

**Future-V Series Energy Storage System  
(For Inverter)**



044.SK0015400

V1.0

## Table Of Contents

Information on this Manual .....	1
<b>Validity</b> .....	<b>1</b>
<b>Scope</b> .....	<b>1</b>
<b>Target Group</b> .....	<b>1</b>
<b>Safety Instructions</b> .....	<b>1</b>
Introduction .....	2
<b>Features</b> .....	<b>2</b>
<b>Product Overview</b> .....	<b>3</b>
Installation .....	4
<b>Unpacking and Inspection</b> .....	<b>4</b>
<b>Preparation</b> .....	<b>4</b>
<b>Mounting the Unit(Please refer to the Future-V Series user manual)</b> .....	<b>5</b>
<b>Battery Connection</b> .....	<b>6</b>
<b>AC Input/GEN/Output Connection</b> .....	<b>8</b>
<b>PV Connection</b> .....	<b>9</b>
<b>Communication Connection</b> .....	<b>10</b>
<b>Dry Contact Signal</b> .....	<b>11</b>
Operation .....	12
<b>Power ON/OFF(Please refer to the Future-V Series user manual)</b> .....	<b>12</b>
<b>Operation and Display Panel</b> .....	<b>12</b>
LCD Display Icons .....	13
LCD Setting .....	15
<b>Display Information</b> .....	<b>20</b>
<b>Operating Mode Description</b> .....	<b>22</b>
<b>Installation Guide</b> .....	<b>23</b>
<b>Introduction</b> .....	<b>23</b>
Fault Reference Code .....	24
Warning Indicator .....	25
Battery Equalization .....	26
Specifications .....	27
Trouble Shooting .....	30

# Information on this Manual

## Validity

This manual is valid for the following devices:

- ▶ SIM 6000 ES Plus-V

## 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:

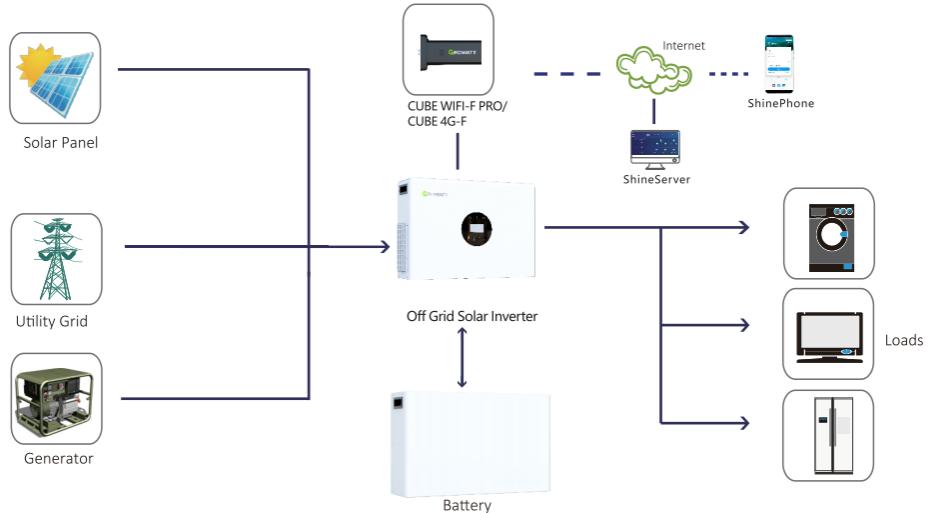
- ▶ Knowledge of how an inverter works and is operated
- ▶ Training in how to deal with the dangers and risks associated with installing and using electrical devices and installations
- ▶ Training in the installation and commissioning of electrical devices and installations
- ▶ Knowledge of the applicable 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. Before using the unit, read all instructions and cautionary marking on the unit, the batteries and all appropriate sections of this manual. The company has the right not to quality assurance, if not according to the instructions of this manual for installation and cause equipment damage.
2. All the operation and connection please professional electrical or mechanical engineer.
3. All the electrical installation must comply with the local electrical safety standards.
4. When install PV modules in the daytime, installer should cover the PV modules by opaque materials, otherwise it will be dangerous as high terminal voltage of modules in the sunshine.
5. **CAUTION**-To reduce risk of injury, charge only deep-cycle lead-acid type rechargeable batteries and lithium batteries. Other types of batteries may burst, causing personal injury and damage.
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 wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
8. **NEVER** charge a frozen battery.
9. For optimum operation of this inverter, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter.
10. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
11. 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.
12. GROUNDING INSTRUCTIONS -This inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
13. **NEVER** cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
14. Make sure the inverter is completely assembled, before the operation.

# Introduction



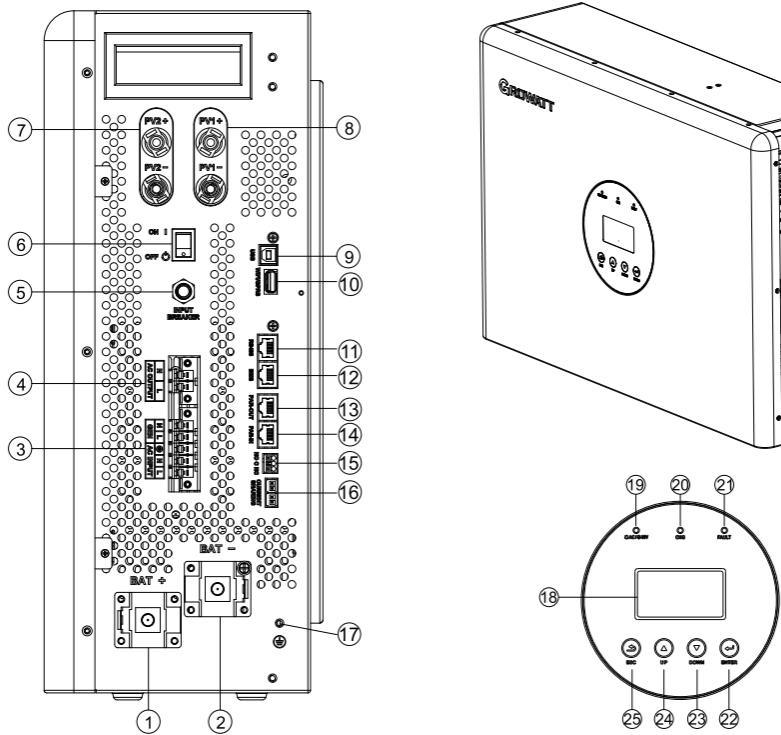
This is a multifunctional off grid solar inverter, integrated with a MPPT solar charge controller, a high frequency pure sine wave inverter and a UPS function module in one machine, which is perfect for off grid backup power and self-consumption applications. This inverter can work with or without batteries. (However, we recommend the use of ABM 5.0L-B1-V series batteries.)

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 6KW, power factor 1
- ▶ MPPT ranges 120V~450V, 500Voc
- ▶ High frequency inverter with small size and light weight
- ▶ Pure sine wave AC output
- ▶ Solar and utility grid can power loads at the same time
- ▶ With CAN/RS485 for BMS communication
- ▶ With the ability to work without battery

## Product Overview



1. Battery +	2. Battery -
3. AC & Generator input	4. AC output
5. Circuit breaker	6. Power on/off switch
7. PV2 input	8. PV1 input
9. USB communication port	10. WiFi/GPRS communication port
11. RS485 communication port (for expansion)	12. BMS communication port (support CAN/RS485 protocol)
13. Parallel communication ports (PAR-OUT)	14. Parallel communication ports ((PAR-IN))
15. Dry contact	16. Current sharing ports
17. GND	18. LCD display
19. Status indicator	20. Charging indicator
21. Fault indicator	22~25. Function buttons

## Installation

### Unpacking and Inspection

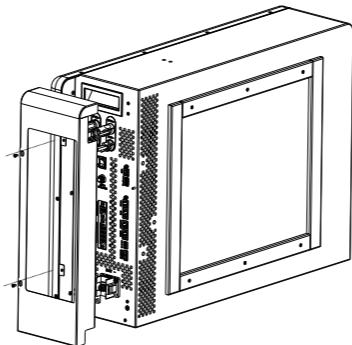
Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items in the package:

Part List			
Item	Item Name	Qty	schematic drawing
A	The inverter	1	
B	Communication cable	1	
C	Current sharing cable	1	
D	Parallel communication cable	1	
E	MC4 connector	4	
F	User manual	1	
G	copper connector	2	
H	Tubular terminal	8	
I	R-type terminal & screws	1+12	
J	AC input/output connector	2	
K	Fixing plate	5	

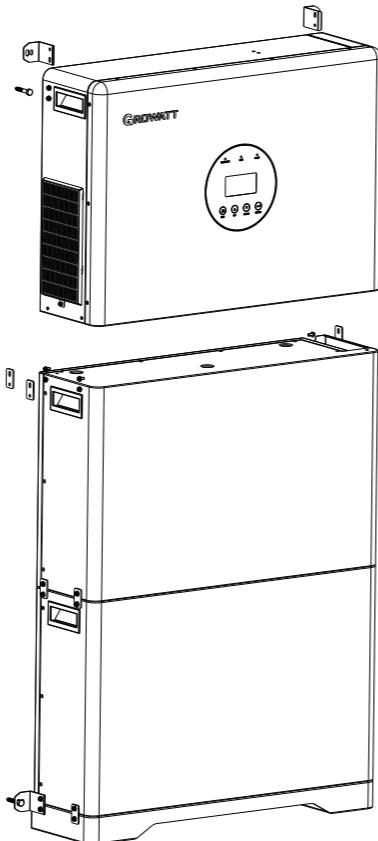
Note: The Software CD is no longer provided, if necessary, please download it from the official website [www.sacolar.com](http://www.sacolar.com)

## Preparation

Before connecting all wiring, please take off the cover of right side by removing two screws as shown below.



## Mounting the Unit(Please refer to the Future-V Series user manual)



## Battery Connection

**Connection for ABM 5.0L-B1-V series Lithium Battery(Please refer to Future-V Series user manual)**

**Connection for other Lithium Battery:(However, we recommend the use of ABM 5.0L-B1-V series batteries)**

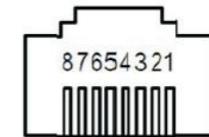
### Lithium battery communication and setting

If choose other lithium battery, In order to communicate with battery BMS, you should set the battery type to "LI" in Program 5. Then the LCD will switch to Program 36, which is to set the protocol type. There are several protocols in the inverter. Please get instruction from Growatt to choose which protocol to match the BMS.

#### 1. Connect the end of RJ45 of battery to BMS communication port of inverter

Make sure the lithium battery BMS port connects to the inverter is Pin to Pin, the inverter BMS port pin and RS485 port pin assignment shown as below:

Pin number	BMS port	RS485 port (for expansion)
1	RS485B	RS485B
2	RS485A	RS485A
3	--	--
4	CANH	--
5	CANL	--
6	--	--
7	--	--
8	--	--



### LCD setting

If use Future-V Series system, it doesn't need any setting, but other lithium battery need run setting. Please check the setting method of other lithium battery as below:

To connect battery BMS, need to set the battery type as "LI" in Program 05.

After set "LI" in Program 05, it will switch to Program 36 to choose communication protocol. You can choose RS485 communication protocol which is from L01 to L50, and you can also choose CAN communication protocol which is from L51 to L99.

05	Battery type	AGM bAtt AGM 005° Flooded
		bAtt FLd 005° Lithium (only suitable when communicated with BMS) (default)
		bAtt LI 005° User-Defined
		bAtt USE 005° If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19, 20 and 21.
		User-Defined 2 (suitable when lithium battery without BMS communication) bAtt US2 005° If "User-Defined 2" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19, 20 and 21. It is recommended to set to the same voltage in program 19 and 20(full charging voltage point of lithium battery). The inverter will stop charging when the battery voltage reaches this setting.

36	RS485 Communication protocol	Protocol 1	P <small>ECL</small> L01 036°
		Protocol 2	P <small>ECL</small> L02 036°
		:	:
		:	:
		Protocol 50	P <small>ECL</small> L50 036°
	CAN Communication protocol	Protocol 51	P <small>ECL</small> L51 036°
		Protocol 52	P <small>ECL</small> L52 036°
		:	:
		:	:
		Protocol 99	P <small>ECL</small> L99 036°

**Note:** When the battery type set to Li, the setting option 12, 13, 21 will change to display percent.

**Note:** When the battery type set as "LI", the Maximum charge current can't be modified by the user. When the communication fail, the inverter will cut off output.

12	Setting SOC point back to utility source when selecting "SBU priority" or "Solar first" in program 01	b2AC 50- 0 12° Default 50%, 6%~95% Settable
13	Setting SOC point back to battery mode when selecting "SBU priority" or "Solar first" in program 01	AC2b 95- 0 13° Default 95%, 10%~100% Settable
21	Low DC cut-off SOC If "LI" is selected in program 5, this program can be set up	CUE 20- 021° Default 20%, 5%~50% Settable

**Note:** Any questions about communicating with BMS, please consult with sacolar.

## AC Input/GEN/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 50A for SIM 6000 ES Plus-V.

**CAUTION!!** There are three terminal blocks with "AC INPUT", "GEN" and "AC OUTPUT" 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 and GEN connection. To reduce risk of injury, please use the proper recommended cable size as below.

### Suggested cable requirement for AC wires

Part	Wire Gauge	Terminal pulling force	Screws Torque
Tubular terminal	1 * 10 AWG	>400N	1.2-1.6 Nm

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

1. Insert the AC wires into the ac connector first, and then install the AC connector to the inverter. It is strictly forbidden to change the operation steps.
2. Remove insulation sleeve 10+/-3mm for five conductors. Then insert the wire into the terminal and press tightly. (Ensure the Terminal pulling force>400N)
3. Insert AC input and GEN wires according to polarities indicated on terminal block and tighten the terminal screws. Be sure to connect PE protective conductor  first.

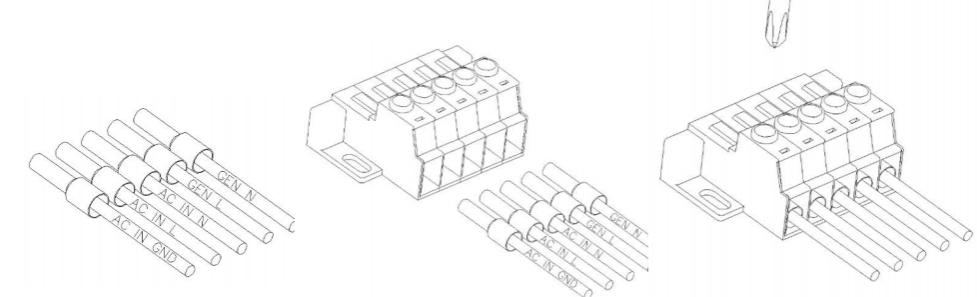
 → **Ground (yellow-green)**

**AC IN L**→**LINE (brown or black)**

**AC IN N**→**Neutral (blue)**

**GEN L**→**LINE (brown or black)**

**GEN N**→**Neutral (blue)**



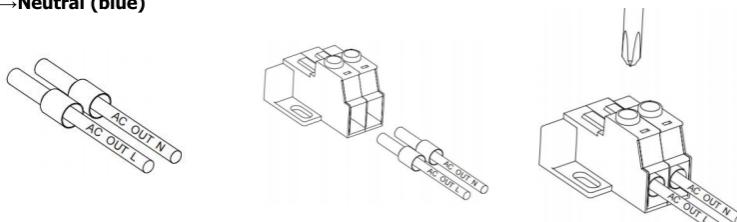
### WARNING:

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 the terminal screws.

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 trig 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	Wire Size	Torque value
SIM 6000 ES Plus-V	1 * 12 AWG	1.2-1.6 Nm

#### PV Module Selection:

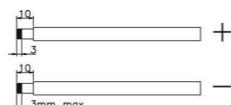
When selecting proper PV modules, please be sure to consider below parameters:

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 start-up voltage.

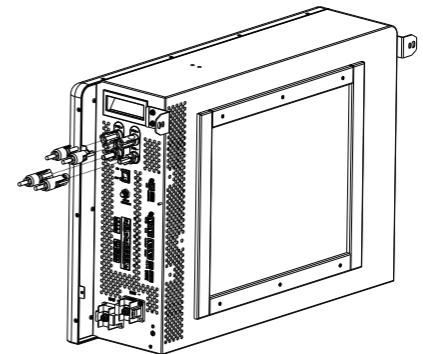
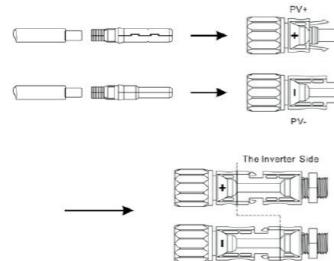
INVERTER MODEL	SIM 6000 ES Plus-V
Max. PV Array Open Circuit Voltage	500Vdc
Start-up Voltage	150Vdc
PV Array MPPT Voltage Range	120Vdc~450Vdc

Please follow below steps to implement PV module connection:

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



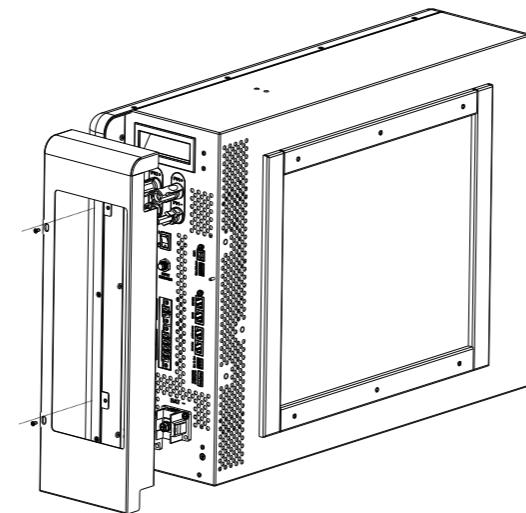
2. Insert PV panel positive and negative cables into MC4 terminal, then connect positive pole(+) of connection cable to positive pole(+) of PV input connector, connect negative pole(-) of connection cable to negative pole(-) of PV input connector.



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. Follow on-screen instruction to install the monitoring software. For the detailed software operation, please check user manual of software. The monitoring software is downloadable from our website [www.sacolar.com](http://www.sacolar.com).

## Dry Contact Signal

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

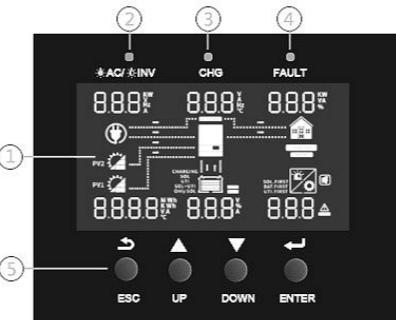
Unit Status	Condition		Dry contact port:	
			NC & C	NO & C
Power Off	Unit is off and no output is powered		Close	Open
Power On	Output is powered from Utility		Close	Open
	Output is powered from Battery or Solar	Program 01 set as Utility first	Battery voltage (SOC)< Low DC warning voltage(SOC)	Open Close
		Program 01 is set as SBU or Solar first	Battery voltage(SOC) > Setting value in Program 13 or battery charging reaches floating stage	Close Open
		Program 01 set as Utility first	Battery voltage (SOC)< Setting value in Program 12	Open Close
		Program 01 is set as SBU or Solar first	Battery voltage (SOC)> Setting value in Program 13 or battery charging reaches floating stage	Close Open

## Operation

### Power ON/OFF(Please refer to the Future-V Series user manual)

### Operation and Display Panel

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



1. LCD display

2. Status indicator

3. Charging indicator

4. Fault indicator

5. Function buttons

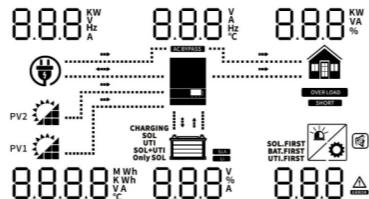
### LED Indicator

LED Indicator		Messages	
	Green	Solid On	Output is powered by utility in Line mode.
		Flashing	Output is powered by battery or PV in battery mode.
	Green	Solid On	Battery is fully charged.
		Flashing	Battery is charging.
	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	Description
<b>AC Input Information</b>	
	AC input icon
	Indicate AC input power, AC input voltage, AC input frequency, AC input current
	Indicate AC power loads in bypass
<b>PV Input Information</b>	
	Left: PV1 input icon Right: PV2 input icon
	Indicate PV power, PV voltage, PV current, etc
<b>Output Information</b>	
	Inverter icon
	Indicate output voltage, output current, output frequency, inverter temperature
<b>Load Information</b>	
	Load icon
	Indicate power of load, power percentage of load
	Indicate overload happened
	Indicate short circuit happened
<b>Battery Information</b>	
	Indicate battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.
	Indicate battery voltage, battery percentage, battery current
	Indicate SLA battery
	Indicate lithium battery
	Indicate charging source priority: solar first, solar and utility, or only solar
<b>Other Information</b>	
	Indicate output source priority: solar first, utility first, SBU mode or SUB mode
	Indicate warning code or fault code
	Indicate a warning or a fault is happening
	Indicate it's during setting values
	Indicate the alarm is disabled

In AC mode, battery icon 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, battery icon 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	

## 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. Then press "ENTER" button to confirm the selection or ESC button to exit.

Program	Description	Setting Option
01	Output source priority: To configure load power source priority	Solar first <b>OPPF SOL 001</b> 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 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) <b>OPPF UFI 001</b> 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 <b>OPPF SBU 001</b> Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery 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.  SUB priority <b>OPPF SUB 001</b> Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, solar and utility will power loads at the same time. Battery provides power to the loads only when solar energy is not sufficient and there is no utility.
02	Maximum charging current: set total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	<b>CHGI 60A 002</b> Default 60A, 10A~100A Settable (If LI is selected in Program 5, this program can't be set up)
03	AC input voltage range	Appliance (default) <b>ACU APL 003</b> If selected, acceptable AC input voltage range will be within 90~280VAC UPS <b>ACU UPS 003</b> If selected, acceptable AC input voltage range will be within 170~280VAC Generator(Only diesel generators allowed) <b>ACU GEN 003</b> If selected, acceptable AC input voltage range will be within 90~280VAC. <b>Note:</b> When connecting generator, the generator should be no less than 10KVA(no less than 20KVA for three phase parallel system), and the inverters should be no more than 2 units in one phase.

04	Power saving mode enable/disable	Saving mode disable (default) <b>SAYE diS 004</b> If disabled, no matter connected load is low or high, the on/off status of inverter output will not be effected.
		Saving mode enable <b>SAYE ENA 004</b> If enabled, the output of inverter will be off when connected load is pretty low or not detected.
05	Battery type	AGM <b>bATT AGM 005</b>
		Flooded <b>bATT FLd 005</b>
		Lithium (only suitable when communicated with BMS) (default) <b>bATT LI 005</b>
		User-Defined <b>bATT USE 005</b> If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19, 20 and 21.
06	Auto restart when overload occurs	User-Defined 2 (suitable when lithium battery without BMS communication) <b>bATT US2 005</b> If "User-Defined 2" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19, 20 and 21. It is recommended to set to the same voltage in program 19 and 20(full charging voltage point of lithium battery). The inverter will stop charging when the battery voltage reaches this setting.
		Restart disable (default) <b>LdTS diS 006</b> Restart enable <b>LdTS ENA 006</b>
		Restart disable (default) <b>ErTS diS 007</b> Restart enable <b>ErTS ENA 007</b>
08	Output voltage *This setting is only available when the inverter is in standby mode (Switch off).	230V (default) <b>OUTU 230 008</b> 220V <b>OUTU 220 008</b>
		240V <b>OUTU 240 008</b> 208V <b>OUTU 208 008</b>
09	Output frequency *This setting is only available when the inverter is in standby mode (Switch off).	50Hz (default) <b>OUTF 50 009</b> 60Hz <b>OUTF 60 009</b>
10	Number of series batteries connected	<b>bATN 4 010</b> (e.g. Showing batteries are connected in 4 series)

11	Maximum utility charging current	RCI 30° GENI 30° 011 Default 30A, 0A~80A Settable Note: If setting value in Program 02 is smaller than that in Program 11, the inverter will apply charging current from Program 02 for utility charger
12	Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 01	b2AC 460° 012 Default 46.0V, 44.0V~51.2V Settable
13	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01	AC26 540° 013 Default 54.0V, 48.0V~58.0V 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      SOL      C50 014° Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.  Solar and Utility      SOL+UTI      50U 014° Solar energy and utility will both charge battery.  Only Solar      Only SOL      050 014° 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	BUZZ ON 015° BUZZ OFF 015° Alarm on (default)      Alarm off
16	Backlight control	LCdb ON 016° LEDb OFF 016° Backlight on (default)      Backlight off
17	Beeps while primary source is interrupted	ALAT ON 017° ALAT OFF 017° Alarm on (default)      Alarm off
18	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	bYP dl5 018° bYP ENR 018° Bypass disable (default)      Bypass enable
19	C.V. charging voltage. If self-defined is selected In program 5, this	Cv 564° 019° Default 56.4V, 48.0V~58.4V Settable

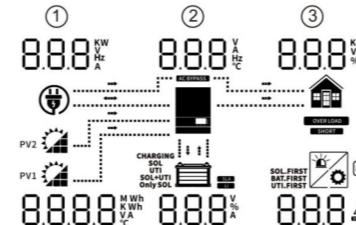
	program can be set up	
20	Floating charging voltage. If self-defined is selected in program 5, this program can be set up	FLEU 540° 020° Default 54.0V, 48.0V~58.4V Settable
21	Low DC cut-off voltage. If self-defined is selected in program 5, this program can be set up.  Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.	CUEU 420° 021° Default 42.0V, 40.0V~48.0V Settable  When reach Low DC cut-off voltage: 1) If battery power is only power source available, inverter will shut down. 2) If PV energy and battery power are available, inverter will charge battery without AC output. 3) If PV energy, battery power and utility are all available, inverter will transfer to line mode and provide output power to loads, and charge the battery at the same time.
23	AC output mode *This setting is only available when the inverter is in standby mode (Switch off).  <b>Note:</b> Parallel operation can only work when battery connected	Single: PPLL S1G 023° L1 Phase: PPLL 3P1 023° L3 Phase: PPLL 3P3 023°  Parallel: PPLL PRL 023° L2 Phase: PPLL 3P2 023°  When the units are used in parallel with single phase, please select "PAL" in program 23.  It requires 3 inverters to support three-phase equipment, 1 inverter in each phase. Please select "3P1" in program 23 for the inverters connected to L1 phase, "3P2" in program 23 for the inverters connected to L2 phase and "3P3" in program 23 for the inverters connected to L3 phase.  Be sure to connect share current cable to units which are on the same phase. Do NOT connect share current cable between units on different phases. Besides, power saving function will be automatically disabled.
28	Address setting (for expansion)	Addr 1 028° Default 1, 1~255 Settable
37	Real time setting---Year	2018 037° Default 2018, range 2018~2099
38	Real time setting---Month	707 12 038° Default 01, range 01~12
39	Real time setting---Date	707 13 039° Default 01, range 01~31
40	Real time setting---Hour	HOUR 13 040° Default 00, range 00~23

41	Real time setting--Minute	MIN 50 04°	Default 00, range 00~59
42	Real time setting--Second	SEC 50 042°	Default 00, range 00~59
43	Battery equalization	Battery equalization enable EQ ENA 043°	Battery equalization disable(default) EQ dIS 043°
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
44	Battery equalization voltage	EQV 584° 044°	Default 58.4V, 48.0V~58.4V Settable
45	Battery equalized time	MIN 60 045°	Default 60min, 5min~900min Settable
46	Battery equalized timeout	MIN 120 046°	Default 120min, 5min~900min Settable
47	Equalization interval	DAY 30 041°	Default 30days, 1 days~90 days Settable
48	Equalization activated immediately	EQ ON 048°	Equalization activated immediately on EQ OFF 048° Equalization activated immediately off(default)  If equalization function is enabled in program 43, this program can be setup. If "On" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "EQ". If "Off" is selected, it will cancel equalization function until next activated equalization time arrives based on program 47setting. At this time, "EQ" will not be shown in LCD main page.
49	Utility charging time	CHG MIN 049°	0000(default) Allow utility to charge the battery all day run.  The time allows utility to charge the battery. Use 4 digits to represent the time period, the upper two digits represent the time when utility start to charge the battery, setting range from 00 to 23, and the lower two digits represent the time when utility end to charge the battery, setting range from 00 to 23.  (eg: 2320 represents the time allows utility to charge the battery is from 23:00 to the next day 20:59, and the utility charging is prohibited outside of this period)
50	AC output time	0000	0000(default) Allow inverter to power the load all day run.  The time allows inverter to power the load. Use 4 digits to represent the time period, the upper two digits represent the time when inverter start to power the load, setting range from 00 to 23, and the lower two digits represent the time when inverter end

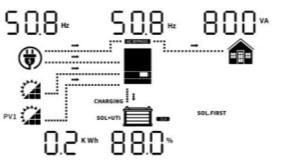
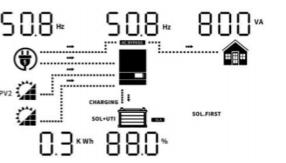
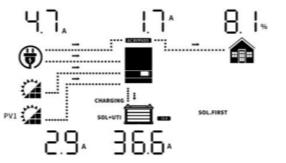
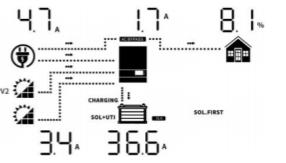
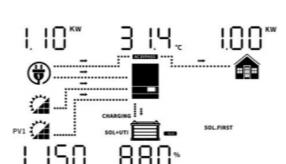
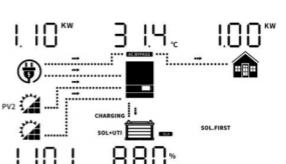
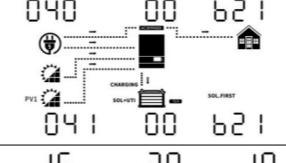
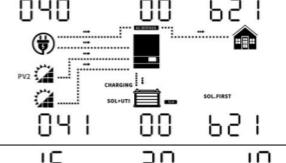
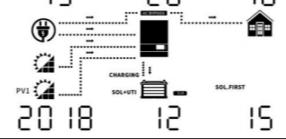
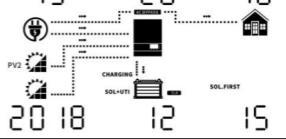
		UP 23:00 050°	to power the load, setting range from 00 to 23. (eg: 2320 represents the time allows inverter to power the load is from 23:00 to the next day 20:59, and the inverter AC output power is prohibited outside of this period)
65	Generator run time	GEN RUN MIN HOUR 24 065°	Default 24, range 01~24 The time allows Generator to work. Use 2 digits to represent the time period setting range from 01 to 24(eg: 02 represents the time allows Generator to run for two hours).
66	BMS Communication Loss	(default) b7SE ENA 066°	If BMS Communication Loss, The inverter 04 and 20 warning Icon flashing, but enable to work for original status.
		b7SE dIS 066°	If BMS Communication Loss, The inverter 04 and 20 warning Icon flashing and disable to work.(cut off the output and can't charge).

### Display Information

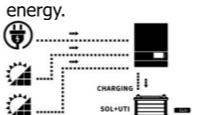
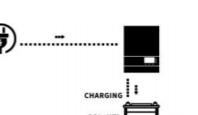
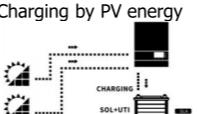
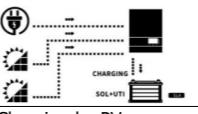
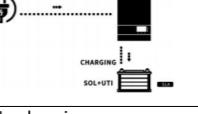
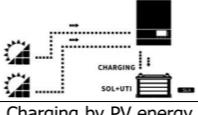
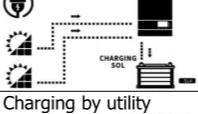
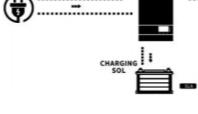
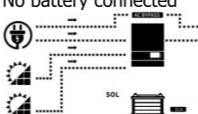
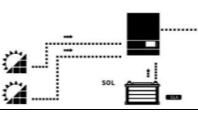
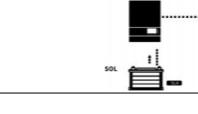
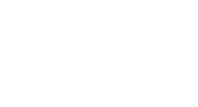
The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: voltage, frequency, current, power, firmware version.



Setting Information	LCD display	
① AC Input voltage (If it flashes, it indicates that the input voltage of the generator is displayed at this time, and the current, power and frequency displayed after turning the page are also the input parameters of the generator.) ② Output voltage ③ Load percentage ④ Left: PV1 input voltage Right: PV2 input voltage ⑤ Battery voltage ⑥ Warning or Fault code (Default Display Screen)	 	

<p>① AC Input frequency ② Output frequency ③ Load power in VA ④ Left: PV1 energy sum in KWH Right: PV2 energy sum in KWH ⑤ Battery percentage ⑥ Warning or Fault code</p>		
<p>① AC Input current ② Output current ③ Load percentage ④ Left: PV1 input current Right: PV2 input current ⑤ Battery charging current ⑥ Warning or Fault code</p>		
<p>① AC input power in Watts ② Inverter temperature ③ Load power in Watts ④ Left: PV1 input power in Watts Right: PV2 input power in Watts ⑤ Battery percentage ⑥ Warning or Fault code</p>		
Firmware version (CPU1: 040-00-b21; CPU2:041-00-b21)		
Time (15:20:10, December 15, 2018)		

## Operating Mode Description

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

# Installation Guide

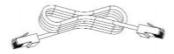
## Introduction

This product is a stand-alone used inverter, it recommends to use it with ABM 5.0L-B1-V Battery Pack.

Note: If only use one battery, the inverter can not to load full 6KW, the battery will be over-current protected. In this case, the inverter maximum can load 5KW.

## Package Contents

In parallel kit, you will find the following items in the package:



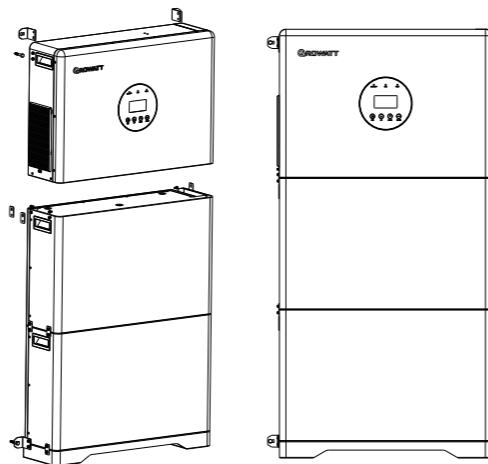
Parallel communication cable



Current sharing cable

## Mounting the Unit

When installing multiple units, please follow below chart. The inverter module should be installed at the top, not in other positions.



**CAUTION!!** Please install the breaker at the AC input side. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input.

Recommended breaker specification of AC input with single phase:

Model	2 units
SIM 6000 ES Plus-V	50A/230VAC

**Note1:** You can use 50A breaker for SIM 6000 ES Plus-V for only 1 unit, and each inverter has a breaker at its AC input.

## Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked	01-
02	Over temperature	02-
03	Battery voltage is too high	03-
04	Battery voltage is too low	04-
05	Output short circuited	05-
06	Output voltage is too high.	06-
07	Overload time out	07-
08	Bus voltage is too high	08-
09	Bus soft start failed	09-
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-
60	Negative power fault	60-
61	PV voltage is too high	61-
62	Internal communication error	62-
80	CAN fault	80-
81	Host loss	81-

## Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on	Beep 3 times every second	01△
02	Over temperature	Beep once every second	02△
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△
10	Output power derating	Beep twice every 3 seconds	10△
12	Solar charger stops due to low battery	Beep once every second	12△
13	Solar charger stops due to high PV voltage	Beep once every second	13△
14	Solar charger stops due to overload	Beep once every second	14△
15	Parallel input utility grid different	Beep once every second	15△
16	Parallel input phase error	Beep once every second	16△
17	Parallel output phase loss	Beep once every second	17△
18	Buck over current	Beep once every second	18△
19	Battery disconnect	No beep	19△
20	BMS communication error	Beep once every second	20△
21	PV power insufficient	Beep once every second	21△
22	Parallel forbidden without battery	Beep once every second	22△
25	Parallel inverters' capacity different	Beep once every second	25△
33	BMS communication loss	Beep once every second	33△
34	Cell over voltage	Beep once every second	34△
35	Cell under voltage	Beep once every second	35△
36	Total over voltage	Beep once every second	36△
37	Total under voltage	Beep once every second	37△
38	Discharge over voltage	Beep once every second	38△
39	Charge over voltage	Beep once every second	39△
40	Discharge over temperature	Beep once every second	40△
41	Charge over temperature	Beep once every second	41△
42	Mosfet over temperature	Beep once every second	42△
43	Battery over temperature	Beep once every second	43△
44	Battery under temperature	Beep once every second	44△
45	System shut down	Beep once every second	45△

## Battery Equalization

Equalization function is added into charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top.

Equalization also helps to remove sulfate crystals that might have built up on the plates. If left unchecked, this condition, called sulfation, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize battery periodically.

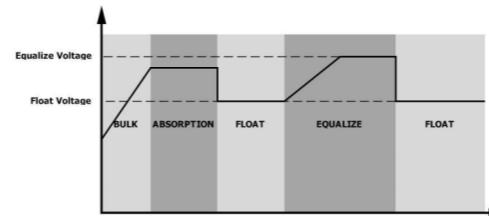
### How to Apply Equalization Function

You must enable battery equalization function in monitoring LCD setting program 43 first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in program 47.
2. Active equalization immediately in program 48.

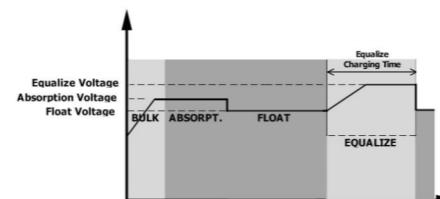
### When to Equalize

In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.

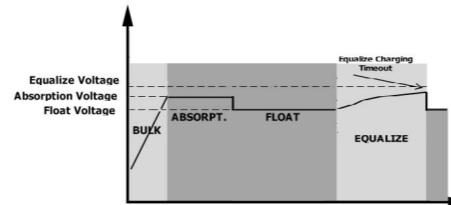


### Equalize charging time and timeout

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalized time is arrived.



However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.



## Specifications

Table 1 Line Mode Specifications

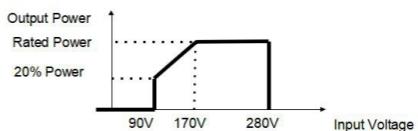
INVERTER MODEL	SIM 6000 ES Plus-V
<b>Input Voltage Waveform</b>	Sinusoidal (utility or generator)
<b>Nominal Input Voltage</b>	230Vac
<b>Low Loss Voltage</b>	170Vac± 7V (UPS); 90Vac± 7V (Appliances)
<b>Low Loss Return Voltage</b>	180Vac± 7V (UPS); 100Vac± 7V (Appliances)
<b>High Loss Voltage</b>	280Vac± 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>	Circuit Breaker
<b>Efficiency (Line Mode)</b>	>95% ( Rated R load, battery full charged )
<b>Transfer Time</b>	10ms typical, 20ms Max@ Single <30ms @ Parallel
<b>Output power derating:</b> When AC input voltage drops to 170V, the output power will be derated.	

Table 2 Inverter Mode Specifications

INVERTER MODEL	SIM 6000 ES Plus-V
<b>Rated Output Power</b>	6kVA/6kW
<b>Output Voltage Waveform</b>	Pure Sine Wave
<b>Output Voltage Regulation</b>	230Vac± 5%
<b>Output Frequency</b>	50Hz
<b>Nominal Output Current</b>	27A
<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>	48Vdc
<b>Cold Start Voltage(Lead-Acid Mode)</b>	46.0Vdc
<b>Cold Start SOC(Li Mode)</b>	Default 30%, Low DC Cut-off SOC +10%
<b>Low DC Warning Voltage (Lead-Acid Mode)</b>	44.0Vdc @ load < 20% 42.8Vdc @ 20% ≤ load < 50% 40.4Vdc @ load ≥ 50%
<b>Low DC Warning Return Voltage (Lead-Acid Mode)</b>	46.0Vdc @ load < 20% 44.8Vdc @ 20% ≤ load < 50% 42.4Vdc @ load ≥ 50%
<b>Low DC Cut-off Voltage (Lead-Acid Mode)</b>	42.0Vdc @ load < 20% 40.8Vdc @ 20% ≤ load < 50% 38.4Vdc @ load ≥ 50%
<b>Low DC Cut-off Voltage (Li Mode)</b>	42.0Vdc
<b>Low DC Warning SOC (Li Mode)</b>	Low DC Cut-off SOC +5%
<b>Low DC Warning Return SOC (Li Mode)</b>	Low DC Cut-off SOC +10%
<b>Low DC Cut-off SOC(Li Mode)</b>	Default 20%, 5%~50% settable
<b>High DC Recovery Voltage</b>	56.4Vdc(C.V. charging voltage)
<b>High DC Cut-off Voltage</b>	60.8Vdc
<b>No Load Power Consumption</b>	<70W

Table 3 Charge Mode Specifications

Utility Charging Mode	
INVERTER MODEL	
	<b>SIM 6000 ES Plus-V</b>
Charging Algorithm	3-Step
Max. AC Charging Current	80Amp(@V <sub>I/P</sub> =230Vac)
Bulk Charging Voltage	58.4Vdc
Voltage	AGM / Gel Battery
Floating Charging Voltage	54Vdc
Charging Curve	<p>The graph illustrates the three-stage charging process. Stage 1 (Bulk) shows a linear increase in voltage over time. Stage 2 (Absorption) is a plateau where voltage remains constant while current decreases. Stage 3 (Maintenance) is a low-current floating stage. A note indicates a minimum of 20mins for the absorption stage.</p>
MPPT Solar Charging Mode	
Max. PV Array Power	4000W+4000W
Max. PV Input Current	16A+16A
Start-up Voltage	150Vdc±10Vdc
PV Array MPPT Voltage Range	120Vdc~450Vdc
Max. PV Array Open Circuit Voltage	500Vdc
Max. Inverter Back Feed Current To The Array	0A
Max. PV Charging Current	100A
Max. Charging Current (AC Charger Plus Solar Charger)	100A

Table 4 General Specifications

INVERTER MODEL	
Safety Certification	CE
Operating Temperature Range	0°C to 55°C
Storage temperature	-15°C~ 60°C
Humidity	5% to 95% Relative Humidity (Non-condensing)
Altitude	<2000m
Dimension(D*W*H), mm	630*440*150
Net Weight, kg	18kg

## Trouble Shooting

Problem	LCD/LED/Buzzer	Explanation	What to do
Unit shuts down automatically during startup process.	LCD/LED lights 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.	<p>Input voltage is 0 on the LCD and green LED is flashing.</p> <p>Green LED is flashing.</p> <p>Green LED is flashing.</p>	<p>Input protector is tripped.</p> <p>Insufficient quality of AC power (Shore or Generator)</p> <p>Set "Battery First" or "Solar First" as the priority of output source.</p>	<p>Check if AC breaker is tripped and AC wiring is connected well.</p> <p>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)</p> <p>Change output source priority to Utility first.</p>
When it's turned on, internal relay is switching on and off repeatedly.	LCD display and LED lights are flashing	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on. (Fault code)	Fault code 01	Fan fault.	1.Check whether all fans are working properly. 2.Replace the fan.
Buzzer beeps once every second, and red LED is flashing. (Warning code)	Fault code 02	Internal temperature of component is over 100°C.	1.Check whether the air flow of the unit is blocked or whether the ambient temperature is too high. 2.Check whether the thermistor plug is loose.
Battery is over-charged.	Fault code 03		Restart the unit, if the error happens again, please return to repair center.
The battery voltage is too high.	Warning code 04	The battery voltage/SOC is too low.	Check if spec and quantity of batteries are meet requirements.
The battery voltage/SOC is too low.		1. Measure battery voltage in DC input. 2. Check battery SOC in LCD when use Li battery 3. Recharge the battery.	
Output short circuited.	Fault code 05		Check if wiring is connected well and remove abnormal load.
Output abnormal (Inverter voltage is higher than 280Vac or lower than 80Vac).	Fault code 06/58		1. Reduce the connected load. 2. Restart the unit, if the error happens again, please return to repair center.
The inverter is overload 110% and time is up.	Fault code 07		Reduce the connected load by switching off some equipment.

Buzzer beeps continuously and red LED is on. (Fault code) Buzzer beeps once every second, and red LED is flashing. (Warning code)	Fault code 08	Bus voltage is too high.	1. If you connect to a lithium battery without communication, check whether the voltage points of the program 19 and 21 are too high for the lithium battery. 2. Restart the unit, if the error happens again, please return to repair center.
	Fault code 09/53/57	Internal components failed.	Restart the unit, if the error happens again, please return to repair center.
	Warning code 15	The input status is different in parallel system.	Check if AC input wires of all inverters are connected well.
	Warning code 16	Input phase is not correct.	Change the input phase S and T wiring.
	Warning code 17	The output phase not correct in parallel.	1. Make sure the parallel setting are the same system(single or parallel; 3P1,3P2,3P3). 2. Make sure all phases inverters are power on.
	Warning code 20	Li battery can't communicate to the inverter.	1. Check whether communication line is correct connection between inverter and battery. 2. Check whether BMS protocol type is correct setting.
	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	1. If you connect to a lithium battery without communication, check whether the voltage points of the program 19 and 21 are too high for the lithium battery. 2. If the battery is connected well, restart the unit. If the error happens again, please return to repair center.
	Fault code 56	Battery is not connected well or fuse is burnt.	
	Fault code 60	Negative power fault	1. Check whether the AC output connected to the grid input. 2. Check whether Program 8 settings are the same for all parallel inverters 3. Check whether the current sharing cables are connected well in the same parallel phases. 4. Check whether all neutral wires of all parallel units are connected together. 5. If problem still exists, contact repair center.
	Fault code 80	CAN fault	1. Check whether the parallel communication cables are connected well. 2. Check whether Program 23 settings are right for the parallel system. 3. If problem still exists, contact repair center
	Fault code 81	Host loss	

Note: To restart the inverter, all power sources need to be disconnected. After the LCD screen light is off, only use the battery to boot.