USER MANUAL

1.5KVA-10KVA OGM Series
Hybrid Inverter

CONTENTS

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ABOUT THIS MANUAL

Purpose

The purpose of this manual is to provide explanations and procedures for installing, operating and troubleshooting for the unit. This manual should be read carefully before installations and operations. Please retain this manual for future reference.

Scope

This document defines the functional requirements of the unit, intended for worldwide use in electronic processing equipment. All manuals are applicable under all operating conditions when installed in the End Use system, unless otherwise stated.

IMPORTANT SAFETY INSTRUCTIONS

⚠ **WARNING: This chapter contains important safety and operating instructions. Read and keep this User Guide for future reference.**

General Precautions

1. Before using the unit, read all instructions and cautionary marking:

    (1) The unit (2) the batteries (3) all appropriate sections of this manual.

2. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.

3. Do not expose the unit to rain, snow or liquids of any type. The unit is designed for indoor use only. Protect the unit from splashing if used in vehicle applications.

4. 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.

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

6. **CAUTION** --Battery are not already installed by the supplier only a qualified professional (e.g. service person) may install the Inverter.

7. **WARNING: WORKING IN VICINITY OF A LEAD ACID BATTERY ISDANGEROUS.**

   BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL OPERATION. Provide ventilation to outdoors from the battery compartment. The battery enclosure should be designed to prevent accumulation and concentration of hydrogen gas in "pockets" at the top of the compartment. Vent the battery compartment from the highest point. A sloped lid can also be used to direct the flow to the vent opening location.

8. **NEVER** charge a frozen battery.

9. No terminals or lugs are required for hook-up of the AC wiring. AC wiring must be no less than 8 AWG gauge copper wire. Battery cables must be rated for 35mm or higher and should be no less than table 1. Crimped and sealed copper ring terminal lugs with a HRNB38-8 hole should be used to connect the battery cables to the DC terminals of the unit. Soldered cable lugs are also acceptable.

10. Be extra cautious when working with metal tools on, or around batteries. The potential exists to drop a tool and short-circuit the batteries or other electrical parts resulting in sparks that could cause an explosion.

11. No AC or DC disconnects are provided as an integral part of this unit. Both AC and DC disconnects must be provided as part of the system installation. See INSTALLATION section of this manual.

12. Fuses are provided as the over current protection of the battery supply.

13. When PV module or panel is exposed to light, it starts to supply high DC voltage, be sure to turn off DC switch before commencing the maintenance, and make sure the cables from PV panel are properly sealed after disconnection.

14. GROUNDING INSTRUCTIONS -This battery charger should be connected to a grounded permanent wiring system. For most installations, the Ground Lug should be bonded to the grounding system at one (and only one point) in the system. All installations should comply with all national and local codes and ordinances.

15. **AVOID** AC output short-circuit; avoid DC input short-circuit and not connect the mains while DC input short-circuit

16. **Warning:** The maintenance information is only to service persons, If the product is used in a manner which is not covered by the scope of warranty, the protection provided by the product maybe impaired.

Personal Precautions

1. Someone should be within range of your voice to come to your aid when you work near batteries.

2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.

3. Wear complete eye protection and clothing protection. Avoid touching eyes while working near batteries. Wash your hands when done.

4. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eyes, immediately flood eyes with running cool water for at least 15 minutes and get medical attention immediately.

5. Baking soda neutralizes lead acid battery electrolyte. Keep a supply on hand in the area of the batteries.

6. NEVER smoke or allow a spark or flame in vicinity of a battery or generator.

7. Be extra cautious when working with metal tools on, and around batteries. Potential exists to short-circuit the batteries or other electrical parts which may result in a spark which could cause an explosion.

8. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with battery. Battery can produce short-circuit current high enough to weld a ring, or the like, to metal causing severe burns.

9. If a remote or automatic generator start system is used, disable the automatic starting circuit and/or disconnect the generator from its starting battery while servicing to prevent accidental starting during servicing.

INSTALLATION

Unpacking and Inspection

Carefully unpack the inverter/charger from its shipping carton.

Verify all of items list below are present. Please call customer service if any items are missing.

- The unit

- 1 user manual

Basic Configuration

1.5KVA-10KVA OGM Series hybrid Inverter is designed to serve as a backup power supply for AC loads. The input power of 1.5KVA-10KVA OGM Series hybrid Inverter comes from PV system and AC grid which not only supply power to AC loads but also charge the battery bank when the power from AC grid or AC generator is present (also known as Line Mode).

In the event of AC grid (or AC generator) outage, the AC loads can be alternatively powered by PV system (if the illumination is sufficient) and battery bank.

The following illustrations show basic applications for 1.5KVA-10KVA OGM Series hybrid Inverter.

Figure 1. Typical Application of 1.5KVA-10KVA OGM series

hybrid Inverter

Note: Appliances like Air conditioner needs at least 3 minutes to restart in case of a power shortage occurs in a way that the power turns off then back on again rapidly (time is required to balance the refrigerant gas in inside circuit); so in order to protect your Air conditioner, please consult the Air conditioner manufacturer whether they have already provided time delay function before installing. Otherwise, Inverter will trig overload fault and shut off its output to protect your appliance but sometimes it is not enough and your Air conditioner can be damaged internally beyond repair.

Batteries

The unit support 12volt,24volt or 48vlot battery bank. Please wire battery correctly. Before proceeding, ensure you have appropriate size batteries for this inverter. The unit can use flooded lead-acid, or sealed GEL/AGM lead-acid batteries so ensure that your batteries are in one of these categories. 1.5KVA-10KVA OGM inverter with built-in MPPT solar controller, for the battery and solar panel connection please refer to figure 2, figure3 and figure4. If with the built-in 48 MPPT 40A solar charge controller, then please configure solar panels more than 2350W, otherwise it can not reach the maximum charge current, if with the built-in48MPPT60A solar charge controller, then please configure solar panels more than 3500W, otherwise it can not reach the maximum charge current.

Note: If you are using a gel battery or a deep cycle battery, please do not use ordinary lead-acid batteries for use in solar energy systems. This is likely to damage the lead acid battery or to reach the desired effect.The battery must be wired to match with the DC input voltage. Recommend to use battery capacity more than 200AH .
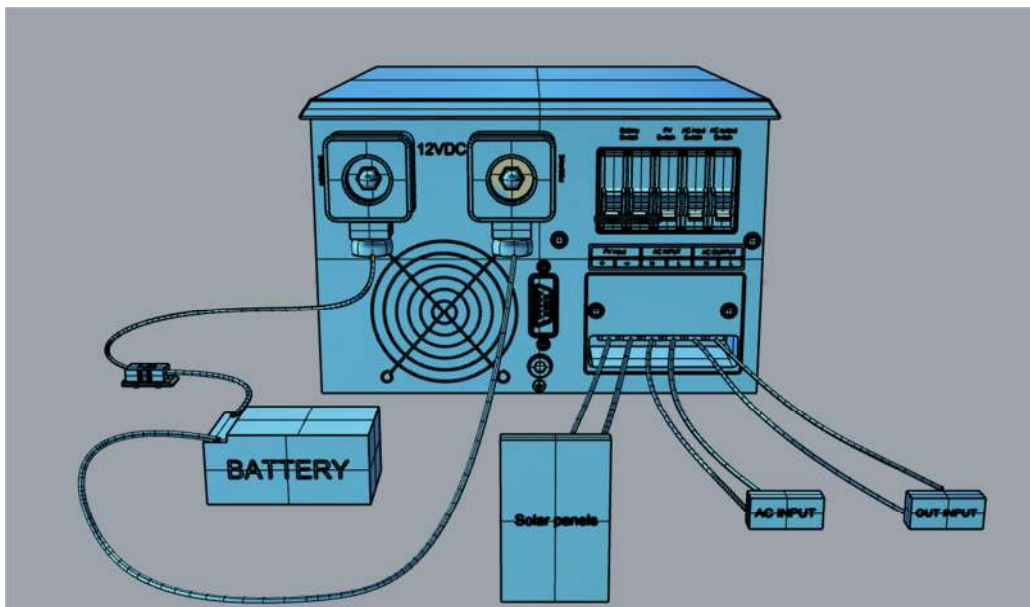

Figure 2. 1.5KVA OGM 12V solar inverter system- the connection diagram of solar panel and batter
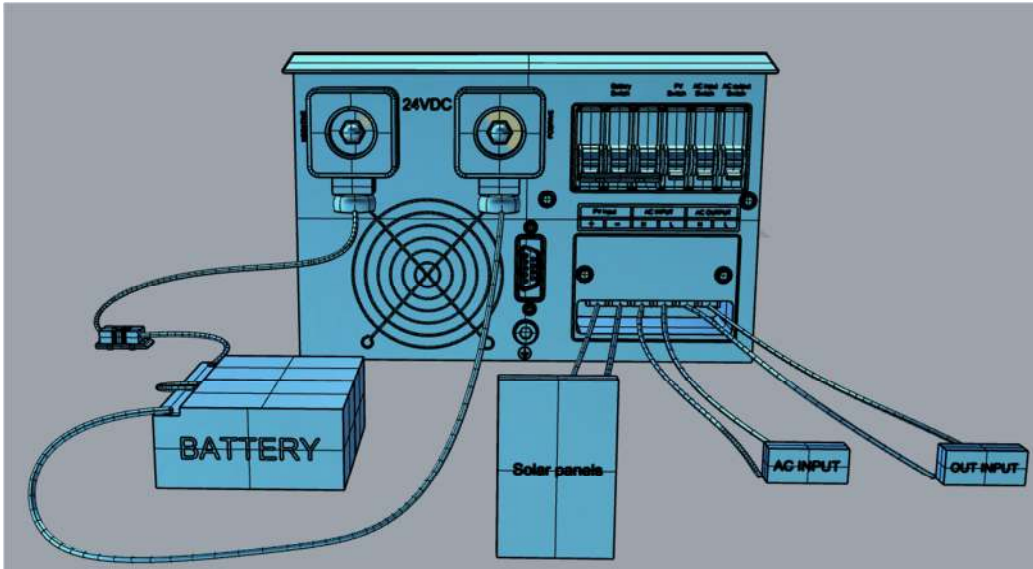
Figure3. 2.5-3.5KVA OGM 24Vsolarinvertersystem-theconnectiondiagram of solar panel and battery
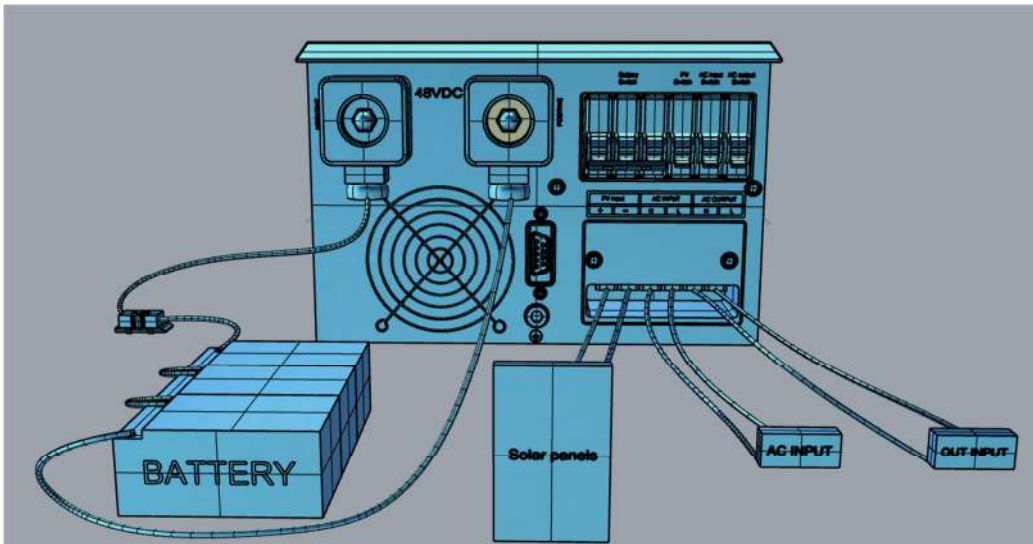

Figure4. 6-10KVA OGM 48Vsolarinvertersystem-theconnectiondiagram of solar panel and battery

Battery Cable Size

Below table 1 you can find information for recommended battery cable and terminal.

Table 1. Recommended battery cable and terminal size

Model	DC	Typical	Battery	1~3 m	0.5 m	Cable Terminal

Number	Voltage	Amperage	Capacity	one-way	one-way	
1.5KVA	12V	100A	200AH	25mm^2	25mm^2	RNBS16-8
2.5KVA	24V	100A	400AH	25mm^2	25mm^2	RNBS16-8
3.5KVA	24V	150A	400AH	35mm^2	35mm^2	RNBS16-8
6KVA	48V	125A	800AH	35mm^2	35mm^2	RNBS16-8
10KVA	48V	200A	800AH	50mm^2	50mm^2	RNBS25-8
						RNBS25-8

DC Disconnect and Over-Current Protection

For safety and to comply with regulations, battery over-current protection and disconnect devices are required. Fuses and disconnects must be sized to protect the DC cables is used, and must be rated for DC operation. Do not use devices rated only for AC service – they will not function properly.

Note that some installation requirements may not require a disconnect device, although over-current protection is still required.

Battery Cable Connection

Observe Battery Polarity! Place the ring terminal of DC cable over the bolt and directly against the unit's battery terminal. Tighten the M8 screw with 6-10 Nm. Do not place anything between the flat part of the Backup System terminal and the battery cable ring terminal or overheating may occur.

DONOTAPPLYANYTYPEOFANTI-OXIDANTPASTETOTERMINALSUNTILAFTERTHEBATTERY CABLE WIRING ISTORQUED!!

WARNING: Shock Hazard

Installation must be performed with care for the high battery voltage in series.

⚠️**Caution!!** Do NOT place anything between battery cable ring terminals and terminals on the inverter. The terminal screw is not designed to carry current.

Apply Anti-oxidant paste to terminals AFTER terminals have been screwed.

Verify that cable lugs are flush with the battery terminals. Tighten battery cables to terminals (6-10 Nm).

AC Cable Size

Before wiring the input and output of inverter, refer to table 2 for minimum recommended cable size and torque value

Table 2. Recommended cable size and torque value for AC wire

Model Number	Typical	AC Input	AC Output	Torque value

	Amperage			
1.5KVA OGM 230Vac	10A	12AWG	14AWG	1.5~2.0 Nm
2.5KVA OGM 230Vac	15A	12AWG	12AWG	1.5~2.0 Nm
3.5KVA OGM 230Vac	20A	12AWG	12AWG	1.5~2.0 Nm
6KVA OGM 230Vac	40A	12AWG	12AWG	1.5~2.0 Nm
10KVA OGM 230Vac	60A	10AWG	10 AWG	2.0~2.5 Nm

AC Connections

Installation should be done by a qualified electrician. Consult local code for the proper wire sizes, connectors and conduit requirements.

On the left of the AC hard wire cover.Two three-station terminal block is provided to make the AC connections. The terminal block is used to hard wire the AC input, AC output, and ground. The National Electrical Code requires that an external disconnect switch be used in the AC input wiring circuit. The AC breakers in a sub panel will meet this requirement.
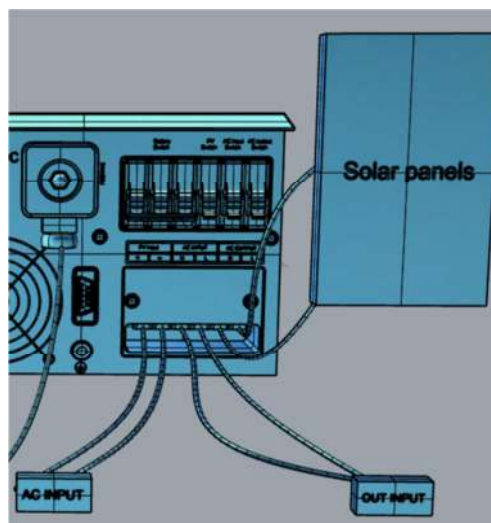
Figure 5. AC Cable Connect to unit

Step 1: Disconnect the unit from the battery by removing the battery cables. Turning off the unit before disconnect from the battery.

Step2: Following the wiring guide located in the AC input wiring compartment as figure5, connect the GND (green/yellow), Line (brown), and neutral (blue) wires from the AC input (utility, generator etc) to the terminal block.

⚠ **Caution!!** Be sure that AC source is disconnected before attempting to hardwire it to the unit.

Step 3: Connect the AC Line output wiring to the terminal marked AC Line (output), following the wiring guide inside the compartment. Torque the wires into the terminal block.

Step 4: Lock the AC covers.

Machine panel introduction
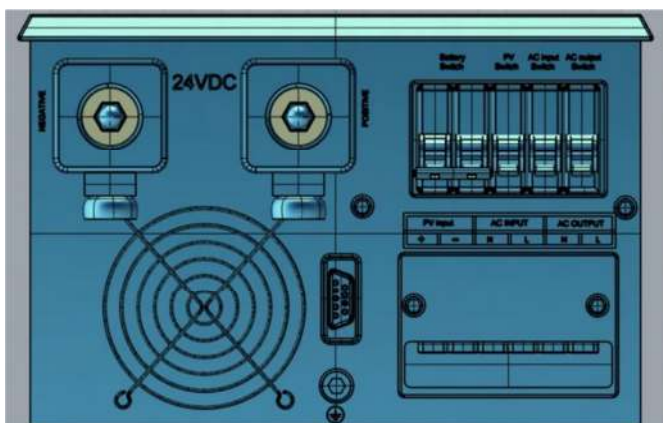
Figure 6. 1.5KVA Front panel   Figure 7. 2.5-10KVAFront panel
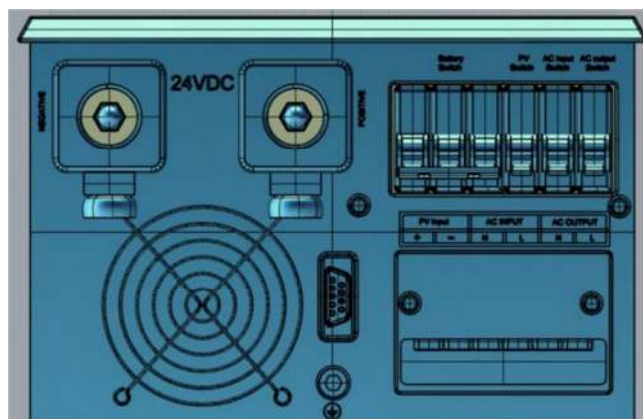
OPERATION

SINE WAVE POWER
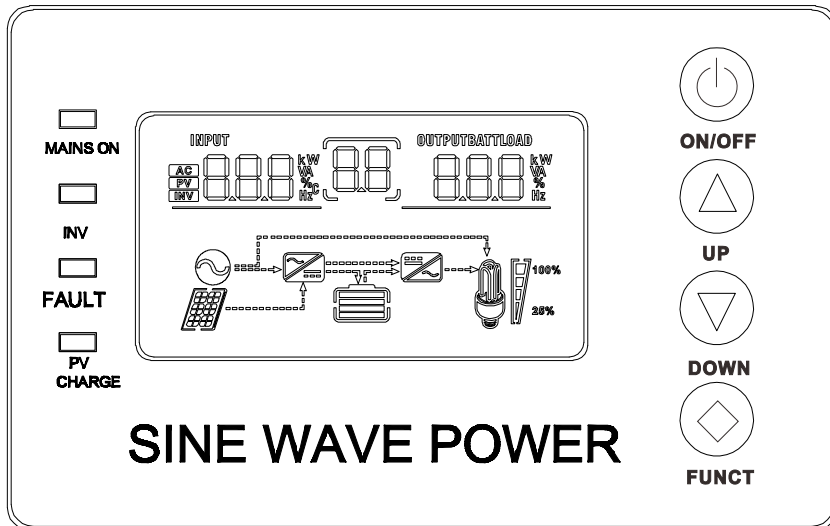
Table 3. configuration button function

Switch	Description
ON/Off	Long press 3 seconds to hear a beep to turn on, press 5 seconds to turn off
UP	Page up, data increment
DOWN	Page down, data is decreasing
FUNCT	Function setting

LED Indicator	
LED	**Description**
MAINS ON	Mains input indication, the inverter is working in bypass, and the mains is charging the battery
INV	Battery inverter status indication
FAULT	Inverter overload indication
PV CHARGE	PV Input and charging indication

C

1. Charging voltage regulation   2. Charging current regulation
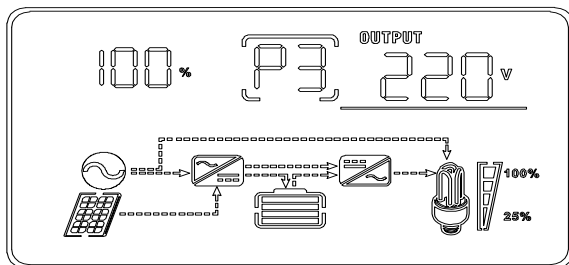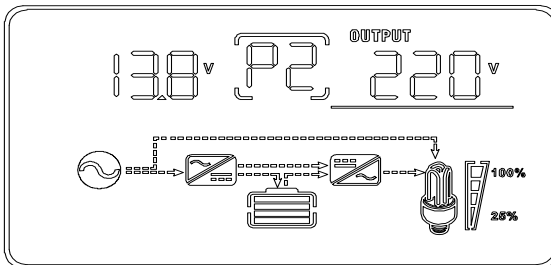
3. Buzzer on & off   4. Mode selection
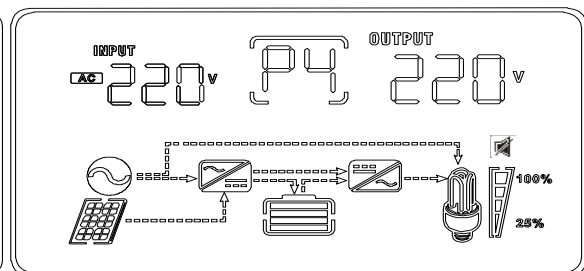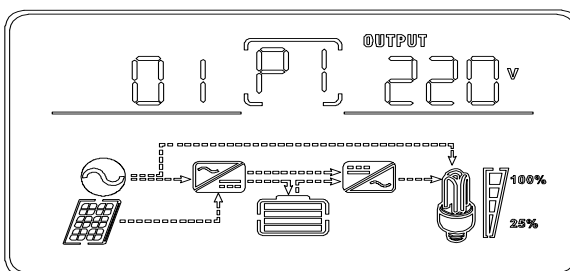
5. DC/AC/ Intelligent mode selection setting
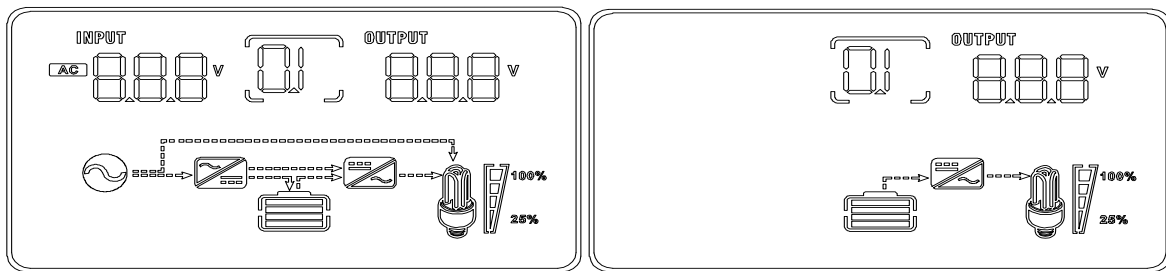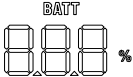
6.AC mode priority   DC mode priority
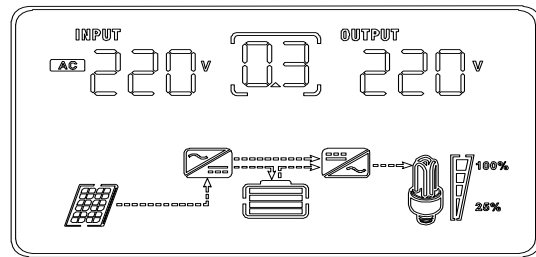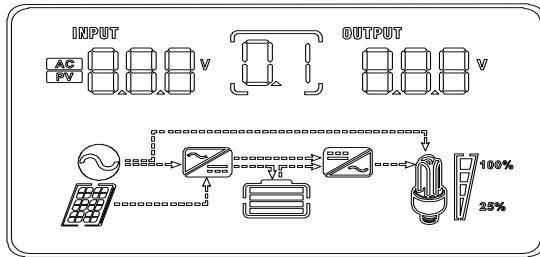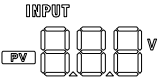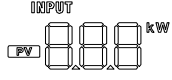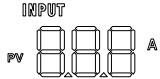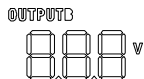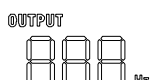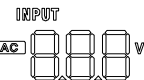
Intelligent mode

LCD display meaning

Table 5. display meaning

	Grid input icon
	AC-DC icon
	DC-AC icon
	PV -icon
	Bypass Icon
$888\,^{Vac}_{Hz}$	AC Voltage and Frequency display
100% 25%	The load icon and level bar indicates the loading level (0~100%), Loading display
BATT 888.%	

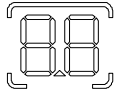|	
	Level of remaining battery capacity, Battery voltage
INPUT PV 8.8.8 V	PV (Solar system)
INPUT PV 8.8.8 kW	PV (Solar system) power generation display
INPUT PV 8.8.8 A	Pv charging current
OUTPUT 8.8.8 V	Ouput voltage
OUTPUT 8.8.8 Hz	Output frequency
INPUT AC 8.8.8 V	AC input voltage
🔇	Light on - prohibit the buzzer, light off – allow the buzzer tweets
8.8.	inverter working mode selection: 01 mains priority, 02 energy saving mode, 03 battery priority

Inverter working mode LCD setting instructions：

Long press the function key for 5 seconds ◇， the inverter enters the function

parameter setting state， P0 Flashing， press ▲/▼key respectively

P0， P1， P2， P3， P4 flashing，

P1-P4 represent the four functional parameters of the inverter, and they are set as follows：

Display code	Description
P0	Exit settings；After setting the required parameters， press ▲/▼ to P0 flashing， press ◇， P0 no flashing， press ◇ again to exit settings
P1	Long press the function key for 5 seconds ◇ enter setting state， press ◇ to P1 flashing， press ◇ again 01、02、03 flashing， press ▲/▼ can choose， 01 Mains priority, 02 is energy saving mode, 03 is battery priority mode
P2	Long press the function key for 5 seconds ◇ enter setting state， press ▲/▼ to p2 flashing， press ◇ again, has a value representing the charging voltage flashing， press ▲/▼ can choose the required charging voltage.
P3	Long press the function key for 5 seconds ◇ enter setting state， press ▲/▼ to p3 flashing， press ◇ again, 20%、40%、60%、80%、100% flashing， Each percentage corresponds to 10A、15A、20A， 25A、30A charging current， press ▲/▼ can choose the required charging current.

P 4	Long press the function key for 5 seconds ◇ enter setting state, press ▲/▼ to p 4 flashing, press ▲/▼ can choose "ON" icon 🔇 slake, Buzzer on, N icon 🔇 light one, Buzzer off

Description of Buzzer alarm

Inverter is operating normally	Buzzer prohibited	By default, the buzzer does not sound
	Buzzer on	The buzzer beeps 4 times every 15 seconds to indicate that the inverter is in the battery - inverter state
Battery high voltage alarm	The buzzer beeps 4 times per second, indicating that the battery voltage is too high	
Battery low voltage alarm	The buzzer beeps twice per second to indicate that the battery voltage is too low	
Over temperature alarm	Buzzer beeps for 2 seconds, stop for 1 second	

Operating Indicators

DC Mode:

Voltage and Frequency exchange every5seconds.

every 5seconds.

PV Mode:

Voltage and Frequency exchange every 5seconds.
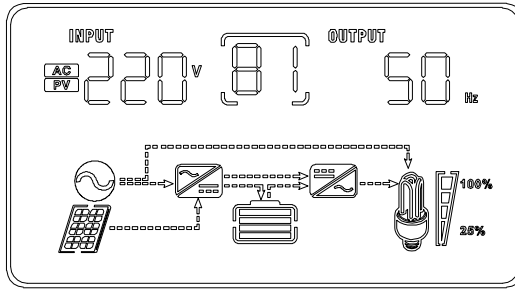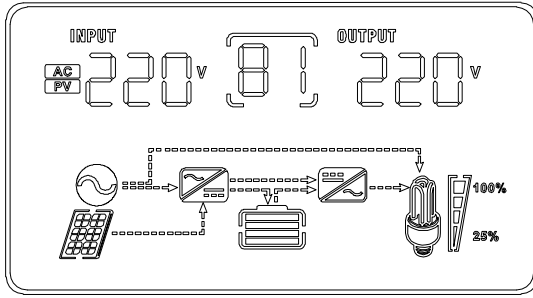
Fault Mode:

The upper left corner of the LCD shows the fault code and buzzer ringing.
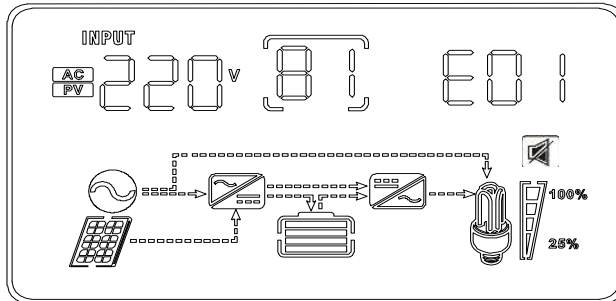
E01	E02	E03	E04
Power tube over current	Output short circuit	Overload	Over temperature
E05	E06	E07	E08
Battery voltage too high	Battery voltage too low	The power amplifier wire is reversed	Output voltage is too low

SPECIFICATIONS

Table 7. Line Mode Specifications

Model	1.5KVA OGM	2.5KVA OGM	3.5KVA OGM	6KVA OGM	10KVA OGM
Rated power	**1KW**	**2KW**	**3KW**	**5KW**	**8KW**
Input Voltage Waveform	Sine wave(Utility or Generator)				
Nominal Input Voltage	220Vac				
Low Line Disconnect	176Vac±4%(NOR)				
	130Vac±4%(WID)				
Low Line Re-connect	185Vac±4%(NOR)				
	138Vac±4%(WID)				
	Note: 1.NOR setting can be used for general electrical appliance 2. WID setting can be used only for some special load, Such as lamp, fan.				

High Line Disconnect	251Vac±4%(NOR)
	251Vac±4%(WID)
High Line Re-connect	242Vac±4%(NOR)
	242Vac±4%(WID)
Max AC Input Voltage	258VAC
Nominal Input Frequency	50Hz / 60Hz (Auto detection)
Low Line Frequency Disconnect	40+0.3Hz for 50Hz, 50+0.3Hz for 60Hz
Low Line Frequency Re-connect	41+0.3Hz for 50Hz, 51+0.3Hz for 60Hz
High Line Frequency Disconnect	55+0.3Hz for 50Hz, 65+0.3Hz for 60Hz
High Line Frequency Re-connect	54+0.3Hz for 50Hz, 64+0.3Hz for 60Hz
Output Voltage Waveform	As same as Input Waveform
Output Short Circuit Protection	Air switch
Efficiency (Line Mode)	>97%
Transfer Time	15ms (typical) 20ms max(WID)
Bypass charger enable in off mode	Yes

Note: NOR – Normal range; WID-Wide range

Table 8. Invert Mode Specifications

Model	1.5KVA OGM	2.5KVA OGM	3.5KVA OGM	6KVA OGM	10KVA OGM

Output Voltage Waveform	Pure Sine Wave		
Rated Output Power	1 ~ 8KW(220VAC)		
Power Factor	0.9 - 1.0		
Nominal Output voltage	220Vac		
Minimum Peak Output Voltage at Rated Power	>191V		
Output Frequency (Hz)	50Hz / 60Hz ± 0.3Hz		
Output Voltage Regulation	±10%		
Nominal Efficiency	>87% (@Normal DC Input; >60% R load)		
Over-Load Protection	105% <load<150%, beeps 0.5s every 1s, and Fault after 60s. Load>150%, beeps 0.5s every 1s, and Fault after 20s.		
Capable of starting electric motor	YES		
Output Short Circuit Protection	Current limit (Fault after 10s), Air switch		
Power saver	Load □25 ±5W (Enabled on "P/S auto" setting of Remote control		
DC voltage			
Nominal DC Input Voltage	12VDC	24VDC	48VDC
Min DC start voltage	10.5Vdc	21Vdc	42Vdc
Low DC Alarm	10.5Vdc ± 0.2Vdc	21Vdc ± 0.4Vdc	42.0 ± 0.8Vdc
Low DC Shut-down	10.5Vdc ± 0.2Vdc	20Vdc ± 0.4Vdc	40.0 ± 0.8Vdc
High DC Shut-down	16.0Vdc ±	32Vdc ± 0.4Vdc	64.0 ± 0.8Vdc

	0.2Vdc		
High DC Shut-down Recovery	15.5Vdc ± 0.2Vdc	31Vdc ± 0.4Vdc	62.0 ± 0.8Vdc

Table 9. AC Charger Mode specification:

Nominal Input Voltage	220Vac
Input Voltage Range	185V -242Vac(NOR) 153V -242Vac(WID)
High Voltage Disconnect	242Vac±4%(NOR) 242Vac±4%(WID)
High Line Re-connect	237Vac±4%(NOR) 237Vac±4%(WID)
Low Voltage Disconnect	185Vac±4%(NOR) 153Vac±4%(WID)
Low Line Re-connect	191Vac±4%(NOR) 157Vac±4%(WID)
Nominal Output Voltage	According to the battery type
	12VDC model: Max 20A
	24VDC model: Max 20A
	48VDC model: Max 20A

Nominal Charge Current	96VDC model: Max 20A
Charge current tolerance	±1A
Charge Algorithm	**Three stage:** **Boost CC** (constantcurrentstage) **Boost CV** (constant voltage stage) **Float** (constant voltagestage)

Note: NOR – Normal range;

WID-Widerange

Rated Battery voltage	12VDC	24VDC	48VDC	96VDC
Rated charge current	30A	50A	60A	60A
Input voltage range	18-150Vdc	34-150Vdc	65-150Vdc	144-180Vdc
Max. PV open circuit array voltage	170Vdc	170Vdc	170Vdc	234Vdc
Max. recommended input power (W)	360W	1200W	2880W	4800W

Table 10. Solar Charger Mode Specifications

Table 11. General Specifications

MODEL	1.5KVA OGM	2.5KVA OGM	3.5KVA OGM	6KVA OGM	10KVA OGM

Indicators	LED+LCD Display				
Protections	Low battery, over charging, over load , over temp.				
Remote control	YES				
Operating Temperature Range	0°C ~ 40°C				
Storage temperature	-15ºC ~ 60ºC				
Operation humidity	5% ~ 95% (non-condensing)				
Earthing(ABYC standard)	Follow customer requirement: Inverter mode: the neutral and the earth joined ; Line mode: the neutral and the earth separated. Use a Relay to realize the function.				
Audible Noise	65dB max				
Cooling	Forced air, variable speed fan				
Size (L*W*H mm)	370*310*150	485*350*170			
MODEL	1.5KVA OGM	2.5KVA OGM	3.5KVA OGM	6KVA OGM	10KVA OGM
Net weight (Kg)					

Product specifications are subject to change without further notice

APPENDIX A

How to Select and Configure PV Panels

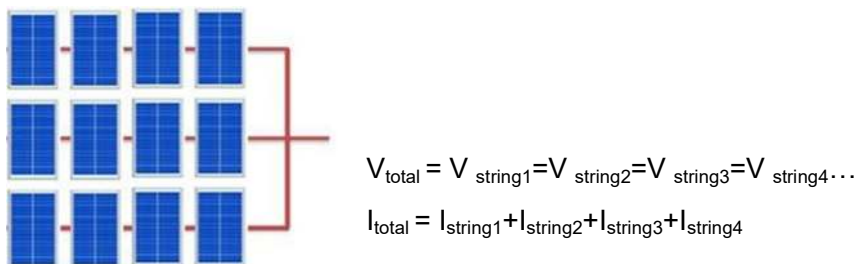The following parameters can be found in each PV panel's specification:

- P_{max}: Max output power(W)
- V_{oc}: open-circuit voltage(V)
- I_{sc}: short-circuit current(A)
- V_{mp}: max power voltage(V)
- I_{mp}: max power current(A)

PV panels can be connected in series or parallel in order to obtain the desired output voltage and current which meets the inverter's allowed range.

When connecting PV panels in series, the max voltage and current of the string is

$$V_{string} = V_1 + V_2 + V_3 + V_4 \ldots$$
$$I_{string} = I_1 = I_2 = I_3 = I_4$$

When connecting the above PV string in parallel, the max voltage and current of the total string is

$$V_{total} = V_{string1} = V_{string2} = V_{string3} = V_{string4} \ldots$$
$$I_{total} = I_{string1} + I_{string2} + I_{string3} + I_{string4}$$

In either case, the total output power is $P_{total} = P_{panel}$ X Number of PV panel The guideline to select and configure PV string is

- P_{total} shall be equal or slightly larger than the max. capacity of solar battery charger (900W for 3000VA

  model and 2600W for 5000VA model). Surplus capacity of PV string does not help the solar charger's capacity and only result in higher installation cost.

- Total V_{mp} of the string shall be within the operating voltage range of solar battery charger (60~72V for 3000VA model and 120~144V for 5000VA model are recommended).

- Total I_{mp} of the string shall be less than the max. input charging current of the solar battery charger (20A for 3000VA and 30A for 5000VAmodel)

- Total V_{oc} of the string shall be less than the max. PV input voltage of the solar battery charger (75V for 3000VA and 150V for 5000VAmodel).

Example 1 - How to connect 4000VAmodel to PV panels with the following parameters?

- P_{max}:260W
- V_{mp}:30.9V

- V_{oc}:37.7V
- I_{mp}:8.42A

- I_{sc}:8.89A

(1) The max. PV input power for 3500VA model is1200W,

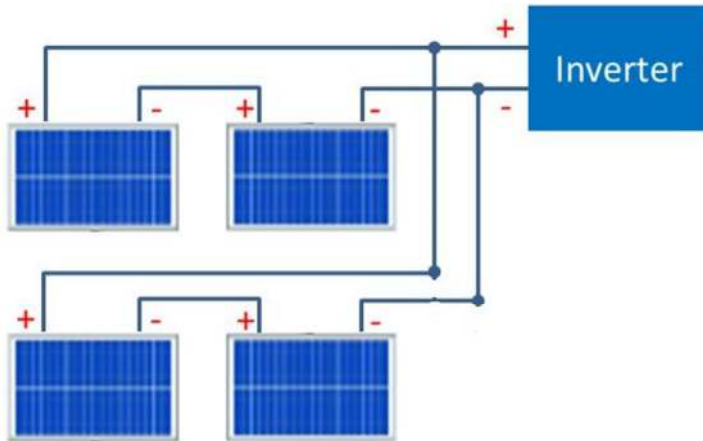 1200W / 260W =4$\Rightarrow$min. 4 PV panels shall be connected.

(2) Best Operating Voltage Range is 60~72

72V/30.9V = 2.33 $\Rightarrow$max. number of PV panel in series is 2.

(3) Max. input charging current is20A,

  20A/8.42A=2.37 $\Rightarrow$max. number of PV panel in parallel is2.

(4) Taking (1)~(3) into consideration, the optimized configuration is 2 PV panels in series and 2 strings in parallel, as shown below.

(5) Check again the V_{oc} and I_{sc} of PV string,

Voc of string is 61.8V < 75V (Max. PV Input Voltage) ⇒OK

Isc of string is 2 x 8.89A = 17.78A < 20A (Max. PV Input Current) ⇒OK

Example 2 - How to connect 5000VA **model to PV panels with the following parameters?**

- P_{max}:260W
- V_{mp}:30.9V
- V_{oc}:37.7V
- I_{mp}:8.42A
- I_{sc}:8.89A

(1) The max. PV input power for 5000VA model is 2600W, 2600W / 260W = 10⇒min. 10 PV panels shall be connected.

(2) Best Operating Voltage Range is110~144V,

144V/30.9V = 4.66 ⇒max. number of PV panel in series is 4.

(3) Max. input charging current is30A,

30A/8.42A=3.56   ⇒max. number of PV panel in parallel is3.

(4) Taking (1)~(3) into consideration,theoptimizedconfigurationis4PVpanelsinseriesasastring,and3 strings in parallel (as shown below).
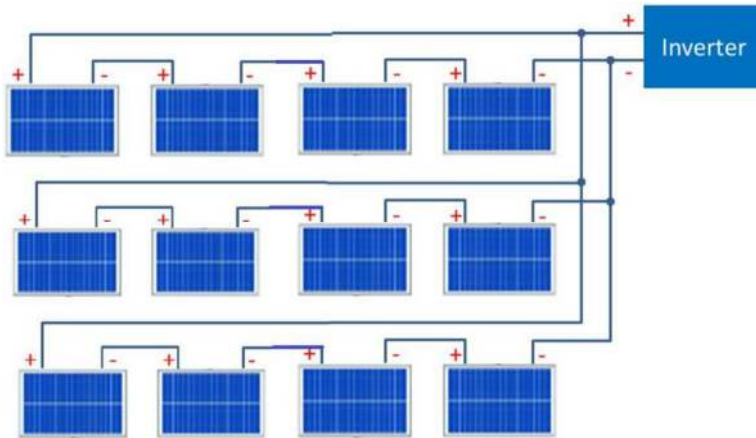
(5) Check again the V_{oc} and I_{sc} of PVstring,

V_{oc} of string is 4 x 30.9V = 123.6V < 150V (Max. PV Input Voltage) $\Rightarrow$OK

I_{sc} of string is 3 x 8.89A = 26.67A < 30A (Max. PV Input Current) $\Rightarrow$OK

DISPOSAL

In the event the product reaches the end of its service life, please contact the local dealer for disposal instructions.

 The product must not be disposed of with the household waste.

Disposal of the product at the end of its service life shall be done in accordance with applicable disposal regulations for electronic waste.

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