



INVERTER INSTALLATION MANUAL

☐ SMART VMH SERIES - SINGLE PHASE - 5KW



wifi

APP



SmartESS(ios)



SmartESS(Android)

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ABOUT THIS MANUAL

Purpose

This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installations and operations. Keep this manual for future reference.

Scope

This manual provides safety and installation guidelines as well as information on tools and wiring.

SAFETY INSTRUCTIONS



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

1. Before using the unit, read all instructions and cautionary markings on the unit the batteries and all appropriate sections of this manual.
2. When we connect the inverter and the battery pack, it is recommended to turn on the inverter first, and then the battery pack, to avoid any problems.
3. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
4. NEVER charge a frozen battery.
5. For optimum operation of this inverter/charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter/charger.
6. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
7. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
8. A fuse (1 piece of 150A, 63VDC) is provided as over-current protection for the battery supply.
9. GROUNDING INSTRUCTIONS- This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
10. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
11. **Warning!!** Only qualified electrician are able to service this device.
12. **CAUTION:** For safety operation and regulation compliance, it's requested to install a separate DC over-current

INTRODUCTION

This is a multi-function inverter/charger, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support with portable size. Its comprehensive LCD display offers user-configurable and easy-accessible button operation such as battery charging current, AC/solar charger priority, and acceptable input voltage based on different applications.

Features

- Pure sine wave inverter
- Configurable input voltage range for home appliances and personal computers via LCD setting
- Configurable battery charging current based on applications via LCD setting
- Configurable AC/Solar Charger priority via LCD setting
- Compatible to mains voltage or generator power
- Auto restart while AC is recovering
- Overload/ Over temperature/ short circuit protection
- Smart battery charger design for optimized battery performance
- Cold start function

Basic System Architecture

The following illustration shows basic application for this inverter/charger. It also includes following devices to have a complete running system:

Generator or Utility.

PV modules (option)

Consult with your system integrator for other possible system architectures depending on your requirements.

This inverter can power all kinds of appliances in home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioner.

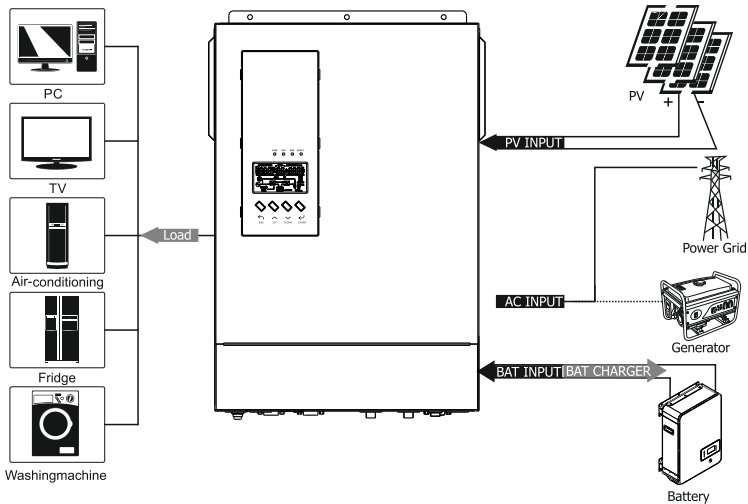
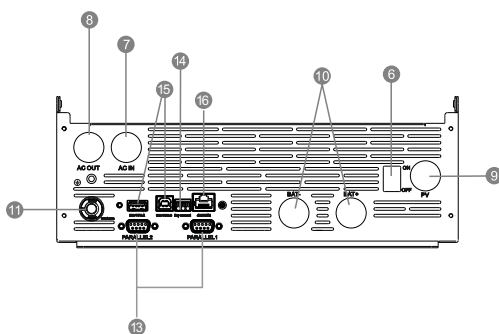
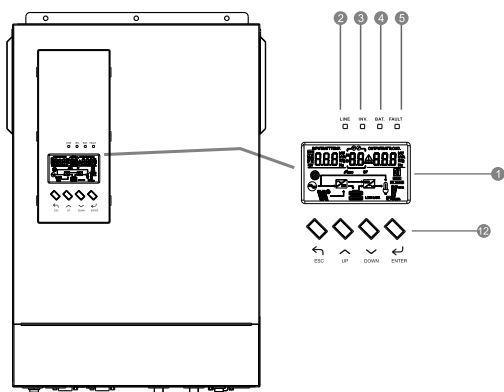


Figure 1 Hybrid Power System



5KW single model

- | | | | |
|---|------------------------|---------------------|----------------------|
| 1. LCD display | 2. Line indicator | 3. INV indicator | 4. Battery indicator |
| 5. Fault indicator | 6. Power on/off switch | 7. AC input | 8. AC output |
| 9. PV input | 10. Battery input | 11. Circuit breaker | 12. Function buttons |
| 13. Parallel communication port (only for parallel model) | | | |
| 14. Dry contact | 15. USB | 16. RS485/CAN | |

INSTALLATION

Check for Physical Damage

Make sure that the inverter is intact during shipment. If there is any visible damage, such as cracks, please contact your dealer immediately.

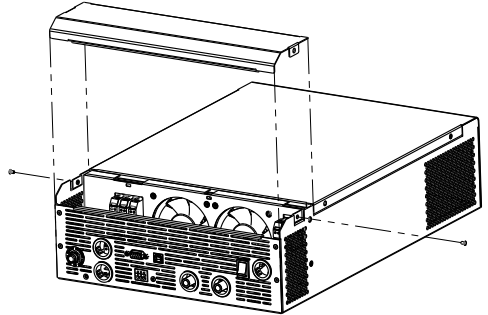
Packing List

Open the package and take out the product, please check the accessories first. The package list is shown below.

- Inverter × 1
- Parallel cable × 1 (optional)
- WIFI module × 1 (optional)

Installation Tools

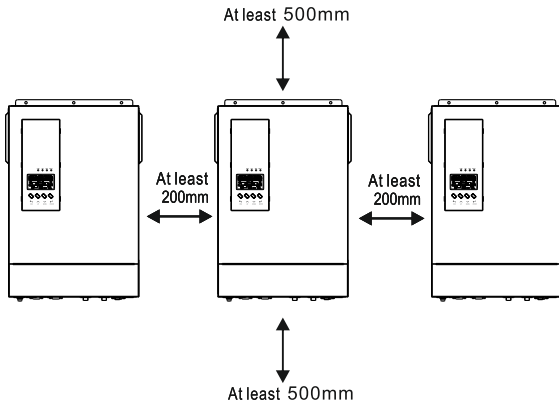
Terminal blocks, RJ45 crimping pliers, screwdrivers, hand wrenches and drills, etc.



Mounting the Unit

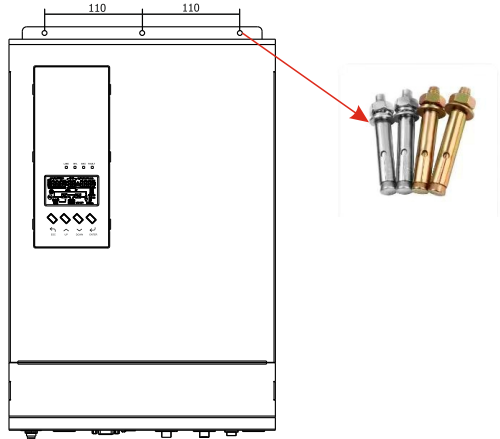
Consider the following points before selecting where to install:

- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface.
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- For proper air circulation to dissipate heat, allow a clearance of approx. 200 mm to the side and approx. 500 mm above and below the unit.
- The ambient temperature should be between 0°C and 55°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.
- Be sure to keep other objects and surfaces as shown in the diagram to guarantee sufficient heat dissipation and to have enough space for removing wires



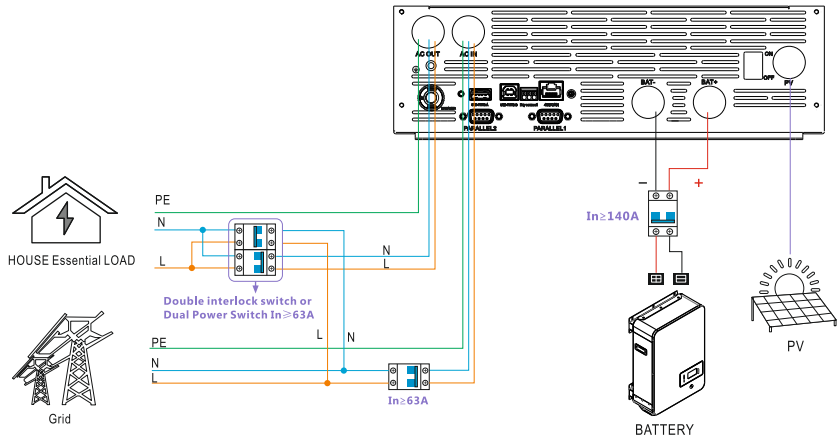
**SUITABLE FOR MOUNTING ON CONCRETE OR OTHER
NON-COMBUSTIBLE SURFACE ONLY.**

Install the unit by screwing three screws



Battery Connection

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



WARNING! All wiring must be performed by a qualified electrician.
WARNING! It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable and terminal size as below.
Ring terminal:

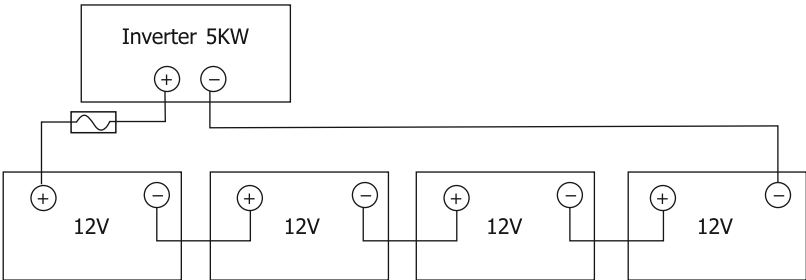


Recommended battery cable and terminal size:

Model	Typical Amperage	Wire Size	Cable mm ²	Ring Terminal		Torque Value
				Dimensions		
				D (mm)	L (mm)	
5KW DC48V	118A	1*2AWG	38	8.4	39.2	5 Nm

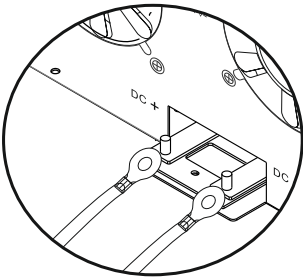
Please follow below steps to implement battery connection:


- 1. Disconnect the battery and photovoltaic when wiring
- 2. Assemble battery ring terminal based on recommended battery cable and terminal size.




- 3. Connect all battery packs as units requires. It's suggested to connect at least 200Ah capacity battery for 5KW model.
- 4. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the bolts are tightened with torque of 2-3 Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring terminals are tightly screwed to the battery terminals.

Wiring sequence:





WARNING: Shock Hazard
Installation must be performed with care due to high battery voltage in series.



CAUTION!! Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur.
CAUTION!! Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.
CAUTION!!Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

AC Input/Output Connection

CAUTION!! Before connecting to AC input power source, please install a separate AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input. The recommended spec of AC breaker is 50A for 5KW.

CAUTION!! There are two terminal blocks with "IN" and "OUT" markings. Please do NOT misconnect input and output connectors.

WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

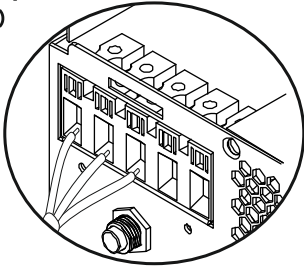
Suggested cable requirement for AC wires

Model	Gauge	Torque Value
5KW DC48V	10 AWG	1.4~ 1.6Nm

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

- 1. Before making AC input/output connection, be sure to open DC protector or disconnecter first.
- 2. Remove insulation sleeve 10mm for six conductors. And shorten phase L and neutral conductor N 3mm.
- 3. Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws. Be sure to connect PE protective conductor (⊕) first.

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

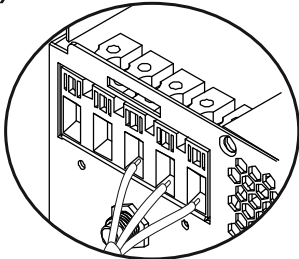


WARNING:

Be sure to that AC power source is disconnected before attempting to hardwire it to the unit.

- 4. Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws. Be sure to connect PE protective conductor (⊕)first.

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



5. Make sure the wires are securely connected.

CAUTION: Important
Be sure to connect AC wires with correct polarity. If L and N wires are connected reversely, it may cause utility short-circuited when these inverters are worked in parallel operation.

CAUTION: Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check manufacturer of air conditioner if it's equipped with time-delay function before installation. Otherwise, this inverter/charger will trig overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

PV Connection

CAUTION: Before connecting to PV modules, please install separately a DC circuit breaker between inverter and PV modules.

WARNING! All wiring must be performed by a qualified personnel.
WARNING! It's very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below.

Model	Typical Amperage	Cable Size	Torque
5KW	80A	8AWG	2.0~2.4 Nm

PV Module Selection:

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

- 1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
- 2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.
- 3. Max. Power Voltage (Vmpp) of PV modules should be close to best Vmp of inverter or within Vmp range to get best performance. If one PV module can not meet this requirement, it's necessary to have several PV modules in series connection. Refer to below table.

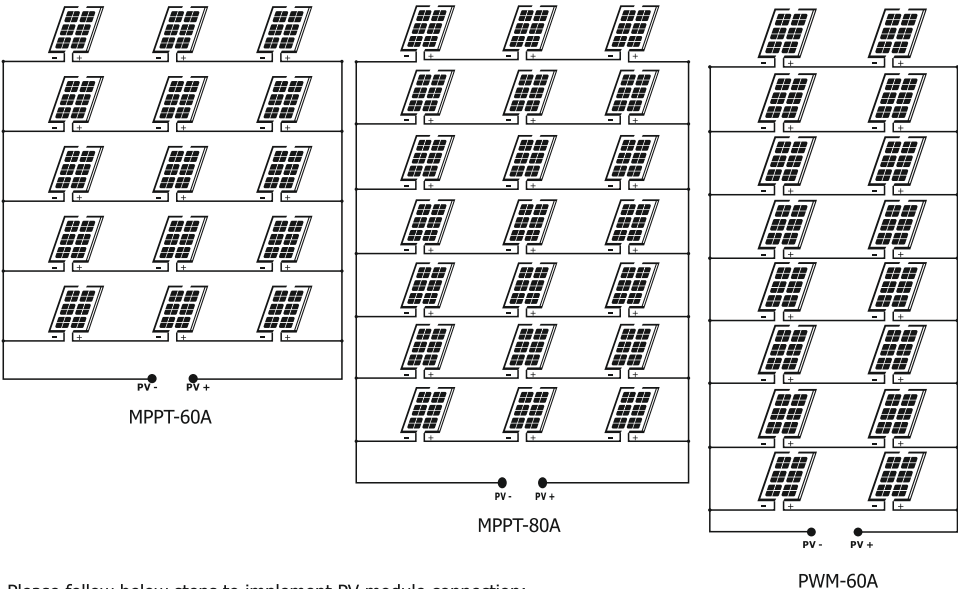
Note:* Vmp: panel max power point voltage.
The PV charging efficiency is maximized while PV system voltage is close to Best Vmp.
Maximum PV module numbers in Series: Vmpp of PV module*X pcs = Best Vmp of Inverter or Vmp range
PV module numbers in Parallel: Max. charging current of inverter/Impp
Total PV module numbers=maximum PV module numbers in series*PV module numbers in parallel

Solar Charging Mode	
INVERTER MODEL	5KW DC48V
Rated Power	5000W
MPPT charger	
solar charging current	80A
Max. PV Array Open Circuit Voltage	450Vdc
PV Array MPPT Voltage Range	120~430Vdc
Min. battery voltage for PV charge	30Vdc
AC INPUT charger	
AC charging current	80A
AC Voltage Range	90~280Vac
Max AC Input Voltage	300Vac

Recommended PV module configuration

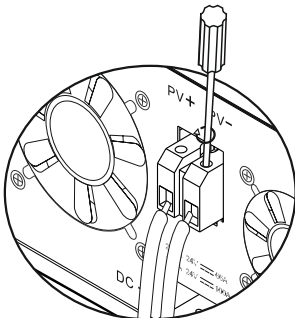
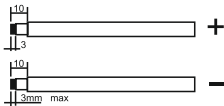
Maximum Power (PmaxI)	250W	Max. PV module numbers in series 2→30.9 x 2 =56~72
Max. Power Voltage Vmpp(V)	30.9V	
Max. Power Current Impp(A)	8.42A	PV module numbers in parallel 8→ 60 A/8.42 Total PV module numbers 2x8=16
Open Circuit Voltage Voc(V)	37.7V	
Short Circuit Current Isc(A)	8.89A	

Solar panel installation schematic



Please follow below steps to implement PV module connection:

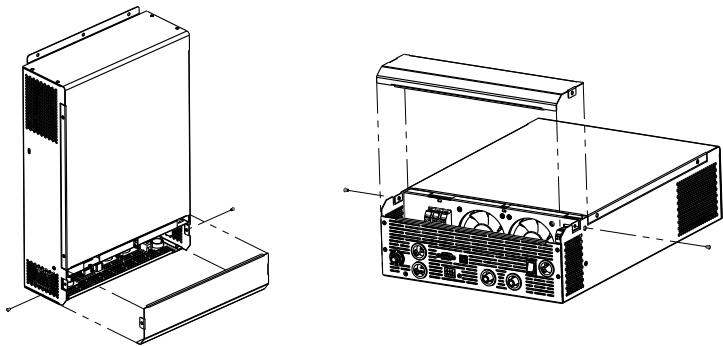
1. Remove insulation sleeve 10 mm for positive and negative conductors
2. Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.



3. Make sure the wires are securely connected.

Final Assembly

After connecting all wirings, please put bottom cover back by screwing two screws as shown below.



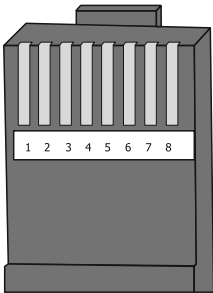
WARNING: It's forbidden to use network cable as the communication cable to directly communicate with the PC port. Otherwise, the internal components of the controller will be damaged.

WARNING: RJ45 interface is only suitable for the use of the company's supporting products or professional

operation.

Below chart show RJ45 Pins definition

Pin	Define
1	RS-485-B
2	RS-485-A
3	
4	CANL
5	CANH
6	
7	
8	



Dry Contact Signal

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

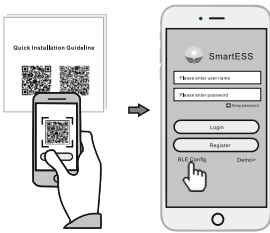
Unit status	Condition			Dry contact port:	
				NC&C	NO&C
Power Off	Unit is off and no output is powered.			Close	Open
	output is powered from Utility			Close	Open
Power On	Output is powered from Battery or Solar.	Program 03 set as utility	Battery voltage<Low DC warning voltage	Open	Close
			Battery voltage>Setting value in Program 21 or battery charging reaches floating stage	Close	Open
	Program 03 is set as SBU SUB, solar first	Battery voltage<Setting value in Program 20	Open	Close	
		Battery voltage>Setting value in Program 21 or battery charging reaches floating stage	Close	Open	

WiFi Connection

1. Wireless Router Connection

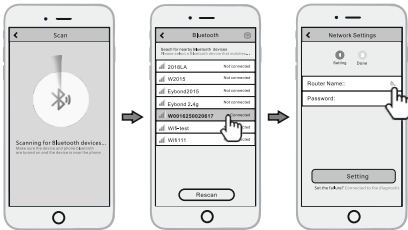
1.1 Download APP and wifi connection

- ① Scan the QR Code from the cover of this guideline and download the APP.
- ② Open the APP and select "BLE Config" on the login interface.



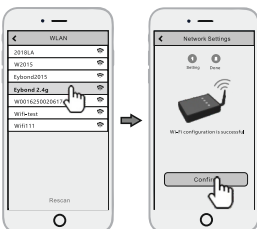
1.2 wifi Config

- ① Wait for the APP to scan for nearby bluetooth devices, and select the bluetooth device with the same PN number as the WFBLE.RTU.Kit for pairing and connection.
- ② After the connection is successful, go to "Network Settings".



1.3 Network Setting

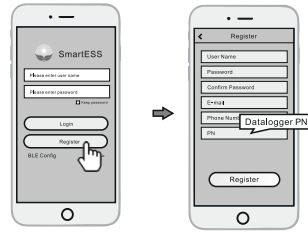
- ① On the "Network Settings" page, select a Wi-Fi router and password that can access the Internet, and click "Settings" to complete the network settings.
- ② After the datalogger is restarted successfully, and shows that "the Wi-Fi configuration is successful", click the confirm button.



2. Create Account And Datalogger

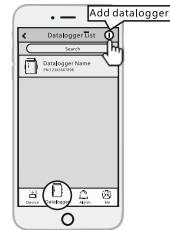
2.1 Create Account

- ① Open the APP, tap the **Register** button.
- ② According to the prompt information, complete creating an account.

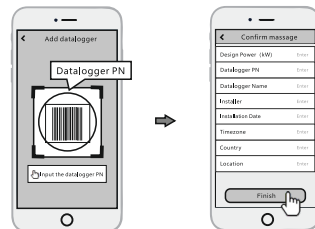


2.2 Add Datalogger

- ① Login the account and click the list button on the bottom of the home page.
- ② Tap the "+" button on the top-right corner of the list page.

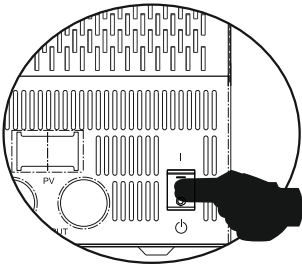


- ③ Scan the datalogger PN on the Wi-Fi Kit, or input it manually.
- ④ According to the prompts, type in the information to finish add datalogger.



OPERATION

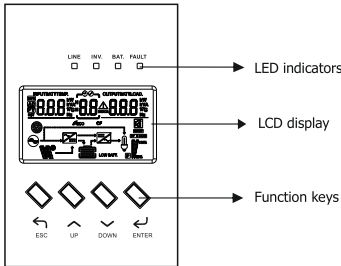
Power ON/OFF



Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch (located on the button of the case) to turn on the unit.

Operation and Display Panel

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



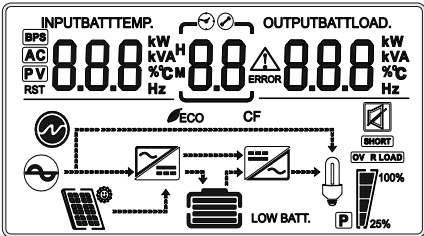
LED Indicator









LED Indicator			Messages
LINE	Green	On	Line is normal and working Line mode.
		Flash	Line is normal, but Line mode is not working.
		Off	Line is abnormality.
INV.	Yellow	On	Battery mode working.
		Off	Other mode.
BAT.	Yellow	On	Battery is floatin charge.
		Flash	Battery is constant pressure charge.
		Off	Other mode.
FAULT	Red	On	Fault mode.
		Flash	Warning mode.
		Off	Other mode.













Function Keys







Function Keys	Description
ESC	Return to previous level.
UP	Increase the setting data.
DOWN	Decrease the setting data.
ENTER	Enter setting mode and Confirm the selection in setting mode go to next selection.






LCD Display Icons




Icon	Function description	
Input Source Information and Output Information		
	Indicates the AC information	
	Indicates the DC information	
	Indicate input voltage, input frequency, PV voltage, battery voltage and charger current. Indicate output voltage, output frequency, load in VA, load in Watt and discharging current.	
Configuration Program and Fault Information		
	Indicates the setting programs	
	Indicates the warning and fault codes. Warning:  flashing with warning code. Fault:  lighting with fault code.	
Battery Information		
	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.	
In AC mode, it will present battery charging status.		
Status	Battery voltage	LCD Display
Constant Current mode/Constant Voltage mode	<2V/cell	4 bars will flash in turns
	2v/cell~2.083v/cell	Bottom bar will be on and the other three bars will flash in turns.
	2.083v/cell~2.167v/cell	Bottom two bars will be on and the other two bars will flash in turns.
	>2.167V/cell	Bottom three bars will be on and the top bar will flash.
Batteries are fully charged.		4 bars will be on.

In battery mode, it will present battery capacity.		
Load Percentage	Battery Voltage	LCD Display
Load >50%	<1.717V/cell	
	1.717V/cell~1.8V/cell	
	1.8V/cell~1.883V/cell	
	>1.883 V/cell	
50%> Load>20%	<1.817V/cell	
	1.817V/cell~1.9V/cell	
	1.9 V/cell ~1.983V/cell	
	>1.983 V/cell	
Load<20%	<1.867V/cell	
	1.867V/cell~1.95V/cell	
	1.95V/cell~2.033V/cell	
	>2.033 V/cell	

Load Information				
	Indicates overload.			
	Indicates the load level by 0-24%, 25-49%, 50-74% and 75-100%.			
	0%~24%	25%~49%	50%~74%	75%~100%
				

Mode Operation Information	
	Indicates unit connects to the mains.
	Indicates unit connects to the PV panel.
	Indicates load is supplied by utility power.
	Indicates the solar charger circuit is working.
	Indicates the DC/AC inverter circuit is working.

Mute Operation	
	Indicates unit alarm is disabled.

LCD Setting






After pressing and holding "ENTER" button for 2 seconds, the unit will enter setting mode.

Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" or "ESC" button to confirm the selection and exit.

Setting Programs:






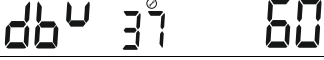


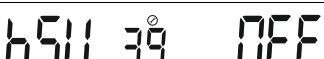
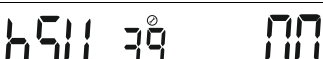
Program	Description	Selectable option	
01	Output voltage NOTE: When the output voltage is set to 208V, the output needs to be derated to 90%.	208V OPV 01 208 ^v	220V OPV 01 220 ^v
		230V (default) OPV 01 230 ^v	240V OPV 01 240 ^v
02	Output frequency	50Hz (default) OPF 02 50 ^{Hz}	60Hz OPF 02 60 ^{Hz}
03	Output source priority : To configure load power source priority	(default) OPP 03 Ut-d	Utility will provide power to the loads as first priority. Solar and battery energy will provide power to the loads only when utility power is not available.
		OPP 03 PU	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, Utility energy will supply power to the loads at the same time.
		OPP 03 Pbc	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 15.
04	AC input voltage range	(default) nOd 04 APP	If selected, acceptable AC input voltage range will be within 90-280VAC.
		nOd 04 UPS	If selected, acceptable AC input voltage range will be within 170-280VAC.

Program	Description	Selectable option	
05	Charger source priority: To configure charger source priority	(default) CHP 05 PNC	Solar energy and utility will charge battery at the same time.
		CHP 05 OPV	Solar energy will be the only charger source no matter utility is available or not.
		CHP 05 Ut-d	Utility will charge battery as first priority. Solar energy charge battery only when utility is not available.
		CHP 05 PV	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.
06	Maximum utility charging current	ACC 06 60 A	Note: If setting value in program 07 is smaller than that in program in 06, the inverter will apply charging current from program 07 for utility charger.
07	Maximum charging current: To configure total charging current for solar and utility chargers.	ACC 07 120 A	Max. charging current = utility charging current + solar charging current. 5KW 48VDC: 2/10/20/30/40/50/60/70/80A can set.
08	Auto return to default display screen	ON (default): If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute. ndF 08 0N	OFF : If selected, the display screen will stay at latest screen user finally switches. ndF 08 OFF
09	Auto restart when overload occurs	Restart disable LTS 09 OFF	Restart enable(default) LTS 09 0N
10	Auto restart when over temperature occurs	Restart disable LTS 10 OFF	Restart enable(default) LTS 10 0N
11	Beeps while primary source is interrupted	Alarm on (default) nlp 11 0N	Alarm off nlp 11 OFF
12	Low power power saving	Power Saving OFF (default) PUS 12 OFF	Power Saving ON PUS 12 0N

Program	Description	Selectable option	
13	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) 	Bypass enable 
14	Buzzer mute setting	Buzzer on (default) 	Buzzer off 
15	Low DC cut-off voltage: <ul style="list-style-type: none"> • If battery power is only power source available, inverter will shut down. • If PV energy and battery power are available, inverter will charge battery without AC output. • If PV energy, battery power and utility are all available, inverter will transfer to line mode and provide output power to loads. 	5KW 48VDC default setting : 47.6V Set Range : 40-50V 	When the battery definition mode is LIB (lithium battery type) mode: the setting point in program 17.

Program	Description	Selectable option	
16	Line Low Voltage	<p>The setting point in program 04 APP mode default setting : 154V Set Range : 90-154V</p> <p>LLV 22[⊙] 154</p>	<p>The setting point in program 04 UPS mode default setting : 185V Set Range : 170-200V</p> <p>LLV 22[⊙] 185</p>
17	Line High Voltage	<p>The setting point in program 04 APP mode default setting : 264V Set Range : 264-280V</p> <p>LHV 23[⊙] 264</p>	<p>The setting point in program 04 UPS mode default setting : 264V Fixed value, cannot be changed.</p>
18	Low Watt Discharge	<p>Default setting : 8 Hours Set Range : 1-8 Hours When the battery voltage exceeds 13.2V (single cell voltage) for more than 30s, this discharge time will be reset.</p> <p>LWD 24[⊙] 8</p>	<p>In battery mode, after the continuous discharge time exceeds this set value, the battery voltage shutdown point will be modified to 11V (single cell voltage) before reaching the battery shutdown point. Alarm for 1 minute and then shut down.</p>
19	Soft Relay Enable	<p>OFF(default) When set to OFF, the output switch will not be closed until the inverter voltage rises to the rated output.</p> <p>SrE 25[⊙] OFF</p>	<p>ON When set to ON, the inverter output gradually increases from 0 to the target voltage value.</p> <p>SrE 25[⊙] ON</p>
20	Set Default (Reset all settings to default values)	<p>Before setting, this interface is displayed as OFF, when it is set to ON, the system will restore the default settings. After the setting is completed, this interface will display OFF again.</p> <p>Std 26[⊙] OFF</p>	<p>Setting conditions: It can be set in mains mode and standby (StandBy: no output but bright screen state). It cannot be set in battery mode.</p>
21	Parallel operation mode	<p>SIG(default) Single mode</p> <p>PARn 27[⊙] SIG</p> <p>3P1: R mode 3P2: S mode 3P3: T mode</p> <p>PARn 27[⊙] 3P1 PARn 27[⊙] 3P2 PARn 27[⊙] 3P3</p>	<p>PAR Parallel mode</p> <p>PARn 27[⊙] PAR</p> <p>When using the parallel function, first connect the parallel system in the correct way, and then correctly set the parallel mode of each machine. If there is a machine set as SIG in the parallel system, the machine will report fault 24. If there are machines set to 3P1, 3P2 and 3P3 in the parallel system, all the machines must be set to one of the three modes, and at least one machine exists in each mode, otherwise all the machines set to these three modes will report fault 24.</p>
22	Set battery alarm	<p>OFF(default) When set to OFF, the battery is not connected, there will be no alarm of battery not connected, low battery voltage of under battery voltage</p> <p>SbA 28[⊙] OFF</p>	<p>ON When set to ON, the battery is not connected, there will be alarm of battery not connected, low battery voltage of under battery voltage</p> <p>SbA 28[⊙] ON</p>

Program	Description	Selectable option	
23	Equalization mode	OFF(default) When set to OFF, the function is not enabled 	ON When set to ON, the controller will start to enter the equalization phase when the floating charge phase reaches the set equalization interval (battery equalization cycle), or when equalization is activated immediately
24	Equalization voltage	12VDC default setting: 14.6V set range: 12.5-15.7V 	24VDC default setting: 29.2V set range: 25-31.5V
		48VDC default setting: 58.4V set range: 48-60V 	
25	Equalization time	In the equalization phase, the controller will charge the battery as much as possible until the battery voltage rises to the battery equalization voltage. Then constant voltage regulation is adopted to maintain the battery voltage and maintain the battery balanced voltage. the battery will remain in the equalization phase until the set battery equalization time is reached. The default setting is 60 minutes, the range can be set to [5-900], and each setting increment is 5 minutes. 	
26	Equalization timeout	In the equalization phase, when the battery equalization time expires and the battery voltage does not rise to the battery equalization voltage point, the charge controller will extend the battery equalization time until the battery voltage reaches the battery equalization voltage. When the battery equalization delay setting ends, and the battery voltage is still lower than the battery equalization voltage, the charge controller will stop equalization and return to the floating charge stage. The default setting is 120 minutes, the range can be set to [5-900], and each setting increment is 5 minutes. 	
27	Equalization interval	When the battery access is detected in the floating charge stage when the equalization mode is turned on, the controller will start to enter the equalization stage when the set equalization interval (battery equalization cycle) is reached. The default setting is 30 days, the setting range is [1-90], and the setting increment is 1 day each time. 	
28	Equalization Now	OFF(default) When set to OFF, equalization function OFF 	ON When set to ON, In the floating charge stage when the equalization mode is turned on and the battery is detected to be connected, the equalization charge is immediately activated, and the controller will start to enter the equalization stage.

Program	Description	Selectable option	
29	Grid Tie Invert	OFF(default) When set to OFF, the function is not enabled 	ON When it is set to ON, the inverter will feed the surplus energy into the mains through maximum power point tracking. After the function is turned on, if the communication is abnormal, alarm 56 will be generated, and the inverter will no longer determine the operation logic according to the BMS information. *This function needs to be used together with the central control board. 
30	Dual output battery mode cut-off voltage	12VDC default setting: 12V set range: 11 -16V  48VDC default setting: 48V set range: 44-60V 	24VDC default setting: 24V set range: 22-32V  When the set point is higher than the constant voltage charging (CV) point - 1V/knot, the constant voltage charging point is taken as the recovery voltage. *This function needs to be used together with the dual output auxiliary board.
31	Dual output battery mode cut-off time	The default setting is OFF. The function is not enabled. The setting range is [5-890]. The unit is minute. When it is set to FUL, the secondary output is not limited to the output time. *This function needs to be used together with the dual output auxiliary board. 	
32	Battery maname system	The default setting is OFF, and the function is not enabled; When it is set to ON, the inverter communicates with the lithium battery BMS through the central central control board and obtains battery information. After the function is turned on, if the communication is abnormal, alarm 56 will be generated, and the inverter will no longer determine the operation logic according to the BMS information. *This function needs to be used together with the central control board. *When the central central control board is not connected, this option page is shielded.  	
33	Battery SOC under lock	The default setting is 20, and the setting range is [5-50]. In the battery mode, when the lithium battery SOC reaches the set value, it will shut down, and alarm 68 will be given at the same time. When it returns to the set value+5%, alarm 68 will be cleared. In standby mode, the battery mode can only be switched to when the set value+10% is reached, and an alarm of 69 will be given when the set value+10% is not reached. After the function is enabled, alarm 69 will occur when the lithium battery SOC reaches the set value+5%, and alarm 69 will be cleared when it returns to the set value+10%. It can be set to OFF. At this time, the inverter will not shut down, start up or alarm according to the SOC condition. After the function is turned on, if the communication is abnormal, the inverter will no longer determine the operation logic according to the SOC information, and the related alarm will be cleared. *This function needs to be used together with the central control board. *When the central central control board is not connected, this option page is shielded.  	

Program	Description	Selectable option
34	Battery SOC turn to battery mode	<p>The default setting is 90, and the setting range is [10-100]. PBG priority: switch to battery mode when the lithium battery SOC reaches the set value under normal mains power mode. After opening, the inverter will switch to battery mode only when SOC is higher than the set point and battery voltage is higher than the voltage point of switching back to battery mode . It can be set to OFF. At this time, the inverter will not switch from mains mode to battery mode according to the SOC condition.</p> <p>After the function is turned on, if the communication is abnormal, the inverter will no longer determine the operation logic according to the SOC information, and the related alarm will be cleared.</p> <p>*This function needs to be used together with the central control board.</p> <p>*When the central central control board is not connected, this option page is shielded.</p>
35	Battery SOC turn to grid mode	<p>The default setting is 50, and the setting range is [10-90]. PBG priority: switch to mains power mode when the lithium battery SOC reaches the set value under mains power normal battery mode. After being turned on, when the SOC is lower than the set point or the battery voltage is lower than the point of switching back to the mains voltage , the inverter will switch to the mains mode.</p> <p>It can be set to OFF, and the inverter will no longer switch from battery mode to mains mode according to the SOC condition.</p> <p>After the function is turned on, if the communication is abnormal, the inverter will no longer determine the operation logic according to the SOC information, and the related alarm will be cleared.</p> <p>When this setting is higher than the STB point, STB and STG will not take effect after taking effect next time.</p> <p>*This function needs to be used together with the central control board.</p> <p>*When the central central control board is not connected, this option page is shielded.</p>

Fault Reference Code

Fault: The inverter enters the fault mode, the LED red light is always on, and the LCD displays the fault code.

The alarm code ALA flashes and the buzzer beeps for 1s and stops for 1 minute. The fault indicator code is always on, the buzzer stops after 10S long beeping, the fault is eliminated after the stop, try to restart the machine, if it fails to restart three times, it will continue in the fault state. A complete power off (screen off) is required before the machine can be restarted.

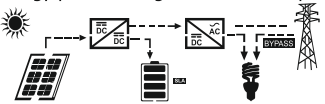
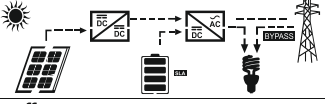
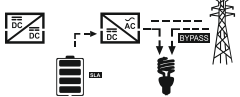
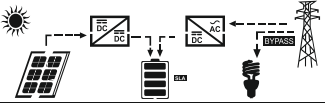
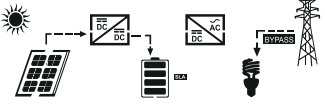
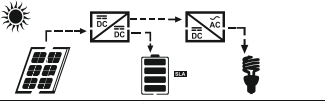
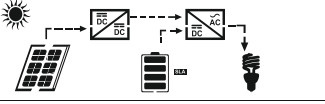
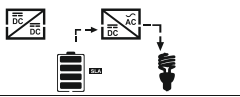
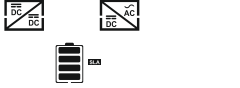
Fault Code	Fault Cause	LCD Indication
1	Bus soft start failed	ALA 1
2	Bus high	ALA 2
3	Bus low	ALA 3
4	Battery over current	ALA 4
5	Inverter transformer over temperature	ALA 5
6	Battery voltage is too high	ALA 6
7	Bus soft failed	ALA 7
8	Bus short Fault	ALA 8
9	INV short Fault	ALA 9
10	INV over voltage	ALA 10
11	INV under voltage	ALA 11
12	INV short	ALA 12
13	Negative power	ALA 13
14	Over load fault	ALA 14
15	Model fault	ALA 15
16	No boot loader	ALA 16
17	Panel flash fault	ALA 17
19	Same serial	ALA 19
20	CAN fault	ALA 20
21	BAT volt different	ALA 21
22	Line volt different	ALA 22
23	Line freq different	ALA 23
24	Output config different	ALA 24
25	Output syn loss	ALA 25
26	BMS Fault	ALA 26

Warning Indicator

(Warning) Alarm: The inverter does not enter the fault mode, the red LED flashes, and the LCD displays the alarm code.

Warning Code	Warning Event	Icon flashing	
50	Battery terminal	ALA	50
51	Battery under	ALA	51
52	Battery low	ALA	52
53	Battery charge short	ALA	53
55	Battery over charge	ALA	55
57	Over temperature	ALA	57
58	Fan fault	ALA	58
59	EEPROM Fault	ALA	59
60	Over load warning	ALA	60
61	Abnormal generator waveform	ALA	61
62	PV energy weak	ALA	62
63	Synchronization signal fail	ALA	63
64	Parallel configuration incompatible	ALA	64
65	Parallel version incompatible	ALA	65
66	Parallel configuration Fault	ALA	66
67	Parallel Line Differ	ALA	67
68	SOC Under	ALA	68
69	SOC Low	ALA	69

Operating State Description

Operating State	Description	LCD display
Match load state Note: DC power produced from your solar array is converted by the inverter into AC power, which is then sent to your main electrical panel to be used by your household appliances. Any excess power generated is not sold back to the grid, but stored in battery.	PV energy is charger into the battery or converted by the inverter to the AC load	PV energy power is larger than inverter power 
		PV energy power is smaller than inverter power 
		PV is off 
Charge state	PV energy and grid can charge batteries.	
Bypass state	Error are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.	
Off-Grid state	The inverter will provide output power from battery and PV power.	Inverter power loads from PV energy. 
		Inverter power loads from battery and PV energy. 
		Inverter power loads from battery only. 
Stop mode	The inverter stop working if you turn off the inverter by the soft key or error has occurred in the condition of no arid.	

Display Setting

The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: battery voltage, battery current, inverter voltage, inverter current, grid voltage, grid current, load in Watt, load in VA, grid frequency, inverter frequency, PV voltage, PV charging power, PV charging output voltage, PV charging current.

Selectable information	LCD display	
Battery voltage/DC discharging current	<div>BATT</div> <div>520^V</div>	<div>480^A</div>
Inverter output voltage/Inverter output current	<div>229^V</div>	<div>INV</div> <div>130^A</div>
Grid voltage/Grid current	<div>229^V</div>	<div>GRID</div> <div>80^A</div>
Load in Watt	<div>100^{KW}</div>	<div>LOAD</div> <div>120^{KVA}</div>
Grid frequency/Inverter frequency	<div>INPUT</div> <div>500^{Hz}</div>	<div>INV</div> <div>500^{Hz}</div>
PV voltage and power	<div>PV</div> <div>120^V</div>	<div>200^{KW}</div>
PV charger output voltage and PV charging current	<div>PV</div> <div>510^V</div>	<div>OUTPUT</div> <div>400^A</div>

SPECIFICATIONS

Table 1 Line Mode Specifications

INVERTER MODEL	5KW
Input Voltage Waveform	Sinusoidal (utility or generator)
Nominal Input Voltage	230Vac
Low Loss Voltage	90Vac±7V(APP); 170Vac±7V(UPS);
Low Loss Return Voltage	100Vac±7V(APP); 180Vac±7V(UPS);
High Loss Voltage	280Vac±7V(UPS,APP)
High Loss Return Voltage	270Vac±7V(UPS,APP)
Max AC Input Voltage	300Vac
Nominal Input Frequency	50HZ/60HZ(Auto detection)
Low Loss Frequency	40HZ±1HZ(UPS,APP),50HZ; 50HZ±1HZ(UPS,APP),60HZ;
Low Loss Return Frequency	43.5HZ±1HZ(UPS),40.5HZ±1HZ(APP),50HZ; 53.5HZ±1HZ(UPS),50.5HZ±1HZ(APP),60HZ;
High Loss Frequency	60HZ±1HZ(UPS),70HZ±1HZ(APP),50HZ; 70HZ±1HZ(UPS),70HZ±1HZ(APP),60HZ;
High Loss Return Frequency	56.5HZ±1HZ(UPS),69.5HZ±1HZ(APP),50HZ; 66.5HZ±1HZ(UPS),69.5HZ±1HZ(APP),60HZ;

Output Short Circuit Protection	Line mode: Circuit Breaker Battery mode: Electronic Circuits
Efficiency (Line Mode)	>99%(Rated R load, battery full charged),Line Mode
Transfer Time	10ms typical (UPS,APP)
Output power derating: When AC input voltage drops to 95V or 170V depending on models, the output power will be derated.	230Vac model:

Table 2 Inverter Mode Specifications

INVERTER MODEL	5KW DC48V
Rated Output Power	5000W
Output Voltage Waveform	Pure Sine Wave
Output Voltage Regulation	208/220/230/240Vac±5%
Output Frequency	60Hz or 50Hz
Peak Efficiency	>94%@48VDC
Overload Protection	60S@102%~110% load; 10S@110%~130% load; 3s@130%~150 load; 200ms@≥150% load;
Surge Capacity	2 x rated power for 5 seconds
Nominal DC Input Voltage	48Vdc
Cold Start Voltage	46.0Vdc
Low DC Warning Voltage	44.0Vdc
Low DC Cut-off Voltage	42.0Vdc
High DC Recovery Voltage	58Vdc
High DC Cut-off Voltage	61Vdc

Table 3 Charge Mode Specifications

Charge Mode Specifications		
INVERTER MODEL		5KW DC48V
Charging Current @ Nominal Input Voltage		1~80A
Absorption Voltage	AGM / FLD/LIB/CUS Battery	50Vdc
	Flooded battery	50Vdc
Floating charging voltage	AGM / FLD/LIB/CUS Battery	54.8Vdc
	Flooded battery	54.8Vdc
Bulk charging voltage (C.V voltage)	AGM / FLD/LIB/CUS Battery	57.6Vdc
	Flooded battery	56.8Vdc
Charging Algorithm		17-Step(Battery Type , AGM/FLD/LIB/CUS Battery)
Solar Charging Mode		
INVERTER MODEL		5KW DC48V
Rated Power		5000W
MPPT charger		
solar charging current		80A
Max.PV Array Open Circuit Voltage		450Vdc max
PV Array MPPT Voltage Range		120~430Vdc
Min battery voltage for PV charge		34Vdc
Standby Power Consumption		2W
Line mode charger		
charging current		80A
Line Voltage Range		90~280VAC(APP mode);170~280VAC(UPS mode);
Battery Voltage Accuracy		+/-0.3%
Voltage Accuracy		+/-2V
Charging Algorithm		17-Step(Battery Type , AGM/FLD/LIB/CUS Battery)

Joint Utility and Solar Charging	
INVERTER MODEL	5KW DC48V
Max Charging Current	80A
Default Charging Current	30A

Table 4 General Specifications

INVERTER MODEL	5KW DC48V
Safety Certification	CE
Operating Temperature Range	-10°C to 50°C
Storage temperature	-15°C~ 60°C
Dimension (D*W*H), mm	450 x 300 x 115
Net Weight, kg	9.0

TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	LCD/LEDs and buzzer will be active for 3 seconds and then complete off.	The battery voltage is too low ($< 1.91\text{V/Cell}$)	1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	1. The battery voltage is far too low ($< 1.4\text{V/Cell}$) 2. Battery polarity is connected reversed. Input protector is tripped	1. Check if batteries the wiring are connected and well. 2. Re-charge battery. 3. Replace battery.
Mains exist but the unit works in battery mode.	Input voltage is displayed as 0 on the LCD and green LED is flashing.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is flashing.	Insufficient quality of AC power (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (Appliance= $>$ wide)
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on.	Fault code 14	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 12	Output short circuited.	Check if wiring is connected well and remove abnormal load.
	Fault code 5	Internal temperature of inverter component is over 90°C .	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 6	Battery is over-charged.	Return to repair center.
		The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.
	Fault code 10/11	Output abnormal (Inverter voltage below than 202Vac or is higher than 253Vac)	1. Reduce the connected load. 2. Return to repair center
	Fault code 1/7/8/9/15/16	Internal components filed.	Return to repair center
	Fault code 51	Over current or surge	Restart the unit, if the error happens again, please return to repair center.
Buzzer beeps and red LED is flashing.	Fault code 2/3	Bus voltage is too high/too low	
	Fault code 15	Model fault	
	Fault code 58	Fan fault	Fan fault
	Fault code 50/51/52	Battery is not connected well or fuse is burnt.	If the battery is connected well, please return to repair center.

Appendix 1 : Approximate Back-up Time Table

5KW	500	613	1288
	1000	268	613
	1500	158	402
	2000	111	271
	2500	90	215
	3000	76	182
	3500	65	141
	4000	50	112
	4500	44	100
	5000	40	90

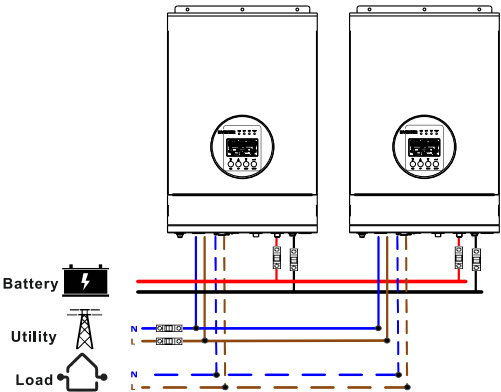
Note: Backup time depends on the quality of the battery, age of battery and type of battery.
Specifications of batteries may vary depending on different manufacturers.

Appendix 2: Paralle function

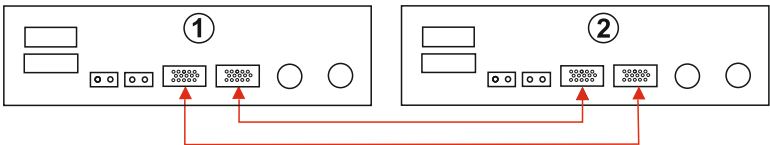
Note: The cable indicated in charts “Communication Connection” represents as below:
the “full line” means the “Parallel communication cable”.



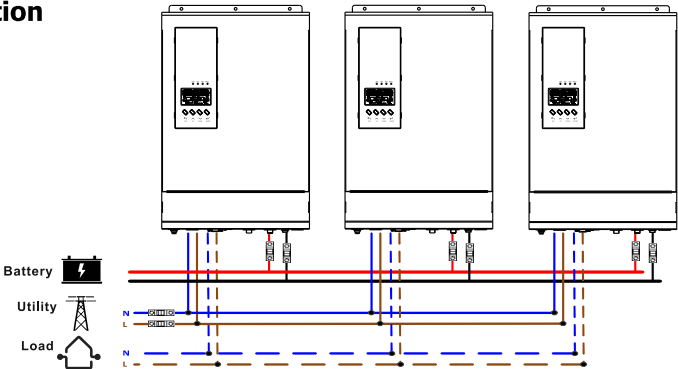
Parallel Operation in single phase
Two inverters in parallel:
Power Connection



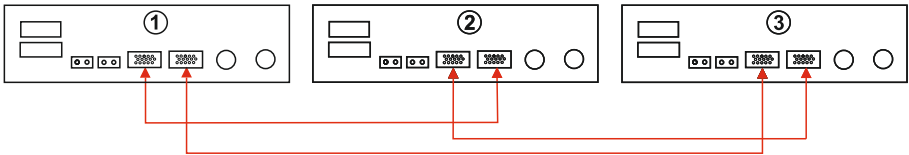
Communication Connection



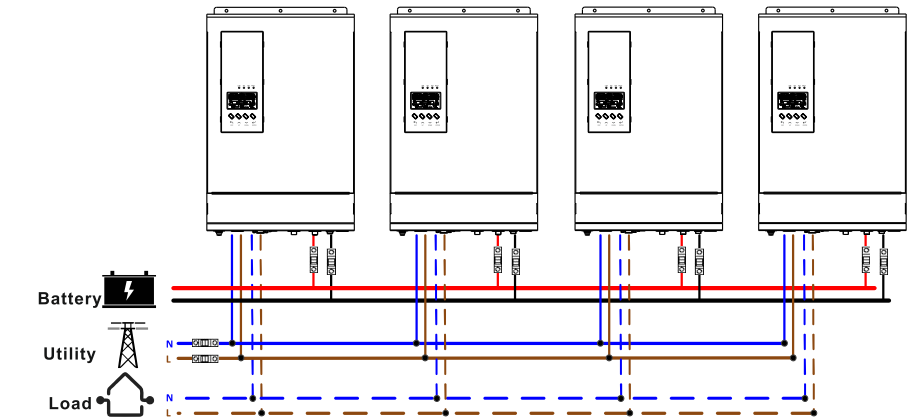
Three inverters in parallel:
Power Connection



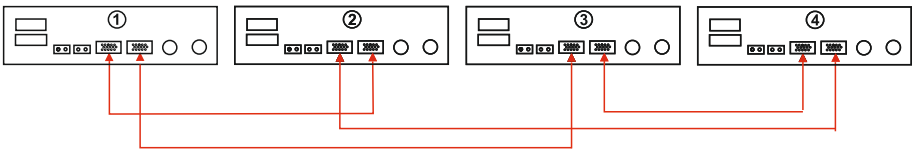
Communication Connection



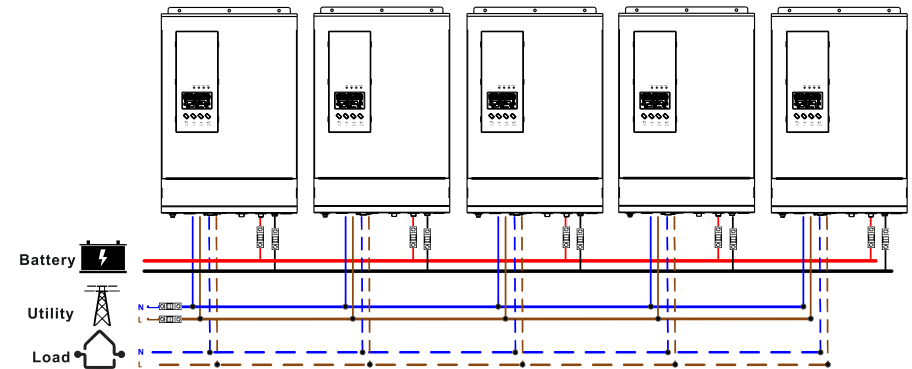
Four inverters in parallel:
Power Connection



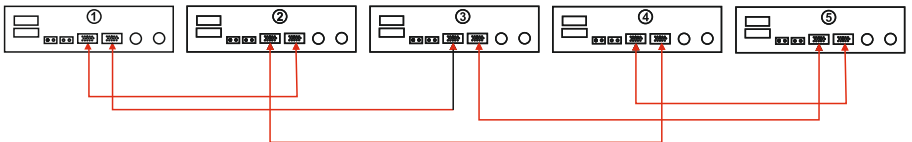
Communication Connection



Five inverters in parallel:
Power Connection

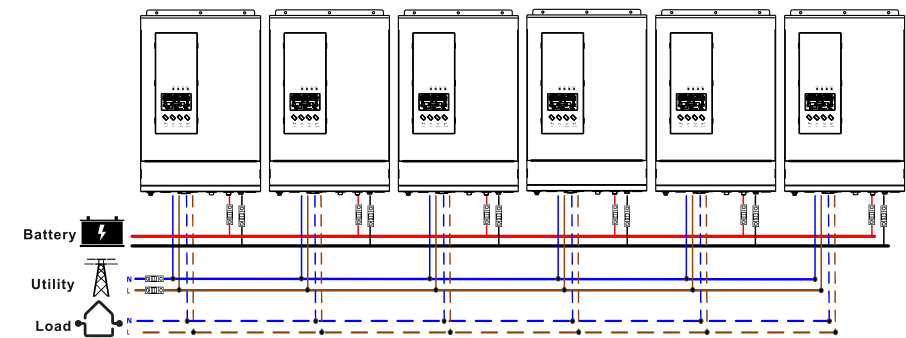


Communication Connection

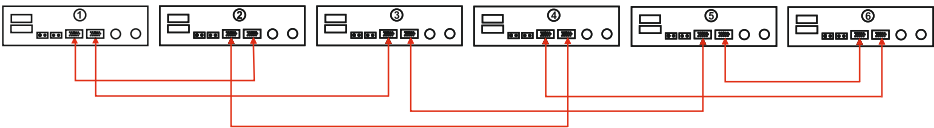


Six inverters in parallel:

Power Connection

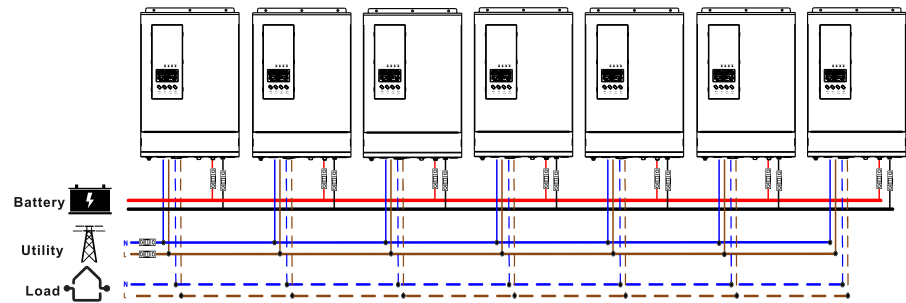


Communication Connection

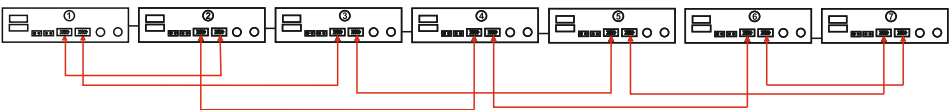


Seven inverters in parallel:

Power Connection

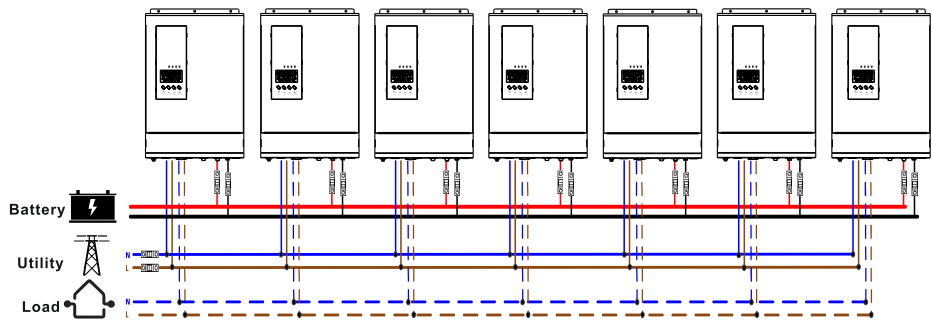


Communication Connection

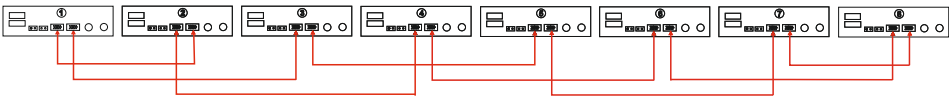


Eight inverters in parallel:

Power Connection

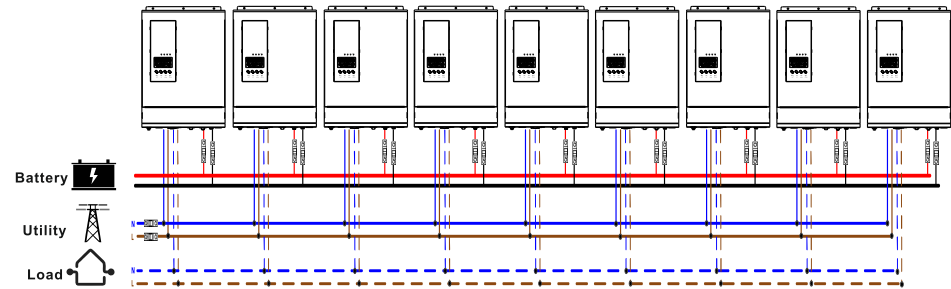


Communication Connection

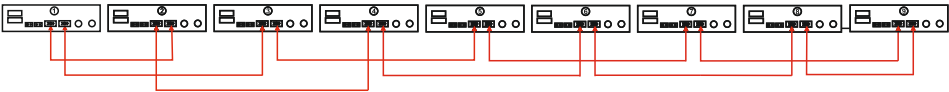


Nine inverters in parallel:

Power Connection



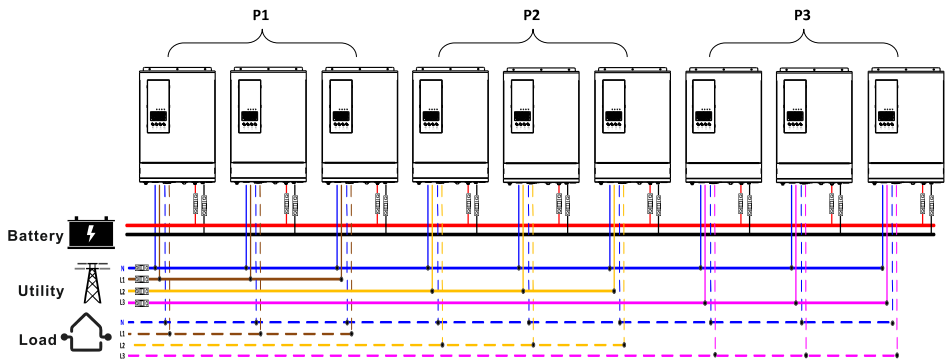
Communication Connection



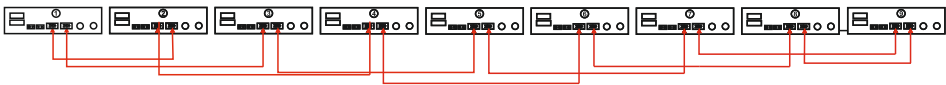
Support 3-phase equipment

Three inverters in each phase:

Power Connection

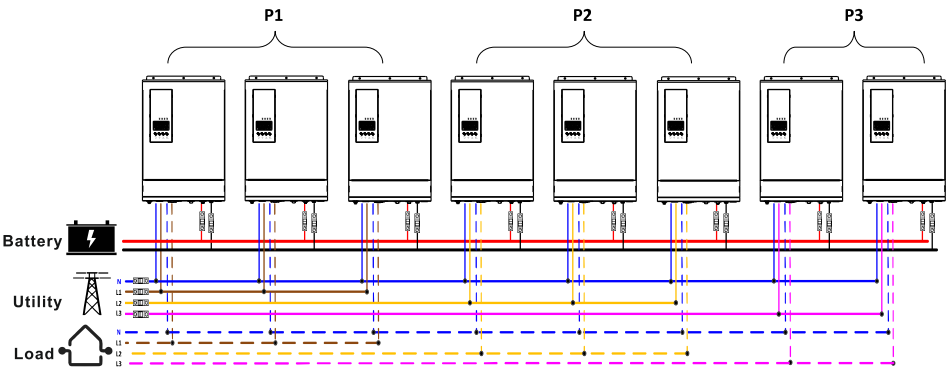


Communication Connection

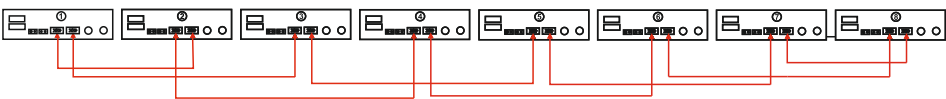


Three inverters in one phase, three inverters in second phase and two inverter for the third phase:

Power Connection

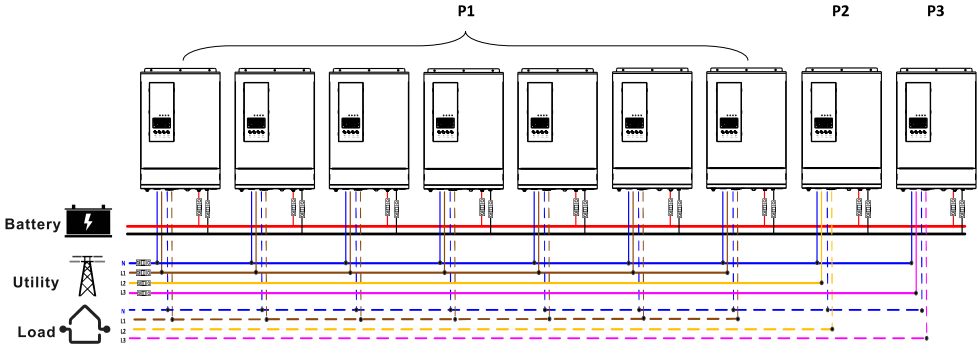


Communication Connection



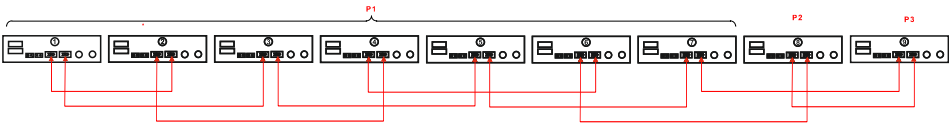
Seven inverters in one phase and one inverter for the other two phases:

Power Connection



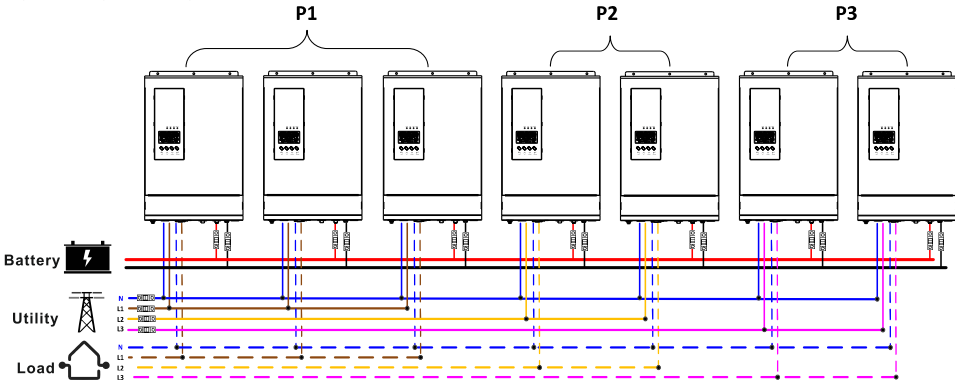
Note: It's up to customer's demand to pick 7 inverters on any phase. P1: L1-phase, P2: L2-phase, P3: L3-phase.

Communication Connection

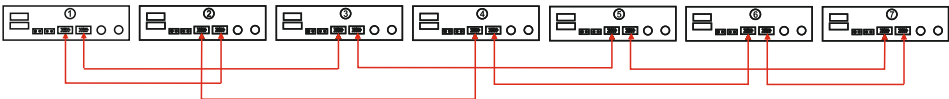


Three inverters in one phase, two inverters in second phase and two inverters for the third phase:

Power Connection

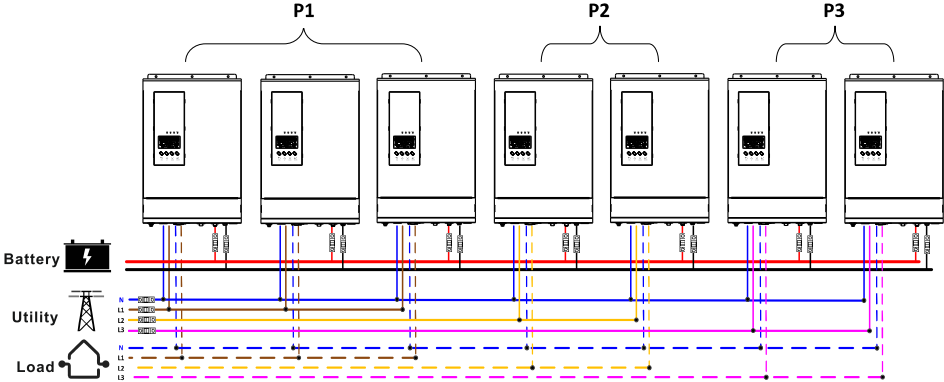


Communication Connection

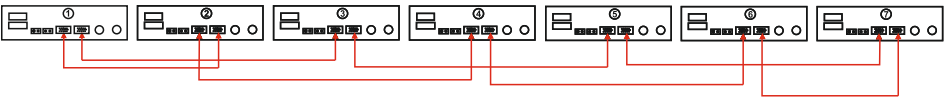


Two inverters in each phase:

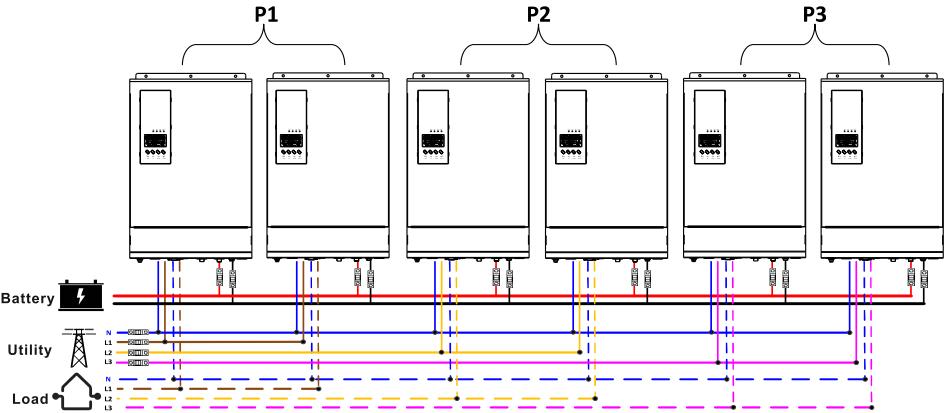
Power Connection



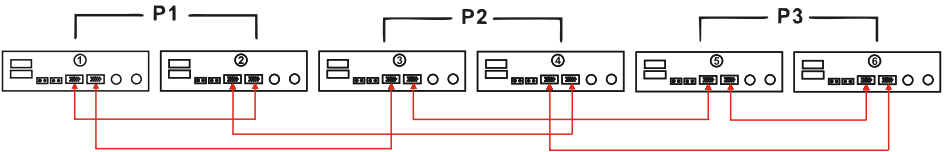
Communication Connection



Four inverters in one phase and one inverter for the other two phases:

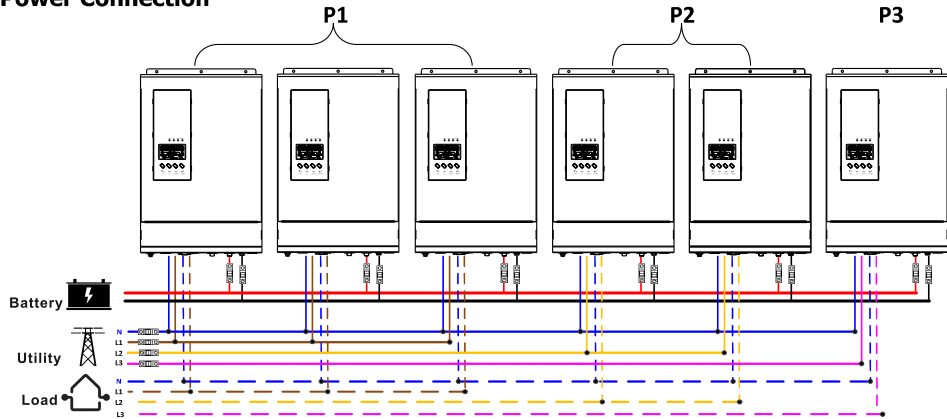


Communication Connection

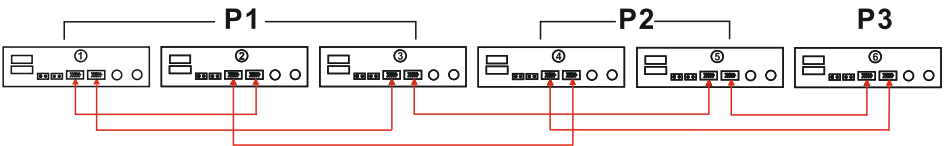


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

Power Connection

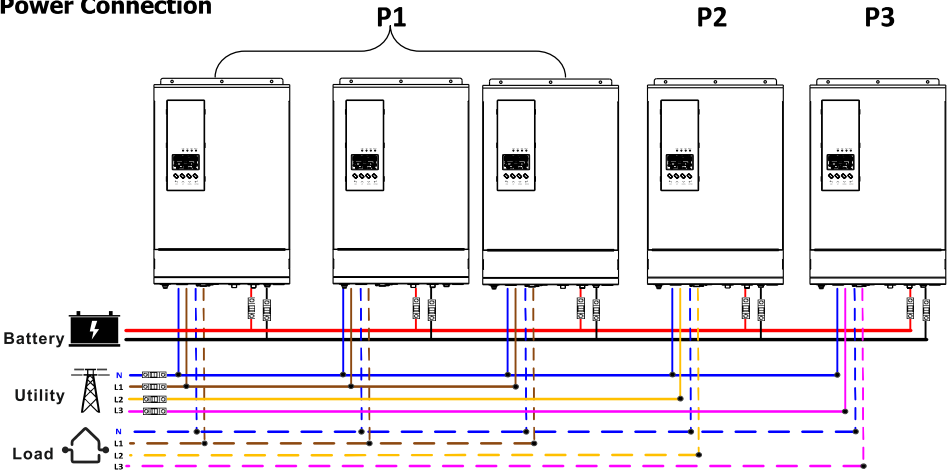


Communication Connection

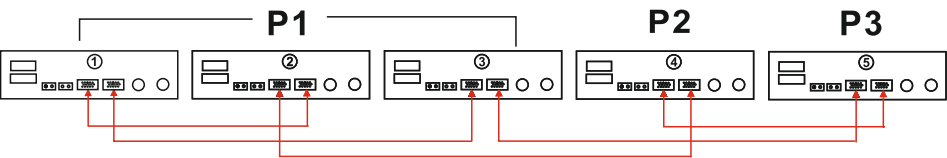


Three inverters in one phase and only one inverter for the remaining two phases:

Power Connection

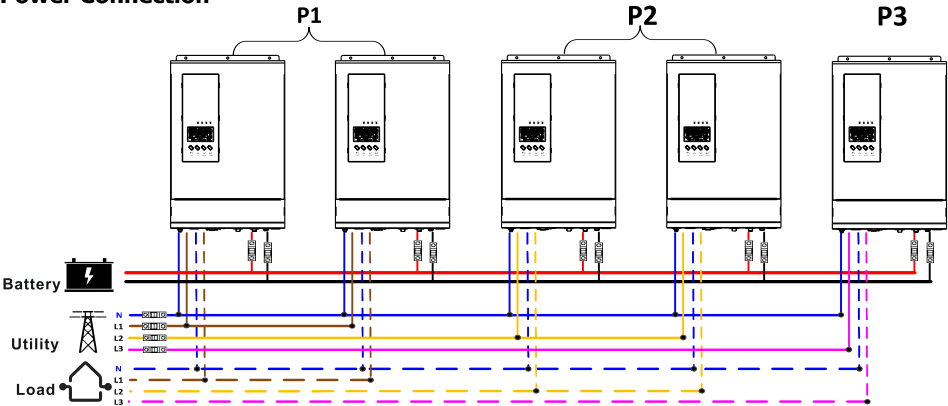


Communication Connection

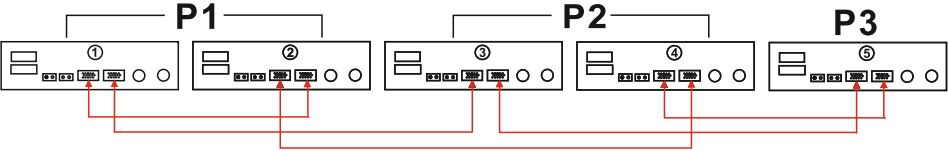


Two inverters in two phases and only one inverter for the remaining phase:

Power Connection

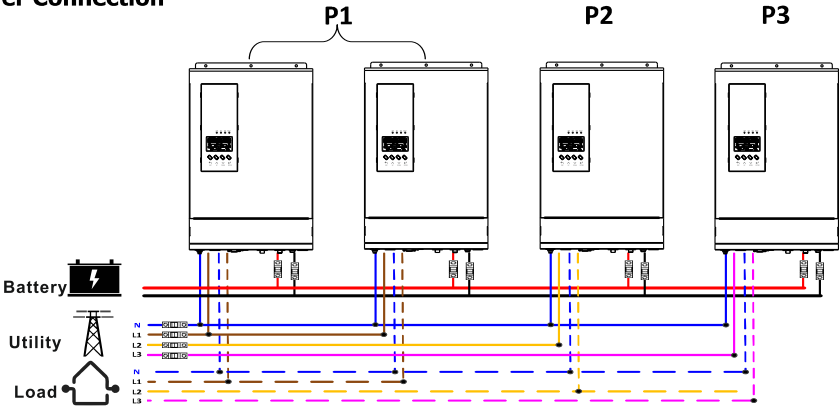


Communication Connection

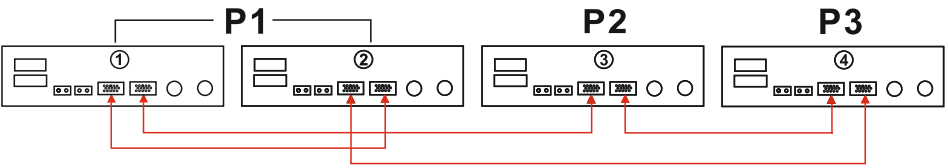


Two inverters in one phase and only one inverter for the remaining phases:

Power Connection

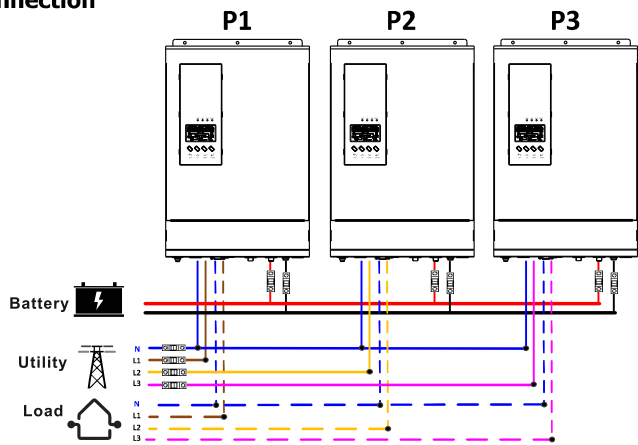


Communication Connection

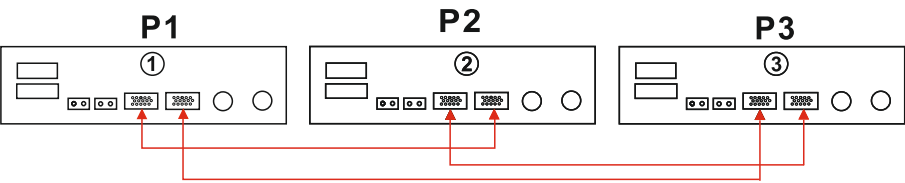


One inverter in each phase:

Power Connection



Communication Connection



USER'S MANUAL

SOLAR INVERTER