



**Off Grid Solar Inverter
SPF 6000 ES Lite
User Manual**

About This Document

This document introduces PV Off-grid Inverter SPF 6000 ES lite in terms of its installation, electrical connection, operation, commission, maintenance, and troubleshooting. Before installing and operating Inverter ensure that you are familiar with the product features, functions, and safety precautions provided in this document.

Symbol	Description
 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a potentially hazardous situation, if not avoided, could result in serious injury or death.
 NOTICE	Is used to address practices which are not safety relevant.

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1 Information on this Manual

1.1 Validity

This manual is valid for the following devices:

- SPF 6000 ES Lite

1.2 Scope

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

1.3 Target Group

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

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

1.4 Safety Instructions



WARNING

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 reserves the right to void the warranty if the equipment is damaged due to improper installation or failure to follow the instructions in this manual.
2. All operations and connections should be performed by a 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 with opaque materials, otherwise the high terminal voltage of the modules in sunlight may pose a danger.
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. Please be clear which kind of battery system you want, lithium battery system or lead-acid battery system, if you choose the wrong system, energy storage system can't work normally.

- | | |
|--|--|
| | <ol style="list-style-type: none">7. NEVER charge a frozen battery.8. Be very cautious when working with metal tools on or around batteries. A potential risk exists that a dropped tool may create sparks or short-circuit the batteries or other electrical components, which could cause an explosion.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. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.11. GROUNDING INSTRUCTIONS - This inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.12. NEVER short-circuit the AC output or DC input. Do NOT connect to the mains when the DC input is short-circuited.13. Make sure the inverter is completely assembled, before the operation.14. 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.15. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.16. This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. |
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2. Product Overview

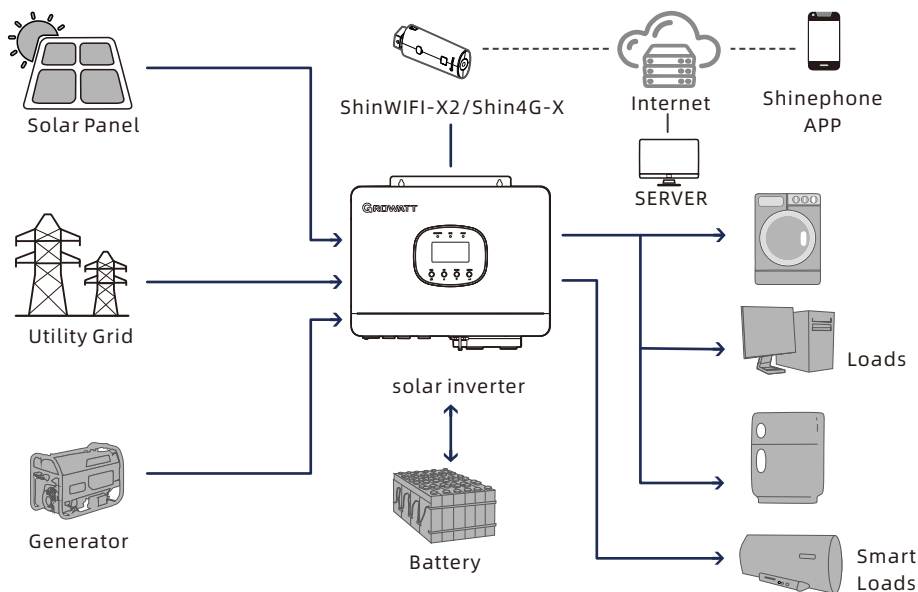


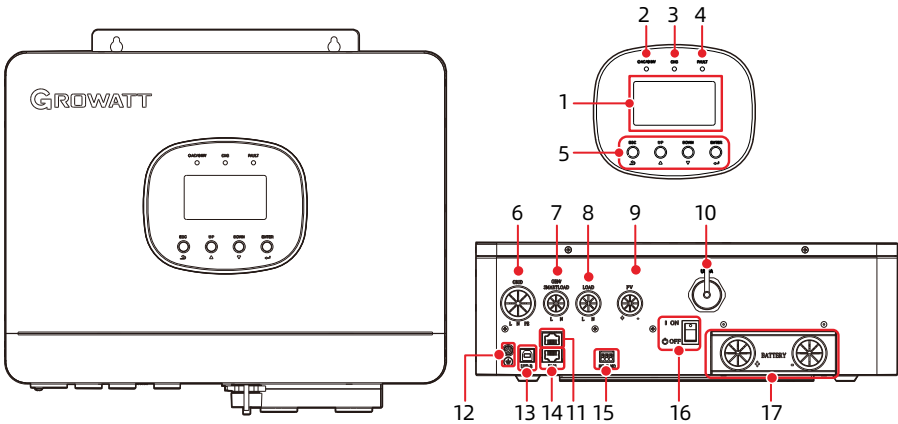
Fig 2.1 Solar Power System

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. 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 / 4G module is a plug-and-play monitoring device to be installed on the inverter. With this device, users can monitor the status of the PV system from the mobile phone or from the website anytime anywhere.

2.1 Product Features

- Rated power 6kW, power factor 1.
- 1 strings of MPPT, Max. PV array power 8000W .
- MPPT Voltage range 75Vdc-450Vdc, MAX 500Vdc.
- Pure sine wave inverter and MPPT solar charge controller integrated inside
- Solar and utility grid can power loads at the same time.
- High frequency inverter with small size and light weight.
- Able to work with or without battery.
- With CAN/RS485 for BMS communication.
- WIFI/4G remote monitoring (optional) .

2.2 Panel and Port Definitions



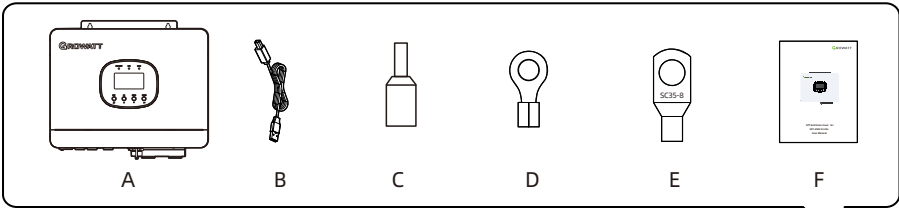
Panel operation	
1. LCD display	2. Status indicator
3. Charging indicator	4. Fault indicator
5. Function buttons	
Connection port	
6. GRID:Grid input	7. GEN/SMARTLOAD:Gen input or smart load
8. LOAD: AC output(main)	9. PV:PV input
12.PE	17. BATTERY: Battery input
Communication port	
10. USB-A: WiFi/4G communication port	11.No connect
13. USB-B:USB communication port	14. BMS communication port (support CAN/RS485)
Other	
15.Dry contact	16. Power on/off switch

3 Installation Instructions

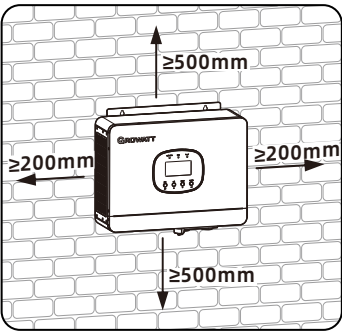
3.1 Accessory list

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.	Item	Item Name	Qty.
A	The unit	1	D	R-type terminal	1
B	Communication cable	1	E	O-type terminal	2
C	Tubular terminal	9	F	User manual	1



3.2 Points for attention



Consider the following points before selecting where to install:

- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- The ambient temperature should be between 0°C-50°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.
- Do not install in too narrow confined space and pay attention to ventilation.
- Be sure to keep other objects and surfaces as

shown in the right diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.



NOTICE

If the energy storage is installed in areas with salt damage, it will be corroded and may cause fire. Therefore, do not install it outdoors in areas with salt damage. The areas with salt damage are defined as the areas which are not 500m away from shore or will be affected by sea breezes. The areas affected by the sea breezes vary depending on meteorological conditions (e.g. typhoons, monsoons) or topographical conditions(dams, hills).



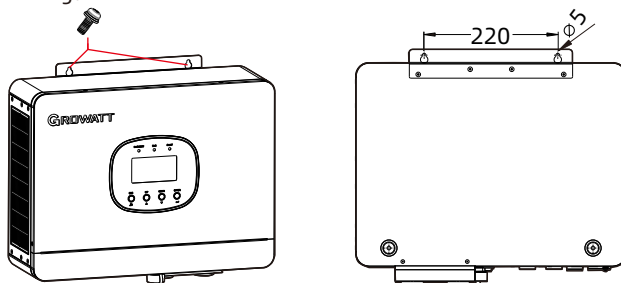
NOTICE

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

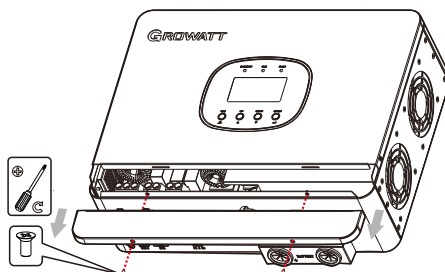
Install the unit by screwing two screws. It's recommended to use M4 or M5 screws.

Preparation for wiring.

(unit: mm)



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



3.3 Battery Connection



WARNING

All wiring must be performed by a qualified person.

- Shock Hazard: Installation must be performed with care due to high battery voltage in series.
- Always disconnect all circuit breakers before making connections to the battery power cable.
- Make sure the battery power cable positive (+) must be connected to battery positive (+) , negative (-) must be connected to battery negative (-) .
- Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, a short circuit may occur, resulting in overheating and fire.
- Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.

3.3.1 Wiring preparation

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

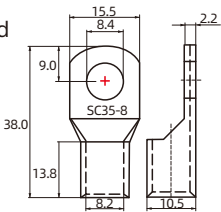
Model	1 unit*
SPF 6000 ES Lite	200A / 60VDC

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

Recommended battery cable and terminal size:

Model	Wire Size		Torque value
SPF 6000 ES Lite	1 * 2 AWG	1*33.62mm ²	2-3 Nm

O-type terminal:



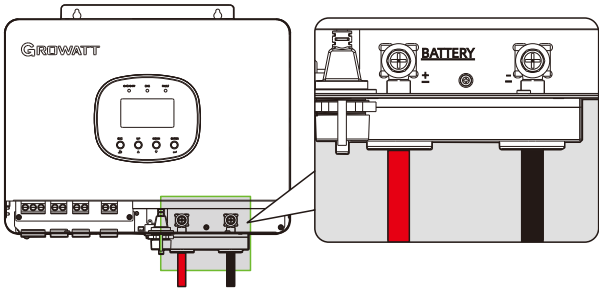
- 3、Battery Module Selection: Choose the appropriate battery according to the actual situation.

Battery Type	SPF 6000 ES Lite
Lead-acid Battery	200Ah capacity battery
Lithium Battery	200Ah capacity battery

3.3.2 Battery power cable connection

Please follow below steps to implement battery connection:

- 1、Assemble battery ring terminal based on recommended battery cable and terminal size.
- 2、Connect all battery packs as units requires.
- 3、Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the bolts are tightened with torque of 2Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring terminals are tightly screwed to the battery terminals.

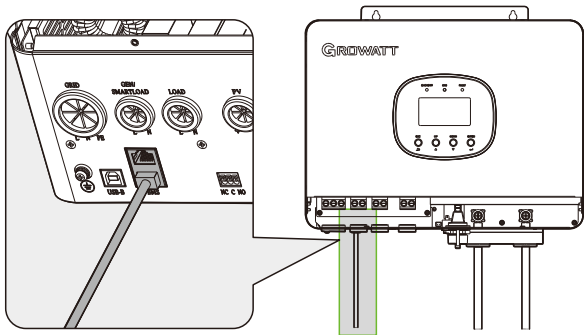


3.3.3 Lithium battery communication cable connection

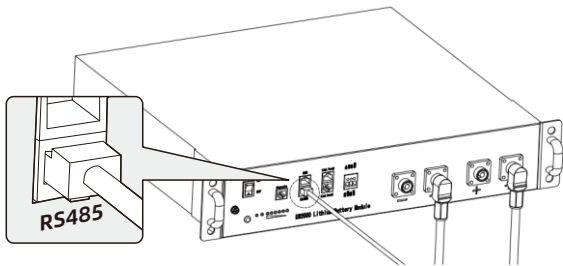
If used with lithium batteries, make sure to connect the BMS communication cable between the battery and the inverter. It is recommended to use lithium batteries that have been tested with our configuration.

Please follow below steps to implement BMS communication cable connection:

- 1、Connect one end of the battery's communication cable to the inverter's BMS communication port (below left), which supports RS485 or CAN protocols.



- 2、The other end of the battery communication cable plugs into the battery communication port (RS485 or CAN).



- 3、The inverter BMS port pin assignment shown as below:

Pin number	BMS port	Pin number	BMS port
1	RS485B	5	CANL
2	RS485A	6	--
3	--	7	--
4	CANH	8	-

8 7 6 5 4 3 2 1

Note: In order to ensure the normal communication of lithium battery BMS, please set the battery type as "Li" in program 5, and then LCD will automatically switch to program 36 to select the 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. (About the specific protocol address of the inverter ,please consult the dealer or manufacturer to choose which communication protocol to match the BMS).

3.4 AC Connection



WARNING

- All wiring must be performed by a qualified personnel.
- Shock Hazard: Be sure that AC power source is disconnected before attempting to wire it to the unit.
- Always disconnect all circuit breakers before making Grid/ GEN/ AC output connection.
- 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.
- There are three terminal blocks with "Grid", "GEN or Smart Load" and "Load" markings. Please do not mistakenly connect the input and output connectors.
- Appliances such as air conditioners require at least 2 to 3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check with manufacturer of air conditioner that if it's equipped with time-delay function before installation. Otherwise, this off grid solar inverter will trigger an overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

3.4.1 Connection preparation

- 1、 Before connecting to AC input power source, please install a separate AC breaker between inverter and Grid power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of Grid. Please refer to typical amperage in below table as required breaker size.

Recommended breaker specification of Grid for a single inverter:

Model	1 unit*
SPF 6000 ES Lite	60A / 230VAC

2、It's very important for system safety and efficient operation to use appropriate cable for Grid connection , GEN or Smart Load connection and Load connection. To reduce risk of injury, please use the proper recommended cable size as below. Recommended AC wires size:

Model	AC Input Wire Size		AC Output Wire Size		Torque value
SPF 6000 ES Lite	1 * 8 AWG	8.37mm ²	1 * 8 AWG	8.37mm ²	1.2-1.6 Nm

3.4.2 Grid/GEN or Smart Load/ Load wires Connection:

Please follow the steps below to make Grid/GEN or Smart Load/ Load connections:

1. Remove the insulation covers of the wires.
2. Connect the PE protection line first, and then lock in the Grid line/GEN or Smart Load line/ Load line in order.
3. Corresponding polarity positions marked on the terminals.

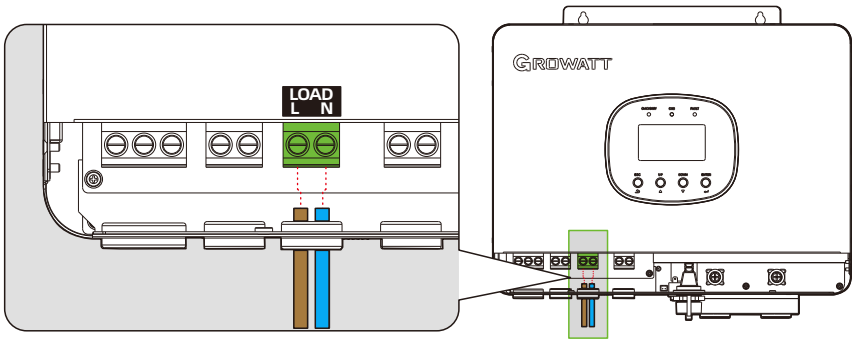
Please refer to the following:

⊕ → Ground (yellow- green), L→LINE (brown or black) N→Neutral (blue)

1. Insert first Load wires according to polarities indicated on terminal block and ensure that the buckle presses the wire tightly.

L→ LINE (brown or black)

N→ Neutral (blue)

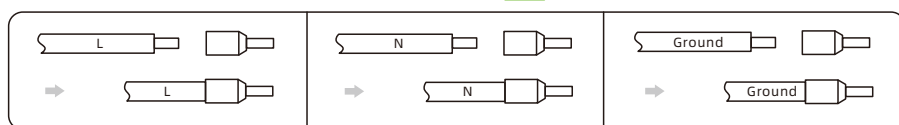
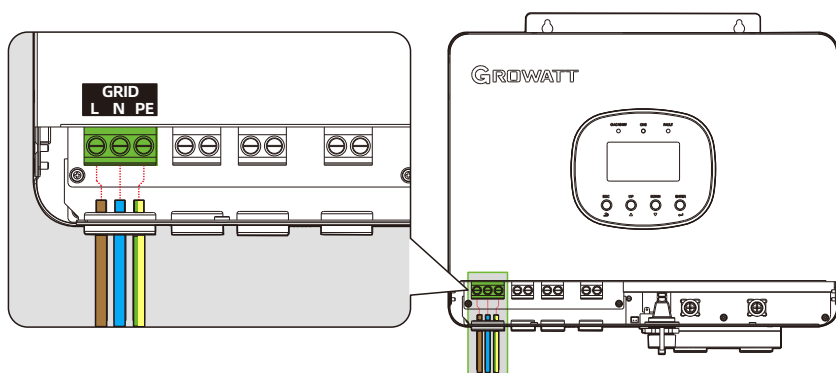


2. Insert Grid wires according to polarities indicated on terminal block and ensure that the buckle presses the wire tightly.

L→ LINE (brown or black)

N→ Neutral (blue)

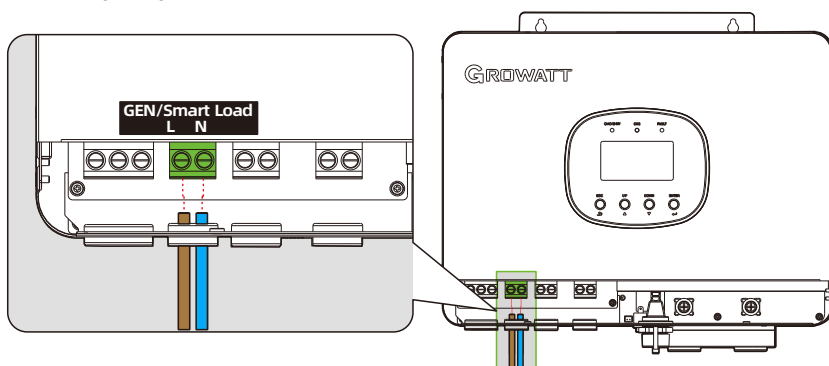
PE→Ground (yellow- green)



3. Insert GEN or Smart Load wires according to polarities indicated on terminal block and ensure that the buckle presses the wire tightly.

L → LINE (brown or black)

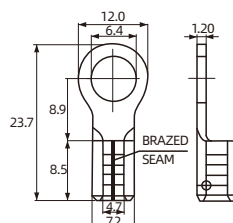
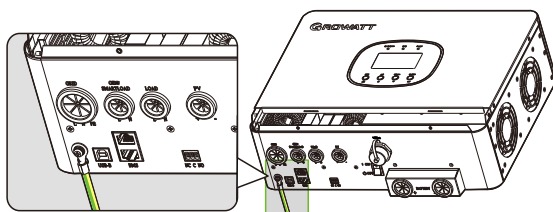
N → Neutral (blue)



5. Make sure the inverter metal housing is grounded (Ground in the grid system).

⊕ → Ground (yellow-green)

R-type terminal:



Precautions:

- 1) Before performing the above operations, please ensure that your operating environment is: Non-energized environment.
 - 2) After inserting the wire according to the polarity marked on the terminal, don't forget to check that the screw is tightened.
 - 3) After you complete all wiring, please check again to confirm whether the corresponding wires are connected in the correct position to avoid misoperation that may cause the inverter to fail to work properly or damage your equipment.
- These details that cannot be ignored ensure a good user experience to a certain extent.

3.5 PV Connection



WARNING

- All wiring must be performed by a qualified personnel.
- Shock Hazard: Operation with power on is strictly prohibited.
- Before connecting the PV input, be sure to turn off all circuit breakers and confirm that the machine is powered off.
- Be sure to connect PV cable with correct polarity.

3.5.1 Connection preparation

- 1、 Before connecting to PV modules, please install separately a DC circuit breaker between inverter and PV modules.
Recommended breaker specification of PV input for a single inverter:

Model	1 unit*
SPF 6000 ES Lite	30 A / 500Vdc

- 2、 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
SPF 6000 ES Lite	1 * 9AWG	8.4mm ²	1.2-1.6Nm

- 3、 PV Module Selection:
When selecting proper PV modules, please be sure to consider below parameters:
 - a)Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter. Exceeding the limit will cause damage to the inverter.
 - b)Open circuit Voltage (Voc) of PV modules should be higher than start-up voltage. Lower than will lead to insufficient photovoltaic.

INVERTER MODEL	SPF 6000 ES Lite
Max. PV Array Open Circuit Voltage	500Vdc
Start-up Voltage	120Vdc
PV Array MPPT Voltage Range	75Vdc~450Vdc

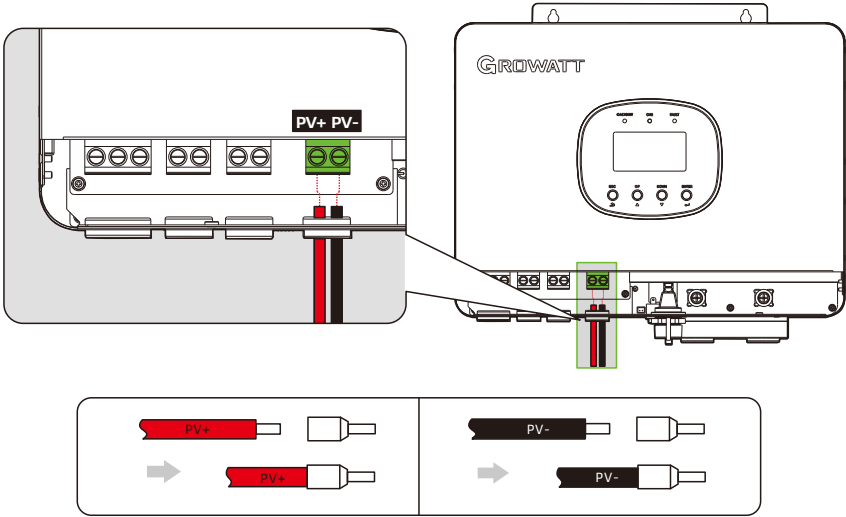
3.5.2 PV cable Connection:

Please follow the steps below to make PV connections:

1. Remove the insulation covers of the wires.
2. Lock in the PV line .
3. Corresponding polarity positions marked on the terminals.

Please refer to the following:

PV+→positive pole (red), PV-→negative pole (black).



3.6 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.ginverter.com.

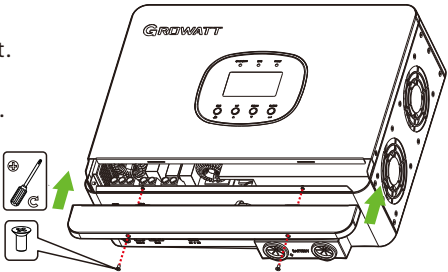
3.7 Dry Contact Signal

There is one dry contact(3A/250VAC) available on the rear panel. Dry contacts are used to connect generators. As shown in the table below. When the inverter meets the conditions on the left, it will perform the function on the right. It could be used to deliver signal to external device When the following conditions are met.

Unit Status	Condition			Dry contact port:	
				NC & C	NO & C
					
If program 24 is set to automatic					
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
			Battery voltage(SOC) > Setting value in Program 13 or battery charging reaches floating stage	Close	Open
		Program 01 is set as SBU or Solar first	Battery voltage (SOC)< Setting value in Program 12	Open	Close
			Battery voltage (SOC)> Setting value in Program 13 or battery charging reaches floating stage	Close	Open
If program 24 is set to enable					
Power On	Output is powered from Battery or Solar	The dry contact always sends a power-on signal.		Open	Close
If program 24 is set to disable					
Power On	Output is powered from Battery or Solar	The dry contact always sends a power-off signal.		Close	Open

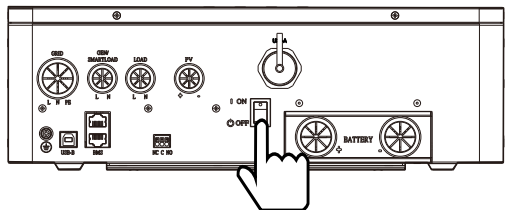
3.8 Final Assembly

Double check that all wiring is correct.
Please put bottom cover back by screwing five screws as shown below.



4 Operation

4.1 Power ON/OFF

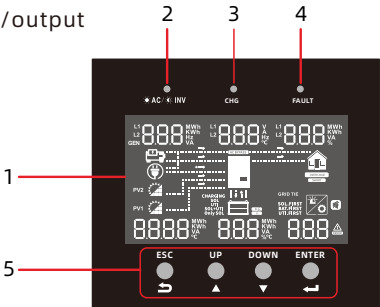


After correct installation, switch on the battery switch, switch on the inverter switch, wait about 40 seconds, inverter output.

4.2 Display Panel Introduction

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



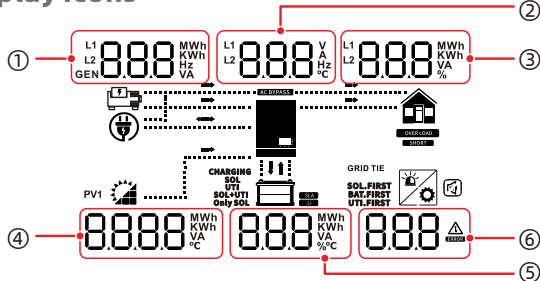
LCD display

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

Function Buttons

Button	Description
ESC	To exit setting mode
UP	To go to previous selection
DOWN	To go to next selection
ENTER	To confirm the selection in setting mode or enter setting mode

4.2.1 LCD Display Icons



Icon	Description
AC Input Information	
	Grid icon
	Generator icon
①	Indicate AC input power, AC input voltage, AC input frequency, AC input current
	Indicate AC power loads in bypass
PV Input Information	
	PV input icon
④	Indicate PV power, PV voltage, PV current, etc.
Output Information	
	Inverter icon
②	Indicate output voltage, output current, output frequency, inverter temperature
Load Information	
	Load icon
③	Indicate power of load, power percentage of load
	Indicate overload happened
	Indicate short circuit happened
Battery Information	
	Indicate battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.
⑤	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
Other Information	
	Indicate output source priority: solar first, utility first, SBU mode or SUB mode

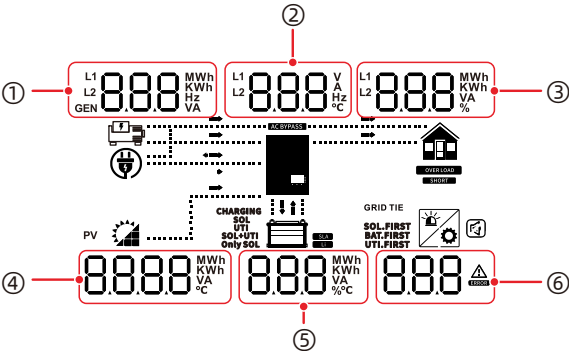
Icon	Description
	Indicate warning code or fault code
	Indicate a warning or a fault is happening
	Indicate it's during setting values
	Indicate the alarm is disabled

In battery charge mode, battery icon will present Battery Charging Status		
Status	Battery voltage	LCD Display
Constant Current mode / Constant Voltage mode	<48V	4 bars will flash in turns.
	48 ~ 50V	Bottom bar will be on and the other three bars will flash in turns.
	50 ~ 52V	Bottom two bars will be on and the other two bars will flash in turns.
	> 52V	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 discharge mode, battery icon will present Battery Capacity		
Load Percentage	Battery Voltage	LCD Display
Load >50%	< 41.2V	
	41.2~43.2V	
	43.2~45.2V	
	> 45.2V	
50%> Load > 20%	< 43.6V	
	43.6~46V	
	46~47.6V	
	> 47.6V	
Load < 20%	< 44.8V	
	44.8~46.8V	
	46.8~48.8V	
	> 48.8	

4.2.2 Display Information

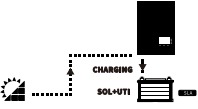
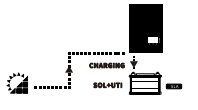
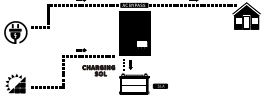
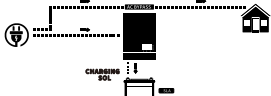
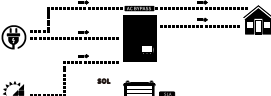
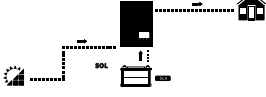
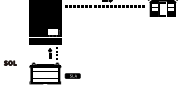
The LCD display information will be switched in turns by pressing “UP” or “DOWN” key. The selectable information is switched as below order: voltage, frequency, current, power, firmware version.



Setting Information	LCD display
①AC Input voltage(grid input) ② Output voltage ③ Load percentage ④ PV1 input voltage ⑤ Battery voltage ⑥ Warning or Fault code (Default Display Screen)	
①AC Input voltage (generator input) (If the AC input is only generator input, it means that what is displayed at this time is the input voltage of the generator. The current, power and frequency displayed after turning the page are also the input parameters of the generator, which will not be explained below.) ② Output voltage ③ Load percentage ④ Left: PV1 input voltage ⑤ Battery voltage ⑥ Warning or Fault code	

Setting Information	LCD display
① AC Input frequency ② Output frequency ③ Load power ④ PV energy sum ⑤ Battery percentage (Setting Item 05 to other battery displays the voltage.) ⑥ Warning or Fault code	The LCD display shows the following information: AC input frequency 500 Hz, output frequency 500 Hz, load power 0.96 kW, PV energy sum 44.5 kWh, battery percentage 79.0%, and a warning icon (triangle with exclamation mark).
① AC Input current ② Output current ③ Load percentage ④ Left: PV1 input current ⑤ Battery charging current ⑥ Warning or Fault code	The LCD display shows the following information: AC input current 9.8 A, output current 4.2 A, load percentage 80%, PV1 input current 2.3 A, battery charging current 46.2 A, and a warning icon (triangle with exclamation mark).
① AC input power ② Inverter temperature ③ Load power ④ Left: PV1 input power ⑤ Battery charging power ⑥ Warning or Fault code	The LCD display shows the following information: AC input power 0.00 kW, inverter temperature 32.1 °C, load power 0.00 kW, PV1 input power 0.000 kW, battery charging power 0.00 kW, and a warning icon (triangle with exclamation mark).
Firmware version (CPU1: 181 A01 326; CPU2 182 A01 310)	The LCD display shows the following information: Firmware version 181 A01 326, 182 A01 310, and a warning icon (triangle with exclamation mark).
Time (13:54:29, May 29, 2024)	The LCD display shows the following information: Time 13:54:29, date 2024 05 29, and a warning icon (triangle with exclamation mark).

4.2.3 Operating Mode Description

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

4.3 LCD parameter setting

4.3.1 General settings

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	SOL.FIRST ⚙️ OPPR SOL 00 1
		Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power the loads at the same time. Utility provides power to the loads only when any one condition happens: -Solar energy is not available -Battery voltage drops to either low-level warning voltage or the setting point in program 12.	
		Utility first (default)	UTIL.FIRST ⚙️ OPPR UT 1 00 1
		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	BAT.FIRST ⚙️ OPPR SBU 00 1
		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	SOL.FIRST UTIL.FIRST ⚙️ OPPR SUB 00 1
		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.	

Program	Description	Setting Option																												
02	Maximum charging current: set total charging current for solar and utility chargers.	CHG.1 60^A 002[*] Default 60A, 0A~100A Settable (Max. charging current = utility charging current + solar charging current) (If LI is selected in Program 5, this program can't be set up)																												
03	AC input voltage range	Appliance (default) AC.V APL 003[*] If selected, acceptable AC input voltage range will be within:90~280VAC																												
		UPS AC.V UPS 003[*] If selected, acceptable AC input voltage range will be within:170~280VAC																												
04	Power saving mode enable/disable	Saving mode disable (default) SAVE DIS 004[*] If disabled, no matter connected load is low or high, the on/off status of inverter output will not be affected.																												
		Saving mode enable SAVE ENA 004[*] If enabled, the output of inverter will be off when connected load is pretty low or not detected.																												
05	Battery type	AGM (default)–Suitable for lead-acid battery BATT AGM 005[*] <table><tr><td>Items that cannot be set</td><td>19</td><td>20</td><td>21</td></tr><tr><td>default</td><td>56.4V</td><td>54V</td><td>42V</td></tr></table> <table><tr><td>Items that can be set:</td><td>default</td><td>Set range</td><td>Set requirements</td></tr><tr><td>02</td><td>60A</td><td>0A~100A</td><td></td></tr><tr><td>11</td><td>30A</td><td>0A~80A</td><td></td></tr><tr><td>12</td><td>46V</td><td>44~51.2V</td><td><13 setting value</td></tr><tr><td>13</td><td>54V</td><td>48~58.0V</td><td></td></tr></table>	Items that cannot be set	19	20	21	default	56.4V	54V	42V	Items that can be set:	default	Set range	Set requirements	02	60A	0A~100A		11	30A	0A~80A		12	46V	44~51.2V	<13 setting value	13	54V	48~58.0V	
Items that cannot be set	19	20	21																											
default	56.4V	54V	42V																											
Items that can be set:	default	Set range	Set requirements																											
02	60A	0A~100A																												
11	30A	0A~80A																												
12	46V	44~51.2V	<13 setting value																											
13	54V	48~58.0V																												

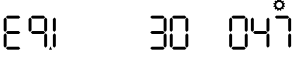
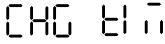
Program	Description	Setting Option																														
		Flooded–Suitable for lead-acid battery or flood battery BAtt FLd 005																														
		<table><tr><td>Items that cannot be set</td><td>19</td><td>20</td><td>21</td></tr><tr><td>default</td><td>56.4V</td><td>54V</td><td>42V</td></tr></table>	Items that cannot be set	19	20	21	default	56.4V	54V	42V																						
		Items that cannot be set	19	20	21																											
		default	56.4V	54V	42V																											
		<table><tr><td>Items that can be set:</td><td>default</td><td>Set range</td><td>Set requirements</td></tr><tr><td>02</td><td>60A</td><td>0A~100A</td><td></td></tr><tr><td>11</td><td>30A</td><td>0A~80A</td><td></td></tr><tr><td>12</td><td>48V</td><td>44~51.2V</td><td><13 setting value</td></tr><tr><td>13</td><td>56V</td><td>48~58.0V</td><td></td></tr></table>	Items that can be set:	default	Set range	Set requirements	02	60A	0A~100A		11	30A	0A~80A		12	48V	44~51.2V	<13 setting value	13	56V	48~58.0V											
		Items that can be set:	default	Set range	Set requirements																											
		02	60A	0A~100A																												
		11	30A	0A~80A																												
		12	48V	44~51.2V	<13 setting value																											
		13	56V	48~58.0V																												
		Lithium (only suitable when communicated with BMS communication) BAtt LI 005																														
		<table><tr><td>Items that cannot be set:</td><td>02</td><td>19</td><td>20</td></tr></table>	Items that cannot be set:	02	19	20																										
		Items that cannot be set:	02	19	20																											
		<table><tr><td>Items that can be set:</td><td>default</td><td>Set range</td><td>Set requirements</td></tr><tr><td>11</td><td>30A</td><td>0A~80A</td><td></td></tr><tr><td>12</td><td>50%</td><td>10%~95%</td><td><13 setting value</td></tr><tr><td>13</td><td>95%</td><td>15%~100%</td><td></td></tr><tr><td>21</td><td>20%</td><td>5%~50%</td><td><12 setting value</td></tr></table>	Items that can be set:	default	Set range	Set requirements	11	30A	0A~80A		12	50%	10%~95%	<13 setting value	13	95%	15%~100%		21	20%	5%~50%	<12 setting value										
		Items that can be set:	default	Set range	Set requirements																											
11	30A	0A~80A																														
12	50%	10%~95%	<13 setting value																													
13	95%	15%~100%																														
21	20%	5%~50%	<12 setting value																													
User-Defined–Suitable for lead-acid battery, battery parameters can be set manually BAtt USE 005																																
<table><tr><td>Items that can be set:</td><td>default</td><td>Set range</td><td>Set requirements</td></tr><tr><td>02</td><td>60A</td><td>0A~100A</td><td></td></tr><tr><td>11</td><td>30A</td><td>0A~80A</td><td></td></tr><tr><td>12</td><td>46V</td><td>44~51.2V</td><td><13 setting value</td></tr><tr><td>13</td><td>54V</td><td>48~58.0V</td><td></td></tr><tr><td>19</td><td>56.4V</td><td>48~58.4V</td><td></td></tr><tr><td>20</td><td>54V</td><td>48~58.4V</td><td></td></tr><tr><td>21</td><td>42V</td><td>40~48V</td><td><12 setting value</td></tr></table>	Items that can be set:	default	Set range	Set requirements	02	60A	0A~100A		11	30A	0A~80A		12	46V	44~51.2V	<13 setting value	13	54V	48~58.0V		19	56.4V	48~58.4V		20	54V	48~58.4V		21	42V	40~48V	<12 setting value
Items that can be set:	default	Set range	Set requirements																													
02	60A	0A~100A																														
11	30A	0A~80A																														
12	46V	44~51.2V	<13 setting value																													
13	54V	48~58.0V																														
19	56.4V	48~58.4V																														
20	54V	48~58.4V																														
21	42V	40~48V	<12 setting value																													

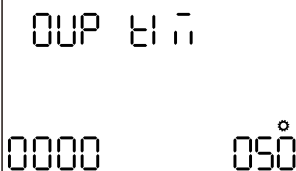
Program	Description	Setting Option																																											
		User-Defined 2 (suitable when lithium battery without BMS communication or communication protocol not matched with the inverter, battery parameters can be set manually) bAtT U52 005⁰ <table><tr><th>Items that can be set:</th><th>default</th><th>Set range</th><th colspan="2">Set requirements</th></tr><tr><td>02</td><td>60A</td><td>0A~100A</td><td colspan="2"></td></tr><tr><td>11</td><td>20A</td><td>0A~80A</td><td colspan="2"></td></tr><tr><td>12</td><td>48V</td><td>44~51.2V</td><td colspan="2"><13 setting value</td></tr><tr><td>13</td><td>52V</td><td>48~58.0V</td><td colspan="2"></td></tr><tr><td>19</td><td>54V</td><td>48~58.4V</td><td colspan="2"></td></tr><tr><td>20</td><td>54V</td><td>48~58.4V</td><td colspan="2">Suggestion=19 setting value</td></tr><tr><td>21</td><td>46V</td><td>40~48V</td><td colspan="2"><12 setting value</td></tr></table>				Items that can be set:	default	Set range	Set requirements		02	60A	0A~100A			11	20A	0A~80A			12	48V	44~51.2V	<13 setting value		13	52V	48~58.0V			19	54V	48~58.4V			20	54V	48~58.4V	Suggestion=19 setting value		21	46V	40~48V	<12 setting value	
Items that can be set:	default	Set range	Set requirements																																										
02	60A	0A~100A																																											
11	20A	0A~80A																																											
12	48V	44~51.2V	<13 setting value																																										
13	52V	48~58.0V																																											
19	54V	48~58.4V																																											
20	54V	48~58.4V	Suggestion=19 setting value																																										
21	46V	40~48V	<12 setting value																																										
06	Auto restart when overload occurs	Restart disable (default) LdRS dI S 006⁰		Restart enable LdRS ENR 006⁰																																									
07	Auto restart when over temperature occurs	Restart disable (default) tTfS dI S 007⁰		Restart enable tTfS ENR 007⁰																																									
08	Output voltage	230V (default) OUt.V 230 008⁰		220V OUt.V 220 008⁰																																									
		240V OUt.V 240 008⁰		208V OUt.V 208 008⁰																																									
09	Output frequency	50Hz(default) OUt.F 50 009⁰		60Hz OUt.F 60 009⁰																																									

Program	Description	Setting Option						
11	Maximum utility & Generator charging current	ACI 30^A CENI 30^A 011[°] Default 30A(utility)/30A(generator), 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^V 012[°] The default value and adjustable range vary in different Battery type, please refer to program 5 for details						
13	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01	AC2b 540^V 013[°] The default value and adjustable range vary in different Battery type, please refer to program 5 for details.						
14	Charger source priority: To configure charger source priority. (After program 67 are enabled, this program is fixed SUN and cannot be set.)	If this off grid solar inverter is working in Line, Standby or Fault mode, charger source can be programmed as below: <table><tr><td>Solar first</td><td>Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.</td></tr><tr><td>Solar and Utility(default)</td><td>Solar energy and utility will both charge battery.</td></tr><tr><td>Only Solar</td><td>Solar energy will be the only charger source no matter utility is available or not.</td></tr></table>	Solar first	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.	Solar and Utility(default)	Solar energy and utility will both charge battery.	Only Solar	Solar energy will be the only charger source no matter utility is available or not.
Solar first	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.							
Solar and Utility(default)	Solar energy and utility will both charge battery.							
Only Solar	Solar energy will be the only charger source no matter utility is available or not.							

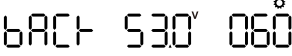
Program	Description	Setting Option	
		If this PV Hybrid Inverter is working in Battery mode or Power saving mode only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient.	
15	Alarm control	Alarm on (default) BUZZ ON 015	Alarm off BUZZ OFF 015
16	Backlight control	Backlight on LCDb ON 016	Backlight off(default) LCDb OFF 016
17	Beeps while primary source is interrupted	Alarm on (default) ALAr ON 017	Alarm off ALAr OFF 017
18	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) bYP dIS 018	Bypass enable bYP ENA 018
19	C.V. charging voltage.	CV 56.4V 019 Default 56.4V, 48.0V~58.4V Settable	
20	Floating charging voltage.	FLCV 54.0V 020 Default 54.0V, 48.0V~58.4V Settable	
21	Low DC cut-off voltage.	CUTV 42.0V 021 The default value and adjustable range vary in different Battery type, please refer to program 5 for details Note: The low voltage alarm point is (program 21) +2V. When this value is reached, the machine reports 04. 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.	

Program	Description	Setting Option	
24	Dry Contact Signal *For details, please refer to Chapter 3.7	Automatic (default) dry Ato 024 ^o	The dry contact can intelligently generate a power-on or power-off signal to the generator based on the battery voltage.
		Enable dry ENA 024 ^o	The dry contact always sends a power-on signal.
		Disable dry diS 024 ^o	The dry contacts always send a power-off signals.
28	Address setting (for expansion)	Addr 1 028 ^o Default 1, 1~255 Settable	
36	RS485 Communication protocol	PtCL LO1 036 ^o	Protocol 1~50
	CAN Communication protocol	PtCL LS1 036 ^o	Protocol 51~99
37	Real time setting---Year	2024 037 ^o	Default 2024, range 2000~2099
38	Real time setting---Month	1001 12 038 ^o	Default 01, range 01~12
39	Real time setting---Date	day 13 039 ^o	Default 01, range 01~31
40	Real time setting---Hour	hour 13 040 ^o	Default 00, range 00~23
41	Real time setting---Minute	1101 50 041 ^o	Default 00, range 00~59
42	Real time setting---Second	SEC 50 042 ^o	Default 00, range 00~59
43	Battery equalization	Battery equalization enable E9 ENA 043 ^o	Battery equalization disable(default) E9 diS 043 ^o
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	

Program	Description	Setting Option	
44	Battery equalization voltage	 Default 58.4V, 48.0V~58.4V Settable	
45	Battery equalized time	 	Default 60min, 5min~900min Settable
46	Battery equalized timeout	 	Default 120min, 5min~900min Settable
47	Equalization interval	 	Default 30days, 1 days~90 days Settable
48	Equalization activated immediately	Equalization activated immediately on 	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 (This program can only be set when program 67 are not enabled)	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

Program	Description	Setting Option	
49			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	Utility output time	0000(default) Allow utility to power the load all day run. 	The time allows utility to power the load. Use 4 digits to represent the time period, the upper two digits represent the time when utility start to power the load, setting range from 00 to 23, and the lower two digits represent the time when utility end to power the load, setting range from 00 to 23.(eg: 2320 represents the time allows utility to power the load is from 23:00 to the next day 20:59, and the utility power is prohibited outside of this period)
54	Lithium Battery Forced Charging Execution Cycle Time. (If program 05 is set to Li and set to ON, it means that the lithium battery is periodically forced to charge to SOC of 100%. OFF indicates that the function is not enabled)	OFF: Turn off periodic strong charging (default) 	ON : Turn on periodic strong charging . Default 30days, 1 days~90 days Settable  

Program	Description	Setting Option	
55	Setting solar energy supply priority when selecting "SUB priority" in program 01.	Charge first SOLd BLU 055°	Solar energy provides power to charge battery as first priority. Solar energy provides power to the loads as second priority.
		Load first(default) SOLd LBU 055°	Solar energy provides power to the loads as first priority. Solar energy provides power to the charge battery as second priority.
57	The power grid mode allows the Smart load output to remain on.	Disable(default) OP2 d15 057°	Enable OP2 ENA 057°
58	Setting of the Smart load output time period. * Note: When time period 1 is set to "Sta 0000-End 0000", it means that the smart load can output all time periods.	First time period 0000 001 058°	Smart load output start time 0000 Sta 058°
			Smart load output shutdown time 0000 ENd 058°
		Second time period 0000 002 058°	Smart load output start time 0000 Sta 058°
			Smart load output shutdown time 0000 ENd 058°
		Third time period 0000 003 058°	Smart load output start time 0000 Sta 058°
			Smart load output shutdown time 0000 ENd 058°

Program	Description	Setting Option	
58		The time setting consists of 4 digits, with the first two digits representing hours and the last two digits representing minutes. For example, Sta2300-End2059 represents the Smart load output time range from 23:00 to 20:59 the next day.	
59	The cut-off battery voltage point/SOC setting for the Smart load output	 Default 48.0V, 44.0V~54.0V Settable Lithium battery mode: Default 60%, 20%~100% Settable	
60	Recovery battery voltage point/SOC setting for the Smart load output	 The other battery mode: Default 53.0V, 48.0V~58.0V Settable. Lithium battery mode: Default 90%, 25%~100% Settable.	
61	Setting of PV power value for the Smart load output to be turned on	 Default 0KW, 0KW~6KW Settable	
62	Menu Return Settings	Disable(default)	Display screen page remains stuck
		Enable	Automatically return to the main page after no human-machine interface operation within five minutes
65	Generator run time	  Default 00, range 01~24 The time allows Generator to work. Use 2 digits to represent the time period, setting range from 00 to 24. (eg: 02 represents the time allows Generator to run for two hours.) Note: 00 represents that the generator can run continuously.	

Program	Description	Setting Option	
66	BMS Communication Loss	Disable (default) b7SE ENR 066°	If BMS Communication Loss, The inverter 04 and 20 warning Icon flashing , but enable to work for original status.
		Disable b7SE d15 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)
90	GEN/ SMARTLOAD Settings	GEN:Generator (default) 57AP GEN 090°	
		OP2: Smart load 57AP OP2 090°	

5 Fault Reference Code

5.1 Fault Reference Code

Fault Code	Fault Event	Icon on
02	Over temperature	02 
03	Battery voltage is too high	03 
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 
11	The main relay failed	11 
12	The INV relay failed	12 
51	INV Over current or surge	51 
52	Bus voltage is too low	52 
53	Inverter soft start failed	53 
58	Output voltage is too low	58 
60	Negative power fault	60 
61	PV voltage is too high	61 
62	Internal communication error	62 
65	BUS voltage imbalance	65 
70	Battery input overcurrent	70 
80	CAN fault	80 

5.2 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 voltage	Beep twice every 3 seconds	10 
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 
18	BUS 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 
29	LLC overcurrent	Beep once every second	29 
30	BUS low voltage	Beep once every second	30 
31	In consistent switches	Beep once every second	31 
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 

6 Specifications

6.1 PV Specification

It's applicable to Grid Tie & Hybrid & Off Grid	
Model	SPF 6000 ES Lite
Max. power	8000W
Max. PV Array Open Circuit Voltage	500Vdc
Nominal PV Voltage	380Vdc
Full load MPPT voltage rated	300Vdc ~ 450Vdc
PV Start-up Voltage	120Vdc±10V
PV Array Voltage High Loss	500Vdc
PV Array Voltage High Comeback	480Vdc
PV MPPT Voltage Range	75Vdc~450Vdc
PV MPPT Voltage Low Loss	60Vdc
PV MPPT Voltage Low Back	75Vdc
Number of MPP Trackers	1
Max. DC Input current/	30Amp
PV Voltage Accuracy	+/-5V

6.2 AC Input Specification

It's applicable to Hybrid & Off-Grid	
Model	SPF 6000 ES Lite
Nominal Input Voltage	230Vac
Low Loss Voltage	170Vac+7V(UPS); 90Vac+7V(Appliances)
Low Loss Return Voltage	180Vac+7V(UPS); 100Vac+7V (Appliances)
High Loss Voltage	280Vac±7V
High Loss Return Voltage	270Vac±7V
Max AC Input Voltage	300Vac
Nominal Input Frequency	50Hz / 60Hz (Auto detection)
AC input frequency range	40.0~65.0Hz
AC input frequency comeback value	42.0/63.0Hz
Max. AC Input current	40Amp (Include Loads and Charging)

6.3 Battery Mode Specification

It's applicable to Grid-tie & Hybrid	
Model	SPF 6000 ES Lite
Nominal Output Power	6000W
Waveform	Pure Sine Wave
Nominal Output Voltage	230Vac
Nominal Output Frequency	50/60Hz auto sensing
Output Voltage Distortion	<3% for linear load, <5% for non-linear load @V nominal
Output DC offset	<150mV
Peak Efficiency	95%
No Load Power Consumption	<55W@Rate Voltage
Transfer Time	<20ms@Single
Output Parallel-able	No

6.4 Smart Load Output Power Specification

Model	SPF 6000 ES Lite
Full Load Output Power	6000W
Maximum Main Load	6000W
Maximum smart load	6000W

6.5 Overload Capability Specification

Line Mode	@>40A AC input current, 1min
Battery Mode	5sec, @>150% Load
	10sec, @101%~150%
	4-cycle, short-circuits

6.6 Battery & Charger Specification

Model	SPF 6000 ES Lite
Nominal DC Voltage	48Vdc
Cold Start Voltage(Lead-Acid Mode)	46.0Vdc
Cold Start SOC(Li Mode)	Default 30%, Low DC Cut-off SOC +10%

Model	SPF 6000 ES Lite
Low DC Warning Voltage (Lead-Acid Mode)	44.0Vdc @ load < 20% 42.8Vdc @ 20% ≤ load < 50% 40.4Vdc @ load ≥ 50%
Low DC Warning Recovery Voltage (Lead-Acid Mode)	46.0Vdc @ load < 20% 44.8Vdc @ 20% ≤ load < 50% 42.4Vdc @ load ≥ 50%
Low DC Cut-off Voltage (Lead-Acid Mode)	42.0Vdc @ load < 20% 40.8Vdc @ 20% ≤ load < 50% 38.4Vdc @ load ≥ 50%
Low DC Warning SOC (Li Mode)	Low DC Cut-off SOC +5%
Low DC Warning Return SOC(Li Mode)	Low DC Cut-off SOC +10%
Low DC Cut-off SOC(Li Mode)	Default 20%, 5%~5% settable
High DC Recovery Voltage	56.4Vdc(C.V. charging voltage)
High DC Cut-off Voltage	60Vdc
Max. AC Charging Current	80Amp
Max. Solar Charging Current	100Amp
Max. Charging Current	100Amp
Absorption Charging Voltage	56.4Vdc
Floating Charging Voltage	54.0Vdc
Overcharge Protection	60Vdc
Charging Algorithm	3-step
Charging process based on default setting. 3 stages: First - max. charging voltage increases to 56.4V; Second- charging voltage will maintain at 56V until charging current is down to 5 Amp, or after 6 hours of continuous charging; Third- go to floating charging at 54V.	

6.7 Environmental

Model	SPF 6000 ES Lite
Operation Temperature Range	0°C ~ 50°C
Storage Temperature Range	-15°C ~ 60°C
Altitude	< 2000m
Relative humidity	5% ~ 95% non-condensing
Cooling	DC FAN
Safety Certification	CE

6.8 Mechanical Specification

Model	SPF 6000 ES Lite
Housing Dimension (L*W*H), mm	365*275*120
Packing Dimension (L*W*H), mm	500*430*195
Housing Color	White
Net Weight, kg	8.5

7 Appendix

Appendix I. Fault information and processing

The energy storage inverter is designed according to the off-grid connected operation standard and meets the safety requirements and electromagnetic compatibility requirements. Before leaving the factory, the inverter undergoes several rigorous tests to ensure that the inverter can operate reliably.



If any of the fault messages listed in Table 5.1 appear on your inverter and the fault has not been removed after restarting, please contact your local dealer or service center .
You need to have the following information ready.

1. Inverter serial number;
2. The problem description (including the fault code and indicator status displayed on the LCD, or specific fault video and picture) is as detailed as possible.
3. Basic system component information (such as batteries, photovoltaic panels, load usage and specifications)
4. Your contact information.

In order to give you a clearer understanding of the inverter's fault information, we will list all possible fault codes and their descriptions when the inverter is not working properly

error code	Description	Solutions
F01	Fan is locked	1. Check whether all fans are working properly. 2. Replace the fan.
F02	Internal temperature of component is over 100°C.	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
F03	Battery is over-charged.	Restart the unit
	The battery voltage is too high	1.Measure battery voltage in DC input. (Check battery SOC in LCD when use Li battery) 2.Adjust the charging current to less than 0.2C 3.Check if spec and quantity of batteries are meet requirements.
W04	Battery voltage is too low	1.Measure battery voltage in DC input. (Check battery SOC in LCD when use Li battery) 2. Recharge the battery.
F05	Output short circuited	1.Disconnect load and restart the unit 2. Check if wiring is connected well and remove abnormal load.

error code	Description	Solutions
F05	Output short circuited	1.Disconnect load and restart the unit 2. Check if wiring is connected well and remove abnormal load.
F07	Overload time out	Reduce the connected load by switching off some equipment.
F08	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
F09/F53/ F57	Bus soft start failed	Restart the unit
F11/F12	Relay detection failed	Restart the unit
W19	lead acid battery disconnect	Check if spec and quantity of batteries are meet requirements.
	Lithium battery disconnect	1.Check BMS communication cable connection 2. Check setup parameters
W20	BMS communication error	1. Check whether communication line is correct connection between inverter and battery. 2. Check whether BMS protocol type is correct setting.
W31	Inconsistent switches	Check if all inverter switches are closed
F29/F51	Over current or surge	Restart the unit
F52	Bus voltage is too low	Restart the unit
F55	Output voltage is unbalanced	Restart the unit
F61	PV voltage is too high	1. Measure whether the PV voltage in the DC input is consistent with the value displayed on the LCD screen. 2. If consistent, standardize the parallel connection method of PV panels.
F62	Internal communication error	Restart the unit
F65	BUS voltage imbalance	Restart the unit
F70	Battery input overcurrent	Reduce the connected load by switching off some equipment.

Other Problem	LCD/LED/Buzzer	Explanation	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 0 on the LCD and green LED is flashing.	Input protector is tripped.	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is flashing.	Insufficient quality of AC power (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2.Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS → Appliance)
	Green LED is flashing.	Set "Battery First" or "Solar First" as the priority of output source.	Change output source priority to Utility first.
When it's turned on, internal relay is switching on and off repeatedly.	LCD display and LEDS are flashing	Battery is disconnected.	Check if battery wires are connected well.

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.

Appendix II Battery Equalization

43	Battery equalization	Battery equalization enable 	Battery equalization disable(default)
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
44	Battery equalization voltage	 Default 58.4V, 48.0V~58.4V Settable	
45	Battery equalized time		Default 60min, 5min~900min Settable
46	Battery equalized timeout		Default 120min, 5min~900min Settable
47	Equalization interval		Default 30days, 1 days~90 days Settable
48	Equalization activated immediately	Equalization activated immediately on 	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.	

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.

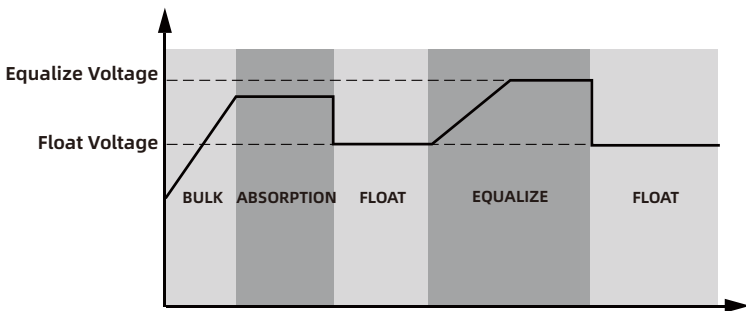
- How to Apply Equalization Function?

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.

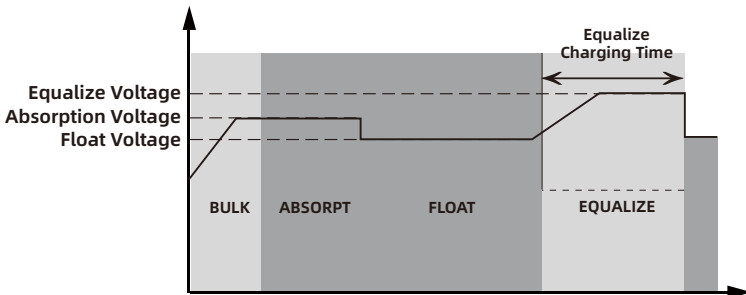
- When to Equalize

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.

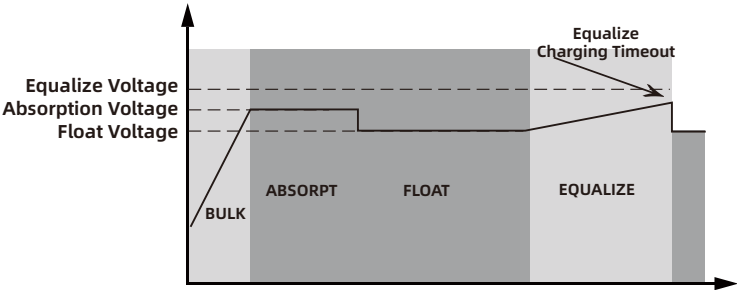


- Equalize charging time and timeout

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.



Appendix III Routine maintenance

To ensure the long-term and good operation of the energy storage system, it is recommended to perform the routine maintenance as described in this section (Cleaning and maintenance of the inverter must be carried out with the power supply disconnected to ensure personal safety).

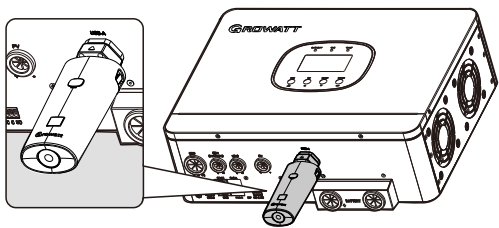
Items	Methods	Maintenance interval
System cleanliness for inverter	● Regularly check the surface of the inverter for dust or other debris and clean it with a dust sponge.	Once every six months to one year
	● Regularly check that radiators and vents are not covered with dust and clean them with a soft brush or compressed air.	Once every 3 months.
Electrical connection	● Check if any cable connection is off or loose.	Half a year after first debugging and testing, and once every six months to one year thereafter.
	● Check if any cable is damaged, and especially if there are cuts on the sheath where the cable contacts with the metal surface.	
	● Check the internal circuit boards and components of the inverter for abnormalities, such as damage, discoloration, etc., and repair and replace them in a timely manner.	

Items	Methods	Maintenance interval
Grounding reliability	Check if the grounding cable is grounded reliably.	
Normal operation	Periodically check the input voltage, output voltage and current of the inverter to ensure that it is operating within its rated range.	
	Regularly check the operating status and performance parameters of the inverter via the inverter's monitoring system or display.	
Other Maintenance	Ensure that the inverter is installed in a dry, well-ventilated environment, protected from humidity, heat or excessive dust.	

Appendix IV WIFI Monitoring

Plug cube WIFI into the WIFI/4G port. Scan the QR code below to download ShinePhone, also you can search ShinePhone in iOS or Google Play Store, download and install it.

- Note:** 1.Make sure you download the lates version.
2.For further information please visit server. growatt.com



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