

# User Manual



## Off Grid Solar Inverter 2KVA-5KVA



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# Information on this Manual

## 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 grid solar inverter with PWM controller, 2KVA;
- ▶ Off grid solar inverter with PWM controller, 3KVA;

## Scope

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

## 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

## 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.

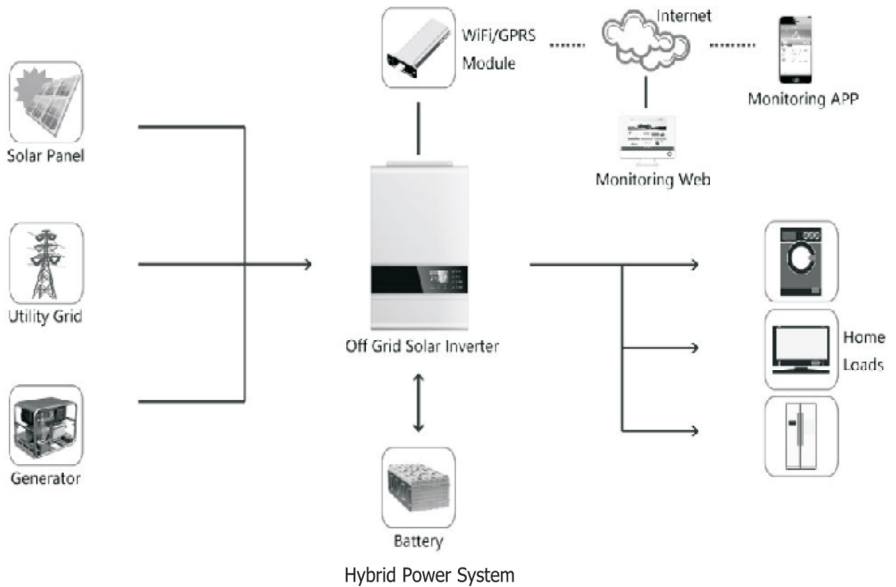
Turning off the unit will not reduce this risk.

8. Be very cautious when working with metal tools on or around batteries. A potential risk, such as dropping a tool to spark or short circuit batteries or other electrical parts, could cause an explosion.
9. 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.
10. 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.
11. **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.
12. 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.
13. **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.

## Symbols

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

# Introduction



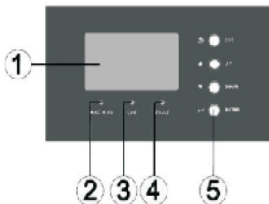
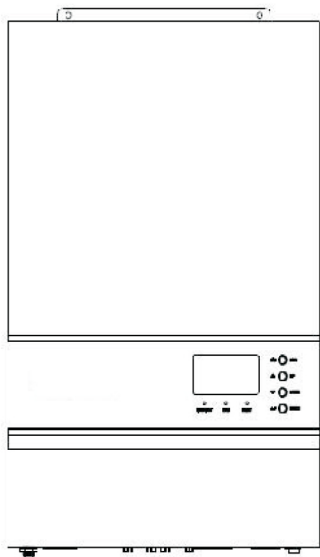
This is a multifunctional off grid solar inverter, integrated with a MPPT/PWM solar charge controller, a high frequency pure sine wave inverter and a UPS function module in one machine, which is perfect for off grid backup power and self-consumption applications. The transformerless design provides reliable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

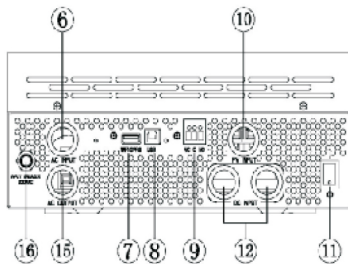
## Features

- ▶ Rated power 2KW to 5KW, power factor 1
- ▶ MPPT solar charge controller / PWM solar charge controller
- ▶ 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**
- ▶ Parallel operation available for 4KW/5KW

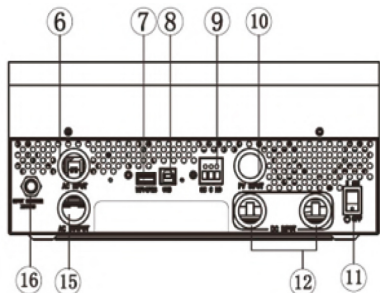
# Product Overview



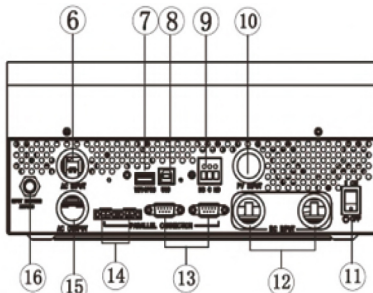
1. LCD display
2. Status indicator
3. Charging indicator
4. Fault indicator
5. Function buttons



**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.

# Installation

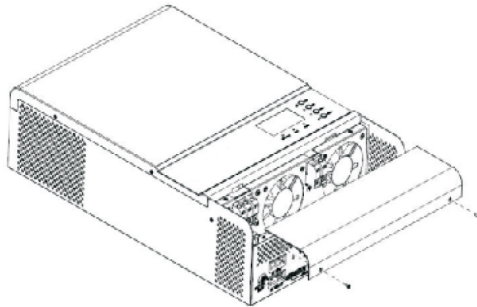
## Unpacking and Inspection

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

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

## Preparation

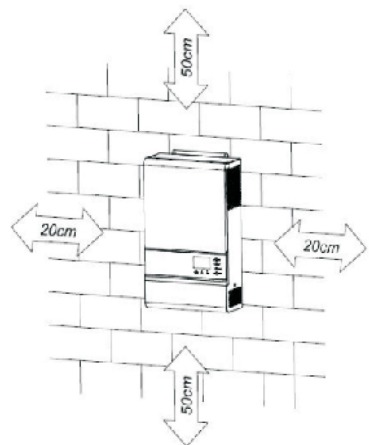
Before connecting all wiring, please take off bottom cover by removing two screws as shown below.



## Mounting the Unit

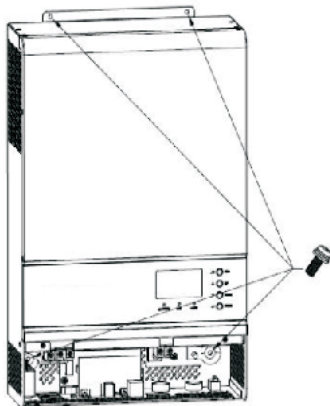
Consider the following points before selecting where to install:

- ▶ 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.



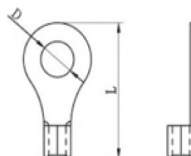
## Battery Connection

**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 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.

**Ring terminal:**



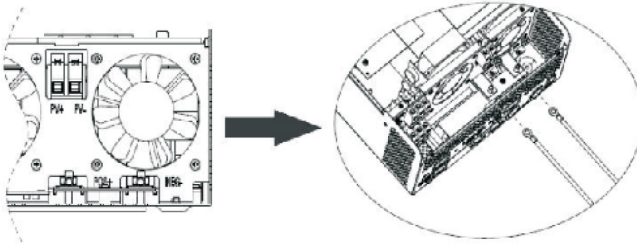
**Recommended battery cable and terminal size:**

Model	Maximum Amperage	Battery capacity	Wire Size	Ring Terminal			Torque value
				Cable mm <sup>2</sup>	Dimensions		
					D (mm)	L (mm)	
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	



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 2/3KVA 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.



	<p><b>WARNING: Shock Hazard</b> Installation must be performed with care due to high battery voltage in series.</p>
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	<p><b>CAUTION!!</b> Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur.</p> <p><b>CAUTION!!</b> Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.</p> <p><b>CAUTION!!</b> 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 (-).</p>
--	---

## 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
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

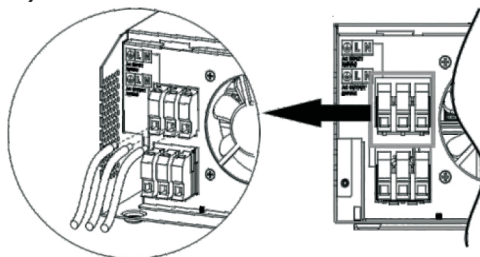
Please follow below steps to implement AC input/output connection:

1. Before making AC input/output connection, be sure to open DC protector or 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:**

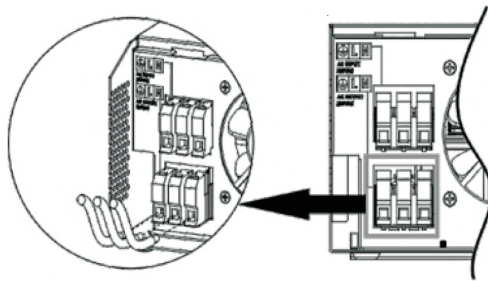
Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

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 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.

## 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 (MPPT)	Typical Amperage	Cable Size	Torque
2KVA / 3KVA 24Vdc	50A	8 AWG	1.4~1.6 Nm
3KVA 48Vdc	30A	10AWG	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:

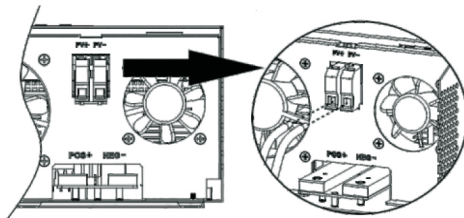
1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.

<b>Solar Charging Mode (MPPT)</b>		
<b>INVERTER MODEL</b>	<b>2KVA / 3KVA(24V)</b>	<b>3KVA(48V) / 4KVA / 5KVA</b>
<b>Max. PV Array Open Circuit Voltage</b>	102Vdc max	145Vdc
<b>PV Array MPPT Voltage Range</b>	30~80Vdc	60~115Vdc
<b>Min. battery voltage for PV charge</b>	17Vdc	34Vdc

<b>Solar Charging Mode (PWM)</b>		
<b>INVERTER MODEL</b>	<b>2KVA / 3KVA(24V)</b>	<b>3KVA(48V)</b>
<b>Max. PV Array Open Circuit Voltage</b>	60Vdc max	90Vdc max
<b>PV Array PWM Voltage Range</b>	30~32Vdc	60~64Vdc
<b>Min. battery voltage for PV charge</b>	17Vdc	34Vdc

Please follow below steps to implement PV module connection:

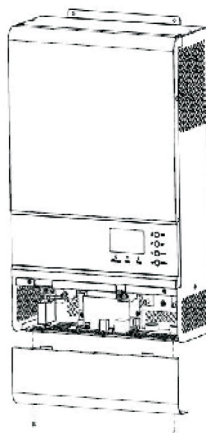
1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable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



3. Make sure the wires are securely connected.

## Final Assembly

After connecting all wiring, 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 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):

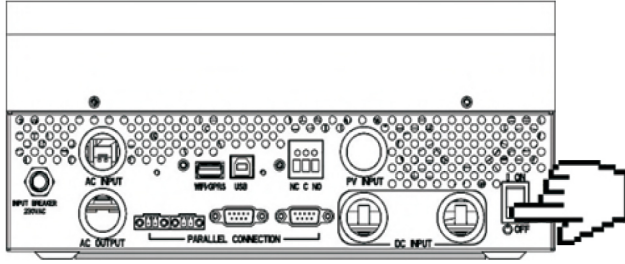
Unit Status	Condition		Dry contact port: 		
			NC & C	NO & C	
Power Off	Unit is off and no output is powered.		Close	Open	
Power On	Output is powered from Utility.		Close	Open	
	Output is powered from Battery or Solar.	Program 01 set as Utility	Battery voltage < Low DC warning voltage	Open	Close
			Battery 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 & 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

# Operation

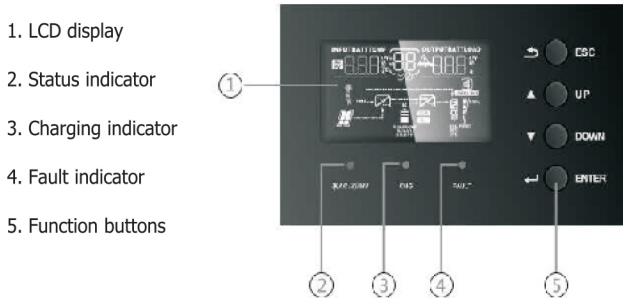
## Power ON/OFF



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



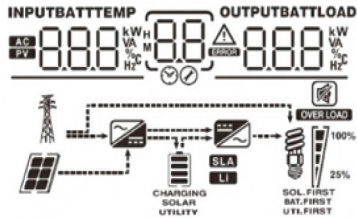
### LED Indicator

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 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

# LCD Display Icons



Icon	Function Description	
<b>Input Source Information</b>		
	Indicates the AC input.	
	Indicates the PV input	
	Indicate input voltage, input frequency, PV voltage, battery voltage and charger current.	
<b>Configuration Program and Fault Information</b>		
	Indicates the setting programs.	
	Indicates the warning and fault codes. Warning: flashing with warning code.	
	Fault:lighting with fault code	
<b>Output Information</b>		
	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.	
	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

	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 load is supplied by utility power.
	Indicates the utility charger circuit is working.
	Indicates the DC/AC inverter circuit is working.
	These three signs indicate the output priority. SOL.FIRST indicates solar first. BAT.FIRST indicates battery first. UTI.FIRST indicates utility first.

### Mute Operation

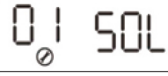
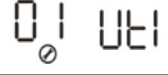




	Indicates unit alarm is disabled.
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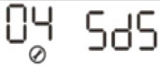





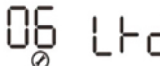


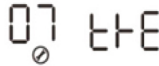
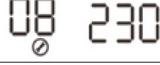
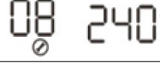
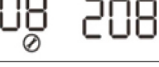





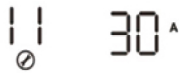




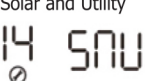

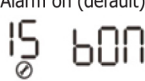
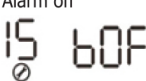


## LCD Setting

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 
		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) 
		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.
02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	 48V 5KVA/4KVA model: default 60A, 10A~140A settable 48V 3KVA MPPT model: default 20A, 10A~45A settable 48V 3KVA PWM model: default 65A, 10A~65A settable 24V MPPT model: default 30A, 10A~80A settable 24V PWM model: default 80A, 10A~80A settable
		03  Appliance (default)
03	AC input voltage range	03  UPS
		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
		Flooded 	 If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19, 20 and 21.
		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)	

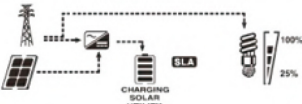
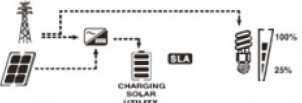
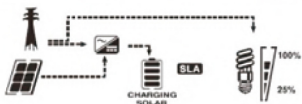
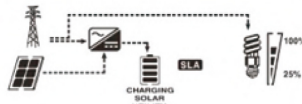
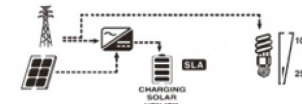

11	Maximum utility charging current	 48V 5KVA/4KVA model: default 30A, 10A~60A Settable 48V 3KVA model: default 10A, 10A~15A Settable 24V model: default 20A, 20A/30A Settable	
12	Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 01	 48V model: default 46.0V, 44.0V~51.2V Settable 24V model: default 23.0V, 22.0V~25.6V Settable	
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	
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.	
15	Alarm control	Alarm on (default) 	Alarm off 
16	Backlight control	Backlight on (default) 	Backlight off 

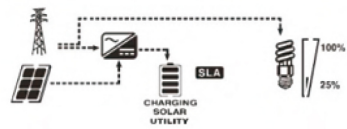
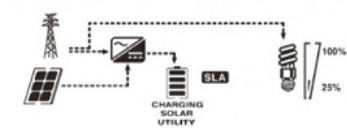
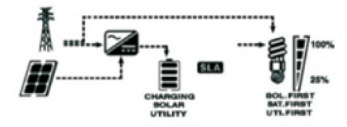
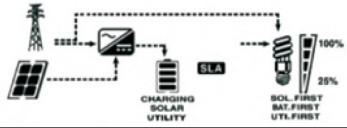

17	Beeps while primary source is interrupted	Alarm on (default) 17 A0N ⊙	Alarm off 17 A0F ⊙
18	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) 18 bYd ⊙	Bypass enable 18 bYE ⊙
19	Bulk charging voltage (C.V voltage). If self-defined is selected in program 5, this program can be set up	C4 19 56.4V ⊙ 48V model: default 56.4V, 48.0V~58.4V Settable 24V model: default 28.2V, 24.0V~29.2V Settable	
20	Floating charging voltage. If self-defined is selected in program 5, this program can be set up	FL4 20 54.0V ⊙ 48V model: default 54.0V, 48.0V~58.4V Settable 24V model: default 27.0V, 24.0V~29.2V Settable	
21	Low DC cut-off voltage. If self-defined is selected in program 5, this program can be set up	C04 21 42.0V ⊙ 48V model: default 42.0V, 40.0V~48.0V Settable 24V model: default 21.0V, 20.0V~24.0V 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): 22 5bE ⊙	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: 22 5bd ⊙	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)
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)	
		NEC 24 d1 S ⊙	
		Enable: Neutral and grounding of AC output is connected.	
NEC 24 ENR ⊙ 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.			

## Display Setting


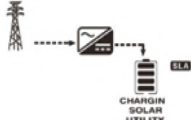



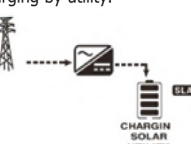


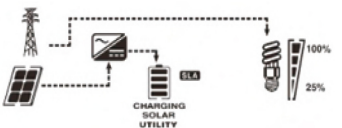
The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: input voltage, input frequency, PV voltage, MPPT charging current, MPPT charging power, battery voltage, output voltage, output frequency, load percentage, load 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)	<p>Input Voltage=230V, output voltage=230V</p> <p>INPUT OUTPUT AC 230v 230v</p> <p>CHARGING SOLAR UTILITY</p>
Input frequency	<p>Input frequency=50Hz</p> <p>INPUT OUTPUT AC 500 Hz 230v</p> <p>CHARGING SOLAR UTILITY</p>
PV voltage	<p>PV voltage=60V</p> <p>INPUT OUTPUT PV 60v 230v</p> <p>CHARGING SOLAR UTILITY</p>
Charging current	<p>Current <math>\geq</math> 10A</p> <p>BATT OUTPUT AC PV 50 A 230v</p> <p>CHARGING SOLAR UTILITY</p> <p>Current &lt; 10A</p> <p>BATT OUTPUT AC PV 5 A 230v</p> <p>CHARGING SOLAR UTILITY</p>

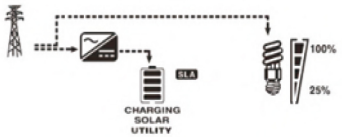
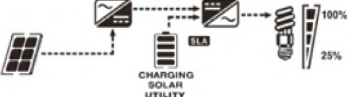

<p>MPPT Charging power</p>	<p>MPPT charging power=500W</p> <p>BATT <b>500</b> W      OUTPUT <b>230</b> V</p>  <p>CHARGING SOLAR UTILITY</p>
<p>Battery voltage/ DC discharging current</p>	<p>Battery voltage=51.0V, discharging current=0A</p> <p>BATT <b>51.0</b> V      BATT <b>0</b> A</p>  <p>CHARGING SOLAR UTILITY</p>
<p>Output frequency</p>	<p>Output frequency=50Hz</p> <p>BATT <b>51.0</b> V      OUTPUT <b>50.0</b> Hz</p>  <p>CHARGING SOLAR UTILITY</p>
<p>Load percentage</p>	<p>Load percent=70%</p> <p>BATT <b>51.0</b> V      LOAD <b>70.0</b> %</p>  <p>CHARGING SOLAR UTILITY</p>
<p>Load in VA</p>	<p>When connected load is lower than 1kVA, load in VA will present xxx VA like below chart.</p> <p>INPUT <b>AC 230</b> V      LOAD <b>350</b> VA</p>  <p>CHARGING SOLAR UTILITY</p> <p>When load is larger than 1kVA (<math>\geq 1\text{kVA}</math>), load in VA will present x.x kVA like below chart.</p> <p>INPUT <b>AC 230</b> V      LOAD <b>150</b> VA</p>  <p>CHARGING SOLAR UTILITY</p>

<p>Load in Watt</p>	<p>When load is lower than 1kW, load in W will present xxx W like below chart.</p> <p><b>INPUT</b> AC 230 V</p> <p><b>LOAD</b> 270 W</p>  <p>When load is larger than 1kW (<math>\geq 1\text{KW}</math>), load in W will present x.x kW like below chart.</p> <p><b>INPUT</b> AC 230 V</p> <p><b>LOAD</b> 1.20 kW</p> 
<p>Main CPU version checking (For models with PWM controller)</p>	<p>Main CPU version 005-00-716</p> <p>005 00 716</p> 
<p>Main CPU version checking (For models with MPPT controller)</p>	<p>Main CPU version 001-02-719</p> <p>001 02 719</p> 
<p>Secondary CPU version checking (For models with MPPT controller)</p>	<p>Secondary CPU version 002-00-719</p> <p>002 00 719</p> 







# Operating Mode Description

Operation mode	Description	LCD display
<p>Standby mode / Power saving 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>*Power saving mode: If enabled, the output of inverter will be off when connected load is pretty low or not detected.</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>Fault mode</p> <p>Note:</p> <p>*Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.</p>	<p>PV energy and utility 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>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 PV energy</p> 












Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	<p>Charging by utility</p> 
Battery Mode	The unit will provide output power from battery and PV power.	<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	
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	

# 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	

# Specifications

Table 1 Line Mode Specifications

<b>INVERTER MODEL</b>	<b>2KVA / 3KVA / 4KVA / 5KVA</b>
<b>Input Voltage Waveform</b>	Sinusoidal (utility or generator)
<b>Nominal Input Voltage</b>	230Vac
<b>Low Loss Voltage</b>	170Vac±7V (UPS) 90Vac±7V (Appliances)
<b>Low Loss Return Voltage</b>	180Vac±7V (UPS); 100Vac±7V (Appliances)
<b>High Loss Voltage</b>	280Vac±7V
<b>High Loss Return Voltage</b>	270Vac±7V
<b>Max AC Input Voltage</b>	300Vac
<b>Nominal Input Frequency</b>	50Hz / 60Hz (Auto detection)
<b>Low Loss Frequency</b>	40±1Hz
<b>Low Loss Return Frequency</b>	42±1Hz
<b>High Loss Frequency</b>	65±1Hz
<b>High Loss Return Frequency</b>	63±1Hz
<b>Output Short Circuit Protection</b>	Line mode: Circuit Breaker Battery mode: Electronic Circuits
<b>Efficiency (Line Mode)</b>	>95% ( Rated R load, battery full charged )
<b>Transfer Time</b>	10ms typical (UPS); 20ms typical (Appliances)
<p><b>Output power derating:</b> When AC input voltage drops to 95V or 170V depending on models, the output power will be derated.</p>	 <p>The graph illustrates the output power derating characteristics. The vertical axis represents Output Power, and the horizontal axis represents Input Voltage. Key points on the graph include:         <ul style="list-style-type: none"> <li>At 90V input voltage, the output power is limited to 20% of the rated power.</li> <li>Between 90V and 170V, the output power increases linearly from 20% to the full Rated Power.</li> <li>From 170V to 280V, the output power remains constant at the Rated Power level.</li> <li>At 280V, the output power drops to zero.</li> </ul> </p>

Table 2 Inverter Mode Specifications

<b>INVERTER MODEL</b>	<b>2KVA / 3KVA 24V</b>	<b>3KVA 48V / 4KVA / 5KVA</b>
<b>Rated Output Power</b>	2KVA/2KW 3KVA/3KW	3KVA/3KW 4KVA/4KW 5KVA/5KW
<b>Output Voltage Waveform</b>	Pure Sine Wave	
<b>Output Voltage Regulation</b>	230Vac±5%	
<b>Output Frequency</b>	60Hz or 50Hz	
<b>Peak Efficiency</b>	93%	
<b>Overload Protection</b>	5s@≥150% load; 10s@110%~150% load	
<b>Surge Capacity</b>	2* rated power for 5 seconds	
<b>Nominal DC Input Voltage</b>	24Vdc	48Vdc
<b>Cold Start Voltage</b>	23.0Vdc	46.0Vdc
<b>Low DC Warning Voltage</b>		
@ load < 20%	22.0Vdc	44.0Vdc
@ 20% ≤ load < 50%	21.4Vdc	42.8Vdc
@ load ≥ 50%	20.2Vdc	40.4Vdc
<b>Low DC Warning Return Voltage</b>		
@ load < 20%	23.0Vdc	46.0Vdc
@ 20% ≤ load < 50%	22.4Vdc	44.8Vdc
@ load ≥ 50%	21.2Vdc	42.4Vdc
<b>Low DC Cut-off Voltage</b>		
@ load < 20%	21.0Vdc	42.0Vdc
@ 20% ≤ load < 50%	20.4Vdc	40.8Vdc
@ load ≥ 50%	19.2Vdc	38.4Vdc
<b>High DC Recovery Voltage</b>	28.2Vdc	56.4Vdc
<b>High DC Cut-off Voltage</b>	30.4Vdc	60.8Vdc
<b>No Load Power Consumption</b>	<25W	<50W
<b>Saving Mode Power Consumption</b>	<10W	<15W

Table 3 Charge Mode Specifications

Utility Charging Mode			
INVERTER MODEL	2KVA / 3KVA 24V	3KVA 48V	4KVA / 5KVA
<b>Charging Current (UPS)</b> @ Nominal Input Voltage	20/30A	10A/15A	10A/20/30A/40/50/60A
<b>Bulk Charging Voltage</b>	<b>Flooded Battery</b>	29.2Vdc	58.4Vdc
	<b>AGM / Gel Battery</b>	28.2Vdc	56.4Vdc
<b>Floating Charging Voltage</b>	27Vdc	54Vdc	54Vdc
<b>Overcharge Protection</b>	31Vdc	60Vdc	60Vdc
<b>Charging Algorithm</b>	3-Step		
<b>Charging Curve</b>			

<b>Solar Charging Mode (MPPT)</b>			
<b>INVERTER MODEL</b>	<b>2KVA / 3KVA 24V</b>	<b>3KVA 48V</b>	<b>4KVA / 5KVA</b>
<b>Efficiency</b>	98.0% max.		
<b>Max. PV Array Open Circuit Voltage</b>	102Vdc	145Vdc	145Vdc
<b>PV Array MPPT Voltage Range</b>	30~80Vdc	60~115Vdc	60~115Vdc
<b>Min battery voltage for PV charge</b>	17Vdc	34Vdc	34Vdc
<b>Battery Voltage Accuracy</b>	+/-0.3%		
<b>PV Voltage Accuracy</b>	+/-2V		
<b>Charging Algorithm</b>	3-Step		
<b>Joint Utility and Solar Charging</b>			
<b>Max Charging Current</b>	80Amp	45Amp	140Amp
<b>Default Charging Current</b>	50Amp	30Amp	60Amp

<b>Solar Charging Mode (PWM)</b>		
<b>INVERTER MODEL</b>	<b>2KVA / 3KVA 24V</b>	<b>3KVA 48V</b>
<b>Max. PV Array Open Circuit Voltage</b>	60Vdc	90Vdc
<b>Best Operating Voltage Range</b>	30~32Vdc	60~64Vdc
<b>Battery Voltage Accuracy</b>	+/-0.3%	
<b>PV Voltage Accuracy</b>	+/-2V	
<b>Charging Algorithm</b>	3-Step	
<b>Joint Utility and Solar Charging</b>		
<b>Max Charging Current</b>	80Amp	65Amp
<b>Default Charging Current</b>	50Amp	50Amp

Table 4 General Specifications

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