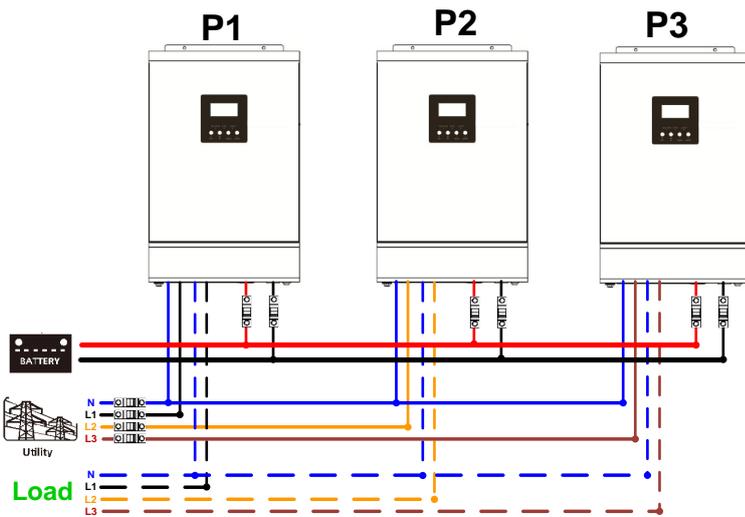


## Communication Connection

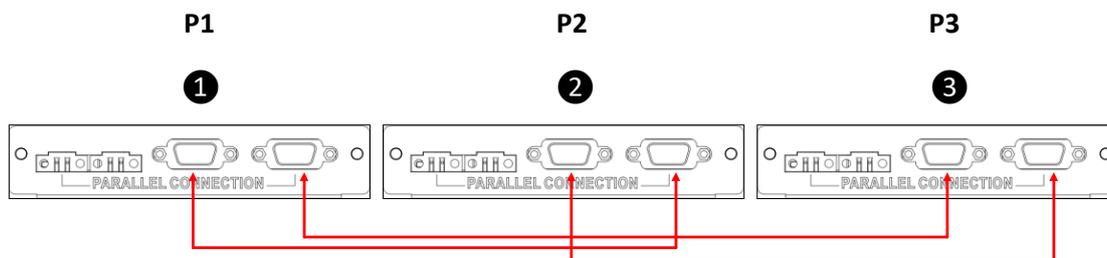


One inverter in each phase:

## 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.

## 7. LCD Setting and Display

### Setting Program:

Program	Description	Selectable option	
28	AC output mode *This setting is able to set up only when the inverter is in standby mode. Be sure that on/off switch is in "OFF" status	Single: 28 <sup>OUTPUT</sup> SIG	When the unit is operated alone, please select "SIG" in program 28.
		Parallel: 28 <sup>OUTPUT</sup> PAL	When the units are used in parallel with single phase, please select "PAL" in program 28. Please refer to 5-1 for detailed information.
		L1 phase: 28 <sup>OUTPUT</sup> 2P1	When the units are operated in 2-phase application, please choose "2PX" to define each inverter. It's required to have at least 2 inverters (one inverter in each phase) or maximum 9 inverters to support two-phase equipment. Please refer to 5-2 for detailed information. Please select "2P1" in program 28 for the inverters connected to L1 phase and "2P2" in program 28 for the inverters connected to L2 phase
		L2 phase: 28 <sup>OUTPUT</sup> 2P2	
		L1 phase: 28 <sup>OUTPUT</sup> 3P1	When the units are operated in 3-phase application, please choose "3PX" to define each inverter. 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 refers to 5-3 for detailed information.
		L2 phase: 28 <sup>OUTPUT</sup> 3P2	

		<p>L3 phase:  </p>	<p>Please select "3P1" in program 28 for the inverters connected to L1 phase, "3P2" in program 28 for the inverters connected to L2 phase and "3P3" in program 28 for the inverters connected to L3 phase.</p> <p>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.</p> <p>Besides, power saving function will be automatically disabled.</p>
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**Fault code display:**

Fault Code	Fault Event	Icon on
60	Power feedback protection	
71	Firmware version inconsistent	
72	Current sharing fault	
80	CAN fault	
81	Host loss	
82	Synchronization loss	
83	Battery voltage detected different	
84	AC input voltage and frequency detected different	
85	AC output current unbalance	
86	AC output mode setting is different	

## 8. Commissioning

### Parallel in single phase

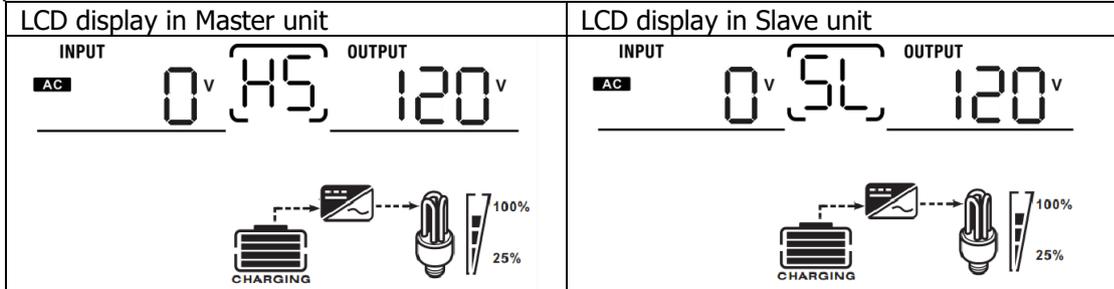
Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on each unit and set "PAL" in LCD setting program 28 of each unit. And then shut down all units.

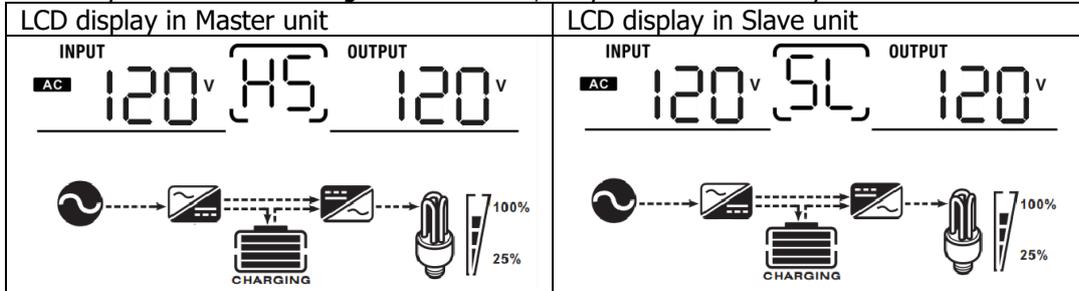
**NOET:** It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on each unit.



**NOTE:** Master and slave units are randomly defined.

Step 4: Switch on all AC breakers of Line wires in AC input. It's better to have all inverters connect to utility at the same time. If not, it will display fault 82 in following-order inverters. However, these inverters will automatically restart. If detecting AC connection, they will work normally.



Step 5: If there is no more fault alarm, the parallel system is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

### Support two-phase equipment

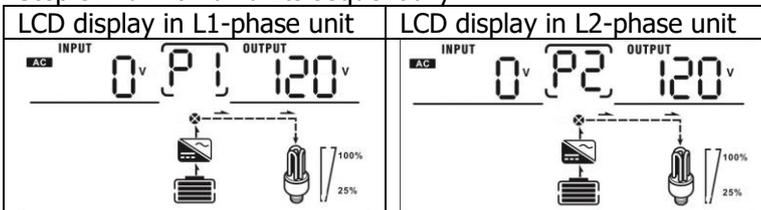
Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are off and each Neutral wires of each unit are connected together.

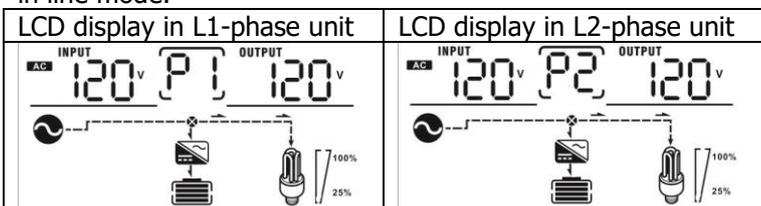
Step 2: Turn on all units and configure LCD program 28 as P1 and P2 sequentially. And then shut down all units.

**NOET:** It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on all units sequentially.



Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and two phases are matched with unit setting, they will work normally. Otherwise, the AC icon will flash and they will not work in line mode.



Step 5: If there is no more fault alarm, the system to support 2-phase equipment is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

**Support three-phase equipment**

Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on all units and configure LCD program 28 as P1, P2 and P3 sequentially. And then shut down all units.

**NOET:** It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on all units sequentially.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit

Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and three phases are matched with unit setting, they will work normally. Otherwise, the AC icon will flash and they will not work in line mode.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit

Step 5: If there is no more fault alarm, the system to support 3-phase equipment is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Note 1: To avoid overload occurring, before turning on breakers in load side, it's better to have whole system in operation first.

Note 2: Transfer time for this operation exists. Power interruption may happen to critical devices, which cannot bear transfer time.

## 9. Trouble shooting

Situation		Solution
Fault Code	Fault Event Description	
60	Current feedback into the inverter is detected.	<ol style="list-style-type: none"> <li>1. Restart the inverter.</li> <li>2. Check if L/N cables are not connected reversely in all inverters.</li> <li>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.</li> <li>4. If the problem remains, please contact your installer.</li> </ol>
71	The firmware version of each inverter is not the same.	<ol style="list-style-type: none"> <li>1. Update all inverter firmware to the same version.</li> <li>2. Check the version of each inverter via LCD setting and make sure the CPU versions are same. If not, please contact your instraller to provide the firmware to update.</li> <li>3. After updating, if the problem still remains, please contact your installer.</li> </ol>
72	The output current of each inverter is different.	<ol style="list-style-type: none"> <li>1. Check if sharing cables are connected well and restart the inverter.</li> <li>2. If the problem remains, please contact your installer.</li> </ol>
80	CAN data loss	<ol style="list-style-type: none"> <li>1. Check if communication cables are connected well and restart the inverter.</li> <li>2. If the problem remains, please contact your installer.</li> </ol>
81	Host data loss	
82	Synchronization data loss	
83	The battery voltage of each inverter is not the same.	<ol style="list-style-type: none"> <li>1. Make sure all inverters share same groups of batteries together.</li> <li>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.</li> <li>3. If the problem still remains, please contact your installer.</li> </ol>
84	AC input voltage and frequency are detected different.	<ol style="list-style-type: none"> <li>1. Check the utility wiring connction and restart the inverter.</li> <li>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.</li> <li>3. If the problem remains, please contact your installer.</li> </ol>
85	AC output current unbalance	<ol style="list-style-type: none"> <li>1. Restart the inverter.</li> <li>2. Remove some excessive loads and re-check load information from LCD of inverters. If the values are different, please check if AC input and output cables are in the same length and material type.</li> <li>3. If the problem remains, please contact your installer.</li> </ol>
86	AC output mode setting is different.	<ol style="list-style-type: none"> <li>1. Switch off the inverter and check LCD setting #28.</li> <li>2. For parallel system in single phase, make sure no 3P1, 3P2 or 3P3 is set on #28. For upporting three-phase system, make sure no "PAL" is set on #28.</li> <li>3. If the problem remains, please contact your installer.</li> </ol>

## Appendix II: Approximate Back-up Time Table

Model	Load (VA)	Backup Time @ 12Vdc 100Ah (min)	Backup Time @ 12Vdc 200Ah (min)
1KW	100	766	1610
	200	335	766
	300	198	503
	400	139	339
	500	112	269
	600	95	227
	700	81	176

Model	Load (VA)	Backup Time @ 24Vdc 100Ah (min)	Backup Time @ 24Vdc 200Ah (min)
2KW	200	766	1610
	400	335	766
	600	198	503
	800	139	339
	1000	112	269
	1200	95	227
	1400	81	176

Model	Load (VA)	Backup Time @ 48Vdc100Ah (min)	Backup Time @ 48Vdc 200Ah (min)
3KW	300	1054	2107
	600	491	1054
	900	291	668
	1200	196	497
	1500	159	402
	1800	123	301
	2100	105	253
	2400	91	219
	2600	71	174

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