GLOBAL SOLAR (PVT.) LTD
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Replus SineO

User manual N

INVERTER / CHARGERS
With 50A PWM Solar Charge Controllers

IP1KVA-12-V / IP3KVA-24-V / IP5KVA-48-V

Customer Service

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Thank you very much for selecting our product!
This manual provides important information and suggestions with respect to installation, use and troubleshooting. Please read this manual carefully before installing or using the product and pay close attention to the safety recommendations.

Warranty:
The inverter is warranted to be free from defects for a period of two years from date of shipment to the original end user.

Notice: ReneSola® is not responsible for any damage to the controller due to lightning strikes, misuse, incorrect battery parameters used, unreasonable system configuration, unauthorized repairs or exceeding the specified parameter.

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1 ABOUT THIS MANUAL

1.1 Purpose

This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installation and operation. Keep this manual for future reference.

1.2 Scope

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

2 SAFETY INSTRUCTIONS

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

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
2. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
3. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire. To
4. reduce the risk of electric shock, disconnect all wires before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
5. CAUTION – Only qualified personnel may install this device.
6. NEVER charge a frozen battery.
7. For optimum operation of this inverter/charger, please follow the required specifications to select appropriate cable size.
8. Be cautious when working with metal tools on or around batteries. Metal tools may cause a short circuit or cause sparks, resulting in an explosion.
9. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
10. Fuses (4 pieces of 40A, 32VDC for 1KVA, 6 pieces of 40A, 32VDC for 3KVA, 1 piece of 200A, 64VDC for 5KVA) are provided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulations when installing this inverter.
12. NEVER cause an AC output or DC input short circuit. Do not connect the inverter to the mains when there is a DC input short circuit.
13. **Warning!!** Only qualified service persons should service this device. If errors persist after following the trouble shooting table, please send this inverter/charger back to your local dealer or service center for maintenance.

3 INTRODUCTION

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

3.1 Features

- Pure sine wave inverter
- Configurable input voltage range for home appliances and personal computers via LCD setting
- Configurable battery charging current based on applications via LCD setting
- Configurable AC/Solar Charger priority via LCD setting
- Compatible with mains voltage or generator power
- Auto restart while AC is recovering
- Overload/ Over temperature/ short circuit protection
- Smart battery charger design for optimized battery performance
- Cold start function
- Up to six units in parallel or in three phase configuration (5KVA unit only)

3.2 Basic System Architecture

The illustration below indicates the basic application of this inverter/charger. It also includes the following devices to have a complete running system:

- Generator or Utility.
- PV modules (optional)

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

This inverter can power all kinds of appliances in a home or office environment, including motorised appliances.

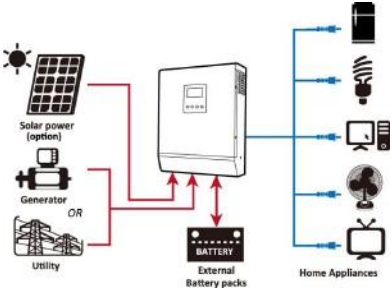
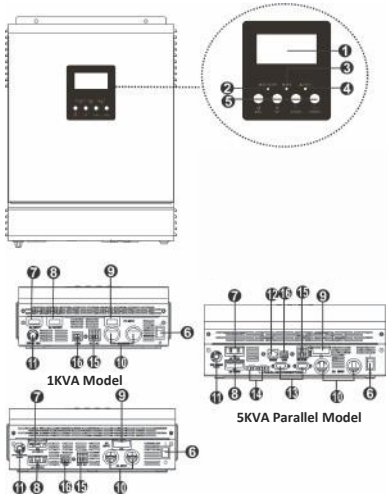


Figure 1 Hybrid Power System

3.3 Product Overview



1. LCD display
2. Status indicator
3. Charging indicator
4. Fault indicator
5. Function buttons
6. Power on/off switch
7. AC input
8. AC output
9. PV input
10. Battery input
11. Circuit breaker
12. RS232 communication port
13. Parallel communication cable (only for parallel model)
14. Current sharing cable (only for parallel model)
15. Dry contact
16. USB communication port

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

4 INSTALLATION

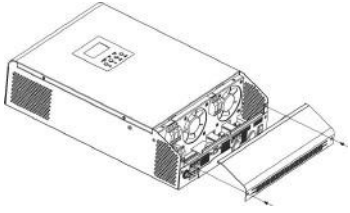
4.1 Unpacking and Inspection

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

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

4.2 Preparation

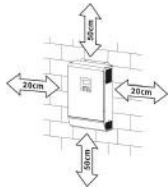
Before connecting wires, remove the bottom cover by removing the two screws as shown below.



4.3 Mounting the Unit

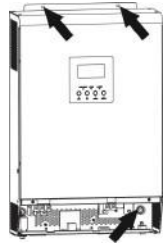
Consider the following points before selecting where to install:

- Do not mount the inverter on flammable 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.
- For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit.
- The ambient temperature should be between 0°C and 55°C to ensure optimal operation.
- Vertical Installation is recommended.
- Ensure that the inverter is clear on all sides of objects as indicated. This is in order to guarantee sufficient heat dissipation and to allow for sufficient room to remove wires.
- Do not install in the same room as vented batteries.



⚠ **SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.**

Mount the unit using three screws. It is recommended that M4 or M5 screws be used.



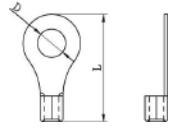
4.4 Battery Connection

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

WARNING! All wiring must be performed by qualified persons.

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

Ring terminal:

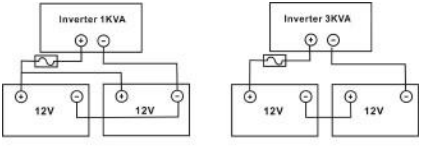


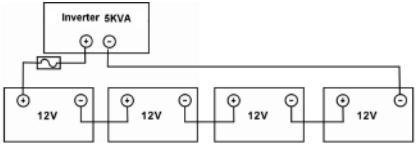
Recommended battery cable and terminal size:

Model	Typical Amperage	Minimum Battery capacity	Recommeded Wire Size	Ring Terminal Cable mm²	Dimensions D (mm)	L (mm)	Torque value
1KVA	66A	100AH	0 – 5m: 35mm²	35	M6	29.2	2~3 Nm
			5 – 10m: 70mm²	35/70	M6	23.8	
3KVA	100A	100AH	0 – 5m: 50mm²	50	M6	33.2	2~3 Nm
			5 – 10m: 2 X 50mm²	50	M6	29.2	
5KVA	84A	200AH	0 – 5m: 70mm²	70	M6	33.2	2~3 Nm
			5 – 10m: 2 X 70mm²	70	M6	29.2	

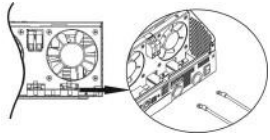
Please follow below steps to implement battery connection:

1. Assemble battery ring terminal based on recommended battery cable and terminal size.
2. The 1KVA model supports a 12VDC battery system, the 3KVA model supports a 24VDC battery system and the 5KVA model supports a 48VDC battery system. Connect all batteries as shown in the diagram below. It's suggested to connect at least a 100Ah capacity battery for the 1 and 3KVA models and at least a 200Ah capacity battery for 5KVA model.





3. Insert the ring terminal of the battery cable flat into the battery connector of the inverter and ensure the bolts are tightened with a 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 voltages.

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

4.5 AC Input/Output Connection

CAUTION!!

Before connecting to the AC input power source, install a separate AC breaker between the inverter and the 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 capacity of the AC breaker is 10A for 1KVA, 32A for 3KVA and 50A for 5KVA.

CAUTION!!

There are two terminal blocks with "IN" and "OUT" markings. 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 the risk of injury, please use the recommended cable size as suggested below.

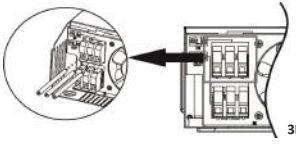
Suggested cable requirement for AC wires

Model	Recommended minimum Wire Sizes	Torque Value
1KVA	2.5 mm^2	0.5~ 0.6 Nm
3KVA	4 mm^2	1.2~ 1.6 Nm
5KVA	10 mm^2	1.4~1.6Nm

Please follow the steps below to complete AC input/output connection:

1. Before making AC input/output connection, be sure to open DC protector or disconnector first.
2. Remove 10mm of the insulation sleeve for six conductors. Shorten phase L and neutral conductor N by 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 red)
   N→Neutral (blue or black)

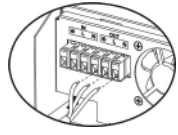
1KVA



3KVA & 5KVA

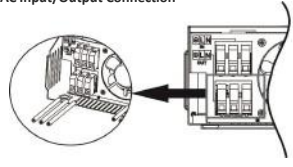
⚠ WARNING:
Be sure that the AC power source is disconnected before attempting to hardwire it to the unit.

4. Insert AC output wires according to the polarities indicated on the terminal block and tighten terminal screws. Be sure to connect PE protective conductor (⏚) first.
   ⏚ **→Ground (yellow-green)**
   L→LINE (brown or red)
   N→Neutral (blue or black)



1KVA

AC Input/Output Connection



3KVA & 5KVA

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 a utility short-circuit when these inverters are connected in parallel.

CAUTION:
Appliances such as air conditioners require at least 2~3 minutes to restart as it requires sufficient time to balance the refrigerant gas inside the circuits. If a power shortage occurs and recovers in a short time, it may cause damage to your connected appliances. To prevent this, type of damage, please check with the manufacturer of the air conditioner that it is equipped with a time-delay function. Otherwise, this inverter/charger will trigger an overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

4.6 PV Connection

CAUTION:
Before connecting to the PV modules, please install a separate DC circuit breaker between the 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.

Typical Amperage	Wire Size	Torque Value
50A	10 mm^2	1.4~1.6 Nm

PV Module Selection:

When selecting PV modules, please be sure to consider below requirements first:

1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.

INVERTER MODEL	1KVA	3KVA	5KVA
Solar Charger			
Charging Current (PWM)	50Amp		
System DC Voltage	12Vdc	24Vdc	48Vdc
Operating Voltage Range	15~18Vdc	30~32Vdc	60~72vdc
Max. PV Array Open Circuit Voltage	50Vdc	60Vdc	105Vdc

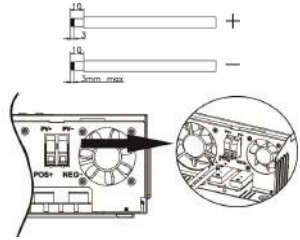
2. Max. Power Voltage (Vmp) of PV modules should be close to best Vmp of inverter or within Vmp range to get best performance. If one PV module can not meet this requirement, it's necessary to have several PV modules in series connection. Refer to below table.

Model	Vmp range
1KVA	15V~18V
3KVA	30V~32V
5KVA	56V~72V

Note: Vmp: Solar module Maximum Power Point Voltage.

Please follow the steps below to complete the PV module connection:

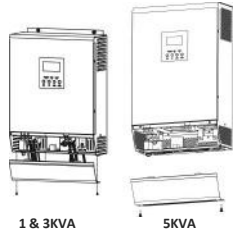
1. Remove 10mm off the insulation sleeve for the positive and negative conductors.
2. Check the correct polarity of the connection cable from the PV modules and also the PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative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



3. Make sure the wires are securely connected.

4.7 Final Assembly

After connecting all wires, replace the bottom cover by re-inserting the two screws as shown below.



1 & 3KVA **5KVA**

4.8 Communication Connection

Use the supplied communication cable to connect the inverter to a PC. Insert the software CD into the computer and follow the on-screen instruction to install the monitoring software. For a detailed description of the software operation, please check the user manual on the CD.

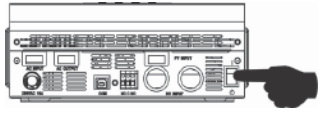
4.9 Dry Contact Signal

There is one dry contact (3A/250VAC) available. It can be used to deliver a signal to an external device when the battery voltage reaches warning level.

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

5 OPERATION

5.1 Power ON/OFF



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

5.2 Operation and Display Panel

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

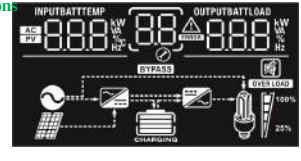
LED Indicator

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

Function Keys

Function Key	Description
ESC	Output is powered by utility in Line 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

5.3 LCD Display Icons



Icon	Function description
Input Source Information	
AC	Indicates AC input
PV	Indicates PV input
INPUT&BATT	Indicates 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	
OUTPUT&BATT&LOAD	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.

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

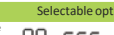
Load Percentage	Battery Voltage	LCD Display
Load >50%	< 1.717V/cell	
	1.717V/cell ~ 1.8V/cell	
	1.8 ~ 1.883V/cell	
	> 1.883 V/cell	
50%> Load > 20%	< 1.817V/cell	
	1.817V/cell ~ 1.9V/cell	
	1.9 ~ 1.983V/cell	
	> 1.983	
Load < 20%	< 1.867V/cell	
	1.867V/cell ~ 1.95V/cell	
	1.95 ~ 2.033V/cell	
	> 2.033	

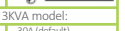
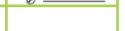
Load Information					
OVER LOAD	Indicates overload				
100% 25%	Indicates the load level by 0-24%, 25-50%, 50-74% and 75-100%	0%~25%	25%~50%	50%~75%	75%~100%
Mode Operation Information					
	Indicates unit is connected to the mains.				
	Indicates unit is connected to the PV array.				
BYPASS	Indicates load is supplied by utility power.				
	Indicates the utility charger circuit is working.				
	Indicates the DC/AC inverter circuit is working.				
Mute Operation					
	Indicates unit alarm is disabled.				

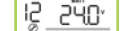
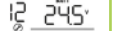
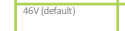
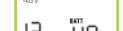
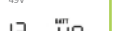
5.4 LCD Setting

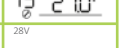
After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press “UP” or “DOWN” button to select setting programs. And then, press “ENTER” button to confirm the selection or ESC button to exit.

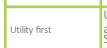
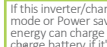
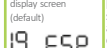
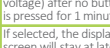
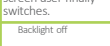
Setting Programs:

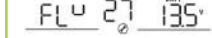
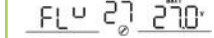
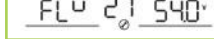
Program	Description	Selectable option	
00	Exit setting mode	Escape 	
01	Output source priority: To configure load power source priority	Solar first	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power 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 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
		SBU priority	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)	10A (Only available for 1KVA/5KVA models)	20A 
		30A 	40A 
		50A (default) 	
		60A (Only for 5KVA models) 	70A (Only for 5KVA models) 
		80A (Only for 5KVA models) 	90A (Only for 5KVA models) 
		100A (Only for 5KVA models) 	110A (Only for 5KVA models) 
03	AC input voltage range	Appliances (default) 	If selected, acceptable AC input voltage range will be within 90-280VAC.
		UPS 	If selected, acceptable AC input voltage range will be within 170-280VAC.
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 affected.
		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 26, 27 and 29.
06	Auto restart when overload occurs	Restart disable(default) 	Restart enable 
07	Auto restart when over temperature occurs	Restart disable(default) 	Restart enable 
09	Output frequency	50Hz (default) 	60Hz 

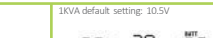
11	Maximum utility charging current Note: If setting value in program 02 is smaller than that in program 11, the inverter will apply charging current of program 02 for utility charge.	Available options in 1KVA model:	
		10A 	20A (default) 
		Available options in 3KVA model:	
		20A 	30A (default) 
		Available options in 5KVA model:	
		2A 	10A 
		20A 	30A (default) 
		40A 	50A 
		60A 	
12	Setting voltage point back to utility source when selecting “SBU priority” or “Solar first” in program 01.	Available options in 1KVA model:	
		11.0V 	11.3V 
		11.5V (default) 	11.8V 
		12.0V 	12.3V 
		12.5V 	12.8V 
		Available options in 3KVA model:	
		22.0V 	22.5V 
		23.0V (default) 	23.5V 

		24.0V 	24.5V 
		25.0V 	25.5V 
		Available options in 5KVA model:	
		44V 	45V 
		46V (default) 	47V 
		48V 	49V 
		50V 	51V 
13	Setting voltage point back to battery mode when selecting “SBU priority” or “Solar first” in program 01.	Available options in 1KVA model:	
		Battery fully charged 	12.0V 
		12.3V 	12.5V 
		12.8V 	13.0V 
		13.3V 	13.5V (default) 
		13.8V 	14.0V 

13	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01.	14.3V 	14.5V 
		Available options in 3KVA model:	
		Battery fully charged 	24V 
		24.5V 	25V 
		25.5V 	26V 
		26.5V 	27V (default) 
		27.5V 	28V 
		28.5V 	29V 
		Available options in 5KVA model:	
		Battery fully charged 	48V 
		49V 	50V 
		51V 	52V 
		53V 	54V (default) 

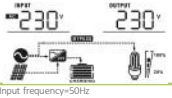
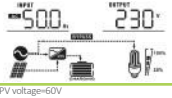
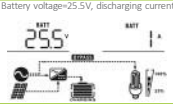
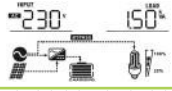
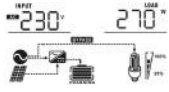
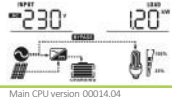
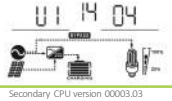
		55V 	56V 
		57V 	58V 
16	Charger source priority: To configure charger source priority	If this inverter/charger is working in Line, Standby or Fault mode, charger source can be programmed as below:	
		Solar first 	Solar energy will charge battery as first priority. Utility will charge battery only when 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 (default) 	Solar energy and utility will charge battery at the same time.
		Only Solar 	Solar energy will be the only charger source no matter utility is available or not.
		If this inverter/charger is working in Battery mode or Power saving mode, only solar energy can charge battery. Solar energy charge battery if it's available and sufficient.	
18	Alarm control	Alarm on (default) 	Alarm off 
19	Auto return to default display screen	Return to default display screen (default) 	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.
		Stay at latest screen 	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) 	Backlight off 
22	Beeps while primary source is interrupted	Alarm on (default) 	Alarm off 

23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) 	Bypass enable 
25	Record Fault code	Record enable 	Record disable (default) 
26	Bulk charging voltage (C.V voltage)	1KVA default setting: 14.1V  3KVA default setting: 28.2V  5KVA default setting: 56.4V  If self-defined is selected in program 5, this program can be set up. Setting range is from 12.0V to 14.6V for 1KVA model, 24.0V to 29.2V for 3KVA model and 48.0V to 58.4V for the 5KVA model. Increment of each click is 0.1V.	
27	Floating charging voltage	1KVA default setting: 13.5V  3KVA default setting: 27.0V  5KVA default setting: 54.0V  If self-defined is selected in program 5, this program can be set up. Setting range is from 12.0V to 14.6V for 1KVA model, 24.0V to 29.2V for the 3KVA model and 48.0V to 58.4V for the 5KVA model. Increment of each click is 0.1V.	

29	Low DC cut-off voltage	1KVA default setting: 10.5V  3KVA default setting: 21.0V  5KVA default setting: 42.0V  If self-defined is selected in program 5, this program can be set up. Setting range is from 10.0V to 12.0V for 1KVA model, 20.0V to 24.0V for the 3KVA model and 40.0V to 48.0V for 5KVA model. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.	
31	Solar power balance: When enabled, solar input power will be adjusted according automatically to connected load power. (Only available for 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 02. (Max. solar power = Max. battery charging power)

5.5 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, charging current, battery voltage, output voltage, output frequency, load percentage, load in Watt, load in VA, load in Watt, DC discharging current, main CPU Version and second CPU Version.

Selectable information	LCD display
Input voltage/Output voltage (Default Display Screen)	Input Voltage=230V, output voltage=230V 
Input frequency	Input frequency=50Hz 
PV voltage	PV voltage=60V 
Charging current	Charging current=50A 
Battery voltage/ DC discharging current	Battery voltage=25.5V, discharging current=1A 
Output frequency	Output frequency=50Hz 
Load percentage	Load percent=70% 
Load in VA	When the connected load is lower than 1KVA, the load will be shown as xxxVA as shown below.  When load is larger than 1kVA (≥1KVA), the load will be shown as x.xkVA as shown below. 
Load in Watt	When the load is lower than 1kW, the load will be shown as xxxW as shown below.  When the load is larger than 1kW, the load will be shown as x.xkW as shown below. 
Main CPU version checking	Main CPU version 00014.04 
Secondary CPU version checking	Secondary CPU version 00003.03 

5.6 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 low or not detected. *Fault mode **Note:** *Fault mode: Errors are caused by inside circuit error or external over temperature, reasons such as output short circuited and so on.	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.
	PV energy and utility can charge batteries.	Charging by utility and PV energy. (Only available in 1KVA and 3KVA models) Charging by utility. (Only available in 1KVA and 3KVA models) Charging by PV energy.
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.	No charging.
	Utility can power loads when the unit starts up without battery. (Only available in 5KVA model with single operation)	Power from utility
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by utility and PV energy. 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.

5.7 Fault Reference Code

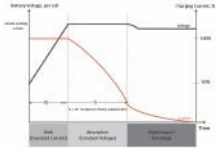
Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off.	01
02	Over temperature	02
03	Battery voltage is too high	03
04	Battery voltage is too low	04
05	Output short circuited or over temperature is detected by internal converter components.	05
06	Output voltage is abnormal. (For 1KVA and 3KVA models) Output voltage is too high. (For 5KVA model)	06
07	Overload time out	07
08	Bus voltage is too high	08
09	Bus soft start failed	09
11	Main relay failed	11
51	Over current or surge	51
52	Bus voltage is too low	52
53	Inverter soft start failed	53
55	Over DC voltage in AC output	55
56	Battery connection is open	56
57	Current sensor failed	57
58	Output voltage is too low	58

NOTE: Fault codes 51, 52, 53, 55, 56, 57 and 58 are only available in 5KVA model.

5.8 Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	01
03	Battery is over-charged	Beep once every second	03
04	Low battery	Beep once every second	04
07	Overload	Beep once every 0.5 second	07 OVER LOAD
10	Output power derating	Beep twice every 3 seconds	10

6.3 Table 3 Charge Mode Specifications

INVERTER MODEL		1KVA	3KVA	5KVA
Charging Algorithm		3-Step		
Utility Charging Mode				
Charging Current to Batteries From AC		10/20Amp (@VI/P=230Vac)	20/30Amp (@VI/P=230Vac)	2/10/20/30/40/50/60 (@VI/P=230Vac)
Bulk Charging Voltage	Flooded Battery	14.6	29.2	58.4
	AGM / Gel Battery	14.1	28.2	56.4
Floating Charging Voltage		13.5Vdc	27Vdc	54Vdc
Charging Curve				
Solar Charging Mode				
Charging Current (PWM)		50Amp		
System DC Voltage		12Vdc	24Vdc	48Vdc
Operating Voltage Range		15~18Vdc	30~32Vdc	60~72vdc
Max PV Array Open Circuit Voltage		50Vdc	60Vdc	105Vdc
Standby Power Consumption		1W	2W	
DC Voltage Accuracy		+/-0.3%		
Joint Utility and Solar Charging				
INVERTER MODEL		1KVA	3KVA	5KVA
Max Charging Current		50Amp		110Amp
Default Charging Current		50Amp		50Amp

6.4 Table 4 General Specifications

INVERTER MODEL	1KVA	3KVA	5KVA
Safety Certification	CE		
Operating Temperature Range	0°C to 55°C		
Storage temperature	-15°C~ 60°C		
Dimension (D*W*H), mm	95 x 240 x 316	100 x 272 x 355	120 x 295 x 468
Net Weight, kg	5.0	6.9	9.8

7 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 the 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.
	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
		Temperature of internal converter component is over 120°C. (Only available for 1-3KVA models)	Check whether the air flow of the unit is blocked or not.
	Fault code 02	Internal temperature of inverter component is over 100°C.	Check whether 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 01	Fan fault	Replace the fan.
	Fault code 06/58	Output abnormal (Inverter voltage below than 190Vac or is higher than 260Vac)	1. Reduce the connected load. 2. Return to repair center
	Fault code 08/09/53/57	Internal components failed.	Return to repair center.
	Fault code 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.