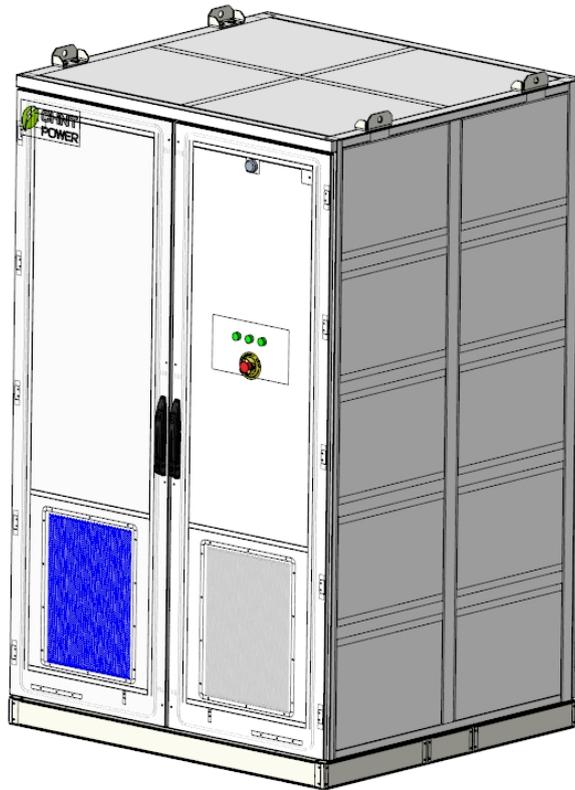


CPS STS 500K

Static Transfer Switch Cabinet

User Manual



Shanghai Chint Power Systems Co., Ltd.

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1 Preface

This operation and maintenance manual applies to the CPS STS 500K Static Transfer Switch Cabinet (hereinafter referred to as "STS Cabinet") developed and produced by Shanghai Chint Power Systems Co., Ltd (hereinafter referred to as "CHINT").

IMPORTANT!



- Please keep this manual under the care of a designated person.
 - Before performing any operations, please read this manual carefully and ensure full understanding of all contents.
-

Main contents

This manual includes instructions on how to operate the STS Cabinet, such as how to debug and properly shut down the cabinet, maintenance plans for the cabinet, and considerations for the handling and recycling of system hardware. Therefore, before using this system, please read this manual carefully and operate the cabinet according to the methods described in this manual, otherwise it may cause equipment damage or personal injury.

Target audience

This manual is only applicable to authorized and qualified after-sales service engineers or authorized operators.

Copyright restrictions

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Version upgrade

Due to product updates and improvements, the manual content will be updated, adjusted, and corrected accordingly. Please refer to the actual product for the purchased items. You can obtain the latest version of the manual through the corresponding sales channels or download the latest operation and maintenance manual from our official website www.chintpower.com.

2 Safety Precautions

The following warnings, safety instructions, and precautions are provided as safety measures to prevent damage to the product or connected equipment components. This document summarizes the warnings and safety precautions generally applicable when using the STS Cabinet. Please read this information carefully for your personal safety and to help extend the product's service life. If personnel injury or equipment damage occurs due to failure to follow the safety instructions in this manual for operation and maintenance, our company reserves the right not to assume responsibility or provide quality assurance!

This manual addresses and reduces the risk of personnel exposure to electrical hazards through effective equipment operation, design, specifications, installation, and maintenance. All electrical work should be performed in accordance with local electrical, building, fire, and other applicable codes, standards, regulations, or utility requirements for the project, and should be carried out by qualified service personnel who have received appropriate training and authorization based on relevant instructions and corresponding training.

2.1 General Safety Requirements

Before using this system, please note the following safety warning information. This information is very important, and familiarity with it will make your operation and maintenance safer:

- Do not smoke or ignite flames near the battery!
- Do not clean the battery with organic solvents!
- Do not disassemble the UPS battery. It contains electrolyte, which is harmful to skin and eyes!
- Do not throw the UPS battery into fire, as it may explode!
- Replacing the UPS battery may cause electric shock or short circuit. Please use tools with insulated handles for operation!
- Keep a distance of 0.5m from heat sources or any place that may generate sparks (such as circuit breakers, fuse boxes, etc.)!
- Avoid the risk of local overheating, such as direct sunlight on the battery PACK.

Before using this system, please note that only qualified personnel with valid electrical knowledge certification or certificates meeting regulatory requirements and safety standards, and with relevant work experience, are allowed to work on circuits and equipment. Such personnel must be fully familiar with all warnings and maintenance procedures described in these operating instructions:

The following requirements must be met before operation and maintenance:

- All live electrical work must be performed under a live work permit. Before starting electrical operations, certified personnel should disconnect and verify that the equipment is de-energized and perform appropriate lockout/tagout procedures.
- Before operation and maintenance, relevant personnel should receive safety training and fill out the 'Safety Training Records', as detailed in Annex 1 Safety Training Records.
- Before operation and maintenance, prepare the required personal protective equipment (PPE) according to the requirements of Annex 2 Personal Protective Equipment List.
- Before operation and maintenance, be sure to disconnect the grid power supply and ensure that the battery system is in a disconnected state.
- All power cables should be considered live unless appropriate power-off measures have been taken.
- All battery racks have formed a conductor grounding network.
- When the fixing screws are M8 hexagon screws, the tightening torque range is 19~24N.m, and a torque wrench should be used for fixing. Before debugging, the tightness of the screws at the busbar must be checked when the system is disconnected from the power supply and completely voltage-free. The screws must be re-tightened every time the equipment is transported.
- Before conducting other electrical performance tests, check whether the cable fixing screws are loose; if they are loose, use special tools to tighten them first.
- The repair and replacement of all components must be completed by certified personnel, and only approved materials, parts, and components can be used for replacement.
- Daily maintenance of the STS Cabinet is strictly prohibited in severe weather conditions such as storms, heavy rain, and thunderstorms.

2.2 Personnel Safety Requirements

- Personnel operating the equipment include professionals and trained personnel.
Professionals: Those who are familiar with the principles and structure of the equipment, have training or experience in operating the equipment, and can clearly identify potential sources and magnitudes of various hazards during the installation, operation, and maintenance of the equipment.
Trained personnel: Those who have undergone corresponding technical and safety training and have the necessary experience, can be aware of the potential hazards that may arise during a certain operation, and can take measures to minimize the hazards to themselves or other personnel.
- Personnel responsible for installing and maintaining the equipment must first undergo strict training, master the correct operation methods, and understand various safety precautions and relevant standards in their country/region.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect and repair equipment.
- Personnel in special scenarios such as electrical operations, high-altitude operations, and special equipment operations must have the special operation qualifications required by the local country/region.
- Replacement of equipment or components (including software) must be completed by authorized professionals.
- Except for personnel operating the equipment, others should not approach the equipment.

2.3 Electrical Safety Requirements

General Requirements

- Installation, operation, and maintenance must be carried out in accordance with the sequence of steps in the manual. Do not modify, add, or change the equipment without authorization, and do not alter the installation sequence without permission.
- Permission from the local power department in the country or region is required before the system can be connected to the grid.
- Before installing or removing power cables, the equipment itself and its upstream and downstream switches must be disconnected.
- If liquid is found inside the equipment, immediately turn off the power and discontinue use.
- Before operating the equipment, carefully check that the tools used meet the requirements and record them in the log. After the operation, ensure all tools are accounted for to prevent them from being left inside the equipment.
- Before installing power cables, ensure that the cable labels are correct and that the cable terminals are properly insulated.

- When installing the equipment, use a torque tool with the appropriate range to tighten the screws. When using a wrench, ensure it is not tilted and that the torque value error does not exceed the specified 10%.
- If the equipment has multiple inputs, disconnect all inputs and wait until the equipment is completely powered off before performing any operations.
- Regularly check the terminal screws of the equipment to ensure they are tightened and not loose.
- If the cable is damaged, it must be replaced by a professional to avoid risks.
- Do not alter, damage, or obscure the labels and nameplates on the equipment. Replace any labels that have become unclear due to long-term use.
- Do not clean the internal or external electrical components of the equipment with solvents such as water, alcohol, or oil.

Grounding requirements

- The grounding impedance of the equipment must meet the requirements of local electrical standards.
- The equipment should be permanently connected to the protective grounding. Before operating the equipment, check the electrical connections to ensure the equipment is reliably grounded.
- Do not operate the equipment without installing a grounding conductor.
- Do not damage the grounding conductor.
- For equipment with a three-core socket, ensure that the grounding terminal in the three-core socket is connected to the protective grounding.
- For equipment with high touch current, the protective grounding terminal of the equipment chassis must be grounded before connecting the input power to prevent electric shock from the equipment's touch current.

Wiring requirements

- The selection, erection, and routing of cables must comply with local laws, regulations, and standards.
- During the laying of power cables, loops and twists are strictly prohibited. If the power cable is found to be insufficient in length, it must be replaced. It is strictly prohibited to make joints or solder points in the power cable.
- All cables must be securely connected, well insulated, and of appropriate specifications.
- Cable trays and wire holes should have no sharp edges. The positions where cables pass through pipes or holes must be protected to avoid damage from sharp edges or burrs.
- Cables of the same type should be bundled together, appearing straight and neat without damage to the outer sheath. Different types of cables should be laid separately, and mutual entanglement or cross-laying is prohibited.

2.4 Installation Environment Requirements

- The temperature and humidity environment for equipment storage should be suitable, stored in a clean, dry, and well-ventilated area, and protected from dust and condensation.

- When installing the equipment, ensure that the installation surface is sturdy and meets the load-bearing requirements of the equipment.
- It is strictly prohibited to install and operate the equipment beyond the specified technical parameters, as this will affect the performance and safety of the equipment.
- It is strictly prohibited to install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, plugging and unplugging outdoor signal interfaces, working at heights, outdoor installation, opening doors, etc.) in severe weather conditions such as thunderstorms, rain, snow, or winds above level 6.
- It is strictly prohibited to install the equipment in environments with direct sunlight, dust, smoke, volatile gases, corrosive gases, infrared radiation, organic solvents, or excessive salt content.
- It is strictly prohibited to install the equipment in environments with metal-conductive dust or magnetic-conductive dust.
- It is strictly prohibited to install the equipment in areas prone to the growth of microorganisms such as fungi and mold.
- It is strictly prohibited to install the equipment in areas with strong vibrations, strong noise sources, or strong electromagnetic interference.
- After installing the equipment, clear the area of empty packaging materials such as cardboard boxes, foam, plastic, and cable ties.

2.5 Mechanical Installation Requirements

General Requirements

- Without evaluation by our company, arc welding, cutting, and other operations on the equipment are prohibited.
- Without evaluation by our company, it is prohibited to install other equipment on top of the device.
- Please use the correct tools and master their proper usage.

Drilling Safety

- Customer and contractor approval must be obtained before drilling.
- Safety protective equipment such as goggles and protective gloves should be worn during drilling.
- Avoid embedded pipes or lines during drilling to prevent short circuits or other hazards.
- Protect the equipment from debris during drilling, and clean up debris promptly after drilling.

2.6 Warnings and Labels

2.6.1 General Warning Labels

Symbol	Meaning
	<p>WARNING - ELECTRIC SHOCK HAZARD!</p> <p>Do not touch system connectors or terminals. Do not open the enclosure door unless proper lockout/tagout procedures and related training have been performed in accordance with local regulations and rules.</p>
	<p>WARNING - ARC FLASH HAZARD!</p> <p>All electrical equipment poses a risk of arc flash. Any equipment modification (such as opening doors) carries a serious risk of arc flash. Arc flash incidents can cause severe injuries. Proper training is required in accordance with local regulations.</p>
	<p>WARNING - FIRE HAZARD!</p> <p>Fire may occur under certain fault conditions.</p>
	<p>CAUTION - SHARP OBJECTS!</p> <p>Multiple sharp objects are present in most system components. Be aware that working around equipment enclosures can easily trigger serious injury risks.</p>
	<p>CAUTION - ELECTROSTATIC SENSITIVE!</p> <p>Electrostatic discharge can damage electronic equipment. Proper handling procedures are required. Wear a grounded anti-static wrist strap and prevent electrostatic discharge when contacting grounded surfaces near the equipment.</p>
	<p>DANGER - HIGH VOLTAGE!</p> <p>The STS Cabinet supports multiple power supplies. Dangerous voltage may be present even when the equipment is not operating. Ensure you fully understand the precautions and warnings in this installation manual. Failure to do so may result in serious injury or death. Follow all safety procedures issued by the manufacturer.</p>

2.6.2 Lockout/Tagout Instructions

Danger

Always follow all applicable lockout/tagout procedures. Failure to follow proper lockout/tagout procedures may result in serious injury or death.

When power is applied to STS Cabinet, dangerous voltages exist on certain components. To prevent accidental death or injury, non-professionals should not touch any components inside the enclosure. To reduce the risk of electric shock, ensure all equipment is properly grounded.

Warning

The STS Cabinet door must remain closed unless access to the interior is required. If possible, personnel should maintain a safe distance from the enclosure when the equipment is energized. Always follow local and national lockout/tagout guidelines when working near STS Cabinet. Lockout and tagout procedures must meet or exceed the aforementioned requirements.

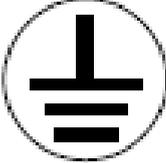
All guidelines outlined in the Chint safety document. Before entering potentially hazardous areas or starting work on STS Cabinet, complete the following regulations:

- Identify and wear appropriate protective clothing and footwear.
- Identify and isolate all power sources and stored energy.
- Use appropriate lockout/tagout devices. When performing lockout/tagout on STS Cabinet, do not touch anything inside the cabinet unless explicitly instructed in the work procedure.
- Complete site-specific lockout/tagout procedures and safety checklists before starting work.

General warning

- When energized, this system poses potential hazards of electric shock, death, and burns. Only authorized personnel fully familiar with the equipment and adequately trained may install, operate, or maintain this equipment.
- To avoid death, personal injury, or product damage, follow all safety procedures specified in the national "Environmental Health and Safety (EHS) Guidelines," and ensure all power sources and stored energy are isolated.
- To avoid the risk of electric shock, death, and burns, strictly adhere to approved grounding practices and procedures.
- To avoid personal injury and equipment damage, personnel working at heights must comply with the national "High-altitude Work Site Regulations."
- To prevent personal injury or equipment damage due to equipment failure, only personnel with relevant training may modify any programmable machines.
- Always ensure compliance with local relevant standards and regulations.
- Certified equipment is used as a critical component of the safety system. Never assume that a safety-critical control loop is functioning properly; always follow the procedures during operation.

Please note the warning signs inside and outside the STS Cabinet.

Warning signs inside the STS Cabinet			
			
Please read the manual carefully	Warning	Danger - live electricity	Recycle
Warning signs outside the STS Cabinet			
			
Protective grounding	Emergency stop	Fire Extinguisher	Warning Electricity
			
General Warning Sign	No Smoking	Accumulator Battery Room	

2.6.3 Terms and Definitions

Terms	Definitions
BMS	Battery Management System, used to detect battery parameters such as voltage, current, and temperature, and manages and controls the battery status. It aggregates information from multiple battery clusters, communicates with the PCS to control charging and discharging, and provides dry contact inputs/outputs as needed. It also communicates with environmental management systems and other equipment as required.
ESMU	Energy Storage Management Unit, the master control module in BMS, which communicates with the main control module to query the information inside the module, and summarizes the information of multiple battery clusters; communicates with HMI to query on the corresponding HMI; communicates with the background to query in the corresponding background; communicates with PCS to control the charging and discharging of PCS; and inputs and outputs dry contacts as required, and communicates with air conditioning, fire protection and other system equipment as required.
LEMS	Local Energy Management System, used to monitor and manage liquid-cooled cabinet.
STS module	Static Transfer Switch module, used to achieve millisecond-level fast switching between dual power sources or between the grid and microgrid to ensure uninterrupted power supply for important loads.
Branch circuit breakers for all circuits	Includes the main grid-connected circuit breaker and branch circuit breakers for liquid-cooled cabinet, diesel generators, photovoltaic inverters and important load connections.
Power distribution communication module	Mainly includes system communication components and system equipment power supply components, located in the upper part of the STS cabinet.
Combiner unit	Mainly realizes combiner-related functions, including combiner copper bars.
Measurement units	<ul style="list-style-type: none"> • Voltage unit: "V" (Volt) • Current unit: "A" (Ampere) • Power unit: "W" (Watt) • Capacity unit: "Ah" (Ampere-Hour)

	<ul style="list-style-type: none">• Energy unit: "Wh" (Watt-Hour)• Internal resistance unit: "mΩ" (milliOhm)• Temperature unit: "°C" (degree Celsius)• Length unit: "mm" (millimeter)• Time unit: "s" (second)• Frequency unit: "Hz" (Hertz)• Mass unit: "kg" (kilogram)• Force unit: "N" (Newton)
--	---

3 Product Introduction

3.1 Application Scenarios

The STS Cabinet is widely used in renewable energy integration, commercial and industrial (C&I), and utility applications. The STS Cabinet is used with CPS ES-125kW/261kWh-EU liquid-cooled commercial and industrial integrated cabinet (hereinafter referred to as liquid-cooled cabinet) and is mainly suitable for microgrids, BCP (emergency power supply in case of accidents or disasters), peak shaving and valley filling, photovoltaic self-consumption, VPP virtual grids, or grid dispatch system solutions to improve energy utilization efficiency and enhance power quality. The STS Cabinet features millisecond-level switching, high efficiency, energy saving, environmental protection, high integration, easy installation, standardized solutions, intelligent control, remote monitoring, and user-friendly operation. It is stable in performance, safe, reliable, and has a long service life.

3.2 Product Components

3.2.1 Product Annotation

The STS Cabinet consists of multiple components, including STS modules, LEMS, BMS, UPS, AC circuit breakers, copper bars, etc. The detailed system annotation is shown in the following figure:

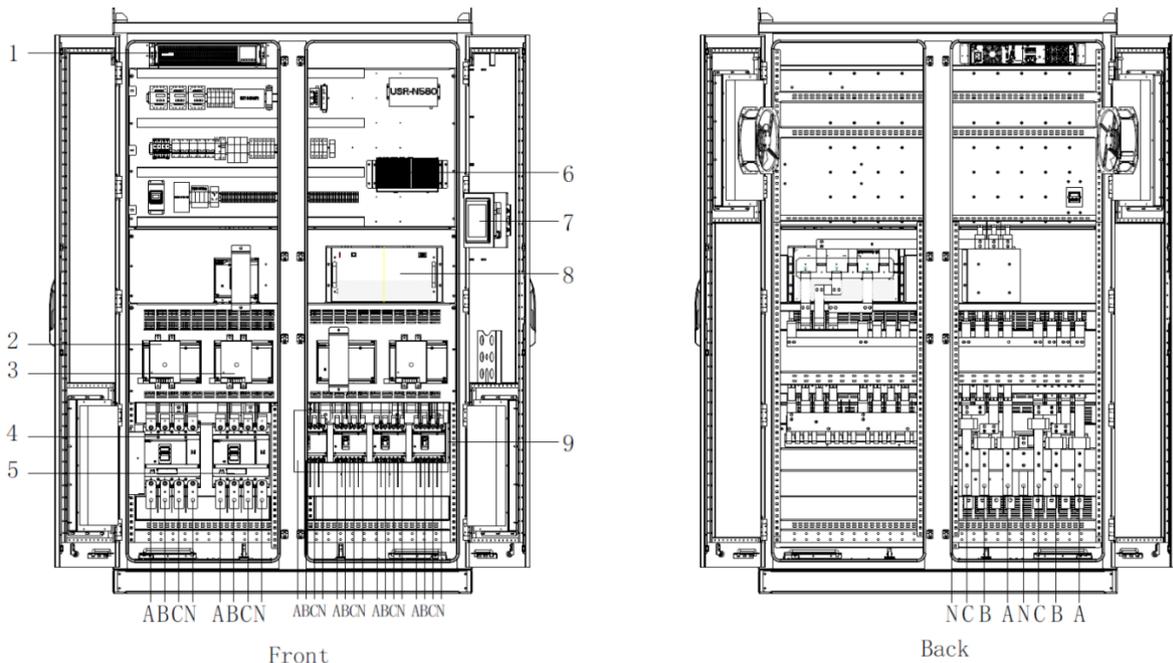


Figure 3-1 System Component Annotation Diagram

Table 3-1 System component details

Number	Name	Code	Function
1	Uninterruptible Power Supply	UPS	Uninterrupted Auxiliary Power Supply
2	Molded Case Circuit Breaker	QFM1	Grid-side Switch
3	Molded Case Circuit Breaker	QFM2	Diesel Generator/PV Switch
4	Molded Case Circuit Breaker	QF4	Important load Switch
5	Molded Case Circuit Breaker	QF5	Specific PV Switch
6	Local Energy Management System	LEMS	Energy Management
7	Energy Storage Management Unit	ESMU	Battery Status Management
8	Seamless Transfer Switch	STS	Uninterrupted switching
9	Molded Case Circuit Breaker	QF6-9	Liquid-cooled cabinet switch

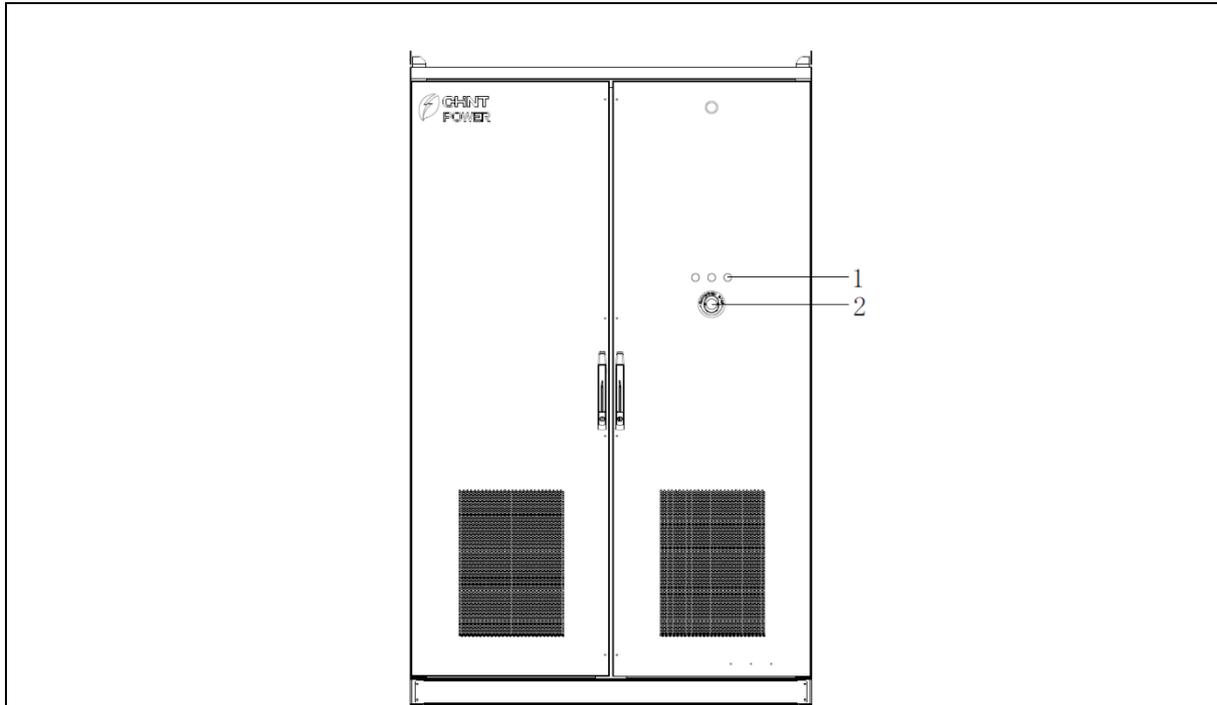
3.2.2 Product Detailed Parameters

Table 3-2 Product Detailed Parameters

Project	Parameters	Remark
System Name	CPS STS 500K	
Grid Port		
Wiring Type	3P4W	
Rated Voltage (V)	400	
Rated Current (A)	721	
Rated Frequency (Hz)	50/60	
Rated Power (kW)	500	
Normal PV or GEN Port		
Wiring Type	3P4W	
Rated Current (A)	721	
Auto Start	Support	

Project	Parameters	Remark
Rated Power (kW)	500	
PCS Port		
Wiring Type	3P4W	
Rated Current (A)	180*4	
Rated Power (kW)	125 * 4	
Important load		
Wiring Type	3P4W	
Rated Current (A)	721	
Rated Power (kW)	500	
Micro-Grid PV		
Wiring Type	3P4W	
Rated Current (A)	721	
Rated Power (kW)	500	
Dimensions (W*D*H, mm)	1500*1370*2400	
Protection level	IP54	
Corrosion Protection level	C3	
On-off Grid Switch Time (ms)	<20	
Certification	IEC 61000	

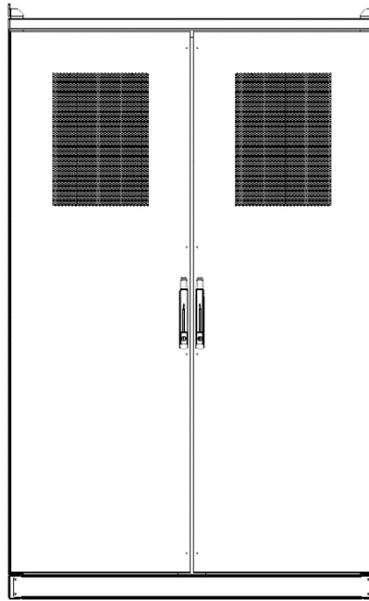
3.3.3 Product View Description



Front view:

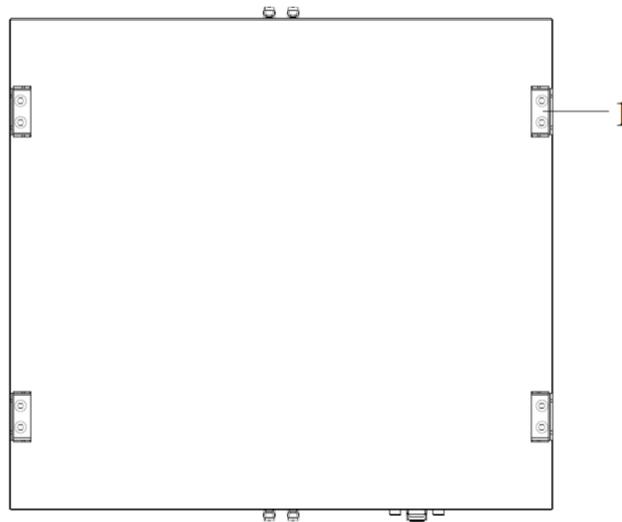
1. The front view of the STS Cabinet includes the left front door and right front door of the equipment;
2. The equipment door is equipped with indicator lights: red for Online Status, green for Run, yellow for Failure, and an emergency stop button;
3. On the front cabinet door, corresponding to the internal equipment area, ventilation and heat dissipation mesh holes are designed.

No.	Name
1	Indicators
2	Emergency stop button



Rear view:

1. The rear view of the STS Cabinet includes the left rear door and right rear door of the equipment;
2. Exhaust devices are arranged on the left and right rear doors;



Top view:

1. There are 4 lifting lugs on the top of the STS Cabinet for convenient on-site hoisting;

No.	Name
1	Lifting lug

3.3.4 Product Incoming and Outgoing Cables

To facilitate on-site cable connection, all cables between internal devices of STS Cabinet are pre-connected before leaving the factory.

Cables between the STS Cabinet and external devices are routed through the bottom of the STS cabinet. All incoming and outgoing cables of the STS Cabinet should be properly protected, and cable conduits should be protected against rodent damage. After cable connection, all cable entry points should be sealed with fireproof putty or other appropriate materials.

The cable entry/exit holes (hole 1-4) at the bottom of the STS Cabinet are shown in the following figure.

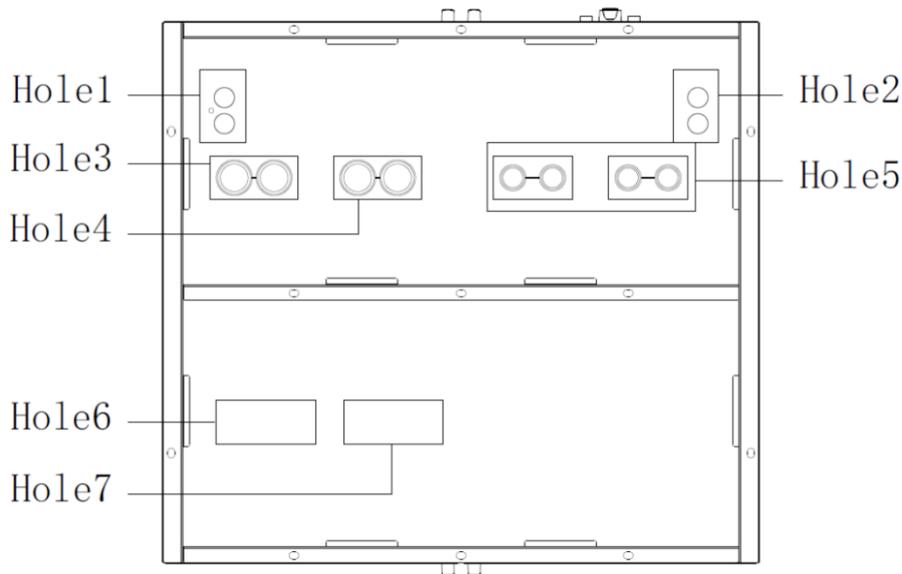


Figure 3-4 Cable Incoming/Outgoing Holes

The functions of each hole are as follows:

Table 3-3 Cable Incoming/Outgoing Holes Description

Number	Name	Description
Hole 1	Communication cable port	The communication cable is connected to external equipment through this hole. Aperture: $\Phi 50\text{mm}$
Hole 2	Communication cable port	The communication cable is connected to external equipment through this hole. Aperture: $\Phi 50\text{mm}$

Hole 3	Output AC power cable	The AC power cable is connected to the important load through this hole. Aperture: $\Phi 80\text{mm}$
Hole 4	Output AC power cable	The AC power cable is connected to the specific PV through this hole. Aperture: $\Phi 80\text{mm}$
Hole 5	Output AC power cable	The AC power cable is connected to the liquid-cooled cabinet through this hole. Aperture: $\Phi 60\text{mm}$
Hole 6	Output AC power cable	The AC power cable is connected to the specific PV through this hole. Customers drill holes according to actual needs.
Hole 7	Output AC power cable	The AC power cable is connected to the specific PV through this hole. Customers drill holes according to actual needs.

3.3.5 Nameplate

Users can identify the STS Cabinet through the nameplate, which is located at the lower right corner of the front door of the STS cabinet, as shown in Figure 3-5. Detailed nameplate information is shown in Figure 3-6.

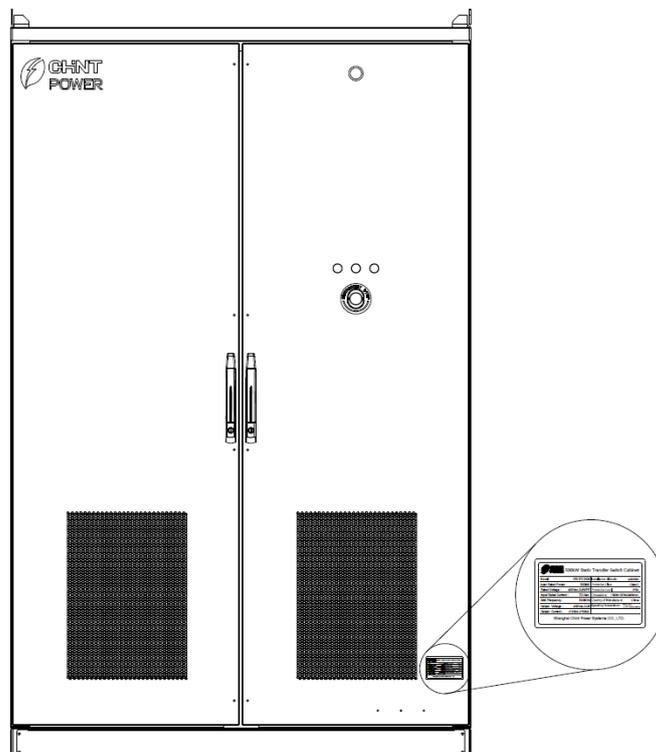


Figure 3-5 Nameplate Location

 500kW Static Transfer Switch Cabinet			
Model:	CPS STS 500K	Installation Altitude:	≤2000M
Input Rated Power:	500kW	Protective Class:	Class I
Rated Voltage :	400Vac,3L/N/PE	Protection Level:	IP54
Input Rated Current :	721Aac	Dimensions:	1500x1370x2400mm
Grid Frequency:	50/60Hz	Country of Manufacture:	China
Output Voltage :	400Vac,3L/N	Operating Temperature:	-25°C~55°C (> 45°C Reduce power)
Output Current :	2*250A 2*500A		
Shanghai Chint Power Systems CO., LTD.			

Figure 3-6 Nameplate

The nameplate contains the following information:

- Product name, specifications, and model;
- Manufacturer's name and trademark;
- Country of manufacture;
- Technical parameters:
 - System operating parameters: rated output voltage (V), rated output current (A), rated operating frequency (Hz), etc.;
 - Operating temperature.


WARNING!

Warning: The parameters on the product nameplate are very important. Damage and removal are strictly prohibited!

3.4 BMS System

The BMS adopts a 3-level architecture, with hardware consisting of ESBMM, ESBCM, and ESMU. The installation locations of BMS components are as follows:

Table 3-4 Installation locations of BMS components

Device level	Device name	Installation location	Function
Level 1, battery PACK level	ESBMM	Inside the battery PACK maintenance panel of liquid-cooled cabinet	Detect the voltage and temperature information of the cells in the battery PACK
Level 2, battery cluster level	ESBCM	Inside the high-voltage box of liquid-cooled cabinet	Data collection, analysis and decision-making; cluster-level protection; information uploaded to ESMU;
Level 3, system level	ESMU	Inside the STS Cabinet	Collect information from each ESBCM and communicate with LEMS and SCADA

The installation location diagram of ESMU in the equipment compartment is as follows:

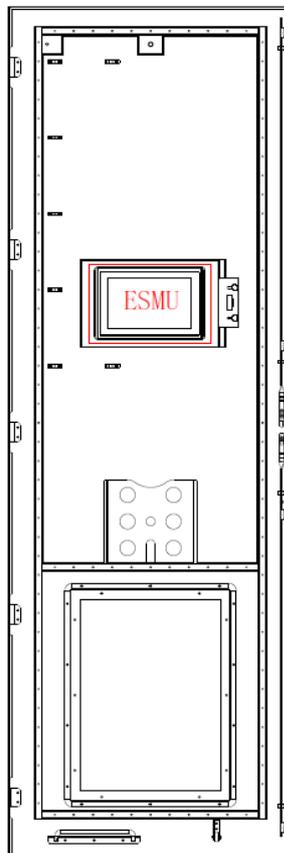


Figure 3-7 ESMU installation location

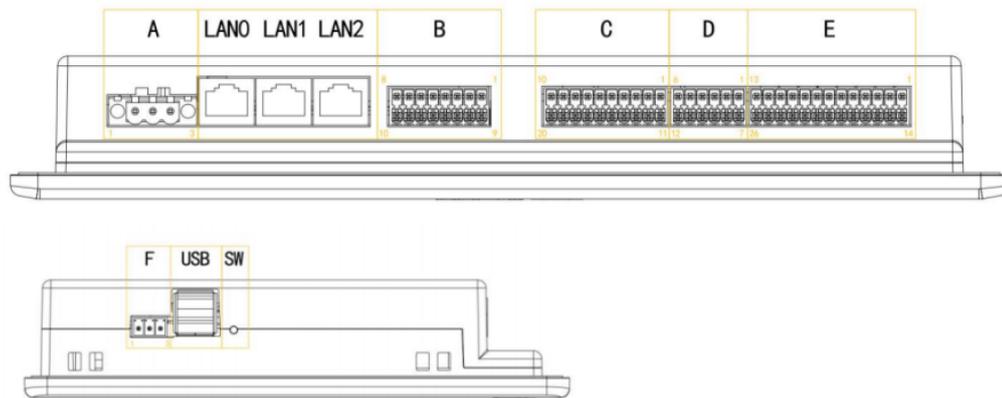


Figure 3-8 ESMU interface

In the interface distribution of ESMU, port A is the power port, LAN is the Ethernet communication port, B, C, D, E, and F are communication ports, USB is the data export and upgrade program import port, and SW is the auxiliary firmware button.

ESMU has a total of 11 pairs of output dry contact interfaces, located on all pins of the E interface.

In conventional design, when the BMS system fails, ESMU will output a dry contact closure signal, which is connected to the PCS input dry contact to achieve fault linkage and ensure system safety.

The definitions of interfaces of ESMU are as follows:

Table 3-5 ESMU interface definitions

Port name	No.	Port definition	Function description	Recommended use
A	1	V+	Positive power supply input	Power input
	2	V-	Negative power supply input	
	3	PE	System grounding	
LAN	-	LAN0	100M/1000M Ethernet	LEMS
	-	LAN1	100M/1000M Ethernet	LEMS
	-	LAN2	10M/100M Ethernet	ESBCM

3.5 LEMS System

The energy management system LEMS is the energy dispatch and management center of the STS Cabinet. LEMS is the brain of the STS Cabinet, mainly responsible for collecting all battery management system data, PCS data, and grid-side data, issuing control commands to various parts, controlling the operation of the entire STS Cabinet, and reasonably arranging the work of PCS. The system can operate automatically according to preset charging/discharging time, power, and operation mode, or it can operate according to dispatch commands.

The installation location diagram of LEMS is as follows:

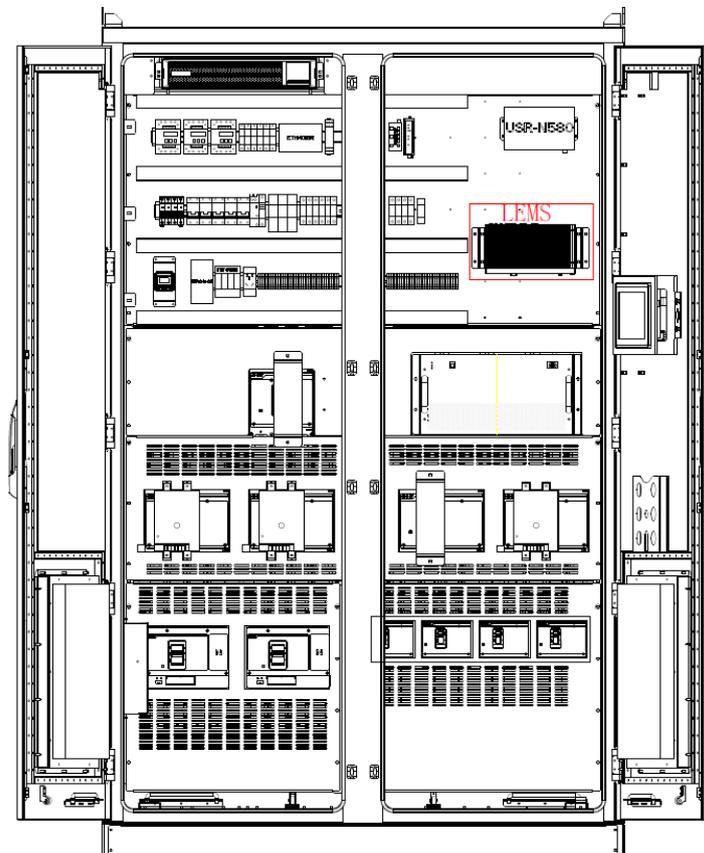


Figure 3-9 LEMS installation location

3.5.1 LEMS Control System Diagram

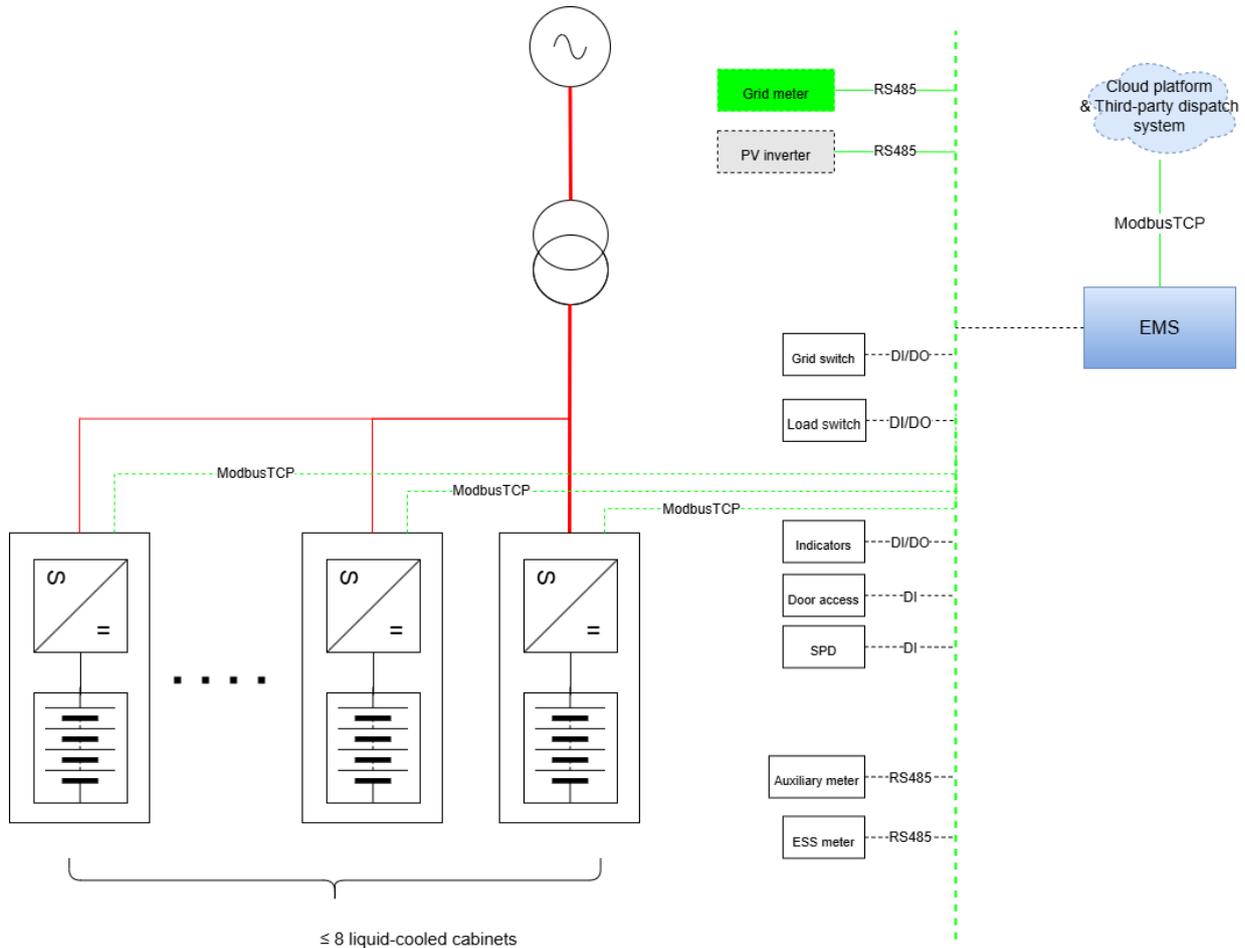


Figure 3-10 LEMS control system diagram

3.5.2 System Functions

This system is suitable for microgrid systems that include energy storage, PV, and loads (including important loads and general loads). It has the functions of maximizing PV output, smoothing load demand peaks, peak-valley power dispatch, and preventing power backflow.

- Maximize PV Utilization

This LEMS can maximize PV power generation by monitoring the generation and consumption status in the microgrid. When the PV power generation in the microgrid exceeds the total load consumption, the LEMS can store the excess power in the ESS and release it when the microgrid load increases, achieving PV energy time-shifting and maximizing PV utilization.

- Smooth the peak load demand

LEMS can use energy storage to smooth internal load fluctuations. When the PV participates in output and the load power still exceeds the set demand limit, LEMS controls the energy storage output to smooth the excess demand, thereby improving the microgrid's economy.

- Power Limit

For microgrids that do not have surplus electricity to feed into the grid, this LEMS provides power limit control functionality. When it detects that the microgrid energy is below the power limit warning threshold, LEMS proactively adjusts energy storage and PV to avoid power limit, preventing the occurrence of power limit conditions.

- Used as a backup power supply for important loads

When the system scheduling option of this LEMS is selected as backup, the LEMS ensures that the energy storage SOC is not lower than the backup SOC set by the system during operation, to ensure that important loads can be provided with backup power when the microgrid is off-grid.

- Peak shaving and valley filling

This LEMS can set strategies by time period, setting the PV energy time shift to fully charge the energy storage during the low electricity price period, and setting peak shaving and valley filling to release the energy storage power during the high electricity price period, thus achieving the function of peak shaving and valley filling.

- Microgrid status monitoring

This LEMS can access the control page by logging into the operation platform established on the local network, obtain the working status of PV and energy storage in real time, and perform static transfer switching. This LEMS can also send the basic information of operation to a third-party platform for data display.

3.5.3 Communication Connection

Table 3-6 Communication Connection

Communication line	Starting point	Communication parameters	Ending point
Shielded twisted pair	Customer grid-connected meter	DLT645: Serial port settings: 2400 8E1	LEMS COM4
		Modbus: Address: 1 Serial port settings: 9600 8N1	
Shielded twisted pair	PV Inverter	Modbus: Address: 1 Serial port settings: 9600 8N1	3n COM6

Network cable	Liquid-cooled cabinet	LAN1 default settings: IP: 192.168.1.100	2n switch
Network cable	LEMS	LAN1 default settings: IP: 192.168.1.100	Monitor platform interface of customer
Dedicated line	STS cabinet 2XT-1~4	/	1# liquid-cooled cabinet PCS-PARA1
Network cable	STS cabinet 2n-LAN3	/	1# liquid-cooled cabinet switch-LAN4

3.6 Grounding Wire

To reduce and eliminate electrical noise in the system and prevent electric shock hazards, the system needs grounding. Grounding methods and requirements depend on specific projects and system configurations. All grounding methods shall comply with NEC Article 250.

Grounding wire shall be at least 16mm² with M8 ring terminal; specifications are as follows:

Table 3-7 Grounding wire specifications

Ground wire specification	Grounding screw	Screw specification	Screw hardness	Screw pitch	Screw material
16mm ²	Conventional grounding	M8*14L	HRC32 Grade 8.8	1.25mm (0.05in)	SUS304

Electrical connection

Before leaving factory, electrical connections between devices within CPS STS 500K have been completed. On-site wiring between external equipment and CPS STS 500K is required, including grounding, AC power line wiring, and communication wiring. Grounding includes equipotential bonding inside CPS STS 500K and grounding to external grounding points.

- Internal grounding
Before leaving factory, equipotential bonding between all devices within CPS STS 500K has been completed and uniformly connected to the grounding copper busbar.

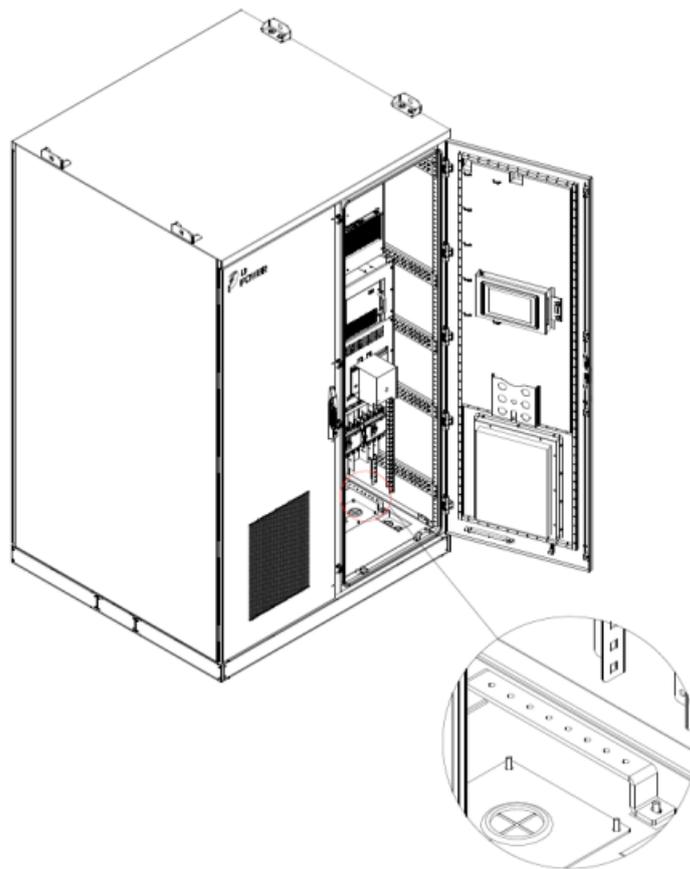


Figure 3-11 Internal grounding copper busbar

- External grounding (cabinet grounding)

There is 1 grounding point at the bottom inside the STS cabinet.

For convenient on-site cable connection, the STS cabinet is designed with grounding points at the bottom inside the STS cabinet, as shown in the figure below. Reliably connect according to the actual situation on site. The external grounding points of the STS cabinet can be grounded in the following ways:

Use M8 bolts to connect the grounding cable to the external grounding point. It is recommended to use a cable $\geq 240\text{mm}^2$.

Table 3-8 Grounding wire

Phase	Cable cross-sectional area	Bolt	Torque
GND	$\geq 240\text{mm}^2$	M8	12.5N.m

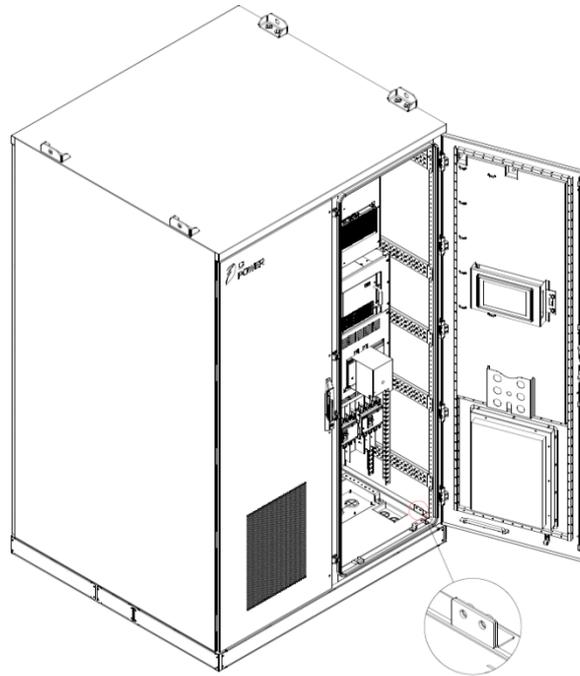


Figure 3-12 Grounding points at the bottom of the STS cabinet

4 Product Installation

Before operating and maintaining the STS cabinet system, the following requirements are necessary:

4.1 Personnel Requirements

All personnel engaged in installation activities should receive training on the Chint STS cabinet system and have relevant experience. Individuals should meet all training prerequisites and must complete system training. These personnel include:

- Service personnel performing any installation work within the scope of the owner's work specified in this document.
- Owner representatives performing any installation work within the scope of the owner's work identified in this document.

4.2 Personal Protective Equipment (PPE) and Tools

WARNING:

- Do not wear watches, rings, jewelry or other metal items.
- Wear a helmet correctly before entering the construction site to protect your head.
- Wear insulated gloves and safety shoes.
- Use well-insulated tools to prevent accidental electric shock or short circuit.

Before installation operations, technical service engineers should prepare personal protective equipment (PPE) and tools. As shown in the safety instructions earlier in this manual, basic PPE is required. Before performing any installation activities, check the condition of personal protective equipment and confirm its availability.

Recommended tools and equipment are detailed in Annex 3 List of Tools. Confirm that all equipment is calibrated through approved calibration procedures and that the calibration is not expired. Due to differences in the scope and scale of project construction involved in each project, the types and quantities of required items should vary according to the actual situation.

4.3 Transportation and Delivery

4.3.1 Transportation Conditions

The internal equipment of the STS cabinet has been installed and fixed before leaving the factory, allowing for whole-machine transportation. The lifting method is as follows: use a

crane to lift and transport the STS cabinet;

The STS cabinet is transported to the power station site by a freight company, and the on-site power station management personnel will be contacted in advance to arrange specific delivery and unloading. The transportation after delivery and unloading needs to be completed by the on-site power station construction personnel.

WARNING:

During the transportation and handling of the STS Cabinet, it is mandatory to comply with the operational safety regulations of the country/region where the project is located.

- All equipment used during transportation must be properly maintained.
- All personnel involved in handling and securing should receive appropriate training, especially in safety aspects.

Note:

Always keep in mind the mechanical parameters of the STS Cabinet during transportation and handling:

- Width × Depth × Height: 1500mm × 1370mm × 2400mm
- Gross weight: approx. 1.1t

Transporting and moving the STS cabinet should at least meet the following conditions:

- All doors of the STS cabinet are tightly locked.
- Select appropriate transportation equipment based on site conditions, usually a crane. The transportation equipment used must have sufficient load-bearing capacity.
- If movement on slopes is required, additional traction devices may be necessary.
- Remove all obstacles that exist or may exist during the movement, such as trees, cables, etc.
- Transportation and movement of the STS cabinet should be carried out under favorable weather conditions whenever possible.
- Warning signs or caution tapes must be set up to prevent non-staff from entering the lifting and transportation area to avoid accidents.
- In addition, when the STS cabinet is landed, the following should be ensured:
- Land gently. Do not drag or push the STS cabinet on any surface.
- The STS cabinet should be placed on a firm, flat, well-drained ground free of obstacles and protrusions, and should be supported only by its base.

4.3.2 Lifting



WARNING:

- During the entire lifting process of the STS Cabinet, the crane's safety operation procedures must be strictly followed.
- No personnel are allowed within a 10m radius of the operation area. Especially under the lifting arm and beneath the lifted or moving machine, to avoid casualties.
- In case of adverse weather conditions such as heavy rain, fog, or strong winds, lifting operations should be stopped.

When lifting the STS cabinet, at least the following requirements must be met:

- Site safety must be ensured during lifting.
- During lifting and installation operations, a professional should be present to command the entire process.
- The lifting tools, lifting angle, and lifting speed are detailed in the lifting diagram below.
- The crane should have sufficient boom length and rotation radius.
- Ensure all sling connections are secure and reliable, and ensure that each section of the sling connected to the lifting rings is of equal length.
- The length of the slings can be adjusted appropriately according to actual site requirements.
- Ensure the STS cabinet remains stable and does not tilt during the entire lifting process.
- Use the four lifting rings of the STS cabinet to complete the lifting operation.
- Take all necessary auxiliary measures to ensure the safe and smooth lifting of the STS cabinet.

Figure 4-1 shows the crane operation during the lifting of the STS cabinet. As shown in the following figure, circle A indicates the crane's working range. When the crane is in operation, standing within circle B is strictly prohibited!

The radius of circle B ≥ 10 meters.

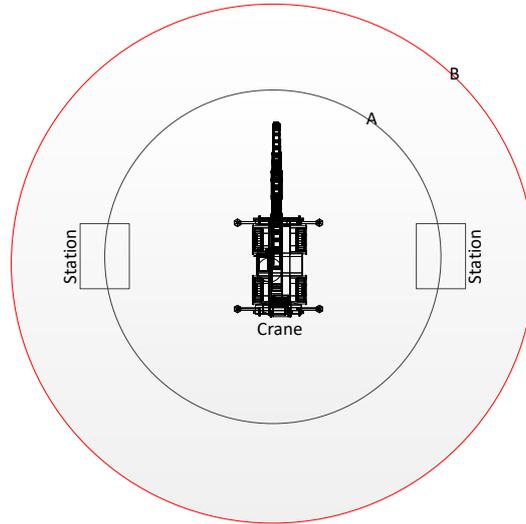


Figure 4-1 Lifting operation

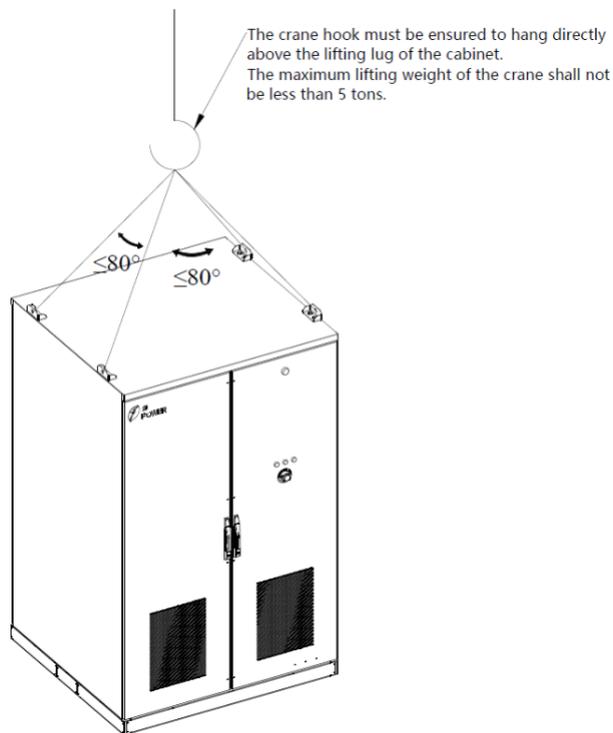


Figure 4-2 Lifting the STS cabinet

Technical requirements:

- Recommended lifting plan: Inclined lifting at the lifting point, with the lifting distance greater than 1 meter from the top of the STS cabinet;

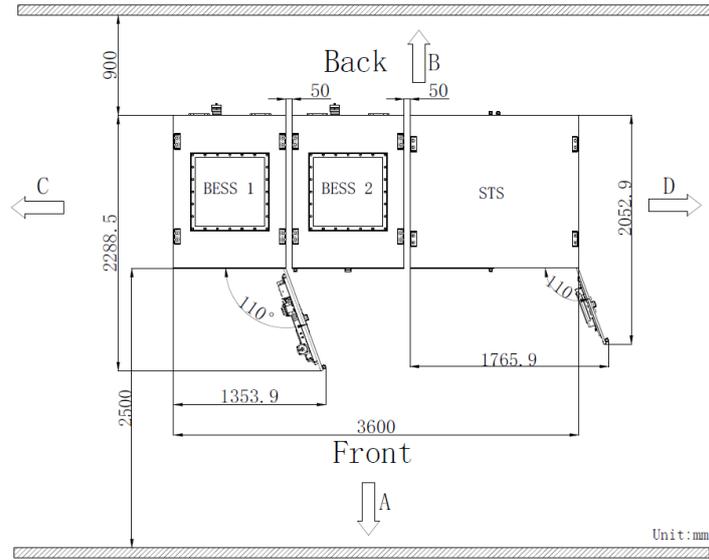


Figure 4-4 Space requirements for Scenario 2

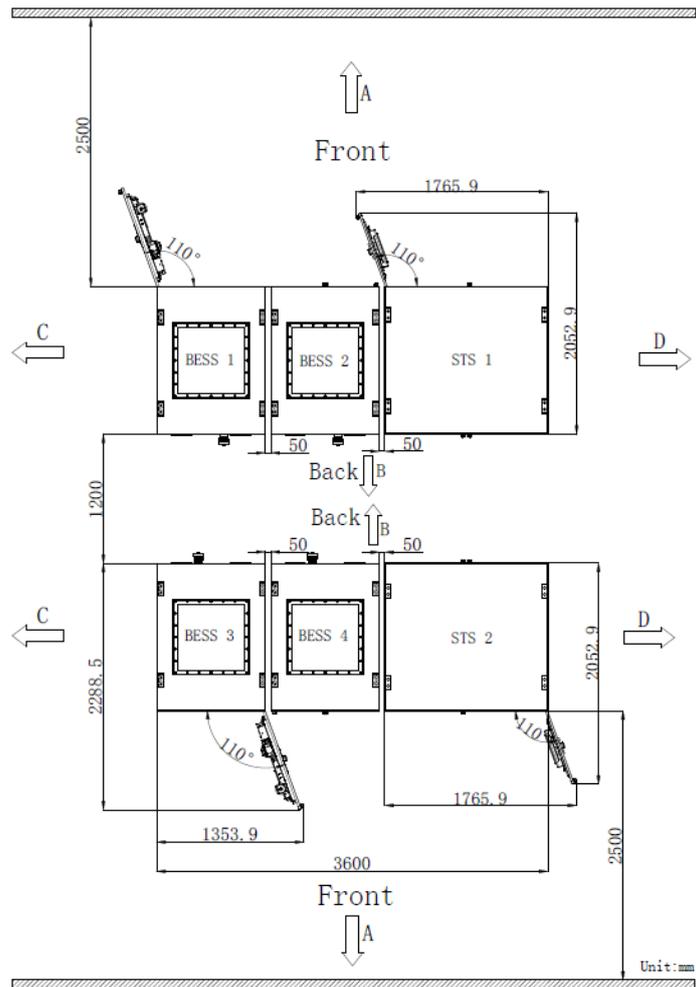


Figure 4-5 Space requirements for Scenario 3

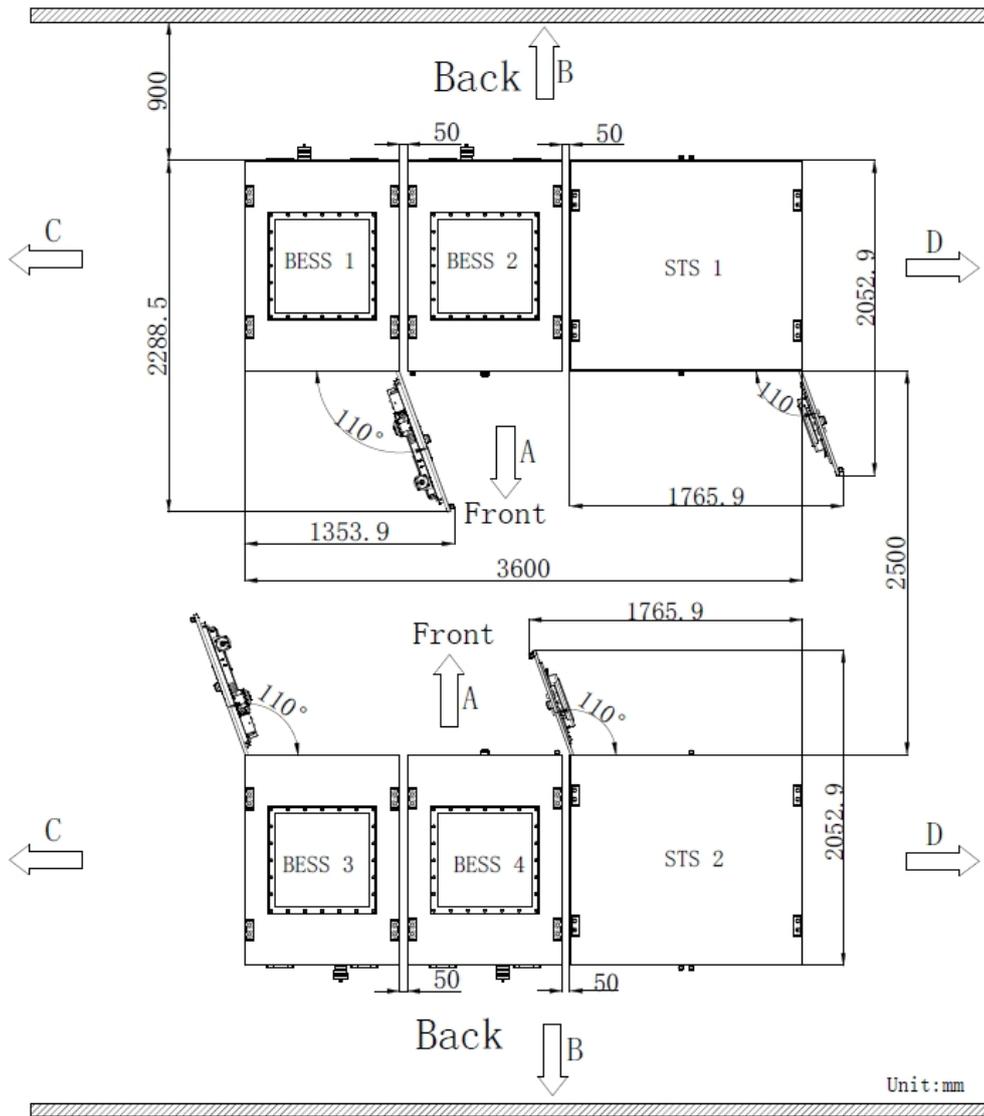


Figure 4-6 Space requirements for Scenario 4

4.4 Installation Requirements for the STS Cabinet

The STS Cabinet must be installed on structures with cement foundations or channel steel supports. The foundation must be flat, solid, safe, and reliable, with sufficient load-bearing capacity. It is strictly prohibited for the foundation surface to have depressions or tilting.

The STS Cabinet can be welded to the foundation steel plate or connected with other methods of equivalent firmness.

The number of support points and the load-bearing capacity of the support units for the STS Cabinet on the foundation are shown in the following figure:

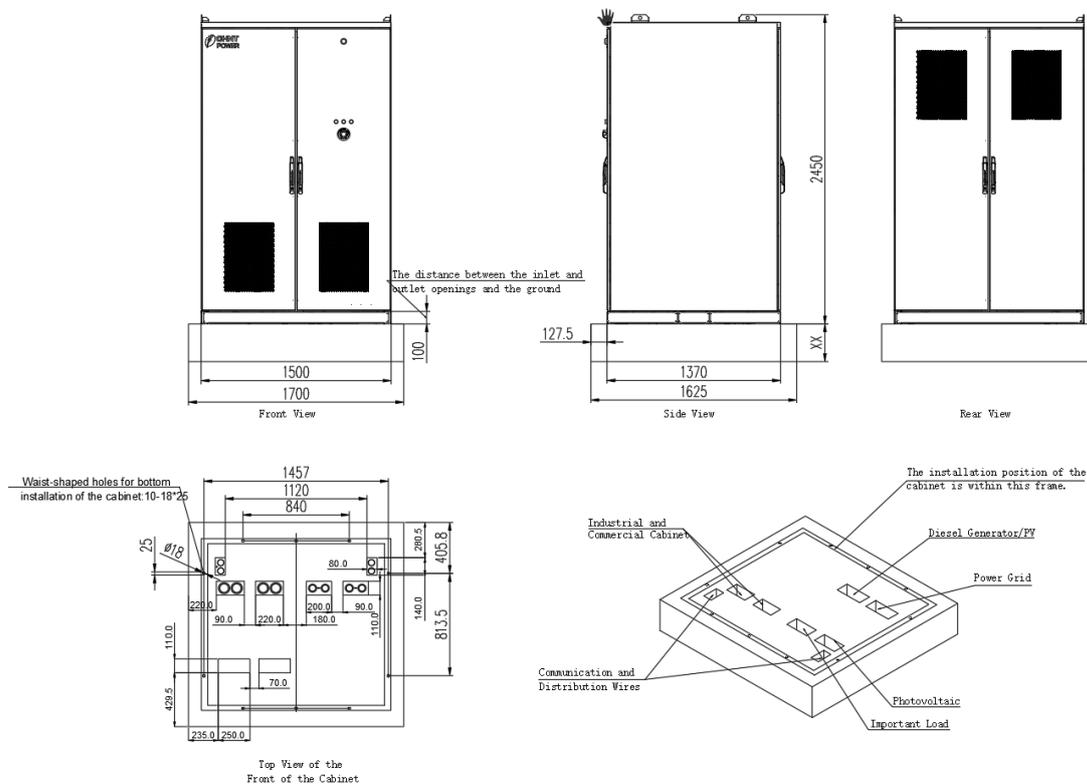


Figure 4-7 Support points

Technical notes:

- This foundation drawing is only for reference in customer foundation design.
- The foundation reference plane of the STS Cabinet must be higher than the horizon and above the maximum precipitation level at the project site.
- The maximum total weight of the STS Cabinet is approximately 1.1t. The foundation must have sufficient strength.
- The flatness of the entire foundation reference plane must be controlled within $\pm 2\text{mm}$. If the foundation flatness exceeds this requirement, after the STS Cabinet are filled with STS modules, it may cause the cabinet doors to fail to open or close properly, or even result in permanent structural deformation that cannot be repaired. Please strictly follow this requirement.

4.5 System Inspection

4.5.1 Overview of STS Cabinet

Table 4-1 Inspection record table for STS Cabinet overview

Specifications							
Dimensions							
Weight and Load							
Appearance of STS cabinet	Front View						
Internal Equipment of STS cabinet	UPS	LEMS	ESMU	Frame Circuit Breaker and Branch Circuit Breaker	Copper Busbar	Power Distribution System	STS module

4.5.2 Safety Inspection

- This STS Cabinet involves high voltage and strong current. Operation by anyone without professional supervision is prohibited. Operators must enhance safety awareness and vigilance, and always wear personal protective equipment, especially insulated gloves. During operation, the equipment shall not be shut down or started up without authorization. In case of an accident, quickly disconnect the main circuit breaker and ensure immediate reporting to the responsible personnel.
- Pay attention to weather conditions and enhance safety awareness during rainy days. Inspect the working environment of the STS Cabinet to ensure cleanliness.

- Ensure there are no insulation faults in the STS Cabinet, and the insulation resistance of all busbars to ground is not less than 2.5MΩ as specified by national standards.
- Check all wire connection points to ensure firm connections. Refer to national standards for specific details, and visually inspect the electrical safety gaps between power line electrodes. See the table below for details:

Table 4-2 Allowable values for electrical clearance and creepage distance

Rated Line Voltage / kV	Electrical Clearance/mm	Creepage distance/ram
0.38 (0.4)	8	12 (max)
0.66 (0.69)	10	20 (max)
3 (3.5)	36	75 (max)

Note: Reference standards IEC 60664 UL 1973-2022.

4.5.3 Equipment Status Check

- Check whether the BMS display screen is normal, whether the total voltage of each battery cluster and the voltage of each battery cell are normal, and ensure that the BMS connection is normal.
- Check whether the operation of each device in the battery system is normal, and whether the power lines and communication lines of each BMS subunit are correctly connected.

4.5.4 Inspection Record

Each STS cabinet is inspected and tested before leaving the factory. After installation is completed, the system must undergo another safety review before operation. To ensure the continuous safe operation of the system throughout its life cycle, we need to perform a visual inspection of the system.

Please record the visual inspection and complete the inspection record. The inspection record form is as follows:

5 Product Wiring and Operating Procedures

5.1 Making Cable Terminals

Table 5-1 Cable details

No.	Required material	Photograph	Cable Type	Conductor Cross-section	Quantity
1	Grid cable		4-core copper cable	$\geq 240 \text{ mm}^2$	2 groups
2	Diesel Generator (DG)		4-core copper cable	$\geq 240 \text{ mm}^2$	2 groups
3	Load cable		4-core copper cable	$\geq 240 \text{ mm}^2$	2 groups
4	PV		4-core copper cable	$\geq 240 \text{ mm}^2$	2 groups
5	4*PCS cable		4-core copper cable	$\geq 70 \text{ mm}^2$	1 groups
6	PE wire		Conventional yellow and green cable	$\geq 120 \text{ mm}^2$ (for load and cabinet grounding)	2 groups
7	Network cable		CAT5E	/	1 groups
8	COM cable		Shielded twisted-pair cable	$2 \times 0.5 \text{ mm}^2$	2 groups

Table 5-2 TLK terminals details

No.	Required material	Type(Recommended)	Quantity	Description
1	TLK terminal 	TLK240-12	32	Grid/load/DG/PV
2		TLK120-8	2	PE
3		TLK70-8	24	For PCS connection(70 mm ² power cable in TRENE system)

Table 5-3 TLK terminal dimensions requirements

Ring terminal dimensions requirements							
Terminal type	Dimensions (mm)						
	S	a	b C1 C2	d1	d2	d3	1
TLK240-12	4.8	35.0	39.0 21.5 19.0	21.0	13.0	26.0	72.0
TLK120-8	43	260	280, 140, 140	150	8.4	19.5	51.0
TLK70-8	43	210	230, 100, 100	120	8.4	16.5	43.0

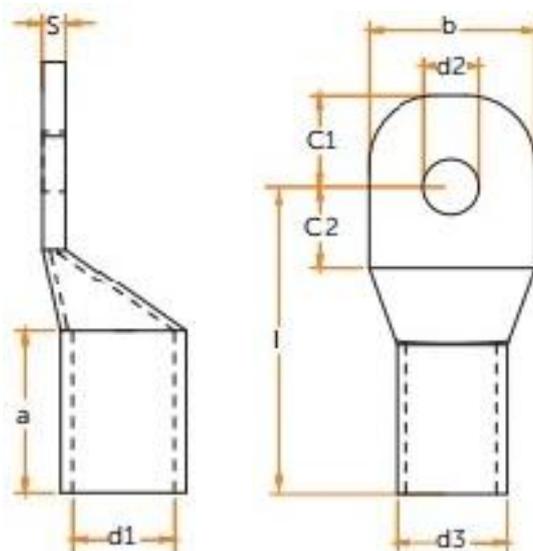


Figure 5-1 TLK terminal dimensions

Description

TLK terminals need to be prepared by the customer. When using copper-core cables, please use copper terminals. When using copper-clad aluminum cables, please use copper terminals. When using aluminum alloy cables, please use copper-aluminum transition terminals, or aluminum terminals with copper-aluminum transition washers.

Note:

The cavity formed after the conductor crimping piece of the TLK terminal is crimped should completely cover the wire core, and the wire core and the TLK terminal should be tightly combined and not loose.

TLK cable terminal making tools:

- 1: Cable;
- 2: Heat shrink tubing;
- 3: TLK terminal;
- 4: Hydraulic crimping tool;
- 5: Heat gun

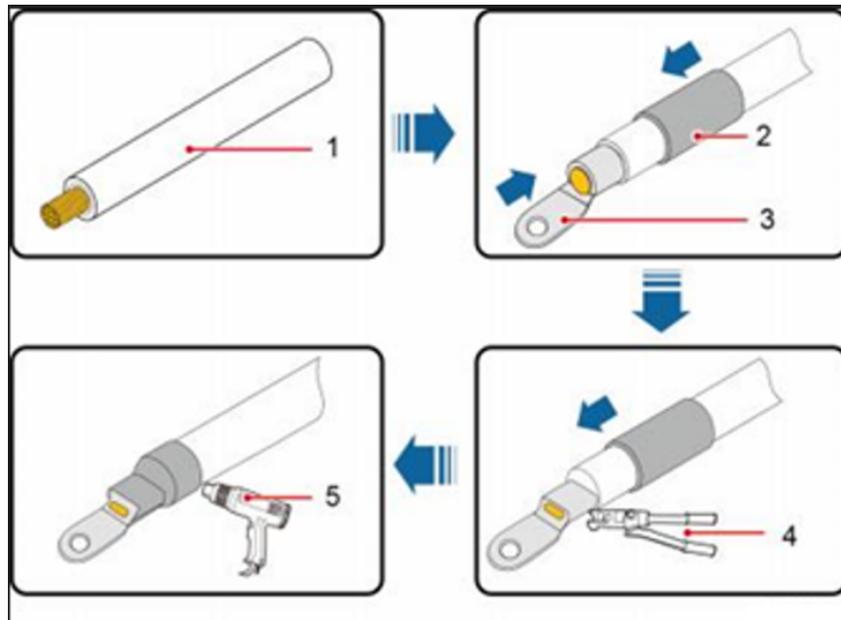


Figure 5-2 Making crimp terminals

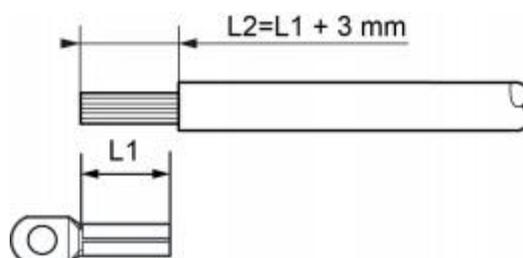


Figure 5-3 Reference length for stripping grounding wire

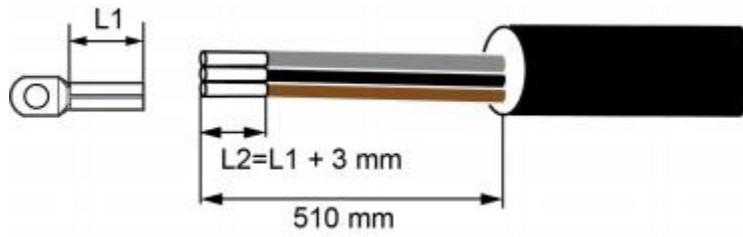


Figure 5-4 Reference length for stripping output AC power wire

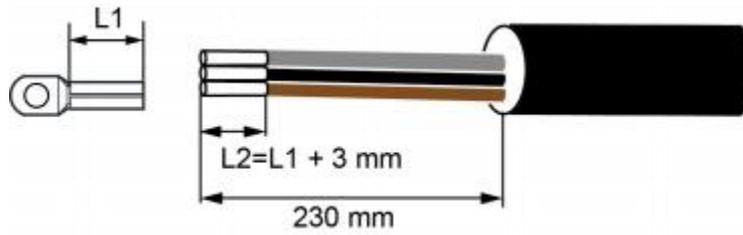


Figure 5-5 Reference length for stripping input AC power wire

5.2 Connecting Cables

1. Open the front and rear door panels;

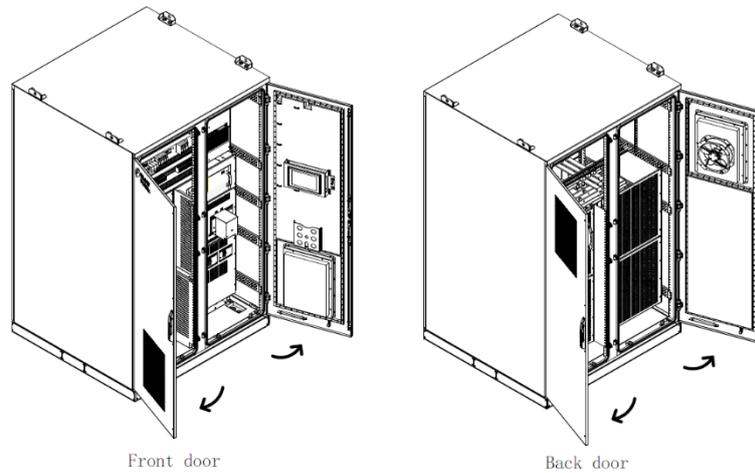


Figure 5-6 Opening front and rear door panels

Open the front door:

- a. Use the door lock key provided with the STS cabinet to open the front door lock;
- b. Open the front door and secure it with the door stopper bracket below the door panel.

Open the rear door:

- a. Use the door lock key provided with the STS cabinet to open the front door lock;
- b. Open the rear door and secure it with the door stopper bracket below the door panel.

2. Connect the grounding wire;

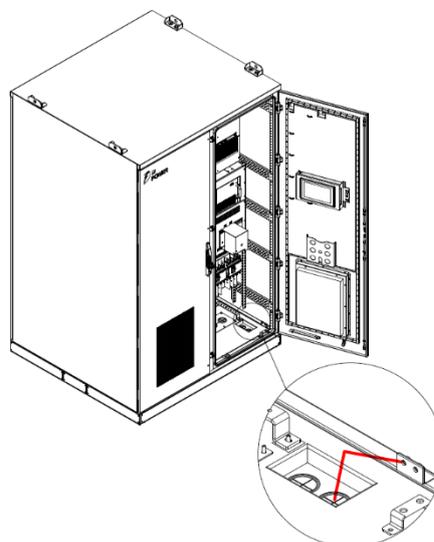


Figure 5-7 Connecting grounding wire

3. Connect the output power cable;

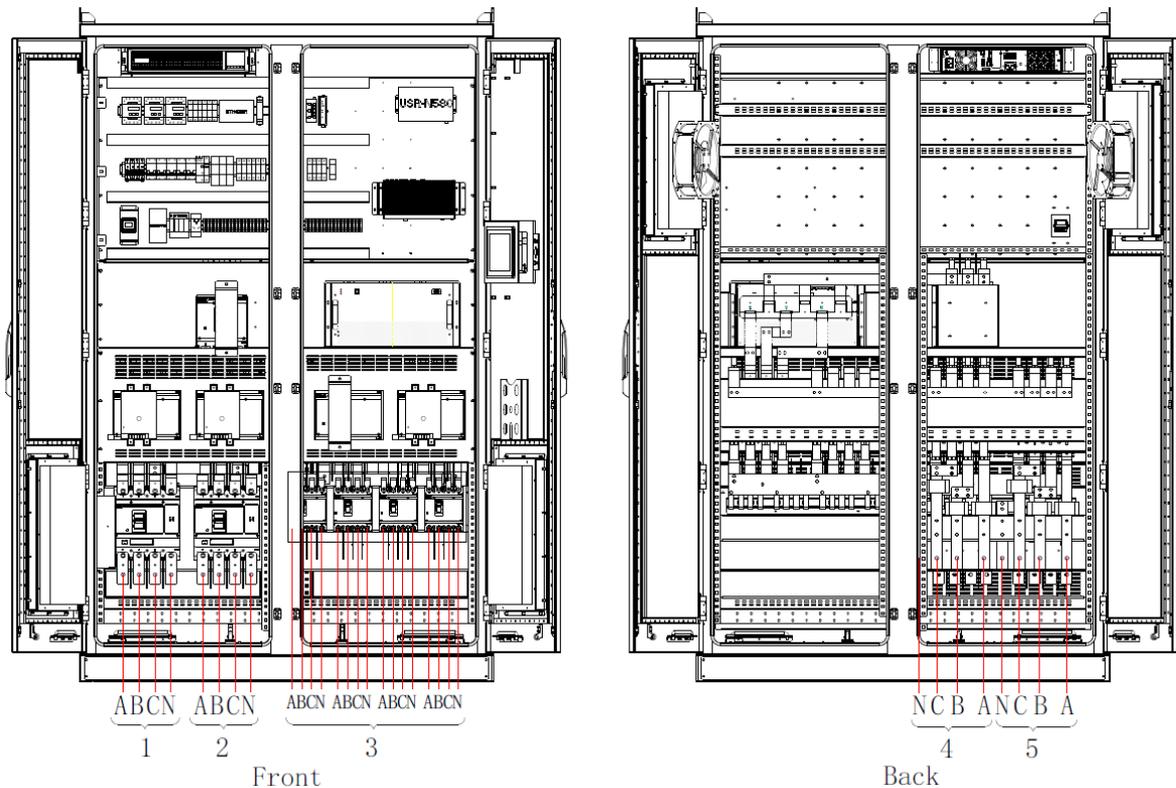


Figure 5-8 Connect output power cable

No.	Output side
1	Connect to important load
2	Connect to specific PV
3	Connect to liquid-cooled cabinet 1-4
4	Connect to diesel generator/PV
5	Connect to grid side

Note:

1. No. 1, 2, 4, and 5 can connect two cables per phase copper bar, and No. 3 can connect one cable per phase copper bar;
2. The specific wiring phase sequence follows the color of the copper bar heat shrink tubing: brown for phase A, black for phase B, gray for phase C, and blue for phase N.
4. Connect the communication cable and network cable;

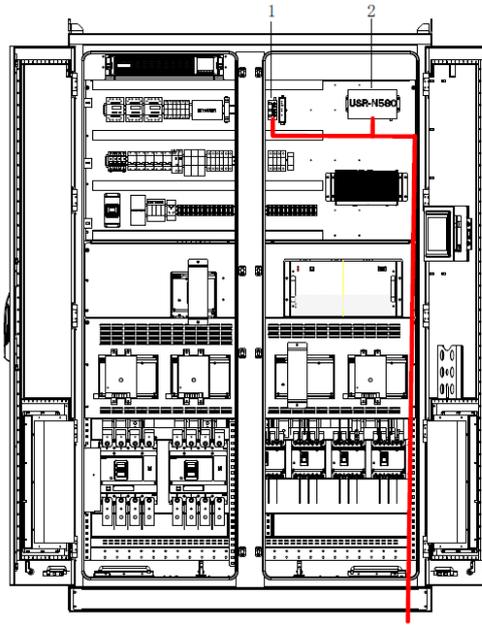


Figure 5-9 Connect communication cable and network cable

No.	Access device	Remark
1	Switch	Insert network cable
2	Serial port server	Insert communication cable

5. Close the front and rear door panels.

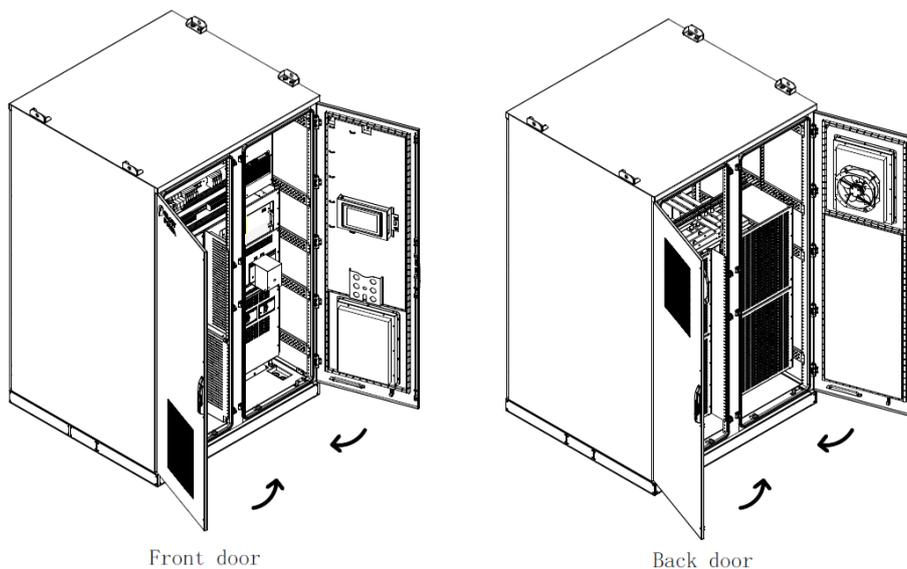


Figure 5-10 Close front and rear door panels

Close the front door:

- a. Remove the limit bracket fixing the front door and place it in the initial position;
- b. Close the front door and ensure the door lock is fully locked;

Close the rear door:

- a. Remove the limit bracket fixing the rear door and place it in the initial position;
- b. Close the rear door and ensure the door lock is fully locked;

Check the correctness and firmness of the wiring. After confirmation, please seal the inlet and outlet areas with fireproof mud.

5.3 Installation Check

Table 5-4 Installation check

No.	Inspection item	<input type="checkbox"/> Satisfied <input type="checkbox"/> Not satisfied
1	Whether the fastening bolts at the bottom of the cabinet are secure.	<input type="checkbox"/> Satisfied <input type="checkbox"/> Not satisfied
2	Check whether the terminal screws are tightened at all positions to ensure that the terminals will not shake.	<input type="checkbox"/> Satisfied <input type="checkbox"/> Not satisfied
3	The terminals and cables are crimped firmly.	<input type="checkbox"/> Satisfied <input type="checkbox"/> Not satisfied
4	Check whether the heat shrink tubing completely covers the terminals and wire cores without any exposure.	<input type="checkbox"/> Satisfied <input type="checkbox"/> Not satisfied
5	Check whether the fireproof mud sealing is completed for the entry and exit areas.	<input type="checkbox"/> Satisfied <input type="checkbox"/> Not satisfied
6	Before closing the door, confirm that there are no extra objects inside the box.	<input type="checkbox"/> Satisfied <input type="checkbox"/> Not satisfied

5.4 Operating Procedures

5.4.1 Power-on Operating Procedures

1. Wear insulated protective gear, press and hold the UPS power button for 3 seconds to turn on the UPS, and check the output voltage is AC220V on the UPS panel;



Figure 5-11 UPS

2. Close the miniature circuit breaker 1QF, 1QF1~6;

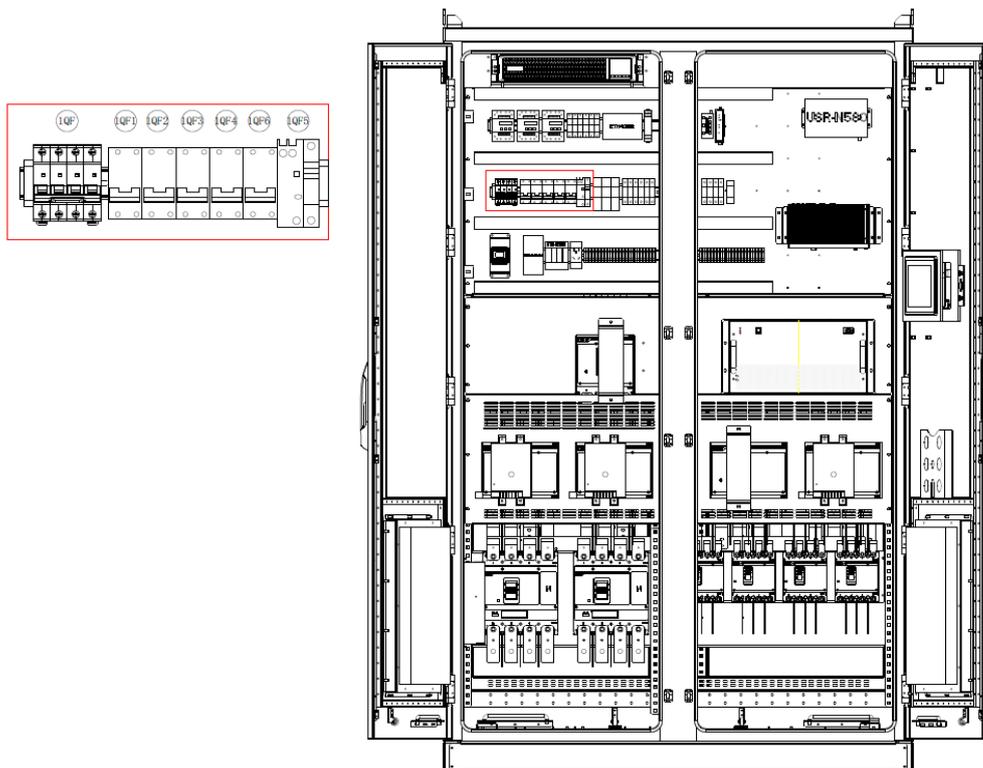


Figure 5-12 Close the miniature circuit breaker 1QF, 1QF1~6

3. Close the molded case circuit breaker QF1; the molded case circuit breakers QFM1 and QF2 will automatically close;

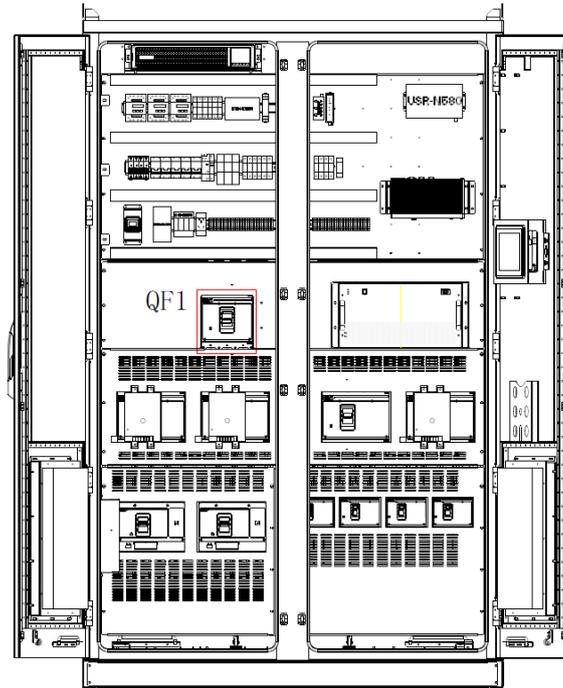


Figure 5-13 Close the molded case circuit breaker QF1

4. Manually close the molded case circuit breakers QF4~9;

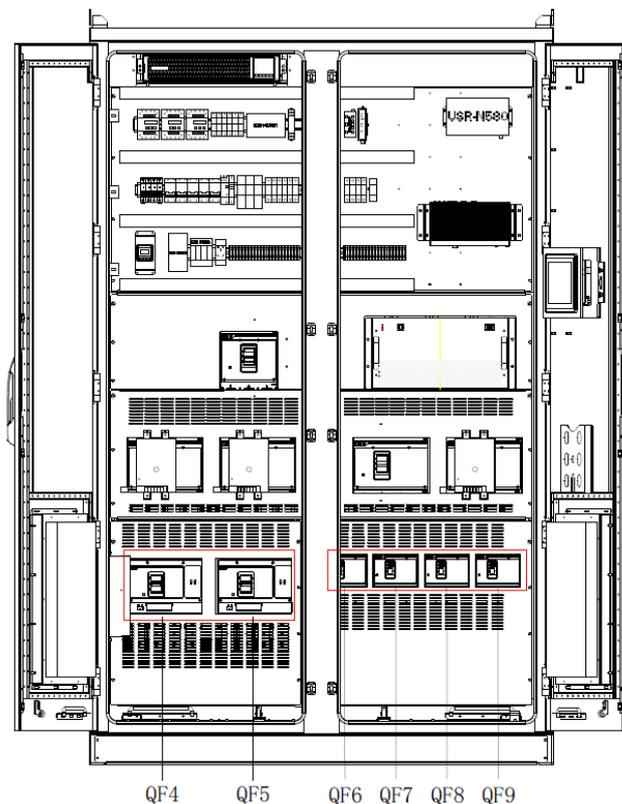


Figure 5-14 Manually close the molded case circuit breakers QF4~9

5. Check the system status on the LEMS screen, and set the LEMS on/off-grid mode and adjust power parameters according to requirements;



Figure 5-15 LEMS screen

5.4.2 Power-off Operation Procedures

1. Check the system status on the LEMS screen, and set the LEMS to issue a PCS shutdown command;
2. The LEMS command breaks QFM1;
3. Break all other circuit breakers;
4. Press and hold the UPS for 3 seconds; the UPS will shut down, and the indicator lights on the UPS display panel will turn off;



Figure 5-16 UPS

Note: If power supply to critical loads can be maintained without network disconnection, skip the above steps.

5.4.3 BMS Operation Procedures

Chint strongly recommends that the BMS be configured and debugged by authorized factory representatives, otherwise it is not covered by the warranty.

The ESMU can communicate with the LEMS via ModbusTCP. ESMUs do not communicate with each other and should be treated as an independent subsystem. The LEMS identifies different ESMUs by IP address. An example architecture is shown below:

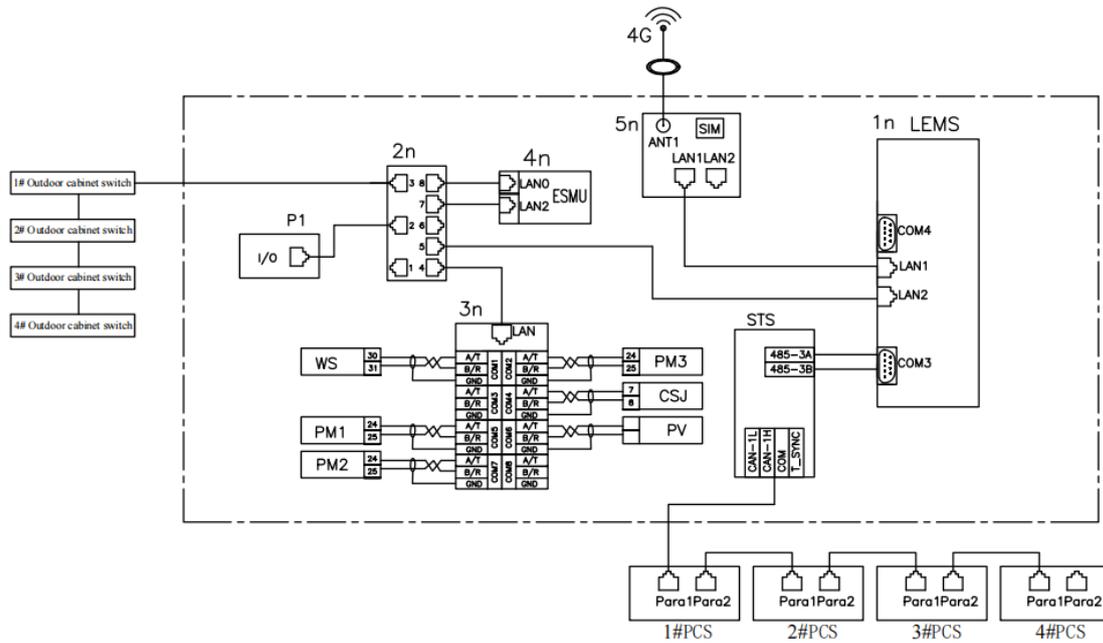


Figure 5-17 System communication architecture diagram

6 Emergency Procedures

6.1 First Aid Measures

Measures to be taken in case of leakage or spillage of electrolyte and other substances:

If electrolyte or other materials leak, evacuate the area immediately. Provide maximum ventilation and remove harmful objects or gases. Wipe clean with a cloth, dispose of it in a plastic bag, then place it in an iron can to allow the battery to cool and the vapor to dissipate. Avoid skin and eye contact or inhalation of vapors, or use absorbent to remove spilled liquid and incinerate it. First aid measures for different parts are as follows:

- Eye first aid: Rinse the eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids, while seeking medical assistance.
- Skin first aid: Remove contaminated clothing, rinse the skin with plenty of water or shower for 15 minutes, while seeking medical assistance.
- Inhalation first aid: Immediately move from the leak area to fresh air, and use oxygen if available.
- First aid for accidental ingestion: Immediately drink milk or water, induce vomiting in the patient. If the patient loses consciousness, seek medical attention immediately.

6.2 Fire Risk Assessment

6.2.1 General Principles

Chint's principle is to protect everyone, including employees, customers, and contractors, from potential injuries and health hazards that may arise from work activities. Chint will provide and maintain a safe and healthy working environment, equipment, and work systems for all employees, and provide them with the necessary information, training, and supervision for this purpose.

Chint will place high importance on health and safety and comply with all statutory requirements.

6.2.2 Management System

The fire safety management plan is included in the "Health and Safety" document. It will confirm the completion of a fire risk assessment to ensure adequate fire safety and will be reviewed as necessary.

Any deficiencies identified during the fire risk assessment process will be prioritized and corrected accordingly. Chint determines the safety protection and preventive measures for firefighting, and the customer is responsible for notifying the remaining responsible parties.

- Ensure these recommendations are implemented and communicated to other employees.
- Ensure coordination among the remaining responsible parties.
- Fire safety should be an agenda item in the weekly end-user manager meetings.

6.2.3 General Overview

The equipment installed in this system mainly includes protection systems (such as molded case circuit breakers, fuses, miniature circuit breakers, etc.), thermal management systems, and cables.

The fire resistance time of the cabinet enclosure reaches 60 minutes, meeting the fire protection requirements of EN1364-1.

6.2.4 Classification of Fire Hazards

Table 6-1 Nature and types of fire source risks

No.	Fire risk	Detailed description	Corresponding measures
1	External fire source	If the temperature exceeds 130°C, there is a risk of battery failure and fire.	The STS Cabinet has a fireproof insulation layer, Just ensure that the cabinet is kept away from fire and heat sources.
2	External heat source		
3	External short circuit	During the installation process, or if the fuse is not installed properly, there may be risks of external short circuit, arc flash, and fire.	Install the screws according to the installation guide manual and conduct a comprehensive inspection to ensure that each one is tightened.
4	Loose screws	Resulting in excessive contact resistance and heating at the connection points and cables.	
5	Over-discharge		

6.2.5 System Safety Protection

Considerations are made from five aspects: component safety, battery cell safety, electrical safety, mechanical safety, and environmental safety.

- Component safety

Table 6-2 Components comply with IEC standards

No.	Component name	Compliant standard number
1	Plastic components	IEC 60707
2	Fuse	IEC 60269
4	Relay	IEC 60947
5	BMS	IEC 60950
6	Anti-corrosion	IEC 60068

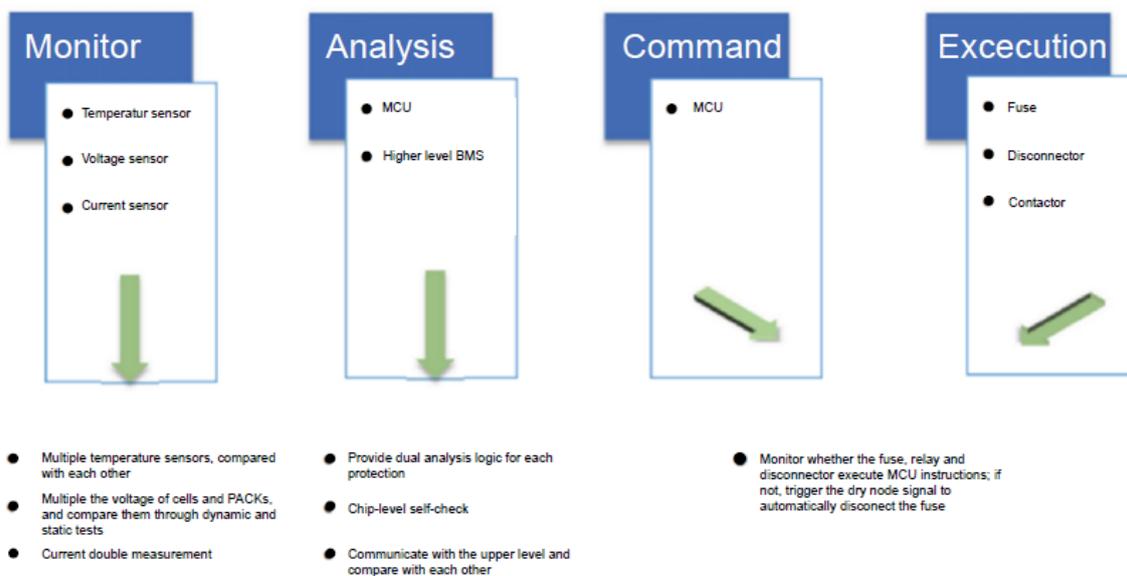
- Electrical safety

Table 6-3 Protection threshold (reference)

BMS function	Detailed description	Parameters
Single cell overcharge	Overcharge voltage protection threshold	3.65V
	Overcharge protection delay time	3s
Single cell over-discharge	Over-discharge voltage protection threshold	2.50V
	Over-discharge protection delay time	3s
	Discharge recovery voltage threshold	3.0V
Battery PACK overcharge	Overcharge voltage protection threshold	189.8 V
	Overcharge protection delay time	3s
	Overcharge recovery voltage threshold	182 V
Battery PACK over-discharge	Over-discharge voltage protection threshold	130 V
	Over-discharge protection delay time	3s
	Discharge recovery voltage threshold	156 V
Overcurrent protection	Discharge overcurrent protection delay time 1	5s
	Discharge overcurrent protection 2	205A
	Discharge overcurrent protection delay time 2	500±50ms
	Charge overcurrent protection	205A
Short circuit	Short circuit protection	-
	Protection conditions	Load short circuit

	Recovery conditions	Load disconnect
Overtemperature protection	Charge high temperature protection	55°C
	Charge temperature recovery	45°C
	Discharge high temperature protection	55°C
	Discharge temperature recovery	45°C
	Charge low temperature protection	0°C
	Charge temperature recovery	5°C
	Discharge low temperature protection	-20°C
	Discharge temperature recovery	0°C

Dual protection mechanism:



- Mechanical safety

Complies with UN38.3 standard, passing tests such as static pressure, impact, drop, and installation.

- Environmental safety

Preventive measures: temperature monitoring, UL94-V0 material, metal casing, BMS high-temperature protection, etc.

6.2.6 Identify Fire Hazards

- Ignition source

There are no obvious ignition sources in the entire system environment, and smoking is

prohibited inside the cabinet.

- Combustible material

No fuel, no large amounts of paper; only some maintenance record paper.

- Work process

No process poses a serious fire hazard.

6.3 Emergency Warning Plan

6.3.1 Emergency Warning Plan

Safety assembly point - to be specified by the end customer

Actions to take after discovering a fire:

- Use the nearest fire alarm call point to raise the alarm
- Proceed to the designated Safety Assembly Point and check in immediately
- Call the fire brigade using a mobile phone (after leaving the cabinet)
- Contact the fire brigade after their arrival
- Do not attempt to handle small fires even if confident
- Do not expose yourself to fire hazards

Actions to take after hearing the alarm:

- Proceed to the designated Safety Assembly Point and check in immediately
- Call the fire brigade with a mobile phone (after leaving the building)
- Contact the fire brigade after their arrival

Visitors:

- Ensure all visitors and contractors are escorted to the safe assembly point
- Assist any disabled persons in evacuation if necessary

The STS cabinet must be installed on a cement foundation or a structure supported by channel steel with a flame-retardant surface. The foundation must be flat, solid, safe, reliable, and have sufficient load-bearing capacity. Any depression or tilting on the foundation surface is strictly prohibited.

7 System Maintenance

7.1 Component Maintenance

7.1.1 ESMU Configuration

The system automatically enters the main interface upon startup. The main interface displays information such as the total voltage and current of the battery system, as well as the voltage, current, SOC value, and working status of the battery cluster.

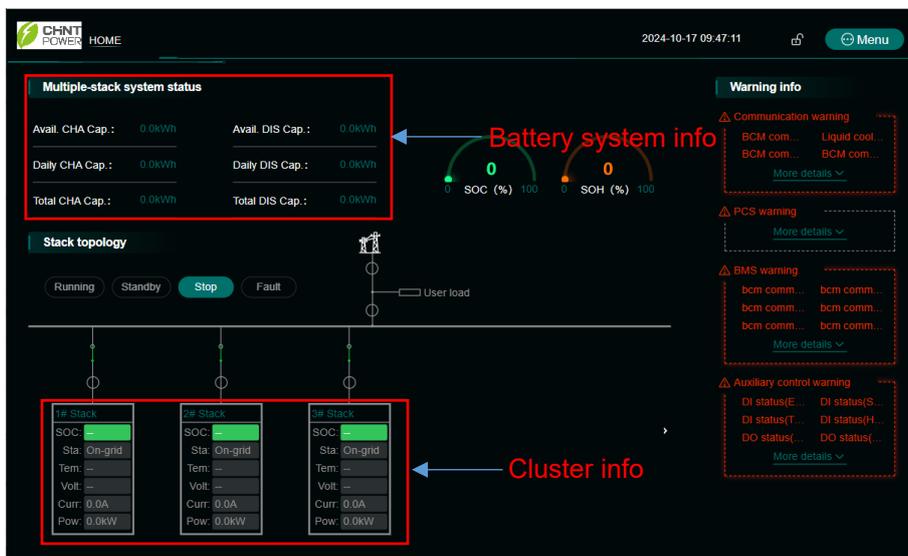


Figure 7-1 Main interface



Click the battery cluster icon on the main interface to display detailed information, including voltage, current, SOC, SOH, charge/discharge capacity, and the maximum and minimum voltage and temperature of the cells.

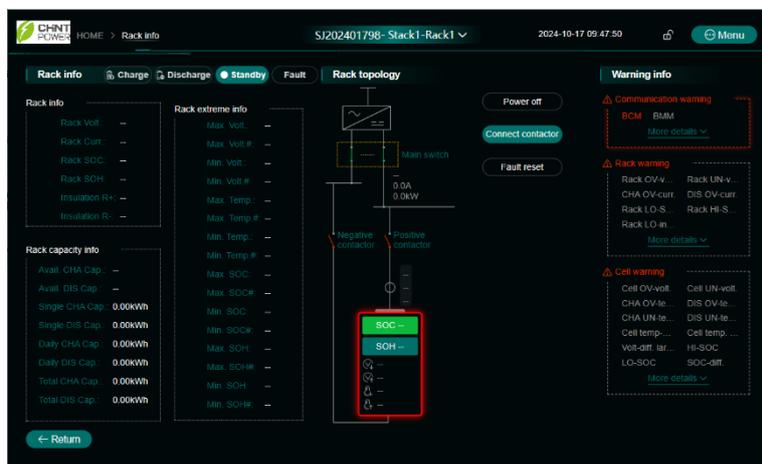


Figure 7-2 Battery cluster parameters (reference)



Click the battery PACK icon in the above figure to display the voltage of each battery PACK, temperature at each location, warning/fault information, etc.

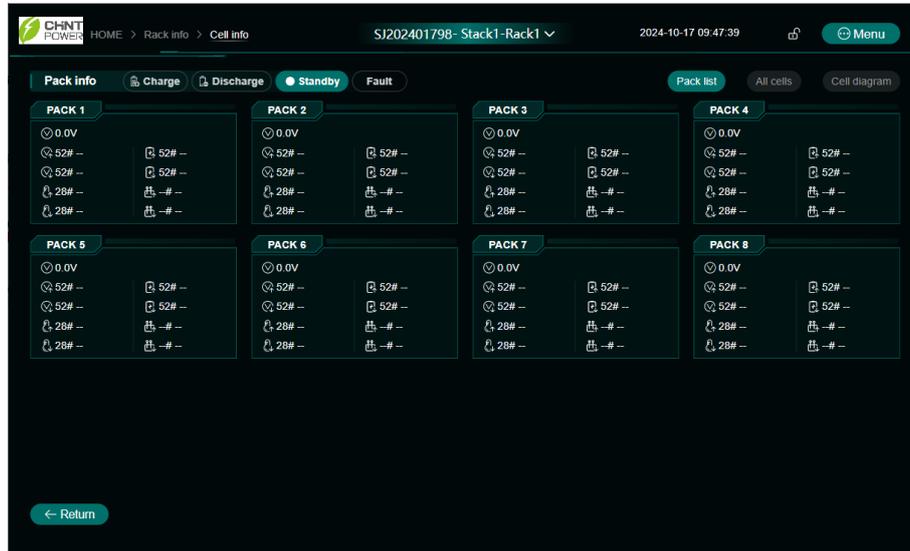


Figure 7-3 Battery PACK parameters (reference)

7.1.2 BMS Automatic Calibration

The battery system SoC needs to be calibrated during maintenance. This calibration requires a complete charge and discharge process, which is an automatic calibration process.

7.2 BMS System Testing

Depending on the project, the parameters of BMS Test may vary.

Communication and control function test, parameter setting check, alarm and protection function test need to be performed once a year.

7.2.1 Communication and Control Function Test

Table 7-1 Communication and control function test

Test purpose:			
1. The BMS should be able to communicate normally with the PCS and LEMS.			
2. The BMS should control the contactor to open or close.			
Prerequisites:			
Visual inspection of the battery, PCS, and HMI is completed.			
Test procedure:			
1. Check the HMI of the PCS to confirm if there is information from the BMS.			
2. Check the HMI of the LEMS to confirm if there is information from the BMS.			
3. Connect all battery cluster communications in parallel to the display control.			
4. Disconnect the communication between the battery cluster and the display control.			
5. Please refer to the communication architecture diagram, see Figure 3-2.			
Test parameters:			
PCS, LEMS, and contactor respond normally			
Test record:			
Category	Test content	Test result (Pass √/Fail ×)	Remark (if any)
1	Communication between BMS and PCS		
2	Communication between BMS and LEMS		
3	Connect all battery clusters in parallel to the display and control unit		
4	Disconnect the battery clusters from the display and control unit		

7.2.2 Parameter Setting

Table 7-2 Parameter setting check

Test purpose:				
BMS parameter settings are correct.				
Prerequisites:				
Communication and control function test has been completed.				
Test process:				
Check the following parameter settings against the standard table on the human-machine interface. <ol style="list-style-type: none"> 1. Battery voltage overvoltage protection threshold: Primary: 3.5V, Secondary: 3.6V, Tertiary: 3.65V. 2. Total voltage overvoltage protection threshold: Primary: 910V, Secondary: 936V, Tertiary: 949V. 3. Charging overtemperature protection threshold: Level 1: 45°C, Level 2: 50°C, Level 3: 55°C. 				
Test parameters:				
Parameter settings on BMS				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remark (if any)
1	Whether having administrative rights to set parameters	N/A	N/A	
2	Battery voltage protection threshold setting			
3	System total voltage protection threshold setting			
4	System charging over-temperature protection threshold setting			

7.2.3 Alarm and Protection Function Test

Table 7-3 Overvoltage alarm and protection function test

Test purpose:				
Ensure that the BMS can implement protection functions during primary, secondary, and tertiary overvoltage alarms.				
Prerequisites:				
Monitoring function and accuracy test have been completed.				
Test procedure:				
<ol style="list-style-type: none"> 1. Reset the voltage protection threshold to make the total voltage or unit voltage reach primary, secondary, and tertiary overvoltage alarms respectively. Default primary over total voltage: 910V, default secondary over total voltage: 936V, default tertiary over total voltage: 949V. 2. The alarm should be displayed on the display control. 3. Check whether the BMS has the corresponding protection function. 				
Test parameters:				
<ol style="list-style-type: none"> 1. When a primary overvoltage alarm occurs, the BMS should notify the PCS to reduce the operating power. 2. When a secondary overvoltage alarm occurs, the BMS should notify the PCS to stop charging and discharging (current limit is 0). 3. When a tertiary overvoltage alarm occurs, the BMS notifies the PCS to shut down, and the BMS delays for 3s to disconnect the contactor. 				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remark (if any)
1	Display control alarm display	N/A		
2	Primary overvoltage alarm protection function			
3	Secondary overvoltage alarm protection function			
4	Tertiary overvoltage alarm protection function			

Table 7-4 Undervoltage alarm and protection function test

Test purpose:				
Ensure that the BMS can implement protection functions during primary, secondary, and tertiary undervoltage alarms				
Prerequisites:				
Monitoring function and accuracy test have been completed				
Test procedure:				
<ol style="list-style-type: none"> 1. Reset the voltage protection threshold to make the total voltage or unit voltage reach primary, secondary, and tertiary undervoltage alarms respectively. Default primary total voltage: 780V, default secondary total voltage: 728V, default tertiary total voltage: 650V 2. The alarm should be displayed on the display control. 3. Check whether the BMS has the corresponding protection function. 				
Test parameters:				
<ol style="list-style-type: none"> 1. When a primary under-voltage alarm occurs, the BMS shall notify the PCS to reduce operating power. 2. When a secondary under-voltage alarm occurs, the BMS shall notify the PCS to stop charging/discharging (current limit is 0). 3. When a tertiary under-voltage alarm occurs, the BMS shall notify the PCS to shut down, and then the BMS shall disconnect the contactor after a 3s delay. 				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remark (if any)
1	Display control alarm display	N/A		
2	Primary under-voltage alarm protection function			
3	Secondary under-voltage alarm protection function			
4	Tertiary under-voltage alarm protection function			

Table 7-5 Overcurrent alarm and protection function test

Test purpose:				
Ensure the BMS can implement protection functions during secondary and tertiary overcurrent alarms				
Prerequisites:				
Monitoring function and accuracy test have been completed				
Test procedure:				
<ol style="list-style-type: none"> 1. Reset the current protection threshold to make the current reach secondary and tertiary overcurrent alarms respectively. Default primary overcharge current: 185A, default secondary overcharge current: 195A, default tertiary overcharge current: 205A. 2. The alarm should be displayed on the display control. 3. Check whether the BMS has the corresponding protection function. 				
Test parameters:				
<ol style="list-style-type: none"> 1. When a secondary overcurrent alarm occurs, the BMS shall notify the PCS to stop charging/discharging (current limit is 0). 2. When a tertiary overcurrent alarm occurs, the BMS shall notify the PCS to shut down, and then the BMS shall disconnect the contactor after a 3s delay. 				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remark (if any)
1	Display control alarm display	N/A		
2	Secondary overcharge current alarm protection function implemented			
3	Protection function implements tertiary overcharge current alarm			

Table 7-6 Overtemperature alarm and protection function test

Test purpose:				
Ensure the BMS can implement protection functions during primary, secondary and tertiary overtemperature alarms				
Prerequisites:				
Monitoring function and accuracy test have been completed				
Test procedure:				
<ol style="list-style-type: none"> 1. Reset the temperature protection threshold to make the temperature reach primary, secondary and tertiary overtemperature alarms respectively. Default primary overcharge temperature: 45°C, default secondary overcharge temperature: 50°C, default tertiary overcharge temperature: 55°C. 2. The alarm should be displayed on the display control. 3. Check whether the BMS has the corresponding protection function. 				
Test parameters:				
<ol style="list-style-type: none"> 1. When a primary overtemperature alarm occurs, the BMS shall notify the PCS to reduce operating power. 2. When a secondary overtemperature alarm occurs, the BMS shall notify the PCS to stop charging/discharging (current limit is 0). 3. When a level 3 overtemperature alarm occurs, the BMS notifies the PCS to shut down, and the BMS delays for 5s before disconnecting the contactor. 				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remark (if any)
1	Display control alarm display	N/A		
2	Implement protection function under a primary overtemperature alarm.		Based on ambient temperature.	
3	Implement protection function under a secondary overtemperature alarm.		Based on ambient temperature.	
4	Implement protection function under a tertiary overtemperature alarm.		Based on ambient temperature.	

7.3 Performance Maintenance

- The operation and maintenance of UPS and circuit breakers must be performed by qualified and authorized personnel.
- Some maintenance items must first shut down the system.

Safety maintenance should be performed and corresponding records should be made for systems that have been running for more than six months or have not been running for a long time. The specific items are as follows:

- Check whether the doors of the STS cabinet can be opened normally, and ensure that the environment inside and outside the STS cabinet is clean and tidy;
- Check whether the insulation of each power line is abnormal, whether the electrical safety gap meets the safety standards, and whether the wiring bolts are loose;
- Check whether the electrical components are normal and whether the circuit breakers can be effectively disconnected.

7.3.1 UPS Maintenance Procedure

The battery is an important part of the UPS system. The life of the battery depends on the ambient temperature and the number of discharges. Use at high temperatures or deep discharge will shorten the life of the battery.

- The standard built-in battery is a sealed maintenance-free lead-acid battery. When the UPS is connected to the grid, whether it is turned on or not, it always charges the battery and provides overcharge and over-discharge protection functions.
- The ambient temperature should be kept between 15 and 25°C as much as possible when using the battery.
- If the UPS is not used for a long time, it is recommended to charge it every 3 months.
- During normal use, the battery should be charged and discharged once every 4 to 6 months, and charged after discharging until shutdown. When used in high-temperature areas, the battery should be charged and discharged once every 2 months, and the standard UPS should be charged for no less than 10 hours each time.
- Batteries should not be replaced individually. Follow the instructions of the battery supplier when replacing.
- Under normal circumstances, the battery service life is 3 to 5 years. If poor condition is found, it must be replaced earlier. Battery replacement must be performed by professionals.

Note:

- Before replacing the battery, turn off the UPS and disconnect it from the grid power.
- Before replacing the battery, remove metal items such as rings and watches.
- Use a screwdriver with an insulated handle when replacing the battery, and do not place tools or other metal objects on the battery.
- Never short-circuit or reverse the positive and negative terminals of the battery.

7.3.2 Circuit Breaker Maintenance Procedure

The maintenance cycle of the circuit breaker is usually recommended by the manufacturer, generally once a year, but it may also be adjusted according to the usage environment and conditions. Pay attention to the following during maintenance:

- Check the appearance: Check whether the circuit breaker has cracks, deformation, or other damage.
- Cleaning: Remove dust and dirt to prevent overheating or poor contact.
- Check wiring: Ensure the wiring is secure, without looseness or corrosion.
- Test operation: Test whether the circuit breaker operates smoothly and whether the trip and reset functions are normal.
- Check trip records: Record the number of trips and their causes, and analyze whether there are potential problems.
- Safety measures: Take appropriate safety measures during maintenance, such as turning off the power and using insulated tools.

Regular maintenance can extend the service life of the circuit breaker and ensure it provides necessary protection at critical moments.

7.3.3 STS Module Maintenance Procedure

To ensure the normal and safe operation of the STS module, we recommend regular maintenance.

7.3.3.1 Precautions before maintenance

 Danger	<ul style="list-style-type: none"> • STS module operates with high voltage. For safety, maintenance personnel must not touch any live terminals during operation and must ensure the equipment's grounding terminals are reliably grounded. • Due to the presence of capacitors in the STS module bus, maintenance work must be performed at least 15 minutes after power-off. • After disconnecting the power supply, place a warning sign at the disconnection point to prevent accidental power-on during maintenance. • To avoid accidental risks, maintenance personnel should wear insulated gear during maintenance. • Only personnel with professional qualifications are allowed to perform maintenance on STS module.
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7.3.3.2 Daily maintenance content and cycle

Table 7-7 Daily maintenance time and content

Maintenance items	Maintenance content.	Recommended time
Routine inspection.	The input and output voltage and current of the STS module, as well as its operating status, must be monitored in real-time to ensure they are within normal ranges.	Daily
	Listen for any abnormal noises during STS module operation and check for any unusual odors.	
	Read the internal temperature of the STS module and observe whether it is within the normal range.	
Status check	Check whether the appearance of the STS module is damaged or rusty.	One month
	Check whether the air inlet and outlet are unobstructed.	
	Check whether the humidity, temperature, dust, and ventilation conditions around the equipment meet the requirements.	
Cable check	Check whether the cables and terminals are damaged.	Three months
	Check whether the main circuit wiring, grounding wire, and communication wiring are reliably connected.	
	Check whether there are signs of aging or burning at the wiring bolts, and shake them by hand to confirm whether they are in a tightened state.	

8 Troubleshooting

- The STS cabinet is a high-voltage system and can only be operated by qualified and authorized personnel!
- Before troubleshooting, it is necessary to check whether all cable connections and settings are correct, and whether the STS cabinet system can be started normally.

8.1 BMS Troubleshooting

Table 8-1 Faults and solutions

No.	Fault phenomenon	Solution
1	The display control does not work properly after startup	Record the phenomenon and restart the power supply.
2	No data can be obtained on the display control screen	Check whether the BMS cable is connected and whether the battery cluster IP address setting is incorrect.
3	The contactor on the display control interface cannot close	Check whether the voltage difference between battery clusters is greater than 5V, in which case the BMS will start the protection program.
4	The total voltage of a single battery cluster is too low, and the ESBMM has disconnected	Check whether the 24V line of the ESBMM is correctly connected; replace the ESBMM module and check whether the module returns to normal.
5	Abnormal voltage sampling of single battery	Disassemble the battery PACK and check whether the sampling fuse is blown; replace the ESBMM module and check whether the module returns to normal.
6	The ESBMM does not perform the balancing function	Disassemble the battery PACK and check whether the sampling fuse is blown; replace the ESBMM module and check whether the module returns to normal.
7	The display shows that the total voltage of the battery cluster is normal, but there is no current or three times the current during charging and discharging.	Check whether the contact resistance of the battery cluster circuit increases; check whether the battery PACK is tightened; check whether the fuse at the DC bus is damaged; check whether the internal resistance of the battery PACK increases and whether the voltage is within the normal range.

8.2 Circuit Breaker Replacement

- This battery system is a high-voltage DC system and can only be operated by qualified authorized personnel.
- Before replacing major components, the main circuit of the battery cluster must be disconnected for maintenance.

- All repairs and replacements of components can only be performed by qualified personnel and must use approved materials, parts, and components for replacement.

The steps for replacing the circuit breaker are as follows:

1. First, ensure that the power is turned off, use a wrench to loosen the wiring bolts or nuts of the circuit breaker, and then remove the wiring tabs from the circuit breaker.
2. Circuit breaker installation: Place the new circuit breaker in the original position, ensuring that the circuit breaker is aligned with the mounting plate or rail. Then, insert the wiring tabs into the blade socket of the circuit breaker and secure them with nuts or bolts.
3. Wiring connection: According to the original wiring diagram, connect the wires of the original circuit to the new circuit breaker in sequence, ensuring that the connections are secure and reliable. Use an electric screwdriver or torque wrench to tighten the wiring bolts or nuts one by one.
4. Functional test: After completing the circuit breaker replacement, restore the power supply and perform a functional test of the circuit breaker. Verify whether the closing and opening functions of the circuit breaker are normal by operating the switch.

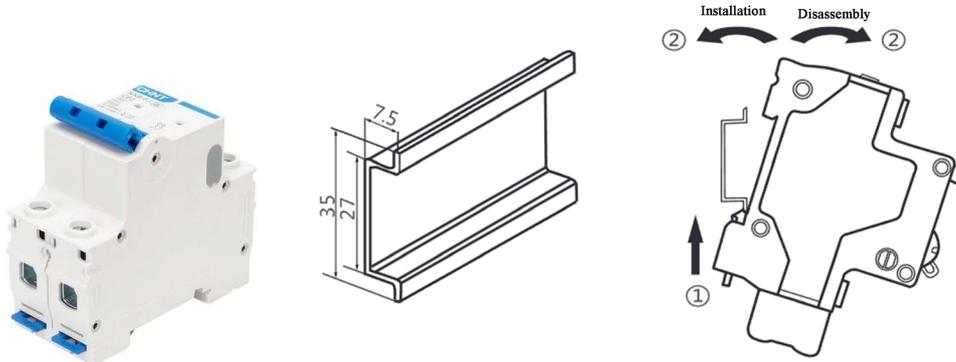


Figure 8-1 Replace circuit breaker

8.3 UPS Troubleshooting

- The UPS is professional equipment and can only be operated by qualified authorized personnel.
- Before replacing major components, the power supply and communication must be disconnected.
- All repairs and replacements of components can only be performed by qualified personnel and must use approved materials, parts, and components for replacement.

Table 8-2 UPS alarm code and description

Alarm code	Alarm description	Alarm type	Buzzer behavior
01	BUS soft start timeout	Fault	Buzzer sounds continuously
02	BUS high voltage fault	Fault	Buzzer sounds continuously
03	BUS low voltage fault	Fault	Buzzer sounds continuously
05	BUS short circuit fault	Fault	Buzzer sounds continuously
06	Inverter soft start timeout	Fault	Buzzer sounds continuously
07	Inverter voltage high fault	Fault	Buzzer sounds continuously
08	Inverter voltage low fault	Fault	Buzzer sounds continuously
10	Inverter voltage short circuit fault	Fault	Buzzer sounds continuously
22	Overload fault	Fault	Buzzer sounds continuously
23	Overtemperature fault	Fault	Buzzer sounds continuously
29	Rectifier fault	Fault	Buzzer sounds continuously
55	NTC not connected	Fault	Buzzer sounds continuously
57	Battery not connected in battery mode	Fault	Buzzer sounds continuously
59	Battery overcharge fault	Fault	Buzzer sounds continuously
62	Inverter capacitor open circuit	Fault	Buzzer sounds continuously
04	Grid power abnormal	Warning	Off

07	L, N reversed	Warning	1 beep per 2 minutes
08	Bypass abnormal	Warning	Off
0A	Battery not connected	Warning	1 beep per second
0b	Low battery voltage alarm	Warning	1 beep per second
0c	Battery overcharge warning	Warning	Buzzer sounds continuously
0F	Overload alarm	Warning	2 beeps per second
10	Fan failure	Warning	1 beep per second
12	Charger failure	Warning	Buzzer sounds continuously
1A	NTC abnormal	Warning	Off
1b	NTC overtemperature warning	Warning	Off
20	Other external alarms	Warning	Off
54	Unknown UPS model	Warning	Buzzer sounds continuously

Table 8-3 UPS troubleshooting

Fault phenomenon	Cause	Solution
Battery icon flashing	Battery voltage too low or battery not connected	Check the UPS battery section, connect the battery properly. If the battery is damaged, please contact your supplier
Charging icon off, alarm indicator flashes once per second and displays "12" alarm code, buzzer sounds continuously	UPS charging failure	Please contact your supplier
The LCD warning indicator flashes once per second and displays the "07" alarm code, and the buzzer sounds once every 2 minutes	Input neutral and live wires are reversed	Please check if the input neutral and live wires are reversed, and if the input grounding wire is not connected or loosely connected
Grid power is normal, but the UPS does not connect to the grid	UPS input circuit breaker is tripped	Manually reset the circuit breaker
Short battery discharge time	Insufficient battery charging	Keep the UPS connected to the grid for more than 10 hours to recharge the battery

	UPS overload	Check the load level and remove non-critical equipment
	Battery aging, capacity reduced	Replace the battery, please contact your supplier for the battery and its components
The UPS cannot start after pressing the power button	The power button was pressed for too short a time	Press and hold the power button for more than one second to start the UPS
	The UPS is not connected to the battery or the battery voltage is low and it is started with a load	Connect the UPS battery properly. If the battery voltage is low, turn off the power first and then start the UPS without load
	UPS internal failure	Please contact your supplier
The LCD warning indicator flashes once per second and displays the "07" alarm code, and the buzzer sounds once every 2 minutes	Input neutral and live wires reversed/grounding wire not connected	Please check if the input neutral and live wires are reversed, or if there is no grounding wire

8.4 STS Module Troubleshooting

Table 8-4 STS module troubleshooting

Fault phenomenon	Cause	Solution
EPO failure	External dry contact signal abnormal	Check if the EPO is short-circuited or if the normally open and normally closed contacts are correctly connected
24V power supply failure	Internal auxiliary power supply failure	(1) Check if the power supply of the signal processing board is out of range—repair the power supply; (2) Check if the power cable between the auxiliary power board and the detection board is correctly and reliably connected; (3) Check if the flexible flat cable from the control board to the detection board is loose—tighten the flexible flat cable; (4) Check if the detection board is working normally—replace the detection board.
Fan failure	Fan stall	Check if the fan is stalled or not rotating.
Connection failure	Internal connection failure	Confirm if the IGBT module is overheating, and check if the fan is working normally.

15V power supply failure	Internal auxiliary power supply failure	(1) Check if the power supply of the signal processing board is out of range—repair the power supply; (2) Check if the power cable between the auxiliary power board and the detection board is correctly and reliably connected; (3) Check if the flexible flat cable from the control board to the detection board is loose—tighten the flexible flat cable; (4) Check if the detection board is working normally—replace the detection board.
Phase A overvoltage fault	Grid voltage exceeds the limit	(1) Confirm whether the grid is overvoltage - the system needs shutdown protection when the grid is overvoltage; (2) Confirm whether the grid overvoltage protection point is appropriate; (3) Check whether the grid voltage detection cable is loose or abnormal - plug in the detection cable tightly.
Phase B overvoltage fault	Grid voltage exceeds the limit	(1) Confirm whether the grid is overvoltage - the system needs shutdown protection when the grid is overvoltage; (2) Confirm whether the grid overvoltage protection point is appropriate; (3) Check whether the grid voltage detection cable is loose or abnormal - plug in the detection cable tightly.
Phase C overvoltage fault	Grid voltage exceeds the limit	(1) Confirm whether the grid is overvoltage - the system needs shutdown protection when the grid is overvoltage; (2) Confirm whether the grid overvoltage protection point is appropriate; (3) Check whether the grid voltage detection cable is loose or abnormal - plug in the detection cable tightly.
Phase A undervoltage fault	Grid voltage is below the limit	(1) Confirm whether the grid is undervoltage - the system needs shutdown protection when the grid is undervoltage; (2) Confirm whether the grid undervoltage protection point is appropriate; (3) Check whether the grid voltage detection cable is loose or abnormal - plug in the detection cable tightly.
Phase B undervoltage fault	Grid voltage is below the limit	(1) Confirm whether the grid is undervoltage - the system needs shutdown protection when the grid is undervoltage;

		<p>(2) Confirm whether the grid undervoltage protection point is appropriate;</p> <p>(3) Check whether the grid voltage detection cable is loose or abnormal - plug in the detection cable tightly.</p>
Phase C under-voltage fault	Grid voltage is below the limit	<p>(1) Confirm whether the grid is undervoltage - the system needs shutdown protection when the grid is undervoltage;</p> <p>(2) Confirm whether the grid undervoltage protection point is appropriate;</p> <p>(3) Check whether the grid voltage detection cable is loose or abnormal - plug in the detection cable tightly.</p>
Grid over-frequency	Grid frequency exceeds limit	<p>(1) Determine if the grid frequency is too high - the system will shut down for protection when the grid frequency is too high;</p> <p>(2) Determine if the grid over-frequency protection point is appropriate.</p>
Grid under-frequency	Grid frequency is below limit	<p>(1) Determine if the grid frequency is too low - the system will shut down for protection when the grid frequency is too high;</p> <p>(2) Determine if the grid under-frequency protection point is appropriate.</p>
Grid phase sequence error	Grid phase sequence A, B, C is reversed	<p>(1) Determine if the grid phase sequence is incorrectly connected - adjust the grid input phase sequence to ABC after power off;</p> <p>(2) Check if the grid voltage sampling cable is incorrectly connected - adjust the grid sampling cable phase sequence to ABC after power off.</p>
Phase A software over-current	AC phase A current exceeds limit	<p>(1) Determine if phase A of the grid has over-current - the system needs to shut down for maintenance when the module has over-current;</p> <p>(2) Confirm if the over-current protection point is appropriate.</p>
Phase B software over-current	AC phase B current exceeds limit	<p>(1) Determine whether an overcurrent has occurred in phase B of the grid—the system needs to be shut down for maintenance when the module is overcurrent;</p> <p>(2) Confirm if the over-current protection point is appropriate.</p>
Phase C software overcurrent	AC phase C current exceeds the limit	<p>(1) Determine whether an overcurrent has occurred in phase C of the grid—the system</p>

		needs to be shut down for maintenance when the module is overcurrent; (2) Confirm if the over-current protection point is appropriate.
Grid voltage imbalance	The voltage difference between phases A/B/C in the three-phase three-wire system exceeds the limit	Confirm whether the grid is normal and whether the voltage distortion rate of the meter is normal. If the issue cannot be resolved, please contact after-sales service.
Grid current imbalance	The current difference between phases A/B/C in the three-phase three-wire system exceeds the limit	Confirm whether the grid is normal and whether the current distortion rate of the meter is normal. If the issue cannot be resolved, please contact after-sales service.
Grid phase loss	Grid phase A/B/C loss	Confirm whether the grid connection is normal. If the issue cannot be resolved, please contact after-sales service.
STS communication fault	Communication interruption between STS and PCS	Fault shutdown, check whether the wiring connection is abnormal
EMS communication fault	Communication interruption between STS and EMS	Fault shutdown, check whether the wiring connection is abnormal
Thyristor short-circuit fault	Thyristor short circuit	Contact the manufacturer for handling
Thyristor open circuit fault	Thyristor open circuit	Contact the manufacturer for handling
Thyristor current quick test short circuit fault	Thyristor current quick test short circuit	Contact the manufacturer for handling

9 Quality Assurance

9.1 Liability Exemption

1. Exceed the quality assurance period of the product.
2. Cannot provide product serial number or the SN is not clear/complete.
3. Damage during transportation/storage/handling.
4. Misuse, abuse, intentional damage, negligence, or accidental damage.
5. Improper commissioning, testing, operation, maintenance or installation performed by customer, including but not limited to:
 - Failure to meet safe operating environment or system requirements of external electrical parameters provided in written document;
 - Failure to operate the covered product in accordance with the product's operating manual or user guide;
 - Relocate and reinstall systems not in accordance with the requirements of Chint power;
 - Unsafe electrical or chemical environment or other similar kind of conditions;
 - Direct failure caused by wrong voltage or faulty power system;
 - Unauthorized disassembly of the products, or unauthorized modification of the product or provided software.
6. Entrust installation, maintenance personnel not designated by the CHINT to install, repair and disassemble the products.
7. Damages caused by ignoring the safety warnings in the manual or break the rules in relevant statutory safety regulations.
8. Damages caused by operating environment beyond the requirements of the product user manual or failure to commissioning, install, use and maintain the equipment according to the requirements of the product user manual.
9. Unforeseen disasters or irresistible accidents (including but not limited to acts of public enemies, acts of government agencies or domestic or foreign institutions, vandalism, riots, fires, floods, typhoons, explosions or other disasters, epidemic or quarantine restrictions, labor disturbances or labor shortages, accidents, cargo embargoes or any other events beyond the control of CHINT).
10. The lightning protection measures have not been implemented or are not in accordance with standards (Photovoltaic systems' lightning protection measures should comply with the relevant IEC standards; otherwise, it may result in damage to

photovoltaic devices such as modules, inverters, distribution facilities, etc., due to lightning strikes).

11. Equipment failure or software damage caused by using non-standard components/accessories, connection of incompatible configurations (such as batteries, etc.) or other brand products or accessories without permission, improper configuration selection/storage/use.
12. Other circumstances that are not covered by the company's after-sales warranty agreement.

9.2 Quality Terms (Warranty Terms)

1. For products that fail during the warranty period, our company will repair or replace new products free of charge;
2. Customer shall present the invoice of the product and date of purchase. At the same time, the trademark on the product should be clearly visible, otherwise we have rights to refuse quality assurance.
3. The unqualified product under replacement should be returned to our company;
4. It is necessary to provide a reasonable time for the company to overhaul the equipment.
5. For more warranty terms, refer to the applicable standard warranty policy in place at time of purchase

Annex 1 Safety Training Records

Customer name		Training location	
Training purpose		Contact number	
Trainer		Training time	
Training content			
Basic requirements	<ul style="list-style-type: none"> • Wear labor protection equipment before entering the site. • On-site installation personnel are not allowed to use metal accessories (watches, necklaces). • Special types of construction projects must be carried out by certified personnel within their scope of work. 		
Overall	<ul style="list-style-type: none"> • Protective covers should be installed on cables in a timely manner. • Clear markings are required: energized equipment • Follow the equipment's power-on and power-off procedures and warning signs. 		
Signature			
If all the above requirements can be met, please sign below:			

Note: The company shall not be held responsible for any accidents caused by improper operation.

Annex 2 Personal Protective Equipment List

No.	Category	Example	Requirement
1	Safety helmet		<p>Before entering the construction site, helmets should be used correctly to protect the head.</p> <p>Helmets should comply with the requirements of GB2811-2007 "Helmet Usage Methods".</p>
2	Electrician suit		<p>On-site service personnel need to wear electrician suits.</p>
3	Safety shoes		<p>Safety shoes must be worn during battery transportation and installation.</p> <p>On-site service personnel need to wear safety shoes.</p>
4	Insulating gloves	 	<p>On-site maintenance personnel need to wear insulating gloves.</p>
5	Mask		<p>On-site service personnel need to wear masks.</p>

Note: Other types of PPE and corresponding quantities are determined by on-site requirements.

Annex 3 List of Tools

No.	Name	Material	Specification	Sample	Qty.	Remarks	Calibration date	Validity Period
1	Laptop				2	Important Tool		
2	Tape Measure	Steel	5 m		1	Important Tool		
3	Wrench (insulated)	Stainless steel	1 complete set		1	Important Tool		
4	Socket wrench (insulated)	Stainless steel	1 complete set		1	Important Tool		
5	Insulated torque wrench	Stainless steel	1 complete set		2	Important Tool		
6	Screwdriver	Stainless steel	1 complete set		1	Important Tool		
7	Gradient meter (level)	Aluminum alloy	1000mm		1	Important Tool		
8	Electric wrench				1	Important Tool		
9	Electric drill				1	Important Tool		

No.	Name	Material	Specification	Sample	Qty.	Remarks	Calibration date	Validity Period
10	Multimeter				1	Important Tool		
11	Forklift				1	Important Tool		

Annex 4 Application Scenarios

- **Data Centers and Server Rooms**
This is the most classic and widely used application scenario for STS.
Scenario description: Core servers, network equipment, storage devices, etc., must never experience power outages. Typically, two utility power sources or one utility power source and one generator are used as input sources.
How it works: Under normal circumstances, the load is powered by the main power source. When the main power source experiences any quality issues or faults such as voltage dips, surges, or interruptions, the STS can automatically switch the load to the backup power source within milliseconds (typically 1/4 cycle, i.e., within 5ms) without interruption, ensuring that server operation is unaffected and preventing data loss or service interruption.
Value: Ensures data integrity, business continuity, and high availability of over 99.999%.
- **Critical Medical Equipment**
Many devices in hospitals are directly related to the safety of patients' lives.
Scenario description: Life support systems in operating rooms, ICUs (Intensive Care Units), and CCUs (Cardiac Care Units), such as ventilators, heart-lung machines, monitors, etc.
How it works: These devices are powered by the hospital's dual power distribution system or UPS system. Once the main power supply line fails, the STS must act immediately, completing the switch before the equipment even detects the power outage, ensuring continuous and stable operation of the equipment and gaining valuable time for life-saving efforts.
Value: Ensure patient safety and avoid medical accidents.
- **Industrial automation and precision manufacturing**
Modern production lines are highly sensitive to power supply quality.
Scenario description: Semiconductor chip manufacturing, precision machining, automated production lines (such as automobile manufacturing), industrial process control (DCS/PLC systems), etc.
How it works: Even a few milliseconds of voltage sag can cause expensive production equipment to shut down, control systems to reset, products to be scrapped, or even damage equipment. STS can prevent this risk by instantly switching to a healthy power source when a decline in power quality is detected, maintaining continuous and stable production processes.
Value: Avoid huge production and economic losses, and protect high-value

production equipment.

- Finance and trading systems

Every second in the financial industry means huge capital flows.

Scenario description: Bank data centers, securities trading center servers, ATM network systems, real-time trading systems, etc.

How it works: Any power interruption may lead to loss of transaction data, trading interruptions, and immeasurable economic and reputational losses. STS provides these core systems with the last line of seamless power protection, ensuring 24/7 uninterrupted financial operations.

Value: Ensure the security of financial data and absolute business continuity, maintaining market confidence.

- Communication and broadcasting centers

Communication hubs and broadcasting systems must operate uninterruptedly.

Scenario description: Telecom operators' core equipment rooms, broadcasting and transmission equipment, signal dispatch centers, etc.

How it works: Power interruptions can cause large-scale communication network failures or broadcasting accidents ("black screen" or "silence"). STS is used to protect these critical devices, ensuring continuous signal transmission and broadcasting, meeting the broadcasting industry's "second-stop" standard.

Value: Ensure smooth communication and broadcasting safety, avoiding major social impacts.

- Transportation hubs and control systems

Modern transportation highly relies on electricity.

Scenario description: Airport air traffic control systems, terminal information display systems; subway and high-speed rail signal control systems, dispatch centers; highway monitoring and toll systems.

How it works: Power outages in these systems can cause traffic chaos or even safety accidents. STS provides seamless power switching for these core control systems, ensuring uninterrupted command and dispatch, normal information display, and the safe and orderly operation of public transportation.

Value: Enhance the safety and operational efficiency of public transportation.

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CPS STS 500K Static Transfer Switch Cabinet User Manual/English Version.

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