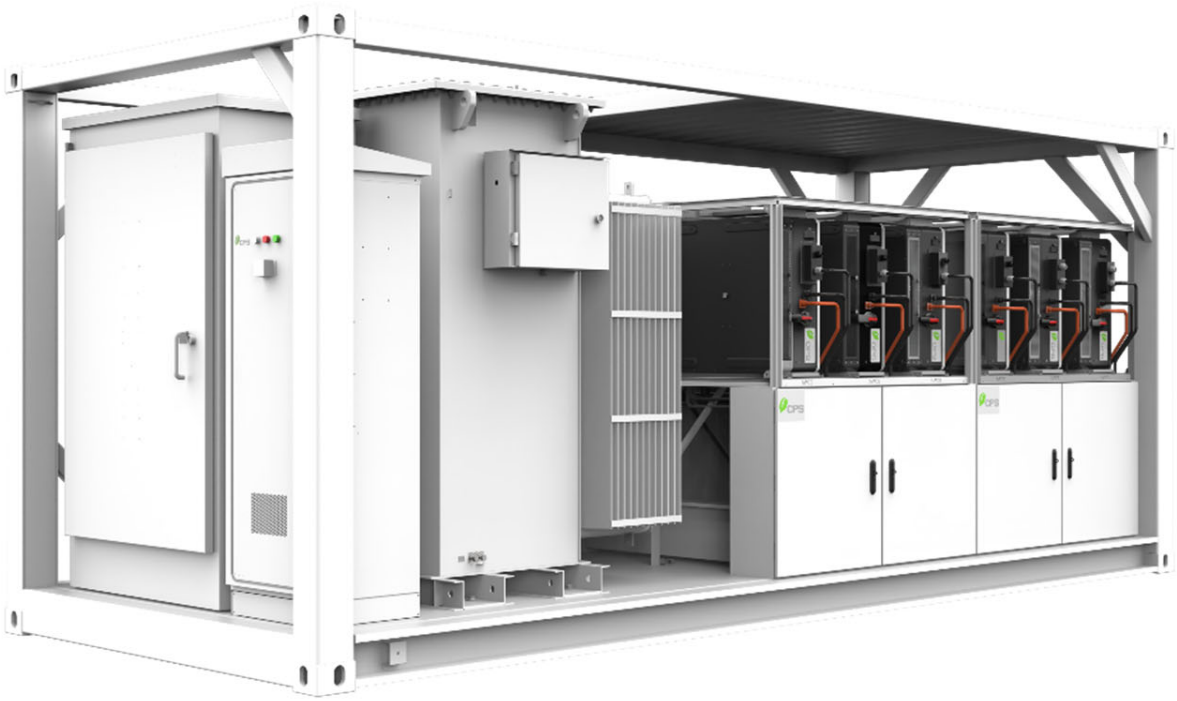
CPS PSW2M-US / PSW2.4M-US PCS SKID

User Manual



CHITN POWER SYSTEMS AMERICA CO., LTD.

Rev 1.0 October 25, 2023

Contents

Preface

Dear user, thank you very much for choosing the CPS PSW2M-US / PSW2.4M-US PCS skid (hereinafter referred to as "PCS skid" in this manual) products developed and produced by Shanghai Chint Power Systems Co., Ltd. CHINT PV grid-connected PCS skid is a highly reliable product, which is widely used in high-standard PV grid-connected systems.

IMPORTANT!

The product description, installation, safe operation, troubleshooting and other important information are contained in this manual. Please read this Manual carefully and make sure that you fully understand all contents before performing any operation.

This manual contains the following main contents:

- **Safety Instructions**

  The introduction for the safety precautions that need to be paid attention to when operating and maintaining the PCS skid.

- **General overview**

  The introduction for the system structure and electrical principle of the PCS skid.

- **Installation**

  The detailed introduction for the installation, wiring steps and precautions of the PCS skid.

- **Operation and maintenance**

  The introduction for operation, setting up, and other aspects of the PCS skid.

- **Technical Data**

  The introduction for technical data of the PCS skid.

- **Quality Assurance**

The introduction for quality assurance clauses of the company.

In case of any problem arising in using, installation or operation, please refer to this manual first, and contact your local dealer or representative. The

instructions in this manual may help you solve most of the use, installation and operation problems.

Applicable Personnel

This manual is applicable to authorized and qualified engineers or operators authorized by the owner, and these people can perform wiring, operation, maintenance, and daily management of the PCS skid.

Manual Management

Please read this manual carefully before using the product. Please keep this Manual and other documents of the product together and ensure these are accessible for relevant personnel.

Copyright Restriction

Version Upgrade

Due to the update and improvement of products, the contents of the Manual will be updated, adjusted and revised accordingly, and the products purchased by users shall be subject to the physical objects. You can get the latest version of the Manual through the corresponding sales channels, or you can download the latest version of the Product User Manual from our official website http://www.chintpowersystems.com.

Chapter 1 Safety Instructions

Please read the safety instructions in this chapter carefully before installing and using the PCS skid. We will not be liable and provide quality assurance if personal injury or equipment damage is caused as a result of failing to follow the safety instructions in this manual!

1.1 Definition of symbols in this manual:

	**Danger:** There is a high-level potential danger that, if not avoided, may result in death or serious injury to personnel.
	**Warnings:** There is a moderate potential danger that, if not avoided, may result in death or serious injury to personnel.
	**Caution:** There is a low-level potential hazard that, if not avoided, may result in moderate or mild injury to personnel.
	**Note:** There is a potential risk that, if not avoided, may result in the equipment not functioning properly or causing property damage.
	**Remarks:** Additional information in the manual that highlights and supplements the content and may also provide tips or tricks to optimize the use of the product, which helps solve problems or save time.

1.2 Interpretation of product markings:

	**Electric Shock Hazard:** This marking indicates that there is high voltage inside the machine body, and touching it may cause electric shock.
	**Energy danger:** Pay attention to the danger of electric shock, and please operate the machine 5 minutes after the discharge is completed.
	**High Temperature:** This product complies with international safety standards, but it generates heat during operation. Therefore, never touch the cooling fin or the metal surface of the PCS skid during operation.
	**Noise prevention:** This marking indicates that the equipment noise has a risk of hearing damage and hearing protection devices is required.
	**Protective Earthing:** This marking is located at the protective earth (PE) terminal and shall be firmly earthed to ensure operator safety.
	**CE Certification:** The PCS skid meets the requirements of CE certification.

1.3 Precautions for product safety

DANGER:

It is necessary to manually shut down through the screen before the PCS skid is repaired. The DC switch on the PV side should be disconnected and the discharge procedure is executed, and then the ac switch on the grid side should be disconnected, confirm that the PCS skid has no power and the machine can be examined and repaired!

WARNING:

All operations and connections shall be completed by professional engineering and technical personnel!

To prevent the risk of electric shock during equipment maintenance or installation, please ensure that all DC and AC power has been disconnected from the equipment, and ensure that the equipment is reliably earthed.

WARNING:

The connected PV panel will generate DC voltage and charge the DC bus capacitor of the PCS skid when it is exposed to sunlight. The charge is still stored in the capacitor when the PV input to the PCS skid is cut off. Therefore, please ensure that the electric energy inside the machine has been completely discharged before maintenance of the equipment. It is necessary to measure the voltage and confirm safety before operation.

CAUTION:

As the equipment is heavy and large in shape, it is recommended that users use forklifts for handling as much as possible. Please pay attention to the center of gravity position of the machine during handling to prevent toppling.

CAUTION:

High temperature will be generated by the PCS skid during working.

Please do not touch the cooling fin and metal surface of the PCS skid!

NOTE:

The PCS skid is specially designed to generated ac power and connect to the public grid. Do not directly connect the ac output terminal of the equipment to private ac electrical equipment.

NOTE:

It is forbidden to directly close the DC switch if the DC switch trips due to a fault. The system must be reset first, and then the DC switch should be closed manually according to prompt of the touch screen.

NOTE:

The PCS skid should not be exposed to direct sunlight, so as to avoid reducing energy conversion efficiency due to excessive internal temperature of the machine.

NOTE:

AC and DC switches should be disconnected and external power supply should be used if it is necessary to update the program.

NOTE:

When the PCS skid is in a charging state, the discharge command is invalid and can only be executed after the charging process is completed.

IMPORTANT:

Before choosing the grid code, contact your local power supply company. If the PCS skid is working under a wrong grid code, the power supply company may cancel the operating license for the equipment.

Before operating the PCS skid, ensure that the whole system complies with national standards and applicable safety regulations.

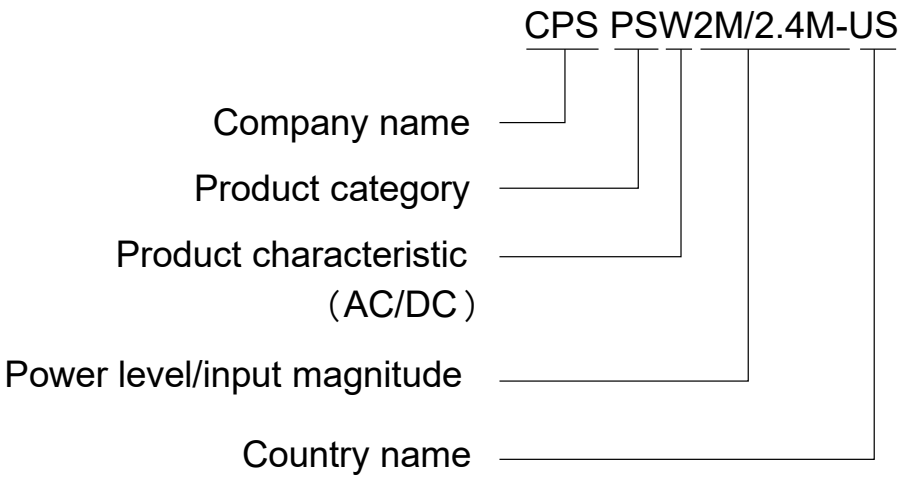
Chapter 2 System Introduction

2.1 PCS Skid

CPS PSW series PCS skid integrates PCS, step-up transformer, AC/DC power distribution, etc. It has the advantages of high efficiency, reliability and environmental protection. Functional characteristics of inverter boost integrated machine:

- Reasonable and efficient layout, improved space utilization rate, integrated design of "transformation" and "boost", implementation of lean intelligence for integrated product delivery
- Secondary circuit integration, unified measurement, protection and communication
- Unified external communication interface, quick commissioning, integrated data acquisition and optical fiber ring network, intelligent operation management
- Support for high/low voltage traversal ride-through, frequency ride-through and dispatching, efficient and stable power grid adaptation
- Voltage levels of 35kV and below are covered in step-up application types
- 110% overload and 50°C without derating are supported, and the system has high stability and flexible configuration
- Support for functions such as multi-machine parallel connection, PQ control (i.e. active and reactive power control function) and VF control (i.e. PCS maintains the output voltage and frequency unchanged, output active power and reactive power are determined by load), etc.
- 1500V wide DC voltage range of the system, flexible DC terminal configuration
- Multiple applications such as peak-load shifting, peak shaving and frequency regulation and new energy grid connection auxiliary, etc.

2.2 Introduction of series and model

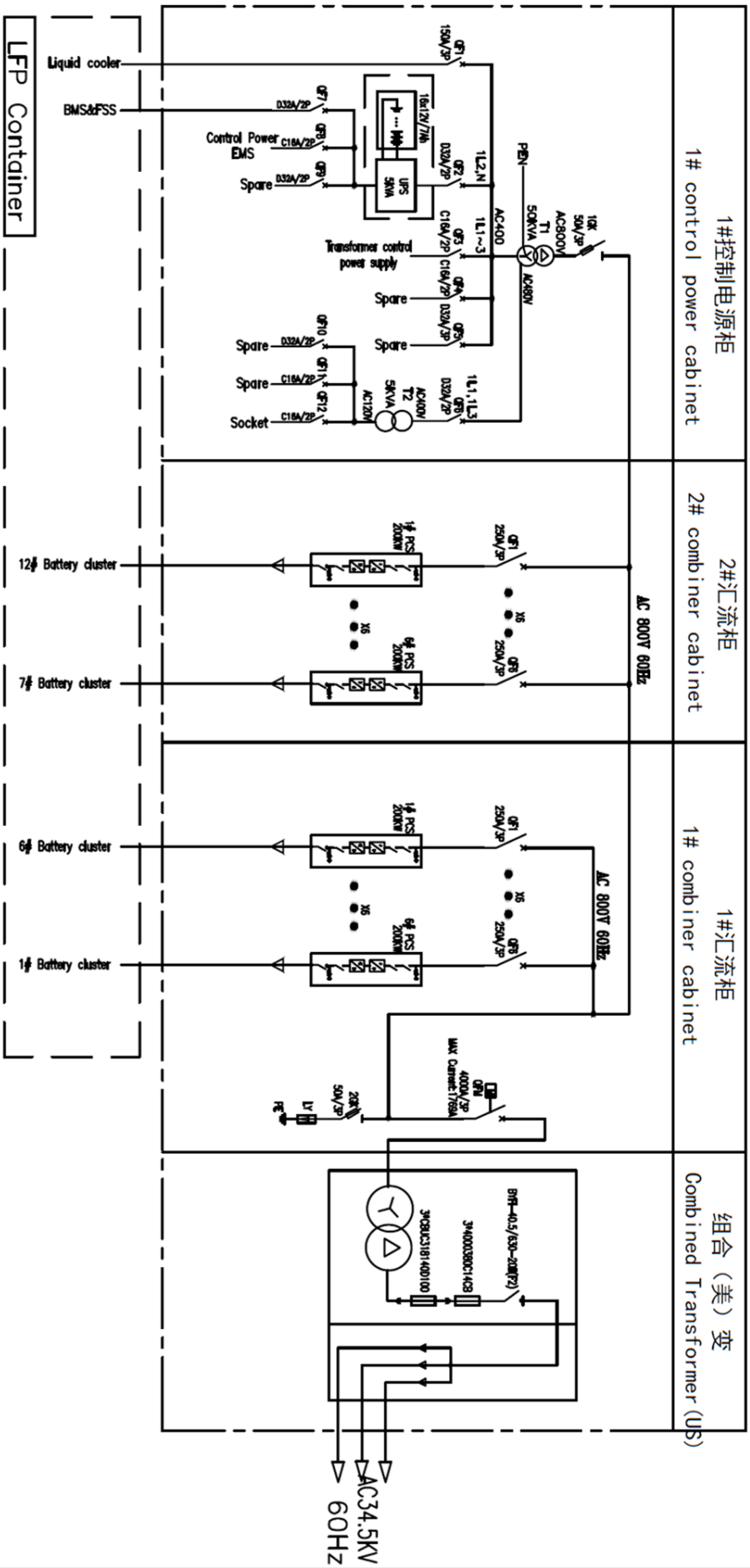


The power of PCS skid is 2000/2400kW. The maximum DC input voltage of the PCS skid is 1500V, and the AC output side voltage is 35KV and below. The specific voltage and frequency can be made according to the actual grid connection requirements, which can adapt to power grid applications in different countries.

2.3 Circuit structure of PCS Skid

The basic principle of the PCS skid is shown in Fig. 2-1. The DC voltage output from the battery compartment is connected to the DC input terminal, and then converted into three-phase AC voltage (3*800VAC) through PCS, and then connected to the power grid after step-up.

Fig. 2-1 Basic schematic diagram of CPS PSW2M-US / PSW2.4M-US


LFP Container
Liquid cooler
BMS&FSS
Control Power EMS
Spare
Transformer control power supply
Spare
Spare
Spare
Spare
Socket
12# Battery cluster
7# Battery cluster
6# Battery cluster
1# Battery cluster
AC 800V 60Hz
AC 800V 60Hz
1#控制电源柜
1# control power cabinet
2#汇流柜
2# combiner cabinet
1#汇流柜
1# combiner cabinet
组合（美）变
Combined Transformer (US)
AC34.5KV
60Hz

2.4 Appearance description and dimensions

1. The appearance and main components of the PCS skid are shown in Fig. 2-2.

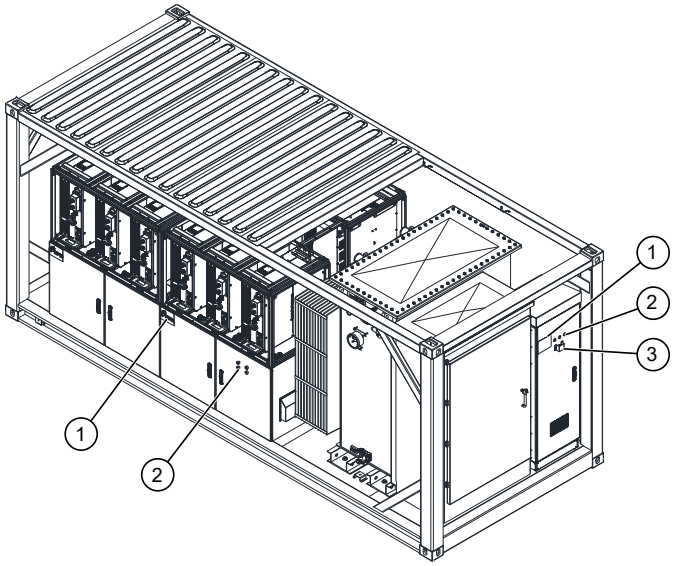


Fig. 2-2 Appearance Diagram of PCS skid

NO.	Name	Function
1	CHINT logo	Identification of equipment manufacturers
2	Indicator	Indicate equipment operation and fault state
3	EMS button	Emergency shutdown button

Table. 2-1 Introduction of PCS skid

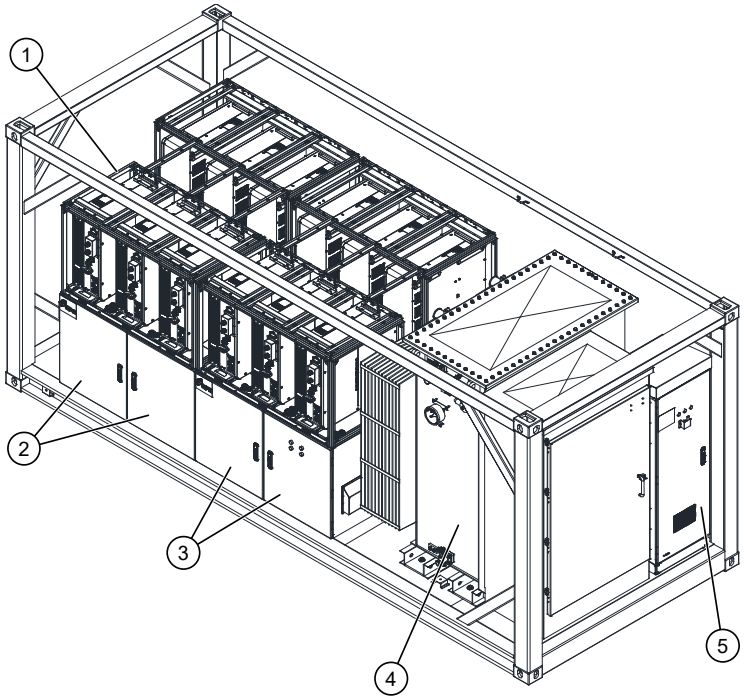


Fig. 2-3 Diagram of main components

1. PCS
2. 1# DC combiner cabinet
3. 1# DC combiner cabinet
4. Transformer
5. Power supply control cabinet

2. The dimensions (unit: mm) of the PCS skid are shown in Fig. 2-3.

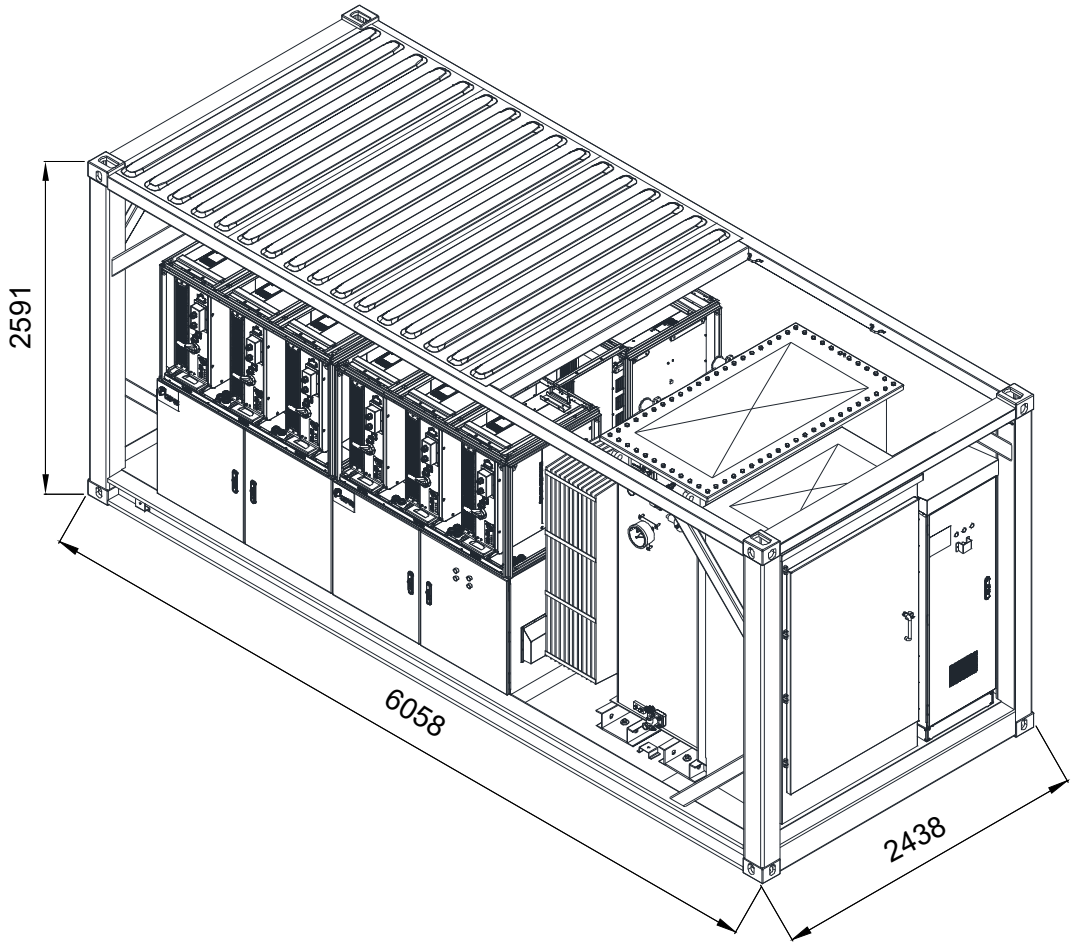


Fig. 2-4 Schematic Diagram of Overall Dimensions

IMPORTANT:

The height of door lock and hinge are not included in the shown dimensions;

2.5 Optional product configuration

The following optional configurations are supported by the CPS PSW2M-US / PSW2.4M-US:

No.	Configuration	Function
1	Metering instrument	Measurement of control load

Table 2-2 Optional Configuration Table

IMPORTANT:

You need to confirm what optional functions are required for the PCS skid before ordering, ensure that the delivered PCS skid meets the use requirements.

Chapter 3 Installation

3.1. Basic requirements

Check before installation:

- ✓ Whether the environmental parameters (including protection grade, working temperature range, humidity, altitude, etc.) of the installed product are within the range specified in the technical parameter table;
- ✓ Ensure that the grid voltage is within the normal range;
- ✓ The grid connection permit has been obtained from the local electricity services department;
- ✓ The installation personnel must be professional electricians or have received professional training;
- ✓ Sufficient air convection space;
- ✓ Keep away from flammables and explosives;
- ✓ Keep away from electromagnetic interference sources.

3.2 Scope of supply

CPS PSW2M-US / PSW2.4M-US is delivered in a complete machine package, and the delivered goods are shown in table 3-1.

No.	Description	Qty.
1	CPS PSW2M-US / PSW2.4M-US PCS skid	1
2	Instructions	1
3	Warranty Card	1
4	Shipping orders	1
5	Certificate of Conformity	1

Table 3-1 Scope of Supply

3.3. List of installation tools

Please refer to table 3-2 for the list of tools required for installing this product.

No.	Description	Specification	Purpose description
1	Open-end wrench	14mm	M8 hexagon head screw
2	Open-end wrench	17mm	M10 hexagon head screw
3	Open-end wrench	19mm	M12 hexagon head screw
4	Straight screwdriver	3mm	Dry contact wiring
5	Sleeve	7mm	M4 nut
6	Sleeve	10mm	M6 nut
7	Torque wrench	25Nm	M10 hexagon head screw
8	Torque wrench	50Nm	M12 hexagon head screw

Table 3-2 Preparation of Installation Tools

3.4 Mechanical installation

3.4.1 Installation requirements for PCS skid

1. The PCS skid shall be installed on the structure supported by cement foundation or channel steel, with surface made of flame-resistant materials. It is necessary to make sure that the foundation is smooth, solid, safe and reliable, and has sufficient bearing capacity. The foundation surface shall not be sunk or inclined.

2. Cable trenches should be preset according to the overall design of the power station and the incoming and outgoing mode of cables at the bottom of the PCS skid when foundation is built. The AC side of the PCS skid does not support bottom wiring, but only supports side outlet copper bars. The DC side is equipped with waterproof connectors for wiring. The specific wiring position of the PCS skid is shown in Fig. 3-1, and Fig. 3-1 is the top view of the PCS skid.

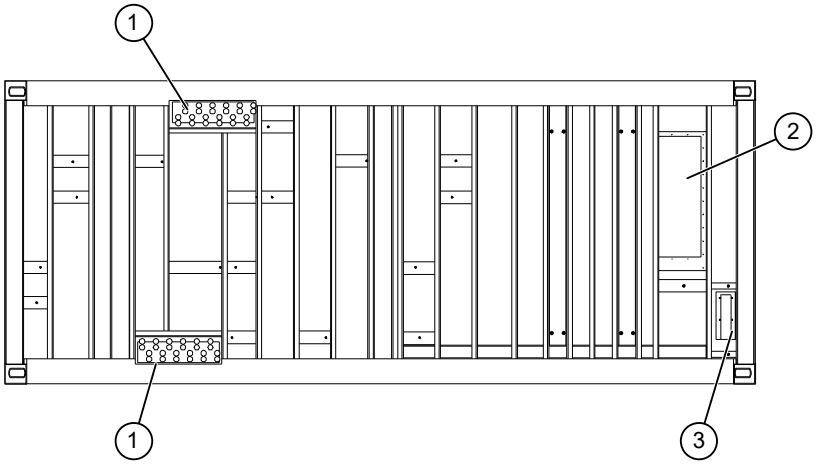


Fig. 3-1 Location of incoming and outgoing line holes

1. DC wiring hole
2. High-voltage wiring hole
3. Communication wiring hole

3. The installation foundation of the PCS skid must be designed and constructed in advance according to certain standards to meet the requirements of mechanical support, cable wiring, ventilation and heat dissipation. Foundation should be constructed to at least meet the following requirements:

- The climatic environment, geological conditions and other characteristics of the inverter room installation site should be fully considered;
- The surrounding environment shall be dry, well ventilated and away from flammable and explosive areas.
- Foundation should be constructed in relatively high elevation areas in the power station area;
- The soil on the installation site needs to have a certain compactness, and certain measures need to be taken to ensure the stability of the foundation if the soil is loose. The bottom of the foundation pit for foundation construction must be tamped and filled;
- The foundation should be sufficient to provide effective load-bearing support for the inverter room and raise the inverter room to prevent rainwater from eroding the base and interior of the inverter room;
- The cement foundation should be constructed with adequate cross-sectional area and height. Recommended cross-sectional area is

(length × width) 6000mm×2500mm. The foundation height should be determined by the construction party according to the site geology;

- Cable wiring should be considered in the construction of foundations. The cable trench can be constructed at the bottom of the inverter room according to the overall design planning of the power station, namely a preset cable trench in the foundation. The cable trench can also be constructed outside the rear door side of the inverter room and be paralleled to the housing.

4. Low cement piers with sufficient supporting capacity shall be set up on the foundation to ensure the firm installation of the inverter room and meet the requirements of cable wiring, and incoming and outgoing positions for cables should be reserved at the same time. The recommended scheme is shown in Fig. 3-2:

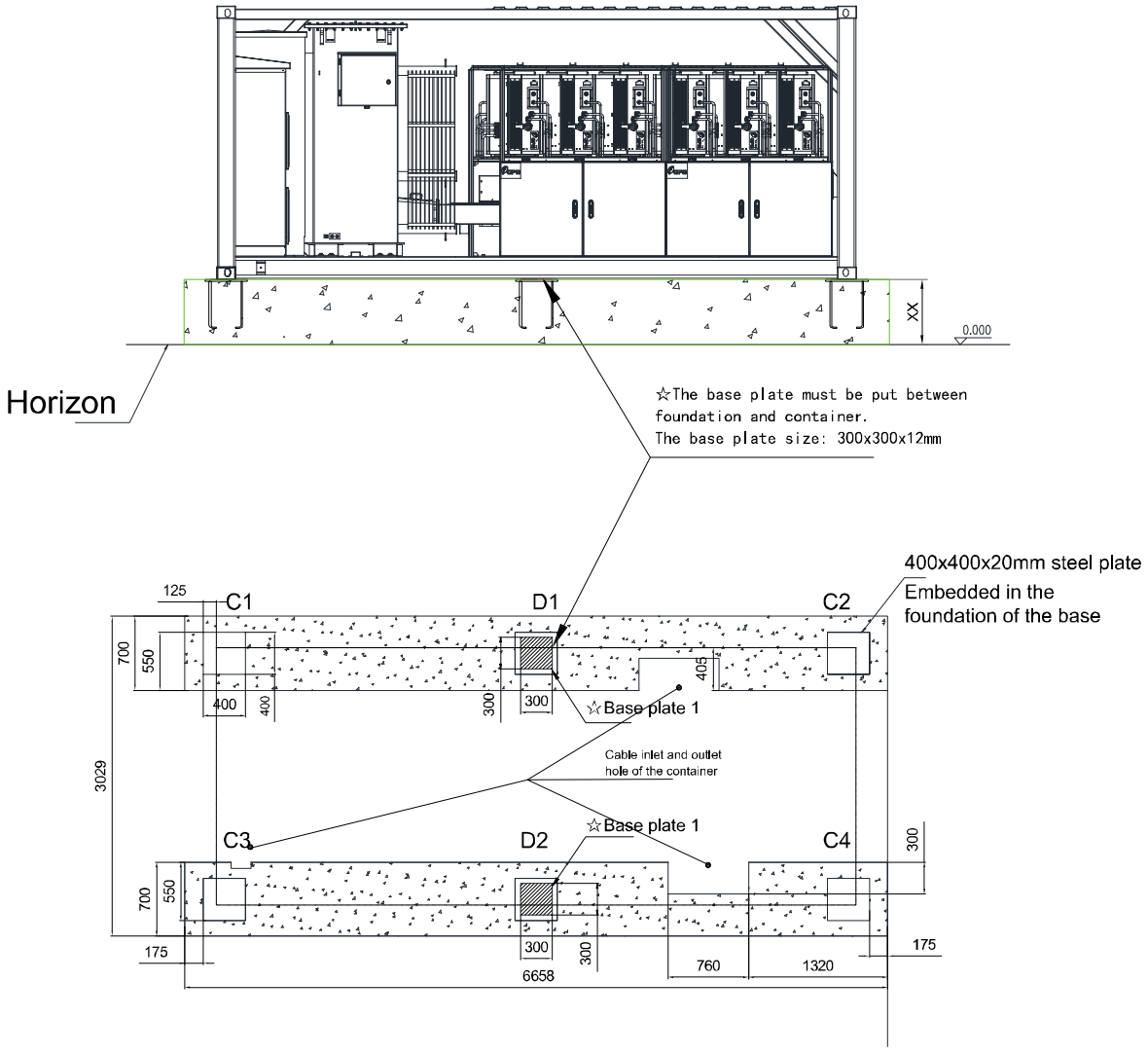


Fig. 3-2 Reference diagram of installation foundation

5. Appropriate distance must be reserved between the PCS skid and walls and other equipment to meet the requirements of minimum maintenance access, escape routes and ventilation, as shown in Fig. 3-3 and table 3-3.

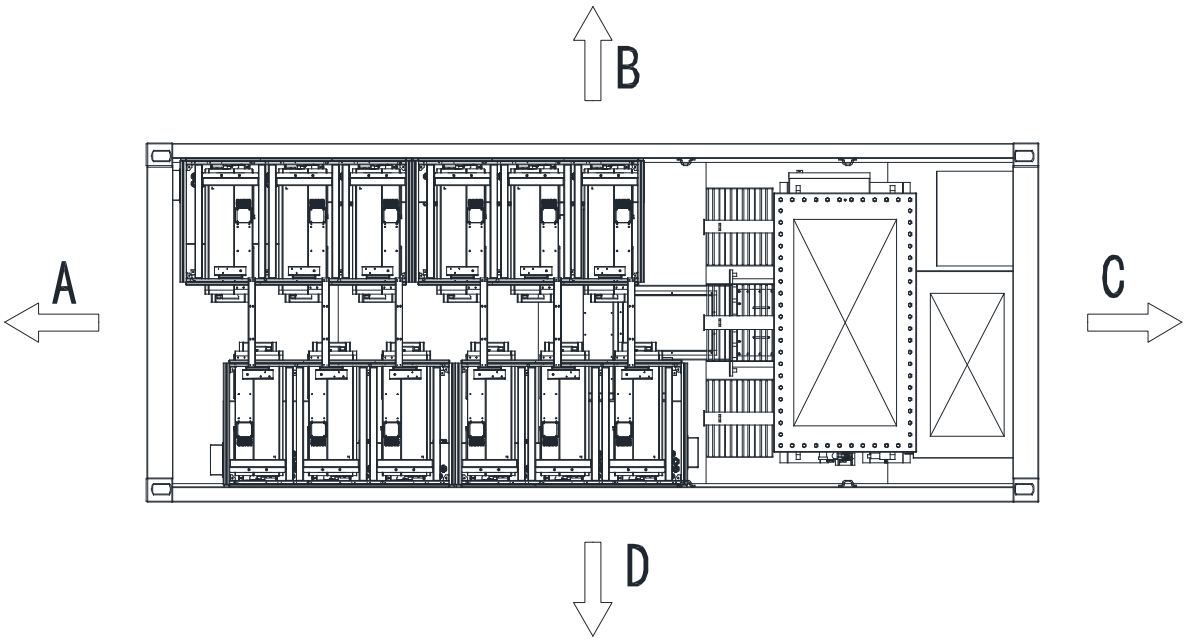


Fig. 3-3 Diagram of installation space distance

No.	Recommended minimum distance	Remarks
A	800 mm	Ensure ventilation and heat dissipation requirements
B	800 mm	Meet the requirements of normal door opening and closing, user operation, wiring construction, etc.
C	1100 mm	Meet the requirements of normal door opening and closing, user operation, wiring construction, etc.
D	800 mm	Meet the requirements of normal door opening and closing, user operation, wiring construction, etc.

Table 3-3 Installation Distance Table

3.4.2 On-site handling of PCS skid installation

1. Lifting Precautions.

DANGER:

- During the whole process of lifting the PCS integrated machine, the safety operation regulations of the crane must be strictly followed.
- It is forbidden to stand within 10m of the operation area. In particular, it is forbidden to stand under the lifting arm and the lifted or moved machine to avoid casualties.
- In case of bad weather conditions, such as heavy rain, fog and strong wind, the lifting operation should be stopped.

When lifting the PCS skid, the following requirements should be met at least:

- Site safety must be ensured during lifting.
- During the lifting and installation operations, there should be professionals on site to command the whole process.
- The lifting cable used has a bearing capacity of more than 10 tons and a length of more than 6.5 meters. 4 lifting cables are used for lifting at 4 corners. Angle between the lifting cable and the equipment should not be less than 60° (Fig. 3-4), and the total bearing capacity should not be less than 40 tons.
- The crane shall have sufficient arm length and radius of rotation, please refer to the dimensions of the PCS skid (Fig. 2-3).
- Please use the four lifting corner fittings of the PCS integrated machine to lift it.
- Ensure that all sling joints are safe and reliable, and all slings connected with lifting rings are of equal length.
- The length of the sling can be properly adjusted according to the actual requirements of the site.
- During the whole lifting process, the PCS integrated machine must be stable and not skewed.

- The PCS integrated machine shall be lifted vertically, and no dragging on the ground is allowed during lifting. It shall not be dragged or pushed on any surface.
- After the PCS integrated machine is lifted 300mm away from the supporting surface, suspend to lift and check the connection between the sling and the PCS integrated machine. Only after confirming that the connection is firm can continue to lift the machine.
- After the PCS integrated machine is in place, it shall be placed gently and landed stably. It is strictly prohibited to place the PCS integrated machine outside the vertical landing by swinging the lifting appliance.
- The PCS integrated machine shall be placed on a solid and flat ground with good drainage and no obstacles or protrusions, and the PCS integrated machine shall be supported by the base only.
- Take all necessary auxiliary measures to ensure the safe and smooth lifting of the PCS integrated machine.

2. Handling with Crane.

Install the sling into the four lifting angle fittings around the PCS integrated machine for lifting, and use a crane to move the machine to an appropriate position for installation, as shown in the following figure.

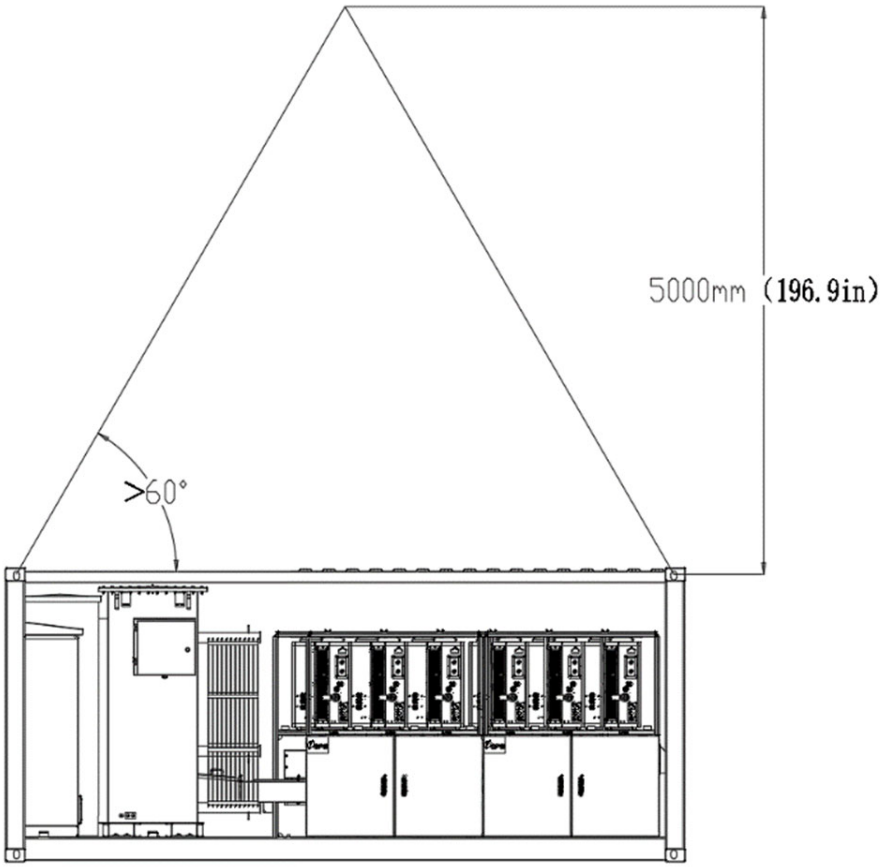


Fig. 3-4 Schematic Diagram of Crane Handling

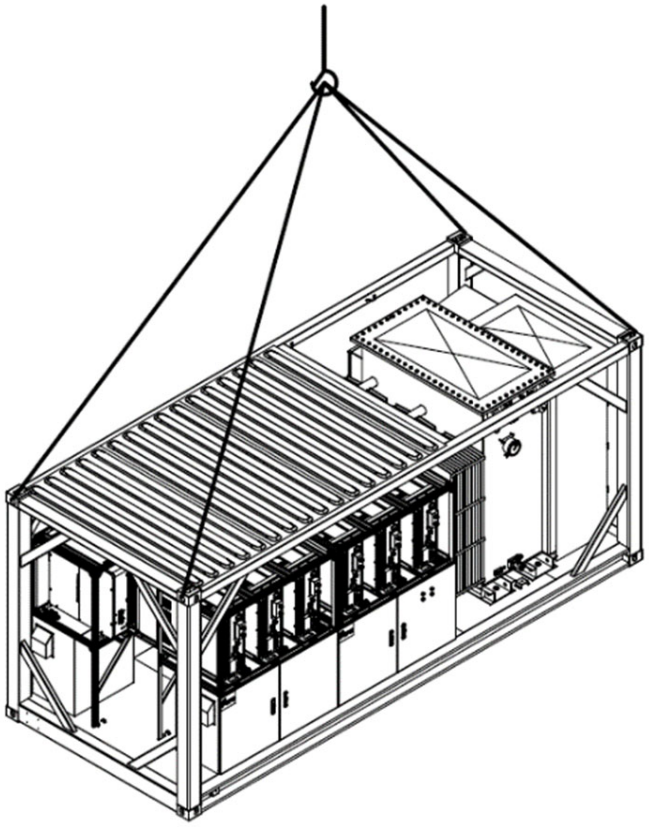


Fig. 3-5 Schematic Diagram of PCS All-in-one Machine Lifting

3.5 Electrical connection

WARNING:

- The configuration of the PV array, grid level, frequency, and other technical parameters must meet the technical parameter requirements of a PCS skid.
- The PCS skid can be connected to the power grid only after being approved by the local power supply company and installed by professional technicians.
- All electrical connections must comply with local electrical installation standards.

3.5.1 Wiring Preparation

1. Open the HV chamber cabinet door (1) and DC side cabinet door (2);

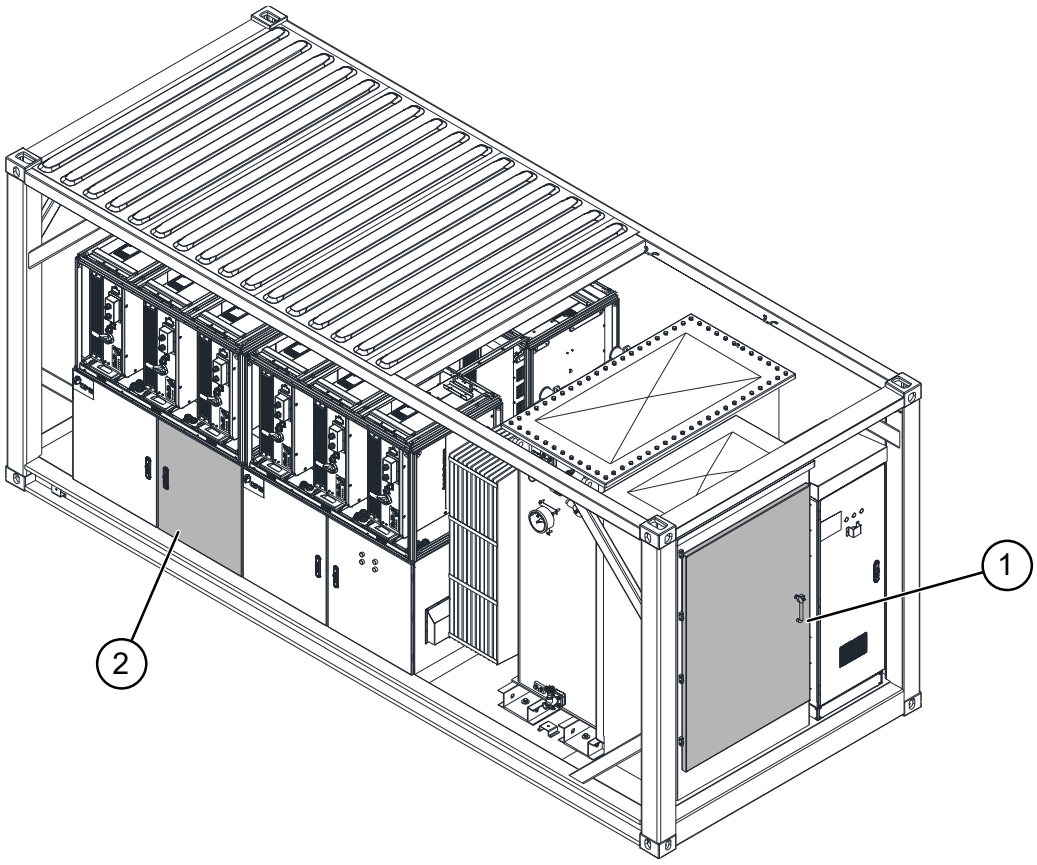


Fig. 3-6 HV Chamber Door and DC Cabinet Door

2. After opening the AC/DC side door, remove the protective cover on the front side of the machine for external distribution;

3. All external wiring must pass through the threading hole under the machine, as shown in the following figure;

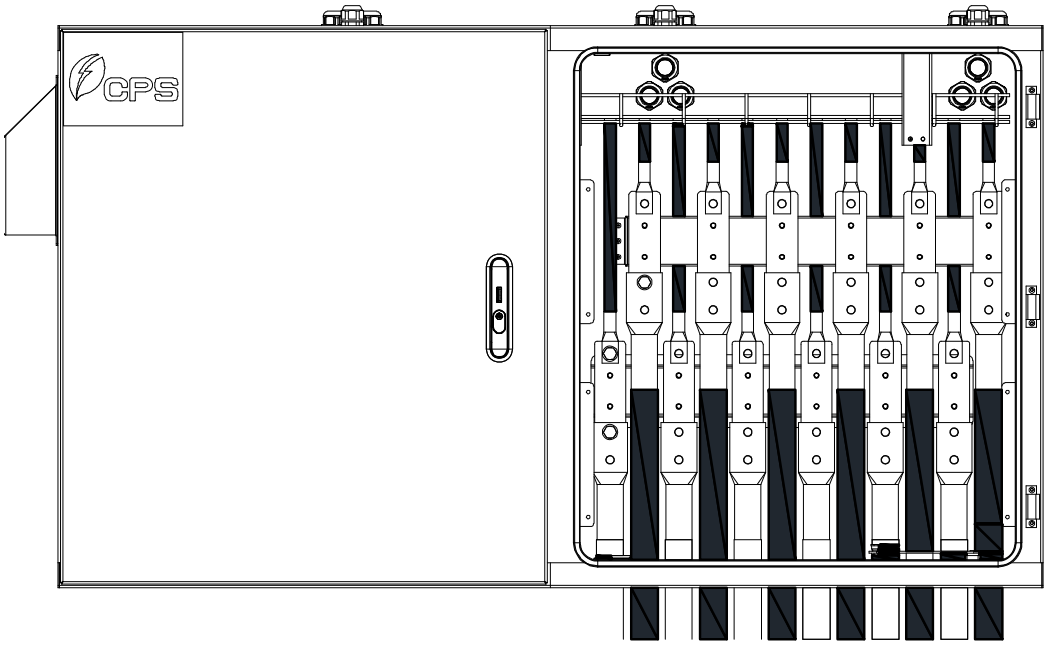


Fig. 3-7 DC Wiring

3.5.2 DC Connection

1. To get the best results from your PCS skid, follow these guidelines:
   - First, ensure that the maximum output voltage of the battery cluster is lower than 1500V
   - Ensure that the polarity on the DC input side is correct, i.e. the positive pole of the battery cluster is connected to the positive DC input of the PCS skid, and the negative pole of the battery cluster is connected to the negative input of the PCS skid
   - The 2400KW PCS skid supports up to 12 inputs, and the maximum current of each DC input is 218A
   - For DC input, it is recommended that each input copper bar be connected with up to two cables. The size of the DC wiring copper bar is shown in Fig. 3-8, and the cable diameter recommendations are shown in table 3-4 below

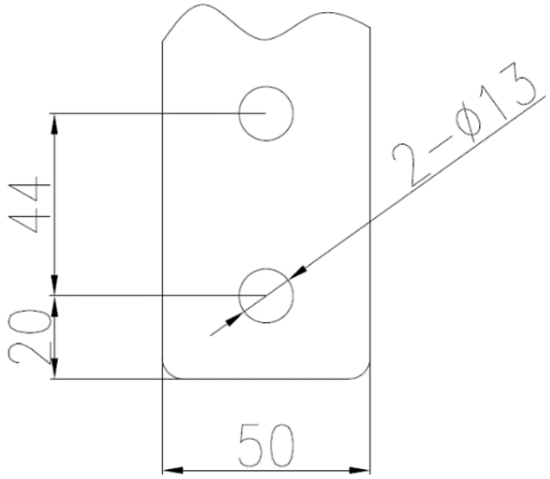


Fig. 3-8 Diameter of Copper Bar for DC Wiring (mm)

Machine type	CPS PSW2M-US	CPS PSW2.4M-US
Number of DC input channels	10-circuit	12-circuit
Recommended cable diameter	⩾2/0 AWG	
Bolt	M12	
Torque	25Nm	

Table 3-4 Cable Parameters

2. Connect the DC positive (1) and negative cables (2) to the positive and negative copper bars of the PCS skid accordingly. The positions of the DC input positive and negative wiring copper bars are shown in Fig. 3-9.

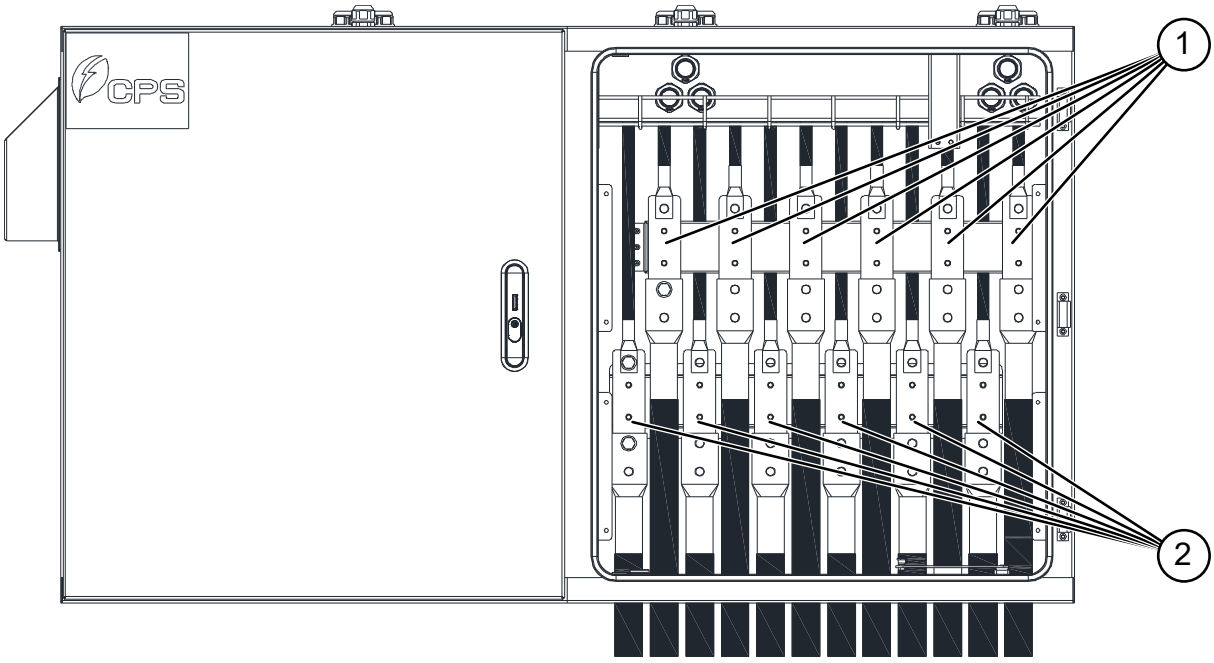


Fig. 3-9 DC Input Wiring Position

NOTE:

There are six groups of DC inputs on one side below the DC distribution isolating switch, with DC "+" wiring copper bar in front and DC "-" wiring copper bar behind.

3. The following principles are recommended for DC input wiring:
   - DT or DTM copper terminals conforming to GB/T 14315 are recommended.
   - Copper core cables with an operating temperature of 90°C or above are recommended.
   - Hexagonal cross section is recommended for the crimping of wiring terminals and cables with 2-3 times.
   - Please confirm the number of DC input channels, select an appropriate cable diameter, then fix the wiring terminal on the copper bar according to the connection method shown in Fig. 3-10, and lock it with a torque wrench (torque: 25Nm).

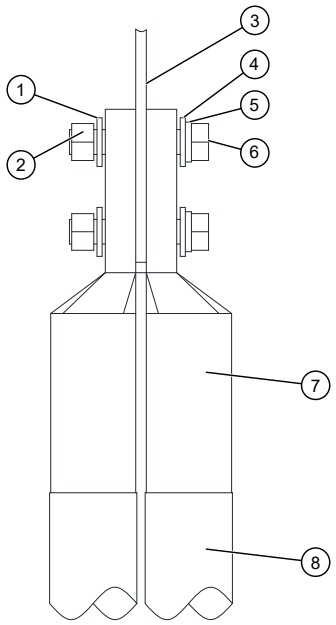


Fig. 3-10 Connection of DC Input Cable

1. Flat washer
2. Nut
3. Copper bar
4. Flat washer
5. Spring washer
6. Bolt
7. Terminal
8. Cable

3.5.3 AC connection

WARNING:

Incorrect ac side wiring will cause failure of or even damage to the PCS skid!

WARNING:

The internal wiring identifications of the PCS skid shall be strictly followed, and the phase sequence of the power grid shall be correct during wiring!

1. The cross-sectional area of each AC input phase of the booster is a maximum of 240mm^2(or 600 kcmil). The high-voltage cable connection position is shown in Figure 3-11.

2. Connect L1 output terminal connection (1), L2 output terminal (2), and L3 output terminal (3) according to the following figure.

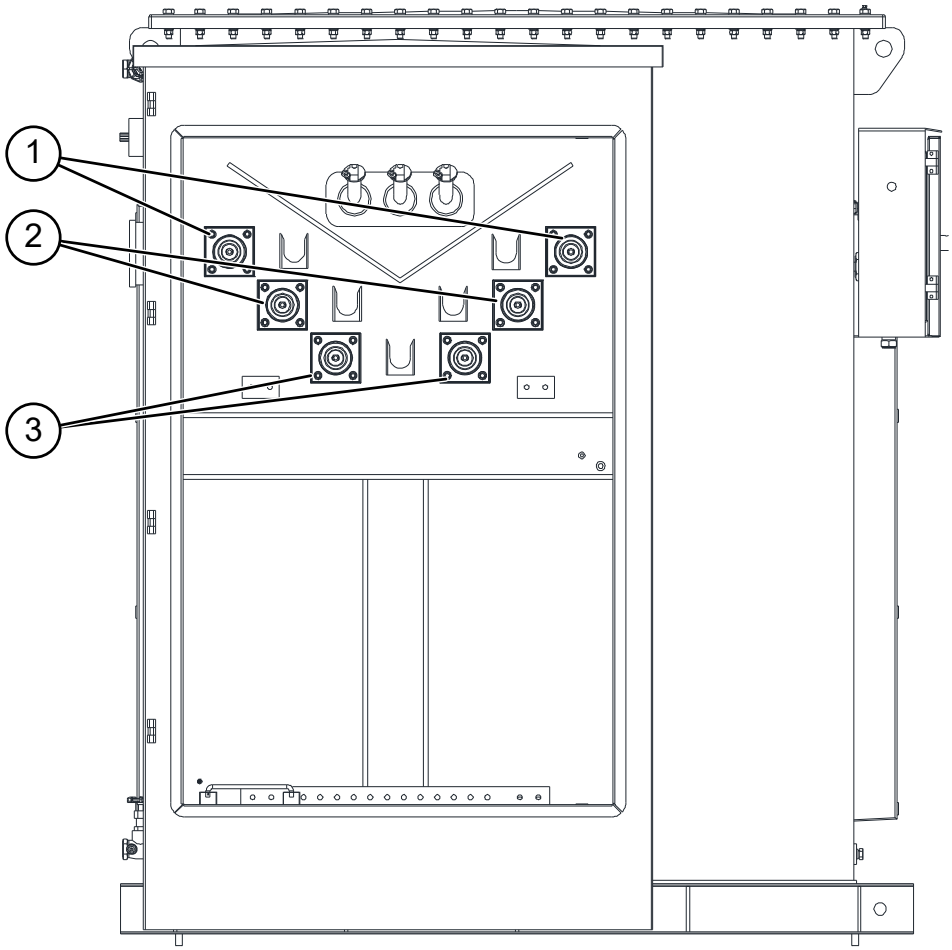


Fig. 3-11 AC Wiring Connection

3.5.4 Earthing connection

1. PCS all-in-one cabin body grounding

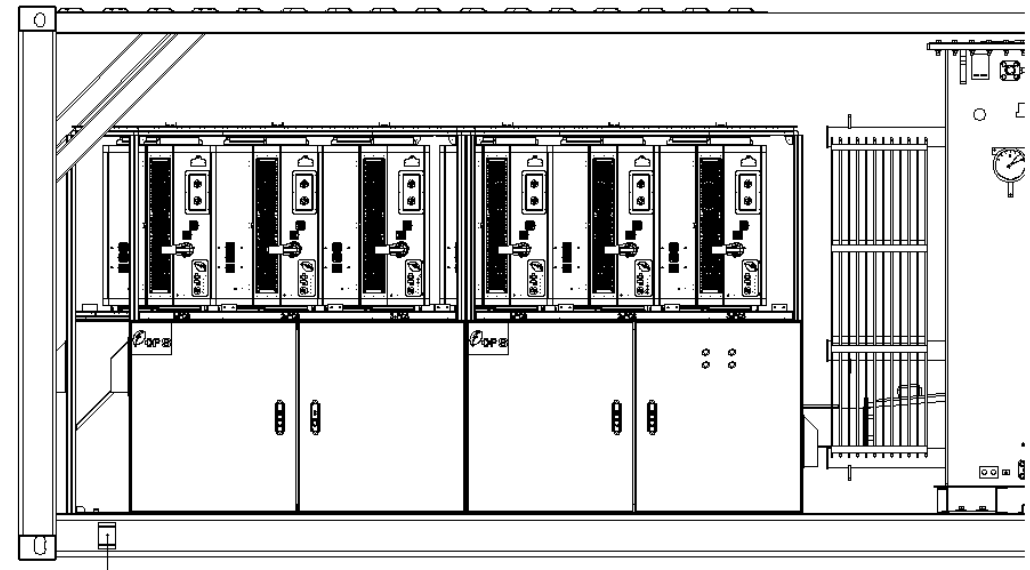
For on-site cable connection, two ground points are designed for the all-in-one cabin body, as shown in the figure below, and two or one of two ground points are reliably connected according to the actual situation. At least one of the two points must be connected to meet the grounding requirements of the cabin body. The external ground point of the fusioncube can be grounded in the following two ways.

· Connect the ground cable to the external ground point using M12 bolts, 50mm2 to 95mm2 or 0AWG to 4/0AWG cables are recommended

Phase	Cross-sectional area of cable	Bolt	Torque
GND	50mm²~95mm² (or 4AWG~1AWG)	M12	25N.m

· Weld the ground steel sheet to the external ground point, and perform anti-corrosion treatment after welding

Phase	Materials	Way	Technology
GND	Flat steel	weld	anticorrosion



Left view

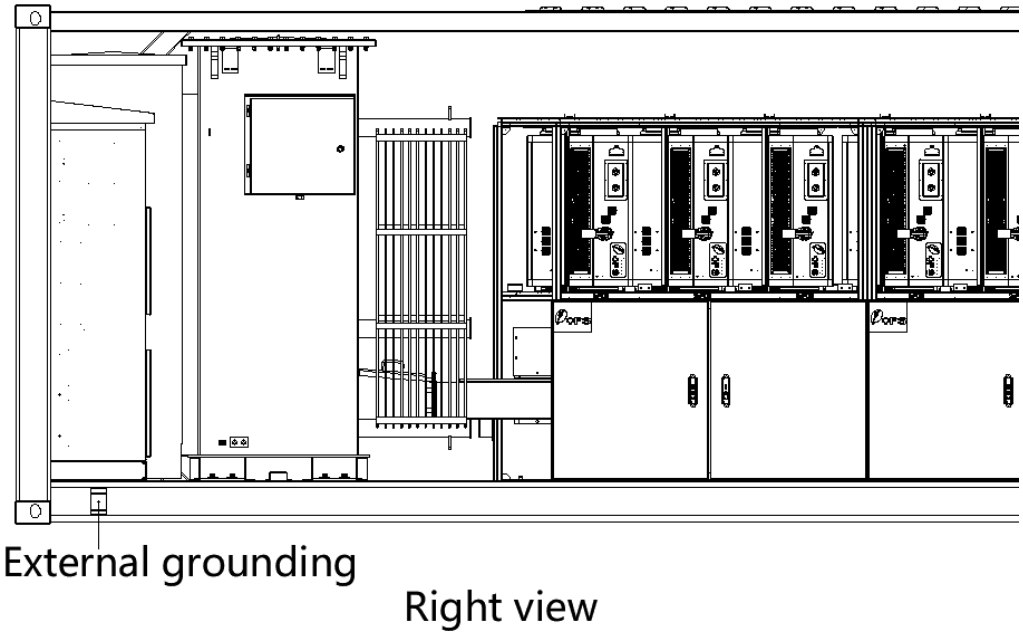


Fig. 3-12 Grounding diagram of the cabin body of PCS skid

2. Ground electrical devices

Please refer to table 3-13 for the diameter of the grounding cable. Fix the wiring terminal of the grounding cable on the grounding copper bar (1) and tighten it with a torque wrench (torque: 25Nm), as shown in the following figure.

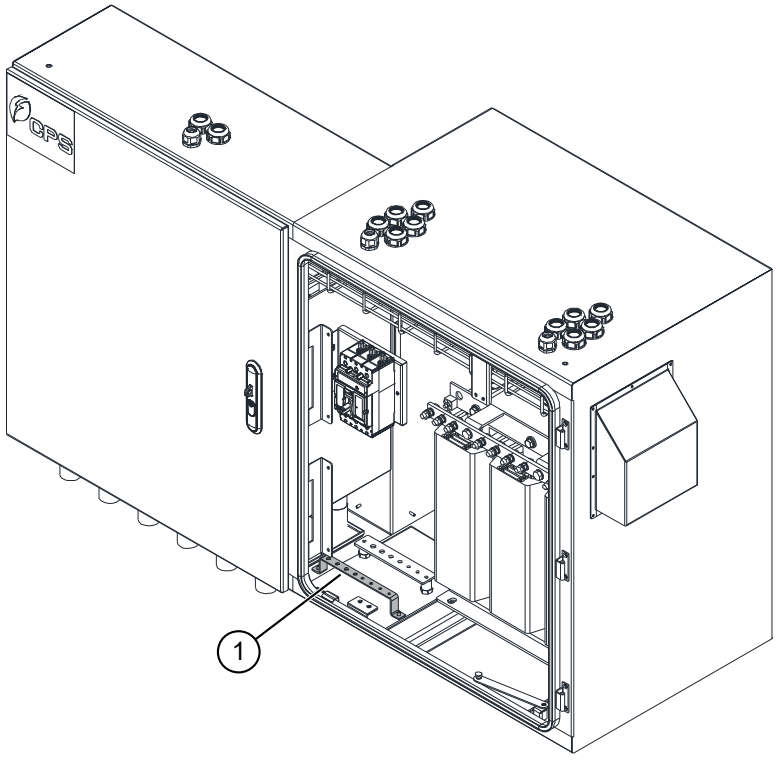


Fig. 3-13 Schematic Diagram of Grounding Cable Connection

Phase	Cross-sectional area of cable	Bolt	Torque
PE	16mm²~35mm² (or 4AWG~1AWG)	M10	25Nm

Table 3-5 Parameters of Grounding Cable

NOTE:

The machine housing shall be reliably and nearby grounded. Avoid the possibility of electric shock to human body.

WARNING:

For large touch current, grounding is required before switching on the power supply.

3.5.5 Communication connection

1. Communication connection with battery compartment BMS:
   - The PCS skid is directly connected to the battery holder BMS through Ethernet and CAN interfaces.

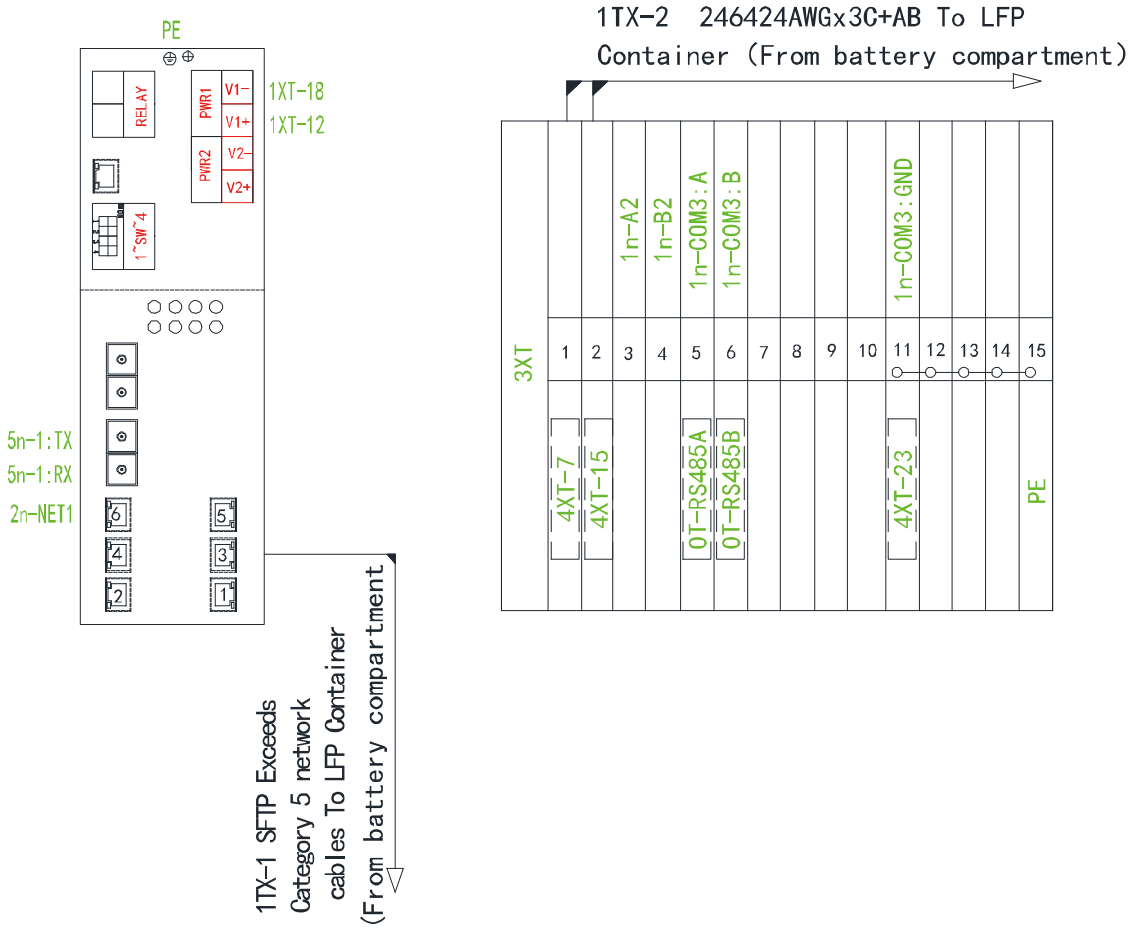


Fig. 3-14 Schematic Diagram of Communication Interface

2. Communication with background upper computer

- Each PCS skid is reserved with 3 Ethernet signal interfaces and 2 optical fiber interfaces for communication with the background. The communication cable shall be a shielded network cable, and both ends of the crystal plug with a straight-through twisted pair shall comply with the 568B standard. Each group of twisted pairs shall correspond to each other at both ends one by one, and the same color shall be kept consistent in the corresponding slots of the crystal plugs at both ends.
- For remote monitoring of multiple PCS skids, the Ethernet interface or optical fiber interface on the PCS skid is connected in parallel with the corresponding interface of another PCS skid and connected to the monitoring background through the bus.

3.5.6 External auxiliary power supply and dry contact connection

1. The external power supply and dry contact wiring of the PCS skid are shown in Fig. 3-15 below:

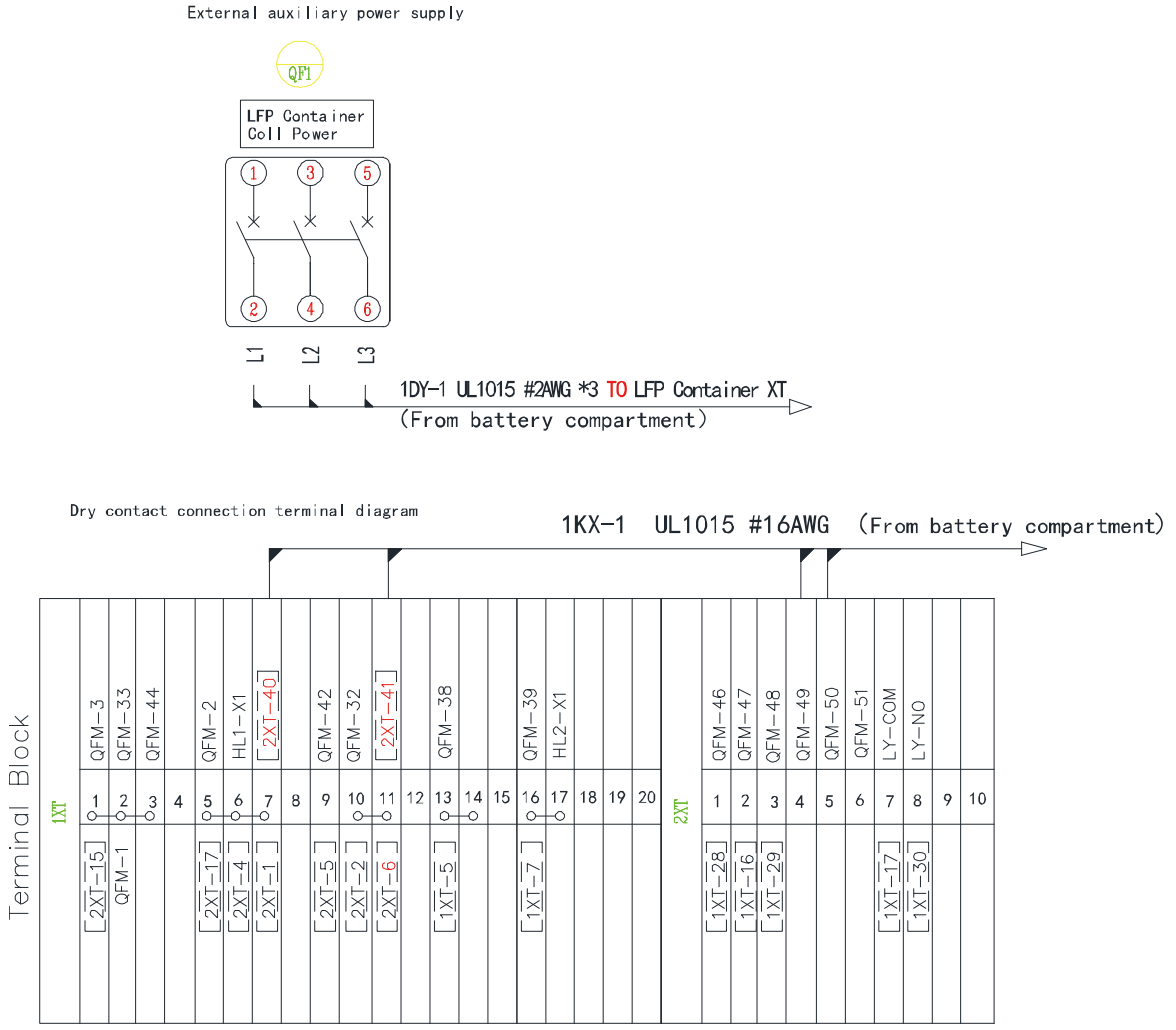


Fig. 3-15 Dry Contact Terminal

- The input dry contact is used to receive BMS tripping signals, and the externally provided signals shall be passive switching signals;
- The output dry contact is used for the tripping feedback signal of the grid-connected main switch, which is a passive switching signal.

2. The PCS skid adopts internal power supply mode and can also provide control power for the battery compartment, with a maximum capacity of 45KVA.

Chapter 4 Power-on and Power-off Operations

After the wiring is completed, turn on and turn off the system as follows.

4.1 Power-on operation process

1. UPS ① in 1# DC combiner cabinet is started, QF8 ② is closed, the red power indicator of UPS is on, and the control circuit power supply is normal;
2. The main circuit closes the HV load switch in the HV chamber of the American transformer (see Fig. 4-2), the LV side closes the frame circuit breaker QFM ③, and the red LED HL3 is on;
3. Close the isolation fuse GK2 ④ in 1# AC combiner cabinet, and then close the control power supply cabinet QFM2 ⑤. The white indicator HL1 of the mains supply at the door of the control power supply cabinet is on, indicating a normal power supply;
4. Close QF2~QF4 ⑥ in 1# control power cabinet successively and measure the voltages at the upper and lower ends, which are both 220V. At this time, UPS, step-up transformer control power supply equipment, and fan can work normally;
5. Close QF1~QF6 ⑦ in 1# AC combiner cabinet and QF7~QF12 in opposite 2# AC combiner cabinet;
6. 1#~12# PCS ⑧ startup;

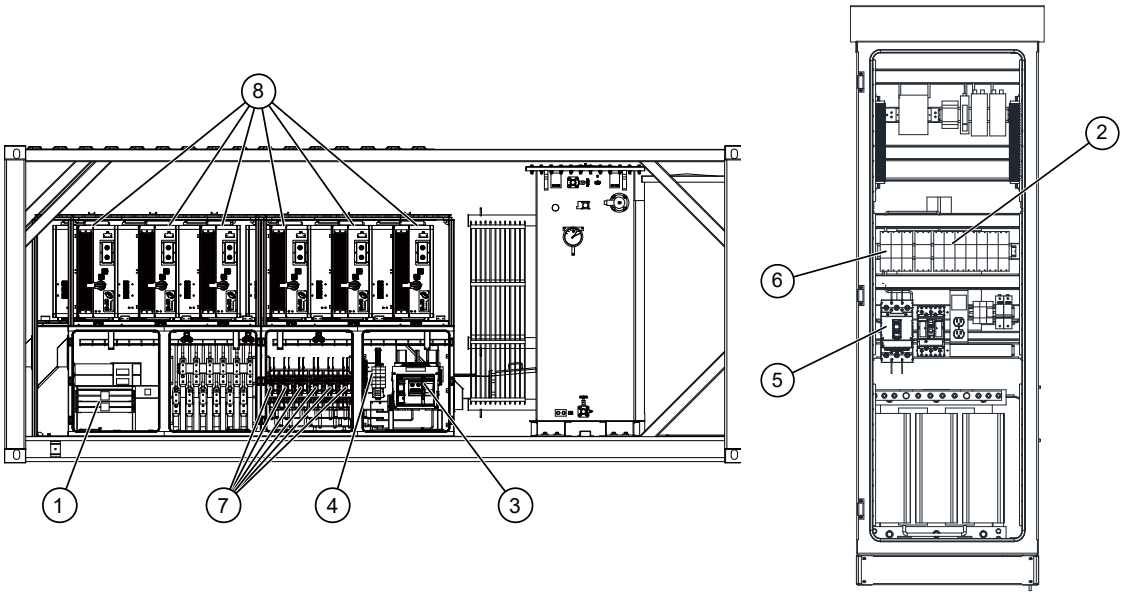


Fig. 4-1 Schematic Diagram of Electrical Switch

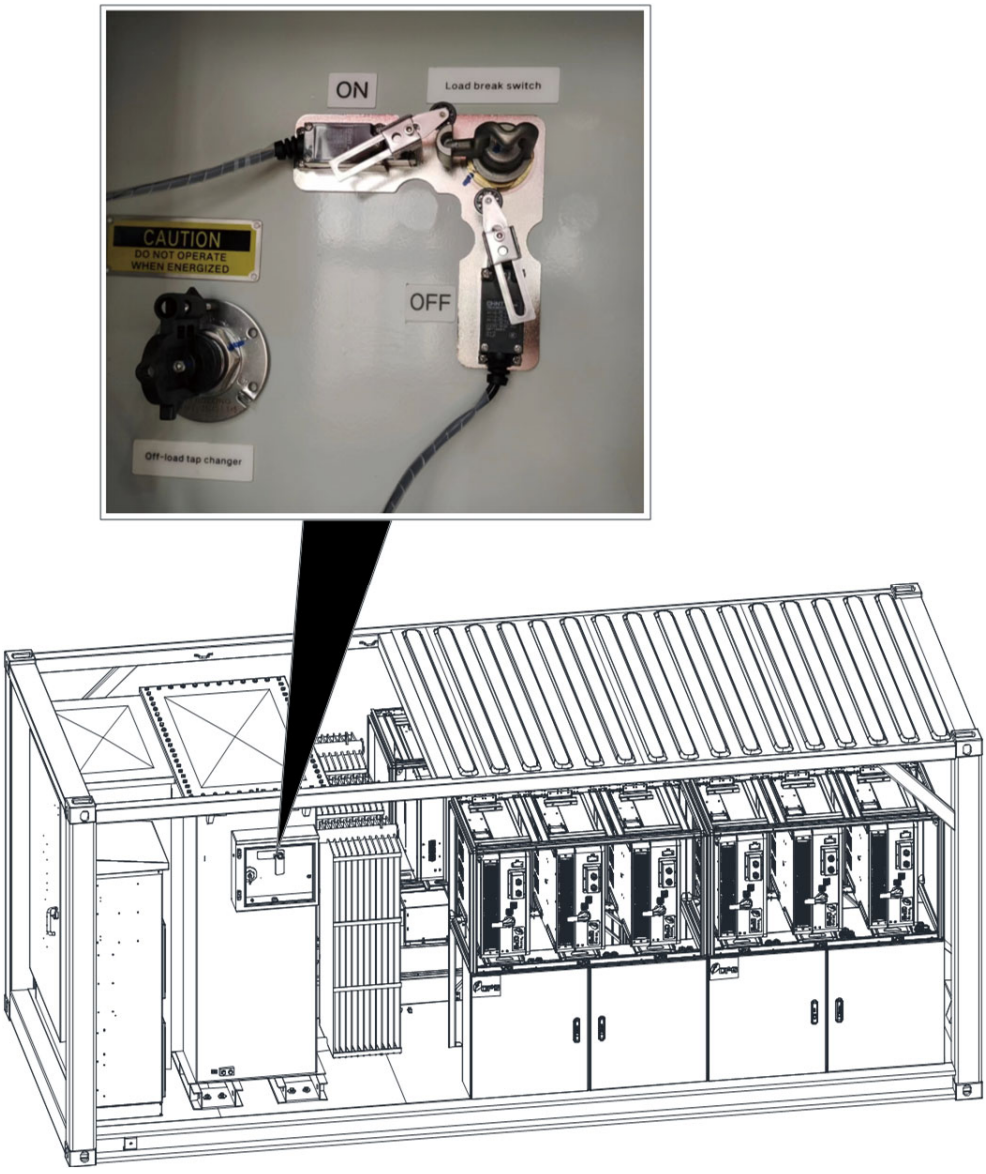
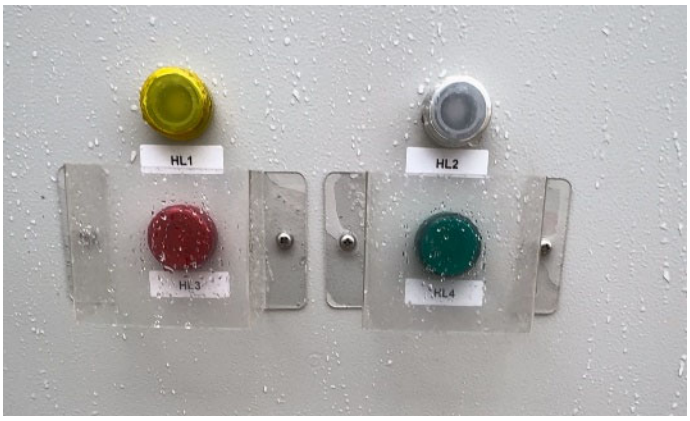


Fig. 4-2 American Transformer HV Indoor HV Load Switch (Closed)

4.2 Power-off operation process

1. Set the PCS output to “0” (refer to the 5.1 Startup/Shutdown)to shutdown the 1#~12# PCS ⑧ and open the PCS AC relays;
2. Disconnect QF1~QF6 ⑦ in 1# AC combiner cabinet and QF7~QF12 in opposite 2# AC combiner cabinet;
3. Turn off the DC SWICTH on the PCS side;
4. Disconnect QFM ③ in 1# AC combiner cabinet at the LV side of the step-up transformer, and the green opening indicator light HL4 is on;
5. Disconnect the main switch QFM2 ⑤ of the control power cabinet, disconnect QF2 ~ QF4 ⑥, and disconnect the isolation fuse GK2 ④ in the 1# AC combiner cabinet. The white indicator light HL1 （Fig. 4-3）of the mains supply in the control power cabinet goes out;
6. Disconnect the Load break switch in the INSTRUMENT compartment next to the high voltage chamber of the American transformer using an insulated operating rod, See Fig 4-2;
7. Disconnect the main DC switch QF8 ② of the control power cabinet, HL4 is off in 1# AC combiner cabinet, press and hold the shutdown button UPS ① for 3 seconds to shut down and confirm that it is shut down. The red UPS indicator light goes out.

Adding note: What's the purposes of yellow LED HL1? Please refer to the picture below:



1# AC combiner cabinet

HL1 (Yellow): Fault Alarm

HL2 (White): Energy storage

HL3 (Red): QFM Closed

HL4 (Green): QFM Opened

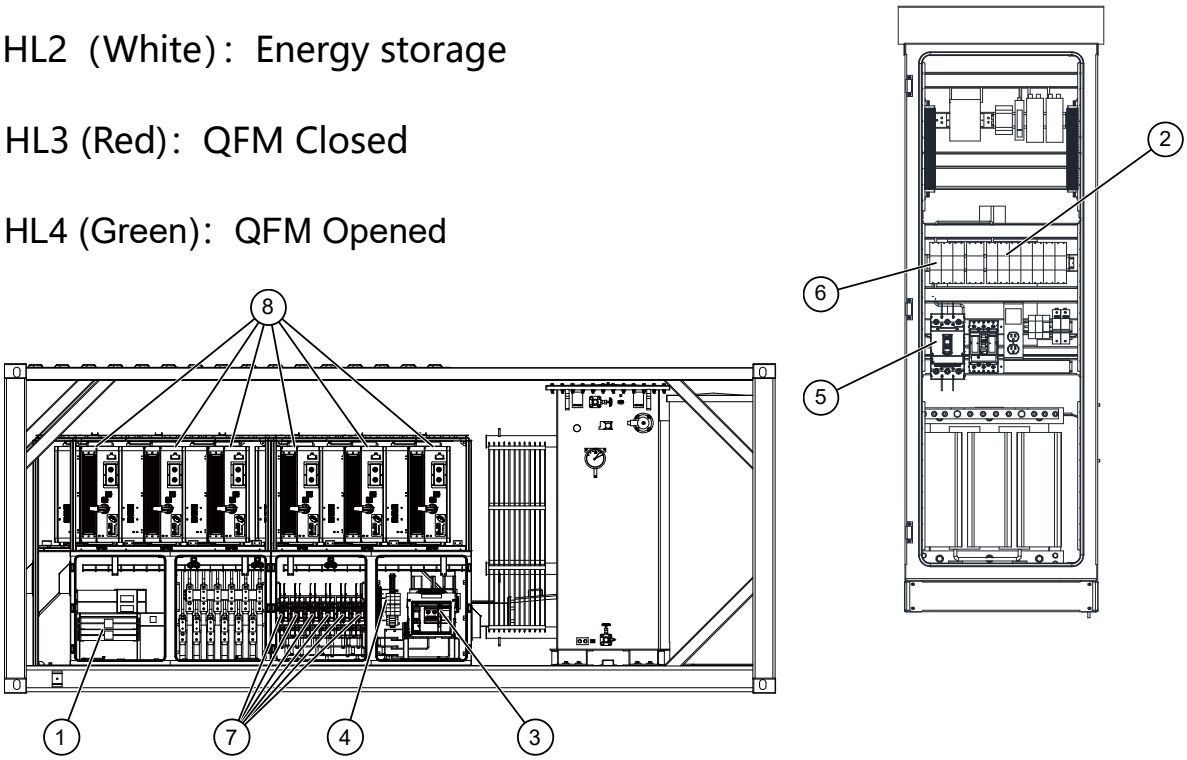


Fig. 4-1 Schematic Diagram of Electrical Switch

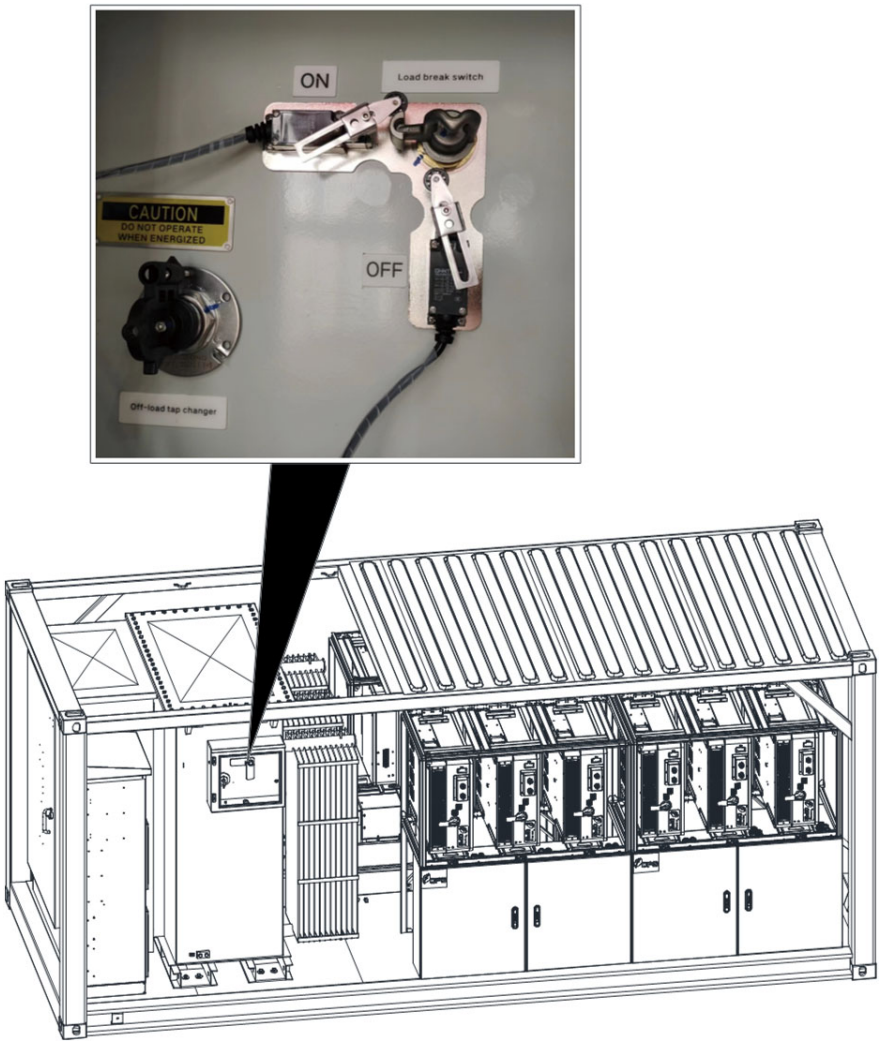


Fig. 4-2 American Transformer HV Indoor HV Load Switch (Closed)

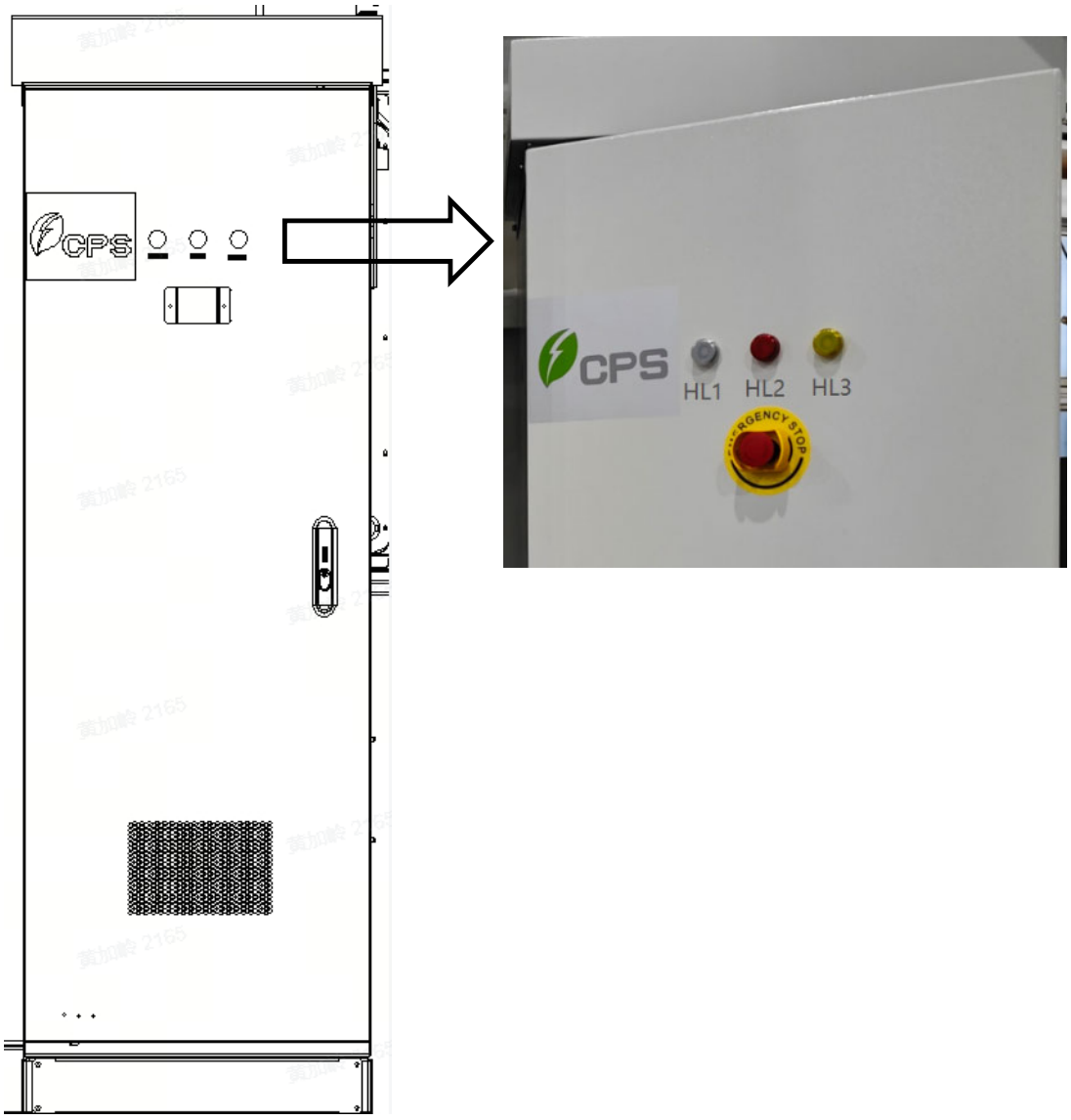


Fig. 4-3 Control power cabinet diagram

Control the power cabinet indicator:

HL1(White): Mains power

HL2(Red): UPS power

HL3(Yellow): Fault Alarm

Chapter 5 Operation

The local controller can be used to control the startup and shutdown of the PCS skid and set the power.

5.1 Startup/Shutdown

1. Connect the laptop port to Ethernet1 of the local controller with a network cable, and open the "SVP Dashboard" client;
2. After opening the client, click the website "http://localhost:8444" in the pop-up window;

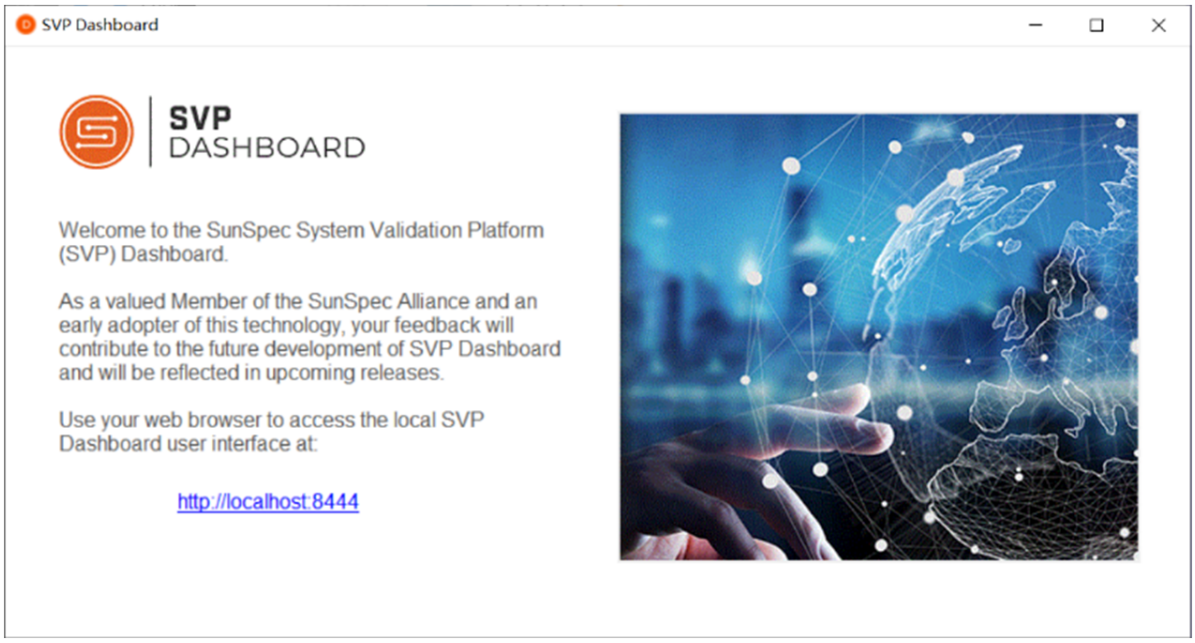


Fig. 5-1 SVP Dashboard Pop-up Window

3. After opening the website, select "open" in the drop-down menu of "device" to open the login interface;

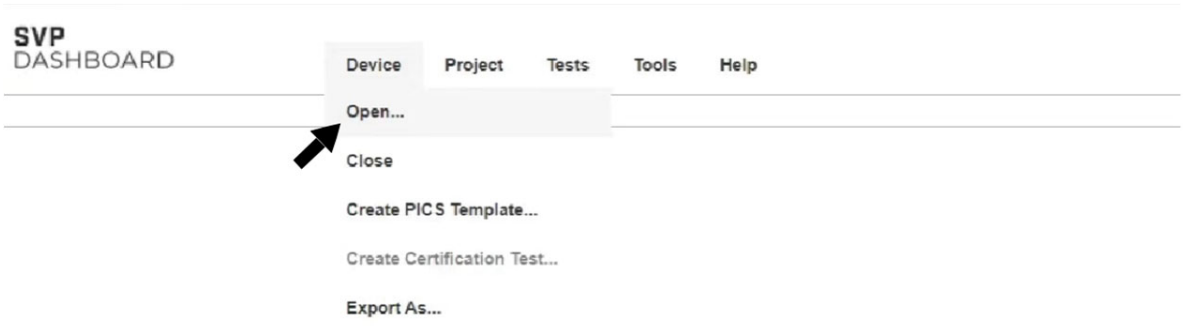


Fig. 5-2 Open the Login Interface

4. After entering the login interface, enter information according to the following figure and click "Open" after input;

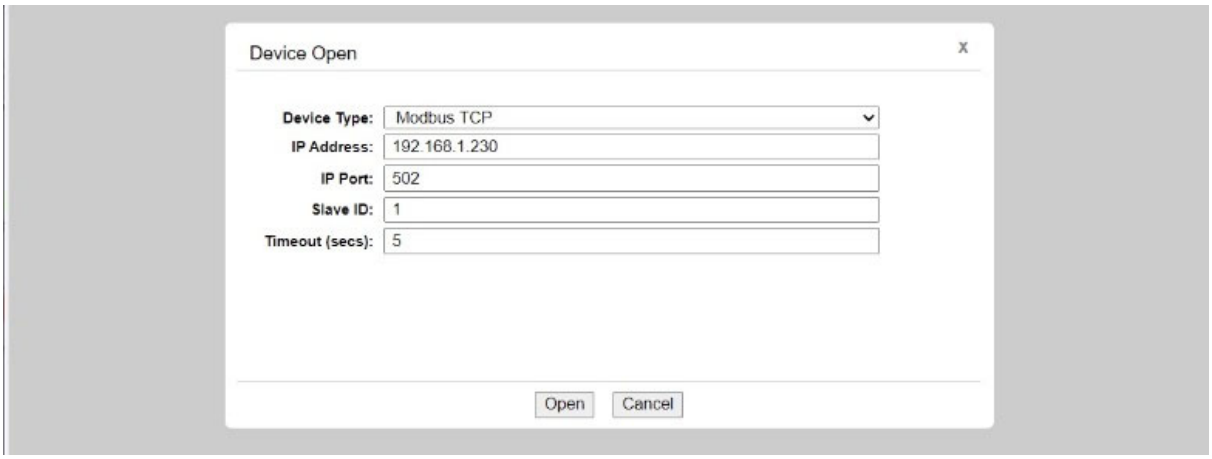


Fig. 5-3 Enter Login Information

5. Click "703", find the Permit Enter Service (ES) column, enter data 0 or 1, and click "Write" below to complete the startup/shutdown operation; Enter “0” to turn off PCS; enter “1” to turn on PCS.

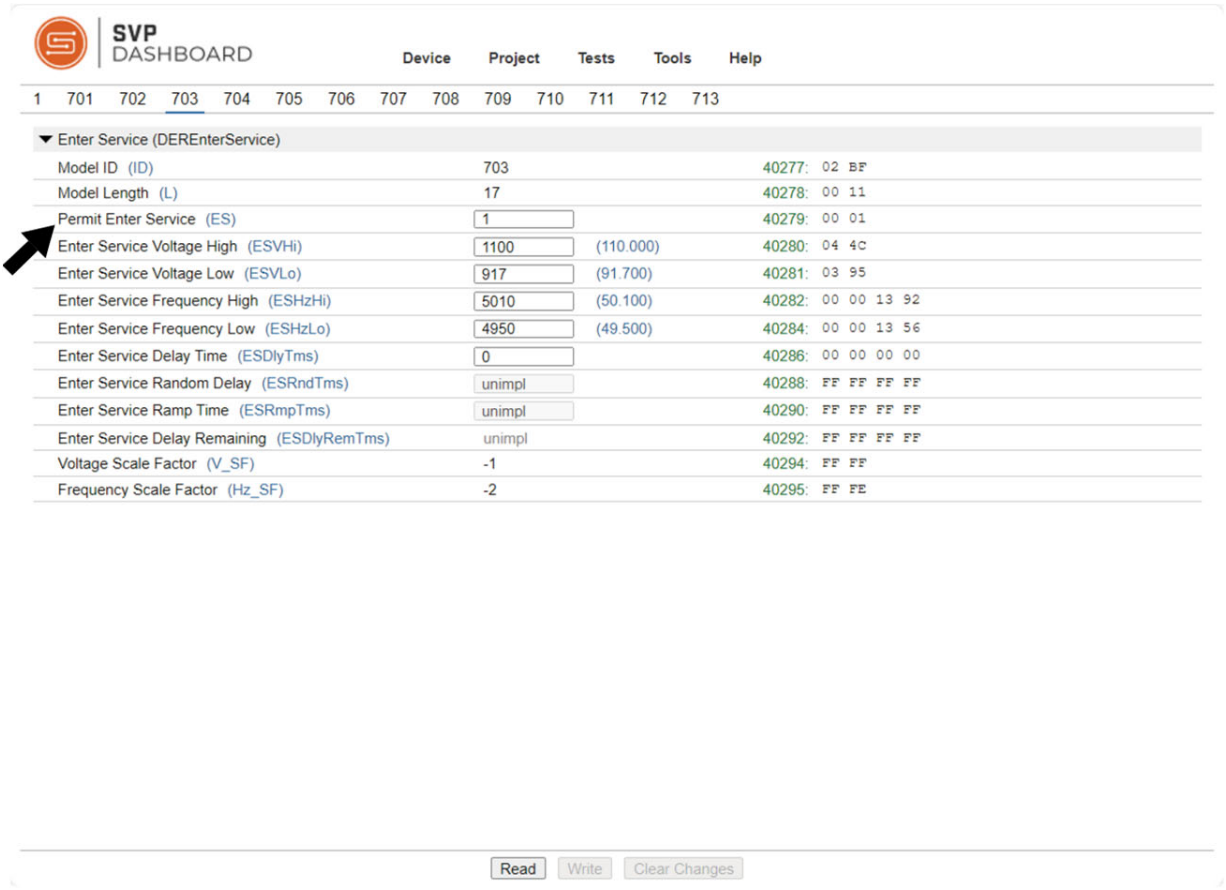


Fig. 5-4 Power-on/off setting

5.2 Power setting

1. Open the startup/shutdown interface. Please refer to the steps in 6.1 "Startup and Shutdown";
2. Click "704" to find the column of Active Power Setpoint, enter data, and click "write" after entering to set active power.

   The input value is -1000~1000, and the representative power is set to -100.0%~100.0%. For example, if 998 is entered, the representative power is set to 99.8%.

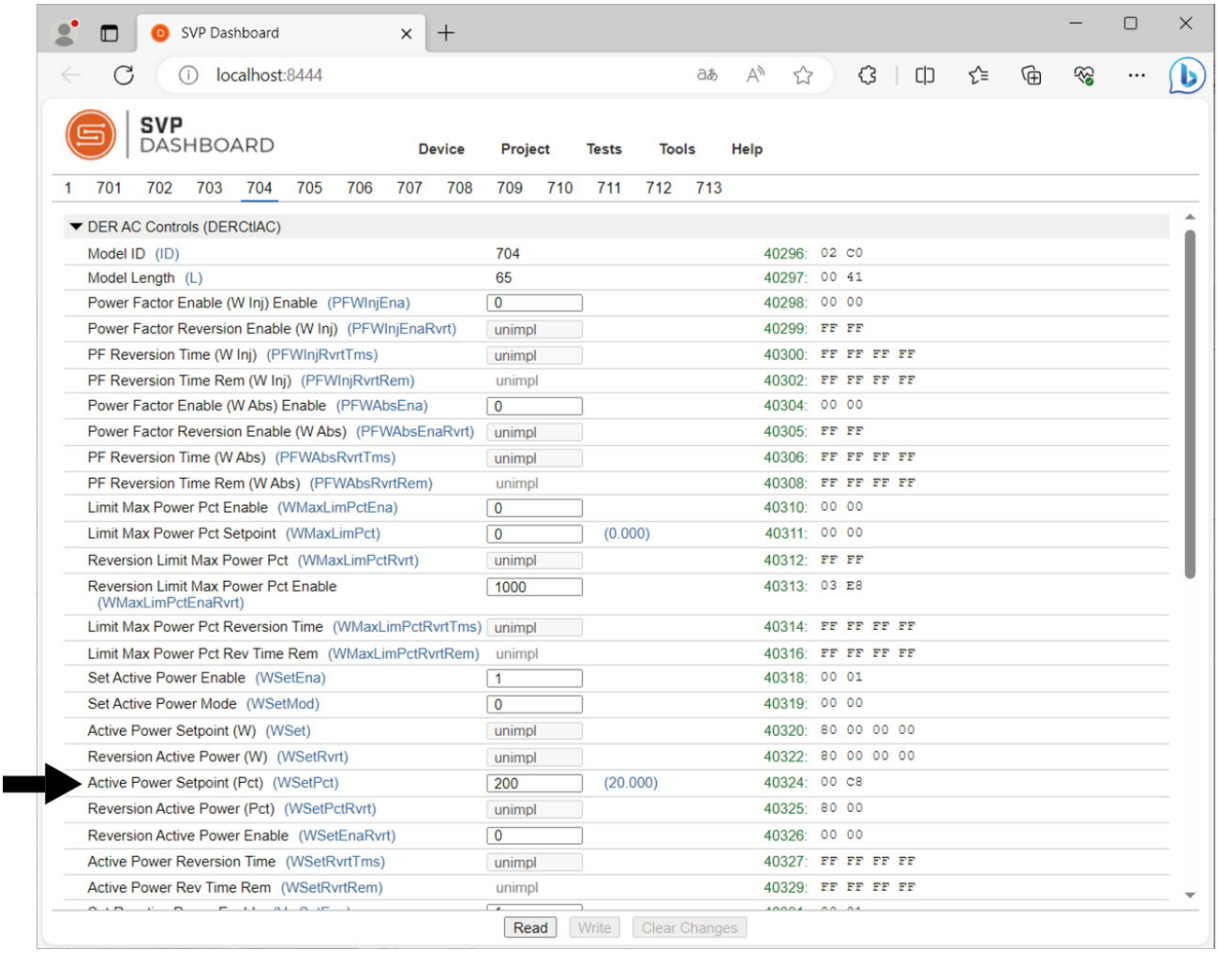


Fig. 5-5 Power Setting

Chapter 6 Maintenance and Troubleshooting

6.1 Maintenance

6.1.1Regular maintenance

Item	Method	Maintenance intervals
System clean	1. Check the temperature and dust of the PCS. Clean enclosure if necessary. 2. Check if the air inlet and outlet as well as air vent filter are normal. Clean the air inlet and outlet as well as air vent filter, with soft brush or vacuum cleaner, if necessary.	6 months to 1 year (depending on the installation environment)
Cable entry	Check whether the cable entry is insufficiently sealed or the gap is excessively large, and reseal the entry when necessary.	Once a year
Electrical connection	1. Check whether all cables are firmly in place. If loose, please tighten all the cables referring to “4 Electrical installation”. 2. Check for cable damage, especially whether the cable surface is scratched or smooth. Repair or replace the cables if necessary.	6 months to 1 year

Table 6-1 Regular maintenance

6.2 Service and Replace

6.2.1 Replace the PCS

DANGER:

Please disconnect the electrical connection in strict accordance with the following steps. Otherwise, the PCS may be damaged, and the personal and life safety of service personnel may be endangered.

Dismount and replace the PCS according to the following steps when the service time is due or when it is needed:

1. Turn off all switches according to the power-off operation process in 4.2;
3. Turn off the operation and switch of DC side equipment (such as battery container equipment);
4. Turn the DC SWITCH (1) on PCS to OFF position;

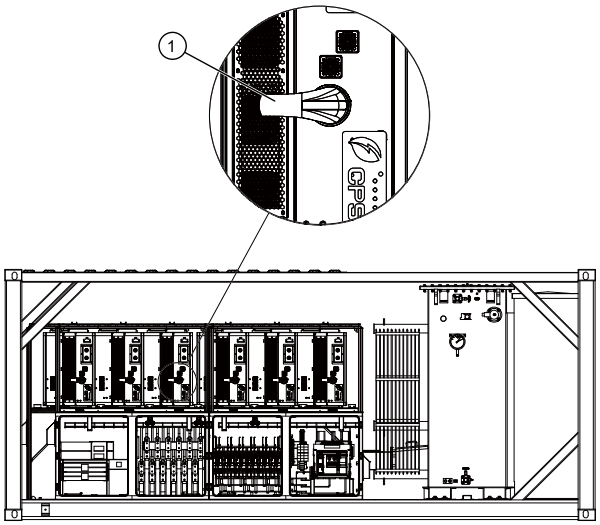


Fig. 6-1 DC switch

5. Connect and hang the maintenance grounding cable at the cable connection between the DC incoming copper bar of the combiner box and the high-voltage chamber of the American transformer;

Fig. 6-2 Grounding Cable

6. Remove the DC cable and AC cable (1),, and PCS grounding cable (2) of PCS incoming and outgoing lines;

Fig. 6-3 Schematic Diagram of Cables

7. Remove the four combination screws (1) of the PCS to remove it;

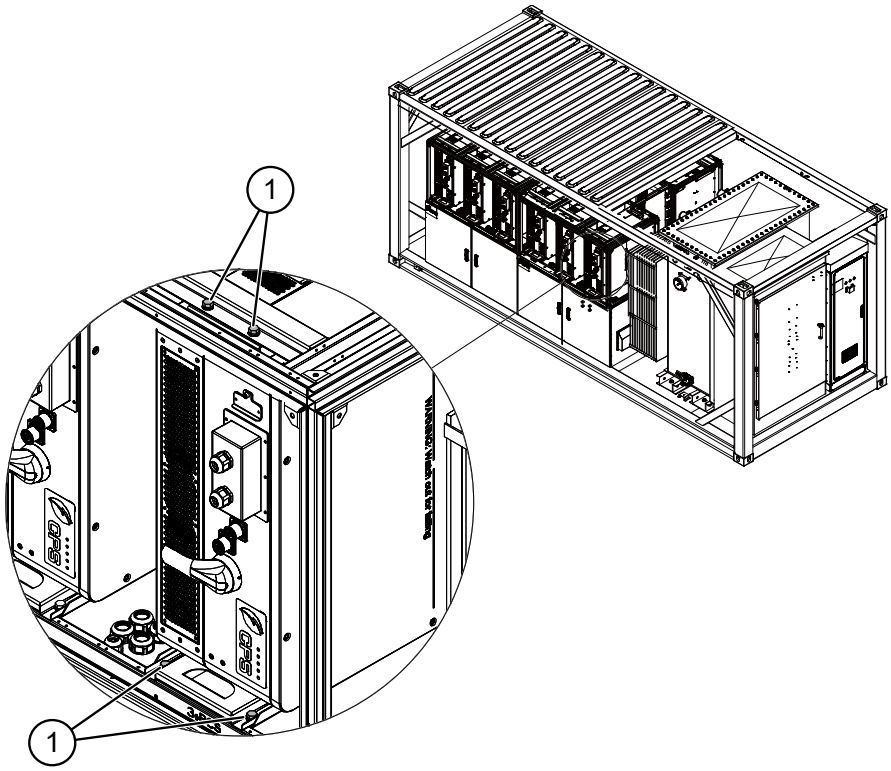


Fig. 6-4 Remove the PCS Combination Screw

8. Install a new PCS on the mounting bracket and tighten the four combination screws; Torque: 25 Nm;

NOTE:

The Weight of one PCS is about 120kg (≈265 pounds).

It is recommended to have four people in total to move the PCS.

WARNING:

Watch out for falling of device when replacing the PCS.

Support the PCS carefully when the external part is approaching to the warning line.

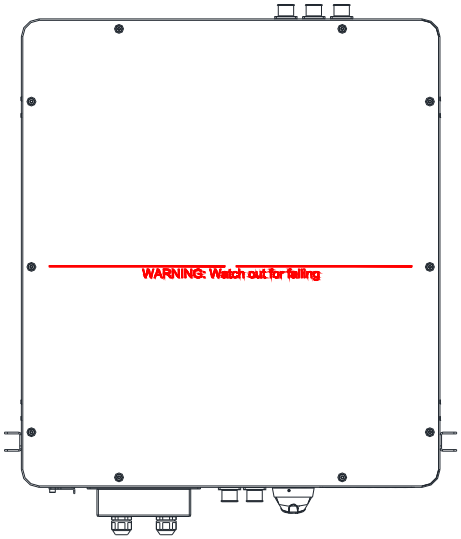


Fig. 6-5 Watch out for the Dropping Safety Line

8. Connect the incoming and outgoing DC cables, AC cables, and PCS grounding cables in the reverse order of cable removal;
9. Turn the DC Switch (1) on PCS to “On” position;

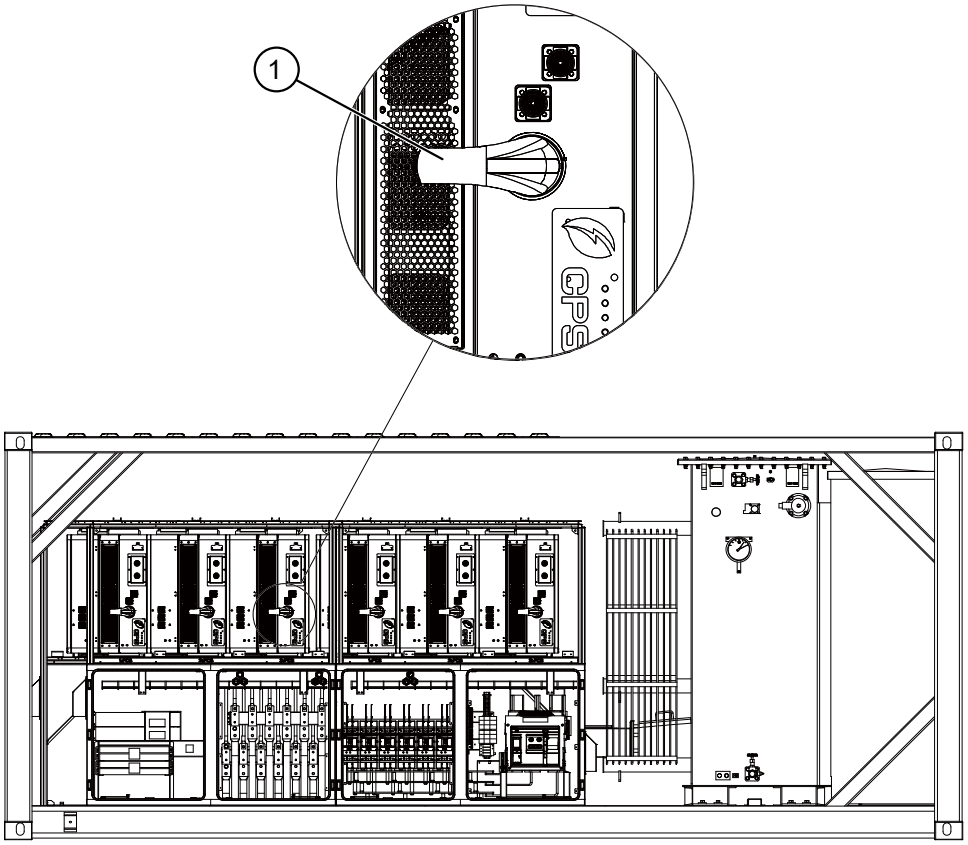


Fig. 6-1 DC SWITCH

10. Run the equipment and check whether the newly replaced PCS operates normally;

6.2.2 Replace cooling fans

If the internal temperature of the PCS is higher than normal operating temperature or abnormal noise is heard assuming the air vent is not blocked and is clean, it may be necessary to replace the external fans. Please refer to the following steps for replacing the cooling fans.

1. Remove the four combined bolts (1) of PCS and remove the PCS from the bracket.

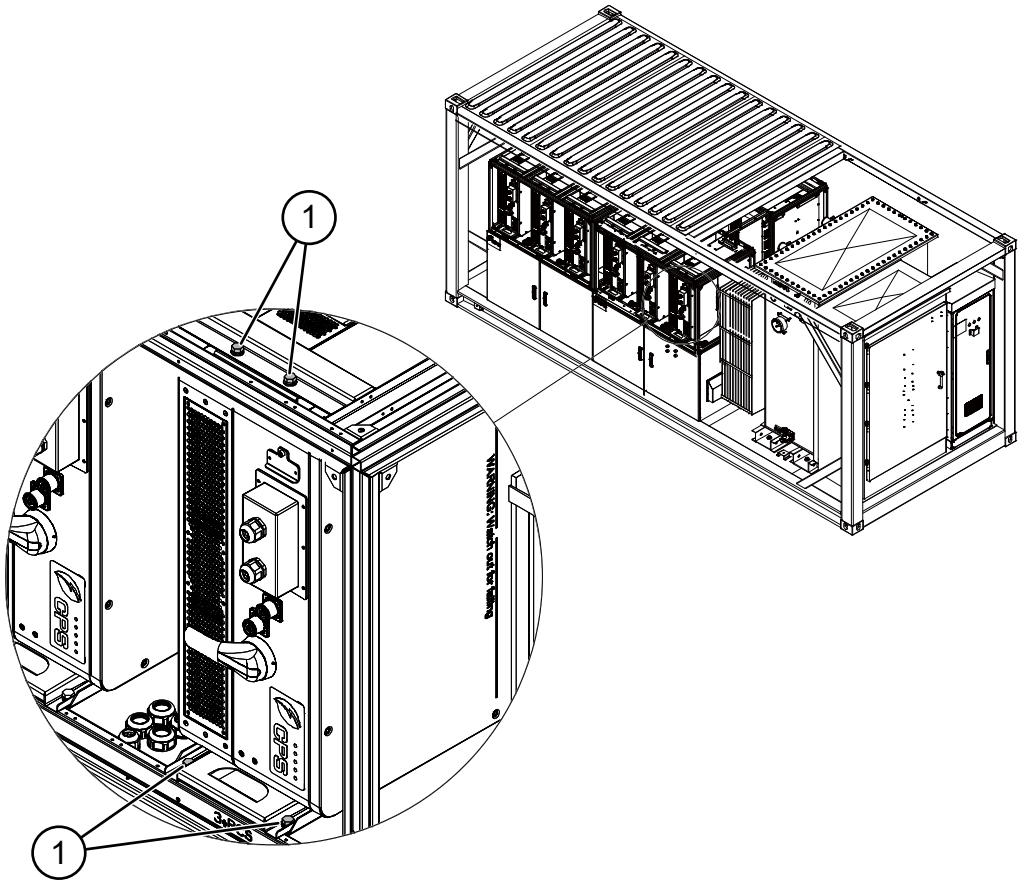


Fig. 6-4 Remove the PCS Combination Screw

NOTE:
The Weight of one PCS is about 120kg (≈265 pounds).
It is recommended to have four people in total to move the PCS.

WARNING:
Watch out for falling of device when replacing the PCS.
Support the PCS carefully when the external part is approaching to the warning line.

2. Put the PCS on flat ground and use a No.2 Phillips head screwdriver to unscrew the four screws on the front plate and take off the fan tray.

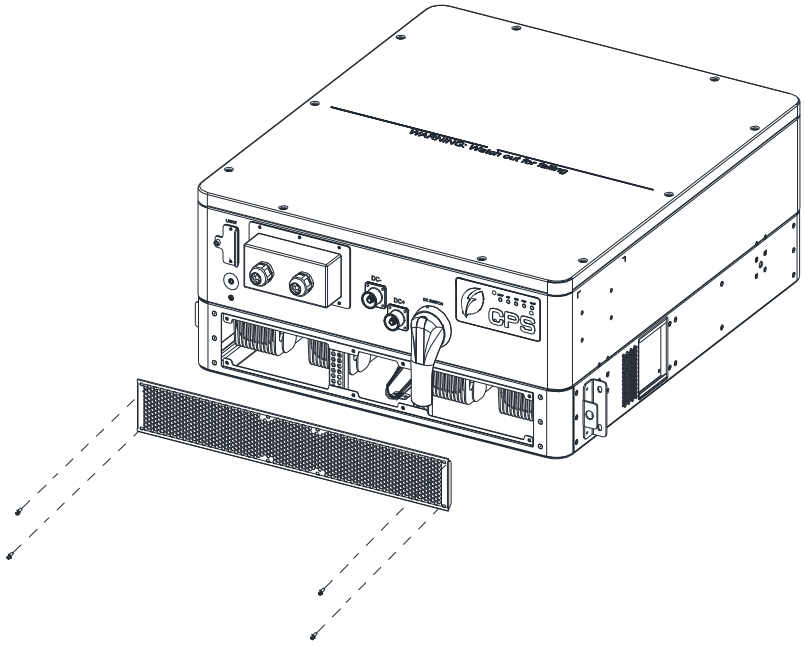


Fig. 6-6 Remove screws

3. Disconnect the cable connector from the cooling fan and cut the cable ties (1).

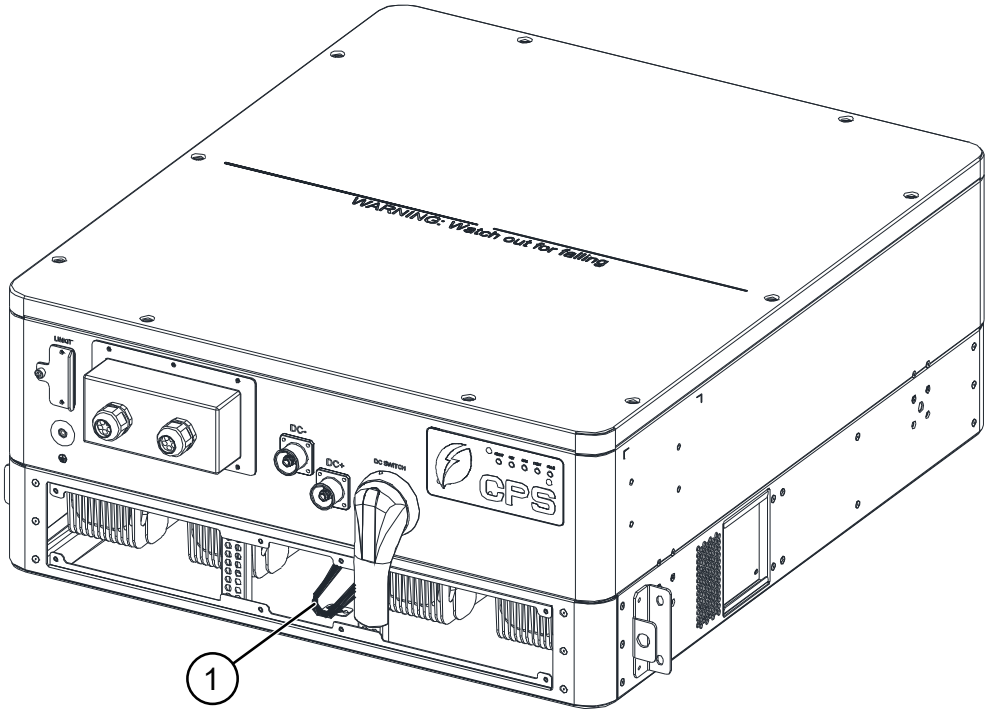


Fig. 6-7 Cut the cable ties

4. Use a No.2 Phillips head screwdriver to take off the four M4 screws (1) on the left or right clamp plate and remove the clamp plate (2).

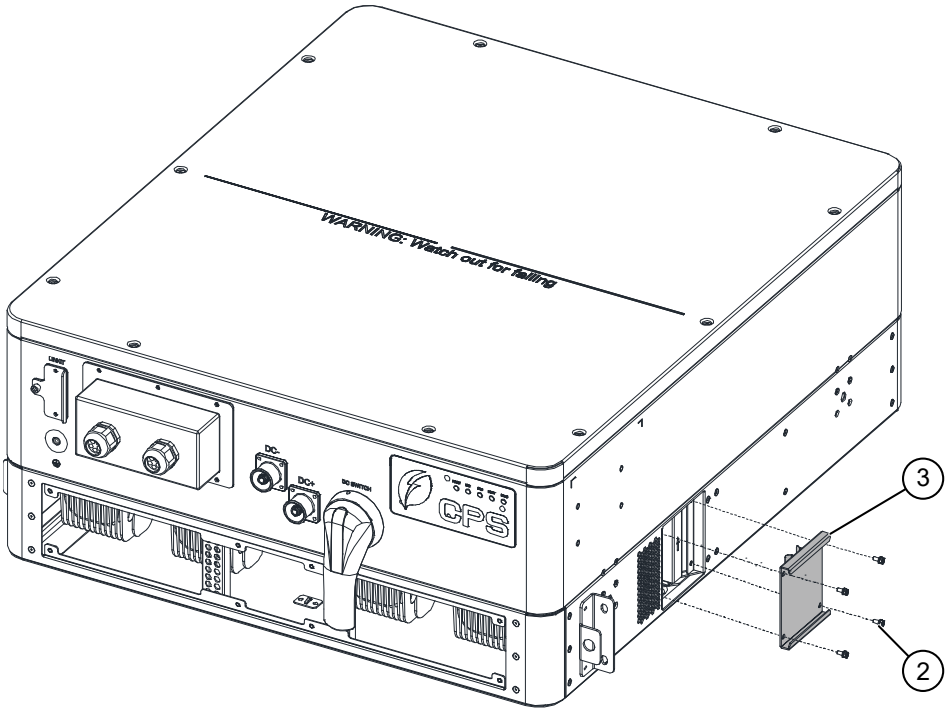


Fig. 6-8 remove the clamp plate out

5. After removing the clamp plate, pull out the fan tray with the aid of the exposed handle (4) of the fan tray.

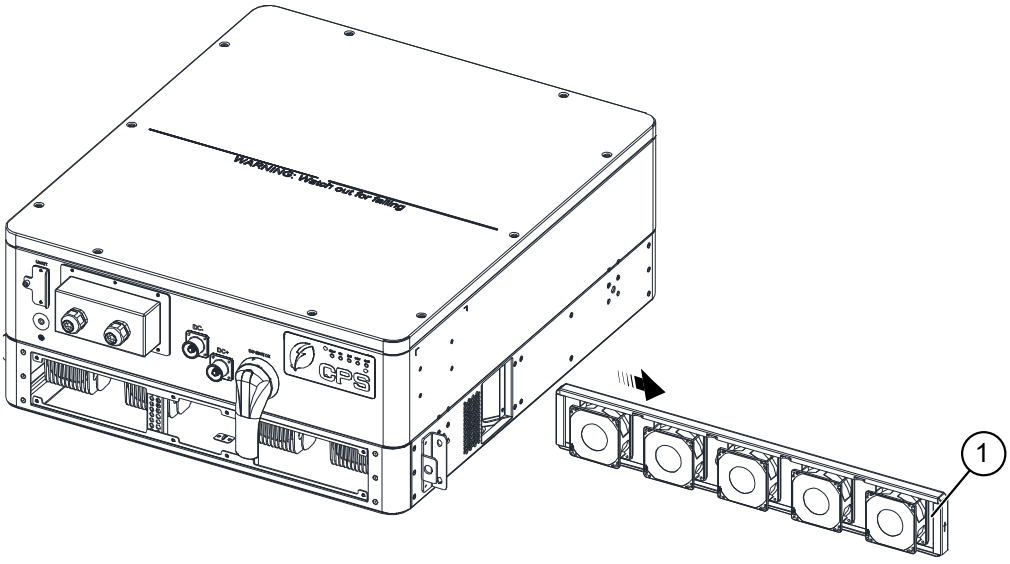


Fig. 6-9 pull out the fan tray

NOTE:

Do not pull it too hard to protect the fan cables from being damaged.

6. Cut off the cable ties between fan cable and fan tray, remove the damaged fans and replace them. Tighten the tapping screws with a torque value of 0.8-1N.m (7.1-8.91in-lbs).

NOTICE:
A rubber pad shall be placed between the fan and fan tray to reduce noise caused by vibration.

7. Fix the new cooling fan on the fan tray and fasten the cable on the fan tray with cable ties in ways shown as below.

   Torque value: 0.8-1N.m(7.1-8.91in-lbs)

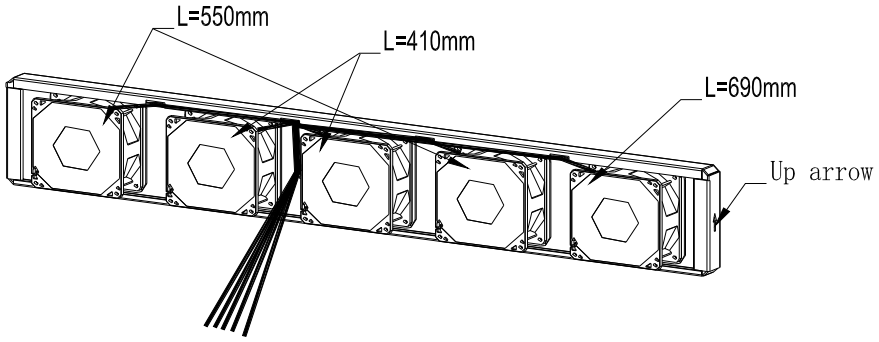


Fig. 6-10 fasten the cable on the fan tray with cable ties

NOTICE:
Fan cables shall be placed in the groove of the fan tray.

8. Install the fan trays, clamp plates and front plate to the PCS, and Tighten the screws.
   Torque value: 1.2N.m (10.6in-lbs).
9. Install the PCS and tighten the combined screws.
   Torque: 25 Nm

6.3 Fault analysis and troubleshooting

Troubleshoot according to following table 6-2:

Fault name	Fault explanation	Fault cause	Fault handling
TempSensor Err	Prompt detection of abnormal temperature	1.Temperature Sensor socket connector has poor contact; 2.Temperature Sensor is damaged;	1.Observe temperature display; 2.Switch off 3-phase working power supply and then reboot the system; 3.Contact service personnel
CommErr	Communication inside PCS fails	Terminal block connecters of internal communication wires have poor contact	1.Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2.Switch off 3-phase power supply and then reboot the system; 3.Contact service personnel
ExtFanErr	Cooling fan failure by visual check	1.Fan is blocked; 2.Fan service life has expired; 3. Fan socket connecter has poor contact.	1.Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2.Check for foreign objects on fan blades; 3.Switch off 3-phase power supply and then reboot the system; 4.Contact service personnel
EepromErr	Internal alarm	Internal memory has a problem	1.Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2.Contact service personnel
TempOver	Ambient or internal temperature is too high	1.Ambient temperature outside the PCS is too high; 2.Fan is blocked; 3.Convection airflow is insufficient due to improper installation.	1.Confirm that external ambient temperature is within the specified range of operating temperature; 2.Check whether air inlet is blocked; 3.Check whether fan is blocked; 4.Check whether the location of installation is appropriate or not; 5.Observe for 30 minutes and see whether the alarm will be eliminated automatically; 6.Contact service personnel
GridV.OutLim	Grid voltage exceeds the specified range	1.Grid voltage is abnormal; Power grid breaks down 2.Cable connection between the PCS and the grid is poor;	1.Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2.Check whether the grid voltage is within the specified range; 3.Check whether the cable between the PCS and power grid is disconnected or has any fault; 4.Contact service personnel

Fault name	Fault explanation	Fault cause	Fault handling
GridF.OutLim	Grid voltage frequency is abnormal, or power grid is not detected	1.Grid frequency is abnormal; 2.Cable connection between the PCS and the grid is poor;	1.Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2.Check whether the grid frequency is within the specified range; 3.Check whether the cable between the PCS and power grid is disconnected or has any fault; 4.Contact service personnel
Battery VoltOver*	Battery voltage exceeds the specified value	Battery overvoltage	1.Observe for 30 minutes and see whether the alarm will be eliminated automatically; 2.Check whether Battery voltage exceeds the specified range; 3.Turn off the Battery input switch, wait for 5 minutes, and then turn on the switch again; 4.Contact service personnel
GFCI.Err	System leakage current is too high	1.Excessive parasitic capacitance on Battery module due to environmental factor; 2.Grounding is abnormal; 3.Internal PCS fault	1.Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2.Detect whether the electrical connection is abnormal 3.Contact service personnel
IntProtect 0010~0620	Internal protection of the PCS	Protection procedure occurs inside the PCS	1.Observe for 10 minutes and see whether the alarm will be eliminated automatically; 2.Contact service personnel
IntFault 0010~0150	Internal fault of the PCS	Fault occurs inside the PCS	1.The PCS can be forced to restart once if it is required by operation and if it is confirmed that there is no other problem; 2.Contact service personnel

Table 6-2 Fault Information

Chapter 7 Technical Data

Model Name	CPS PSW2M-US / PSW2.4M-US
DC Input	
Max. DC Input Voltage	1500V
Min. DC Voltage	875V
DC Voltage range for nominal power	950-1500V
Number of CPSECB 200KTL/US-800 PCS Units	12
Number of DC inputs	12
AC output	
Rated power	2400Kva / 2400Kw
Rated grid frequency	60Hz
Medium voltage rating	34.5kV
Vector Group	Dy1, Dy11
Cooling class	KNAN
Insulating fluid	Biodegradable oil, FR3 type or equivalent
Environment	
Protection degree	NEMA 3R
Cooling	Forced air cooling
Operating temperature range	-22°F to +140°F/- 30°C to +60°C
Storage temperature range	-40°F to +158°F/-40°C to +70°C
Operating humidity	0-100%
Operating altitude	6562ft/2000m
Display and communication	
Communication	RS485 / Ethernet / CAN
Modbus data mapping	CPS
Mechanical	
Dimensions (WxHxD)	6058×2591×2438mm
Weight	15000kg
Safety	
Certifications and standards	UL1741, CSA-22.2 NO.107.1-16, IEEE1547-2018, FCC Part 15
Selectable grid standard	IEEE 1547-2018, IEEE 1547.1-2010
Smart-grid features	Volt-Ride Thru, Freq-Ride Thru, Ramp-Rate, PF, Volt-VAR, Freq-Watt, Volt-Watt
Protective functions	
Black start	Yes
Reverse polarity protection	Yes
Overvoltage protection	Yes
Grid monitoring	Yes
Ground fault monitoring	Yes
Active / reactive power response time	< 100ms

Chapter 8 Quality Assurance

8.1 Exemption from liability

1. Be damaged during transportation;
2. Be operated in environments beyond those specified in this manual;
3. The product is used incorrectly or improperly (including installation and use);
4. Change products or software provided without authorization;
5. Ignore the safety warnings and relevant statutory safety specifications contained in products and documents;
6. Unpredictable disasters or irresistible accidents occur;

8.2 Quality terms (warranty)

1. For products that fail during the warranty period, our company will repair or replace with new products free of charge;
2. The replaced unqualified products shall be returned to us;
3. We need a reasonable time to repair the device.

If you have any questions about the CPS PSW2M-US / PSW2.4M-US PCS SKID, please contact us. We will be very happy to serve you.

CHINT POWER SYSTEMS AMERICA CO., LTD.

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