



# KuBank User Manual

(IEC&UL&JP versions)

V1.2

CSI Energy Storage Co., Ltd.

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# 1 Safety Precautions

## Symbol on Products

Always note hazard warnings on the machine body, including:

Marks	Explanation
	UKCA mark of conformity.
	CE mark of conformity.
	Pay attention to the danger. Do not operate this product in the live status.
	No fire.
	High voltage inside. Risk of electric shock by touching it.
	Do not dispose of this product as household waste.
	Recycling equipment.
	The noise emission source.
	Schematic diagram of protective equipment wearing.
	This symbol indicates a protective ground terminal which needs to be firmly grounded to ensure the safety of operators.

## 1.1 General Security

### 1.1.1 Declaration

In the installation, operation, and maintenance of equipment, please read this manual first and follow all safety precautions on the equipment and in this manual.

The "Notes", "Attention", "Warning", and "Danger" items in this manual do not represent all safety precautions that should be followed, but are supplementary to all safety precautions. The company assumes no responsibility for any liabilities caused by violating general safety operation requirements or violating design, production, and equipment safety standards.

This equipment should be used in an environment that meets the design specifications, otherwise it may cause equipment failures. The resulting equipment function abnormalities or component damage, personal safety accidents, property losses, etc. are not within the scope of equipment quality warranty.

When installing, operating, and maintaining equipment, you should comply with local laws, regulations, and norms. The safety precautions in this manual only serve as supplements to local laws, regulations, and norms.

The company assumes no responsibility for the following circumstances:

- Installing and using the equipment in an environment that exceeds the regulations in relevant international, national, and regional standards.
- Operating outside of the use conditions specified in this manual.
- Unauthorized disassembly, modification of products, or modification of software code.
- Not following the operation instructions and safety warnings in the product and documentation.
- Equipment damage caused by abnormal natural environments (force majeure, such as earthquakes, fires, storms, floods, mudslides, etc.).
- Equipment damage caused by customer failure to follow transportation and installation requirements.
- Equipment damage caused by storage conditions not meeting product documentation requirements.
- Hardware or data damage caused by customer negligence, improper operation, or intentional damage.
- System damage caused by third parties or customer reasons, including relocation and installation system failure that does not meet the requirements of this manual, as well as identification mark adjustment, modification, or removal that does not meet the requirements of this manual.
- Defects, failures, or damages caused by behaviors, events, negligence, or accidents outside of the seller's reasonable control, including power outages or electrical failures, theft, war, riots, civil unrest, terrorism, intentional or malicious damage, etc.

### 1.1.2 General Requirements

#### **Dangerous**

There is a high voltage in the equipment, and non-standard operation may cause electric shock or fire, resulting in death, serious personal injury or serious property damage. Please operate in accordance with the following instructions:

- Please follow the operation sequence and safety precautions given in this manual and other relevant documents.
- Please comply with the warning labels, cautions, and protective measures on the equipment.
- Please use the correct tools according to the requirements of this manual and master the correct use of the tools.
- Please comply with the power station safety regulations, such as implementing operation ticket and work ticket systems.
- Other than the personnel operating the equipment, please do not approach the equipment. When operating the equipment, temporary warning signs or barriers must be set up for isolation.

- The warning labels, cautions, and protective measures on the equipment must be clearly visible, and any artificial alteration, damage, or blocking is prohibited. Once they become blurred, please replace them in a timely manner.
- It is prohibited to install, wire, maintain, or replace equipment while it is energized.
- It is prohibited to clean electrical components inside the equipment with water.
- Please check if the equipment is damaged, such as holes, dents, or other internal damage indicators.
- Please check that the cables installed in advance are securely connected.
- Please check that there is no displacement of internal components and that any unauthorized changes to the equipment's structure or installation sequence are prohibited.
- Do not power on the equipment until it is fully installed or confirmed by professional personnel.
- Before contacting any conductor surface or terminal, measure the voltage at the contact point and confirm that the equipment or maintenance components have reliable grounding protection to eliminate electric shock hazards.
- If liquid enters the equipment, immediately press the emergency stop button and notify the site manager.
- Do not open the cabinet door when the system is running.
- When initially powered on or performing main circuit live operations, please wear arc-resistant clothing.

### **Caution**

- It is prohibited to perform operations such as arc welding, drilling, or cutting on the equipment. These operations can damage the sealing of the entire enclosure, the electromagnetic shielding performance of the equipment, internal components and cables. Metal debris generated during these operations can enter the equipment and cause electrical short circuits, affecting equipment function or causing equipment damage.
- When the equipment is operating, the outer casing temperature is relatively high, posing a risk of burns. Do not touch it.
- During equipment operation, if a fault is found that may cause personal injury or equipment damage, the operation should be immediately terminated, reported to the responsible person, and effective protective measures should be taken.
- After the fire acoustic and visual alarm is triggered, evacuate the site immediately.
- When operating and maintaining equipment, if personnel need to leave temporarily, please close

and lock the cabinet door.

### **Notice**

- During transportation, transfer, installation, wiring and maintenance operations, the laws and regulations and relevant standards of the country or region must be met.
- The materials and tools required for operation that are provided by users must comply with the laws and regulations and relevant standards of the country or region.
- Permission from the power department of the country or region is required before grid connection can be established.
- Before opening the box door, the water, snow or other debris on the top of the box should be cleaned off to avoid falling into the box during installation, operation, and maintenance.

### **Explain**

- It is prohibited to perform reverse engineering, decompilation, disassembly, dismantling, modification, implantation, or other derivative operations on the device software. Users cannot study the internal implementation of the device, obtain the source code of the device software, infringe intellectual property rights, or disclose any results of device software performance testing.
- It is recommended that users provide their own video equipment to record the detailed process of installing, operating, and maintaining the device.



## 1.2 Personnel Requirements

- Only qualified personnel are allowed to operate the equipment, including transportation, transfer, installation, wiring, and maintenance. When operating the equipment, they must wear protective equipment that meets local safety requirements.
- Operators must pass relevant training and exams provided by our company to possess professional knowledge of energy storage systems.

### Explain

The specific qualification requirements shall be subject to the local regulations and industry standard requirements.

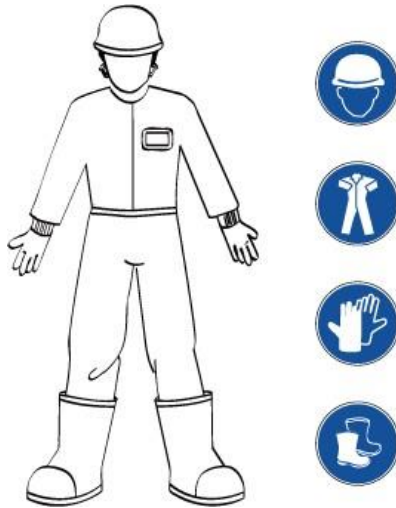


Figure 1-1 Schematic diagram of protective equipment wearing

- When installing, operating, and maintaining, it is strictly prohibited to wear objects that are easily conductive, such as watches, bracelets, bangle bracelets, rings, and necklaces, to avoid electric shock burns.
- When performing operations such as transportation, transfer, installation, wiring, and maintenance, it is necessary to comply with the laws and regulations and relevant standards of the country or region.
- Familiarize yourself with the composition and working principles of the entire energy storage system and operate according to the manual description.

## 2 Product description

### 2.1 Product Introduction

The industrial and commercial energy storage system (KuBank) is composed of energy storage inverter system, energy storage battery system, local energy management system, temperature control system, electrical distribution unit, and fire protection system, which is mainly used in industrial and commercial scenarios. KuBank can effectively improve the operating life of the system through precise temperature control of liquid cooling, BMS active balancing, and intelligent management. Modular and outdoor cabinet design is adopted to meet the needs of overseas transportation, plug & play, easy O&M.

### 2.2 Enclosure Design

#### 2.2.1 Mechanical Parameters

The external dimensions of KuBank(IEC) are shown in the figure:

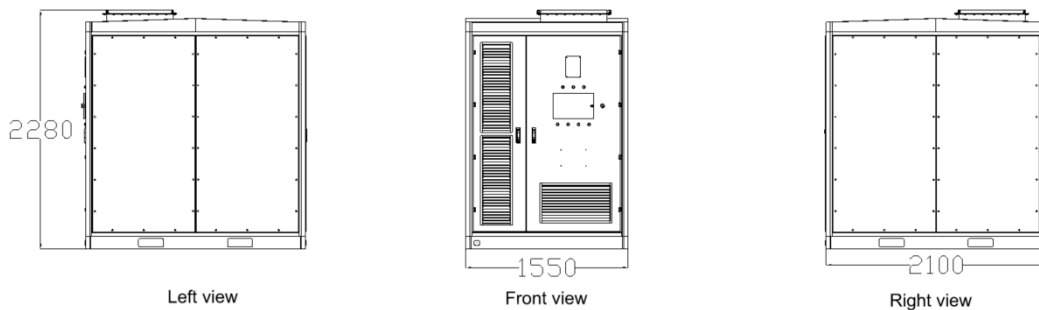


Figure 2-1 Dimensions of KuBank (IEC version)

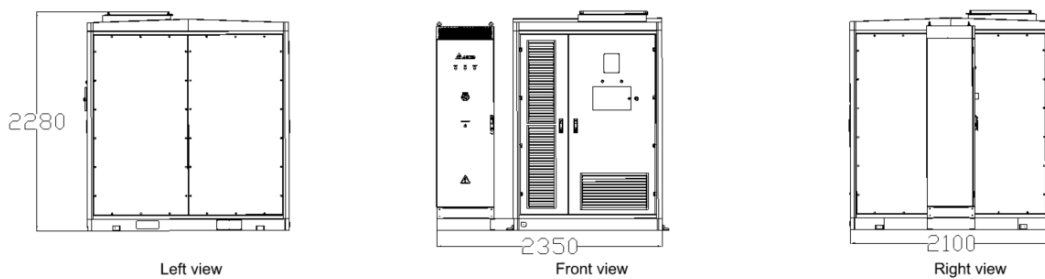


Figure 2-2 Dimensions of KuBank (UL version)

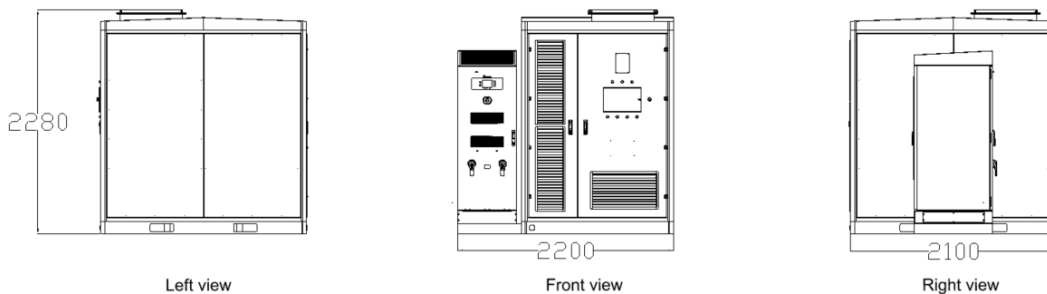


Figure 2-3 Dimensions of KuBank (JP version)

\*The figure is for reference only and actual product shall prevail

## 2.3 Internal System Design

### 2.3.1 Battery



Figure 2-4 Diagram of battery cell

Item	Data
Rated capacity	280Ah
Rated energy	896Wh
Rated voltage	3.2V
Voltage range	2.8V~3.6V

### 2.3.2 Battery Module

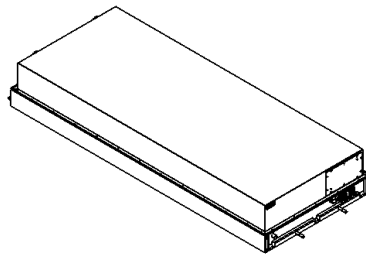


Figure 2-5 Diagram of battery module

Item	Data
Rated energy	61.824kWh
Rated voltage	220.8V
Voltage range	193.2V~248.4V

### 2.3.3 Battery String

Item	Data
Rated capacity	247.296kWh
Rated voltage	883.2V
DC Voltage range	772.8V~993.6V
Operating Temperature	-30°C to 55°C

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Max continuous Charging circuit	180A
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Charge/Discharge methods	CP
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### 2.3.4 PCS (IEC version)

#### 2.3.4.1 Structure Layout

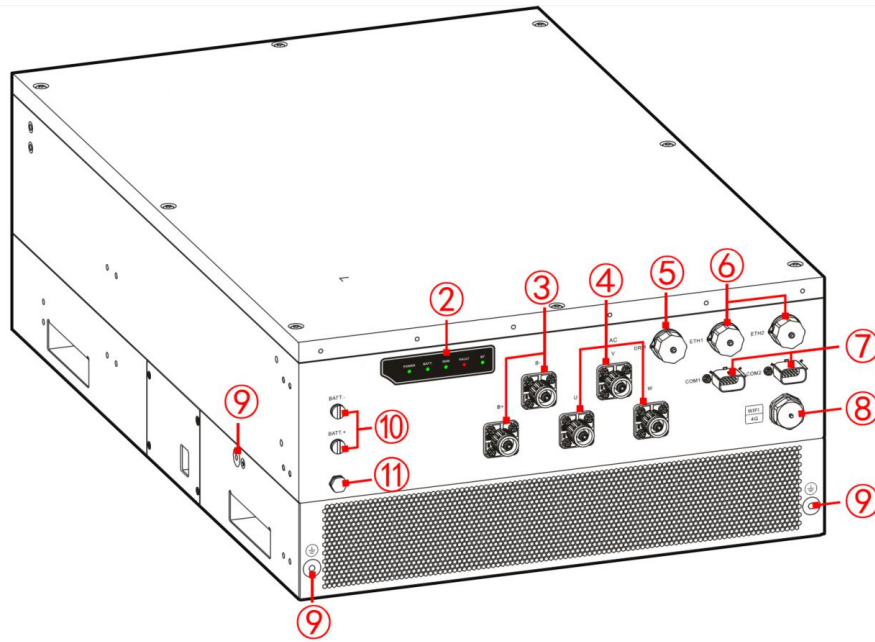



Figure 2-6 Structure layout diagram (IEC version)

Table 2-1 Component illustration

No.	Mark	Name	Illustration
2	-	Strip indicator	Indicate the work status of PCS
3	B+/B-	DC terminals	Wiring terminals of DC side.
4	AC U/V/W	AC terminals	Wiring terminals of AC side.
5	DRM	DRM port	Reserved port for DRM function.
6	ETH1/ETH2	Ethernet	Used to connect with upper computer. Ethernet is mainly used for LAN monitor and realize remote monitor.
	COM2 COM1		Communication port Used for BMS communication. Reserved port for communication.
8	WIFI/4G	Wireless communication port	Used for wireless communication.
9		Grounding terminal of wiring side	Used to connect the PCS with ground.
10	BAT.+/BAT.-	Waterproof plug	Reserved port for battery voltage sampling (optional).
11	-	Breather valve	Used to balance the pressure difference between inside and outside of the PCS

#### 2.3.4.2 Strip indicator panel

The strip indicator panel has five indicator lights (as shown in Figure2-7), which can indicate the current operating status of the PCS. The description of these five indicator lights is shown in Table2-2

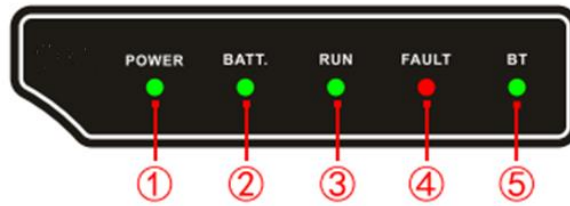


Figure2-7 Strip indicator panel

Table2-2 Indicator status illustration

No.	Mark	Color	Name	Status illustration
1	POWER	Green	Operation power indicator	On: the inner power of the PCS has been established.
				Off: the inner power of the PCS has not been established.
2	BATT.	Green	Battery connection indicator	On: the battery has been connected and meets the work condition.
				Off: the battery voltage does not meet the work condition.
3	RUN	Green	Running status indicator	Flicker: standby or OFF
				On: in grid-tied operating status.
				Off: AC and DC terminals not connected.
4	FAULT	Red	Fault alarm indicator	On: there is fault on PCS
				Flicker: there is alarm on PCS
				Off: there is no fault or alarm
5	BT	Green	Bluetooth indicator	On: the Bluetooth is normally connected
				Flicker: the Bluetooth is ready to connect
				Off: the power of Bluetooth is not established

### 2.3.5 PCS (UL version)

#### 2.3.5.1 Structure Layout

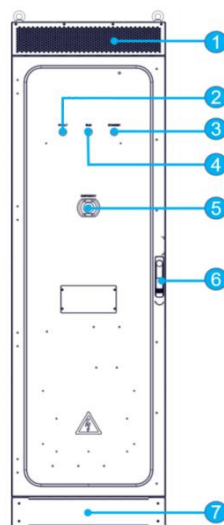


Figure 2-8 Front side structure layout diagram (UL version)

Table2-3 Component illustration

NO.	Description
1	Air exit (grill)
2	Fault indicator lamp
3	Run indicator lamp
4	Standby indicator lamp
5	Emergency stop cover
6	Enclosure door latch, lockable (handle and key hole)
7	Front side base cover <ul style="list-style-type: none"> <li>● Provide access for forklift</li> <li>● Provide access for front side cable routing</li> </ul>

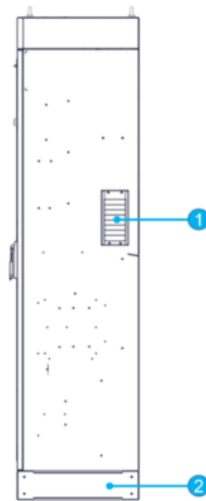


Figure 2-9 Left and right side structure layout diagram (UL version)

Table2-4 Component illustration

NO.	Description
1	Side air inlet filter
2	Side base cover <ul style="list-style-type: none"> <li>● Provide access for forklift</li> <li>● Provide access for front side cable routing</li> </ul>

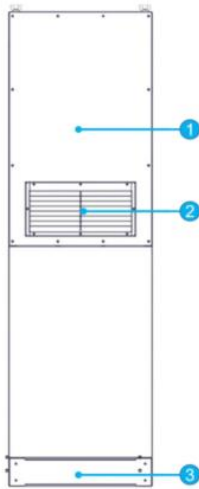


Figure 2-10 Rear side structure layout diagram (UL version)

Table2-5 Component illustration

NO.	Description
1	Rear panel
2	Rear air inlet filter
3	Rear base cover <ul style="list-style-type: none"> <li>● Provide access for forklift</li> <li>● Provide access for front side cable routing</li> </ul>

### 2.3.6 PCS (JP version version)

#### 2.3.6.1 Structure Layout

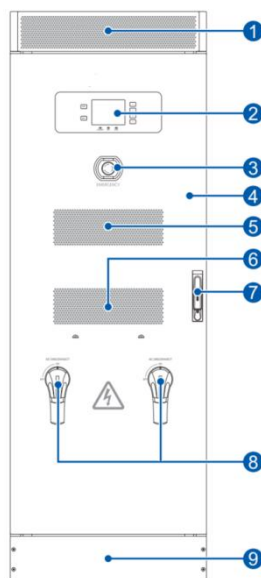


Figure 2-11 Front side structure layout diagram (JP version)



Table2-6 Component illustration

NO.	Description
1	Air exit (grill)
2	Display panel (keypad and display)
3	DC disconnect, emergency stop button
4	Front access door
5	Air outtake (filters)
6	Air intake (filters)
7	Enclosure door latch, lockable (handle and key hole)
8	AC and DC disconnect switches
9	Front side base cover <ul style="list-style-type: none"> <li>● Provide access for forklift</li> <li>● Provide access for front side cable routing</li> </ul>

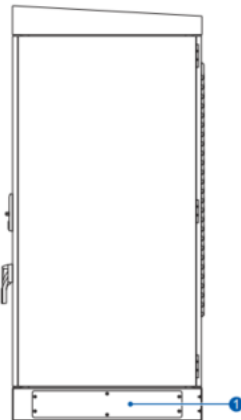


Figure 2-12 Left and right side structure layout diagram (JP version)

Table2-7 Component illustration

NO.	Description
1	Side base cover <ul style="list-style-type: none"> <li>● Provide access for forklift</li> <li>● Provide access for front side cable routing</li> </ul>



Figure 2-13 Display panel (JP version)

Table2-8 Component illustration

NO.	Description
1	On button (Disabled)
2	OFF button (Disabled)
3	Standby mode
4	Run mode
5	Fault mode
6	Function mode

### 2.3.7 Cooling system

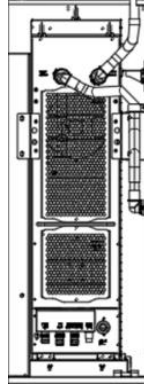


Figure 2-14 Cooling system

Item	Data
Coolant medium	50%EG
Working pressure	0.3bar ~ 3bar
Weight	≤75kg
Power range	0 ~ 4.5kW
Compressor rated power	3kW

## 3 Transport and Storage

### 3.1 Precautions

Batteries must be loaded and unloaded in accordance with local laws, regulations, and industry standards. Rough loading and unloading may cause short circuits or damage to the battery pack, which may result in electrolyte leakage, rupture, explosion, or fire. Failure to transport and store according to the requirements of this manual may result in the expiration of the warranty.

### 3.2 Transport Methods

Can be transported by road and sea.

### 3.3 Requirements for Transportation

#### Notice

This product has been certified by UN38.3 (UN38.3: Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria) and SN/T 0370.2-2009 "Packaging Inspection Regulations for Export Dangerous Goods Part 2 Performance Inspection" and belongs to Class 9 dangerous goods.

### **Shipping conditions**

- If the battery pack collides, falls, smokes, or catches fire before shipment, please follow the emergency response plan for corresponding operations. Otherwise, shipment is prohibited.
- Before shipment, the energy storage system must be inspected. The box should be intact and undamaged, the cabinet door should be closed and locked, and there should be no foreign objects protruding from the box, no smoke or burning smell. Otherwise, shipment is prohibited.

### **Explain**

During loading, unloading, and transportation, attention should be paid to handling with care and taking moisture-proof measures. The specifications of products affected by external factors such as temperature, transportation, storage, etc. are based on the date of manufacture.

### **Transportation Requirements**

- The energy storage system or battery is not suitable for railway or air transportation.
- Ocean transportation must comply with the IMDG CODE and the International Maritime Dangerous Goods Code (IMDG Code).
- Land transportation must comply with ADR or JTT617 transportation requirements.
- The transportation must meet the regulatory requirements of the transportation regulatory authorities of the country of origin, transit countries, and destination countries.
- The transportation must comply with international dangerous goods transportation rules and the regulatory requirements of the corresponding country's transportation regulatory authorities.
- Full monitoring of the transportation process is required.
- Land transportation vehicles must meet the following requirements: the weight of individual energy storage systems is approximately 3.5 tons.
- Land transportation speed limits: flat roads have a speed limit of 80 km/h, and rugged roads have a speed limit of 60 km/h. In case of conflict, local traffic regulations shall prevail.
- Stacking is prohibited during port and ship transportation.

### **During transportation, the following actions should be prohibited**

- Falling into water.
- Dropping or mechanical impact.
- Inverting or tipping over.

### **Explain**

If any of the above situations occur, please follow the emergency response plan.

## **3.4 Storage Requirements**

- In order to prevent condensation from forming inside the energy storage system or the system being immersed in water during rainy seasons, the energy storage system should be stored in a place with higher ground elevation.
- The base of the cabinet must be raised, and the specific height of the raise should be reasonably determined based on site geology, meteorological conditions, etc. Additionally, when the ambient temperature is too low, heating measures should be provided for the internal equipment of the energy storage system.
- The energy storage system should be stored on a dry, flat, solid surface with sufficient load-bearing capacity and no vegetation coverage. The storage surface must be level, without accumulated water, irregularities, or undulations, and the flatness should be no greater than 5mm.

- Before storage, the cabinet door and all internal equipment doors of the energy storage system should be securely locked.
- Storage temperature range:  $-30^{\circ}\text{C}\sim+60^{\circ}\text{C}$ , recommended storage temperature:  $-30^{\circ}\text{C}\sim+25^{\circ}\text{C}$ .
- Due to capacity degradation that occurs during long-term battery storage, it is not recommended to store batteries for extended periods. Even when batteries are stored at the recommended optimal storage temperature, irreversible capacity degradation can occur due to calendar aging, and the longer the storage duration, the greater the irreversible degradation.
- Storage relative humidity: 0~95%, no condensation.
- Effective protection should be provided for the inlet and outlet vents of the energy storage system, and effective measures should be taken to prevent water, dust, and other foreign objects from entering the cabinet.
- Regular inspection. At least once every half month, inspect whether the cabinet and all internal equipment are intact and undamaged.
- Prior to installation of long-term stored (more than half a year) energy storage systems, the cabinet door should be opened for visual inspection to ensure there is no condensation on the exterior of the cabinet. Verify that the cabinet and internal equipment are intact and undamaged. Additionally, a power-on and start-up inspection is required. If necessary, professional testing should be conducted before installation.
- The Pack should be stored in a clean and dry place, protected from direct sunlight and rain exposure. The storage location should be free of harmful gases, flammable, explosive products, and corrosive chemicals to avoid mechanical shocks, heavy pressure, and strong magnetic fields. Avoid direct sunlight exposure.
- Be mindful of the surrounding harsh environments such as sudden changes in temperature or impact damage to prevent damage to the Pack.
- Regular inspection to check if the packaging is intact and free from damage such as infestation by pests or rodents. If any damage is found, it should be immediately replaced.
- The packaging box cannot be tilted or inverted. Starting from the date of delivery, energy storage systems stored for more than 6 months under the above conditions require a charge-discharge cycle to bring the system's SOC (State of Charge) to 30%~40%. After charging, the SOC must remain consistent.

## 4 Mechanical Installation

### Warning:

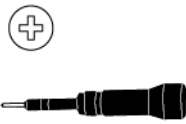

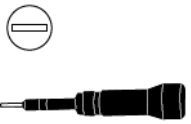
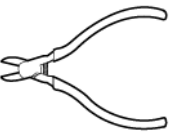
In the whole process of mechanical installation, it is necessary to strictly comply with the relevant standards and requirements of the project site.

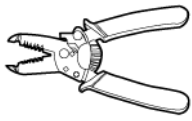



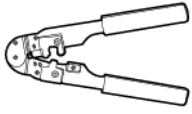
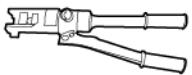

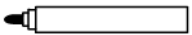
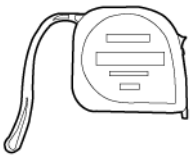


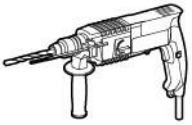

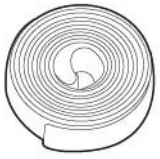






### 4.1 Preparation before installation

#### Description:









- The graphic tool is for reference only, please refer to the actual product.
- Due to the varying conditions on site, this tool list does not fully list the few tools that may be used. Please prepare the unlisted tools according to the actual situation for the on-site installation personnel and users.

#### Installation tools:

 <p>Cross insulated torque screwdriver</p>	 <p>Insulating torque socket wrench (including extension rod)</p>	 <p>One-stroke insulating torque knife</p>	 <p>Beveling pliers</p>
---	--	---	--

			
Wire stripping pliers	Wire cutter	Rubber hammer	Art knife
			
Crystal head wire crimping pliers	Hydraulic tongs	Multimeter DC voltage range $\geq$ 1500V DC	Marker pen
			
Steel tape measure	Level ruler	Vacuum cleaner	Percussion drill
			
Percussion bit $\Phi$ 16mm	Heat shrinkable sleeve	HOT AIR GUN	Cable tie
			
Insulated ladder	Crane	Lifting rope hand ring Rope Length $\geq$ 1845m m $\times$ 4	Forklift

## Personal protective tools:

 Insulating gloves	 Protective gloves	 Goggles	 Dust mask
 Insulating shoes	 Reflective Vest	 Safety helmet	 Safety belt

## 4.2 Inspection Before Installation

### 4.2.1 Deliverables Inspection

Check whether deliverables are complete against the attached packing list.

### 4.2.2 Product Inspection

- Check if the actual cabinet received matches the ordered model.
- Check the product and internal equipment to ensure there is no damage. If any problems or doubts are found, please contact the carrier or our company in a timely manner.

### Warning:

Only complete and undamaged equipment can be installed!

Before installation, please ensure that:

- The cabinet itself is intact and without any damage.
- All equipment inside the cabinet is intact and undamaged.

## 4.3 Installation Environment Requirements

### 4.3.1 Site Requirement

The climate environment and geological conditions, such as stress wave emission and underground water level, should be fully considered when selecting the installation site.

The environment around the installation site should be dry and well ventilated.

There should be no trees around the installation site to prevent branches or leaves blown off by heavy winds from blocking the door or air inlet of the energy storage system.

The installation site should be away from areas where toxic and harmful gases are concentrated, and free from inflammable, explosive and corrosive materials.

The installation site should be far away from residential areas to avoid noises.



### 4.3.2 Foundation Requirements

#### **Warning:**

This product is very heavy as a whole. Before the foundation construction, a detailed inspection of the installation site (mainly referring to geological and environmental climate conditions, etc.) should be conducted to confirm that all requirements are met before the design and construction of the foundation can proceed.

Unreasonable foundation construction plans can bring significant difficulties or troubles to equipment placement, door opening and closing, and later operation. Therefore, the installation of foundations must be designed and constructed according to certain standards in advance to meet the requirements of mechanical support, cable routing, and later maintenance and repair.

At least the following requirements should be met when constructing the foundation:

- The bottom of the foundation pit for construction must be compacted and filled.
- The foundation shall be made according to the foundation drawing provided by Atlas or confirmed by our company, with a surface tolerance requirement of  $\pm 5\text{mm}$  on the foundation.
- The foundation should be sufficient to provide effective load-bearing support for the equipment.
- Raise the cabinet to prevent rainwater from eroding the base and interior of the cabinet. It is recommended that the foundation be raised about 300mm above the horizontal ground level of the installation site.
- Corresponding drainage measures should be constructed based on local geological conditions.
- Build a cement foundation with sufficient cross-sectional area and height. The height of the foundation is determined by the construction party based on the site geology.
- When constructing the foundation, cable routing should be considered.

The dregs excavated during foundation construction should be removed immediately to avoid latter impact on lifting.

#### **Notice:**

- Built a maintenance platform around the foundation to facilitate later maintenance.
- During the foundation construction, reserve enough space for the AC/DC side cable trench according to the position and size of the cable inlet and outlet holes and pre-embed the cable conduit.
- Determine the specifications and quantity of the perforating gun according to the model and quantity of the cables.
- A drainage system is necessary to prevent the bottom or internal equipment from being soaked in water during the rainy season or during heavy rainfall.
- Both ends of all embedded pipes should be temporarily sealed to prevent impurities from entering and causing troubles to later wiring.
- After all cables are connected, cable inlet and outlet and connector should be sealed with fireproof mud or other suitable materials to prevent rodent access.

Pre-embed the grounding unit according to the relevant standards of the country/region where the project is located.

### 4.3.3 Installation Spacing Requirement

To ensure that the equipment can be better dissipated and maintained, reserve enough space around the installation site. The following figure shows the required minimum spacing.

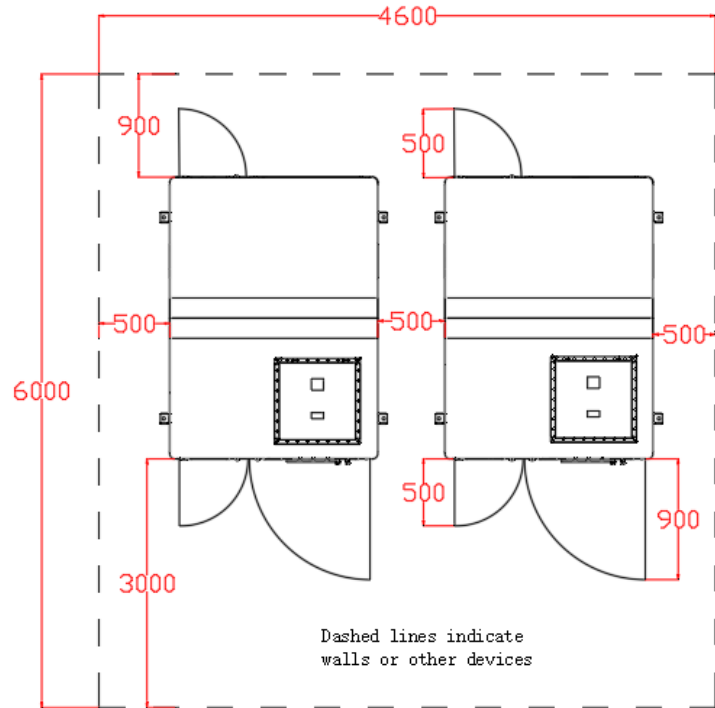


Figure 4-1 Recommended installation space for IEC version

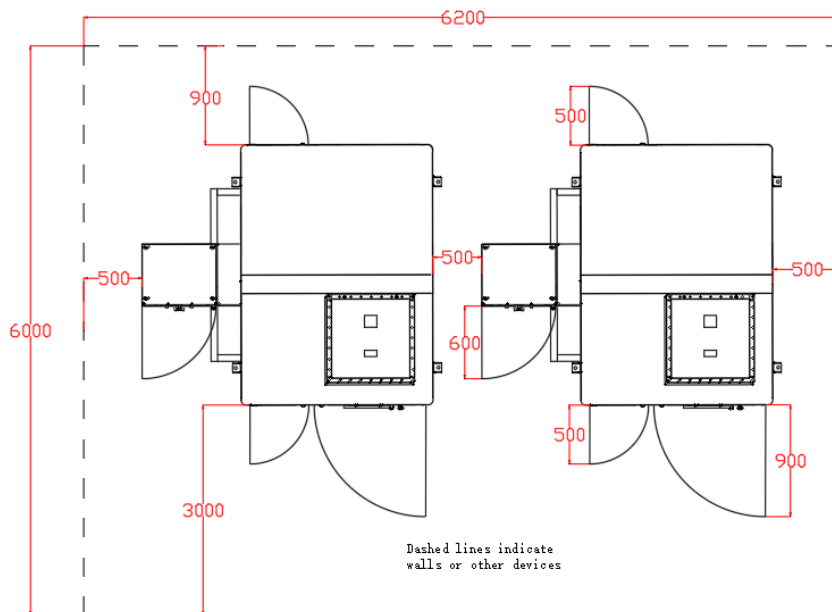


Figure 4-2 Recommended installation space for UL version

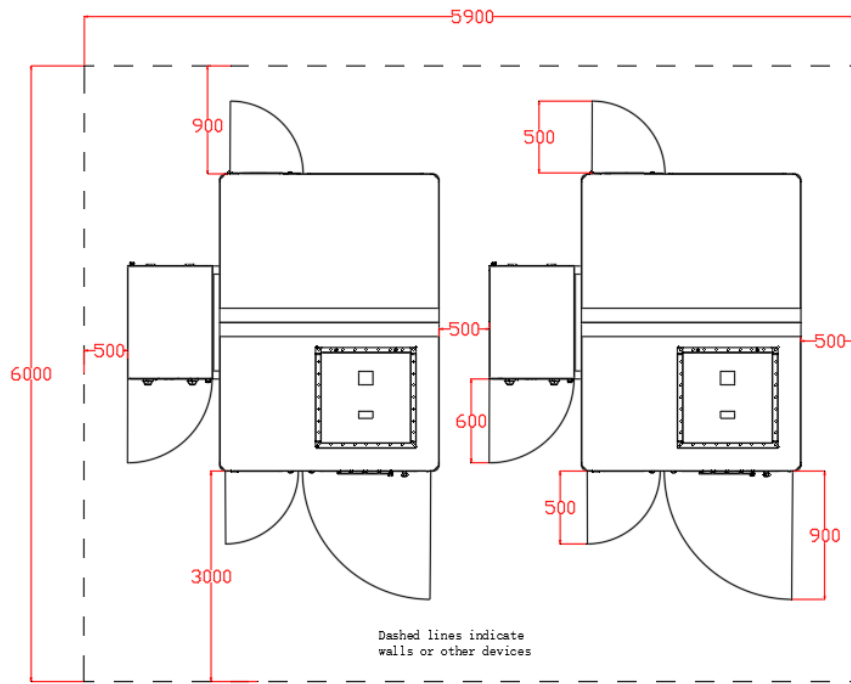


Figure 4-3 Recommended installation space for JP version

## 4.4 Installation Foundation Requirements

Install the foundation according to the diagram below:

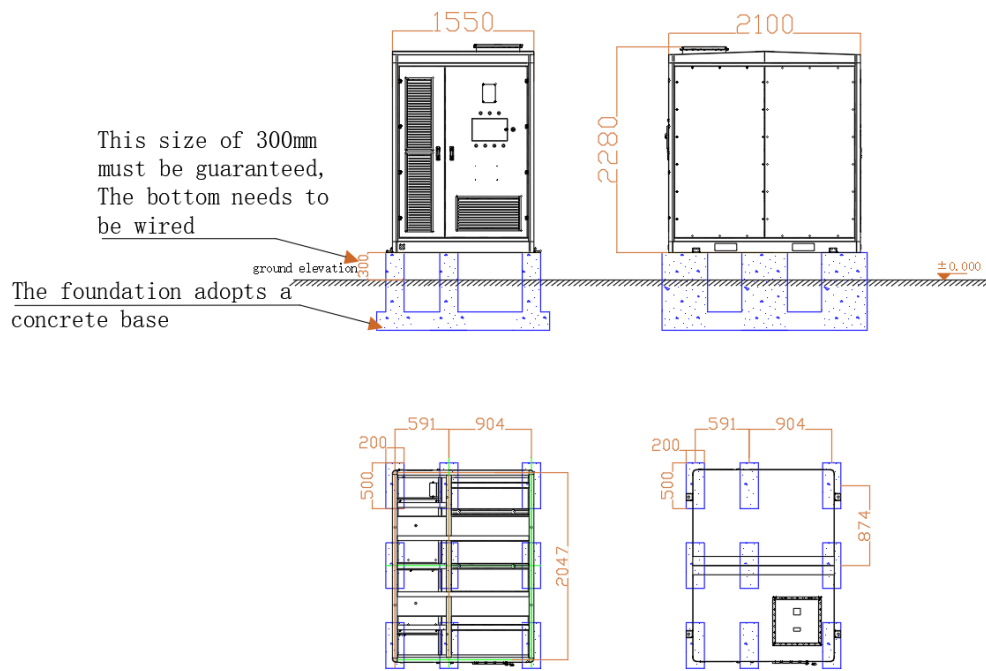


Figure 4-4 Installation foundation diagram for IEC version

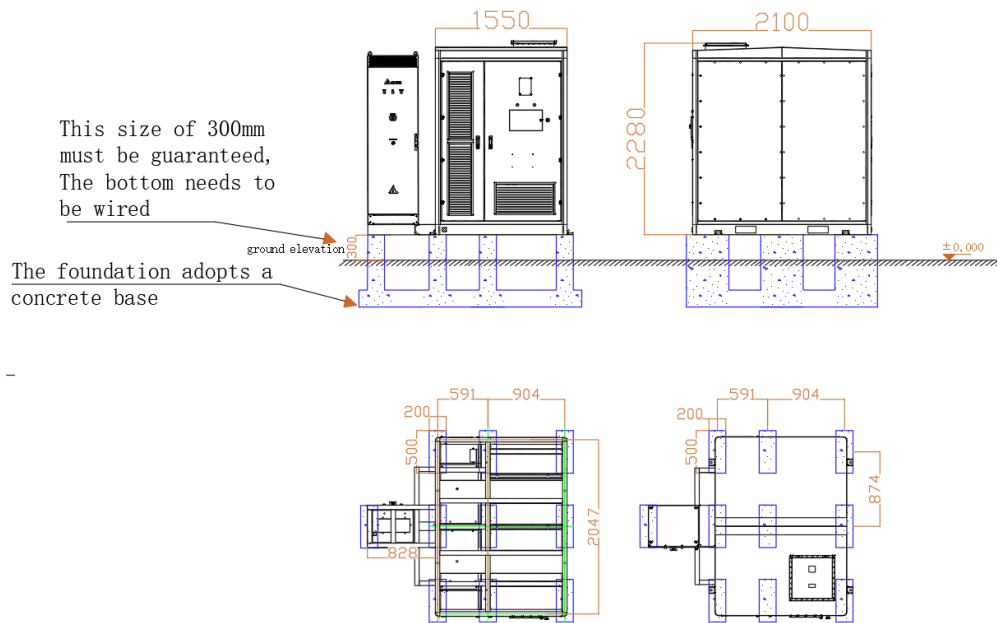


Figure 4-5 Installation foundation diagram for UL version

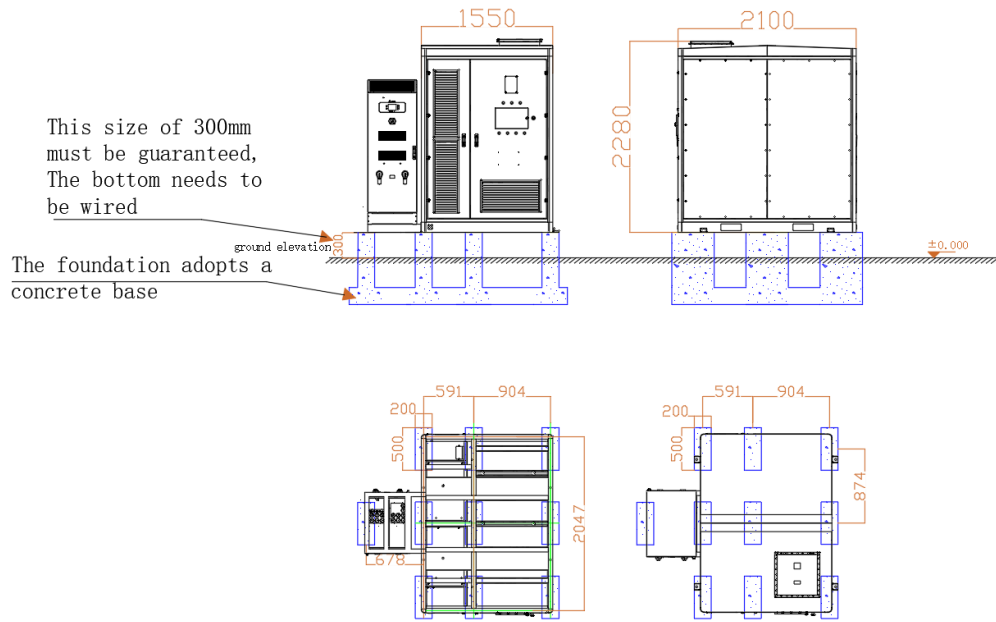


Figure 4-6 Installation foundation diagram for JP version

## 4.5 Forklift Transport

If the installation site is flat, you can use a forklift to move the products. The bottom of the product is equipped with base openings specially used for forklift transportation. Move the products through the side base openings.

If a forklift is used, the following requirements should be met:

The forklift should be equipped with sufficient load capacity.

The length of the forklift feet should meet the requirements of the device.

The forklift feet should be inserted into the fork pockets at the bottom of the workstation (for the location of the fork pockets, see the figure below). The depth of the forklift feet inserted into the pockets should be the depth of the pockets.

The transportation, moving and putting down of the products should be slow and stable.

It is recommended to try transportation.

- Only place the products in a stable place. The place should be well drained without any obstruction or bulging.

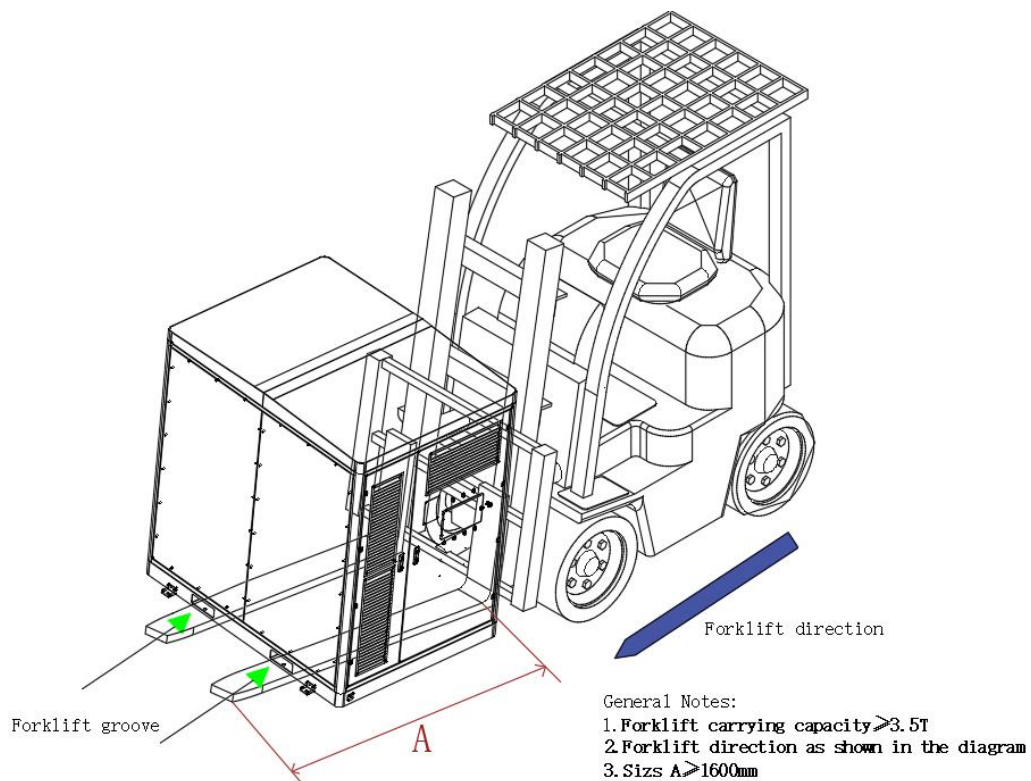


Figure 4-7 Forklift transportation for IEC version

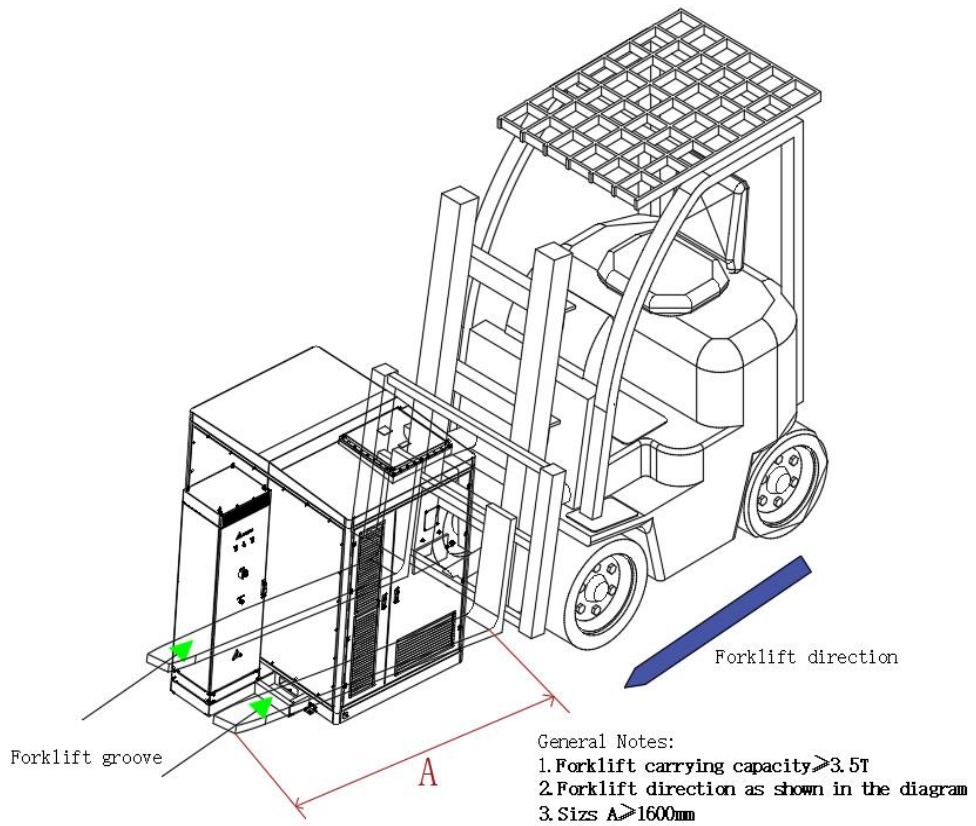


Figure 4-8 Forklift transportation for UL version

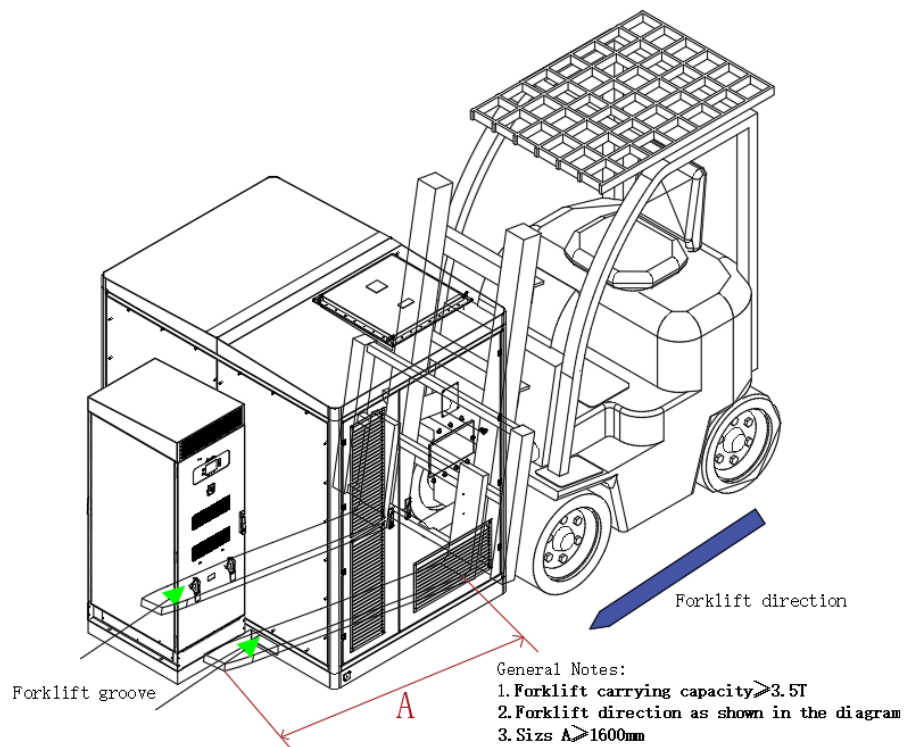


Figure 4-9 Forklift transportation for JP version

## 4.6 Anchoring Enclosure

Hoist the cabinets to the intended location and prepare to weld it. Secure the cabinets to the foundation by welding or with the L-shaped angle steels.

### Fixed by Welding

Secure the bottom of the cabinets to the foundation by welding. Take proper painting measures to prevent the welding point from corrosion.

### Fixed by L-shaped Angle Steels

Positions need to be fixed with L-shaped angle steels at the bottom of the cabinets are marked in the figure below.

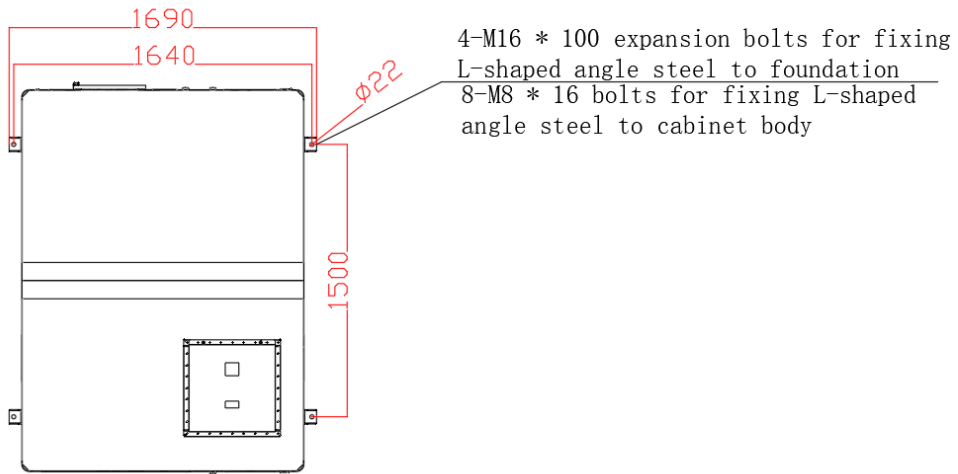


Figure 4-10 Cabinet anchoring lugs

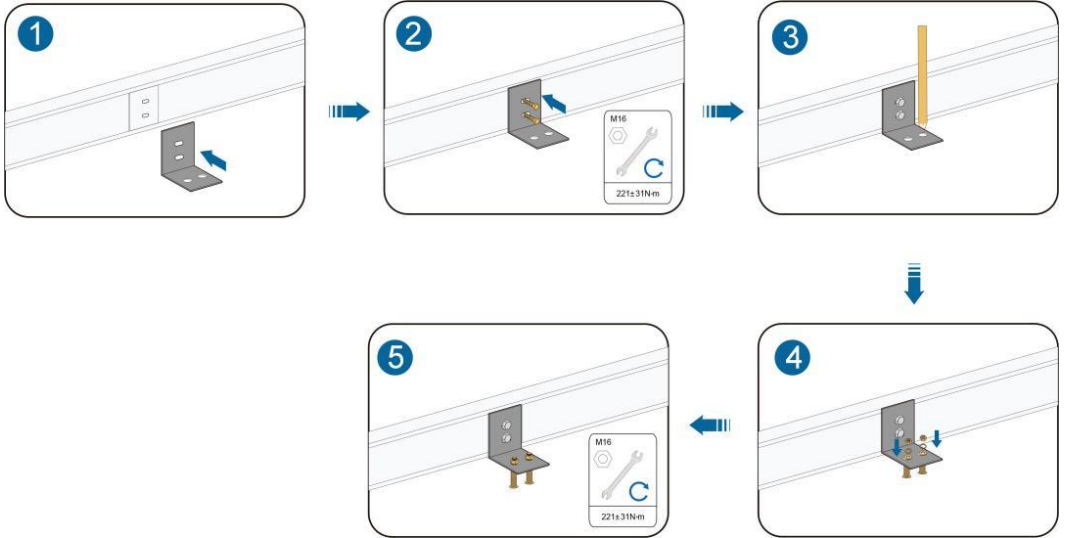
## Installation Tools Preparation

When installing L-shaped angle steel, the tools that may be used are as follows:

No.	Name	Parts source
1	Marker pen	Installer/User provided
2	Drill	Installer/User provided
3	M16 expansion bolt	In the scope of delivery
4	M8 bolt	In the scope of delivery
5	L-shaped angle steel	In the scope of delivery



# Anchoring Method



# 5 Electrical Connection

## 5.1 Preparation before wiring

### 5.1.1 Installation tools



Safety gloves



Safety shoes



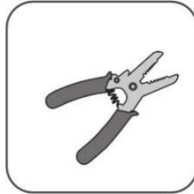
Protective clothing



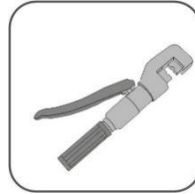
Goggles



Torque screwdriver



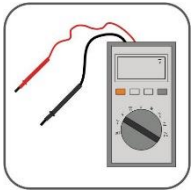
Wire stripper



Hydraulic pliers



Heat gun



Multimeter



Screwdriver



Torque wrench

### 5.1.2 Cables Prepare

The cables must meet the following requirements:

The current carrying capacity of the cable meets requirements. Factors affecting the current carrying capacity of a conductor include but are not limited to:

Environmental conditions.

Type of the insulation material of the conductor.

Cabling method.

Material and cross-sectional area of the cable.

## 5.2 Auxiliary power and signal cables connection

### 5.2.1 Cable inlet of the auxiliary power and signal

The auxiliary power and signal cables for the energy storage cabinet can enter the energy storage cabinet through the cable entrance at the bottom or the cable entrance on the side.

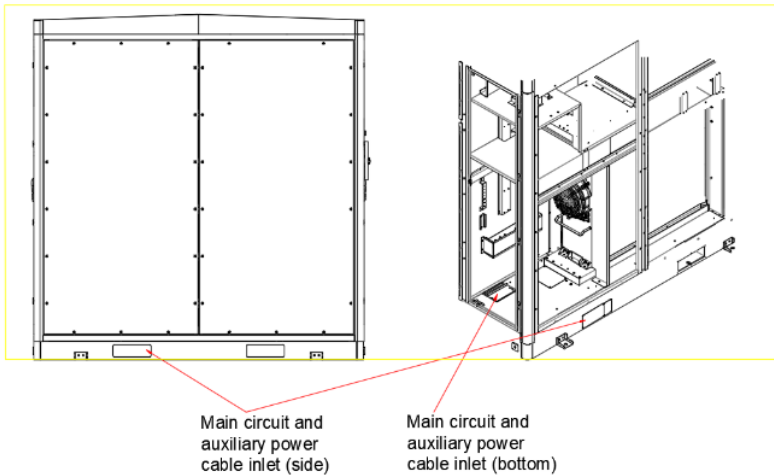


Figure 5-1 Cable inlet of the auxiliary power and signal

### 5.2.2 Connection area diagram

The following figure shows the cable connection area for connecting the energy storage cabinet to external devices:

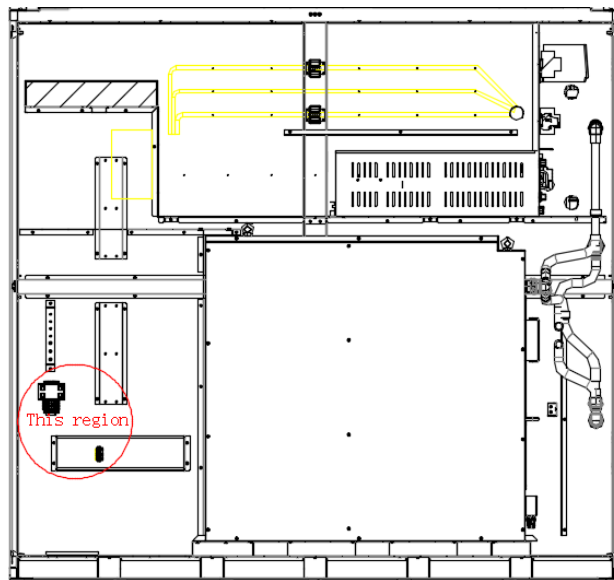


Figure 5-2 Wiring area diagram

### 5.2.3 Cable connection terminals and cable specifications

Cable connection terminals for connecting the energy storage system to external devices include: Auxiliary power terminal, Communication and dry contact terminal.

The terminal list is presented as follows:

Terminal list				
Serial	Terminal Name	Code	Specification	Quantity
1	Auxiliary power terminal(L/N)	XD1:1~2	800V,41A	2
2	Auxiliary power input	XD1:3	/	1

	terminal(PE)			
3	E-stop input signal terminal	X11:1,X11:2	800V,24A	2
4	Reserve dry contact	X11:3,X11:4	800V,24A	2
5	Reserve CAN contact	X11:5,X11:6	800V,24A	2
6	Reserve RS485 contact	X11:7,X11:8	800V,24A	2

Table 5-1 Description of Energy Storage Cabinet terminals (IEC VERSION)

Auxiliary power terminal,



Figure 5-3 Auxiliary power terminal (L/N) (XD1)

Straight-through terminal, nominal working voltage: 1000 V, rated current: 32 A, connection quantity: 2, connection mode: straight-plug connection, rated connection capacity: 4 mm<sup>2</sup>, cross section: 0.2 mm<sup>2</sup>-6 mm<sup>2</sup>, installation mode: NS 35/7,5, NS 35/15, Color: gray

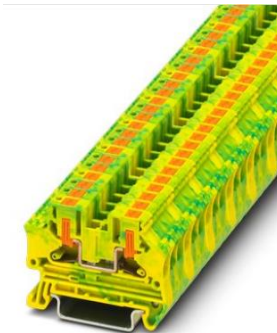


Figure 5-4 Auxiliary power terminal (PE)

Ground terminal, connection quantity: 2, connection mode: in-line connection, first layer, rated connection capacity: 4 mm<sup>2</sup>, cross section: 0.2 mm<sup>2</sup>-6 mm<sup>2</sup>, installation mode: NS 35/7,5, NS 35/15, color: yellow and green.

Auxiliary power cables specification and installation instructions as follow:

Auxiliary power cables connection

1. Ac cables: Prepare three 450V 4mm<sup>2</sup> AC cables. Connect the AC cable to the corresponding terminal and use a hot sleeve to prevent exposure the naked part.
2. Connect the AC cable to the AC terminal: There are three identifiers indicating

the phase terminal of the AC cable : L1 is the L1 phase, N is the zero phase, and PE is grounded. Fix the AC cable to the L1, N, and PE terminals.

Dry contact input terminal specification as follow:

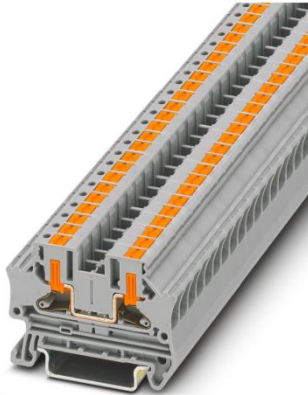


Figure 5-5 (X11:1~X11:8) Terminal diagram

Straight-through terminal, nominal working voltage: 800 V, rated current: 24 A, connection quantity: 2, number: 1, connection mode: straight-plug connection, rated connection capacity: 2.5 mm<sup>2</sup>, cross section: 0.14 mm<sup>2</sup>-4 mm<sup>2</sup>, installation mode: NS 35/7,5, NS 35/15, Color: gray.

### 5.3 AC wiring connection

#### 5.3.1 Cable inlet of the AC wiring (IEC version)

The AC wiring for the energy storage cabinet can enter the energy storage cabinet through the cable entrance at the bottom or the cable entrance on the side.

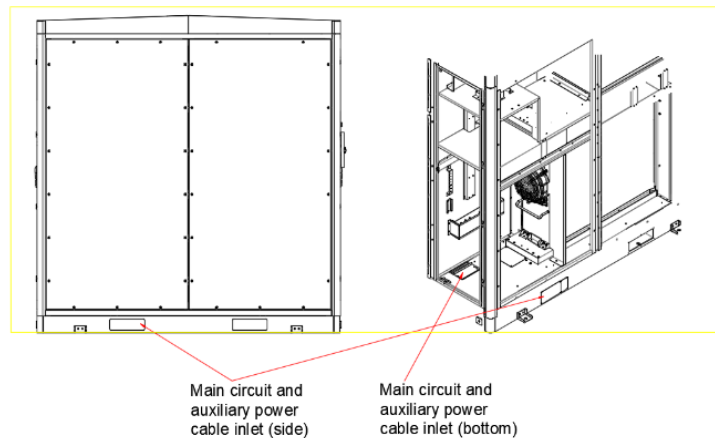


Figure 5-6 Cable inlet of the AC wiring (IEC version)

#### 5.3.2 Connection area diagram(IEC version)

The following figure shows the AC cable connection area for connecting the energy storage cabinet to external devices:

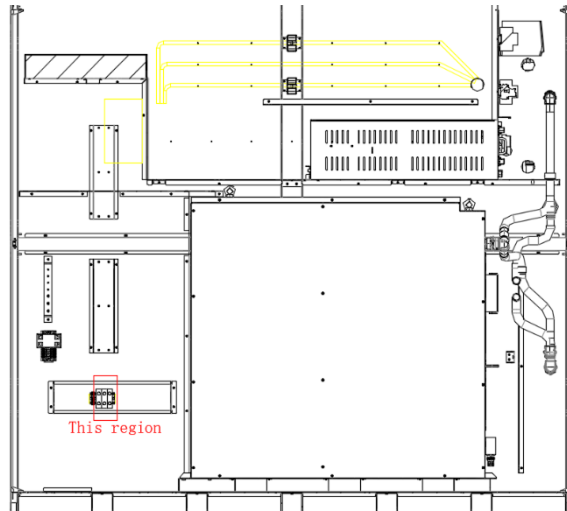


Figure 5-7 Wiring area diagram(IEC version)

### 5.3.3 Terminal Description (IEC version)

AC wiring terminal specification as follow:



Figure 5-8 Main circuit terminal(L1/L2/L3) (XD0) terminal (IEC version)

High current terminal, nominal working voltage: 1000 V, rated current: 192 A, connection quantity: 2, number: 1, connection mode: screw connection, rated connection capacity: 70 mm<sup>2</sup>, cross section: 16 mm<sup>2</sup>-95 mm<sup>2</sup>, installation mode: NS 35/7,5, NS 35/15, NS 35/15-2,3, NS 32, Color: gray.

AC wiring cables specification and installation instructions as follows,

Main circuit cables connection

1. Ac cables: Prepare three 70mm<sup>2</sup> 600V cables for AC cables. PCS support three-phase/three-wire AC connection, L1, L2, L3 phase terminal. Connect the AC cable to the corresponding terminal and use a hot sleeve to prevent exposure the naked part.
2. When an AC cable is connected to an AC terminal, there are three identifiers indicating the phase of the AC cable terminal: L1 is L1 phase, L2 is L2 phase, and L3 is L3 phase. Fix the AC cable to the L1, L2, and L3 terminals.

### 5.3.4 Cable inlet of the AC wiring (UL version)

The AC wiring for the energy storage cabinet can enter the energy storage cabinet through the cable entrance at the bottom or the cable entrance on the side.

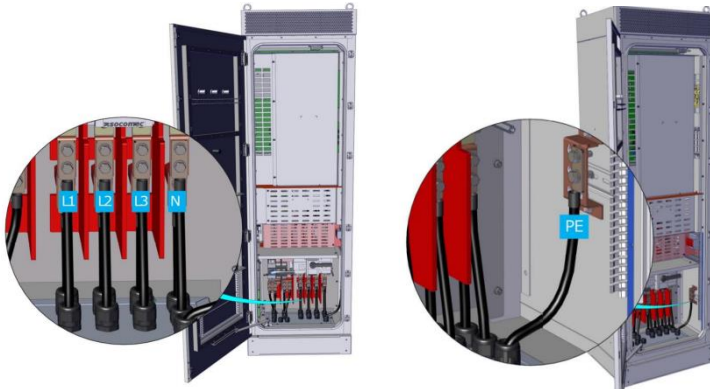


Figure 5-9 Cable inlet of the AC wiring (UL version)

### 5.3.5 Connection area diagram (UL version)

The following figure shows the AC cable connection area for connecting the battery cabinet to external devices:

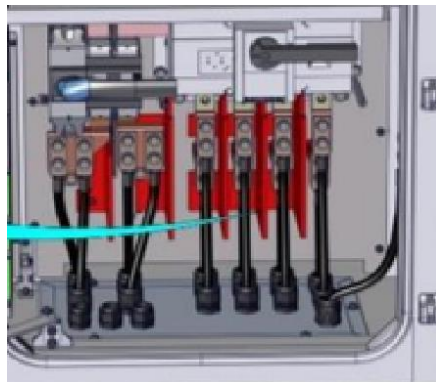


Figure 5-10 Wiring area diagram (UL version)

### 5.3.6 Terminal Description (UL version)

AC wiring terminal as follows,

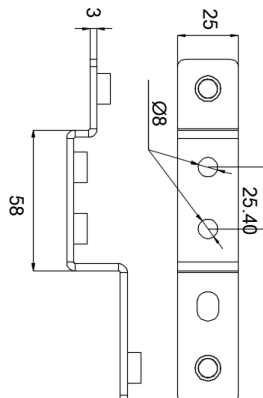


Figure 5-11 AC wiring terminal (L1/L2/L3)(XD0) (UL version)

AC wiring cables specification and installation instructions as follow:

#### AC wiring cables connection

1. Ac cables: Prepare eight 2AWG cables. Use two 2AWG cables for each phase. 600V cable for AC connection. PCS support Three-phase/four-wire AC connection, L1, L2, L3 phase and neutral terminals. Connect the AC cable to the two-hole connector and use a hot sleeve to prevent exposure the naked part.
2. When an AC cable is connected to an AC terminal, there are three identifiers indicating the phase of the AC cable terminal: L1 is the L1 phase, L2 is the L2 phase, L3 is the L3 phase, and N is the neutral phase. Fix the AC cable to terminals L1, L2, L3, and N. Fastening bolt (M8\*35).

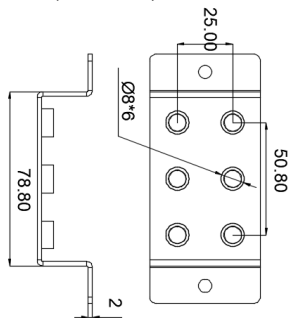


Figure 5-12 AC wiring terminal (PE) (UL version)

AC wiring (PE) specification and installation instructions as follow:

#### AC wiring (PE) cables connection

Prepare one 3 AWG (25 mm<sup>2</sup>) 600V cables for grounding protection.

Then use a socket or adjustable wrench to connect and secure the grounding cable lugs to the grounding copper plate at the inner sidewall of the cabinet adjacent to the AC terminals as shown below, fasten the bolts (M8\*20) with torque wrench.

### 5.3.7 Cable inlet of the AC wiring (JP version)

The AC wiring for the energy storage cabinet can enter the energy storage cabinet through the cable entrance at the bottom or the cable entrance on the side.

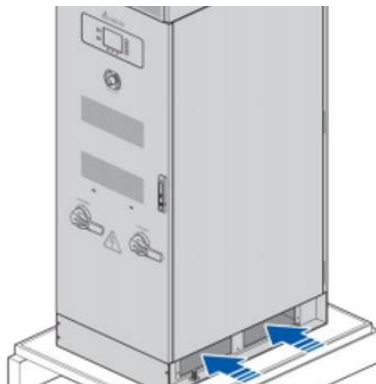


Figure 5-13 Cable inlet of the AC wiring (JP version)

### 5.3.8 Wiring area Diagram (JP version)

The following figure shows the AC cable connection area for connecting the energy storage cabinet to external devices:



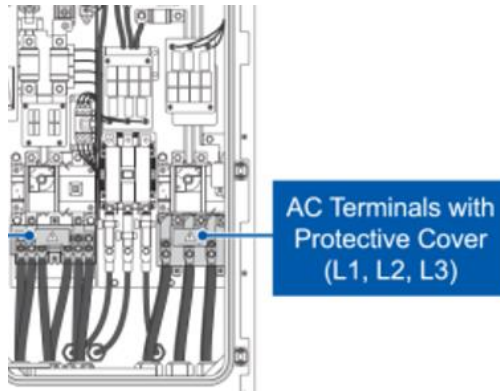


Figure 5-14 Wiring area diagram (JP version)

### 5.3.9 Terminal Description (JP version)

#### AC wiring:

Prepare AC cables: Prepare six 1/0 ~ 2 AWG size, 600V cables for AC wiring. The PCS supports 3-phase/3-wire connection type AC wiring with L1, L2 and L3 phase terminals, and each phase terminal requires two cables to connect. Attach the AC cables to the two-hole lugs in the accessory kit, and use thermal casing to prevent the exposure of the naked part.

Remove protective cover of AC terminals: Remove the protective cover in front of the AC terminals as the figure shown below. There are three labels indicating the phases of the terminals: “ L1” for L1 phase, “ L2” for L2 phase, and “ L3” for L3 phase. Each phase terminal provides back-to-back connection way for connecting two AC cables.

Connect AC cables to AC terminals: Loose the hex socket screws of the AC terminals by Allen wrench, then lead the AC cables with two-hole lugs through the AC cable glands into the PCS, connect and secure these cables to the relevant “ L1”, “L2” and “ L3” terminals.

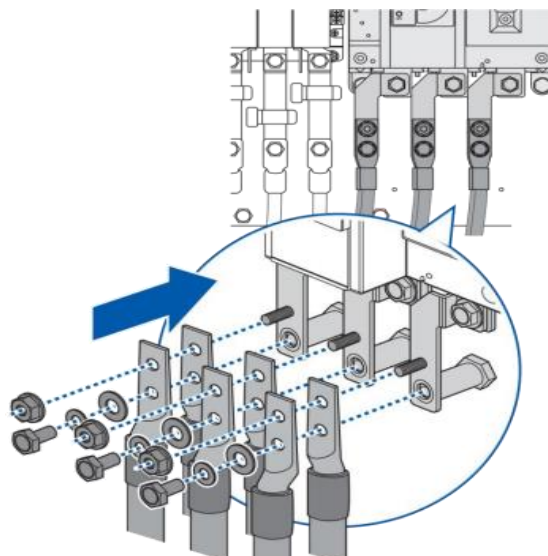


Figure 5-15 AC Cable Connection with L1, L2, L3 Terminal

## 5.4 DC connection

### **5.4.1 Safety precautions**

Before starting the wiring, the following items should be carefully checked:

1. Measure the open circuit voltage on the battery side to ensure that the open circuit voltage does not exceed the maximum DC voltage of the energy storage converter.
2. Identify the positive and negative terminals of the cable and mark them.
3. Check whether the battery side is grounded.
4. The battery side of the open circuit voltage should not exceed the maximum DC input voltage of the energy storage inverter, too high battery side open circuit voltage (OCV) may cause damage to the energy storage inverter.
5. When a ground fault is found on the battery side, the fault must be removed before connecting the DC input terminal of the energy storage inverter.
6. Strictly follow the wiring labels inside the device.
7. Please comply with all safety specifications listed by the on-site battery manufacturer.
8. Only after all the checks and measurements are completed and the relevant parameters meet the requirements, the DC side wiring can be started.

### **5.4.2 DC connection procedure**

Please strictly follow the safety instructions in this manual at all times. In order to avoid human casualties and property losses that may occur during installation or operation, and to effectively extend the service life of the product, please be sure to read the safety instructions carefully.

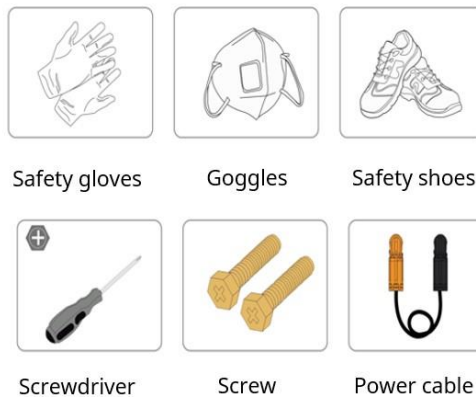
Improper use or mishandling may harm:

- Life and personal safety of the operator or third parties.
- Energy storage battery systems or other property belonging to the operator or third parties.
- The safety precautions in this manual cannot contain all the norms to be followed, it should be combined with the actual situation in the field.
- Arthas shall not be liable for any damage caused by non-compliance with the safety precautions in the manual.
- When installing equipment with hazardous voltages, be sure to follow the relevant codes and local installation safety guidelines.
- Please follow the regulations regarding the proper use of tools and personal protective equipment.
- All connections must be made under clear guidance, and any form of conjecture and vague attempts are strictly prohibited.
- Tools with an insulating protective layer must be used.
- The connection cable should meet the requirements of voltage and current.
- Each connection must be safe and reliable to ensure that there will be not loose, virtual contact problems. The joint must have the function of corrosion resistance,

wear resistance and earthquake resistance.

- All connections must meet the requirements of relevant national standards to prevent various forms of arc discharge.
- The connection between the internal battery must have a seismic anti-loosening device, and the connection of temperature, voltage and current sensors should also be safe and reliable to prevent loosening, aging and extrusion. It is strictly forbidden to have any metal exposure in each induction line.
- Any form of short circuit is strictly prohibited during the connection.
- Do not operate without wearing protective equipment.
- Connection key points: Ensure that the connection is correct, reliable (not loose), good contact, and no short circuit.
- After the connection is completed, it must be measured and confirmed point by point.
- All connection points must ensure that there is no contact with the outer box or other components, short circuit.

### 5.4.3 Tool preparation



### 5.4.4 Installation procedure

Step 1:

Before connecting power cables, wear insulation shoes and gloves. Before connecting the power cables between packs, verify that the high voltage box circuit breaker is in the off position.

Step 2:

Connect the series cables between packs successively:

1. Connect the BAT- of Pack4# to the BAT+ of Pack3#;
2. Connect the BAT- of Pack3# to the BAT+ of Pack2#;
3. Connect the BAT- of Pack2# to the BAT+ of Pack1#.

The positive end of the aviation plug needs to be inserted into the positive base, the negative plug needs to be inserted into the negative base, the positive color is

orange, the negative is black. The aircraft makes a "click" sound when the plug is firmly inserted.

Step 3:

Connect pack to BMS box cable:

1. Connect the BAT+ (total positive) of Pack4# to the B+ of the BMS box;
2. Connect the BAT- (total negative) of Pack1# to the B- of the BMS box.

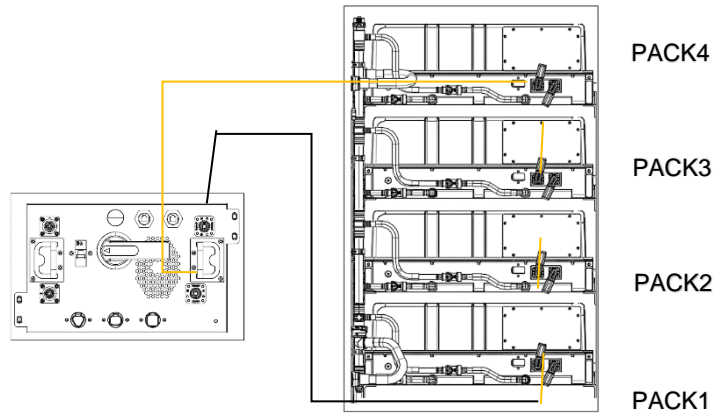


Figure 5-16 DC cable connection on the battery side

Step 4:

Connect BMS box to PCS cable:

1. Connect the P+ of the BMS box to the P+ of PCS;
2. Connect the P- of the BMS box to the P- of PCS.

## 6 Power up and Shutdown

### 6.1 Power up

#### Warning:

- The Turnkey Station can only be put into operation after confirmation by a professional and approved by the local power department.
- For Turnkey Stations with a long shutdown time, it must be checked thoroughly and carefully to ensure all indexes are acceptable before powering up.

The main switch position are as follows:

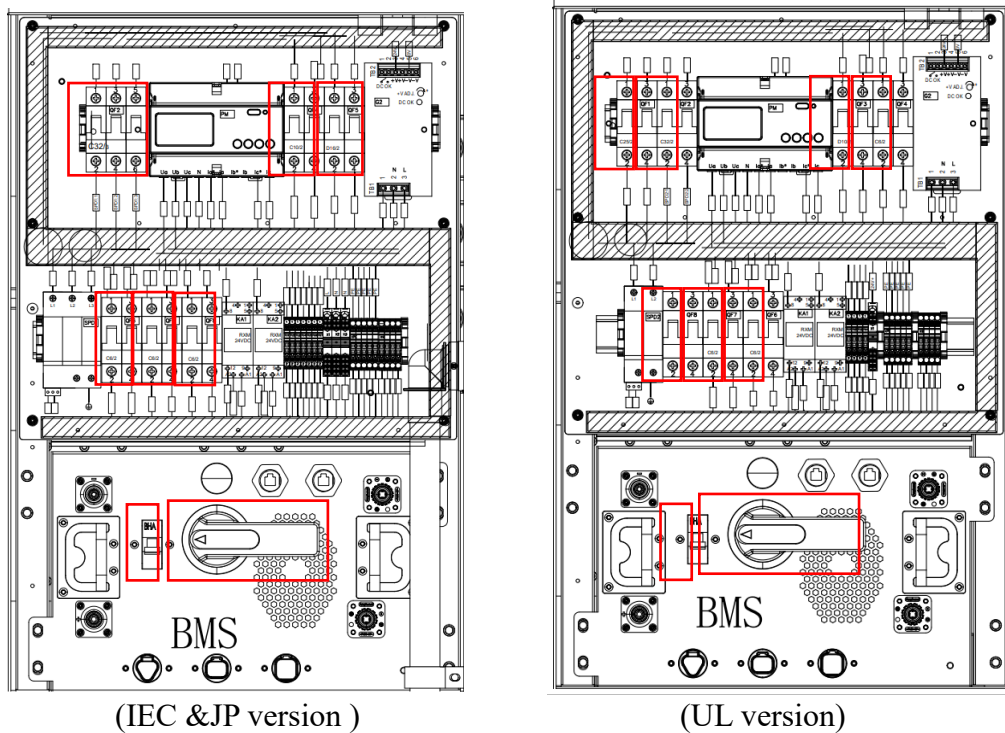


Figure 6-1 Main switch position

#### 6.1.1 Inspection Before Power up

Before power up the equipment, check the following items carefully.

- Check whether the wiring is correct.
- Check whether the emergency stop button is released.
- Check and ensure that there is no grounding fault.
- Check whether the AC and DC voltages meet startup conditions and ensure that there is no over-voltage when using a multimeter.
- Check and ensure that no tools or components are left inside the equipment.
- Check all air inlets and outlets for blockage.

#### 6.1.2 Power up Steps

Step 1 Press the UPS power button to light up the UPS screen. Press the UPS power button again for about 1.5 sec, and then the UPS will output 220V power;

Step 2 Power the distribution system

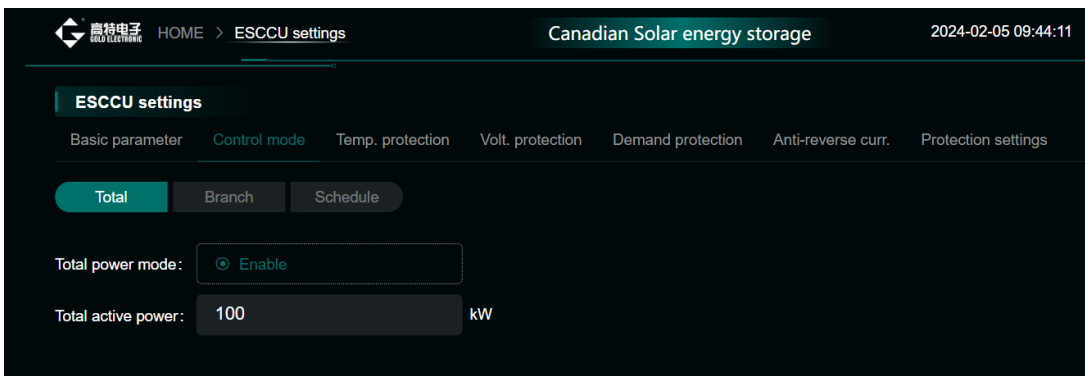
1. Close the auxiliary power supply main switch(UL version).
2. Close the SPD switch.
3. Close the AC power supply switch of UPS.
4. Close the power supply switch of liquid cooling chiller.
5. Close the power supply switch of BMS box .
6. Close the power supply switch of AC/DC module.
7. Close the Auxiliary distribution switch.

Step 3 Power on the AC side;

Step 4 Power on the DC side.

1. Turn the circuit breaker handle of BMS box to "ON".
2. Close the Power switch of BMS and then the indicator light of BMS BOX will light up and blink.
3. Wait until the BMS box is connected to the grid and the indicator light is on.
4. Wait until PCS precharge is complete.

Step 5 Control HMI of LEMS to deliver power.

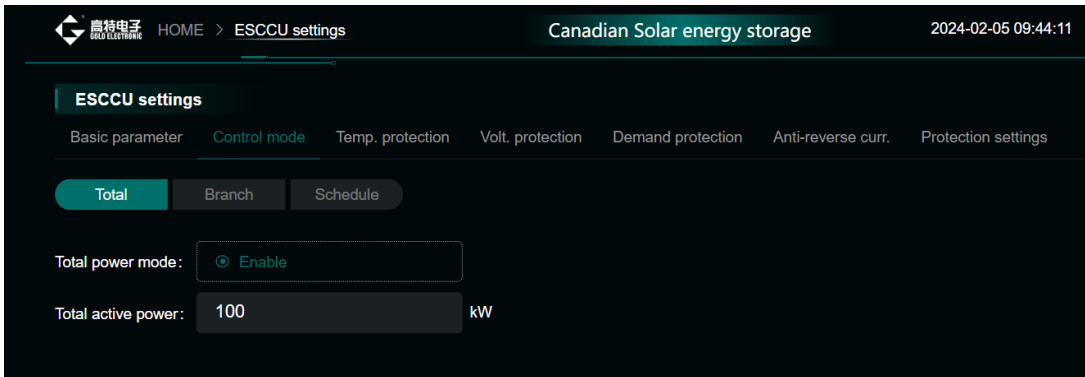


-- End.

## 6.2 Shutdown

### 6.2.1 Planned Shutdown

Step 1 Shutdown preparations: Control LEMS human-machine interface, deliver power 0 kw, and make PCS enter standby mode (The emergency stop button of the cabinet can be pressed to stop the machine in special circumstances).



Step 2 Disconnect the AC circuit breaker.

Step 3 Turn off the power switch of the BMS box so that the internal DC contactor will be disconnected.

Step 4 Turn the handle of BMS box to "OFF".

Step 5 Turn off the power distribution switches.

Step 6 Power off the UPS.

Step 7 Test the electricity after the system discharges completely.

--End

## 6.2.2 Emergency Shutdown

Contact the local fire department in case of an on-fire emergency.

# 7 Deployment commissioning

## Preconditions

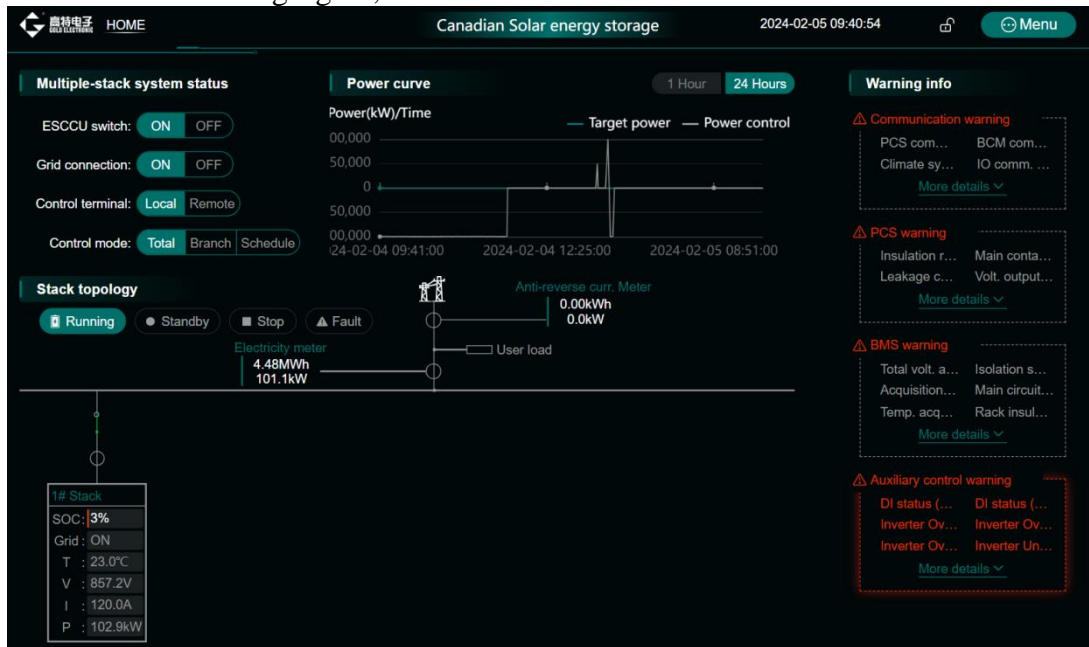
The system has been powered on.

The battery pack cell temperature is within the set temperature range (5°C~45°C) .

### 7.1 Confirmation of information

Operation procedure:

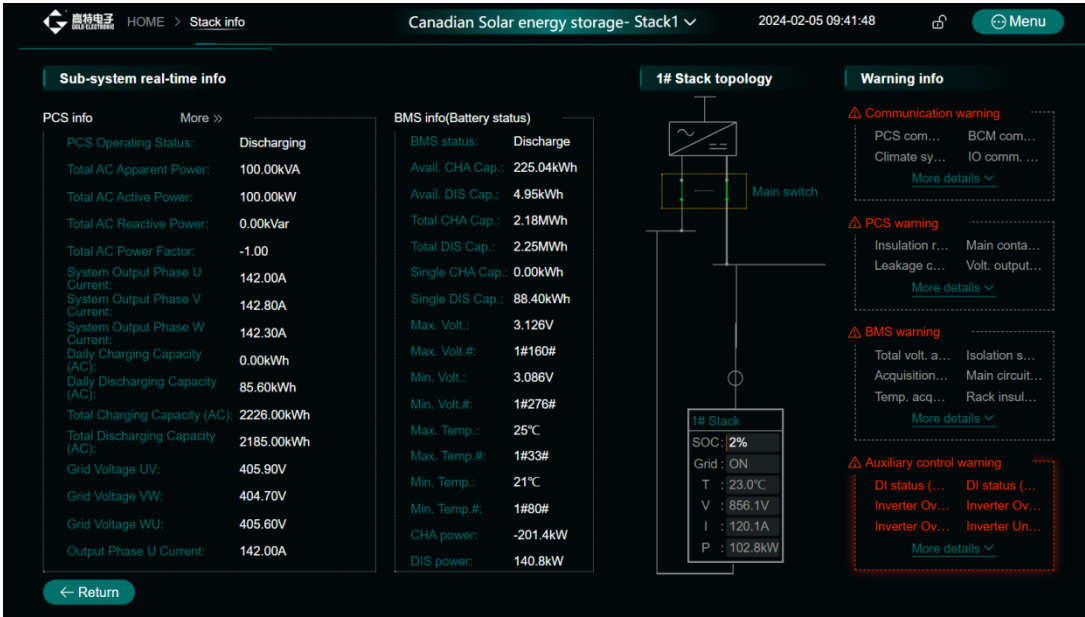
Step 1 Make sure the LEMS interface is lit and displayed, and the homepage is shown in the following figure,



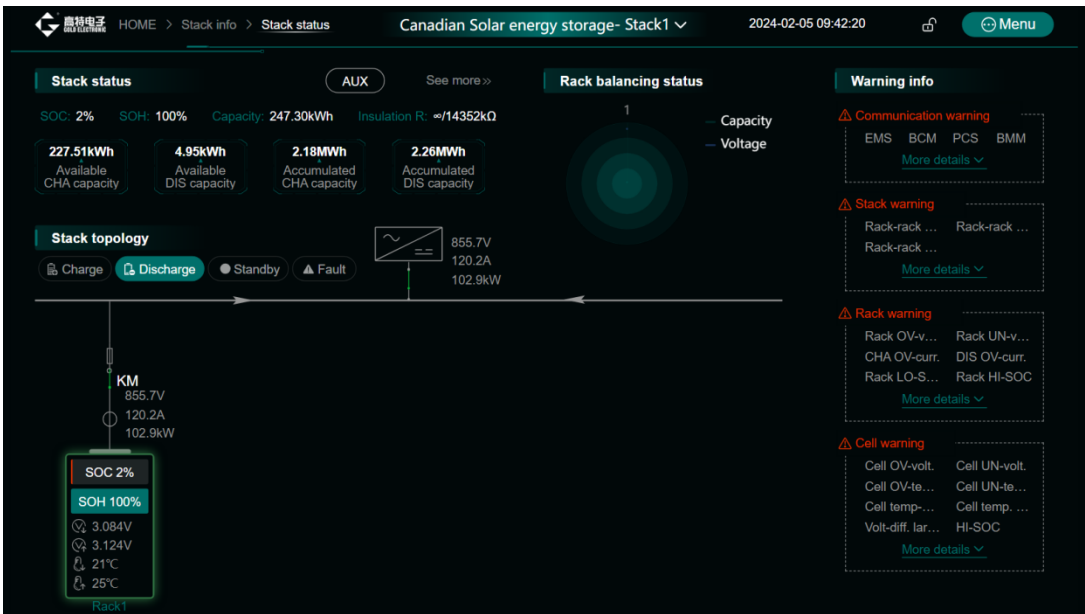
Step 2 Verify that the data on the homepage is consistent with the actual data.

Step 3 Go to the system information screen and check whether the PCS and BMS information is correct.

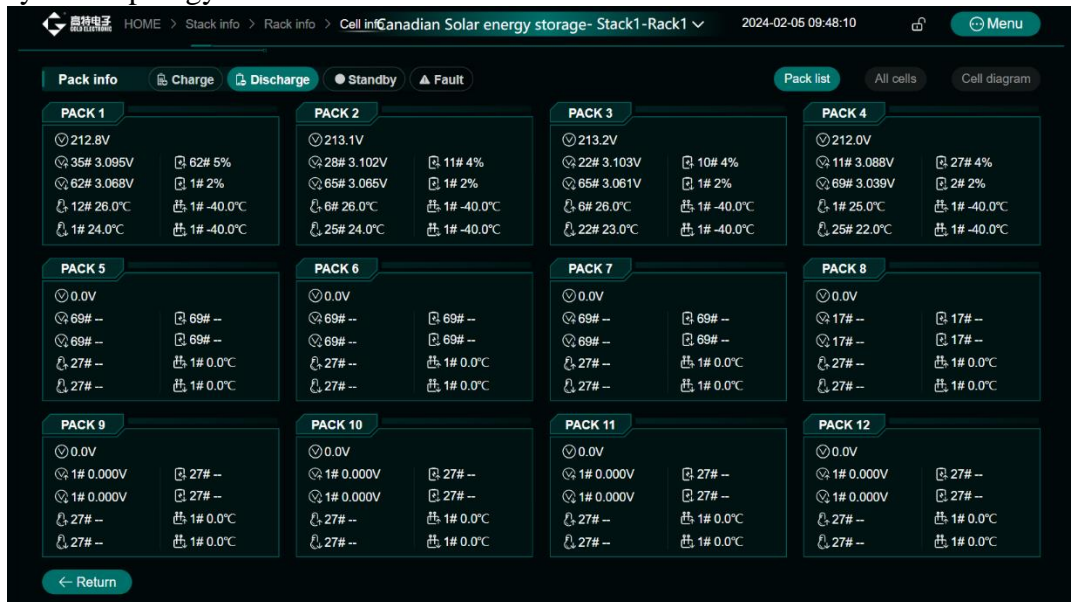




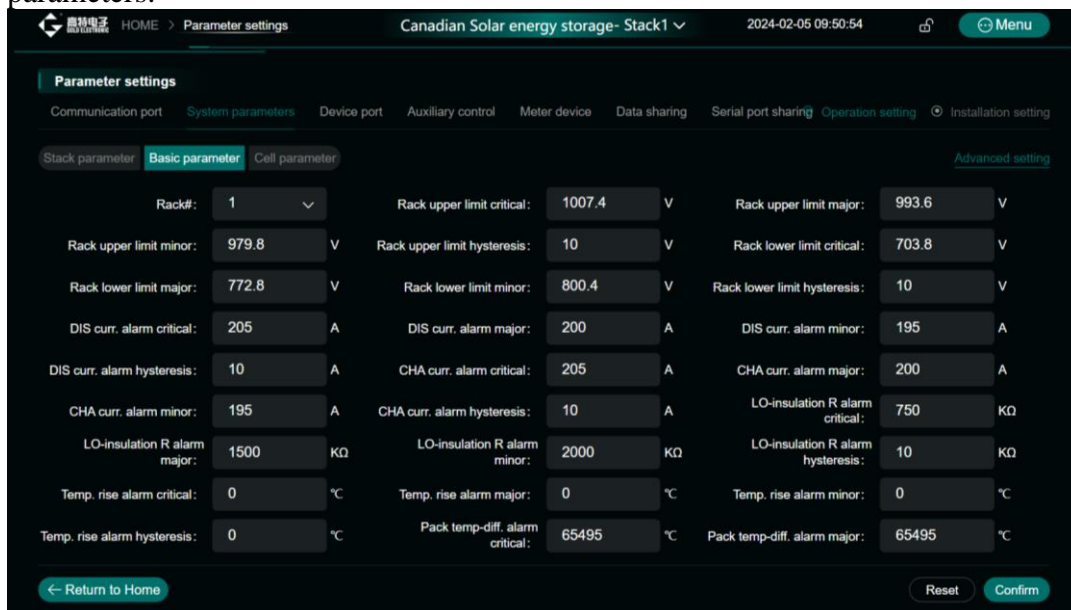
Step 4 On the real-time system information page, check whether the basic system information and alarm information are correct.



Step 5 On the String information page, check whether the String information and system topology are correct.



Step 6 Click More >> Parameter Configuration >> System Parameter >> Protection Parameter >> String Basic Parameter to set and confirm String parameters.



Step 7 Choose More Operations >> Parameter Settings >> System Parameters >> Protection Parameters >> Battery Parameters to set and confirm battery parameters.

HOME > Parameter settings Canadian Solar energy storage- Stack1 2024-02-05 09:51:08

Parameter settings

Communication port System parameters Device port Auxiliary control Meter device Data sharing Serial port sharing Operation setting Installation setting

Stack parameter Basic parameter Cell parameter Advanced setting

Rack#:	1	CHA temp. upper limit critical:	50	CHA temp. upper limit major:	45
CHA temp. upper limit minor:	40	CHA temp. upper limit hysteresis:	5	CHA temp. lower limit critical:	0
CHA temp. upper limit major:	5	CHA temp. upper limit minor:	10	CHA temp. lower limit hysteresis:	5
DIS temp. upper limit critical:	50	DIS temp. upper limit major:	45	DIS temp. upper limit minor:	40
DIS temp. upper limit hysteresis:	5	DIS temp. lower limit critical:	0	DIS temp. lower limit major:	5
DIS temp. lower limit minor:	10	DIS temp. lower limit hysteresis:	5	Cell temp-diff. alarm critical:	20
Cell temp-diff. alarm minor:	15	Cell temp-diff. alarm minor:	10	Cell temp-diff. hysteresis:	5
HI-SOC alarm critical:	101	HI-SOC alarm major:	101	HI-SOC alarm minor:	101
HI-SOC alarm hysteresis:	2	LO-SOC alarm critical:	0	LO-SOC alarm major:	0

Return to Home Reset Confirm

Step 8 Check whether the data of PCS and auxiliary control equipment is correct.

HOME > Stack info > Stack status > AUX Canadian Solar energy storage- Stack1 2024-02-05 09:43:08

AUX

DI/DO Meter Liquid cooling UPS Climate

liqcool

Normal Minor Major Critical

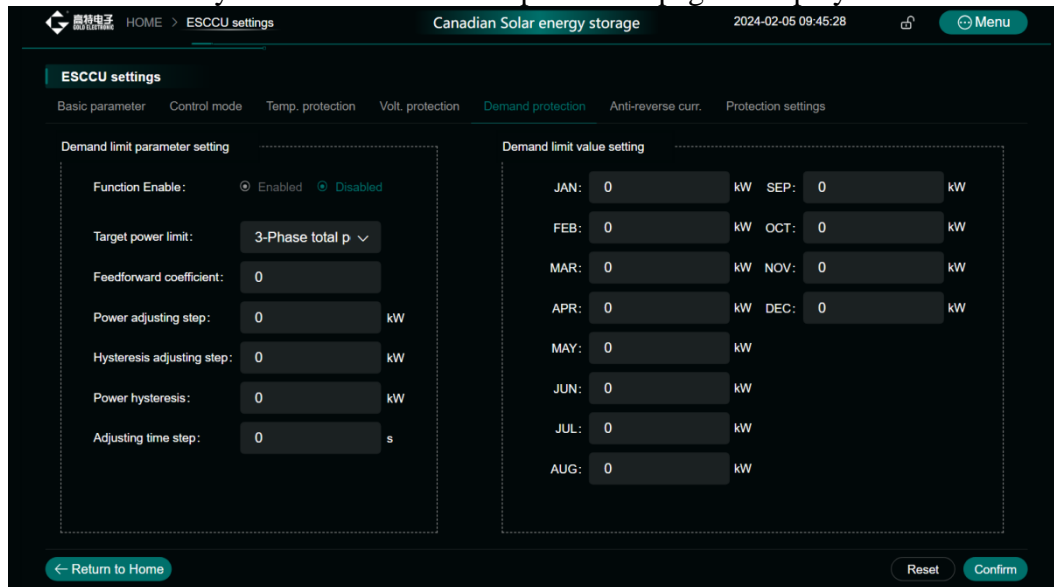
<b>AI info</b> Outlet Temperature: 19.60°C Inlet Temperature: 19.80°C Exhaust Temperature: 8.80°C Ambient Temperature: 10.00°C Inlet Pressure: 1.02Bar Outlet Pressure: 1.68Bar Current Pump Speed: 60% Pump Status: Running Compressor Status: Stopped Current Mode: Internal Circulation	<b>DI warning</b> Liquid Cooling Communication Fault: <span style="color: green;">●</span> System Lack of Water Warning: <span style="color: green;">●</span> High Outlet Pressure Warning: <span style="color: green;">●</span> Inverter Communication Fault: <span style="color: green;">●</span>	<b>AO info</b> Mode Selection: Manu <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Set</span> Max Cell Temperature: 25.00 °C <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Set</span> Min Cell Temperature: 21.00 °C <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Set</span> Average Cell Temperature: 23.00 °C <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Set</span>
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System Power On/Off: Power Off Power On

Return

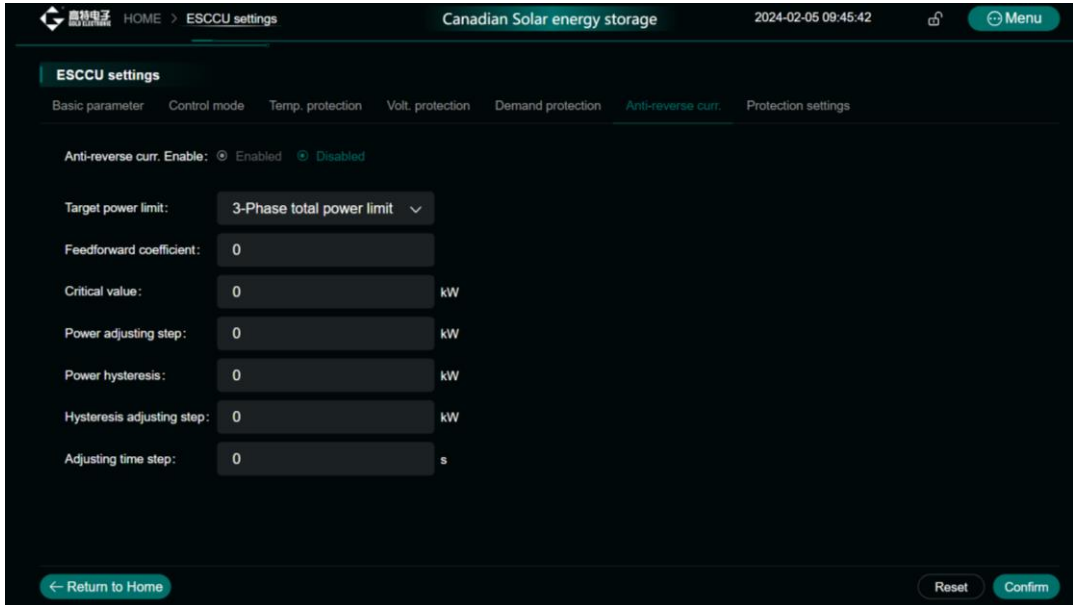
## 7.2 Load limiting and anti-reverse current setup

Step 1 Tap More Operations >> Protection Parameter Settings >> Demand Protection Policy. The Electric demand protection page is displayed.



Parameter	Setting instructions
Setting of Electric demand	This value is the maximum power value of the gate meter. When the power exceeds this value, the energy storage system will reduce the charging power.
Return difference of Power	When the setting value of electric demand - Gate meter power is within the range of return difference, the power of the energy storage system remains the previous calculation result.
Time step	The calculation time of the output power is easy to calculate frequently when the value is too low, and the actual power has not been adjusted in place after the last power adjustment, and it is recalculated, and the energy storage system power is easy to jump.

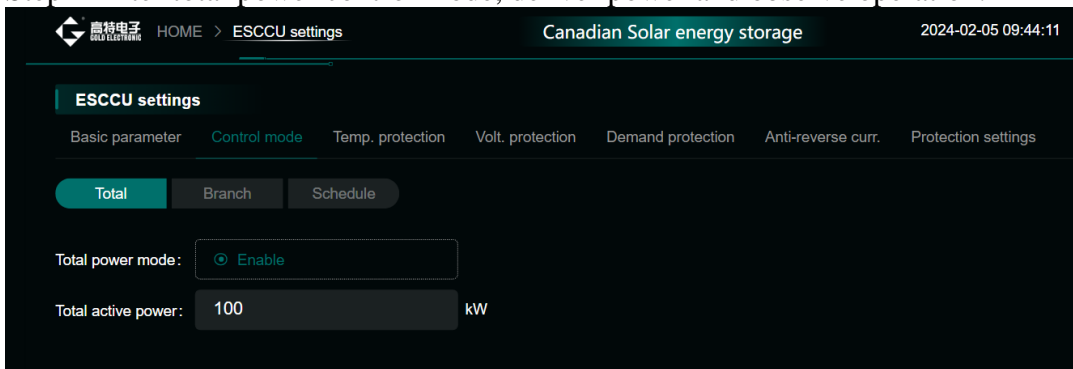
Step 2 Tap More Operations >> Protection Parameter Settings >> Anti-Counter-current Policy. The anti-counter-current policy page is displayed.



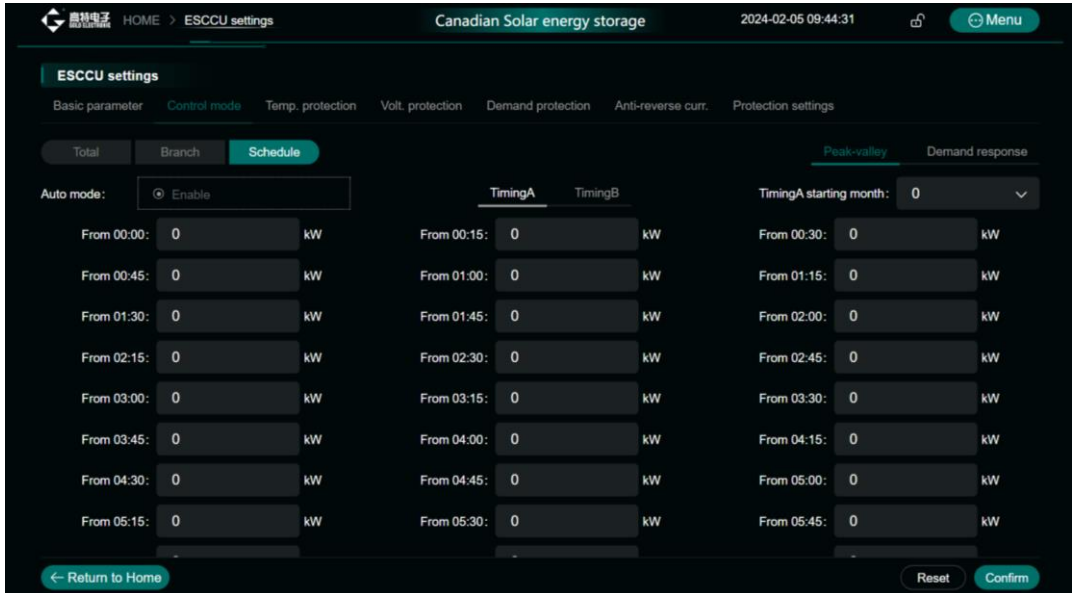
Parameter	Setting instructions
Threshold	This value is the minimum power allowed by the gate meter. When the power is lower than this value, the energy storage system will reduce the discharge power.
Return difference of Power	When the gate meter is within the range of (critical value + power back difference value), the power output of the energy storage system maintains the previous calculation result.
Time step	The calculation time of the output power is easy to calculate frequently when the value is too low, and the actual power has not been adjusted in place after the last power adjustment, and it is recalculated, and the energy storage system power is easy to jump.

### 7.3 System boot

Step 1 Enter total power control mode, deliver power and observe operation.



Step 2 Enter the planned automatic mode, deliver the power curve, and observe the running status.

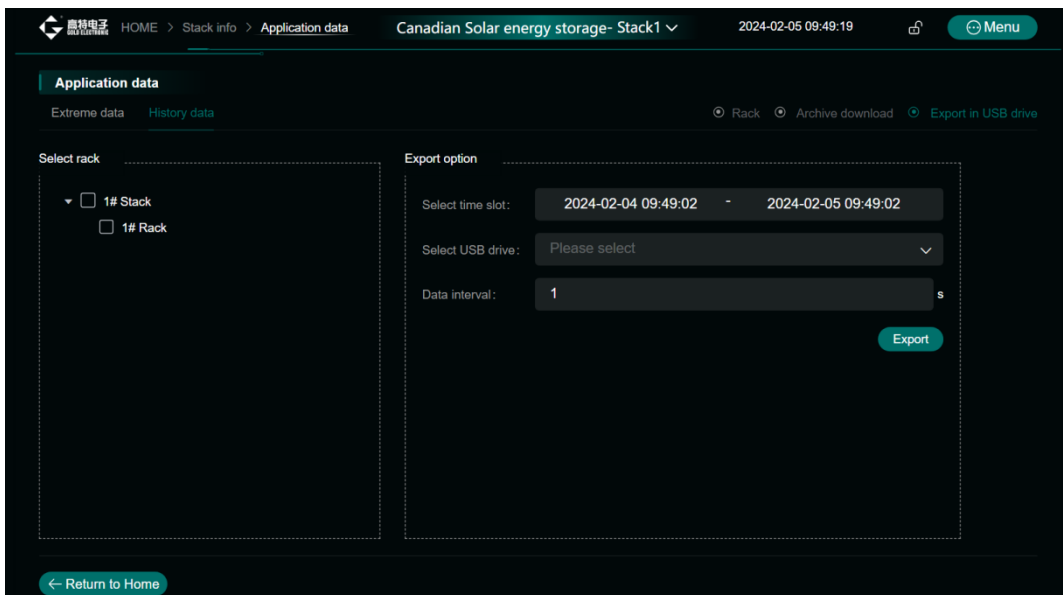


## 7.4 Export historical data log and stored data

Step 1 Insert a USB flash drive into the LEMS.

Step 2 Click to go to More Operations >> Running Monitoring >> Historical Data >> USB Flash Drive Export.

Step 3 Select String, event end, USB flash drive, Time interval, and click Export.



# 8 Fire Suppression

## 8.1 General Rules

Please comply with the fire laws and regulations of the country/region where the project is located.

Check and maintain the fire equipment regularly to ensure a normal operation of all functions.

## 8.2 Fire Suppression Equipment

KuBank includes an aerosol fire suppression system that can effectively extinguish the fire. It is equipped with combustible gas detectors, smoke detectors, and temperature and humidity sensor. If any abnormality is detected, the system sends a signal to the station-level alarm host through the electrical compartment external terminal for early warning of fire.

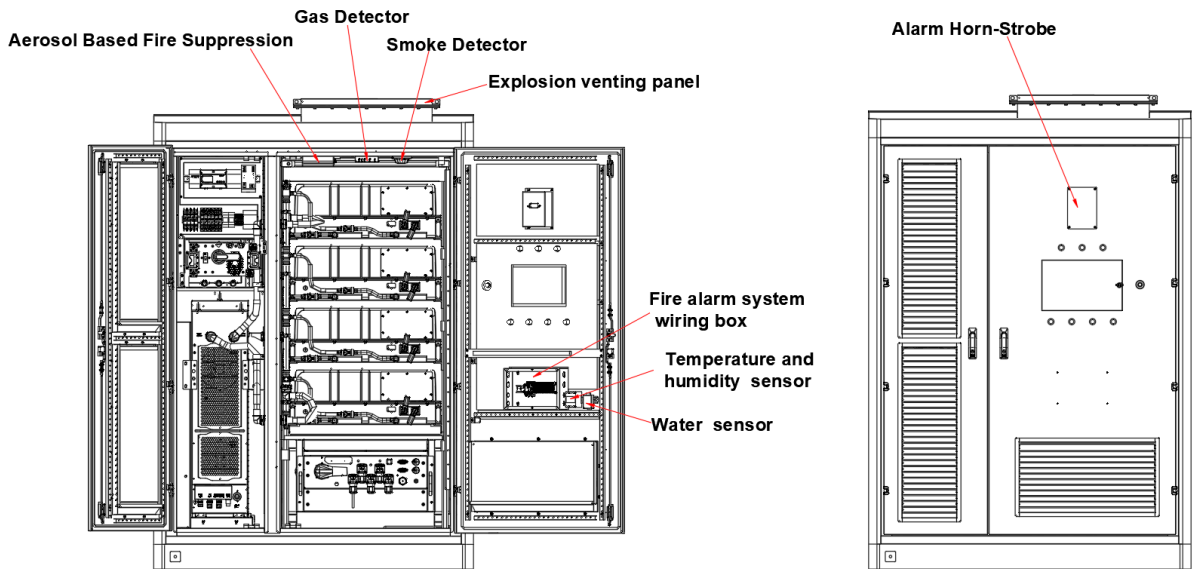


Figure 8-1 Fire protection system layout

### 8.3 Aerosol Fire Suppression System

Kubank is equipped with an aerosol fire suppression system. When the concentration of smoke and combustible gas in the cabinet reaches the threshold, the aerosol fire extinguishing system will automatically start , The system control block diagram is shown below.

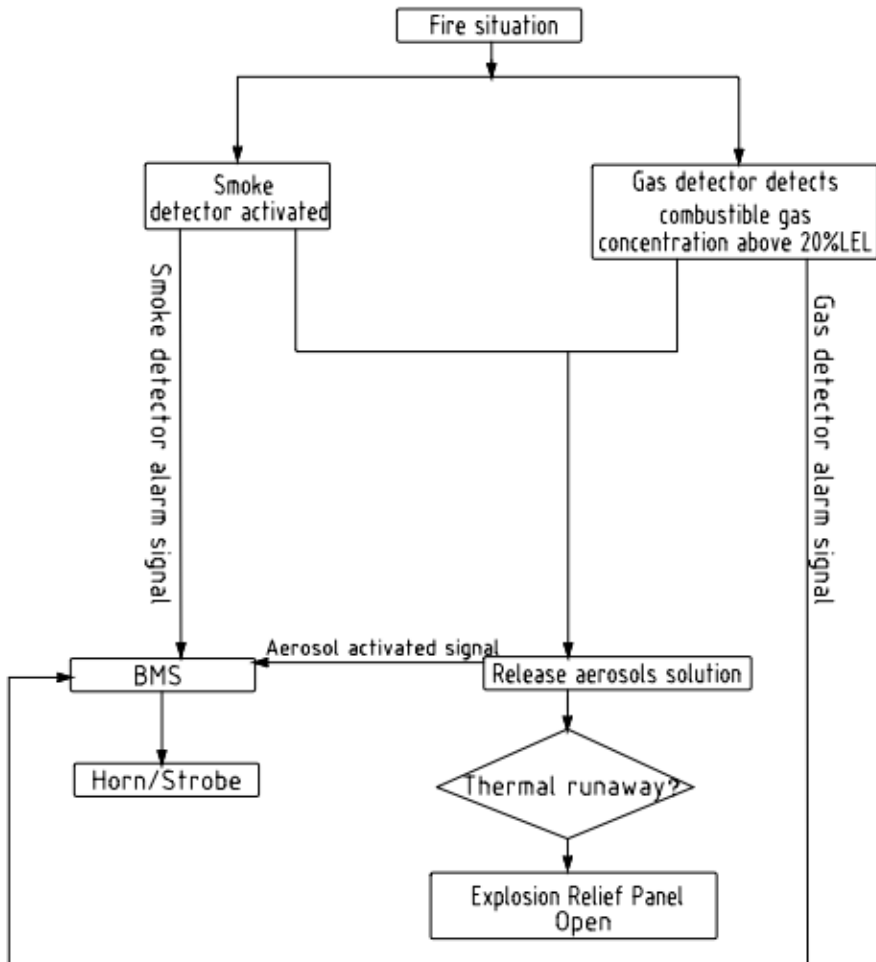


Figure 8-2 System control block diagram



## 9 Preventative Maintenance

### 9.1 Precautions Before Maintenance

- Do not open the door to maintain the device in rainy, humid or windy days.
- Avoid opening the container door when the humidity is high in rain, snow or fog, and make sure that the seals around the container door do not curl when the door is closed.
- Perform regular maintenance on the electrical cabinet, always refer to CSI guidelines and recommendations for maintenance.
- To avoid electric shock, do not perform any other maintenance operations beyond this manual.

### 9.2 Maintenance intervals

No.	Item	Check method	Period
1	System status and cleanliness	Check whether the outdoor cabinet and internal equipment are damaged or deformed	Once a year
2		Check whether there is abnormal noise during the running of internal devices	
3		Check whether the temperature inside the outdoor cabinet is too high	
4		Check whether the humidity and dust inside the cabinet are within the normal range. Clean if necessary.	
5		Check whether the air inlet and air outlet of the outdoor cabinet are blocked	
6	Outside the container	Check whether there are flammable objects on the top of the container	
7		Check whether the welding points between the container and the foundation steel plate are firm and whether there is corrosion	
8		Check whether there is any damage, flaking paint or sign of oxidization on the enclosure	
9		Check whether the lock of the cabinet door can be unlocked flexibly	
10		Check whether the sealing strip is fixed properly	

11	Inside the container	Check whether there are foreign objects, dust, dirt, and condensed water inside the integrated energy storage system		
12		Check whether there is abnormal noise in the running of PCS		
13	Air inlet and outlet	Check the temperature of the radiator and the amount of dust accumulated. Clean heat-dissipation modules with a vacuum cleaner if necessary		
14	Wiring and cable layout	Check whether the cable layout is normal and whether there is a short circuit. For any non-conformances found during inspection, correct them immediately		
15		Check whether all cable entry are well sealed		
16		Check whether there is water seepage inside the device		
17		Check whether the power cables are loose, and fasten them again by the torque specified previously		
18		Check whether the power cables and control cables are damaged, especially if the surface contacting the metal surface is cut		
19		Check whether the insulation tapes on the power cable terminals fall off		
20	Ground connection and equipotential connection	Check whether the ground connection is correct and the grounding resistance shall be no more than 4Ω.		
21		Check whether the equipotential connection inside the integrated system is correct		
22	Screw	Check whether internal screws fall off		
23	Safety function	Check whether the emergency stop button work normally		<b>Half a year</b>
24		Simulate shutdown		
25		Check the warning marks and other device marks, and replace them timely when they are fuzzy or damaged		

26	Internal components inspection	Check the cleanness of the circuit board and other elements and components.	
27		Check the temperature of the radiator and the amount of dust accumulated. Clean heat-dissipation modules with a vacuum cleaner if necessary	
28		Replace the air filter screen when necessary	
29	Device maintenance	Carry out regular inspection for corrosion of all metal components	
30		Check the contactors (auxiliary switches and micro-switches) annually to ensure the good mechanical operation	
31		Check the running parameters (especially voltage and insulation)	

### 9.3 Liquid cooling system maintenance

#### 9.3.1 Visual check

Maintenance Item	Maintenance Standard	Detection Mode
Operating data	<p>The current, voltage, inlet and outlet coolant temperature / pressure and other data during chiller operation meet the following range:</p> <ul style="list-style-type: none"> <li>• Current: less than the maximum operating current marked on the nameplate</li> <li>• Voltage: 220~240V±10%</li> <li>• Coolant operating temperature range: -30°C~55°C</li> </ul>	Visual check
Running voice	<p>The chiller operates without abnormal vibration and noise. Mainly observe the operation of the following parts:</p> <ul style="list-style-type: none"> <li>• Compressor</li> <li>• Fan</li> <li>• Circulation pump</li> </ul>	Visual check + hearing
Pipeline	The refrigeration system has no refrigerant leakage	Visual

Maintenance Item	Maintenance Standard	Detection Mode
reliability	The coolant circulation system has no leakage	check
Chiller appearance	The chiller is clean and dust-free and free of dirt	Visual check

### 9.3.2 Fans Maintenance

Maintenance Item	Maintenance Standard	Maintenance Cycle	Detection Mode	Troubleshooting
Operational reliability of fan	There is no dust in the fan and no foreign matter blockage at the tuyere	6 months	Visual inspection	Clean the dust of the fan with a brush and clean the foreign matter at the tuyere after 1 minute of power off.
	The fan blades are not damaged, and the fan rotates smoothly without abnormal noise	6 months	Visual inspection	After 1 minute of power off, fasten the fixing screws of the fan and check whether there is any internal cable or other objects interfering with the rotation of the fan. If the fan fails, please replace it.



The above maintenance intervals are only recommended values, you can adjust them according to actual planning.

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### 9.3.3 Electrical control system maintenance

Maintenance Item	Maintenance Standard	Maintenance Cycle	Detection Mode	Troubleshooting
Reliability of power cable and power terminal of wiring panel	No looseness of electrical cables and terminals	6 months	Visual inspection	Tighten the loose cables and terminals with a screwdriver after 1 minute of power off.
	There is no aging, damage, abnormal heating and other abnormalities in the power cable	6 months	Visual inspection	Replace the power cable after 1 minute of power off.
	There is no dust at the wiring panel	6 months	Visual inspection	Clean up the dust with a brush after 1 minute of power off.



The above maintenance intervals are only recommended values, you can adjust them according to actual planning.

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### 9.3.4 Condenser maintenance



The edges of the condenser blades are sharp, please wear gloves for operation.

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Maintenance Item	Maintenance Standard	Maintenance Cycle	Detection Mode	Troubleshooting
Condenser cleaning	Condenser is free of dust and foreign matter blockage	6 months	Visual inspection	Clean the condenser with compressed air or a vacuum with a brush head after 1 minute of power off.

Maintenance Item	Maintenance Standard	Maintenance Cycle	Detection Mode	Troubleshooting
	Fins are not seriously deformed	6 months	Visual inspection	Use tools such as a fin comb to correct it after 1 minute of power off.

 NOTE

The above maintenance intervals are only recommended values, you can adjust them according to actual planning.

### 9.3.5 Coolant maintenance

Maintenance Item	Maintenance Standard	Maintenance Cycle	Detection Mode	Troubleshooting
Coolant	<ul style="list-style-type: none"> <li>• Concentration meets range requirements</li> <li>• The PH value and the concentration of each electrolyte meet the requirements.</li> <li>• No dirt, precipitation, algae, etc.</li> </ul>	6 months	<ul style="list-style-type: none"> <li>• Coolant tester</li> <li>• Visual inspection</li> </ul>	Replace the coolant after 1 minute of power off.



#### NOTE

The above maintenance period is only a suggested value, and user can adjust it according to the actual performance of the coolant. The maintenance cycle of the coolant with better stability can be relatively extended.

Operation steps for replacing coolant in the chiller are as follows:

- Cut off the power and wait at least 1 minute.
- Use a drain pipe with quick connector to connect drain port of the chiller.
- Open the ball valve at the coolant drain port, close the valve after draining the coolant, and remove the drain pipe.



#### CAUTION

Ethylene glycol is a substance that pollutes groundwater, so the equipment operator must abide by the relevant national and local regulations, it may not discharge it at will.

- Remove the filter element of the filter for cleaning or replacement.
- Add the coolant, check the PH value and electrolyte concentration of the coolant.
- After the coolant replenishment is completed, close the ball valve at the coolant filling port and remove the pipe.
- Close the right door of the chiller and lock the door locks.

## 9.4 Fire protection system maintenance

### 9.4.1 Visual check

No.	Maintenance Item	Maintenance Cycle	Check method
1	Smoke detector	Every quarter	Make sure there are no changes that affect device performance. Check for changes in usage, changes in environmental conditions, equipment location, physical obstacles, equipment orientation, physical damage, and cleanliness.
2	Gas Detector (H <sub>2</sub> )	Every quarter	Check whether the label is intact and the system status is normal.
3	Horn & Strobe	Every quarter	Check whether the label is intact and the system status is normal.
4	Aerosol extinguisher	Every quarter	<ul style="list-style-type: none"> <li>• Check whether the fixing bracket of the aerosol fire extinguishing device is loose.</li> <li>• Check whether the aerosol fire extinguisher body is damaged. If damaged, should be replaced in time.</li> <li>• Check whether the aerosol extinguisher is expired.</li> </ul>
5	Explosion relief panel	Every quarter	Check whether the label of the explosion relief panel is intact and loose.

### 9.4.2 Periodic testing

No.	Test item	Test cycle	Test method	failure cause	Solution
1	smoke detector	Annually	Blow smoke test with smoke temperature gun.	Unable to trigger alarm	Recommended total replacement



No.	Test item	Test cycle	Test method	failure cause	Solution
2	Gas Detector	Annually	Test with calibrated gas.	Unable to trigger alarm	Recommended total replacement
3	Horn & Strobe	Annually	Test whether the alarm sound is 94~97 dB(A) when the distance is 1m. Test whether the flash intensity meets the requirements.	<ul style="list-style-type: none"> <li>• No alarm</li> <li>• The alarm sound is below the specified value</li> <li>• Failure to flash</li> <li>• The flash intensity is not enough to meet the demand</li> </ul>	Recommended total replacement
4	Aerosol extinguisher	Annually	The aerosol is replaced by a special test piece, and the indicator light of the aerosol test piece is switched from off to on	No response	Check the wires

## 9.5 Batteries Maintenance

No.	Item	Content	Check interval
1	Battery enclosure status and clean	Check whether battery Strings and internal devices are damaged or deformed	Once a year
2		Check whether there is abnormal noise during the running of internal devices	
3		Check whether the temperature in the battery String is too high	
4		Check whether the internal humidity and dust inside the enclosure are within the normal range. Clean if necessary	
5	Cable connections	Check whether the cables of the battery pack are loose	
6		Check whether the battery cable is damaged or overheated	
	Corrosion	Check whether the battery has corrosion	

7	leakage	leakage	
8	Grounding	Check whether the grounding is correct. The grounding resistance should not be greater than 4Ω.	
9	Check the ambient temperature and humidity	Check the ambient temperature record to see whether the temperature is within the operating range	
10		Check the ambient humidity record to ensure that the humidity is within the operating range	
11	Functional check	Check the status of the AC/DC circuit breaker. The circuit breaker is open or closed properly	
12		Measure whether the 24V output voltage is within the specification range	
13		Check whether the current, voltage and temperature in the operation record of the battery enclosure are within the operating ranges	

## 9.6 Maintenance Precautions

For safe and efficient maintenance of the system, maintenance personnel must carefully read and observe the following safety requirements:

- Have the electrician certificate issued by the Work Safety Supervision Bureau, and receive professional training before assuming their work.
- Follow relevant safety precautions, use necessary tools, and wear personal protective equipment.
- Do not wear metal accessories such as jewelry or watches.
- Never touch the high-voltage positive and negative electrodes of the energy storage system by both hands at the same time under all circumstances.
- Prior to the maintenance of the energy storage system, disconnect all high-voltage and low-voltage switches.
- Do not clean this product directly with water. If necessary, use the vacuum cleaner to clean it.
- Plug and remove cables in accordance with the specifications, without brute force or violent operation.
- After maintenance is completed, clean tools and materials in time and check whether there are metal objects left inside or at the top of the product.

## 9.7 Maintenance

- The working temperature should be kept between 5°C~45°C. The desired temperature charging and discharging should be 15°C~30°C and typically 25°C.
- The String should not be charged or discharged with high magnifying power. The continuous charging and discharging current of a single String should not exceed the rated current.
- When the energy storage system is not used in a long time, it should be charged once every six months, until its SOC is 30%~40%.
- When the system is used after long-term storage, it should be fully charged at least once to restore the best performance of the battery
- Regularly check whether the air duct of the cooling system is blocked and clean the system. In particular, clean the air inlet and outlet of the fan and use a vacuum cleaner if necessary, to maintain free air circulation inside the cabinet. Before dust removal, the power supply must be cut off. It is forbidden to rinse the system with water.
- Regularly check whether the fastening bolts of the high-voltage cables and connecting busbars of the energy storage system are loose, whether the contacts are in good conditions, and whether the terminal surfaces are severely corroded or oxidized.
- Regularly check the protective covers of high-voltage positive and negative electrodes of the PACK for ageing, damage and missing.
- Regularly check cables for loosening, ageing, damage and fracture and inspect whether the insulation is in good conditions.
- Regularly check the battery cabinet for pungent odor and high-voltage connections for burning odor.
- Regularly check whether the voltage, temperature and other data of the monitoring upper computer are correct and whether there are fault alarms in the alarm column.
- Regularly check whether the status and alarm indicators of the energy storage system are in good conditions and whether they work properly.
- Regularly check whether the emergency stop button of the energy storage system can be used, in order to quickly shut down the system in an emergency.
- Regularly check whether the fire extinguishers are in good conditions and within the validity period.
- Never use different types of battery modules in series or parallel.

# 10 Appendix

## 10.1 KuBank Specification (IEC version)

DC Parameters	
	CSI-KuBank-S-247-2h-IEC
Battery Chemistry	Lithium Iron Phosphate (LFP)
Pack Configuration	1P69S (69 Cells)
System Configuration	1P276S (4 Packs)
DC Voltage (Nominal)	883.2 Vdc
DC Voltage Range <sup>1</sup>	772.8 Vdc ~ 993.6 Vdc
Rated Energy Capacity	247 kWh
Max. Short Circuit Current	9kA
Charging/Discharging Mode	0.5 P / 0.5 P
AC Parameters	
Rated AC Power	100 kW
Max.AC Power	110 kW
Nominal AC voltage	400Vac (3P+PE)
AC voltage range	340 to 440 Vac (settable)
Nominal grid frequency	50Hz
Frequency Range	45-55/55-65
Current THD	< 3% (at rated power)
Power Factor	-1 ~ 1, continuously adjustable
General	
Auxiliary Power Supply	230Vac (1P+N+PE)
Auxiliary Current	20A
Duration @Rated Power	2 hrs
AC Round Trip Efficiency	≥ 90%
Control Backup	2-hrs UPS for control system including BMS, installed in the cabinet
Operating Temperature (Ambient)	-30 °C to 55 °C
Relative Humidity	≤95% (non-condensing)
Communication Interface	Ethernet / RS485 / CAN
Communication Protocol	Modbus TCP / Modbus RTU / CAN 2.0
Certifications	IEC/EN/BS 62477-1, EN/BS 61000-6-2/-4, UN38.3
Design Standards/Codes	IEC62619, IEC61000, NFPA69, IEC62933
Enclosure	Non-standard sheet metal
Dimensions (W*H*D)	1550*2280*2100mm
Weight (Battery Included)	≤3600kg
Altitude	< 2000 m (derating between 2000 m ~ 4000 m)
Enclosure Ingress Rating	IP54 / NEMA 3R
Painting/Coating	RAL9003
Seismic Parameter	Zone 4
Noise Level @1m	≤ 75 dB
Fire Detection and Alarm	Combustible gas detection and smoke detection, Sound and light alarm, Deflagration venting
Fire Suppression	Aerosol-based fire suppression system option available
Emergency Stop/Shut-off	Local and remote

## 10.2 KuBank Specification (JP version)

<b>DC Parameters</b>	
	CSI-KuBank-S-247-2h-JP
Battery Chemistry	Lithium Iron Phosphate (LFP)
Pack Configuration	1P69S (69 Cells)
System Configuration	1P276S (4 Packs)
DC Voltage (Nominal)	883.2 V
DC Voltage Range <sup>1</sup>	772.8 V ~ 993.6 V
Rated Energy Capacity	247 kWh
Charging/Discharging Mode	0.5 P / 0.5 P
<b>AC Parameters</b>	
AC Connection	
Rated AC Power (PCS)	125 kVA
Rated AC voltage output (PCS)	480Vac
AC voltage range (PCS)	422 to 528 Vac
Nominal grid frequency	50 Hz / 60 Hz
Frequency Range	59.3 to 60.5 Hz, adjustable
Current THD	< 5% (IEEE 1547 compliant)
Power Factor	-1 ~ 1, continuously adjustable
<b>General</b>	
Duration @Rated Power	2 hrs
AC Round Trip Efficiency	≥ 90%
Control Backup	2-hrs UPS for control system including BMS, installed in the cabinet
Operating Temperature (Ambient)	-30 °C to 55 °C
Relative Humidity	≤95% (non-condensing)
Communication Interface	Ethernet / RS485 / CAN
Communication Protocol	Modbus TCP / Modbus RTU / CAN 2.0
Certifications	IEC62619, IEC61000-6-2/-4, UL1973, UL9540, UL9540A, UN38.3, UN3480
Grid Codes	Test Report according to JEAC 9701
Enclosure	Non-standard sheet metal
Dimensions (W*H*D)	Battery Enclosure 1550*2280*2100mm; PCS Enclosure 600*1766*800mm
Weight	≤3600kg
Altitude	< 2000 m (derating between 2000 m ~ 4000 m)
Enclosure Ingress Rating	IP54 / NEMA 3R
Painting/Coating	RAL9003
Seismic Parameter	Zone 4
Noise @1m distance	≤ 75 dB
Fire Detection and Alarm	Combustible gas detection and smoke detection, Sound and light alarm, Deflagration venting
Fire Suppression	Aerosol-based fire suppression system option available
Emergency Stop/Shut-off	Local and remote

## 10.3 KuBank Specification (UL version)

<b>DC Parameters</b>	
	CSI-KuBank-S-247-2h-UL
Battery Chemistry	Lithium Iron Phosphate (LFP)
Pack Configuration	1P69S (69 Cells)
System Configuration	1P276S (4 Packs)
DC Voltage (Nominal)	883.2 V
DC Voltage Range <sup>1</sup>	772.8 V ~ 993.6 V
Rated Energy Capacity	247 kWh
Max. Short Circuit Current	9kA
Charging/Discharging Mode	0.5 P / 0.5 P
<b>AC Parameters</b>	
AC Connection	
Rated AC Power	125 kVA
Nominal AC voltage	480Vac
AC voltage range	422 to 528 Vac
Nominal grid frequency	60 Hz
Frequency Range	59.3 to 60.5 Hz, adjustable
THD	< 3%
Power Factor	-1 ~ 1, continuously adjustable
<b>General</b>	
Duration @Rated Power	2 hrs
AC Round Trip Efficiency	≥ 90%
Control Backup	2-hrs UPS for control system including BMS, installed in the cabinet
Operating Temperature (Ambient)	-30 °C to 55 °C
Relative Humidity	≤95% (non-condensing)
Communication Interface	Ethernet / RS485 / CAN
Communication Protocol	Modbus TCP / Modbus RTU / CAN 2.0
Certifications	UL1973, UL9540, UL9540A, UN38.3, UL1741, UL1741SB
Grid Code	UL1741SB, IEEE1547, UL 1741 CRD
Enclosure	Non-standard sheet metal
Dimensions (W*H*D)	Battery enclosure 1550*2280*2100 mm; PCS Enclosure: 600*500*2000 mm
Weight (Battery Included)	≤ 3600kg
Altitude	< 2000 m (derating between 2000 m ~ 4000 m)
Enclosure Ingress Rating	IP54 / NEMA 3R
Painting/Coating	RAL9003
Seismic Parameter	Zone 4
Noise @1m distance	≤ 75 dB
Fire Detection and Alarm	Combustible gas detection and smoke detection, Sound and light alarm, Deflagration venting
Fire Suppression	Aerosol-based fire suppression system option available
Emergency Stop/Shut-off	Local and remote