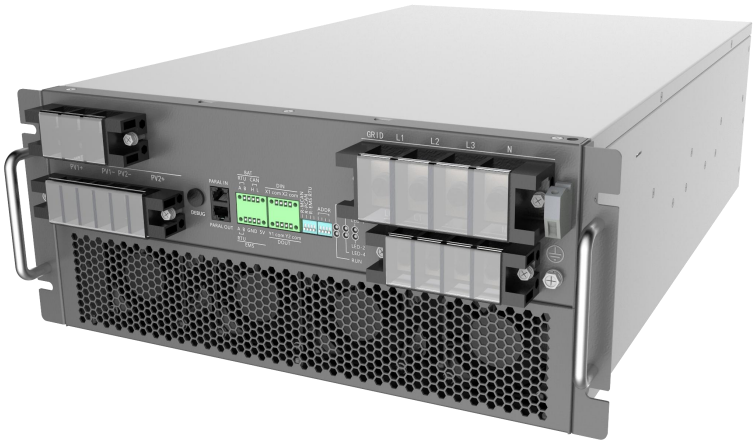
# SP60~30HCG2

# Series Hybrid Energy Storage Inverter
# Product Specification

version：V1.7

date：August 15(th), 2025

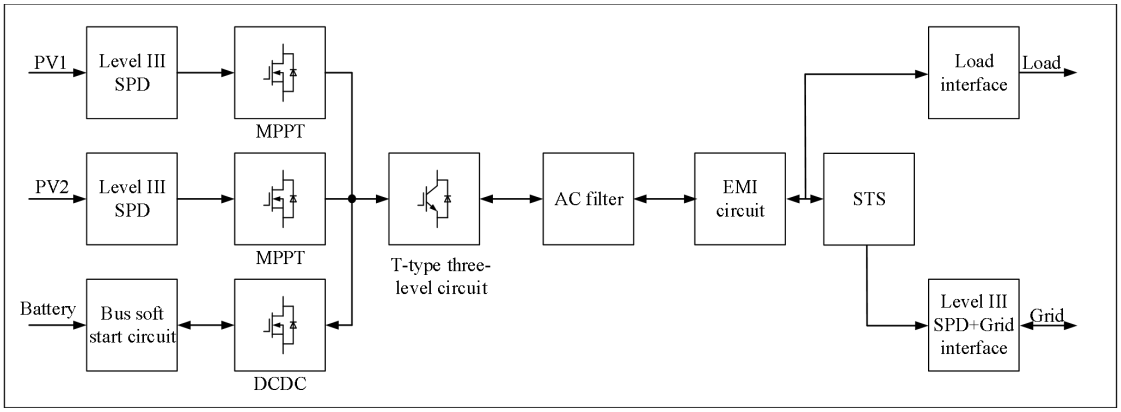


catalogue

# 1. Product introduction

An efficient and highly reliable hybrid energy storage inverter is mainly developed for small and medium-sized energy storage microgrid, which supports photovoltaic access, including off-grid switching devices, multiple parallel operation, hybrid operation of oil and gas engines, and fast off-grid switching. It is suitable for small-scale industry and commerce, small-scale island microgrid, farm, villa, battery cascade utilization and other scenarios to meet the needs of different users.

## 1.1 main topology




Picture 1

## 1.2 Product features

(1) High efficiency and high reliability：

- **Low power consumption: standby power consumption is low ≤15W, and no-load running loss is less than 160W**；
- **High efficiency**：Maximum conversion efficiency 98.2%；
- **High protection**：The core control part has the protection level of IP5X, which can work stably in harsh environment, such as dust and high salt fog；
- **Air duct isolation design**：The design of isolated air duct improves the safety and reliability of products；
- **High overload capacity**：It has 150% instantaneous overload capacity, which enhances the adaptability and durability of the system；
- **Seamless switching function**：Support seamless switching from grid to grid, ensuring the

continuity and stability of power supply.

(2) function：

- **Oil-engine hybrid mode：** Support the hybrid operation of oil and gas engines, provide flexible energy combination methods and improve energy utilization efficiency；
- **Three-phase independent grid-connected control technology：** It realizes three-phase independent control, optimizes power distribution and improves the flexibility and efficiency of the system.
- **Seamless handover:** seamless handover (less than 10ms) in parallel and off-grid；
- **Power grid adaptability：** Perfect high and low voltage crossing function, island protection, black start and other functions.
- **Parallel machine function：t**he AC side supports 15 parallel grid-connected or off-grid operation;
- **Flexible application scenarios：** It is suitable for small-scale industry and commerce, small-scale island microgrid, farm, villa and other scenes to meet the specific needs of different users.

(3) Convenience：

- **Communication and monitoring：** Support a variety of communication protocols, support mainstream BMS protocols, and facilitate remote monitoring and management;
- **High maintainability：** Front wiring and maintenance；
- **Fault protection：** Perfect fault protection and fault recording function；
- **Wide voltage range：** It is suitable for voltage input of various battery configurations, with strong adaptability, and can meet the energy demand of different capacity requirements. The battery has better adaptability and higher cost performance，As low as 200V，such as 50kW/100kWh(280AH)、60kW/120kWh(314AH).

# 2. Product model and size

## 2.1. product model

SP60HCG2、SP50HCG2、SP40HCG2、SP30HCG2

## 2.2. Naming rules

This document is applicable to the model description of SP**HC** series products.

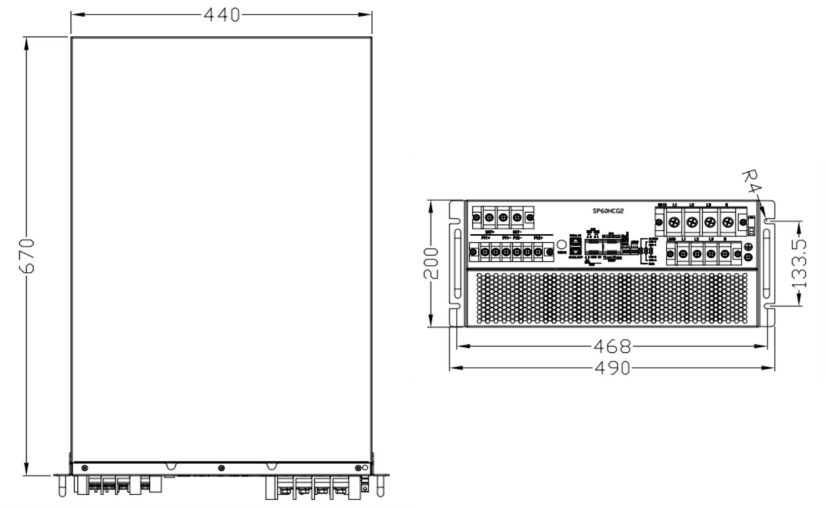
| serial number | code | meaning |
|---|---|---|
| 1 | Name of the company | SP：Sino Soar |
| 2 | Rated AC power | 60：Rated AC output power 60kW<br>50：Rated AC output power 50kW<br>40：Rated AC output power 40kW<br>30：Rated AC output power 30kW |
| 3 | Dc voltage level | H：The input voltage of DC side is within 200~1000V . |
| 4 | Assembly mode | C：Insert frame |
| 5 | Module classification | G2：Hybrid energy storage inverter<br>PS：Energy storage converter<br>DC：Dc converter<br>PV：DC MPPT<br>IV：Inverter |

## 2.3. Product appearance and size

(1) Product appearance

Picture 2

(2) product size




Picture 3

## 2.4. Specification parameter

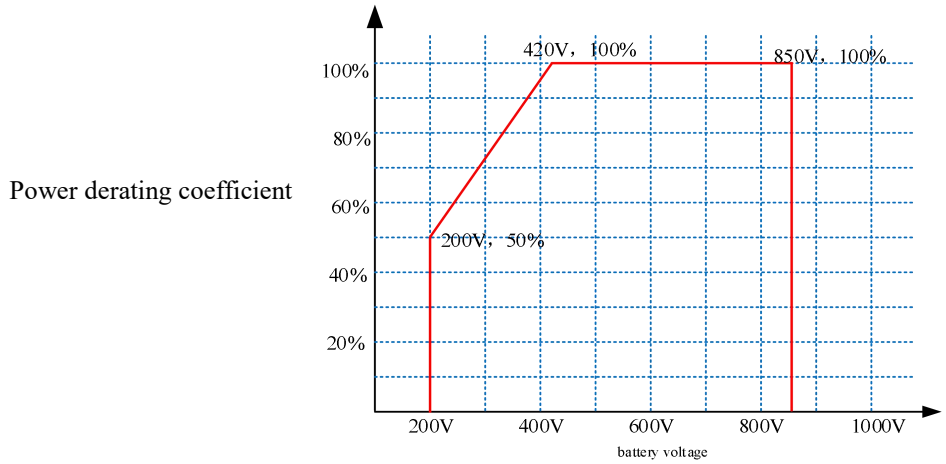
## 2.5. parameter

| parameter | SP60HCG2 | SP50HCG2 | SP40HCG2 | SP30HCG2 |
|---|---|---|---|---|
| Battery parameters | | | | |
| Maximum battery voltage | 850V | | | |
| Minimum battery voltage | 200V | | | |
| Supported battery types | Lithium iron phosphate battery, ternary battery, lead-acid battery, etc. | | | |
| Rated battery voltage range | 420V-850V | 350V-850V | 270V-850V | 210V-850V |
| Maximum battery current | 150A | | | |
| PV parameter | | | | |
| Maximum power | 38.4kW+38.4kW | | | |
| Maximum PV voltage | 850V | | | |
| PV starting voltage | 250V | | | |
| MPPT voltage range | 200V-800V | | | |
| Maximum PV current | 64A+64A | | | |
| AC side (grid-connected) | | | | |
| Rated power | 60kVA | 50kVA | 40kVA | 30kVA |
| Rated current | 87A | 72.5A | 58A | 43.5A |
| Maximum bypass current | 174A | 145A | 116A | 87A |
| Rated grid voltage | 400V/230V | | | |
| Grid voltage range | -20%~15% | | | |
| Power grid frequency range | 50Hz/47Hz~52Hz(60Hz/57Hz~62Hz) | | | |
| Current harmonics | <3%（More than 30% load） | | | |
| Power factor | -1~1 | | | |
| AC side (off-grid) | | | | |
| Output rating | 60kVA | 50kVA | 40kVA | 30kVA |
| Maximum output power | 66kVA | 55kVA | 44kVA | 33kVA |
| Rated output current | 87A | 72.5A | 58A | 43.5A |

| | | | | |
|---|---|---|---|---|
| Maximum output current | 95.7A | 79.8A | 63.8A | 47.9A |
| Rated voltage | 400V/230V | | | |
| Output voltage harmonics | <3%(Resistive load) | | | |
| Degree of unbalancedness | 100% | | | |
| frequency range | 50/60Hz | | | |
| Output overload (current)<br>Ie: Rated output current | $I_e*1.1<I_{load}\leqslant I_e*1.25$ 100s<br>$I_e*1.25<I_{load}$ 300ms | | | |
| system parameter | | | | |
| Communication port | EMS：RS485<br>Battery：CAN or RS485 | | | |
| DIDO | DI：2 channels；DO：2channels | | | |
| Maximum efficiency | 97.8% | | | |
| Installation mode | Insert frame | | | |
| Wastage | standby time <15W，no-load power <160W | | | |
| Weight | ⩽50kg | | | |
| Measure | W*L*H：440*670*200mm | | | |
| Protect | IP20 | | | |
| Temperature range | -30--60℃(45℃derate) | | | |
| Humidity range | 5-95% | | | |
| Cooling mode | Intelligent forced air cooling | | | |
| Altitude | 4000m（2000m Use above derating） | | | |
| Authentication | CE，IEC62019，IEC62477，IEC6100，EN50549 | | | |

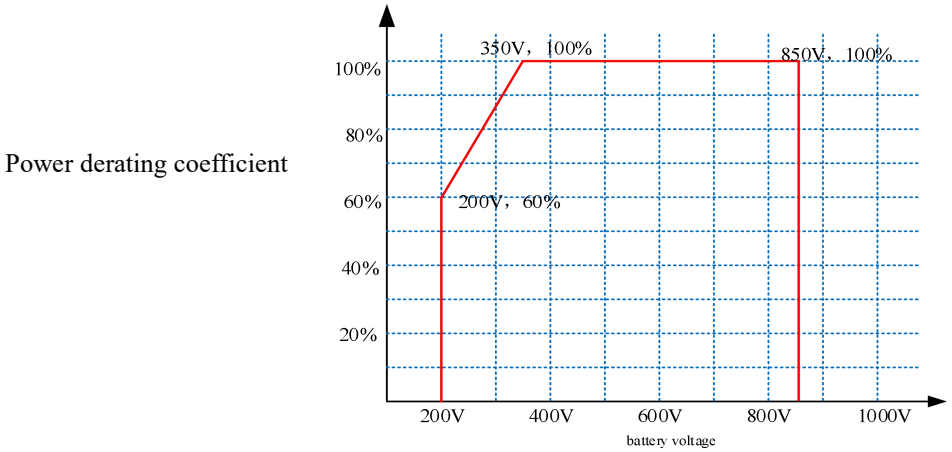
## 2.6. Power derating curve (battery voltage)

**SP60HCG2 Curve of battery side charging and discharging power and battery voltage**



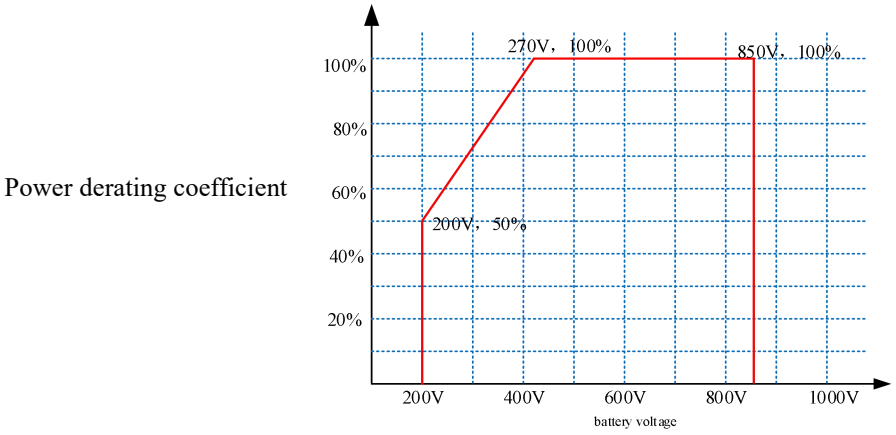

Picture 4

**SP50HCG2 Curve of battery side charging and discharging power and battery voltage**



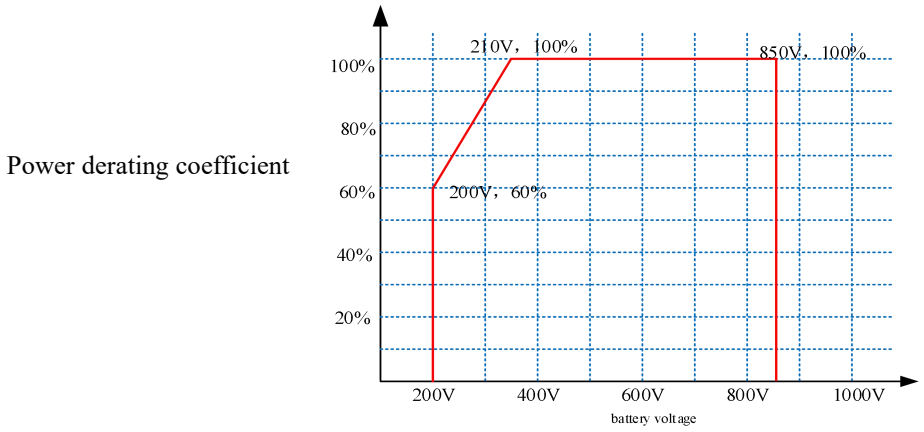

Picture 5

**SP40HCG2 Curve of battery side charging and discharging power and battery voltage**



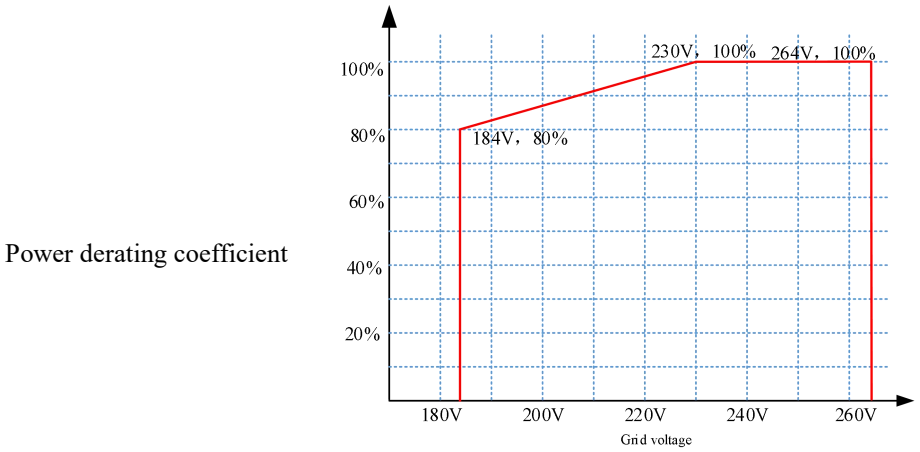

Picture 6

**SP30HCG2 Curve of battery side charging and discharging power and battery voltage**



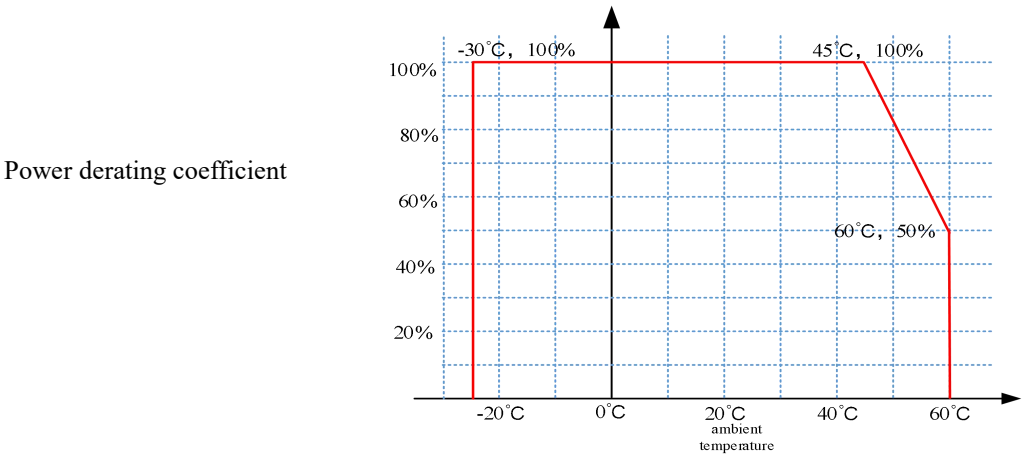

Picture 7

## 2.7. Power derating curve (grid voltage)




Picture 8

## 2.8. Temperature derating curve

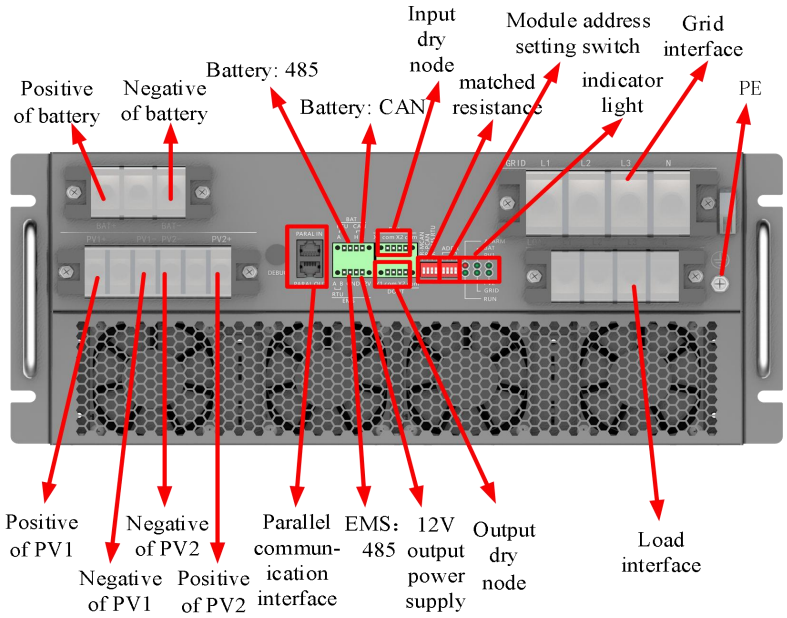



Picture 9

## 2.9. Safety protection

- Air duct isolation, salt spray prevention and control warehouse sealing；
- Humidity range 5%-95%；
- Anti-interference 2KV grounding, Class III lightning protection, and Class II lightning protection is required for AC side or power distribution unit during the application of PCS；
- Running vibration test, transportation test with packing material.

# 3. Port definition




Picture 10 Port definition schematic

Power port definition：

| name | function | remarks |
|---|---|---|
| BAT+/BAT- | Battery input terminal | OT terminal (RNB38-6)35mm² wire cable |
| LOAD（L1/L2/L3/N） | AC load terminal | OT terminal(RNB22-6S)，25mm² wire cable |
| GRID（L1/L2/L3/N） | AC power network terminal | OT terminal(RNB60-8)，50mm² wire cable |
| PV1+/PV1-/PV2V-/PV2+ | Photovoltaic input terminal | OT terminal(RNB22-6S)，16mm² wire cable |
| PE | ground terminal | OT terminal(RNB22-6S)，10mm² wire cable |

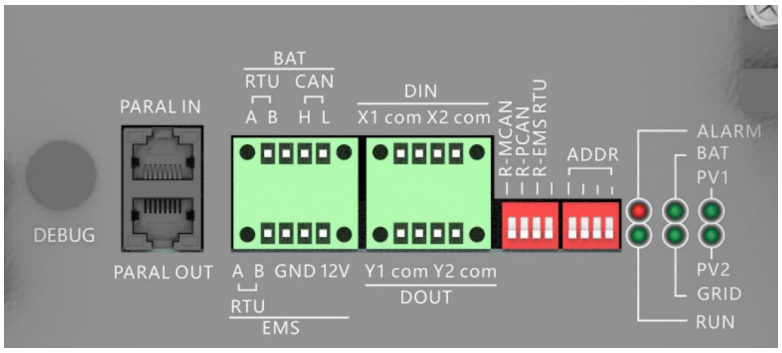
**⚠watch**

- M6 screws are used to fix the power terminals of battery interface, load interface and photovoltaic interface. Please use the screws provided with it to fix the power cable, and the torque of the fixing screws is 5.5~6.5N. m. Too large will lead to terminal damage, and too small will lead to poor contact.
- The power terminal of the power grid is fixed with M8 screws. Please use the screws provided with it to fix the power cable, and the torque of the fixing screws is 15.5~16.5

N.m . Too large will lead to terminal damage, and too small will lead to poor contact.

- The module shall be reliably grounded during operation. Poor grounding may lead to electric shock danger and damage to the module. The torque of the fixing screw is 5 N.m..

The signal terminal interface is defined as shown in the Picture 11 show

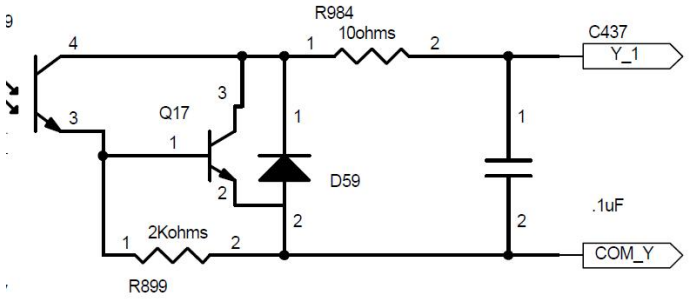



Picture 11 Definition of signal terminal interface

| name | function | remarks |
|---|---|---|
| PARAL IN | Parallel line input | Parallel line |
| PARAL OUT | Parallel line output | Parallel line |
| BAT_RTU | Battery RS485 interface | BAT communication interface |
| BAT_CAN | Battery CAN interface | |
| RTU(A-B) | Communication interface with EMS | Upper computer or EMS or SAEMS100 (optional) coordinated control system. |
| 12V-GND | SAEMS Power supply port | output capability 12V/0.5A |
| X1 | Input dry contact | emergency stop button |
| X1_com | Input dry contact | |
| X2 | Input dry contact | reserve |
| X2_com | Input dry contact | reserve |
| Y1 | Output dry contact | Output capacity: the maximum voltage of the port is not higher than 24V, and the maximum current is not more than 200mA. |
| com | | |
| Y2 | Output dry contact | |
| com | | |
| R-MCAN | Parallel communication matching resistor | ON: indicates that the communication matching resistor is connected.<br>Module 1 and the last module need to be connected with parallel communication matching resistors (dial the code to the ON position), that is, parallel communication matching resistors are needed at the beginning |
| R-PCAN | Parallel communication matching resistor | |
| R-EMS RTU | EMS RTU Communication matching resistance | |

| | | |
|---|---|---|
| | | and end, and others are not needed. |
| ADDR | Module address dialing | ON：Represents 1, otherwise represents 0. The address of the module is expressed in binary, with high position on the left and status on the right, that is, the No.1 module is expressed as 0001; Module 3 is indicated as 0011. |
| DEBUG | Debugging interface | For internal debugging only. |
| ALARM | trouble lamp | The converter is always on when there is a fault, and always off when there is no fault. |
| RUN | status indicator lamp | The converter is always on during normal operation, and flashes once per second during trouble-free standby, and the converter often goes out when it fails. |
| BAT | Battery status indicator lamp | The function of the battery terminal circuit is always on when it is running, it flashes once per second when the battery is normal, and it is always off when the battery is abnormal. |
| GRID | Power grid status indicator lamp | Grid-connected operation is always on, and the power grid flashes once per second when there is no abnormality, and the power grid is always off when there is abnormality. |
| PV1 | PV1 status indicator lamp | When PV1 is running, it is always on, flashing once per second when PV1 is normal, and it is always off when PV1 is abnormal. |
| PV2 | PV2 status indicator lamp | When PV2 is running, it is always on. When PV2 is normal, it flashes once per second. When PV2 is abnormal, it is always off. |

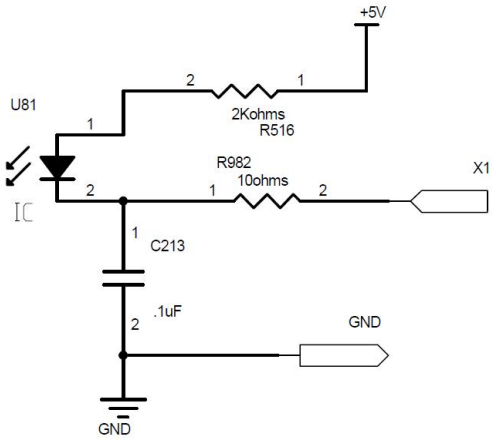
The internal schematic diagram of the output trunk node is shown in picture 12.：




Picture 12 internal principle of output trunk node

**The maximum voltage of the port is not higher than 24V, and the maximum current is not more than 200mA.**

The internal schematic diagram of the input stem node is shown in Figure 13：

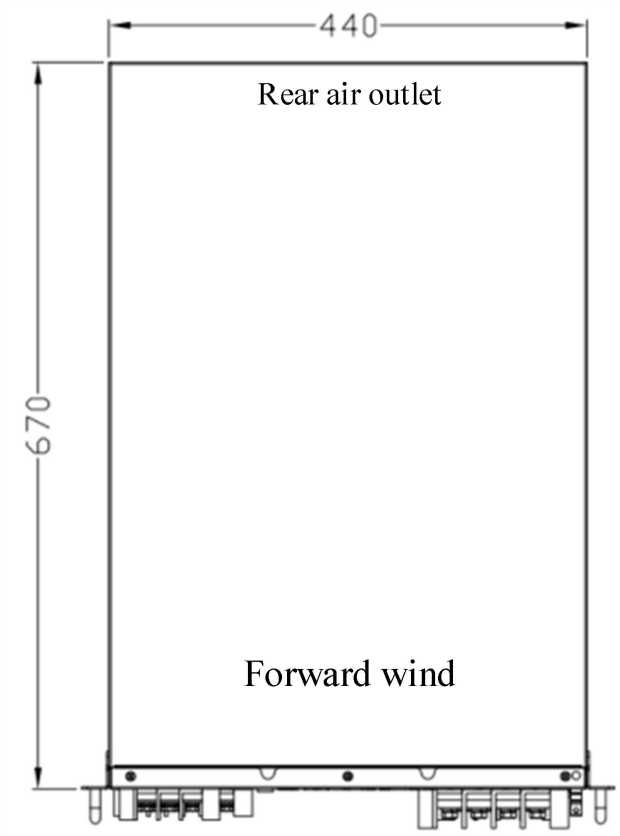



Picture 13 input internal schematic diagram of dry node

**the input trunk node has a built-in power supply, so it only needs to provide a switch for short circuit, and the sum of the short circuit impedance of the switch and the line impedance should be less than 0.1 Ω.**

# 4. dissipate heat

## 4.1. Air inlet and outlet modes




Picture 14

## 4.2. Heat dissipation requirements

The cooling mode of the module is intelligent fan speed-regulating air cooling, with air inlet on the front panel and air outlet on the rear panel. The rated air inlet of the module is 500CFM(14.1m3/min). When installed in the integrated system, the air inlet of the cabinet should face the air inlet of the front panel of the module, and the distance between the air inlet of the module and the cabinet should be greater than 110mm； ; Corresponding air ducts and air outlets should also be added to the cabinet, which should be opposite to the module air outlet and the cabinet air outlet, and the distance between the module air outlet and the cabinet body should be greater than 110mm, so as to directly send hot air outside the cabinet and avoid the backflow of hot air in the cabinet. If there is no relevant air outlet duct, an exhaust fan should be added at the air outlet of the cabinet, and the air volume of the fan should be 2 times of the air intake requirement of the module. Considering the need

to add dust-proof cotton to the air inlet, the air inlet area of the cabinet should be 3 times larger than the air inlet area of the module. It is recommended to use 40PPI density polyurethane reticulated foam cotton for dust-proof cotton, and the flame retardant grade should meet 94V0. The air outlet area of the cabinet should be twice that of the module, and it is recommended to use 10 mesh insect-proof steel mesh at the air outlet. Refer to fig. 14 for air intake.

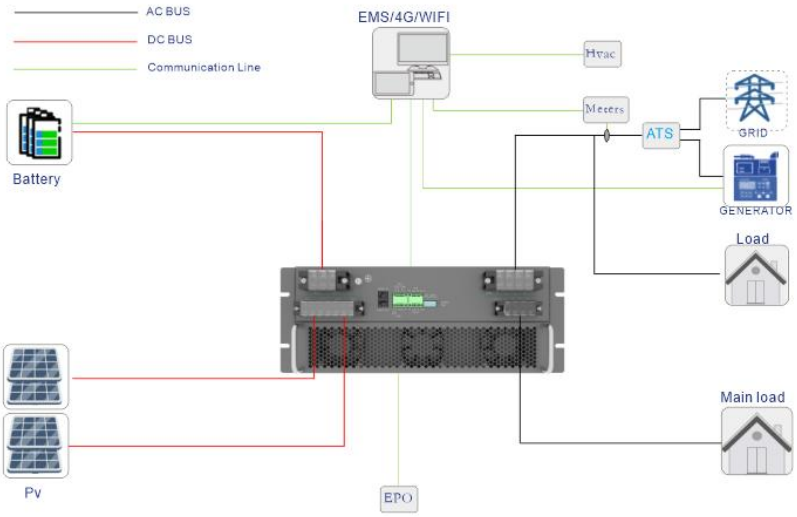
# 5. Application scenarios

- **Small industry and commerce**：Suitable for small factories, commercial buildings, office buildings, etc., it is used to optimize energy consumption, realize peak-valley electricity price management, reduce electricity expenditure, and provide emergency power reserve function to ensure that key equipment can still operate normally when the power grid is unstable;
- **Small island microgrid**：In remote islands or areas without stable power grid coverage, it can be combined with renewable energy such as solar photovoltaic panels and wind turbines to build an independent microgrid to provide stable power supply；
- **Farms and agricultural facilities**：In the agricultural field, the inverter can be combined with solar energy and energy storage system to provide electricity for irrigation, greenhouse control, automation equipment, etc., and at the same time support the hybrid mode of oil and engine to ensure that it can still maintain operation when energy is insufficient；
- **Farm**：Provide energy solutions for farms, realize the combination of solar power generation and energy storage, improve the self-sufficiency rate of energy, and provide emergency power for farms at the same time to ensure that farm electricity consumption will not be affected when the power grid fails；
- **Temporary electricity consumption and construction site**：In construction sites, outdoor activities, temporary facilities and other scenes, it can be used as a mobile power supply to provide necessary power support, and at the same time support oil-engine mixing to ensure the continuity of power supply;
- **Remote areas and emergency rescue**：In remote areas or emergency rescue scenes, Allinone is light in weight and high in integration, which can be quickly deployed to provide stable power supply and support the operation of key facilities such as communication equipment and medical equipment;
- **Battery cascade utilization**：Participate in national or regional energy optimization projects, such as the demonstration project of scenery and firewood storage island, and demonstrate the performance and benefits in practical application.

## 5.1. Small industrial and commercial energy storage

Main application scenarios: factories, villas, supermarkets, farms, field construction and other scenarios.

Main functions: photovoltaic spontaneous self-use, emergency standby, etc.

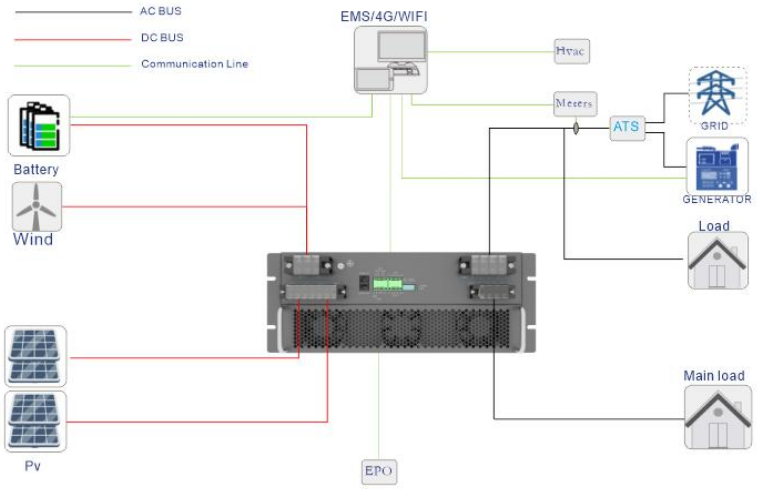



Picture 15

## 5.2. Solution of off-grid microgrid

Main application scenarios: power unstable areas, villas, farms, islands, oil production, and other areas without electricity.

Main functions: spontaneous self-use, emergency power supply, oil engine management, fan management, etc.。

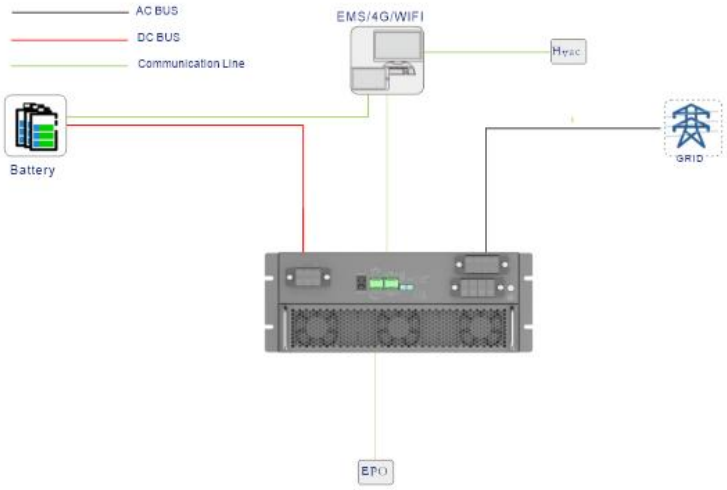



Picture 16

## 5.3. Three-phase imbalance and low voltage control

Main application scenarios: high-voltage, low-voltage and unbalanced terminal grid voltage caused by new energy access or load fluctuation and line impedance.

Main functions: three-phase independent grid-connected independent control, energy balance, maximum compensation of 150%.

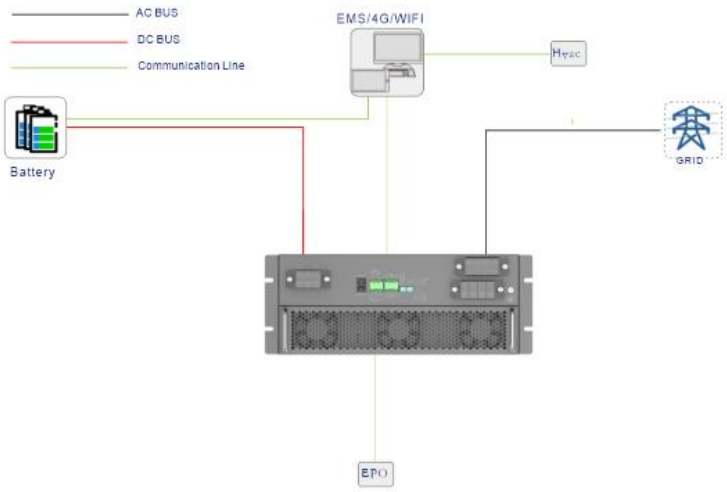



Picture 17

## 5.4. Energy storage+emergency standby power

Main application scenarios: EPS replacement, mobile power supply, battery cascade utilization, sodium ion battery, fuel cell, etc.

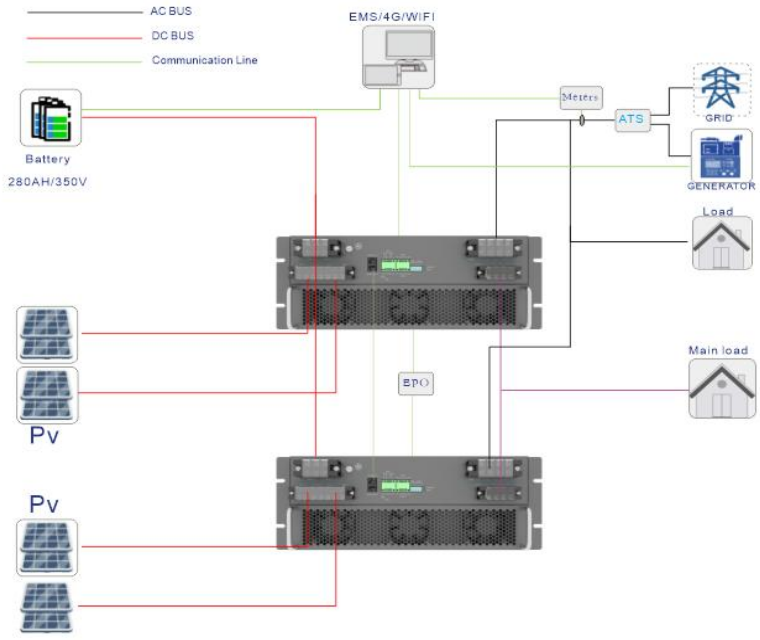
Main functions: support single-phase charging function, wide battery power full load range, and the maximum current is 150A A.




Picture 18

## 5.5. Multi-machine parallel scheme

Main functions: support multiple parallel machines, support transformer-free output, and support transformer startup.




Picture 19

# 6. External EMS scheduling function（select to breed）

## 6.1. Introduction of microgrid EMS

Matching EMS series products can be selected, and the version is light storage diesel version of microgrid EMS. Micro-grid EMS is a key component to ensure the efficient, reliable and economical operation of the micro-grid, which is responsible for dispatching and managing distributed power generation resources, energy storage equipment, loads and possible grid-connection, off-grid and anti-reflux operations to ensure the stable and economical operation of the system.

Picture 20

## 6.2. EMS function

● Monitoring and data acquisition: real-time monitoring of energy flow in microgrid, including power generation, energy storage, photovoltaic and load. Collect and record key parameters, such as voltage, current, power and frequency, system diagnosis, cloud platform docking, etc.

● Control and optimization: optimize the operation of microgrid according to the energy demand and supply.

● Protection and safety: ensure the safe operation of microgrid, including overload protection, short circuit protection, equipment fault detection and response measures.

● Energy management: Manage the energy distribution in microgrid to ensure the effective use of

energy and reduce waste, and may include demand response and peak-valley flattening strategy.

● Economic dispatch: based on the change of electricity price and energy cost, economic dispatch is carried out to minimize the overall operating cost.

● User interaction: provides a user interface, allowing users to view energy usage, set operation mode and operation parameters.。

● Grid connection and islanding operation: manage the grid connection and disconnection of microgrid and main grid.

Remote OTA: It can diagnose EMS and inverter faults remotely and upgrade the software remotely.

# EMS working model

(1) Spontaneous use：

Suitable for areas with high electricity price, low or no FIT subsidy on the Internet.

The surplus photovoltaic power generation is stored in the battery, and when the photovoltaic power generation is insufficient or there is no photovoltaic power generation at night, the battery is discharged for the load to use electricity, which improves the spontaneous self-use rate of the photovoltaic system and the self-sufficiency rate of household energy, and saves electricity expenses.

Such as：

1）When the PV illumination is sufficient, the PV output power is 35kW, the load consumption is 10kW, and the battery charge is 25kW.

2）When the PV illumination is weak, the PV output power is 10kW, the load consumes 20kW, and the battery discharges 10kW to the load.

(2) economic pattern：

It is suitable for scenes with large peak-valley price difference.

In this mode, the charging and discharging time period is manually set, such as the low electricity price period at night is set as the charging time period, and the system charges the battery with the maximum charging power during this time period, so it is necessary to enable the "grid charging" function in the "energy storage control", and the high electricity price period is set as the discharging

time period, so that the battery can be discharged only during the discharging time period, saving the electricity cost.。

(3) Give priority to surfing the internet：

It is suitable for the grid-connected scenario of full internet access mode.

Maximize photovoltaic power generation on the internet, and store energy by charging the battery when photovoltaic power generation exceeds the maximum output capacity of the inverter during the day; When the photovoltaic power generation is less than the maximum output capacity of the inverter, the battery is discharged to ensure that the inverter maximizes the output energy to the power grid.

## 6.3. Other EMS parameter information

See EMS specification for details.