SP30 /25/15 HBG2 Series Hybrid Energy Storage Inverter
Product Specifications

Version: V1. 3

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1. Product Introduction

hybrid energy storage inverter developed mainly for small and medium-sized energy storage microgrids . It supports photovoltaic access, contains an on-grid and off-grid switching device, supports multiple parallel operations, supports hybrid operation of diesel engines, and supports on-grid and off-grid fast switching. It is suitable for a variety of scenarios such as small industrial and commercial, small island microgrids, farms, villas, battery cascade utilization, etc., to meet the needs of different users.

1.1. Main topology

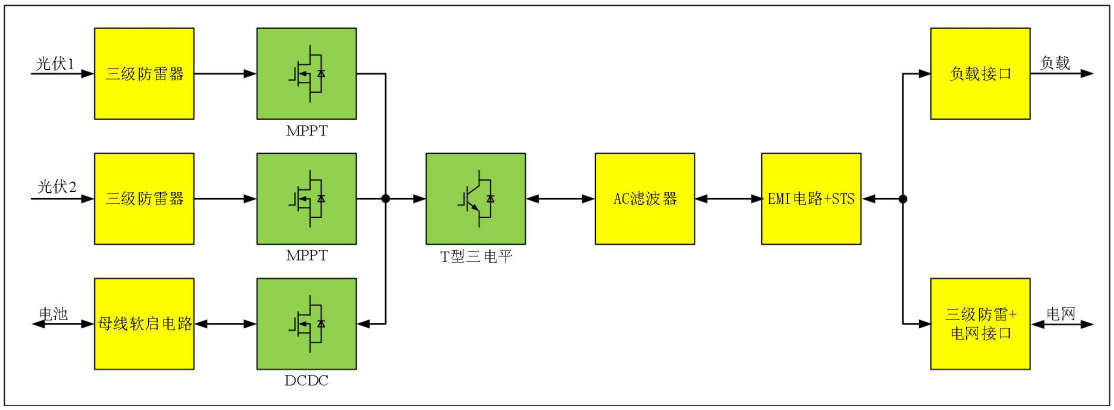


Figure 1

1.2. Features

① High efficiency and high reliability:

- **Low power consumption:** standby power consumption is ⩽ 25W , no - load operation loss is less than 160W ;
- **High efficiency:** the highest conversion efficiency is 97.8% ;
- **High protection:** The core control part has an IP 5 X protection level and can work stably in harsh environments such as sand and dust, high salt fog, etc.
- **Air duct isolation design** : The isolated air duct design improves the safety and reliability of the product;
- **High overload capacity:** With 150% instantaneous overload capacity, it enhances the adaptability and durability of the system;
- **Seamless switching function:** supports seamless switching on and off the grid, ensuring the continuity and stability of power supply.

② Function:

- **Diesel-engine hybrid mode:** supports diesel-engine hybrid operation, provides flexible energy combination, and improves energy utilization efficiency;
- **Three-phase independent grid-connected control technology:** realizes three-phase independent control, optimizes power distribution, and improves system flexibility and efficiency;
- **Seamless switching:** seamless switching between on-grid and off-grid (less than 10 ms);
- **Grid adaptability:** complete high and low voltage ride-through function, island protection, black start and other functions;
- **Parallel function:** The AC side supports 15 units in parallel and grid-connected operation or off-grid operation, and the DC side also supports multiple units in parallel;
- **Flexible application scenarios:** Suitable for various scenarios such as small-scale industry and commerce, small island microgrids, farms, villas, etc., to meet the specific needs of different users.

③ Convenience:

- **Communication and monitoring:** Support multiple communication protocols and mainstream BMS protocols to facilitate remote monitoring and management;
- **High maintainability:** front wiring and front maintenance;

- **Fault protection:** Complete fault protection and fault recording functions;
- **Wide voltage range:** Suitable for voltage input of various battery configurations, strong adaptability, and can meet energy needs of different capacity requirements. Better battery adaptability, higher cost performance, as low as 200V , such as 30k W /20-70k W h (100AH) , 30k W / (60-215) k W h (280AH) .

2. Product model and size

2.1. Product Model

SP30HBG2 , SP25HBG2 , SP15HBG2

2.2. Naming convention

the model description of SP**HB** series products

Serial number	Code	meaning
1	Company Name	SP: Zhongteng Micro Network
2	AC rated power	30 : AC rated output power 30kW 25 : AC rated output power 25 kW 15 : AC rated output power 15 kW
3	DC voltage level	H: DC input voltage is within 200~1000V
4	Assembly method	B: Subframe
5	Module Classification	G2: Hybrid Energy Storage Inverter PS: Energy Storage Converter DC: Direct current converter PV: DC MPPT IV: Inverter

2.3. Product appearance and size

① Product Appearance

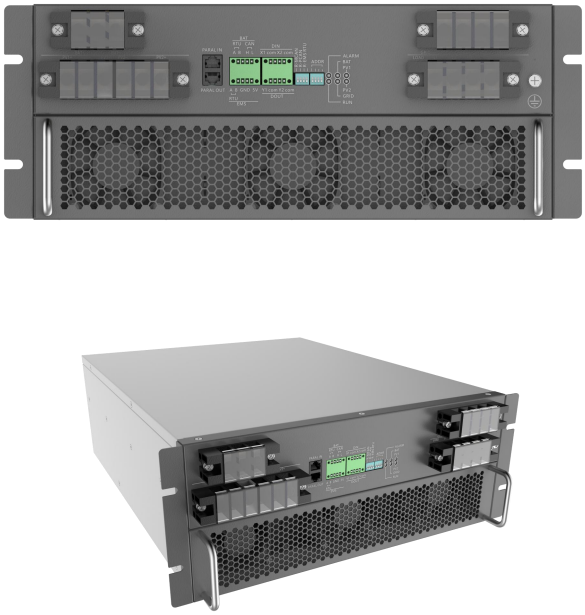


Figure 2

② Product size

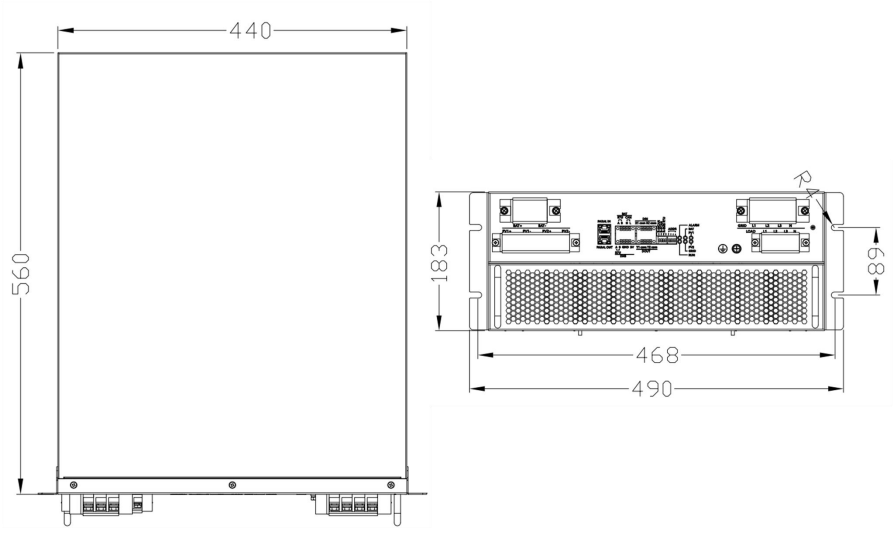


Figure 3

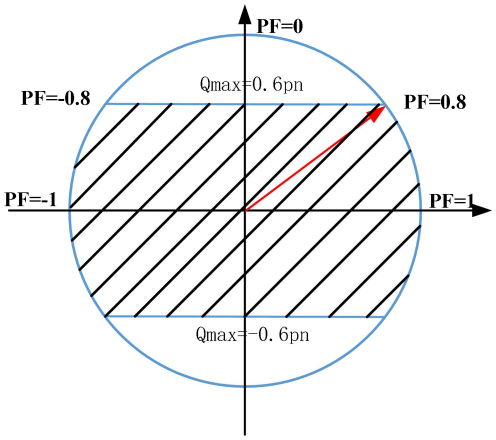
3. Specifications

3.1. parameter

parameter	SP30HBG2	SP25HBG2	SP15HBG2
Battery parameters			
Maximum battery voltage	850V		
Minimum battery voltage	200V		
Rated battery voltage range	320V-8 2 0V	320V-8 2 0V	200V -8 2 0V
Maximum battery current	100A	80A	80A
PV parameters			
Maximum Power	19.2kW+19.2kW	15kW+15kW	15kW+15kW
Maximum PV voltage	850V		
PV starting voltage	250V		
MPPT voltage range	200V-800V		
Overvoltage level	Level II		
Maximum feedback current	0A		
Maximum PV current	32A+32A	25A+25A	25A+25A
AC side (grid-connected)			
Rated Power	30kVA	25kVA	15kVA
Rated current	43.5A	36.2A	22A
Rated grid voltage	400V/230V		
Grid voltage range	-20%~15%		
Starting surge current	8.5A		
Grid frequency range	50Hz (47Hz~52Hz) or 60Hz (57Hz~62Hz)		
Current harmonics	< 3 %		
Power Factor	- 1 ~ 1 (see Figure 4 below)		
Overvoltage level	Level II		
Protection level	Level I		
AC side (off-grid)			
Rated output power	30kVA	25kVA	15kVA
Maximum output power	33kVA	27.5kVA	16.5kVA

Rated output current	43.5A	36.2A	22A
Maximum output current	48A	40A	24.2A
Rated voltage	400V/230V		
Output voltage harmonics	<3% (resistive load)		
Imbalance	100%		
Frequency range	50/60Hz		
Maximum fault current	472A/20ms		
AC maximum protection current	48A	39.8A	24.2A
Output overload (current) Ie：Rated output current	I_e*1.1<I_{load} ≤I_e*1.25 1 0 0s I_e*1.25<I_{load} ≤I_e*1.4 3 00ms I_e*1.4<I_{load} ≤I_e*1.5 1 00ms I_e*1.5<I_{load} 30 ms		
System Parameters			
Communication port	EMS: RS485 Battery: CAN or RS485		
DIDO	DI: 2 channels; DO: 2 channels		
Maximum efficiency	97.8%		
Installation	Insert frame		
loss	Standby < 25 W, no-load power < 1 6 0W		
weight	35kg		
size	W*L*H:440*560*183mm		
Protection	IP20		
Temperature range	-25--60℃(use at a derating when the temperature is above 45℃)		
Humidity range	5-95%		
Cooling method	Intelligent forced air cooling		
Pollution degree	Level II		
altitude	4000m (derating is used above 2000m)		
Certification	CE, IEC62019, IEC62477, IEC610 0 0, EN50549-1 , AS4777.2		
Grid support	LVRT, HVRT, VSG		

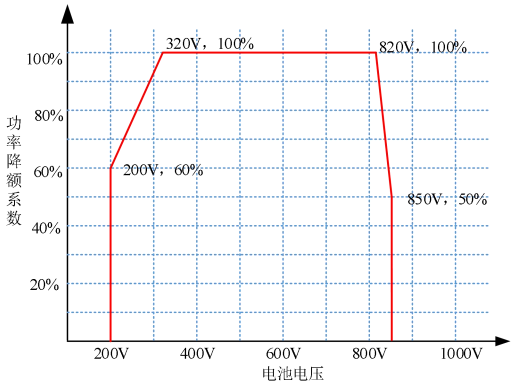
3.2. Active and reactive power curves



picture 4

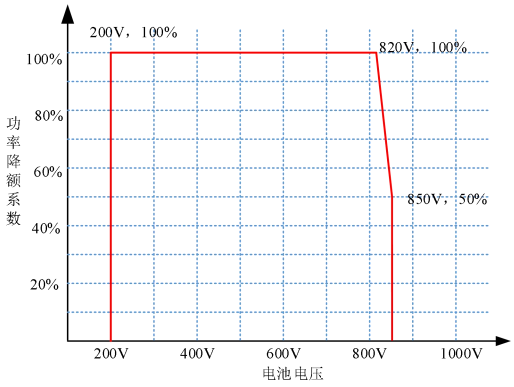
3.3. Power derating curve (battery voltage)

① SP30/25HBG2 power derating curve



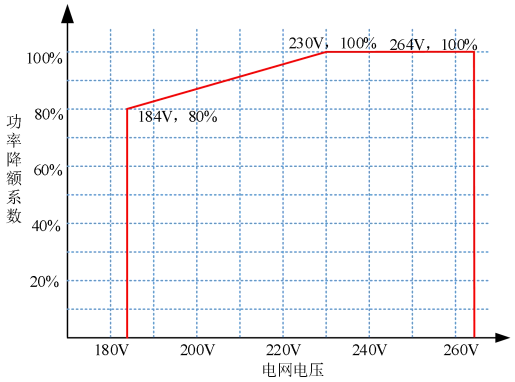
picture 5

② SP15HBG2 power derating curve



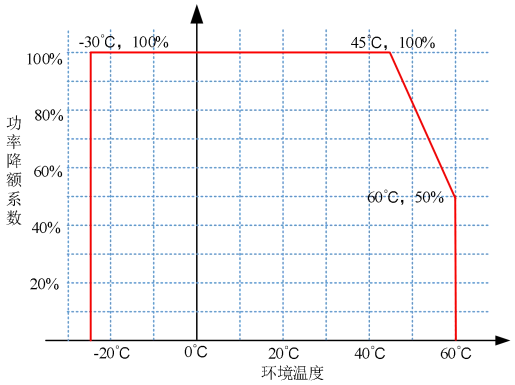
picture 6

3.4. Power derating curve (grid voltage)



picture 7

3.5. Temperature derating curve



picture 8

3.6. Safety protection

- Air duct isolation, salt spray protection, and control chamber sealing;
- Humidity range 5%-95%;
- Anti-interference 2KV to ground, Class III lightning protection, during PCS application, the AC side needs to add Class II lightning protection or the distribution unit;
- Operation vibration test and transportation test with packaging materials.

4. Port Definition

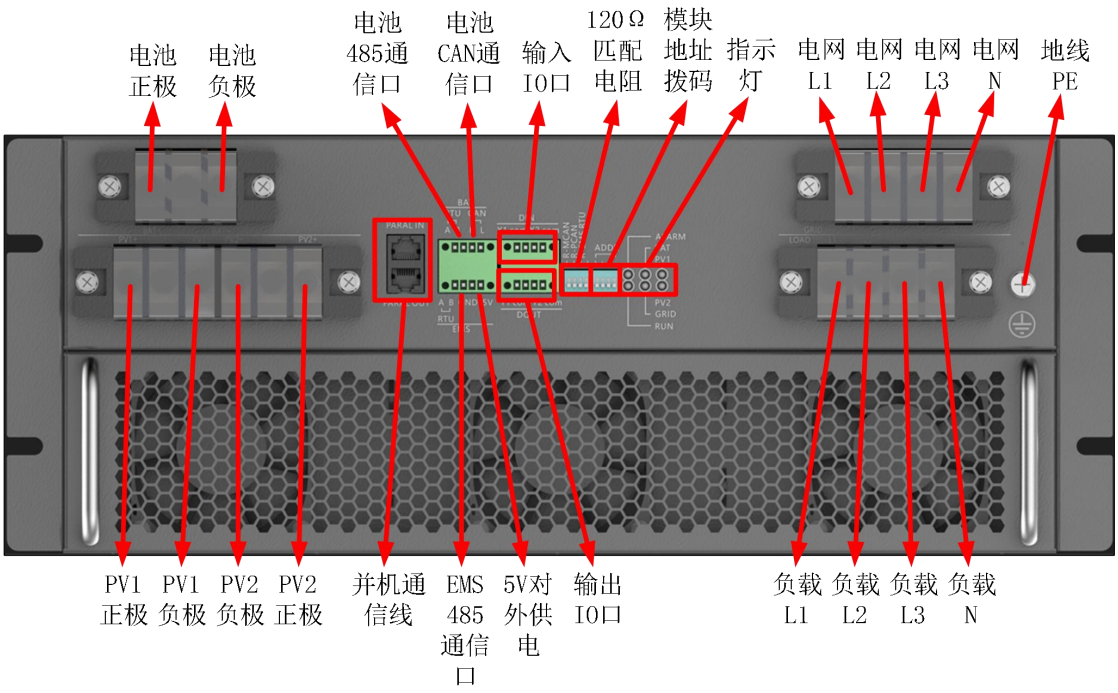


Figure 9 Port definition diagram

Power port definition:

name	Function	Remark
BAT + / BAT-	Battery input terminal	OT terminal (RNB 22-6 S), 25 mm² cable recommended
LOAD (L1/L2/L3/N)	AC load terminal	OT terminal (RNB 22 - 6S), 16 mm² cable
GRID (L1/L2/L3/N)	AC grid terminal	OT terminal (RNB 22-6 S), 25 mm² cable recommended
PV1+ / PV1- / PV2V- / PV2+	Photovoltaic input terminal	OT terminal (RNB 14 - 6S), 10 mm² cable recommended
PE	Ground terminal	OT terminal (RNB 14 - 6S), 10 mm² cable recommended

careful

- The power terminals are fixed with M6 screws. Please use the screws provided with the machine to fix the power cables. The fixing torque is 3 N.m (30 kgf · m). A screw torque that is too large may damage the terminal, and a screw torque that is too small may cause poor contact.
- The module needs to be reliably grounded during operation. Poor grounding may cause

electric shock and module damage. The fixing screw torque is 5N.m.

The signal terminal interface definition is shown in Figure 10

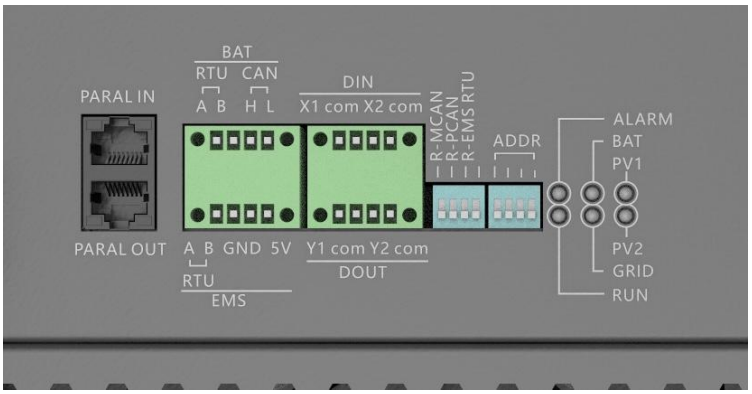


Figure 10 Signal terminal interface definition

name	Function	Remark
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(AB)	Communication interface with EMS	Host computer or EMS or SAEMS100 (optional) coordination control system
5V-GND	SAEMS power supply port	Output capacity 5V/1A
X1	Input dry node	Emergency stop button
X1_com	Input dry node	
X2	Input dry node	Reserve
X2_com	Input dry node	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 resistance	ON : Indicates that the communication matching resistor is connected 1 and the last module need to be connected to parallel communication matching resistors (the dial switch is turned to the ON position), that is, the first and last modules need parallel
R -PCAN	Parallel communication matching resistance	
R-EMS RTU	EMS RTU communication matching resistor	

		communication matching resistors, and the rest do not.
ADDR	Module address dial	ON : indicates 1, otherwise indicates 0 The module address is represented in binary, with the high bit on the left and the low bit on the right, that is, module No. 1 is represented as 0001; module No. 3 is represented as 0011.
ALARM	Fault indicator light	The light is always on when a fault occurs in the converter and always off when there is no fault.
RUN	Status indicator	The light is always on when the converter is operating normally, flashes once per second when in standby mode without any fault, and is always off when there is a converter fault.
BAT	Battery status indicator	The light is always on when the battery circuit function is running, flashes once per second when there is no abnormality in the battery, and is always off when there is an abnormality in the battery.
GRID	Grid status indicator	It is always on when the grid is connected, flashes once per second when there is no abnormality in the grid, and is always off when there is an abnormality in the grid.
PV1	PV1 status indicator	The light is always on when PV1 is running, flashes once per second when there is no abnormality in PV1, and is always off when there is an abnormality in PV1.
PV2	PV2 status indicator	The light is always on when PV2 is running, flashes once per second when there is no abnormality with PV2, and is always off when there is an abnormality with PV2.

The internal schematic diagram of the output dry node is shown in Figure 1 1 :

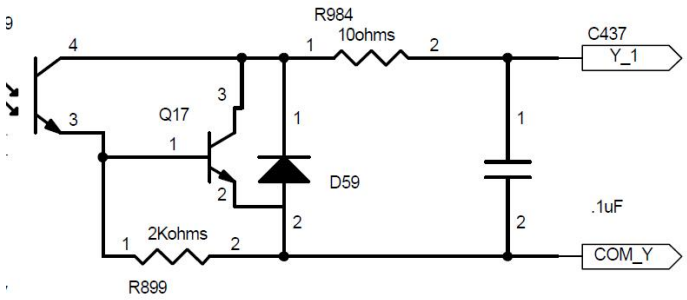


Figure 11 Internal principle of output dry node

The maximum voltage of the port shall not exceed 24V, and the maximum current shall not exceed 200mA.

The internal schematic diagram of the input dry node is shown in Figure 1 2 :

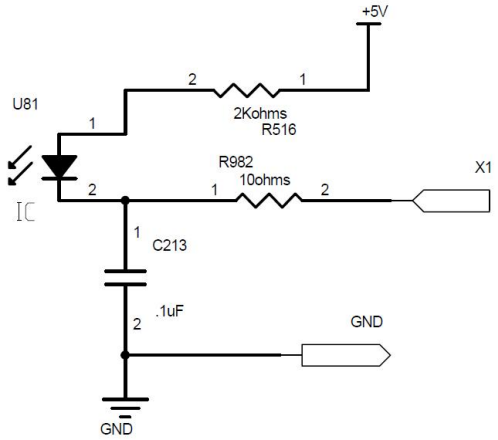


Figure 12 Internal schematic diagram of input dry node

The input dry node has a built-in power supply, and only a switch needs to be provided externally for short-circuiting. The sum of the switch short-circuit impedance and the line impedance should be less than 0.1Ω.

5. Heat dissipation

5.1. Air inlet and outlet

Figure 13

5.2. Heat dissipation requirements

The module is cooled by forced air cooling, with the front panel as the air inlet and the rear panel as the air outlet. The rated air inlet of the module is 350CFM (10m3 / min). When installed in an 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; the corresponding air duct and air outlet should also be added to the cabinet. The air duct should face the air outlet of the module and the air outlet of the cabinet, and the distance between the air outlet of the module and the cabinet should be greater than 110mm, so as to directly send the hot air out of the cabinet to avoid the hot air backflow 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 twice the air volume required for the module. Considering that dustproof cotton needs to be added to the air inlet, the air inlet area of the cabinet should be greater than 3 times the air inlet area of the module. It is recommended to use polyurethane mesh foam cotton with a density of 40 PPI for dustproof cotton, and the flame retardant level must meet 94V0. The air outlet area of the cabinet should be twice that of the module. It is recommended to use a 10-mesh insect-proof steel mesh at the air outlet. The air inlet reference is shown in Figure 13.

6. Application Scenario

- **Small-scale industry and commerce :** Suitable for small factories, commercial buildings, office buildings, etc., to optimize energy consumption, achieve peak and valley electricity price management, reduce electricity bills, and provide emergency backup power to ensure that key equipment can still operate normally when the power grid is unstable;

- **Small island microgrids :** On remote islands or areas without stable grid coverage, SP30HBG2 can be combined with renewable energy sources such as solar photovoltaic panels and wind turbines to build independent microgrids to provide stable power supply;

- **Farms and agricultural facilities :** In the agricultural sector, the inverter can be combined with solar energy and energy storage systems to provide power for irrigation, greenhouse control, automation equipment, etc., while supporting diesel-engine hybrid mode to ensure that operations can be maintained when energy is insufficient;

- **Villas and houses :** Provide energy solutions for high-end houses, realize the combination of solar power generation and energy storage, improve energy self-sufficiency, and provide home emergency power supply to ensure that home electricity is not affected when the power grid fails;

- **Temporary power supply and construction sites :** In construction sites, outdoor activities, temporary facilities and other scenarios, SP30HBG2 can be used as a mobile power supply to provide necessary power support, while supporting hybrid power to ensure the continuity of power supply;

- **Remote areas and emergency rescue:** In remote areas or emergency rescue scenarios, SP30HBG2 is lightweight, highly integrated, and allinone can be quickly deployed to provide a stable power supply to support the operation of key facilities such as communication equipment and medical equipment;

- **Battery Recycling :** Participate in national or regional energy optimization projects, such as wind, solar, diesel and energy storage island demonstration projects, to demonstrate the performance and benefits of SP30HBG2 in actual applications.

6.1. Small commercial energy storage

Main application scenarios: homes, villas, supermarkets, farms, field construction, etc.
Main functions: photovoltaic self-generation for own use, emergency power backup, etc.

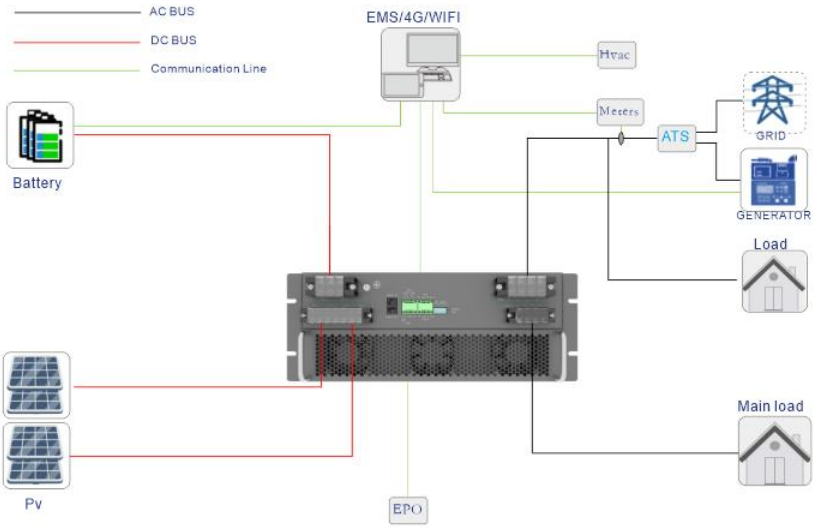


Figure 14

6.2. Off-grid microgrid solutions

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

Main functions: self-generation for own use, emergency power backup, oil engine management, fan management, etc.

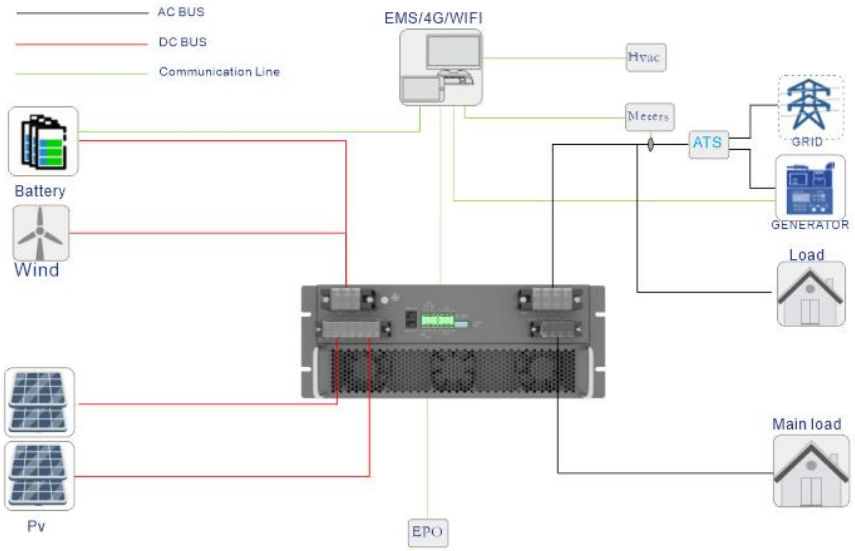


Figure 15

6.3. Three-phase unbalance and low voltage control

Main application scenarios: high voltage, low voltage, imbalance of terminal grid voltage due to new energy access, load fluctuation, line impedance, etc.

Main functions: Three-phase independent grid connection and independent control to achieve energy balance, with maximum compensation of 150%.

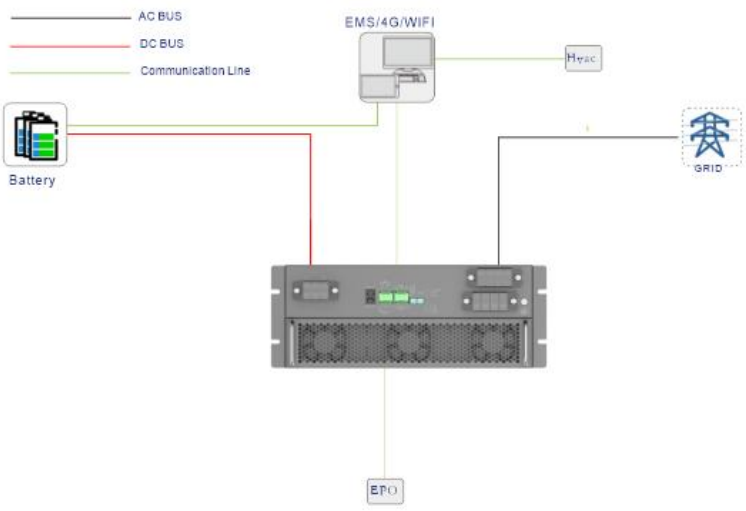

AC BUS
DC BUS
Communication Line
EMS/4G/WIFI
Hvac
Battery
GRID
EPO

Figure 16

6.4. Energy storage + emergency power backup

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

Main functions: support single-phase charging function, wide battery power full load range (320V-820V), maximum current 100A.

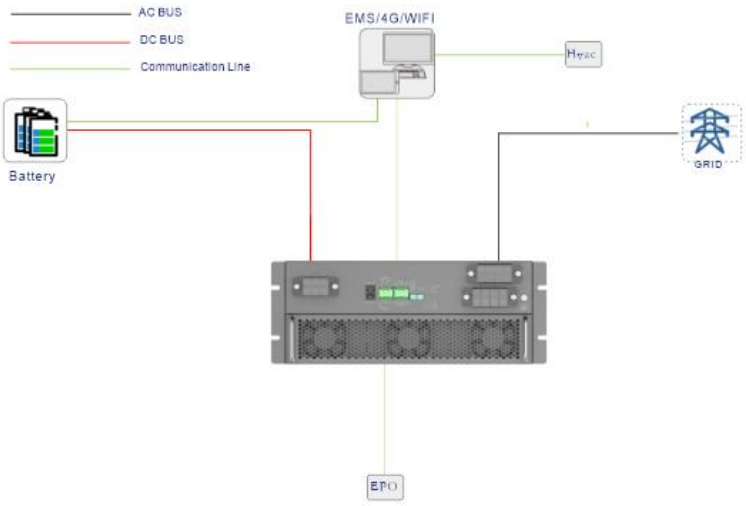


Figure 17

6.5. Energy storage + emergency power backup

Main functions: Support multiple parallel operation, support transformer-free output, and support transformer start-up.

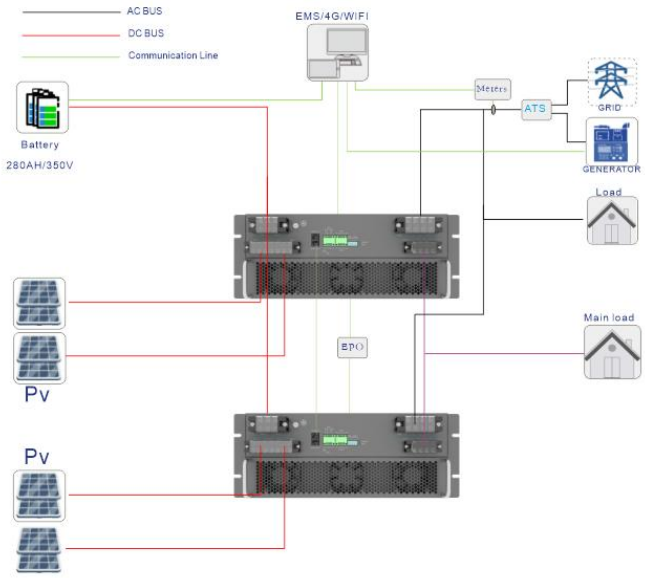


Figure 18

7. External EMS dispatch function (optional)

7.1. Microgrid EMS Introduction

An optional EMS system is available, which is a photovoltaic, energy storage and diesel version of microgrid EMS. Microgrid EMS is a key component to ensure efficient, reliable and economical operation of microgrids. It is responsible for dispatching and managing distributed generation resources, energy storage equipment, loads and possible grid-connected, off-grid and anti-reverse flow operations to ensure stable and economical operation of the system.

Figure 19

7.2. EMS Function

- Monitoring and data collection: Real-time monitoring of energy flows in microgrids, including power generation, energy storage, photovoltaics, and load conditions. Collect and record key parameters such as voltage, current, power, frequency, etc., system diagnosis, cloud platform docking, etc.
- Control and optimization: Optimize the operation of the microgrid based on energy demand and supply.
- Protection and safety: Ensure the safe operation of the microgrid, including overload protection, short circuit protection, equipment fault detection and response measures.
- Energy management: Manage the distribution of energy in the microgrid to ensure efficient use of energy, reduce waste, and may include demand response and peak-shaving strategies.

- Economic dispatch: Based on electricity price changes and energy costs, economic dispatch is performed to minimize overall operating costs.
- User interaction: Provides a user interface that allows users to view energy usage, set operating modes, and operating parameters.
- Grid-connected and islanded operation: Manage the connection and disconnection of microgrids from the main grid.
- Remote OTA: remote diagnosis of EMS and inverter faults, remote software upgrade

7.3. EMS working mode

① Self-use:

Applicable to areas with high electricity prices and low or no FIT subsidies.

The excess photovoltaic power generation is stored in the battery. When the photovoltaic power generation is insufficient or there is no photovoltaic power generation at night, the battery is discharged to supply electricity to the load, thereby improving the self-generation and self-use rate of the photovoltaic system and the household energy self-sufficiency rate, and saving electricity bills.

For example: (1) When the PV is in sufficient sunlight, the PV output power is 35kW, the load consumes 10kW, and the battery charges 25kW.

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

② Economic model:

Applicable to scenarios with large price differences between peak and valley electricity consumption.

This mode manually sets the charging and discharging time periods. For example, the night time period with low electricity prices is set as the charging time period. The system charges the battery at the maximum charging power during this time period. It is necessary to enable the "grid charging" function in the "energy storage control" and set the high electricity price time period as the discharging time period. The battery can only be discharged during the discharging time period, saving electricity costs.

③ Priority Internet Access:

Applicable to the grid-connected scenario of full-price grid-connected mode.

Photovoltaic power generation is maximized to the grid. When photovoltaic power generation exceeds the maximum output capacity of the inverter during the day, energy is stored by charging the battery; when photovoltaic power generation is less than the maximum output capacity of the inverter, the battery is discharged to ensure that the inverter outputs maximum energy to the grid.

7.4. Other EMS parameter information

See EMS specification for details