**GROWATT**

**PV Hybrid Inverter**

**SPE 6000TL HVM-G2**
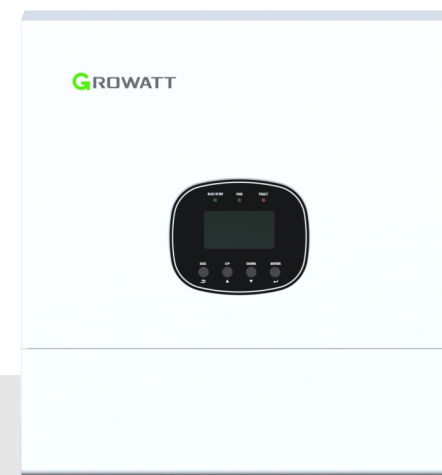
# Table Of Contents

# 1. Information on this Manual

## 1.1 Validity

This manual is valid for the following devices:

▶ SPE 6000TL HVM-G2

## 1.2 Scope

This manual describes the assembly, installation, operation and troubleshooting 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.

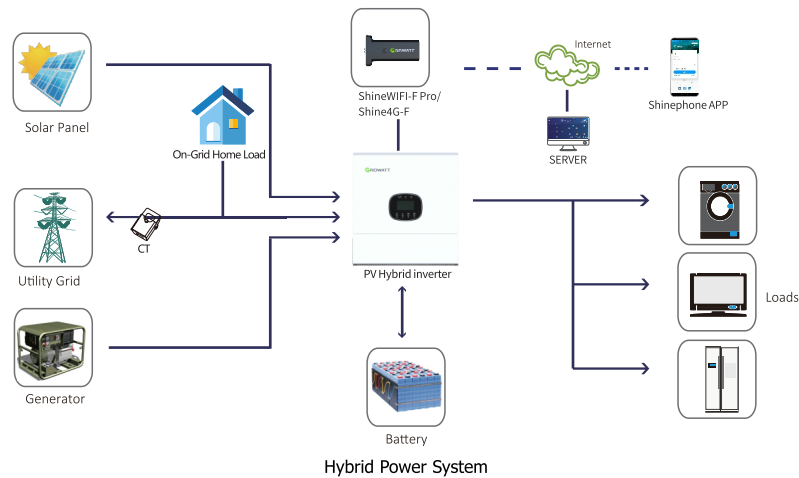▶ Knowledge of and compliance with this document and all safety information.

## 1.4 Safety Instructions

**WARNING:** 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. 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.

7. **NEVER** charge a frozen battery.

8. 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.

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 cause AC output and DC input short circuited. Don't connect to mains when DC input short circuits.

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.

# 2. Product Overview



Solar Panel

On-Grid Home Load

ShineWIFI-F Pro/Shine4G-F

Internet

SERVER

Shinephone APP

CT

Utility Grid

PV Hybrid inverter

Loads

Generator

Battery

Hybrid Power System

    This is a multifunctional PV Hybrid 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 / 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.

## 2.1 Product Features

▶ Built-in high-frequency sine wave inverter and MPPT solar controller;
▶ Independent generator port, built-in ATS;
▶ 2-channel MPPT, input current 16A+16A, power 4000W+4000W, realizes DC-DC boosting and maximum power tracking through BOOST, and the efficiency can reach up to 97%;
▶ Use full-bridge topology to realize DC-AC inverter function;
▶ 170-280VAC (or 90-280VAC) AC input range can be selected;
▶ The default output voltage is 230Vac,and 50HZ/60HZ output frequency can be selected;
▶ Charging current can be adjusted from 0A-100A;
▶ High-efficiency single-phase sine wave inverter output;
▶ Built-in solar controller and standby power-saving mode make the product more energy-saving and environmentally friendly;
▶ Three-stage mains charging mode and adjustable charging voltage and current;
▶ The use of high-speed and high-performance DSP control improves the response speed of the system;
▶ LED-LCD dual display;
▶ WIFI/GPRS function (optional);
▶ Up to 200% output impact resistance;
▶ Equipped with input over-under voltage protection and input over-current protection;
▶ Output short-circuit protection, output over-under voltage protection (can be set according to safety regulations when connected to the grid), output over-under frequency protection (can be set according to safety regulations when connected to the grid), output over-current protection; output overload protection;
▶ BUS over and under voltage protection, over temperature protection and derating, fan fault detection, Relay fault detection; ISO insulation resistance detection, DCI protection; GFCI leakage current protection; NG detection;
▶ Parallel function (9 units in parallel);
▶ Grid connection function;
▶ Intelligent load management dual output;
▶ External CT anti-reflux function.

# 2.2 Panel and Port Definitions
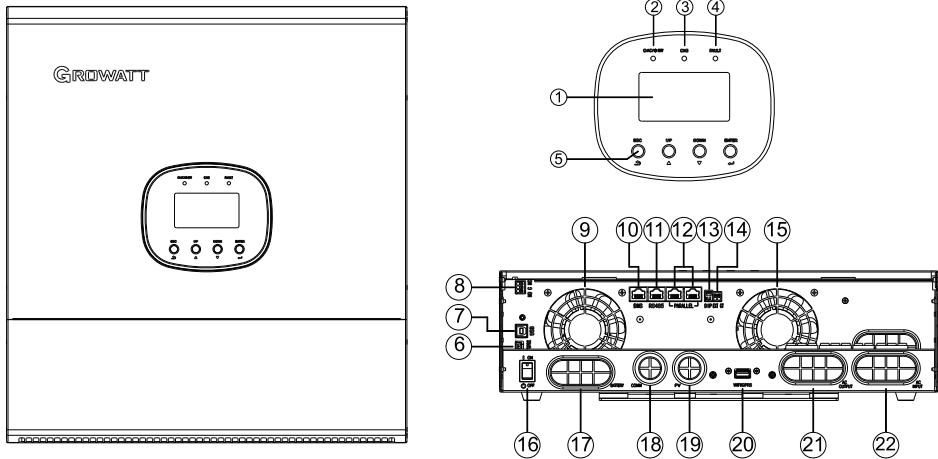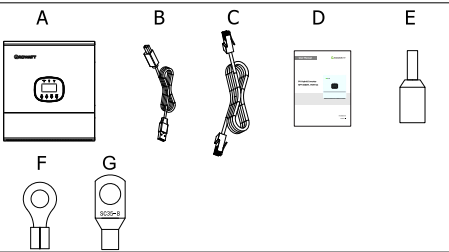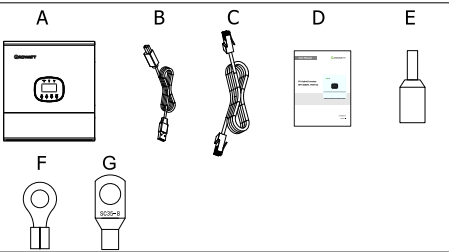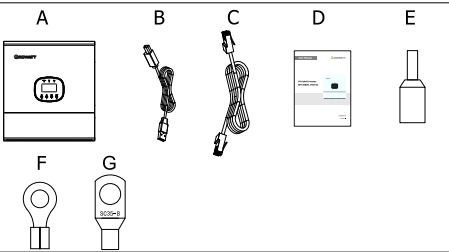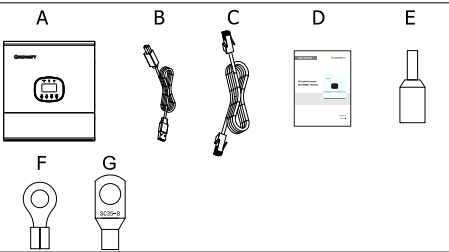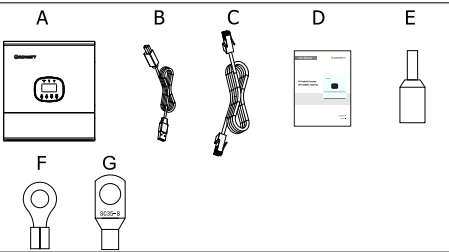


| Panel operation | |
|---|---|
| 1. LCD display | 2. Status indicator |
| 3. Charging indicator | 4. Fault indicator |
| 5. Function buttons | 6. WiFi/4G communication port |
| 7.USB communication port | 8. Dry contact |
| 9.Fan | 10. BMS communication port (support CAN/RS485 ) |
| 11.RS485 communication port (for expansion) | 12.Parallel communication ports |
| 13.DIP | 14.EXT CT |
| 15.Fan | 16.Power on/off switch |
| 17.Battery input | 18.COM |
| 19.PV input | 20. WiFi/4G communication port |
| 21.AC output | 22.AC input |

# 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 | | | A    B    C    D    E |
|---|---|---|---|
| Item | Item Name | Num | |
| A | The unit | 1 | |
| B | Communication cable | 1 | |
| C | Parallel communication cable | 1 | |
| D | User manual | 1 | |
| E | Tubular terminal | 11 | F    G |
| F | R-type terminal | 5 | |
| G | O-type terminal | 2 | |

## 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 and 55°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.
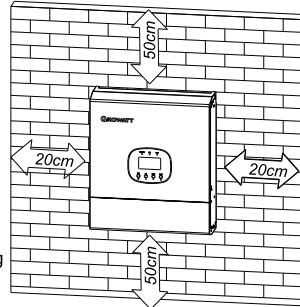▶ Be sure to keep other objects and surfaces as shown in the right diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.

⚠ 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).
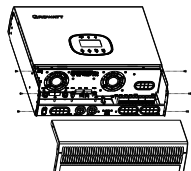
**SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.**
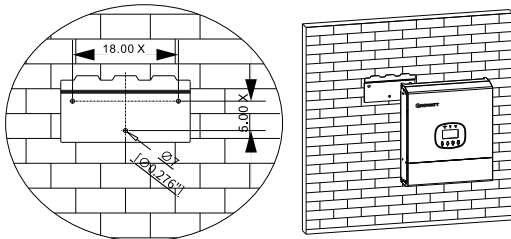
Install the unit by screwing three screws. It's recommended to use M4 or M5 screws.

Preparation for wiring

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* |
|---|---|
| SPE 6000TL HVM-G2 | 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:

**O-type terminal:**

| Model | Wire Size | | Torque value |
|---|---|---|---|
| SPE 6000TL HVM-G2 | 1 * 2 AWG | 33.6mm² | 2-3 Nm |
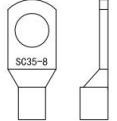
3、Battery Module Selection: Choose the appropriate battery according to the actual situation.

| Battery Type | Recommended specifications |
|---|---|
| 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.
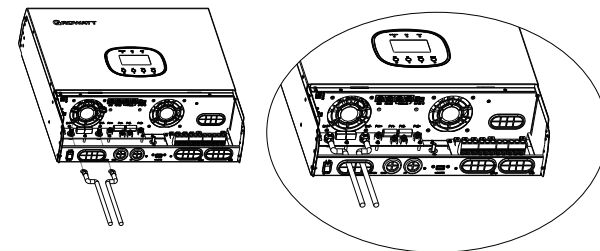
### 3.3.3 Lithium battery communication cable connection

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 , which supports RS485 or CAN protocols.
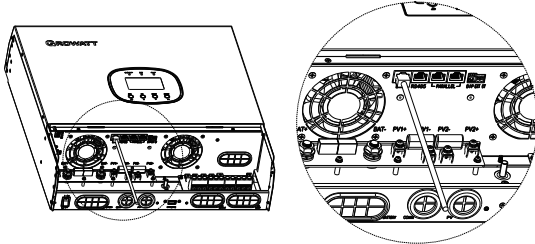


2、The other end of the battery communication cable plugs into the battery communication port (RS485 or CAN)
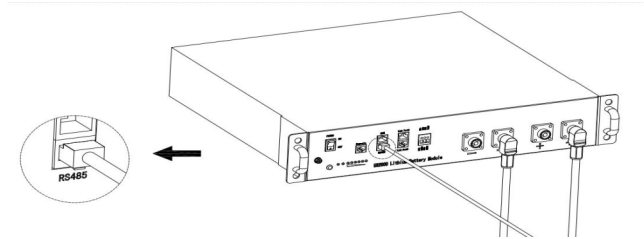


3、The inverter BMS port pin and RS485 port pin assignment shown as below:

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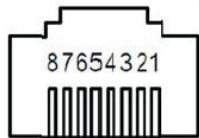


Note: The RS485 port (for expansion) is used for communication expansion and connection to external devices.

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 AC input/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 "AC INPUT", "GEN"and "AC OUTPUT" markings. Please do NOT mis-connect input and output connectors.
- ▶ 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.

### 3.4.1 Connection preparation

1、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. Please refer to typical amperage in below table as required breaker size.

Recommended breaker specification of AC input for a single inverter:

| Model | 1 unit* |
|---|---|
| SPE 6000TL HVM-G2 | 63A/ 230VAC |

2、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.

Recommended AC wires size:

| Model | Wire Size | | Torque value |
|---|---|---|---|
| SPE 6000TL HVM-G2 | 1 * 8 AWG | 8mm² | 1.2-1.6 Nm |

### 3.4.2 AC Input/GEN/Output wires Connection：

Please follow the steps below to make AC output/AC input/GEN connections:
1. Remove the insulation covers of the seven wires.
2. Connect the PE protection line first, and then lock in the AC output line, AC input line, and GEN line in order. Corresponding polarity positions marked on the terminals.
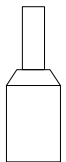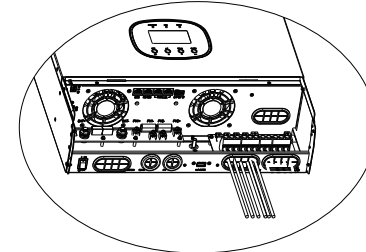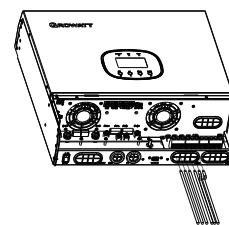
Please refer to the following:

⏚ →**Ground (yellow-green) L→LINE (brown or black) N→Neutral (blue)**

1.First, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws.
**L→LINE (brown or black)**
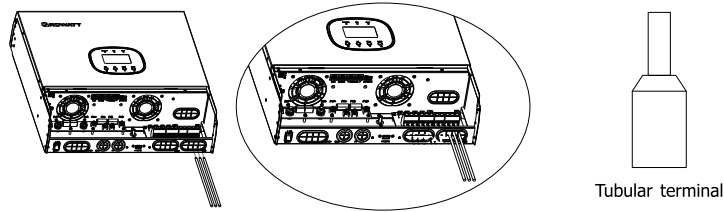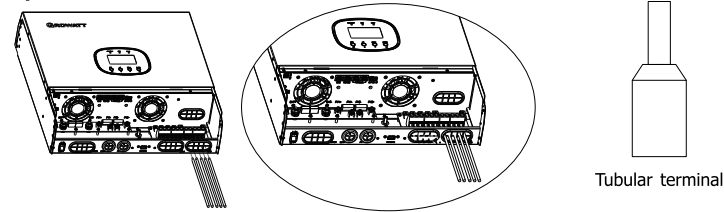**N→Neutral (blue)**



Tubular terminal

2.Second, insert AC input wires according to polarities indicated on terminal block and tighten terminal screws.

⏚ →**Ground (yellow-green)**
**L→LINE (brown or black)**
**N→Neutral (blue)**

Tubular terminal

3.Last,insert GEN wires according to polarities indicated on terminal block and tighten the terminal screws.

**L→LINE (brown or black)**
**N→Neutral (blue)**

Tubular terminal

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

⏚ →**Ground (yellow-green)**
**L→LINE (brown or black)**
**N→Neutral (blue)**

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*(2 strings） | 1unit（1 string) |
|---|---|---|
| SPE 6000TL HVM-G2 | 35A / 500Voc | 16A / 500Voc |

2、It' 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 |
|---|---|---|---|
| SPE 6000TL HVM-G2 | 1 * 10 AWG | 5 mm² | 1.2-1.6 Nm |

3、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. Exceeding the limit will cause damage to the inverter.

2.Open circuit Voltage (Voc) of PV modules should be higher than start-up voltage. Lower than will lead to insufficient photovoltaic.

| INVERTER MODEL | SPE 6000TL HVM-G2 |
|---|---|
| Max. PV Array Open Circuit Voltage | 500Vdc |
| Start-up Voltage | 80Vdc |
| PV Array MPPT Voltage Range | 60Vdc~450Vdc（Recommend 380 Vdc ) |
| Quantity Of PV Panels | Recommend 3~9 photovoltaic panels |

### 3.5.2 PV cable Connection:

Please follow below steps to implement PV module connection:

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

R-type terminal
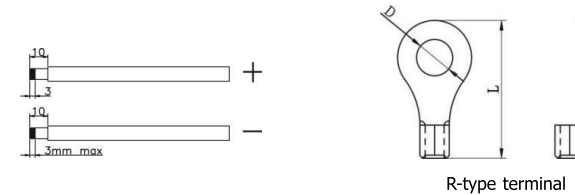
2. then connect positive pole(+)of connection cable to positive pole(+)of PV input connector, connect negative pole(-) of connection cable to negative pole(-) of PV input connector.
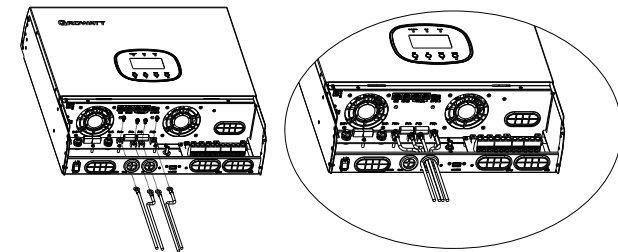
## 3.6 Communication Connection

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 battery voltage reaches warning level.

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

## 3.8 CT Connection

CT is an optional accessory. Adding CT can turn on the anti-reflux function of the inverter. The specific installation method is as follows.

| Serial number | CT specification | Recommender system | Property |
|---|---|---|---|
| 1 | 100A-50mA / 2000:1 / 4m | Single system or 3 Pcs three-phase parallel system or 2Pcs Single phase parallel | Additional purchase |
| 2 | 250A-62.5mA / 4000:1 / 10m | 3-6 Pcs Single phase parallel or 6 Pcs three-phase parallel system | Additional purchase |
| 3 | 500A-66.7mA / 7500:1 / 10m | 6-9 Pcs Single phase parallel or 9 Pcs three-phase parallel system | Additional purchase |

The specific installation method is as follows.

1. The L line passes through the CT, and the arrow on the CT indicates the current direction points to the inverter.

2. Connect the two signal wires coming out of the CT to the terminal marked EXT CT.

White line→ No. 1 Signal Terminal
Black line→ No. 2 Signal Terminal
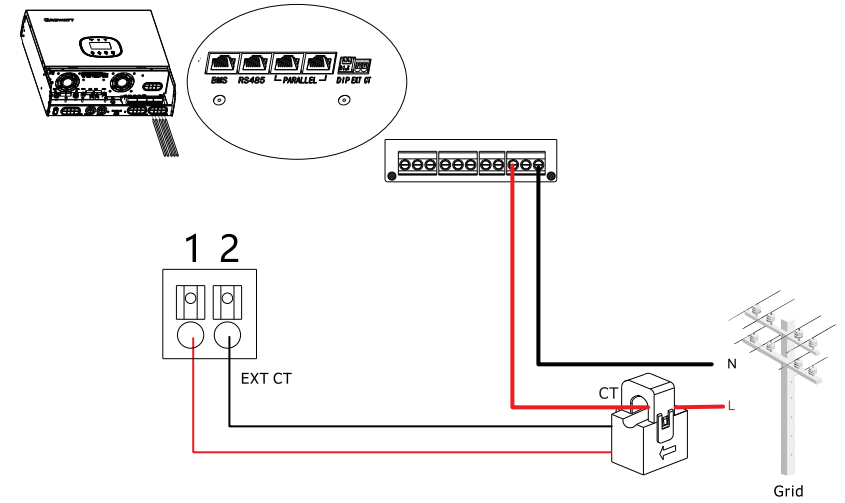


Final Assembly
Double check that all wiring is correct. Please put bottom cover back by screwing four screws as shown below.
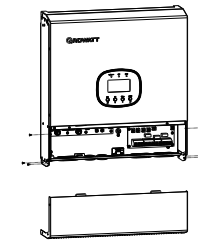


## 3.9 Wiring system for inverter

# 4. Operation

## 4.1 Power ON/OFF

After correct installation, switch on the battery switch, switch on the inverter switch, wait about 30s,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

LED Indicator

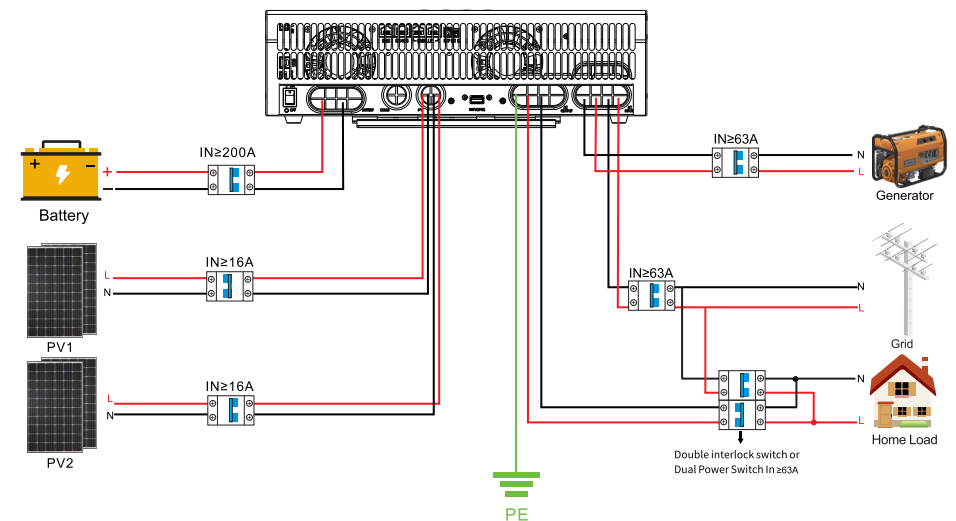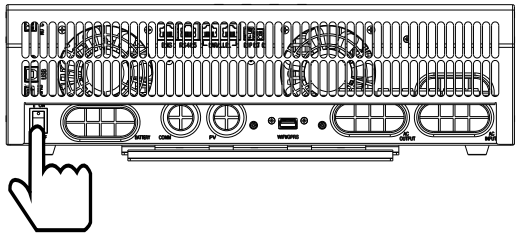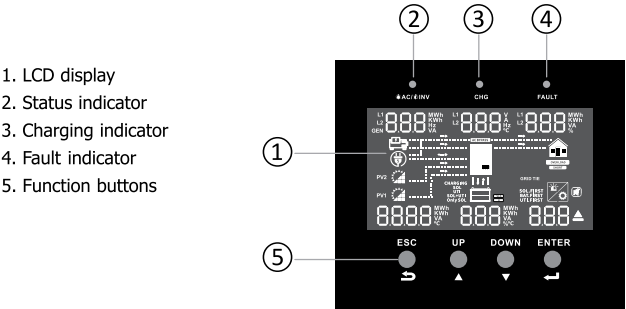| LED Indicator | | | Messages |
|---|---|---|---|
| ☀AC/☀INV | Green | Solid On | Output is powered by utility in Line mode. |
| | | Flashing | Output is powered by battery or PV in battery mode. |
| ☀CHG | Green | Solid On | Battery is fully charged. |
| | | Flashing | Battery is charging. |
| ⚠FAULT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

Function Buttons

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

## 4.2.1 LCD Display Icons
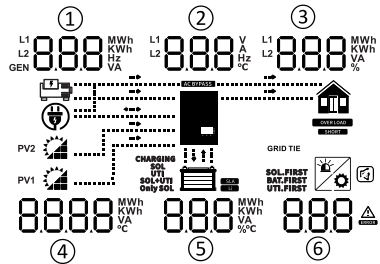
| Icon | Description |
|---|---|
| AC Input Information | |
| (AC input icon) | AC input icon |
| (Generator icon) | Generator icon |
| ① | Indicate AC input power, AC input voltage, AC input frequency, AC input current |
| AC BYPASS | Indicate AC power loads in bypass |
| PV Input Information | |
| PV2 / PV1 | Down: PV1 input icon    UP: PV2 input icon |
| ④ | Indicate PV power, PV voltage, PV current, etc |
| Output Information | |
| (Inverter icon) | Inverter icon |
| ② | Indicate output voltage, output current, output frequency, inverter temperature |
| Load Information | |
| (Load icon) | Load icon |
| ③ | Indicate power of load, power percentage of load |
| OVER LOAD | Indicate overload happened |
| SHORT | Indicate short circuit happened |
| Battery Information | |
| (Battery icon) | 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 |
| SLA | Indicate SLA battery |
| Li | Indicate lithium battery |
| CHARGING SOL / SOL+UTI / Only SOL | Indicate charging source priority: solar first, solar and utility, or only solar |
| Other Information | |
| SOL.FIRST / BAT.FIRST / UTI.FIRST | Indicate output source priority: solar first, utility first, SBU mode or SUB mode |
| ⑥ | Indicate warning code or fault code |
| (warning icon) | Indicate a warning or a fault is happening |
| (gear icon) | Indicate it's during setting values |
| (mute icon) | Indicate the alarm is disabled |
| GRID TIE | Indicate the grid is feeding |

| 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 will flash in turns. |
| | 50 ~ 52V | Bottom two bars will be on and the other 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 | |
| | 43.6~45.6V | |
| | 45.6~47.6V | |
| | > 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.
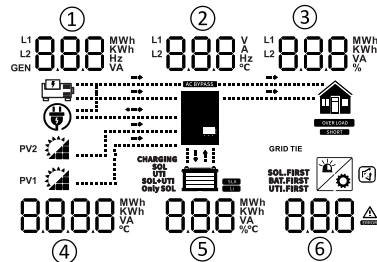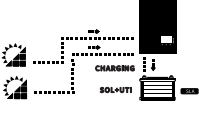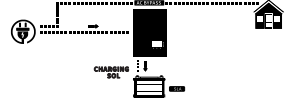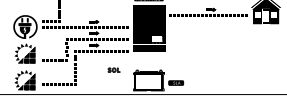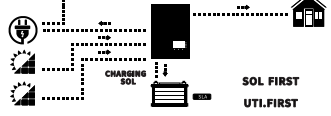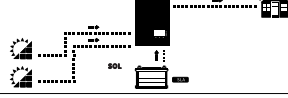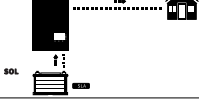


| Setting Information (Off grid) | LCD display: Left | LCD display: Right |
|---|---|---|
| ① AC Input voltage(grid input)<br>② Output voltage<br>③ Load percentage<br>④ Left: PV1 input voltage<br>    Right: PV2 input voltage<br>⑤ Battery voltage | 228ᵥ  227ᵥ  80%<br>299.1ᵥ  54.9ᵥ | 228ᵥ  229ᵥ  8.1%<br>296.6ᵥ  54.9ᵥ |
| ① AC Input voltage(generator input)<br>    (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.)<br>② Output voltage<br>③ Load percentage<br>④ Left: PV1 input voltage<br>    Right: PV2 input voltage<br>⑤ Battery voltage | 228ᵥ  229ᵥ  86%<br>296.9ᵥ  55.0ᵥ | 229ᵥ  228ᵥ  87%<br>295.5ᵥ  55.0ᵥ |
| ① AC Input frequency<br>② Output frequency<br>③ Load VA power<br>④ PV energy sum<br>⑤ Battery percentage or voltage | 50.0Hz  50.0Hz  0.96KVA<br>44.5KWh  79.0% | / |
| ① AC Input current<br>② Output current<br>③ Load percentage<br>④ Left: PV1 input current<br>    Right: PV2 input current<br>⑤ Battery charging current | 98A  4.2A  80%<br>2.3A  46.2A | 98A  4.3A  8.1%<br>2.3A  46.2A |
| ① AC input power<br>② Output voltage<br>③ Load power<br>④ Left: PV1 input power<br>    Right: PV2 input power<br>⑤ Battery charging power | 2.18KW  229ᵥ  0.96KW<br>0.680KW  2.59KW | 2.14KW  228ᵥ  0.94KW<br>0.673KW  2.58KW |
| ① AC input VA power<br>② Inverter temperature<br>③ Load VA power<br>④ llc temperature | 2.25KVA  30.1℃  0.95KVA<br>27.9℃ | / |

| ① Left: Today's Feed to Grid energy<br>   Right: Total Feed to Grid energy<br>② Output frequency<br>③ Left: Today's load energy<br>   Right: Total load energy<br>④ Left: Today's PV energy<br>   Right: Total PV energy<br>⑤ Left: Today's battery discharge energy<br>   Right: Total battery discharge energy<br>⑥ Indicate today's energy or total energy. | 0.1 KWh  499 Hz  0.4 KWh<br>18 KWh  0.0 KWh  tod | 0.1 KWh  499 Hz  19.7 KWh<br>446 KWh  23.1 KWh  tot |
|---|---|---|
| Firmware version<br>INV:156-00-606<br>LLC:157-00-606<br>COM: 158-00-606 | 156  00  606<br>157  00  606 | 156  00  606<br>158  00  606 |
| Time<br>(13:54:29, May 29, 2024) | 13  54  29<br>2024  05  29 | / |

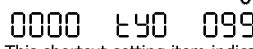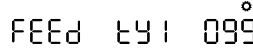| Setting Information (on grid) | LCD display: Left | LCD display: Right |
|---|---|---|
| ① Feed to Grid voltage<br>② Output voltage<br>③ Load percentage (Home Load+OP Load)<br>④ Left: PV1 input voltage<br>   Right: PV2 input voltage<br>⑤ Battery voltage | 229 V  229 V  6.7 %<br>402.2 V  52.0 V | 229 V  229 V  6.6 %<br>395.8 V  52.0 V |
| ① Feed to Grid frequency<br>② Output frequency<br>③ Load VA power (OP Load)<br>④ PV energy sum<br>⑤ Battery percentage or voltage | 499 Hz  500 Hz  0.64 KVA<br>70.8 KWh  52.0 V | 499 Hz  499 Hz  0.61 KVA<br>70.8 KWh  52.0 V |
| ① Feed to Grid current<br>② Output current<br>③ Load percentage (OP Load)<br>④ Left: PV1 input current<br>   Right: PV2 input current<br>⑤ Battery charging current | 2.6 A  1.6 A  0.3 %<br>7.6 A  79.8 A | 2.8 A  1.7 A  0.3 %<br>7.7 A  79.8 A |
| ① CT power<br>② CT active power screen<br>③ Load power (Home Load+OP Load)<br>④ Left: PV1 input power<br>   Right: PV2 input power<br>⑤ Battery charging power | 0.53 KW  C-t  0.02 KW<br>30.16 KW  4.15 KW | 0.53 KW  C-t  0.02 KW<br>3092 KW  4.14 KW |

| ① Feed to Grid power<br>② Output voltage<br>③ Load power (OP Load)<br>④ Left: PV1 input power<br>   Right: PV2 input power<br>⑤ Battery charging power | 0.54 KW  229 V  0.02 KW<br>2.997 KW  4.14 KW | 0.52 KW  229 V  0.01 KW<br>3.037 KW  4.14 KW |
|---|---|---|
| ① CT power<br>② CT active power screen<br>③ Load power (Home Load+OP Load)<br>④ Inverter temperature<br>⑤ llc temperature | 0.58 KVA  C-t  0.43 KVA<br>37.0 ℃  40.0 ℃ | 0.58 KVA  C-t  0.39 KVA<br>37.0 ℃  40.0 ℃ |
| ① Feed to Grid VA power<br>② Inverter temperature<br>③ Load VA power (OP Load)<br>④ llc temperature | 0.62 KVA  37.0 ℃  0.38 KVA<br>40.0 ℃ | / |
| ① Left: Today's Feed to Grid energy<br>   Right: Total Feed to Grid energy<br>② Output frequency<br>③ Left: Today's load energy<br>   Right: Total load energy<br>④ Left: Today's PV energy<br>   Right: Total PV energy<br>⑤ Left: Today's battery discharge energy<br>   Right: Total battery discharge energy<br>⑥ Indicate today's energy or total energy. | 0.0 KWh  500 Hz  0.6 KWh<br>2.5 KWh  3.4 KWh  tod | 42.1 KWh  499 Hz  468 KWh<br>710 KWh  17.7 KWh  tot |
| Firmware version<br>INV:156-00-606<br>LLC:157-00-606<br>COM: 158-00-606 | 156  00  606<br>157  00  606 | 156  00  606<br>158  00  606 |
| Time<br>(13:54:29, May 29, 2024) | 13  54  29<br>2024  05  29 | / |

## 4.2.3 Operating Mode Description

| Operation mode | Description | LCD display |
|---|---|---|
| Standby mode / Power saving mode<br>Note:<br>*Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.<br>*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**  |
| Line Mode | The unit will provide output power from the mains. It can also charge the battery at line mode. | **Charging by PV energy**<br>**Charging by utility**<br>**No battery connected**  |
| Feeds to the grid | Solar feeds to the grid or battery feeds to the grid | **PV energy charges battery, PV energy provides power to the load and feeds remaining energy to the grid.**  |
| Battery Mode | The unit will provide output power from battery and PV power. | **Power from battery and PV energy**<br>**Power from battery only**  |

## 4.3 LCD parameter 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 |
|---|---|---|
| 99 | Quick Settings<br>* After setting TY1, TY2, or TY3, the initial default values of some settings will be changed. Users can set them based on actual usage, which can help users quickly set the inverter settings | **Ty0: User-defined settings(default)**<br>`0000 tY0 099`<br>This shortcut setting item indicates that all of the following setting items are initial default values, and users need to change the setting items according to actual needs.<br><br>**Ty1: On Grid Mode**<br>`FEEd tY1 099`<br>Change the default values of the following settings as follows:<br><br>Program / Default / Setting Option table below<br><br>The values of these settings represent a brief description:<br>Solar energy can be fed into the power grid, default is the certification standard of the South African power grid, and the maximum power fed into the power grid is 6KW.<br>The specific priorities are as follows:<br><br>**1. Load priority setting:**<br>When there is solar energy: solar energy is prioritized to supply power to the loads, and excess power is charged to the battery; when there is insufficient solar energy, solar energy and utility supply power to the loads together; when there is insufficient solar energy and no utility, the battery will discharge.<br>When there is no solar energy, utility prioritizes supplying power to the load. When utility is not available, the battery only supplies power to the loads. |

| Program | Default | Setting Option |
|---|---|---|
| 01 | SUB | SUB |
| 03 | UPS | UPS |
| 14 | SNU | SNU |
| 55 | BLU | BLU,LBU,LUB |
| 67 | ENA | ENA, DIS |
| 68 | SAF | SAF |
| 69 | 6KW | 0--6KW |
| 71 | DIS | ENA, DIS |
| 76 | DIS | ENA, DIS |
| 78 | 0 | 0--6KW |
| 79 | DIS | ENA, DIS |
| 80 | 12KW | 0--12KW |

**2.Charging priority setting:**
solar energy and utility jointly charge the battery, and utility charging time is executed according to the program 75 setting time.

**3. Solar priority setting:**
BLU (default): Solar energy prioritizes charging the battery, excess energy is used to power the load, and finally the remaining energy is fed to the grid.
LBU: Solar energy is prioritized to power the load, excess energy is charged to the battery, and finally the remaining energy is fed to the grid.
LUB: Solar energy is prioritized to power the load, excess energy is fed to the grid, and finally there is surplus energy to charge the battery.

**4. Battery energy priority:**
The battery can be discharged only when there is no utility.

TY2：Zero Export Limit Mode

`COUt  tY2  099`

Change the default values of the following settings as follows:

| Program | Default | Setting Option |
|---|---|---|
| 01 | SUB | SUB |
| 03 | UPS | UPS |
| 14 | SNU | SNU |
| 55 | LUB | BLU,LBU,LUB |
| 67 | ENA | ENA, DIS |
| 68 | SAF | SAF |
| 69 | 6KW | 0--6KW |
| 71 | ENA | ENA, DIS |
| 76 | ENA | ENA, DIS |
| 78 | 0 | 0--6KW |
| 79 | DIS | ENA, DIS |
| 80 | 12KW | 0--12KW |

The values of these settings represent a brief description:
Solar and battery energy can be fed into the power grid, default is the certification standard of the South African power grid, and the maximum power fed into the power grid is 6KW. At the same time, the anti-backflow power is 0KW.
The specific priorities are as follows:

**1. Load priority setting:**
When there is solar energy: when there is sufficient solar energy, the solar energy is prioritized to supply power to the load, and then fed into the grid, and the excess is used to charge the battery; when there is insufficient photovoltaic energy, during the battery feeding time (Program 74), the solar energy and the battery supply power to the load and the grid together; when not during the battery feeding time (Program 74), the solar energy and utility supply power to the load together.
When there is no solar energy: during the battery feeding time (program 74), the battery supplies power to the load and feeds the grid; outside the battery feeding time (program 74), utility supplies power to the load.

**2.Charging priority setting:**
When there is solar energy, the solar energy charges the battery with excess energy after loading and feeding the grid; when there is no solar energy, utility sets the charging time according to program 75.

**3. Solar priority setting:**
BLU : Solar energy prioritizes charging the battery, excess energy is used to power the load, and finally the remaining energy is fed to the grid.
LBU: Solar energy is prioritized to power the load, excess energy is charged to the battery, and finally the remaining energy is fed to the grid.
LUB (default): Solar energy is prioritized to power the load, excess energy is fed to the grid, and finally there is surplus energy to charge the battery.

**4. Battery energy priority:**
When there is sufficient solar energy, the excess solar energy charges the battery.
When the solar energy is insufficient, the battery is allowed to discharge during the feeding period according to program 74.

TY3：Off Grid Mode

`OFFG  tY3  099`

Change the default values of the following settings as follows:

| Program | Default | Setting Option |
|---|---|---|
| 01 | UTI | UTI,SOL,SBU, SUB |
| 03 | APL | UPS,APL |
| 14 | CSO | CSO,OSO,SNU |
| 55 | BLU | BLU,LBU,LUB |
| 67 | DIS | ENA, DIS |
| 68 | SAF | SAF |
| 69 | 6KW | 0--6KW |
| 71 | DIS | ENA, DIS |
| 76 | DIS | ENA, DIS |
| 78 | 0 | 0--6KW |
| 79 | DIS | ENA, DIS |
| 80 | 12KW | 0--12KW |

The values of these settings represent a brief description:
Grid connection is not enabled, enter off grid mode .
The specific priorities are as follows:

**1. Load priority setting:**
When there is utility: during the output time of program 50, utility bypasses to supply power to the load; outside the output time of utility, the battery and photovoltaic supply power to the load.
When there is no utility: battery and solar energy provide power to the load.

**2. Charging priority setting:**
Prioritize solar energy to charge the battery.
When there is solar energy, solar energy charges the battery.
When there is no solar energy, utility charges the battery during the program 50 grid output time and the program 49 utility charging time.

| 01 | Output source priority: To configure load power source priority.（After program 67 are enabled, this program is fixed SUB and cannot be set.） | **Solar first** `OP.Pr SOL 001` <sub>SOL.FIRST</sub> |
|---|---|---|
| | | 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:<br>- Solar energy is not available<br>- Battery voltage drops to either low-level warning voltage or the setting point in program 12. |
| | | **Utility first** `OP.Pr Uti 001` <sub>UTL.FIRST</sub> |
| | | 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** `OP.Pr SbU 001` <sub>BAT.FIRST</sub> |
| | | 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(default)** `OP.Pr SUb 001` <sub>SOL.FIRST UTL.FIRST</sub> |
| | | 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. | `CHG.1 50 A 002`<br>Default 50A, 0A~100A Settable<br>(Max. charging current = utility charging current + solar charging current)<br>(If LI is selected in Program 5, this program can't be set up) |
| 03 | AC input voltage range（After program 67 are enabled, this program is fixed UPS and cannot be set.） | Appliance (default)<br>`AC.u APL 003`<br>If selected, acceptable AC input voltage range will be within: 90~280VAC |
| | | UPS<br>`AC.u UPS 003`<br>If selected, acceptable AC input voltage range will be within: 170~280VAC |
| 04 | Power saving mode enable/disable | Saving mode disable (default)<br>`SAuE diS 004`<br>If disabled, no matter connected load is low or high, the on/off status of inverter output will not be effected. |
| | | Saving mode enable<br>`SAuE EnA 004`<br>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 AGñ 005` |
|---|---|---|

AGM (default)—Suitable for lead-acid battery

| Items that cannot be set | 19 | 20 | 21 |
|---|---|---|---|
| default | 56.4V | 54V | 42V |

| Items that can be set: | default | Set range | Set requirements |
|---|---|---|---|
| 02 | 80A | 0A~100A | |
| 11 | 60A | 0A~80A | |
| 12 | 46V | 44~51.2V | <13 setting value |
| 13 | 54v | 48~58.0V | |

Flooded—Suitable for lead-acid battery or flood battery `bAtt FLd 005`

| Items that cannot be set: | 19 | 20 | 21 |
|---|---|---|---|
| default | 58.4V | 56V | 42V |

| Items that can be set: | default | Set range | Set requirements |
|---|---|---|---|
| 02 | 80A | 0A~100A | |
| 11 | 60A | 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`

| Items that cannot be set： | 02 | 19 | 20 |
|---|---|---|---|
| default | | 54V | 54V |

| Items that can be set: | default | Set range | Set requirements |
|---|---|---|---|
| 11 | 20A | 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`

| Items that can be set: | default | Set range | Set requirements |
|---|---|---|---|
| 02 | 50A | 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 |

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  US2  005`

| Items that can be set: | default | Set range | Set requirements |
|---|---|---|---|
| 02 | 20A | 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 |

| No. | Name | Left option | Right option |
|---|---|---|---|
| 06 | Auto restart when overload occurs | Restart disable (default)  `LdrS dIS 006` | Restart enable  `LdrS ENA 006` |
| 07 | Auto restart when over temperature occurs | Restart disable (default)  `trrS dIS 007` | Restart enable  `trrS ENA 007` |
| 08 | Output voltage | 230V (default)  `OUtY 230 008`  240V  `OUtY 240 008` | 220V  `OUtY 220 008`  208V  `OUtY 208 008` |
| 09 | Output frequency | 50Hz (default)  `OUtF 50 009` | 60Hz  `OUtF 60 009` |

**11 — Maximum utility & Generator charging current**

`ACI        30ᴬ`

`GEN!      20ᴬ  011`

Default 30A/20A, 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 or generator charger

**12 — Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 01**

`b2AC  46.0ᵛ  012`

The default value and adjustable range vary in different Battery type, please refer to program 5 for details
Limit: program 21 +2V≤ program 12 ≤ program 13 -2V
Limit: program 21 +5%≤ program 12 ≤ program 13 -5%

**13 — Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01**

`AC2b  54.0ᵛ  013`

The default value and adjustable range vary in different Battery type, please refer to program 5 for details
Limit: program 12 +2V ≤ program 13
Limit: program 12 +5% ≤ program 13

---

**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 inverter is working in Line, Standby or Fault mode, charger source can be programmed as below:

| Option | Description |
|---|---|
| Solar first  `CG.Pr ˢᵒᴸ CS0 014` | Solar energy will charge battery as first priority.  Utility will charge battery only when solar energy is not available. |
| Solar and Utility (default)  `CG.Pr ˢᵒᴸ⁺ᵁᵀᴵ SNU 014` | Solar energy and utility will both charge battery. |
| Only Solar  `CG.Pr ᴼⁿˡʸ ˢᴼᴸ OS0 014` | Solar energy will be the only charger source no matter utility is available or not. |

If this 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.

| No. | Name | Left option | Right option |
|---|---|---|---|
| 15 | Alarm control | Alarm on (default)  `bU22 ON 015` | Alarm off  `bU22 OFF 015` |
| 16 | Backlight control | Backlight on  `LCdb ON 016` | Backlight off (default)  `LEdb OFF 016` |
| 17 | Beeps while primary source is interrupted | Alarm on (default)  `ALAn ON 017` | Alarm off  `ALAn 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`

The default value and adjustable range vary in different Battery type, please refer to program 5 for details. program 19≥ program 20

**20 — Floating charging voltage.**

`FLtY  54.0ᵛ  020`

The default value and adjustable range vary in different Battery type, please refer to program 5 for details. program 19≥ program 20

**21 — Low DC cut-off voltage.**

`CUtY  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.

Limit: program 21≤ program 12 -2V(5%).

| | | | |
|---|---|---|---|
| 23 | AC output mode<br>*This setting is only available when the inverter is in standby mode (Switch off).<br>**Note:**<br>Parallel operation can only work when battery connected | Parallel: (default)<br>PrLL  PAL  023<br>L2 Phase:<br>PrLL  3P2  023 | L1 Phase:<br>PrLL  3P1  023<br>L3 Phase:<br>PrLL  3P3  023 |
| | | When the units are used in parallel with single phase or alone, please select "PAL" in program 23.<br><br>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. | |
| 24 | Dry control | Dry off<br>dry  diS  024<br>Dry Auto (default)<br>dry  AtO  024 | Dry on<br>dry  ENA  024 |
| 28 | Address setting<br>(for expansion) | Addr  1  028<br>Default 1, 1~255 Settable | |
| 37 | Real time setting---Year | 2024  037 | range 2000~2099 |
| 38 | Real time setting---Month | mon  12  038 | range 01~12 |
| 39 | Real time setting---Date | dAY  13  039 | range 01~31 |
| 40 | Real time setting---Hour | HOur  13  040 | range 00~23 |
| 41 | Real time setting---Minute | min  50  041 | range 00~59 |
| 42 | Real time setting---Second | SEC  50  042 | range 00~59 |
| 43 | Battery equalization | Battery equalization enable<br>E9  ENA  043 | Battery equalization disable(default)<br>E9  diS  043 |
| | | If "Flooded" or "User-Defined" is selected in program 05, this program can be set up. | |
| 44 | Battery equalization voltage | E9v  58.4  044<br>Default 58.4V, 48.0V~58.4V Settable | |
| 45 | Battery equalized time | min<br>E9t  60  045 | Default 60min, 5min~900min Settable |
| 46 | Battery equalized timeout | min<br>E9tO  120  046 | Default 120min, 5min~900min Settable |

| | | | |
|---|---|---|---|
| 47 | Equalization interval | dAY<br>E9  30  047 | Default 30days, 1 days~90 days Settable |
| 48 | Equalization activated immediately | Equalization activated immediately on<br>E9  On  048 | Equalization activated immediately off(default)<br>E9  OFF  048 |
| | | 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 "E9". If "Off" is selected, it will cancel equalization function until next activated equalization time arrives based on program 47setting. At this time, "E9" will not be shown in LCD main page. | |
| 49 | Utility charging time<br>(This program can only be set when program 67 are not enabled) | 0000(default)<br>Allow utility to charge the battery all day run.<br>CHG  LIm<br>0000  StA  049<br>CHG  LIm<br>0000  ENd  049 | The start time can be set in the range: 00-23 (hour), 00-59 (min)The end time can be set in the range: 00-23 (hour), 00-59 (min)0000 defaults to 4 digits in total, the first two digits set the hour, and the last two digits set the minute.(Set the same number from start to end time, indicating that it is valid for 24 hours)For example: Sta2300-End2000, which means the allowed mains charging time range is from 23:00 to 20:00 of the next day. |
| 50 | Utility output time<br>(This program can only be set when program 67 are not enabled) | 0000(default)<br>Allow utility r to power the load all day run.<br>OUP  LIm<br>0000  StA  050<br>OUP  LIm<br>0000  ENd  050 | The start time can be set in the range: 00-23 (hour), 00-59 (min)The end time can be set in the range: 00-23 (hour), 00-59 (min)0000 defaults to 4 digits in total, the first two digits set the hour, and the last two digits set the minute.(Set the same number from start to end time, indicating that it is valid for 24 hours)For example: Sta2300-End2000, which means the allowed mains charging time range is from 23:00 to 20:00 of the next day.<br>Item 01 will only take effect if it is set to UTI. |
| 54 | Lithium battery strong charging execution cycle time.<br>(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)<br>FCHG  OFF  054 | ON : Turn on periodic strong charging .Default 30days, 1 days~90 days Settable<br>FCHG  ON  054<br>FCHG  030  054 |

| 55 | Setting solar energy supply priority when selecting "SUB priority" in program 01 (Only selecting enable in program 67 and disable in program71 ,program 55 can work) | Charge first (default) **S.Crd bLU 055** | Solar energy provides power to charge battery as first priority. Solar energy provides power to feed to grid as second priority. |
|---|---|---|---|
| | | Load first **S.Crd LbU 055** | Solar energy provides power to the loads as first priority. Solar energy provides power to the charge battery as second priority. |
| | | Load first **S.Crd LUb 055** | Solar energy provides power to the loads as first priority. Solar energy provides power to feed to grid as second priority. |
| 56 | NG relay enable setting | NG relay enable(default) **nGry EnA 056** | Grounding in inverter operation mode, ungrounded in grid operation mode |
| | | NG relay disable **nGry diS 056** | No grounding in any mode |
| 57 | The power grid mode allows the second AC output to remain on | Disable(default) **OP.2 diS 057** | Enable **OP.2 EnA 057** |
| 58 | Setting of the second AC output time period | First time period **0000 001 058** | Second time period **0000 002 058** |
| | | Third time period **0000 003 058** | |
| | | Second AC output start time **2359 StA 058** | Second AC output shutdown time **0000 End 058** |
| | | 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 second AC output time range from 23:00 to 20:59 the next day. | |
| 59 | The cut-off battery voltage point/SOC setting for the second AC output | **LOSS 48.0v 059** Default 48.0V, 44.0V~54.0V Settable Lithium battery mode：Default 60%, 20%~70% Settable | |
| 60 | Recovery battery voltage point/SOC setting for the second AC output | **bACt 53.0v 060** Default 53.0V, 48.0V~58.0V Settable Lithium battery mode：Default 90%, 20%~100% Settable | |
| 61 | Setting of PV power value for the second AC output to be turned on | **PuL 0.0kw 061** Default 0.0KW, 0KW~6KW Settable | |
| 62 | Menu Return Settings | Disable(default) **nENU diS 062** | Display screen page remains stuck |
| | | Enable **nENU EnA 062** | Automatically return to the main page after no human-machine interface operation within five minutes |
| 65 | Generator run time | **GEN run tin** Default 00, range 01~23 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. **HOUr 04 065** | |

| 66 | BMS Communication Loss | Enable (default) **bnSE EnA 066** | If BMS Communication Loss, The inverter 04 and 20 warning Icon flashing , but enable to work for original status. |
|---|---|---|---|
| | | Disable **bnSE 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) |
| 67 | Feed to grid configuration | Feed to grid disable(default) **FEEd diS 067** | Solar energy feed to grid disable. |
| | | Feed to grid enable **FEEd EnA 067** | Solar energy feed to grid enable. |
| 68 | Set country customized Regulations *This setting is only available when the program 67 is that Feed to grid enable | South Africa(Default) **FrnG SAF 068** | If selected, acceptable feed-in grid voltage range will be195.5~253VAC. Acceptable feed-in grid frequency range will be 49.0~51.0Hz. |
| | | Europe **FrnG EUr 068** | If selected, acceptable feed-in grid voltage range will be184~264.5VAC. Acceptable feed-in grid frequency range will be 51.5~47.5Hz. |
| | | South America **FrnG SAd 068** | If selected, acceptable feed-in grid voltage range will be184~264.5VAC. Acceptable feed-in grid frequency range will be 57~62Hz. |
| | | Asia **FrnG ASA 068** | If selected, acceptable feed-in grid voltage range will be195.5~253VAC. Acceptable feed-in grid frequency range will be 47.0~51.5Hz. |
| 69 | Feed grid power settings | **FEEd 6.0kw 069** The maximum feed grid power can be set Default 6KW, 0KW~6KW Settable | |
| 70 | battery feed current | **L99A 140A 070** Default 140A, 0A~150A Settable *If Program 05 is set to Li mode. The value LXXX in the lower left corner of the LCD is the maximum allowable discharge current of the lithium battery. The middle value is to set the maximum allowable discharge current value of the battery. The smaller of the two is the current limit value of the battery feed grid. | |
| 71 | battery feed enable | Feed to grid disable(default) **FEEd diS 071** | battery energy feed to grid disable. |
| | | Feed to grid enable **FEEd EnA 071** | battery energy feed to grid enable. |
| 72 | batery feed loss point | **LOSS 46.0v 072** Lithium battery mode：Default 40%, 30%~90% Settable The other battery mode: Default46.0V, 46.0V~52.0V Settable | |
| 73 | battery feed back point | **bACt 54.0v 073** Lithium battery mode：Default 80%, 40%~100% Settable The other battery mode: Default 54.0V, 48.0V~54.0V Settable | |

| | | | |
|---|---|---|---|
| 74 | battery feed time | **First time period**<br>`0800  001  074` | **Second time period**<br>`1200  002  074` |
| | | **Third time period**<br>`1800  003  074` | |
| | | **Battery feed start time**<br>`0800  StA  074` | **Battery feed shutdown time**<br>`1159  End  074` |
| | | * There are three time periods for battery feeding that can be set, which can be achieved by setting the start feeding time and the ending feeding time.<br>*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 battery feeding time range from 23:00 to 20:59 the next day. | |
| 75 | Grid charging time<br>(The setting is only valid when program 67 is enabled) | **First time period**<br>`2000  001  075` | **Second time period**<br>`0000  002  075` |
| | | **Third time period**<br>`0600  003  075` | |
| | | **Grid charging start time**<br>`2000  StA  075` | **Grid charging shutdown time**<br>`2359  End  075` |
| | | * There are three time periods for grid charging that can be set, which can be achieved by setting the start feeding time and the ending feeding time.<br>*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 grid charging time range from 23:00 to 20:59 the next day.<br>Note: When time period 1 is set to 0000, it means that charging can be done during the entire time period; charging takes priority over power feeding. | |
| 76 | External CT | **disable(default)**<br>`EtCt  diS  076` | Disable external CT Anti-backflow function |
| | | **enable**<br>`EtCt  EnA  076` | Enable external CT Anti-backflow function |
| 77 | External CT sampling ratio | `2000  Ctr  077`<br>Default 2000, 1000~9999 Settable.<br>For example,2000 means the sampling ratio is 1:2000 | |
| 78 | Anti-backflow power<br>(The setting is only valid when program 76 is enabled) | `E11P  000ᴋᵂ 078`<br>Default 0kW, 0~6.0KW Settable | |
| 79 | Grid peak cutting | **Disable(default)**<br>`Grid  diS  079` | **Enable**<br>`Grid  EnA  079` |
| 80 | Grid peak cutting power<br>(The setting is only valid when program 79 is enabled) | `Grid  120ᴋᵂ 080`<br>Default 12.0kW, 0~12.0kW Settable | |

# 5. Parallel Installation Guide

Introduction

This inverter can be used in parallel with two different operation modes.

1. Parallel operation in single phase with up to 9 units.
2. Maximum 9 units work together to support 3-phase equipment. Seven units support one phase maximum.

## 5.1 Parallel accessories



Parallel communication cable
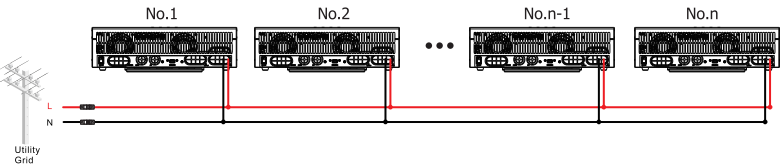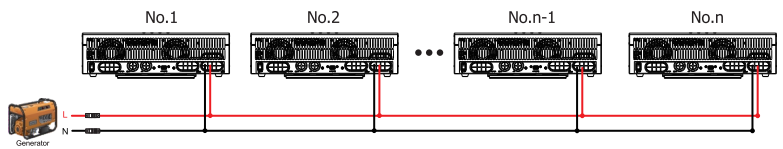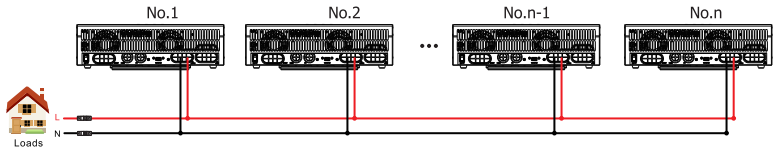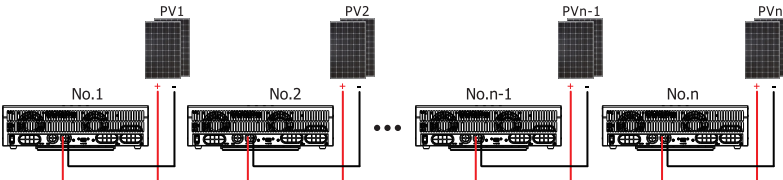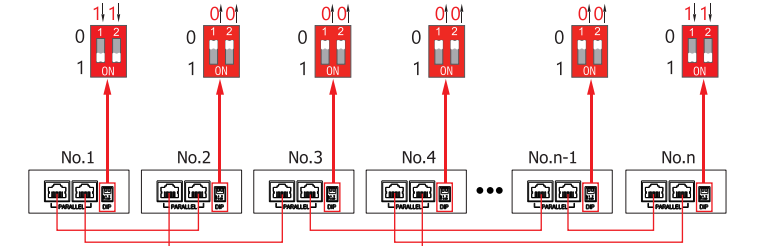
## 5.2 Points of Attention for Parallel

- Ensure that all breakers in the line on the load side are disconnected.
- Be sure the length of all battery cables is the same. Otherwise, there will be voltage difference between inverter and battery to cause parallel inverters not working.
- Be sure that all inverters will share the same battery bank. Otherwise, the inverters will transfer to fault mode.
- Each inverter in the parallel system can only be connected to a separate PV string, and it is prohibited for multiple PV ports to share the same string, and there is a risk of blowing up the inverter.
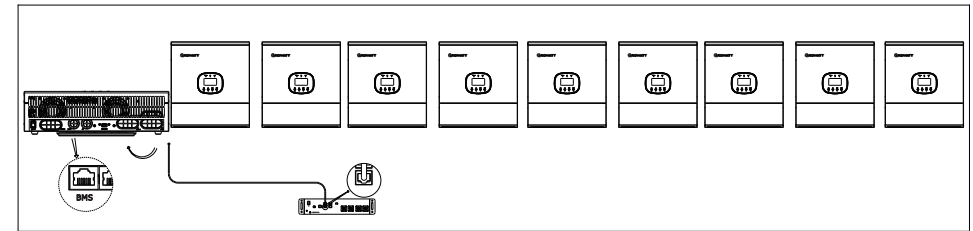- Recommended battery capacity.

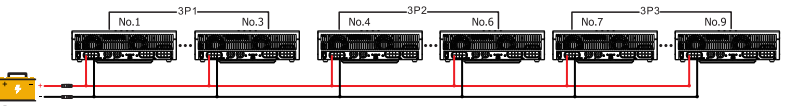| Inverter parallel numbers | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Battery Capacity | 400AH | 600AH | 800AH | 1000AH | 1200AH | 1400AH | 1600AH | 1800AH |

## 5.3 Wire Connections

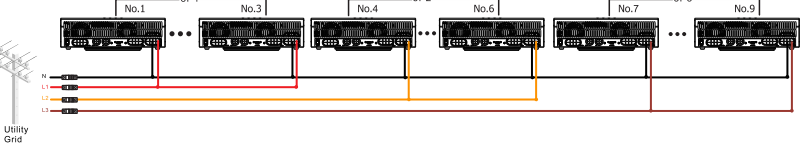### 5.3.1 Single-phase parallel wire connection

| Parallel mode Port | Charts and descriptions |
|---|---|
| DC Input<br>left-positive,<br>right-negative | When the inverters are connected in parallel, the + wires are connected together and the - wires are connected together at the DC input.（chart below）<br><br>In the inverter parallel system, each inverter battery needs to be connected to a DC circuit breaker, single access circuit breaker specifications recommended 400 A. If you choose to access the total circuit breaker at the system end, the recommended access circuit breaker specifications 400 A * the number of parallel (eg: four inverter system access to the total circuit breaker, the recommended access circuit breaker specifications 1600A) |

| | |
|---|---|
| **AC Input** | When the inverters are connected in parallel, the N wires are connected together and the L wires are connected together at the AC input.（chart below） |
| |  |
| | In an inverter-parallel system, an AC circuit breaker is required to be connected to the utility for each inverter, and a single access circuit breaker size of 70A is recommended. |
| **Generator** | When the inverters are connected in parallel, the N wires are connected together and the L wires are connected together at the generator input (chart below). |
| |  |
| **AC Output** | When the inverters are connected in parallel, the N wires are connected together and the L wires are connected together at the AC output (chart below). |
| |  |
| | In an inverter-parallel system, an AC circuit breaker is required to be connected to the load for each inverter, and a single access circuit breaker size of 70A is recommended. |
| **PV Input** | Each inverter in the system is individually connected to the PV string (chart below). |
| |  |
| **Parallel communication port** | Please put the CAN communication DIP to on status for the first and the end inverter. |
| |  |
| **Lithium BMS Communication port** | Make sure to connect the BMS communication cable between the battery and one inverter of the parallel system. It's recommended to connect to the master inverter of the parallel system. |



## 5.3.2 Three-phase parallel wire connection

| Parallel mode Port | Charts and descriptions |
|---|---|
| **DC Input left-positive, right-negative** | When the inverters are connected in parallel, the + wires are connected together and the - wires are connected together of the DC input (chart below). |
| |  |
| | In the inverter parallel system, each inverter battery needs to be connected to a DC circuit breaker, single access circuit breaker specifications recommended 400 A. If you choose to access the total circuit breaker at the system end, the recommended access circuit breaker specifications 400 A * the number of parallel (eg: four inverter system access to the total circuit breaker, the recommended access circuit breaker specifications 1600A). |
| **AC Input** | After the inverter is connected in parallel, at the AC input, the N wires are connected together and the L wires are connected together of each phase (chart below). |
| |  |
| | In an inverter-parallel system, an AC circuit breaker is required to be connected to the utility for each inverter, and a single access circuit breaker size of 70A is recommended. |
| **Generator** | After the inverter is connected in parallel, at the generator input, the N wires are connected together and the L wires are connected together of each phase（chart below）. |
| |  |
| **AC Output** | After the inverter is connected in parallel, at the AC output, the N wires are connected together and the L wires are connected together of each phase (chart below). |
| |  |
| | In an inverter-parallel system, an AC circuit breaker is required to be connected to the utility for each load, and a single access circuit breaker size of 70A is recommended. |

| PV Input | Each inverter in the system is individually connected to the PV string（chart below） |
|---|---|
| |  |
| Parallel communication port | Please put the CAN communication DIP to on status for the first and the end inverter. |
| |  |
| Lithium BMS Communication port | Make sure to connect the BMS communication cable between the battery and one inverter of the parallel system. It's recommended to connect to the master inverter of the parallel system. |
| |  |

## 5.4 Parallel Example

Parallel Operation in Single Phase

Single-phase parallel master and slave do not need to be set, the system automatically assigns the master and slave according to the order of start-up, the first one to start is the master, and the rest are the slaves. Be sure to confirm that the wiring is correct, the wiring is shown in the following figure, parallel less than nine wires in order to reduce.

Nine inverters in parallel:

Power Connection
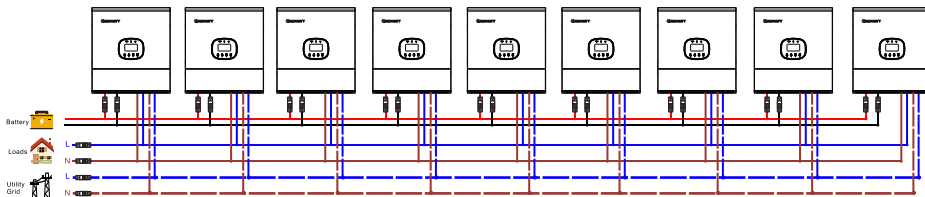


Parallel Operation in Three Phase

Try to connect to the utility at the same time after three-phase parallel connection.

When setting up three-phase parallel, you need to define the master and the slave, see the 5.5 for the specific setting method. Be sure to confirm that the wiring is correct, the wiring method is shown in the table below. The following chart is an example of (3+3+3) (4+3+2)

(3+3+3)Three inverters in one phase, three inverters in second phase and three inverters for the third phase:
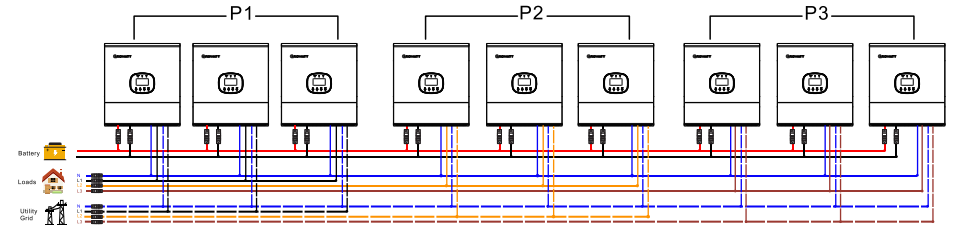
Power Connection



(4+3+2)Four inverters in one phase, three inverters in second phase and two inverters for the third phase:

Power Connection
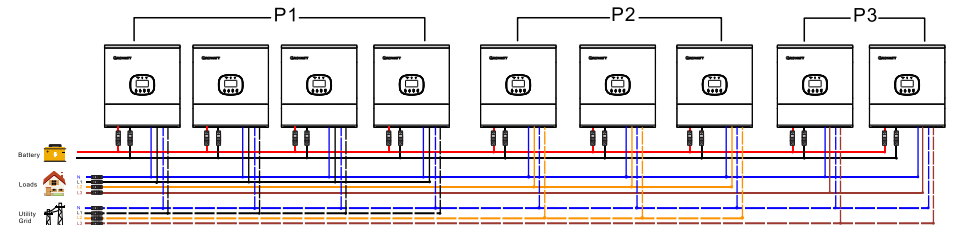


## 5.5 Parallel setup and display

Refer to Program 23 on Page 21

Parallel in Single Phase

Step 1: Check the following requirements before commissioning:

• Correct wire connection.

• Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on each unit and set "PAL" in LCD setting program 23 of each unit. And then shut down all units.

**Note:** It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on each unit.

| LCD display in Master unit | LCD display in Slave unit |
|---|---|
|  |  |

**Note:** Master and slave units are randomly defined.

Step 4: Switch on all AC breakers of Line wires in AC input. It's better to have all inverters connect to utility at the same time. If not, it will display warning 15.

| LCD display in Master unit | LCD display in Slave unit |
|---|---|
| 230ᵥ _ 230ᵛ _ 01% <br><br> 00  56.4ᵥ  HSt | 230ᵥ _ 230ᵛ _ 01% <br><br> 00  56.4ᵥ  SL1 |

Step 5: If there is no more fault alarm, the parallel system is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Parallel in Three Phase

Step 1: Check the following requirements before commissioning:
- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on all units and configure LCD program 23 as P1, P2 and P3 sequentially. Then shut down all units.

**Note:** It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on all units sequentially. Please turn on HOST inverter first, then turn on the rest one by one.

| LCD display in L1-phase unit | LCD display in L2-phase unit | LCD display in L3-phase unit |
|---|---|---|
| 0ᵥ  230ᵛ  0.1% <br><br> 00ᵥ  56.4ᵥ  HSt | 0ᵥ  230ᵛ  0.1% <br><br> 00ᵥ  56.4ᵥ  3P2 | 0ᵥ  230ᵛ  0.1% <br><br> 00ᵥ  56.4ᵥ  3P3 |

Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and three phases are matched with unit setting, they will work normally. Otherwise, they will display warning 15/16 and will not work in the line mode.

| LCD display in L1-phase unit | LCD display in L2-phase unit | LCD display in L3-phase unit |
|---|---|---|
| 230ᵥ _ 230ᵛ _ 01% <br><br> 00ᵥ  56.4ᵥ  HSt | 230ᵥ _ 230ᵛ _ 01% <br><br> 00ᵥ  56.4ᵥ  3P2 | 230ᵥ _ 230ᵛ _ 01% <br><br> 00ᵥ  56.4ᵥ  3P3 |

Step 5: If there is no more fault alarm, the system to support 3-phase equipment is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

**Note 1:** If there's only one inverter in L1-phase, the LCD will show as "HST". If there is more than one inverter in L1-phase, the LCD of the HOST inverter will show as "HST", the rest of L1-phase inverters will show as "3P1".

**Note 2:** To avoid overload occurring, before turning on breakers in load side, it's better to have whole system in operation first.

**Note 3:** Transfer time for this operation exists. Power interruption may happen to critical devices, which cannot bear transfer time.

## 5.6 Example of a parallel system diagram

Single-phase parallel wire connection：
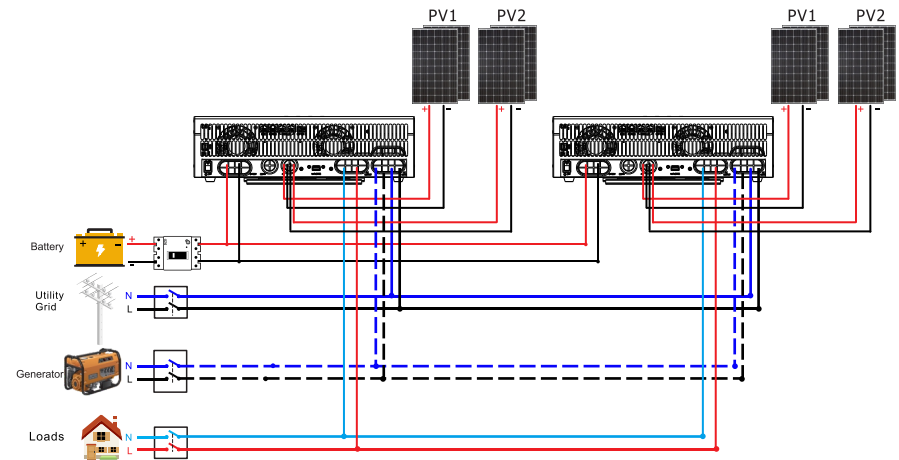


Three-phase parallel wire connection：
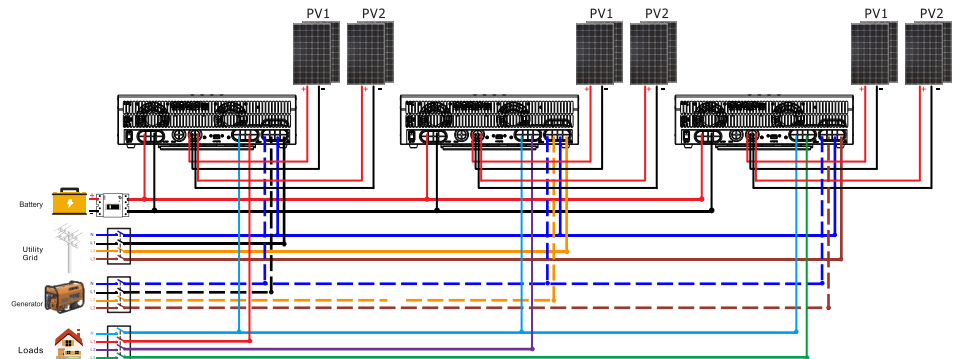
# 6. Fault Reference Code

## 6.1 Fault Reference Code
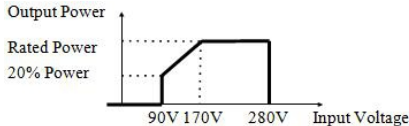
| Fault Code | Fault Event | Icon on |
|---|---|---|
| 02 | Over temperature | 02 |
| 03 | Battery voltage is too high | 03 |
| 05 | Output short circuited | 05 |
| 06 | Output voltage is too high. | 06 |
| 07 | Overload time out | 07 |
| 08 | Bus voltage is too high | 08 |
| 09 | Bus soft start failed | 09 |
| 11 | The main relay failed | 11 |
| 18 | LLC Over current or surge | 18 |
| 50 | IGBT Over current or surge | 50 |
| 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 |
| 66 | GFCI is too high | 66 |
| 67 | DCI failed | 67 |
| 80 | CAN fault | 80 |

## 6.2 Warning Indicator

| Warning Code | Warning Event | Audible Alarm | Icon flashing |
|---|---|---|---|
| 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 △ |
| 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 △ |
| 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 △ |
| 23 | The parallel version is different | Beep once every second | 23 △ |
| 25 | Parallel inverters' capacity different | Beep once every second | 25 △ |
| 26 | ISO detection failed | Beep once every second | 26 △ |
| 28 | GFCI error | Beep once every second | 28 △ |
| 36 | Li battery total over voltage | Beep once every second | 36 △ |
| 37 | Li battery total under voltage | Beep once every second | 37 △ |
| 38 | Li battery discharge over voltage | Beep once every second | 38 △ |
| 39 | Li battery charge over voltage | Beep once every second | 39 △ |
| 40 | Li battery discharge over temperature | Beep once every second | 40 △ |
| 41 | Li battery charge over temperature | Beep once every second | 41 △ |
| 81 | Host loss | Beep once every second | 81 △ |

# 7. Specifications

## 7.1 AC Input Specifications

| INVERTER MODEL | SPE 6000TL HVM-G2 |
|---|---|
| Nominal Input Voltage | 230Vac |
| Input Voltage Range | 170~280Vac（UPS）; 90~280Vac（APL） |
| Low Loss Voltage | 170Vac±7V (UPS); 90Vac±7V (APL) |
| Low Loss Return Voltage | 180Vac±7V (UPS); 100Vac±7V (APL) |
| High Loss Voltage | 280Vac±7V |
| High Loss Return Voltage | 270Vac±7V |
| Nominal Input Frequency | 50Hz / 60Hz (Auto detection) |
| Low Loss Frequency | 40±1Hz |
| Low Loss Return Frequency | 42±1Hz |
| High Loss Frequency | 65±1Hz |
| High Loss Return Frequency | 63±1Hz |
| Overload Protection | AC Bypass: load≤110%, normal; 110%＜load ＜150%, 07 warning load ＞150%: 5s AC Input Circuit ⪢40A: 10s |
| Output Short Circuit Protection | Circuit Breaker |
| MAX Bypass Circuit | 40A±1A |
| Transfer Time | 10ms typical, RCD 20ms Max@ Single <30ms @ Parallel |
| Output power derating: When AC input voltage drops to 170V, the output power will be derated. |  |

## 7.2 Inverter Mode Specifications

| INVERTER MODEL | SPE 6000TL HVM-G2 |
|---|---|
| Output Voltage Waveform | Pure Sine Wave |
| No Load Power Consumption | ＜ 35W |
| Rated Output Power | 6.0KVA/6.0KW |
| Nominal Output Current | 26.1A |
| Output Voltage Regulation | 230Vac±2% |
| Output Frequency | 50Hz/60Hz±0.3Hz |
| Output Voltage THDV | Linear Load＜3%, Nolinear Load ‹ 5% |
| INV Efficiency | 95.5% MAX |
| Overload Protection | Inverter: 101%< load <150% : 10s; load ＞150%: 5s |
| Nominal DC Input Voltage | 48Vdc |
| Cold Start Voltage(Lead-Acid Mode) | 46.0Vdc |
| Low DC Cut-off Voltage (Lead-Acid Mode) | 42.0Vdc @ load < 20% 40.8Vdc @ 20% ≤ load < 50% 38.4Vdc @ load ≥ 50% |
| Low DC Warning Voltage (Lead-Acid Mode) | Low DC Cut-off SOC + 2Vdc |
| Low DC Warning Return Voltage (Lead-Acid Mode) | Low DC Cut-off SOC + 4Vdc |
| Low DC Cut-off SOC (Li Mode) | 20% |
| Cold Start SOC(Li Mode) | Low DC Cut-off SOC + 10% |
| 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% |
| High DC Recovery Voltage | 56.4Vdc |
| High DC Cut-off Voltage | 60.0Vdc |
| Transfer Time | 10ms typical, RCD 20ms Max@ Single <30ms @ Parallel |

## 7.3 Smart Load Output Power Specification

| It's applicable to Hybrid & Off-Grid | |
|---|---|
| Model | SPE 6000TL HVM-G2 |
| Full Load Output Power | 6000W |
| Maximum Main Load | 6000W |
| Maximum smart load | 6000W |

## 7.4 AC Charge Mode Specifications

| AC Charging Mode | |
|---|---|
| INVERTER MODEL | **SPE 6000TL HVM-G2** |
| Charging Algorithm | 3-Step or Equalizing Charging |
| Max. AC Charging Current | 80A |
| Bulk Charging Voltage — Flooded Battery | 58.4Vdc |
| Bulk Charging Voltage — AGM / Gel Battery | 56.4Vdc |
| Floating Charging Voltage | 54Vdc |
| Charging Curve |  3-Step Charging  Eq Charging |

## 7.5 MPPT Solar Charging Mode Specifications

| MPPT Solar Charging Mode | |
|---|---|
| INVERTER MODEL | **SPE 6000TL HVM-G2** |
| Max. PV Array Power | 4000W+4000W |
| Max. PV Input Current | 16A±1A/16A±1A |
| Start-up Voltage | 80Vdc±5Vdc |
| PV Array MPPT Voltage Range | 60Vdc~450Vdc±5Vdc |
| Max. PV Array Open Circuit Voltage | 500Vdc |
| Nominal PV Voltage | 380Vdc |
| PV Array Voltage High Loss | 510Vdc±5Vdc fault (500Vdc warning) |
| PV Array Voltage High Comeback | 490Vdc±5Vdc |
| Number of MPP Trackers | 2 |
| Charging Algorithm | 3-Step or Equalizing Charging |

## 7.6 Grid Feeding Specification

| Grid Feeding Mode | |
|---|---|
| Model | **SPE 6000TL HVM-G2** |
| Nominal output voltage | 230Vac |
| Nominal output frequency | 50Hz / 60Hz (Auto detection) |
| Max feeding power | 6000W |
| Output voltage range | 195.5~253VAC(±3%)@Asia regulation<br>184~264.5VAC(±3%)@Europe regulation<br>184~264.5VAC(±3%)@South America regulation<br>195.5~253VAC (±3%)@South Africa regulation (default) |
| Output voltage comeback value | 205~243VAC(±3%)@Asia regulation<br>194~254.5VAC(±3%)@Europe regulation<br>194~254.5VAC(±3%)@South America regulation<br>195.5~253VAC(±3%)@South Africa regulation(default) |
| Operational frequency range | 49-51Hz(±0.1Hz)@Asia regulation<br>47.5~51.5Hz(±0.1Hz)@Europe regulation<br>57-62Hz(±0.1Hz)@South America regulation<br>47.0Hz~51.5Hz(±3%)@South Africa regulation(default) |
| Output frequency comeback value | 49.5~50.5Hz(±0.1Hz)@Asia regulation<br>48-51Hz(±0.1Hz)@Europe regulation<br>57.5~61.5Hz (±0.1Hz)@South America regulation<br>47~51.5Hz(±0.1Hz)@ South Africa regulation(default) |
| Output current | 26.1A |
| O/P current distortion | <5% |
| O/P current DC component | <130mA |
| Power Factor | 0.8 leading to 0.8 lagging |
| Max. Conversion Efficiency(PV/AC) | 96.5% |
| European Efficiency @Vnominal(PV/AC) | 95.5% |

## 7.7 Physical Dimension

| Physical Dimension Mode | |
|---|---|
| INVERTER MODEL | **SPE 6000TL HVM-G2** |
| Inverter dimension(L*W*H),mm | 457*422*115 |
| Packaging dimension(L*W*H),mm | 460*422*125 |
| colour | White |
| Net Weight (KG) | 13 |
| Rough Weight (KG) | 15 |

# 8. 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 6-1 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 |
|---|---|---|
| F02 | Internal temperature of component is over 100℃. | 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 |
| F03 | 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. |
| 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 lithum battery without communication, check whether the voltage points of the program 19 and 21 are too high for the lithum battery. 2. Restart the unit |
| F09/53/57 | Bus soft start failed | Restart the unit |
| W15 | The input status is different in parallel system. | Check if AC input wires of all inverters are connected well. |
| W16 | Input phase is not correct. | Change the input phase S and T wiring. |
| W17 | The output phase not correct in parallel. | 1.Make sure the parallel setting are the same system(sigle or paralle; 3P1,3P2,3P3). 2.Make sure all phases inverters are power on. |

| | | |
|---|---|---|
| W19 | lead acid battery disconnect | Check if spec and quantity of batteries are meet requirements. |
| W19 | 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. |
| 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 |
| F80 | CAN fault | 1. Check whether the parallel communication cables are connected well. 2. Check whether Program 23 settings are right for the parallel system. |
| F81 | Host loss | 1. Check whether the parallel communication cables are connected well. 2. Check whether Program 23 settings are right for the parallel system. |

| 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. |
| Mains exist but the unit works in battery mode. | 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) |
| Mains exist but the unit works in battery mode. | 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  Restore factory settings

After pressing and holding UP and DOWN buttons at the same time for 3 seconds, the unit will enter PASSmode. Change themiddle three numbers 000 to 305.Then press "ENTER" button to confirm the selection and Wait about 7 seconds. Press"ESC" to return and the setting is completed.

**Note:** When inverter is used in parallel, every inverter need to disconnect parallel communication cable and restore alone.

| Program | Setting Option |
|---------|----------------|
| PASS | PASS 305 000 |

## Appendix III  Battery Equalization

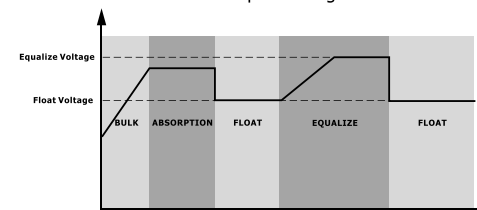| 43 | Battery equalization | Battery equalization enable | Battery equalization disable(default) |
|----|---------------------|-----------------------------|----------------------------------------|
|    |                     | E9    ENA 043 | E9    diS 043 |
|    |                     | If "Flooded" or "User-Defined" is selected in program 05, this program can be set up. | |
| 44 | Battery equalization voltage | EqV    58.4v 044<br>Default 58.4V, 48.0V~58.4V Settable | |
| 45 | Battery equalized time | min<br><br>Eqt    60 045 | Default 60min, 5min~900min Settable |
| 46 | Battery equalized timeout | min<br><br>Eqto    120 046 | Default 120min, 5min~900min Settable |
| 47 | Equalization interval | dAY<br><br>Eqi    30 047 | Default 30days, 1 days~90 days Settable |
| 48 | Equalization activated immediately | Equalization activated immediately on | Equalization activated immediately off(default) |
|    |                     | E9    ON 048 | E9    OFF 048 |
|    |                     | 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 "E9". If "Off" is selected, it will cancel equalization function until next activated equalization time arrives based on program 47setting. At this time, "E9" 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. Equalizationalso 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.
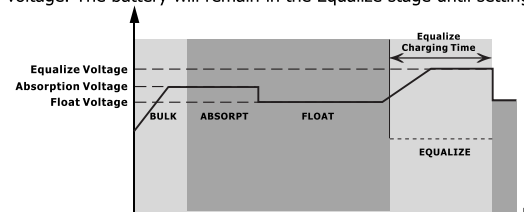


However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery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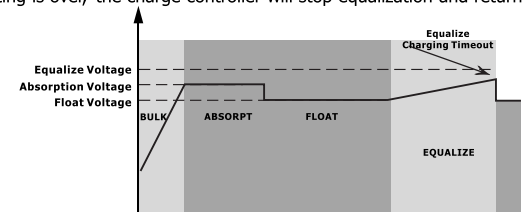
## Appendix IV Routine maintenance

To ensure the long-term and good operation of the energy storage system, it is recommended to performthe 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. | |
| 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 V 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 latest version.

2.For further information please visit server. growatt.com



【Android & iOS】