String PCS MV Station Operation and Maintenance Manual

Issue Version: V1.1

Revision Information

Version	Changes	Issue Date
A00	New Added	2024.01.07
A01	Version upgrade	2024.01.31
A02	Version upgrade	2024.03.07
A03	Version upgrade	2024.03.09
A04	Version upgrade	2024.03.28
A05	Split the manual into three separate manuals	2024.03.29
V1.0	Change the installation location of the power meter option and update the related layout drawing Add maintenance and operation instructions for dust nets; Adjust the position of internal components and replace with new version images; Delete A05 version encoding and use V1.0 version encoding directly.	2024.05.16
V1.1	Replace with new version images;	2024.06.17

Contents

Contents

1 Scope

This manual can serve as the on-site operation guide for the 2400 kW/2580 kW/3200 kW/3440 kW/3600 kW /3870 kW/4000 kW/4300 kW Integrated energy storage power station of Sineng Electric products, and is not applicable to other Integrated energy storage power station of Sineng Electric. With the upgrading of products, Sineng Electric will update this user operation manual from time to time, Sineng Electric has the final right to interpret the content of the manual!

No unit or individual may extract or copy part or all of the content of this document without authorization, and dissemination is also forbidden in any form.

The user manual is applicable to professional technical personnel who need to install, operate and maintain the medium-voltage Power Conversion Syste. Professional and technical personnel shall meet the following req.uirements:

- Possess certain professional knowledge of electronics, electrical wiring and machinery, and be familiar with electrical and mechanical schematic diagrams.
- Be familiar with the composition and working principle of the energy storage system, and the composition and working principle of its front and rear products.
- Have received professional training related to the installation and commissioning of electrical products.
- It shall have the emergency response ability to hazards or emergencies during installation or commissioning.
- Be familiar with the relevant standards and specifications of the country/region where the project is located.

2 Product Description

The relevant instructions for integrated energy storage power station in this manual exactly refer to EH-4000-HA-MR-US-34.5, with an output voltage of 6kV~35kV,No detailed supplementary explanation will be provided below. This chapter mainly introduces the appearance, performance parameters, and internal structure of the integrated energy storage power station.

2.1 Symbol convention

In order to ensure the personal and property safety of users when using the product and to use the product more efficiently and optimally, the manual provides relevant information and uses the following symbols to highlight it. The following lists the symbols that may be used in this manual. Please read carefully to better use this manual.

Sign	Description
	This sign indicates that it shall be noted.
	This sign indicates that there is high voltage inside the equipment. Touching the equipment may cause electric shock.
	This sign indicates a highly dangerous risk, which must be especially noticed.
	Maintenance, inspection and other operations can only be carried out after the energy storage converter is powered off for 5 minutes.
	This sign indicates that the temperature here is beyond the acceptable range of the human body. Please do not touch it to avoid personal injuries.
	It is strictly forbidden to step on this place, which may cause equipment damage and affect safe operation.
	This sign indicates the protective earth terminal, which needs to be reliably grounded to ensure the safety of operators.
	This is the lifting position, which shall be firm and reliable during lifting.

2.2 Safety instructions

2.2.1 General safety precautions

Notice

- Before starting operation, please carefully read the precautions and operation instructions in this manual to avoid accidents. The "danger", "warning" and "caution" in this manual do not represent all the safety precautions that should be observed, but only serve as a supplement to the safety precautions in various operations.
- The personnel responsible for product installation,electrical connection, commissioning, maintenance and fault handling shall be trained, master the correct operation methods,and have corresponding operation qualifications and basic safety operation knowledge.
- When carrying out various operations of this products and equipment, the operator must strictly comply with the relevant equipment precautions and special safety instructions provided by Sineng. The safety warnings listed in the manual only represent the parts that Sineng Company knows. Sineng Company does not assume any responsibility for violating general safety operation requirements or violating safety standards for design, production, and use of equipment.

Dangerous

Before any operation of the device, a preliminary arc flash assessment in the operation area is necessary.

- The operators must receive related safety training;
- Use best practices to assess the areas that may be affected by an arc flash;
- Before operating by areas that may be affected by arc flashing, we must wear personal protection equipment(PPE) that meets the requirements. Incorrect maintenance and maintenance work may have the risk of damage or personal injury!

2.2.2 Disclaimers

It is stated that Sineng Company has the right not to provide quality assurance in case of any of the following circumstances.

Transportation damage.

- Damage caused by storage conditions that do not meet the requirements of product documents.
- Incorrect equipment storage, installation and use.
- Unqualified personnel shall install and use the equipment.
- Operate without following the operating instructions and safety warnings in the product and documents.
- Operate in harsh environment beyond the product and documentation.
- Operate in the range of parameters specified in the applicable technical specifications.
- Unauthorized disassembly, change of product or modification of software code.
- Equipment damage caused by abnormal natural environment. (Force majeure, such as lightning, earthquake, fire, storm, etc.)

- The warranty period is exceeded and the warranty service is not extended.
- Any installation and operation environment beyond the provisions of relevant international standards.

2.2.3 Personnel requirements

The installation, electrical connection, commissioning, maintenance, troubleshooting and replacement of Integrated energy storage power station must be carried out by professional electrical technicians in accordance with local regulations. Operators personnel meet the following requirements:

- After professional training, master correct operation methods, and have corresponding operation qualifications and basic safety operation knowledge.
- Read this manual completely and master the safety matters related to operation.
- Be familiar with relevant safety specifications of electrical system.
- Be familiar with the composition and working principle of the whole energy storage power generation system, and the relevant standards of the country/region where the project is located.
- Wear personal protective equipment throughout the process.
- When operating and maintaining equipment, you must wear high-voltage insulating gloves and safety helmets, insulating shoes and insulating clothing; When commissioning the ring-network cabinet, it is necessary to operate the secondary room through the insulating stool.

2.2.4 Container identification protection

- It is strictly forbidden to alter, damage or block the identification of equipment.
- It is strictly forbidden to alter, damage or cover the nameplate of equipment.

2.2.5 Setting of safety warning signs

- The operation site shall be marked out as a dangerous restricted area, and warning signs or warning tapes shall be set up to prevent irrelevant personnel from entering.
- Obvious LOCKOUT or/and TAGOUT methods shall be set around the equipment to prevent accidents caused by wrong closing.

2.2.6 System installation

Notice

When lifting heavy objects, it is strictly forbidden to walk under the lifting arm and lifting objects.

- It is forbidden to stack any combustible, flammable or explosive materials inside and around the equipment.
- The equipment should be kept away from the living area as far as possible. If necessary, please take sound insulation measures.
- The equipment shall be well ventilated to avoid affecting the system performance.
- Before installing the equipment, make sure that it is not electrically connected and powered on.
- When lifting the equipment, it is forbidden to drag the wire rope and sling on the top of the box, and it is forbidden to use hard objects to hit the equipment.
- In the process of installation, if it is found that personal injury or equipment injury may be caused, the personnel

operating the equipment shall immediately terminate the operation, report to the project leader, and take effective protective measures.

- It is strictly prohibited to install, use and operate outdoor equipment (including but not limited to handling equipment, installation equipment, connecting cables, etc.) in bad weather such as lightning, rain, snow, strong wind, etc.
- It is forbidden to wear watches, bracelets, bracelets, rings, necklaces and other conductive objects during installation, operation and maintenance.
- Before contacting any conductor surface or terminal, use a voltmeter to measure the voltage at the contact point to confirm that there is no danger of electric shock.
- After installing the equipment, empty packaging materials in the equipment area, such as cartons, foam, plastic, cable ties, etc., shall be removed.
- The paint scratches during the transportation and installation of the box must be repaired in time. It is strictly forbidden to directly expose the scratched box to the outdoor environment for a long time.
- It is forbidden to install other equipment on the top of the integrated power station without the evaluation.
- It is forbidden to conduct arc welding, drilling, cutting and other operations on the top of the enclosure, otherwise it may damage the top of the equipment and cause water leakage. When operating in the space above the top of the equipment (such as lifting), protection shall be added on the top of the equipment to avoid damage to the top. After the construction, the inspection shall be carried out. There shall be no damage to the protective paint of the equipment. When the top is damaged, it shall be repaired in time.

2.2.7 Electrical connection

Dangerous

Before electrical connection, please check the equipment inside and outside for damage to avoid electric shock or fire after power on.

- When installing equipment that needs to be grounded, a permanently connected protective ground wire must be installed first, and the protective ground wire must be removed last when dismantling the equipment.
- All electrical connections must meet the national/regional electrical standards.
- The equipment can be connected to the grid only after obtaining the permission from the power department of the country/region where it is located.
- The cables used in the energy storage power generation system must be firmly connected, well insulated and of appropriate specifications.
- Before the electrical connection of the equipment, if it is possible to touch the live parts, the corresponding switch device of the front level of the equipment must be disconnected.
- Before connecting the load (electrical equipment) cable, it is necessary to confirm whether the input voltage value is within the rated voltage range of the equipment.
- The use of cables in high temperature environment may cause aging and damage of insulation layer, and sufficient distance shall be kept between cables and heating devices.

- Signal line and high current line or high voltage line shall be bound separately.
- User-provided cables shall comply with local cable regulations.

2.2.8 Operation

Dangerous

The power supply voltage of the power supply system is dangerous. Direct contact or indirect contact through wet objects may cause electric shock hazard. Unstandardized and incorrect operation may cause accidents such as fire or electric shock. Please operate in strict accordance with the safety precautions listed in this manual.

- The initialization parameters when the equipment is powered on for the first time must be set by professional personnel. The wrong setting may affect its normal operation and cause it to be inconsistent with the country's certification.
- When operating the equipment, local regulations and specifications shall be observed.
- Before connecting the power supply, ensure that the equipment has been correctly electrically connected.
- The heat exchanger and vent of the equipment shall not be blocked during the operation of the equipment to prevent the equipment from being damaged by high temperature alarm and fire.

2.2.9 Maintenance and replacement

Notice

After the equipment stops running, please wait for at least 5 minutes to ensure that the voltage drops to a safe voltage range, and the low-voltage cabinet has been connected with the grounding wire before maintenance or repair.

- During the maintenance process, the high-voltage side switch and low-voltage side frame circuit breaker of the box-type substation must be powered off and pasted with warning signs and necessary locking measures (**Such as tagout lockout**) to ensure that the equipment will not be accidentally re-energized.
- During maintenance, please try to avoid irrelevant personnel entering the maintenance site, and erect temporary warning signs or fences for isolation.
- Any fault affecting the safety performance of the equipment shall be removed immediately before it can be opened again.
- Please maintain the equipment when you are familiar with and understand the contents of this manual, and have appropriate tools and testing devices.
- If the equipment has multiple power supplies, all power supplies of the equipment should be disconnected before the equipment can be maintained.
- When replacing the equipment, ensure that the equipment has been powered off.

2.3 Product Introduction

The products described in this article are basically the same except for the inconsistent number of PCS modules. The following content is illustrated using EH-4000-HA-MR-US-34.5 as an example.

Table 2-1 Production Configuration

Models	Single module capacity (kW)	Input channels	Number of modules	Isolation transformer
EH-4300-HA-MR-US-US-34.5	215	10 or 20	20	Internal, Medium voltage
EH-4000-HA-MR-US-US-34.5	200	10 or 20	20	Internal, Medium voltage
EH-3870-HA-MR-US-US-34.5	215	9 or 18	18	Internal, Medium voltage
EH-3600-HA-MR-US-US-34.5	200	9 or 18	18	Internal, Medium voltage
EH-3440-HA-MR-US-US-34.5	215	8 or 16	16	Internal, Medium voltage
EH-3200-HA-MR-US-US-34.5	200	8 or 16	16	Internal, Medium voltage
EH-2580-HA-MR-US-34.5	215	6 or 12	12	Internal, Medium voltage
EH-2400-HA-MR-US-34.5	200	6 or 12	12	Internal, Medium voltage
EH-4300-HA-MR-US	215	10 or 20	20	External
EH-4000-HA-MR-US	200	10 or 20	20	External
EH-3870-HA-MR-US	215	9 or 18	18	External
EH-3600-HA-MR-US	200	9 or 18	18	External
EH-3440-HA-MR-US	215	8 or 16	16	External
EH-3200-HA-MR-US	200	8 or 16	16	External
EH-2580-HA-MR-US	215	6 or 12	12	External
EH-2400-HA-MR-US	200	6 or 12	12	External

Note:

- The product model comes with a "34.5" shipping configuration transformer; The product model does not have "34.5" and the shipment does not come with a transformer. Customers need to

configure the transformer themselves.

- Please contact the customer service center of Sineng for transformer selection.
- When PCS operates in off grid mode, a three-phase four wire isolation transformer must be added to the AC side, and the N line must be grounded

Integrated energy storage power station EH-4000-HA-MR-US-34.5, suitable for large energy storage power station. It adopts outdoor movable containers to integrate PCS, DC&AC LV Panel, step-up transformers, etc., to meet the modular design and rapid installation requirements of large energy storage power station, ensuring the long-term safety and stability of energy storage power station. The main color of the container is RAL7035, and our company accepts customization of other colors.

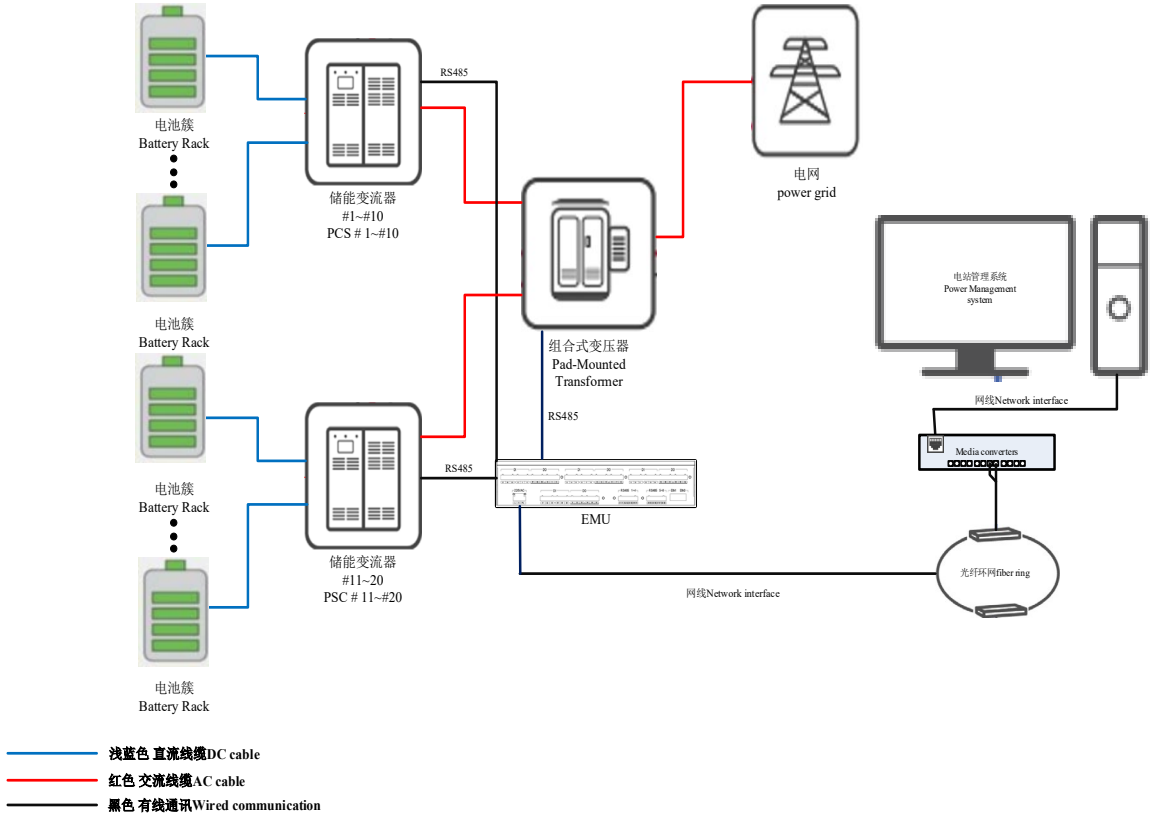


Figure 2-1 Composition of Integrated energy storage Power Station Power Generation System

2.4 Electrical diagram of equipment system

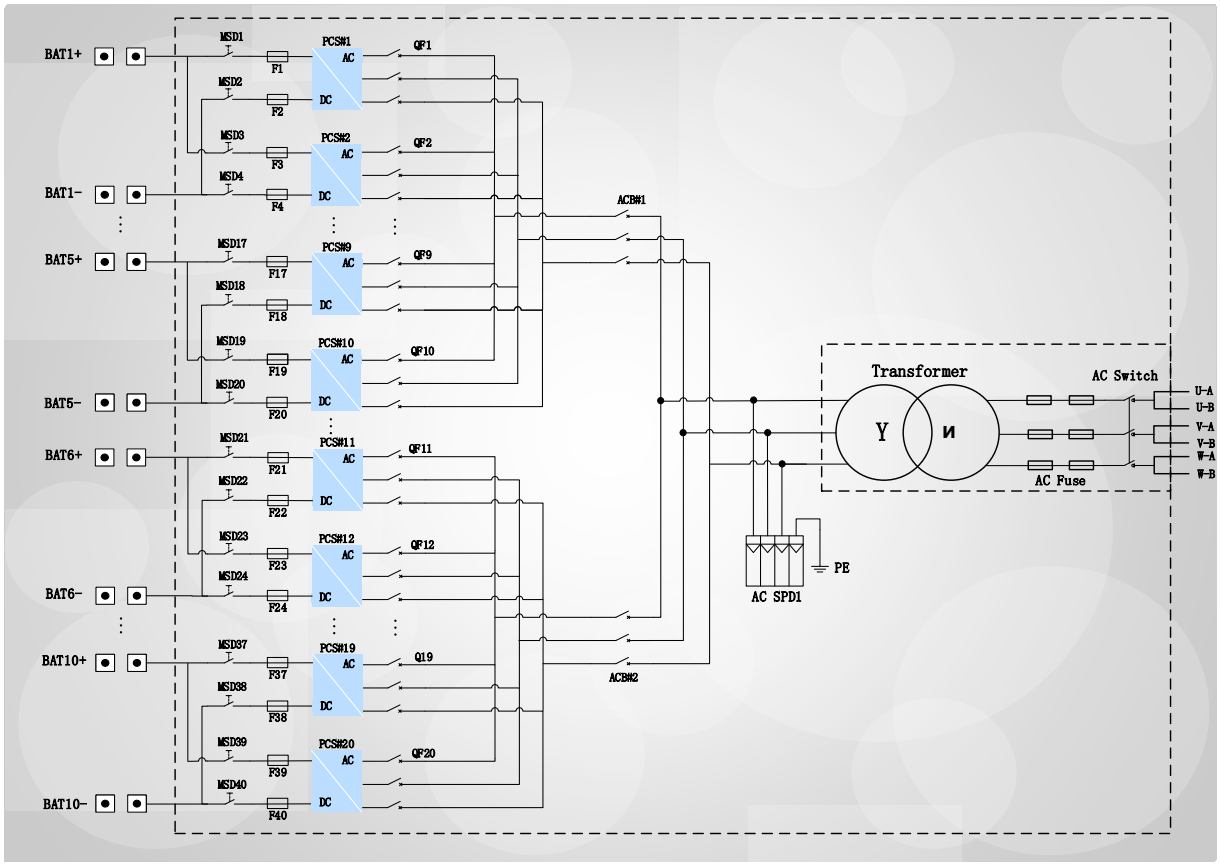


Figure 2-3 EH-4000-HA-MR-US-34.5 System Topology

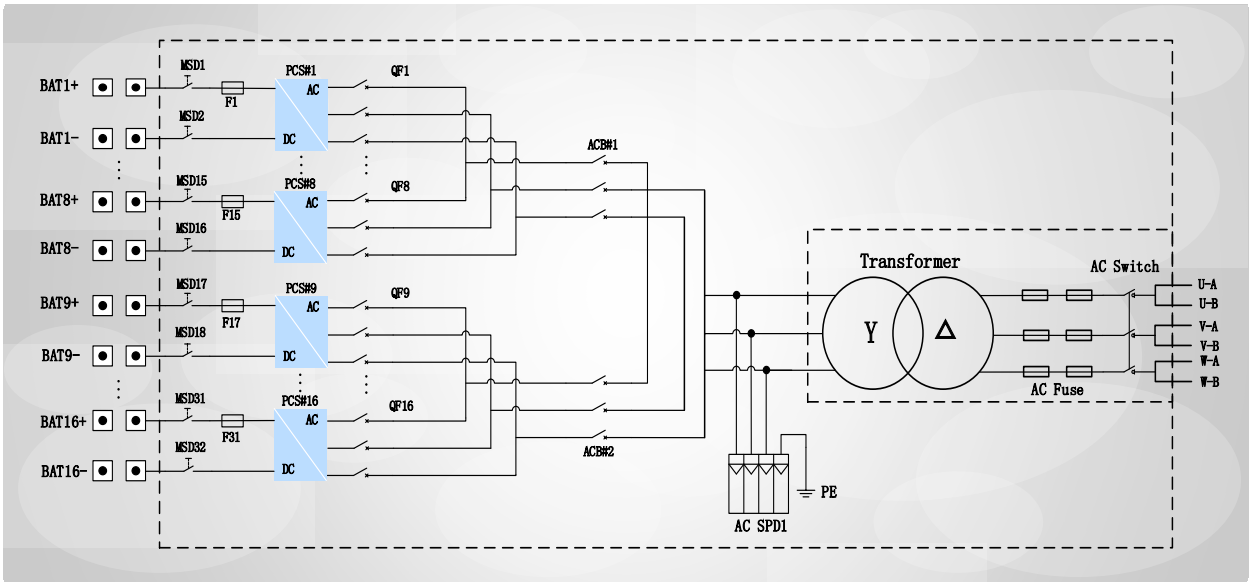


Figure 2-4 EH-4000-HA-MR-US-34.5 System Topology (Configuration 2)

2.5 Derating curve

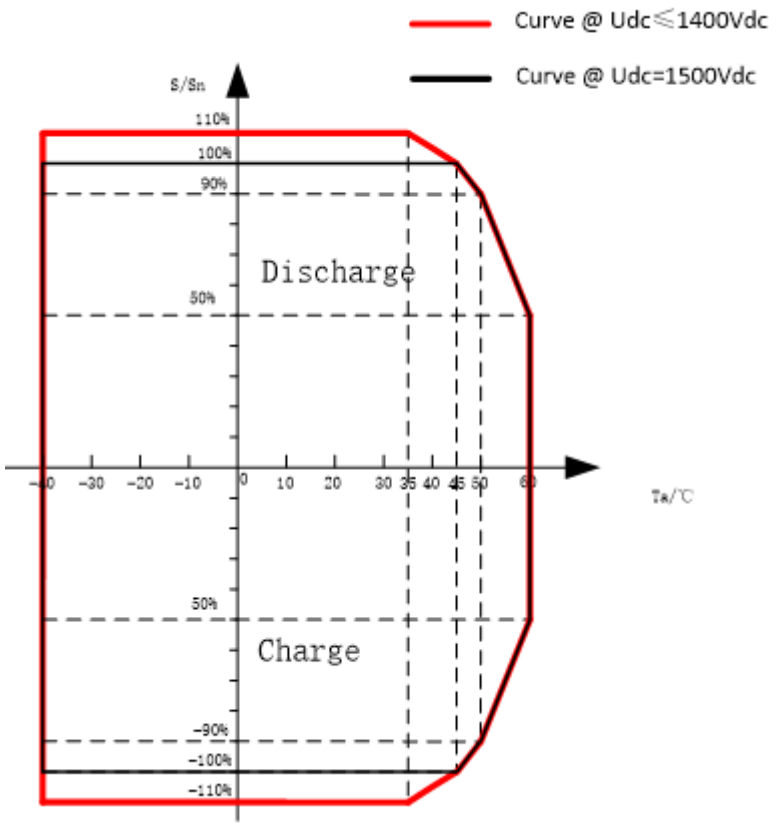


Figure 2-4 System Layout Diagram

2.6 System Layout

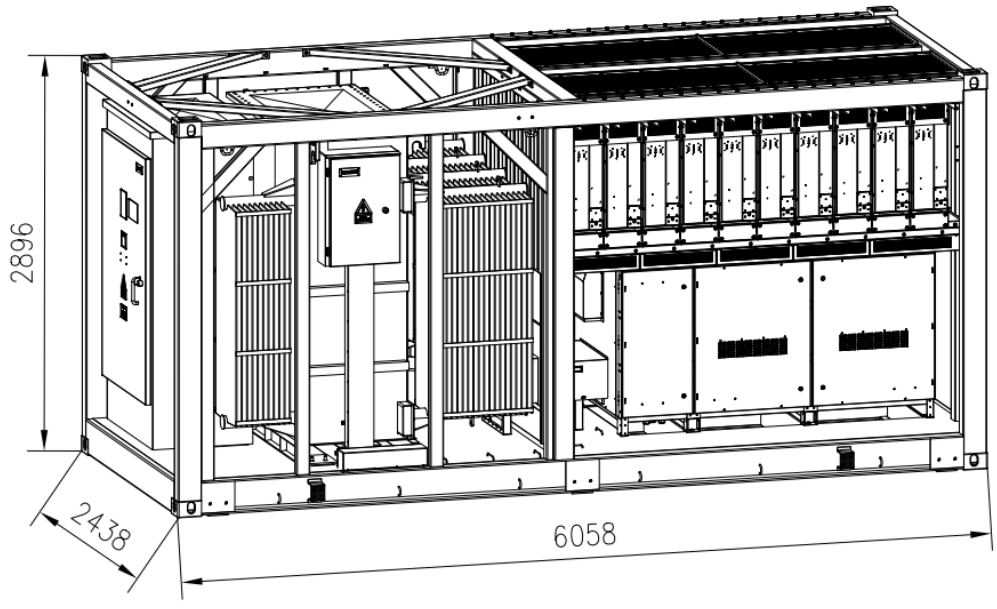


Figure 2-4 System Layout Diagram

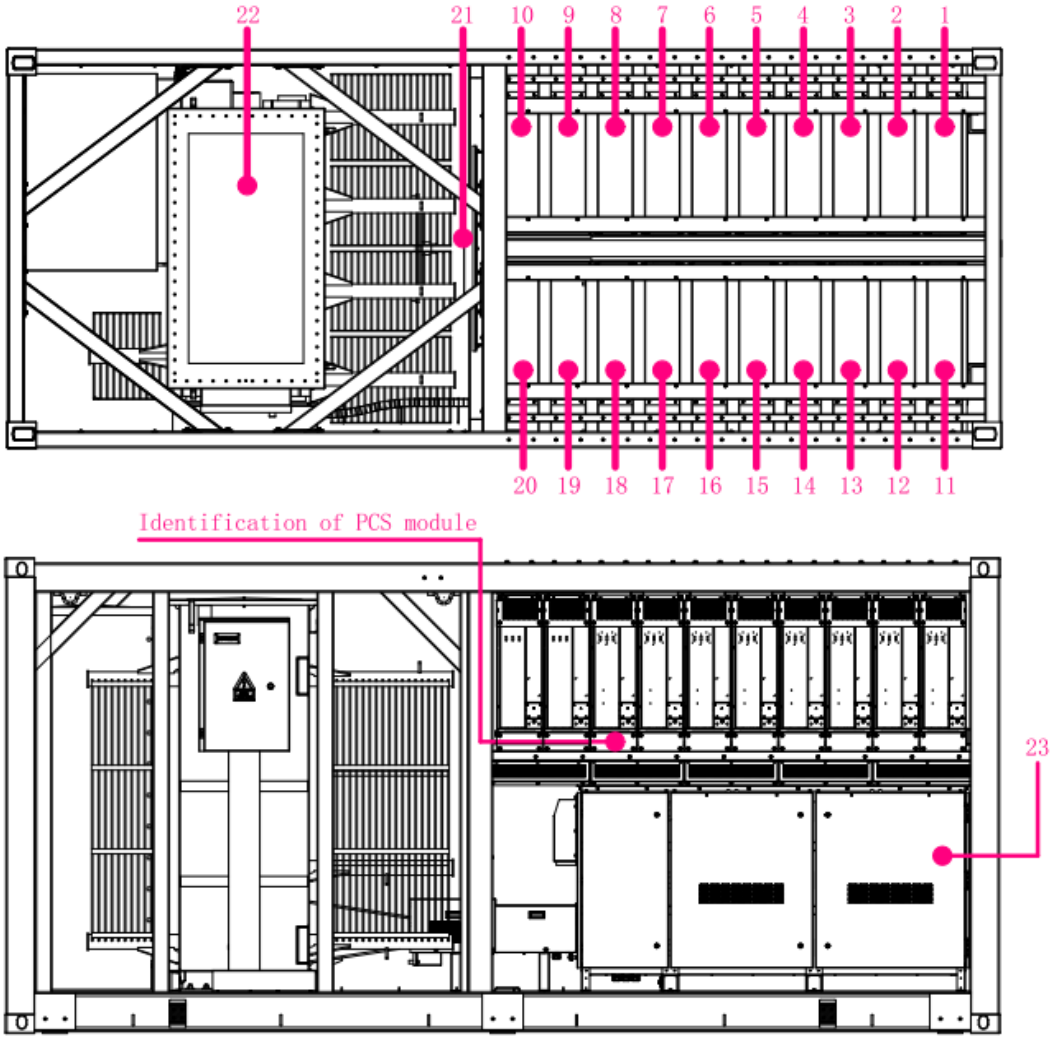


Figure 2-5 Internal schematic diagram of system layout

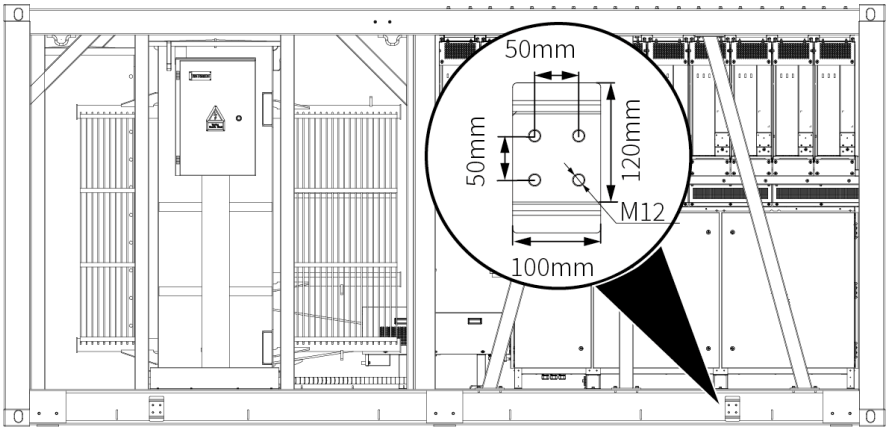


Figure 2-6 Internal schematic diagram of system layout

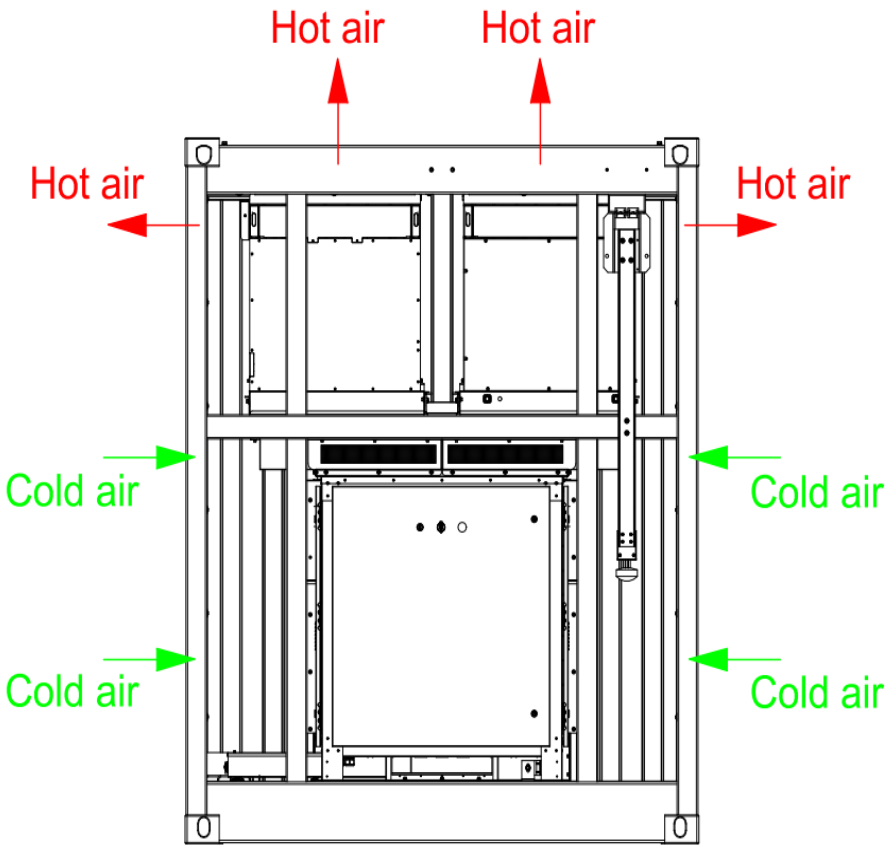


Figure 2-7 Schematic diagram of system heat dissipation

The functional cabinets are arranged orderly in the Integrated energy storage Power Stationafter testing in detail, which is suitable for inspection and maintenance.

Table 2-3 List of Main Equipment in Integrated energy storage power station

Number	Equipment
1~10	PCS modules #1~#10
11~20	PCS modules #11~#20
21	LV power connection AC
22	MV Transformer
23	DC&AC LV Panel

The overall dimensions of the integrated energy storage power station are as follows:

Table 2-4 Mechanical characteristics

Product model	Transport Outline dimensions W*D*H (mm)	Transport Outline dimensions W*D*H (mm)	Weight/kg
EH-4300-HA-MR-US-34.5	6058×2438×2896	6058×2438×2896	17100
EH-4000-HA-MR-US-34.5	6058×2438×2896	6058×2438×2896	17000
EH-3870-HA-MR-US-34.5	6058*2438*2896	6058*2438*2896	16800
EH-3600-HA-MR-US-34.5	6058*2438*2896	6058*2438*2896	16500
EH-3440-HA-MR-US-34.5	6058*2438*2896	6058*2438*2896	16300
EH-3200-HA-MR-US-34.5	6058*2438*2896	6058*2438*2896	16000

EH-2580-HA-MR-US-34.5	6058*2438*2896	6058*2438*2896	14500
EH-2400-HA-MR-US-34.5	6058*2438*2896	6058*2438*2896	14100
EH-4300-HA-MR-US	6058×2438×2896	6058×2438×2896	8000
EH-4000-HA-MR-US	6058×2438×2896	6058×2438×2896	8000
EH-3870-HA-MR-US	6058*2438*2896	6058*2438*2896	7800
EH-3600-HA-MR-US	6058*2438*2896	6058*2438*2896	7800
EH-3440-HA-MR-US	6058*2438*2896	6058*2438*2896	7600
EH-3200-HA-MR-US	6058*2438*2896	6058*2438*2896	7600
EH-2580-HA-MR-US	6058*2438*2896	6058*2438*2896	7600
EH-2400-HA-MR-US	6058*2438*2896	6058*2438*2896	7600

3 Equipment

3.1 Storage

The suitable storage environment for integrated energy storage power station is described in Table 3-1.

Item	Specifications
Operating temperature (C)	-40~+60>45 de-rating
Storage temperature(C)	-40~+70
Relative humidity	0~100%,non-condensing
Elevation (m)	2000m(1000m standard />1000m optional, (2000m option on request)
Contamination level	Level III
Max inclination degree	10
Anti-corrosion Degree	ISO-12944-2017 C4-M optional
Storage Duration	max 10 month*

Remark:

- The working environment should be free of conductive particles, erosive gases that will damage the insulation
- If there is no need to install an integrated energy storage power station immediately, then it needs to be reasonably preserved, and the preservation of the intelligent energy storage booster power station needs to meet the following conditions:
  - Please ensure that the ground of the integrated energy storage power station storage site has sufficient load-bearing capacity (>1000kg/m^2);
  - When the intelligent integrated energy storage power station is placed on the ground, it is necessary to ensure that the angle between the power station and the vertical normal is less than 10 degrees;
  - Do not store the station in the low area where flood may happen so as to prevent the flood in the integrated power station;
  - * Do not remove the sealing sticker of the integrated energy storage power station, if the sealing sticker is removed for storage, it may lead to abnormal PCS normal startup in the future.

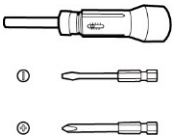
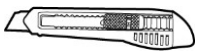
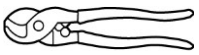
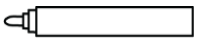
 Warning
During the storage process of the intelligent energy storage booster power station, Sineng will not be responsible for any damage to the power station or other additional damage caused by the removal of the external ventilation duct cover plate.

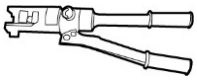
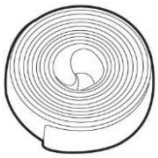
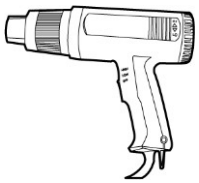
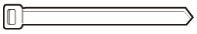
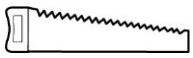
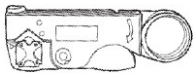
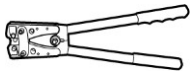
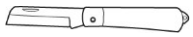
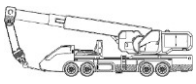
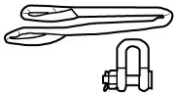
3.2 Installation

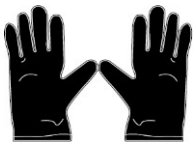
3.2.1 Installation Tool

The tools shown are for reference only, please refer to the actual object. Due to different site conditions, this tool list does not fully list a few tools that may be used. Please prepare tools not listed based on the actual situation for on-site installation personnel and users. Some special tools and installation materials shipped with the product are not listed in this table. Please refer to the actual situation.

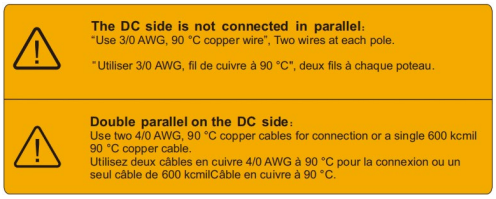
Table 3-2 Installation Tool

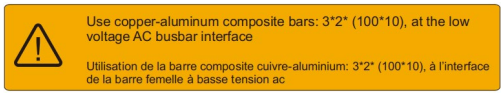
Tool			
 Percussion drill	 Jacket	 Torque wrench	 Torque screwdriver
 Diagonal pliers	 Wire stripper	 Adjustable wrench	 Rubber hammer
 Tool knife	 Wire nippers	 Open torque wrench	 Combination wrench
 File	 Vacuum cleaner	 Multimeter	 Marking pen

 Tape	 Digital or bubble level	 Hydraulic clamp	 Heat shrinkable sleeve
 Hot air gun	 Cable tie	 Leather tape measure	 Hand saw
 Wire stripper	 Inner hexagon spanner	 Crimping pliers	 Electrician knife
 Crane	 Rope shackle	 Claw hammer	 Miter ladder
  8mm, 200kW PCS			

Match 8mm standard sleeve, used for fasten the 200kW PCS water proof Cable terminal			
 Terminal Cripping	 Wire Stripper	 Network Wire crimping pliers	 Wire Crimper
 Large range clamp ammeter	 Super Large range clamp ammeter	 Temperature measuring gun	 Universal jack conversion socket
 Safety gloves	 Protective glasses	 Safety hat	 Safety shoes

3.2.1 Warning label

Sign	Position
	DC side

	Medium voltage side (scenario: configuring transformer)
	Low voltage AC side (scenario: no transformer configured)
Note: Grounding must comply with local safety regulations.	

3.2.2 Screw Tightening Torques

Figure 3-3 Recommended torque table for screws

Screw Size	Torque (N.m)	Torque (lbf.inch)
M3	0.44~0.62	3.89~5.49
M4	1.75~2.34	15.49~20.71
M5	2.02~2.69	17.88~23.81
M6	7.12~8.90	63.02~78.77
M8	13~16	115.06~141.61
M10	26~33	230.12~292.07
M12	46~58	407.13~513.34
M14	72~92	637.25~814.27
M16	117~144	1035.54~1274.51

3.3 Structural installation and fixation requirements

3.4 Electrical Connections

Medium-voltage AC cable holes, meter power cables, energy storage converter DC cables, power supply and BMS cables, transformer signal cables, GPS signal cable threading holes, see Figure 3-1 below.

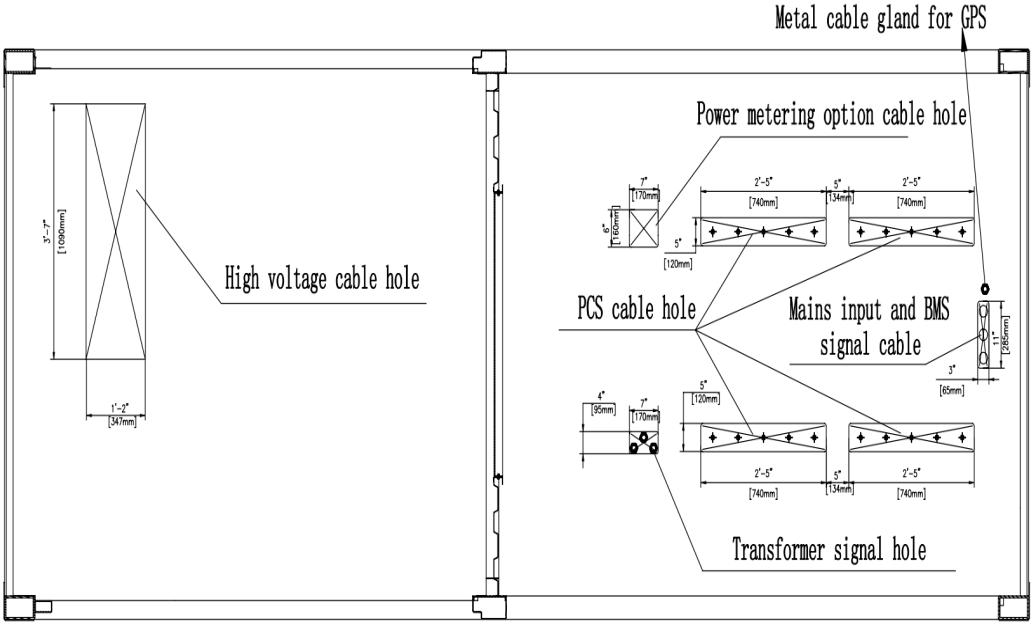


Figure 3-1 Equipment bottom inlet hole

The grounding position of the integrated energy storage power station is shown in Figure 3-2 below;

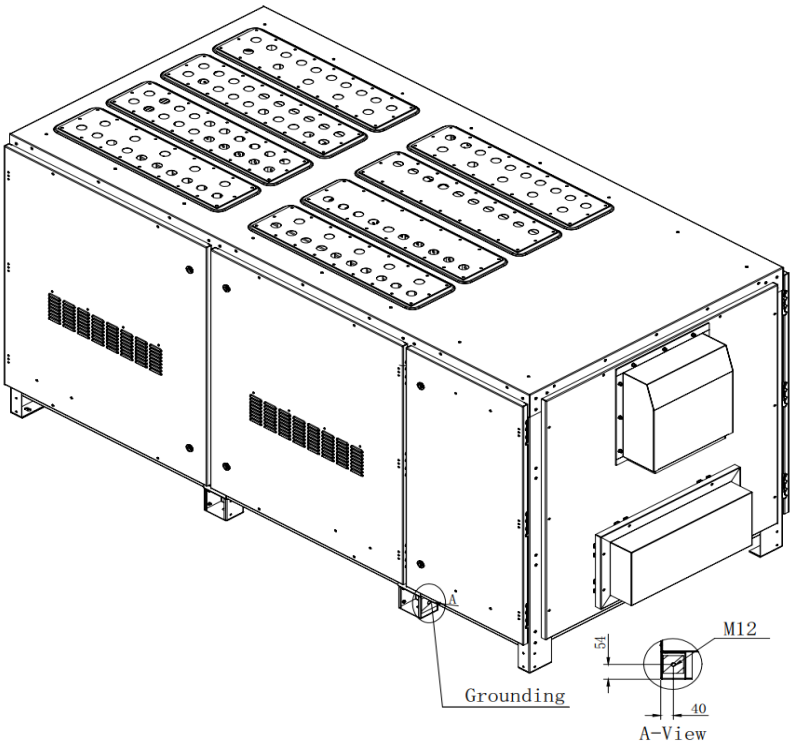


Figure 3-2 Grounding point of the energy storage power station

The DC wiring copper bar of the PCS is shown in Figure 3-3 and 3-4 below;

Note: The product parameters described in the document are basically consistent, taking EH-4000-HA-MR-US-34.5 as an example.

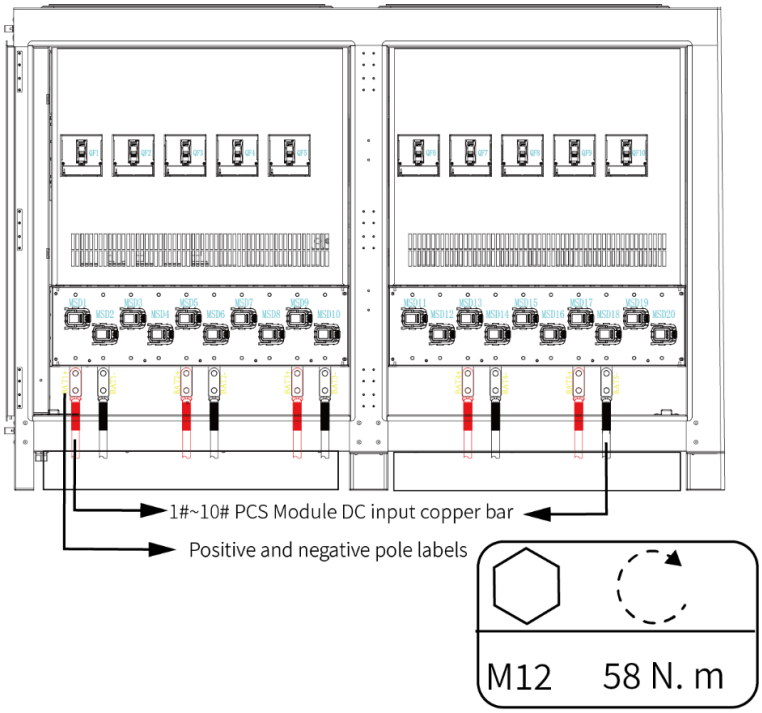


Figure 3-3 1#~10# PCS DC wiring copper bar (Configuration 1)

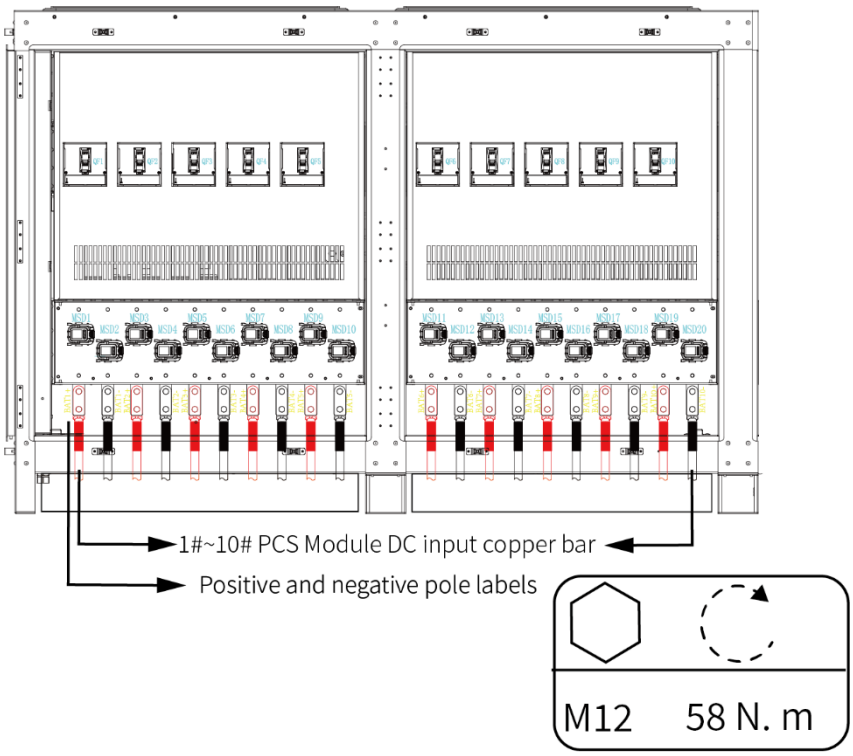


Figure 3-13 1#~10# PCS DC wiring copper bar (Configuration 2)

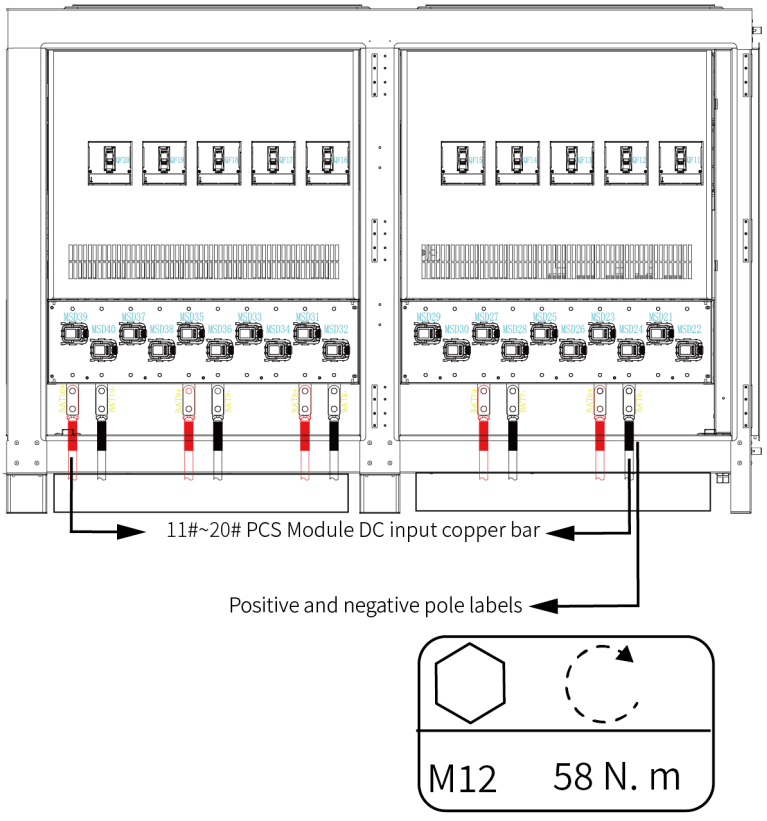


Figure 3-4 11#~20# PCS DC wiring copper bar (Configuration 1)

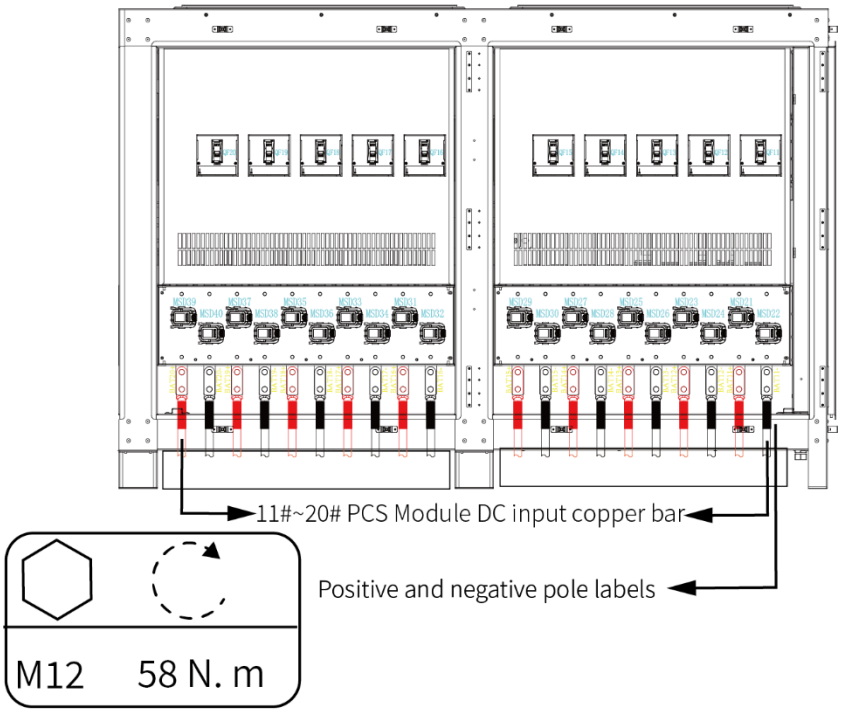


Figure 3-15 11#~20# PCS DC wiring copper bar (Configuration 2)

The size of the PCS DC wiring copper bar is shown in Figure 3-5 below;

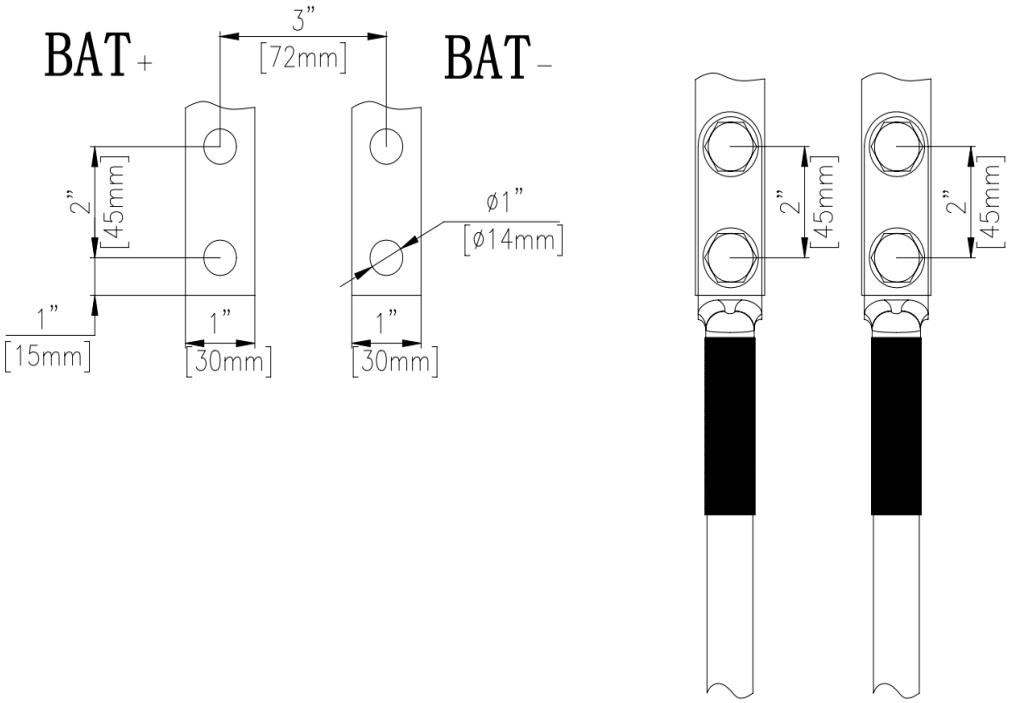


Figure 3-5 PCS DC wiring copper bar size (Unit: mm and inch)

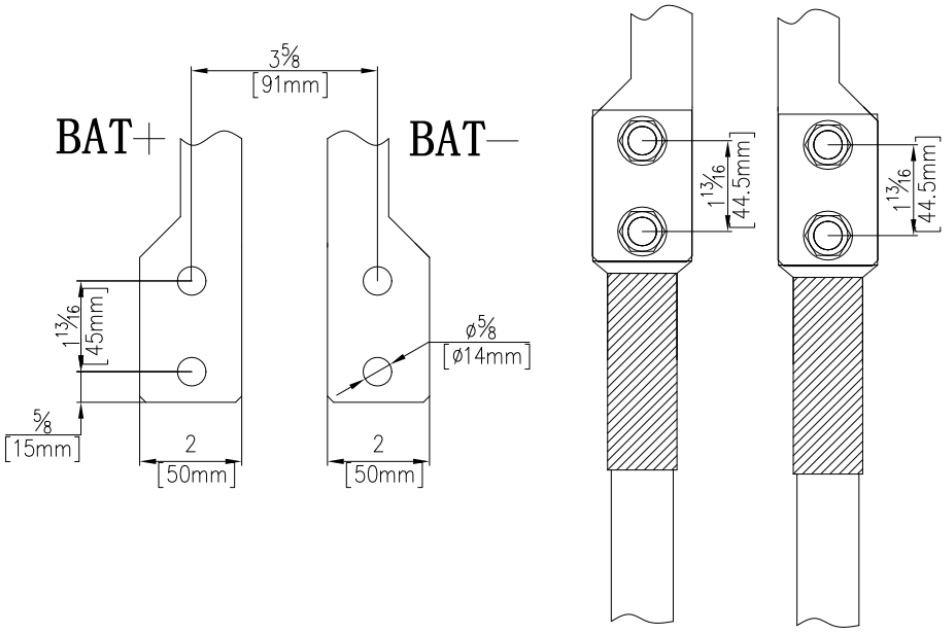


Figure 3-6 PCS DC wiring copper bar size (Unit: mm and inch)

The first and second types of terminals are recommended for the direct side input terminals, and the third type of terminals is not recommended, as shown in Figure 3-6 below.

The DC side is not connected in parallel:

"Use 3/0 AWG, 90 ºC copper wire', Two wires at each pole. Use 300 kcmil 90 ºC aluminium wire", with copper to aluminum lug for connection, two wires at each pole.

"Utilisez 3/0 AWG, fil de cuivre à 90 ºC ', deux par pôle. Utilisez 300 kcmil, 90 ºC fil d'aluminium" avec des cosses en cuivre -aluminium pour la connexion, deux fils par pôle.

Double parallel on the DC side:

Use two 4/0 AWG, 90 ºC copper cables or a single 600 kcmil 90 ºC copper cable for connection. Use two set MAX 400 kcmil, 90 ºC aluminium cables or a single MAX. 750 kcmil 90 ºC aluminum cable with copper to aluminum lug for connection.

Utilisez deux câbles en cuivre AWG 4/0 à 90 ºC ou un câble en cuivre à 90 ºC de 600 kcmil pour la connexion Utilisez deux jeux de câbles en aluminium jusqu'à 400 kcmil, 90 ºC ou un câble en aluminium jusqu'à 750 kcmil, 90 ºC Les cosses cuivre - aluminium connectent les câbles.

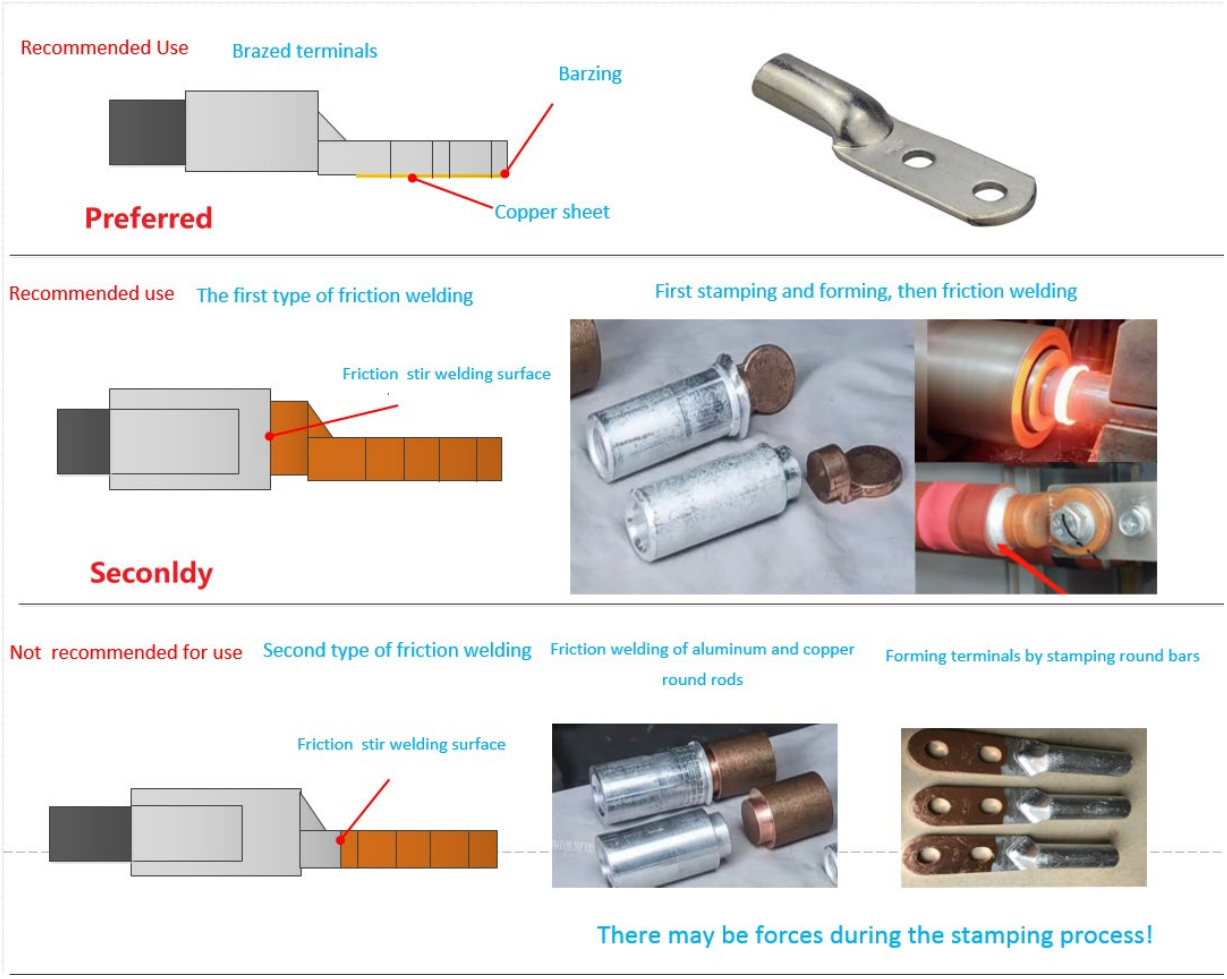


Figure 3-7 Recommended DC Wiring Terminals

3.5 DC&AC LV Panel & Energy management unit

3.5.1 DC&AC LV Panel layout drawing

Mainly providing power supply for internal equipment of integrated energy storage power stations, energy storage inverter control systems, communication and other equipment. Customized power metering option from customers is also placed in the DC&AC LV Panel (**Optional function**).

- **The product parameters described in the document are basically consistent, taking EH-4000-HA-MR-US-34.5 as an example.**
- **The protection switch configured on the DC side must meet the standard NFPA70.**
- **Please contact the customer service center of Sineng for battery selection.**

3.5.1.1 DC&AC LV Panel front view & Rear view

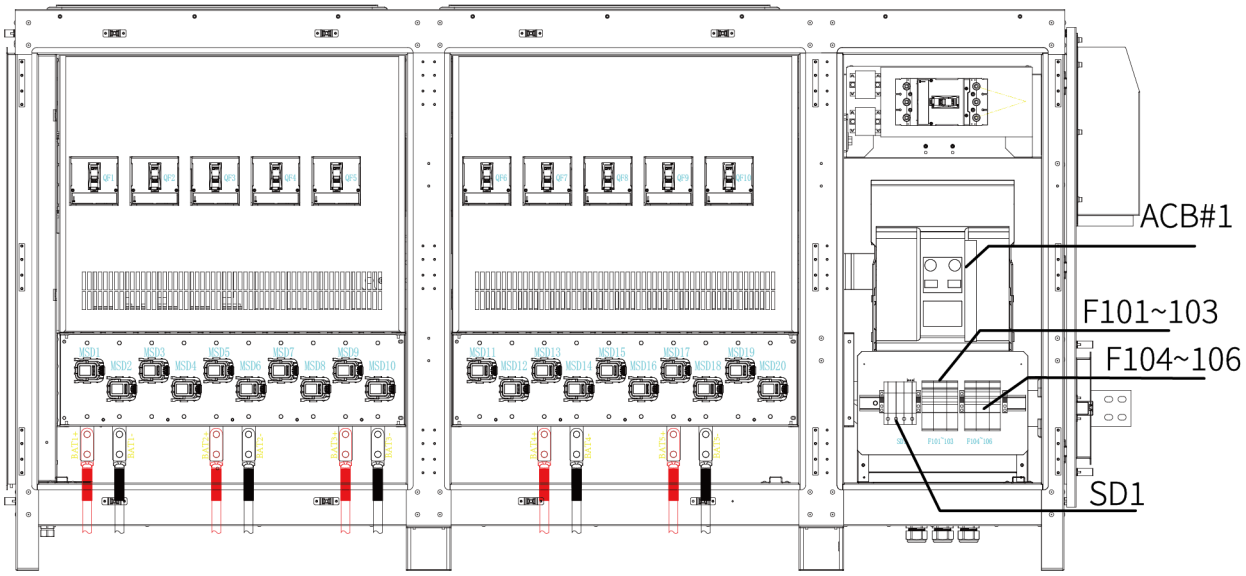


Figure 3-8 Front view of DC&AC LV Panel

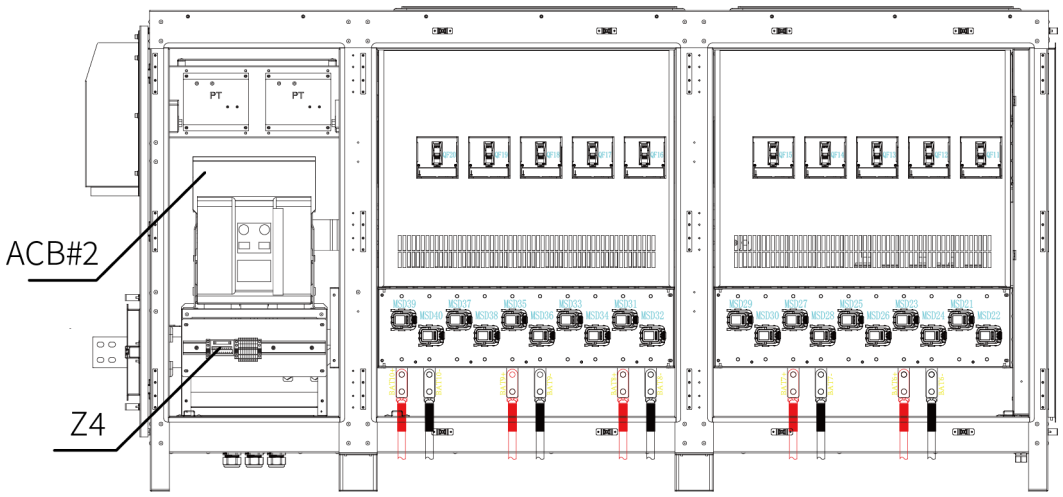


Figure 3-9 Rear View of DC&AC LV Panel

3.5.1.2 DC&AC LV Panel Left and right door opening view & left front view

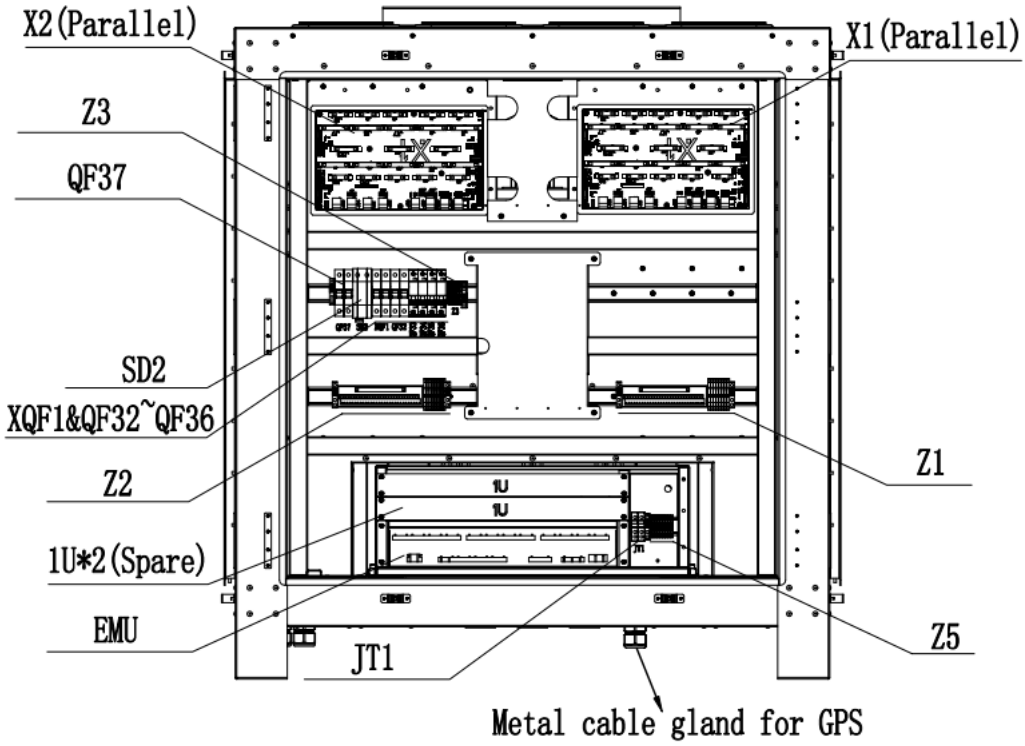


Figure 3-10 View of the left opening door of the DC&AC LV Panel

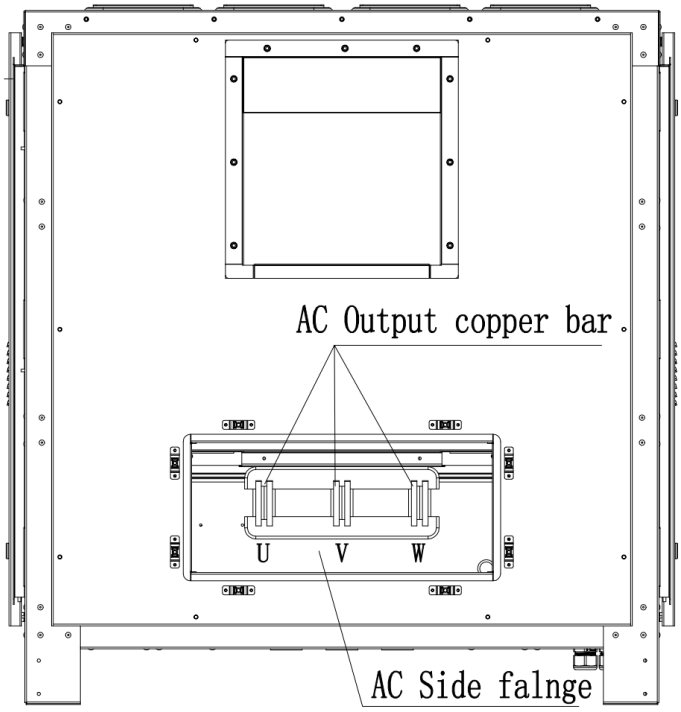


Figure 3-11 Right view of DC&AC LV Panel

Note:

- External communication output cables are connected to U, V, and W copper bars.
- Please contact the customer service center of Sineng for the selection of transformers

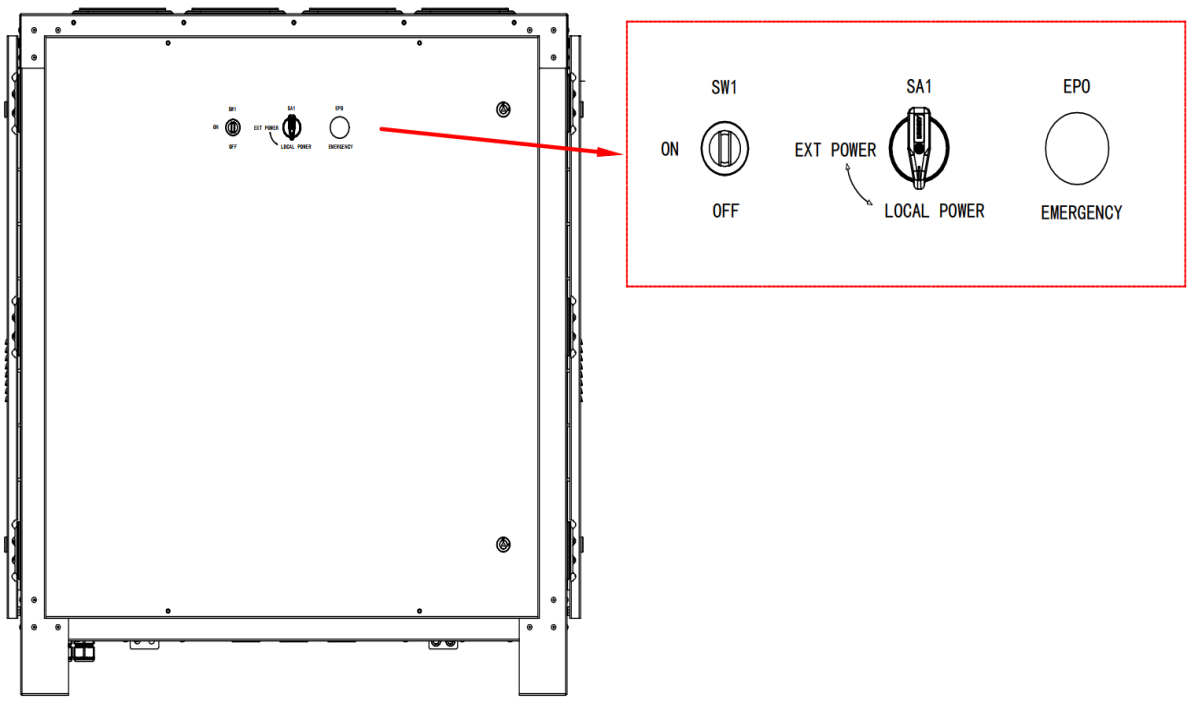


Figure 3-12 Left Front Operation Panel

3.5.1.3 DC&AC LV Panel bottom incoming line

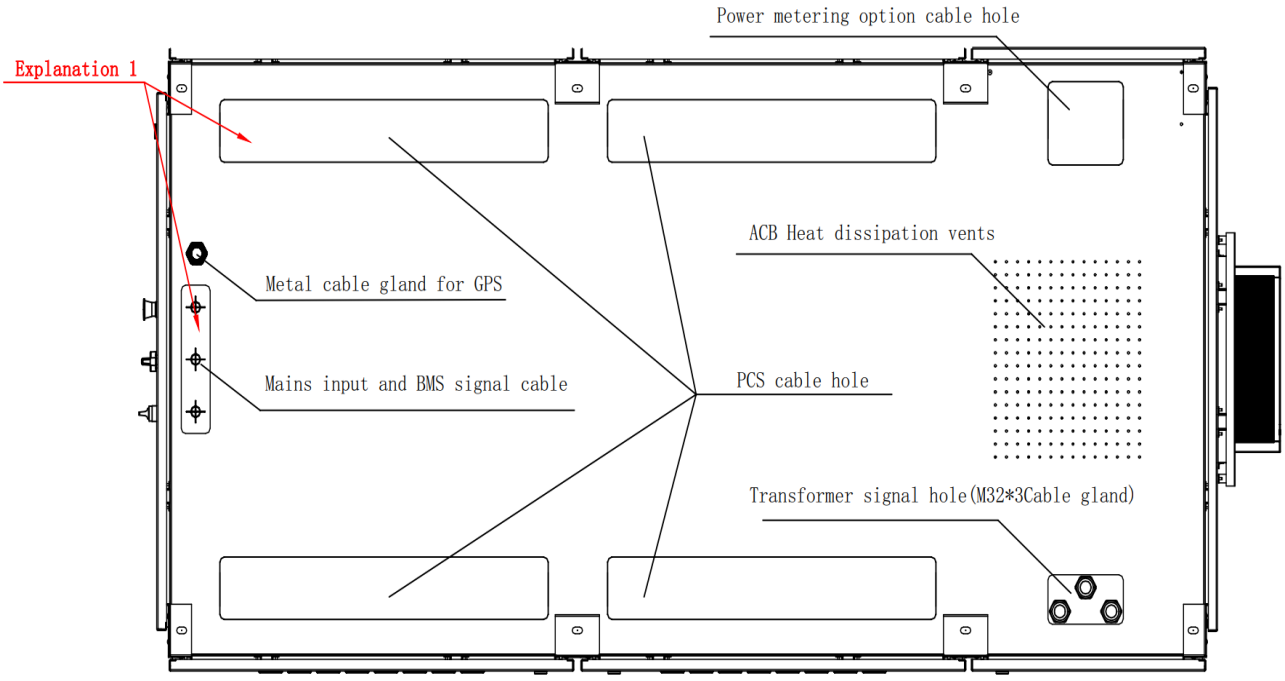


Figure 3-13 Bottom view of DC&AC LV Panel

Explanation 1: The bottom cable enters the hole positioning mark, which can be punched according to the actual size of the cable.

3.5.1.4 Description of the main equipment and switch functions of the DC&AC LV Panel

Table 3-4 Description of DC&AC LV Panel equipment and switch functions

Tag	Functional Description
MSD1~MSD40	DC side maintenance isolater switch*
QF1~QF20	PCS module output switch
ACB1#~ACB2#	PCS output main switch
F101~F103	AC lightning protection fuse
F104~F106	AC auxiliary power supply fuse
XQF1	EXT Power(277VAC)switch**
QF37	Lightning arrester switch
QF32	Backup power switch
QF33	ACB1#&ACB2# ACB1#&ACB2# Operation power switch
QF34	Communication power switch
QF35	Transformer temperature control power switch
QF36	Fan power switch
SD1	AC output surge protector
SD2	External power supply surge protector
EPO	Emergency shut down
SA1	Auxiliary power supply switching switch
SW1	Enable switch of PCS
EMU	Energy management unit
Z1	1#~10# PCS Module signal line
Z2	11#~20# PCS Module signal line
Z3/Z5	DC&AC LV Panel cabinet signal line
Z4	Medium voltage transformer signal line
JT1	XQF1 External auxiliary power supply XQF1 terminal block

*** Special Note: MSD1~MSD40 is an isolating switch that is forbidden to operate with electricity, with load, otherwise it will lead to arc pulling and endanger personal safety.**

**** Whether the external auxiliary power supply is connected depends on the specific situation of the project.**

3.5.2 Energy management unit

The Energy management unit a communication management device, a power distribution and protection device, and its functions include: communication management function and power distribution protection function

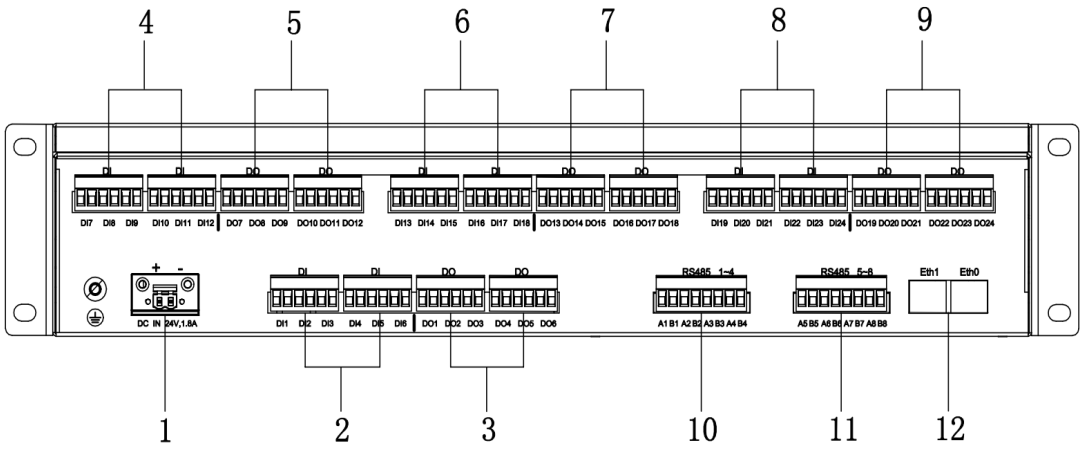


Figure 3-13 EMU Front View

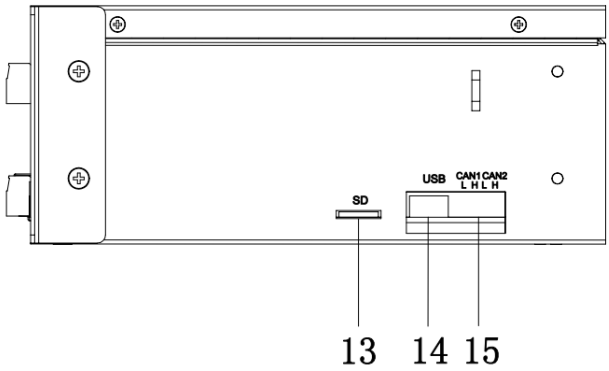


Figure 3-14 EMU Side View

The Energy management unit is placed in the DC&AC LV Panel, as the communication host of SKID, the Energy management unit is internally connected to the energy storage converter, transformer, meter (optional) and GPS timing equipment, and its Energy management unit has three external communication modes to choose: RS485, CAN and Ethernet, and the definition of internal terminals and communication cables is shown in Table 3-5;

Table 3-5 Energy management unit Unit Port Definition

Number	Tag	Functional Description
1	DC IN 24V	EMU Power
2/6/8	DI1~DI6/ DI13~DI24	Passive dry node
3/5/7/9	DO1~DO24	Passive dry node
4	DI7~DI12	BMS Reserve dry nodes
10	RS485_1	PCS1#~10#PCS monitoring communication
	RS485_2	PCS11#~20#PCS monitoring communication
	RS485_3	GPS equipment communication
	RS485_4	Reserved**
11	RS485_5	Reserved**
	RS485_6	Power metering options

	RS485_7	Reserved**
	RS485_8	Transformer temperature sensor
12	Eth0/Eth1	Ethernet port EMS communication*
13	SD	SD card slot
14	USB	USB interface
15	CAN1	PCS 1#~20# communication
15	CAN2	Reserved**

* Note: The typical communication topology diagram of the all-in-one energy storage converter can be referred to Appendix 1.

** Note: Reserved for customized equipment or other options.

3.5.3 Power metering option (3P3L)

●The installation position of the power metering option in the integrated energy storage power station is shown in Figure 3-15,3-16,3-17*;

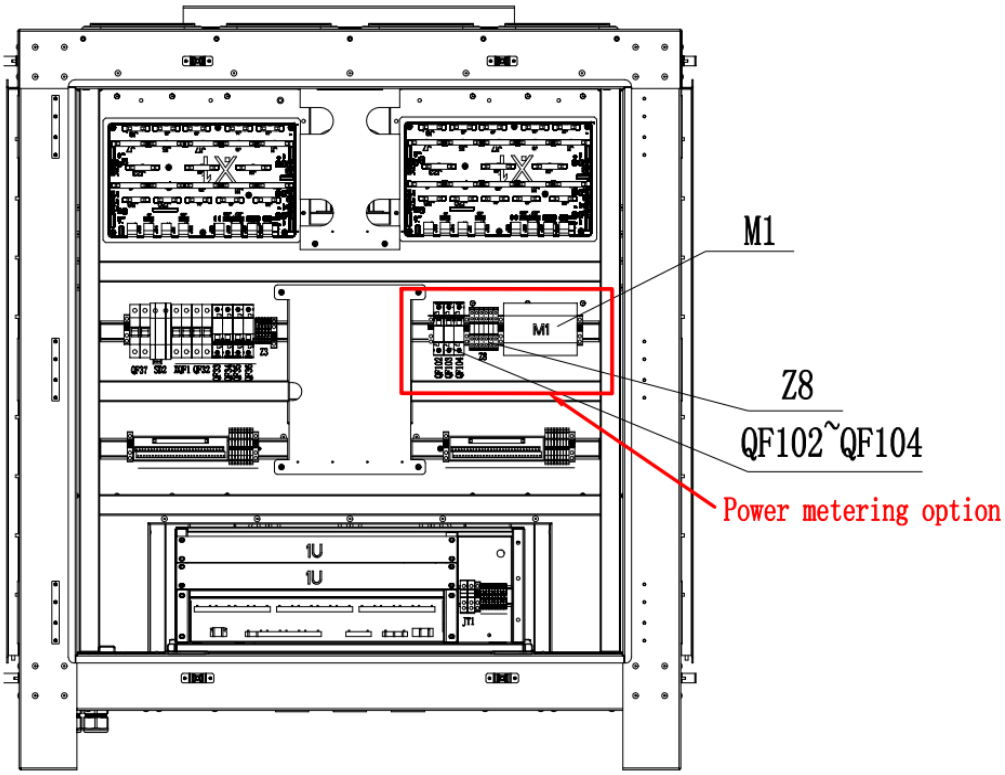


Figure 3-15 Installation location of the power metering option

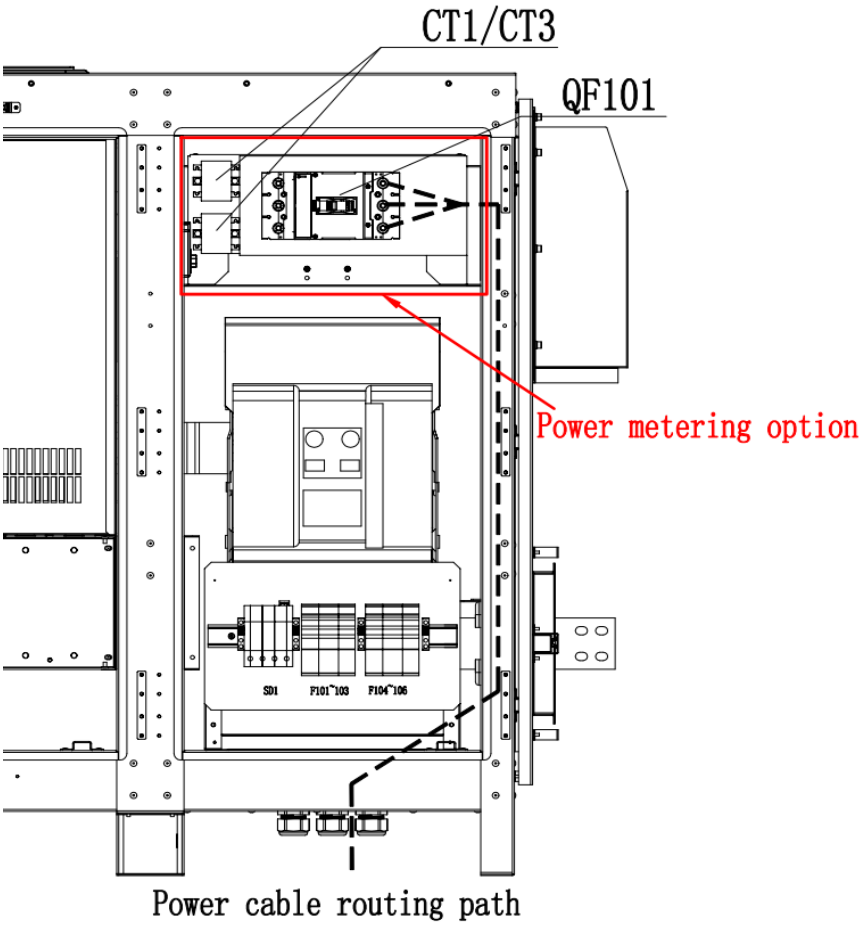


Figure 3-16 Power metering option switch mounting location

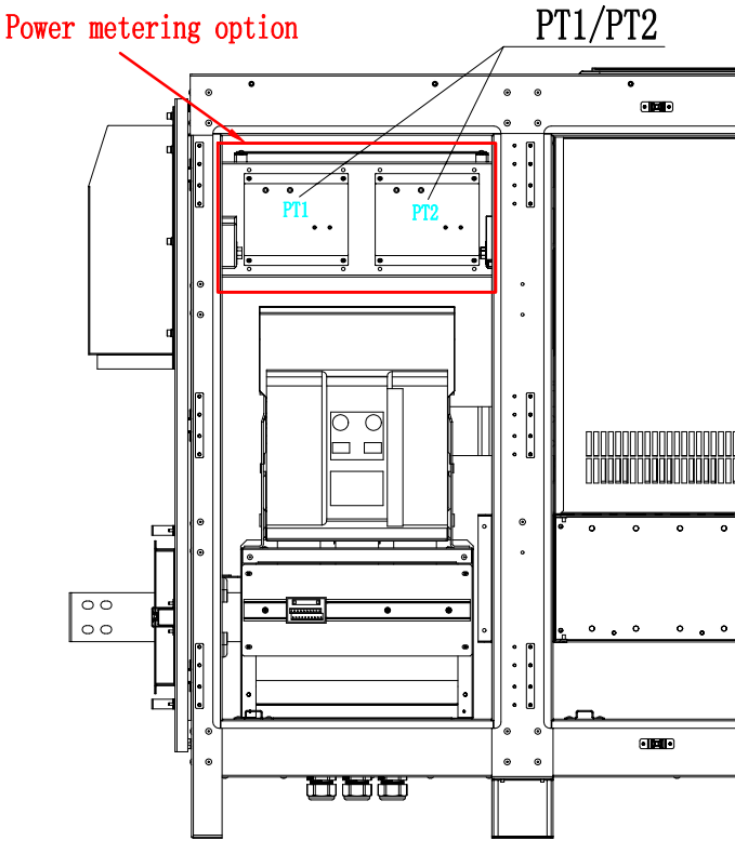


Figure 3-17 Power Metering Option PT Mounting Position

- The internal components of the power metering option are defined in Table 3-6 below.

Table 3-6 Functional Description of Internal Device in the power metering option

Tag	Functional Description
QF102~QF104	AC energy meter switch
M1	AC energy meter
Z8	Internal detection line adapter terminals
CT1&CT3	Current transformers
QF101	AC circuit breaker (100A,690V)
PT1&PT2	Potential Transformer

Note:

The power meter communicates with the energy management unit through RS485, and then uploads the relevant data to the monitoring center.

* The power metering is an optional accessory and will not be installed if the power metering is not selected.

To reduce auxiliary power consumption, this function is disabled by default and the meter

does not upload information. If this function needs to be enabled on site, the three cables tied to the lower left side of ACB # 1 should be connected to F104~F106 according to the markings.

3.6 Power on and off operations during maintenance and repair of integrated energy storage power stations

Note: Relevant operators must wear corresponding PPE, such as insulated gloves, goggles, safety gloves, helmets, and safety shoes, as shown in Figure 3-18;

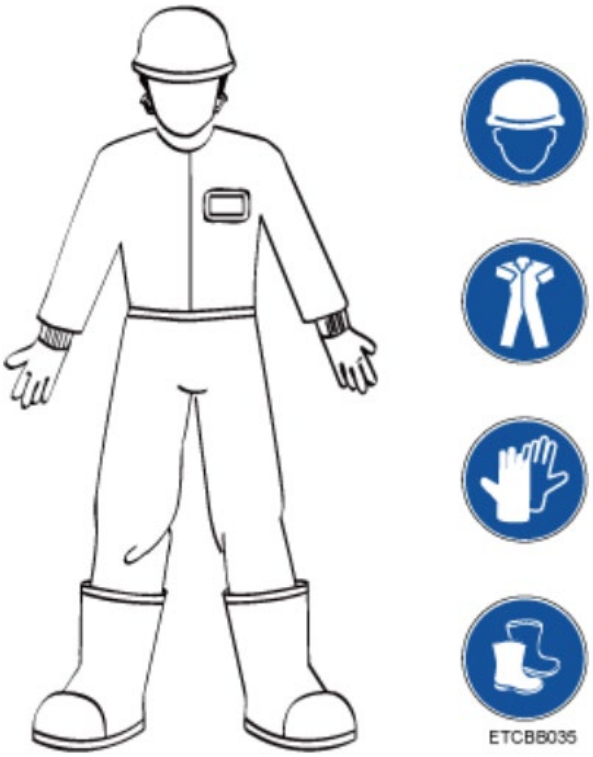


Figure 3-18 Schematic diagram of PPE required for power on and off operators

3.6.1 Preparation for power-on commissioning of all-in-one energy storage power station

3.6.1.1 Internal switch status check

Note: Check and confirm the switching status of the integrated energy storage power station before powering on.

Table 3-7 Switch Status Before Debugging

Serial Number	Tags	Switch Status
1	Medium voltage load switch	Disconnect
2	F101~F103	Disconnect
3	ACB#1ACB#2	Disconnect
4	QF1~QF20	Disconnect
5	MSD1~MSD40*	Close

6	F104~F106	Disconnect
7	SA1	EXT POWER Position
8	XQF1	Disconnect
9	QF32	Disconnect
10	QF33	Disconnect
11	QF34	Disconnect
12	QF35	Disconnect
13	QF36	Disconnect
14	QF37	Disconnect
15	QF101~QF104**	Disconnect

- After confirming the status of each switch in the above table, hang the warning sign of "debugging/repairing, prohibiting closing" at the operating position of the equipment, and provide its own padlock for ACB1# and ACB2# switches to prevent misoperation by other personnel;
- After the MSD1~MSD40 maintenance isolation switch is disconnected, please pay attention to keep it in a unified manner to prevent loss or damage during the subsequent commissioning process.
- ** QF101~QF104 is an option, Please refer to SLD.

3.6.2 Equipment Power on Operation Steps

Warning: Medium voltage operation (34.5KV) is involved in the process of powering the equipment, the operator must be carried out by professional electrical technicians who meet local specifications, and personal protection must be done during the operation, and the specific requirements of personnel can refer to the instructions in 2.2.3 above!!

✧ For projects with external power supply, the equipment powering process can refer to Figure 3-19, and the specific operating steps can be found in the instructions below!

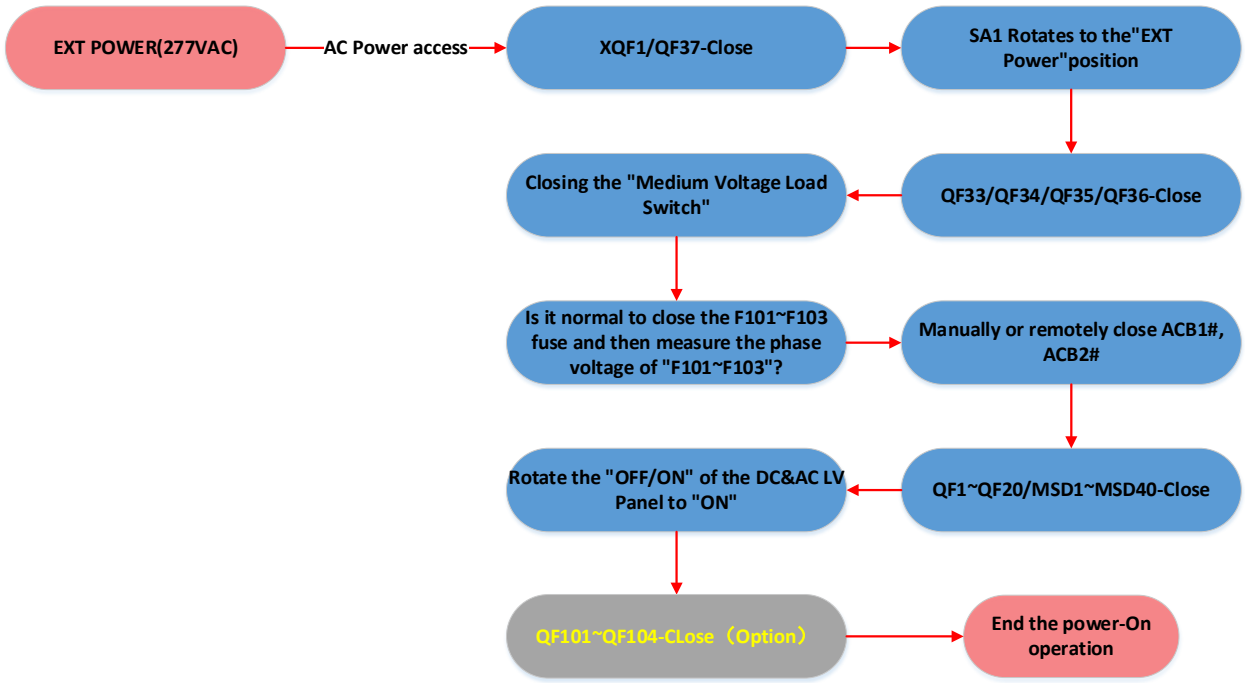


Figure 3-19 Equipment power on operation process-1#

- After the device is powered on normally, the power supply direction of the main power supply and auxiliary power supply is shown in the red line in Figure 3-20.

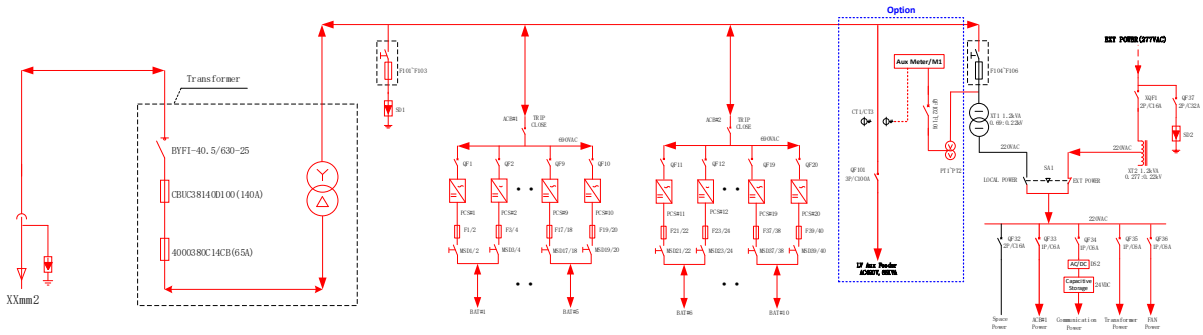


Figure 3-20 Power on state diagram -1#

1. Measure the input port JT1 terminal of the XQF1 switch using a multimeter and confirm that the input voltage is 277VAC;
2. Close the XQF1, QF37 switches;
3. Rotate the SA1 twist switch to the "EXT POWER " position;
4. Then close QF33, QF34, Q35, and Q36;
5. After the above steps are completed, wait for the equipment to power on normally and then close the primary side circuit breaker, load switch and F101~F103 fuse;
6. Close the oil immersed load switch of the American style box transformer to supply medium voltage power to the transformer, and test whether the AC low-voltage side voltage is normal (690VAC) with a multimeter after the load switch is closed, and the measurement position is F101~F103, as shown in the figure 3-21 below.

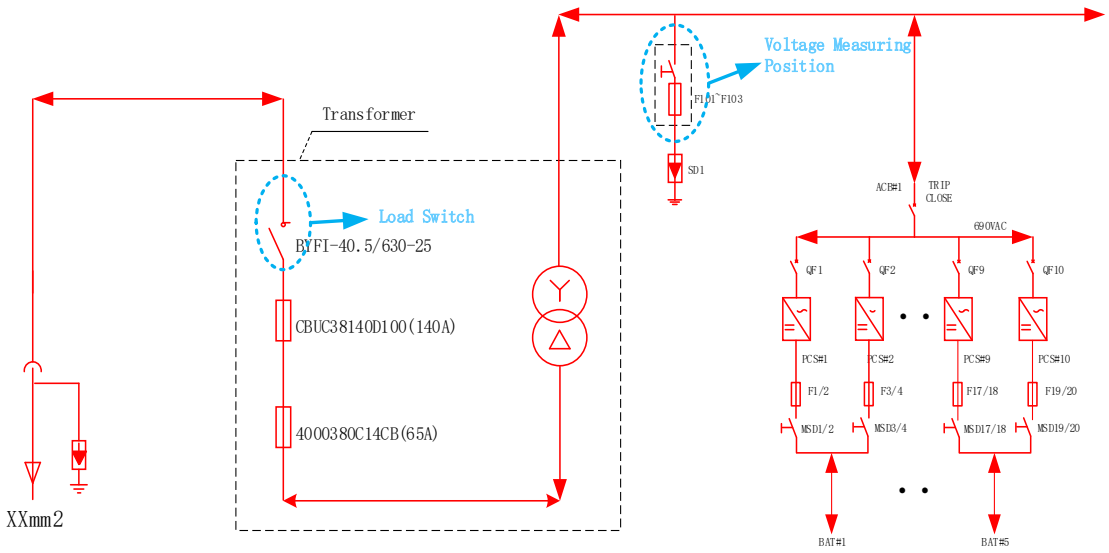


Figure 3-21 Schematic diagram of medium voltage load switch and low voltage fuse

7. After testing the normal voltage on the low-voltage side, the ACB1# and ACB2# switches can be closed remotely through backend operation;
8. Then manually close the QF1~QF16 circuit breaker on the AC side of the energy storage converter, and then confirm that the MSD1~MSD40 maintenance switch plug connector on the DC side is plugged in;
9. Finally, the "OFF/ON" rotary switch on the door panel of the DC&AC LV Panel is rotated to the "ON" state;
10. For integrated energy storage power stations with power metering options, please close the QF101~QF104 circuit breaker. If this option is not available, it can be skipped;
11. After the above power-on operation steps are completed, the start-up operation instruction can be issued through the monitoring background to wait for the normal operation of the PCS.

✧ **For projects without external power supply, the equipment powering process can refer to Figure 3-22, and the specific operating steps can be found in the instructions below!**

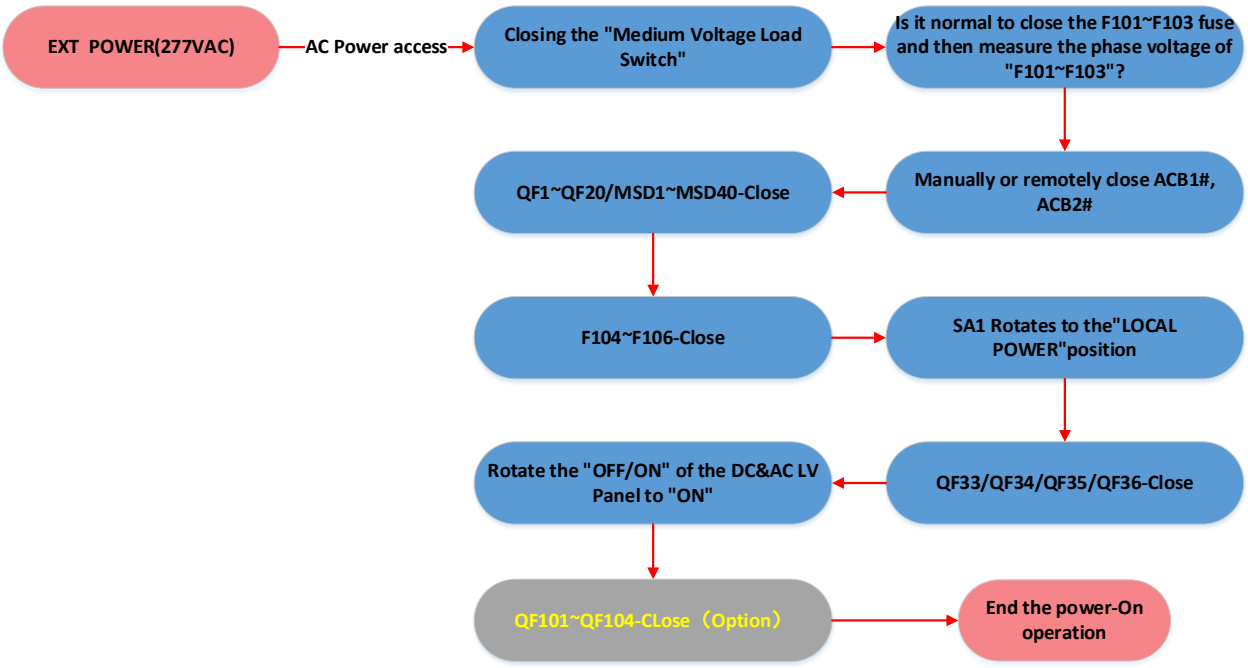


Figure 3-22 Equipment power on operation process-2#

1. After the device is powered on normally, the power supply direction of the main power supply and auxiliary power supply is shown in the red line in Figure 3-23.

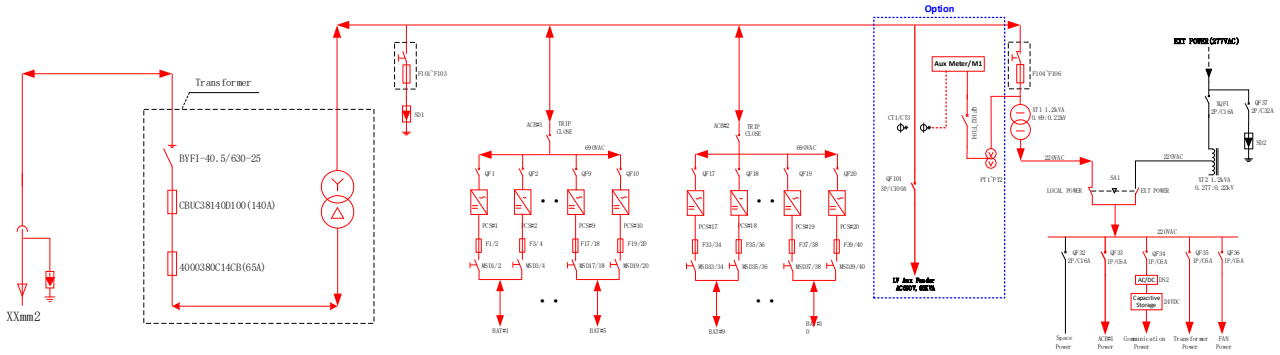


Figure 3-23 Power on state diagram -2#

2. Close the oil immersed load switch of the American style box transformer to apply medium voltage to the transformer. After the load switch is closed, close the F101~F103 fuses and use a multimeter to test whether the AC low-voltage side voltage is normal (690VAC). The measurement positions are F101~F103, as shown in Figure 3-21;
3. After testing the normal voltage on the low-voltage side, the ACB1# and ACB2# switches can be closed remotely through backend operation;
4. Then manually close the QF1~QF16 circuit breaker on the AC side of the energy storage converter, and then confirm that the MSD1~MSD40 maintenance switch plug connector on the DC side is plugged in;
5. Close F104~F106 fuses;

6. Rotate the SA1 twist switch to the " LOCAL POWER " position;
7. Then close QF33, QF34, Q35, and Q36;
8. Finally, the "OFF/ON" rotary switch on the door panel of the DC&AC LV Panel is rotated to the "ON" state;
9. For integrated energy storage power stations with power metering options, please close the QF101~QF104 circuit breaker. If this option is not available, it can be skipped;
10. After the above power-on operation steps are completed, the start-up operation instruction can be issued through the monitoring background to wait for the normal operation of the PCS.

* Note:

The complete primary schematic diagram of the all-in-one energy storage converter can refer to Appendix 2.

3.6.3 The integrated energy storage power station is powered off and operated

Warning: Medium voltage operation (34.5KV) is involved in the during the power-off equipment process , and the operator must be carried out by professional electrical technicians who meet local specifications, and personal protection must be done during the operation, and the specific requirements of personnel can be referred to the instructions in 2.2.3 above!

✧ **The power-off process of the integrated energy storage power station can be shown in Figure 3-24 below, and the specific operation steps refer to the instructions below!**

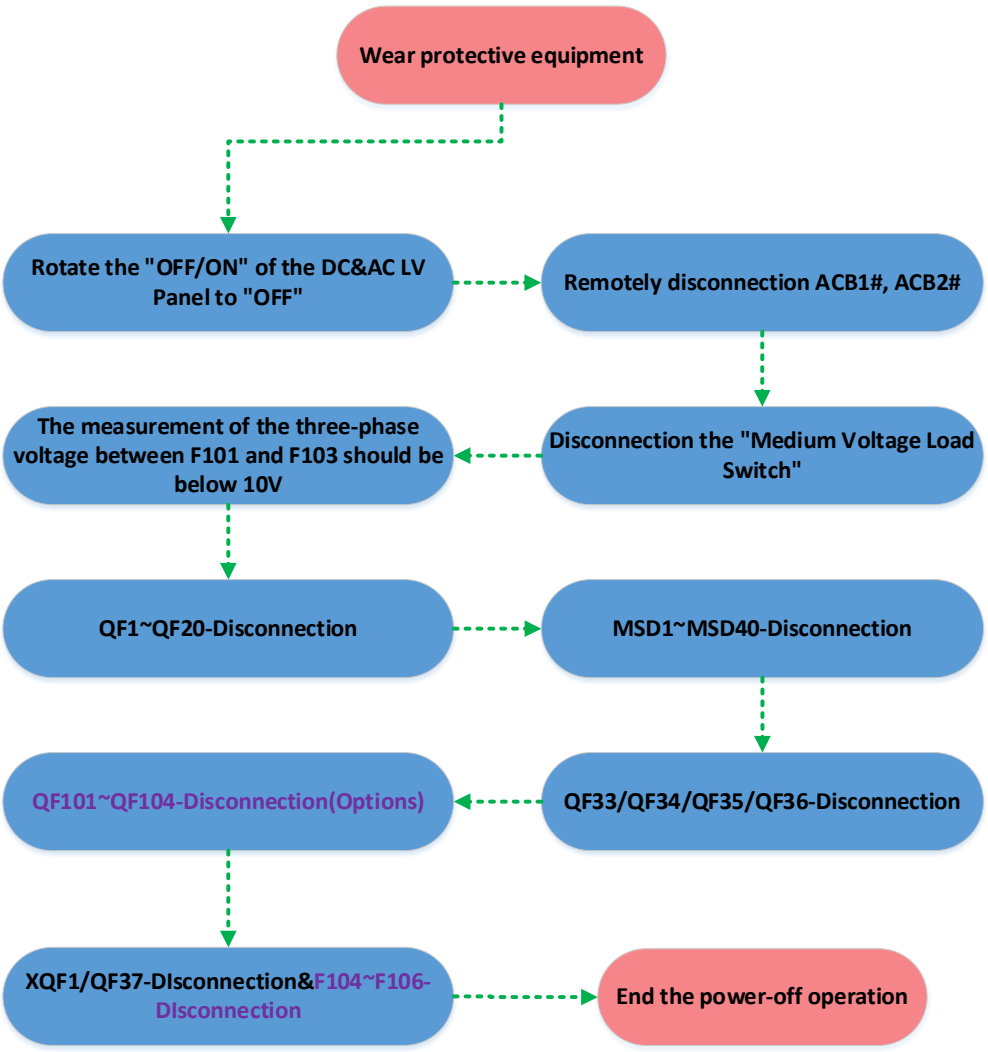


Figure 3-24 Equipment power off operation process

1. The energy storage converter can be shut down through the background remote shutdown instruction, or the "OFF/ON" rotary switch on the door panel of the DC&AC LV Panelcan be directly rotated to the "OFF" position for manual shutdown;
2. Through background operation, the ACB1# and ACB2# circuit breakers of the energy storage converter are disconnected;
3. Use a special tool to manually disconnect the medium-voltage load switch of the American box transformer;
4. After the medium voltage load switch is disconnected, test whether the three-phase voltage on the AC low voltage side is normal and lower than about 10V with a multimeter, and the measurement position is F101~F103, as shown in Figure 3-25 above;
5. The QF1~QF16 circuit breaker on the AC side and the MSD1~MSD40 maintenance switch on the DC side of the energy storage converter are manually disconnected (**Note: MSD1~MSD40 is an isolating**

switch that is forbidden to operate with electricity, with load, otherwise it will lead to arc pulling and endanger personal safety);

6. Then disconnect the QF33, QF34, QF35, and QF36 switches;
7. For integrated energy storage power stations with power metering options, please close the QF101~QF104 circuit breaker. If this option is not available, it can be skipped;
8. Finally, XQF1 and QF37 can be disconnected to complete the power-off operation of the integrated energy storage power station (**If it is a project without external auxiliary power supply, it is OK to directly disconnect the F104~F106 insurance**).

Note:

- The mechanical life of the MSD maintenance switch is 200 times, please do not plug and unplug frequently, it is recommended to only operate when the PSC module is powered on and off for the first time or when the PSC module is replaced, so as not to affect the service life of the MSD switch!
- In the process of replacing wearing parts and normal mcaintenance, whether it is necessary to turn off all power supplies of all integrated energy storage power stations needs to be judged according to the location and maintenance position of replacing wearing parts, and all integrated energy storage power stations can also be shut down for vulnerable device replacement and normal maintenance operations

4 Maintenance

Periodical maintenance can keep the Integrated energy storage power Stationin optimized state and will prolong its service life.

4.1 Cautions

1. Ensure that the system is not powered on before maintaining the integrated energy storage power station and operate according to the following prompted information:
2. Control the Power Conversion System / Medium voltage output load switch disconnected from the power grid;
3. Disconnect the integrated energy storage power station from the main circuit of the front-end battery cabinet;
4. Finally, disconnect all secondary equipment switches in the low-voltage cabinet;
5. After completing the above operations, wait for 5min, and you can maintain transformer cabin and LV cabin.

Note: During maintenance, it is recommended to use multimeter to measure the voltage of the metal parts that may be touched to avoid electric shock

4.2 Maintenance Cycle

The maintenance cycle of integrated energy storage power station is described in Table 4-1.

Table 4-1 Maintenance Cycle of station

Cycle	Maintenance items
6 months after power-on and commissioning, then every 2 years.	Check electrical connections.
2 years	Clean power cables.
Every 6 months (depending on the contents of dusts in the environment).	Clean dust filter.
Every 3-5 years (depending on the contents of dusts in the environment).	Replac dust filter.
Every 10 years (According to the use environment).	Repair fans*
Every 6 months	Check the appearance of the equipment, the ventilation and airtightness of the equipment room
Every 6 months	Check the operation and historical

	parameters of the PCS
Every 6 months	Measuring power cable temperature rise
Every 12 months	Power connection reliability check and calibration
It depends on the actual situation of the energy storage converter module	Repair and replacement of PCS modules
Note*: Maintenance includes all cooling fans.	

4.3 Check electrical connections

Periodically check if the electrical connections are firm and reliable Pre-fabricated Power station six months after power-on and commissioning, then check every two years.

The positions to be checked:

1. Before maintenance, ensure that all power sources are disconnected (including the high-voltage load switch of the medium voltage transformer, pay attention to personal protection before operation) to avoid electric shock;
2. Check whether the connection of the medium voltage cable on the side of the medium voltage transformer is reliable, whether the bolts of the cable connection are loose, and whether there are any phenomena such as melting, blackening, corrosion, etc; If the above situations occur, please tighten the bolts in a timely manner or replace them with bolts of the same specification;
3. Check whether the DC side copper bars and cable connections in the DC&AC LV Panel are reliable; Whether the screws connecting the cables are loose, whether there are melting, blackening, corrosion, and other phenomena; If the above situations occur, please tighten the bolts in a timely manner or replace them with bolts of the same specification;
4. Check whether the connection of the low-voltage signal cable in the DC&AC LV Panel is reliable, and whether the communication cable is loose. If the cable is loose, please tighten it in a timely manner.

4.4 Clean Power Cables

Be sure to clean the power cables after integrated energy storage power station have been put into operation for 2 years.

When cleaning the power cable, pay attention to the following:

1. Ensure that all power sources are turned off before maintenance (including the high-voltage load switch of the medium voltage transformer, pay attention to personal protection before operation) to avoid the risk of electric shock;
2. To avoid the rust at the cable connection part, do not use conductive liquid such as water to clean power cables, and do not use any wet cloth to clean the connectors of the power cables;

3. Use dry cloth or brush to clean the dusts from the insulation coat of the power cables, and use dry brush to clean the metal connector and fixing screws;
4. The dusts on the copper bus that connects to the power cables and the magnetic component interface also need to be cleaned away;
5. If any fixing bolts rust, please replace them in a timely manner

4.5 Cleaning/Replacement dust-proof cotton

After the integrated energy storage power station is put into operation for 6 months, it is necessary to clean the dust proof cotton in the DC&AC LV Panel, PSC module inlet area, and low-voltage copper busbar box of the integrated energy storage power station. After 3-5 years of operation, it is necessary to replace all dust proof cotton in the DC&AC LV Panel, PSC module inlet area, and low-voltage copper busbar box of the integrated energy storage power station (**The cycle of cleaning and replacing the dustproof cotton needs to be determined according to the dust situation on site**).

When cleaning and replacing dust-proof cotton, pay attention to the following:

1. Ensure that all power is turned off before cleaning and replacing the dust-proof cotton to avoid the risk of electric shock;
2. Dust-proof cotton includes: DC&AC LV Panel, The air inlet area of the PSC module of the integrated energy storage power station and low-voltage copper busbar box;
3. Open the front and rear four door panels inside the DC&AC LV Panel, remove the fixed parts of the Dust-proof cotton A on the inner side of the door panels, and then remove the Dust-proof cotton for cleaning and replacement. After completion, install the Dust-proof cotton on the door panel and fix it with the removed structural components (**The dustproof cotton can be replaced according to the situation if it has been in operation for 3~5 years**), as shown in Figure 4-1;

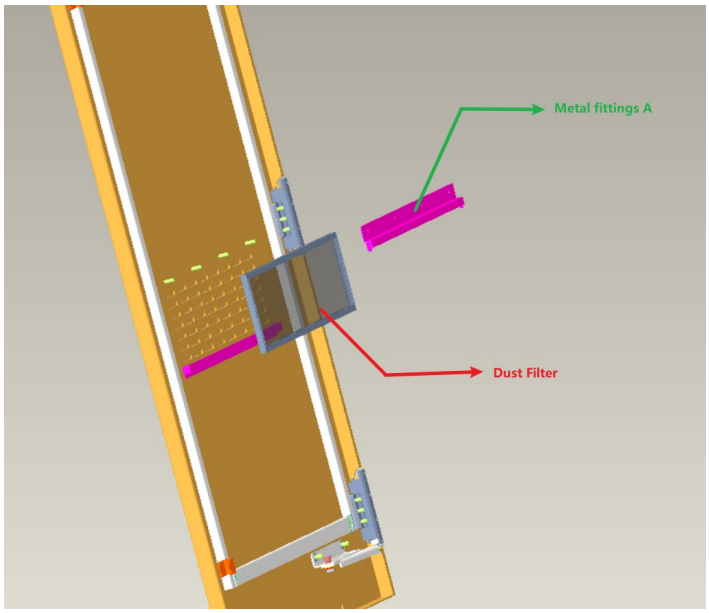


Figure 4-1 Schematic diagram of replacing dust-proof cotton in DC&AC LV Panel

4. Remove the 4 screws of the dust-proof cotton fixing structural parts at the air outlet of the DC&AC LV Panel cooling fan, and then directly pull out the dust-proof cotton structural parts, as shown in Figure 4-2 below.

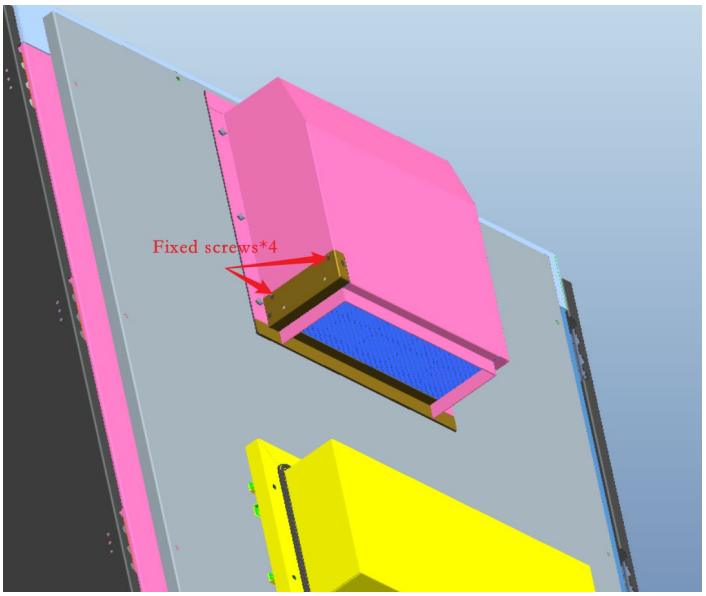


Figure 4-2 Schematic diagram of dismantling dustproof cotton structural components-1

5. After removing the dust-proof cotton structural components, remove the internal dust-proof cotton for cleaning and replacement. After completion, install the dust-proof cotton structural components in their original positions, as shown in Figure 4-3 below

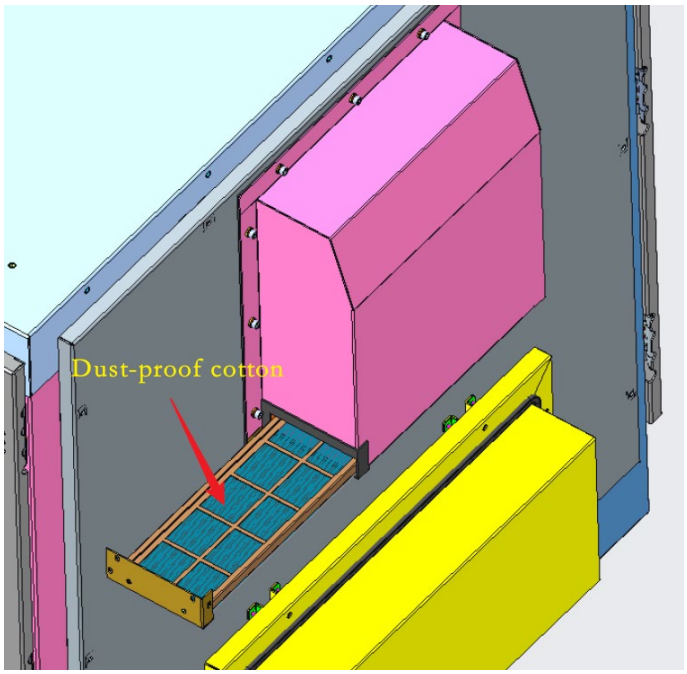


Figure 4-3 Schematic diagram of dismantling dustproof cotton structural components-2

6. Remove the 10 baffles in the air inlet area below the PCS module of the integrated energy storage power station, each baffle is fixed by 6 screws, and the baffles can be removed by directly removing the screws, as shown in 4-4 below;

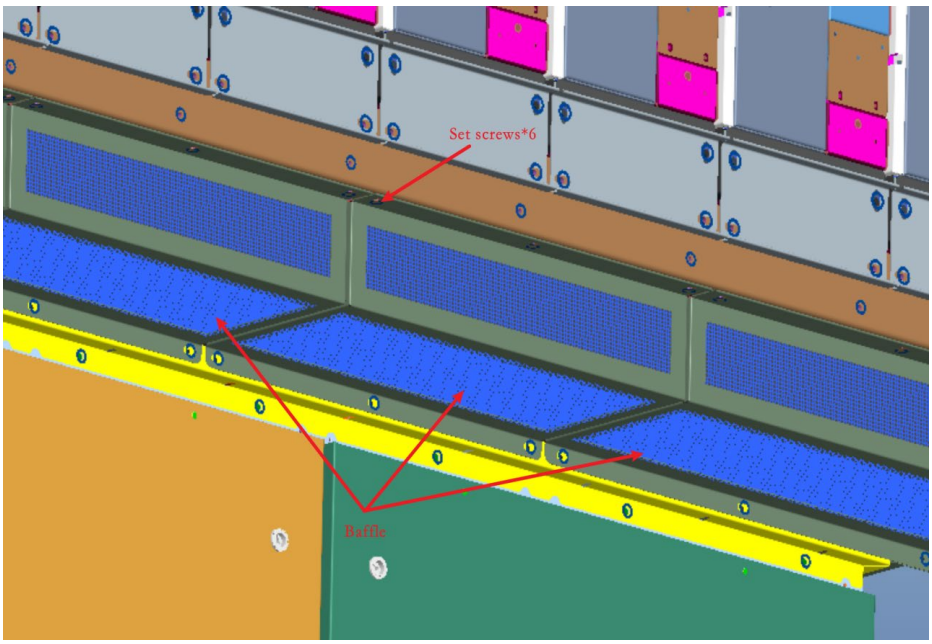


Figure 4-4 The baffle in the air inlet area below the PCS module

7. Remove the dust proof cotton from the inside of the removed baffle for cleaning and replacement. After completion, install the dust proof cotton on the inside of the baffle. Finally, install the baffle in its original position (The dustproof cotton can be replaced according to the situation if it has been in operation for 3~5 years), as shown in Figure 4-5 below;

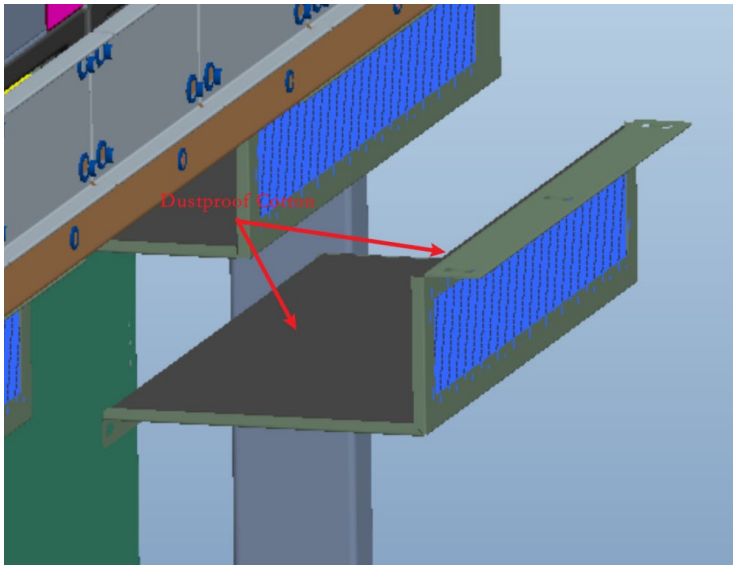


Figure 4-5 Installation location of dust-proof cotton

8. Remove the 8 screws of the isolation baffle on the left side of the low-voltage copper bar bridge, remove the isolation baffle and put it in one place, then remove the 4 fixing screws of the bridge cover, and pull the cover to the low-voltage cabinet side until the dust-proof cotton can be operated.as shown in Figures 4-6 and 4-7 below;

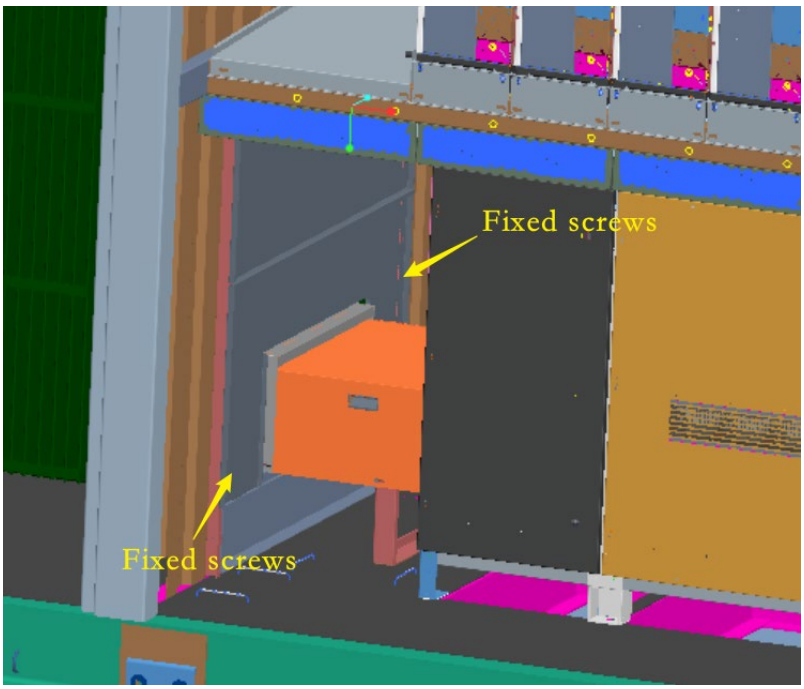


Figure 4-6 Schematic diagram of dismantling the isolation baffle

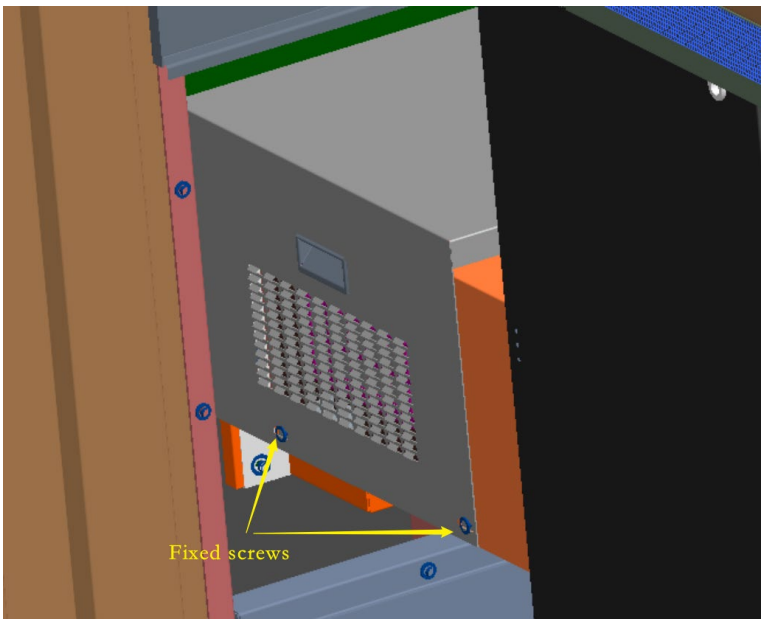


Figure 4-7 Schematic diagram of dismantling the outer cover

9. Remove the dust-proof cotton for cleaning and replacement (the dust-proof cotton is fixed on the 4-tooth binding net bar), then fix the dust-proof cotton on the binding net bar after completion, and finally restore all the removed structural members, as shown in Figure 4-8 below;

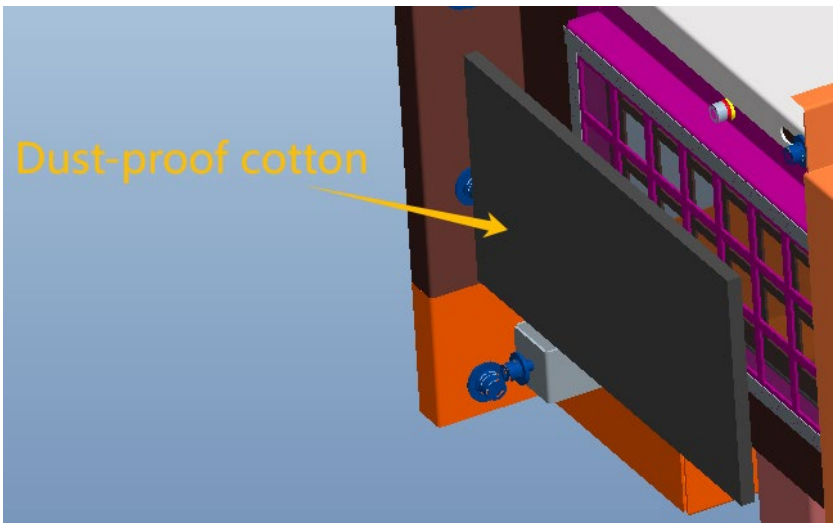


Figure 4-8 Schematic diagram for replacing dust proof cotton

Explain: According to the on-site operation situation, clean the dust-proof cotton every 6 months. If any damage is found to the dust-proof cotton, please replace it in a timely manner. Our company is not responsible for any quality problems caused by failure to replace the dust-proof cotton in a timely manner.

4.6 Replace the fan

After the integrated energy storage power station is put into operation for 10 years, the fans in the PCS module and DC&AC LV Panel need to be replaced (**Whether the fan must be replaced on a regular basis needs to be determined according to the actual usage**)

Pay attention to the following points when replacing the fan:

1. Before replacing the fan assembly of the DC&AC LV Panel and the fan assembly of the PCS module, please ensure that all power supplies are turned off to avoid the risk of electric shock;
2. The work of replacing the fan includes: dismantling and installing the fan components of the DC&AC LV Panel and PCS module, dismantling and tightening the screws, and removing and connecting the quick plug terminals of the fan;
3. Replacement of DC&AC LV Panel fan components: directly remove the fan outlet elbow, remove the internally installed fan components, and then remove the fan plug-in terminals to remove the fan, as shown in Figure 4-9 below;

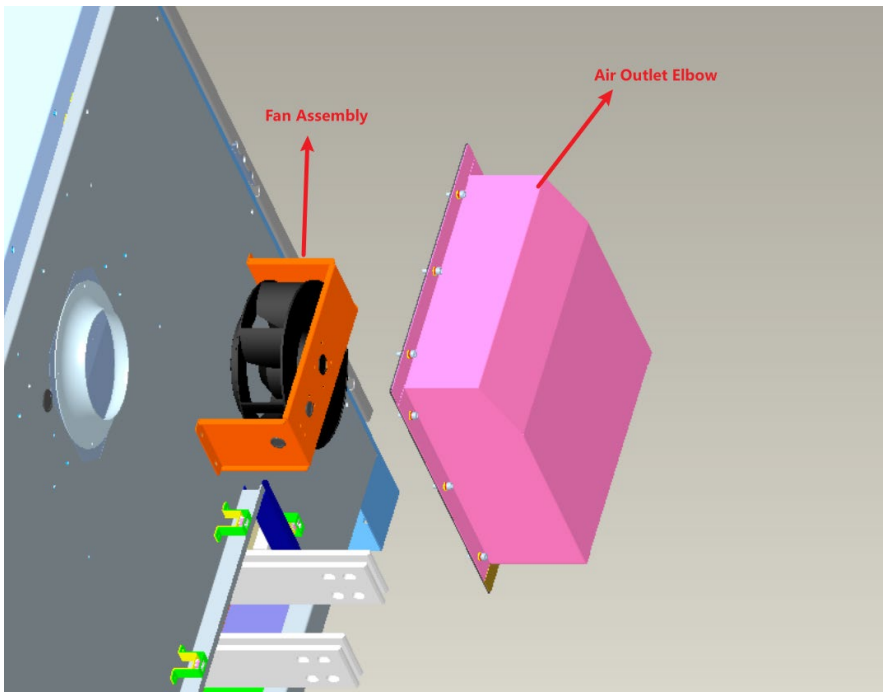


Figure 4-9 Schematic diagram for replacing the fan components of the DC&AC LV Panel

4. Replacement of PCS module fan component: directly remove the fastening screw at position A of the PCS module fan component, then use a screwdriver to pull out the fan component 150mm from position B. Then remove the corresponding plug-in terminal of the fan to remove it, as shown in Figure 4-10 below;

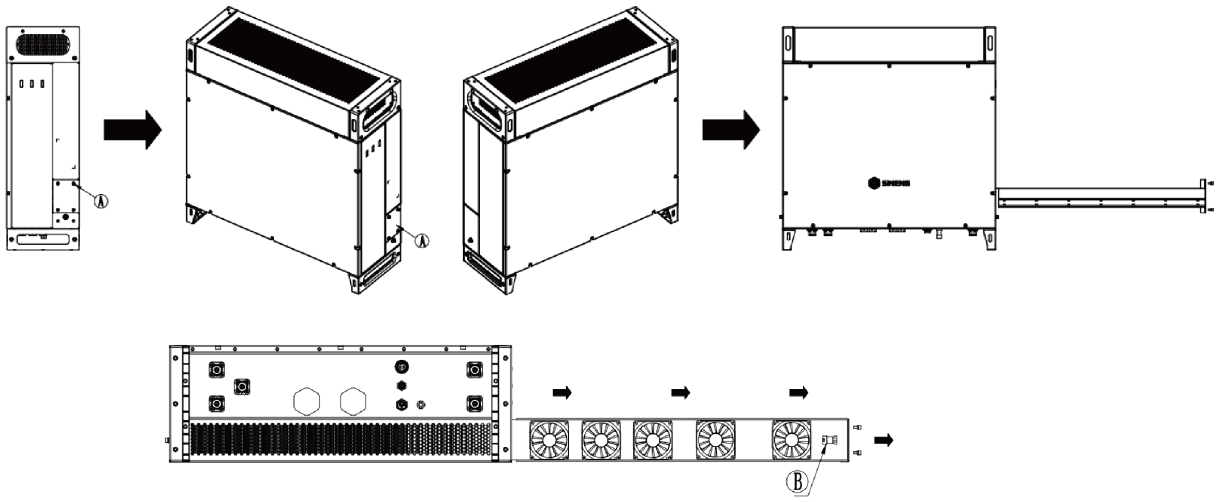


Figure 4-5 Schematic diagram of replacing the fan component of the PCS module

4.7 Check the appearance, ventilation, and airtightness of the equipment

After the integrated energy storage power station is put into use for 6 months, it is necessary to inspect its appearance and the ventilation and airtightness between the equipment.

Pay attention to the following points during inspection:

1) Check the appearance of the equipment for obvious deformation, dents, cracks, and rust;

2) Check if there are foreign objects blocking the air ducts at the inlet and outlet of the DC&AC LV Panel and PCS module;

3) Check whether the waterproof adhesive strip of the front and rear door panels of the DC&AC LV Panel is cracked or detached.

Explanation: If there are any abnormal situations during the above inspection, please handle them in a timely manner to prevent converter failures caused by prolonged inactivity.

4.8 Check PCS operation and historical parameters

After the integrated energy storage power station is put into use for 6 months, it is necessary to check the operation and historical parameters of the PCS.

- Through the monitoring backend of the power station or our company's monitoring backend, check the real-time data of the operating PCS to see if there are any abnormalities in voltage, current, power, power factor and other related data. In addition, check its historical records to see if there are any abnormal alarms or faults.

4.9 Measure the temperature rise of power cables

After 6 months of operation of the integrated energy storage power station, it is necessary to conduct temperature rise checks on the PCS DC and AC power cables.

Pay attention to the following points during inspection:

1. Use a thermal imaging analyzer to scan the DC and high-voltage cables of the operating PCS, and check if the temperature of the DC and AC power cables of the equipment is abnormal. If any abnormal temperature of the power cables is found, please handle it in a timely manner to prevent major faults from occurring;
2. For abnormal temperature rise of power cables, please ensure that all power sources are turned off when handling faults to avoid the risk of electric shock.

4.10 Power Connection Point Reliability Check

After 12 months of operation of the integrated energy storage power station, it is necessary to inspect the connection points of the DC side power cables in the DC&AC LV Panel.

Pay attention to the following points during inspection:

1. Before checking the DC side cable connection points inside the DC&AC LV Panel, please ensure that all power sources are turned off and take personal protective measures to avoid the risk of electric shock;
2. After ensuring that all power sources are turned off, use tools to calibrate and inspect the torque of the connection point bolts.

Warning: Before calibrating the power connection point, make sure to turn off the DC and AC power sources, otherwise it may cause danger!

4.11 Repair and replacement of PCS modules

For the operation steps of the maintenance and replacement of the energy storage converter module, please refer to Annex

5 Field test items of each equipment (Reference)

5.1 PCS Module

The user manual of PCS module in the actual project shall prevail.

5.2 Transformer

The detailed specifications of the transformer can be found in the separate user manual, and only some of the instructions are described below, The transformer is provided in a separate user manual along with the equipment.

5.2.1 Transformer inspection/maintenance before installation/commissioning, and maintenance after operation

Transformer inspection/maintenance cycle:

1. Transformer should be checked and maintained before putting into operation;
2. The transformer in operation shall be inspected and maintained one year after installation and use, then the time interval can be changed once every two years. (For poor operating conditions, such as heavily polluted areas, the maintenance interval will be reduced accordingly).

5.2.2 Main Components

Main components of the transformer are shown in the figure 5-1 below

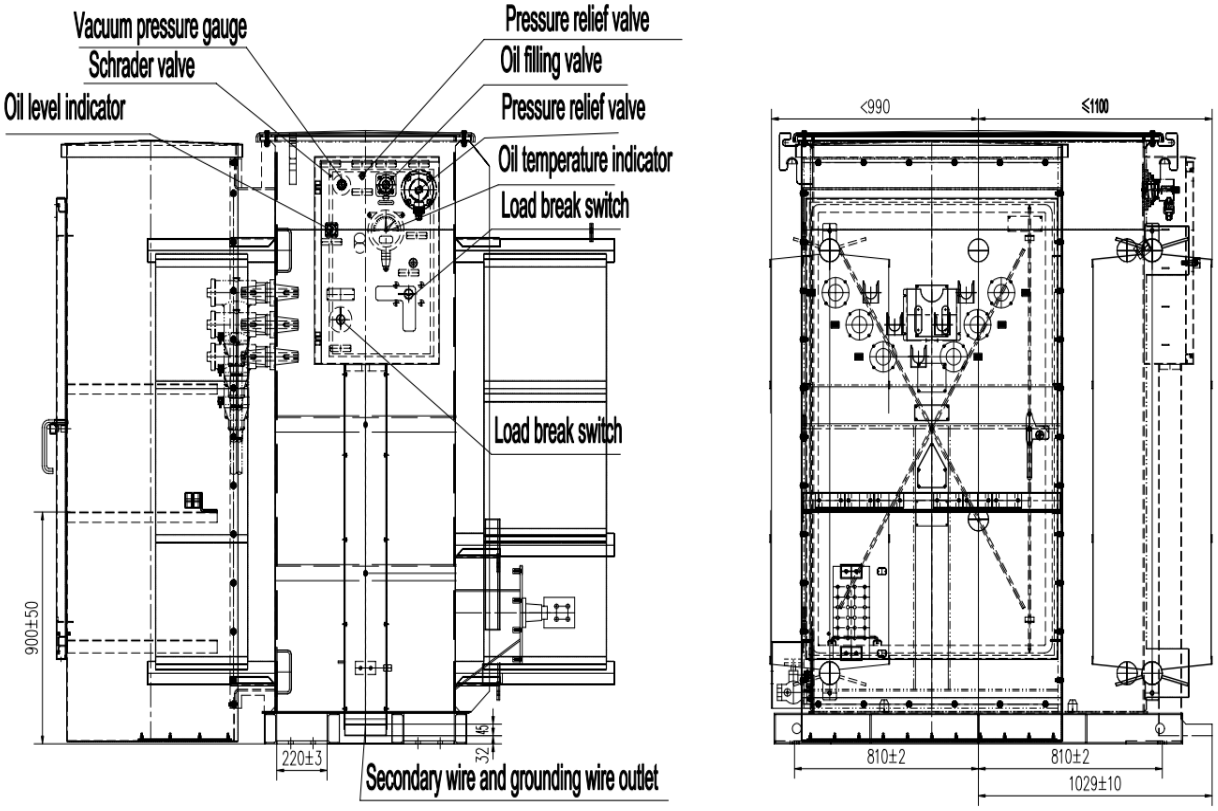


Figure 5-1 transformer components

Table 5-1 Transformer component names

No.	List of main accessories
1	Vacuum pressure gauge
2	Schrader valve
3	Oil level indicator
4	Pressure relief valve
5	Oil filling valve
6	Pressure relief valve
7	Oil temperature indicator
8	Load break switch
9	Load break switch
10	Secondary wire and grounding wire outlet
11	Off-load tap changer
12	Oil drain valve

5.2.3 Transformer weight and oil weight

ExplainFR3 Oil Density: 0.92 gm/cm (7.677 lb/gal)

Table 5-2 Transformer weight

Description	Untank weight	Oil weight	Toal weight
EH-3200-HA-MR-US-34.5	4050 kg/8929 lbs	1570 kg/3461 lbs	7830 kg/17262 lbs
EH-4000-HA-MR-US-34.5	3701 kg/8160 lbs	1769 kg /3900 lbs	8192 kg/18060 lbs
EH-4300-HA-MR-US-34.5	3960 kg/8730 lbs	1910 kg /4210 lbs	8768 kg/19330 lbs

5.2.4 Medium voltage cable connection area

Connection area for the medium-voltage cables are shown in the following figure 5-2 below.

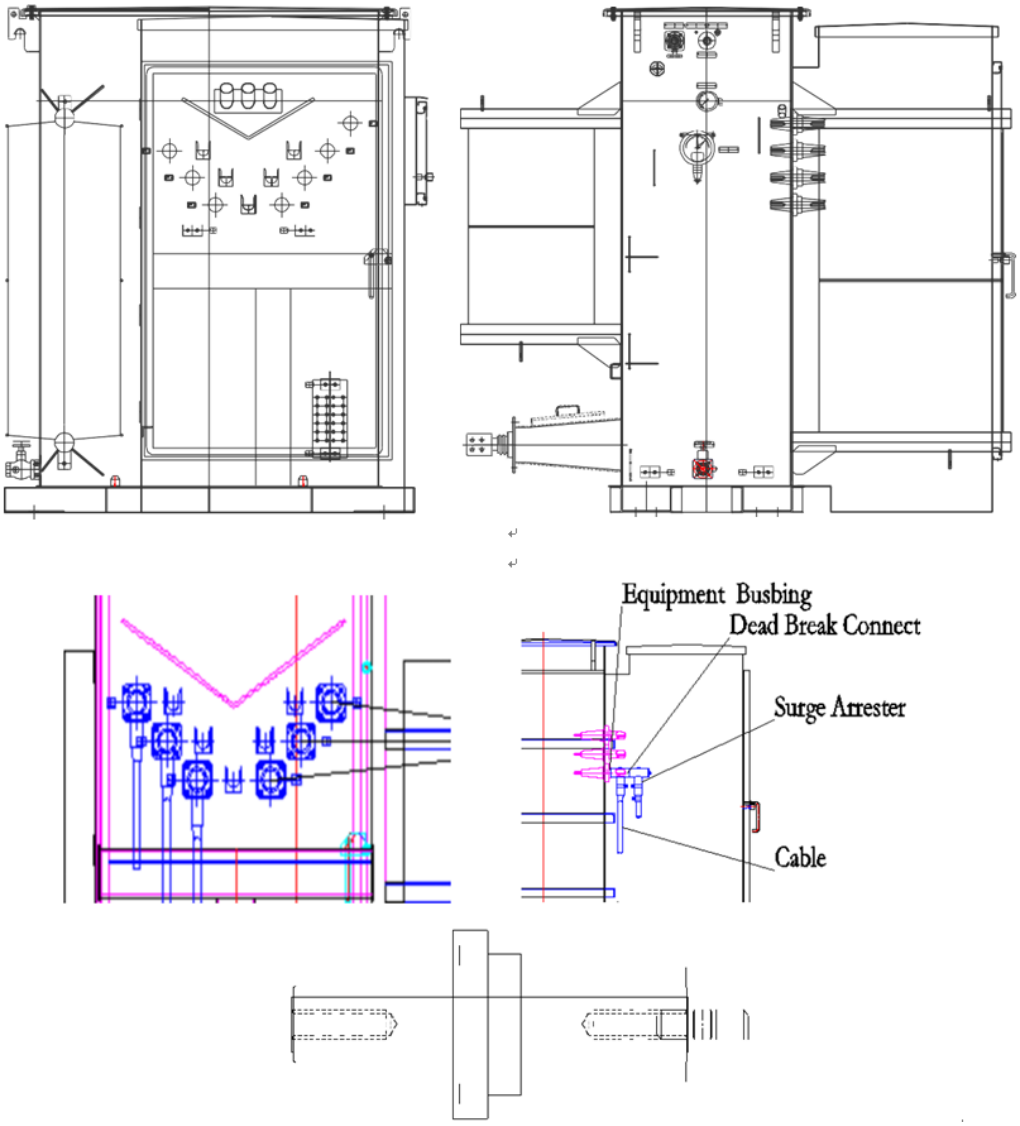


Figure 5-2 Medium voltage cable area

Note: The connection stud of the bushing is 5/8in-11UNC-28 and is made of copper. It is recommended to use copper material when connecting the bushing. The medium-voltage cables must be fitted with type C connection plugs.

5.2.5 Cable connection procedure

Rotate threaded pin into bushing nut eye until bottom, As shown in Figure 5-3 below;

Note: The twin-head screw is made of copper. Tin cerium coating!

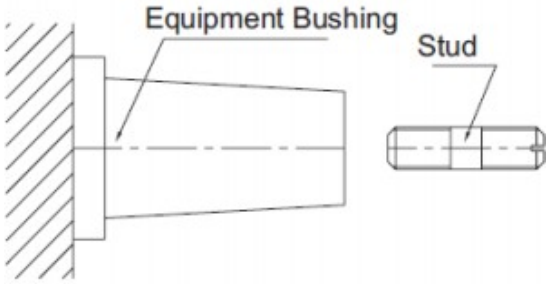


Figure 5-3 Cable installation 1

Clean cable adapter and dead break connector . Lubricate cable adapter outer surface, dead break connector inner surface,. Insert compression connector into dead break connector. Until compression connector eye is in the centre of dead break connector, As shown in Figure 5-4 below;

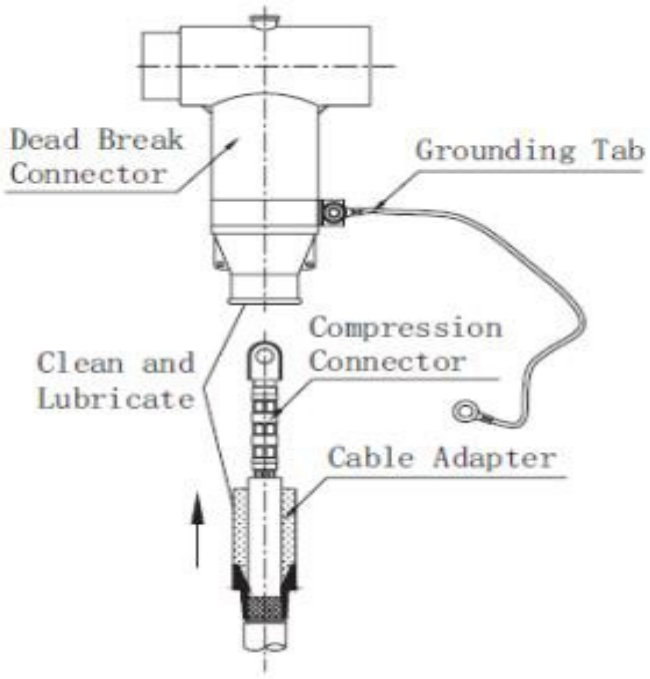


Figure 5-4 Cable installation 2

Clean and lubricate the bushingthen install the dead break connector, As shown in Figure 5-5 below;

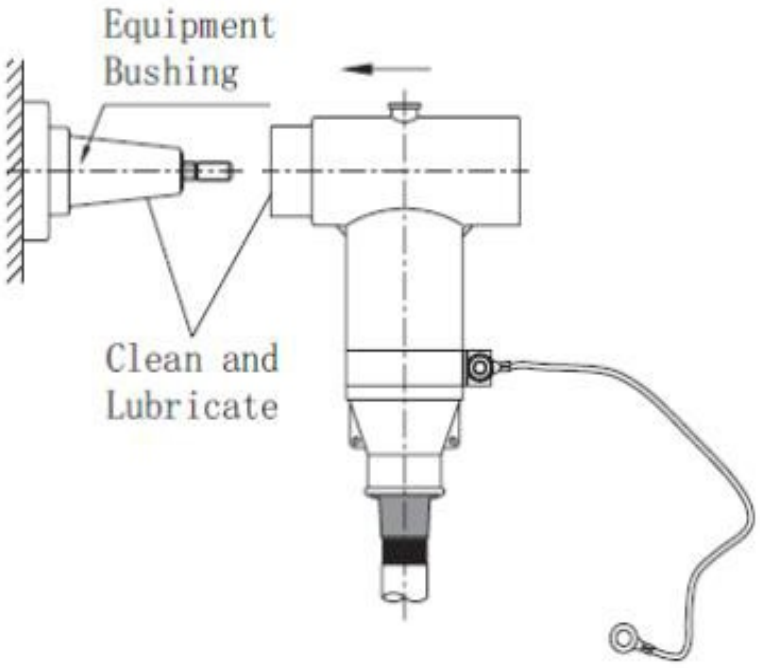


Figure 5-5 Cable installation 3

Install the back cap, As shown in Figure 5-6 below;

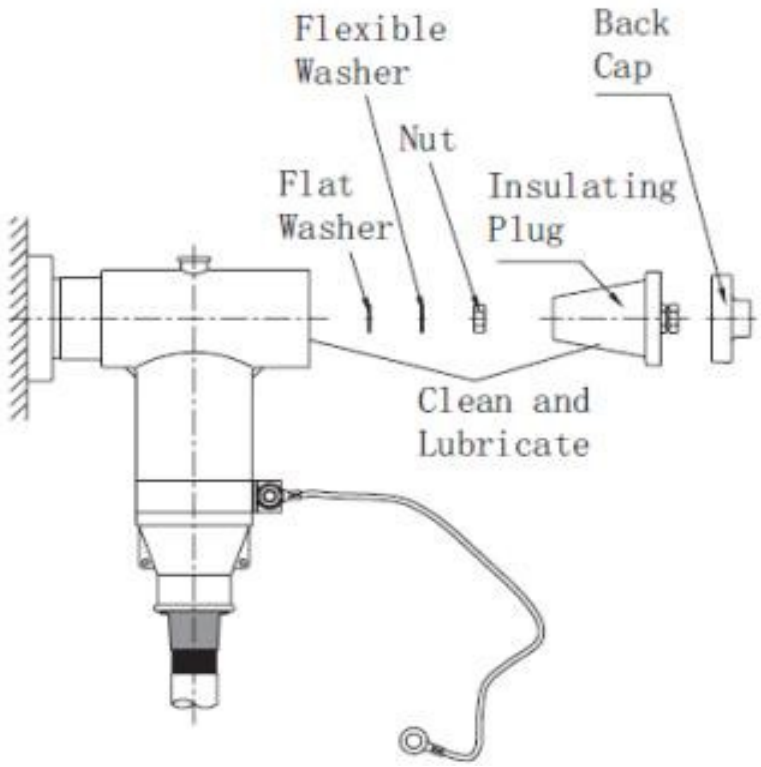


Figure 5-6 Installing the back cover

Connect the coupling adapter casing to cable adapter, As shown in Figure 5-7 below;

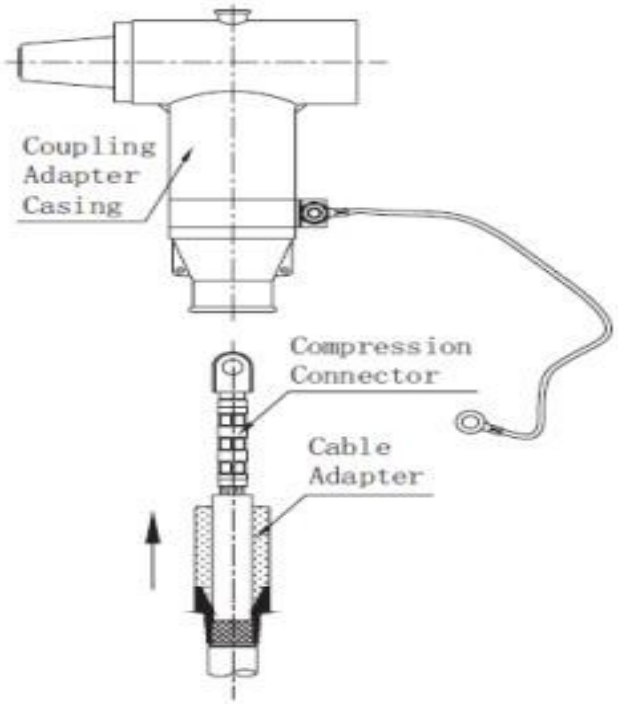


Figure 5-7 Connect the coupling adapter

Install the connecting bolt, As shown in Figure 5-8 below;

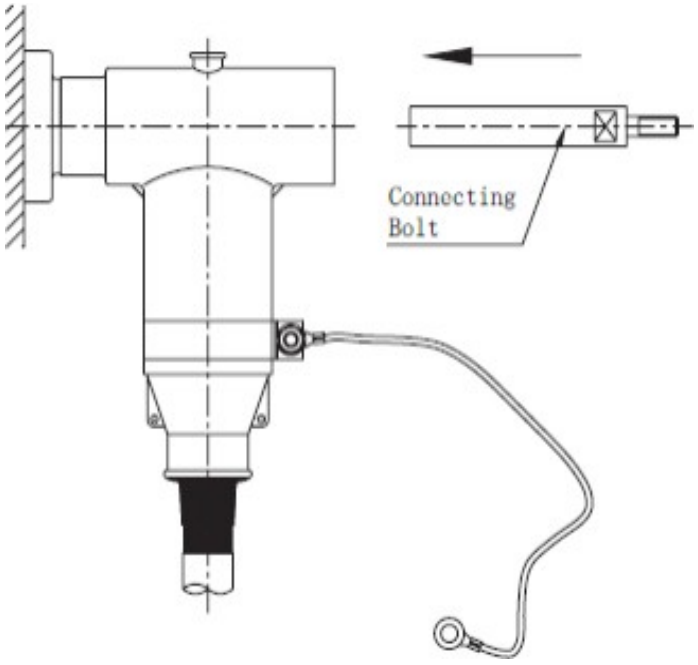


Figure 5-8 Install bolt

Clean and lubricate dead break connector, coupling adapter and insulating plug, then connect them, As shown in Figure 5-95-105-11 below;

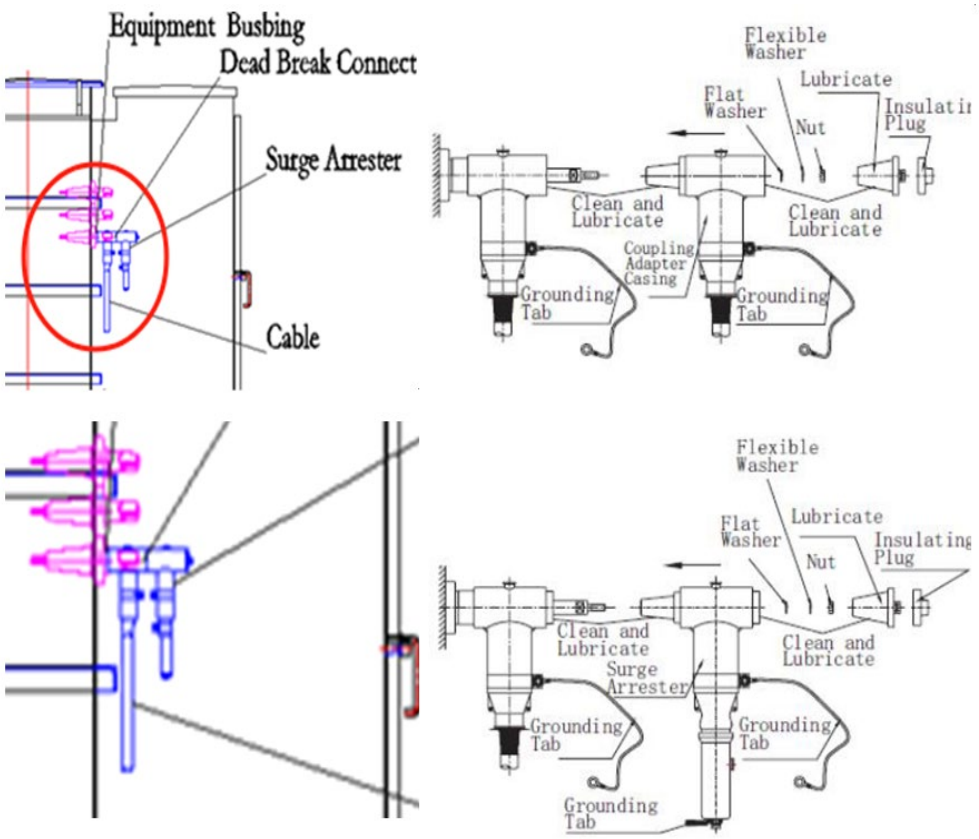


Figure 5-9 Cable assembly

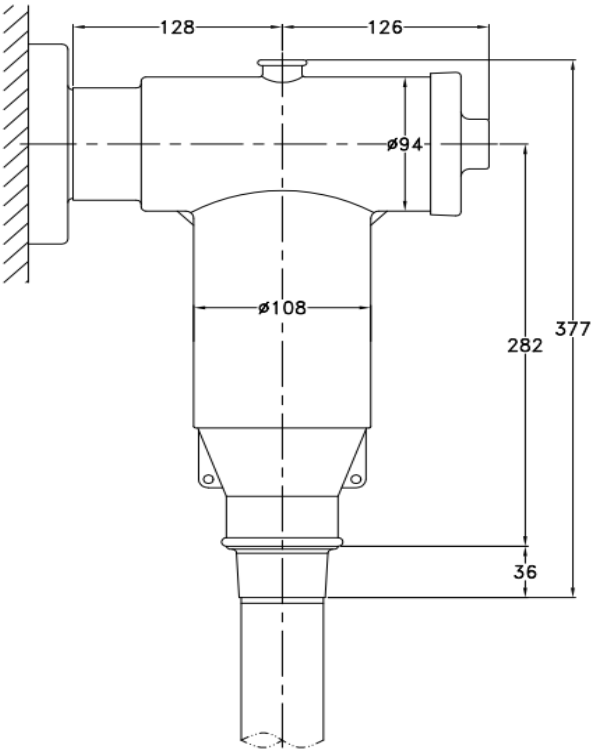


Figure 5-10 Pad-mounted version MV bushing front connector(Dead Break Connect)

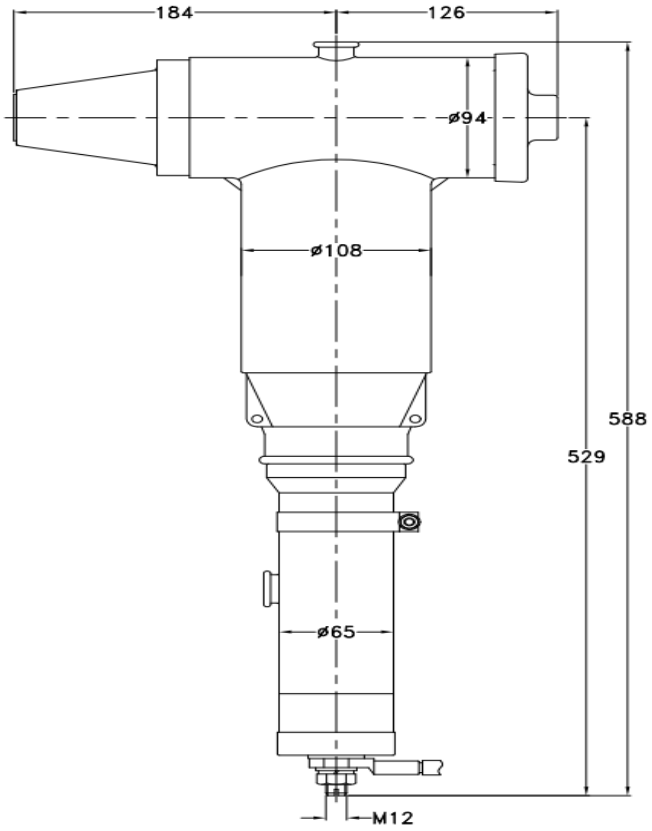


Figure 5-11 Follow-up arrester(Surge Arrester)

5.2.6 American box transformer medium voltage AC terminal installation and stacking terminal installation space and spacing

The installation position of the medium voltage AC terminal is shown in Figure 5-12 below.

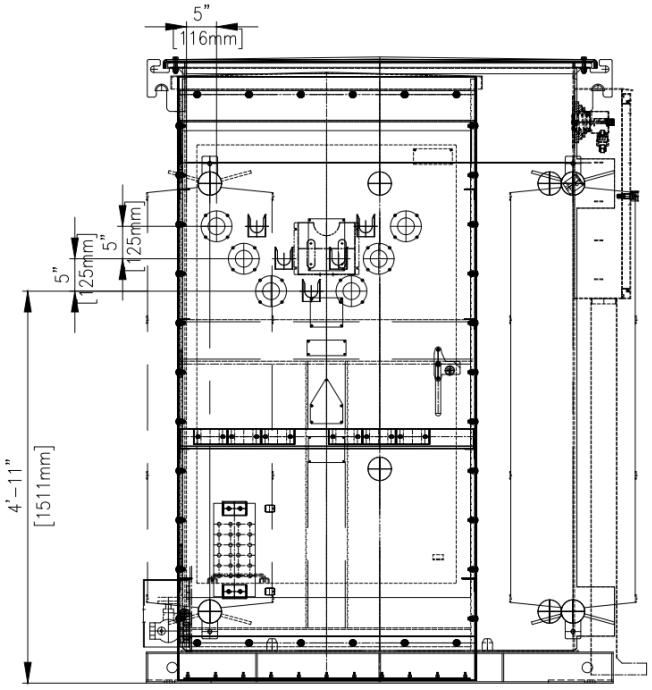


Figure 5-12 MV AC Terminals installation location

The installation space and spacing of the stacked terminals are shown in Figure 5-13 below.

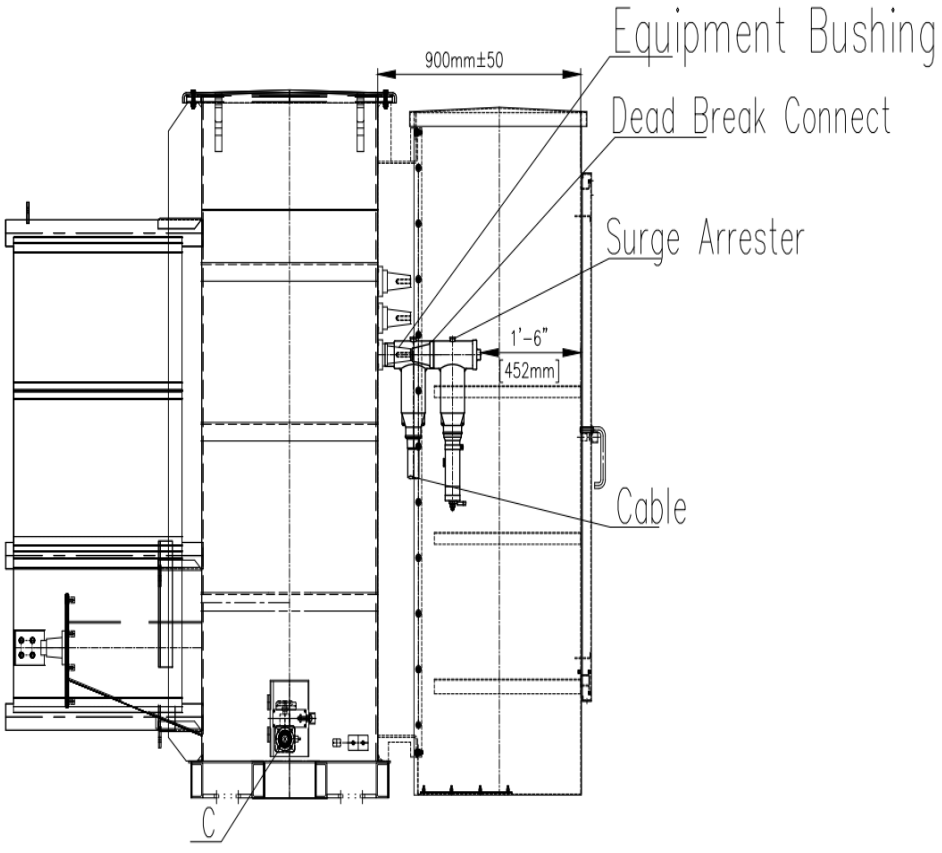


Figure 5-13 Stacked terminals Installation space and margin

6 Parts to be installed on the construction site

After the foundation of the all-in-one machine is fixed on the site, other accessories need to be installed. The accessories have been supplied to the site along with the equipment. If you have any questions, please contact the engineers of Sineng.

7 Painting make-up measures

Wear treatment of the shell (visual inspection of the damage degree of the container paint surface, preparation of corresponding tools and materials, and on-site assessment of the quantity of materials based on the paint repair situation).

- Light scratch (not exposing the steel substrate);
  - Use fine sandpaper to gently grind the damaged area to remove dirt;
  - Wet the cotton cloth with absolute ethyl alcohol, wipe the polished area to remove surface dirt and dust, and then dry it with a clean cotton cloth;
  - Depending on the degree of paint damage, choose one of the following methods: spray paint, paint by brush, or use a spray gun to evenly apply paint to the damaged coating until the coating damage is no longer visible.
- Deep scratches (exposing the steel substrate);
  - Lightly polish the damaged area with fine sandpaper to remove dirt;
  - Wet the cotton cloth with absolute ethyl alcohol, wipe the polished area to remove surface dirt and dust, and then dry it with a clean cotton cloth;
  - Use a brush or a spray gun to apply zinc-rich primer to the coating damage;
  - According to the degree of paint damage, choose one of the methods of spray paint, brush paint, or spray gun painting to evenly repair the coating damage until the coating damage is not exposed.
- Large-scale impact pits.

Please contact our customer service or find a local supplier to provide a repair plan based on the specific situation.

8 Contact Us

SINENG Electric Co., Ltd.

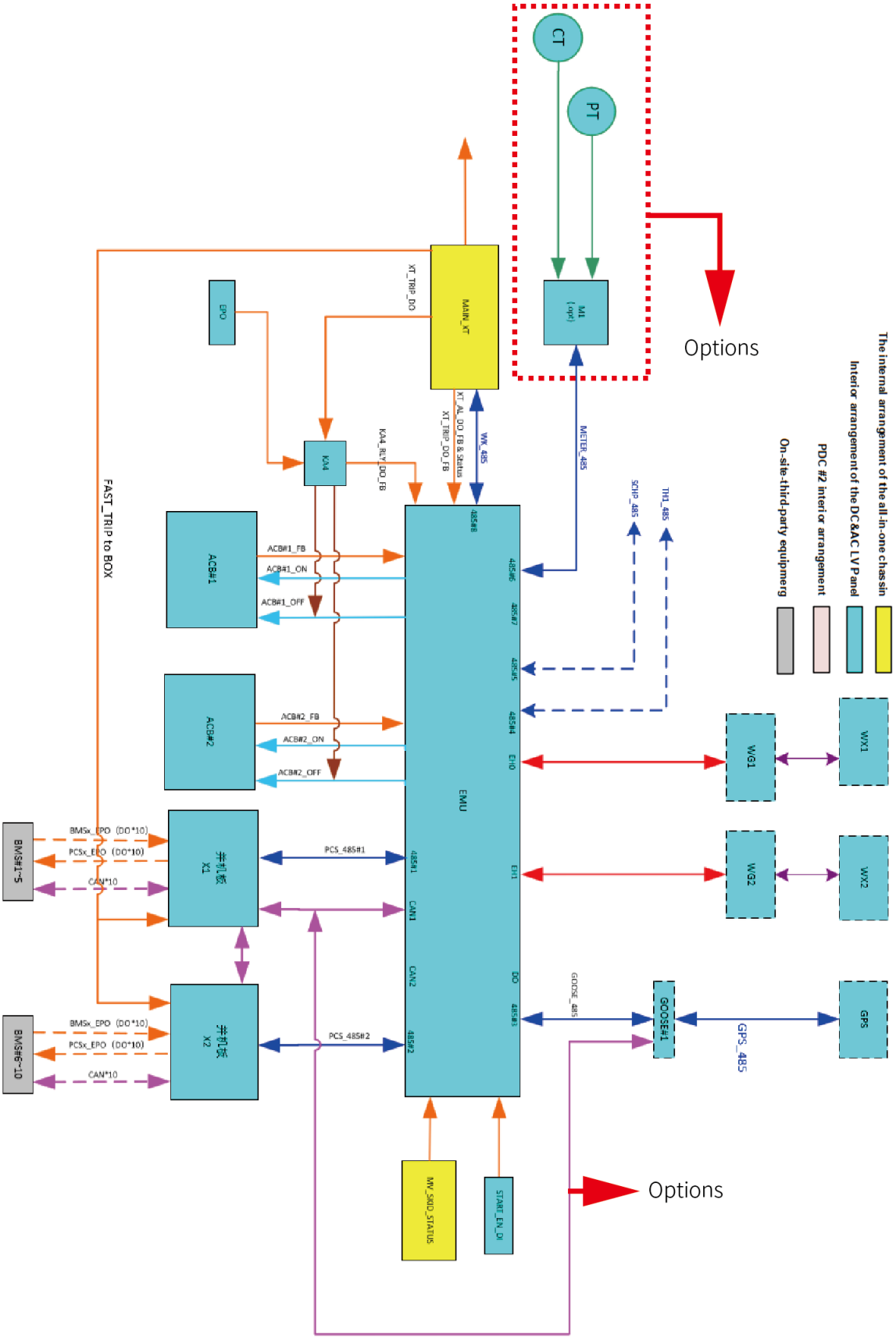
Address: #6 Hehui Road, Huishan Economic Development Zone, Wuxi, Jiangsu

Post Code: 214174

Customer service hotline: 0510-81888198

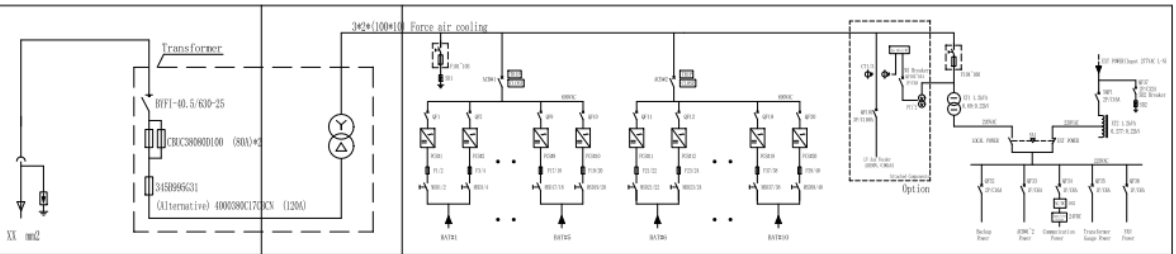
Website: www.si-neng.com

1 Attachment 1 Communication Topology Diagram



2 Attachment 2 Primary system drawing

Primary System Diagram



Main Components And Configuration

High voltage (MV Side)		
Oil immersed load switch (Two Position)	BYFI-40.5/630-25kA	1
Surge Arrester	-HCOV 24.4kV	3
ELSP Fuse	CBUC38080D100 (80A)	2*3
Expulsion Fuse	ABB 3458996631	3
(Alternative) Bay-O-Net Fuse	4000380C17CBCN (120A)	3

Transformer
Transformer
SL-4300kVA
34.5kV±2x2.5%/0.69kV
D,y1 Uk=8±7.5%
Frequency: 60Hz
Full load efficiency: 99.1% @ 1 power fator

Low voltage		
PCS	EH-0215-HA-H-US(PCS#1~20)	20
AC ACB	NDW3A-25 2000A/3P/65kA@AC230V (ACB#1, ACB#2)	2
AC MCCB	UTV250HT FTU 250A 3P UL/250A/50kA@AC800V(QF1~20)	20
DC Fuse	400A/150kA@DC1500V(F1~40)	40
DC branch Manual Disconnect	350A/DC1500V (DSD1~40)	40
LV AC Fuse	1000VAC/40A 50kA(F101~103)	3
LV Surge Protection Device	DS44S-690 In=20kA(SD1)	1

Fuse	1500VDC/20A 30kA(F104~106)	3
Transformer	Single-phase-1.2kVA-690:220(XT1)	1
Transformer	Autotransformer-1.2kVA-277:220(XT2)	1
MCB	ND82-63/C16/2P 7.5kA@AC277V (XQF1,QF32)	2
MCB	ND82-63/C6/1P 7.5kA@AC240V(QF33~36)	4
MCB	ND82-63/C32/2P 7.5kA@AC277V(QF37)	1
LV Surge Protection Device	RPM-40/1N+NPG In=20kA(SD2)	1
Manual switching	HYSS.1-63F-4P-AZ (SA1)	1
EMU	SAU-100-D	1
AC/DC	HBP-150-24(DS2)	1
AC MCCB	UTV250HT FTU 100A 3P UL/50kA@AC800V(QF101)	1
CT	AKH-0.66/G G-301 150/5A 0.2(CT1/3)	2
PT	JDZ-1 600V/100V 0.2 5VA(PT1~2)	2
MCB	ND82-63/C6/1P 7.5kA@AC240V (QF102~104)	3
Meter	ADL3000-E-B(OU)	1

3 Attachment 3 Module replacement operation of integrated energy storage power station

Note:

- The following replacement steps for the energy storage converter module are based on the example of module 5!
- There are two ways to replace the module to adapt to different working conditions, which are explained in the following way A and B respectively.
- The brand-new module is transported to the vicinity of the all-in-one machine by power-assisted tools such as trolleys, and the old module after replacement is the same; This part is not elaborated in the manual;

Method A

1. Remove the ground wire of the converter module that needs to be replaced, as shown in Figure 1 below;

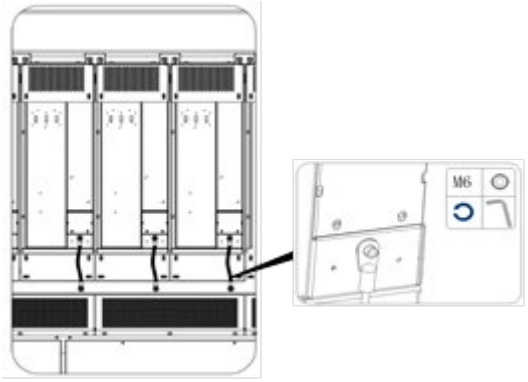


Figure 1 Disassembling the grounding cable of the module

2. Remove the front fastening bolts and sealing plates corresponding to the module to be replaced, as shown in Figure 2 below;

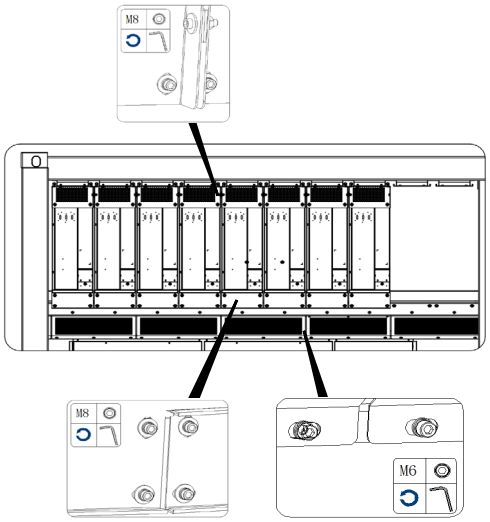


Figure 2 Disassembling the fastening bolt and sealing plate

3. Disassemble the module power cable;

1.1 The AC side of the power module is N-type orange, the positive electrode of DC side is A-type orange, and the negative electrode is B-type black, as shown in Figure 3 below;

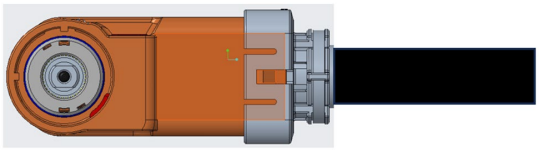


Figure 3 Quick Insert Terminals

Note: When this quick plug waterproof terminal cable is fastened, it is necessary to use a special tool to tighten it, and the special tool is shown in Figure 4 below;

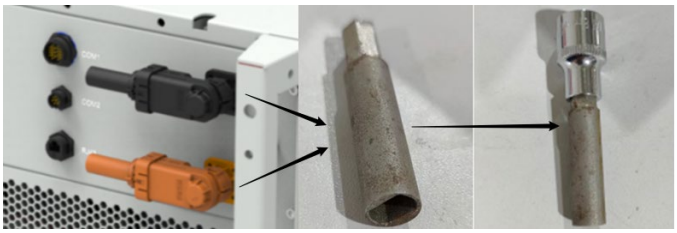


Figure 4 Special tools for fastening cables

1.2 When the AC and DC quick-plug terminal is dismantled, first rotate the quick-in terminal to be disassembled to the angle shown in Figure 5 below, and then press the disassembly button of the quick-plug terminal to gently pull out the terminal, and the fast-plug terminal removal button is shown in Figure 6 below.

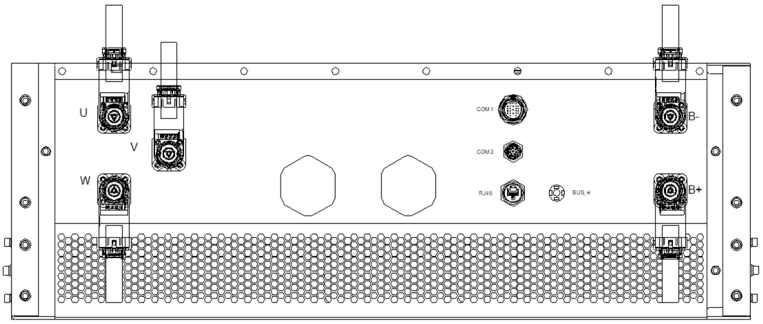


Figure 5 Installation & Removal of Quick Insert Terminals

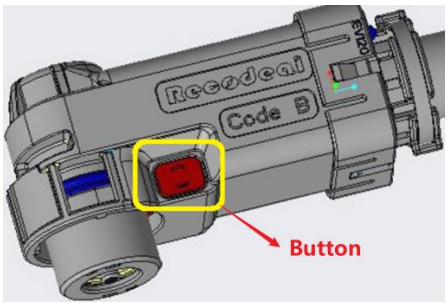


Figure 6 Removing the Button Position

4. After removing the module, tighten the bolts, only removing the bolts is required, as shown in Figure 7 below;

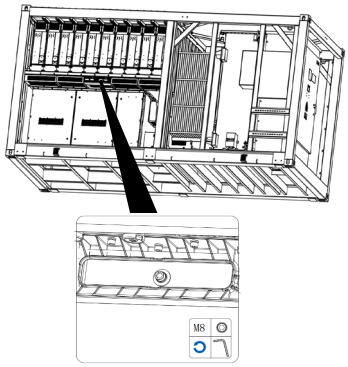


Figure 7 Disassembling the module fastening bolts

5. Install the lifting appliance for the lifting module;

1.1 The spreader is placed in the high-pressure room (wrapped by wrapping film) of the first batch of all-in-one machines, and the outer door is affixed with the spreader logo as shown in Figure 8 below;

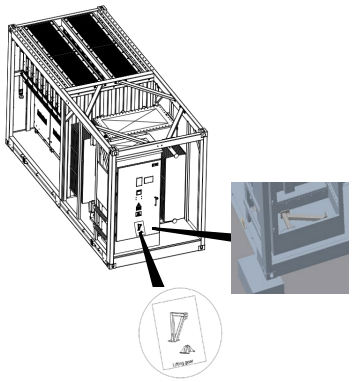


Figure 8 Placement position of spreader

1.2 Install the sling with the help of the escalator above the module to be replaced (on the container beam), as shown in Figure 9 below.

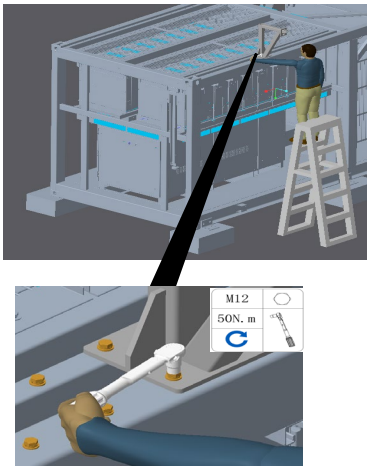


Figure 9 Installation of lifting tools

6. Disassemble the module (two people are required);

1.1 Assemble the pulley block as shown in Figure 10 below;

Figure 10 Assembly of pulley block

Fasten the upper end of the pulley block in the opening of the top spreader, and install the -shaped lock in the U-shaped structure at the bottom of the container for easy operation (anti-falling and self-locking function). See the video file for details; After that, the module is pulled out about 1/2, and the matching special hooks are placed in the slideways on both sides of the top of the module (the special hooks need to be placed in the center of the module! The upper part of the special hook is locked with the assembled pulley block -lock, as shown in Figure 11 below;

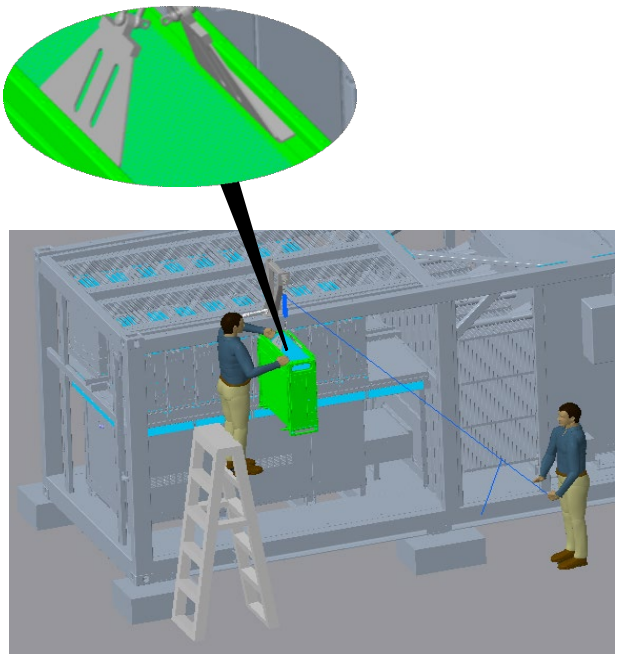


Figure 11 Disassembling Module-1

After the module is completely pulled out (damage caused by collision between the module and the container should be avoided here), one person is responsible for maintaining the balance of the module, and the other person uses the self-locking device of the pulley block to slowly lower the module to the ground, as shown in Figure 12 below.

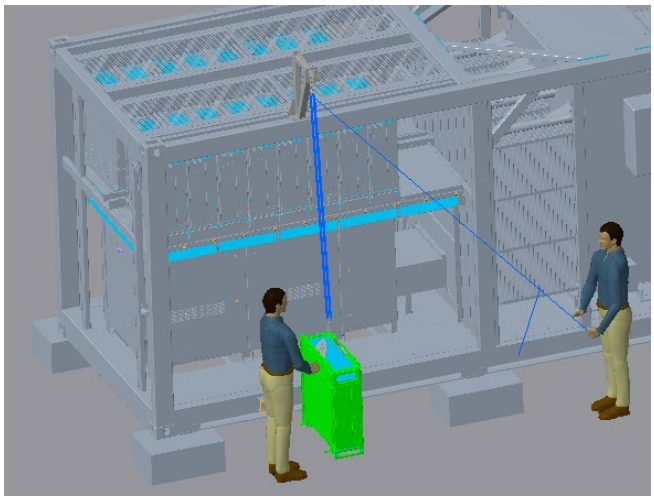


Figure 12 Disassembling Module-2

1) Install module;

Install the spreader,pulley block and self-locking device; On the ground, place the matching special hooks in the slideways on both sides of the top of the module (the special hooks should be placed in the center of the module!), the upper part of the special hook is locked with the assembled pulley block -shaped lock; One person pulls the rope to rise slowly, and the other person is responsible for keeping the module balanced; As shown in Figure 13 below; (The weight of a single module is about 100 kg /220 lbs, and the force required to pull the rope after passing through the pulley block is about 20 kg /44 lbs)

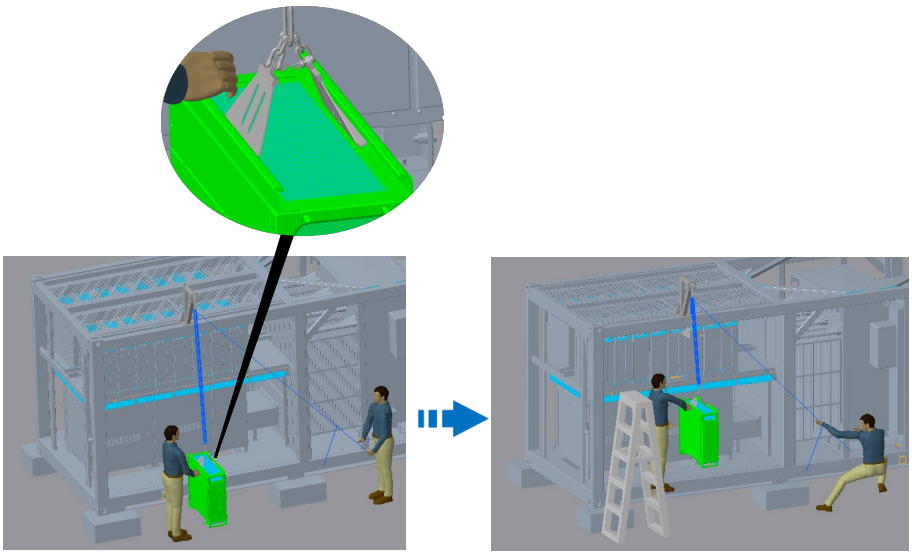


Figure 13 Installing Module-1

When the module rises to the position of the slide rail at the top of the container, stop rising (the pulley block has a self-locking device, so it will not fall down), and then push the module into the corresponding slide rail; It should be done slowly to avoid bumping and damage to containers or modules, as shown in Figure 14 below.

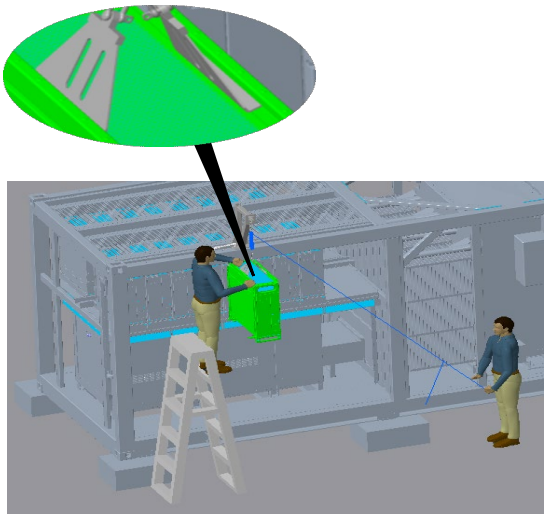


Figure 14 Installing Module-2

Push the module in with a little force, without handling the special hook, which will automatically disengage during the push-in, and push the module until it is even with the adjacent module, as shown in Figure 15 below.

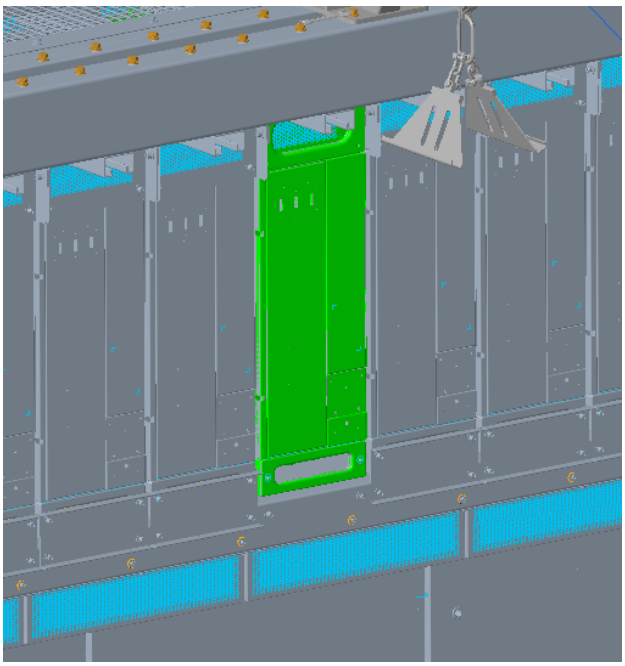


Figure 15 Installing Module-3

Fasten the rear fixing bolts of the module, as shown in Figure 16 below;

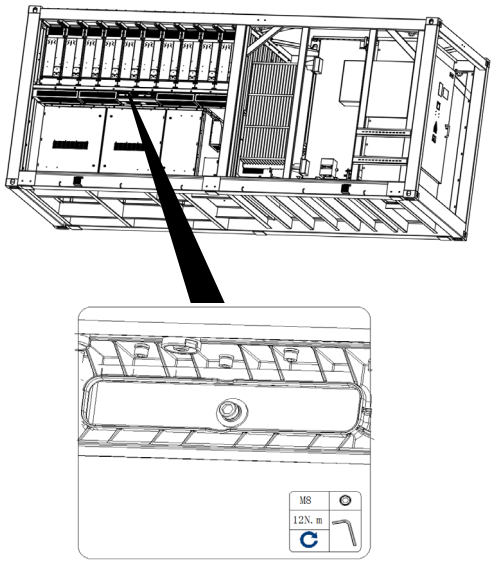


Figure 16 Fixed module fastening bolts

2) Install the module power cable;

The AC side of the power module plug-in terminal is N-type orange, the positive electrode of DC side is A-type orange, and the negative electrode is B-type black, as shown in Figure 17 below;

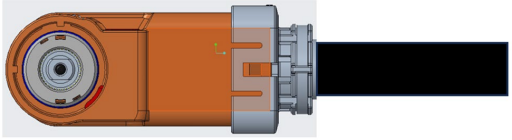


Figure 17 Quick Insert Terminals

When the AC and DC quick-plug terminal is wiring, first push the quick-plug terminal to be installed at the angle shown in Figure 18 below, and after the plug of the quick-plug terminal is installed in place, there will be a snap lock sound, which means that the terminal installation is completed. In addition, after the installation and fixation of the push-in terminal, the angle of the cable can be adjusted according to the actual situation of the site (the angle can be rotated left and right after the plug-in terminal is fixed).

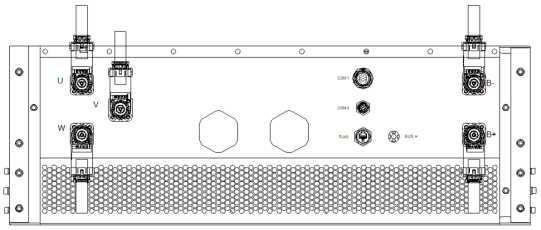


Figure 18 Installation & Removal of Quick Insert Terminals

The front closure plate and fastening bolts dismantled in step 2 of installation are shown in Figure 19 below;

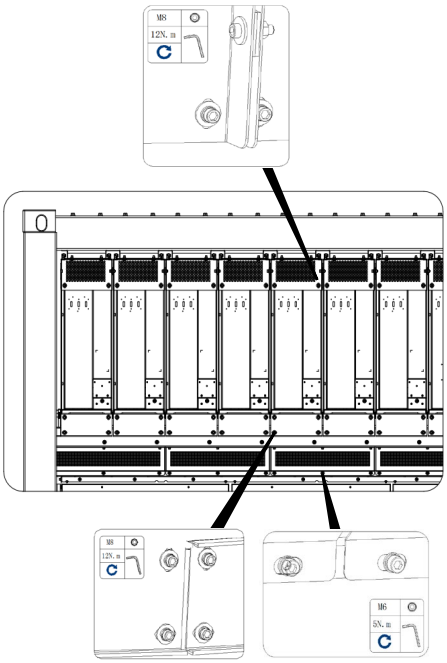


Figure 19 Installation of fastening bolts and sealing plates

Install the module grounding wire dismantled in step 1, as shown in Figure 20 below;

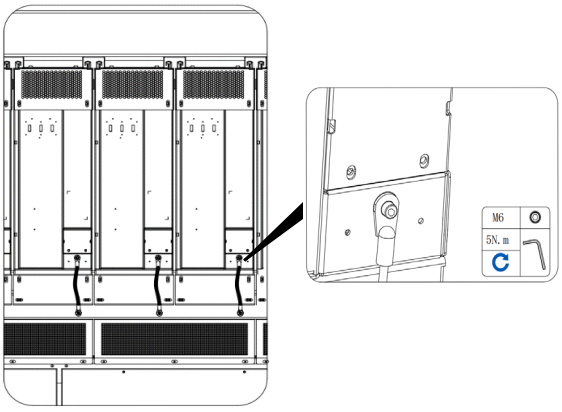


Figure 20 Installation of module grounding wire

Dismantle the pulley block and spreader in turn with the help of the escalator, and properly place them for the following use.(the bolts need to be reset after the sling is removed to prevent long-term water accumulation in the threaded holes of the container), as shown in Figure 21 below;

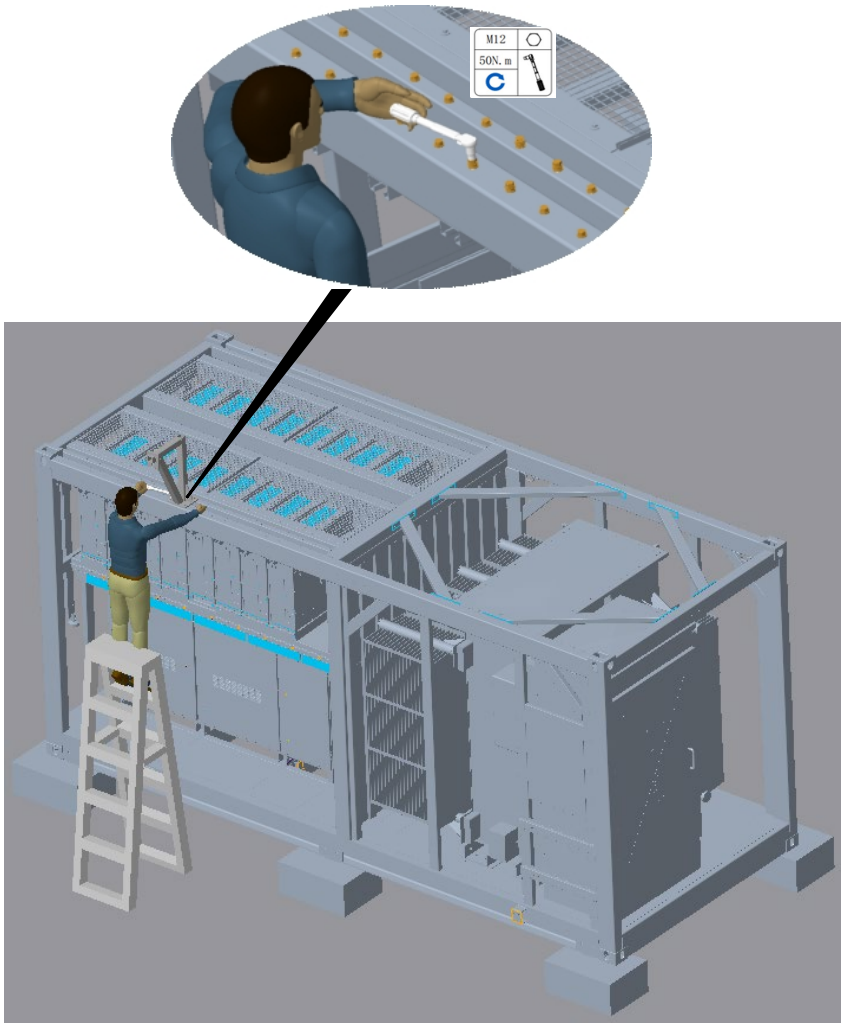


Figure 21 Disassembly and reset of lifting equipment

Remove the ground wire of the converter module that needs to be replaced, as shown in Figure 1 below;

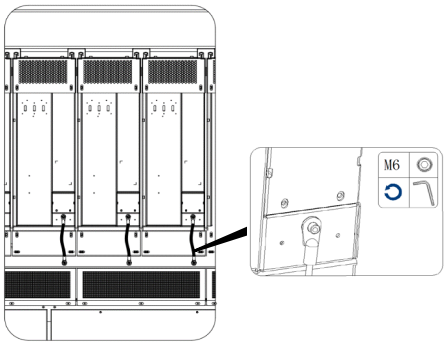


Figure 1 Disassembling the grounding cable of the module

Remove the front fastening bolts and sealing plates corresponding to the module to be replaced, as shown in Figure 2 below;

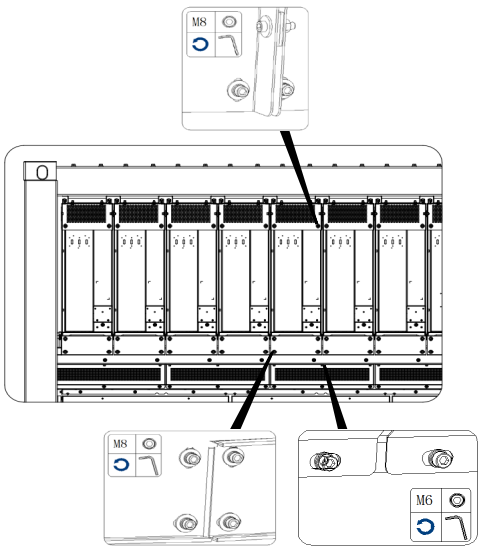


Figure 2 Disassembling the fastening bolt and sealing plate

Disassemble the module power cable;

The AC side of the power module is N-type orange, the positive electrode of DC side is A-type orange, and the negative electrode is B-type black, as shown in Figure 3 below;

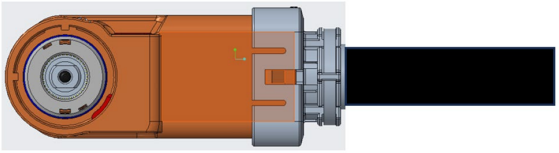


Figure 3 Quick Insert Terminals

Note: When this quick plug waterproof terminal cable is fastened, it is necessary to use a special tool to tighten it, and the special tool is shown in Figure 4 below;

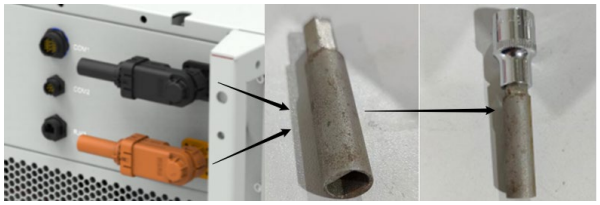


Figure 4 Special tools for fastening cables

When the AC and DC quick-plug terminal is dismantled, first rotate the quick-in terminal to be disassembled to the angle shown in Figure 5 below, and then press the disassembly button of the quick-plug terminal to gently pull out the terminal, and the fast-plug terminal removal button is shown in Figure 6 below.

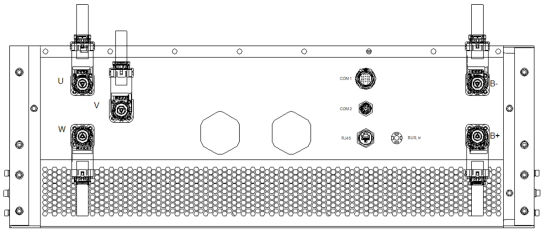


Figure 5 Installation & Removal of Quick Insert Terminals

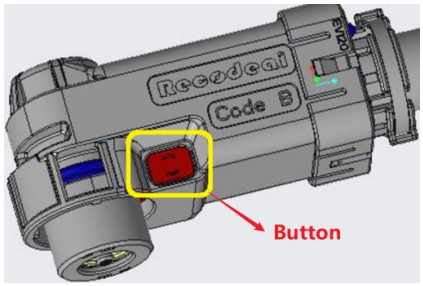


Figure 6 Removing the Button Position

After removing the module, tighten the bolts, only removing the bolts is required, as shown in Figure 7 below;

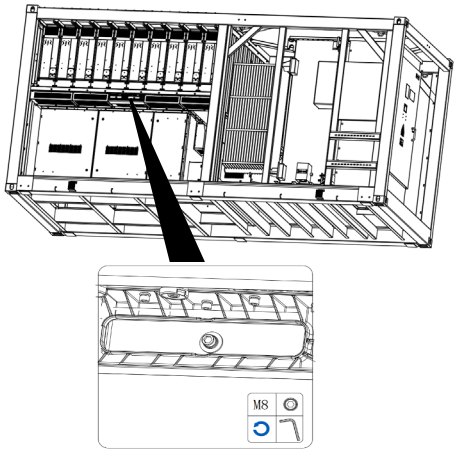


Figure 7 Disassembling the module fastening bolts

Crane removal module

The crane shown in the figure is a schematic, which only explains the operation steps of this hoisting method. The specific crane type should be selected according to the actual situation on site

Pull out the module by about 1/2, and place the special hooks in the slideways on both sides of the top of the module (the special hooks should be placed in the center of the module!), the special hook uses the supporting part of the spreader in "Mode A"; Hang the upper end of the special hook on the hook of the crane by means of the lifting rope (the lifting rope is not within the scope of supply), Please pay attention to the opening size of the special hook here.as shown in Figure 8 below;

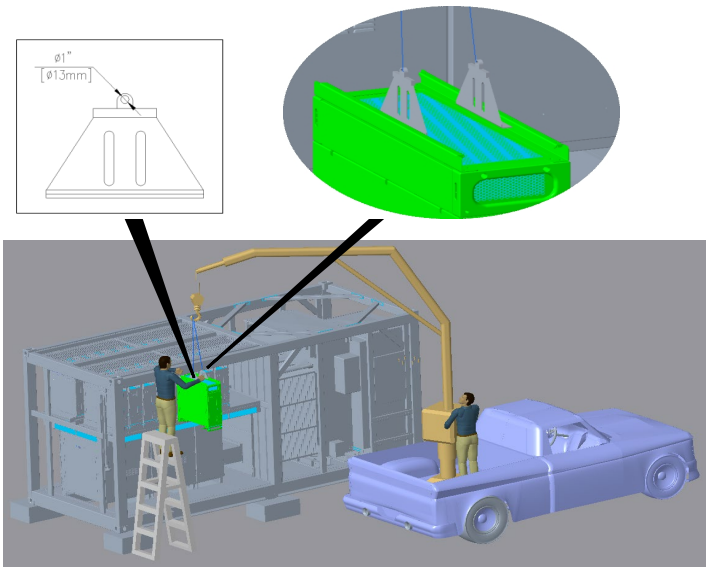


Figure 8 Opening size and hoisting of special hook

Cooperate with the crane to completely extract the module (damage caused by collision between the module and the container should be avoided here), and then slowly lower the module to the ground, with one person responsible for operating the crane and the other person responsible for keeping the module balanced; As shown in figure 9 below.

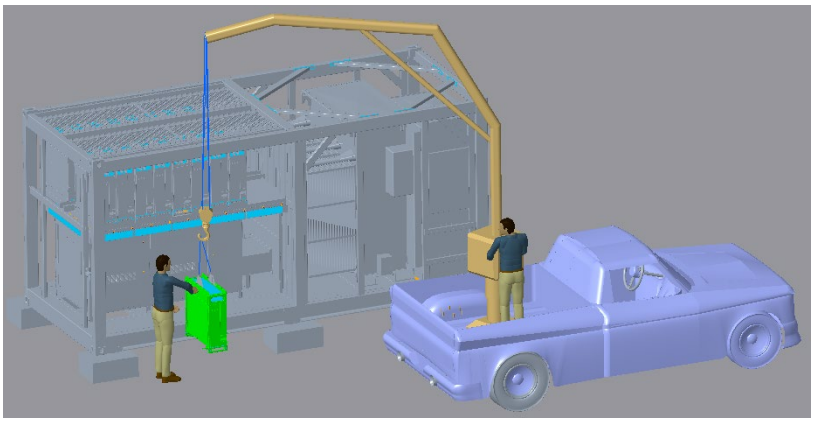
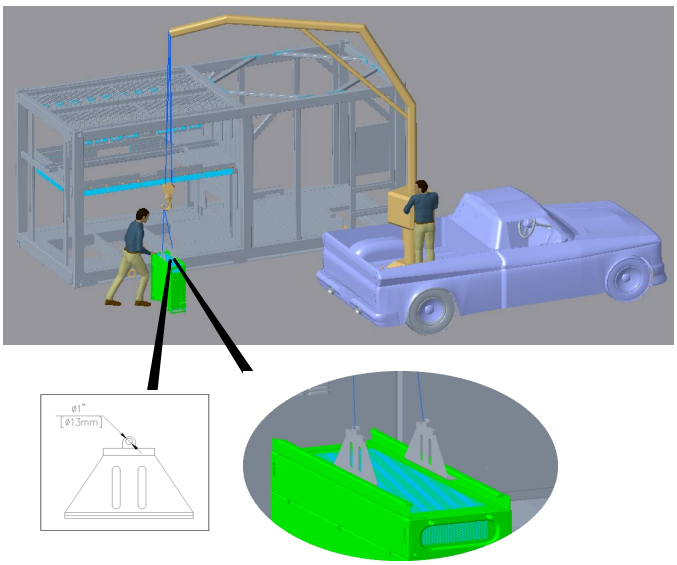


Figure 9 Disassembling Module

Crane Install module;

Place the matching special hooks in the slideways on both sides of the top of the module on the ground (the special hooks should be placed in the center of the module!), hang the upper end of the special hook on the hook of the crane by means of the lifting rope (the lifting rope is not within the scope of supply). Please pay attention to the opening size of the special hook here. One person is responsible for operating the crane and the other person is responsible for keeping the module balanced; As shown in Figure 10 below;



10 -1

Figure 10 Installing Module-1

When the module rises to the slide rail position at the top of the container, it stops rising, and then pushes the module into the corresponding slide rail; It should be done slowly to avoid bumping and damage to containers or modules, as shown in Figure 11 below.

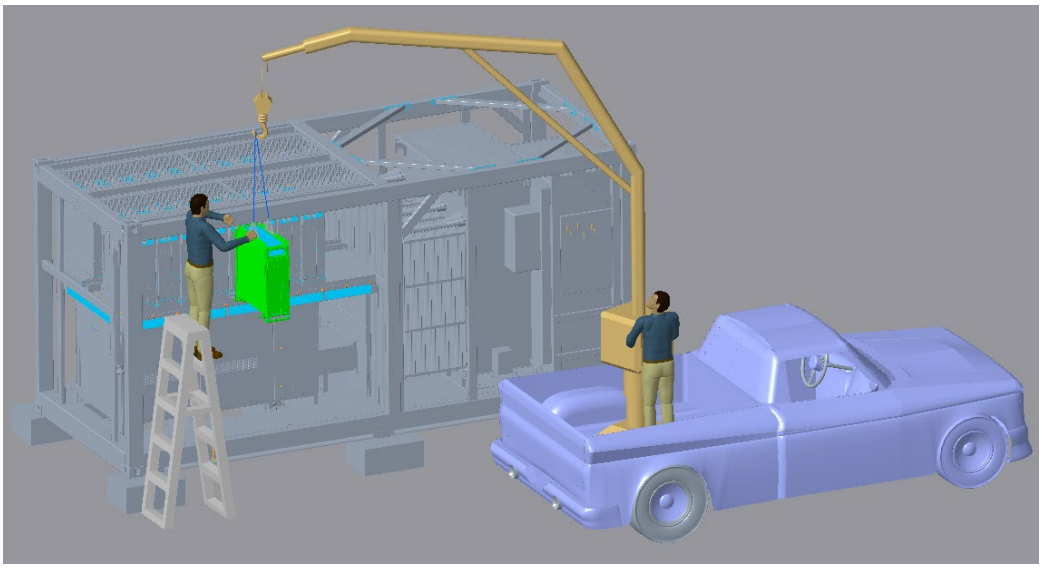


Figure 11 Installing Module-2

Push the module in with a little force, without handling the special hook, which will automatically disengage during the push-in, and push the module until it is even with the adjacent module, as shown in Figure 12 below.

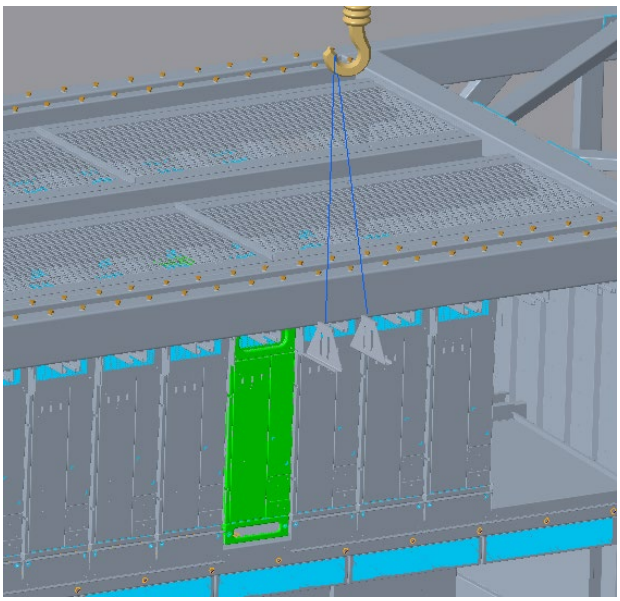


Figure 15 Installing Module-3

Fasten the rear fixing bolts of the module, as shown in Figure 13 below;

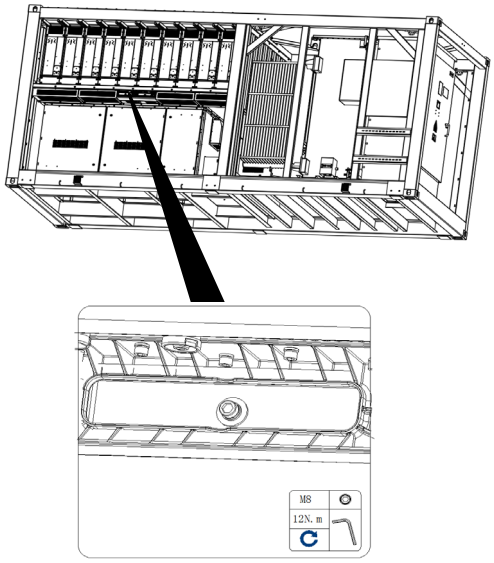


Figure 13 Fixed module fastening bolts

Install the module power cable;

The AC side of the power module plug-in terminal is N-type orange, the positive electrode of DC side is A-type orange, and the negative electrode is B-type black, as shown in Figure 14 below;

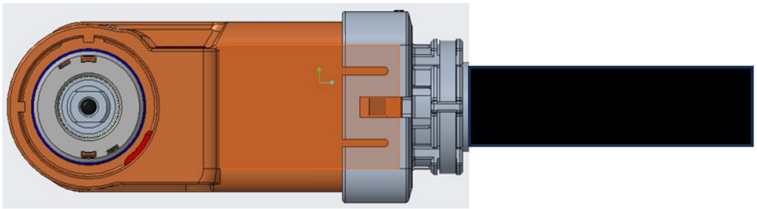


Figure 14 Quick Insert Terminals

When the AC and DC quick-plug terminal is wiring, first push the quick-plug terminal to be installed at the angle shown in Figure 15 below, and after the plug of the quick-plug terminal is installed in place, there will be a snap lock sound, which means that the terminal installation is completed. In addition, after the installation and fixation of the push-in terminal, the angle of the cable can be adjusted according to the actual situation of the site (the angle can be rotated left and right after the plug-in terminal is fixed).

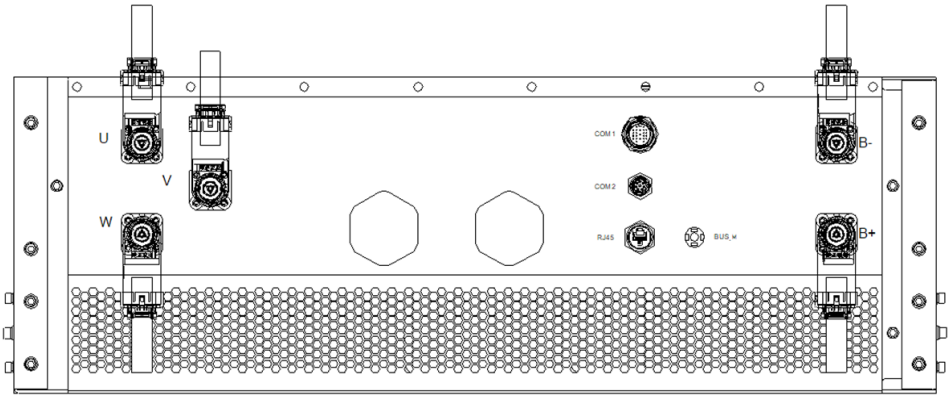


Figure 15 Installation & Removal of Quick Insert Terminals

The front closure plate and fastening bolts dismantled in step 2 of installation are shown in Figure 16 below;

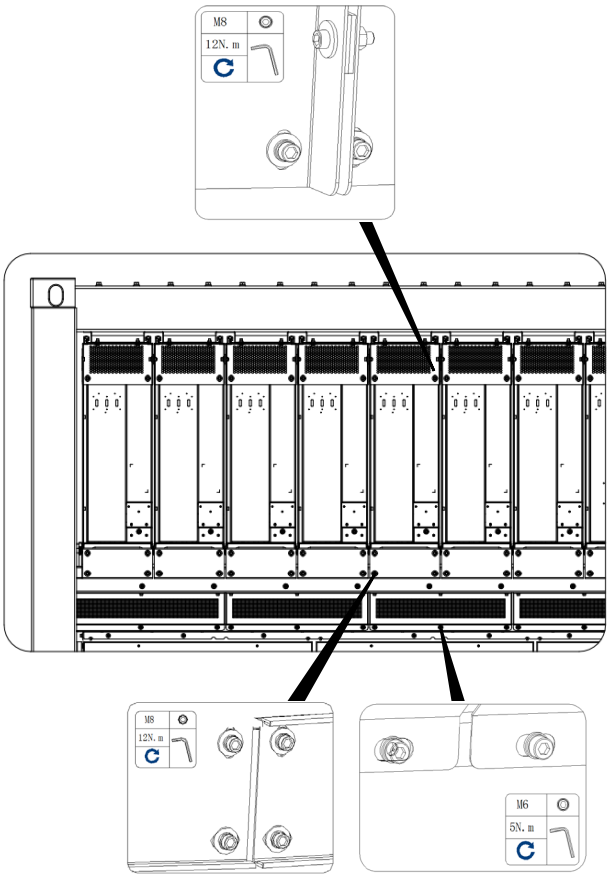


Figure 16 Installation of fastening bolts and sealing plates

Install the module grounding wire dismantled in step 1, as shown in Figure 17 below;

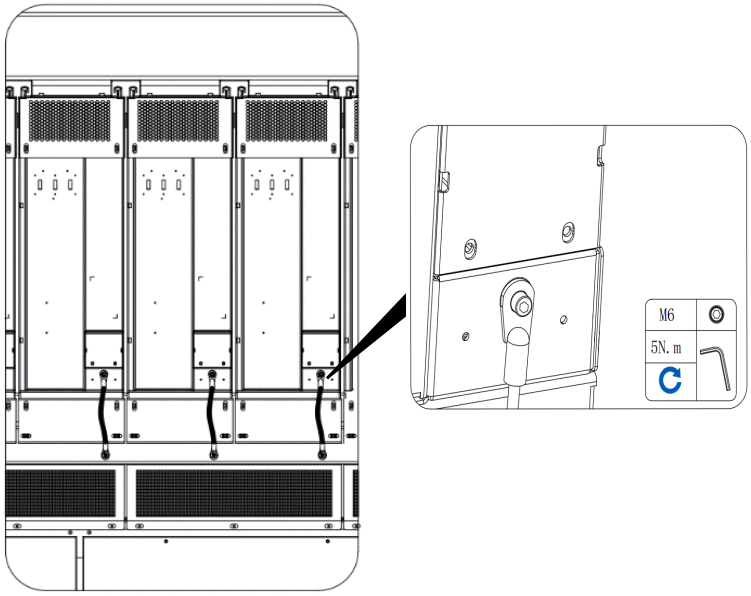


Figure 17 Installation of module grounding wire

EDN