User Manual

3-5.5 KVA INVERTER
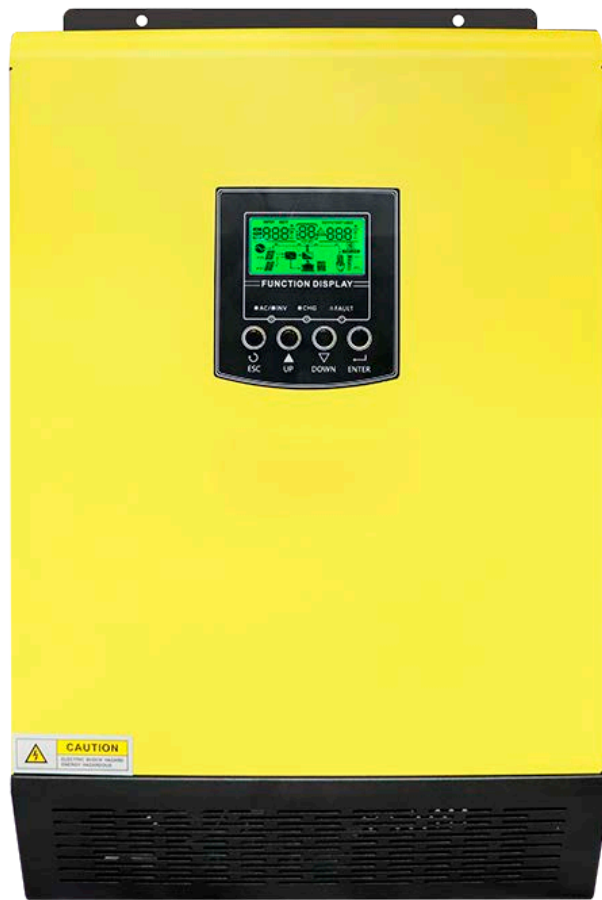
Version：2.0

CONTENTS

1. ABOUT THIS MANUAL

1.1 Purpose

This manual describes how to assemble, install, operate the units and how to troubleshoot of this unit. Please read this manual carefully before installation and operation.Keep this manual for future reference.

1.2 Scope

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

1.3 SAFETY INSTRUCTIONS

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

1.Read and follow all installation, operation, and maintenance in formation carefully before using the product.

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 personally. Take it to a qualified service center to repair

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

5. **WARNING :** Disconnecting all power supply before any maintaining or cleaning ,please noted that if you only turn off the unit are not safe enough.

6. **WARNING:** Only qualified service persons are allowed to operate this product. If fault not solved after following troubleshooting table, please send this inverter back to local dealer or service center for maintenance.

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

8. **CAUTION :** It's requested to use PV junction box with surge protection. Otherwise, it may cause damage on inverter.

2. INTRODUCTION

This is a multi-function inverter/charger, combining varies of functions of inverter, solar charger and battery charger.Supply uninterruptible electric energy to loads.Its comprehensive LCD display allowed user setting the varies date according to user's requirements,such as battery charging current, AC/solar charger priority, and setting different input voltage based on different applications.

2.1 Features

1. Hybrid solar inverter(on/off grid inverter)

2. Output power factor PF=1.0

3. On-grid with energy storage

4. Configurable AC/Solar Charger priority via LCD setting

5. Smart battery charger design for optimized battery performance

6. Compatible to mains voltage or generator power

7. Overload ,Over temperature ,Short circuit protection ,Fault record ,History record

8. External WIFI devices

9. Parallel operation with up to 9 units

2.2 Basic System Architecture

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

Generator or Utility.

PV modules

Consult with integrator who provide you the system about the architectures as you request. This inverter can supply power to all kinds of appliances in home or office ,including motor-type appliances, such as tube light, fan, refrigerator and air-conditioner.

Figure 1 Hybrid Power System

2.3 Product Overview
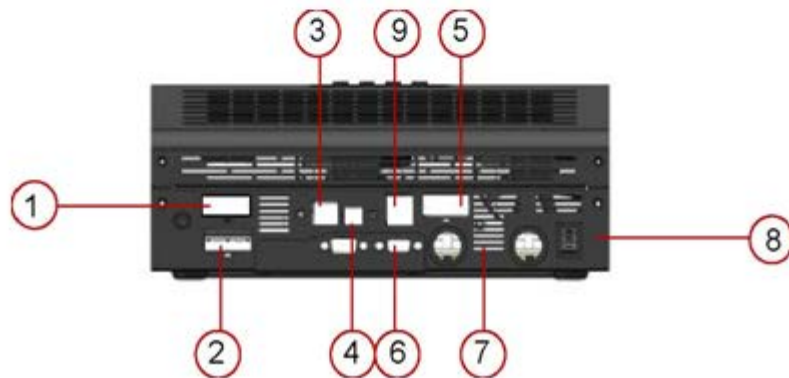
1：**AC Input**	6： **Parallel interfaces**
2：**AC Output**	7：**DC Input**
3：**RS232 terminal**	8：**ON/OFF switch**
4：**USB terminal**	9：**Generator dry contact**
5：**PV Input**	

3. INSTALLATION

3.1 Unpacking and Inspection

Before installation ,please inspect the unit. Be sure that everything in the package is not damaged. The following items inside of package would be received.

The Inverter x 1

 User manual x 1

3.2 Preparation

Please remove the two screws on the back cover of the device before opening it.

3.3 Mounting the Unit

Consider the below points before selecting where to install:

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

2. Mount on the surface of a solid material.

3. Install this inverter at a visible place in order to allow the LCD display to be read at all times.

4. For proper air circulation and dissipate heat ,make sure there is 20 cm distance from the two side, 50 cm distance from bottom of the unit.

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

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

7. Be sure to keep other objects and surfaces as shown in the diagram to guarantee sufficient heat dissipation and to have enough space for collecting wires.

Suitable for mounting on concrete or other non-combustible surface only

3.4 Battery Connection

CAUTION: For safety operation and regulation compliance, it's requested to adopt a separate DC over-current protector or disconnect device between battery and inverter. It may not be necessary to have a disconnect device in some applications ,however ,it's still need to adopt over-current protection device. 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 cable as below.

24VDC battery connection diagram
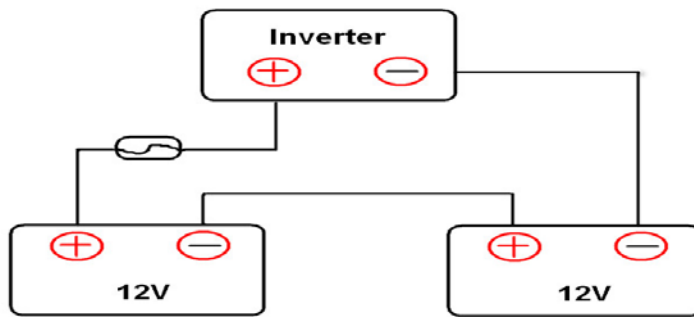
48VDC battery connection diagram
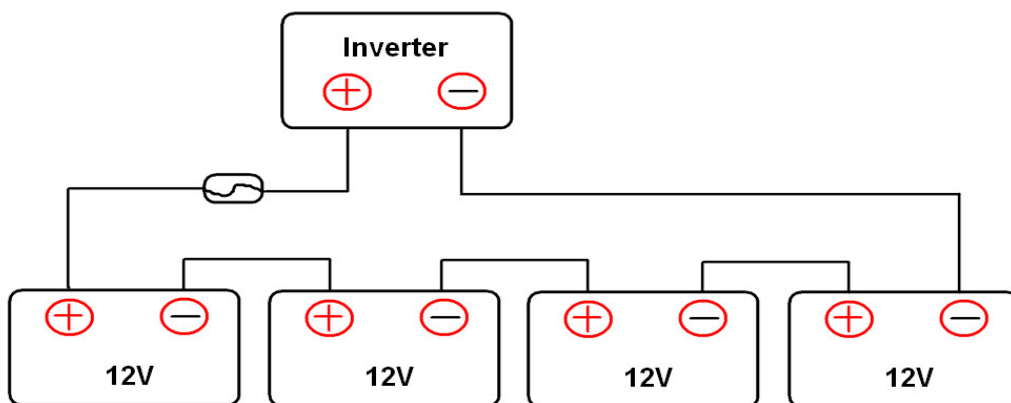
CAUTION! Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

3.5 AC Input/Output Connection

CAUTION! Before connecting to AC input power source, please install a separate AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input. The recommended spec of AC breaker is 32A for 3KVA and 50A for 5.5KVA. There are two terminal blocks with "IN" and "OUT" markings. Please do NOT connect input and output connectors wrong.

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

Model	Gauge	Cable (mm^2)	Torque Value
3KVA	12 AWG	4	1.2 Nm
4-5.5KVA	10 AWG	6	1.2 Nm

3.6 PV Connection

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

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 cable size as below.

Model	Wire Size	Cable (mm^2)	Torque value（max）
3 - 5.5KVA	12AWG	4	1.2 Nm

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

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

PV Module Selection:

When selecting proper PV modules, please be sure to consider below parameters: 1.Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.

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

INVERTER MODEL	3 - 5.5KVA
Max. PV Array Open Circuit Voltage	450Vdc
PV Array MPPT Voltage Range	120Vdc~450Vdc

Application Example:

	SOLAR INPUT	Qty of panels	Total input power
	(Min in serial: 6 pcs, max. in serial: 12 pcs)		
Solar Panel Spec. 250Wp Vmp: 30.1Vdc Imp: 8.3A Voc: 37.7Vdc Isc: 8.4A	6 pcs in serial	6 pcs	1500W
	9 pcs in serial	9 pcs	2250W
	12 pcs in serial	12 pcs	3000W
	9 pieces in serial and 2 sets in parallel	18 pcs	4500W

PV Module Wire Connection

Please follow below steps to implement PV module connection:

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

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

3. Fix PV wire cover to the inverter with supplied screws as shown in below chart.

3.7 Final Assembly

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

3.8 Communication Connection

Please use supplied communication cable to connect inverter and PC, follow the instructions on the screen to install the monitoring software. For the detailed software operation, please check user manual.

4. OPERATION

4.1 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.

4.2 Operation and Display Panel

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

LCD display

LED indicators

Function keys
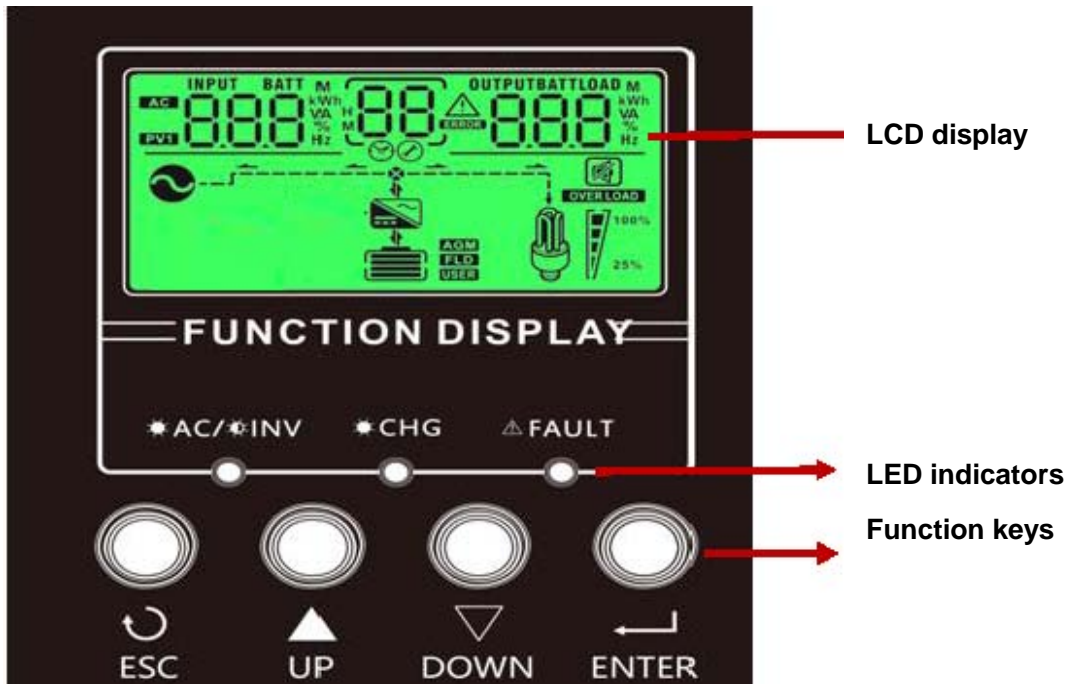
LED Indicator

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

4.3 LCD Display Icons
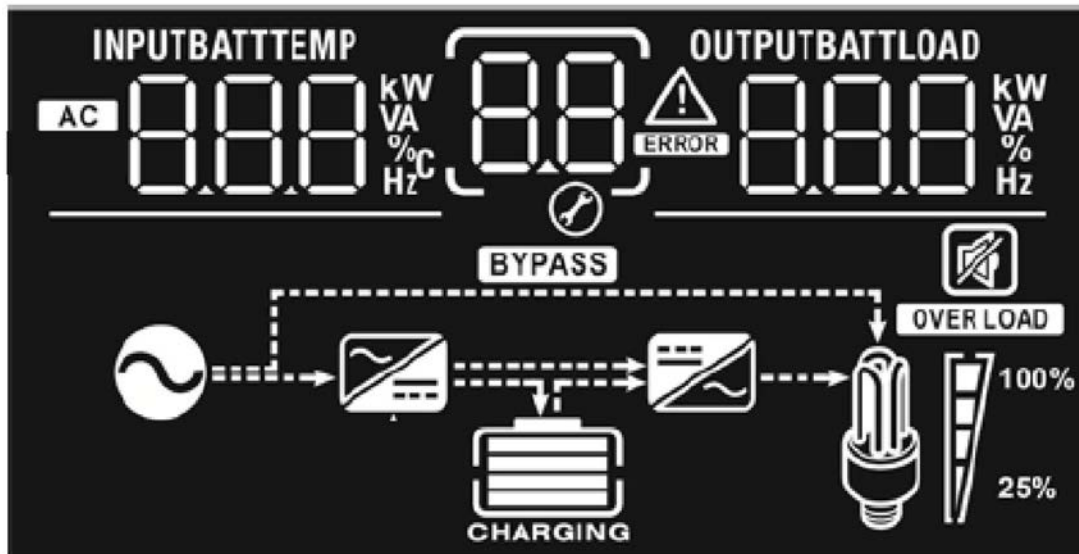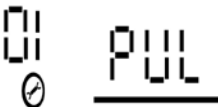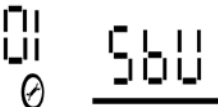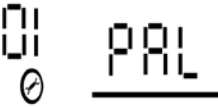
Icon	Description
Input source information	
AC	Indicates the AC input
PV	Indicates the PV panel input
Left digital display information	
INPUTBATT 8.8.8 kW VA %C Hz	Induct input voltage, input frequency , battery voltage, PV voltage, charger current
Middle digital display information	
8.8	Indicates the setting programs
8.8 ERROR	Indicates the warning and fault codes. Warning : Flashing with warning code. Fault: display with fault code.

Right digtal display information	
OUTPUTBATTLOAD 888 kW VA % Hz	Indicates the output voltage, output frequency, load percent, load VA, load W
Battery information	
CHARGING	Indicates battery level by 0-24%，25-49%，50-74%，75-100% and charging status.
Load information	
OVER LOAD	Indicates over load

	Battery voltage and current information
100% 25%	Indicates the load level by 0-25%，25-50%，50-75% ，75-100%

	0-25%	25-50%	50-75%	75-100%

Mode operation informtion	
∿	Indicates until connects to the mains
	Indicates until connects to the PV panel
	Indicates the solar charger is working
	Indicates the DC/AC inverter circuit is working
Mute operation	
	Indicates until alarm is disabled

4.4 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, pree "ENTER" button to confirm the selection or ESC button to exit.

Program	Description	Selectable option	
00	Exit setting mode	Escape:	long press the ESC button for 3 seconds ,and the mute will turn on automatically
01	Output source Priority selection	Utility first(default) 01 UtI	**Line:** (default) Utility will provide power to the load as the first priority, solar charging the battery. When solar energy is insufficient, utility and solar energy charge the battery at the same time. When utility is unavailable it will be powered by solar energy or batteries.
		Solar first 01 PUL	**Solar:** Solar energy provides power to the loads as the first priority. When the solar energy is sufficient, the extra energy will charges the battery. When solar energy is insufficient for load, batteries and solar will supply power at the same time. When solar energy and batteries are insufficient or solar energy is unavailable, utility power supply power to the load.
		Battery first 01 SbU	**Battery:** Battery provides power to the loads as the first priority. Utility provides power to the loads when battery voltage drop to low-level warning voltage or setting point, and the utility power will charge the battery. When the battery is fully charged, battery provides power to the load again.
		Utility and Solar first 01 PAL	**Solar + Line:** Solar energy provides power to the load as the first priority. If solar energy is not sufficient to power all load, utility energy will supply power the load at the same time.

02	Output voltage	230Vac(default) `02 230` ⊘	240Vac `02 240` ⊘
		220Vac `02 220` ⊘	
03	Output Frequency	50Hz(default) `03 50Hz` ⊘	60Hz `03 60Hz` ⊘
04	Battery type	AGM(default) `04 AGN` ⊘	Flooded `04 FLd` ⊘
		User-Defined `04 USE` ⊘	
05	Bulk charge current	24V model default setting:28.0 `bLU 05 28.0` ⊘ 48V model default setting:56.0 `bLU 05 56.0` ⊘	**Bulk charging voltage:** (default 56.0Vdc) the setting range is from 48V to 60V for 48V model (or 24V to 30V for 24V model) the increment or decrement is 0.1v per click. Please note: if you need set this, please select user-defined first in battery working mode
06	Floating charge current	24V model default setting:27.4 `FLO 06 27.4` ⊘ 48V model default setting:54.8 `FLO 06 54.8` ⊘	**Floating charge voltage:** （default 54.8Vdc）the setting range is from 48V to 60V for 48V model (or 24V to 30V for 24V model) the increment or decrement is 0.1v per click. Please note: if you need set this, please select user-defined first in battery working mode.

07	Low voltage alarm	24V model default setting:22.0 LOU 07 22.0 48V model default setting:44.0 LOU 07 44.0	**Low-voltage alarm:** (default 44.0Vdc) setting range of 48V 36V (or 24V 18V) to 48V 50V (or 24V 25V) setting increase or decrease of 0.1V.
08	Low voltage Shutdown	24V model default setting:20.4 CUt 08 20.4 48V model default setting:40.8 CUt 08 40.8	**Low Voltage Shutdown:** (default 40.8Vdc) Settings range from 36V (or 18V of 24V) of 48V to 50V (or 25V of 24V) of 48V. Settings increase or decrease by 0.1V.
09	Solar energy feed to grid configuration	(default) Grd 09 dEN	Solar energy feed to grid disable
		Grd 09 ENb	Solar energy feed to grid enable
10	AC charge	30A(default) CHt 10 30ᴬ	（default 30A）setting range is 0A to 60A, the increment or decrement is 10A per click
11	Start parallel	PAt 11 dEN	Cancel parallel
		PAt 11 ENb	Enter parallel
12	Setting single phase ID address	PId 12 01	（default 01）setting range is 1 to 12, the increment or decrement is 1 per click

13	Setting three phase for A/B/C order	A (default) PSH 13 A	C PSH 13 C
		B PSH 13 b	

4.5 Parallel function operation instructions

Single phase parallel:

1. Connecting the parallel communication line and power cable as shown below
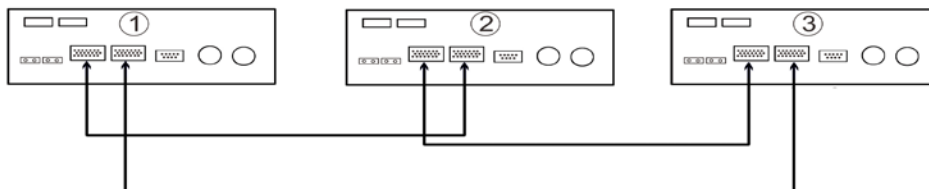
   Warning: All inverters must share the same battery pack when paralleling.

2. Set the parameters of each inverter separately (working mode, single-phase parallel function, parallel ID).

   Warning: When working in parallel, the working mode of each inverter must be the same working mode, and the ID address of each inverter cannot be repeated.

3. After setting the parameters, turn on each inverter in turn.

Parallel diagram:

Power wire diagram:

Three-phase parallel:

1. Connecting the parallel communication line and power cable as shown below

   Warning: All inverters must share the same battery pack when paralleling

2. Set the parameters of each inverter independently (working mode, single-phase parallel function, parallel ID address, three-phase parallel function and set A/B/C phase sequence).
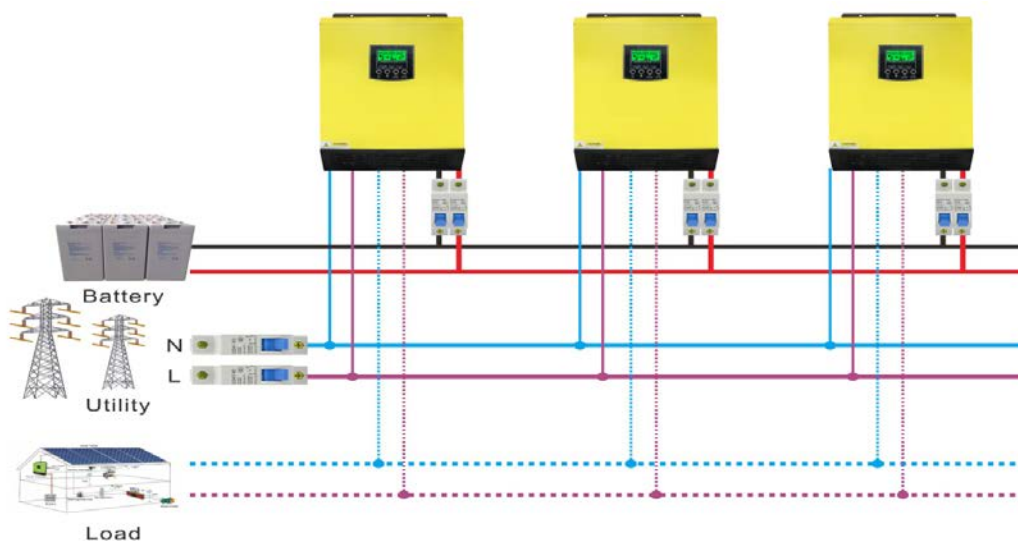
   Warning: When working in parallel, the working mode of each inverter must be the same working mode. And the ID address of each inverter cannot be repeated.

3. After setting the parameters, first turn on the A phase inverter and then turn on each inverters in turn.

Parallel diagram:
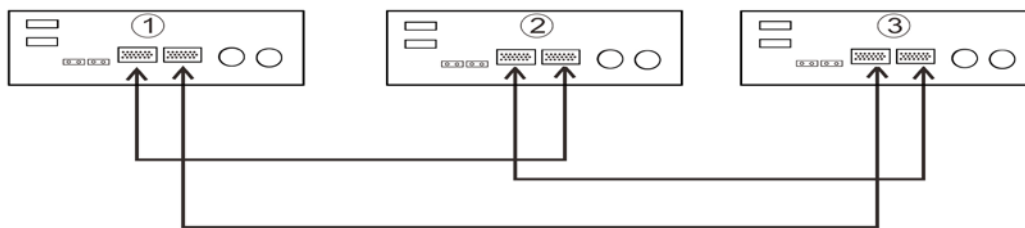
Power wire diagram:
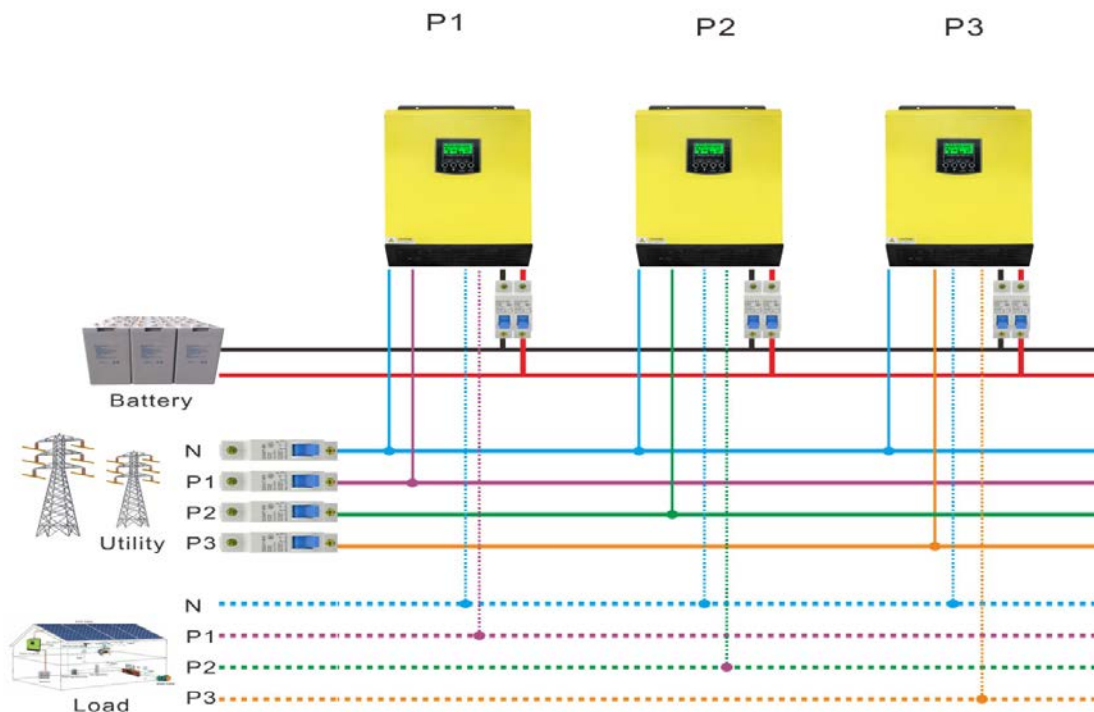
4.6 Fault Reference Code

Fault code	Fault event
01	Bus voltage is too high
02	Inverter voltage is too high
03	Inverter voltage is too low
04	Bus soft start failure
05	Overload fault
06	Output short circuited or over temperature
07	Battery voltage is too low
08	Inverter soft start failure
09	Bus voltage is too low
10	Battery voltage is too high
21	PV voltage is too low
22	PV voltage is too high
23	PV is over current
24	PV over temperature
25	PV Overload
26	PV boost fault

4.7 Warning Indicator

Warning code	Warning Event
01	Battery voltage is too low
02	Input voltage is too low
03	Input voltage is too high
04	Overload
05	Over temperature
06	Fan is locked when inverter is on
07	Battery voltage is too high

5.TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Possible cause	What to do
Unit shuts down automatically during start up process	LCD/LED and buzzer will be active then complete off	The battery voltage is too low	1.Re-charge battery. 2. Replace battery
No response after power on	No indication	1.The battery voltage is too low. 2. Internal fuse tripped	1. Contact repair center for replacing the fuse. 2. Re-charge battery. 3. Replace battery

Mains exist but the unit works in battery mode	Input voltage is displayed as '0' on the LCD and green LED is flashing	Input protector is triggered	Check if AC breaker is turned on and AC wiring is connected well.
	LED is flashing	Insufficient quality of AC power	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)Change output source
When the unit is turned on, internal relay is switched on and off repeatedly	LCD display and LED flashing	Battery is disconnected	Check if battery wires are connected well
Buzzer beeps continuously and red LED is on	warning code 06	Fan fault	Replace the fan
	warning code 05	Internal temperature of inverter component is over 100°C	Check whether the environment around the equipment well ventilated
	Fault code 10	The battery voltage is too high	Check if spec and quantity of batteries are meet requirements
		Battery is over-charged	Return to repair center
	Fault code 06	Output short circuited	Check if wiring is connected well and remove abnormal load
	warning code 05	Overload error , the inverter is overload 100% and overload time reaches the upper limit	Reduce the connected load by switching off some equipment

	Fault code 22	If PV input voltage is higher than specification, the output power will be derated. At this time, if connected loads is higher than derated output power, it will cause overload	Reduce the number of PV modules in series or the connected load
	Fault code 02/03	Output abnormal (Inverter voltage below than 190VAC or is higher than 260VAC)	1. Reduce the connected load 2. Return to repair center
	Fault code 01/04/06/08	Internal components failed	Return to repair center
	Fault code 23	Over current or surge	Remove abnormal load or check PV input
	Fault code 01	Bus voltage is too high	Restart the unit if the error happens again please return to repair center
	Fault code 09	Bus voltage is too low	
	Fault code 02/03	Output voltage is unbalanced	

6. SPECIFICATIONS

Table 1   Solar Mode Specifications

MODEL	3KVA 24V	3.2KVA 48V	5.5KVA 48V
Normal DC voltage	24VDC	48VDC	48VDC
Max PV array power	5000W		
Rated output power	3000W	3200W	5000W
Max PV open circuit voltage	450VDC		
PV operating voltage range	120-450VDC		
PV normal operating voltage	280-360VDC		
Normal output voltage	220/230/240VAC		
Output voltage range	230 ± 5％VAC		
Normal output current	13A	14A	21.7A
Power factor	1.0		
Efficiency(DC/AC)	≥92%		
Frequency	50/60Hz		
Overload protection	MPPT will close immediately as long as the input power is greater than the maximum output power		
Max input current	19.6A		
Max solar charge current	90A		

Table 2　Line Mode Specifications

Input Voltage Waveform	pure Sine wave (utility or generator)	
Normal Input Voltage	230VAC	
Low Loss Voltage	120VAC±7V（wide range）170VAC±7V(narrow range)	
Low Loss Return Voltage	130VAC±7V（wide range）180VAC±7V(narrow range)	
High Loss Voltage	280VAC±7V	
High Loss Return Voltage	270VAC±7V	
Max AC Input Voltage	300VAC	
Normal Input Frequency	50Hz / 60Hz (Auto detection)	
Low loss Frequency	40±1Hz	
Low loss Return Frequency	42±1Hz	
High loss Frequency	65±1Hz	
High loss Return Frequency	63±1Hz	
Output short circuit protection	Circuit Breaker	
Max AC charge current	60A (Optional 10A to 60A)	
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)	
Transfer Time	≤10ms	
Communication	USB or RS232 or WIFI	
Humidity	0-90% RH(No-condensing)	
Operation temperature	0-50℃	
Fast charging voltage(optional)	24.0-30.0VDC	48.0-60.0VDC
Float charging voltage(optional)	24.0-30.0VDC	48.0-60.0VDC
Over-charging voltage	30.0VDC	60.0VDC

Table 3 Inverter Mode Specifications

Normal DC voltage	24V	48V
Waveform	pure Sine wave	
Output Voltage Regulation	230VAC±5%	
Output Frequency	50/60Hz±1Hz	
Peak Efficiency	≥90%	
Power factor	1.0	
Overload Protection	1s@≥150% load , 20s@101%~120% load , 10s@121%~150% load	
Transfer time	≤10ms	
Protection features	Low voltage protection; High voltage protection Overload protection ; Over-temperature protection Short circuit protection; Over-charge protection	
Cold start voltage	23.0VDC	46.0VDC
Low voltage alarm(optional)	18.0-23.0VDC	36.0-46.0VDC
Low voltage alarm recovery	22.0VDC	44.0VDC
Low voltage shutdown(optional)	18.0-23.0VDC	36.0-46.0VDC
High voltage alarm recovery	31.0VDC	62.0VDC
Dimension(WxDxH)mm	295x468.6x120.2	
Net Weight (KG)	10.35	11.35
Gross Weight (KG)	11.25	12.35