# User Manual


## *All-in-one solar charge inverter*

SPI-16K-H3P | SPI-18K-H3P | SPI-20K-H3P

Ver. : V01 2025-10-28

# CONTENTS

# 1.Safety Precautions

## 1.1 How to Use This Instruction Manual

This manual contains important information, guidelines, operation and maintenance for the following products: **SPI-16K-H3P**, **SPI-18K-H3P**, **SPI-20K-H3P**.
Read the manual and other related documents before performing any operation on the inverter. Documents must be stored carefully and be available at all times.

## 1.2 Safety signs

| | |
|---|---|
| ⚠ DANGER | DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury. |
| ⚠ WARNING | WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury. |
| ⚠ CAUTION | CAUTION: Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury. |
| ⚠ NOTICE | NOTICE: Provides tips or cues regarding product operation. |

## 1.3 Safety Instructions

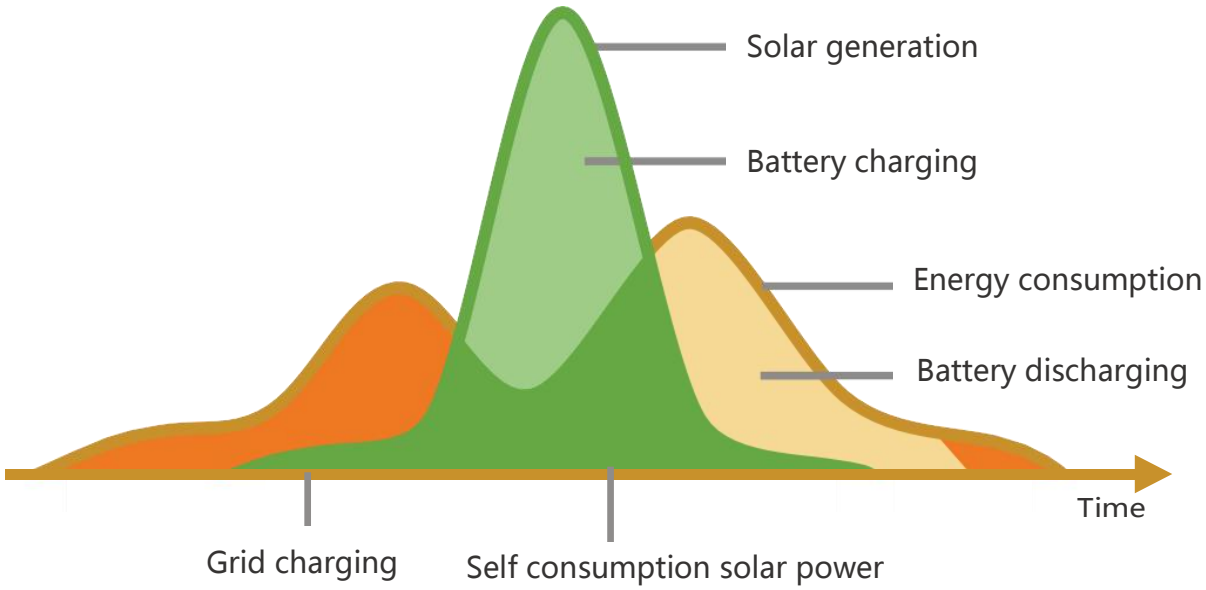
**WARNING:** This chapter contains important safety and operating instructions. Read and keep this manual for future reference.

- Be sure to comply the local requirements and regulation to install this inverter.
- Beware of high voltage. Please turn off the switch of each power sources before and during the installation to avoid electric shock.
- For optimum operation of this inverter, please follow required specification to select appropriate cable size and necessary protective device.
- Do not connect or disconnect any connections when the inverter is working.
- Do not open the terminal cover when the inverter working.
- Make sure the inverter is well grounding.
- Never cause AC output and DC input short circuited.
- Do not disassembly this unit, for all repair and maintenance, please take it to the professional service center.
- Never charge a frozen battery.
- Please keep children away from touching or mishandling the inverter.
- Please make sure that this inverter is the only input power source for the load, do not use it in parallel with other input AC power sources to avoid damage.Ensure this inverter is the sole input power source for the load. Do not parallel it with other AC input power sources to avoid damage.

# 2.Product Introduction

## 2.1 Product Description

The SPI H3P series is a new type of solar energy storage inverter integrating solar energy storage, utility power charging storage, and AC sine wave output. Adopting DSP control and advanced control algorithms, it features fast response speed, high reliability, and compliance with industrial standards.




## 2.2 Product Features

- Supports connection of lead-acid batteries and lithium-ion batteries.
- Features Dual activation function when lithium-ion batteries are in hibernation; activation of lithium-ion batteries can be triggered by either mains power or photovoltaic power input.
- Supports three-phase pure sine wave output (350~415V).
- Supports phase voltage adjustment within the AC range of 200, 208, 220, 230 and 240 volts.
- Supports two-way photovoltaic input, with the function of simultaneously tracking the maximum power charging or load-carrying capacity of two MPPTs.
- Dual MPPT with 99.9% efficiency and maximum 36A current in a single circuit, perfectly adapted to high power modules.
- 2 charging modes are available: solar only,  mixed mains/PV charging.
- With the time-slot charging and discharging setting function, you can set the time period for cutting in/out of mains charging and switch the time period between battery discharging and mains bypass power supply mode.
- Energy saving mode function to reduce no-load energy losses.
- With two output modes of utility bypass and inverter output, with uninterrupted power supply function.

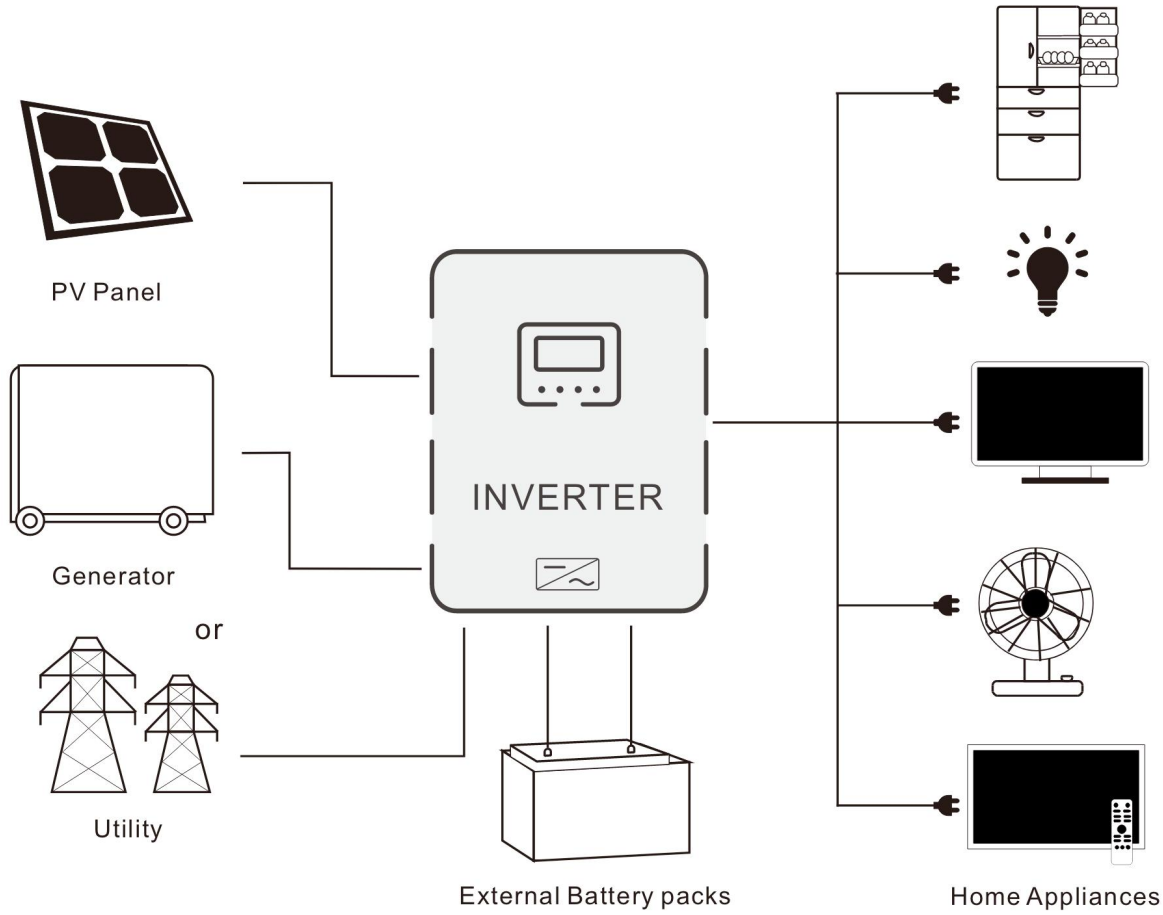
- LCD large screen dynamic flow diagram design, easy to understand the system data and operation status.
- 360° protection with complete short circuit protection, over current protection, over under voltage protection, overload protection, backfill protection, etc.
- Support CAN, USB, and RS485 communication.

## 2.3 System Connection Diagram

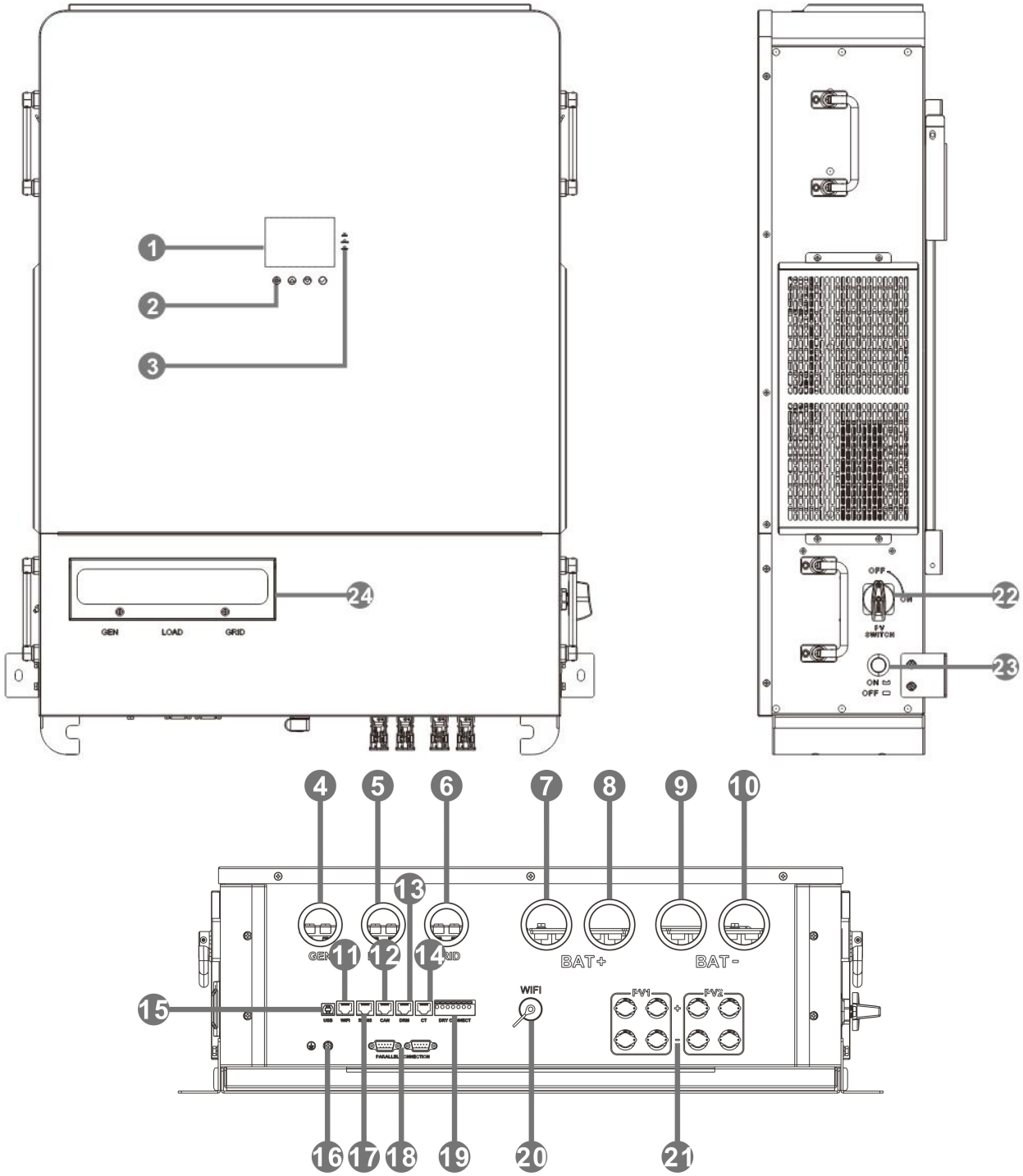
The diagram below shows the system application scenario of this product. A complete system consists of the following components:

- **PV modules:** Converts light energy into DC energy, which can be used to charge the battery via an inverter or directly inverted into AC power to supply the load.
- **Utility grid or generator:** Connected to the AC input, it can supply the load and charge the battery at the same time. The system can also operate generally without the mains or generator when the battery and the PV module power the load.
- **Battery:** The role of the battery is to ensure the regular power supply of the system load when the solar energy is insufficient and there is no mains power。
- **Home load:** Various household and office loads can be connected, including refrigerators, lamps, televisions, fans, air conditioners, and other AC loads.
- **Inverter:** The energy conversion device of the whole system.

**Note: The actual application scenario determines the specific system wiring method.**

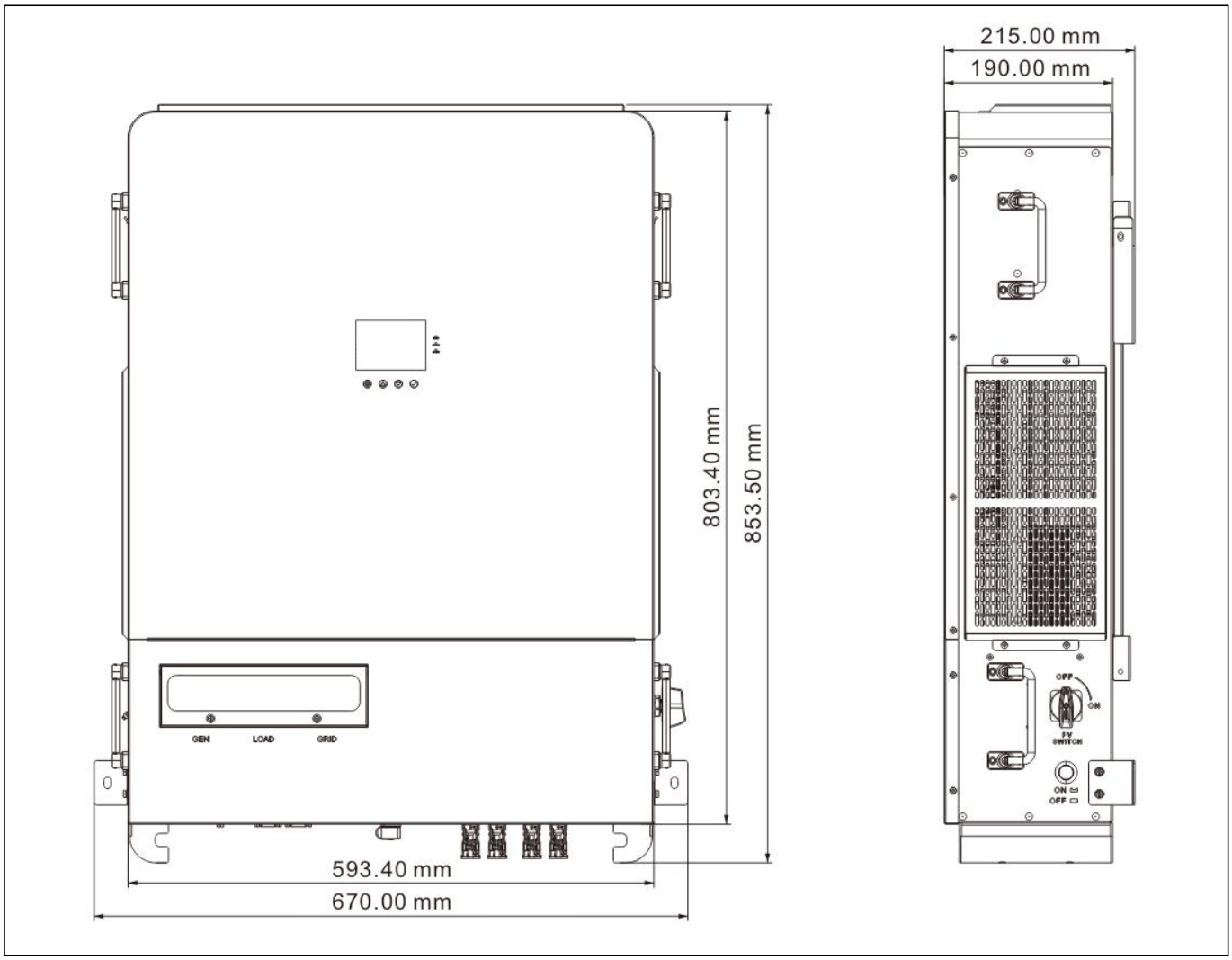


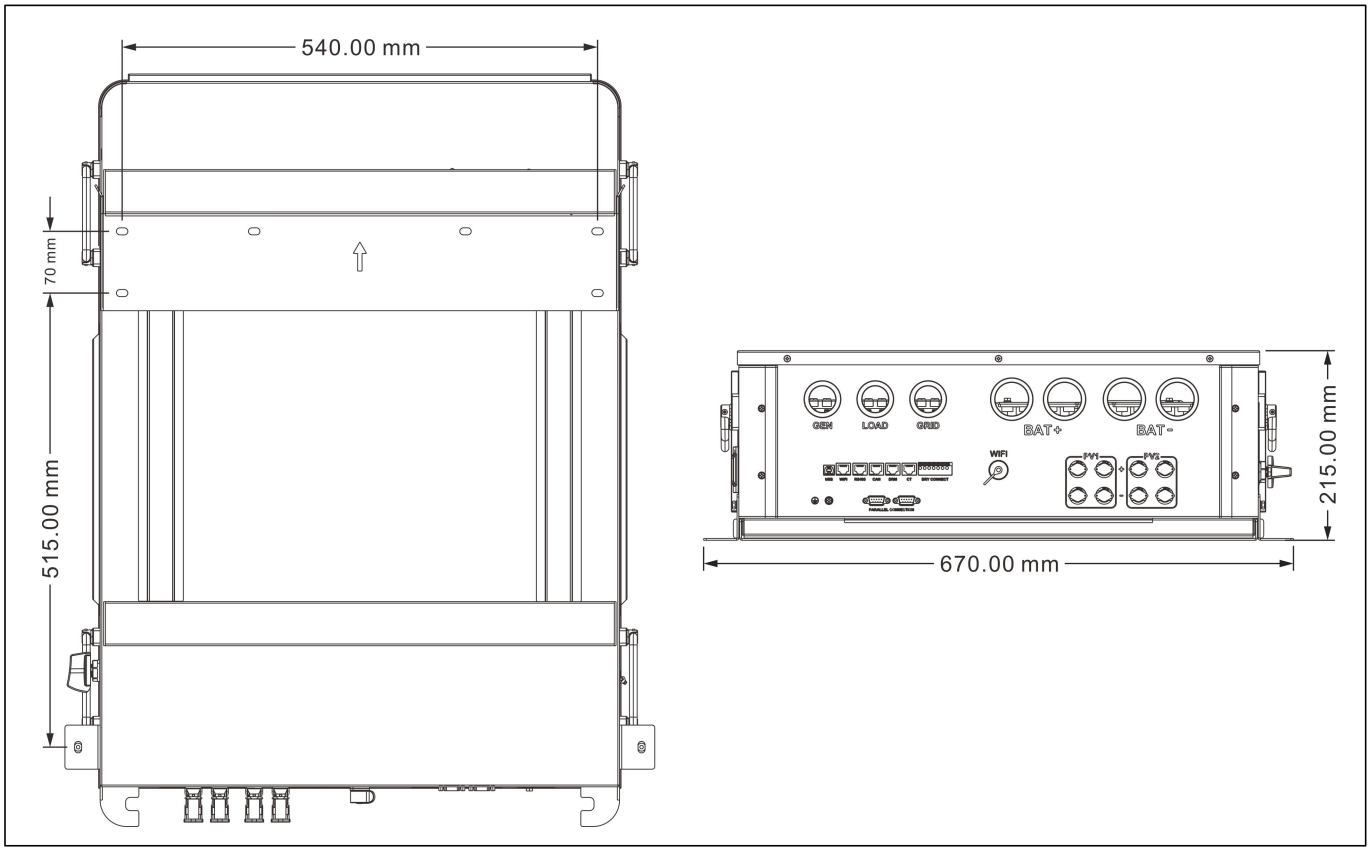
# 2.4 Product Overview




| | | | | | |
|---|---|---|---|---|---|
| 1 | LCD Screen | 2 | Physical Buttons | 3 | LED Indicators |
| 4 | Generator Input<br>(L1 + L2 + L3 + N) | 5 | AC Output<br>(L1 + L2 + L3 + N) | 6 | Grid Input<br>(L1 + L2 + L3 + N) |
| 7 | Battery + | 8 | Battery + | 9 | Battery - |
| 10 | Battery - | 11 | WiFi Port | 12 | CAN Port |
| 13 | DRM Port | 14 | CT Port | 15 | USB Port |
| 16 | Grounding Screw | 17 | RS485 Port | 18 | Parallel Port |
| 19 | Dry Contact Prot | 20 | WIFI Port | 21 | PV Input (PV1 + PV2) |
| 22 | PV Switch | 23 | Power on/off switch | 24 | GEN/LOAD/GRID<br>Circuit Breaker |

# 2.5 Product Size

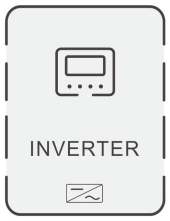


# 3.Installation

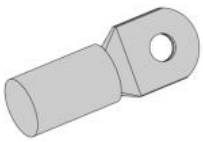
## 3.1 Parts List

Please check the equipment before installation. Make sure that there is no damage to the packaging.You should have received the following items in the package:



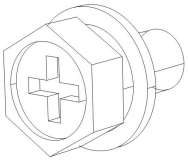

Inverter
x 1pcs

Wall mount bracket
x 1pcs

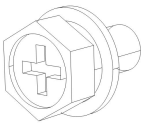


Crimp Terminal
SC95-8
x 4pcs

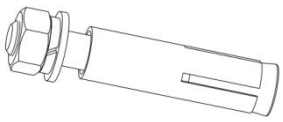
Crimp Terminal
SC50-8
x 8pcs



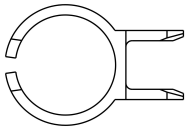
Hexagon socket cross recessed screw
M8x12mm
x 9pcs



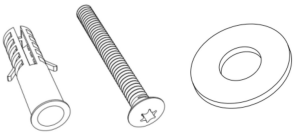
Hexagon socket cross recessed screw
M5x10mm
x 4pcs



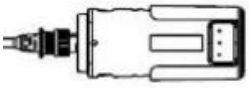
Expansion bolt
M8*60mm
x 4pcs



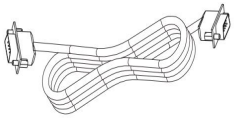
MC4 unlocking tool
x 1pcs



Round-head self-tapping screws FA6x35 + white rubber plugs + washers
x 1bag

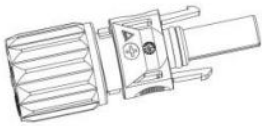


WiFi logger
x 1pcs

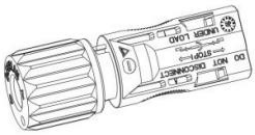


Parallel cable
x 1pcs

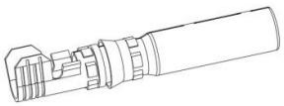
Black screw M4x8mm
x 4pcs



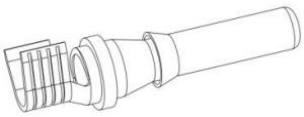
PV+ terminal
x 4pcs



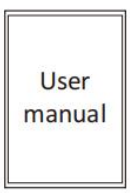
PV- terminal
x 4pcs



PV+ Input Metal Core
x 4pcs



PV- Input Metal Core
x 4pcs




User Manual
x 1pcs

The warranty card
x 1pcs


Quality Certificate
x 1pcs

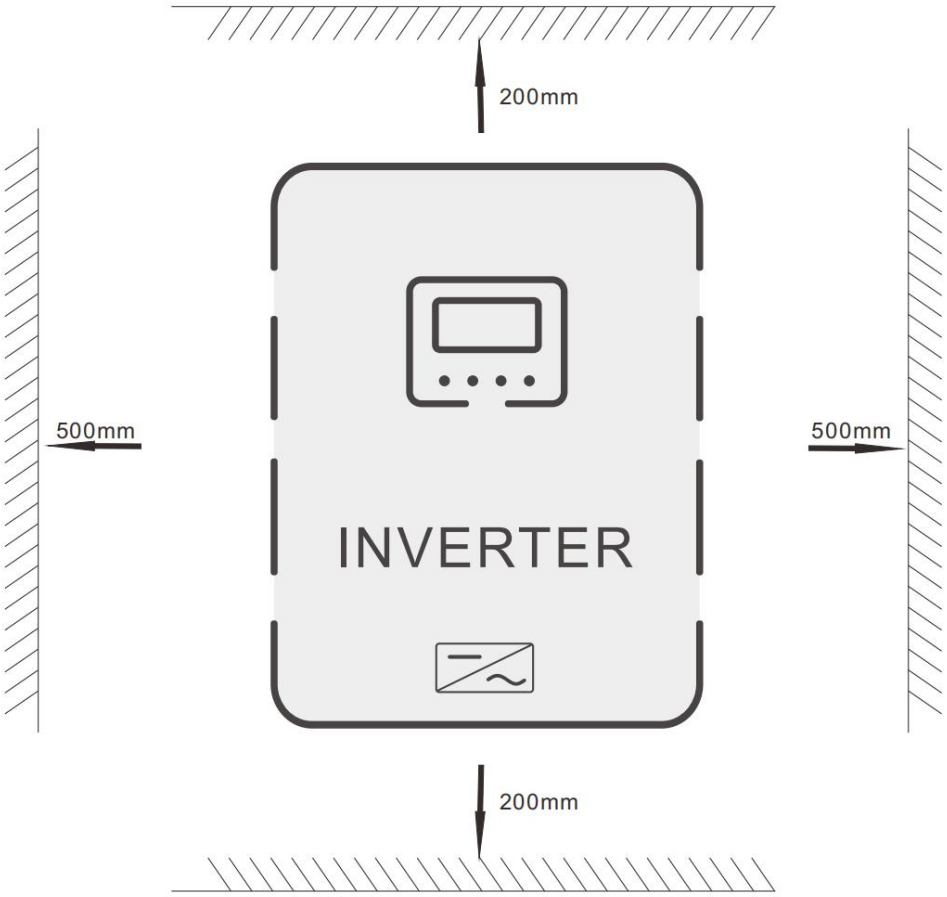
Outgoing inspection report
x 1pcs

# 3.2 Mounting Instructions

## 3.2.1 Installation Location Selection

SPI H3P Series is designed for indoor use only (IP20 rated). Consider the following factors when selecting the installation location:

- Choose the solid wall to install the inverter.
- Mount the inverter at eye level.
- Adequate heat dissipation space must be provided for the inverter.
- The ambient temperature should be between -10 ~55℃ ( 14 ~131℉) to ensure optimal operation.




**⚠ DANGER**

- Do not install the inverter where highly flammable materials are near by.
- Do not install the inverter in potential explosive areas.
- Do not install the inverter with lead-acid batteries in a confined space.

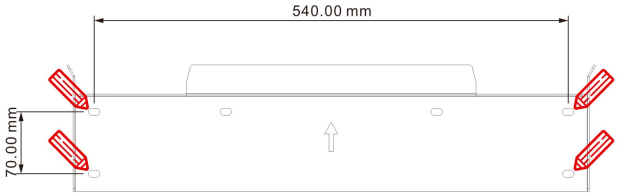
**⚠ CAUTION**

- Do not install the inverter in direct sunlight.
- Do not install or use the inverter in a humid environment.

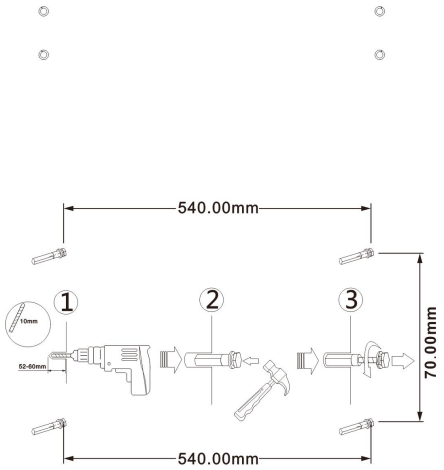
## 3.2.2 Mounting the Inverter

- **Step 1:** Use the wall-mounting bracket as a template to determine the drilling positions. Ensure the holes are level, mark them with a marker, and use a rotary hammer to drill into the wall. Keep the drill perpendicular to the wall to avoid shaking and prevent surface damage. If there is significant deviation in hole positioning, remeasure and reposition.
- **Step 2:** Select a solid wall with a thickness of at least 80 mm, and drill four holes according to the marked positions (hole diameter: φ8, depth: 45–50 mm). Insert M8 expansion bolts into the holes and tighten the nuts securely.
- **Step 3:** Align the wall-mounting bracket with the drilled holes, and fasten it firmly to the wall by tightening the expansion bolts and nuts.
- **Step 4:** ① Install the inverter. Slowly hang the inverter on the frame via the matching hooks, then tighten the screws on both sides. ② Mark the positions of the bent feet on both sides according to the hole positions. Remove the bent feet and drill two holes with a diameter of φ6 and a depth of 35-40 mm. Then install the bent feet and tighten them with M6 self-tapping screws.

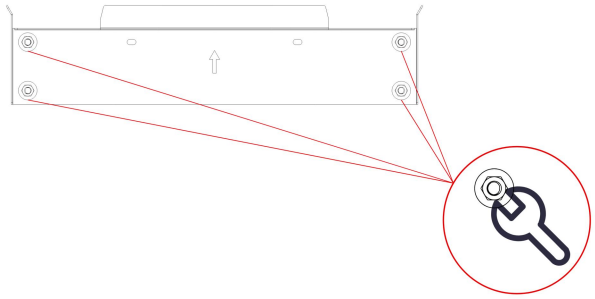
**Step 1**



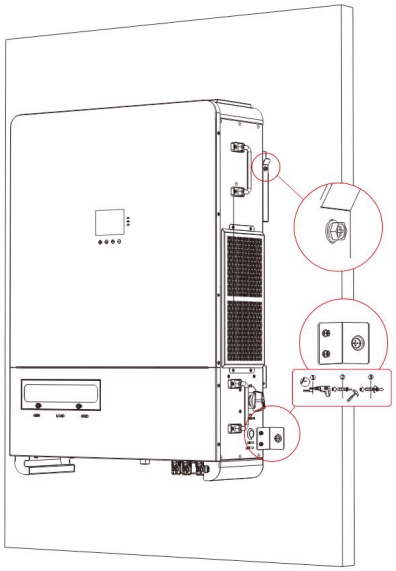

**Step 2**




**Step 3**

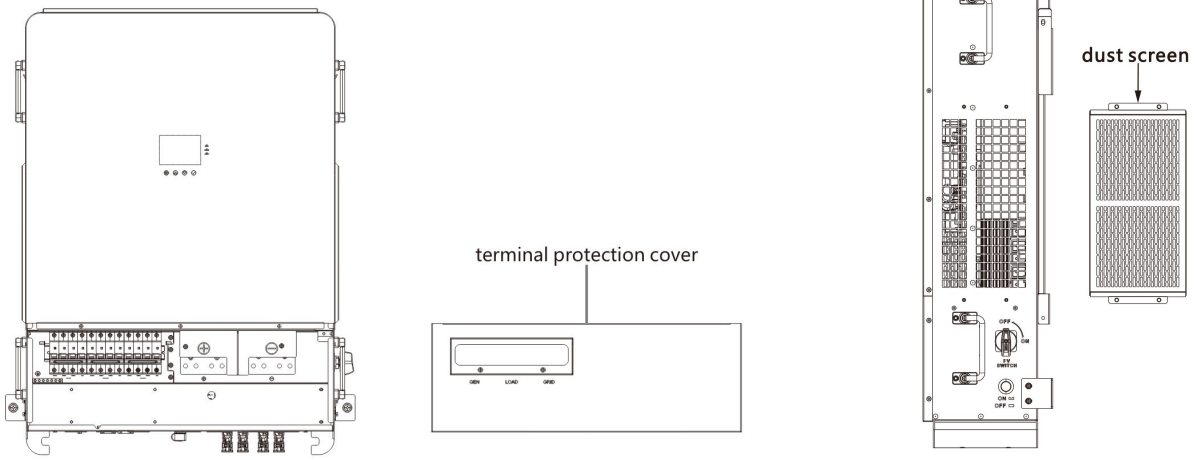


**Step 4**



### 3.2.3 Removing the Terminal Protection Cover

Using a screwdriver, remove the terminal protection cover and anti-insect net.

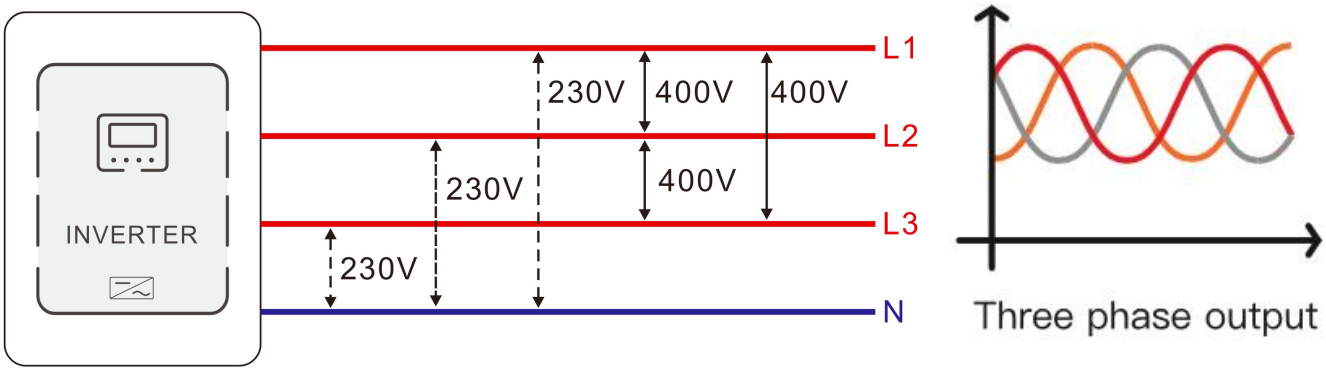



**NOTICE**

When using the device in areas with poor air quality, the dust screen is prone to being blocked by air particles. Please regularly remove and clean the dust screen to avoid affecting the internal air circulation rate of the frequency converter, which may cause over-temperature protection faults (Fault 19/20) and affect the service life of the power supply and inverter.

# 4.Connection Instructions

## 4.1 Single-Phase or Three-Phase Mode

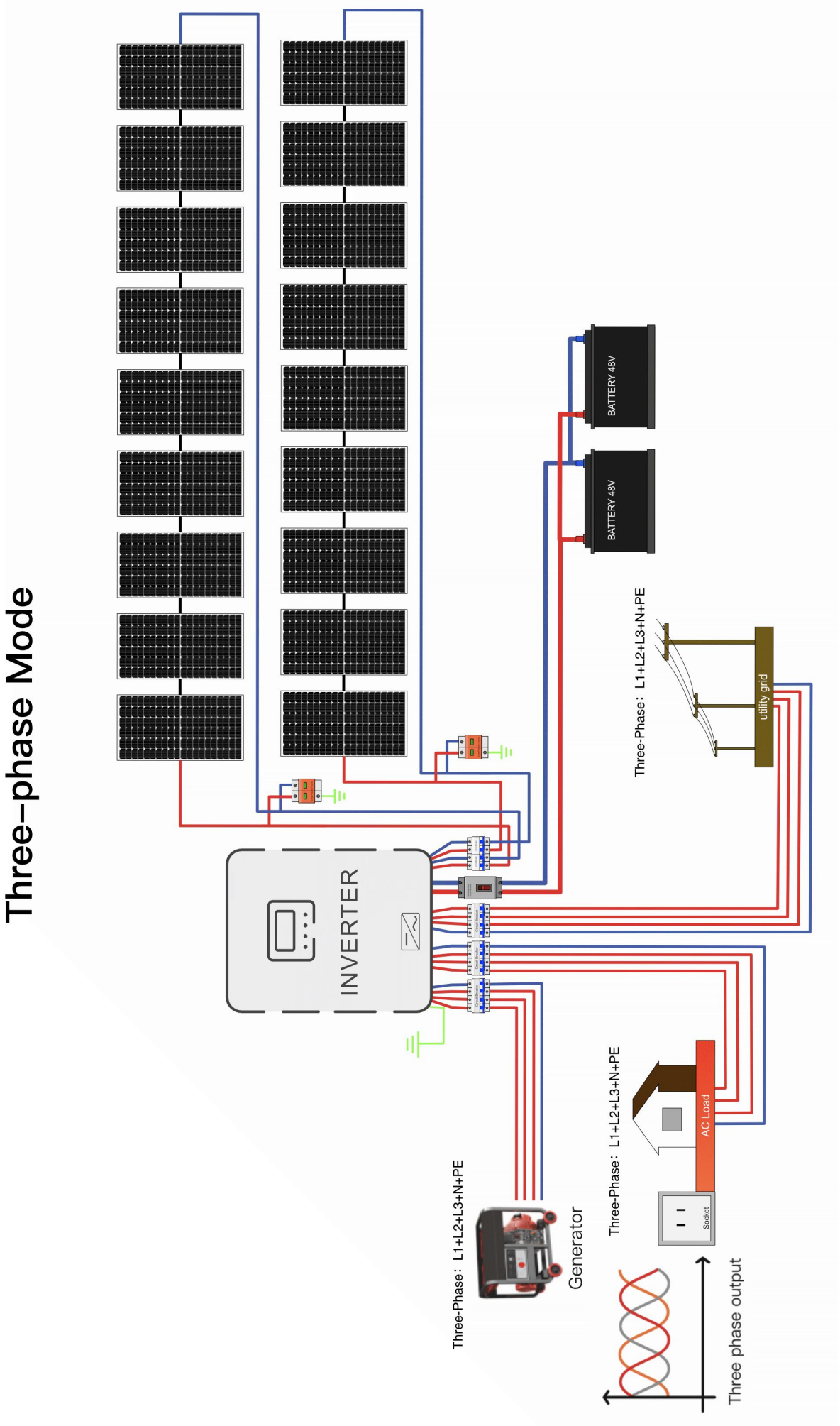



| Project | Description |
|---|---|
| Applicable model | SPI series H3P model |
| AC output phase voltage (L-N) | 200~240Vac, 230Vac default |

**NOTICE**

- Users can change the output phase mode and output voltage through the settings menu. For details, please refer to Chapter 5.2.
- The output voltage corresponds to parameter setting item [38], and the output phase voltage can be set within the range of 200V to 240V.

# Three-phase Mode



# 4.2 Cable & Circuit Breaker Requirement

## ■ PV Input

| Model | Cable Diameter | Max. Input Current | Circuit Breaker Specifications |
|---|---|---|---|
| SPI-16K-H3P | 6mm²/ 10AWG | 36A | 2P-45A |
| SPI-18K-H3P | 6mm²/ 10 AWG | 36A | 2P-45A |
| SPI-20K-H3P | 6mm²/ 10AWG | 36A | 2P-45A |

## ■ Battery

| Model | Cable Diameter | Max. Input Current | Circuit Breaker Specifications |
|---|---|---|---|
| SPI-16K-H3P | Mode 1: 70 mm²/00 AWG*2<br>Mode 2: 30 mm²/2 AWG*4 | 300A | 2P-350A |
| SPI-18K-H3P | Mode 1: 85 $mm^2$/ 000 AWG*2<br>Mode 2: 40$mm^3$/1 AWG*4 | 360A | 2P-400A |
| SPI-20K-H3P | Mode 1: 85 $mm^2$/ 000 AWG*2<br>Mode 2: 40$mm^2$/1 AWG*4 | 360A | 2P-400A |

## ■ Grid

| Models | Output Mode | Cable Diameter | Max. Input Current | Circuit Breaker Specifications |
|---|---|---|---|---|
| SPI-16K-H3P | Three-phase | 15mm²/6 AWG (L1/L2/L3/N) | 60A | 4P-65A |
| SPI-18K-H3P | Three-phase | 15mm²/6 AWG (L1/L2/L3/N) | 60A | 4P-65A |
| SPI-20K-H3P | Three-phase | 15mm²/6 AWG (L1/L2/L3/N) | 60A | 4P-65A |

## ■ Generator

| Models | Output Mode | Cable Diameter | Max. Input Current | Circuit Breaker Specifications |
|---|---|---|---|---|
| SPI-16K-H3P | Three-phase | 15$mm^2$/6 AWG (L1/L2/L3/N) | 60A | 4P-65A |
| SPI-18K-H3P | Three-phase | 15$mm^2$/6 AWG (L1/L2/L3/N) | 60A | 4P-65A |
| SPI-20K-H3P | Three-phase | 15$mm^2$/6 AWG (L1/L2/L3/N) | 60A | 4P-65A |

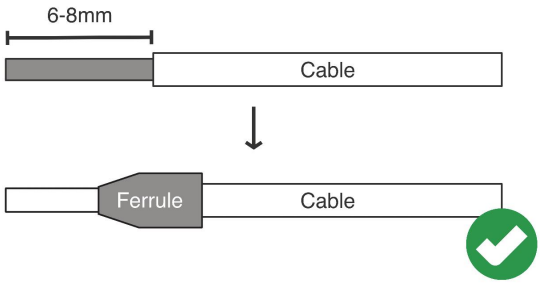
## ■ Load

| Models | Output Mode | Cable Diameter | Max. Output Current | Circuit Breaker Specifications |
|---|---|---|---|---|
| SPI-16K-H3P | Three-phase | 15$mm^2$/6 AWG (L1/L2/L3/N) | 21.8A | 4P-65A |
| SPI-18K-H3P | Three-phase | 15$mm^2$/6 AWG (L1/L2/L3/N) | 26.1A | 4P-65A |
| SPI-20K-H3P | Three-phase | 15$mm^2$/6 AWG (L1/L2/L3/N) | 29.0A | 4P-65A |

NOTICE

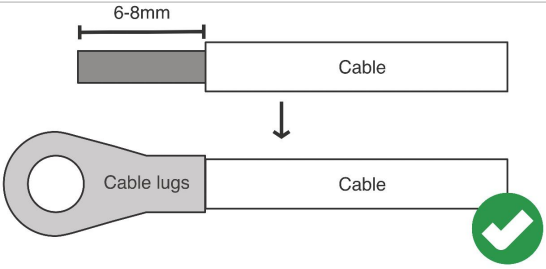
- **AC input, and AC output:**

1. Use a stripper to remove the 6~8mm insulation of the cable.
2. Fixing a ferrule at the end of the cable. (ferrule needs to be prepared by the user)




- **Battery connections:**

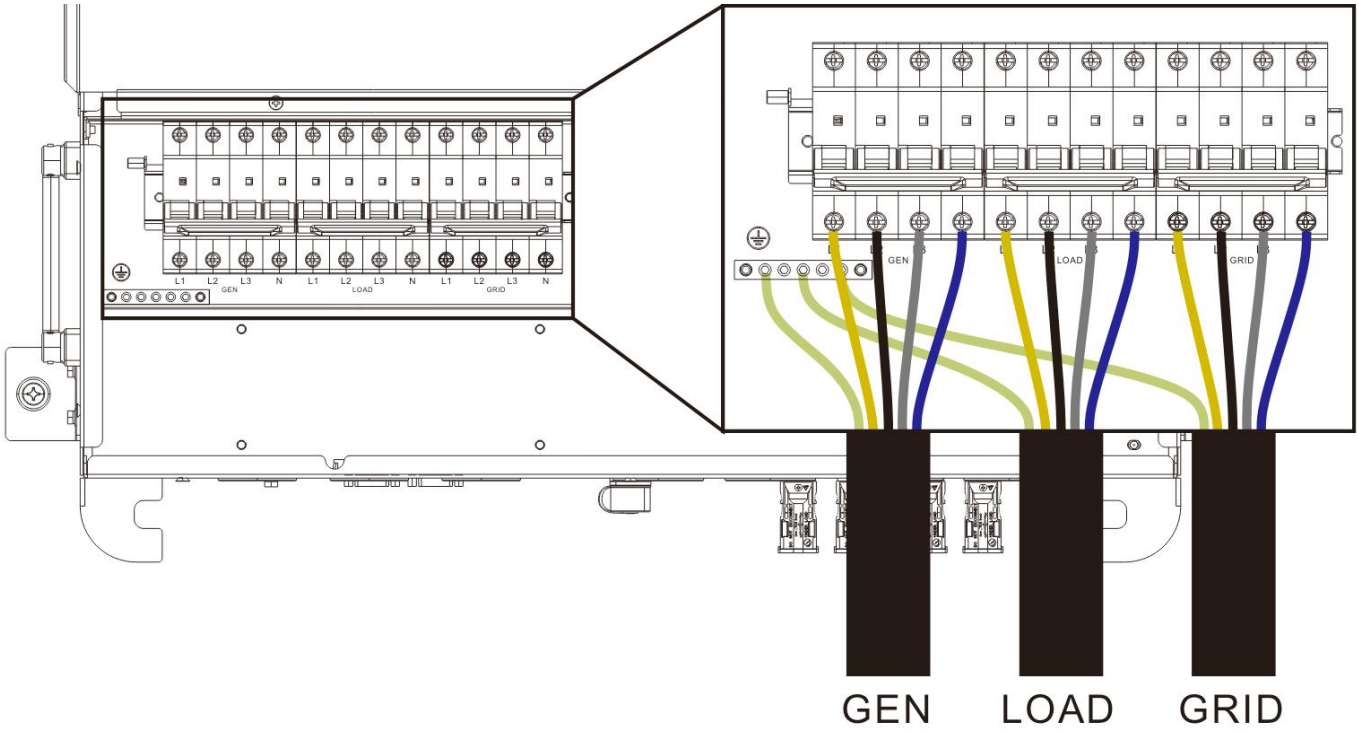
1. Use a stripper to remove the 6~8mm insulation of the cable
2. Fixing cable lugs that supply with the box at the end of the cable.




The wire diameter is for reference only. If the distance between the PV array and the inverter or between the inverter and the battery is long, using a thicker wire will reduce the voltage drop and improve the performance of the system.

# 4.3 GRID & LOAD & Generator Connection

Connect the live,neutral and ground wires according to the cables' position and order shown in the diagram below.



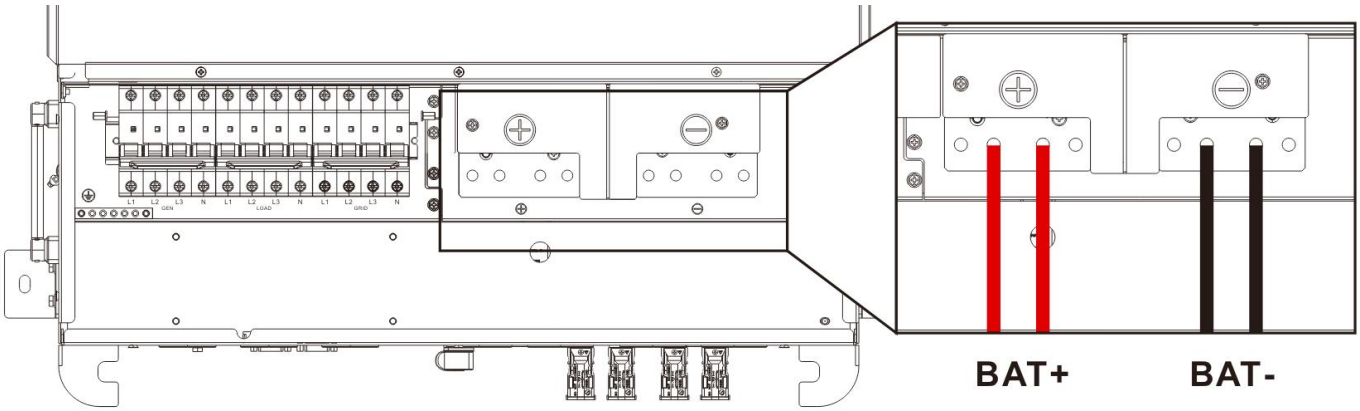

DANGER

- Before connecting AC input and output, the circuit breaker must be turned off to avoid electric shock hazards, and never operate with electricity.
- Please check that the cable used is sufficient for the requirements, too thin, poor quality cables are a serious safety hazard.

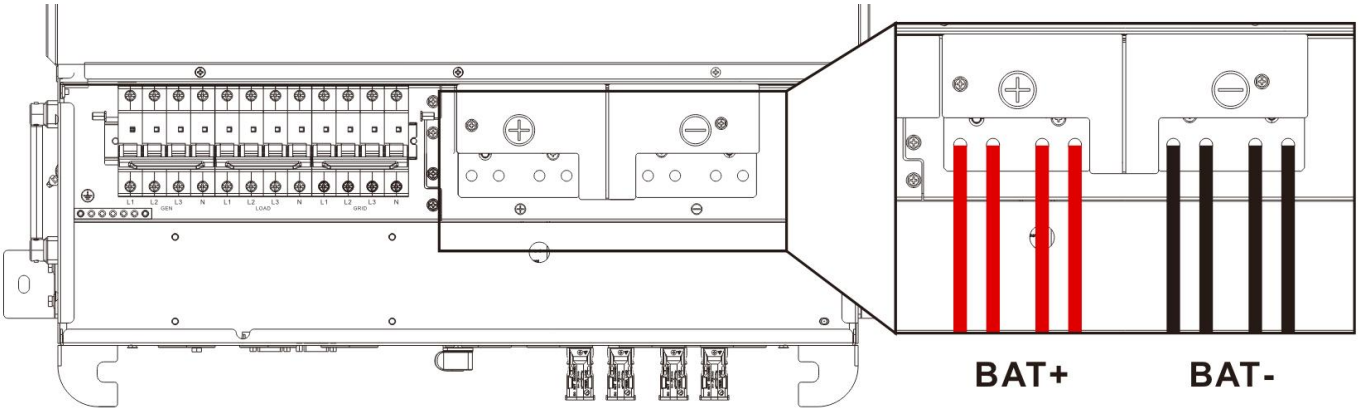
# 4.4 Battery Connection

Connect the positive and negative cable of the battery according to the diagram below.

- **Mode 1:** Each cable is recommended to be 85 mm² / 000 AWG, using crimp terminals SC95-8.




- **Mode 2:** Each cable is recommended to be 40 mm²/1 AWG, using crimp terminals SC50-8.



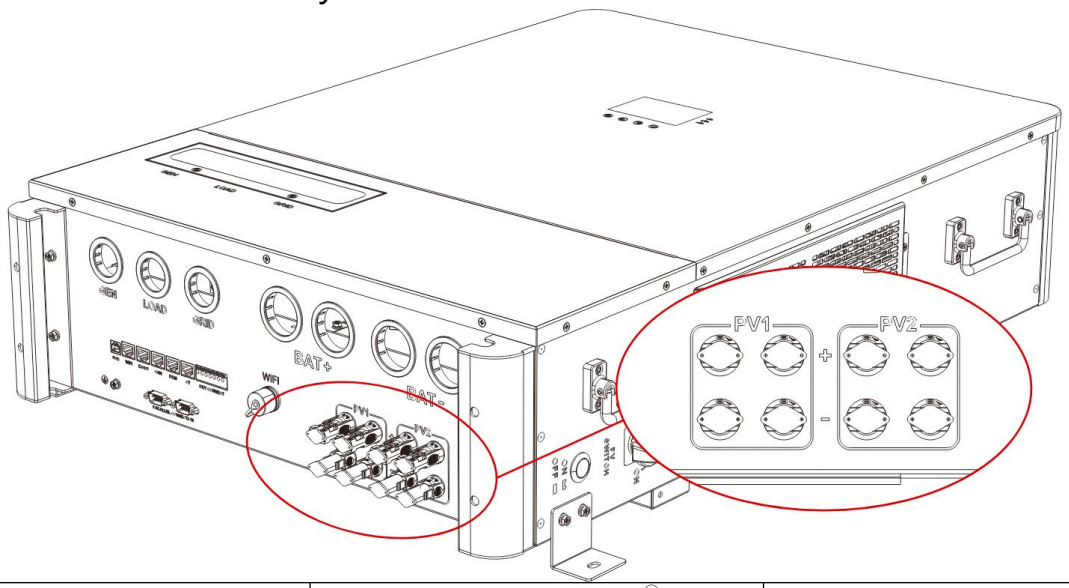

**⚠ DANGER**

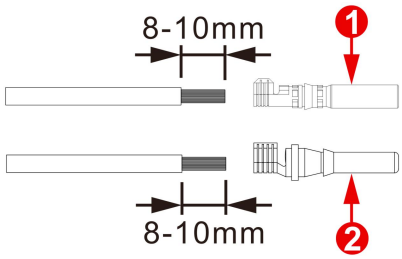
- Before connecting battery, the circuit breaker must be turned off to avoid electric shock hazards, and never operate with electricity.
- Make sure that the positive and negative terminals of the battery are connected correctly, reversed polarity connection on battery will damage the inverter.
- Please check that the cable used is sufficient for the requirements, too thin, poor quality cables are a serious safety hazard.

# 4.5 PV Connection

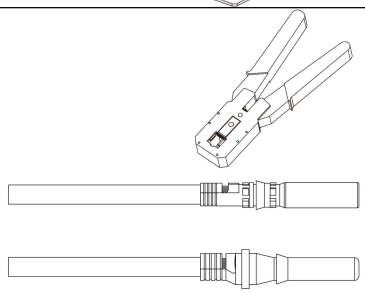
1.Before connecting PV, first close the external circuit breaker and make sure that the cable used is sufficiently thick. Please refer to section "4.2 Cable & Circuit Breaker Selection".

2.According to the cable sequence and terminal positions shown in the figure below, correctly connect the PV input wires. When using in parallel, different units must be connected to different PV arrays or PV sources.

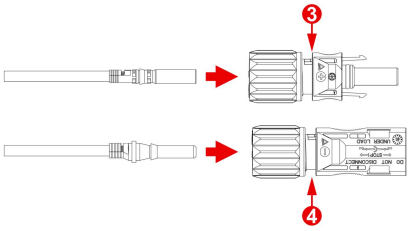


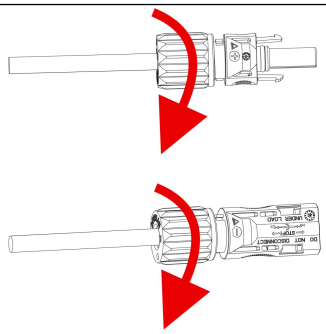

① PV+ metal contact
② PV- metal contact



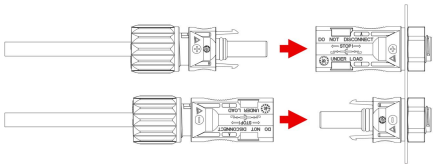
Press the wire by crimping tool



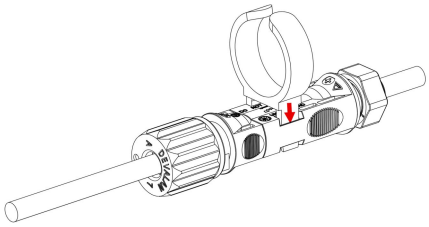

③ Positive connector
④ Negative connector
Hear "click"



Tighten terminal



Connect to the inverter port

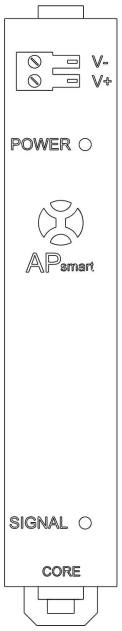


Disconnect PV terminal

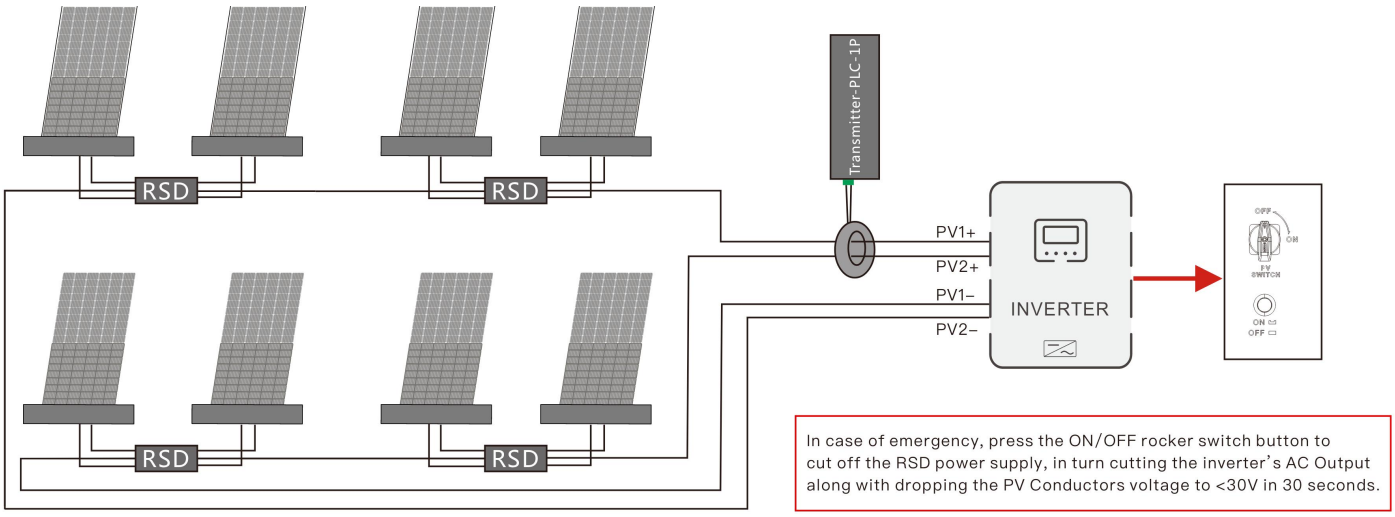
**⚠ DANGER**

- Before connecting the PV, the circuit breaker must be turned off to avoid electric shock hazards, and never operate with electricity.
- Make sure that the open-circuit voltage of the PV modules connected in series does not exceed the maximum open-circuit voltage of the inverter (the value is 1000V), otherwise the inverter may be damaged.

## Transmitter-PLC Device(Customer Optional)

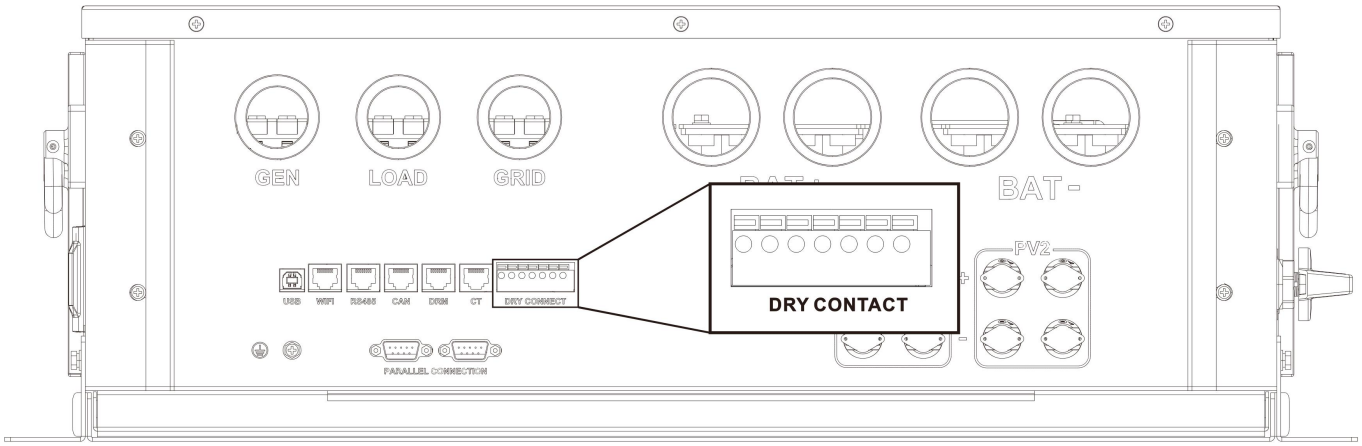



The inverter includes a rapid shutdown system that complies with 2017 and 2020 NEC 690.12 requirements. A rapid shutdown switch should be connected to the RSD terminals on the inverter and mounted on a readily accessible location outdoors (check with your AHJ for requirements).
The APsmart Rapid Shutdown System Transmitter-PLC is part of a rapid shutdown solution when paired with APsmart RSD, a PV module rapid shutdown unit. While powered on, the Transmitter-PLC sends a signal to the RSD units to keep their PV modules connected and supplying energy. RSD units automatically enter rapid shutdown mode when the Transmitter-PLC is switched off and resume energy production when power is restored to the Transmitter-PLC.



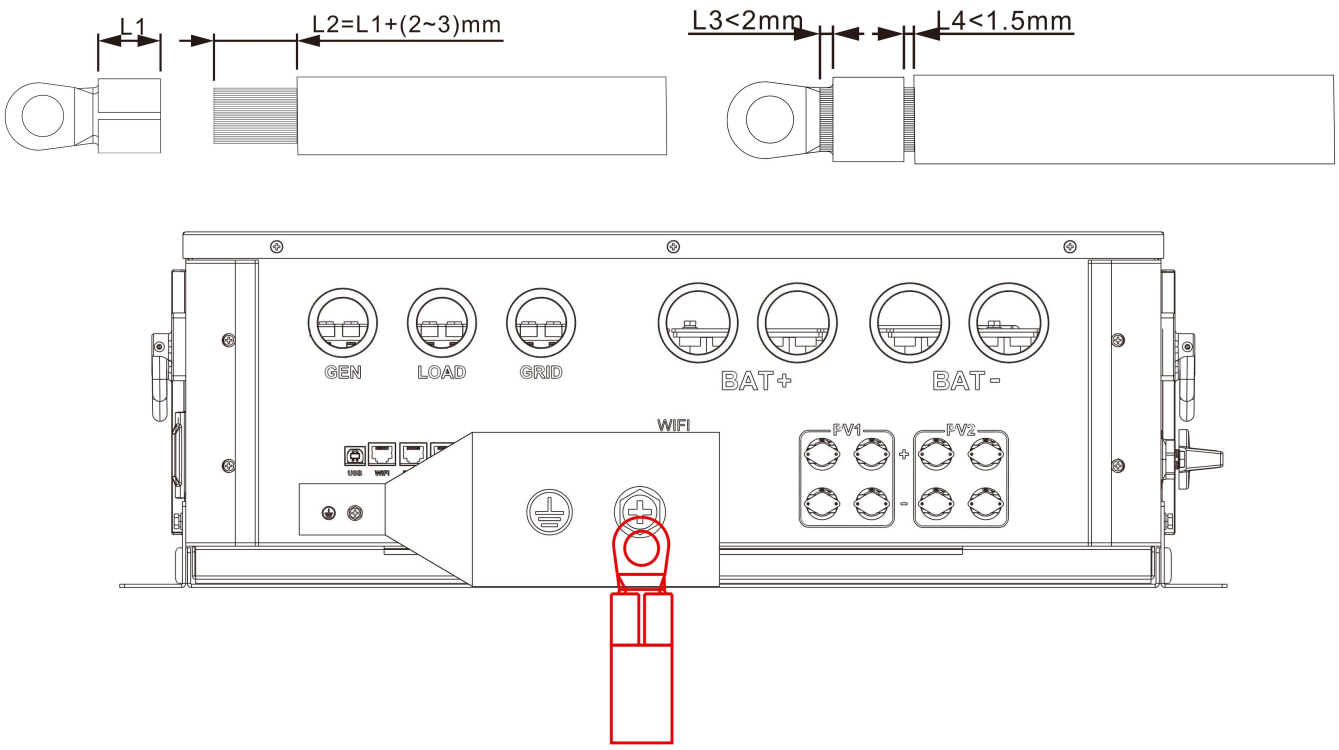

# 4.6 Dry Contact Connection

Use a small screwdriver to push back the direction indicated by the arrow, then insert the communication cable into the dry junction port.
(Communication cable diameter 0.2~1.5mm²)



# 4.7 Grounding Connection

Please make sure the grounding terminal connect to the Grounding Bar.




> **NOTICE**
>
> Grounding wire shall be not less than 4 mm² in diameter and as close as possible to the earthing point.

# 4.8 Final Installation

After ensuring that the wiring is reliable and the wire sequence is correct, install the terminal protection cover in place.

- **Step 1:** Close the circuit breaker of the battery.
- **Step 2:** Press the ON/OFF switch on the side of the inverter. The screen and indicator lights turning on indicates that the inverter has been activated.
- **Step 3:** Sequential close of the circuit breakers for PV, AC input and AC output.
- **Step 4:** Start the loads one by one in order of power from small to large.

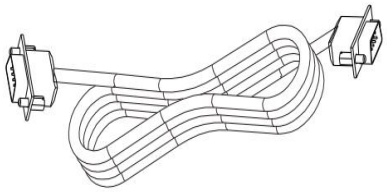
# 4.9 Parallel Connection

## 4.9.1 Introduction to Parallel Connection

1.Up to six units connected in parallel.

2. When using the parallel operation function, the following connecting lines (package accessories) shall be firmly and reliably connected.

**Parallel communication cable *1**



## 4.9.2 Precautions for Connecting the Parallel Connecting Lines

### Warning

### 1.PV connection:

When connecting in parallel, the PV arrays connected to each inverter must be independent of each other. The PV arrays corresponding to PV1, PV2 ports of the same inverter must also be independent.

### 2.Battery connection:

When paralleling, all solar energy storage inverters must be connected to the same battery, with BAT+ connected to BAT+ and BAT- connected to BAT-. Before powering on and starting, it is necessary to check and ensure that the connections, wiring length, and cable size are correct to prevent abnormal operation of the parallel system output caused by incorrect connections.

### 3.Load connection:

**For three-phase parallel connection:** all solar storage inverters must be connected in the manner of N-to-N and PE-to-PE. The L lines of all inverters in the same phase shall be connected together, but the AC output L lines of different phases shall not be connected together. Other cautions are the same as those for single-phase parallel connection.Refer to the schematic diagram for wiring.

### 4.Grid connection:

**In three-phase parallel connection,** all solar storage inverters must be connected in the manner of N-to-N and PE-to-PE. The L lines of all inverters in the same phase shall be connected together, but the AC output L lines of different phases shall not be connected together. Refer to the schematic diagram for wiring.

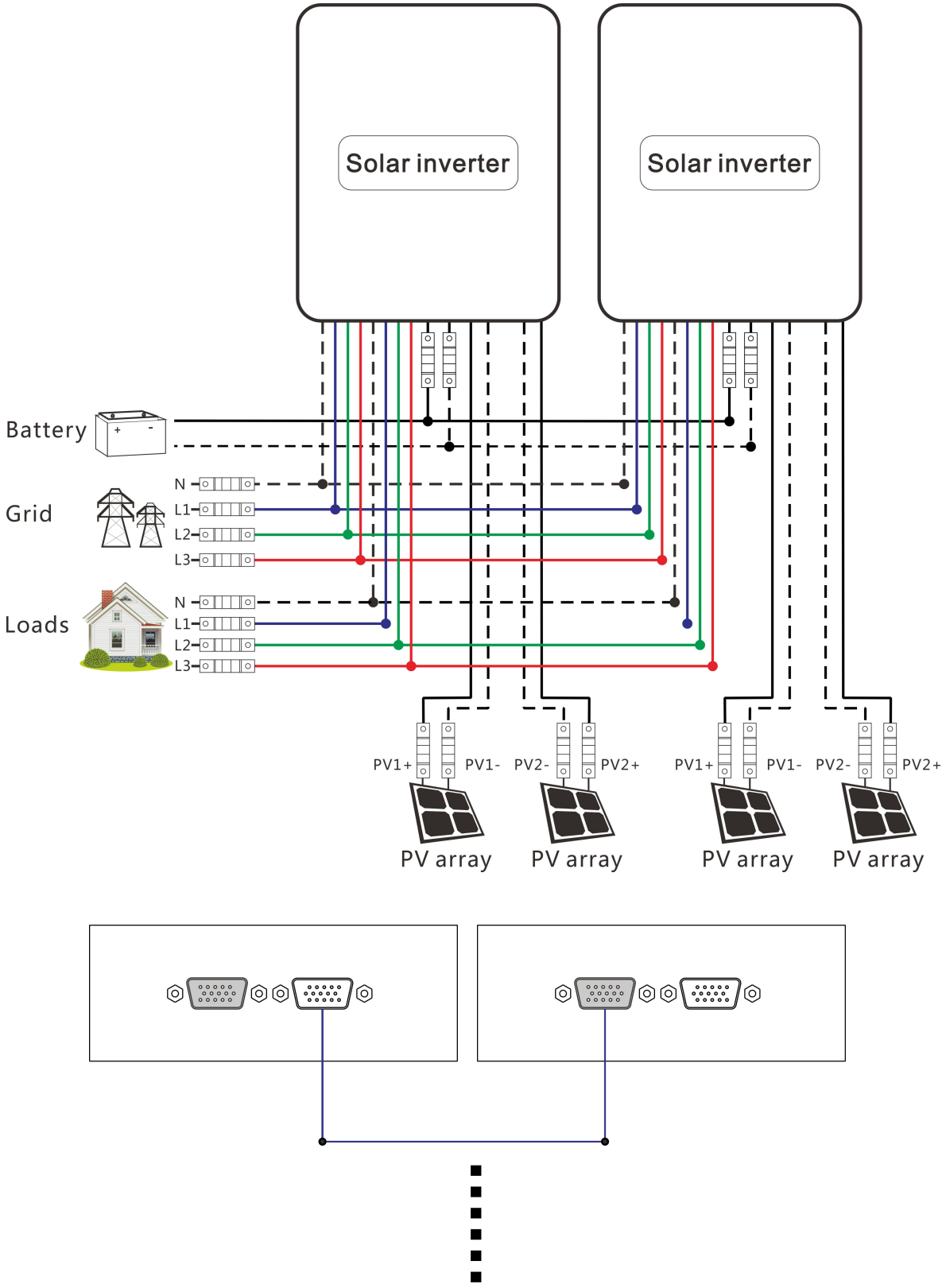
### 5.Communication Lines:

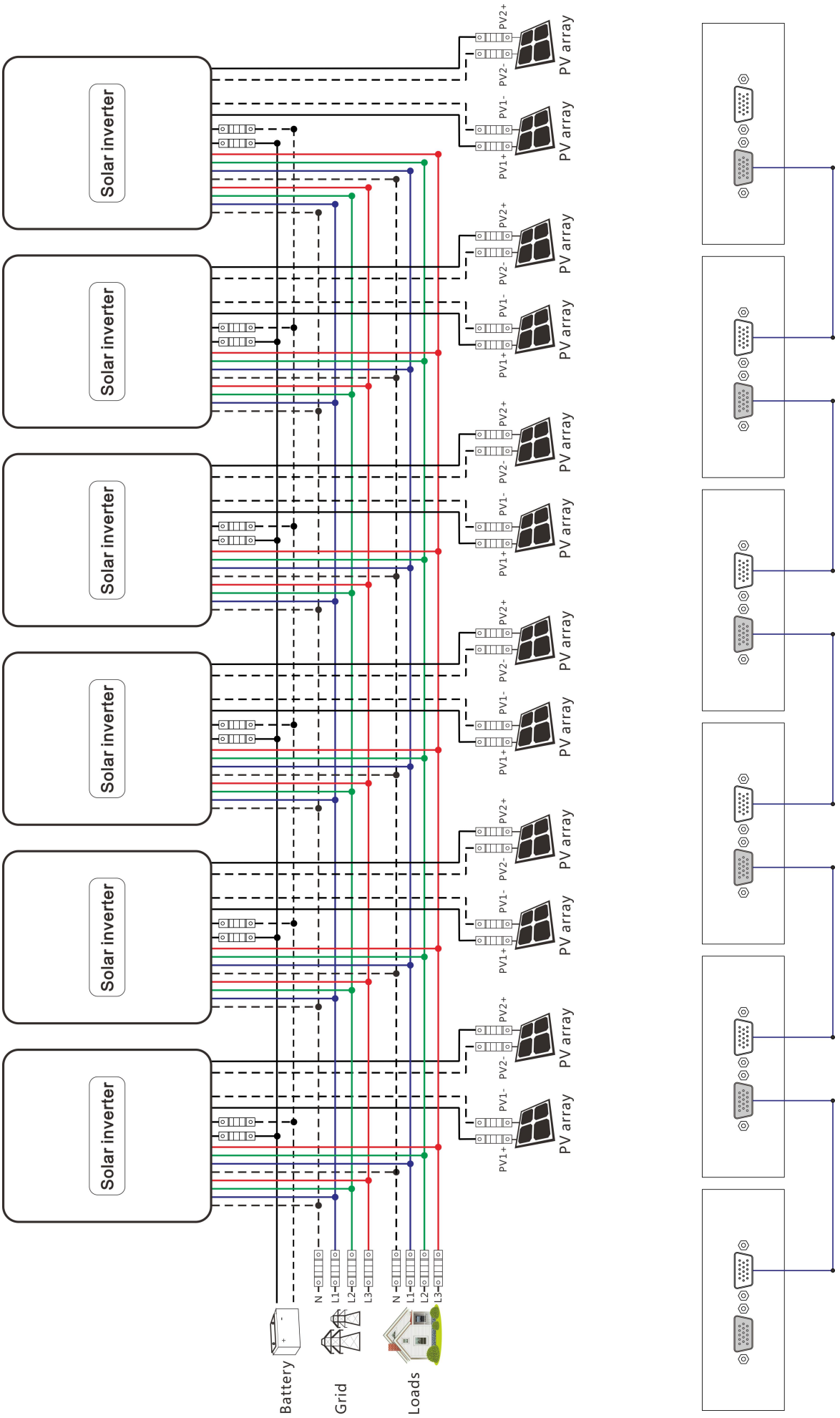
The parallel-operation communication cables produced by our company are DB15 standard computer cables with shielding function, designed for parallel-machine connection. Each inverter should adopt an "one-out-one-in" connection mode: the male connector (output) of an inverter must be connected to the female connector (input) of the parallel inverter. In addition, the communication cable of each parallel inverter will be secured with DB15 terminal screws to prevent the communication cable from falling off or poor contact, which may otherwise cause abnormal operation or damage to the system output.

**6**.Before and after connecting the system, carefully refer to the system wiring diagram below. Ensure all connections are correct and secure before powering on.

**7.** After the system is correctly wired, powered on, and operating normally, if a new inverter needs to be connected, ensure that the battery input, PV input, AC input, and AC output are disconnected, and all solar energy storage inverters are powered off before reconnecting to the system.

## 4.9.3 Schematic Diagram of Parallel Connection

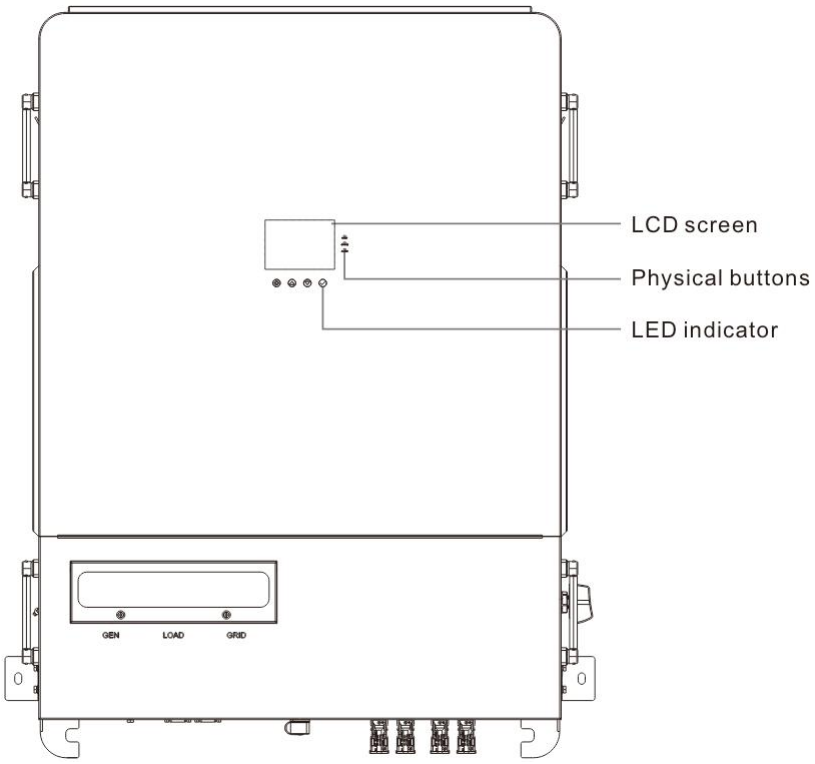



Solar inverter
Solar inverter
Solar inverter
Solar inverter
Solar inverter
Solar inverter
PV1+
PV1-
PV2+
PV2-
PV array
Battery
Grid
Loads
N
L1
L2
L3

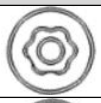
# 5.Operation

## 5.1 Operation and Display Panel

The operation and display panel below includes 1 LCD screen, 3 LED indicators, and 4 physical buttons.



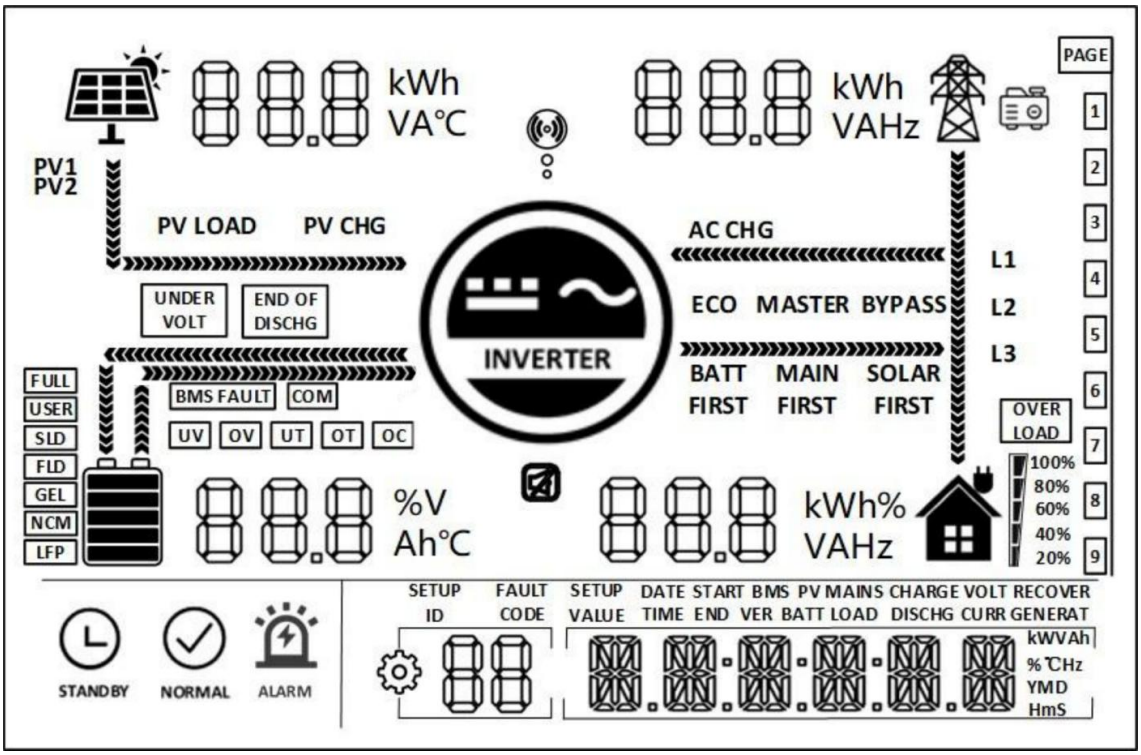

### ■ Physical buttons

| Button | Description |
|---|---|
|  | To enter/exit settings menu |
|  | To go to previous selection |
|  | To go to next selection |
|  | To confirm/enter selection in settings menu |

### ■ LED indicators

| Indicator | Color | Description |
|---|---|---|
| AC/INV | Green | Steady on: Mains bypass output |
| | | Flashing: Inverter output |
| CHARGE | Yellow | Steady on: Charging completed |
| | | Flashing: Charging in progress |
| FAULT | Red | Flashing: Fault occurred |

## ■ Display Panel



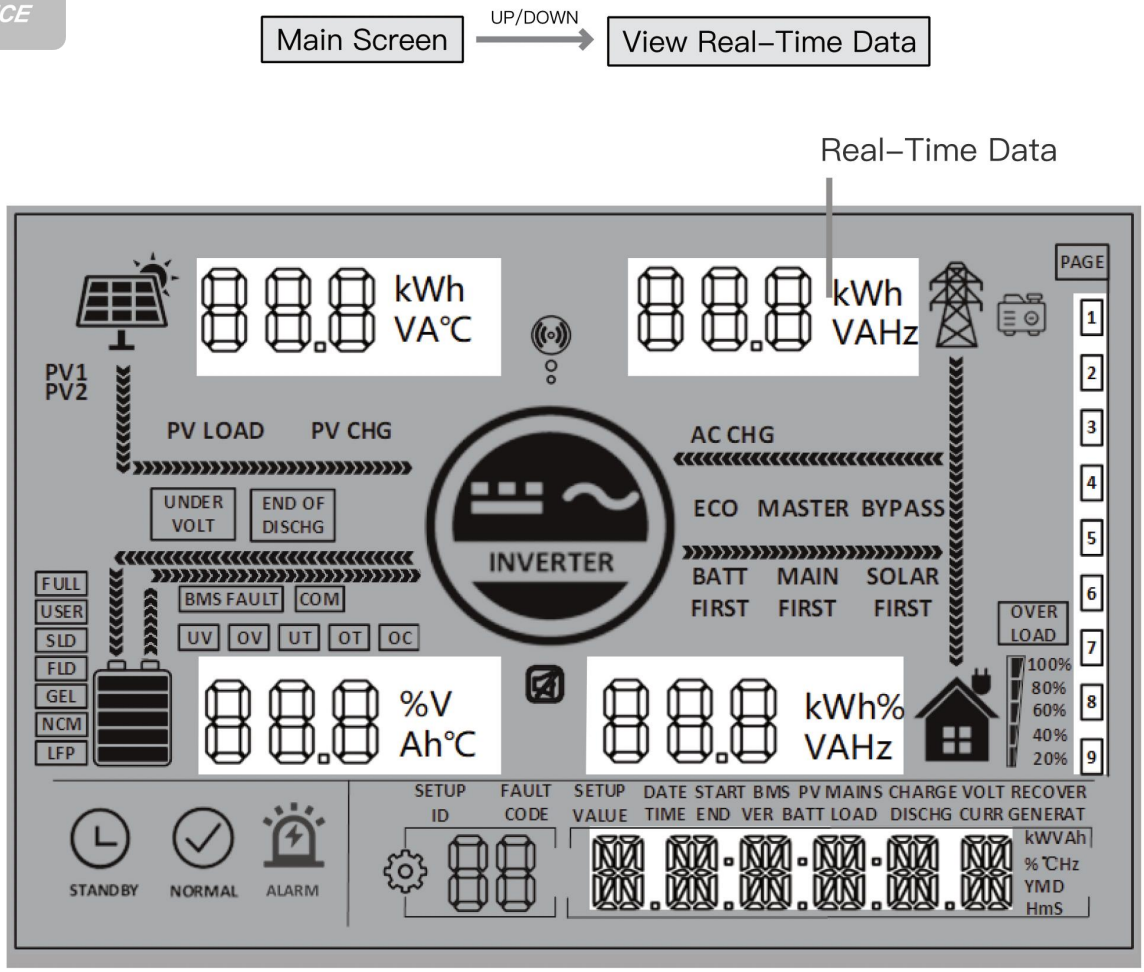

| Icon | Description | Icon | Description |
|---|---|---|---|
|  | Solar Panel |  | Grid |
|  | Battery |  | Generator |
|  | Inverter Working Status |  | Home load |
|  | The inverter is communicating with the data collector |  | The buzzer is in mute mode |
|  | Power Flow Direction | | |
|  | The inverter is in standby mode |  | The inverter is working normally |
|  | There is a fault |  | Settings |
|  | Load power: 80%–100% |  | SOC: 80%–100% |
|  | Load power: 60%–79% |  | SOC: 60%–79% |
|  | Load power: 40%–59% |  | SOC: 40%–59% |
|  | Load power: 20%–39% |  | SOC: 20%–39% |
|  | Load power: 5%–19% |  | SOC: 5%–19% |

| | | | |
|---|---|---|---|
| UNDER VOLT | Battery under-voltage | END OF DISCHG | Battery over-discharge |
| OVER LOAD | Overload | BMS FAULT | BMS fault |
| COM | System communication error | UV | System under-voltage |
| OV | System overvoltage | UT | System temperature too low |
| OT | Too high system temperature | OC | System over-current |
| FULL | Battery full power | USER | User-defined battery |
| SLD | Sealed lead-acid battery | FLD | Flooded lead-acid battery |
| GEL | Gel lead-acid battery | NCM | Ternary Li-ion battery |
| LFP | LFP Li-ion battery | ECO | Energy-saving mode |
| PV LOAD | PV energy is carrying the load | PV CHG | PV power is charging the battery |
| AC CHG | AC input power is charging the battery | MAINS FIRST | The output mode of the inverter is mains first |
| BYPASS | The output mode of the inverter is mains bypass | SOLAR FIRST | The output mode of the inverter is Solar first |
| BATT FIRST | The output mode of the inverter is battery first | | |

## ■ View real-time data

On the screen, press the UP/DOWN button to view real-time data of the inverter in operation.

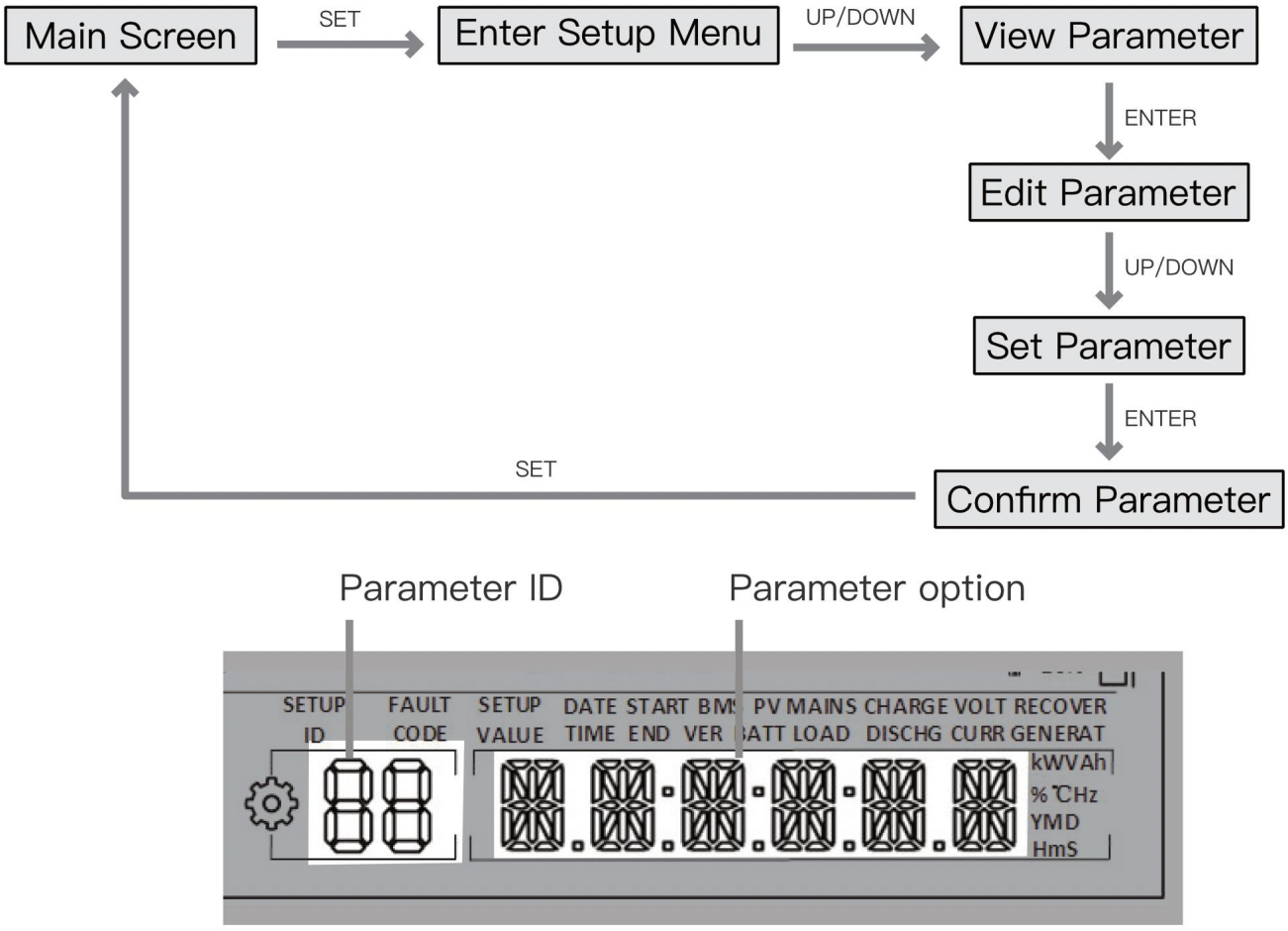
NOTICE




| Page | PV | Battery | AC input | Load | General |
|---|---|---|---|---|---|
| 1 | PV input voltage | Battery voltage | AC input voltage | Phase voltage | Current time |
| 2 | PV input current | Battery current | AC input current | Phase current | Current date |
| 3 | PV input power | Battery voltage | Total AC input power | Active power | Total PV power generation |
| 4 | Today's photovoltaic power generation in kWh | Battery current | Today's AC charging kWh | Apparent power | Total load electricity consumption |
| 5 | PV side radiator temperature | INV radiator temperature | AC frequency | AC output frequency | RS485 address |
| 6 | / | Rated battery voltage | Bus voltage | Rated output power | Software version |
| 7 | Max. PV charging current | Max. battery charge current | Max. AC charging current | Total AC output active power | / |
| 8 | | | / | Total AC output apparent power | / |

# 5.2 Setting

NOTICE







| ID | Parameter | Option | Description |
|---|---|---|---|
| **00** | Exit | ESC | Exit the setup menu. |
| **01** | AC output mode | UTI | PV energy priority with the load, When PV power is insufficient, the grid and PV jointly supply the load. When PV power exceeds the load demand, the surplus charges the battery.<br>Grid charging is activated only when the battery is over-discharged. (06 Settings as" OSO(only PV)", the grid power will not charge), the battery is only discharged when off the grid. |
| | | SBU | Prioritises the use of PV to power the load and switches back to the grid to power the load only when the battery voltage is lower than the set value in parameter item [4] (when connected to the BMS, according to item [61]). When the battery voltage is higher than the value set in parameter [5] (when connected to the BMS, according to item [62]), it switches back to the PV from the grid to supply the load. |
| | | SUB<br>**default** | PV energy first used for charging, the remaining energy supply load,when PV energy is insufficient, it is supplemented by the grid，the grid energy is first supplied to the load and second used for charging(if 06 Settings as" OSO(only PV )" ,the grid energy will not used for charging). |
| | | SOL | PV first mode. When the PV power is unavailable or the battery voltage is lower than the set value in the item 4, it will switch to the grid mode |
| **02** | AC output frequency | 50.0<br>**default** | In grid mode the AC output frequency will adapt to the grid frequency, otherwise the output will follow the preset values. |
| | | 60.0 | |
| **03** | AC input voltage range | UPS<br>**default** | When output voltage is 220/230V, input voltage range: 170V~282V, UPS frequency range: 50Hz frequency class 47-55Hz, 60Hz frequency class 57-65Hz |
| | | APL | When output voltage is 220/230V, input voltage range: 90V~282V, APL frequency range: 40-70Hz |
| **04** | Voltage point of battery switch to grid | 43.6<br>**default** | When parameter **[01]= SBU/SOL**, output source will switch to grid from battery when the battery voltage below the preset value.<br>Setting range: 40~52V. |

| | | | |
|---|---|---|---|
| **05** | Voltage point of grid switch to battery | 56.8<br>**default** | When parameter **[01]=SBU/SOL**, output source will switch to battery from grid when the battery voltage above the preset value.<br>Setting range: 48~60V. |
| **06** | Battery charging mode | SNU<br>**default** | PV and grid hybrid charging, with PV charging prioritized. When PV energy is insufficient, mains charging supplements it. When PV energy is sufficient, mains charging stops.<br>**Note:** PV and mains can only charge simultaneously when the mains bypass output is loaded. During inverter operation, only PV charging can be activated. |
| | | OSO | Only PV charging, without activating grid charging. |
| **07** | Battery charging current | 200A<br>**default** | Corresponding to SPI-16K-H3P, setting range: 0~300A. |
| | | 275A<br>**default** | Corresponding to SPI-18K-H3P, setting range: 0~360A. |
| | | | Corresponding to SPI-20K-H3P, setting range: 0~360A. |
| **08** | Battery type | USER | User-defined, user can set all battery parameter. |
| | | SLd | Sealed lead-acid battery. |
| | | FLd | Flooded lead-acid battery. |
| | | GEL<br>**default** | Gel lead-acid battery. |
| | | L14/ L15/ L16 | L14/ L15/ L16 lithium iron phosphate batteries, corresponding to lithium iron phosphate batteries 14, 15, 16 series. |
| | | N13/ N14 | Ternary lithium batteries, N13/N14, corresponding to ternary lithium batteries 13 series, 14 series. |
| | | No bat | No battery. |
| **09** | Boost charging voltage | 57.6V<br>default | Setting range 48V~58.4V, step 0.4V, valid when battery type is custom and lithium battery. |
| **10** | Boost charging maximum time | 120<br>**default** | Boost charging maximum time setting, refers to the constant voltage charging when the voltage reaches the **parameter [09]** setting voltage maximum charging time, set the range of 5min~900min, step of 5 minutes. |
| **11** | Battery float charging voltage | 55.2<br>default | Setting range 48V~58.4V, step 0.4V, this parameter can not be set after the BMS communication is successful. |
| **12** | Battery over - discharge voltage (delayed shutdown) | 42<br>**default** | When the battery voltage is lower than the judgement point, and triggers the **parameter [13]**, the inverter output is switched off, the setting range is 40V~48V. |

| | | | |
|---|---|---|---|
| **13** | Battery over-discharge delay time | 5<br>**default** | The battery voltage is lower than **parameter [12**], and the inverter output is switched off after triggering the delay time set in this parameter, the setting range is 5s~50s, the step is 5s. |
| **14** | Battery under-voltage alarm point | 44<br>default | When the battery voltage is lower than this judgement point, the device will under-voltage alarm, the output will not be switched off, the setting range is 40V~52V, the step is 0.4V. |
| **15** | Battery discharge limiting voltage | 40<br>default | When the battery voltage is lower than this parameter value, the output will be turned off immediately. The setting range is 40V~52V, the step is 0.4V. |
| **16** | Battery equalization charging | DIS | Disable equalization charging. |
| | | ENA<br>**default** | Enable equalization charging, valid when battery type is FLd, SLd, and USER. |
| **17** | Battery equalization charging voltage | 58 | Setting range 48V~58V in 0.4V steps, valid when battery type is FLd, SLd, and USER. |
| **18** | Battery equalization charging duration | 120 | Setting range 5min~900min in 5 min steps, valid when battery type is FLd, SLd, and USER. |
| **19** | Battery equalization charging delay time | 240 | Setting range 5min~900min in 5 minute steps, valid when battery type is FLd, SLd, and USER. |
| **20** | Battery equalization charging interval | 30 | Setting range 0~30 days in 1 day steps, valid when battery type is FLd, SLd, and USER. |
| **21** | Battery equalization charging stop-start | DIS<br>default | Start equalization charging immediately. |
| | | ENA | Stop equalization charging immediately. |
| **22** | Energy-saving mode | DIS<br>**default** | Disable energy-saving mode. |
| | | ENA | Enable energy-saving mode, when the load power is less than 25W, the output of the inverter will switch off after a 5-minute delay. When the load exceeds 50W, the inverter will restart automatically. |
| **23** | Overload automatic restart | DIS | Disable overload automatic restart, if an overload occurs to shut down the output, the machine will not be restored to power on again. |
| | | ENA<br>**default** | Enable overload automatic restart. If an overload occurs that shuts down the output, the machine delays for 3 minutes before restarting the output. After accumulating 5 times, it will not restart again. |
| **24** | Over-temperature auto restart | DIS | Disable over-temperature auto restart and when over-temperature occurs, it will turn off the output and the inverter will no longer turn on the output |

| | | | |
|---|---|---|---|
| | | ENA<br>**default** | Enable over-temperature auto restart and when over-temperature occurs, it will turn off the output and the output will restart when the temperature drops |
| **25** | Buzzer alarm | DIS | Disable buzzer alarm. |
| | | ENA<br>**default** | Enable buzzer alarm. |
| **26** | Mode change alarm | DIS | Disable alarm prompt when the status of the main input source changes. |
| | | ENA<br>default | Enable alarm prompt when the status of the main input source changes. |
| **27** | Inverter overload switch to bypass | DIS | Disable automatic switching to grid to power the load when the inverter is overloaded. |
| | | ENA<br>**default** | When the inverter is overloaded, it automatically switches to grid to power the load. |
| **28** | Grid charging current | 150A | Corresponds to SPI-16K-H3P, setting range: 0~300A. |
| | | 180A | Corresponds to SPI-18K-H3P, setting range:0~360A. |
| | | 180A | Corresponds to SPI-20K-H3P, setting range: 0~360A. |
| **29** | BMS fault causes the battery to stop working. | DIS<br>**default** | Disable BMS Faulty battery stops working. |
| | | ENA | Enable BMS Faulty battery stops working. |
| **30** | RS485 communication address | ID: 1 | RS485 address setting range: 1~253. |
| **31** | AC output mode (can be set in the standby mode only) | SIG<br>**default** | When single inverter is used, the default is **SIG mode**. |
| | | PAL | In parallel operation. |
| **32** | RS485 communication | DIS<br>**default** | Disable the BMS communication function. |
| | | 485 | RS485 BMS communication function. |
| | | CAN | CAN BMS communication function. |
| **33** | BMS communication | When **item [32] = 485 / CAN**, the corresponding lithium battery manufacturer brand should be selected for communication. | |
| | | WOW<br>**default** | **485 protocol:**<br>PAC=PACE, RDA=RITAR, AOG=ALLGRAND，<br>OLT=OLITER, CEF=CFE, XYD=SUNWODA, DAQ=DYNESS,<br>WOW=SRNE, PYL=PYLONTECH，POW=POWMr,<br>VOL=VILION, SGP=SGP, GSL Energy, PYT=Pylon tech 2 |
| | | | **CAN protocol:**<br>UZE=YUZE, SGP=SGP, GSL Energy, PYT=Pylon tech 2 |

| | | | |
|---|---|---|---|
| **34** | On-grid and anti-reverse current | DIS **default** | Disable this function. |
| | | ON GRD | When **parameter [01]=UTI**, PV energy will be prioritized for load supply. After meeting the load demand, the remaining electricity will be fed back to the grid, and any further excess energy will be used to charge the battery.<br>When **parameter [01]=SUB**, PV energy will prioritize charging the battery. After meeting the battery demand, the remaining electricity will be used to power the load (if the remaining electricity is insufficient for the load, the remaining PV power will be mixed with grid power to supply the load), and any additional excess energy will be fed back to the grid. |
| | | LM HOME LOAD | When **parameter [01]=UTI**, PV energy will be prioritized for load supply. Excess energy will be subject to anti-backflow control, and any remaining excess energy will be used to charge the battery.<br>When **parameter [01]=SUB**, PV energy will be prioritized for charging. After meeting the battery's requirements, the remaining energy will be used for load supply, and any further excess energy will be subject to anti-backflow control. |
| **35** | Battery under-voltage recovery point | 52V **default** | When the battery is under-voltage, the battery voltage needs to be higher than this setting value in order to restore the battery inverter AC output, setting range: 44V~54.4V. |
| **37** | Battery full charge and recharging recovery point | 52V **default** | Inverter stops charging when the battery is full. Inverter resumes charging when the battery voltage below this value. Setting range: 44V~54V. |
| **38** | AC output phase voltage | 230V **default** | Setting range: 200/208/220/230/240Vac. |
| **39** | Charging current limiting method (when BMS is enabled) | **[SET]** The maximum battery charging current is limited according to the setting in [07]. | |
| | | **[BMS]** Default Maximum battery charging current is limited according to the current limit value of the BMS. | |
| | | **[INV]** Maximum battery charging current is limited by the machine's derating logic. | |
| **40** | 1st slot grid start charging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **41** | 1st slot grid end charging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **42** | 2nd slot grid start charging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |

| | | | |
|---|---|---|---|
| **43** | 2nd slot grid end charging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **44** | 3rd slot grid start charging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **45** | 3rd slot grid end charging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **46** | Time slot grid charging function | DIS **default** | Disable this function. |
| | | ENA | When the segmented scheduled grid charging function is enabled, grid charging will only be performed during the set charging time periods. |
| **47** | 1st slot battery start discharging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **48** | 1st slot battery end discharging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **49** | 2nd slot battery start discharging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **50** | 2nd slot battery end discharging | 00:00:00 default | Setting range: 00:00:00-23:59:00. |
| **51** | 3rd slot battery start discharging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **52** | 3rd slot battery end discharging | 00:00:00 **default** | Setting range: 00:00:00-23:59:00. |
| **53** | Time slot battery discharging function | DIS **default** | Disable this function. |
| | | ENA | After enabling the segmented timed battery discharge function, the battery will discharge only during the specified discharge period. |
| **54** | Local date | 00:00:00 | YY/MM/DD. Setting range: 00:01:01-99:12:31. |
| **55** | Local time | 00:00:00 | Setting range: 00:00:00-23:59:59. |
| **56** | Leakage current detection protection | DIS **default** | Disable detecting Leakage current value. |
| | | ENA | Enable detecting Leakage current value. |
| **57** | Stop charging current | 3 | Charging stops when the charging current is less than this setting (unit: A). |
| **58** | Discharging alarm SOC setting | 15 | Triggers an alarm when the battery SOC is less than the set value (unit: %, valid only when BMS communication is normal). |
| **59** | Discharging cut-off SOC setting | 5 | Stops discharging when the battery SOC is less than the set value (unit: %, valid only when BMS communication is normal). |

| | | | |
|---|---|---|---|
| **60** | Charging cut-off SOC setting | 100 | Stops charging when the battery SOC is higher than the set value (unit: %, valid only when BMS communication is normal). |
| **61** | Switching to grid SOC setting | 10 | Switch to grid power when the battery SOC is less than this setting value (unit: %, valid only when BMS communication is normal). |
| **62** | Swithing to inverter output SOC setting | 100 | Switches to inverter output mode when SOC is higher than this setting value (unit: %, valid only when BMS communication is normal). |
| **63** | N-PE bonding automatic switching function | DIS default | Disable automatic switching of N-PE connections. |
| | | ENA | Enable automatic switching of N-PE connections. |
| **67** | on-grid power setting | 0 **default** | Setting range: 0 to inverter rated power. |
| **68** | Output phase - angle setting | Three-phase with N line | For three-phase four-wire system, where the mains input has a N line connected. |
| | | Three-phase without N line **(Not settable by default)** | For three-phase three-wire system, where the mains input has no N line connected. |
| **70** | Insulation impedance detection | DIS **default** | Disable detecting insulation impedance value. |
| | | ENA | Enable detecting insulation impedance value. |
| **72** | Battery grid-connected discharge enable | DIS **default** | The battery is not permitted to discharge to the grid. |
| | | ENA | The battery is permitted to discharge to the grid. |
| **73** | Generator charging current setting | 150A **default** | Configurable when the generator is GEN_IN, with a maximum of 300A for SPI-16K-H3P |
| | | 180A **default** | Configurable when the generator is GEN_IN, with a maximum of 360A for SPI-18K-H3P |
| | | 180A **default** | Configurable when the generator is GEN_IN, with a maximum of 360A for SPI-20K-H3P |
| **74** | Generator power setting | 32kW | Configurable when the generator is GEN_IN.<br>For SPI-16K-H3P, the maximum is 32kW, corresponding to a maximum grid input of 16kW for charging and 16kW for load supply. |
| | | 36kW | Configurable when the generator is GEN_IN.<br>For SPI-18K-H3P, the maximum is 36kW, corresponding to a maximum grid input of 18kW for charging and 18kW for load supply. |

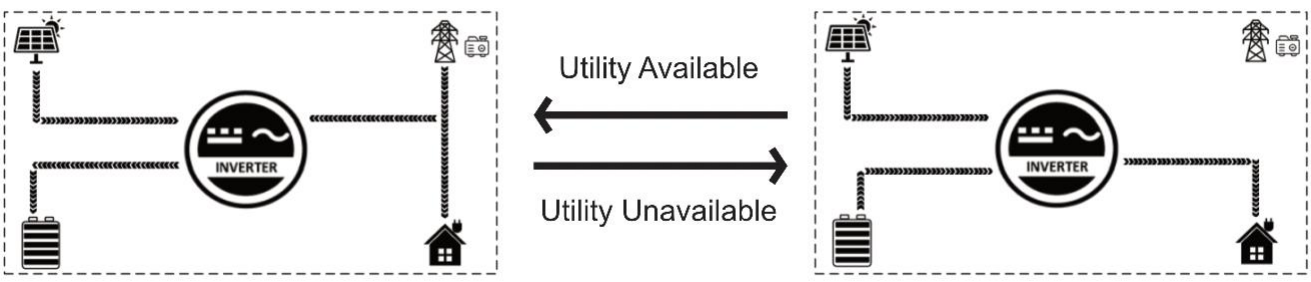
| | | | |
|---|---|---|---|
| | | 40kW | Configurable when the generator is GEN_IN.<br>For SPI-20K-H3P, the maximum is 40kW, corresponding to a maximum grid input of 20kW for charging and 20kW for load supply. |
| **76** | External CT transformation ratio | 2500 | Setting range: 0~5000 |
| **77** | External CT anti-backflow error power | 300W<br>**default** | It can be set between 0W and 500W, which means that in order to prevent power sampling errors, 0-500W of electricity is drawn from the grid to ensure that there is no backflow at all. |
| **79** | AFCI Enable | DIS<br>**default** | Disable AFCI function. |
| | | 1-10 | Enable AFCI function. Detection Threshold: 1–10 |
| **80** | AFCI fault manual clearing | NULL<br>**default** | Do not clear. |
| | | CLEAR | Manually clear the AFCI fault. |
| **81** | Generator operating mode | GEN IN<br>**default** | Generator interface used as generator function input. |
| | | AC OUT | Generator interface used as secondary load port output. |
| **82** | CT manual enabling | NO CT | No CT input. |
| | | TO INV | CT direction set to inverter flow as positive direction. |
| | | TO GRD | CT direction set to grid flow as positive direction. |

# 5.3 AC Output Mode

The AC output mode corresponds to parameter setting item 01 and 34, which allows the user to set the AC output power source manually.

- **Utility Priority Output 01 UTI**

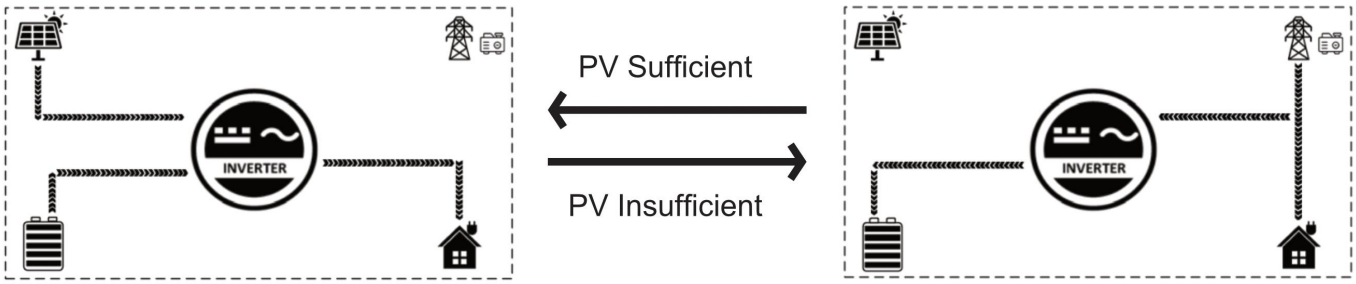
Utility priority for power supply. It will only switch to the inverter when the grid power is cut off.**(Priority: PV > Utility > Battery)**



- **PV and Utility hybrid loading 01 SUB (default)**

PV priority charging; When PV power is insufficient, utility power and PV will perform hybrid charging (when item 06 is set to "PV-only charging", utility power will not be used for charging), and utility power will supply the load. When PV power meets the charging demand but cannot meet the load demand, PV and utility power will perform hybrid loading, and the battery will only discharge in off-grid mode.

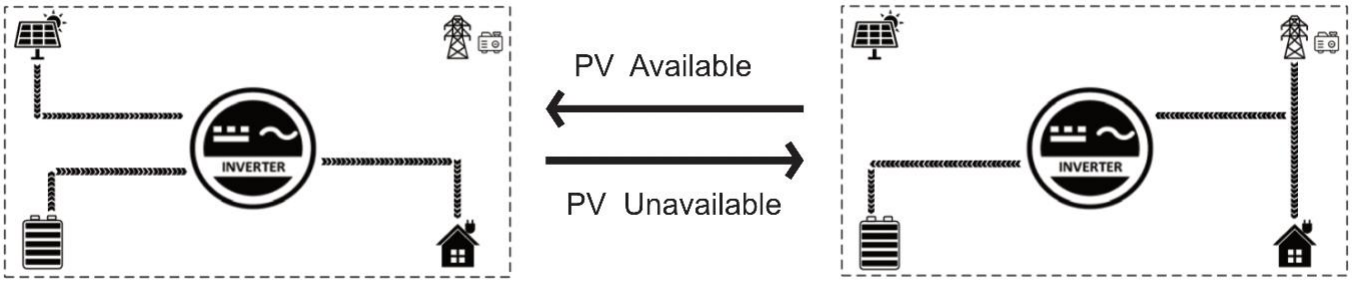
**(Priority: Utility > PV > Battery)**




- **PV Priority Output 01 SOL**

PV prioritizes power supply to the load. When PV meets the load demand, the excess power will charge the battery. When PV energy is insufficient, the battery will supplement energy to power the load. When PV is invalid, it will switch to utility power supply, and finally use battery power supply. When PV energy is insufficient, and when the battery level is lower than the parameter (Battery to utility ) or the SOC setting value for switching to utility, it will switch to utility power supply for the load and charging. PV charges when there is no load. This mode can maximize the use of PV power generation while maintaining battery capacity, and is suitable for areas with stable power grids.

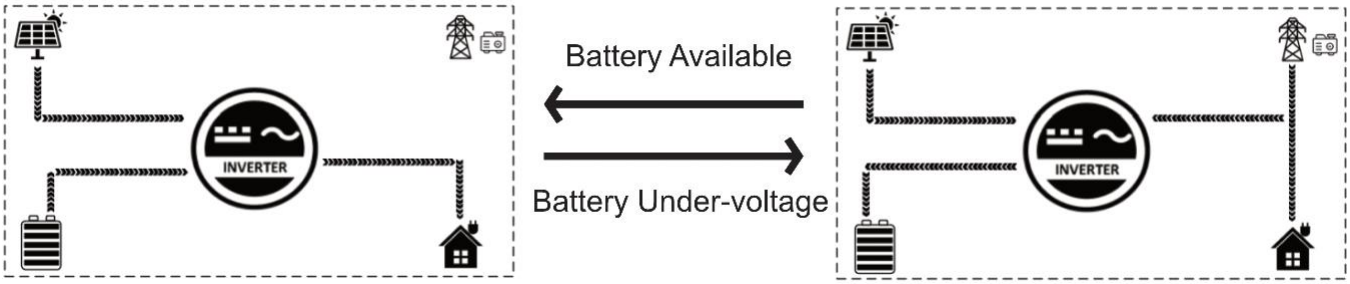
**(Priority: PV > Utility > Battery)**




- **Inverter Priority Output 01 SBU**

The PV will supply power to the loads on a priority basis. If the PV is insufficient or unavailable, the battery will be used as a supplement to supply power to the load. When the battery voltage touches the value of parameter [04] (Voltage point of battery switch to utility), it will switch to utility power supply to the load (without BMS connected) / When the BMS is connected and the Li-ion battery SOC touches the value of parameter [61] (Switching to utility SOC setting), it will switch to utility power supply to the load. This mode maximises the use of DC energy, and it is

suitable for the areas where the utility power is stable.
**(Priority: PV > Battery > Utility)**

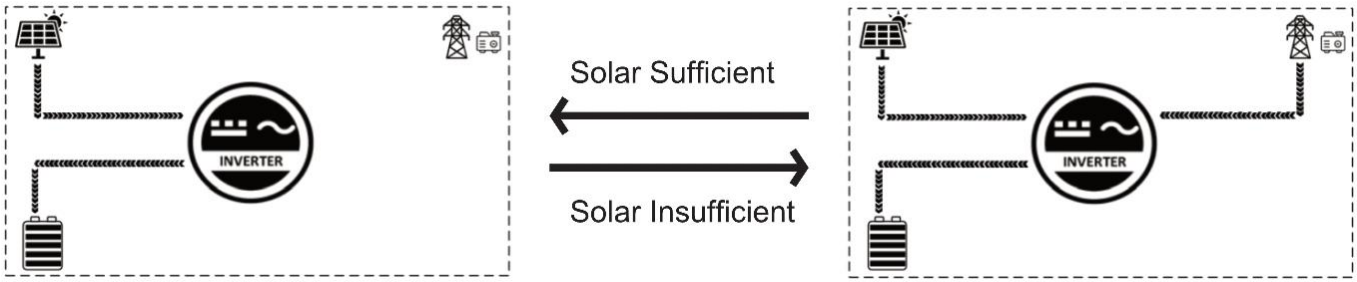



# 5.4 Battery Charging Mode

The charging mode corresponds to parameter [06], which allows the user to set the charging mode manually.

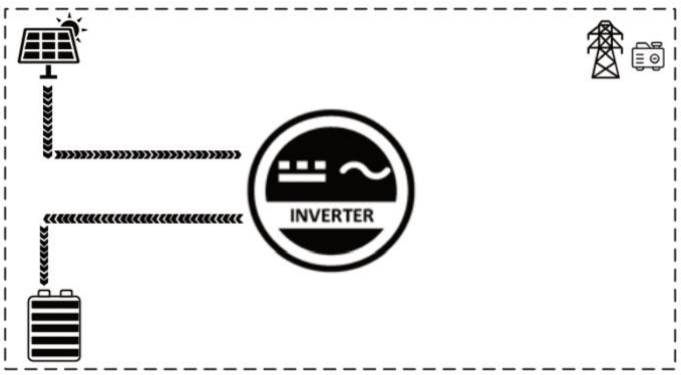
- **Hybrid Charging SNU (default)**

PV and utility power charge the battery at the same time, with PV taking priority and mains power acting as a supplement when PV is insufficient. This is the fastest charging method and is suitable for areas with insufficient power supply, providing sufficient backup power for users. **(Priority: PV > Utility)**




- **Only PV Charging OSO**

Only PV power is used to charge the battery, without starting the utility charging. This is the most energy-efficient method, with all battery power coming from solar energy, and is usually used in areas with good radiation conditions.

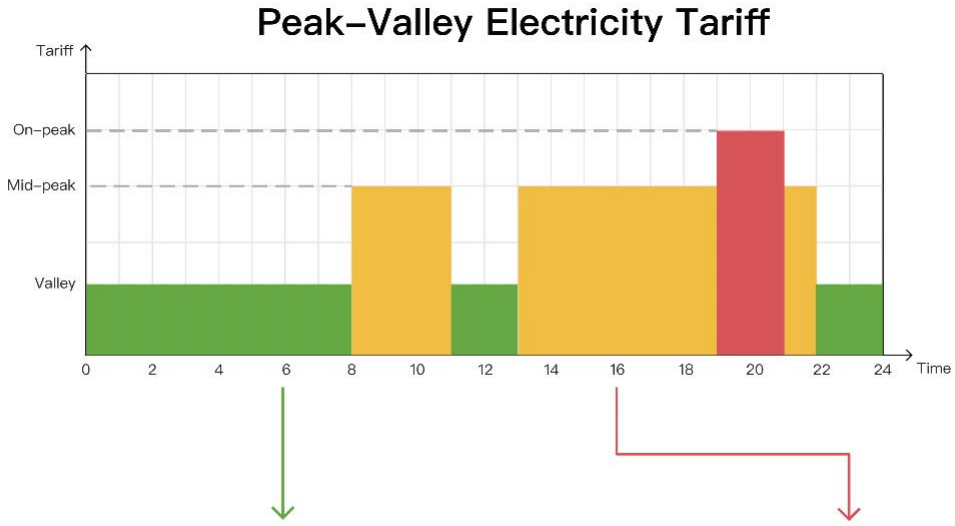


# 5.5 Time-slot Charging/Discharging Function

SPI H3P series is equipped with time-slot charging / discharging function, users can set different charging/discharging time slots according to the local peak and valley electricity price, so as to make efficient use of utility power and PV energy. When the utility price is expensive, the battery can be used to supply power to the loads. When the utility price is cheap, the utility power can be used to supply to the loads and charge, which can help users save the electricity bill to the greatest extent. Users can turn on/off the time-sharing charging/discharging function in the setting menu parameters [46] and [53], and set the charging and discharging time periods in parameters [40-45], [47-52] for timed mains charging start/time setting and timed battery discharging start/time setting. Here is a case example to help users understand the function.

⚠ *NOTICE*

Before using this function for the first time, please set the local time in parameter [54], [55], then the user can set the corresponding time slot according to the local peak and valley tariff charges.




**Time-slot Utility Charging & Loading Function**


With 3 definable periods, the user can freely set the mains charging/supplying power time within the range of 00:00 to 23:59. During the time period set by the user, if PV energy is available, PV energy will be used first, and if PV energy is not available or insufficient, utility energy will be used as a supplement.

**Time-slot Battery Discharging Function**

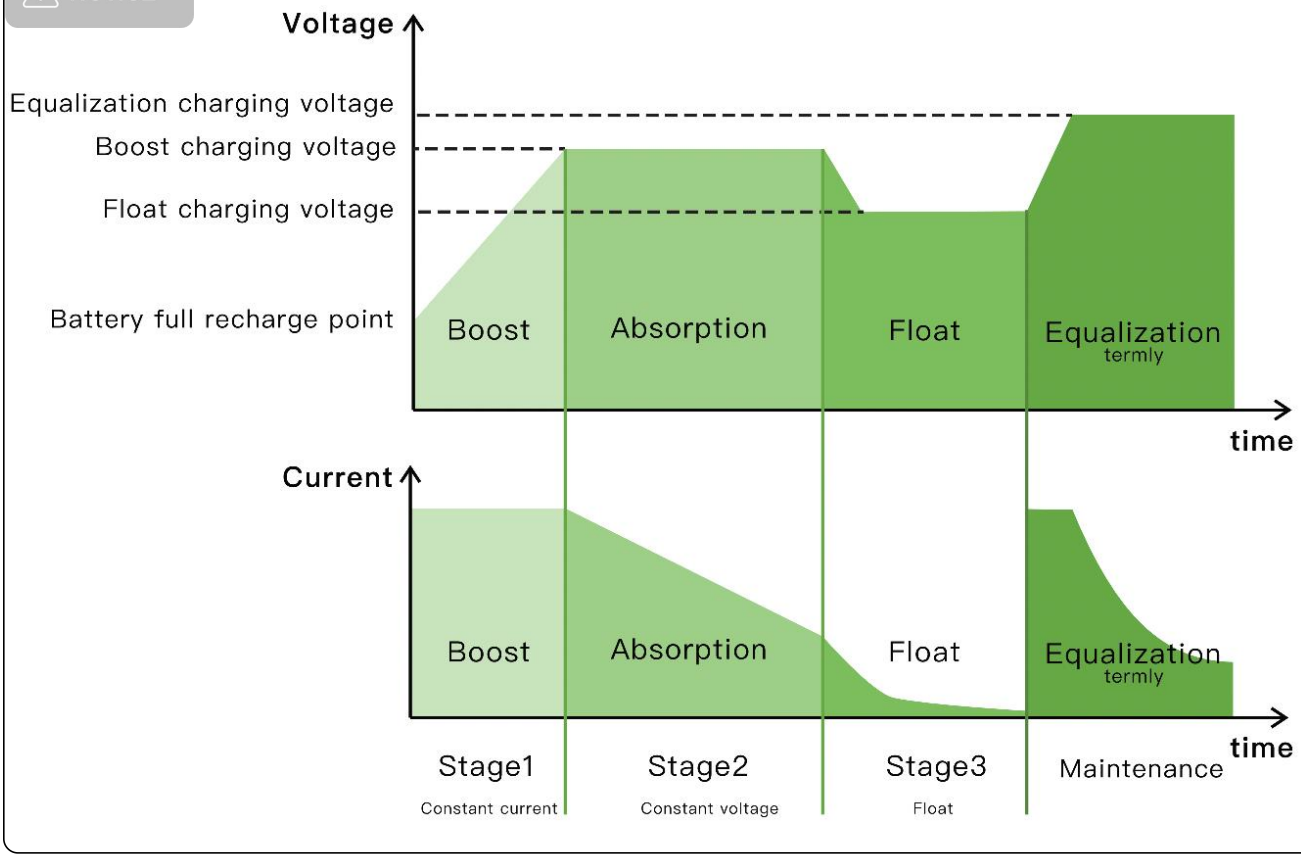

With 3 definable time periods, users can freely set the battery discharge time within the range of 00:00 to 23:59. During the time set by the user, the inverter will give priority to the battery inverter to carry the load, and if the battery power is insufficient, the inverter will automatically switch to mains power to ensure stable operation of the load.

# 5.6 Battery Parameters

## ■ Lead-acid battery

| Parameters \ Battery type | Sealed lead acid battery (SLD) | Gel lead acid battery (GEL) | Flooded lead acid battery (FLD) | User-defined (USE) |
|---|---|---|---|---|
| Overvoltage Disconnect Voltage | 60V | 60V | 60V | 60V |
| Equalization Charging Voltage | 58V | 56.8V | 58V | 40 ~ 60V settable |
| Boost Charging Voltage | 57.6V | 56.8V | 57.6V | 40 ~ 60V settable |
| Float Charging Voltage | 55.2V | 55.2V | 55.2V | 40 ~ 60V settable |
| Undervoltage Alarm Voltage | 44V | 44V | 44V | 40 ~ 60V settable |
| Undervoltage Disconnect Voltage | 42V | 42V | 42V | 40 ~ 60V settable |
| Discharge Limit Voltage | 40V | 40V | 40V | 40 ~ 60V settable |
| Over-discharge Delay Time | 5s | 5s | 5s | 1 ~ 30s settable |
| Equalization Charging Duration | 120 min | - | 120 min | 0 ~ 600 min settable |
| Equalization Charging Cycle | 30d | - | 30d | 0 ~ 250d settable |
| Bulk Charging Cycle | 120m | 120m | 120m | 10 ~900m settable |

NOTICE

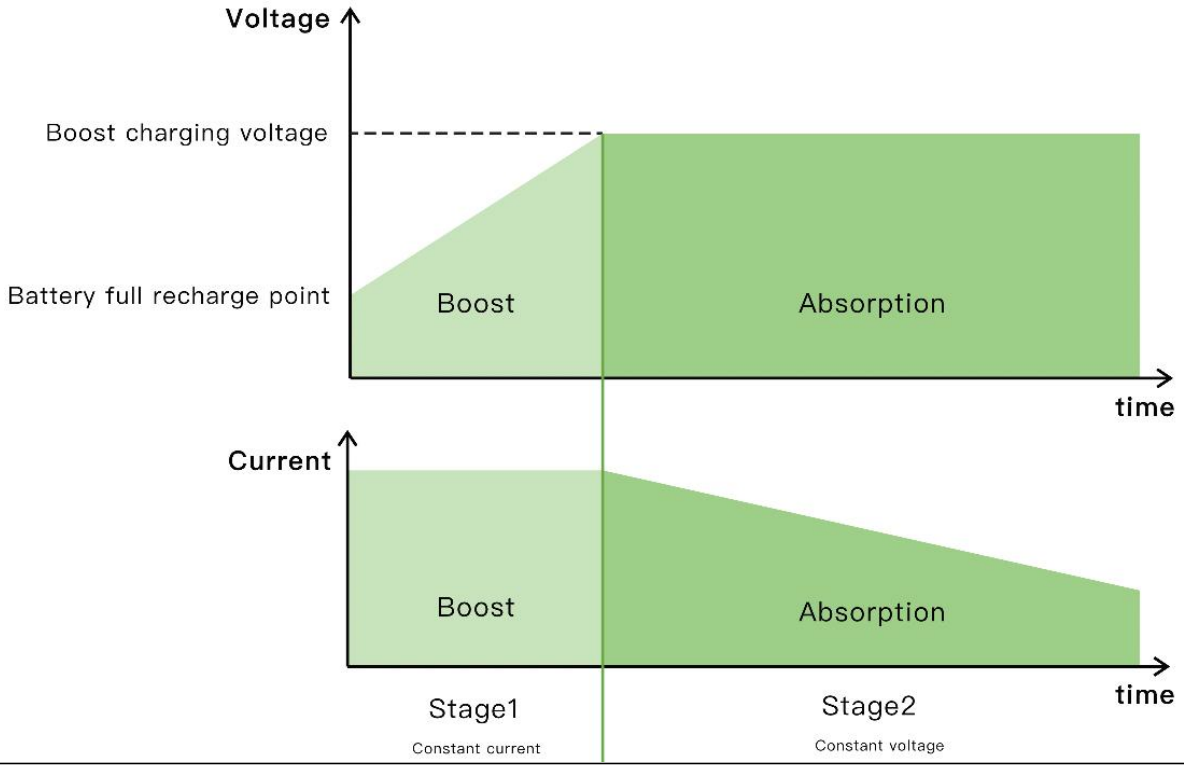


## ■ Lithium-ion Battery

| Battery type / Parameters | Ternary (N13) | Ternary (N14) | LFP (L16) | LFP (L15) | LFP (L14) | Adjustable |
|---|---|---|---|---|---|---|
| Overvoltage Disconnect Voltage | 60V | 60V | 60V | 60V | 60V | 60V |
| Equalization Charging Voltage | - | - | - | - | - | 40 ~ 60V settable |
| Boost Charging Voltage | 53.2V | 57.6V | 56.8V | 53.2V | 49.2V | 40 ~ 60V settable |
| Float Charging Voltage | 53.2V | 57.6V | 56.8V | 53.2V | 49.2V | 40 ~ 60V settable |
| Undervoltage Alarm Voltage | 43.6V | 46.8V | 49.6V | 46.4V | 43.2V | 40 ~ 60V settable |
| Undervoltage Disconnect Voltage | 38.8V | 42V | 48.8V | 45.6V | 42V | 40 ~ 60V settable |
| Discharge Limit Voltage | 36.4V | 39.2V | 46.4V | 43.6V | 40.8V | 40 ~ 60V settable |
| Over-discharge Delay Time | 30s | 30s | 30s | 30s | 30s | 1 ~ 30s settable |
| Equalization Charging Duration | - | - | - | - | - | 0 ~ 600 min settable |
| Equalization Charging Cycle | - | - | - | - | - | 0 ~250d settable |
| Boost Charging Cycle | 120 min settable | 120 min settable | 120 min settable | 120 min settable | 120 min settable | 10 ~ 900 min settable |

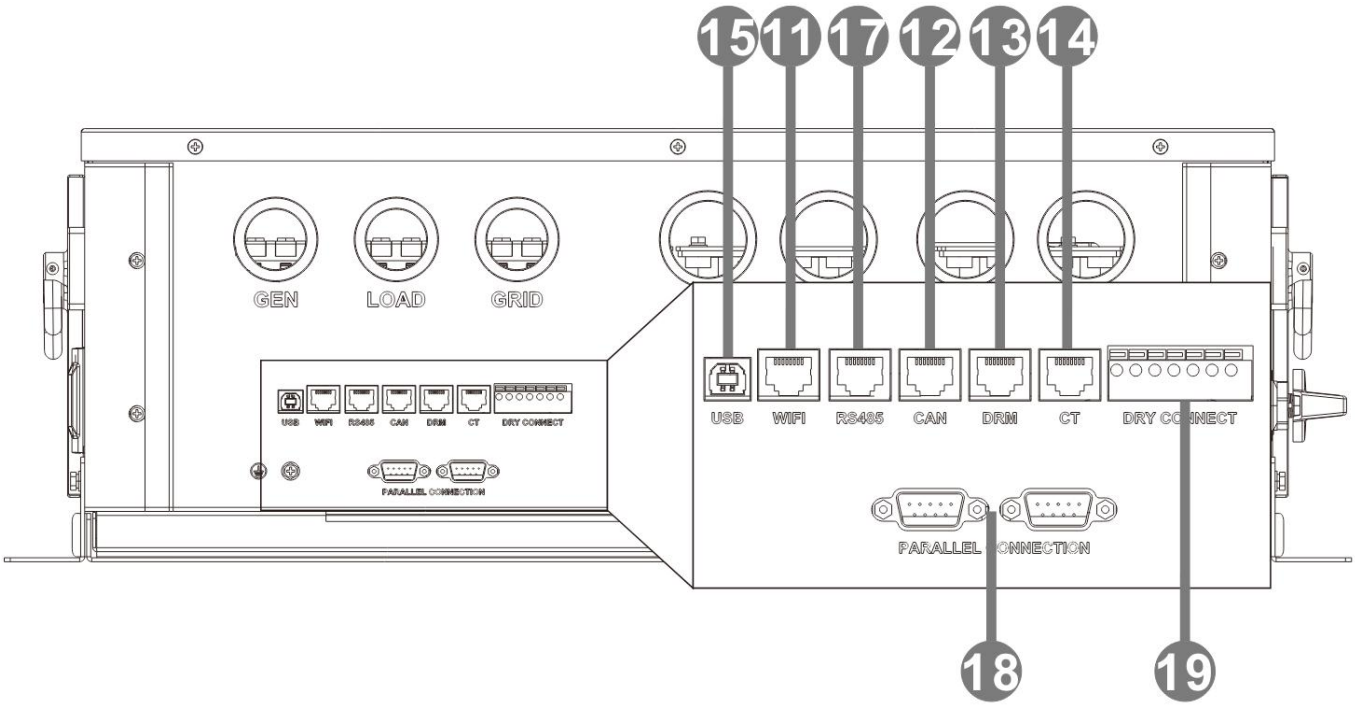
⚠ *NOTICE*

If no BMS is connected, the inverter will charge according to the battery voltage with a preset charging curve. When the inverter communicates with the BMS, it will follow the BMS instructions to perform a more complex stage charging process.



# 6.Communication

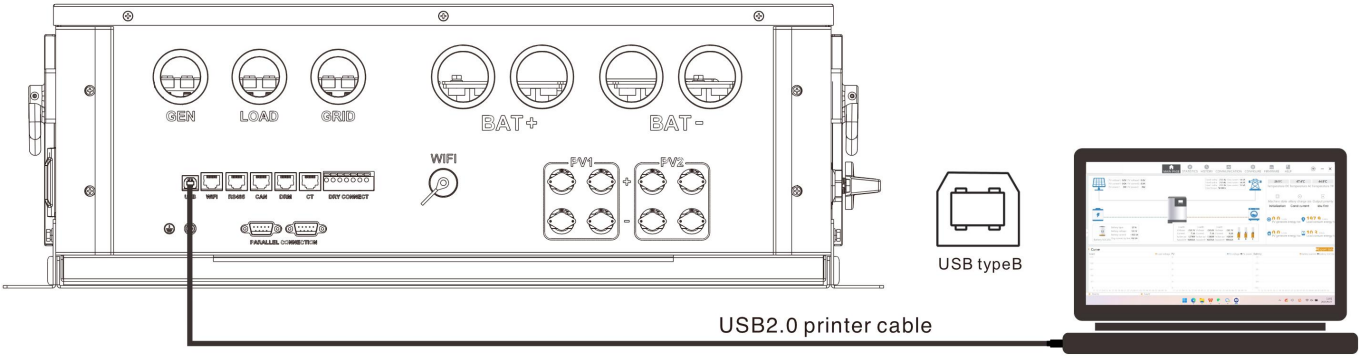
## 6.1 Product Overview




| | | | | | |
|---|---|---|---|---|---|
| 11 | WiFi Port | 12 | CAN Port | 13 | DRM Port |
| 14 | CT Port | 15 | USB Port | 17 | RS485 Port |
| 18 | Parallel Port | 19 | Dry Contact Prot | | |

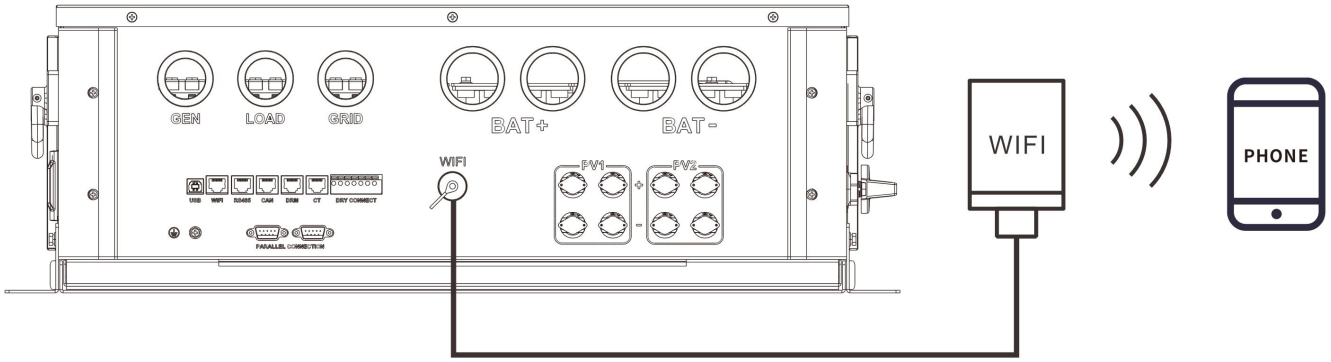
## 6.2 USB Communication Function

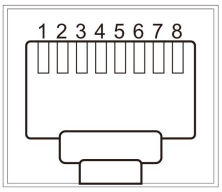
Users can use the host computer software to read and modify the device parameters through this port. If you need the installation package of the host computer software, you can download it from the official website of SRNE or contact us to get the installation package.



# 6.3 WiFi Communication Function

The WiFi port is used to connect to the Wi-Fi/GPRS logger module, which allows users to view the operating status and parameters of the inverter via mobile phone APP.



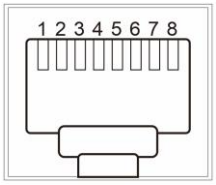




WIFI

| RJ45 | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Pin 5 | Pin 6 | Pin 7 | Pin 8 |
|---|---|---|---|---|---|---|---|---|
| Description | 5V | GND | / | / | / | / | RS485-A | RS485-B |

# 6.4 RS485/CAN Communication Function

The RS485/CAN communication port  is used to connect to the BMS of Liion battery.




RS485/CAN

| RJ45 | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Pin 5 | Pin 6 | Pin 7 | Pin 8 |
|---|---|---|---|---|---|---|---|---|
| Description | RS485-B | RS485-A | / | CANH | CANL | / | RS485-A | RS485-B |

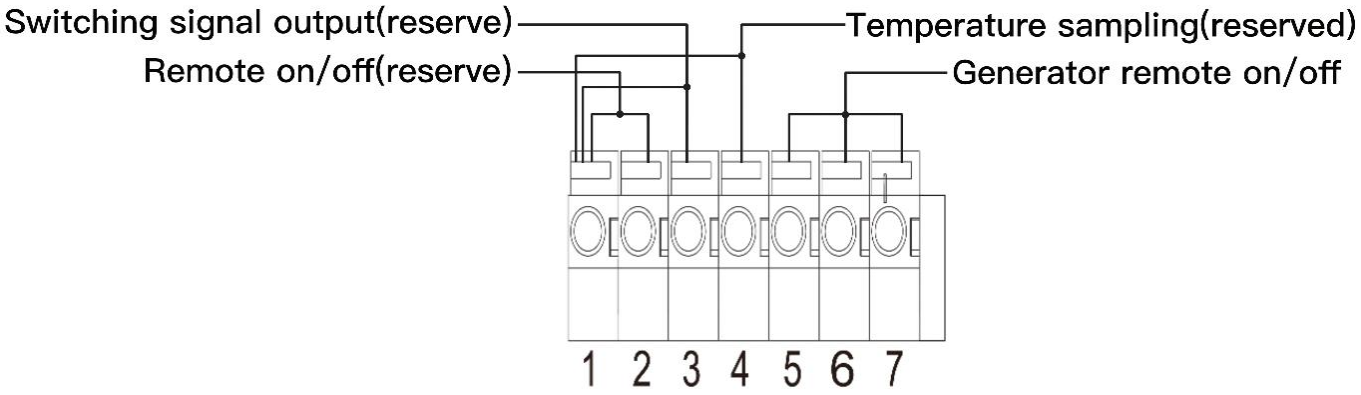
***NOTICE***

If you need to use the inverter to communicate with the lithium battery BMS, please contact us for the communication protocol or upgrade the inverter to the appropriate software programme.

# 6.5 Dry Contact Function

**The dry contact port has 4 functions :**

1. Remote switch on/off
2. Switching signal output
3. Battery temperature sampling
4. Generator remote start/stop

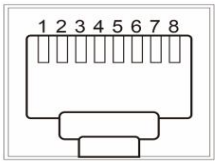



| Function | Description |
|---|---|
| Remote switch on/off (reserved) | When pin 1 is connected with pin 2, the inverter will switched off the AC output. When pin1 is disconnected from pin2, the inverter outputs normally. |
| Switching signal output (reserved) | When the voltage of battery reaches the battery discharge limiting voltage (parameter [15]), pin 3 to pin 1 voltage is 0V.<br>When the battery charging is normal, pin 3 to pin 1 voltage is 5V. |
| Temperature sampling (reserved) | Pin 1 & Pin 4 can be used for battery temperature sampling compensation. |
| Generator remote switch | When the voltage of battery reaches the battery under-voltage alarm point (parameter [14]) or voltage point of battery switch to utility (parameter [04]), pin 6 to pin 5 normally open, pin 7 to pin 5 normally close.<br>When the voltage of battery reaches the voltage point of utility switch to battery (parameter [05]) or battery is full, pin 6 to pin 5 normally close, pin 7 to pin 5 normally open. (Pin 5/6/7 outputs 125Vac/1A, 230Vac/1A,30Vdc/1A) |

⚠ *NOTICE*

If you need to use the remote start/stop function of the generator with dry contact, ensure that the generator has ATS and supports remote start / stop.

# 6.6 DRM(Only Australia)




DRM

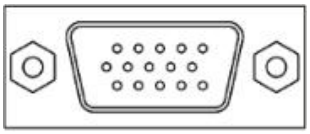
| RJ45 | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Pin 5 | Pin 6 | Pin 7 | Pin 8 |
|---|---|---|---|---|---|---|---|---|
| Description | DRM5 | DRM6 | DRM7 | DRM8 | RefGen | COM/ DRM0 | V+ | V- |

| MODEL | RJ45 socket asserted by shorting pins | | Requirement |
|---|---|---|---|
| DRM0 | 5 | 6 | Operate the power-off device. |
| DRM5 | 1 | 5 | Do not generate power to the grid. |
| DRM6 | 2 | 5 | The power generation shall not exceed 50% of the rated power. |
| DRM7 | 3 | 5 | The power generation shall not exceed 75% of the rated power, and reactive power shall be absorbed when possible. |
| DRM8 | 4 | 5 | Increase power generation (limited by other active DRM). |

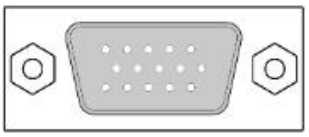
# 6.7 Parallel Communication Function

a) This port is used for parallel communication, through which the parallel modules can communicate with each other.
b) Each inverter has two DB15 ports, one for the male connector and the other for the female connector.
c) When connecting, make sure to connect the male connector of the inverter with the female connector of the inverter to be paralleled, or connect the female connector of the inverter to the male connector of the inverter to be paralleled.
d) Do not connect the male connector of the inverter to its female connector.

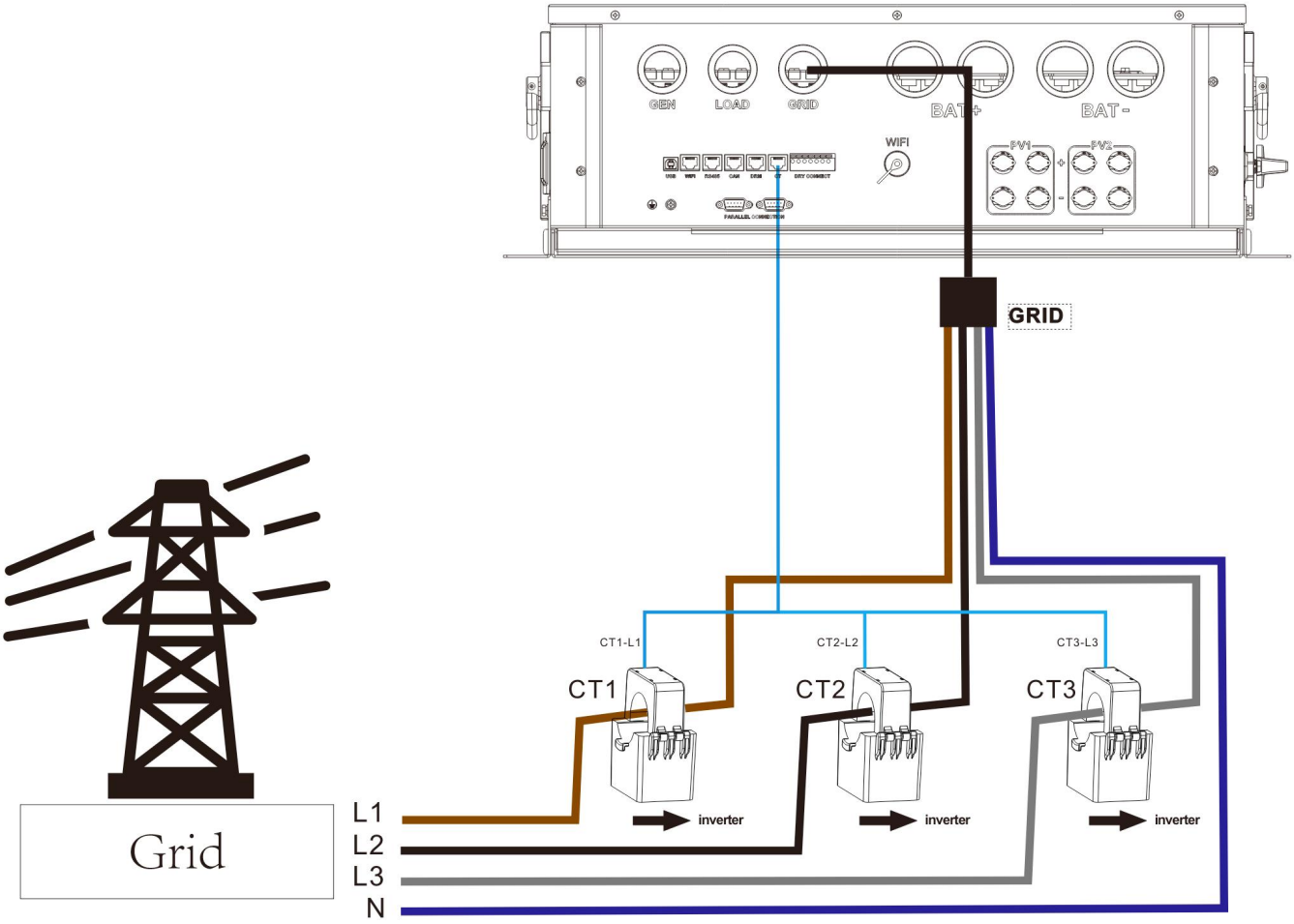
Female connector

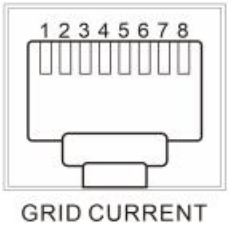


Male connector



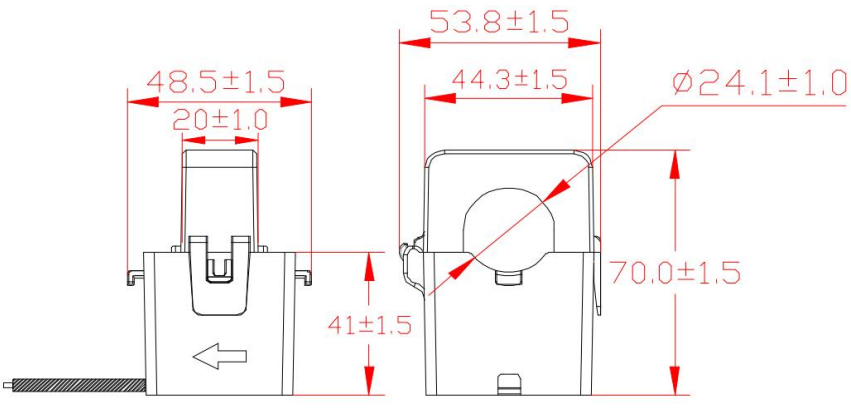
# 6.8 External CT Connection(Customer Optional)



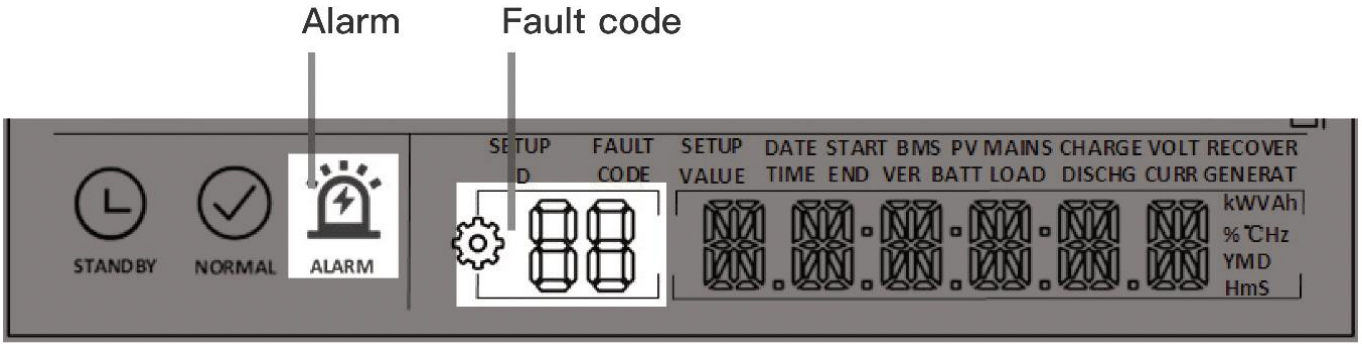

| RJ45 | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Pin 5 | Pin 6 | Pin 7 | Pin 8 |
|---|---|---|---|---|---|---|---|---|
| Description | CT1+ | CT1- | / | CT2+ | CT2- | / | CT3+ | CT3- |

1. Split Core Current Transformer (CT) dimension: (mm)
2. Secondary output cable length is 4m.




# 7.Fault Codes and Countermeasures

## 7.1 Fault Codes




| Fault Code | Fault name | Whether it affects the output or not | Description |
|---|---|---|---|
| 【01】 | BatVoltLow | No | Battery undervoltage alarm. |
| 【02】 | BatOverCurrSw | Yes | Battery discharge average current overcurrent (software protection). |
| 【03】 | BatOpen | Yes | Battery not-connected alarm. |
| 【04】 | BatLowEod | Yes | Battery undervoltage stop discharge alarm. |
| 【05】 | BatOverCurrHw | Yes | Battery overcurrent (hardware protection). |
| 【06】 | BatOverVolt | Yes | Charging overvoltage protection. |
| 【07】 | BusOverVoltHw | Yes | Bus overvoltage (hardware protection). |
| 【08】 | BusOverVoltSw | Yes | Bus overvoltage (software protection). |
| 【09】 | PvVoltHigh | No | PV overvoltage protection. |
| 【10】 | PvAFCIErr | No | PV arc fault. |
| 【11】 | PvOCHw | No | Boost overcurrent (hardware protection). |
| 【12】 | SpiCommErr | Yes | SPI communication fault of master and slave chips. |
| 【13】 | OverloadBypass | Yes | Bypass overload protection. |
| 【14】 | OverloadInverter | Yes | Inverter overload protection. |
| 【15】 | AcOverCurrHw | Yes | Inverter overcurrent (hardware protection). |
| 【16】 | AuxDSpReqOffPWM | Yes | Slave chip OFF request fault. |
| 【17】 | InvShort | Yes | Inverter short-circuit protection. |
| 【18】 | Bussoftfailed | Yes | Bus soft-start failure. |
| 【19】 | OverTemperMppt | No | PV radiator over-temperature protection. |
| 【20】 | OverTemperInv | Yes | Inverter heat dissipation over-temperature protection |
| 【21】 | FanFail | Yes | Fan blockage or failure fault. |
| 【22】 | EEPROM | Yes | Memory failure. |
| 【23】 | ModelNumErr | Yes | Model setting error. |
| 【24】 | Busdiff | Yes | Positive and negative bus voltage imbalance. |
| 【25】 | BusShort | Yes | Bus short-circuit. |

| | | | |
|---|---|---|---|
| 【26】 | RlyShort | Yes | Inverted AC Output Backfills to Bypass AC Input. |
| 【27】 | LinePhaselose | Yes | Grid input phase lose. |
| 【28】 | LinePhaseErr | Yes | Grid input phase error |
| 【29】 | BusVoltLow | Yes | Bus voltage undervoltage protection. |
| 【30】 | BatCapacityLow1 | No | Alarm given when battery capacity rate is lower than 10% (setting BMS to enable validity). |
| 【31】 | BatCapacityLow2 | No | Alarm given when battery capacity rate is lower than 5% (setting BMS to enable validity). |
| 【32】 | BatCapacityLowStop | Yes | Inverter stops when battery capacity is low (setting BMS to enable validity). |
| 【33】 | ControlCanFault | Yes | Control CAN fault in parallel operation. |
| 【34】 | CanCommFault | Yes | CAN communication fault in parallel operation. |
| 【35】 | ParaAddrErr | Yes | Parallel ID （communication address）setting error. |
| 【36】 | Balance currentOC | Yes | Balance bridge arm overcurrent failure. |
| 【37】 | ParaShareCurrErr | Yes | Parallel current sharing fault . |
| 【38】 | ParaBattVoltDiff | Yes | Large battery voltage difference in parallel mode. |
| 【39】 | ParaAcSrcDiff | Yes | Inconsistent AC input source in parallel mode. |
| 【40】 | ParaHwSynErr | Yes | Hardware synchronization signal error in parallel mode. |
| 【41】 | InvDcVoltErr | Yes | Inverter DC component of voltage abnormality. |
| 【42】 | SysFwVersionDiff | Yes | Inconsistent parallel operation program versions. |
| 【43】 | ParaLineContErr | Yes | Parallel wiring fault. |
| 【44】 | Serial number error | Yes | Serial number not set at factory. |
| 【45】 | Error setting of split-phase mode | Yes | [31] Incorrect settings for parallel operation mode. |
| 【46】 | MeterComErr | Yes | Meter communication error. |
| 【48】 | AFCIComErr | Yes | AFCI communication error. |
| 【56】 | Low insulation resistance fault | No | PV1+, PV2+ and PV- abnormally low impedance to ground. |
| 【57】 | Leakage current overload fault | Yes | System leakage current exceeds limit. |
| 【58】 | BMS communication error | No | BMS communication fault. |
| 【60】 | BMS battery low temperature alarm | No | BMS low-temperature alarm (takes effect after successful BMS communication). |
| 【61】 | BMS battery over temperature alarm | No | BMS over-temperature alarm (takes effect after successful BMS communication). |
| 【62】 | BMS battery over current alarm | No | BMS over-current alarm (takes effect after successful BMS communication). |
| 【63】 | BMS battery undervoltage alarm | No | BMS under-voltage alarm (takes effect after successful BMS communication). |

# 7.2 Troubleshooting

| Fault Code | Meaning | Causes | Remedy |
|---|---|---|---|
| / | No screen display | No power input, or the switch on the bottom of the unit is not switched on. | Check whether the battery air circuit breaker or PV air circuit breaker is closed. Check if the switch is in the "ON" position. Press any button on the screen to exit the screen sleep mode. |
| 01 | Battery under-voltage | The battery voltage is lower than the value set in parameter [14]. | Charge the battery until the battery voltage exceeds the set value in parameter [14]. |
| 03 | Battery not connected | The battery is not connected, or the BMS is in discharge protection state. | Check whether the battery is reliably connected. Check if the battery circuit breaker is closed. Ensure that the BMS can communicate normally. |
| 04 | Battery over-discharge | The battery voltage is lower than the value set in parameter [12]. | **Manual reset:** Turn off and restart the device. **Automatic reset:** Charge the battery to make the battery voltage higher than the value set in parameter [35]. |
| 06 | Battery over-voltage when charging | Battery is in over-voltage condition. | Manually turn off the power and restart. Check if the battery voltage exceeds the limit value. If it does, the battery needs to be discharged until the voltage is lower than the battery overvoltage recovery point. |
| 13 | Bypass over-load (software detection) | Bypass output power or output current over-load for a period of time. | Reduce the load power and restart the device. For details, please refer to item 11 of the protection functions. |
| 14 | Inverter over-load (software detection) | Inverter output power or output current over-load for a period of time. | |
| 19 | Heat sink of PV input over-temperature (software detection ) | Heat sink of PV input temperature exceeds 90℃ for 3s. | Normal charging and discharging will resume when the temperature of the radiator cools down below the over-temperature recovery temperature. |
| 20 | Heat sink of inverter output over-temperature (software detection) | Heat sink of inverter output temperature exceeds 90℃ for 3s. | |
| 21 | Fan failure | Hardware detects fan failure. | After turning off the machine's power, manually switch the fan and check for any foreign objects blocking it. |
| 26 | AC input relay short-circuit | The relay is used to control the AC input. | Manually shut down and restart the machine. If the fault reappears after restarting, contact the after-sales service department to repair the machine. |
| 28 | Utility input phase fault | AC input phase does not match AC output phase. | Ensure that the AC input phase is the same as the AC output phase. |

⚠ NOTICE

If you encounter product faults that cannot be solved by the methods in the above table, please contact our after-sales service department for technical support and do not disassemble the equipment by yourself.

# 8.Protection and Maintenance

## 8.1 Protection Functions

| No. | Protection Functions | Definition |
|---|---|---|
| **1** | PV input current / power limiting protection | When the configured PV array charging current or power exceeds the rated PV input value, the inverter will limit the input power and charge at the rated value. |
| **2** | PV overvoltage protection | If the PV voltage exceeds the maximum value allowed by the hardware, the device will report a fault and stop PV boosting to output a sinusoidal AC waveform. |
| **3** | Night anti-reverse charging protection | At night, the battery will be prevented from discharging to the PV module because the battery voltage is greater than the PV module voltage. |
| **4** | Mains input overvoltage protection | When the grid voltage of per phase exceeds 280Vac, the mains charging will be stopped and will switch to inverter output. |
| **5** | Mains input undervoltage protection | When the mains voltage of per phase falls below 170Vac, the mains charging will be stopped and will switch to inverter output. |
| **6** | Battery overvoltage protection | When the battery voltage reaches the over-voltage disconnection voltage point, it will automatically stop the PV and grid charging of the battery to prevent over-charging and damage to the battery. |
| **7** | Battery undervoltage protection | When the battery voltage reaches the low-voltage disconnection voltage point, it will automatically stop discharging the battery to prevent the battery from being over-discharged and damaged. |
| **8** | Battery overcurrent protection | When the battery current exceeds the range allowed by hardware, the machine will turn off output and stop discharging the battery. |
| **9** | AC output short-circuit protection | In the event of a load short-circuit fault, the AC output voltage will be shut down immediately. To resume normal output, the load short-circuit fault must first be eliminated, followed by a manual re-powering. |
| **10** | Radiator over-temperature protection | When the internal temperature of the inverter is too high, the inverter will stop charging and discharging; when the temperature returns to normal, the inverter will resume charging and discharging. |

| | | |
|---|---|---|
| **11** | Inverter overload protection | After triggering the overload protection, the inverter will resume output after 3 minutes, 5 consecutive overloads will switch off the output until the inverter restarts.<br>(102%<load<110%) : error, output switched off after 5 minutes.<br>(110%<load<125%) : error reported and output switched off after 10s.<br>(>125% load): error reported and output switched off after 5s. |
| **12** | AC backfeed protection | Prevents backfeeding of battery inverter AC to bypass AC inputs. |
| **13** | Bypass overcurrent protection | Built-in AC input overcurrent protection circuit breaker. |
| **14** | Bypass wiring error protection | When the phase of the two bypass inputs is different from the phase of the inverter phase split, the machine will prohibit cutting into the bypass to prevent the load from dropping out or short-circuiting when cutting into the bypass. |

# 8.2 Maintenance

**To maintain optimal long-term performance, it is recommended to perform the following inspections twice a year for inverter systems:**

1.Ensure that the airflow around the inverter is not blocked and remove any dirt or debris from the radiator.

2.Check that all exposed conductors are not damaged by sunlight, friction with other surrounding objects, dry rot, insect or rodent damage, etc. The conductors need to be repaired or replaced if necessary.

3.Verify that the indications and displays are consistent with the operation of the equipment, note any faults or incorrect displays and take corrective action if necessary.

4.Check all terminals for signs of corrosion, insulation damage, high temperatures or burning/discolouration and tighten terminal screws.

5.Check for dirt, nesting insects and corrosion, clean as required, clean insect screens regularly.

6.If the lightning arrester has failed, replace the failed arrester in time to prevent lightning damage to the inverter or other equipment of the user.

**⚠ DANGER**

Make sure that the inverter is disconnected from all power sources and that the capacitors are fully discharged before carrying out any checks or operations to avoid the risk of electric shock.

**The Company shall not be liable for damage caused by :**

1.Damage caused by improper use or use in a wrong location.

2.PV modules with an open-circuit voltage exceeding the maximum permissible voltage.

3.Damage caused by the operating temperature exceeding the restricted operating temperature range.

4.Dismantling and repair of the inverter by unauthorised persons.

5.Damage caused by force majeure: damage during transport or handling of the inverter.

# 9.Datasheet

| MODEL | SPI-16K-H3P | SPI-18K-H3P | SPI-20K-H3P | Setting |
|---|---|---|---|---|
| **INVERTER OUTPUT** | | | | |
| Rated Output Power | 16000W | 18000W | 20000W | |
| Max. AC Output Power | 17600VA | 19800VA | 22000VA | |
| Rated AC Output Current | 23.2A | 26.0A | 29.0A | |
| Rated Output Frequency | 50/60Hz | | | √ |
| Rated Output Voltage | 230/400Vac (Three-Phase) | | | |
| Output Voltage Range | 230/400Vac ± 5% | | | |
| **BATTERY INPUT** | | | | |
| Battery Types | Li-ion / Lead-Acid / User Defined | | | √ |
| Rated Battery Voltage | 48Vdc | | | |
| Battery Voltage Range | 40-60Vdc | | | |
| Max. PV Charging Current | 300A | 360A | 360A | √ |
| Max. Grid/Generator Charging Current | 300A | 360A | 360A | √ |
| Max. Charging/Discharging Current | 300A | 360A | 360A | √ |
| Charging Curve | 3 Stages / Equalization | | | |
| Charging Strategy for Li-Ion Battery | Self-adaption to BMS | | | |
| **PV INPUT** | | | | |
| No. of MPPT Trackers | 2 | | | |
| Max. PV Input Power | 15kW+15kW | 15kW+15kW | 15kW+15kW | |
| Input Current | 36A+36A | 36A+36A | 36A+36A | |
| Min. PV Input Voltage / Start-up Voltage | 160V/160V | | | |

| | | |
|---|---|---|
| Max. PV Input Voltage | 1000V/1000V | |
| MPPT Operating Voltage Range | 160-800V/160-800V | |
| **GRID / GENERATOR INPUT** | | |
| Rated Input Frequency | 50/60Hz | |
| Rated Input Voltage | 230/400Vac (Three-Phase) | |
| AC Voltage Range | Phase Voltage 170~280Vac; Line Voltage 305~485Vac | |
| Bypass Overload phase Current | 60A | |
| **EFFICIENCY** | | |
| MPPT Tracking Efficiency | >99.9% | |
| Max. Efficiency | 97.6% | |
| **GENERAL DATA** | | |
| Parallel Capacity | 1~6 units | |
| Dimensions (W × H × D) | 593.4x803.4x215mm | |
| Weight | 50kg | |
| Protection Degree | IP20, indoor use only | |
| Operating Temperature | -10~55℃, >45℃ Derating | |
| Noice | <60dB | |
| Cooling Method | Air Cooling | |
| **COMMUNICATION** | | |
| Internal Interface | RS485 / CAN / WiFi | √ |
| External Module (optional) | Wi-Fi/4G Stick | √ |
| **PROTECTION** | | |
| With PV input current / power limiting protection, PV input over-voltage, Anti-reverse charge protection at night, AC input over-voltage protection, AC input under-voltage protection, Battery over-voltage protection, Battery under-voltage protection, Battery over-current protection, AC output short-circuit protection, Heat sink over- temperature protection, nverter over-load protection, AC output reverse, Bypass over-current protection, Bypass phase inconsistency protection. | | |
| **CERTIFICATION** | | |
| Safety | IEC62109-1, IEC62109-2 | |
| EMC | EN61000-6-1, EN61000-6-3 | |
| RoHS | Yes | |