

SP100HCPS/SP125HCPS Energy Storage Converter User Manual



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1 Manual Description

This document primarily introduces the product information, installation wiring, configuration debugging, fault troubleshooting, and maintenance content of the energy storage converter. Please read this manual carefully before installing and using this product to understand the product safety information and familiarize yourself with the product's functions and features. The document may be updated periodically; please obtain the latest version of the documentation and more product information from the official website.

1.1 Applicable Products

This document applies to the following models of energy storage converters:




SP125HCPS, SP100HCPS

1.2 Applicable Personnel

Applicable only to professionals who are familiar with local regulations and standards, electrical systems, have received professional training, and possess in-depth knowledge of this product.

1.3 Symbol Definitions

To facilitate the use of this manual, the following symbols are used to highlight relevant important information. Please read the symbols and descriptions carefully.

 Danger
<ul style="list-style-type: none"> ● Indicates a highly potential hazard which, if not avoided, will result in death or serious injury.
 Warning
<ul style="list-style-type: none"> ● Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 Caution
<ul style="list-style-type: none"> ● Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Note

- Emphasis and supplement to the content, may also provide tips or tricks for optimal product use, helping you solve a problem or save time.

2 Safety Precautions

The safety precaution information contained in this document must always be followed when operating the converter.

Note

- The converter covered in this document has been strictly designed and tested in accordance with safety regulations. However, as electrical equipment, relevant safety instructions must be followed before performing any operation on the converter. Improper operation may lead to serious injury or property damage.

2.1 General Description

Note

- Due to converter version upgrades or other reasons, the document content will be updated periodically. Unless otherwise agreed, the document content cannot replace the safety precautions on the product labels. All descriptions in the document are for guidance only.
- Please read this document carefully before installing the converter to understand the converter and precautions.
- All operations on the converter must be performed by professional, qualified electrical technicians who are familiar with the relevant local standards and safety regulations.
- Damage to the converter or personal injury caused by failure to install, use, or configure the converter in accordance with the requirements of this document or the corresponding user manual is not within the responsibility scope of the converter manufacturer.

2.2 Energy Storage Converter Safety

Warning









- Ensure the voltage and frequency at the grid connection point comply with the converter's grid-tie specifications.
- It is recommended to add circuit breakers or fuses and other protective devices on the AC side of the energy storage converter. The rating of the protective device should be greater than 1.5 times the converter's AC output rated current.
- The protective ground wire of the energy storage converter must be securely connected, ensuring the impedance between the neutral wire and the ground wire is less than $10\ \Omega$.
- Copper core cables are recommended for AC output lines. If aluminum wires must be used,

please use copper-aluminum transition terminals to connect to the converter.

- When the hybrid converter triggers overload protection once, the converter can automatically restart.

 **Danger**

- When installing the converter, avoid letting the converter's connectors bear weight, otherwise it may lead to connector damage.
- After the converter is installed, the labels and warning marks on the converter must be clearly visible; obscuring, altering, or damaging them is prohibited.
- The markings on the converter are as follows:

	High voltage hazard. The converter operates with high voltage. When operating on the converter, ensure the converter is powered off.		Delayed discharge. After powering down the converter, please wait 15 minutes for the converter to fully discharge.
	Read the converter's relevant instructions carefully before operating the converter.		Potential hazard after converter operation. Take precautions during operation.
	The converter surface is at high temperature. Do not touch the converter while it is running, otherwise it may cause burns.		Protective grounding point.
	CE Mark		The converter must not be disposed of as household waste. Please dispose of the converter according to local laws and regulations, or return it to the converter manufacturer.

2.3 Battery Safety

Warning

- Before installing the battery pack, carefully read the battery pack user manual to understand the product and precautions. Please strictly follow the requirements in the battery pack user manual for operation.
- If the battery pack is fully discharged, please strictly follow the requirements in the battery pack user manual to charge the battery pack.
- The output capability of the battery pack can be affected by some environmental factors, such as temperature, humidity, weather conditions, etc., which may limit the battery pack's output capability, thereby limiting the converter's load capacity.
- If the battery pack cannot start, please contact after-sales service as soon as possible, otherwise it may cause permanent damage to the battery pack.
- Use a multimeter to measure the positive and negative poles of the battery pack output cables to ensure the positive and negative poles of the battery pack output cables are correctly connected to the positive and negative poles of the converter's battery input interface; and the battery pack output voltage is within the allowable input voltage range of the converter.

2.4 Personnel Requirements

Note

- Personnel responsible for installing or maintaining the hybrid converter must be strictly trained, understand various safety precautions, and master the correct operation methods of the hybrid converter.
- Only qualified professionals or trained personnel are allowed to install, operate, maintain, and repair the hybrid converter.

2.5 Operational Safety

When operating the converter, the operator must use insulated tools and wear safety protective equipment to ensure personal safety.

3 Product Introduction

3.1 Product Features

3.1.1 Product Positioning

A high-efficiency, high-reliability energy storage converter primarily developed for small and medium-sized energy storage microgrids. Supports multi-unit parallel operation and hybrid operation with generators. Suitable for various scenarios such as commercial and industrial peak shaving and valley filling, integrated PV and storage energy storage, islands, microgrids, farms, villas, etc., meeting the needs of different users.

3.1.2 Product Advantages

- (1) High Efficiency, High Reliability:
- (2) Low Power Consumption: Standby power consumption $\leq 15W$, no-load running loss less than 200W.
- (3) High Efficiency: Maximum conversion efficiency 98.5%.
- (4) High Protection: Core control part has IP5X protection rating, can work stably in harsh environments such as dust, high salt spray, etc.
- (5) Isolated Air Duct Design: Adopts an isolated air duct design, improving product safety and reliability.
- (6) High Overload Capability: Possesses 150% instantaneous overload capability, enhancing system adaptability and durability.
- (7) Generator Hybrid Mode: Supports hybrid operation with generators, providing flexible energy combination methods, improving energy utilization efficiency.
- (8) Three-Phase Independent Grid-Tie Control Technology: Achieves three-phase independent control, optimizes power distribution, improves system flexibility and efficiency.
- (9) Grid Adaptability: Comprehensive high/low voltage ride-through function, islanding protection, black start function, etc.
- (10) Parallel Function: AC side supports up to 15 units parallel grid-tie or off-grid operation;

DC side also supports multi-unit parallel use.

- (11) Flexible Application Scenarios: Suitable for commercial and industrial peak shaving and valley filling, integrated PV and storage energy storage, islands, microgrids, farms, villas, etc., meeting specific needs of different users.
- (12) Communication and Monitoring: Supports multiple communication protocols, supports mainstream BMS protocols, facilitating remote monitoring and management.
- (13) High Maintainability: Front wiring, front maintenance.
- (14) Fault Protection: Comprehensive fault protection and fault recording functions.

3.1.3 Specification Parameters

(1) Product Parameters

Parameter	SP100HCPS	SP125HCPS
Battery Parameters		
Maximum Battery Voltage	950V	
Minimum Battery Voltage	680V	
Rated Battery Voltage Range	680V-900V	680V-900V
Maximum Battery Current	150A	200A
AC Side (Grid-Tied)		
Rated Power	100kVA	125kVA
Rated Current	145A	181A
Rated Grid Voltage	400V/230V	
Grid Voltage Range	-20%~15%	
Grid Frequency Range	50Hz/47Hz~52Hz(60Hz/57Hz~62Hz)	
Current THD	<3% (>30% load)	
Power Factor	-1~1	
AC Side (Off-Grid)		
Rated Output Power	100kVA	125kVA
Maximum Output Power	110kVA	137.5kVA
Rated Output	145A	181A

Current		
Maximum Output Current	160A	200A
Rated Voltage	400V/230V	
Output Voltage THD	<3% (Resistive Load)	
Unbalance Degree	100%	
Frequency Range	50/60Hz	
Output Overload (Current) I _e : Rated Output Current	$I_e * 1.1 < I_{load} \leq I_e * 1.25$ $I_e * 1.25 < I_{load}$	100s 300ms
System Parameters		
Communication Ports	EMS: RS485 Battery: CAN or RS485	
DI/DO	DI: 2; DO: 2	
Maximum Efficiency	98.5 %	
Installation Method	Chassis Mount	
Losses	Standby <15W, No-load Power <200W	
Weight	≤50kg	
Dimensions	W*L*H: 440*720*200mm	
Protection	IP20	
Temperature Range	-30~60℃(Derating at 45℃)	
Humidity Range	5-95%	
Cooling Method	Intelligent Fan Speed Control Air Cooling	
Altitude	4000m (Derating use above 2000m)	
Certifications	CE, IEC62477, IEC6100, EN50549	

3.1.4 Product Operating Characteristic Curves

(1) Battery Voltage Derating Curve

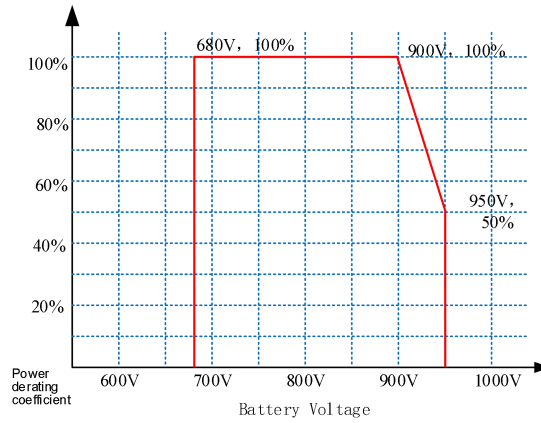


Figure 1

(2) Grid Voltage Derating Curve

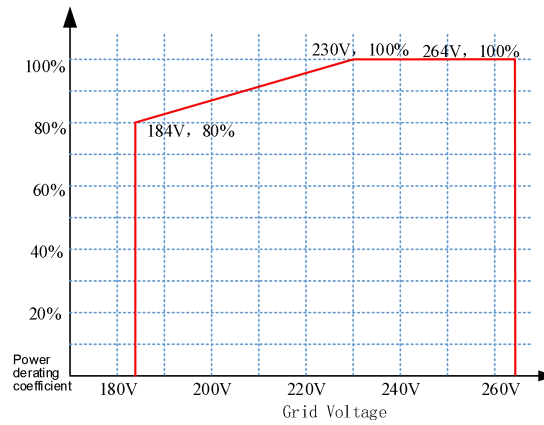


Figure 2 AC Charge/Discharge Power vs. Grid Voltage

(3) Operating Ambient Temperature Derating Curve

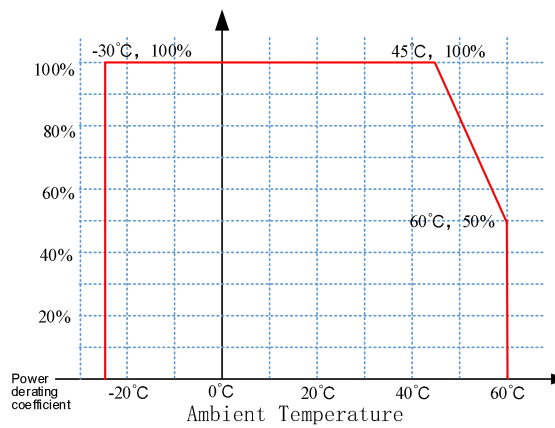


Figure 3 AC Charge/Discharge Power vs. Ambient Temperature

3.2 Classic Product Applications

Classic applications are as follows:

- (1) **Small Commercial & Industrial:** Suitable for small factories, commercial buildings, office buildings, etc., used to optimize energy consumption, achieve peak and off-peak electricity price management, reduce electricity costs, while providing emergency backup power function to ensure critical equipment can still operate normally when the grid is unstable.
- (2) **Small Island Microgrids:** In remote islands or areas without stable grid coverage, build independent microgrids to provide stable power supply.
- (3) **Farms and Agricultural Facilities:** In the agricultural field, provide power for irrigation, greenhouse control, automated equipment, etc., while supporting hybrid generator mode to ensure operation can be maintained when energy is insufficient.
- (4) **Temporary Power and Construction Sites:** In construction sites, outdoor activities, temporary facilities, etc., can be used as mobile power sources, providing necessary power support, while supporting hybrid generator operation to ensure power supply continuity.

3.2.1 Small Commercial & Industrial Energy Storage

Main Application Scenarios: Supermarkets, farms, field construction, etc.

Main Functions: Peak and off-peak electricity pricing, emergency backup power, etc.

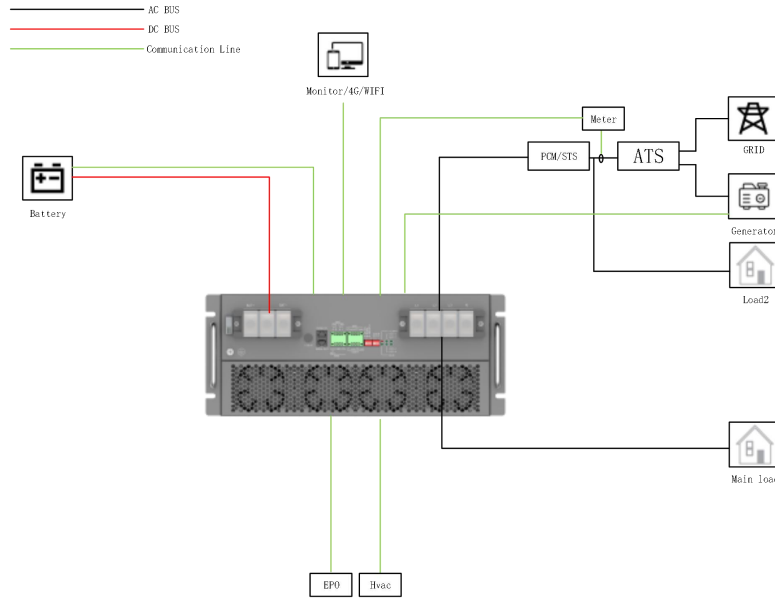


Figure 4

3.2.2 Off-Grid Microgrid Solution

Main Application Scenarios: Areas with unstable power, farms, islands, oil extraction, etc.

areas without electricity. Main Functions: Emergency backup power, generator management, fan management, etc.

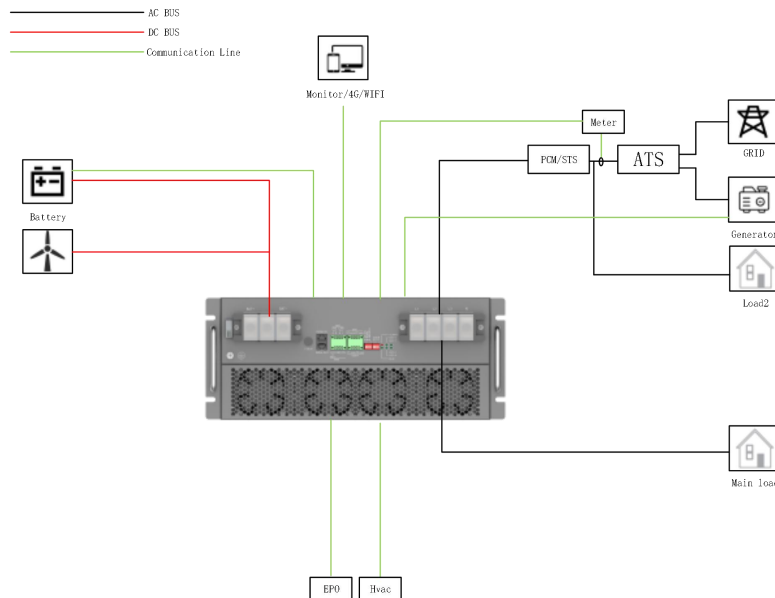


Figure 5

3.2.3 Three-Phase Unbalance and Low Voltage Mitigation

Main Application Scenarios: Grid end voltage overvoltage, undervoltage, unbalance caused by new energy integration or load fluctuation, line impedance, etc.

Main Functions: Three-phase independent grid-tie independent control, achieving energy balance, maximum compensation 150%.

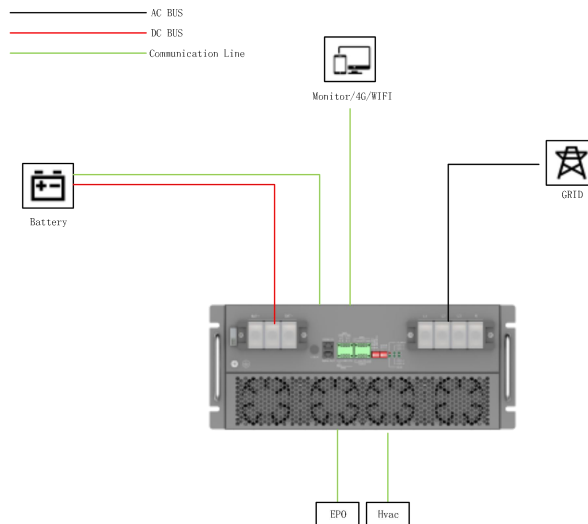


Figure 6

3.2.4 Energy Storage + Emergency Backup Power

Main Application Scenarios: EPS replacement, mobile power supply, battery echelon use, sodium-ion batteries, fuel cells, etc.

Main Functions: Supports single-phase charging function, battery maximum charge/discharge current up to 200A.

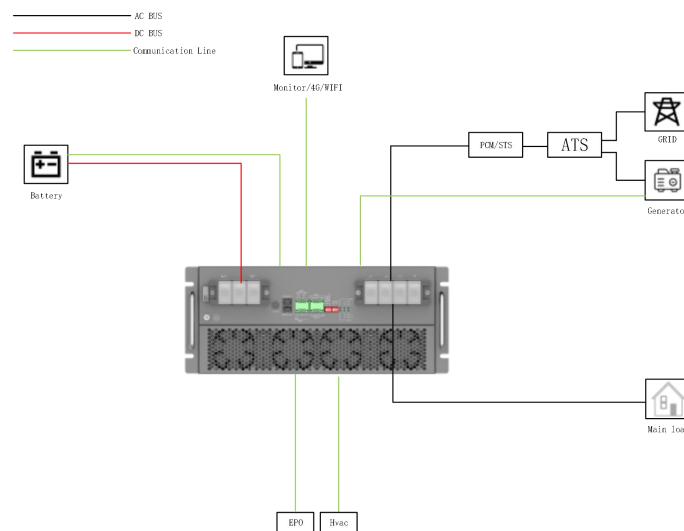


Figure 7

3.2.5 Multi-unit Parallel Scheme

Main Functions: Supports multi-unit parallel operation, supports transformerless output, supports transformer starting.

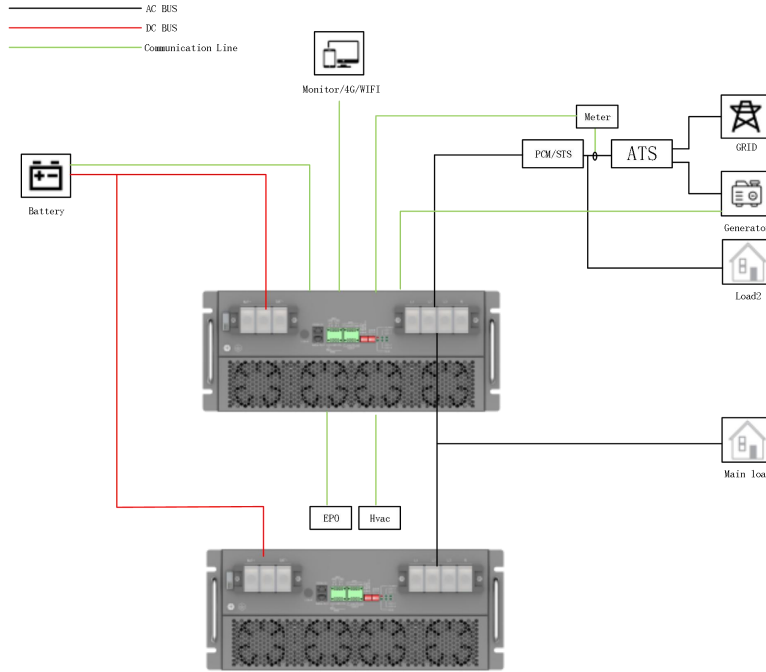


Figure 8

3.3 Model Number Rule Explanation

This document applies to the model number explanation of the SPHC series products.

No.	Code	Meaning
1	Company Name	SP: 中腾微网
2	AC Rated Power	125: AC rated output power 125kW 100: AC rated output power 100kW
3	DC Voltage Level	H: DC side input voltage within 200~1000V
4	Assembly Method	C: Chassis
5	Module Classification	G2: Hybrid Energy Storage Inverter PS: Energy Storage Converter DC: DC Converter PV: DC MPPT IV: Inverter

3.4 Product Circuit Introduction

3.4.1 Power Circuit Introduction

The power circuit schematic of the SP125HCPS, SP100HCPS series converters is shown in Figure 9. The converter internally includes a bus capacitor soft-start circuit, so the BMS may not need a corresponding bus capacitor soft-start circuit.

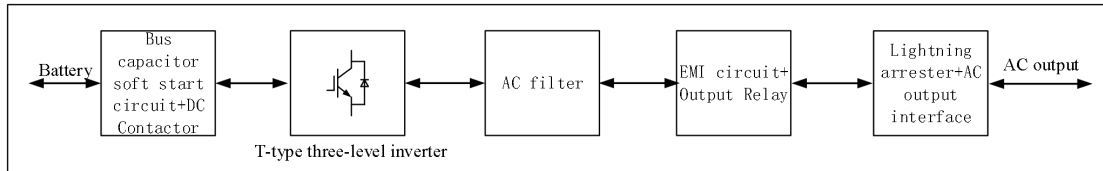


Figure 9 Power Circuit Schematic

3.5 Product Structure

3.5.1 Product Appearance



Figure 10 Product 45-degree Angle View



Figure 11 Product Front View

3.5.2 Product Dimensions

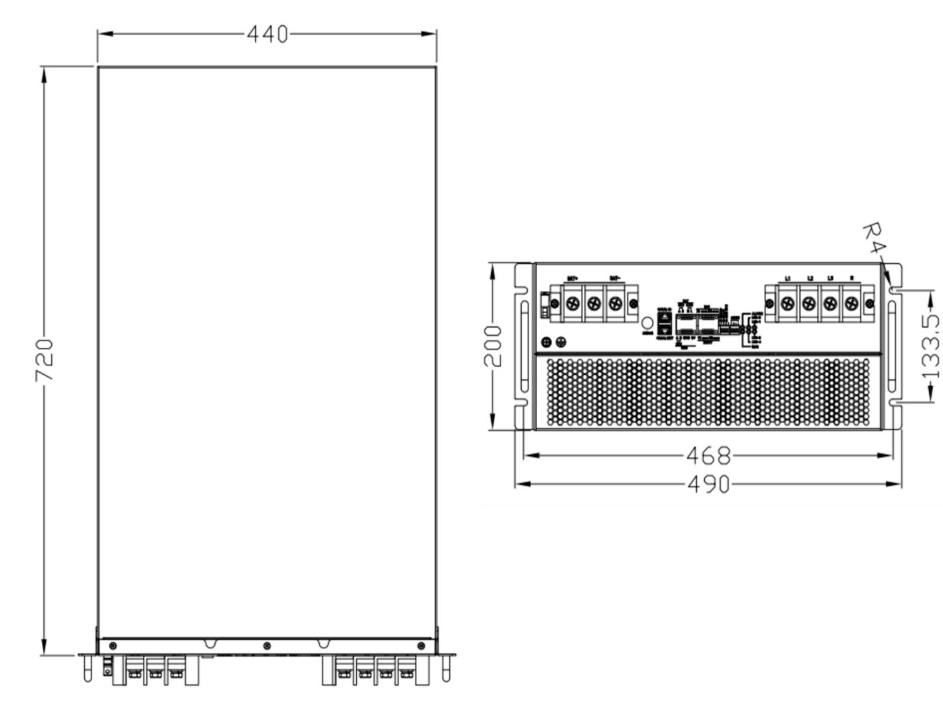


Figure 12 Product Dimensions


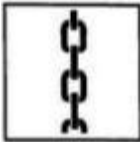
4 Transportation, Storage, and Installation




4.1 Transportation and Storage

When transporting and storing the converter module, please pay attention to the markings on the packaging box. The transportation and storage process should meet the following requirements:

⚠ Caution	
<ul style="list-style-type: none"> ● Ensure that the outer packaging of the converter is not removed during storage and transportation; ● Ensure the storage environment is free of corrosive and toxic gases; ● Ensure the storage temperature is maintained between -45°C and 70°C, and the relative humidity is maintained between 5%RH and 95%RH; ● Ensure that stacking during storage does not exceed 4 layers, and ensure there is no risk of the stack tipping over; ● Conduct regular inspections during storage; if insect damage or rodent bites are found, replace the packaging materials promptly; ● Ensure the transportation vehicles and storage warehouses meet fire safety requirements; ● If the storage time exceeds six months, the converter must be inspected and tested by professionals before being put into use; ● Avoid transporting the converter in rainy or bad weather conditions. If unavoidable, be sure to take necessary protective measures; ● If long-term storage is required, ensure that from the date of purchase, power is applied once a year for no less than 6 hours each time. 	


Packaging marking icon descriptions are shown in the table below:

Icon	Description
	Center of gravity mark, indicating the location of the energy storage converter's center of gravity.
	Lifting mark, indicating the position of chains or ropes when hoisting the energy storage converter.

	Upward mark, indicating the placement orientation when handling and placing the energy storage converter. Do not invert, place sideways, or tilt.
	Handle with care mark. Avoid severe friction or collision during transportation and placement.
	Keep dry mark. The energy storage converter should be protected from rain or moisture during transportation and storage.

4.2 Unpacking and Inspection

When unpacking the converter, perform the following checks:

 Warning	
<ul style="list-style-type: none"> ● ● ● ● ● ● 	<ul style="list-style-type: none"> ● Before unpacking, check if the converter's outer packaging is damaged. If damaged, contact relevant personnel promptly for confirmation and replacement; ● Place the converter on a level surface with the front facing up, and remove the sealing tape of the outer packaging; ● Take out the shipping accessories and confirm if there are any missing or incorrectly shipped accessories. If there are missing or incorrect accessories, contact relevant personnel promptly for confirmation and replenishment of the relevant accessories; ● Remove the cushioning foam, then require two or more people to assist in taking out the converter module to prevent the converter from falling during removal, threatening life and property safety; ● Check if the plastic film packaging bag of the module is damaged. If damaged, contact relevant personnel promptly for confirmation and replacement; ● Remove the plastic film of the module, check if there are obvious scratches or defects on the module's appearance. If there are obvious scratches or defects, contact relevant

- personnel promptly for confirmation and replacement;
- Check if the parameters on the converter module's nameplate match the purchase contract, such as model, rated power, voltage range, and other key parameters.
 - If the parameters on the converter module's nameplate do not match the purchase contract, contact relevant personnel promptly for confirmation and replacement; Dispose of the converter-related packaging materials reasonably according to local laws and regulations.

4.3 Handling and Installation




4.3.1 Installation and Handling Precautions

During the transportation, storage, or installation of the converter, the laws, regulations, and relevant standards of the country and region must be met. Before installation, the hybrid converter needs to be moved to the installation location. To avoid personal injury or equipment damage during handling, please note the following:

Warning

- Arrange personnel according to the weight of the hybrid converter to avoid injury caused by the weight exceeding the human handling capacity.
- When installing or handling the hybrid converter, wear safety gloves to avoid injury.
- Ensure the converter remains balanced during handling to prevent falling.

4.3.2 Installation Tools

Tools		
Forklift	Torque Wrench	Screwdriver
 <p>Use a forklift for short-distance carrying to prevent falling during handling, causing personal injury or equipment damage.</p>	 <p>When connecting power cables, use a torque wrench to fasten according to the relevant torque value to prevent poor contact between the power cable and the terminal due to insufficient torque or terminal damage due to excessive torque.</p>	 <p>Cross-head screwdriver for M6 screws, used to fix the module in the cabinet.</p>

4.3.3 Installation Environment

The installation environment of the converter must meet the following conditions:

⚠ Caution
<ul style="list-style-type: none"> ● The converter must be installed in a location with shelter, avoiding direct sunlight; ● The converter should be installed in a well-ventilated place to prevent affecting its performance due to poor heat dissipation; ● During operation, the surface temperature of the machine is high. Please be sure to install it in a location that is not easily touched; ● The converter must be kept away from children and special populations; ● The installation area of the converter should be away from flammable and explosive materials, and away from strong interference equipment; ● The installation rack or wall should have certain fire resistance; ● The converter should avoid being installed near office areas or residences that are sensitive to noise.

To ensure the safety of the installation personnel, relevant safety measures must be taken when installing or maintaining the product. The following procedures must be followed during electrical installation:

 Danger

- All power sources connected to the converter must be disconnected to ensure the converter is in a de-energized state.
- Warning signs must be placed at the disconnected positions to prevent re-energization during installation.
- Necessary grounding and short-circuit connections must be made.
- Live parts must be properly treated and isolated with insulating materials to avoid harm to personnel.
- Only professionals are allowed to perform installation operations on the converter. The installation process must strictly follow the user manual guidance.
- Installers must comply with the relevant electrical operating procedures of the country or region.
- Installers need to understand the voltage level of the power supply area and judge voltage compatibility.

The converter has the following environmental requirements:

 Caution

- This product is for installation inside a cabinet and needs to be installed in the final system for use;
- The installation altitude should not exceed 4000m; derating is required above 2000m, and use is prohibited above 4000m;
- The converter operating ambient temperature is between -30°C and $+60^{\circ}\text{C}$. When the ambient temperature is $>45^{\circ}\text{C}$, the converter needs to be derated;
- The converter operating ambient humidity is between 5%RH and 95%RH, without condensation;
- When the converter operates in a high-dust environment, dust filtration devices need to be added according to the site conditions, but without affecting the converter's air intake and exhaust volume;

4.3.4 Air Duct Requirements

The converter module employs forced air cooling, with the front panel serving as the air intake and the rear panel as the exhaust port. The rated air intake capacity of the converter module is 500CFM(14.1m³/min). When installed in an integrated system, the cabinet's air intake must be directly aligned with the front panel's intake port, maintaining a distance of over 110mm between the module's intake and the cabinet body. The cabinet should also incorporate dedicated air ducts and exhaust ports that directly face the module's exhaust port and the cabinet's exhaust port, ensuring a minimum distance of 110mm between the module's exhaust port and the cabinet body to prevent hot air recirculation. Where existing exhaust ducts are unavailable, a fan with twice the module's intake capacity should be installed at the cabinet's exhaust port. To accommodate the added dust-proof cotton layer required for the intake port, the cabinet's intake area must be three times larger than the module's intake area. The dust-proof cotton should be 40PPI polyurethane mesh foam with a flame retardancy rating of 94V0. The cabinet's exhaust port area should double the module's exhaust port area, and a 10-mesh insect-proof steel mesh is recommended for the

exhaust port. The intake configuration is illustrated in the reference diagram below.

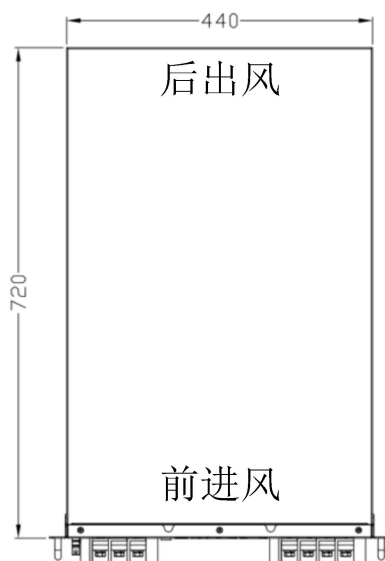


Figure 13

5 Cable Connection Instructions

5.1 Port definition

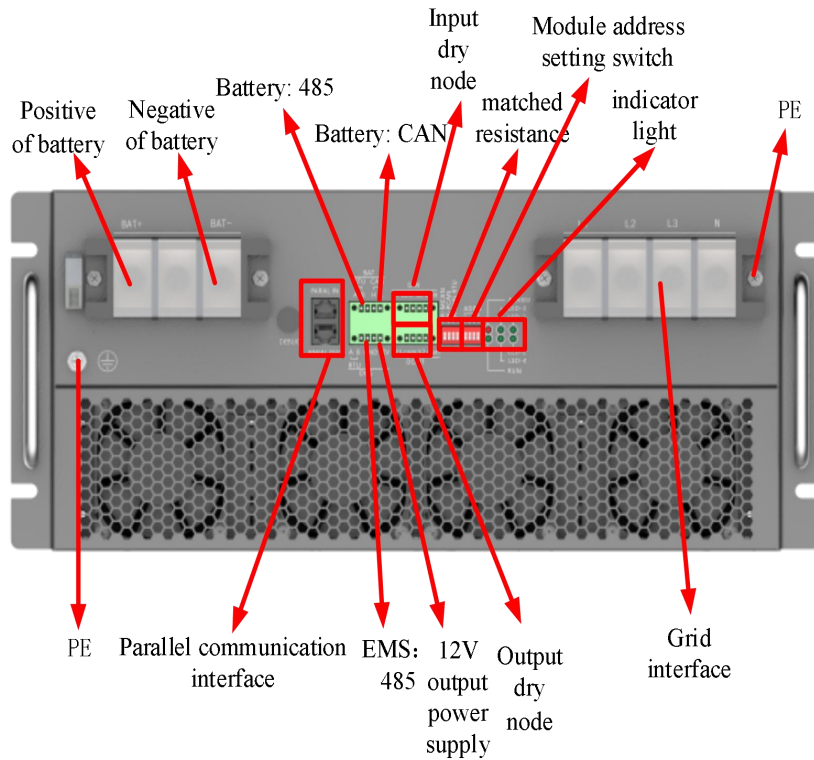


Figure 14 Port Definition Diagram

Power port definition:

Name	Function	Notes
BAT+/BAT-	Battery input terminals	OT terminal (RNB60-8), recommended with 50mm ² cable
GRID/Load(L1/L2/L3/N)	Exchange AC power terminal	OT terminal (RNB60-8), recommended with 50mm ² cable
PE	ground terminal	OT terminal (RNB22-6S), recommended with 10mm ² cable

⚠ Caution

- The power terminals of the battery interface and grid interface are secured with M8 screws. Use the included screws to fasten the power cables, with a torque of 15.5~16.5N.m. Excessive torque may damage the terminals, while insufficient torque may cause poor contact.
- The module must be reliably grounded during operation. Poor grounding may cause electric shock hazard and module damage. The fixing screw torque is 5N.m.

The signal terminal interface is defined in Figure 15

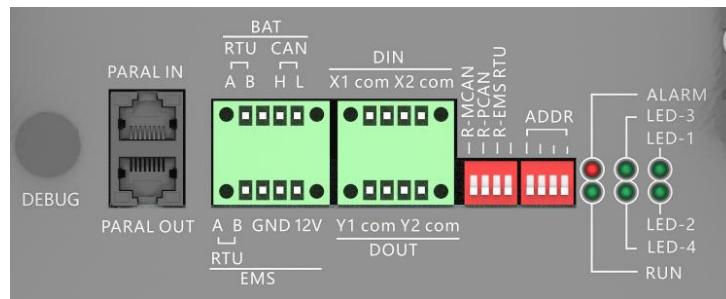


Figure 15 Signal terminal interface definition

Power port definition:

Name	Function	Notes
BAT+/BAT-	Battery input terminals	OT terminal (RNB60-8), recommended with 50mm ² cable
GRID/Load(L1/L2/L3/N)	Exchange AC power terminal	OT terminal (RNB60-8), recommended with 50mm ² cable
PE	ground terminal	OT terminal (RNB22-6S), recommended with 10mm ² cable

The signal terminal interface is defined in Figure 16

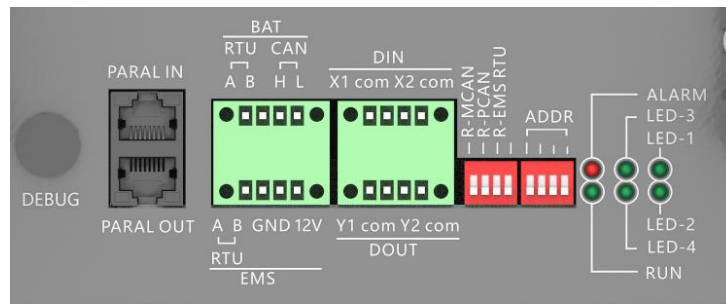


Figure 16 Signal terminal interface definition

Name	Function	Notes
PARAL IN	Parallel input	line
PARAL OUT	Parallel output	line
BAT_RTU	Battery RS485 interface	BAT communication interface
BAT_CAN	Battery RS485 interface	
RTU(A-B)	Communicate with EMS	Upper computer, EMS, or SAEMS100 (optional) coordinated control system
12V-GND	SAEMS power supply port	Output capability 12V/0.5A
X1	dry contact input	scram button
X1_com	dry contact input	
X2	dry contact input	obligate
X2_com	dry contact input	obligate
Y1	dry contact output	Output capability: The maximum voltage of the port is not higher than 24V, and the maximum current is not higher than 200mA
com		
Y2	dry contact output	
com		
R-MCAN	Parallel communication matching resistor	ON: The communication matching resistor must be connected to both the first and last modules (set the DIP switch to ON position). This means the first and last modules require parallel communication matching resistors,
R-PCAN	Parallel communication matching resistor	
R-EMS RTU	EMS RTU	

	communication matching resistor	while the others do not.
ADDR	Module address dialing	ON: represents 1, while OFF represents 0. The module address is represented in binary format, with the left side as the high bit and the right side as the low bit. For example, Module 1 is represented as 0001, and Module 3 as 0011.
DEBUG	debugging interface	For internal debugging only
ALARM	fault indicating lamp, trouble lamp	The converter fails to turn on when it is faulty and turns off when it is not.
RUN	Status indicator	The converter is normally on. When there is no fault, it flashes once per second. When there is a fault, it is often off.
LED1	obligate	
LED2	obligate	
LED3	Battery status indicator	The battery circuit function is on during normal operation. When the battery is normal, it flashes once per second. When the battery is abnormal, it is off.
LED4	Grid status indicator	It stays on during grid operation. It flashes once per second when the grid is normal and turns off when the grid is abnormal.

The schematic diagram of the output node is shown in Figure 17:

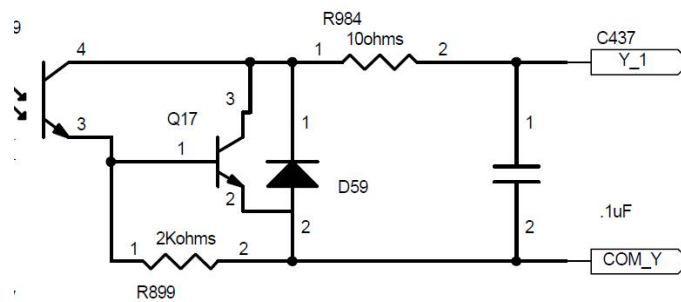


Figure 17 Output dry node internal principle

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

The internal schematic of the input node is shown in Figure 18:

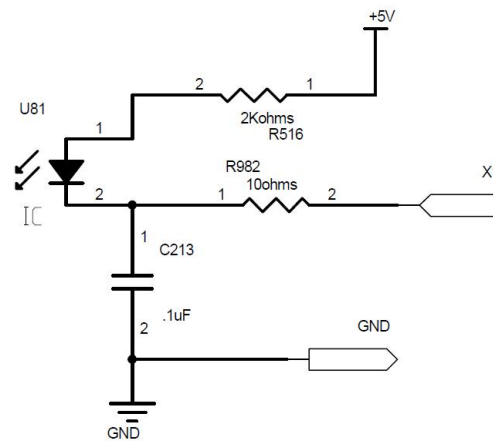


Figure 18 Input dry node internal schematic

The input node is built-in with power supply. Only a switch is required to short the external node. The sum of the short-circuit impedance of the switch and the line impedance should be less than 0.1Ω.


5.2 Cable Wiring Tool

Tools and Instruments		
multimeter	torque spanner	Wire stripper

 <p>Measure the equipment's power status</p>	 <p>Connect power wire, torque 5N.m (30kgf/m)</p>	 <p>For power cable crimping</p>
<p>bolt driver</p>	<p>decrustation pliers</p>	<p>Hot air gun (or hot air blower), heat shrink tube</p>
 <p>A screwdriver used to tighten and remove M6 screws</p>	 <p>For power cable processing</p>	 <p>Wrap the conductive part of the power cable to prevent leakage</p>

Add appropriate tools to the site as needed to avoid delays in installation due to lack of tools.

5.3 DC side wiring

 warn	
<ul style="list-style-type: none"> ● The battery voltage must not exceed the maximum allowable DC voltage of 950V of the converter, otherwise the equipment may be damaged; ● When there is a grounding fault in the system, the grounding fault must be eliminated before the wiring is carried out after the fault; ● The DC power cable screw of the converter should be tightened according to the installation torque of 4.92N.m. If the installation torque is less than this, it will cause fire due to poor contact, and if the installation torque is more than this, it will cause damage to the power terminal; ● If the wiring error of the converter, it will cause the converter to work normally, or even lead to equipment damage; ● During installation, install cables in strict order to prevent accidents. 	

The installation sequence of the battery side cable is as follows:

Step 1 Measure the battery terminal voltage with a multimeter to ensure that the battery voltage is within the input voltage range of the converter;

Step 2 Turn off the battery switch, measure with a multimeter, and confirm that the power cable to be installed to the converter is not charged;

Step 3 Cut the heat shrink sleeve to the appropriate length, and assemble the heat shrink sleeve to the power cable to be crimped;

Step 4: Use a wire stripper to strip the insulation of the power cable to the appropriate length, then put on the corresponding cold press terminal, and finally use a wire press to tighten the terminal;

Step 5 After the terminal crimping is completed, check whether the terminal crimping is reliable. If the crimping is not strong enough, cut off the terminal and repeat step 4;

Step 6 After the terminal is securely crimped, use a heat gun to heat shrink the sleeve and make the corresponding insulation;

Step 7 Connect the battery pack's positive and negative power cables to the converter's terminals "BAT+" and "BAT-". Use a torque wrench to calibrate and tighten the connection, ensuring a secure fit between the power cables and terminals.

5.4 Communication side wiring

Warning

- The power grid voltage shall not exceed the maximum allowable AC voltage of the converter 264V, otherwise the equipment may be damaged;
- When there is a grounding fault in the system, the grounding fault must be eliminated before wiring;
- The AC power cable screw of the converter should be tightened according to the installation torque of 4.92N.m. If the installation torque is less than this, it will cause fire due to poor contact, and if the installation torque is more than this, it will cause damage to the power terminal;
- During the installation process, if the phase sequence is wrong, the converter will not work normally or even be damaged;
- During installation, install cables in strict order to prevent accidents.

The installation sequence of AC power cables is as follows:

Step 1: Use a multimeter to measure the grid port voltage (phase voltage less than 264V) and ensure that the grid voltage is within the input voltage range of the converter;

Step 2 Turn off the power grid switch, measure the AC power cable and the converter AC

terminal with a multimeter, and confirm that the AC power cable and the converter AC terminal to be installed are in the non-electric state;

Step 3 Cut the heat shrink sleeve to the appropriate length, and assemble the heat shrink sleeve to the power cable to be crimped;

Step 4: Use a wire stripper to strip the insulation of the power cable to the appropriate length, then put on the corresponding cold-pressed terminal, and finally press the terminal with a wire press;

Step 5 After the terminal crimping is completed, check whether the terminal crimping is reliable. If the crimping is not strong enough, cut off the terminal and repeat step 4;

Step 6 After the terminal is securely crimped, use a heat gun to heat shrink the sleeve and make the corresponding insulation;

Step 7 Connect the power cable of the grid to the "L1", "L2", "L3" and "N" terminals of the converter grid side power terminal. Use a torque wrench to calibrate and install the torque so that the power cable and power terminal have good contact.

Step 8 Connect the AC power cable to the "L1", "L2", "L3" and "N" terminals on the converter's load side. Use a torque wrench to calibrate and install the torque so that the power cable and power terminals have good contact.

5.5 Wiring Diagram

This section mainly illustrates the wiring diagram of one cluster one management single machine, one cluster one management multi-machine parallel, and single battery pack multi-machine parallel.

- Ensure the battery pack addresses are uniquely mapped to converter addresses to prevent EMS control inaccuracies caused by PCS and battery pack mismatches.
- The SAEMS400 must communicate with all battery packs using either RTU or CAN communication. Either method is acceptable, with RTU operating at 115200 baud and CAN at 125kbps.
- The SAEMS400 communicates with converters through RTU and CAN protocols. Both protocols require simultaneous connection, with all parallel converters' RTU and CAN communication cables being individually connected.
- Ensure the matching resistor for RTU and CAN communication in the last converter module remains enabled.
- Ensure all parallel converters have unique addresses (change converter addresses via DIP configuration), with RTU communication at 115200 baud and CAN communication at 125kbps.
- The SAEMS400 communicates with the electricity meter via RTU (Remote Terminal Unit) at a baud rate of 9600, primarily to enable the external reverse flow protection function.
- For SAEMS400 product selection, please contact the relevant staff.
- STS is a product for purchase. For purchasing, please contact the relevant staff.

5.5.1 Cluster and manage single-machine connection diagram

The wiring diagram for this operational mode is shown in Figure 19. All power cables connected to the converter must be externally equipped with isolating switches. The converter operates in both grid-connected and off-grid modes, with automatic switching between them. The SAEMS400 coordinates system-wide control based on user-defined parameters, enabling the system to adapt to diverse operational requirements.

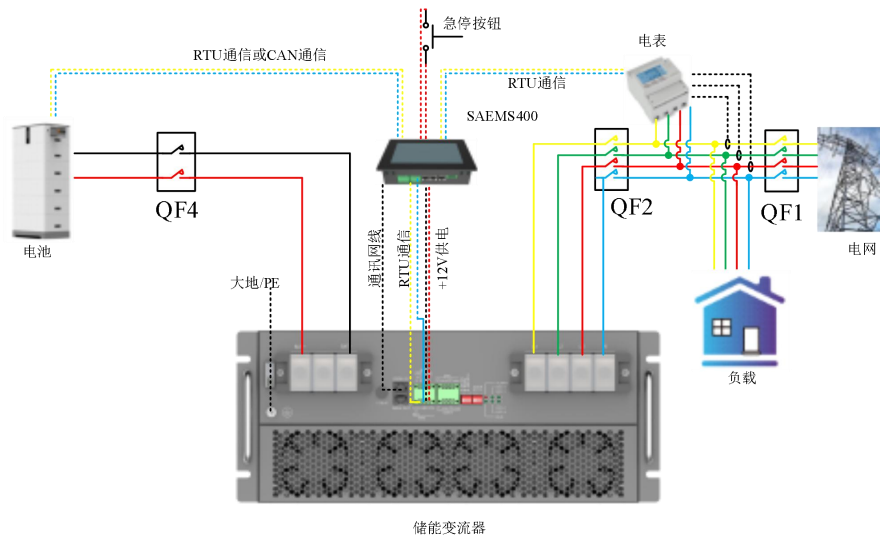


Figure 19. Diagram of cluster management wiring



- For electricity metering, we recommend the Acrel ADL400 model.
- The CT must be installed between the load and QF1; otherwise, the intended effect cannot be achieved.
- If the electricity meter is not installed, the internal anti-current function of the converter can be enabled. In this case, the load is powered by the grid, and the converter only supplies power to the important load;
- The converter must be reliably grounded, otherwise it will cause personal safety and converter damage.

5.5.2 Cluster-based management of multiple parallel (off-grid) machines

The wiring diagram for this operational mode is shown in Figure 20. All power cables connected to the converter must be externally linked to isolation switches, with the converter operating exclusively in off-grid mode. A maximum of 15 units can be connected in parallel, each converter being equipped with an independent battery pack on its battery side for one-to-one management. The SAEMS400 coordinates system-wide control based on user-defined parameters, enabling the system to operate according to diverse user requirements.

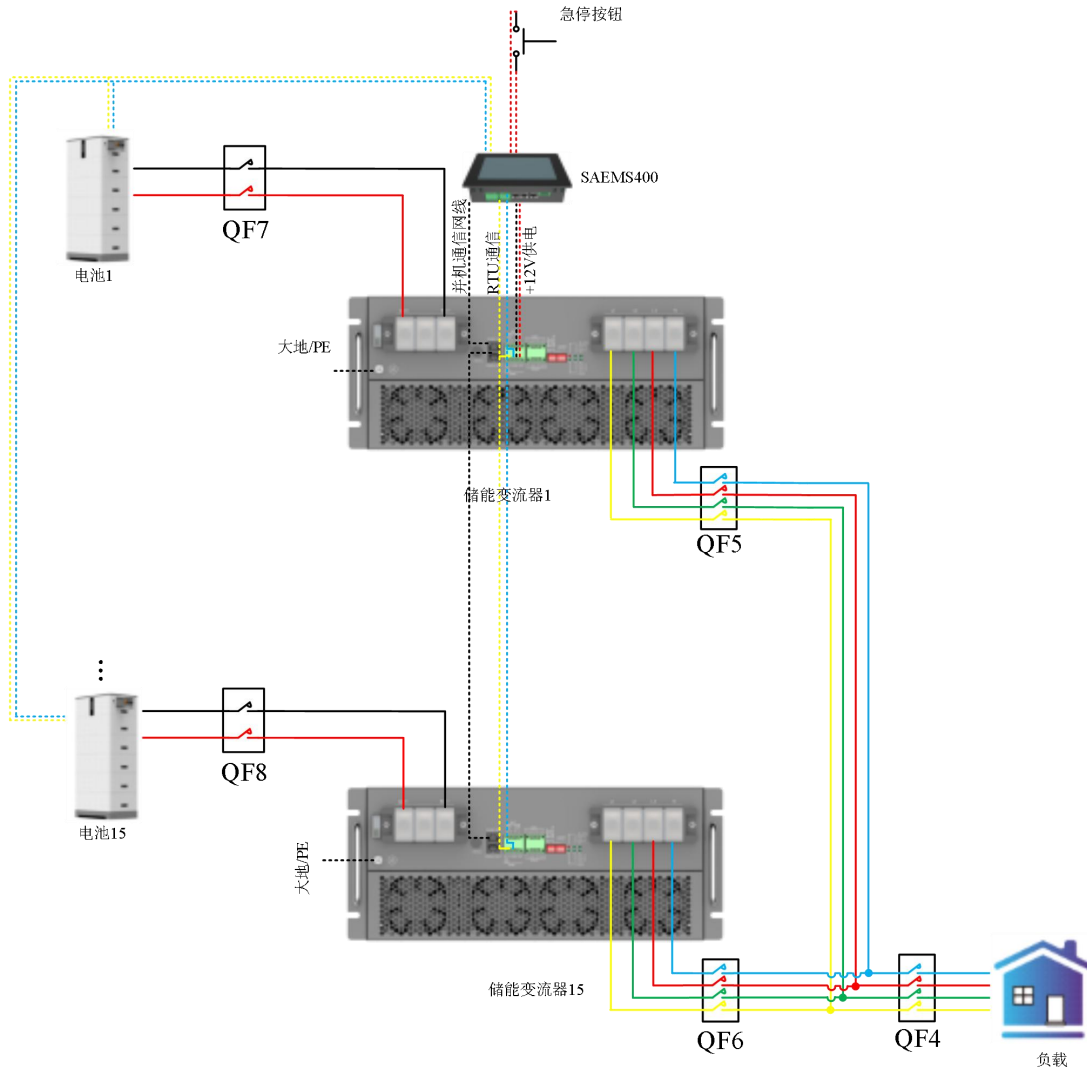


Figure 20: Diagram of a cluster managing multiple parallel-connected machines



warn

- In this wiring mode, the converter only works in off-grid mode and cannot be connected to the grid;
- All converters must be reliably grounded, otherwise personal safety and converter damage will occur.

5.5.3 Cluster-based management of multiple parallel machines (with off-grid switching)

(1) Scenarios for using up to 15 parallel units

The wiring diagram for this operational mode is shown in Figure 21. The converter requires an external STS to enable grid-connected/disconnected switching, with all power cables connected to the converter needing external isolating switches. The SAEMS400 coordinates system-wide control based on user-defined parameters, allowing the system to operate according to different

user requirements.

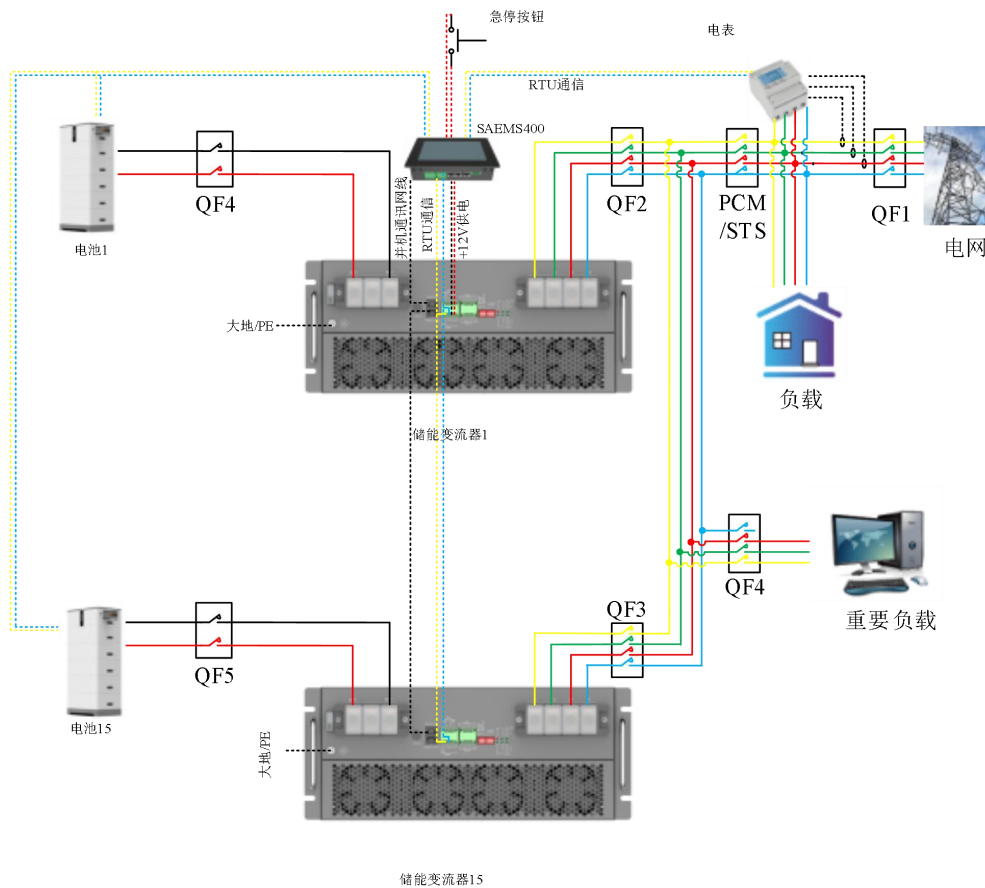


Figure 21 Schematic diagram of cluster management for multi-machine parallel wiring



warn

- For electricity metering, we recommend the Acrel ADL400 model.
- The CT must be installed between the load and QF1; otherwise, the intended effect cannot be achieved.
- If the electricity meter is not installed, the internal anti-current function of the converter can be enabled. In this case, the load is powered by the grid, and the converter only supplies power to the important load;
- All converters must be reliably grounded, otherwise personal safety and converter damage

will occur.

5.5.4 Diagram of multi-device parallel connection for off-grid battery pack

The wiring diagram for this operational mode is shown in Figure 23. The system supports up to 15 converters in parallel, with each converter operating exclusively in off-grid mode. All power cables must be connected to the converters via external isolating switches. The SAEMS400 coordinates the entire system based on user-defined parameters, enabling customized operation to meet diverse user requirements.

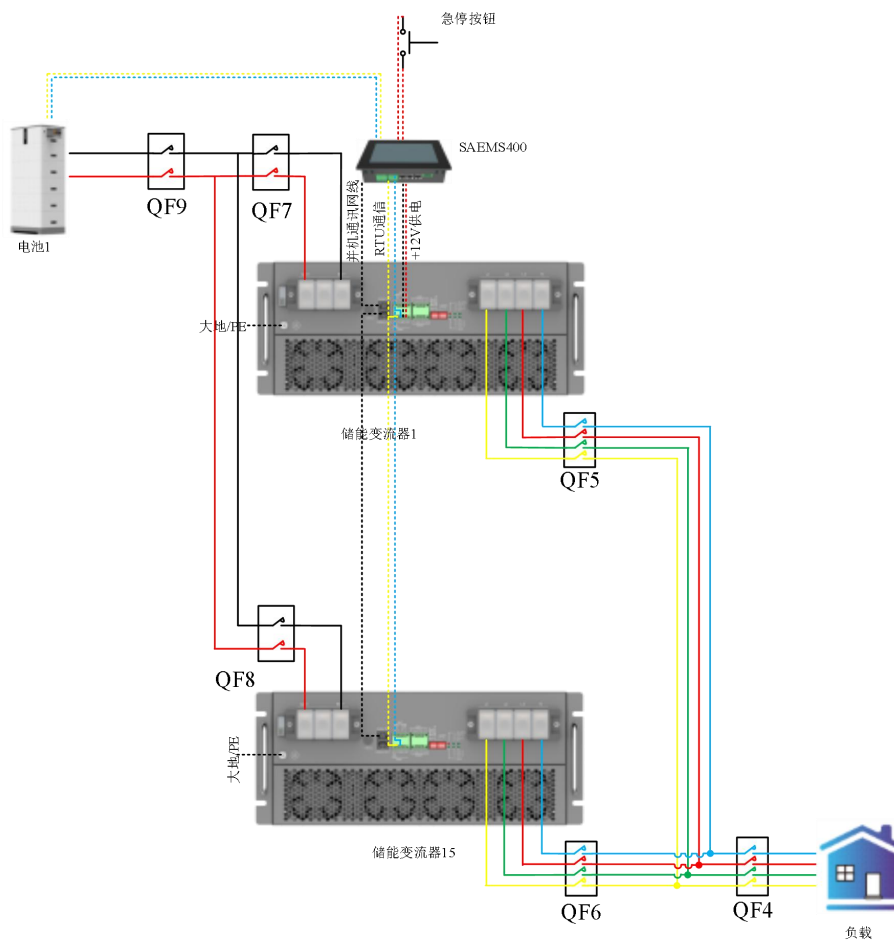


Figure 22 Schematic diagram of multi-machine parallel wiring for a single battery pack



- This wiring mode only works in off-grid mode and cannot be connected to the grid;
- All converters must be reliably grounded, otherwise personal safety and converter damage will occur.

5.5.5 Diagram of multi-unit parallel connection with single battery pack (with off-grid switching capability)

(1) Scenario for 15 parallel units

The wiring diagram for this operational mode is shown in Figure 25. This parallel configuration requires an external STS device to enable grid-off switching, supporting up to 15 units in parallel. All power cables connected to the converter must be equipped with external isolating switches. The SAEMS400 coordinates system control based on user-defined parameters, allowing the system to operate according to diverse user requirements.

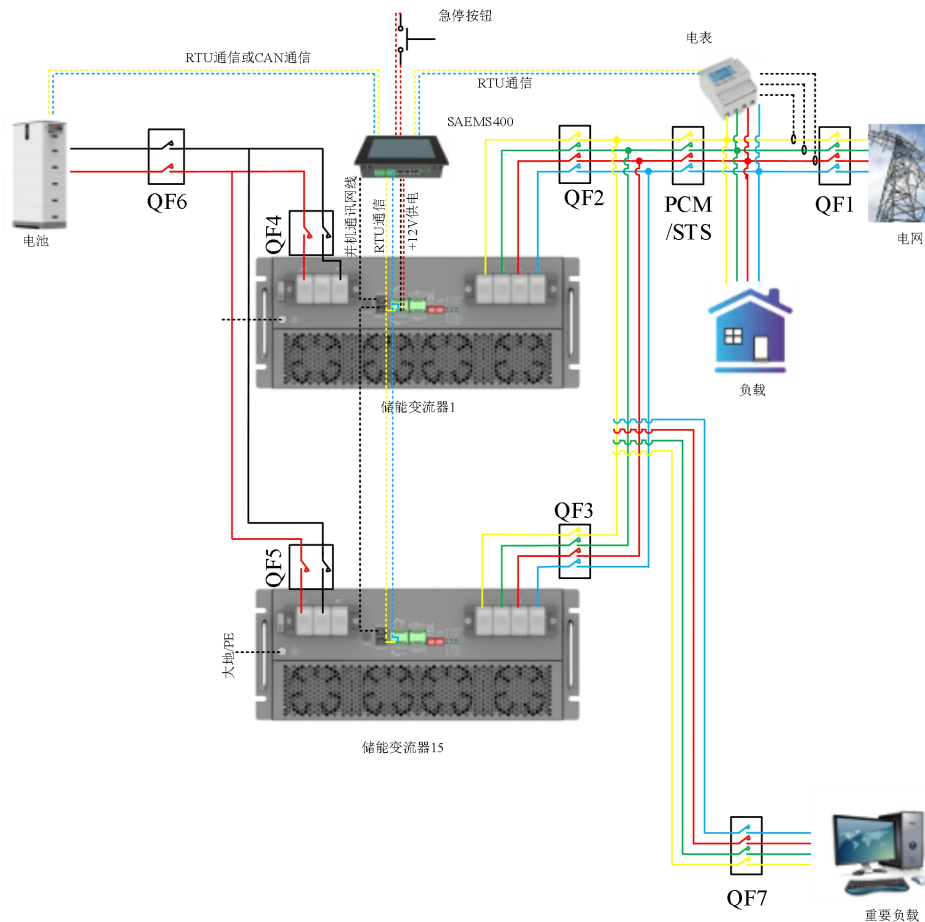


Figure 23 Schematic diagram of multi-machine parallel wiring of single battery pack



- For electricity metering, we recommend the Acrel ADL400 model.
- The CT must be installed between the load and QF1; otherwise, the intended effect cannot be achieved.
- If the electricity meter is not installed, the internal anti-reverse flow function of STS can be enabled. In this case, the load is powered by the power grid, and the converter only supplies power to the important load.
- All converters and STS must be reliably grounded to prevent personal injury and converter damage.

6 Power on/off operations and fault diagnosis

6.1 Power on/off

6.1.1 Power-on steps after initial power-on and maintenance

- (1) Connect to the network and power on

Step 1: Check whether the power cable and communication cable are connected correctly and securely, whether the module address is correct, and whether the communication matching resistor is enabled. Refer to the wiring diagram in section 5.5 for the check.

Step 2: Use the multimeter's beeper function to test for short circuits between positive and negative terminals of the battery port, and between L1, L2, L3, and N terminals of the AC port. If the multimeter's beeper sounds and displays an impedance below 2Ω , this indicates a short circuit between the tested terminals. In such cases, check for insulation damage or incorrect cable connections in the power cable. If no abnormalities are found during inspection, contact the converter maintenance team for troubleshooting. Otherwise, confirm that no short circuit exists.

Step 3: Use the multimeter's beeper function to test for short circuits between the battery port's positive/negative terminals and AC ports 'L1, L2, L3, N, and PE (grounding terminal). If the multimeter's beeper sounds and displays an impedance below 2Ω , it indicates a ground short circuit. In this case, check for insulation damage or wiring errors in the power cable. If the beeper remains silent, no short circuit is present.

Step 4: Use the DC voltage range of the multimeter to test the battery voltage and check whether the battery voltage is within the range required by the converter. If the battery voltage is not within the range required by the converter, replace the battery pack so that the battery voltage is within the range required by the converter.

Step 5: Test the grid voltage using the AC voltage range of a multimeter to verify if the phase voltage falls within the converter's specified range. If the phase voltage exceeds the required range, check the grid phase sequence and cable connections. If both the phase sequence and cable connections are correct, the converter will operate in off-grid mode. Once the grid

voltage stabilizes, the converter will automatically resume grid-connected operation.

Step 6: Close the circuit breaker at the converter's battery terminal. Wait for 10 seconds, then check if the fault indicator light and battery status indicator light on the front panel remain illuminated. If the lights are off, use the DC measurement mode of a multimeter to verify the battery voltage at the converter's battery port falls within the specified range. If not, inspect whether the power cables are properly connected and check for reverse connections at the battery port. If no reverse connections are found and the battery voltage meets the required range, contact the converter's technical support for troubleshooting. (For parallel-connected converters, close the circuit breaker at the load port while disconnecting the main circuit breaker connected to critical loads.)

Step 7: Close the circuit breaker at the converter's grid terminal. Wait for 10 seconds and check if the grid status indicator on the front panel flashes. If the indicator does not flash, use the AC detection mode of a multimeter to verify whether the voltage at the grid port falls within the converter's specified range. If not, confirm the correct connection of the power cables and check for phase sequence errors in the grid port cables. If no reversed connections are detected, this indicates a grid fault. Wait for the grid to stabilize before rechecking the converter's status. If the measured voltage at the grid port is within the specified range, contact the converter maintenance team for troubleshooting.

Step 8: Wait for the converter's fault indicator light to transition from continuously on to continuously off, with status indicators blinking at 1-second intervals. Then issue the converter's inverter startup command. After 20 seconds, observe the operational status indicator light, battery status indicator light, and grid status indicator light transitioning from blinking to continuously on at 1-second intervals. If the operational status indicator light or battery status indicator light fails to turn on continuously, verify the successful issuance of the startup command and the compatibility of the communication protocol. If the grid status indicator light does not transition from blinking to continuously on, contact the converter maintenance personnel for troubleshooting.

Step 9: Use the AC voltage test function of the multimeter to measure the voltage difference between the effective values of L1, L2, and L3 at the converter's load port and the grid phase voltage. Verify if the difference exceeds 2V. If the measured difference is greater than this

threshold, check whether the multimeter's test function matches the AC voltage measurement requirements. If the multimeter's test function is set to AC voltage and within the appropriate range, and the measured difference remains above 2V, contact the converter's technical team for troubleshooting.

Step 10: Close the main circuit breaker on the critical load side and verify its operational status. If the critical load functions normally, the converter is ready to start. If not, use the AC voltage test function on a multimeter to check the AC voltage at the critical load. Abnormal AC voltage indicates a faulty cable connection between the converter and the critical load. Normal AC voltage suggests the critical load is damaged.

6.1.2 Pre-charge steps

(1) Turn off the network gateway

Step 1: Send the shutdown command and check if the inverter's front panel status indicators (operational, grid, and battery) are blinking at 1-second intervals or remain constantly off. If any indicator stays on, verify the communication protocol with the inverter and confirm successful command delivery. If no issues are detected, contact the inverter maintenance team for troubleshooting.

Step 2: Ensure that the important load is in the off state or the external maintenance bypass switch is closed. Otherwise, the maintenance converter will cause the important load to be cut off, resulting in unnecessary loss;

Step 3: Disconnect the AC port circuit breaker and battery port circuit breaker of the converter, and hang a "Under maintenance, do not power on" sign at the circuit breaker. At this time, the converter fault indicator light is always on, and the grid status indicator light and battery status indicator light are always off;

Step 4: Use the DC and AC voltage test ranges of the multimeter to measure the voltage between the battery terminal, AC terminal, and PE. Check if the voltage drops below 60V. If it remains above 60V, wait until all terminal voltages drop below 60V before proceeding.

Step 5: Use the DC voltage test mode and AC voltage test mode of the multimeter to measure the voltage between the positive and negative battery terminals, and between the AC terminals L1, L2, and L3. Check if the voltage drops below 60V. If the voltage remains above 60V,

wait until it drops below 60V before proceeding.

Step 6: Wait for 15 minutes until the converter is fully discharged;

Step 7: Take a photo with your phone to record the cable connections, so you won't connect the wrong cables after maintenance.

Step 8: Remove the power cable and communication cable connected to the converter, and use the insulation tape to protect the cable insulation;

Step 9: Two or more people are required to remove the converter for maintenance and repair. It is strictly prohibited for a single person to maintain and repair the converter.

(2) Turn off the network

Step 1: Ensure that the important load is in the state of power off, otherwise, the maintenance of the converter will cause the power off of the important load, resulting in unnecessary loss;

Step 2: Send the shutdown command and verify if the inverter's front panel status indicator and battery status indicator are flashing every second or remaining constantly off. If both indicators stay on, check the communication protocol with the inverter and confirm successful command delivery. If no issues are detected, contact the inverter maintenance team for troubleshooting.

Step 3: Disconnect the load port circuit breaker and battery port circuit breaker of the converter, and hang a sign "Under maintenance, do not power on" at the circuit breaker. At this time, the fault indicator light of the converter is always on, and the battery status indicator light is always off;

Step 4: Use the DC and AC voltage test ranges of the multimeter to measure the voltage between the battery port, load port, and PE. Verify if the voltage drops below 60V. If it remains above 60V, continue monitoring until all voltages drop below 60V before proceeding.

Step 5: Use the multimeter's DC voltage test mode and AC voltage test mode to measure the voltage between the battery terminals (positive and negative) and between AC terminals L1, L2, L3, and N. Verify if the voltage drops below 60V. If it remains above 60V, continue waiting until the voltage across all terminals falls below 60V before proceeding.

Step 6: Wait for 15 minutes until the converter is fully discharged;

Step 7: Take a photo with your phone to record the cable connections, so you won't connect the

wrong cables after maintenance.

Step 8: Remove the power cable and communication cable connected to the converter, and use the insulation tape to protect the cable insulation;

Step 9: Two or more people are required to remove the converter for maintenance and repair. It is strictly prohibited for a single person to maintain and repair the converter.

6.1.3 The host computer controls the startup

As shown in Figure 26, when the inverter fault indicator remains off while the operational status and battery status indicators flash at 1-second intervals, select the module ID from the upper-left corner of the host computer control software. This ID must match the address dialing code on the module; otherwise, parameter settings and operations cannot be performed on the inverter. After selecting the corresponding module ID, click the "All Start" button in the lower-left corner of the control software to initiate operation. For parallel-connected inverters, enable the multi-unit mode to perform simultaneous operations. By selecting different module IDs, individual inverters can be controlled separately.



Figure 24 Schematic diagram of startup and shutdown settings

As shown in Figure 24, the converter's operational status can be determined through the 'Working Mode' option in the basic information panel at the top-left corner of the host computer software. When the converter is in grid-connected operation, users can adjust charging/discharging power by clicking 'Grid-connected Power Scheduling Method' with the left mouse button, where positive values indicate discharge power and negative values indicate charging power.

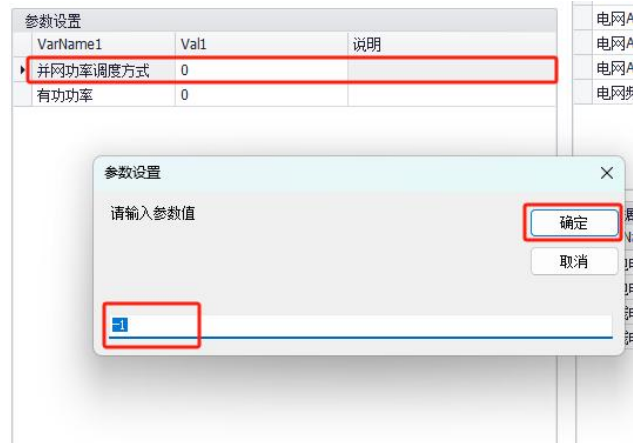


Figure 25 Power scheduling window

6.1.4 Customer EMS control system operation and power-on/off

The converter is controlled by sending on/off commands, charging power, discharging power, maximum allowable charging current, and maximum allowable discharging current through EMS. For details, refer to the relevant communication protocol.

6.1.5 Equipped with SAEMS400 for control operation and power management

The converter can be started and stopped via physical buttons, while parameters can be adjusted through the screen. Users can customize settings to meet their specific charging/discharging needs at different times. For detailed configuration instructions, please refer to the user manual of SAEMS series products.

6.2 Fault diagnosis and resolution

6.2.1 Module alarm or failure and solutions

Alarm or fault name	fault code	Shut down?	Fault recovery method	Troubleshooting measures
Soft launch failed	1	shut down	From recovery	1. Power off the module, wait 1~2 minutes, then restart the module; 2. If the issue persists after these steps, please contact Zhongteng Micro Network's customer service for assistance.
Duplicate or invalid address	3	shut down	Check before startup and restore after power loss	1. Power off the module and select a different module address from the system (address range: #1 to #10). 2. Addresses range from #1 to #10. The DIP switch is arranged from left to right, with the left side representing the high bit and the right side the low bit. The 'NO' position is valid and is counted in binary. 3. After resetting the address, power off and restart to take effect.
ECAP hitch	4	shut down	From recovery	1. Check whether the network cable between the parallel machines is not properly connected. Reconnect the network cable. 2. Replace the network cable.
AC relay short circuit	5	shut down	Power off and restart	1. When the module is powered off, check whether the inverter's intermediate relay is damaged.
CPLD wave-by-wave current limiting fault	6	Shut down	From recovery	1. The machine has overcurrent. Check the load or wiring.
Short circuit between input/output lines	8	shut down	From recovery	1. Power off the module and check whether there is a short circuit between each phase and line.
Shut down with overload protection	9	shut down	From recovery	1. The device has been overloaded for a long time. Check the load.

6.2.2 Battery issues and solutions

Alarm or fault name	fault code	Shut down?	Fault recovery method	Troubleshooting measures
Busbar imbalance	BUS 17	shut down	From recovery	1. Power off the module, wait 1 to 2 minutes, then restart the module; 2. Contact customer service.
Busbar overvoltage	BUS 18	shut down	From recovery	1. Check for overvoltage on the busbar's P and N terminals. Deactivate the system, wait for 1 minute, then reactivate it.
Busbar undervoltage	BUS 19	shut down	From recovery	1. Check whether the busbar's P and N terminals are under-voltage and whether the input voltage is too low; 2. Contact customer service.
Busbar sampling error	BUS 20	Shut down	From recovery	1. The bus voltage differs from P+N, indicating sampling error.
DC soft start failed	21	shut down	From recovery	1. Wait for the bus voltage to rise and restart the machine
Battery reversed	22	shut down	From recovery	1. Check whether the positive and negative terminals of the battery are reversed.
Battery Overvoltage	23	shut down	From recovery	1. Check whether the battery input is overvoltage. Power off and wait for 1 minute before re-powering.
Battery under-voltage	24	shut down	From recovery	1. Check whether the battery input is under voltage.
Overcharge	25	shut down	From recovery	1. Check whether the discharge is overcurrent.
Overcharge	26	shut down	From recovery	1. Check whether the current is excessive during charging.
DC contactor fault	32	shut down	From recovery	1.PTC or DC contactor malfunction.

6.2.3 Power grid faults and solutions

Alarm or fault name	fault code	Shut down?	Fault recovery method	Troubleshooting measures
Low grid frequency	33	shut down	From recovery	1. Check whether the low-frequency protection point setting of the power grid is too high; 2. Check whether the time of the low-frequency protection point of the power grid is too short;

				3. Check whether the actual frequency of the power grid is too low.
High power grid frequency	34	shut down	From recovery	<ol style="list-style-type: none"> 1. Check whether the setting of high-frequency protection point of power grid is too low; 2. Check whether the time of high-frequency protection point is too short; 3. Check whether the actual frequency of the power grid is too high.
Low grid voltage	35	shut down	From recovery	<ol style="list-style-type: none"> 1. Check whether the setting of the power grid undervoltage protection point is too high; 2. Check whether the time of the power grid undervoltage protection point is too short; 3. Check whether the actual voltage of the power grid is too low.
The power grid voltage is high	36	shut down	From recovery	<ol style="list-style-type: none"> 1. Check whether the setting of the power grid overvoltage protection point is too low; 2. Check whether the time of the power grid overvoltage protection point is too short; 3. Check whether the actual voltage of the power grid is too high.
Phase reversed	37	shut down	From recovery	1. Check whether the phase sequence is reversed.
Island failure	40	shut down	From recovery	
Abnormal output current	41	shut down	From recovery	<ol style="list-style-type: none"> 1. Check whether the current output is overcurrent; 2. Check for short circuit in AC output.
The inverter overcurrent is abnormal	43	Do not turn off	Alerts, self-recovery	The machine inductor current is inconsistent with the output current.
Abnormal leakage current	47	Do not turn off	Alerts, self-recovery	1. Check whether the leakage current protection point is set too low;

				2. Check whether the time of leakage current protection point is too short; 3. Check whether there is insulation problem in the power circuit (check when power is off).
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6.2.4 Module system failure and solution

Alarm or fault name	fault code	Shut down?	Fault recovery method	Troubleshooting measures
Fan failure	50	Do not turn off	Alerts, self-recovery	1. Check whether the fan is damaged.
Model error	52	shut down	From recovery	1. Failed to lock phase in VF mode.
Auxiliary source error	53	shut down	From recovery	1. Check whether the auxiliary voltage is too low.
SysFault	54	shut down	From recovery	1. Report other faults that cause the shutdown. To eliminate this fault, first eliminate the other faults.
Arm hitch	55	shut down	From recovery	1. Check for dialing code errors, communication interruptions, or emergency stop failures.
Overheating fault	57	shut down	From recovery	1. Check whether the machine environment is too high and strengthen ventilation.
IGBT temperature anomaly	58	shut down	From recovery	1. Check whether the temperature difference between the three IGBTs is excessive.
Flash initialization	59	shut down	From recovery	1.EEPROM chip initialization

error				failed
Internal communication failure	61	shut down	From recovery	1. Check whether the wiring between DSP and ARM is unstable or disconnected. 2. Does the DSP or ARM lack a program?
CPLD unusual	64	shut down	From recovery	1. The CPLD hardware version number is incorrect.

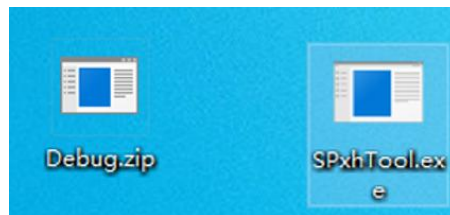
7 Installation and use of the host computer

7.1 Install and uninstall the host computer

(1) Software installation

Step 1: Extract the installation package "Debug.zip" to generate the executable file "SPxhTool.exe".

Step 2: Double-click the executable file "SPxhTool.exe" to run the software directly.



7.2 Host computer usage

(1) communication junction

Connect the PC to the EMS RTU communication port.

(2) Upper computer software debugging function

a) Communication Page

Step 1: Select basic information. The user type is customer, and the model and language are optional.

Step 2: As shown in Figure 30, during RTU communication, users must select the corresponding serial port and baud rate (default: 115200). After completing parameter selection, click Connect.

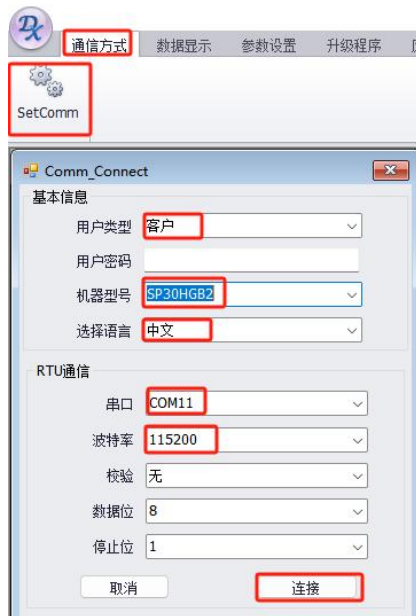


Figure 26

a) Display interface

The main information display interface is shown in Figure 27:

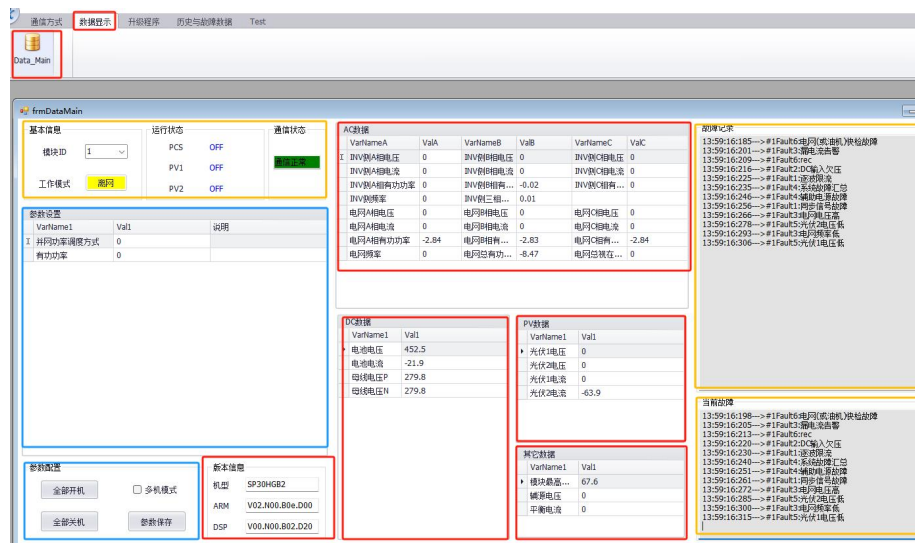


Figure 27 Information display interface

The red boxes contain read-only data, including AC data, DC data, PV data, version information, and other information. The yellow boxes indicate status information, while the blue boxes represent configurable data or information.

Information bar features (yellow box):

pay attention to

- You can select the target module ID from the dropdown options to control it.
- In the status bar, the running part of the device is marked as "Run", and the closed part is marked as "OFF".

- In the communication status box, the color is green when communication is normal and red otherwise.
- The fault record box displays all faults (including historical and current ones). When a new fault occurs, the fault record accumulates. Double-click to clear the fault information.
- The fault box displays real-time updates. When a fault changes, the information in the box updates. Double-click to clear the fault information.

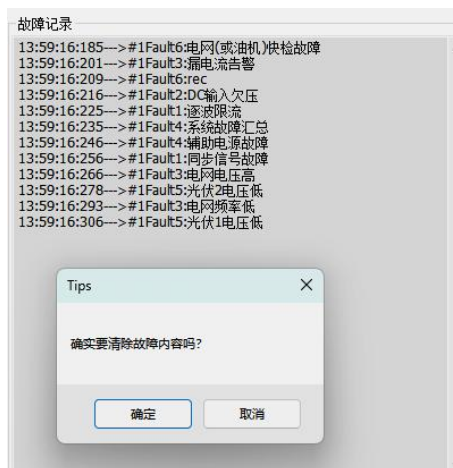


Figure 28

Description of the data or information settings bar (in the blue box):

- pay attention to
- Multi-device mode: If you select multi-device mode from the lower-left corner, all devices will be turned on or off. If not selected, the operation will only affect the devices in the current module.
 - Parameter settings: Left-click anywhere on the parameter row to open a pop-up window for configuration.

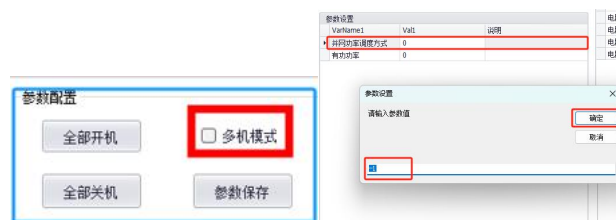


Figure 29

7.3 Upgrade function for host computer

7.3.1 ARM native upgrade

The specific steps for ARM native upgrade are shown in the figure.

Step 1: Close all information display and parameter settings interfaces.

Step 2: Select "Local ARM Upgrade";

Step 3: Select "ARM" from the dropdown menu.

Step 4: Select the modules to upgrade. You can upgrade a single module or multiple modules simultaneously.

Step 5: Select the files to upgrade. The upgrade file path must not contain Chinese characters or special characters such as parentheses. The file name must include the device model as a prefix and an underscore as a separator, such as "SP30HGB2_MASTER_CPU.hex".

Step 6: Click Start Upgrade. You can check the upgrade status in the upgrade process interface. If the upgrade fails, follow the upgrade steps to find the reason. If the upgrade is successful, the ARM upgrade is complete.

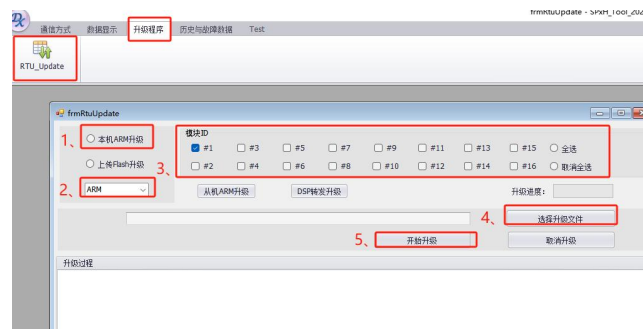


Figure 30

7.3.2 Local DSP Upgrade

pay attention to

- The DSP firmware upgrade consists of two phases: First, the upgrade program is uploaded to the ARM's Flash memory; second, the stored program is transferred to the DSP. During the upgrade, all other interfaces must be disabled to prevent failure. The upgrade file path must not contain Chinese characters or special symbols like parentheses, and the file name should include the device model as a prefix with an underscore as the separator, e.g., "SP30HGB2_0424.out".
- The first phase of the DSP firmware upgrade involves the following steps: Step 1: Select 'Upload Flash Upgrade'; Step 2: Choose 'DSP' from the dropdown menu. After completing these four steps, click 'Start Upgrade'.
- After completing the first upgrade phase, proceed to the second phase. After selecting the first two steps, click "DSP Forward Upgrade" to start the second phase. You can check the upgrade progress using the progress bar (if the selection box is gray, this step will be skipped by default).

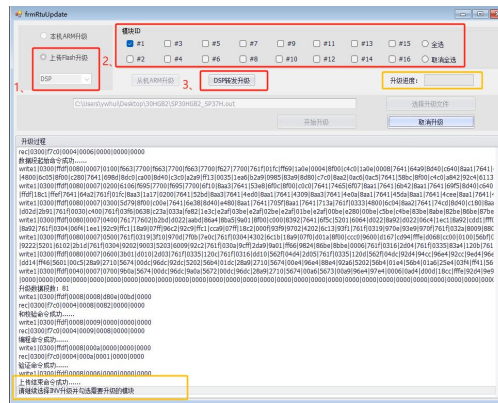


Figure 31

7.4 History and Error Page

7.4.1 history

Select the module ID, click Query History, and click Export to Excel if needed to export the data.

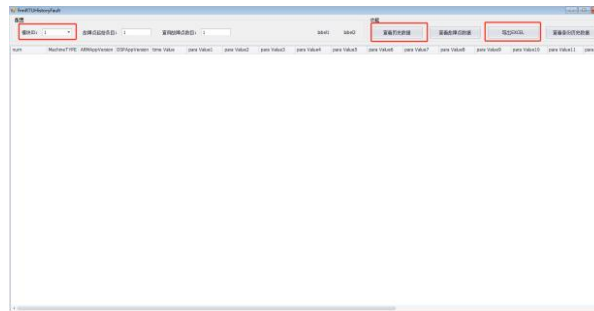


Figure 32

7.4.2 fault data

Select the module ID and the starting entry for the fault point, which indicates the address offset for querying fault point data (default is 1, representing the latest fault record). The default fault point count is 1 (multiple queries are not supported). Click Query Fault Point Data, and if needed, click Export to Excel to export the data.

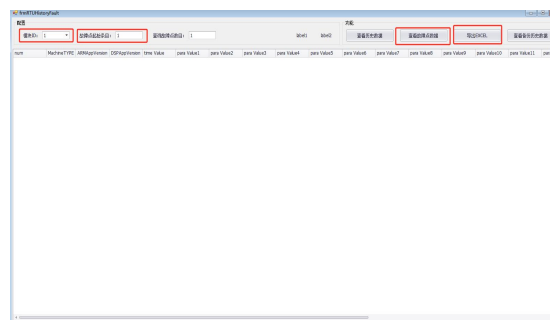


Figure 33