

NENGHUI



All-in-one Liquid-cooled
ESS Cabinet NE233L
User Manual

Please ensure that you thoroughly review the user manual for the energy storage system prior to its operation.

Keep this manual for future reference.

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Our product is designed to adhere to standards for environmental conservation and safety. The storage, operation, and disposal of the product must be in accordance with the instructions provided in the manual, as well as any applicable contracts or legal regulations.

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1. Preface

1.1. Overview

This document primarily outlines the procedures for installing, establishing electrical connections, commissioning, and resolving issues with the NE233L energy storage system. It is imperative to study this manual attentively prior to the installation and utilization of the energy storage system to comprehend the safety guidelines and to become acquainted with its functionalities and features.

1.2. About this Manual

Prior to the installation, operation, or maintenance of this equipment, it is essential to thoroughly read this manual and gain a comprehensive understanding of the equipment.

The manual's content is subject to ongoing updates and revisions, there may be minor inconsistencies or errors when compared to the actual product. Users are advised to consult the physical product they have purchased and to obtain the most current version of the manual through the company's official website or through authorized sales channels.

1.3. Symbol Usage

To safeguard the personal and property safety of users while utilizing the product, pertinent information has been provided. Emphasis is placed on this information through the use of specific symbols.

Only properly trained and qualified personnel are allowed to perform the installation procedures identified in this Manual.

Below is a list of symbols that you may encounter in this manual. Please read and understand them to ensure proper use of the manual.

	DANGER: This signifies an imminently hazardous situation. Failure to avoid it will likely result in death or severe injury. The DANGER designation is reserved for the most extreme circumstances and is not applied to property damage hazards unless there is also a significant risk of personal injury at these levels.
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 WARNING	<p>WARNING: This indicates a hazardous situation. If not avoided, it has the potential to result in death or serious injury. The WARNING label is not used for property damage hazards unless there is an associated risk of personal injury that is proportional to the severity of the property damage.</p>
 CAUTION	<p>CAUTION: This denotes a hazardous situation. If not avoided, it may lead to minor or moderate injury. The CAUTION indicator can also serve as a warning for unsafe operations that could potentially cause property damage.</p>
	<p>ATTENTION: This indicates a potential risk, which, if not avoided, may lead to equipment malfunction or property damage.</p>

2. Safety Precautions

2.1. Personnel Requirements

The lifting, transportation, installation, wiring, operation, and maintenance of the Energy Storage System (ESS) must be conducted by professional electrical technicians who adhere to local regulations. Operators are required to meet the following criteria:

- Possess a solid understanding of electronics, electrical wiring, and mechanics, and be well-versed in electrical and mechanical schematics.
- Be thoroughly familiar with the composition and operational principles of the ESS, as well as its associated front-end and back-end equipment.
- Have completed professional training specifically related to the installation and commissioning of electrical systems.
- Demonstrate the capability to manage emergencies and handle unexpected situations that may occur during the installation or commissioning process.
- Be knowledgeable about the relevant standards and regulations applicable to the country or region where the project is situated.

2.2. Electrical Safety

	<ul style="list-style-type: none"> ● There is a risk of electric shock when touching points or terminals connected to the power grid or internal equipment! ● Both the battery and grid sides may generate voltage. Always use a standard voltmeter to verify that there is no voltage present before making contact. ● Lethal high voltage exists in the cabinet. Pay attention to and follow the warning labels on the product! ● Damaged internal component may cause electric shock or fire! ● Comply with the safety precautions detailed in this manual and any other relevant documentation for the equipment. ● Abide by the protective requirements and precautions specific to the battery. ● Allow a 10-minute waiting period to ensure the equipment is fully energized before beginning any operations.
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 WARNING	<ul style="list-style-type: none"> ● All activities, including lifting, transportation, installation, wiring, operation, and maintenance, must adhere to the relevant regulations and ordinances applicable in the project area. ● It is crucial to use the ESS as instructed by this manual to prevent equipment damage. ● Upon disconnecting the power supply of the ESS, the battery will not power off immediately.
---	--

 CAUTION	<p>To prevent unauthorized individuals from approaching the energy storage container, which could lead to accidents or mishandling, please follow these precautions:</p> <ul style="list-style-type: none"> ● Install prominent warning signs around the ESS to avoid accidental closures that may result in accidents. ● Position warning signs or establish safety tapes in the vicinity of the equipment.
---	--

2.3. Battery Safety

Battery Protection Signs

	<p>This sign indicates a high voltage hazard which may cause electrical hazards if touched.</p>
	<p>This sign indicates that the temperature here is higher than the acceptable range for human body. Do not touch it arbitrarily to avoid personal injury.</p>
	<p>This sign indicates that this is the protective earthing (PE) terminal, which needs to be firmly grounded to ensure the safety of personnel.</p>

To ensure the secure operation of the product, it is imperative for technical staff to adhere to the safety protocols outlined below. The company disclaims liability for product malfunctions,

component failures, personal injuries, or property damages resulting from the following circumstances:

- Any depletion or permanent impairment of battery capacity due to the customer's delay in charging.
- Any harm or leakage of the battery resulting from incorrect usage or neglect of proper operational procedures.
- Damage to the battery from delayed recharging by the customer, leading to excessive battery discharge.
- Damage caused by the use of inappropriate charging and discharging equipment by the customer.
- Repeated deep discharges of the battery due to inadequate maintenance, on-site capacity increases, or extended periods of incomplete charging.
- Damage resulting from incorrect configuration of the battery's operational parameters by the customer.
- Direct harm to the battery from operating conditions that do not conform to the necessary standards for its function.
- Alterations to the battery's usage made by the customer, such as self-installed additional loads.
- Inadequate upkeep of the battery as per the guidelines in the system manual provided with the equipment.
- Damage to the product due to the customer's continued use of batteries after the expiration of the warranty period.
- Damage resulting from the use of batteries that are faulty or physically distorted.
- Combining batteries supplied by the company with those from other sources, such as batteries from different brands or with varying capacity ratings.
- Damage to the product or loss of other property due to the improper storage or installation of batteries in proximity to flammable or explosive materials.
- Accidents involving personal safety and property loss caused by not wearing the appropriate protective gear during battery operations, which should be handled by trained professionals.
- Damage to the battery from activities such as eating, drinking, or smoking in close proximity

to it.

- The battery being stolen.

2.4. Operation and Maintenance Safety

	<ul style="list-style-type: none"> ● It is mandatory to equip oneself with personal protective gear when carrying out maintenance, inspections, or any other tasks associated with the energy storage system. ● Technicians engaged in maintenance are required to equip safety goggles, helmets, insulated footwear, gloves, and other protective apparel. ● The battery unit does not contain any parts that can be serviced by the user. ● Self-maintenance of the battery is prohibited. Only personnel appointed by Nenghui are authorized to perform tasks such as removal, replacement, or handling of the battery. ● To mitigate the risk of electric shock, refrain from conducting any maintenance procedures not outlined in this manual. ● For repair assistance, reach out to after-sales service team of Nenghui . ● To maintain fire safety, the replacement of internal components should be executed solely by skilled professionals.
---	---

	<p>Taking apart or burning the battery poses a significant fire hazard!</p>
---	---

	<ul style="list-style-type: none"> ● Avoid applying any substances to the components, whether inside or outside the equipment. ● Do not clean the equipment with cleaning agents or subject it to harsh chemicals.
---	--

2.5. Storage

In case installation is not to be conducted soon after delivery acceptance, the ESS shall be stored according to the requirements in this section. The ESS with outer packaging shall be stored in a ventilated, dry, and clean indoor environment. Meanwhile, the following instructions shall be complied with:

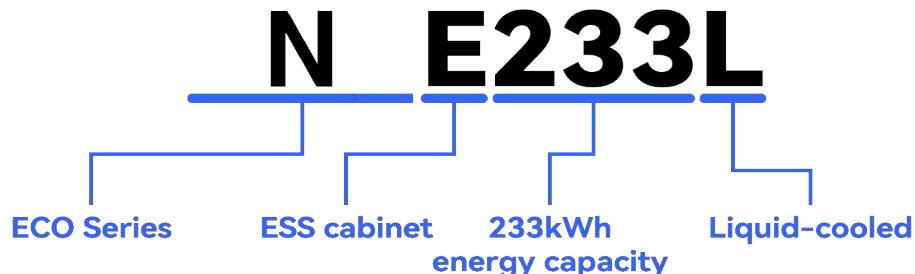
- The ESS Cabinet shall be kept with transportation packaging, and the desiccant inside the packaging shall be retained rather than discarded.
- Keep ESS Cabinet SOC in 30%~50% during storage; Avoid long-term storage when SOC is lower than 15%. In case ESS Cabinet is to lay idle for a long time, turn off the power-consuming equipment in a timely manner.
- The warehouse ground shall be flat and strong enough to bear the weight of the ESS. The warehouse environment must be free from noxious gases, combustible and explosive materials, as well as corrosive substances.
- During storage, the equipment shall be ventilated and protected against moisture, and the warehouse must be free from water accumulation.
- Temperature of storage environment: -20°C to 55°C; relative humidity of storage environment: 0-95%, without condensation. The ESS should be positioned at least 2 meters away from any heat sources. The packaging box should be elevated a minimum of 20 centimeters from the floor and maintained at a distance of no less than 50 centimeters from walls, windows, or air intake vents.
- Regular inspection shall be conducted, generally no less than once a week. The packaging shall be checked for potential damage of rodent bites. If there is damage to the outer packaging, it shall be remedied or replaced immediately.

2.6. Product Disposal

When the battery system reaches end-of-life, it shall not be disposed of as regular waste. Contact the relevant authorized recycling agency for proper disposal.

3. Product Introduction

3.1. Naming Role



3.2. Product Overview

NE233L is a C&I ESS Cabinet product that is exclusively developed and manufactured by Nenghui . It features an integrated All-In-One design, incorporating LFP (Lithium Iron Phosphate)batteries, High Voltage Box (HVB), Power Conversion System (PCS), Fire Suppression System (FSS), liquid-cooling unit, and additional components all within one ESS Cabinet.

This cabinet is designed with attributes such as energy efficiency, compact dimensions, high energy density, adaptability to various environments, the ability to be quickly installed on-site, compatibility with the electrical grid, and the ease of expanding its capacity.

NE233L Cabinet appearance is shown below as Figure 3-1 and Figure 3-2.



Figure 3-1

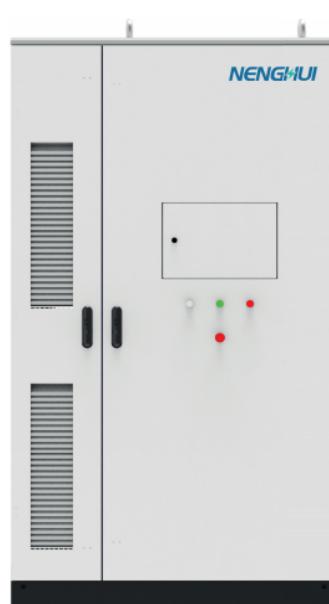


Figure 3-2

3.2.1. Specification

Nenghui NE233L Cabinet	
DC Side	
Cell type	LFP 280Ah
Pack Capacity	46.592kWh/1P52S
System Capacity	232.96KWh/1P260S
Rated Voltage	832V
Recommended voltage range	728-936Vdc
AC Side	
Rated Output Power	105kW
Max Power	115.5kW(continuous 1 minute)
Nominal Voltage	400Vac/3P+N+PE
Nominal Frequency	50Hz/60Hz
THDi	≤3%
DC component	<0.5%lpn
Power factor	-0.99 lagging ~ 0.99 leading
General	
System Efficiency	≥90%
Charge/Discharge Rate	0.5P
Depth of Discharge	95%DOD($25\pm2^{\circ}\text{C}$)
Cycle Life	≥8000 times ($25\pm2^{\circ}\text{C}, 0.5P, 95\%$ DOD)
Ingress Protection	IP55
Switching time	≤100ms
Cooling Method	Active Liquid cooling
Operating Temperature	-25 to 55°C
Relative Humidity	5-95%RH
Noise	≤75dB
Working Altitude	≤2000m (Derated above 2,000m, maximum application altitude≤4000m)
Dimensions (W*D*H)	1050*1350*2400mm
Weight	2570kg
Fire Suppression System	PACK-level aerosol+Cabinet-level aerosol
Communication interface	Ethernet/RS485
Standards complied with	UN38.3, IEC62477, IEC61000, IEC63056, UL9540A, EN50549

3.2.2. Electrical Diagram

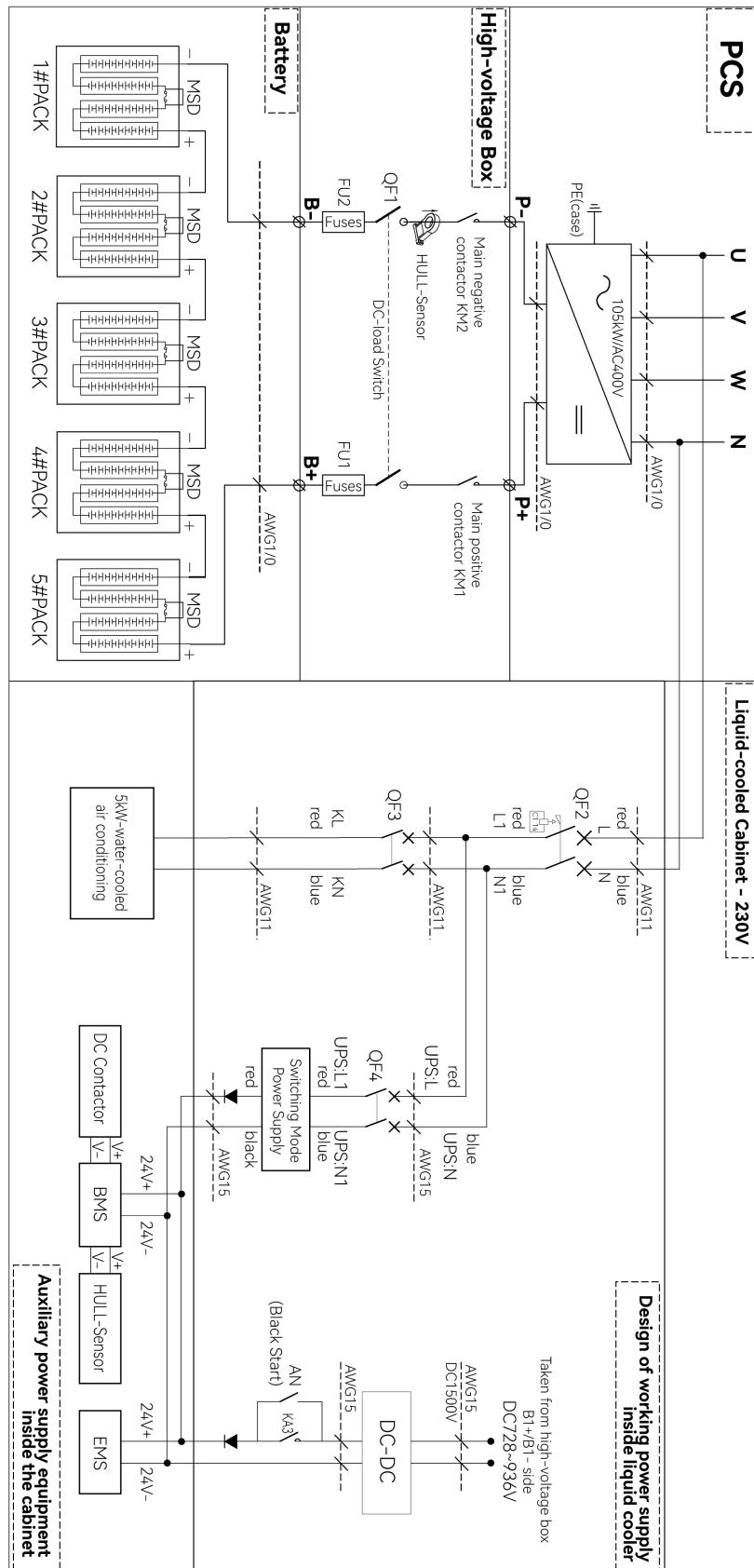


Figure 3-3 Electrical Diagram

3.2.3. System Communication

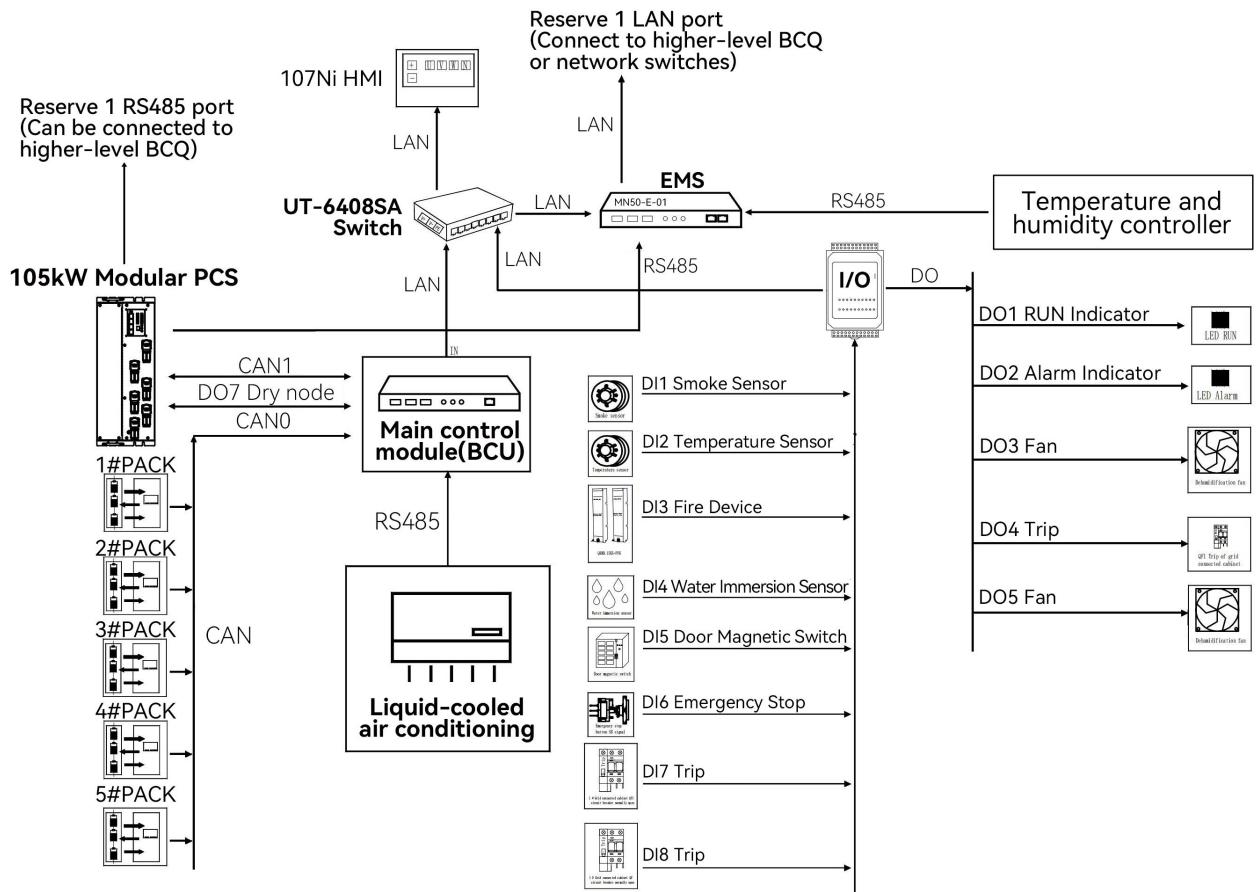


Figure 3-4 System Communication Diagram

NE233L adopts a three-level communication system.

Level-I is the BMU slave control device of the BMS, which is responsible for acquisition of PACK voltage, NTC temperature and other signals as well as the battery equalization management.

Level-II is the BCU, main control device of the BMS, responsible for the summary and processing of the signals acquired by BMU, the realization of charging/discharging control, threshold protection, and the formulation and execution of thermal management strategies.

Level-III is the BCQ, Local EMS Controller, the brain of ESS, Level-III realizes the info-acquisition, monitoring, processing and control of the BMS, PCS, HVB, FSS status and other signals of the ESS Cabinet.

3.2.4. Operation Modes

- On-grid operation mode

The AC side of NE233L is connected to the grid, and its DC side is internally connected to the lithium battery. It is applicable for scenarios such as power expansion, PV plus EV charging, peak shaving, demand management, power quality management. Based on grid-tied P/Q operating mode, NE233L can be charged/discharged with constant power, constant current, and constant voltage on lithium batteries.

- Off-grid operation mode

The DC side of NE233L is connected to the lithium battery. When the system is running off-grid or as black start power, NE233L operates with VF (Voltage-Frequency) mode: it delivers fixed-frequency and effective three-phase AC and voltage, supplying continuous AC power to the load on the AC side. NE233L is applicable in scenarios such as micro-grid in islands and remote areas, as well as a power source for important loads.

3.3. Product Appearance

3.3.1. Cabinet Appearance & Structure

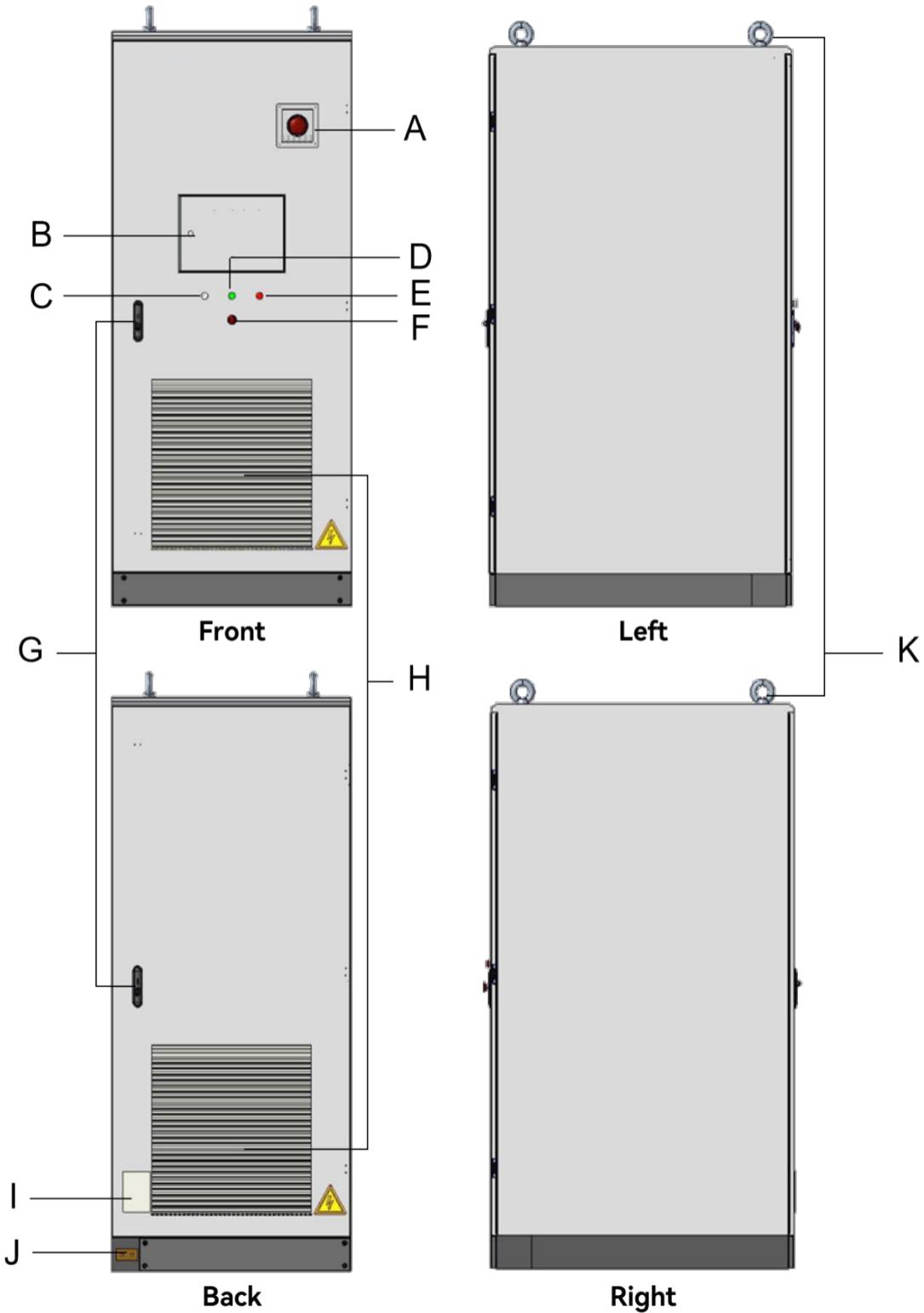
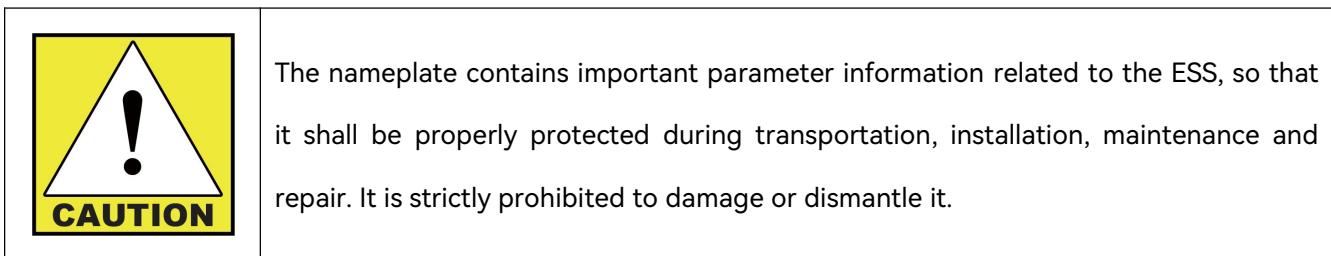


Figure 3-5 Cabinet Appearance

*The figures are for reference, please refer to actual product.

No.	Item	Quantity	Note
A	Warning Light	1	It will flash and emit an alarm sound once emergency happen
B	Human Machine Interface(HMI)	1	Touch screen to control system
C	Power Indication Light	1	White light for power indication
D	Running Indication Light	1	Green light for running indication
E	Fault Indication Light	1	Red light for fault indication
F	Emergency Stop Button	1	For emergency shutdown
G	Cabinet Door Lock	2	
H	Ventilation Grille	2	For cabinet ventilation
I	Aluminum Name Plate	1	Include model, battery type, main technical parameters, and place of origin.
J	Grounding Copperplate	1	For cabinet grounding connection
K	Hanging Ring	4	For lifting the cabinet (place inside the cabinet for transportation)



3.3.2. LED Indicator

Indicator	Name	Status	Description
White	POWER	ON	Both QF2 and QF4 are switched on.
		OFF	Either QF2 or QF4 is switched off, or neither of them are switched off.
Green	RUN	ON	1. ESS Cabinet in charging status, charging power $\geq 5\text{kW}$. 2. ESS Cabinet in discharging status, discharging power $\geq 3\text{kW}$.
		OFF	The ESS Cabinet in standby mode, neither charging nor discharging.
Red	FAULT	ON	Fault occurs
		OFF	No-fault status

3.3.3. Dimension

Cabinet Dimension(W*D*H): 1050*1350*2400 mm; Weight: 2570kg

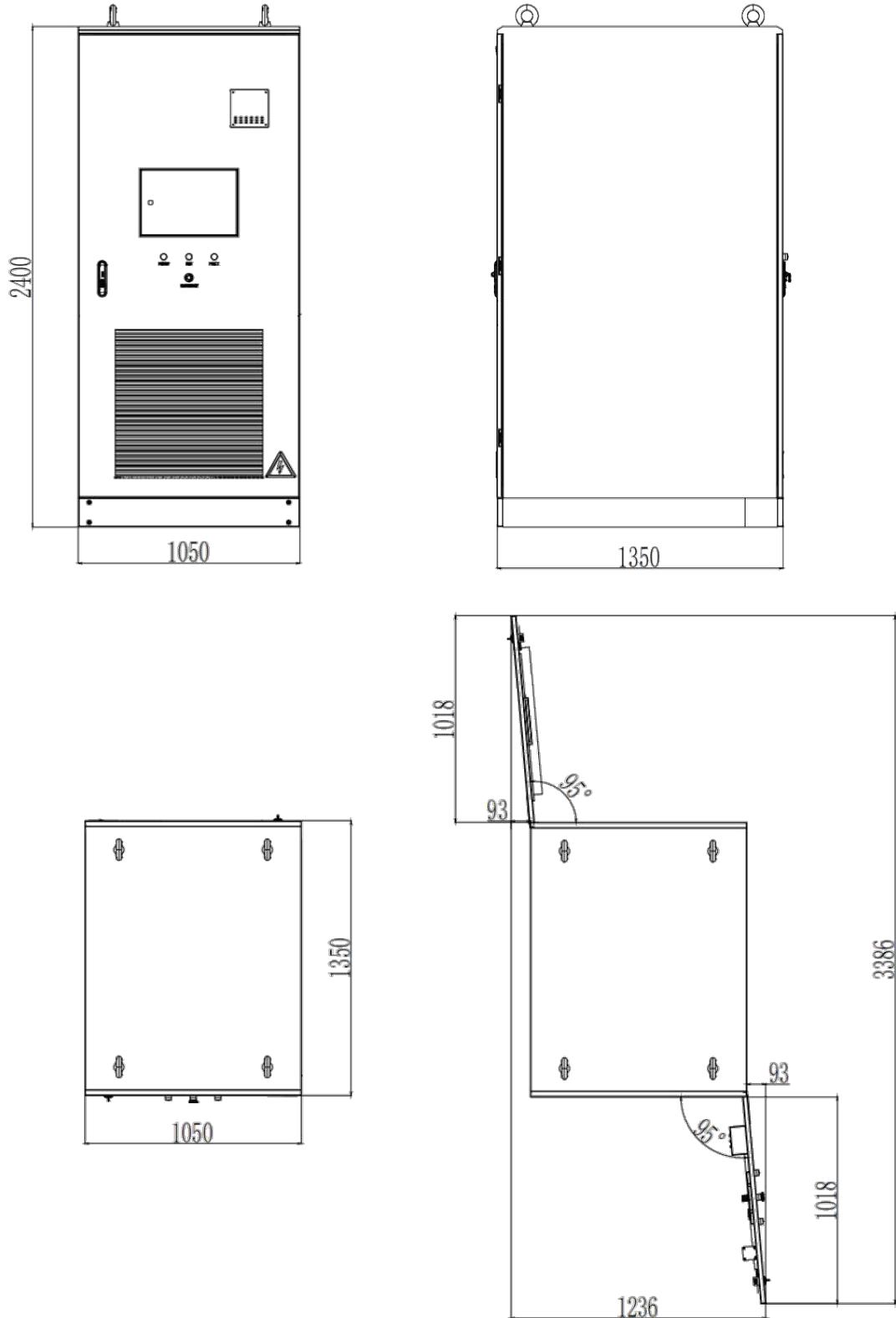


Figure 3-6 Cabinet Dimension

Dimension with Package(W*D*H): 1130*1490*2525 mm; Weight: 2700kg



Figure 3-7 Cabinet with Package

3.3.4. Ventilation Design

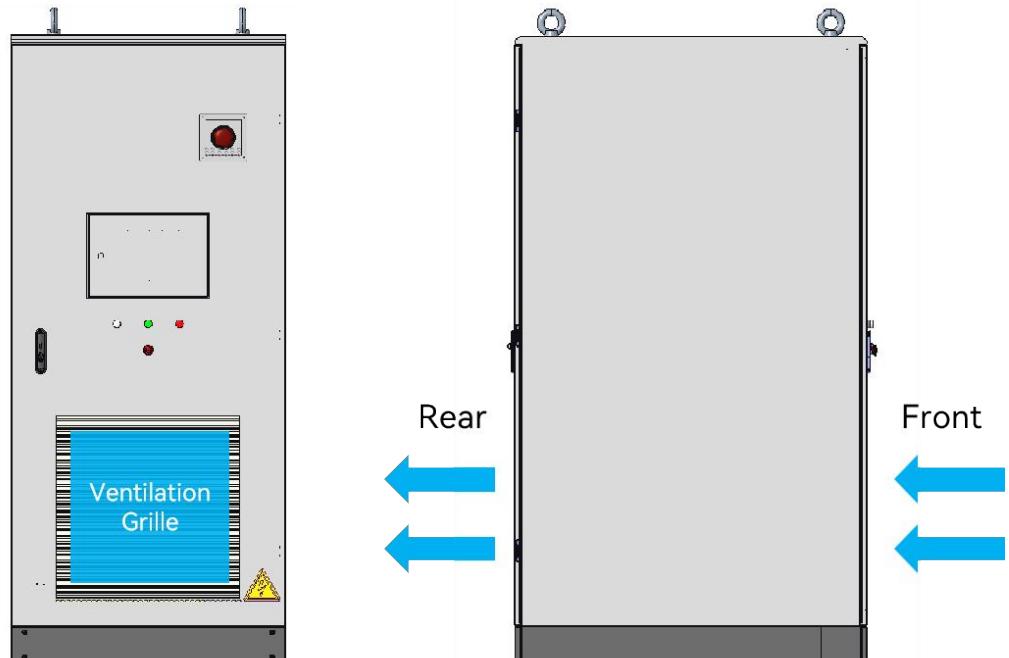


Figure 3-8 Ventilation Direction

The ESS HV Box adopts design front air in and rear air out. Cold air enters through the ventilation grills on the front side of Cabinet.

The ESS Cabinet ventilation fan is equipped with an air filter, which is easy to disassemble and replace. The air filter mesh is to be maintained (cleaned) regularly to ensure proper ventilation.

3.3.5. Cable Inlet&Outlet Design

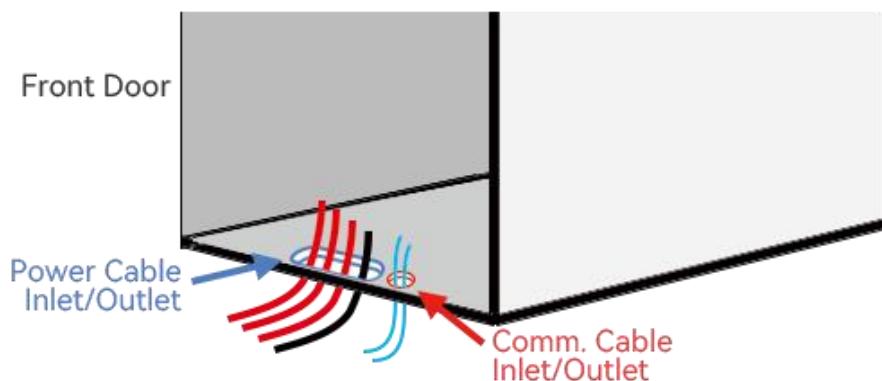


Figure 3-9 Cable Inlet/Outlet Hole

The product in standard configuration has all connecting cables coming in and out from the bottom of the cabinet, near by the front door.

The circle hole under the cabinet is for communication cables, and the rectangle one is for AC power cables.

3.4. Internal Components

3.4.1. Internal Equipment Layout

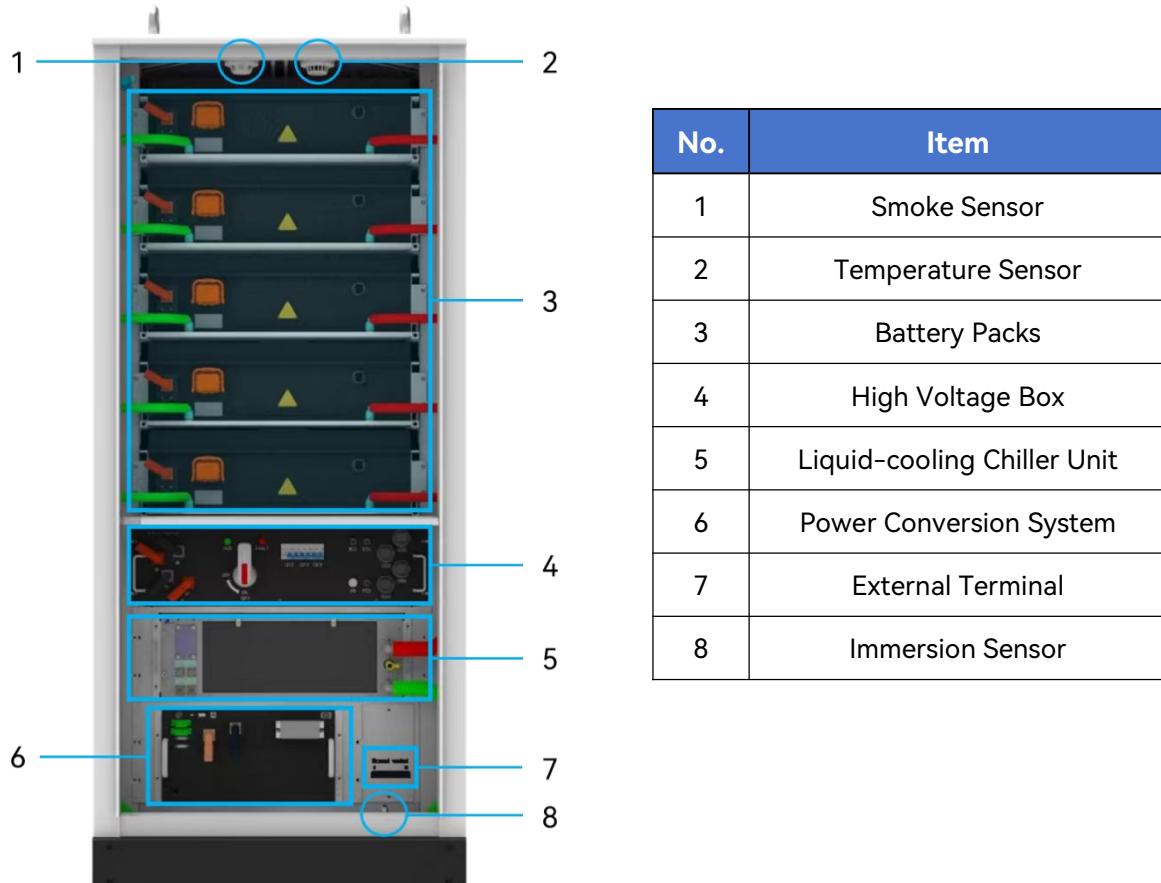


Figure 3-10 Internal Layout of Cabinet

3.4.2. Power Conversion System(PCS)

3.4.2.1. Introduction



Figure 3-11 PCS

PCS is a device that realizes bidirectional conversion of electrical energy. It converts DC into AC feeding to power grid or directly to AC loads; it also rectifies the AC into DC to charge the batteries.

3.4.2.2. Circuit Diagram

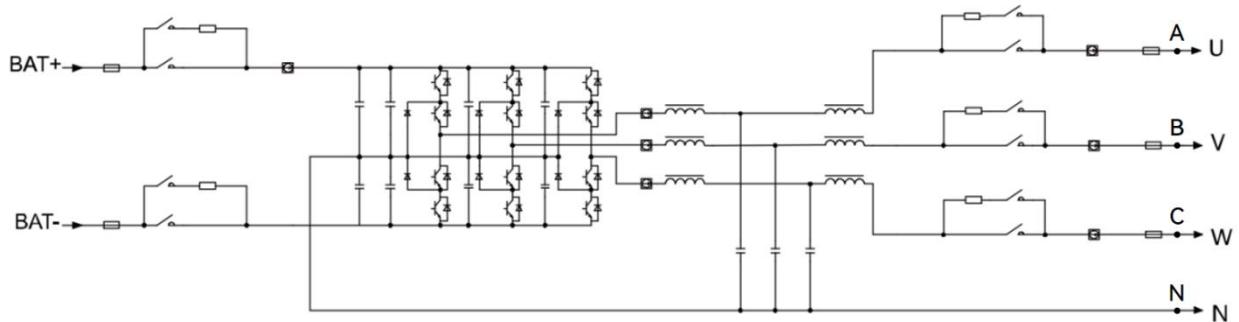


Figure 3-12 PCS Circuit Diagram

3.4.2.3. Dimension & Ports

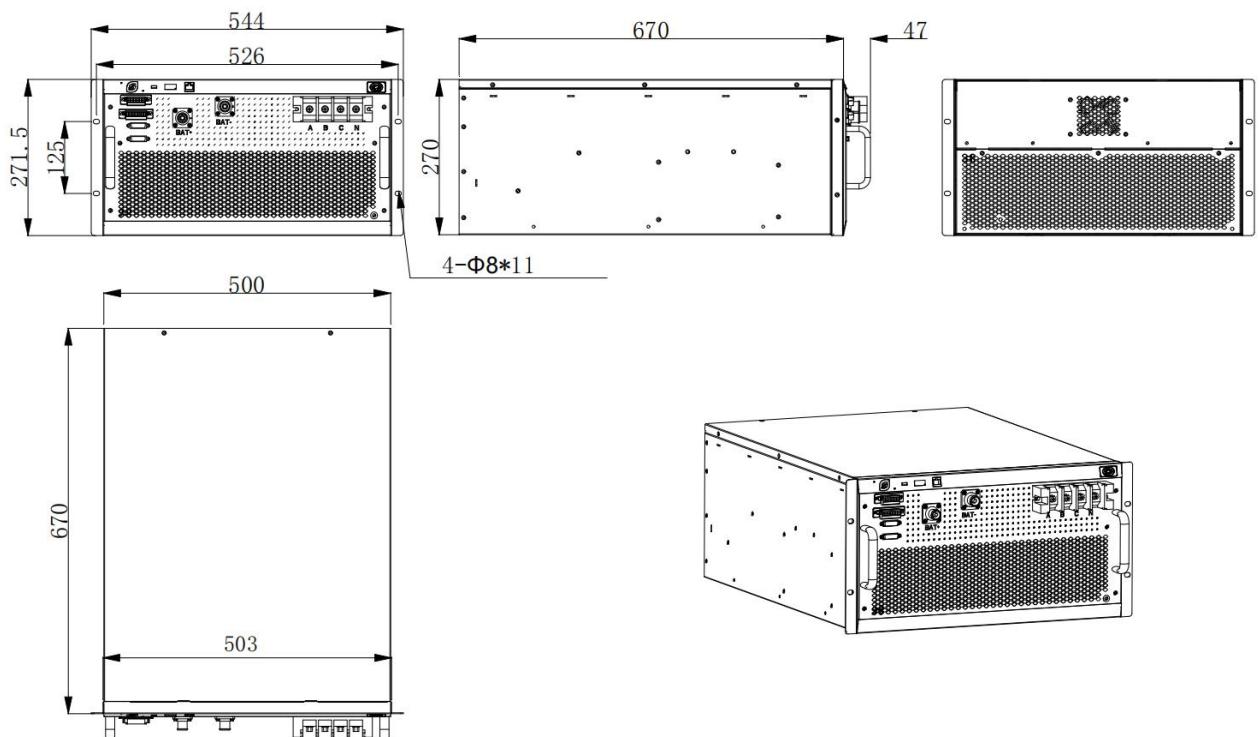


Figure 3-13 PCS Dimension

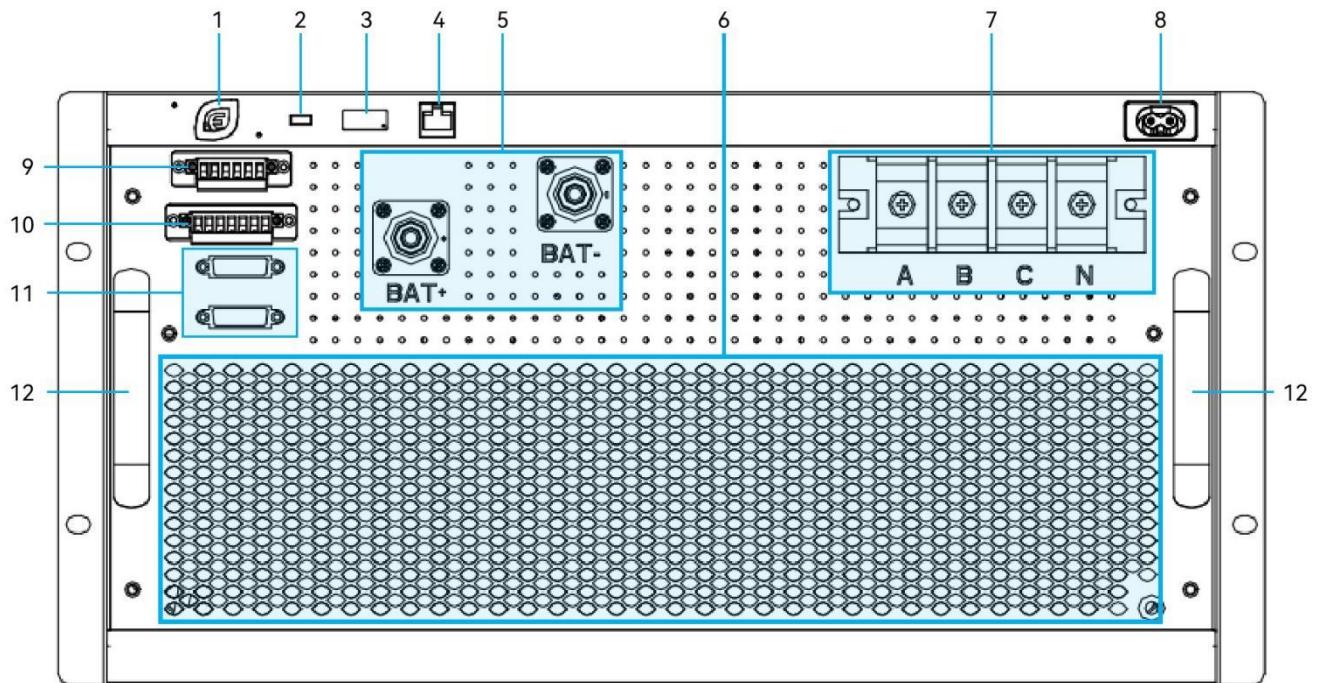


Figure 3-14 Ports of PCS

No.	Port Name	Description
1	Indicator light	Steady-on in green when power is on; Fast flash in green at 0.5s intervals when standby; Slow flash at 1s intervals when power is off with no fault. Continuous in red when a fault occurs.
2	ETH/Local switch	Right turn for local debugging; Left turn for Ethernet (reserved)
3	(IO)6-digit DIP switch	Digit 1, 2 for CAN communication matching resistor connection; Digit 3~6 for module address setting (binary) - the 6th digit is the lowest (from right to left)
4	TEST debugging network port	Debugging communication port for internal use only
5	DC interface	For DC cable connection
6	Fans&Vents	Air duct vents, front air-in and rear air-out
7	AC Interface	For AC cable connection
8	230V power input terminal	230Vac input (internal use only)
9	Grid current sampling interface	A/B/C three-phase current sampling input interface (reserved for 105kW equipment)
10	Grid voltage sampling interface	A/B/C/N grid voltage sampling input interface (reserved for 105kW equipment)
11	External communication port	COM (26pin signal terminal) signal port
12	Handle	Drawer module handle, not to bear heavy load

Communication Port Definition

Pin No.	Pin Descriptions	Pin Definitions
10	BCQ_485A	BCQ communication
19	BCQ_485B	
1	HMI_485A	HMI communication
11	HMI_485B	
20	ETH_485A	Reserved communication
2	ETH_485B	
12	CAN_1L	CAN parallel connection
21	CAN_1H	
3	CAN_2L	BMS communication
13	CAN_2H	
18	OP	24V+/GND type selection signal
5	DC24V+output power supply 1	DC24V output power
15	DC24V+output power supply 2	DC24V output power
14	GND-ISO1	Signal common terminal 1
23	GND-ISO2	Signal common terminal 2
26	EPO_ISO	Emergency stop input
25	FIRE_ALARM	Fire alarm input signal
24	LED_RUN	LED running signal
6	LED_FLT	LED fault signal
16	SPD_ALARM	Lightning protection input signal
8	DO_ISO	DO1 digital output (reserved)
7	DI1_ISO	DI1 digital input signal (BMS to PCS fault shutdown alarm)
17	DI2_ISO	DI2 digital input signal (reserved)
4	INV_SYNC	Internal power frequency synchronization signal
22	CARRIER SYNC	Internal carrier synchronization signal
9	GND-ISO4	DO digital output (STS backup)

*This communication port will be connected before shipping, so there is no need for on-site wiring.

3.4.2.4. Technical Parameter

PCS	Technical Parameters
DC-side Parameters	
Rated DC power (kW)	105
Number of routes	1
Maximum input current (A)	170
Voltage range (V)	672-950Vdc
Voltage stabilization accuracy	≤±2%

Current stabilization accuracy	$\leq \pm 5\%$
Voltage limiting	Support
Current limiting	Support
AC-side Parameters	
Rated output power (kW)	105
Rated output current (A)	145
Overload capacity	110% Long term @ambient temp $\leq 35^{\circ}\text{C}$ 120% @60 seconds
AC wiring	Three-phase four-wire (3L+N+PE)
Isolation	Non-Transformer
Power factor	-1 to +1
Rated voltage (Vac)	AC400V/230V
Voltage range (Vac)	400V(-15%to+15%)
Rated grid frequency(Hz)	50/60
Charge/discharge switch time	<100ms
Protection Functions	
DC-side protection	Isolating switch or fuse bank
DC-side control	DC contactor
AC-side protection	Circuit breaker or fuse
AC-side control	AC relay
Short circuit protection	Support
AC phase sequence protection	Support
Comm fault protection	Support
Anti-islanding protection	<2s
DC over-voltage protection	Support
AC over-voltage protection	Support
Reverse Polarity protection	Support
Overheating protection	Support
LVRT	Fault-ride-through
General Parameters	
Max. efficiency	$\geq 98\%$
Dimensions(mm)	W544*D717*H270
Structure and Ventilation	Front maintenance;Front air-in,rear air-out
Weight (kg)	50
Cooling method	Air cooling
Standby loss	<0.2% of rated power
No load loss	<0.5% of rated power
Ingress Protection	IP20
Communication protocol	RS485 & Modbus-RTU for EMS; CAN for BMS
Operation environment temperature	-20°C to 55°C (>45°C derating)
Relative humidity	0-95% RH (No condensing)
Attitude	2000m (Derating above 2000m)

3.4.3. High Voltage Box(HVB)

3.4.3.1. Introduction

The High Voltage Box of NE233L is essential for managing energy usage and high-voltage circuits. It is integrated BCQ and high-voltage protection components like breakers and fuses, ensuring the system's control, protection, and communication, supporting various communication modes and power sources. It's designed for reliability and safety, making it a vital part of ESS operations.

3.4.3.2. Dimension & Ports



Figure 3-15 Dimension of HVB

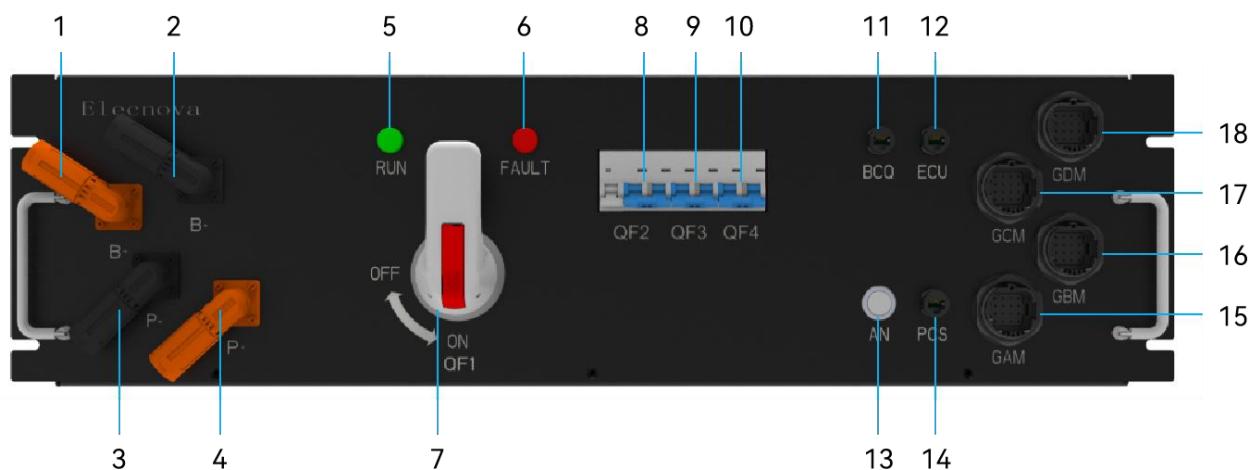


Figure 3-16 Ports of HVB

No.	Port Symbol	Name	Description
1	B+	Battery positive connector	Positive pole connection between PACK and high-voltage box
2	B-	Battery negative connector	Negative pole connection between PACK and high-voltage box
3	P+	PCS positive connector	Positive pole connection between PCS and high-voltage box
4	P-	PCS negative connector	Negative pole connection between PCS and high-voltage box
5	RUN	Operation indicator light	Indicate the normal operating status of the high-voltage box
6	FAULT	Fault indicator light	Indicate the shutdown status of the high-voltage box due to malfunction
7	QF1	DC main circuit switch	Connection control between battery and PCS
8	QF2	Auxiliary power circuit breaker	Auxiliary power control inside the cabinet
9	QF3	Chiller unit power circuit breaker	Power supply control of chiller unit
10	QF4	Control power circuit breaker	Integrated cabinet control system power supply control
11	BCQ	EMS Ethernet interface	Connect to network device or higher-level communication device like EMS or network hub
12	ECU	Local HMI Ethernet interface	Connect to HMI
13	AN	Black start button switch	Control system black start power control switch
14	PCS	PCS Ethernet interface	Provide Modbus TCP/IP communication method for PCS connection
15	GAM	BMS & PCS communication interface	BMS communication power supply and PCS communication interface
16	GBM	IO node signal communication terminal	IO module node signal interface inside the high-voltage box
17	GCM	Signal communication terminals for components inside the cabinet	Cabinet indication control and equipment communication interface
18	GDM	High voltage control box interface power terminal	Power supply interface for electrical components inside the cabinet

Switches Description

Switch	Description
QF1	Close to connect the main positive/negative contactors of battery packs.
QF2	Close to activate the 230V auxiliary power system.
QF3	Close to power the chiller unit, which then enters its self-check and start state.
QF4	Close to power the high-voltage box, and the cabinet power indicator light will be on.

3.4.3.3. Communication Terminals' Pin Definition

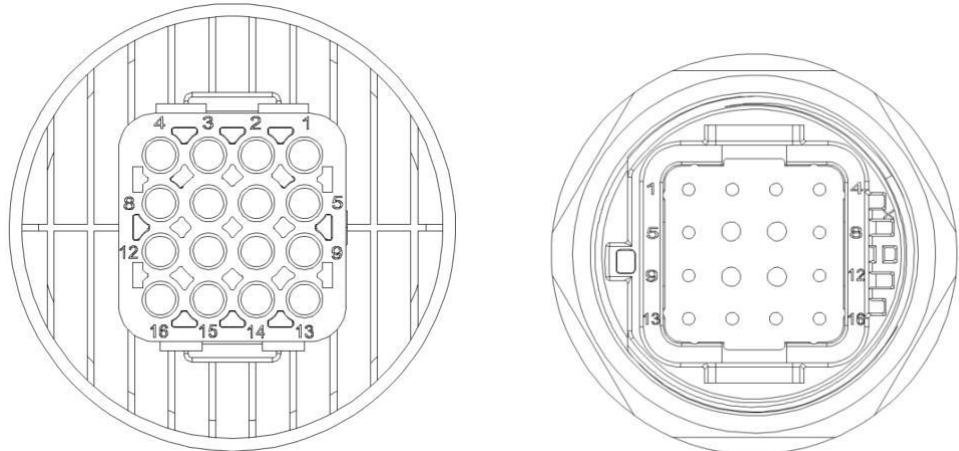


Figure 3-17 GAM, GBM and GCM Sockets

GDM Socket

Ports	Pin No	Pin	Port Definitions
GAM	1	2V+	Power supply for slave control
	2	2V-	Power supply for slave control
	3	A-5	Address allocation of slave control
	4	A-12	Internal communication of slave control
	5	A-24	Internal communication of slave control
	6	NA	/
	7	C-2	PCS CAN1H
	8	C-12	PCS CAN1L
	9	B-7	PCS DO7+
	10	B-25	PCS DO7-
	11	485A1	PCS 485A1
	12	485B1	PCS 485B1
	13	NA	/
	14	NA	/
	15	C-5	Debugging CAN2H
	16	C-15	Debugging CAN2L
GBM	1	DI1	Temperature detection feedback
	2	DI2	Smoke detection feedback
	3	DI3	Fire sprinkler feedback
	4	DI4	Immersion sensor feedback
	5	DI5	Door/access control feedback
	6	DI6	Emergency stop feedback
	7	DI7	POC cabinet QF1 feedback
	8	DI8	POC cabinet QF feedback
	9	GND	GND common point
	10	NA	/

GCM	11	KA2:A2	EPO shunt release QF2+
	12	ID:18	EPO shunt release QF2-
	13	KA2:A2	FSS shunt release QF2+
	14	ID:18	FSS shunt release QF2-
	15	B-31	FSS feedback BCU+
	16	B-5	FSS feedback BCU-
	1	HW	Power indicator light
	2	HG	Running indicator light
	3	HR	Fault indicator light
	4	COM	Common point of indicator light
	5	B-18	Liquid-cooled unit 485A
	6	B-36	Liquid-cooled unit 485B
	7	485A2	Power meter 485A
	8	485B2	Power meter 485B
	9	NA	/
	10	NA	/
	11	DO4+	POC cabinet QF1+
	12	DO4-	POC cabinet QF1-
	13	NA	/
	14	NA	/
	15	DO5+	POC cabinet QF+
	16	DO5-	POC cabinet QF-
GDM	1	3V+	Power supply inside the cabinet+
	2	3V-	Power supply inside the cabinet-
	3	4V+	Fan power supply+
	4	4V-	Fan power supply-
	5	NA	/
	6	AC-L	PCS-L
	7	AC-N	PCS-N
	8	PE	PCS-PE
	9	NA	/
	10	KL	Water cooling unit L
	11	KN	Water cooling unit N
	12	KPE	Grounding of chiller unit
	13	NA	/
	14	UPSL	UPS power supply L
	15	UPSN	UPS power supply N
	16	UPSPE	UPS power supply PE

*The four communication ports will be connected before shipping, so there is no need for on-site wiring.

3.4.3.4. Technical Parameters

High-voltage Box	
Power input	AC 230V
Low-voltage output	DC 24V
Rated high-voltage output	DC 832V
Operating temperature	-25 to 55°C
Current accuracy	±1%FSR
Voltage accuracy	±1%FSR
Protection level	IP20
Dimensions(W*D*H)	943*800*231mm
Weight	Appr. 60kg

3.4.4. Battery Pack

3.4.4.1. Introduction

The NE233L cabinet utilizes the NH-P1P52LS liquid-cooled battery pack, which is equipped with 280Ah cells. It features a 1P52S configuration and employs liquid cooling to maintain a temperature difference among the cells within 3 °C, thereby enhancing operational efficiency and extending the service life of the battery.

3.4.4.2. Dimension & Ports



Figure 3-18 NH-P1P52LS Battery Pack

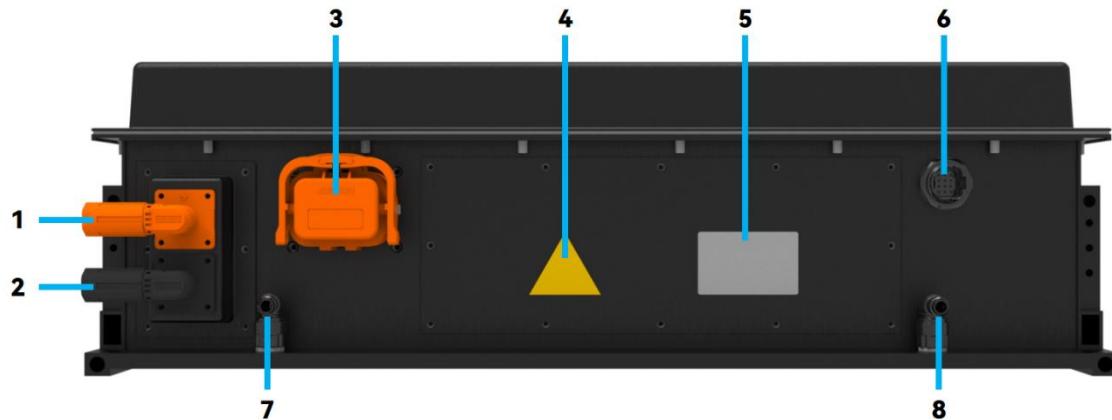


Figure 3-19 Ports of Battery pack

No.	Item	No.	Item
1	Power-in connector	5	Pack nameplate
2	Power-out connector	6	BMS Communication port
3	MSD	7	Liquid cooling inlet
4	Warning signs	8	Liquid cooling outlet

BMS Communication Port Pins' Definition

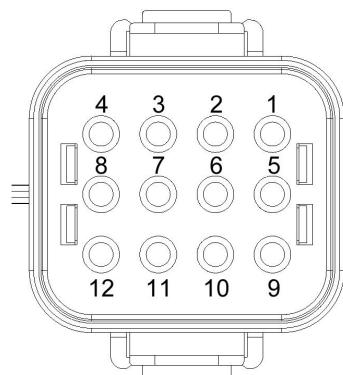


Figure 3-20 BMS Communication Socket

Port	Pin No.	Pin Name	Pin Definitions
BMS communication	1	24V+	BMS 24V power supply +
	2	24V-	BMS 24V power supply -
	3	I01	Automatic allocation of BMS address
	4	CAN0H	BMS internal communication CAN0H
	5	CAN0L	BMS internal communication CAN0L
	6	/	/
	7	24V+	BMS 24V power supply +

8	24V-	BMS 24V power supply -
9	I02	Automatic allocation of BMS address
10	CAN0H	BMS internal communication CAN0H
11	CAN0L	BMS internal communication CAN0L
12	/	/

*The BMS communication port will be connected before shipping, so there is no need for on-site wiring.

3.4.4.3. Technical Parameters

NH-P1P52LS	
Cell Type	LFP
Rated Capacity	280Ah
Grouping	1P52S
Rated Energy	46.592kWh (rated condition)
Rated Voltage	166.4Vdc
Recommended Operating Voltage	145.6~187.2Vdc
Rated Charge/Discharge Rate	0.5P
Cycle Life	≥8000 times@75%
Operating Temperature	-20~50°C (Discharging)/0~55°C (Charging)
Ingress Rating	IP65
Dimensions(W*D*H)	812*1132*238 mm
Weight	342 kg

3.4.5. Liquid-cooling Chiller Unit

3.4.5.1. Introduction

NE233L adopts a drawer type chiller product with a 5kW AC power supply standard. The chiller adopts an integrated structure, and all components are enclosed in one chassis, with a compact external structure, making it easy to install and maintain. The chiller unit supports multiple functions such as CAN communication, power-off memory, self starting, intelligent cooling and heating. The liquid cooling unit is equipped with a variable frequency compressor and a variable frequency water pump to achieve dual variable frequency regulation of the refrigeration system and the coolant circulation system, achieving high efficiency and energy saving during operation.

The liquid cooling method realizes a small temperature difference and fast cooling, which can effectively extend the battery life and delay decay.

3.4.5.2. Dimension & Ports



Figure 3-21 Chiller Unit

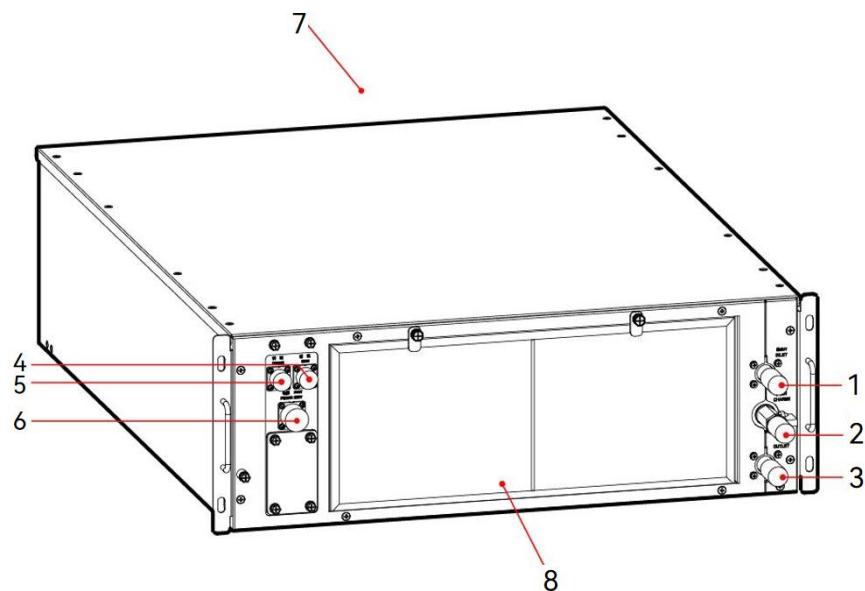


Figure 3-22 Ports of Chiller Unit

No.	Item	No.	Item
1	Coolant Inlet	5	Debug Interface
2	Coolant filling&drain Port	6	Power Interface
3	Coolant Output	7	Air Output
4	COM Interface	8	Air Input

3.4.5.3. System Principle

The liquid-cooling chiller is composed of a refrigeration cycle system and a coolant cycle system, and the system principle is shown below.

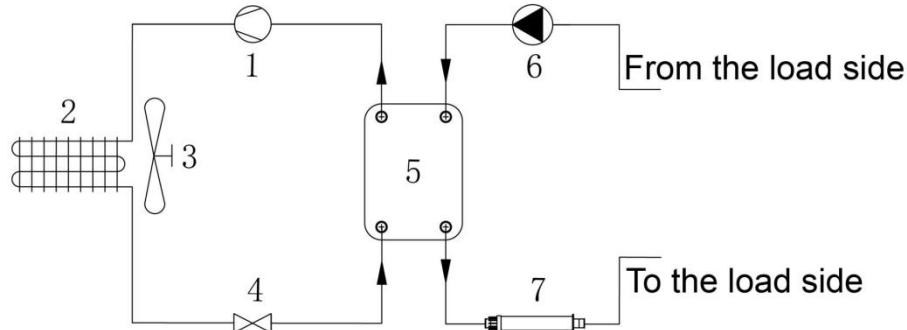


Figure 3-23 System principle diagram

No.	Item	No.	Item
1	Compressor	5	Plate Heat Exchanger
2	Condenser	6	Circulation Water Pump
3	External Circulation Fan	7	Electric Heater
4	Throttling Element		

3.4.5.4. Technical Parameters

Liquid-cooled Chiller Unit	
Operating voltage range	220V±15%, 50/60Hz±3Hz
Operating environment temperature range	-30°C~+55°C
Operating relative humidity range	5%~95%
Storage environment temperature range	-40°C~+70°C
Storage environment relative humidity range	5%~95%
Working altitude	≤1000m The refrigerating capacity is derated when the altitude is above 1000m, and the refrigerating capacity will be derated by 5% for every 1000m increase. The highest application altitude is ≤4000m
Unit size(W×D×H)	700mm×900mm×245mm(without flange)
Max. flow	50L/min
IP level	IP55
Inlet coolant temperature range	-30°C~55°C
Outlet coolant temperature range	5°C~40°C

3.4.6. External Terminal

External terminal is designed for the access of on-site meter connection, the connection with POC(Point of Connection) cabinet and the off-grid parallel connection.

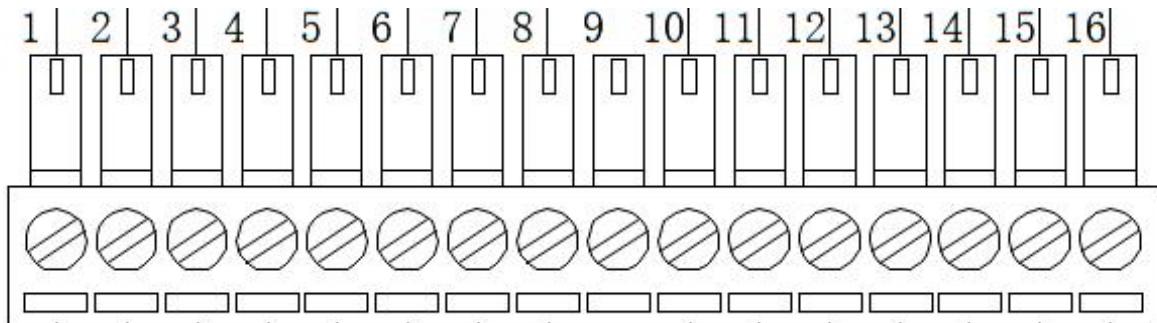


Figure 3-24 External Terminal

External terminal 1:

External terminal 1 is standard configuration, used for POC cabinet connection, on-site meter and debugging. When there is no off-grid paralleling requirement, the received cabinet will only have this one external terminal.

Pin Definition:

Pin No.	Definition	Pin No.	Definition
1	QF1 NO Contact	9	/
2	QF1 COM NO Contact	10	On-site Meter Comm. RS485A
3	QF NO Contact	11	On-site Meter Comm. RS485B
4	QF COM NO Contact	12	Host debugging CANH
5	QF1 Trip Signal	13	Host debugging CANL
6	QF1 Trip Signal	14	/
7	PCS RS485A	15	/
8	PCS RS485B	16	/

External terminal 2: (Optional)

External terminal 2 is optional configuration. When there is a need for off-grid paralleling, a second external terminal will be required, the received cabinet will have a second external terminal. Currently, terminal 2 is only defined with 5 pins.

Pin Definition:

Pin No.	Definition	Pin No.	Definition
1	CAN1L	4	INV-SYNC
2	CAN1H	5	GND-ISO1
3	CARRIER-SYNC		

3.4.7. Fire Suppression System(FSS)

3.4.7.1. Work Principle

Nenghui NE233L equipped FSS consists of pack-level FSS and cluster-level FSS:

- Pack-level applies early detection and fast fire extinguishing for internal combustion sources. Each pack is assembled with 1 set of module-level FSS devices, which detects fire and automatically extinguish fire without power supply. It provides pack-level safety protection according to requirements of IEC62933. Once fire or heat reaching 185°C is detected, FSS immediately start fire extinguishing.
- Cluster-level applies key control, expansion prevention and growth suppression for the external combustion sources. Cluster-level FSS is an aerosol-based fire protection system. When smoke, or high temperature, or fire is detected, the audible and visual alarm is triggered immediately to inform personnel to take actions; At the meantime, it starts fire extinguishing device. The FSS Synchronously sends the Fire message to all related agents and personnel.

3.4.7.2. FSS components

- Aerosol FSS devices

JAD300-U01 fast aerosol-based fire extinguishing device is suitable for relatively closed spaces such as power cabinet etc.

In case of fire, the aerosol generator in the fire extinguishing device is activated by the electric trigger after the fire extinguishing device receives the electric starting signal. The aerosol generator generates fire extinguishing agent through the combustion reaction. The heat from the reaction process decomposes the chemical coolant so that the fire extinguishing agent and the coolant work together to extinguish the fire.

- Audible and Visual Alarm

The audible and visual alarm is a device that emits audible and visual alarm signals. When the alarm device receives a signal, it emits a strong audible and visual signal to alert on-site personnel.

- Temperature and Smoke Detectors

The temperature/smoke detectors are anti-explosive, mounted on the ceiling of the Cabinet. They are used to detect the fire in Cabinet.

3.5. System Protections

3.5.1. Data Detection

The BMS(battery management system) keeps detecting on how the battery is running by measuring its voltage, current, and temperature, as well as figuring out how much charge it has (SOC), how healthy it is (SOH), and how much power it can deliver (SOP). It then makes sure the battery charges and discharges in the best way possible, based on its current condition and the performance of the energy storage system.

3.5.2. Circuit Protection

The battery system incorporates advanced high-voltage sampling capabilities and is fortified with circuit breakers, fuses, and an array of safety mechanisms designed to offer real-time status updates.

In the event of a battery malfunction, the system is programmed to initiate a response that includes reporting the issue, regulating the flow of charging and discharging currents or power, and managing the timing of contactor disconnection to mitigate risks. These measures are instrumental in safeguarding the integrity and reliability of the power system as a whole.

3.5.3. Safety Protection

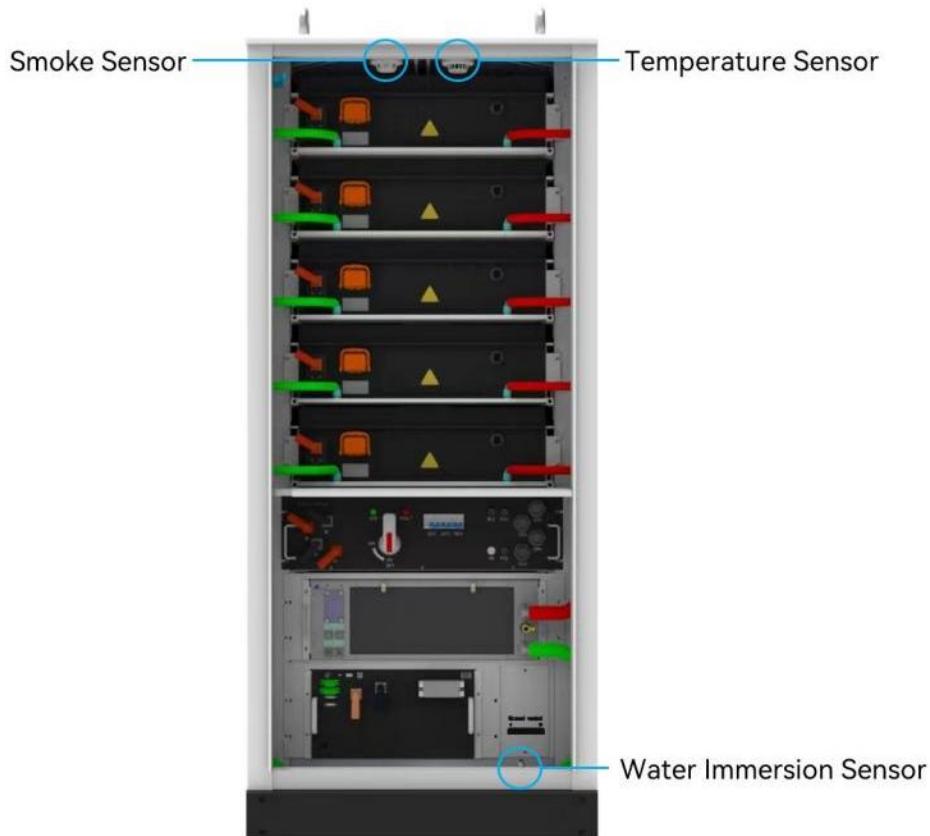


Figure 3-25 Sensors Position

NE233L cabinet is furnished with an array of detectors designed to identify smoke, temperature fluctuations and water immersion, among other hazards. Additionally, it is equipped with a aerosol-based FSS(fire suppression system). It can detect potential safety hazards in the cabinet in real-time and prevent fire accidents such as accidental battery fire and other fire safety accidents.

4. Transportation

4.1. Precaution

 <p>WARNING</p>	<ul style="list-style-type: none"> ● The ESS Cabinet must not be disassembled during transportation or installation. ● Malfunctions caused by unauthorized modifications are not covered by the warranty. ● Transport the ESS cabinet in strict accordance with the description in this chapter! ● Always pay attention to the gravity center marking on the package of the cabinet! ● Due to the fact that the gravity center is not the mechanical center, always pay attention to the gravity center marking during transportation. ● With or without external package, it is strictly prohibited to tilt the ESS Cabinet with an angle exceeding 5° during transportation. If the tilt angle is too large, the cabinet may overturn. Due to its large volume and weight, personal injury/death and equipment damage may occur when tilted. ● During transportation, avoid mechanical impact on the cabinet, such as violent shaking or sudden lowering or lifting. ● Avoid transporting the ESS cabinet in rain. If unavoidable, please take necessary rain-proofing measures. ● Only personnel with license and approved by the authority are allowed to handle the ESS cabinet.
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 <p>CAUTION</p>	<p>To ensure safe and intact transportation of the product to destination/site, please also take any other necessary auxiliary measures.</p>
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4.2. Transportation with Outer Package

To ensure that the ESS Cabinet is properly protected during transportation, please transport it with package as much as possible in accordance with the signs on the package. The package signs are illustrated as follows:

Sign	Meaning
	Right side up. It is prohibited to handle the cabinet lying down, tilted or up side down.
	Handle with care. Avoid damage to the ESS Cabinet caused by excessive collision and friction.
	Moisture prevention. Protect the ESS Cabinet from and against rain or moisture.
	No Rolling
	Recyclable
	Hazardous goods, category-9.
	No Stacking
	Center of Gravity

The unpackaged ESS Cabinet may be moved with forklift, pallet truck or crane. When moving the ESS Cabinet, pay attention to its weight as well as the gravity center marking and lifting marking

on the package box. Ensure that the transportation equipment has sufficient load-bearing capacity and arrange support or lifting points reasonably.

4.2.1. Transportation with Forklift

Transporting the ESS Cabinet with a forklift is a standard transportation method. During transportation, the center of gravity of the box shall be placed between the two forks of the forklift. A trial forking shall be conducted before normal handling. The length of fork shall not be less than 1.6m.

When using a forklift to lift, lower, and move the ESS Cabinet, please ensure that the operation is slow and smooth. In addition, only place the ESS Cabinet on a hard and leveled ground.

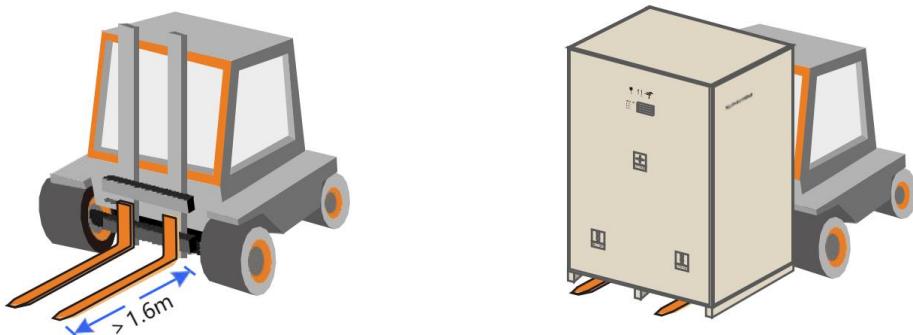


Figure 4-1 Schematic Diagram of Transportation with Forklift

During the transportation with forklift, please strictly follow the safety operating procedures for forklift. The packaging of the ESS cabinet may block the driver's sight, so auxiliary personnel shall be arranged to provide assistance.

4.2.2. Transportation with Crane

A crane may be used to lift and transport the ESS Cabinet. For the purpose of lifting, tie two flexible lifting straps to the outer packaging box through lifting signs. The equipment shall be lifted with the hook being perpendicular to ESS gravity center. Tilting transportation is strictly prohibited!

When using a crane to lift, lower, and move the ESS cabinet, please ensure that the operation is slow and smooth. In addition, only place the ESS cabinet on a hard and leveled ground. In lifting

operations, please ensure that the angle between the rope and the equipment is greater than 60° to maintain good force conditions.

During the process of transportation with crane, please strictly follow the safety operating procedures for crane. In case of adverse weather conditions such as heavy rain, heavy fog or strong winds, the lifting operation shall be stopped.

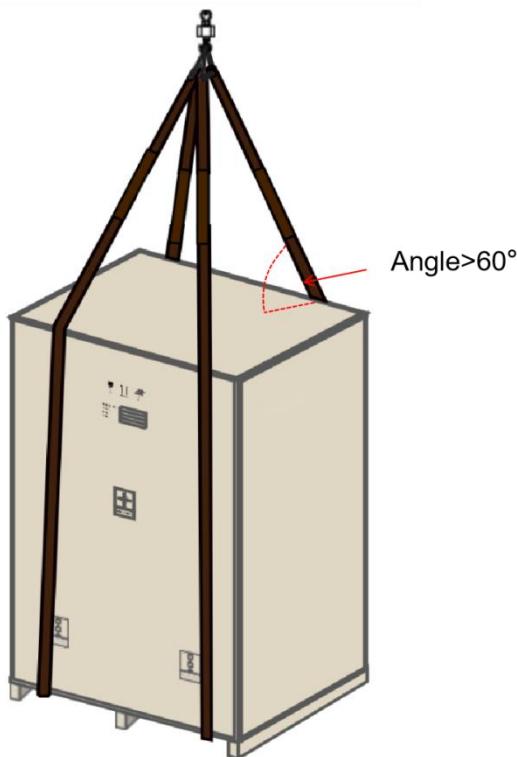


Figure 4-2 Lifting Operation

	If the crane is used to transport the cabinet without unpacking, it will inevitably damage the outer package, making it unusable for a second time.
--	---

4.3. Transportation without Outer Package

The transportation of ESS Cabinet without outer packaging is usually carried out near the final installation location. The unpackaged ESS Cabinet may be transported by using forklift, crane or other means.



Before moving the ESS Cabinet to the predetermined position, it is recommended to conduct cable laying first. Considering the thickness of cables, once the ESS cabinet is seated, cable routing operations becomes difficult and cables may be easily damaged.

4.3.1. Transportation with Forklift

During the process of transportation with forklift, please strictly follow the safety operating procedures for forklift.

When using a forklift to lift, lower, and move the ESS cabinet, please ensure that the operation is slow and smooth. In addition, only place the ESS cabinet on a hard and leveled ground.

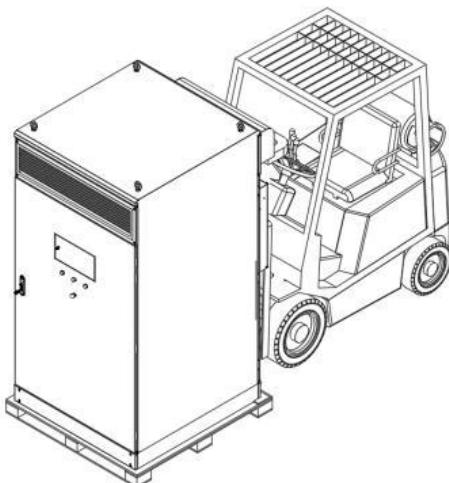


Figure 4-3 Transportation with Forklift (with Bottom Wooden Pallet)

If the unpacking location is closer to the installation location, a forklift may be used to transport the ESS Cabinet with a bottom wooden pallet. Please ensure that the gravity center of the ESS Cabinet is placed between the two forks of the forklift.

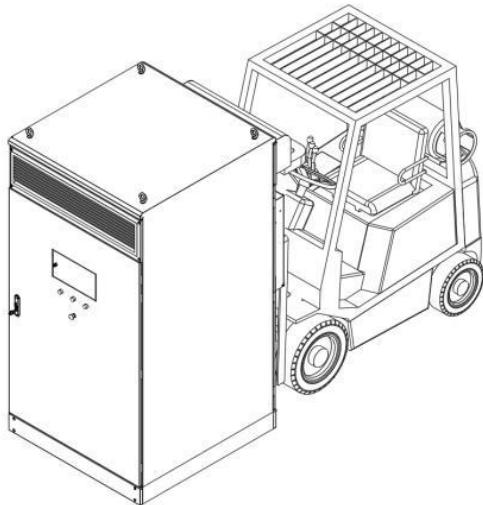


Figure 4-4 Transportation with Forklift (without Bottom Wooden Pallet)

If the wooden pallet at the bottom of the ESS cabinet has been removed, it may be transported directly by a forklift, and the forks may be placed directly in the base fork grooves.

For the purpose of facilitating the on-site transportation, the fork grooves have been designed in advance, and the base baffle must be removed before transportation.

4.3.2. Transportation with Crane



The lifting rings are dismantled before shipping. It is required to be installed before lifting.

For the purpose of facilitating the transportation with crane, the lifting rings are designed on the top of the ESS cabinet. Users may directly lift and transport the ESS cabinet through lifting rings.



Figure 4-5 Transportation with Crane (no package, no pallet)

During lifting operation, the center of the hook shall be perpendicular to the center of the ESS cabinet, and a trial lifting shall be conducted. Tilted lifting is strictly prohibited. Meanwhile, during the lifting of the ESS cabinet, please strictly follow the safety operating procedures for crane. When using a crane to lift, lower, and move the ESS cabinet, please ensure that the operation is slow and smooth, and ensure that the angle between the rope and the equipment is greater than 60° to maintain good force conditions. In addition, only place the ESS cabinet on a hard and leveled ground.

5. Installation

5.1. Installation Preparation

5.1.1. Basic Installation Requirements

 WARNING	<ul style="list-style-type: none">For the mechanical setup phase, it is crucial to follow all applicable standards and requirements of the installation site.Utilize only the equipment that has been specifically designated by Nenghui . Deviating from this and using non-designated equipment could lead to a reduction in the system's protective capabilities, potentially resulting in personal injury.
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With IP55, NE233L cabinet is designed for installation in industrial environments. For safe and efficient operation, please make sure that the installation environment complies with the following instructions:

- Make sure that the installation ground is always dry, flat and free from water accumulation;
- Ensure that the ground is leveled without shaking and the ground is strong enough to bear the weight of the ESS Cabinet.
- The ambient temperature range at the installation site is -20°C to 55°C; the relative humidity range shall be 0-95% (without condensation).
- Reserve sufficient space in front of and behind the cabinet for convenience of ventilation, heat dissipation, installation maintenance and safe escape.
- The ESS Cabinet grounding resistance shall be less than 4Ω.
- Ensure that the location is convenient for operations of LED indicators and LCD screen.
- There shall be no flammable gases or combustible materials nearby or in the installation area.
- The installation environment shall be clean.

5.1.2. Installation Environment Requirements

The ground, space, cable ducts, air ducts, ventilation equipment, and protective measures in the control room of the ESS Cabinet shall be properly designed to meet at least the following requirements

5.1.2.1. Foundation Preparation



- The concrete foundation or channel steel must be able to withstand at least 3 tons of weight without deformation.
- Please ensure to comply with local safety regulations during the project implementation.

The ESS shall be installed on a concrete foundation or channel steel structure that is flame-retardant. It is necessary to ensure that the foundation is flat, solid, safe and reliable with sufficient load capacity.

There shall be neither depression nor inclination on the surface of the foundation.

For the foundation construction, the cable trenches shall be pre-constructed according to the design of the ESS of which the cable entry and exit are bottom-in and bottom-out.

Holes shall be pre-drilled on the foundation. The size and position of such holes shall be consistent with the cable holes at bottom of the cabinet, so that the cabinet can be properly seated on the foundation.

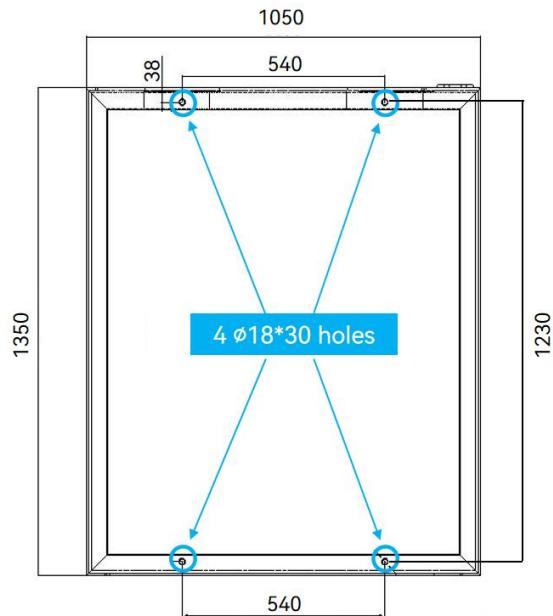


Figure 5-1 The position of pre-drilled holes

The base of the cabinet is equipped with 4 positioning $\phi 18*30$ holes, as shown in Figure 5-1 (unit: mm).

5.1.2.2. Space Requirements

For proper installation, it is necessary to maintain an appropriate and sufficient distance to adjacent building or equipment, so as to meet the requirements of maintenance corridor, escape ways and ventilation.

1) Single cabinet installation

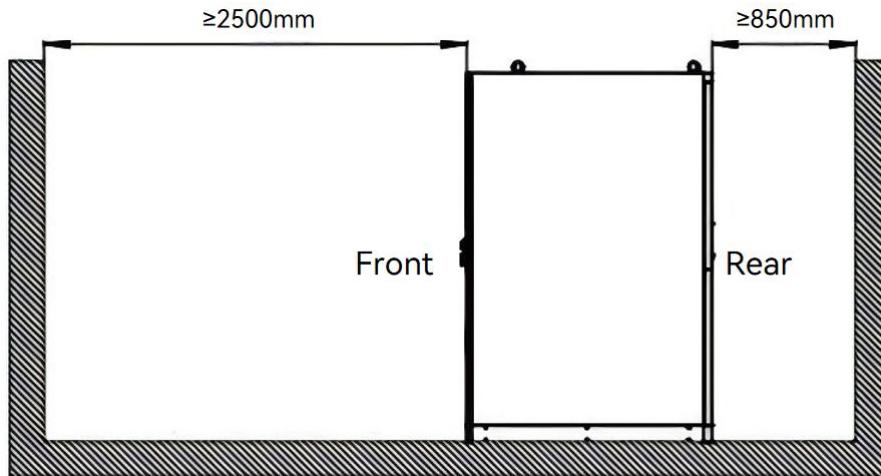


Figure 5-2 Minimum Front&Rear space requirement

The minimum space requirements of the front and rear of the ESS cabinet are shown in the Figure 5-2. There must be at least 2500mm of space in front of the cabinet and at least 850mm of space behind it.

If possible, it is recommended to choose spacious location, so as to ensure reliable and efficient operation.

2) Multiple cabinets installation

The following illustrates the minimum space required when 10 cabinet are installed with their front doors facing each other, front door facing rear door and installed side by side. The area within the dashed lines is minimum reserved for maintenance access space.

When the cabinets on the left and right are joined, there will be a gap of about 6-10mm, which is recommended to be taken into consideration during planning.



The distances mentioned in this section are only recommendations; actual installation should be carried out according to the on-site conditions and local relevant regulations.

a. Install with front doors facing each other

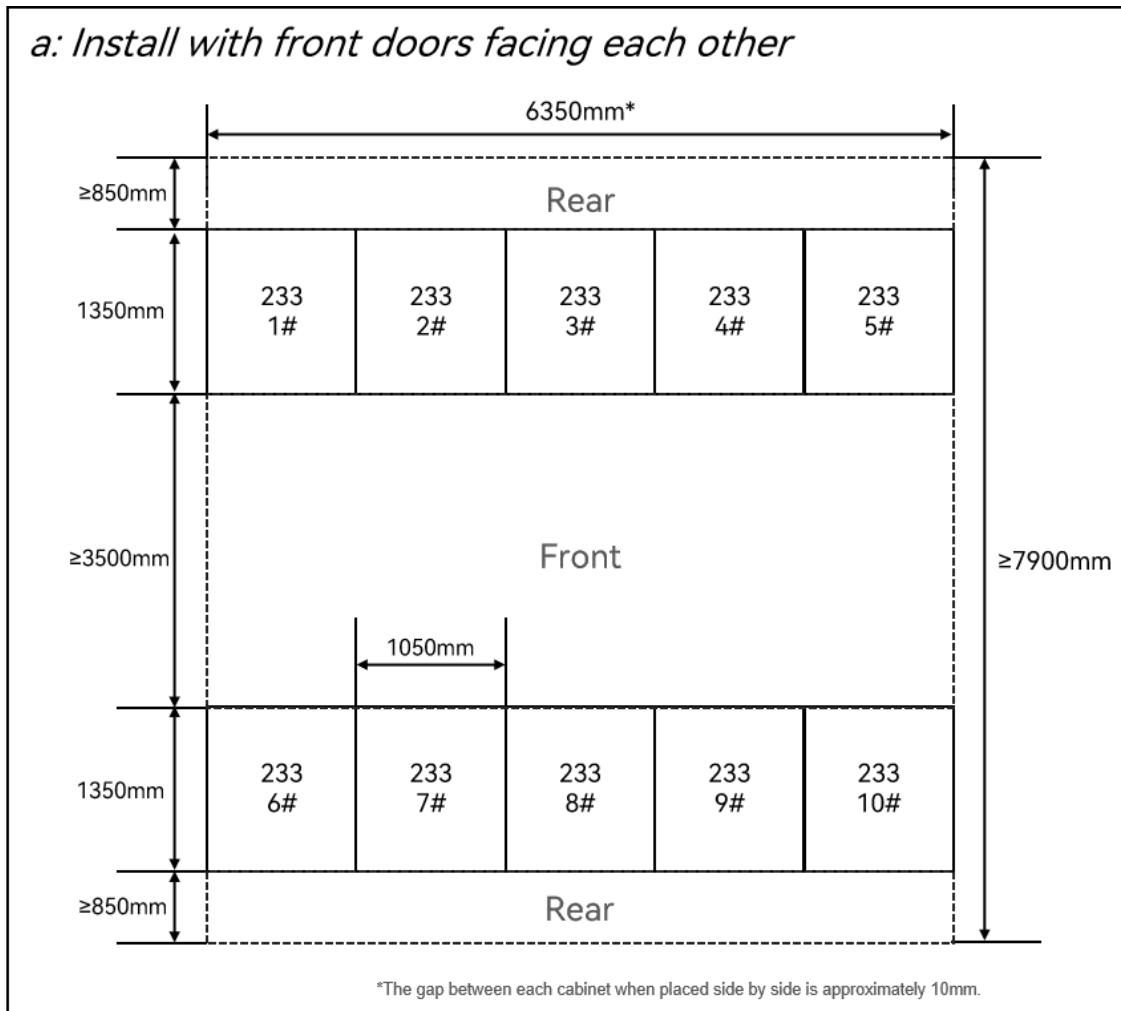


Figure 5-2 The space requirement of front doors facing each other

b. Install with front door facing rear door

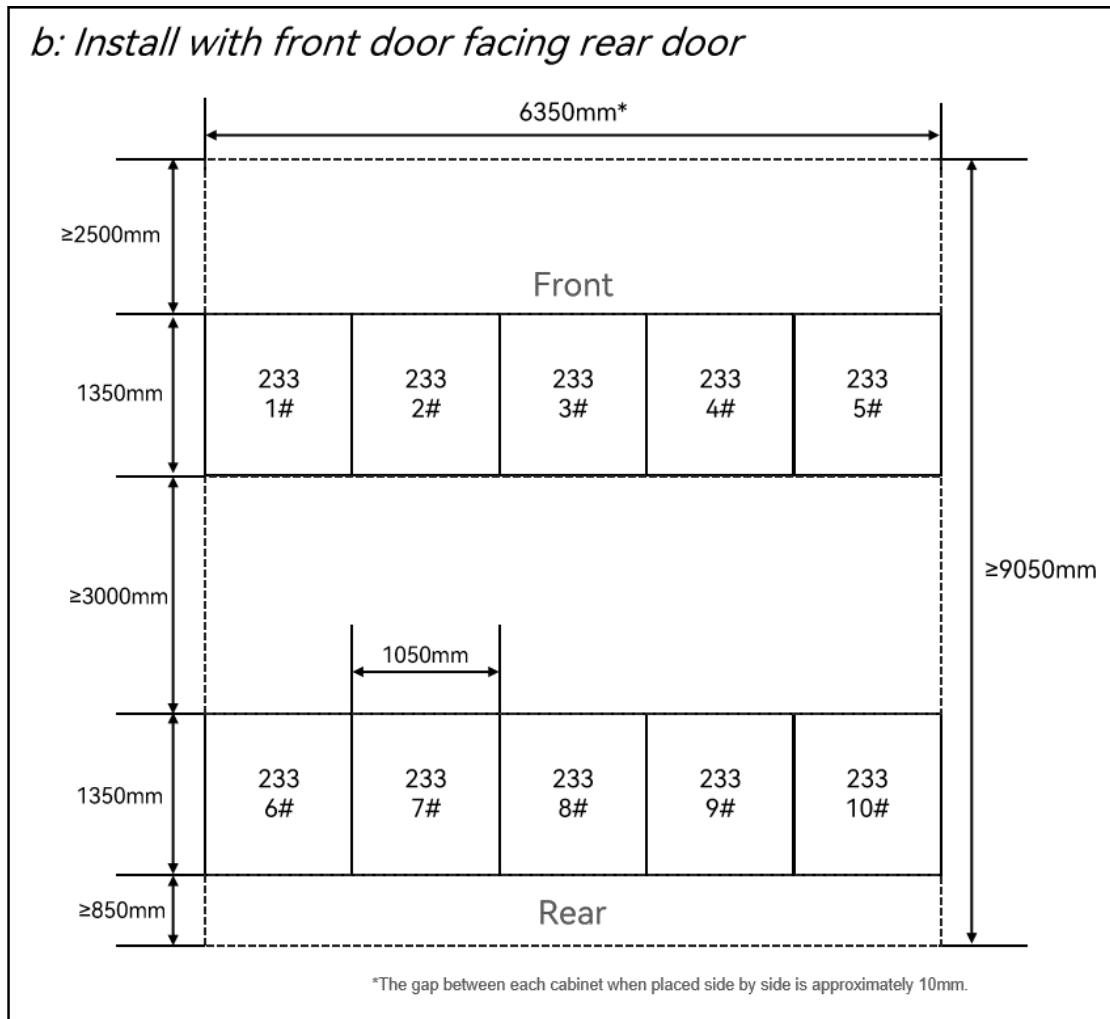


Figure 5-3 The space requirement of front door facing rear door

c. Install side by side

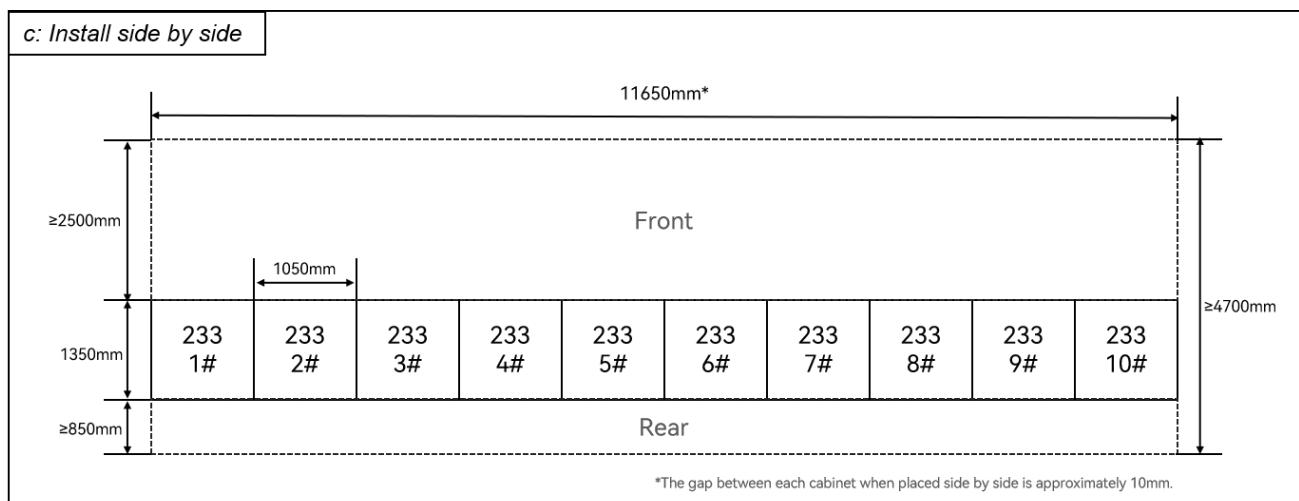


Figure 5-4 The space requirement of side by side

5.1.2.3. Cable Trunking Requirements

The ESS Cabinet adopts bottom in/out wiring design. It is recommended that all external cables are routed from the cable trench for easy installation and maintenance.

Concrete cable trenches shall be pre-built in the electrical control room; Steel brackets shall be installed, so as to raise the installation surface and lay the cables in raised areas.

Reliable connections are mandatory either between cable trays or from cable trays to grounding electrodes.

The cross-section drawing of cable trench is shown in the figure below. For cable laying, the communication cables and power cables shall be separated and the DC cables and AC cables shall be laid separately. This is beneficial for maintenance, and it also reduces the interference of power circuits to communication lines.

 CAUTION	<ul style="list-style-type: none"> The dimensions marked in the figure below are the minimum sizes. Actual installation should be carried out according to the number of cabinets, the conditions on site and local regulations. The width of the cable trench depends on the number of cables; the more cabinet there is, the greater the width required. It must not exceed the width of the cabinet.
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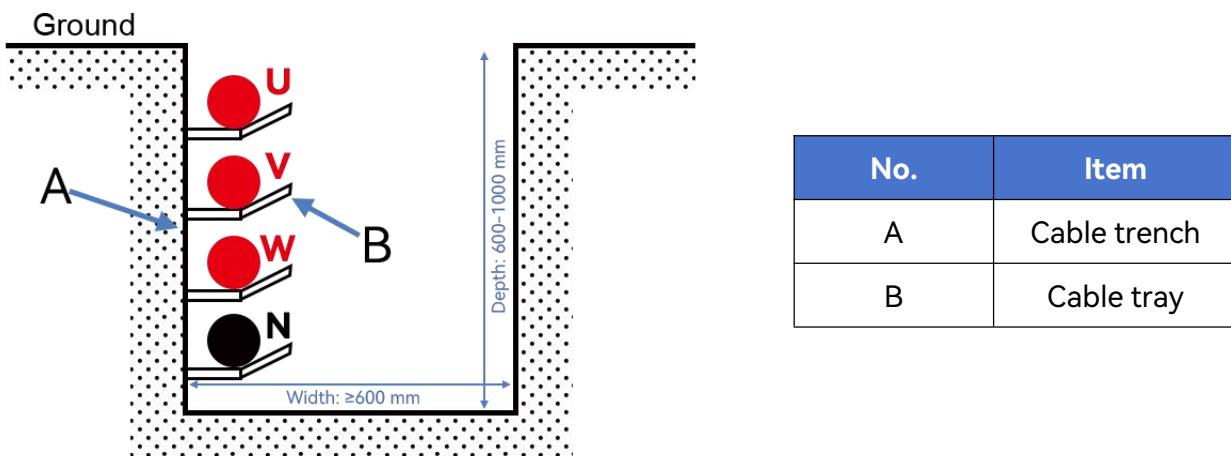


Figure 5-3 Cable Trunking & Minimum Size of Cable Trench

5.1.3. Cable Preparation

5.1.3.1. Cable and Connector Selection

The cable diameter shall be selected according to the maximum current of the AC or DC sides with margin. Please select cables of same specifications and same type on the same side.

The recommended specifications for connecting cables are detailed in the table below.

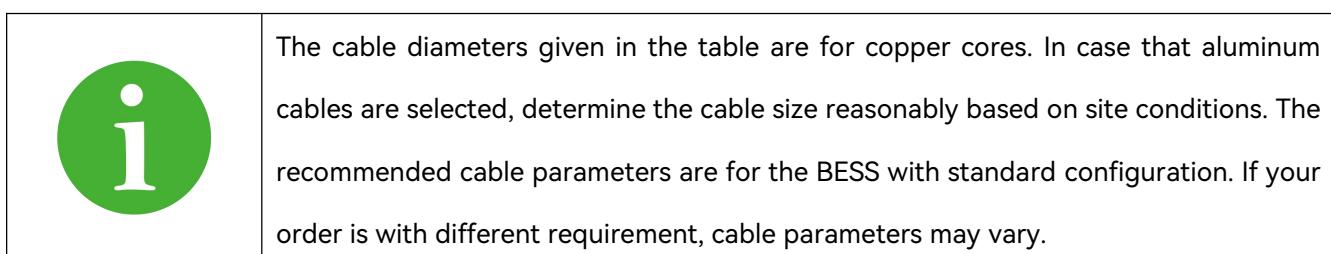
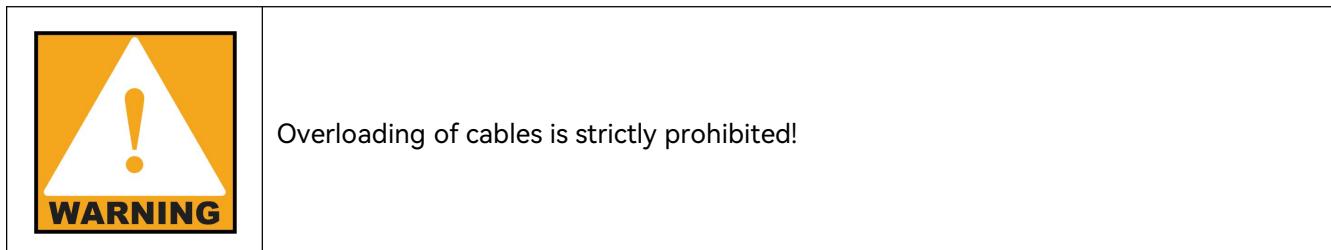
Terminal Symbol	Function Description	Bolt Spec.	Max. Voltage and Current	Cable Recommendation	Cable Terminal
A	A-phase input terminal	M8	Voltage≤460V Current≤158A	Flexible cable 50mm ²	GTNR50-8
B	B-phase input terminal	M8	Voltage≤460V Current≤158A	Flexible cable 50mm ²	GTNR50-8
C	C-phase input terminal	M8	Voltage≤460V Current≤158A	Flexible cable 50mm ²	GTNR50-8
N*	Neutral input terminal	M8	Voltage≤460V Current≤158A	Flexible cable 25-50mm ²	GTNR25-8 GTNR50-8
PE*	Grounding interface	M8 or M12	/	PE cable 25-50mm ²	GTNR25-8/12 GTNR50-8/12
/	Communication			RS485	

*Adjust according to the usage environment.

The control and communication line connections are connected using connectors, and the connector plug and connectors configuration information is:

Connector plug model: LC2AM-5.08-16P-1Y-00A

Recommendation wire diameter: Flexible cable 1mm²



5.1.3.2. Cable Placement

The cables used in the system is generally classified into power cables and communication cables. When laying communication cables, please keep them away from power cables and maintain right angles at intersections. The communication cables shall be as close to the ground surface as possible or be supported by supporting beams, channel steel, or metal rail.

The power cables and communication cables shall be placed in different cable trenches, so as to avoid the long-distance parallel routing to reduce the electromagnetic interference to communication line caused by power line voltage transients.

When the wires are cross distributed, the crossing angle shall be set to 90 degrees, and the distance may be appropriately.

If it is unavoidable that power lines and communication lines must run parallel over a long distance, please determine the appropriate distance between the two according to the following table, the minimum distance shall be greater than 200mm.

Parallel Line Length(m)	Minimum Distance(m)
200	0.3
300	0.5
500	1.2

5.1.3.3. Cable Fixing

Loose contact of cables to copper noses may lead to over-heating or even fire, please follow the torque requirements when tightening the screws/bolts of copper noses:

Bolt Size	M3	M4	M5	M6	M8	M10	M12	M16
Torque(N · m)	0.7-1	1.8-2.4	4-4.8	7-8	17-20	34-40	60-70	119-140

5.1.3.4. Cable Protection

The protection of cables encompasses both communication and power cables. The measures to protect them are detailed below:

- Communication Cable Protection

Given their small size, communication cables are susceptible to damage or detachment from wiring terminals. It is advisable to install power cables before laying the communication cables. Utilize cable trays extensively and secure communication cables with zip ties where trays cannot be used. Additionally, communication cables should be kept at a distance from heating elements and power cables.

- Power Cable Protection

Power cables carry dangerous levels of voltage and current, so it is necessary to use appropriate cable trays. During installation, it is crucial to safeguard the insulation layer from scratches or damage to prevent short circuits. Power cables should also be adequately secured in areas where cable trays are not in use.

5.2. On-site Installation

	<p>It is prohibited to perform any un-related mechanical operation either inside or on the top of the ESS Cabinet.</p> <p>During installation, please ensure the ESS Cabinet is clean (both inside and surrounding place)</p>
---	---

5.2.1. Removal of Packaging

	<p>The packaging plates of the ESS cabinet are heavy. To remove the outer packaging, please ensure that at least two workers are performing this operation simultaneously.</p>
---	--

Please remove the transportation package of the cabinet with the following steps.

Step 1: Remove the top plate of the package box.

Step 2: Remove the wooden sides of the package box.

Step 3: Remove the shielding material from the package box.

Step 4: Remove the anchoring components that secure the cabinet to the transportation board.

At this point, the ESS Cabinet can be detached from the wooden transportation pallet.



After the ESS cabinet is detached from the wooden pallet, it is strictly prohibited to transport the ESS cabinet through the wooden pallet again. In addition, since now the ESS cabinet is at risk of tipping over, please handle with special care



The ESS cabinet may be repacked in accordance with the reversed steps for storage. Please keep the shielding materials and desiccants inside the box during repacking, and store the ESS cabinet in strict accordance with the description in this manual.

5.2.2. Inspection before Installing

Before fixing the ESS Cabinet, please:

- Ensure that the cable trenches and the cable laying meet the installation requirements.
- Ensure that the installation and openings of channel steel meet the installation requirements.
- Other than channel steel, anchor bolts may also be used to fix the ESS cabinet on a pre-built solid foundation. In such case, it is necessary to pre-drilled holes on the foundation, and the holes shall meet the requirements of the positioning holes at the bottom of the ESS cabinet.

5.2.3. Fixing of Cabinet



- Please ensure that both the AC and DC sides are not live before installation.
- Be sure not to touch any live part!



- All electrical connections shall comply with the electrical connection standards of the country/region where the project is located.
- Only professional electricians or qualified personnel are allowed to conduct electrical connection for the product.
- Check all cables before connection to make sure that insulation is perfect; Replace all cables of any insulation defect to avoid risk of safety problem.
- Please perform the wiring operation in strict accordance with the wiring markings inside the equipment.
- Mind the polarities of DC cables and the phase sequence of AC cables.
- Don't pull the cables hard to avoid damage to insulation.
- Bending allowance shall be reserved for all cables.
- Take auxiliary measures to reduce stress of cables.
- Once wiring operation is completed, conduct inspection carefully, so as to ensure that the wiring is correct and fixed properly.
- The ESS cabinet may be connected to the power grid only after the Grid connection is approved by local authority and that the ESS cabinet is installed by professional technician(s).



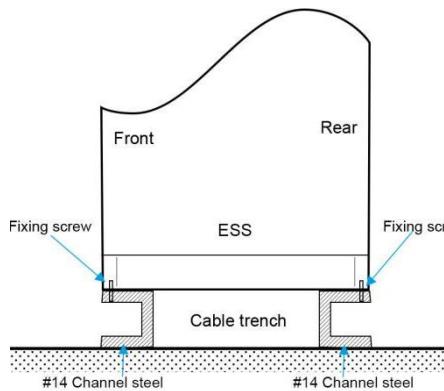
The AC side of the ESS cabinet shall be placed close to the later-stage external transformer, so as to minimize the length of the cables from AC side of the cabinet to the later-stage transformer.

Fix the ESS Cabinet according to the following steps:

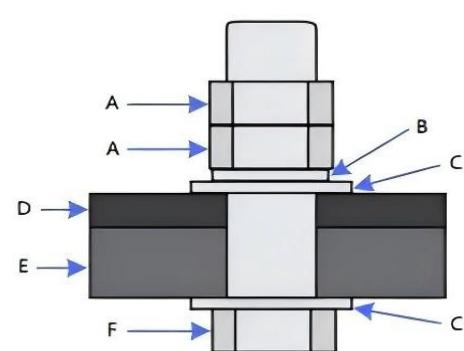
Step 1: Shift the ESS cabinet to the destination position and align it with the installation holes.

Step 2: Fix the cabinet to the #14 channel steel or to the foundation with M16 bolts through the pre-drilled slots on the base of cabinet.

a. Fixing method of channel steel



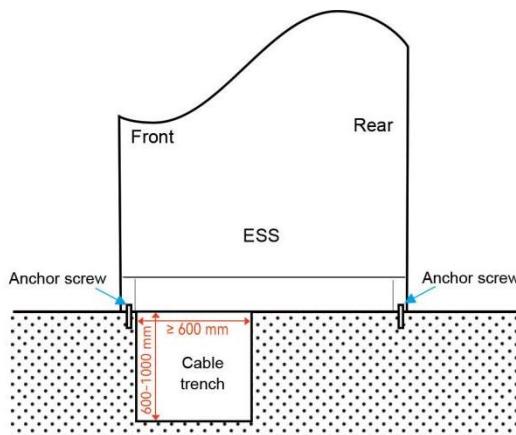
Fixing Method of Channel Steel



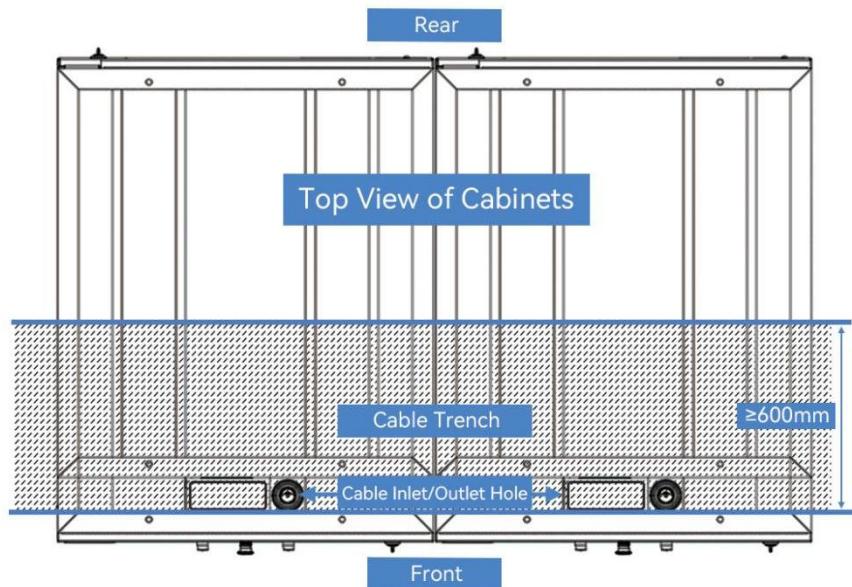
No.	Item
A	Nut
B	Spring washer
C	Flat washer
D	Base of cabinet
E	Channel steel
F	Bolt

Screw Fixing Method

b. Fixing method of foundation



Fixing Method of Foundation



The Position of Cable Trench in Top View (2 cabinets)

Step 3: Install the front and rear baffles to the base of cabinet upon completion.

5.2.4. Cable Connection

5.2.4.1. Safety Requirement

In order to ensure the safety of personnel and equipment during electrical installation, follow all safety instructions in this manual (especially those in this chapter), complying also with local safety regulations (of destination region/country).

During the electrical connections of the ESS Cabinet, as well as all other operations carried out to the ESS Cabinet, always follow the Five Safety Rules below:

- 1) Disconnect all external connections of the ESS and the connections to the internal power supply.
- 2) Make sure that the ESS will not be re-powered on by all means.
- 3) Use a multi-meter to make sure that the inside of the ESS is completely powered-off.
- 4) Conduct necessary earthing connection and short-circuit connection.
- 5) Use insulating coverings to cover the potentially-live parts near the operation section.

5.2.4.2. Tool Preparation



Screwdriver



Allen Wrench



Stripping Pliers



Torque Wrench



Wire Crimper



Hydraulic Plier



Multimeter



Heat Gun

5.2.4.3. Overview of Wiring Area

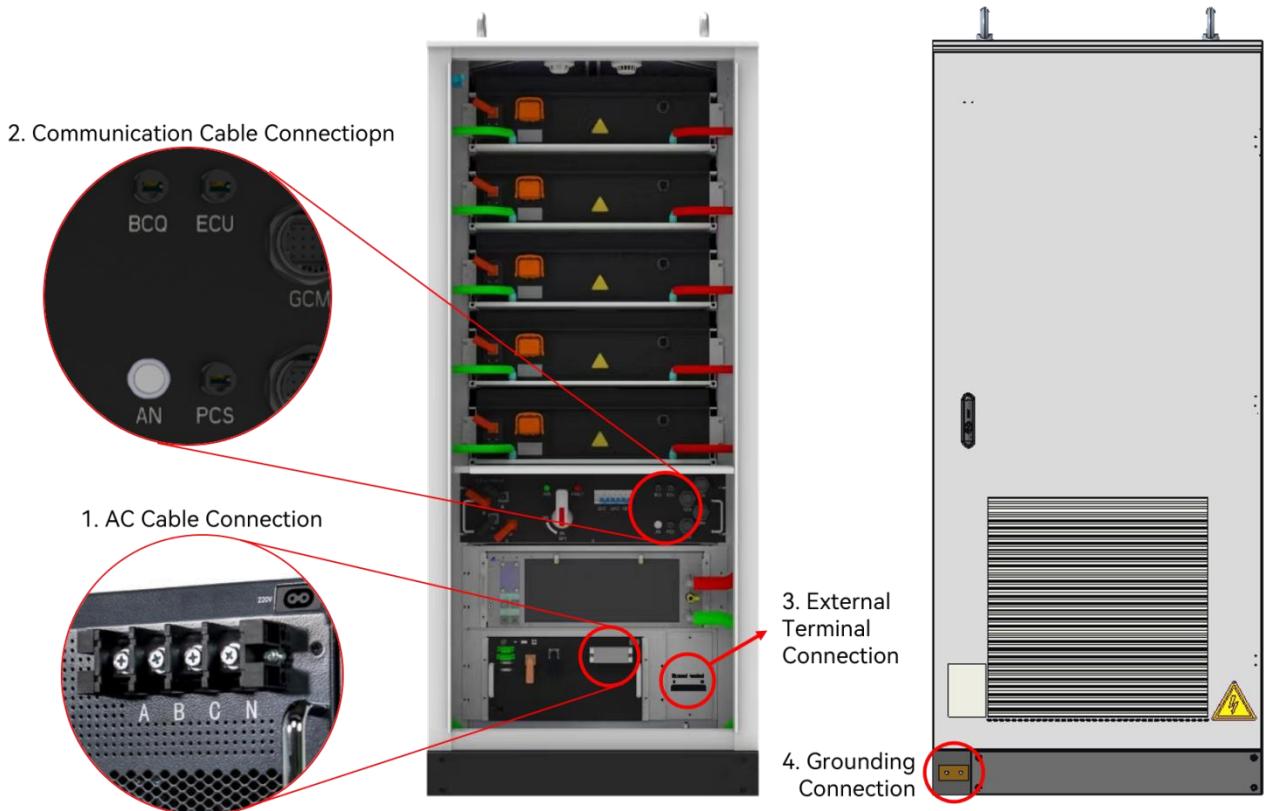


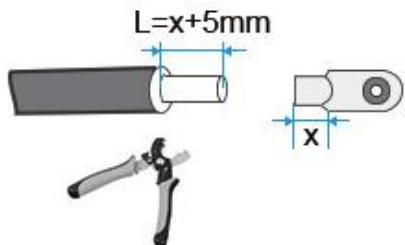
Figure 5-4 Wiring Area

The NE233L cabinet completes most of the internal wiring before leaving the factory, so during on-site installation, only the wiring in the three areas shown in the Figure 5-4 needs to be connected:

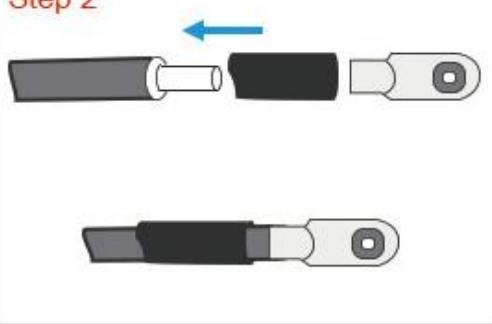
- AC cable connection
- Communication cable connection
- External terminal connection
- Grounding connection

5.2.4.4. AC Cable Connection

 WARNING	<p>Make sure that the battery unit of the ESS Cabinet is disconnected before connection.</p>
---	--

Step 1

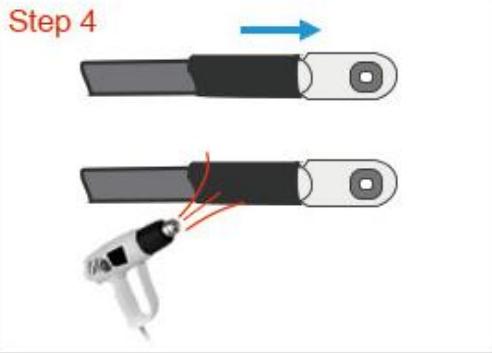
Step 1: Strip the cable with Stripping Piler, to expose copper core for a length of the-copper-nose-conduit-depth(x in figure) +5mm. Based on the cable specifications, it is recommended to use DT XX-8 copper nose terminal for wiring, where XX is the wire diameter of cable.

Step 2

Step 2: Select a heat shrink tubing that matches the cable size. The length of the tubing shall exceed the copper nose conduit by 20mm. Slide the heat shrink tubing and DT terminal sequentially onto the cable.

Step 3

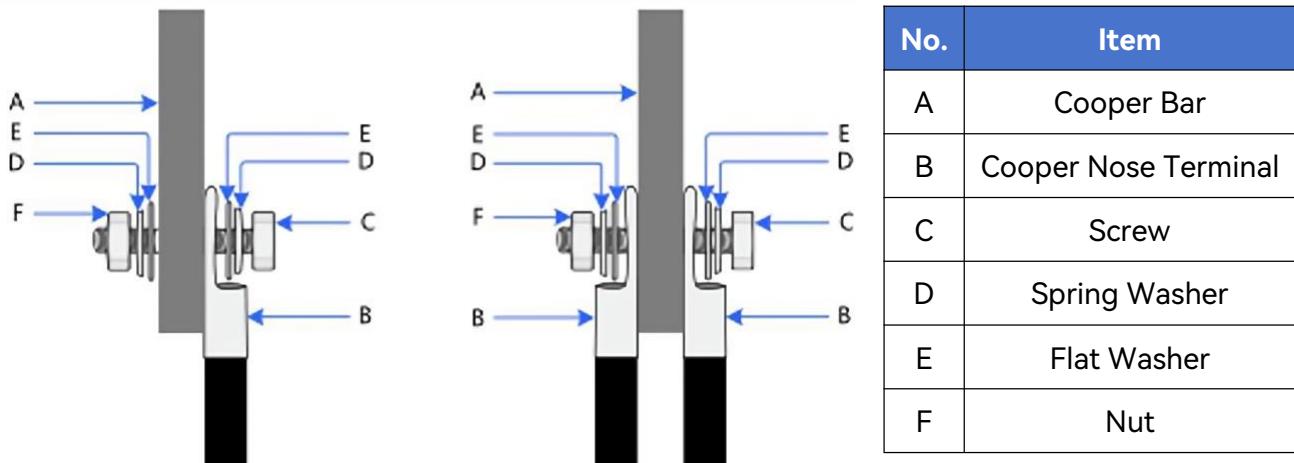
Step 3: Crimp copper nose terminal. Put the exposed copper core into the copper nose conduit. Use a wire crimper to compress the copper nose terminal. Compress it at least twice.

Step 4

Step 4: Wrap the heat shrink tubing over the copper nose till the copper nose conduit is fully covered. Use a heat gun to tighten the heat shrink tubing.

Step 5: Connect the power cables.

- Select bolts that match copper nose terminals.
- Fix the nose onto the wiring bar, minding the phase order of A-B-C-N.
- Tighten the screws with screwdriver and/or wrench. The tightening torque of copper cables is 20N.m.



Step 7: Check and make sure that the wiring is securely fixed.

5.2.4.5. Communication Connection

The communication and sampling lines inside the cabinet have already been pre-connected, and the external communication lines of high-voltage box need to be connected. Under normal circumstances, only the BCQ port needs to be configured.



Need to be configured:

BCQ: Through BCQ interface to connect EMS. Or connect higher level communication device, like network hub.

No need to be configured generally:

ECU: No on-site wiring is required. It will be pre-connected before delivery.

This port is used to connect to HMI.

PCS: Used to connect other PCS with TCP/IP communication method.(not applicable in ESS cabinet)

5.2.4.6. External Terminal Connection

Connect the pins 1–6 of the external terminal to the circuit breaker in the POC cabinet for signal acquisition. It is recommended that the circuit breaker in the POC cabinet be structured in two layers, with the upper layer breaker named QF and the second layer breaker named QF1.



When providing a POC cabinet yourself, please choose the circuit breakers that is capable of collecting contact signals.

As shown in the figure and table below, connect the external terminal to the circuit breaker.

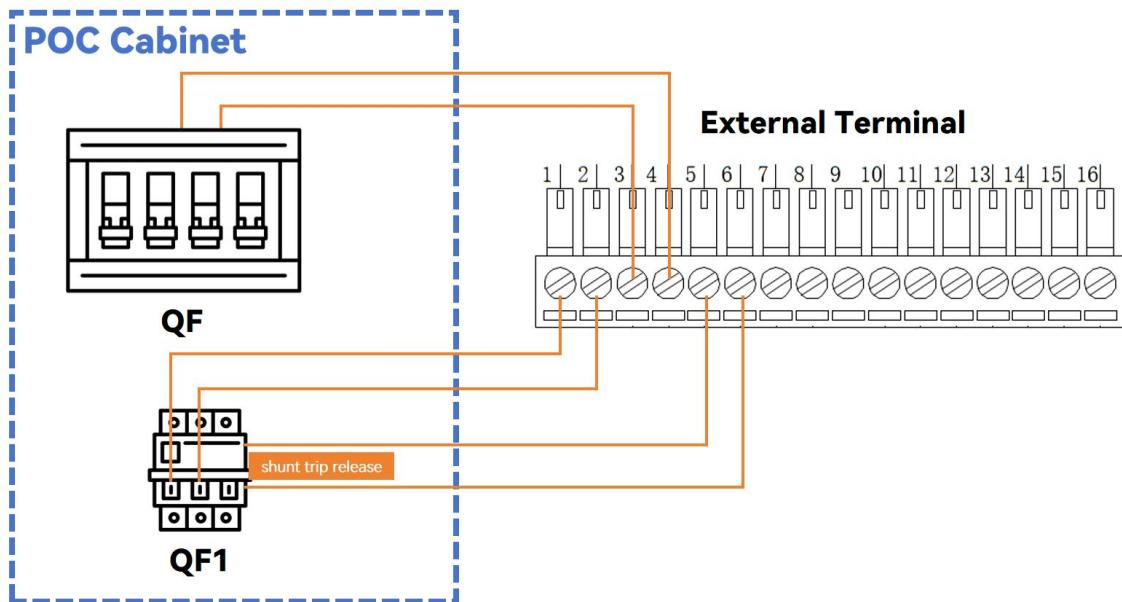


Figure 5-5 Schematic Diagram of External Terminal Connection

Pin No.	Definition	Pin No.	Definition
1	QF1 NO Contact	4	QF COM NO Contact
2	QF1 COM NO Contact	5	QF1 Trip Signal
3	QF NO Contact	6	QF1 Trip Signal



The diagram is for illustrative purposes only and the POC cabinet used on-site varies. If you have any doubts during installation, please contact the POC manufacturer or our after-sales personnel.

5.2.4.7. Grounding Connection

The grounding panel on the cabinet is equipped with both M12 and M8 screws; choose one of them. Select PE cable of 25–50mm², connect suitable DT terminal as 5.4.4.4, and then install it with torque 60–70 N · m.

Grounding connection shall comply with the following instructions:

- The grounding connection shall comply with the grounding standards and codes of the country/region where the project is located.
- The connection between the equipment and the grounding electrode shall be tightened and reliable.
- Upon completion of grounding, the grounding resistance shall be measured and not exceeding 4Ω.

 WARNING	<p>The grounding cables shall be well grounded! Otherwise:</p> <ul style="list-style-type: none"> ● In case of malfunction, it may pose a fatal electric shock hazard to operators! ● Lightning strikes may cause equipment damage! ● The equipment may malfunction! ● The wiring shall be conducted in strict accordance with the wiring markings inside the equipment.
---	--

5.2.5. Sealing of Inlet Holes

Check carefully all the electric connections upon completion of works. When all connections are verified, seal the gaps with fireproof mud. The fireproof mud is provided by Nenghui and will be shipped together with the cabinet.

Don't remove the protective sponge which prevents the cables from being scratched.

 WARNING	<ul style="list-style-type: none"> ● If the sealing is not done properly, there's a risk of moisture infiltrating the equipment. ● An inadequate seal might permit the intrusion of rodents or similar creatures.
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5.2.6. On-grid Parallel Connection

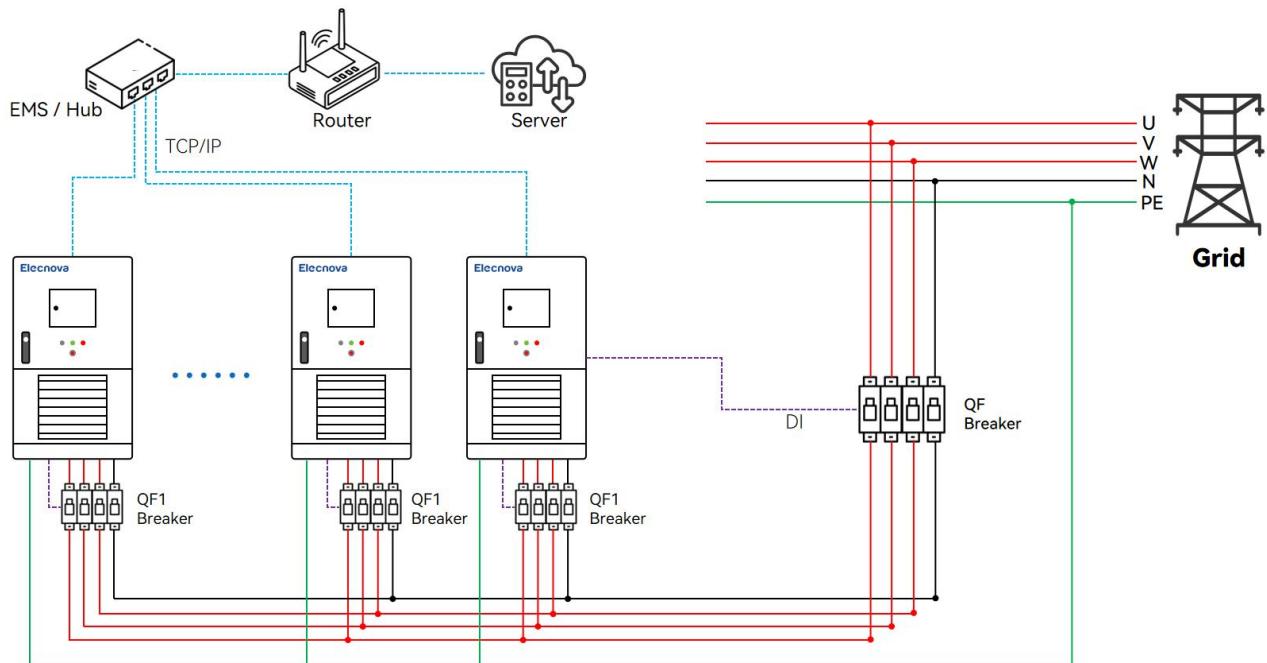


Figure 5-6 On-grid Parallel Connection Diagram

In the case of on-grid parallel connection, each cabinet must go through a circuit breaker (QF1 breaker) before junction, and then pass through the main circuit breaker to export to the grid. Each cabinet collects the NO contact and tripping signal of its own QF1 breaker through DI, and the master device additionally collects the tripping signal of the QF circuit breaker. The BCQ port of the high-voltage box need be connected to the same higher-level EMS or network hub, and then the data can be uploaded to the server through the router.

5.2.7. Off-grid Parallel Connection (Optional)

	<p>This feature is optional. If you have the need for offline and standalone applications, please inform our sales or technical staff in advance.</p>
--	---

When there is a need for off-grid parallel connection, a second external terminal will be installed above each cabinet's external terminal. It is necessary to connect the pins 1-5 of the second

external terminal on each machine one-to-one correspondingly.

Currently, NE233L supports up to 6 units in off-grid parallel connection.

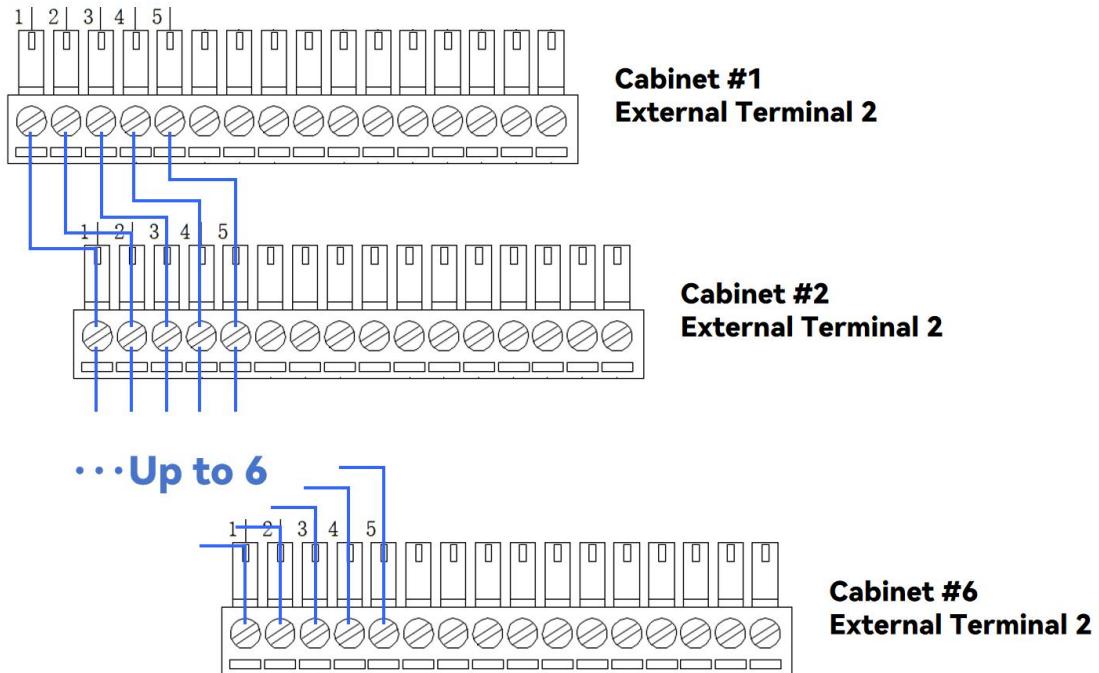


Figure 5-7 The Connection of Off-grid Parallel

5.2.8. Installation Check-list

Upon completion of installation, to ensure the normal operation, conduct the following inspections:

Mechanical Installation Inspection
<input type="checkbox"/> The ESS Cabinet is not deformed or damaged
<input type="checkbox"/> There is sufficient maintenance space around the Cabinet
<input type="checkbox"/> Temperature,humidity, and ventilation conditions of the environment (where the BESS is seated) meet the requirements
<input type="checkbox"/> Clear warning signs have been put up in and out of the ESS Cabinet
<input type="checkbox"/> There is no flammable, explosive or hazardous materials near the ESS Cabinet
Electrical installation inspection
<input type="checkbox"/> The ESS Cabinet grounding cables: complete and secured
<input type="checkbox"/> The ESS Cabinet power cables connection: correct and secured
<input type="checkbox"/> The ESS Cabinet communication cable connection, correct and kept at a proper distance from power cables
<input type="checkbox"/> The cables ID number: correctly and clearly identified
<input type="checkbox"/> The insulated protective cover: complete and secured and the warning signs are clear and secured
Other Inspections
<input type="checkbox"/> Inside the cabinet: no foreign objects, like tools, parts, waste or conductive dust
<input type="checkbox"/> The ESS Cabinet and cables: neat and secured

6. Power On&Off

6.1. Power-on Operation

After the POC (Power on Condition) cabinet is connected to the grid and the grid power is connected to the ESS cabinet, the PCS indicator light will flash green, and the cooling fan will start. If the PCS shows a red light, it is necessary to verify that the phase sequence and voltage of the POC cabinet are correct.

Afterwards, please comply with the following steps to operate.

- 1) Once the mains power is connected properly, close the high voltage box switches QF2, QF3, and QF1* in sequence. This ensures that the external PCS is in a shutdown state after powering on (confirm the PCS status on the HMI or Website platform).
- 2) Afterward, close the high voltage box QF4, which will prompt the BMS to close the main contactors.
- 3) Consequently, the ESS cabinet RUN indicator will light up, signifying that the ESS Cabinet has been successfully powered on.

*The description of switches, please refer to 3.3.3.2.

Once the high-voltage box is active, the BMS enters a self-check state. If no issues are detected, the high voltage box operation indicator light will illuminate, and the system will automatically close the high voltage contactor within the high voltage box. This action generates DC high voltage at both the positive and negative terminals of the battery. Subsequently, the BCQ begins to check the PCS. If no faults are found, the BCQ will instruct the PCS to connect its main contactors. If the BCQ does not issue any command, the PCS will remain in standby mode. If the BCQ issues a power-on command, the PCS will initiate a self-check for grid connection.

	<p>During the commissioning or maintenance phase, if the PCS is not in standby mode, it is strictly forbidden to perform a power-on operation using the BMS.</p>
---	--

6.2. Charging and Discharging

After ESS Cabinet is powered on, BCQ starts its programmed operation and issues charging/discharging commands to the charger. BMS detects the charging/discharging current. Built-in charger starts charging/discharging operations. During charge/discharge period, both green indicator and white indicator light up.

6.3. Power-off Operation

- 1) Disconnect QF1, DC load switch on the high-voltage box. Then, disconnect QF4, MCB, on the high-voltage box panel. As a result, the main circuit contactors in the high-voltage box are disconnected, the green and red LED indicators on the high-voltage box panel go out, indicating that the high-voltage box is powered off.
- 2) After the high-voltage box is powered off, switch off QF3 to cut off the liquid-cooled unit; Thereafter, switch off QF2 to disconnect ESS Cabinet from AC220V/230V power supply. Then disconnect Power DB to disconnect ESS cabinet from the grid.
- 3) The white LED indicator on the cabinet front panel goes out: it indicates that NE233L is successfully powered off.



Before powering off NE233L, please ensure that it has exited from the charge/discharge mode. Never cut off the power supply when the ESS cabinet is in charge/discharge mode!

6.4. Black Start

The NE233L cabinet has a black start function. The function follow the steps below:

- 1) After the power grid is disconnected, switch off QF1, 2, 3, and 4.
- 2) Then, first switch on QF1 and hold down the “AN” button until the green RUN light comes on. The “AN” button shows as Figure 6-1.



Figure 6-1 Black Start Button

- 3) After that, first close QF4, and within three seconds, close QF2. The black start is completed.

	<p>When using the black start function in a parallel connection application, please start the master unit first, and then start the slave units in sequence.</p>
---	--

7. HMI

7.1. Hardware Parameters

Item	Specifications
Product Features	
LCD screen	10.1" TFT
Backlight type	LED
Resolution ratio	1024×600
Display brightness	300cd/m ²
Touch screen	Four-wire resistive type
Input voltage	24±20%VDC
Rated power	6W
Processor	Cortex-A53 quad-core 1GHz
Memory	512M
System storage	8G
External Interfaces	
Serial interface	Mode 1: COM1(RS232), COM2(RS485), COM3(RS485), COM4(RS232) Mode 2: COM1(RS232), COM4(RS232), COM9(RS422)
USB interface	1×Host
Ethernet port	1×10/100MHz self-adaptive
Environmental Conditions	
Operating temperature	0°C-50°C
Operating humidity	5%-90% (without condensation)
Storage temperature	-10°C to 60°C
Storage humidity	5%-90% (without condensation)
Product Specifications	
Shell material	Cast aluminum panel
Dimensions (mm)	271×213
Cabinet opening (mm)	260×202
Certification	
Product certification	Complying with CE/FCC certification standards
Protection level	IP65 (front panel)
Electromagnetic compatibility	Industrial level 3

7.2. Operation Instruction

7.2.1. Function Introduction

The energy storage system supports the on-site viewing of its operating status and monitoring data, the on-site configuration of strategy parameters, and the on-site viewing of alarm records through the HMI configuration screen.

7.2.2. Account Login

The HMI configuration screen has two types of account: engineer account and administrator account. Both engineer account and administrator account support the viewing and editing of operational permissions. Without logging in to the account, only viewing operations are supported. The administrator account can reset the password of engineer account.

Select the account and enter the correct password, so as to complete the account login.



Figure 7-1 Log-in page

Click the account name in the upper right corner, and then a "log out" button will pop up. Click it to log out of the account. (Figure 7-2)

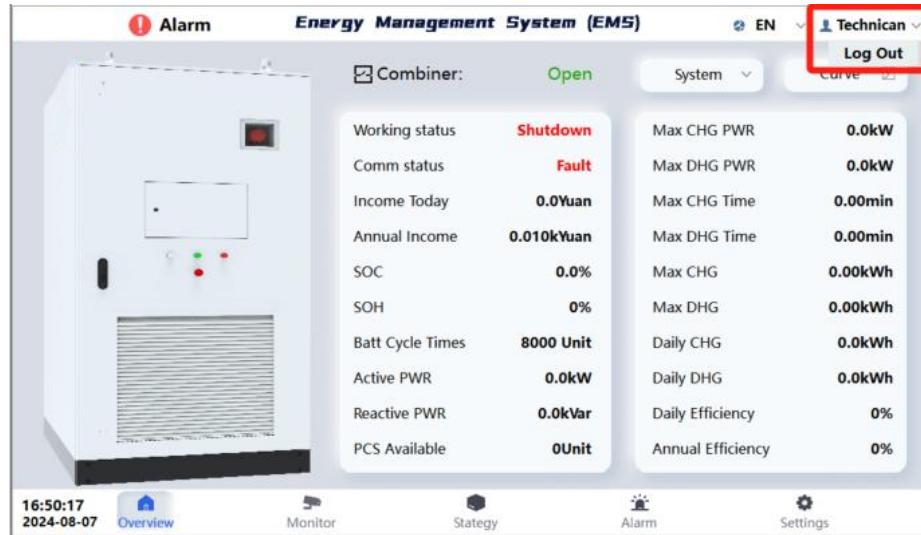


Figure 7-2 Log out button

7.2.3. Overview

The overall operation data of the BCQ system and grid-tied bus-bars are displayed, the switching of the system as a whole and each grid-tied bus-bar is supported, and the viewing of parameter operation curve chart is supported. (Figure 7-3)

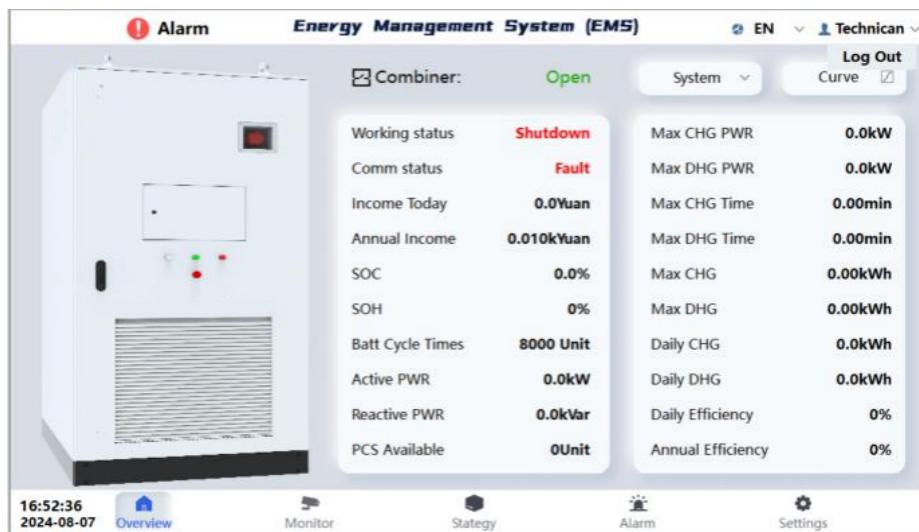


Figure 7-3 Overview page

Operation Curve Chart:

This is the operation curve chart that supports the viewing of power parameters, charging/discharging level, energy storage benefits, and battery SOC of the BCQ system. (Figure 7-4)

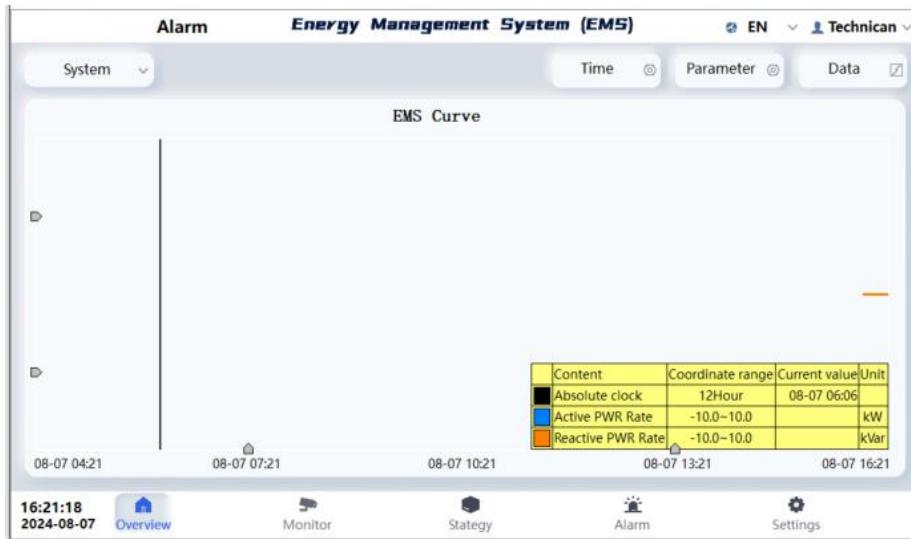


Figure 7-4 EMS operation curve chart

When viewing the operation curve, you can set the query time: (Figure 7-5)

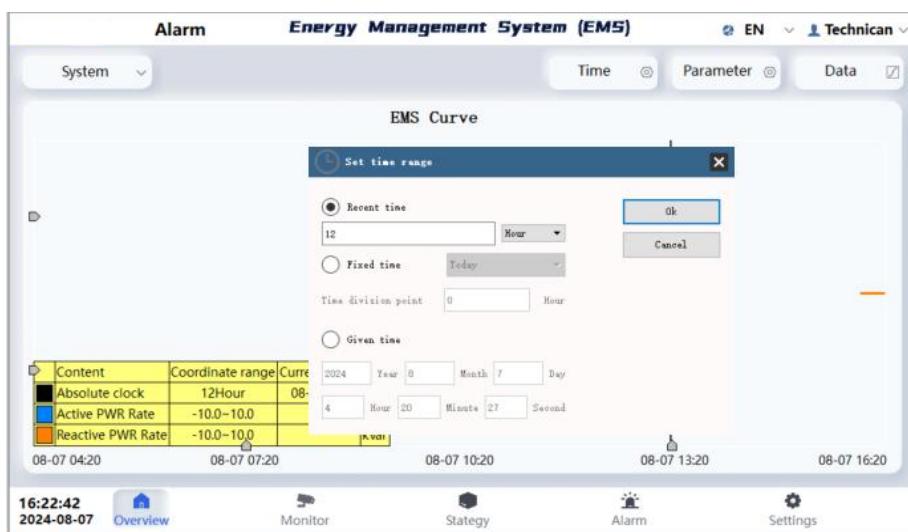


Figure 7-5 Query time setting

7.2.4. Monitoring

The operation data of BCQ system, PCS, BMS equipment, and auxiliary systems are displayed, and the viewing of parameter operation curve chart is supported. The remote control of equipment is supported. (Figure 7-6)

You can switch to different energy storage cabinets in the upper left corner of the interface.



Figure 7-6 Detail information of PCS

Operation Curve Chart:

The viewing of operation curve of equipment parameters is supported. The switching of parameters and the setting of query time are supported. (Figure 7-7)

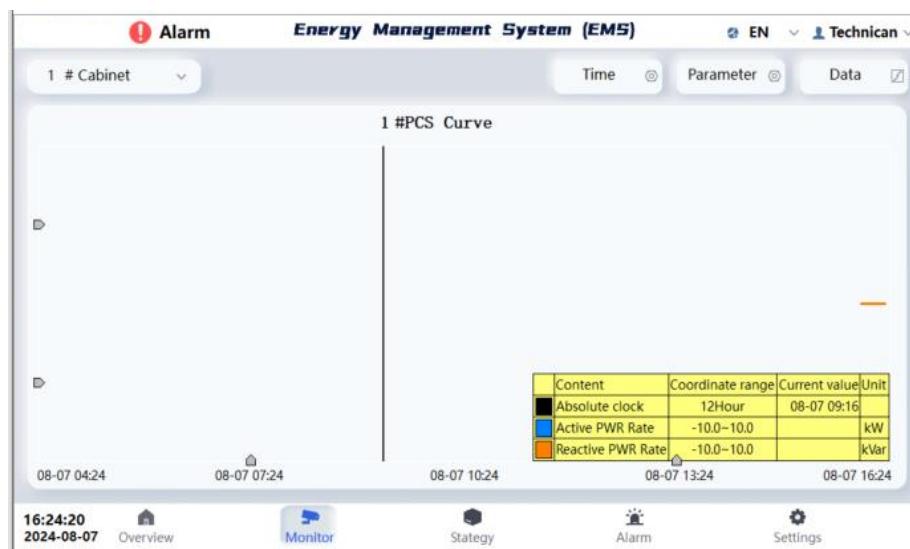


Figure 7-7 PCS operation curve chart

Remote Control:

Click the control button and select the operation content and password in the pop-up window, so as to complete the control operation. (Figure 7-8)

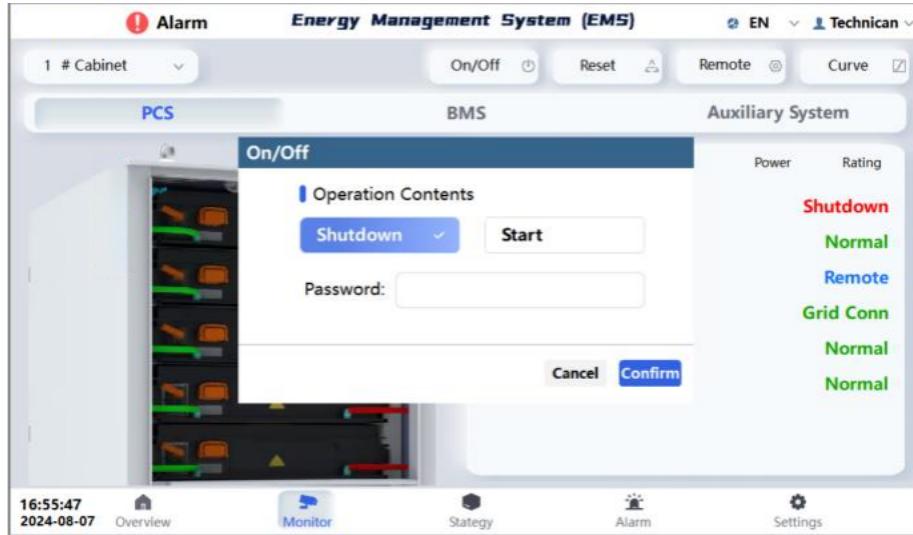


Figure 7-8 PCS remote control page

Battery Cell:

Click "Battery Details" on the BMS equipment monitoring page, so as to view the detailed data of battery cells. (Figure 7-9)



Figure 7-9 Detail information of battery cell

In "Details of Battery Cell" in Figure 7-10, the voltage and temperature data of all battery cells can be viewed, and the quick queries by entering the battery section number and temperature measurement point is supported.

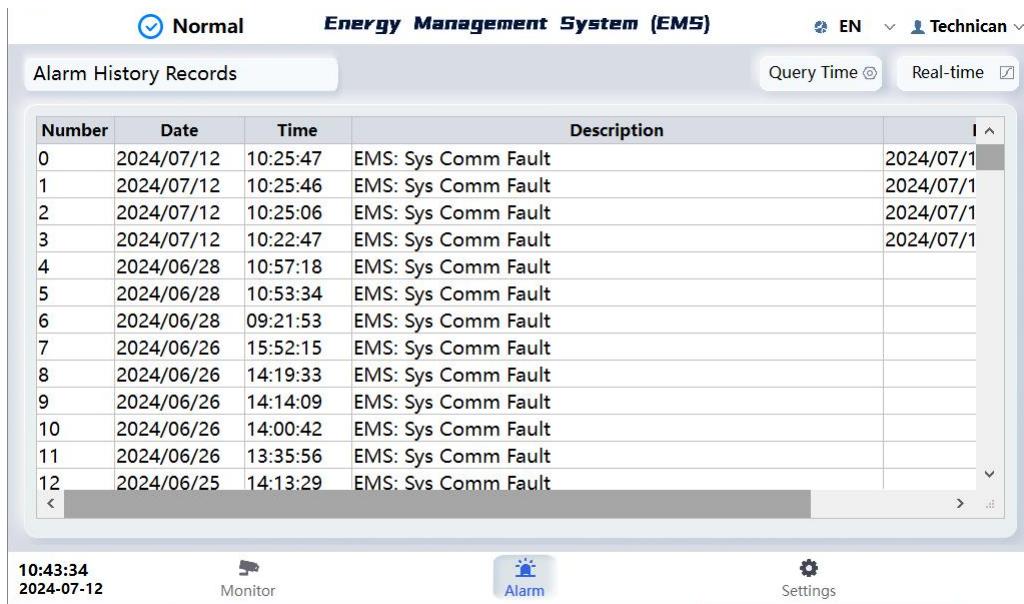


Figure 7-10 Battery cell details page

7.2.5. Alarm

Various alarm information during the operation of energy storage system is displayed, including real-time alarms and historical alarm records. (Figure 7-11)

If there is an alarm during the operation of the energy storage system when any other interface is displayed on the screen, the alarm icon in the upper left corner will flash continuously.

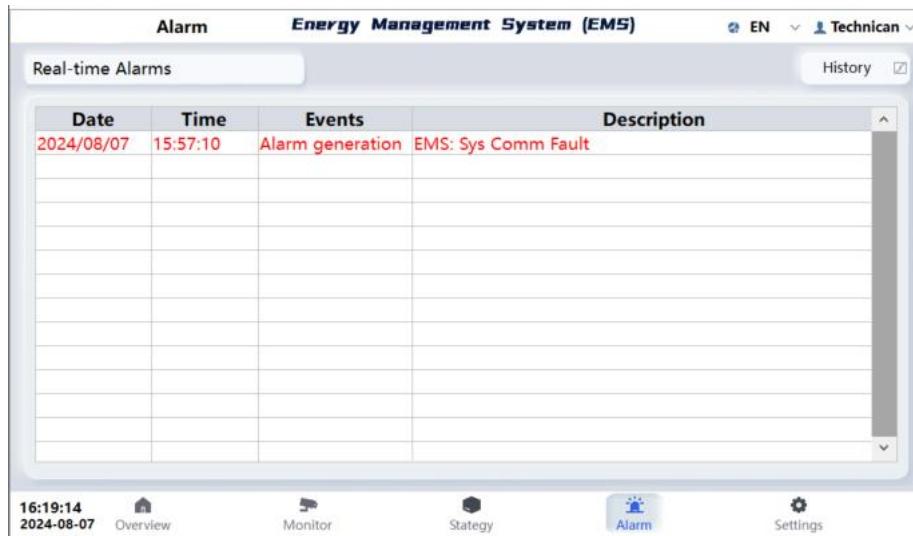


Figure 7-11 Alarm page

Click on "Historical Alarm" to display the historical alarm records of the energy storage system (Figure 7-12):

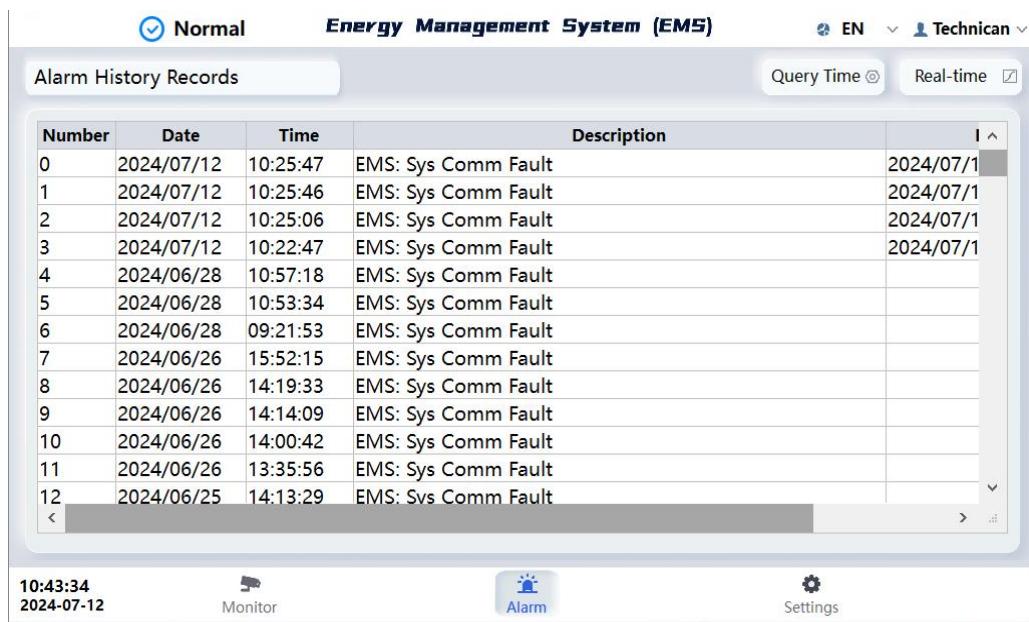


Figure 7-12 Alarm history record page

7.2.6. Setting

This interface is for password change, basic setting, buzzer & screen saver, restart operation, and equipment information. (Figure 7-13)

To enter the "Settings" interface, you need to log in to your account.

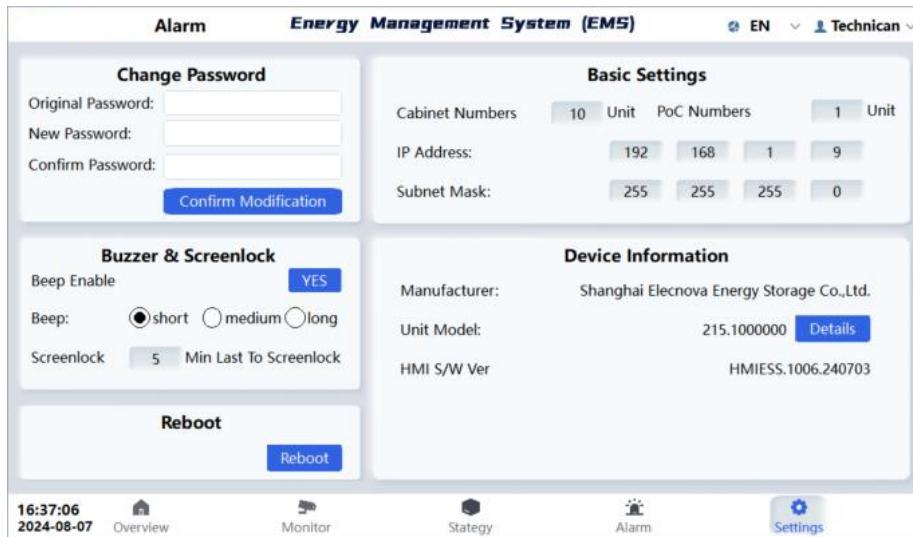


Figure 7-13 Setting page

Password Change: Enter the original and new account passwords. The new password will become valid only after the original password is verified as correct.

Buzzer & Screen Saver: Set the alarm duration of the buzzer when an alarm occurs; when there is no operation on the HMI screen within the set time, the system will log out of the account

automatically and enter the screen saver interface.

Restart: Click on "Restart Equipment" to automatically restart the HMI screen.

Basic Setting: Set the number of energy storage cabinets and the number of grid-tied points.

Equipment Information: Display the manufacturer information, equipment model, and software version of the energy storage system.

8. Maintenance

8.1. Emergency Faults and Handling Methods

8.1.1. Fire

Step 1: Evacuate on-site personnel to a safe place, delineate an isolation zone, and pass the warning message to relevant personnel to report.

Step 2: To the extent that safety is ensured, follow steps below:

- 1) In case wiring harness is in fire, fight fire with a carbon dioxide or dry powder fire extinguisher.
- 2) In case ESS Cabinet catches fire, fight fire with a high-pressure water gun at distance.
- 3) In case site smoke inhaled, evacuate and seek medical methods at nearest hospital as soon as possible.

	<p>If a fire is caused by abnormal charging or discharging, cut off the power supply immediately. Then extinguish the fire!</p>
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8.1.2. Water Flooding

Step 1: Regardless of whether the system is powered on or not, evacuate personnel from site to a safe place and delineate a safe isolation zone.

Step 2: Notify ESS Cabinet supplier for maintenance after the water recedes.

Step 3: Do not start the ESS Cabinet until original supplier/manufacturer examines and determines so.

8.2. System Maintenance

8.2.1. Maintenance Methods

To ensure safety and reliability, read and comply with the following instructions:

Option 1:

This option is recommended for ESS Cabinet with SOC at low level.

- 1) Discharge the battery to the cut-off condition (average cell voltage < 3.1V or min voltage < 2.8V), then keep still for 1 hour;
- 2) Charge the battery to SOC 100% (max cell voltage > 3.65V), then keep still for 1 hour;
- 3) Discharge the battery to SOC 40%.

Option 2:

This option is recommended for ESS Cabinet with SOC at high level.

- 1) Charge the battery to SOC 100% (max cell voltage > 3.65V) then keep still for 1 hour;
- 2) Discharge the battery to cut-off condition (average cell voltage < 3.1V or min voltage < 2.8V), then keep still for 1 hour;
- 3) Recharge the battery to SOC 40%.

8.2.2. Maintenance Interval

8.2.2.1. Interpretation of Terms

Normal Operation: ESS Cabinet operates every day;

Intermittent Operation: ESS Cabinet operation frequency is not fixed during a month. ESS Cabinet does not run on daily basis;

Long-term Idle: ESS Cabinet is shut down for more than 3 consecutive months. (the battery system shall be charged to minimum SOC 40% before it is laid idle)

8.2.2.2. Maintenance under Normal Operation

- Perform the battery system maintenance once every 12 months to prevent battery damage.
- Inspect the system once every 12 months and keep the inspection records properly.

8.2.2.3. Maintenance under Intermittent Operation

Same as those for Normal Operation system.

8.2.2.4. Maintenance under Long-term Idle

- Keep ESS Cabinet SOC in 30%~50% during storage; Avoid long-term storage when SOC is lower than 15%. In case ESS Cabinet is to lay idle for a long time, turn off the

power-consuming equipment in a timely manner.

- Check ESS Cabinet every 3 months. Make and keep the inspection records properly.
- ESS Cabinet maintenance shall be done every 3 months to prevent battery damage.
- Before using ESS Cabinet under Long-term Idle, fully charge the ESS Cabinet at least once to restore its performance to the optimal state.

8.3. Components Maintenance

	<ul style="list-style-type: none"> ● Please strictly follow local regulations for safety precautions during maintenance operations. ● The maintenance period is a recommended value and can be adjusted according to actual planning.
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8.3.1. PCS Dust-proof Filter Maintenance



Figure 8-1 PCS Dust-proof Filter

The dust filter is a consumable part, and its cleaning or replacement cycle is directly related to the on-site conditions of the liquid-cooled energy storage system during routine maintenance.

Item	Standard	Period	Inspection Method	Handling
PCS Dust-proof Filter	The dust-proof device is free from dust accumulation, foreign object blockage, and damage.	6 months	Visual inspection	After a power outage of at least 1 minute, use a brush to clean dust and other blockages, or replace the filter and dust filter net.

8.3.2. Fire Protection System Maintenance

Regularly inspect the appearance of point-type photoelectric smoke detectors, point-type temperature sensors, sound and light alarms, aerosol fire extinguishing devices, and other components to maintain their cleanliness.

Item	Standard	Period	Inspection Method	Abnormal Handling
Point-type smoke detector	Visual inspection, keep all components clean	1 months	Visual inspection	Contact after-sales service if abnormal.
Point-type heat detector				
Audible and visual alarm				
Aerosol fire extinguishing device				

8.3.3. Liquid-cooled Chiller Maintenance

1) Routine maintenance

Item	Maintenance Standard	Inspection Method	Abnormal Handling
Operating Data	The current, voltage, and inlet/outlet liquid temperature/pressure during unit operation should be within the following ranges: Current: Less than the maximum operating current indicated on the nameplate Voltage: $220V \pm 15\%$ Cooling liquid operating temperature range: -30°C to 55°C	Visual Inspection	Contact after-sales service if data is abnormal
Operating Sound	No abnormal vibration or noise during unit operation, mainly observe the operation of the following components: Compressor, Fan, Circulating water pump	Visual + Auditory Inspection	Contact after-sales service if operation is abnormal
Pipeline Reliability	No refrigerant leakage in the refrigeration system.	Visual Inspection	Please contact after-sales service for maintenance.

Pipeline Reliability	No leakage in the cooling liquid circulation system.	Visual Inspection	Please contact after-sales service for maintenance.
Unit Appearance	The unit surface is clean, free of dust and dirt.	Visual Inspection	Power off for at least 1 minute, then use a brush or cloth to clean the unit's surface.

2) Chiller Unit Filter&Cabinet Filter maintenance



Figure 8-2 Cabinet Filter

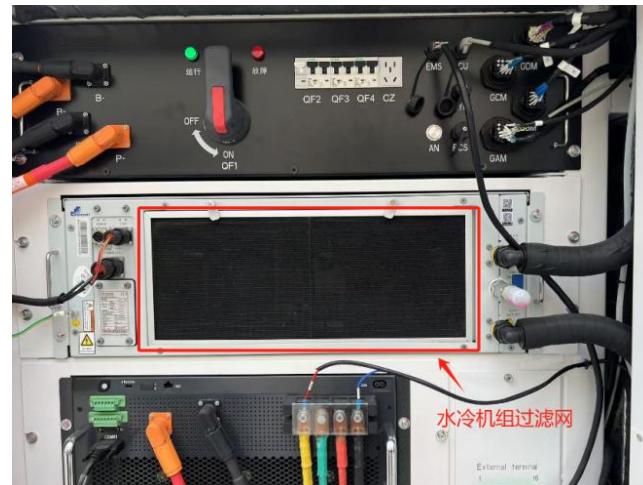


Figure 8-3 Liquid-cooled Chiller Unit Filter

Item	Standard	Period	Inspection Method	Handling
Filter Cleaning	The filter is free from dust accumulation, foreign object blockage, and damage	1 month	Visual Inspection	Power off for at least 1 minute, then use a brush to clean dust and other blockages, or rinse with clean water and dry in a shaded area.

3) Cooling Fan Maintenance



Figure 8-4 Cooling Fan

Item	Standard	Period	Inspection Method	Abnormal Handling
Fan Reliability	The fan is free from dust, and there are no foreign objects blocking the air outlet	6 months	Visual Inspection	Power off for at least 1 minute, then use a brush to clean the dust from the fan thoroughly. Remove any foreign objects from the air outlet.
	The fan blades are free from damage, and the fan operates smoothly without any noise	6 months	Visual Inspection	Power off for at least 1 minute, then tighten the fan and check for any internal cables or other obstructions that may interfere with the fan's rotation. If the fan malfunctions or operates abnormally, please contact after-sales service.

4) Cable&Terminal Maintenance

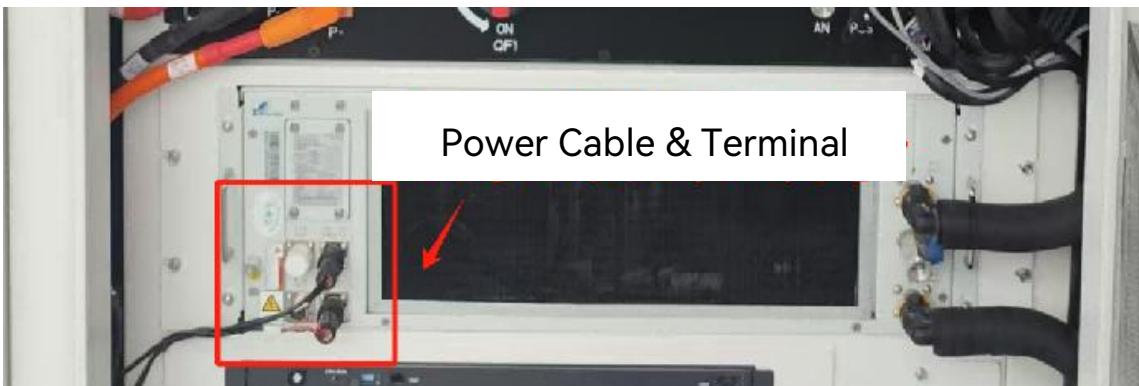


Figure 8-5 Power cable and terminal

Item	Standard	Period	Method	Abnormal Handling
Reliability of Wiring Cables and Terminals	No looseness in power plug electrical cables and terminal connections	6 months	Visual inspection	Power off for at least 1 minute, then reconnect any loose power plugs; use a screwdriver to tighten any loose cables.
	No aging, damage, abnormal heating, or other abnormalities in electrical cables	6 months	Visual inspection	Power off for at least 1 minute, then replace the power cables.
	No dust at the wiring panel	6 months	Visual inspection	Power off for at least 1 minute, then clean the dust with a brush.

5) Coolant Maintenance

Item	Standard	Period	Inspection Method	Abnormal Handling
Coolant	Concentration meets the required range	6 months	Visual inspection	Contact after-sales service in case of abnormality
	Regularly replace the coolant	4-5 years	/	Use a professional filling machine to replace the coolant.

Coolant selection precautions:

It is **not recommended** to mix different brands of coolants.

If it is necessary to use your own coolant for replenishing or replacing, please choose:

Type: Glycol-based coolant

Freezing temperature: -35°C

Concentration: Glycol concentration of 45-55%.

Filling machine selection precautions:

Nenghui can provide the filling machine specifically utilized for NE233L cabinet, for more details, you can consult with the sales staff.

If you wish to use your own filling machine for replenishing or replacing the coolant, please send the brand, model, and technical specifications of the filling machine to Nenghui in advance.

The basic process of using filling machine for coolant replacement:

Step 1:

Gas tightness test. Insert the air hose of the filling machine into the exhaust port of the pipeline below the cabinet, tighten it, and then turn on the "gas test" function of the filling machine. After the pressure rises to 0.2 mega-pascals, turn off the "gas test" function and observe whether the pressure drops. No change indicates good gas tightness.

Step 2:

Pipeline connection. Place the supply hose into the coolant, insert the delivery hose into the filling port of the liquid chiller unit. And then Insert the air hose into the exhaust port on the top of the

cabinet pipeline (ensure the exhaust pipe at the bottom is sealed properly), and the other end is placed into the coolant, as the return tube.

Step 3:

Filling. Turn on the filling switch and ensure that there is an adequate supply of coolant before proceeding with the filling. The entire process takes approximately 1 hour.

Step4:

Filling completion and pressure holding. When the return tube is filled with coolant and free of air bubbles, it indicates that the filling is essentially complete. Two people are required to collaborate on the pressure holding operation: one person holds the return tube and observes the pressure rising to 2.1 mega-pascals, at which point the filling machine is shut off. The other person then closes the filling valve of the liquid chiller and removes the air hose from the top pipeline of the cabinet, sealing it tightly. The filling is completed.

6) Cooling Pipe&Valve Maintenance



Figure 8-6 Cooling Pipe&Valve Position

Item	Standard	Period	Inspection Method	Abnormal Handling
Pipeline Appearance	No damage, deformation, or corrosion	Every 6 months	Visual inspection	Contact after-sales service in case of abnormality
Pipeline Reliability	No damage, deformation, or corrosion	Every 6 months	Visual inspection	Contact after-sales service in case of abnormality
Valve Reliability	No failure or damage	Every 6 months	Visual inspection	Contact after-sales service in case of abnormality.

9. Warranty Statement

Refer to Limited Warranty Letter for Nenghui ESS Products (Standard Edition).

The warranty conditions are also subject to terms and conditions of a contract.

10. After-sales Service

For any question about this product, please contact us with info below:

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Website: www.nhet.energy