# **User Manual**



# 6.5KW 48V Split Phase Solar Inverter SPH6548P

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# 1. Safety

#### 1.1 About this Manual

- This Manual contains important information, guiding principles, operation, and maintenance of the product, and applies to the model: SPH6548P
- Users must follow the instructions in this Manual during installation, use, and maintenance

# 1.2 Symbols and description

Symbol	Description
△DANGER	Dangerous situations that will lead to death or serious injury when ignored
<u> </u>	Dangerous situations that may lead to death or serious injury when ignored
<u> </u>	Dangerous situations that may lead to mild or moderate injury when ignored
① NOTICE	Operation tips

# 1.3 Safety matters

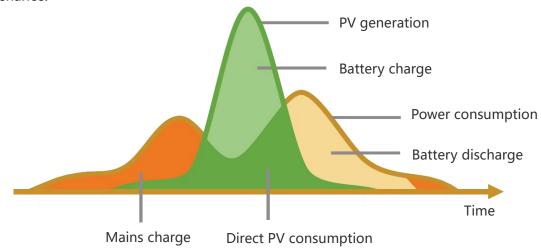
## 

- This chapter contains important safety matters. Please read and keep this Manual for future reference.
- Please make sure to comply with local requirements and regulations when installing the inverter.
- Be careful of high voltage. Before and during installation, please turn off the switch of each power supply to avoid electric shock.
- In order to achieve optimal operation of the inverter, please select the appropriate cable size and necessary protective devices according to regulations.
- Do not connect or disconnect any connections when the inverter is working.
- Do not open the terminal cover when the inverter is working.

# 2. About the Product

## 2.1 Description

SPH6548P is a new type of solar storage inverter that integrates PV storage, mains charge, and energy storage and outputs sinusoidal AC. Equipped with DSP control and advanced control algorithm, it has high response speed and good reliability, and applies to industrial scenarios.



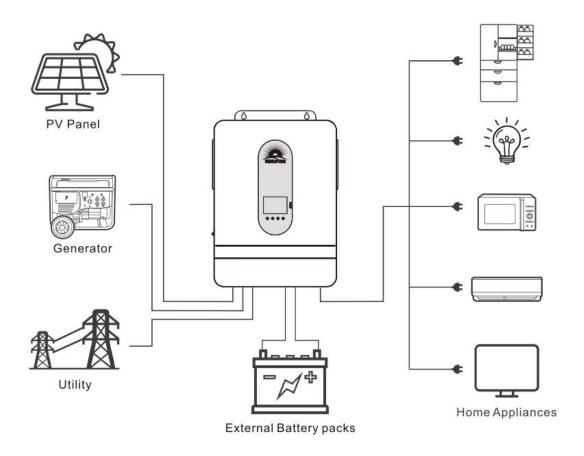
#### 2.2 Features

- Support the connection of various types of energy storage batteries such as lead-acid battery and lithium-ion battery
- Have the dual activation function during lithium-ion battery sleep, that is, access to mains/PV power can activate the lithium-ion battery
- Support split-phase/single-phase pure sine wave output
- Support adjusting the voltage of each phase within the range of 100 Vac, 105 Vac, 110 Vac,
   120 Vac and 127Vac
- Support two-channel PV input and have the function of simultaneous two-channel maximum power point tracking (MPPT) for charging/carrying capacity
- Support two-channel MPPT, with an efficiency of up to 99.9% and a maximum single-channel current of 18 A, perfectly fitting high-power modules
- Provide four charge modes: only PV, mains first, PV first, and mains + PV
- Have the timed charge and discharge function, that is, users can set the charge and discharge time according to the time-of-use price to save electricity costs
- Have the energy-saving mode, reducing no-load energy losses
- Provide two output modes: mains bypass output and inverter output, achieving uninterrupted power supply
- Support LCD display of dynamic flowchart, updating system data and operating status at any time
- Provide 360 ° protection, including short circuit protection, overcurrent protection, overvoltage and undervoltage protection, and overload protection
- Support CAN, USB, RS485 communication

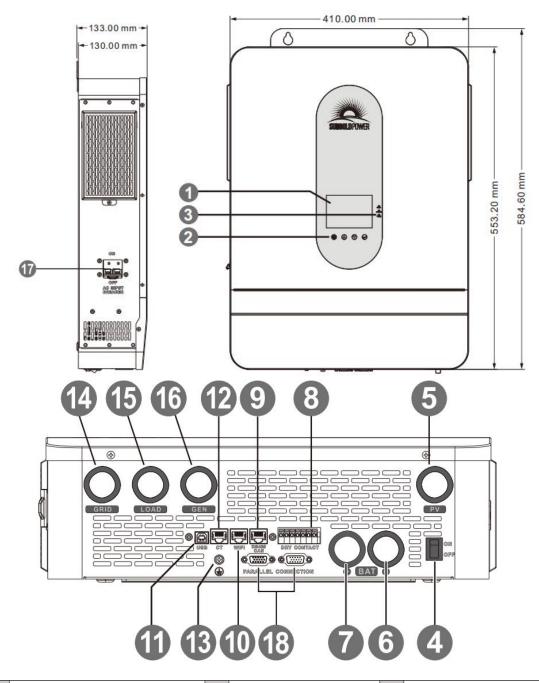
# 2.3 System connection diagram

The following figure shows the system application scenario of the product. A complete system consists of the following parts:

- 1. **PV module:** It converts solar energy into DC to charge batteries or into AC to supply power to loads.
- 2. **Mains or generator:** Connected to AC input, it can charge batteries while supplying power to loads. When the battery and PV module supply power to the load, the system can generally operate without mains or generator.
- 3. **Battery:** The function of a battery is to ensure normal power supply for the system load when there is insufficient PV power and no mains.
- 4. **Household load:** It can connect various household and office loads, including refrigerators, lighting fixtures, TVs, fans, air conditioners, and other AC loads.
- 5. **Inverter:** It is the energy conversion device of the entire system.
- The actual application scenario determines the specific system wiring mode



# **2.4 Product overview**



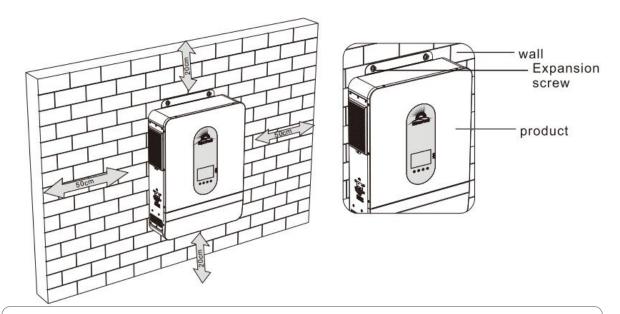
1	LCD screen	2	Physical button		LED indicator
4	ON/OFF rocker switch		PV input		Battery (positive electrode)
7	Battery (negative electrode)		Dry contact		RS485/CAN port
10	WIFI port	11	USB-B port 12 C		CT (under development)
13	Grounding screw	14	4 AC output (L1+L2+N) 15 AC input (L1+L2+		AC input (L1+L2+N)
16	Generator input(L1+L2+N)	17	AC input circuit breaker	18	Parallel communication port

# 3. Installation

#### 3.1 Installation location

SPH6548P is only for indoor use **(protection level: IP20).** Before selecting the installation location, users should consider the following factors:

- A solid wall
- Installation height: flush with the line of sight
- Sufficient heat dissipation space
- Ambient temperature: -10°C-55°C (14°F-131°F), to ensure optimal operation



#### *∧ DANGER*

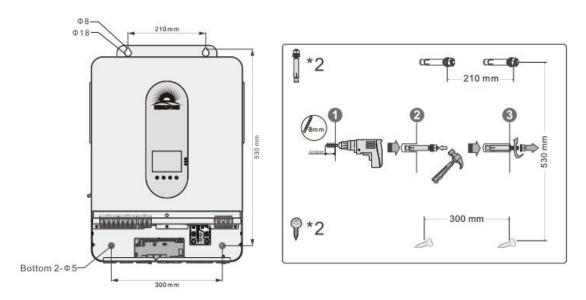
- Do not install the inverter near highly flammable materials
- Do not install the inverter in potentially explosive areas
- Do not install the inverter and lead-acid battery in enclosed spaces

#### **↑ CAUTION**

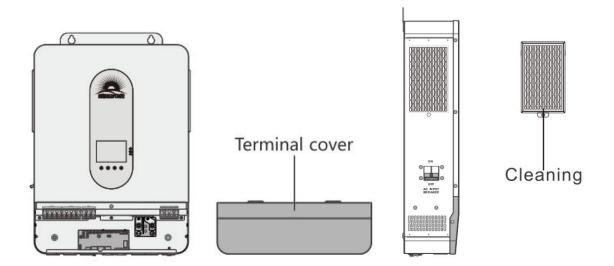
- Do not install the inverter in direct sunlight
- Do not install or use the inverter in damp environments

#### 3.2 Inverter installation

Drill 4 installation holes of the specified sizes on the wall with an electric drill, insert 2 expansion screws above, and fix the inverter with 2 M5 screws below.



# 3.3 Removal of terminal cover and insect-proof net



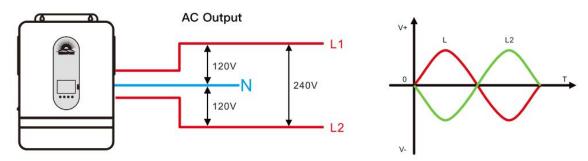
# ① NOTICE

 When using the inverter in areas with poor air quality, the dustproof net is easily blocked by air particles. Please regularly remove and clean it to avoid affecting the air flow rate inside the inverter; otherwise it may cause inverter overheating (19/20 fault), and affect power supply and the service life of the inverter

# 4. Wiring

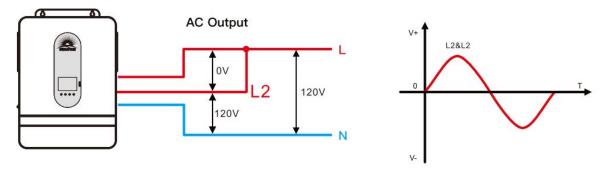
# 4.1 Wiring mode (depends on the output mode)

#### • Split-phase mode (default)

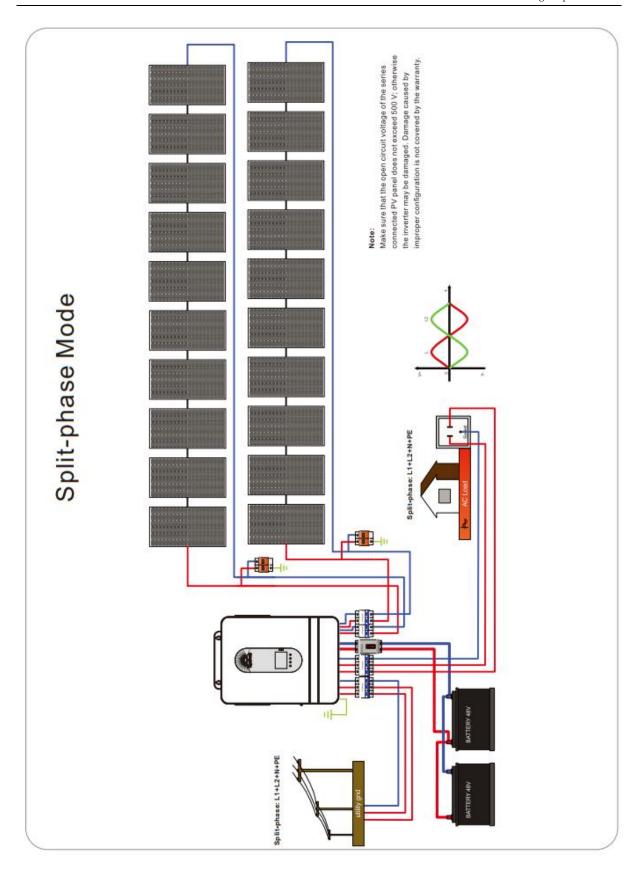


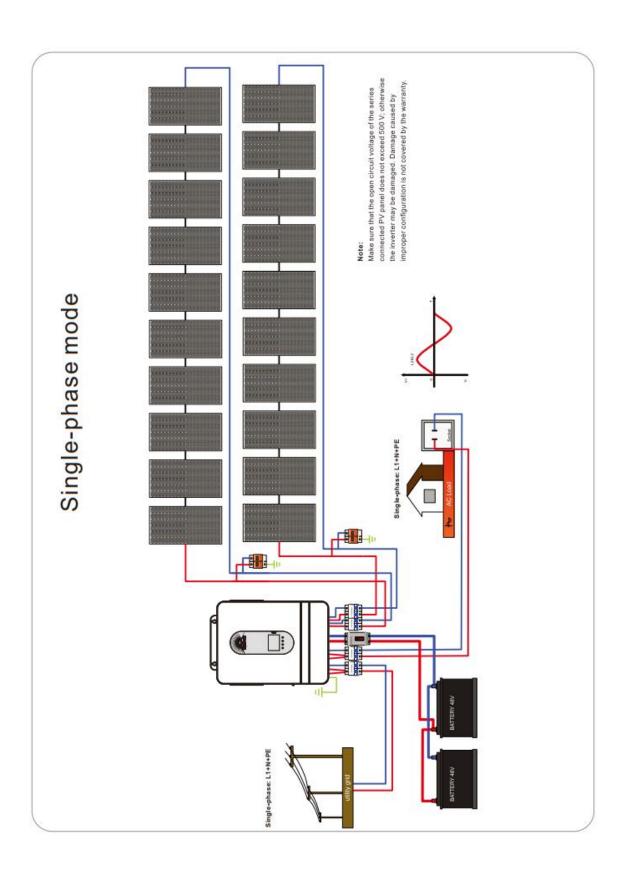
Item	Description
Applicable model	SPH6548P
AC output phase voltage (L-N)	100 VAC-120 VAC, 120 VAC (default)
AC output line voltage (L-L)	200 VAC-240 VAC, 240 VAC (default)

#### Single-phase mode



Item	Description
Applicable model	SPH6548P
AC output phase voltage (L-N)	100 VAC-120 VAC, 120 VAC (default)





# 4.2 Cable and circuit breaker model

#### PV INPUT

Inverter Model	Cable Size	Maximum Input Current	Circuit Breaker Model
SPH6548P	4mm <sup>2</sup> /12AWG	18A/18A	2P-25A

# • Grid input

Inverter Model	Output Mode	Diagram	Maximum Current	Cable Size	Circuit Breaker Model
	Split-phase mode	L1 L2 N	40A(L1/L2/ N)	10mm²/8AWG (L1\L2\N)	3P-40A
SPH6548P	Single-pha se mode	L1 L2 N	40A(L1/L2) 80A(N)	10mm²/8AWG(L1/L2) 20mm²/4AWG(N)	2P-80A

# Generator input

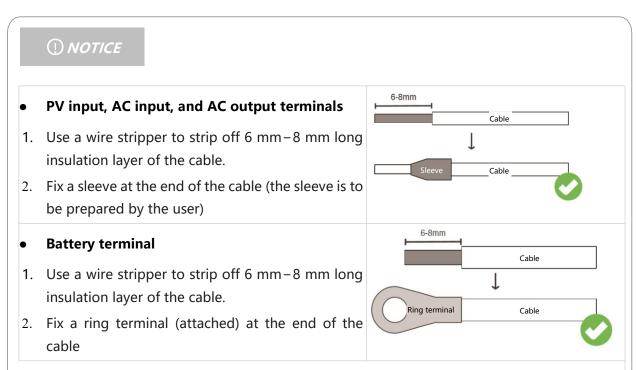
Inverter Model	Output Mode	D	iagrar	n	Maximum Current	Cable Size	Circuit Breaker Model
	Split-phase mode	    L1	     	    N	40A(L1/L2/ N)	10mm²/8AWG (L1\L2\N)	3P-40A
SPH6548P	Single-phas e mode	L1	L2	    N	40A(L1/L2) 80A(N)	10mm²/8AWG(L1/L2) 16mm²/6AWG(N)	2P-80A

# Battery

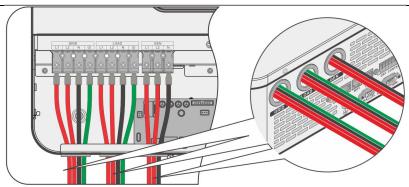
Inverter Model	Cable Size	Maximum Current	Circuit Breaker Model
SPH6548P	35mm²/2AWG	150A	2P-160A

#### AC output

Inverter Model	Output Mode	С	Diagran	n	Maximum Current	Cable Size	Circuit Breaker Model
	Split-phase mode		L2	N	40A(L1/L2/ N)	10mm²/8AWG (L1\L2\N)	3P-40A
SPH6548P	Single-pha se mode	L1	L2	    N	40A(L1/L2) 80A(N)	10mm²/8AWG(L1/L2) 16mm²/6AWG(N)	2P-80A



The cable size is for reference only. If the distance between the PV array and the inverter or between the inverter and the battery is long, using thicker cables will reduce voltage drop and improve system performance.



## 4.3 GRID LOAD and Gen wiring

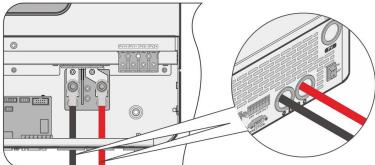
Connect the live wire, neutral wire, and ground wire according to the cable position and sequence shown in the following figure.

## **∧** DANGER

- Before connecting AC input and output, be sure to disconnect the circuit breaker to avoid the risk of electric shock. Do not conduct live operation.
- Please check whether the cables used are sufficient to meet the requirements. Cables that are too thin or of poor quality may pose serious safety hazards.

# 4.4 Battery wiring

Connect the positive and negative cables of the battery according to the cable position and sequence shown in the following figure

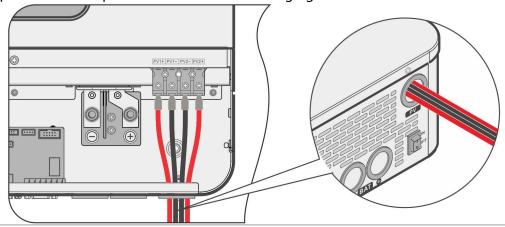


#### *∧ DANGER*

- Before connecting the battery, be sure to disconnect the circuit breaker to avoid the risk of electric shock. Do not conduct live operation.
- Please check the positive and negative terminals of the battery for correct connection and no reverse connection; otherwise it may damage the inverter.
- Please check whether the cables used are sufficient to meet the requirements. Cables that are too thin or of poor quality may pose serious safety hazards.

## 4.5 PV wiring

Connect the positive and negative terminals of the two-channel PV modules according to the cable position and sequence shown in the following figure.

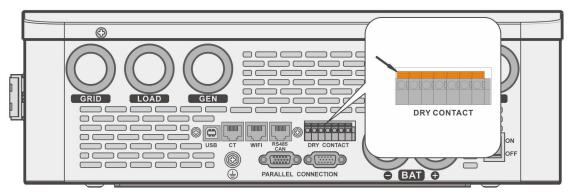


#### **↑ DANGER**

- Before connecting PV modules, be sure to disconnect the circuit breaker to avoid the risk of electric shock. Do not conduct live operation.
- Please make sure that the open circuit voltage of the series connected PV modules does not
  exceed the maximum open circuit voltage of the inverter (in SPH series, this value is 550 V);
  otherwise the inverter may be damaged.

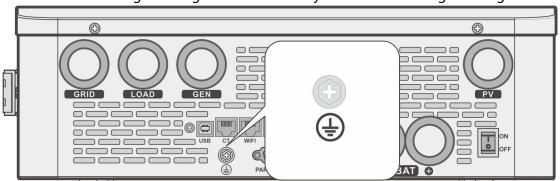
# 4.6 Dry contact wiring

Use a small-sized screwdriver to push back in the direction indicated by the arrow, and then insert the communication cable into the dry contact port. (Communication cable section:  $0.2 \text{ mm}^2-1.5 \text{ mm}^2$ )



# 4.7 Grounding

Please ensure that the grounding terminal is reliably connected to the grounding busbar.



#### ① NOTICE

• The grounding cable size shall not be less than 4 mm<sup>2</sup> and shall be as close as possible to the grounding point

#### 4.8 Inverter start

After confirming reliable wiring and correct wiring sequence, restore the terminal cover to its original position

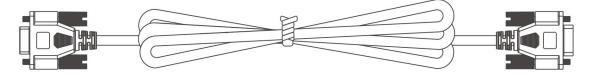
- Step 1: Close the circuit breaker of the battery
- Step 2: Press the rocker switch at the bottom of the inverter, and the screen and indicator will light up, indicating that the inverter is enabled
- Step 3: Close the circuit breakers for PV input, AC input, and AC output in sequence
- Step 4: Start loads one by one in order of power from small to large

# 4.9 Parallel wiring

#### 4.9.1 Parallel operation

- 1. The parallel operation supports up to six solar storage inverters.
- 2. When using the parallel function, it is necessary to connect the parallel communication cable in a correct and reliable manner. See the figure blow for the communication cable (packaging accessory):

#### Parallel communication cable\*1



# 4.9.2 Cautions for parallel connection



#### **Warning:**

#### 1. PV wiring:

In parallel connection, the PV array of each inverter must be independent, and the PV array of PV1 and PV2 for one inverter must also be independent.

#### 2. Battery wiring

In single-phase or three-phase parallel connection, all solar storage inverters must be connected to the same battery, with BAT+ connected to BAT+ and BAT- to BAT-, and before power on and start-up, it is necessary to check and ensure correct connection, wiring length, and cable size, so as to avoid the abnormal operation of parallel system output caused by wrong connection.

#### 3. LOAD wiring:

In single-phase parallel connection, all solar storage inverters must be connected in the manner of L-to-L, N-to-N, and PE-to-PE, and before power on and start-up, it is necessary to check and ensure correct connection, wiring length, and cable size, so as to avoid the abnormal operation of parallel system output caused by wrong 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. Other cautions are the same as those for single-phase parallel connection.

#### 4. GRID and GEN wiring:

In single-phase parallel connection, all solar storage inverters must be connected in the manner of L-to-L, N-to-N, and PE-to-PE, and before power on and start-up, it is necessary to check and ensure correct connection, wiring length, and cable size, so as to avoid the abnormal operation of parallel system output caused by wrong connection. Meanwhile, it is not allowed to have multiple different AC source inputs to avoid damage to the external equipment of the inverter. The AC source input shall be consistent and unique.

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. Other cautions are the same as those for single-phase parallel connection.

#### 5. Communication wiring:

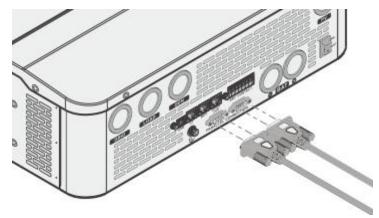
Our company's communication cable for parallel operation is a DB15 standard computer cable with shielding function, and it is used for single-phase or three-phase parallel connection. Each inverter shall be connected with one out and one in, that is, the male connector (out) of the inverter is to be connected to the female connector (in) of the parallel inverter, not the one of the inverter. In addition, DB15 terminal screws will be used to tighten the communication cable of each parallel inverter to avoid falling off or poor contact of the communication cable, followed by abnormal operation or damage of the system output.

**6.** Before and after connecting the system, please carefully refer to the following system wiring diagrams to ensure that all wiring is correct and reliable before power on.

**7.** After the system is correctly wired, powered on, and in normal operation, if a new inverter needs to be connected, make sure to disconnect the battery input, PV input, AC input and AC output, and that all solar storage inverters are powered off before reconnecting into the system.

# 4.9.3Wiring diagram for single-phase parallel connection (phase difference between L1 and L2: 0°)

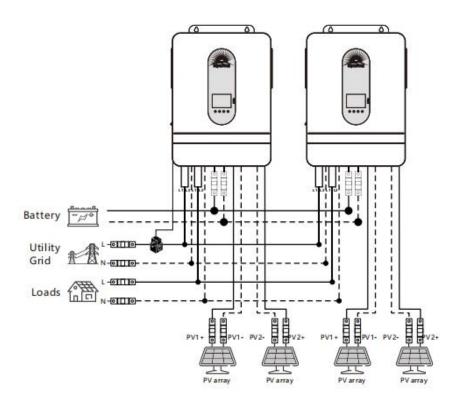
• The communication cable of parallel solar storage inverter is to be locked with screws after connecting. See the diagram below:

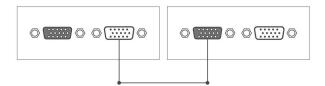


See the diagram below for parallel connection

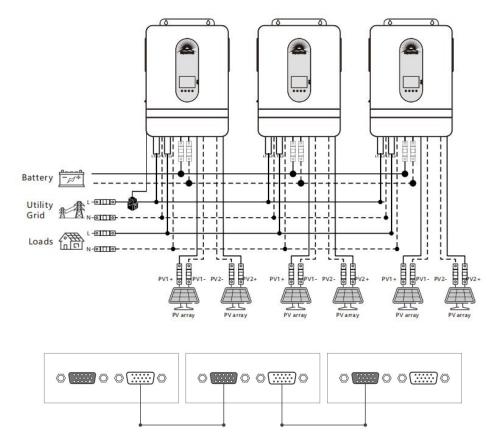
Set the item [31] to "PAL" and the item [68] to "0 $^{\circ}$ ." When setting the item [38] to "120 V," the output L-N voltage is 120 V

1. Two parallel-connected solar storage inverters:

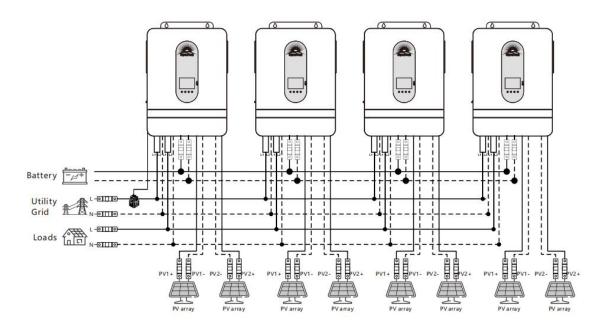




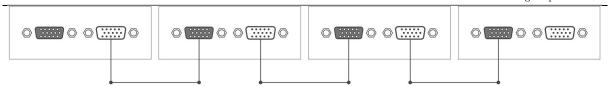
#### 2. Three parallel-connected solar storage inverters:



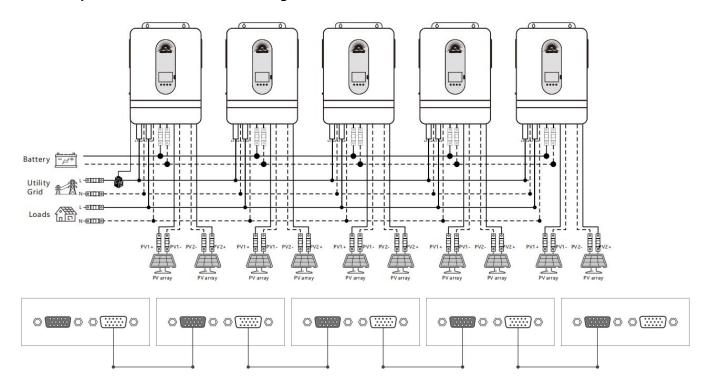
#### 3. Four parallel-connected solar storage inverters:



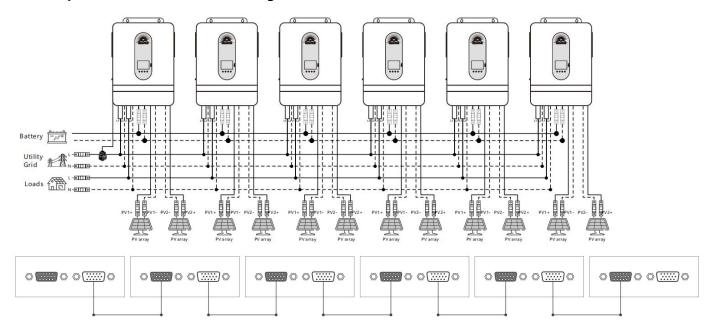
Sun Gold Power Inc www.sungoldpower.com



#### 4. Five parallel-connected solar storage inverters:



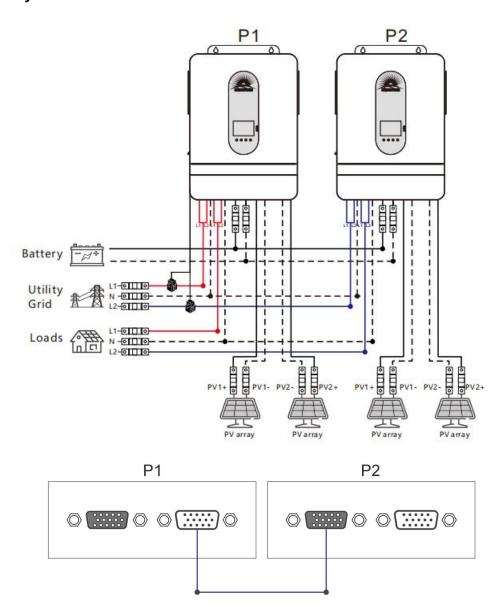
#### 5. Six parallel-connected solar storage inverters:



# 4.9.4 Wiring diagram for two-phase parallel connection (phase difference between L1 and L2: 0°)

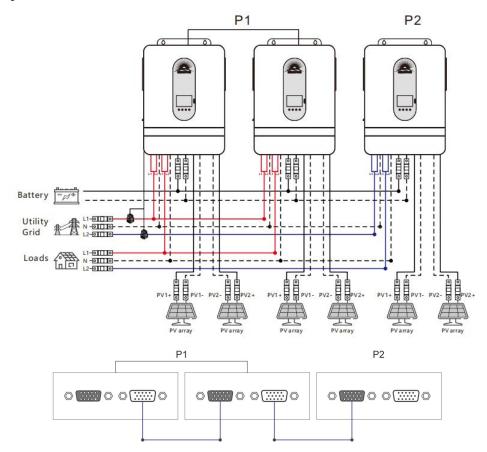
- (1) P1: Set the item [31] to "2P0;" P2: Set the item [31] to "2P1," all of the P1/P2 inverter item [68] can not be set, it is default "0°" and the phase difference between P1 and P2 is 120°. When setting the item [38] to "120 V," the voltage between the live wire L1 of P1 phase and the live wire L2 of P2 phase is 208 V, and the L1-N voltage is 120 V
- (2) P1: Set the item [31] to "2P0;" P2: Set the item [31] to "2P2," all of the P1/P2 inverter item [68] can not be set, it is default "0°" and the phase difference between P1 and P2 is 180°. When setting the item [38] to "120 V," the voltage between the live wire L1 of P1 phase and the live wire L2 of P2 phase is 240 V, and the L1-N voltage is 120 V, L2-N voltage is 120V

#### a. Split-phase system (two inverters)

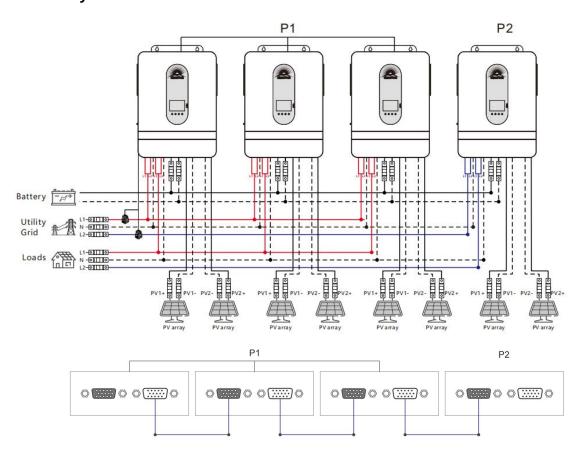


#### b. Split-phase system (three inverters)

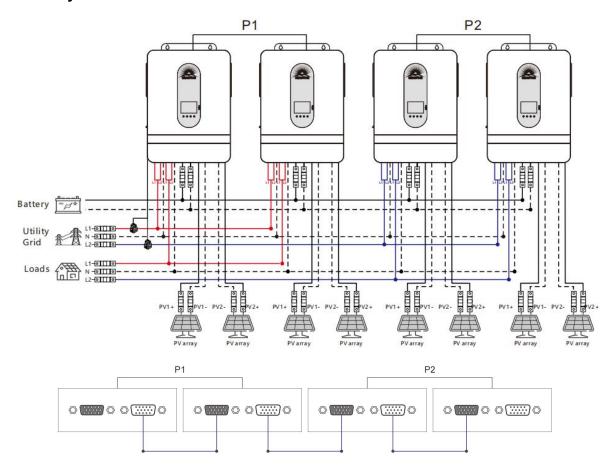
#### 2+1 system



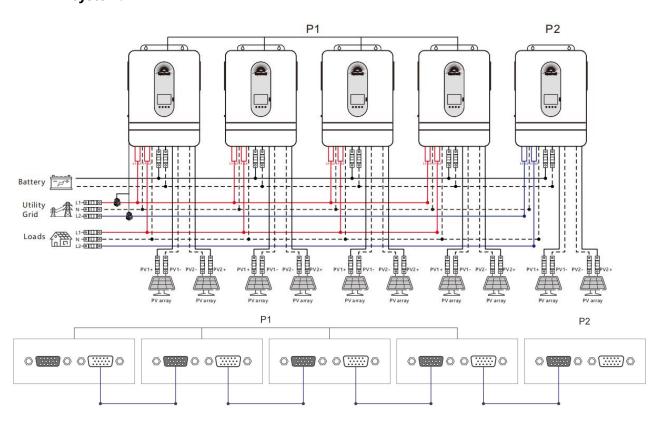
## c. Split-phase system (four inverters)



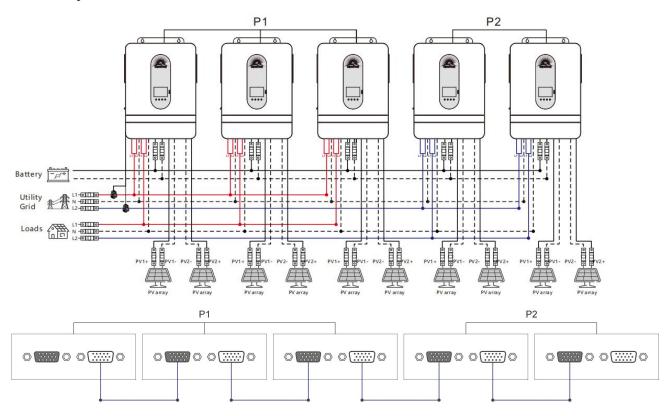
#### 2+2 system:



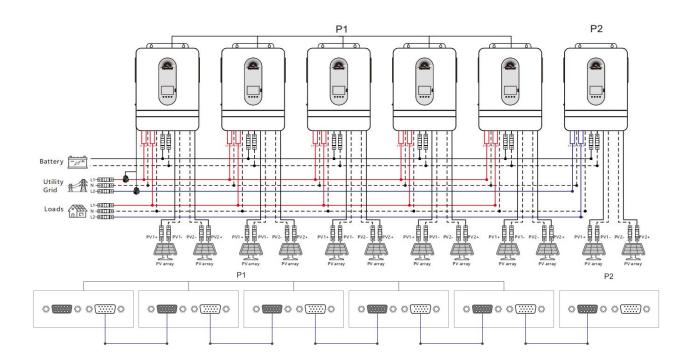
#### d. Split-phase system (five inverters)



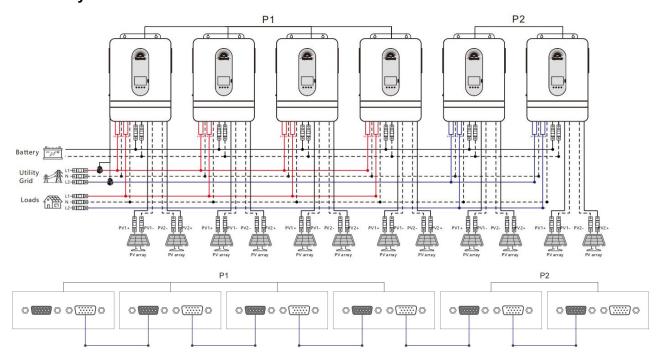
#### 3+2 system:



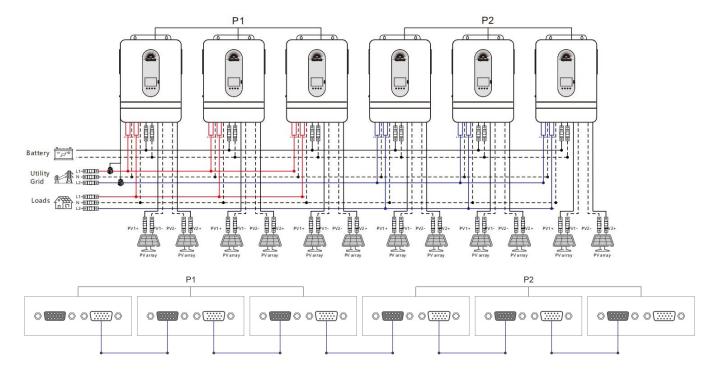
#### e. Split-phase system (six inverters)



#### 4+2 system:



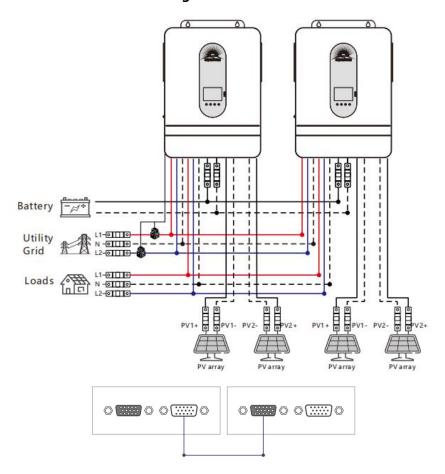
#### 3+3 system:



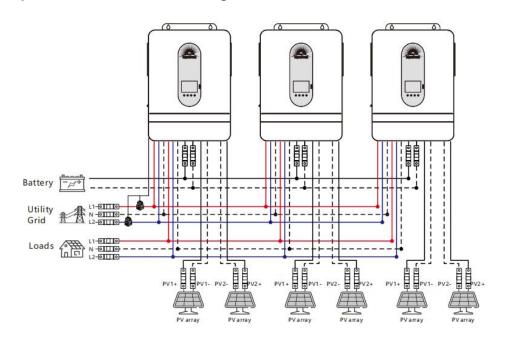
# 4.9.5 Wiring diagram for split-phase parallel connection (phase difference between L1 and L2: 180°)

Set the item [31] to PAL, and set the item [68] to 180°. When setting the item [38] to "120 V," the L1-L2 voltage is 240 V, and the L1-N voltage is 120 V, L2-N voltage is 120V

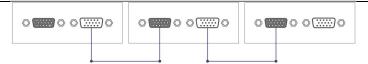
#### a. Two parallel-connected solar storage inverters:



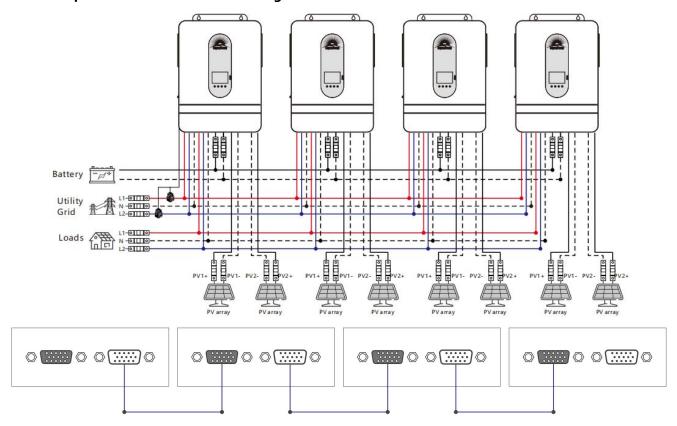
#### b. Three parallel-connected solar storage inverters:



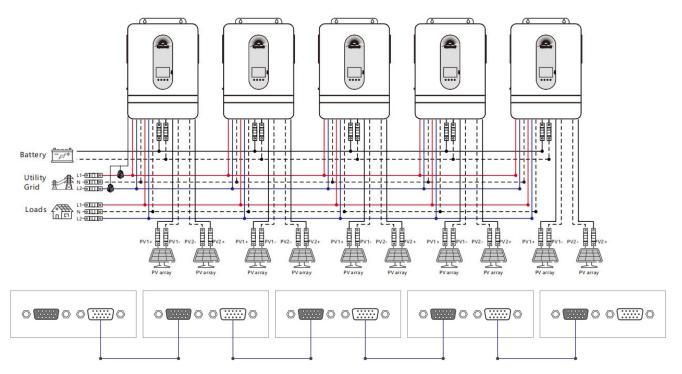
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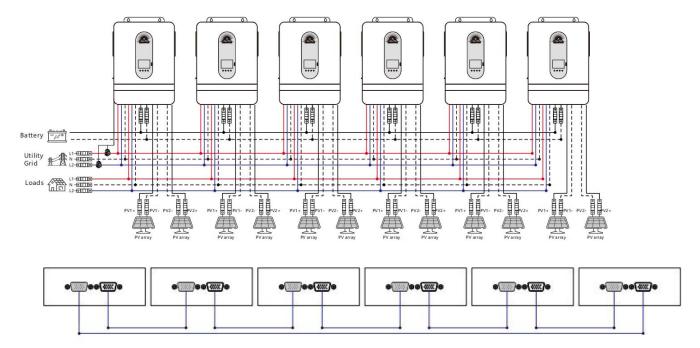
#### c. Four parallel-connected solar storage inverters:



#### d. Five parallel-connected solar storage inverters:



#### e. Six parallel-connected solar storage inverters:

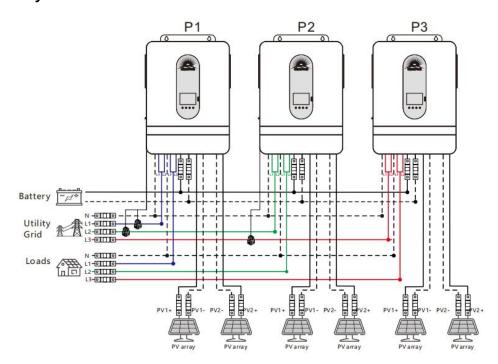


#### 4.9.6 Wiring diagram for three-phase parallel connection

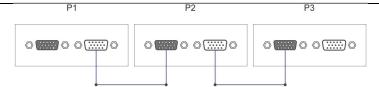
P1: Set the item [31] to "3P1;" P2: Set the item [31] to "3P2;" P3: Set the same to "3P3", all of P1/P2/P3 inverters item [68] can not be set, it is default "0°"

At this point, the P1-P2, P1-P3, and P2-P3 phase difference is 120°. When setting the item [38] to "120 VAC," the voltage between the live wire L1 of P1 phase and the live wire L2 of P2 phase is 230\*1.732=208 VAC. Similarly, the L1-L3 and L2-L3 voltage is 208 VAC:

#### a. Three-phase system (three inverters)

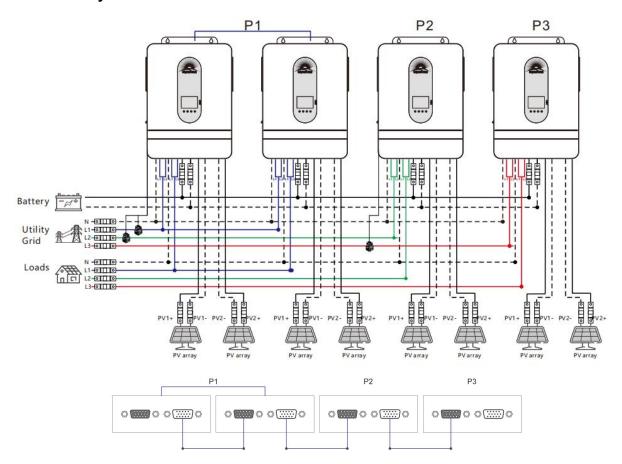


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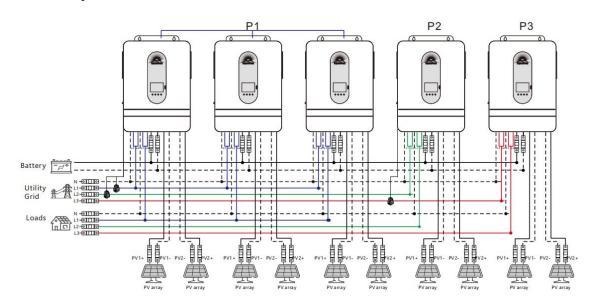


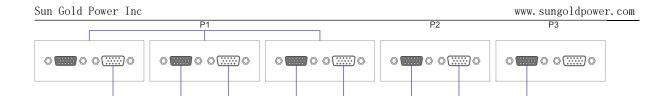
#### b. Three-phase system (four inverters)

#### 2+1+1 system:

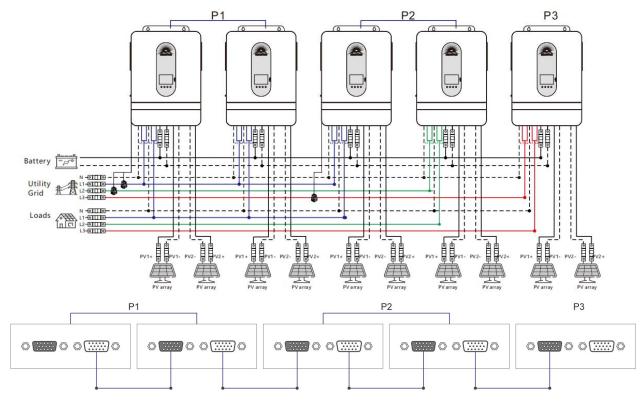


#### c. Three-phase system (five inverters)



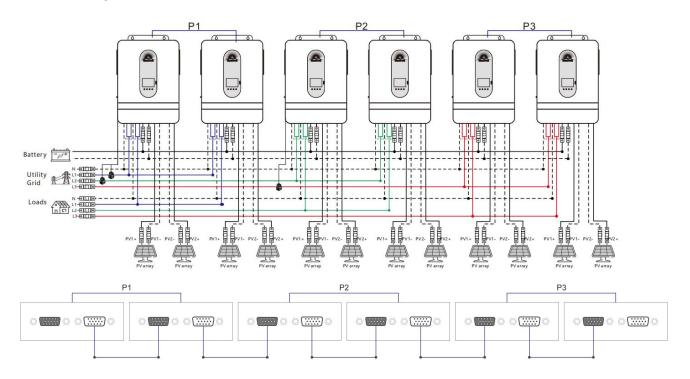


#### 2+2+1 system:

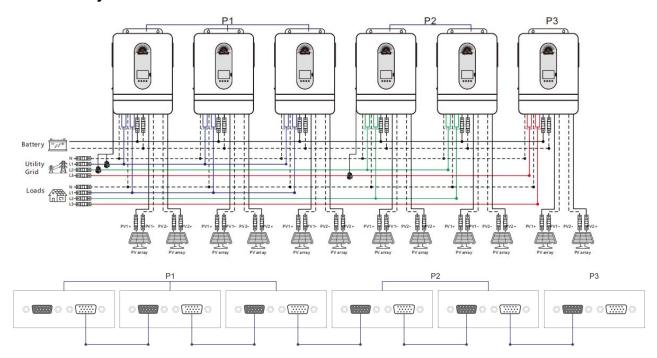


#### d. Three-phase system (six inverters)

#### 2+2+2 system:



#### 3+2+1 system:



#### Note:

- 1) Before powering on and lighting up the screen, check for correct wiring according to the above wiring diagrams to avoid system problems.
- 2) Check all connections for firm fixing to avoid detachment and abnormal system operation.
- 3) When connecting the AC output to the load, complete wiring according to the requirements of the electrical load to avoid damage to the load.
- 4) Set the item [38] to the same parameter, or only set it in the host inverter. During parallel operation, the voltage set in the host shall prevail, so the host inverter will forcibly set the item to the value for slave inverters. Only in standby mode can the item be set.
- 5) The inverter defaults to single mode at the factory. If using the parallel or three-phase function, set the item [31] on the screen as follows:

Power on one inverter each time, turn off the other inverters, and then set the item [31] according to the on-site system operation mode. After setting the inverter,

turn off the inverter, and set the other inverters one by one. After all are set, power on all inverters at one time to enter the working state.

#### In single-phase parallel operation:

Set the item [31] to "PAL" and the item [68] to "0 $^{\circ}$ ." When setting the item [38] to "120 V," the output L-N voltage is 120 V

#### In two-phase parallel operation:

- (1) P1: Set the item [31] to "2P0;" P2: Set the item [31] to "2P1," all of P1/P2 inverters item [68] can not be set, it is default "0°" and the phase difference between P1 and P2 is 120°. When setting the item [38] to "120 V," the voltage between the live wire L1 of P1 phase and the live wire L2 of P2 phase is 208 V, and the L1-N voltage is 120 V
- (2) P1: Set the item [31] to "2P0;" P2: Set the item [31] to "2P2," all of P1/P2 inverters item [68] can not be set, it is default "0°" and the phase difference between P1 and P2 is 180°. When

setting the item [38] to "120 V," the voltage between the live wire L1 of P1 phase and the live wire L2 of P2 phase is 240 V, and the L1-N voltage is 120 V

#### In split-phase parallel operation:

Set the item [31] to PAL, and set the item [68] to  $180^\circ$ . When setting the item [38] to "120 V," the L1-L2 voltage is 240 V, and the L1-N voltage is 120 V

#### In three-phase parallel operation:

P1: Set the item [31] to "3P1;" P2: Set the item [31] to "3P2;" P3: Set the same to "3P3" all of P1/P2/P3 inverters item [68] can not be set, it is default "0°"

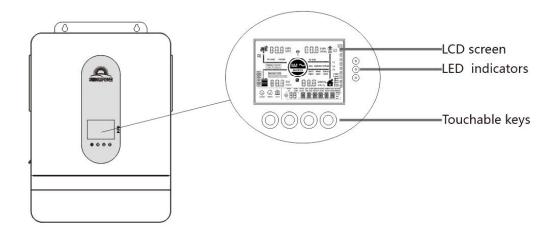
At this point, the P1-P2, P1-P3, and P2-P3 phase difference is 120°. When setting the item [38] to "120 VAC," the voltage between the live wire L1 of P1 phase and the live wire L2 of P2 phase is 230\*1.732=208 VAC. Similarly, the L1-L3 and L2-L3 voltage is 208 VAC:

6) After the system runs, measure the correct output voltage before connecting to loads.

# 5. Operation

# 5.1 Operation and display panel

The operation and display panel of the inverter includes one LCD screen, three indicators, and four physical buttons



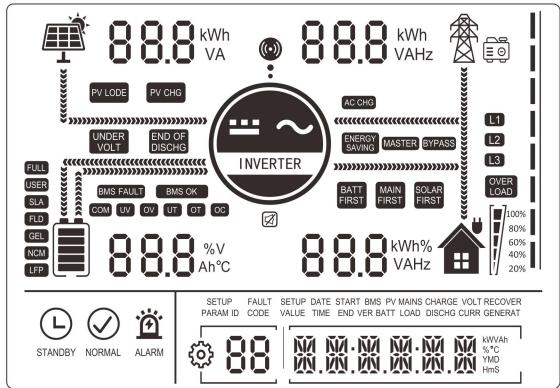
#### Physical button

Physical button	Description					
<b>(6)</b>	Enter/Exit the setup menu					
	Go to the next option					
	Go to the previous option					
$\bigcirc$	Confirm/Enter the option in setup menu					

#### • LED indicator

Indicator	Color	Description	
AC/INIV	Green	Normally ON: mains bypass output	
AC/INV		Flash: inverter output	
CHARGE	Yellow	Normally ON: charging completed	
		Flash: charging	
	Red	Normally ON: level-1 fault	
FAULT		Flash: level-2 fault	
		OFF: level-3 or level-4 fault	

#### Display screen



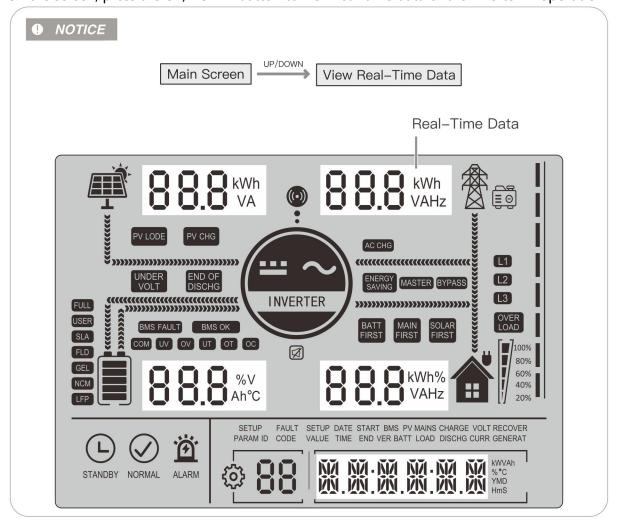
Icon	Description	Icon	Description		
	PV panel		Mains		
	Battery	<b>= 0</b>	Generator		
NETTER NO.	The inverter is working		Load		
<b>©</b>	The inverter is communicating with the data collector		The buzzer is in mute mode		
»»»»»»»»»	Power flow direction				
STANDBY	The inverter is in standby mode	NORMAL	The inverter is working normally		
ALARM	There is a fault	<i>{</i> ?}}	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%		

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Icon	Description	lcon	Description
	Load power: 5%-19%		SOC: 5%-19%
UNDER VOLT	I I Rattory linger-voltage		Battery over-discharge
OVER LOAD	( )Voriond		BMS fault
СОМ	System communication error	UV	System under-voltage
OV	System overvoltage	UT	Too low system temperature
ОТ	Too high system temperature	ос	System overcurrent
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
PVLOAD	PVLOAD PV power is loading		PV power is charging the battery
ACCHG	ACCHG AC input power is charging the battery		The output mode of the inverter is mains first
BYPASS	BYPASS The output mode of the inverter is mains bypass		The output mode of the inverter is PV first
BATT FIRST	The output mode of the inverter is battery first		

#### • Real-time parameters view

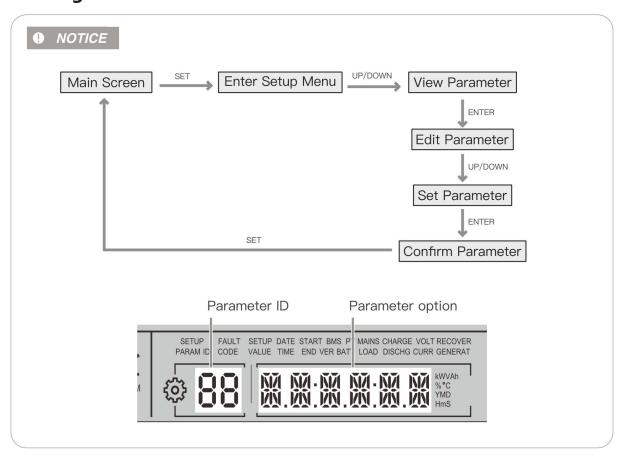
On the screen, press the UP/DOWN button to view real-time data of the inverter in operation



Split Phase Solar Inverter V1.0 37

Page	PV	Battery	AC input	Load	General
1	PV input voltage	Battery voltage	Mains input voltage	Single-phase voltage	Current time
2	PV input current	Battery current	Mains input current	Single-phase current	Current date
3	PV input power	Battery voltage	Mains total input power	Single-phase active power	PV gross generation
4	PV generation for the day	Battery current	Mains charging capacity for the day	Single-phase apparent power	Total load consumption
5	PV heat sink temperature	Heat sink temperature	Mains frequency	Inverter output frequency	RS485 address
6	Rated open circuit voltage	Rated battery voltage	Bus voltage	Rated output frequency	Software version
7	Maximum PV charge current	Maximum battery charge current	Maximum mains charge current	Total output active power	/
8			/	Total output apparent frequency	/

## 5.2 Setting



ID	Parameter	Option	Description
00	Exit	ESC	Exit the setup menu
		UTI (default)	Photovoltaic energy priority with the load, photovoltaic is not enough, the grid power and photovoltaic mixed load, photovoltaic energy is enough with the load, the excess energy to charge the battery, the grid power only starts charging when the battery is too discharged (06 Settings as" OSO(only PV))", the grid power will not charge), the battery is only discharged when off the grid
01	AC output mode	SBU	Inverter first. The PV mode is to be applied first for loading, and only when the battery voltage is lower than the set value in the item 4, it will switch to the mains mode for loading. When the battery voltage is higher than the set value in the item 5, it will switch back to the PV mode from the mains mode.
		SOL	The PV mode is to be applied first and 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 mains mode
		SUB	Solar energy priority charging, insufficient solar energy, grid energy and solar energy hybrid charging (if 06 Settings as" OSO(only PV)",the grid energy will not charge) and grid with load, when solar energy is enough to charge,excess energy not enough to load, excess solar energy and grid will hybrid load, the battery is discharged only when off the grid
		50.0	In bypass mode, the AC output frequency will adapt to the mains
02	AC input frequency	60.0 (default)	frequency, and in other cases, the output will follow the preset value.
	AC input voltage	UPS (default)	When the output voltage is 120/110 V, the input voltage range is 90 V-140 V
03	range	APL	When the output voltage is 100/105 V, the input voltage range is 85 V-140 V
04	Battery to mains voltage threshold	43.6 (default)	When the parameter item 01 is SBU or SOL and the battery voltage is lower than the threshold, the output switches from inverter to mains. Setting range: 40 V-52 V
05	Mains to battery voltage threshold	57.6 (default)	When the parameter item 01 is SBU or SOL and the battery voltage is higher than the threshold, the output switches from mains to inverter. Setting range: 48 V-60 V
06	Battery charge mode	SNU (default)	When both PV power and mains are used to charge the battery at one time, the PV charge first and when the PV power is insufficient, the mains tags in. Only in bypass mode can both PV power and mains be used to charge the battery at one time, and only the PV charge mode can be enabled during inverter

ID	Parameter	Option	Description
			operation.
		oso	Do not enable the mains charge mode when in only PV charge mode
07	Battery charge current	60A	SPH6548P setting range:0-140A
		USER	User-defined, and in this type, you can set all battery parameters
		SLD	Sealed lead-acid battery
		FLD	Flooded lead-acid battery
		GEL (default)	Gel lead-acid battery
08	Battery type	L14/L15/L16	LFP battery L14/L15/L16, corresponding to 14, 15, and 16 series of LFP batteries
		N13/N14	Ternary Li-ion battery N13/N14, corresponding to 13 and 14 series of ternary Li-ion batteries
		NOb	No battery
09	Battery boost charge voltage	56.8	Setting range: 48 V-58.4 V, with a step of 0.4 V, available for user-defined and lithium-ion battery types
10	Boost charge duration	120	The continuous charging time when the voltage reaches the set voltage during constant voltage charging, with a setting range of 5 min-900 min and a step of 5 min
11	Battery floating charge voltage	55.2	Setting range: 48 V-58.4 V, with a step of 0.4 V. This parameter cannot be set after successful BMS communication
12	Battery over-discharge voltage (delayed shutdown)	42	When the battery voltage is lower than the voltage and triggers the set value in the item 13, it will turn off the inverter output. Setting range: 40 V-48 V, with a step of 0.4 V
13	Battery over-discharge delay time	5	When the battery voltage is lower than the set value in the item 12 and triggers the delay time set in this parameter item, it will turn off the inverter output. Setting range: 5s-50s, with a step of 5s
14	Battery under-voltage alarm threshold	44	When the battery voltage is lower than the threshold, it will give an under-voltage alarm and the output will not shut down. Setting range: 40 V-52 V, with a step of 0.4 V
15	Battery discharge	40	When the battery voltage is lower than the value, the output immediately shuts down. Setting range: 40 V-52 V, with a step of 0.4 V, available for user-defined and Li-ion batteries
			0.4 V, available for user-defined and Li-fort batteries

ID	Parameter	Option	Description			
	charge	ENA	Enable equalizing charge, but only available for flooded lead-acid batteries, sealed lead-acid batteries, and user-defined ones			
17	Equalizing charge voltage	58	Setting range: 48 V-58 V, with a step of 0.4 V, but only available for flooded lead-acid batteries, sealed lead-acid batteries, and user-defined ones			
18	Equalizing charge duration	120	Setting range: 5 min – 900 min, with a step of 5 min, but only available for flooded lead-acid batteries, sealed lead-acid batteries, and user-defined ones			
19	Equalizing charge delay time	240	Setting range: 5 min – 900 min, with a step of 5 min, but only available for flooded lead-acid batteries, sealed lead-acid batteries, and user-defined ones			
20	Equalizing charge interval	30	Setting range: 0 day - 30 days, with a step of 1 day, but only available for flooded lead-acid batteries, sealed lead-acid batteries, and user-defined ones			
21	Equalizing charge	DIS (default)	Stop equalizing charge immediately			
21	Enable/Disable ENA		Start equalizing charge immediately			
		DIS (default)	Disable energy-saving mode			
22	Energy-saving mode	ENA	Enable energy-saving mode, and when the load power is below 50 W, it will turn off the inverter output after a 5-minute delay. When it exceeds 50 W, the inverter will automatically restart.			
		DIS	Disable overload auto restart and when overload occurs, it will turn off the output and the inverter will no longer resume startup			
23	Overload auto restart	ENA (default)	Enable overload auto restart, and If overload occurs, the output will be turned off, and after a delay of 3 min, the output will restart.  After 5 cumulative attempts, the inverter will no longer resume startup			
25	Duzzer elerm	DIS	Disable buzzer alarm			
25	Buzzer alarm	ENA (default)	Enable buzzer alarm			
26	Mode switch prompt	DIS	Disable prompt when the status of the main input source changes			
20	wode switch prompt	ENA (default)	Enable prompt when the status of the main input source changes			
27	Inverter to bypass	DIS	Disable auto switch to mains for loading in case of inverter overload			
	switch	ENA (default)	Enable auto switch to mains for loading in case of inverter overload			
28	Grid charge current	60A	SPH6548P setting range:0-80A			

ID	Parameter	Option	Description			
30	RS485 communication address	ID: 1	Setting range: 1-254			
		SIG (default)	Single inverter operation			
		PAL	Parallel operation			
		2P0/2P1/2P2	Two-phase parallel operation			
			or the machine screens connected to P1			
			t the output voltage of the setting item [38] is set to 120 VAC			
			he inverters connected to P2 are set to "2P1" on the screen, the			
			e difference between P1 and P2 is 120°, the voltage between the			
			of phase-P1 and the live wire L2 of phase-P2 is 120*1.732=208			
			voltage of L1-N and L2-N is 120 VAC.			
31	Parallel mode		he inverters connected to P2 are set to "2P2" on the screen, the			
			e difference between P1 and P2 is 180°, the voltage between the			
		live wire L1 of phase-P1 and the live wire L2 of phase-P2 is120*2=240 VAC, and the voltage of L1-N and L2-N is120 VAC.				
			Three-phase parallel operation			
		Set to "3P1" on the screen for all the inverters connected to P1; set to "3P2" on				
		the screen for all the inverters connected to P2; and set to "3P3" on the screen				
		for those connected to P3. 1) Assuming that the output voltage of the setting item				
		[38] is set to 120 VAC: then the voltage phase difference of P1-P2, P1-P3, and P2-P3 is 120°, the voltage between the live wire L1 of phase-P1 and the live wire				
			P2 is 120*1.732=208 VAC, and similarly the voltage of L1-L3 and			
		•	VAC; the voltage of L1-N, L2-N, and L3-N is 120 VAC.			
	DC40E	DIS (default)	Enable PC and Remote Monitoring Protocol			
32	RS485 communication	485	Enable the BMS communication function based on RS485			
32	function		communication			
	tunction	CAN	Enable the BMS communication function based on CAN communication			
		Select the cor	responding communication protocol in item 33 when you set it to			
	DMC	485 or CAN in item 32				
33	BMS	SGP=SUNGO	DLDPOWER,PAC = PACE, RDA = Ruida, AOG = Aoguan, OLT =			
	communication	Oliter, HWD = Sunwoda, DAQ = Daqin, WOW = SNPOWER, PYL = Pylontech,				
		UOL = Vilion				
	Limit power to CT	DIS (default)	Disable this function			
34	(under development)	Home load	solar energy can be supplied to the home load that connected to the grid, excess energy will not be feed to the grid.			

ID	Parameter	Option	Description
35	Battery under-voltage recovery threshold	52	When the battery is under voltage, the battery voltage needs to be greater than the threshold to restore the AC output of the battery inverter. Setting range: 44 V-54.4 V
37	Recharge voltage threshold for fully charged battery	52	After the battery is fully charged, the inverter stops charging, and recovers charging when the battery voltage is lower than the threshold. Setting range: 44 V-54 V
38	AC output voltage	120	Setting range: 100/105/110/120 /127VAC
		LCSET	The maximum battery charge current is not greater than the set value of [item 07]
39	Charge current limit (when BMS works)	LCBMS (default)	The maximum battery charge current is not greater than the maximum value of BMS
		LCINV	The maximum battery charge current is not greater than the logical judgment value of inverter
40	Period-1 battery charge start time	00:00:00	Setting range: 00:00:00-23:59:00
41	Period-1 battery charge end time	00:00:00	Setting range: 00:00:00-23:59:00
42	Period-2 battery charge start time	00:00:00	Setting range: 00:00:00-23:59:00
43	Period-2 battery charge end time	00:00:00	Setting range: 00:00:00-23:59:00
44	Period-3 battery charge start time	00:00:00	Setting range: 00:00:00-23:59:00
45	Period-3 battery charge end time	00:00:00	Setting range: 00:00:00-23:59:00
		DIS (default)	Disable the function
46	Timed battery charge function	ENA	After the timed mains charge/loading function is enabled, the power supply mode will turn into SBU, where mains is available for power supply in the set period or after battery over-discharge. If the timed discharge function is enabled at the same time, the power supply mode of the system will be changed into UTI, where mains is only available for power supply in the set charge period, and the system only switches to the power supply of battery inverter during the set discharge period or mains failure
47	Period-1 battery discharge start time	00:00:00	Setting range: 00:00:00-23:59:00

ID	Parameter	Option	Description
48	Period-1 battery discharge end time	00:00:00	Setting range: 00:00:00-23:59:00
49	Period-2 battery discharge start time	00:00:00	Setting range: 00:00:00-23:59:00
50	Period-2 battery discharge end time	00:00:00	Setting range: 00:00:00-23:59:00
51	Period-3 battery discharge start time	00:00:00	Setting range: 00:00:00-23:59:00
52	Period-3 battery discharge end time	00:00:00	Setting range: 00:00:00-23:59:00
		DIS (default)	Disable the function
53	Timed battery discharge function	ENA	After the timed battery discharge function is enabled, the power supply mode will be changed into UTI, where the system only switches to the power supply of battery inverter during the set discharge period or mains failure
54	Current date	date 00:00:00	Year/Month/Day
	Guirent date 00.00.00		Setting range: 00:01:01-99:12:31
55	Current time	00:00:00	Setting range: 00:00:00-23:59:59
56	Leakage curr ent DIS(defa		Disnable leakage current protection
	protection enable	ENA	Enable leakage current protection
57	Charge stop current	3	The charge stops when the charge current is less than the set value (unit: A)
58	SOC setting for discharge alarming	15	When the capacity is less than the set value, the SOC alarms (unit: %, only available during normal BMS communication)
59	SOC setting for discharge cutoff	5	When the capacity is less than the set value, the discharge stops (unit: %, only available during normal BMS communication)
60	SOC setting for charge cutoff	100	When the capacity is greater than the set value, the charge stops (unit: %, only valid during normal BMS communication)
61	SOC setting for switching to mains	10	When the capacity is less than the set value, it switches to mains (unit: %, only available during normal BMS communication)
62	SOC setting for switching to inverter output	100	When the capacity is greater than the set value, it switches to the inverter output mode (unit: %, only available during normal BMS communication)
62	Auto N-PE	DIS (default)	Disable auto N-PE connection switch
63	connection switch	ENA	Enable auto N-PE connection switch

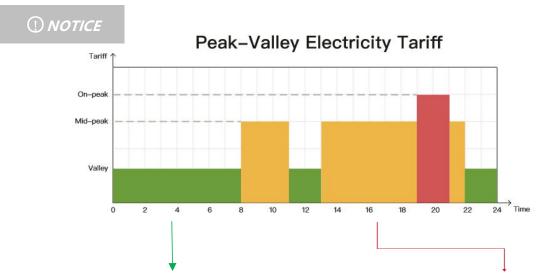
ID	Parameter	Option	Description
	function		
67	Power sales setting	0 (default)	Setting range: 0-rated power
	AC output phase	0	0 represents the single-phase mode Assuming that the AC output voltage of item 38 is 120 V, the phase difference of L1-L2 is 0°, and L1/L2 can be connected in parallel, the phase voltage of L1-N/L2-N is 120 V
68	mode	180 (default)	180 represents the split-phase mode Assuming that the AC output voltage of item 38 is 120 V, the phase difference of L1-L2 is 180°, the phase voltage of L1-N/L2-N is 120 V, and the voltage of L1-L2 is 240 V
73	Max charging current by generator	40A	SPH6548P setting range :0-80A
74	Generator input power	6KW	setting range:0-10KW
76	CT ratio (under development)	1000	When connect an external CT, enter the current ratio according to CT specification.
77	Anti-reflux Error calibration power (option)	100W	Setting range 0-500w
79	AFCI check	DIS(default)	Disable AFCI check function
79	(option)	ENA	Enable AFCI check function
80	AFCI fault manually clear	IGNORE	Ignore the AFCI fault report
80	(option)	CLEAR	Clear the AFCI fault

## 5.5 Timed charge/discharge function

SPH6548P has the timed power charge/discharge function. Users can set different charge and discharge periods according to the local time-of-use price, thus reasonably using mains and PV power. When mains is expensive, the battery inverter is used to supply power to the load; when mains is cheap, it can be used to supply power to and charge the load, thus helping users reduce electricity expenses to the full extent. Users can turn on/off the timed charge/discharge function in items 46 and 53 in the setup menu, and set charge and discharge periods in parameters 40-45 and 47-52.

The following is an example to help users understand the function.

Before using the function for the first time, please set the local time and date in parameters 54 and 55, and then you can set corresponding periods based on the local time-of-use price.



#### **Timed charge and loading function**

With 3 definable periods, users can freely set the mains charge/loading period in the range of 00:00-23:59. During the period set by the user, in case of PV energy output, it will be used inverter to load; if the battery power is first; in case of no PV energy output or lack of PV energy, mains will be used as a supplement. switch to mains to ensure stable operation of

#### **Timed battery discharge function**



With 3 definable periods, users can freely set the battery discharge period in the range of 00:00-23:59. During the period set by the user, the inverter will first use the battery insufficient, the inverter will automatically the load.

## **5.6 Battery parameters**

## • Lead-acid battery

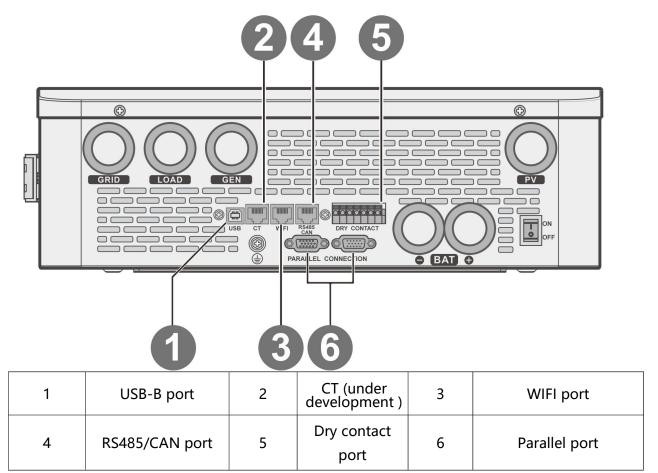
Battery type Parameters	Sealed lead acid battery (SLD)	Gel lead acid battery (GEL)	Flooded lead acid battery (FLD)	User-defined (USE)	Adjustable
Overvoltage disconnection voltage	60V	60V	60V	60V	
Battery fully charged recovery point	52V	52V	52V	52V	<b>V</b>
Boost charge voltage	57.6V	56.8V	57.6V	40 ~ 60V	√
Undervoltage alarm voltage([01] fault)	44V	44V	44V	40~60V	<b>V</b>
Undervoltage alarm voltage recovery point([01] fault)	l				
Low voltage disconnection voltage([04] fault)	42V	42V	42V	40 ~ 60V	<b>V</b>
Low voltage disconnection voltage recovery point ([04] fault)(setup item [35])	52V	52V	52V	52V	٧
Discharge limit voltage	-	-	-	40 ~ 60V	<b>V</b>
Over-discharge delay time	5s	5s	5s	1 ~ 30s	<b>V</b>
Boost charge duration	-	-	-	10 ~ 900 minutes	٧

### • Li-ion battery

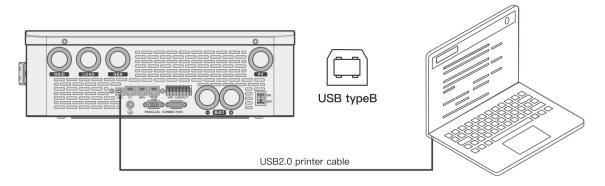
Battery type Parameters	Ternary (N13)	Ternary (N14)	LFP (L16)	LFP (L15)	LFP (L14)	Adjustable
Overvoltage disconnection voltage	60V	60V	60V	60V	60V	
Battery fully charged recovery point	50.4V	54.8V	53.6V	50.4V	47.6V	<b>V</b>
Equalizing charge voltage	-	-	-	-	-	V
Boost charge voltage	53.2V	57.6V	56.8V	53.2V	49.2V	√
Undervoltage alarm voltage([01] fault)	43.6V	46.8V	49.6V	46.4V	43.2V	<b>V</b>
Undervoltage alarm voltage recovery point([01] fault)	Undervoltage alarm voltage+0.8V					
Low voltage disconnection voltage([04] fault)	38.8V	42V	48.8V	45.6V	42V	٧
Low voltage disconnection voltage recovery point ([04] fault)(setup item [35])	46V	49.6V	52.8V	49.6V	46V	٧
Discharge limit voltage	36.4V	39.2V	46.4V	43.6V	40.8V	<b>V</b>
Over-discharge delay time	30s	30s	30s	30s	30s	V
Boost charge duration	120 minutes	120 minutes	120 minutes	120 minutes	120 minutes	<b>V</b>

## 6. Communication

## **6.1 Overview**



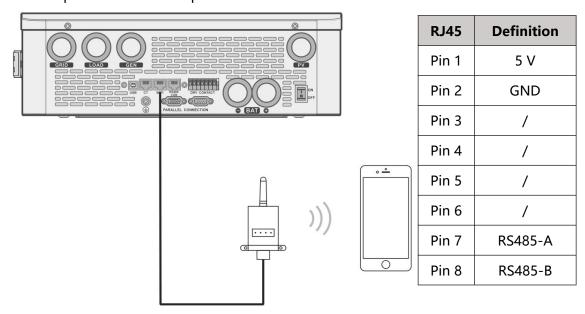
## 6.2 USB-B port



Users can use the upper computer software through the port to read and modify device parameters. If needing the installation package for the upper computer software, you can contact us to get it.

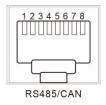
## 6.3 WIFI port

The WIFI port is used to connect to the Wi-Fi/GPRS data acquisition module, and then users can view the operation status and parameters of the inverter via the mobile APP.



## 6.4 RS485/CAN port

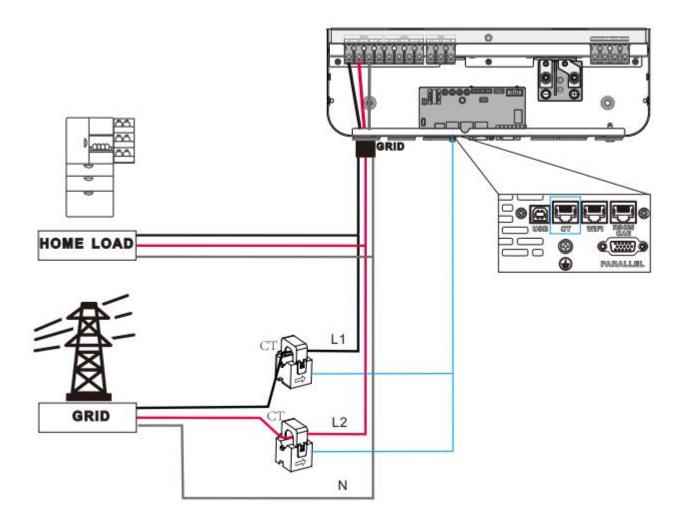
The RS485/CAN port is used to connect to the BMS of the Li-ion battery.



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

## 6.5 CT port (under development)

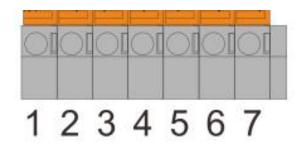
CT direction: to inverter



## 6.6 Dry contact port

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

- 1. RSD power supply
- 2. Remote ON/OFF
- 3. Battery temperature sampling
- 4. Remote generator start/stop



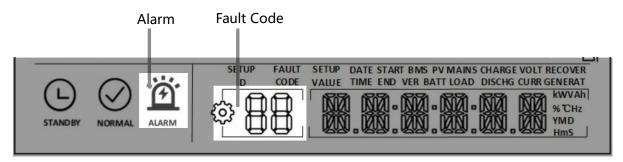
Function	Description
RSD power supply	PIN 1 is GND, PIN 2 is RSD 12V+
Remote ON/OFF	When pin 1 is connected to pin 3, the inverter will turn off the AC output.  When disconnected, the inverter is in normal output.
Temperature sampling (reserved)	Pins 1 and 4 can be used for battery temperature sampling compensation.
Remote generator start/stop	When the battery voltage reaches the under-voltage alarm voltage (parameter 14) or the voltage threshold for mains to switch to the battery (parameter 04), pins 6 to 5 are normally open, and pins 7 to 5 are normally closed.  When the battery voltage reaches the voltage threshold for the battery to switch to mains (parameter 05), or the battery is fully charged, pins 6 to 5 are normally closed, and pins 7 to 5 are normally open. (5/6/7 pin output: 125 VAC/1 A, 230 VAC/1 A, and 30 VDC/1 A)

## ① NOTICE

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

## 7. Fault Codes and Response Measures

## 7.1 Fault codes



Fault Code	Meaning	Affect Output or Not	Description	
01	BatVoltLow	Yes	Battery under-voltage alarm	
02	BatOverCurrSw	Yes	Overcurrent software protection for average battery discharge current	
03	BatOpen	Yes	Disconnected battery alarm	
04	BatLowEod	Yes	Under-voltage battery discharge stop alarm	
05	BatOverCurrHw	Yes	Battery overcurrent hardware protection	
06	BatOverVolt	Yes	Charge overvoltage protection	
07	BusOverVoltHw	Yes	Bus overvoltage hardware protection	
08	BusOverVoltSw	Yes	Bus overvoltage software protection	
09	PvVoltHigh	Yes	PV overvoltage protection	
10	PvBoostOCSw	No	Boost overcurrent software protection	
11	PvBoostOCHw	No	Boost overcurrent hardware protection	
12	SpiCommErr	Yes	SPI communication fault of master and slav chips	
13	Overload Bypass	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 heat sink over-temperature protection	
20	OverTemperInv	Yes	Inverter heat sink over-temperature	

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			protection	
21	FanFail	Yes	Fan fault	
22	EEPROM	Yes	Memory fault	
23	ModelNumErr	Yes	Model setting error	
24	Busdiff	Yes	Positive and negative bus voltage imbalance	
25	BusShort	Yes	Bus short-circuit	
26	Rlyshort	Yes	Inverter AC output backward to bypass AC output	
28	LinePhaseErr	Yes	Mains input phase error	
29	BusVoltLow	Yes	Bus low-voltage protection	
30	BatCapacityLow1	Yes	Alarm of battery capacity rate below 10% (taking effect after BMS communication is successful)	
31	BatCapacityLow2	No	Alarm of battery capacity rate below 5% (taking effect after BMS communication is successful)	
32	BatCapacityLowStop	Yes	Battery low-capacity OFF (taking effect after BMS communication is successful)	
34	CanCommFault Yes Parallel can communication f		Parallel can communication fault	
35	ParaAddrErr	Yes	Parallel ID (communication address) setting error	
37	ParaShareCurrErr	Yes	Parallel current sharing fault	
38	ParaBattVoltDiff	Yes	Large battery voltage difference in parallel mode	
39	ParaAcSrcDiff	Yes	Inconsistent mains input source in parallel mode	
40	ParaHwSynErr	Yes	Hardware synchronization signal error in parallel mode	
41	InvDcVoltErr	Yes	Inverter DC voltage error	
42	SysFwVersionDiff Yes		Inconsistent system firmware version in parallel mode	
43	ParaLineContErr	Yes	Parallel connection fault	
44	Serialnumbererror Ye		Failure to set the serial number before leaving factory	
45	Errorsettingofsplit-phasemode Yes Setting error of setting items in paramode		Setting error of setting items in parallel mode	
56	Lowinsulation	No	Abnormally low earth impedance of PV1+, PV2+, and PV-	

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	resistancefault		
57	Leakagecurrent overloadfault	Yes	System current leakage out of the standard
58	BMSComErr	No	BMS communication fault
60	BMSUnderTem	No	BMS under-temperature alarm (taking effect after BMS communication is successful)
61	BMSOverTem	No	BMS over-temperature alarm (taking effect after BMS communication is successful)
62	BMSOverCur	No	BMS overcurrent alarm (taking effect after BMS communication is successful)
63	BMSUnderVolt	No	BMS under-voltage alarm (taking effect after BMS communication is successful)
64	BMSOverVolt	No	BMS overvoltage alarm (taking effect after BMS communication is successful)

## 7.2 Troubleshooting

Battery under-voltage  Disconnected battery  Other battery overvoltage is lower than the value set in parameter [14].  Battery under-voltage  Disconnected battery  Disconnected battery is not connected, or the BMS of the lattery is in the discharge protection state  The battery voltage is lower than the value set in parameter 12  The battery voltage is lower than the value set in parameter 12  The battery voltage is lower than the value set in parameter 12  The battery voltage is lower than the value set in parameter [35]  Manuall reset: Turn off the power, and restart Check if the battery voltage is higher than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage is below the overvoltage recovery threshold of the battery  Disconnected battery voltage is lower than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage is below the overvoltage recovery threshold of the battery until the voltage is below the overvoltage recovery threshold of the battery  Disconnected of the battery voltage is lower than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage is higher than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage is below the overvoltage recovery threshold of the battery until the voltage is below the overvoltage recovery threshold of the battery until the voltage is below the overvoltage recovery threshold of the battery until the voltage is higher than the value set in parameter [35]  Disconnected	Fault Code	Meaning	Cause	Solution
Disconnected battery	/	No screen display	or the device switch at its	air-switch has been closed; check if the switch is in "ON"; press any button on the
Disconnected battery  Disconnected battery is reliably connected check if the circuit breaker of the battery off; ensure that the BMS of the lithium-ib battery can communicate normally.  Manual reset: Turn off the power, and restart Automatic reset: Charge the battery unti the battery voltage is higher than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage exceeds the limit. If the limit is exceeded, discharge the battery until the voltage is below the overvoltage recovery threshold of the battery  Disconnected check if the circuit breaker of the battery off; ensure that the BMS of the lithium-ib battery can communicate normally.  Manual reset: Turn off the power, and restart Check if the battery voltage is higher than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage exceeds the limit. If the limit is exceeded, discharge the battery until the voltage is below the overvoltage recovery threshold of the battery  Disconnected check if the circuit breaker of the battery off; ensure that the BMS of the lithium-ibattery can communicate normally.  Manual reset: Turn off the power, and restart the battery voltage is higher than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage is higher than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage is higher than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage is higher than the value set in parameter [35	01	_	lower than the value set in	Charge the battery until the battery voltage exceeds the value set in parameter [14].
Battery over-discharge  The battery voltage is lower than the value set in parameter 12  Rechargeable battery overvoltage protection  Rechargeable battery overvoltage protection  The battery is in the overvoltage state  The output power or current of the bypass is overloaded within a certain period  Inverter overload (software detection)  Over-high temperature of the heat sink for PV input input  The temperature of the heat sink for PV input exceeds 90°C for 3s  The battery voltage is higher than the value set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage exceeds the limit. If the limit is exceeded, discharge to battery until the voltage is below the overvoltage recovery threshold of the battery  Reduce the load power, and restart the device. For more details, please refer to item 11 in Protection Function  Wait until the temperature of the heat sink below the over-temperature recovery temperature, when charge and discharge to battery until the voltage is higher than the values set in parameter [35]  Manually turn off the power, and restart Check if the battery voltage exceeds the limit. If the limit is exceeded, discharge to battery until the voltage is higher than the values in parameter [35]  Manually turn off the battery voltage is higher than the values in the battery voltage is higher than the values in the battery voltage is higher than the values in the battery voltage is higher than the values in the battery voltage is higher than the values in the battery voltage is higher than the values in the battery voltage is higher than the values in the battery voltage is higher than the values in the battery voltage is higher than the values in the battery voltage is higher than the values in the battery voltage is higher than the values in parameter [35]	03		connected, or the BMS of the lithium-ion battery is in the discharge	Check if the battery is reliably connected; check if the circuit breaker of the battery is off; ensure that the BMS of the lithium-ion battery can communicate normally.
Rechargeable battery overvoltage protection  The battery is in the overvoltage state  The output power or current of the bypass is overloaded within a certain period  The output power or current of the inverter is overloaded within a certain period  The output power or current of the inverter is overloaded within a certain period  Over-high temperature of the heat sink for PV input input  The temperature of the heat sink for PV input exceeds 90°C for 3s  Check if the battery voltage exceeds the limit. If the limit is exceeded, discharge to battery until the voltage is below the overvoltage recovery threshold of the load power, and restart the device. For more details, please refer to item 11 in Protection Function  Wait until the temperature of the heat si is below the over-temperature recovery temperature, when charge and discharge to battery until the voltage exceeds the limit. If the limit is exceeded, discharge to battery until the voltage is below the overvoltage recovery threshold of the limit. If the limit is exceeded, discharge to battery until the voltage is below the overvoltage recovery threshold of the limit. If the limit is exceeded, discharge to battery until the voltage is below the overvoltage recovery threshold of the limit. If the limit is exceeded, discharge to battery until the voltage is below the overvoltage recovery threshold of the limit. If the limit is exceeded, discharge to battery until the voltage is below the overvoltage recovery threshold of the limit. If the limit is exceeded, discharge the battery until the voltage is below the overvoltage recovery threshold of the limit. If the limit is exceeded, discharge to battery until the voltage is below the overvoltage recovery threshold of the limit. If the limit is exceeded, discharge the battery until the voltage is below the overvol	04	_	lower than the value set in	restart Automatic reset: Charge the battery until the battery voltage is higher than the value
13 (software detection)  Inverter overload (software detection)  Inverter overload (software detection)  Over-high temperature of the heat sink for PV input input  Current of the bypass is overloaded within a certain period  The output power or current of the inverter is overloaded within a certain period  The output power or current of the inverter is overloaded within a certain period  Wait until the temperature of the heat si is below the over-temperature recovery temperature, when charge and discharge temperature, when charge and discharge temperature.	06	battery overvoltage	_	overvoltage recovery threshold of the
Inverter overload (software detection)  Over-high temperature of the heat sink for PV input input  The output power or current of the inverter is overloaded within a certain period  Wait until the temperature of the heat sink for PV input exceeds 90°C for 3s  item 11 in Protection Function  Wait until the temperature of the is below the over-temperature recovery temperature, when charge and discharge	13	(software	current of the bypass is overloaded within a	<b>'</b>
temperature of the heat sink for PV input input  temperature of the heat sink for PV input input  temperature of the heat sink for PV input exceeds 90°C for 3s  temperature, when charge and discharge	14	(software	current of the inverter is overloaded within a	•
detection)  20 Over-high The temperature of the		temperature of the heat sink for PV input (software detection)	heat sink for PV input exceeds 90°C for 3s	temperature, when charge and discharge

	temperature of the	heat sink for inverter	
	heat sink for	output exceeds 90°C for	
	inverter output	3s	
	(software		
	detection)		
21	Fan fault	Software detection founds	Shut down, manually flick the fan, and
21	raii iauit	the fan has a fault	check if any foreign objects are blocking it
			Manually shut down, and restart. If the
26	AC input relay	Stuck rolay for AC output	fault occurs again after restarting, contact
20	short-circuit	Stuck relay for AC output	the after-sales service personnel to repair
			the machine
		The phase of AC input is	Ensure that the phase of AC input is the
28	Mains input phase	The phase of AC input is	same as that of AC output. For example, if
28	fault	inconsistent with that of	the output is in the split-phase mode, the
		AC output	input shall also be in the split-phase mode.

## ① NOTICE

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

# 8. Protection Function and Product Maintenance

## **8.1 Protection function**

No	<b>Protection Function</b>	Description
1	PV current-limiting protection	When the charge current or power of the configured PV array exceeds the rated current and power of the inverter, it will charge at the rated current and power
2	PV overvoltage protection	If the PV voltage exceeds the maximum allowable value of hardware, the machine will report the fault, and stop the step-up of PV to output sine AC waves
3	Reverse charge protection at night	At night, as the battery voltage is greater than that of the PV module, it will prevent the battery from discharging to the PV module
4	mains input overvoltage protection	When the mains voltage of each phase exceeds 140 VAC, it will stop mains from charging, and switch it to inverter output
5	Mains input under-voltage protection	When the mains voltage of each phase is lower than 90 VAC, it will stop mains from charge, and switch it to inverter output
6	Battery overvoltage protection	When the battery voltage reaches the overvoltage disconnect voltage threshold, it will automatically stop PV and mains from charging the battery, thus preventing damage to the battery due to overcharge
7	Battery under-voltage protection	When the battery voltage reaches the low-voltage disconnect voltage threshold, it will automatically stop discharging the battery, thus preventing damage to the battery due to overdischarge
8	Battery overcurrent protection	When the battery current exceeds the allowable range of hardware, the machine will turn off the output, and stop discharging the battery
9	AC output short-circuit protection	When a short-circuit fault occurs at the load output terminal, it will immediately turn off the output of AC voltage. Only after manually powering on the device, normal output restores
10	Heat sink 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 charge and discharge again
11	Overload protection	After overload protection is triggered, the inverter output will be restored after 3 min, and after 5 times of overload, the output will

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d.
ed, and the output will
ed, and the output will
he output will be
ard to bypass AC input
ent protection
different from that of
hibit connecting to the
short circuit of load
• • · · ·

#### 8.2 Maintenance

In order to maintain the best long-term performance, it is recommended to conduct following checks twice a year.

- 1. Make sure that the airflow around the inverter is smooth, and remove any dirt or debris from the heat sink.
- 2. Check whether the insulation of all exposed wires is damaged by exposure to sunlight, friction with other objects around them, dryness, bite by insects or rodents, etc. Repair or replace wires if necessary.
- 3. Verify the consistency of the indication and display with the device operation. Please pay attention to any faults or errors, and take corrective actions if necessary.
- 4. Check all wiring terminals for corrosion, insulation damage, and signs of high temperature or burning/discoloration, and tighten the terminal screws.
- 5. Check for dirt, nesting insects, and corrosion, clean up as required, and clean the insectproof net regularly.
- 6. If the arrester fails, replace it in time against lightning damage to the inverter or even other devices of the user.



• Before conducting any inspection or operation, please ensure that the inverter is disconnected from all power sources and that the capacitor is fully discharged to avoid the risk of electric shock.

#### Our company will not be held responsible for damage due to the following reasons:

- 1. Damage caused by improper use or use in the wrong location.
- 2. The open circuit voltage of the PV module exceeds the maximum allowable voltage.
- 3. The operating temperature exceeds the limited operating temperature range.
- 4. Unauthorized personnel dismantle, and repair the inverter.
- 5. Force majeure: damage during transportation or handling of the inverter

## 9. Data sheet

Inverter Model	SPH6548P	Settable
Inverter output		
Rated output power	6500W	
Maximum peak power	13,000 VA	
Rated output voltage	120/240 VAC (single-phase/split-phase)	Y
Rated frequency	50/60 Hz	Y
Output wave	Pure sine wave	
Switching time	10 ms (typical value)	
Parallel number	6	
Battery		
Battery type	Lithium-ion battery/lead-acid battery/user-defined battery	Y
Rated battery voltage	48 Vdc	
Voltage range	40 Vdc-60 Vdc	Υ
Maximum mains/generator charge current	80 A	Y
Maximum mix charge current	140 A	Υ
PV input		
MPPT channel number	2	
Maximum input power	5000W+5000W	
Maximum Input Current	18/18 A	
Maximum open circuit voltage	550 Vdc+550Vdc	
MPPT operating voltage range	150 Vdc-450 Vdc	
Mains/generator	input	
Inputvoltage	65 VAC-140 VAC	

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range		
nput frequency range		
Bypass overload current	40A	
Efficiency		
MPPT tracking efficiency	99.9%	
Maximum efficiency of battery inverter	93%	
General		
Dimension	23inch *16.2inch *5.2inch	
Weight	42lbs(18.9 kg )	
Protection level	IP20, for indoor use only	
Ambient temperature	−10°C−55°C, >45°C derating	
Noise	<60 dB	
Cooling mode	Intelligent fan	
Communication		
Built-in interface	RS485/CAN/USB/dry contact	Υ
External module (optional)	Wi-Fi/GPRS	Y
Certification		
Safety	IEC62109-1, IEC62109-2	
EMC	EN61000-6-1, EN61000-6-3, and FCC 15 class B	
RoHS	Yes	