User Manual

Off Grid Solar Inverter
2KVA-5KVA

Version: 1.0

Table Of Contents

1.0 Information on this Manual 1
1.1 Validity 1
1.2 Scope 1
1.3 Target Group 1
1.4 Safety Instructions 1
1.5 Symbols 2
2.0 Introduction 3
2.1 Features 3
2.2 Product Overview 4
3.0 Instation 5
3.1 Unpacking and Inspection 5
3.2 Preparation 5
3.3 Mounting the Unit 5
3.4 Battery Connection 6
3.5 AC Input/Output Connection 8
3.6 PV Connection 9
3.7 Final Assembly 10
3.8 Communication Connection 11
3.9 Dry Contact Signal 11
3.10 Parallel installation 12
4.0 Parallel installation 24
4.1 Power ON/OFF 24
4.2 Operation and Display Panel 24
4.2.1 LCD Display Icons 25
4.2.1 LCD Setting 27
4.3 Display Setting 32
4.4 Operating Mode Description 35
4.5 Fault Reference Code 36
Warning Indicator 37
5.0 Specifications 38
6.0 Trouble Shooting 42

1.0 Information on this Manual

1.1 Validity

This manual is valid for the following devices:

- Off grid solar inverter with MPPT controller, 2KVA;
- Off grid solar inverter with MPPT controller, 3KVA;
- Off grid solar inverter with MPPT controller, 4KVA;
- Off grid solar inverter with MPPT controller, 5KVA;
- Off gird solar inverter with PWM controller, 1KVA;
- Off grid solar inverter with PWM controller, 2KVA;
- Off grid solar inverter with PWM controller, 3KVA;

1.2 Scope

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

1.3 Target Group

This document is intended for qualified persons and end users. Tasks that do not require any particular qualification can also be performed by end users. Qualified persons must have the following skills:

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and installations
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of the applicable standards and directives
- Knowledge of and compliance with this document and all safety information

1.4 Safety instructions

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

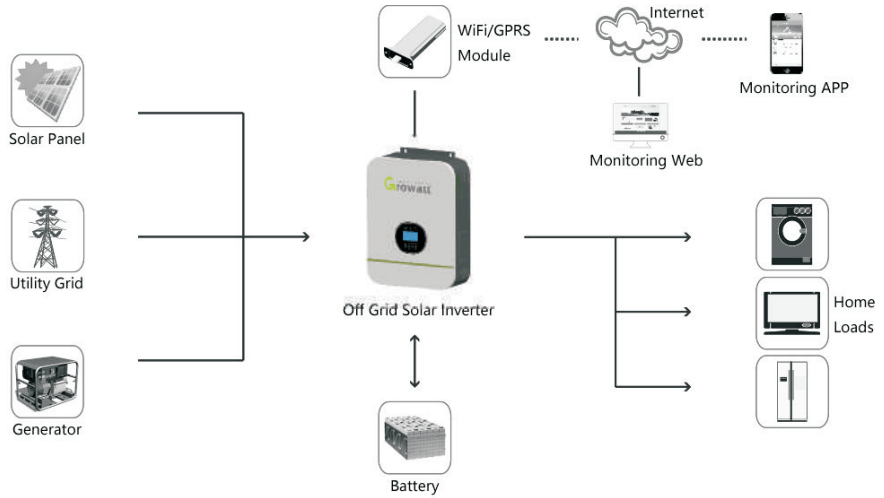
1. **CAUTION –** Only qualified personnel can install this device with battery.
2. Before using the unit, read all instructions and caution marks on the unit, understand the batteries and all appropriate sections of this manual.
3. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
4. **NEVER** cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
5. **NEVER** charge a frozen battery.
6. 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.
7. To reduce risk of electric shock, disconnect all wiring before attempting any maintenance or cleaning.

8. For optimum operation of this off grid solar inverter, please follow required spec to select appropriate cable size. It's very important to correctly operate this off grid solar inverter.
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. GROUNDING INSTRUCTIONS –This off grid solar inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
11. Fuses (3 pieces of 40A, 32VDC for 1KVA, 4 pieces of 40A, 32VDC for 2KVA and 6 pieces for 3KVA, 1 piece of 200A, 58VDC for 4KVA and 5KVA) are provided as over-current protection for the battery supply.
12. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this off grid solar inverter back to local dealer or service center for maintenance.

1.5 Symbols

Symbol	Explanation
	Indicates a hazardous situation which, if not avoided, can result in machine damage or people injury Refer to page 23
	Indicates a hazardous situation which, if not avoided, can result in machine damage or people injury Refer to page 24
	Indicates overload which, if not avoided, can result in machine damage or people injury Refer to page 24

2.0 Introduction



Hybrid Power System

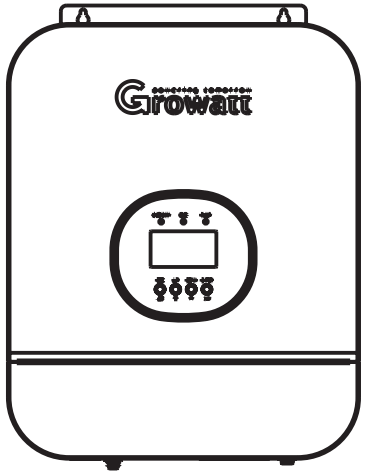
This is a multifunctional off grid solar inverter, integrated with a MPPT/PWM solar charge controller, a high frequency pure sine wave inverter and a UPS function module in one machine, which is perfect for off grid backup power and self-consumption applications. The transformerless design provides reliable power conversion in compact size.

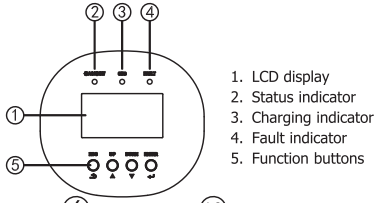
The whole system also need other devices to achieve complete running such as PV modules, generator, or utility grid. Please consult with your system integrator for other possible system architectures depending on your requirements. The WiFi / GPRS module is a plug-and-play monitoring device to be installed on the inverter. With this device, users can monitor the status of the PV system from the mobile phone or from the website anytime anywhere.

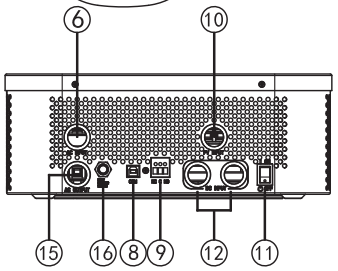
2.1 Features

- Rated power 2KW to 5KW, power factor 1
- MPPT solar charge controller / PWM solar charge controler
- High frequency inverter with small size and light weight
- Pure sine wave AC output
- Overload, short circuit and deep discharge protection
- Configurable AC/ solar input priority via LCD setting
- Compatible to mains voltage or generator power
- WIFI/ GPRS remote monitoring (optional)
- Parallel operation available for 4KW/5KW (optional)

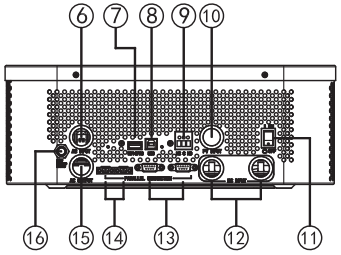
2.2 Product Overview



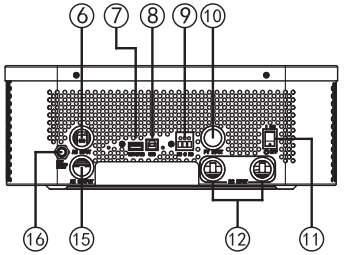




Single Model (2KVA/3KVA)



Single Model (4KVA/5KVA)



Parallel Model (4KVA/5KVA)

6. AC input
7. WiFi/GPRS communication port
8. USB communication port
9. Dry contact
10. PV input
11. Power on/off switch
12. Battery input
13. Parallel communication ports (only for parallel model)
14. Current sharing ports (only for parallel model)
15. AC output
16. Circuit breaker

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

3.0 Installation

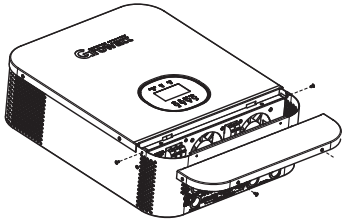
3.1 Unpacking and Inspection

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

- The unit x 1
- User manual x 1
- USB communication cable x 1
- Software CD x 1
- Current sharing cable (parallel model available)
- Parallel communication cable (parallel model available)

3.2 Preparation

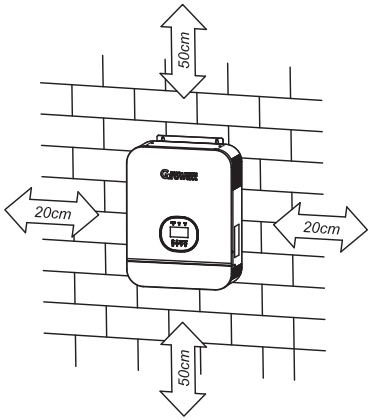
Before connecting all wiring, please take off bottom cover by removing two screws as shown below.



3.3 Mounting the Unit

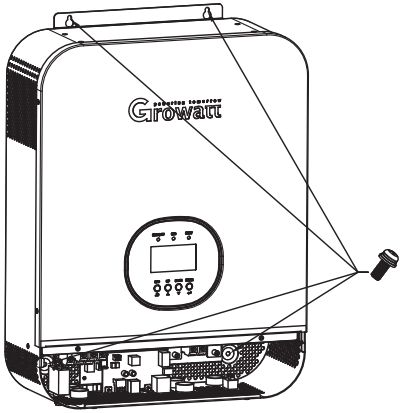
Consider the following points before selecting where to install:

- 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.

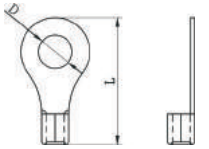
Install the unit by screwing three screws. It's recommended to use M4 or M5 screws.



3.4 Battery Connection

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

Ring terminal:



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

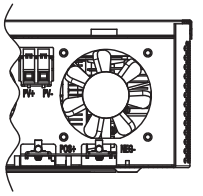
Recommended battery cable and terminal size:

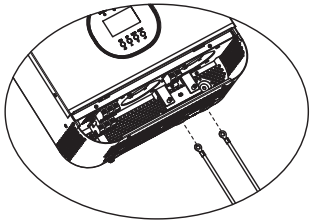
Model	Maximum Amperage	Battery capacity	Wire Size	Ring Terminal			Torque value
				Cable mm²	Dimensions		
					D (mm)	L (mm)	
2KVA	109A	100AH	1*4AWG	22	6.4	29.2	2~ 3 Nm
			2*8AWG	16	6.4	23.8	
3KVA	164A	100AH 200AH	1*2AWG	38	6.4	33.2	2~ 3 Nm
			2*6AWG	28	6.4	29.2	
4KVA	110A	200AH	1*4AWG	22	6.4	39.2	2~ 3 Nm
			2*8AWG	16	6.4	33.2	
5KVA	137A	200AH	1*2AWG	38	6.4	39.2	2~ 3 Nm
			2*6AWG	28	6.4	33.2	

Model (PWM)	Typical Amperage	Battery capacity	Wire Size	Ring Terminal			Torque value
				Cable mm2	Dimensions		
					D (mm)	L (mm)	
2KVA	66A	100AH	1*6AWG	14	6.4	29.2	2~ 3 Nm
			2*10AWG	8	6.4	23.8	
3KVA	100A	100AH 200AH	1*4AWG	22	6.4	33.2	2~ 3 Nm
			2*8AWG	14	6.4	29.2	

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 for 1-3KVA model and at least 200Ah capacity battery for 4KVA/5KVA model.
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 (-).

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 20A for 2KVA, 32A for 3KVA, 40A for 4KVA and 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.

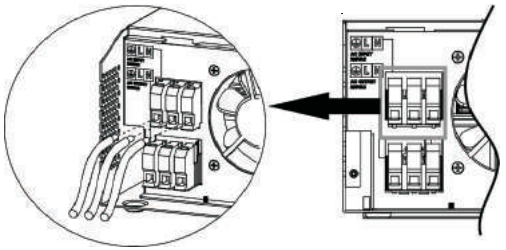
WARNING! It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

Suggested cable requirement for AC wires

Model	Gauge	Torque Value
1KVA	16 AWG	0.5~ 0.6 Nm
2KVA	14 AWG	0.8~ 1.0 Nm
3KVA	12 AWG	1.2~ 1.6 Nm
4KVA	10 AWG	1.4~ 1.6Nm
5KVA	8 AWG	1.4~ 1.6Nm

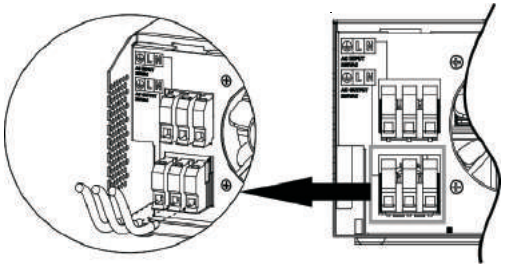
Please follow below steps to implement AC input/output connection:

1. Before making AC input/output connection, be sure to open DC protector or disconnector 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 with manufacturer of air conditioner that if it's equipped with time-delay function before installation. Otherwise, this off grid solar inverter will trigger overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

3.5 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" 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 (MPPT)	Typical Amperage	Cable Size	Torque
2KVA / 3KVA	50A	8 AWG	1.4~1.6 Nm
4KVA / 5KVA	80A	6 AWG	1.4~1.6 Nm

Model (PWM)	Typical Amperage	Cable Size	Torque
2KVA 3KVA	50A	8 AWG	1.4~1.6 Nm

PV Module Selection:

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

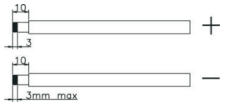
1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.

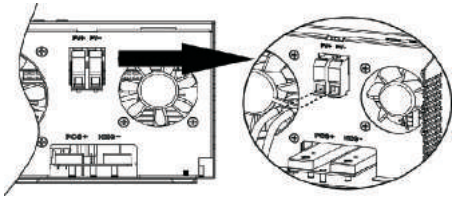
Solar Charging Mode (MPPT)			
INVERTER MODEL	**1KVA**	**2KVA / 3KVA**	**4KVA / 5KVA**
Max. PV Array Open Circuit Voltage	102Vdc max	102Vdc max	145Vdc
PV Array MPPT Voltage Range	15~80Vdc	30~80Vdc	60~115Vdc
Min. battery voltage for PV charge	8.5Vdc	17Vdc	34Vdc

Solar Charging Mode (PWM)		
INVERTER MODEL	**1KVA**	**2KVA / 3KVA**
Max. PV Array Open Circuit Voltage	50Vdc max	60Vdc max
PV Array PWM Voltage Range	15~18Vdc	30~32Vdc
Min. battery voltage for PV charge	8.5Vdc	17Vdc

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.

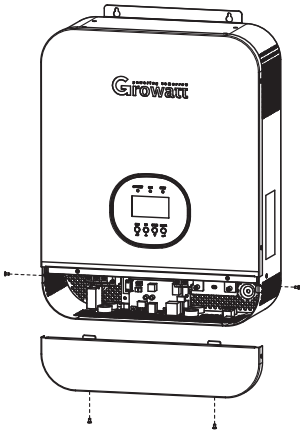




3. Make sure the wires are securely connected.

3.7 Final Assembly

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



3.8 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.

3.9 Dry Contact Signal

There is one dry contact (3A/250VAC) available on the rear panel. When program 24 is set as "disable", it could be used to deliver signal to external device when battery voltage reaches warning level. When program 24 is set as "enable" and the unit is working in battery mode, it could be used to trigger the grounding box to connect neutral and grounding of AC output together.

When program 24 is set as "disable" (default setting):

Unit Status	Condition			Dry contact port: NC C NO	
				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
		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

When program 24 is set as "enable":

Unit Status	Condition	Dry contact port: NC C NO	
		NC & C	NO & C
Power Off	Unit is off and no output is powered.	Close	Open
Power On	Unit works in standby mode, line mode or fault mode	Close	Open
	Unit works in battery mode or power saving mode	Open	Close

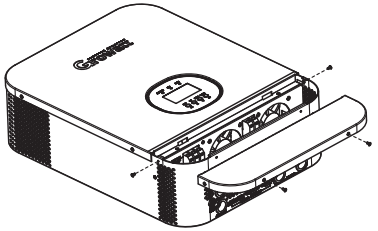
3.10 Parallel installation(Only 4KVA/5KVA available)

3.10.1 Parallel board installation

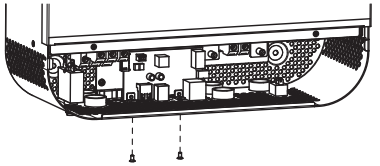
(Following steps just for some customers have installed the inverter,but later need to increase the parallel connection function, so need install the parallel board by themselves)

This installation steps are only applied to 5KVA/5KW model

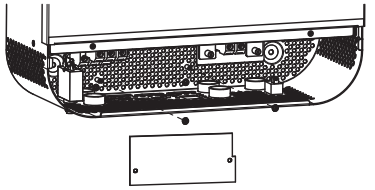
Step 1: Remove wire cover by unscrewing all screws.



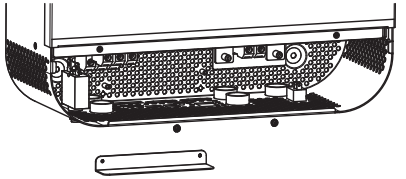
Step 2: Remove communication board by unscrewing two screws as below chart.



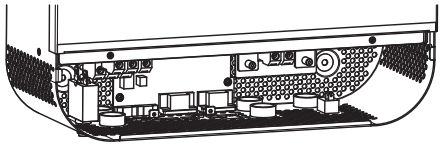
Step 3: Remove two screws as below chart and remove 2-pin and 14-pin cables. Take out the board under the communication board.



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

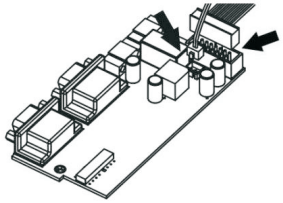


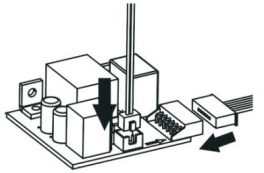
Step 5: Install new parallel board with 2 screws tightly.



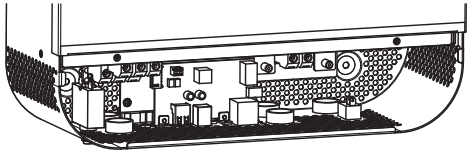
Step 6: Re-connect 2-pin and 14-pin to original position.

Parallel board **Communication board**





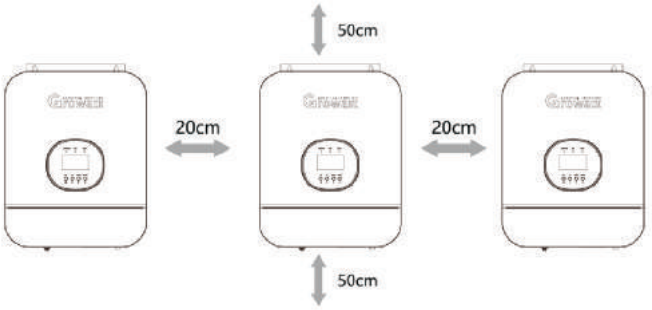
Step 7: Put communication board back to the unit.



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

3.10.2 Mouting the Unit

When installing multiple units, please follow below chart.

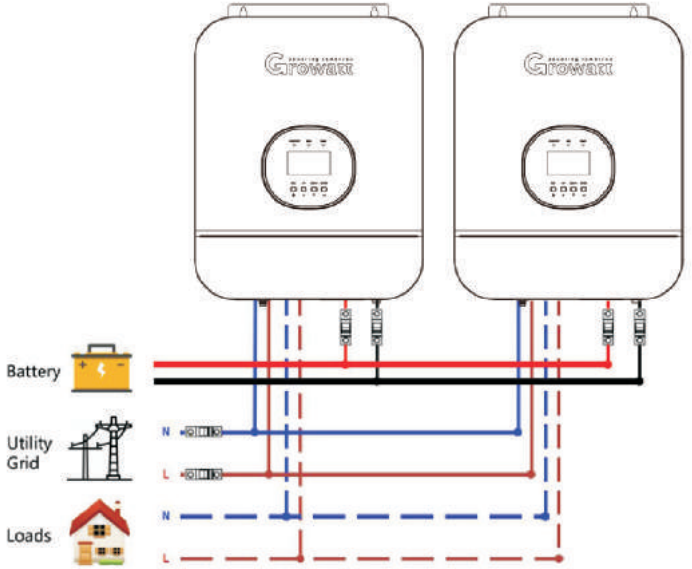


NOTE: For proper air circulation to dissipate heat, allow a clearance of approx. 20cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

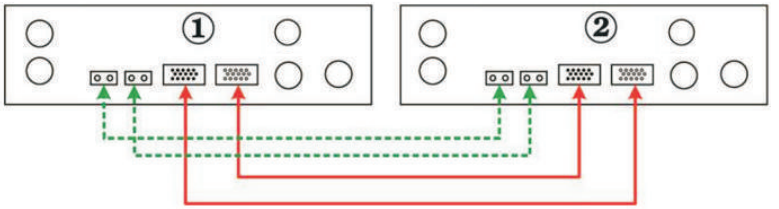
3.10.3 Parallel Operation in Single phase (Only 4KVA/5KVA available)

2 inverters in parallel:

Power Connection

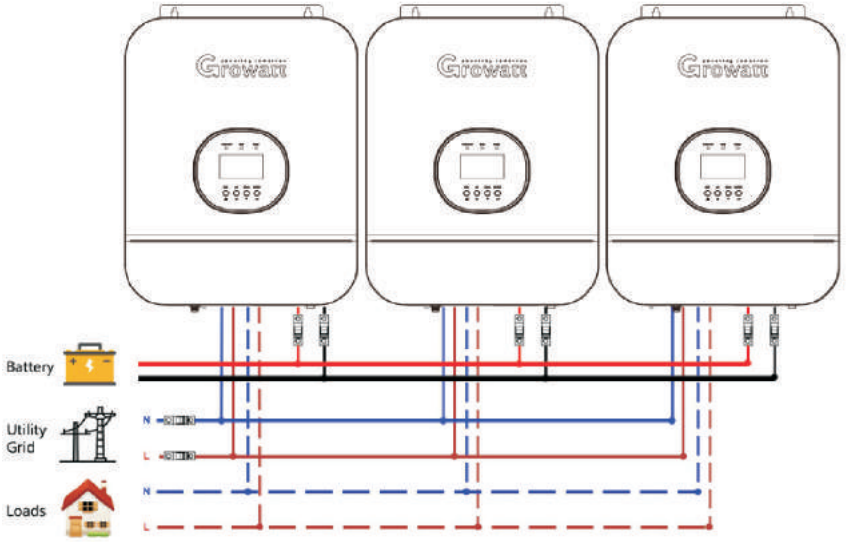


Communication Connection

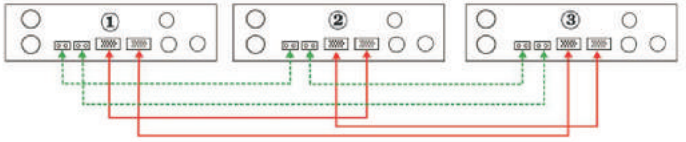


3 inverters in parallel:

Power Connection

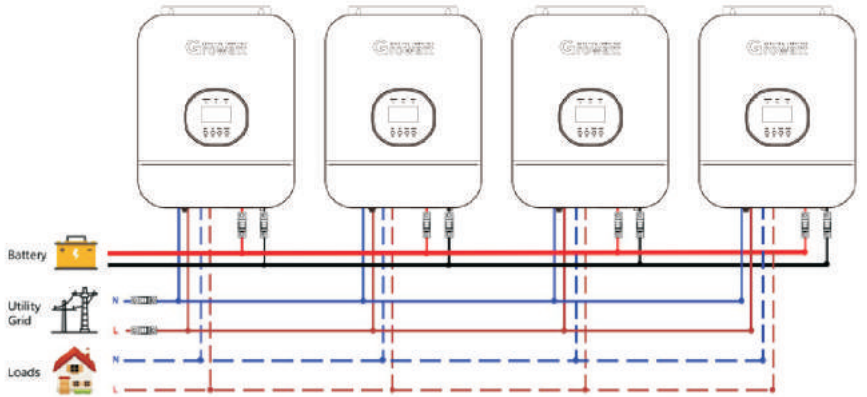


Communication Connection

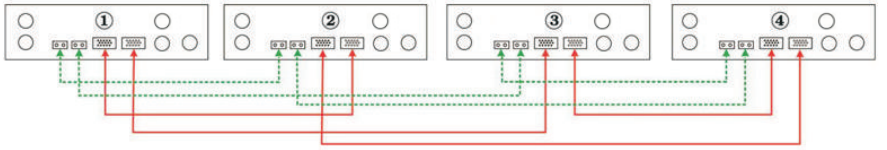


4 inverters in parallel:

Power Connection

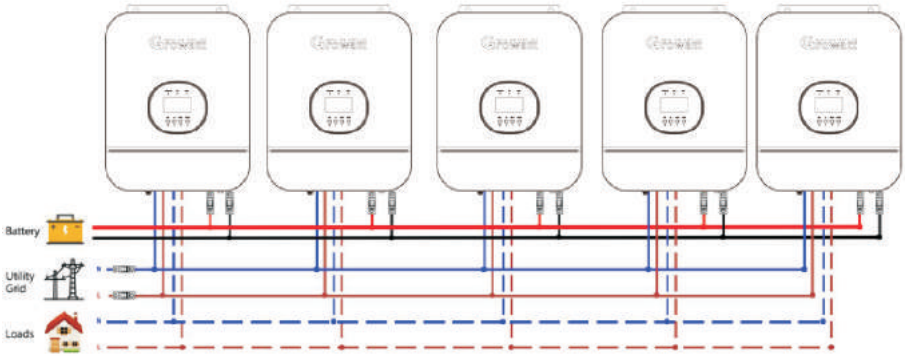


Communication Connection

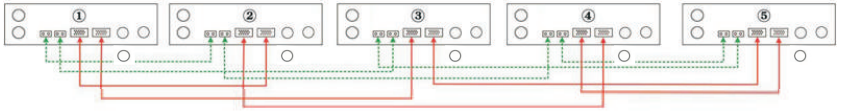


5 inverters in parallel:

Power Connection



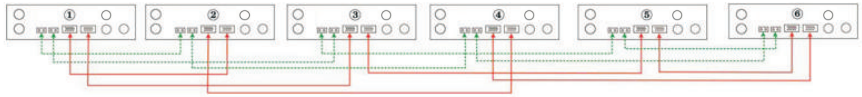
Communication Connection



6 inverters in parallel:

Power Connection

Communication Connection



3.10.4 Parallel Commissioning

Parallel in single phase

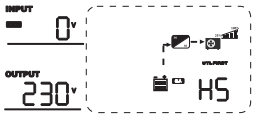
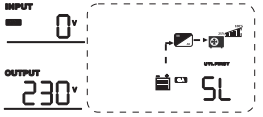
Step 1: Check the following requirements before commissioning:

- 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 23 of each unit. And then shut down all units.

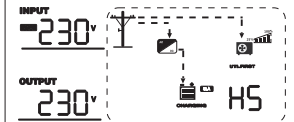
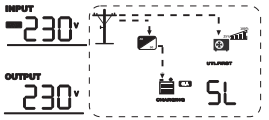
NOET: It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on each unit.

LCD display in Master unit	LCD display in Slave 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 warning 15.

LCD display in Master unit	LCD display in Slave unit
	

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

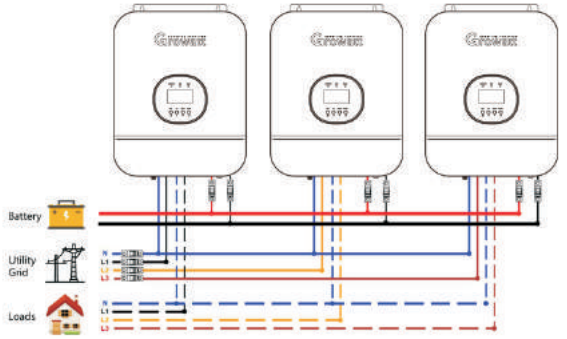
Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

3.10.5 Parallel operation in three phase (Only 4KVA/5KVA available)

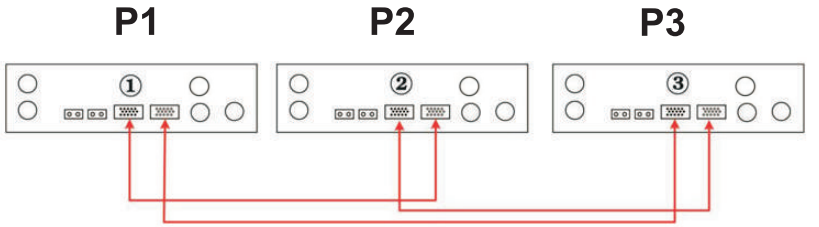
3 inverters group three phase

one inverter in eachphase:

Power Connection



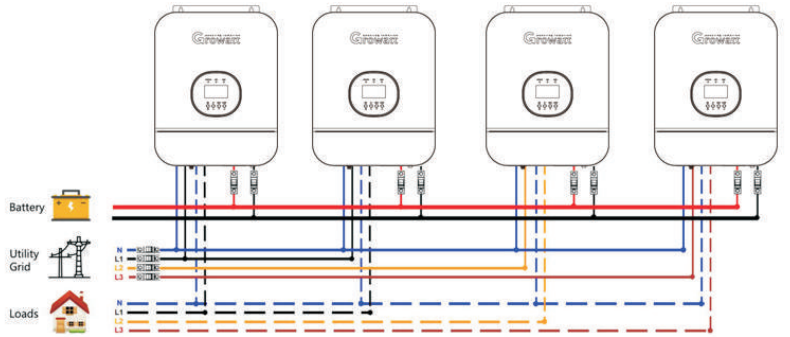
Communication Connection



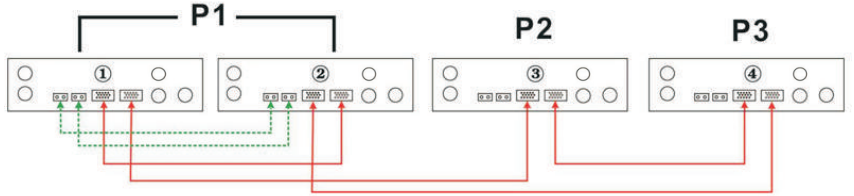
4 inverters group three phase

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

Power Connection



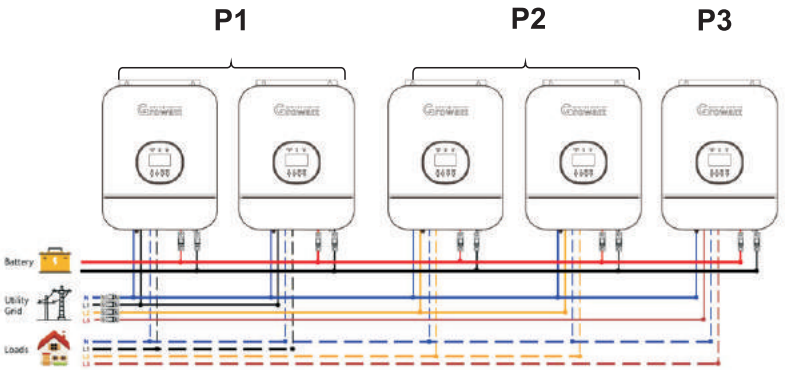
Communication Connection



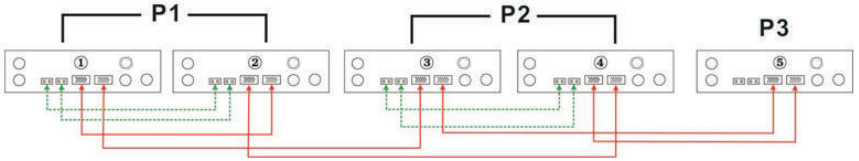
5 inverters group three phase

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

Power Connection

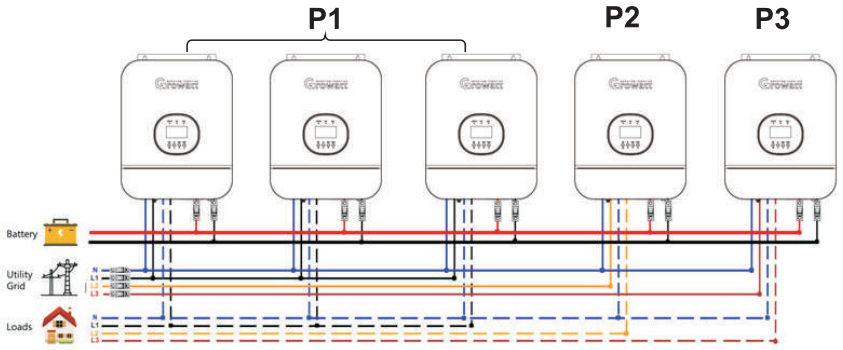


Communication Connection

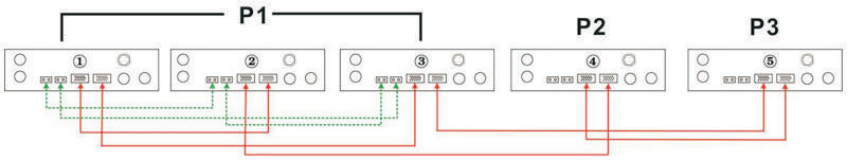


Three inverters in one phase and only one inverter for the remaining two phases:

Power Connection



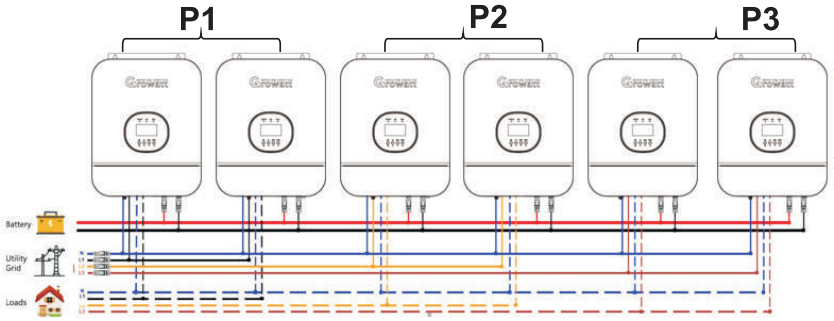
Communication Connection



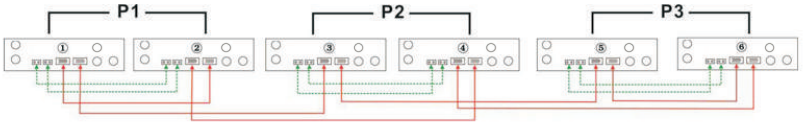
6 inverters group three phase

Two inverters in each phase:

Power Connection

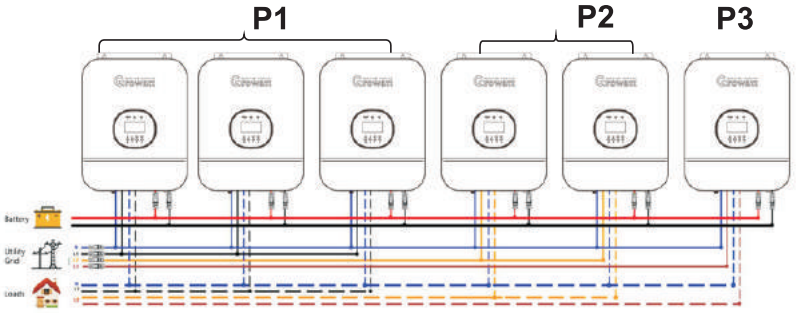


Communication Connection

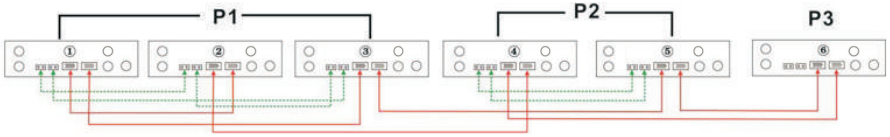


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

Power Connection

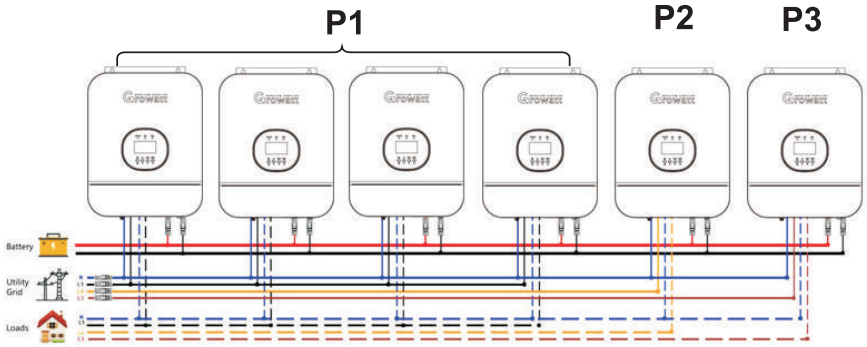


Communication Connection

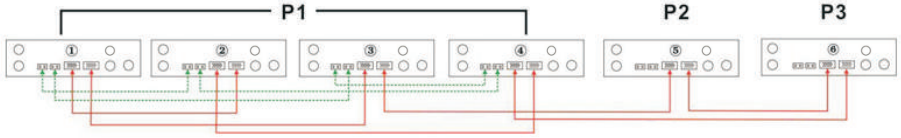


Four inverters in one phase and one inverter for the other two phases:

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.

3.10.6 Support three-phase equipment

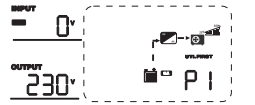
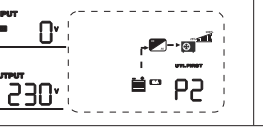
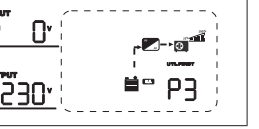
Step 1: Check the following requirements before commissioning:

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

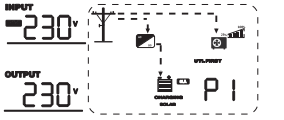
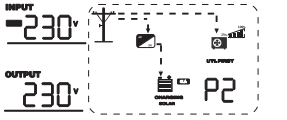
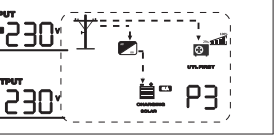
Step 2: Turn on all units and configure LCD program 23 as P1, P2 and P3 sequentially. Then shut down all units.

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.

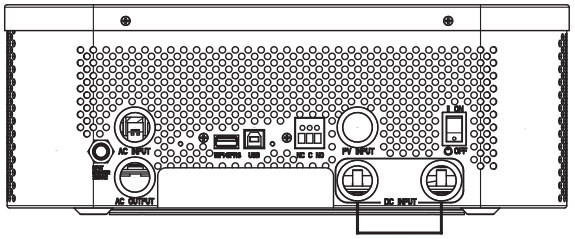
Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

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.

4.0 Operation

4.1 Power ON/OFF

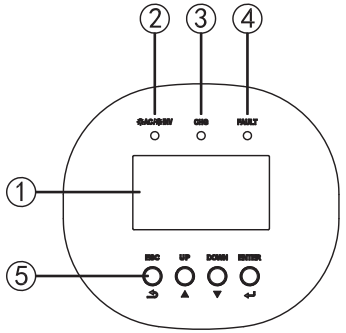


Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch (located on the button of the case) to turn on the unit.

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.

1. LCD display
2. Status indicator
3. Charging indicator
4. Fault indicator
5. Function buttons



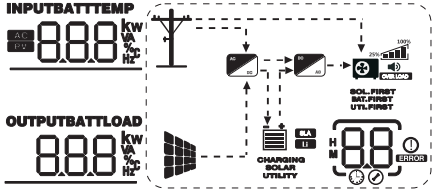
LED Indicator

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 Buttons

Button	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

4.2.1 LCD Display Icons



Icon	Function Description
Input Source Information	
AC	Indicates the AC input.
PV	Indicates the PV input
INPUT	Indicate input voltage, input frequency, PV voltage, battery voltage and charger current.
Configuration Program and Fault Information	
	Indicates the setting programs.
	Indicates the warning and fault codes. Warning: flashing with warning code. Fault:lighting with fault code
Output Information	
OUTPUTBATTLOAD	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.
Battery Information	
CHARGING	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.
SOLAR UTILITY	These two signs indicate the charge priority. SOLAR indicates solar first. UTILITY indicate utility first. SOLAR blinking indicates solar only; SOLAR and UTILITY both on indicates combined charging.

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

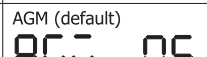
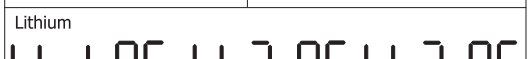
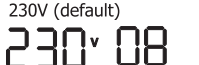
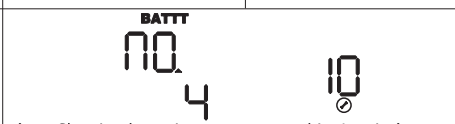
Mode Operation Information	
	Indicates unit connects to the mains.
	Indicates unit connects to the PV panel.
BYPASS	Indicates load is supplied by utility power.
	Indicates the utility charger circuit is working.
	Indicates the DC/AC inverter circuit is working.
SOL.FIRST BAT.FIRST UTI.FIRST	These three signs indicate the output priority. SOL.FIRST indicates solar first. BAT.FIRST indicates battery first. UTI.FIRST indicates utility first.
Mute Operation	
	Indicates unit alarm is Enabled.

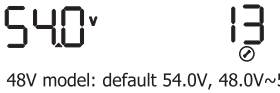
4.2.2 LCD Setting

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.

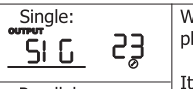
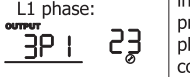
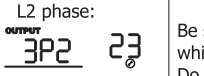
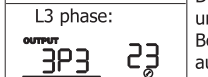
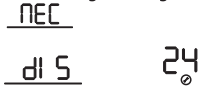
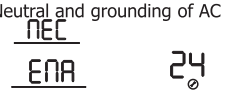
Setting Programs:

Program	Description	Setting Option	
01	Output source priority: To configure load power source priority	Solar first	SOL 01
		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 the loads at the same time. Utility provides power to the loads only when any one condition happens: - Solar energy is not available - Battery voltage drops to either low-level warning voltage or the setting point in program 12.	
		Utility first (default)	UTI 01
		Utility will provide power to the loads as first priority. Solar and battery energy will provide power to the loads only when utility power is not available.	
		SBU priority	SBU 01
		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.	
02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	80A 02	
		48V model: default 60A, 10A~140A Settable 24V model: default 40A, 10A~80A Settable 12V model: default 40A, 10A~60A Settable	
03	AC input voltage range	APL 03 Appliance (default)	If selected, acceptable AC input voltage range will be within 90~280VAC
		UPS 03 UPS	If selected, acceptable AC input voltage range will be within 170~280VAC
		GEN 03 Generator	If selected, acceptable AC input voltage range will be within 90~280VAC

04	Power saving mode enable/disable	 Saving mode disable (default)	If disabled, no matter connected load is low or high, the on/off status of inverter output will not be effected.
		 Saving mode enable	If enabled, the output of inverter will be off when connected load is pretty low or not detected.
05	Battery type	AGM (default) 	User-Defined  If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19, 20 and 21.
		Flooded 	
		Lithium  If "LI 1", "LI 2", or "LI 3" is selected, parameters can be set as "Use-Defined". For lithium battery, program 19 and program 20 need to be set as the same value	
06	Auto restart when overload occurs	Restart disable (default) 	Restart enable 
07	Auto restart when over temperature occurs	Restart disable (default) 	Restart enable 
08	Output voltage	230V (default) 	220V 
		240V 	208V 
09	Output frequency	50Hz (default) 	60Hz 
10	Number of series batteries connected	 (e.g. Showing batteries are connected in 4 series)	

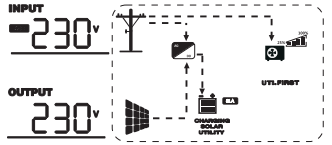
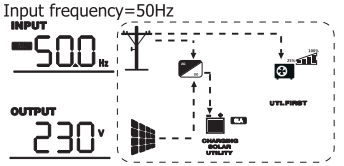
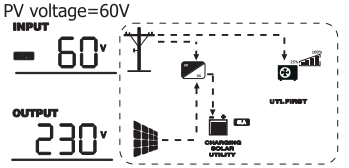
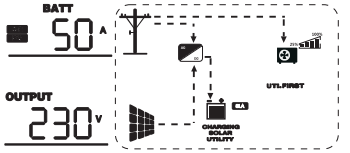
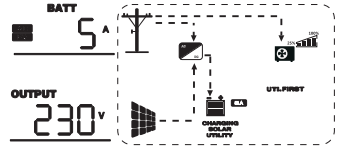
11	Maximum utility charging current	 48V model: default 30A, 10A~60A Settable 24V model: default 30A, 20A~30A Settable 12V model: default 20A, 10A~20A Settable
12	Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 01	 48V model: default 46.0V, 44.0V~51.2V Settable 24V model: default 23.0V, 22.0V~25.6V Settable 12V model: default 11.5V, 11.0V~12.8V Settable
13	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01	 48V model: default 54.0V, 48.0V~58.0V Settable 24V model: default 27.0V, 24.0V~29.0V Settable 12V model: default 13.5V, 12.0V~14.5V Settable
14	Charger source priority: To configure charger source priority	If this off grid solar inverter is working in Line, Standby or Fault mode, charger source can be programmed as below:
		Solar first  Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.
		Utility first  Utility will charge battery as first priority. Solar energy will charge battery only when utility power is not available.
		Solar and Utility  Solar energy and utility will both charge battery.
		Only Solar  Solar energy will be the only charger source no matter utility is available or not.
		If this off grid solar inverter is working in Battery mode or Power saving mode, only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient.

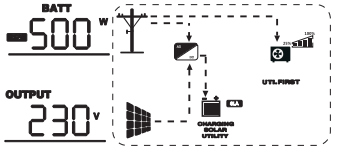
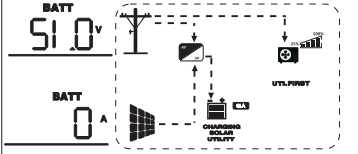
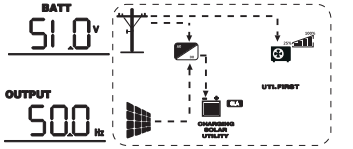
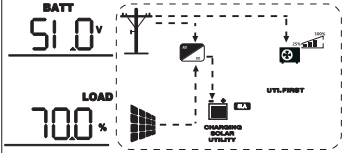
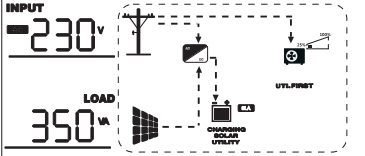
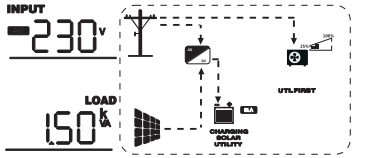
17	Beeps while primary source is interrupted	Alarm on (default) 	Alarm off 
18	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) 	Bypass enable 
19	Bulk charging voltage (C.V voltage). If self-defined is selected in program 5, this program can be set up	 48V model: default 56.4V, 48.0V~58.4V Settable 24V model: default 28.2V, 24.0V~29.2V Settable 12V model: default 14.1V, 12.0V~14.6V Settable	
20	Floating charging voltage. If self-defined is selected in program 5, this program can be set up	 48V model: default 54.0V, 48.0V~58.4V Settable 24V model: default 27.0V, 24.0V~29.2V Settable 12V model: default 13.5V, 12.0V~14.6V Settable	
21	Low DC cut-off voltage. If self-defined is selected in program 5, this program can be set up	 48V model: default 42.0V, 40.0V~48.0V Settable 24V model: default 21.0V, 20.0V~24.0V Settable 12V model: default 10.5V, 10.0V~12.0V Settable	
22	Solar power balance. When enabled, solar input power will be automatically adjusted according to connected load power. (Only available for 4KVA/5KVA model)	Solar power balance enable (Default): 	If selected, solar input power will be automatically adjusted according to the following formula: Max. input solar power = Max. battery charging power + Connected load power.
		Solar power balance disable: 	If selected, the solar input power will be the same to max. battery charging power no matter how much loads are connected. The max. battery charging power will be based on the setting current in program 2. (Max. solar power = Max. battery charging power)

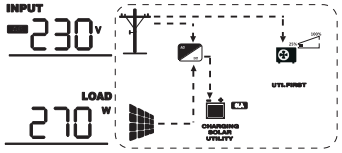
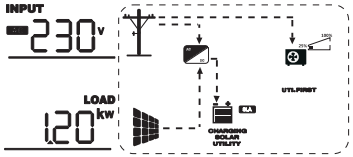
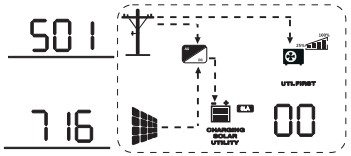
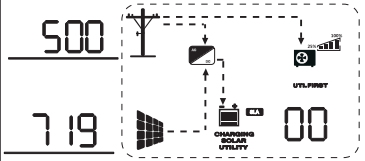
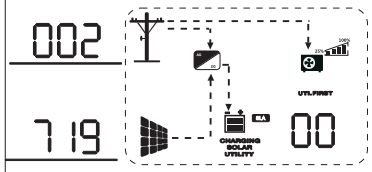
23	AC output mode *This setting is only available when the inverter is in standby mode (Switch off).	Single: 	When the units are used in parallel with single phase, please select "PAL" in program 23. It requires 3 inverters to support three-phase equipment, 1 inverter in each phase. Please refers to 5-2 for detailed information. Please select "3P1" in program 23 for the inverters connected to L1 phase, "3P2" in program 23 for the inverters connected to L2 phase and "3P3" in program 23 for the inverters connected to L3 phase. Be sure to connect share current cable to units which are on the same phase. Do NOT connect share current cable between units on different phases. Besides, power saving function will be automatically disabled.
		Parallel: 	
		L1 phase: 	
		L2 phase: 	
		L3 phase: 	
24	Allow neutral and grounding of AC output is connected together: When enabled, inverter can deliver signal to trigger grounding box to short neutral and grounding	Disable: Neutral and grounding of AC output is disconnected. (Default)  Enable: Neutral and grounding of AC output is connected.  This function is only available when the inverter is working with external grounding box. Only when the inverter is working in battery mode, it will trigger grounding box to connect neutral and grounding of AC output.	

4.3 Display Setting

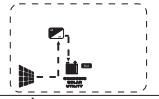
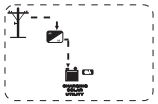
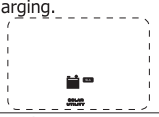
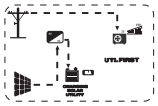
The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: input voltage, input frequency, PV voltage, MPPT charging current, MPPT charging power, battery voltage, output voltage, output frequency, load percentage, load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

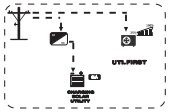
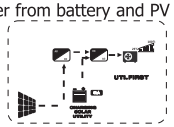
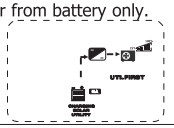
Setting Information	LCD display
Input voltage/Output voltage (Default Display Screen)	Input Voltage=230V, output voltage=230V 
Input frequency	Input frequency=50Hz 
PV voltage	PV voltage=60V 
Charging current	Current ≧10A  Current < 10A 

MPPT Charging power	MPPT charging power=500W 
Battery voltage/ DC discharging current	Battery voltage=51.0V, discharging current=0A 
Output frequency	Output frequency=50Hz 
Load percentage	Load percent=70% 
Load in VA	When connected load is lower than 1KVA, load in VA will present xxx VA like below chart.  When load is larger than 1KVA (≧1KVA), load in VA will present x.xKVA like below chart. 

Load in Watt	When load is lower than 1KW, load in W will present xxx W like below chart.  When load is larger than 1KW (≧1KW), load in W will present x.x kW like below chart. 
Main CPU version checking (For models with PWM controller)	Main CPU version 501-00-716 
Main CPU version checking (For models with MPPT controller)	Main CPU version 500-00-719 
Secondary CPU version checking (For models with MPPT controller)	Secondary CPU version 002-00-719 

4.4 Operating Mode Description

Operation mode	Description	LCD display
Standby mode / Power saving mode **Note:** *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output. *Power saving mode: If enabled, the output of inverter will be off when connected load is pretty low or not detected.	No output is supplied by the unit but it still can charge batteries.	Charging by utility and PV energy. 
		Charging by utility. 
		Charging by PV energy. 
		No charging. 
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.	PV energy and utility can charge batteries.	Charging by utility and PV energy. 
		Charging by utility. 
		Charging by PV energy. 
		No charging. 
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by PV energy 

Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by utility 
Battery Mode	The unit will provide output power from battery and PV power.	Power from battery and PV energy. 
		Power from battery only. 

4.5 Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked	
02	Over temperature	
03	Battery voltage is too high	
04	Battery voltage is too low	
05	Output short circuited 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	
11	Main relay failed	
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	
80	CAN fault	
81	Host loss	

4.6 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	Beep once every second	
03	Battery is over-charged	Beep once every second	
04	Low battery	Beep once every second	
07	Overload	Beep once every 0.5 second	 
10	Output power derating	Beep twice every 3 seconds	
12	Solar charger stops due to low battery	Beep once every second	
13	Solar charger stops due to high PV voltage	Beep once every second	
14	Solar charger stops due to overload	Beep once every second	
15	Parallel input utility grid different	Beep once every second	
16	Parallel input phase error	Beep once every second	
17	Parallel output phase loss	Beep once every second	

5.0 Specifications

Table 1 Line Mode Specifications

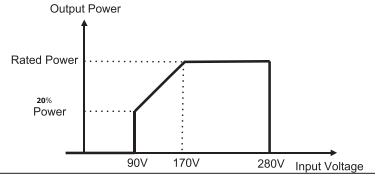
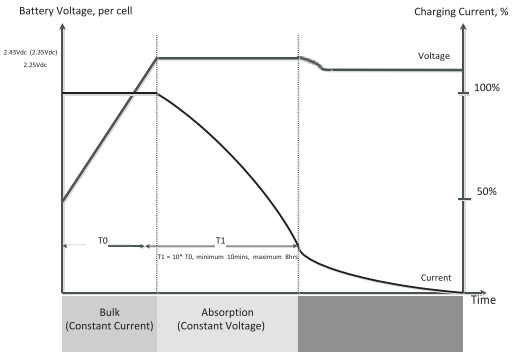
INVERTER MODEL	1KVA / 2KVA / 3KVA / 4KVA / 5KVA
Input Voltage Waveform	Sinusoidal (utility or generator)
Nominal Input Voltage	230Vac
Low Loss Voltage	170Vac±7V (UPS) 90Vac±7V (Appliances)
Low Loss Return Voltage	180Vac±7V (UPS); 100Vac±7V (Appliances)
High Loss Voltage	280Vac±7V
High Loss Return Voltage	270Vac±7V
Max AC Input Voltage	300Vac
Nominal 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	Line mode: Circuit Breaker Battery mode: Electronic Circuits
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)
Transfer Time	10ms typical (UPS); 20ms typical (Appliances)
Output power derating: When AC input voltage drops to 95V or 170V depending on models, the output power will be derated.	

Table 2 Inverter Mode Specifications

INVERTER MODEL	1KVA	2KVA / 3KVA	4KVA / 5KVA
Rated Output Power	1KVA/1KW	2KVA/2KW 3KVA/3KW	4KVA/4KW 5KVA/5KW
Output Voltage Waveform	Pure Sine Wave		
Output Voltage Regulation	230Vac±5%		
Output Frequency	60Hz or 50Hz		
Peak Efficiency	93%		
Overload Protection	5s@≥150% load; 10s@110%~150% load		
Surge Capacity	2* rated power for 5 seconds		
Nominal DC Input Voltage	12Vdc	24Vdc	48Vdc
Cold Start Voltage	11.5Vdc	23.0Vdc	46.0Vdc
Low DC Warning Voltage			
@ load < 20%	11.0Vdc	22.0Vdc	44.0Vdc
@ 20% ≤ load < 50%	10.7Vdc	21.4Vdc	42.8Vdc
@ load ≥ 50%	10.1Vdc	20.2Vdc	40.4Vdc
Low DC Warning Return Voltage			
@ load < 20%	11.5Vdc	23.0Vdc	46.0Vdc
@ 20% ≤ load < 50%	11.2Vdc	22.4Vdc	44.8Vdc
@ load ≥ 50%	10.6Vdc	21.2Vdc	42.4Vdc
Low DC Cut-off Voltage			
@ load < 20%	10.5Vdc	21.0Vdc	42.0Vdc
@ 20% ≤ load < 50%	10.2Vdc	20.4Vdc	40.8Vdc
@ load ≥ 50%	9.6Vdc	19.2Vdc	38.4Vdc
High DC Recovery Voltage	14.5Vdc	29Vdc	58Vdc
High DC Cut-off Voltage	15.2Vdc	30.4Vdc	60.8Vdc
No Load Power Consumption	<15W	<25W	<50W
Saving Mode Power Consumption	<5W	<10W	<15W

Table 3 Charge Mode Specifications

Utility Charging Mode				
INVERTER MODEL		**1KVA**	**2KVA / 3KVA**	**4KVA / 5KVA**
Charging Current (UPS) @ Nominal Input Voltage		10/20A	20/30A	10A/20/30A/40/50/60A
Bulk Charging Voltage	**Flooded Battery**	14.6Vdc	29.2Vdc	58.4Vdc
	AGM / Gel Battery	14.1Vdc	28.2Vdc	56.4Vdc
Floating Charging Voltage		13.5Vdc	27Vdc	54Vdc
Overcharge Protection		15.5Vdvc	31Vdc	60Vdc
Charging Algorithm		3-Step		
Charging Curve				

Solar Charging Mode (MPPT)		
INVERTER MODEL	**2KVA / 3KVA**	**4KVA / 5KVA**
Efficiency	98.0% max.	
Max. PV Array Open Circuit Voltage	102Vdc	145Vdc
PV Array MPPT Voltage Range	30~80Vdc	60~115Vdc
Min battery voltage for PV charge	17Vdc	34Vdc
Standby Power Consumption	2W	
Battery Voltage Accuracy	+/-0.3%	
PV Voltage Accuracy	+/-2V	
Charging Algorithm	3-Step	
Joint Utility and Solar Charging		
Max Charging Current	80Amp	140Amp
Default Charging Current	40Amp	60Amp

Solar Charging Mode (PWM)	
INVERTER MODEL	**2KVA / 3KVA**
Max. PV Array Open Circuit Voltage	60Vdc
Best Operating Voltage Range	30~32Vdc
Standby Power Consumption	2W
Battery Voltage Accuracy	+/-0.3%
PV Voltage Accuracy	+/-2V
Charging Algorithm	3-Step
Joint Utility and Solar Charging	
Max Charging Current	80Amp
Default Charging Current	40Amp

Table 4 General Specifications

INVERTER MODEL	**2KVA / 3KVA**	**4KVA / 5KVA**
Safety Certification	CE	
Operating Temperature Range	0°C to 55°C	
Storage temperature	-15°C~ 60°C	
Humidity	5% to 95% Relative Humidity (Non-condensing)	
Dimension, mm	380 x 265 x 115	455 x 295 x 130
Net Weight, kg	7.5	11

6.0 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 01	Fan fault	Replace the fan.
	Fault code 02	Internal temperature of component is over 100°C.	Check if the air flow of the unit is blocked or the ambient temperature is too high.
	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 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
	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 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 08/09/53/57	Internal components failed.	Return to repair center.
	Fault code 51	Over current or surge.	Restart the unit, if the error happens again, please return to repair center.
	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.