HW5

Water cooling container Dry-Wet Tower Product Manual

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BITMAIN TECHNOLOGIES INC.

www.bitmain.com

Declaration

The purpose of the Product Use and Maintenance Manual (hereinafter referred to as the product manual) is only to provide guidance information to help you correctly use the ANTSPACE HW5 container Water cooling system (hereinafter referred to as this product). Before installing and using this product for the first time, you are obligated to carefully read all the materials delivered, especially the precautions mentioned in the product manual, which will help you better and safely use this product. Please keep the product manual properly for future reference.

Before using this product, please check if the product components are complete. If there are any missing parts, please contact BITMAIN in a timely manner and carefully inspect the product before installation and use.

BITMAIN will not be liable for the loss of you, third-party personnel or property caused by the following situations, and the damage to the product caused by these situations will not be covered by the warranty. If the user requests repair services, paid repair services can be provided after assessing by the BITMAIN service organization.

a. The entire equipment and components of this product have exceeded the warranty period, or have been damaged due to abnormal use or abnormal natural environment.

b. Install, use and store this product incorrectly, or failure to install, use and store it according to the instructions and requirements of the product manual.

c. Operate this product under operating environmental conditions that exceed the requirements specified in the product manual.

d. Exceeding the installation and use scope specified in international standards or local laws, regulations, and industry regulations.

e. Repairs or changes to this product by non BITMAIN authorized technical personnel.

f. Use the software provided with the product outside of this product, or use the software other than provided software or specialized software on this product.

g. Other circumstances that do not require liability within the legal scope of the country (region) where the operation is carried out.

Special attention: If the user purchases this product from a non BITMAIN official sales channel, BITMAIN does not guarantee that the product manual can be fully transmitted. Training and services related to installation, use, maintenance, etc. should be provided by the seller. When using this product, it is assumed that the user is aware of the relevant installation, use, and maintenance content of the product, which also applies to the content of this

declaration.

The product manual is not intended to indicate that BITMAIN has made any promises or warranties regarding its products and services, whether express or implied, including but not limited to the warranties of suitability, safety, and suitability for a specific purpose recommended in the product manual.

The photos, graphics, charts and illustrations provided in the product manual are for explanatory and illustrative purposes only, and may differ from the actual product. The actual specifications and configurations of the product may change from time to time as needed, so they may differ from the content of the product manual. Please refer to the actual product purchased.

Due to the continuous iteration of products and the application of new designs, materials and technologies, BITMAIN will make improvements or modifications to the software and hardware described in the product manual and the content of the product manual at any time based on factors including but not limited to product characteristics, product performance and usage environment, without prior notice. If you find any inconsistencies between the actual situation of this product and the product manual during use, or if you want the latest information or have any questions or ideas, please feel free to call us or log in to the service website for inquiries.

Change History

Version	Changed Items	Before Changing	After Changing	Changed On	Changed By
v1.0.1	First release			2024.07	

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1 About this Manual

This manual mainly introduces the working principle, on-site installation, fault handling and maintenance methods of the ANTSPACE HW5 Water cooling system.

1.1 Scope of Application

This manual is applicable to the ANTSPACE HW5 model.

1.2 Intended Audience

This manual is applicable to professional technical personnel who need to install, operate, and maintain the product. Professional technical personnel must meet the following requirements:

a. Possess certain professional knowledge in electronics, electrical wiring, and machinery, and be familiar with electrical and mechanical schematic diagrams.

b. Familiar with the composition and working principles of Water cooling systems and related products.

c. Have received professional training related to the installation and trial operation of electrical products.

d. Have the ability to respond urgently to hazards or unexpected situations that occur during installation or trial operation.

e. Familiar with the relevant standards and specifications of the country/region where the project is located.

1.3 Use of the Manual

Read this Manual carefully before using this product.

The content of the manual will continue to be updated and corrected, but it is inevitable that there may be slight discrepancies or errors with the actual product. Users should refer to the actual product they purchased and can download or obtain the latest version of the manual materials through www.bitmain.com or sales channels.

1.4 Symbol Conventions

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 highlights it with the following symbols.

The following are the symbols that may be used in this manual. Please read carefully to better use this manual.

Danger

Indicates a high potential danger that, if not avoided, could result in serious accidents such as personal injury, equipment damage, etc.

Warning

Indicates a moderate potential hazard, which, if not avoided, could result in serious accidents such as equipment damage.

Caution

Indicates a potential danger that, if not avoided, may result in the equipment not functioning properly.

2 Safety Description

2.1 General Safety Instructions

DISCLAIMER: The equipment company is not responsible for any of the following situations.

a. Operation beyond the conditions specified in this manual.

b. Usage under installation and operating environments which are not specified in related international specifications.

c. Failure to follow the operation instructions and safety precautions on the product and in the document.

d. Damage caused by abnormal natural environments.

2.2 All Safety Instructions

To ensure the safety of personnel and the equipment, please follow the safety symbols on the equipment and all the safety instructions in this manual.

The marks "Caution", "Warning" and "Danger" in this manual do not represent all the safety instructions. They are only supplements to the safety instructions.

1) Local Safety Laws and Regulations

When operating the equipment, you must follow the local laws and regulations. The safety instructions in this manual are only supplements to the local laws and regulations.

2) Personal Requirements

Only trained and qualified personnel are allowed to install, operate, and maintain Bitmain equipment. Such personnel must understand various safety precautions, and master the correct operating methods.

Only trained and qualified personnel are allowed to install, operate, and maintain Bitmain equipment.

Only personnel certified or authorized by equipment provider are allowed to replace or change the equipment or components (including software).

Any fault or error that might cause safety problems must be reported immediately to a

supervisor.

3] Grounding Requirements

Equipment to be grounded must meet the following requirements:

When installing the device, always make the ground connection first; and when dismantling the device, disconnect the ground wire last.

Do not damage the ground conductor.

Do not operate the equipment in the absence of a properly installed ground conductor.

Ensure that the equipment is connected permanently to the protective ground.

4] Personal Safety

Keep irrelevant people away from the equipment. Only operators are allowed to access the equipment.

Before operating a device, wear insulated shoes and insulated gloves, and pay attention to eye protection. Remove conductive objects such as jewelry and watches to avoid electric shocks or burns.

Ensure that tool handles are insulated.

5] Equipment Safety

Put away the keys to the device when installation, operation and maintenance.

Before operations, ensure that the equipment is firmly secured to the floor or other solid objects, such as a wall or an installation rack.

Do not block the ventilation while the device is operating.

Tighten the screws by using a tool when installing the panel.

After the installation, remove packing materials from the equipment area.

2.3 Electrical Safety

1) High Voltage

Danger

The high-voltage power supply provides power for the operation of the equipment. Direct contact or indirect contact with the high-voltage
power supply through wet objects (or conductors) is fatal. Irregular and incorrect high-voltage operation may cause accidents such as fire or electric
shock. Signal wires should be tied separately from high-current wires or high-voltage wires.

2) High Leakage Current

Danger

1. Before turning on the power, all components of the equipment and the general grounding wire must be grounded, otherwise personal and equipment safety will be endangered.
2. If a "large leakage current" sign is pasted near the power terminal of the equipment, the protective grounding terminal of the equipment chassis must be grounded before connecting to the AC input power supply to prevent the equipment's leakage current from causing electric shock to the human body.
3. Exposed cables in the equipment should be insulated immediately.

3) Power Cable

Danger

It is prohibited to install or remove the power cord while the power is on. The moment the power cord core comes into contact with a conductor, arcs or sparks will occur.

Before installing or removing a power cable, turn off the power switch.

Before connecting a power cable, check that the label on the power cable is correct.

If the power cable is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

The appliance should fit with means for disconnection from the supply mains having a contact separation in all poles that provide full disconnection under overvoltage category III conditions, and these means must be incorporated in the fixed wiring in accordance with the wiring rules.

2.4 Mechanical Safety

1] Drilling Holes

Warning

It is prohibited to drill holes in the cabinet by yourself. Drilling holes that do not meet the requirements will damage the internal components or pipelines of the equipment and damage the internal cables.

2] Sharp Objects

Handle the sharp objects with care during sealing panels removal, use of knives, etc. Protective gloves should be worn when working.

Warning

When carrying the equipment by hand, you should wear protective gloves to prevent your hands from being cut by the sharp corners of the equipment.

3] Fan

When replacing a component, place the component, screws, and tools in a safe place. Otherwise, if any of them fall into the operating fans, the fans may be damaged.

When replacing a component near fans, do not insert your fingers or boards into the operating fans until the fans are switched off and stops running.

4] Moving Heavy Objects

Warning

1. Please wear protective gloves when carrying heavy objects to avoid scratching your hands.
2. When carrying heavy objects, be prepared to bear the weight to avoid being crushed or sprained by heavy objects.
3. When pulling the equipment out of the cabinet, be careful because the equipment installed on the cabinet may be unstable or heavy to avoid being crushed or hit.
4. It is prohibited for one person to carry heavy equipment alone. When transporting the device, do not tilt the device more than 15° (relative to vertical).
5. When moving or lifting the equipment, please protect the equipment to avoid scratches or bumps.
6. When transporting, it is strictly prohibited to use the components as a supporting point to prevent damage to the components.

2.5 Operation Safety

1) High Temperature and Pressure

Misoperations may cause over high pressure, which may result in eruption of coolant.

Pay attention to high-pressure parts: exhaust valves and drain valves.

2) High-Speed Running

Pay attention to high-speed running part: fan.

2.6 Others

1) Binding Signal Cables

> **Caution**
>
> Bundling signal wires should be bundled separately from high-current wires or high-voltage wires.

2) Laying Out Power Cables

When the temperature is very low, violent strike or vibration may damage the power cable sheathing. To ensure safety, comply with the following requirements:

Power cables can be laid or installed only when the temperature is higher than 0°C.

Before laying out power cables, which have been stored in a temperature lower than 0°C, move the power cables to an environment of the ambient temperature and store them at the ambient temperature for at least 24 hours.

Handle power cables with caution, especially at a low temperature. Do not drop the power cables directly from the vehicle.

3) Storage

Do not store devices near a heat source or under direct sunshine.

Keep devices away from fire or high-temperature objects, especially devices injected with pressurized nitrogen or refrigerant; otherwise, explosion or refrigerant leakage may occur, causing personal injury.

4] Recovery and Disposal

The sign indicates that the product cannot be disposed of with other wastes that have a shell in European Union (EU) areas. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources.

Figure 2-1 Sign

3 ANTSPACE HW5 Container Water Cooling System Composition and Working Principle

3.1 System Overview

The container Water cooling system aims to provide cooling Water that meets the pressure, temperature, and flow requirements for the heat dissipation unit of the internal high computing power server, ensuring a good working environment for the load.

The type of heat dissipation options for container Water cooling systems: evaporative cooling (dry-wet dry tower). The internal cooling medium can be selected according to the local environmental temperature, such as suitable antifreeze, deionized water, or pure water.

3.2 System Composition

Table 3-1 Main components of container Water cooling system

Sub system	Function	Main components
Pumping station	Transport and monitor the cooling water status to maintain stable system operation	Centrifugal pumps, expansion tanks, sensors, valves, exhaust valves, filters, pipelines, and other related accessories
Control cabinet	Control the operation of various components in the pump station, read the numerical display of each sensor, and upload it	Circuit breakers, intermediate relay, PLC, switch power supply, touch panels, and other related accessories
Network and distribution system	Distribute network and power for high computing power servers	Circuit breakers, aviation plugs, cables, switches, and other related accessories
Manifold components	Flow distribution and transportation	Manifold, elbows, hoses, chucks, valves, and other related accessories
Accessories	Supporting components and spare accessories required for the use of container	Screws, miniature circuit breakers, aviation plugs, clamps, rubber hoses and other related accessories

	Water cooling system	
Dry-wet tower	Transfer heat from the load to the atmosphere	Spray pumps, coolers, air inlet grilles, fans, and other related accessories

3.3 Working Principle

The pump station provides two cooling waters that meet the requirements for temperature, pressure, flow rate, and medium to the manifold components. After two stages of Water separation, the manifold delivers the cooling Water to the water-cooled plate, which takes away the heat inside the equipment. The heated cooling Water enters the cooling tower for forced heat exchange with the external air, or enters a plate heat exchanger for heat exchange with the external cold source. The cooled cooling water is then transported to the water-cooled plate again through the pump station and manifold components for circulation, thereby taking away the heat inside the heating load and ensuring that the heating load operates in a good environment.

Dry-wet tower: The dry-wet tower for both dry and wet use should be used for both dry and wet working conditions. The working principle of wet working conditions is to use water and air as cooling media, and use the evaporation of some cooling water to carry away the heat released by the cooling Water during the flow process inside the coil. Internally equipped with: spray device, serpentine condensing coil, (filler heat exchange layer) dehydrator, bottom with a water collection tank, external spray pump, and top with an axial flow fan. During operation, cooling water is pumped from the spray pump to the upper part of the condensing disc and the Water condensed by the cooling water outside the tube flows out from the lower part of the condensing disc. After absorbing the heat of the coolant, a portion of the water evaporates into water vapor, which is sucked away by an axial flow fan and discharged into the atmosphere. The non-evaporative cooling water drips into the lower collection tank for circulation by the spray pump. The axial flow fan draws air from the top, strengthening air flow, causing the water collection tank to bear negative pressure, reducing the evaporation temperature of water, accelerating water film evaporation, and strengthening the heat release of the condensing coil. The function of a dehydrator is to block non evaporative water droplets in the air and allow them to flow back to the collection tank, in order to reduce the consumption of cooling water. In addition, a floating ball valve is also installed in the water collection tank. When the water continuously evaporates and consumes, the floating ball valve automatically opens to provide supplementary spray water. The working principle of dry working condition is to forcibly

exchange heat between the cooling Water with high temperature from the water-cooled plate and low-temperature air, and the cooling Water with reduced water temperature enters the system again through the pump unit for heat dissipation.

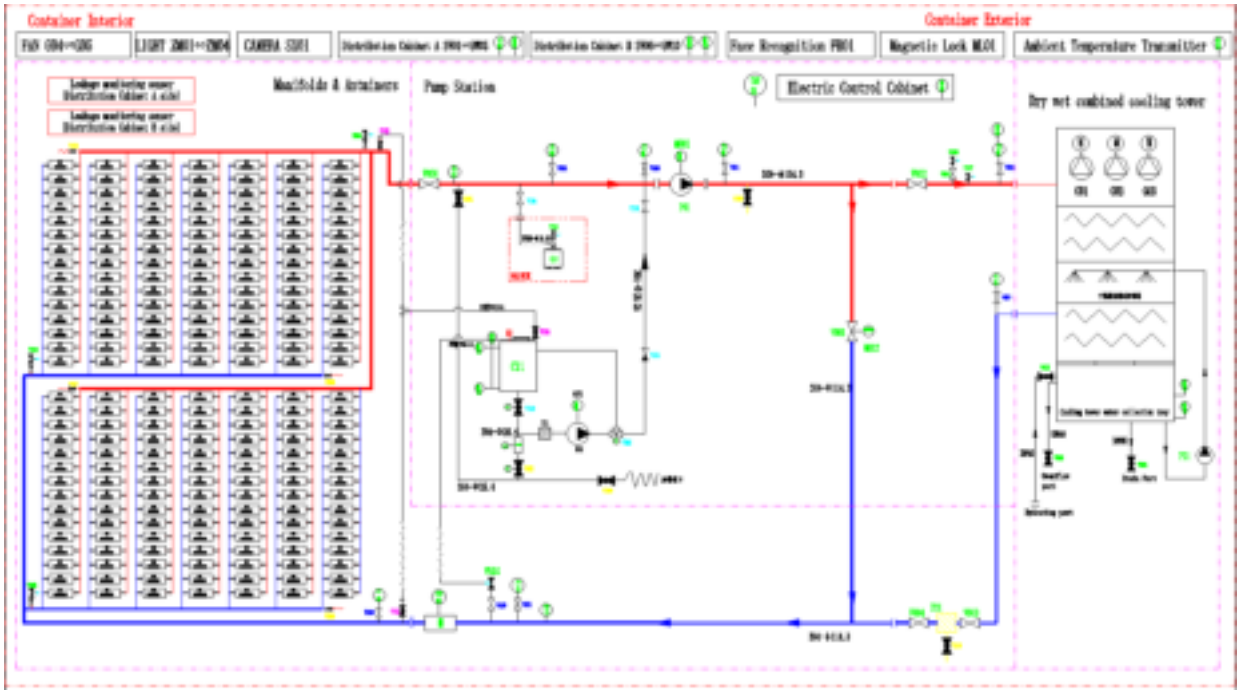


Figure 3-1 Schematic diagram of container Water cooling system

4 ANTSPACE HW5 Container Water Cooling System Performance Index Requirements

Table 4-2 Main components of system performance index of container water cooling system

S/N	Name	Index	Remarks
Environment			
1	Working temperature	-35～40℃	Outdoor
	Working temperature	5～40℃	Indoor
2	Working humidity	10～90%	
3	Storage temperature	-35～70℃	
4	Storage humidity	5～95%	
5	Altitude	≤2000m	
Container technology			
1	External dimensions (L×W×H) (mm)	12192×2438×2896	(Including cooling tower, excluding cage ladder)
2	High computing power server capacity	210 S21 Hyd. series and S19 Hyd. series high computing servers	
3	Box certification	China Classification Society Certification	
4	Safety certification	NFPA 79:2021 UL 508A:2018 R8.21 CSA C22.2 No. 14-18 ANSI/ISO 12100:2012	
5	Power rating (kW)	1062	

6	Input Voltage and Frequency	400V±5% AC,60Hz/50Hz	
7	Transport weight (T)	14	Excluding high computing power servers and water cooling
8	Operating weight (T)	24	Including high computing power servers, water cooling and cooling water
9	Main switch capacity of distribution cabinet (A)	1200	The container Water cooling system includes two distribution cabinets, each with a 1200A main switch
10	Rated current (A)	≤986	Rated current of each distribution cabinet inside the container
11	Single unit rated current (A)	≤10	
12	Flow rate (m^3/h)	≥85	
Technical indicators of dry-wet tower			
1	Type	Dry-wet tower	Remarks
2	Heat dissipation capacity (kW)	1200	
3	Water temperature during operation	35℃±1℃	@Wet-bulb temperature =28℃
4	Box certification	China Classification Society Certification	
5	Operating power(kW)	15~29	
6	Water supply pipe interface	DN40	G1½ external thread, with protruding length of 15mm

7	Drainage pipe interface	Ball valve DN65	G2½ ball valve internal thread, 20mm deep
8	Overflow pipe connector	Ball valve DN40	G1½ ball valve internal thread, 17.5mm deep
9	Noise@25℃, 15m	70dBA	

5 ANTSPACE HW5 Container Water Cooling System Structural Views

5.1 External View of Container Water Cooling System (including dry-wet tower)

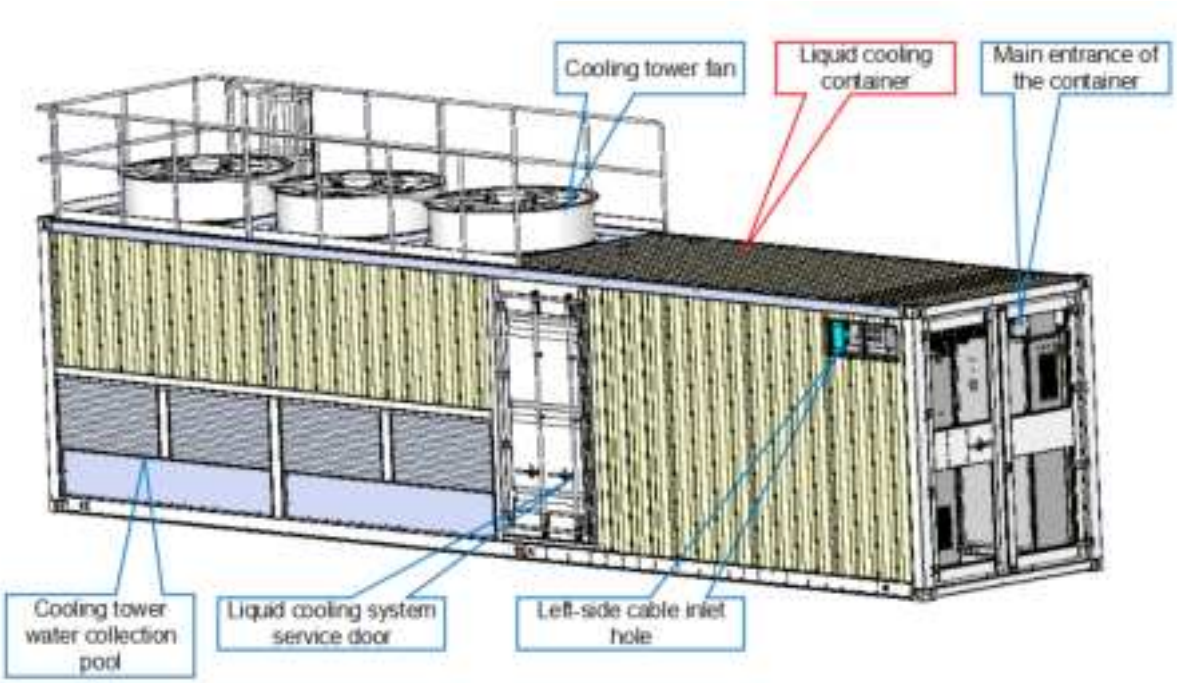


Figure 5-1 Schematic diagram of container Water cooling system (with dry-wet tower)

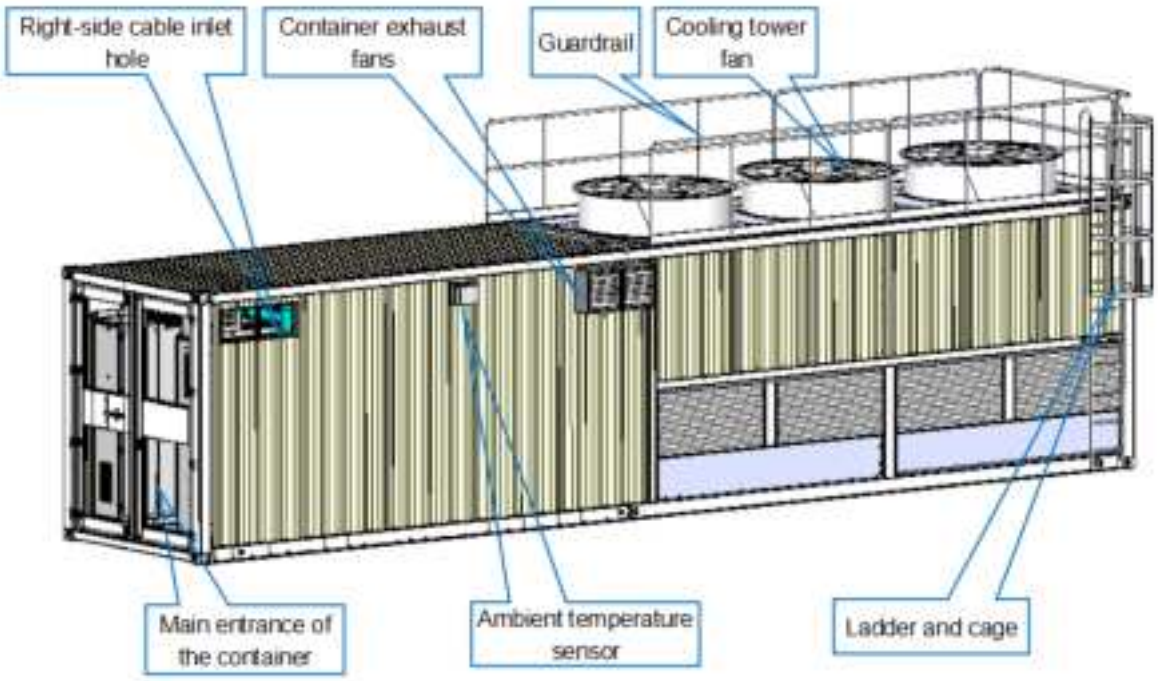


Figure 5-3 External view of container Water cooling system

5.2 Internal View of Container Water Cooling System

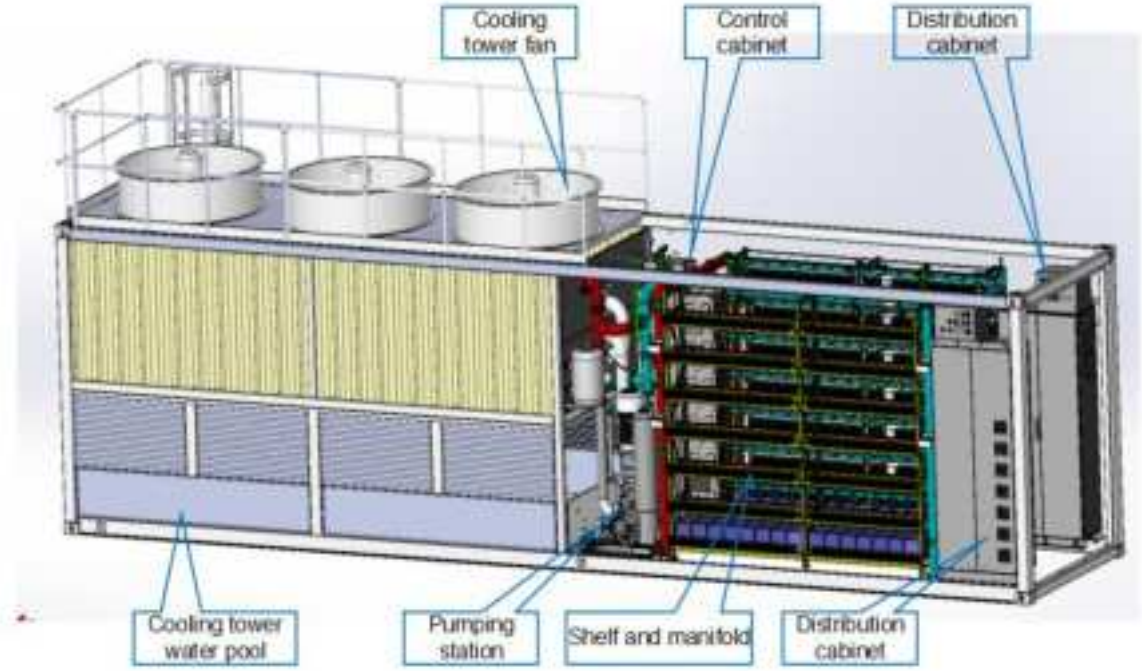


Figure 5-4 Internal view of container

Figure 5-5 Internal view of manifold components

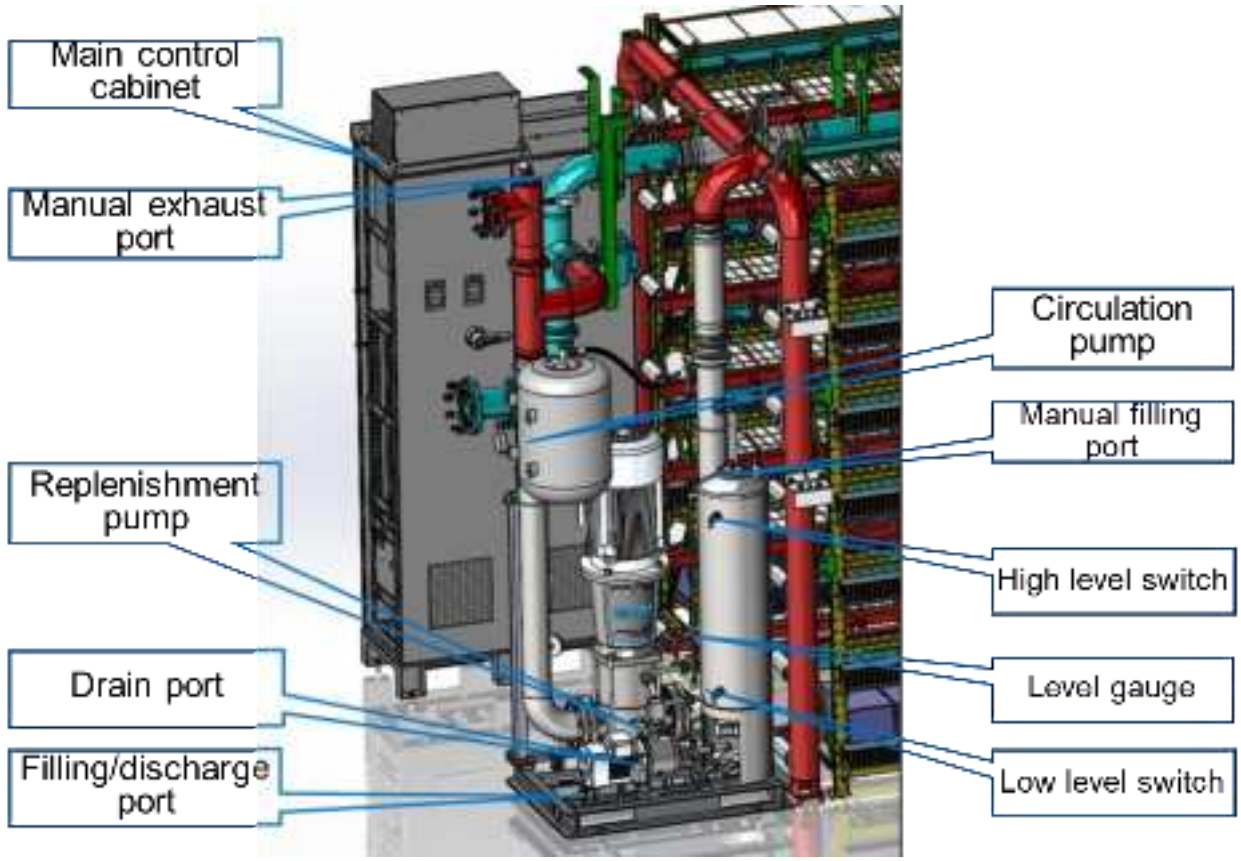


Figure 5-6 Internal view of pumping station

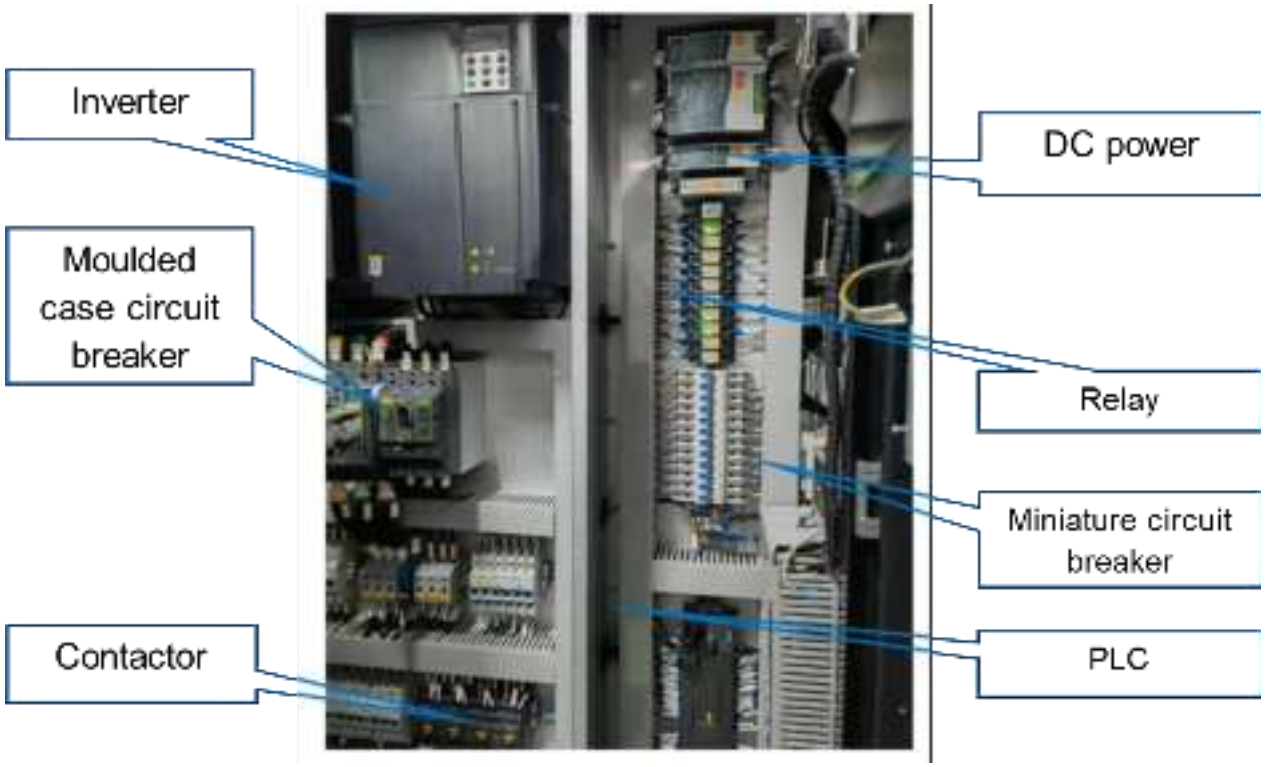


Figure 5-7 Internal view of main control cabinet

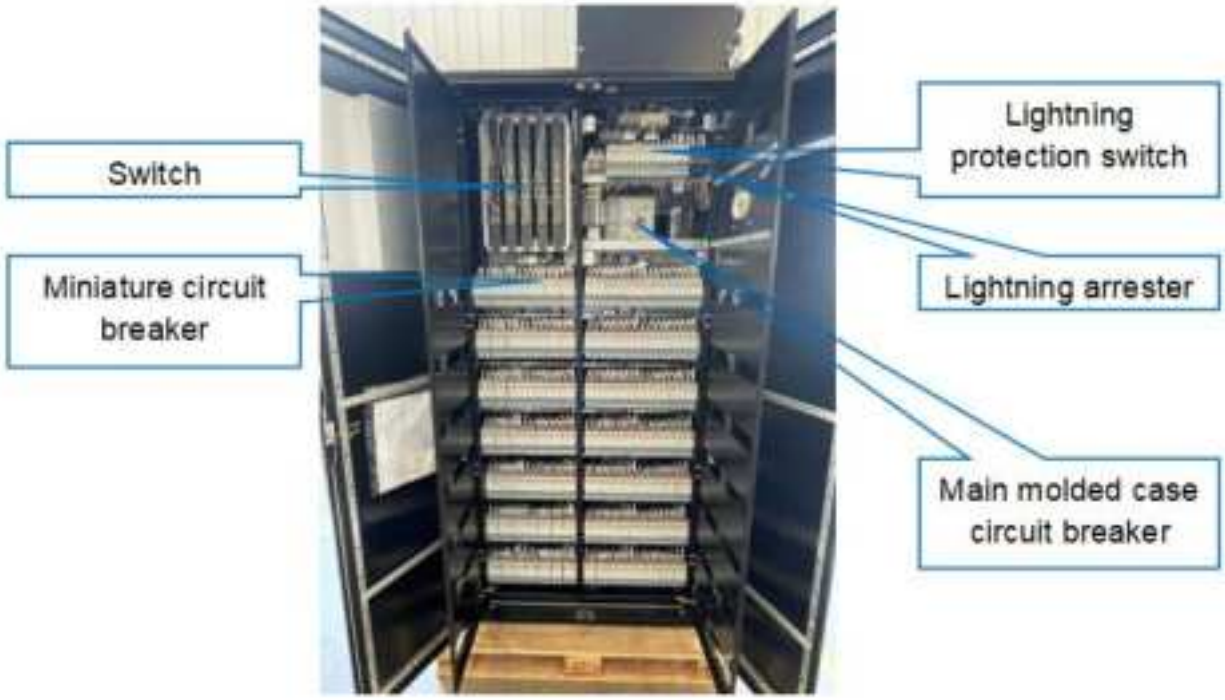


Figure 5-8 Internal view of distribution cabinet

6 ANTSPACE HW5 Container Water Cooling System Composition

6.1 ANTSPACE HW5 Container Water Cooling System Composition

ANTSPACE HW5 container Water cooling system mainly consists of containers, cooling towers, intermediate connecting pipelines, and other related components, as shown in 错误!未找到引用源。. Its functions are shown in Table 6-1.

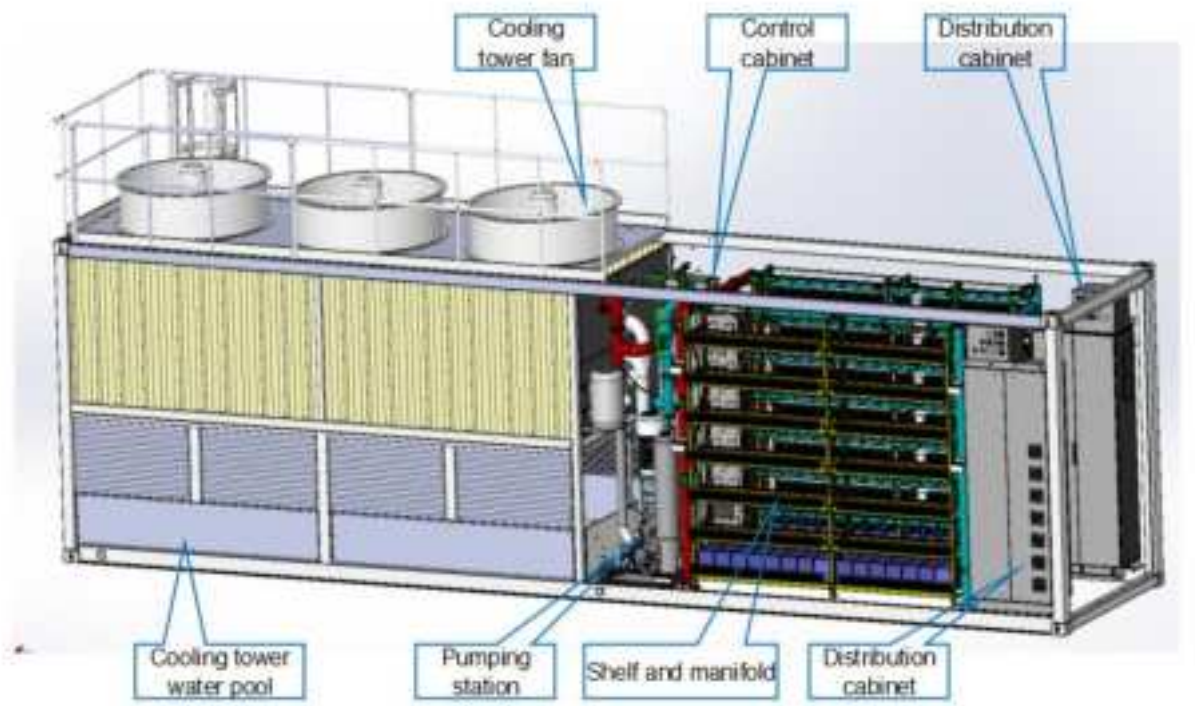


Figure 6-9 Water cooling system composition

Table 6-1 Summary of device functions--Main components of the container water cooling system

S/N	Model	Function	Remarks
1	Container	The container includes pump sets, cooling tower, distribution cabinets, manifold, shelves, etc., used to distribute water, electricity, and power to the mining machine.	1 set
2	Cooling tower fan	Used for coil heat dissipation of cooling tower	3 sets
3	Guardrail	Safety guardrail on top of the container	1 set

4	Ladder	Used for climbing to the top of the container	1 set
5	Cage	Safety protection for the ladder	1 set
6	Container exhaust fans	Used for internal heat dissipation of the container	1 set

7 Installation of Cooling Tower Fans and Guardrails for ANTSPACE HW5 Container Liquid Cooling System

7.1 Precautions for Installation

Warning

Installation should only proceed if products are complete and undamaged!
Ensure both the product and its internal components are intact and free from damage prior to installation.

Warning

Installation should only proceed if products are complete and undamaged!
Ensure both the product and its internal components are intact and free from damage prior to installation.

Caution

- Exercise caution when using tools to unpack to prevent product damage.
- Upon receipt of the product, inspect its exterior, structural components, and internal condition for any damage. Ensure consistency between the packing list and the actual order. If any discrepancies or issues are found, refrain from installation and promptly notify us.

7.2 Product Inspection

Check if the received products match the ordered models.

Compare with the packing list to ensure the supplied scope aligns with the contract.

Inspect the products visually for any damages.

In case of any issues or doubts, contact the forwarding agent or our company promptly.

Warning

Installation should only proceed if products are complete and undamaged!

Before installation, please ensure:

- The product is in perfect condition without any damage.
- Both the product and its internal components are intact and undamaged.

7.3 Requirements for installation environment

1) Siting requirements

a. Choose installation sites by considering the climate and geological characteristics, such as groundwater levels.

b. Ensure ample ventilation in the surrounding area.

c. Clear the installation vicinity of trees to prevent branches or leaves from obstructing air intakes during windy conditions.

d. Avoid areas with concentrated toxic gases and keep a safe distance from flammable, explosive, or corrosive substances.

e. Minimize noise impact by selecting locations away from residential areas.

2) Foundation Preparation

a. The soil at the installation site should be compact. It is recommended that the relative compactness of the soil at the installation site is ≥98%. Implement stabilization measures if the soil is loose.

b. Ensure the bottom of foundation pit is thoroughly compacted and leveled to provide adequate and effective support for the equipment.

c. Elevate the foundation above ground level to prevent water infiltration into the equipment's base and interior.

d. Meet the specified requirements for foundation cross-sectional area and height.

e. Consider cable routing when building the foundation.

f. A drainage system should be constructed to prevent the bottom or interior of the product from being soaked in water during the rainy season or heavy rainfall.

g. Promptly clear excavated soil from the foundation area to facilitate equipment hoisting.

h. Ensure the foundation can support the equipment's operating weight with a safety margin in accordance with local regulations. The equipment's operating weight shall be ≥24 tons.

3] Installation Space Requirements

a. Allow sufficient space around the installation site to optimize heat dissipation and facilitate future maintenance.

b. Ensure proper ventilation for the container cooling tower, maintain a minimum distance of 2m from obstructions to the air intake and no overhead obstructions within 10m of the air outlet.

c. Establish a stable and robust foundation for the container cooling tower.

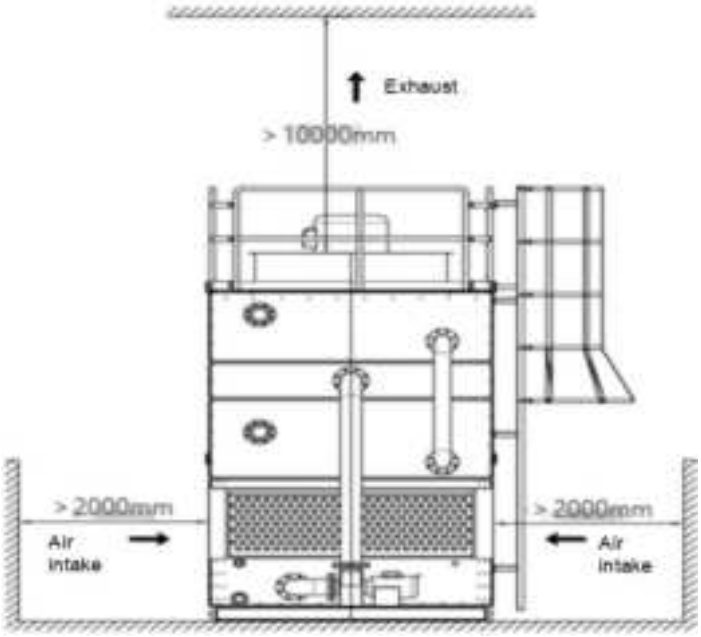


Figure 7-1 Space Requirements

4] Tool preparation for installation

The installation tools include but are not limited to the recommended tools below. Additional auxiliary tools may be used on site as necessary.

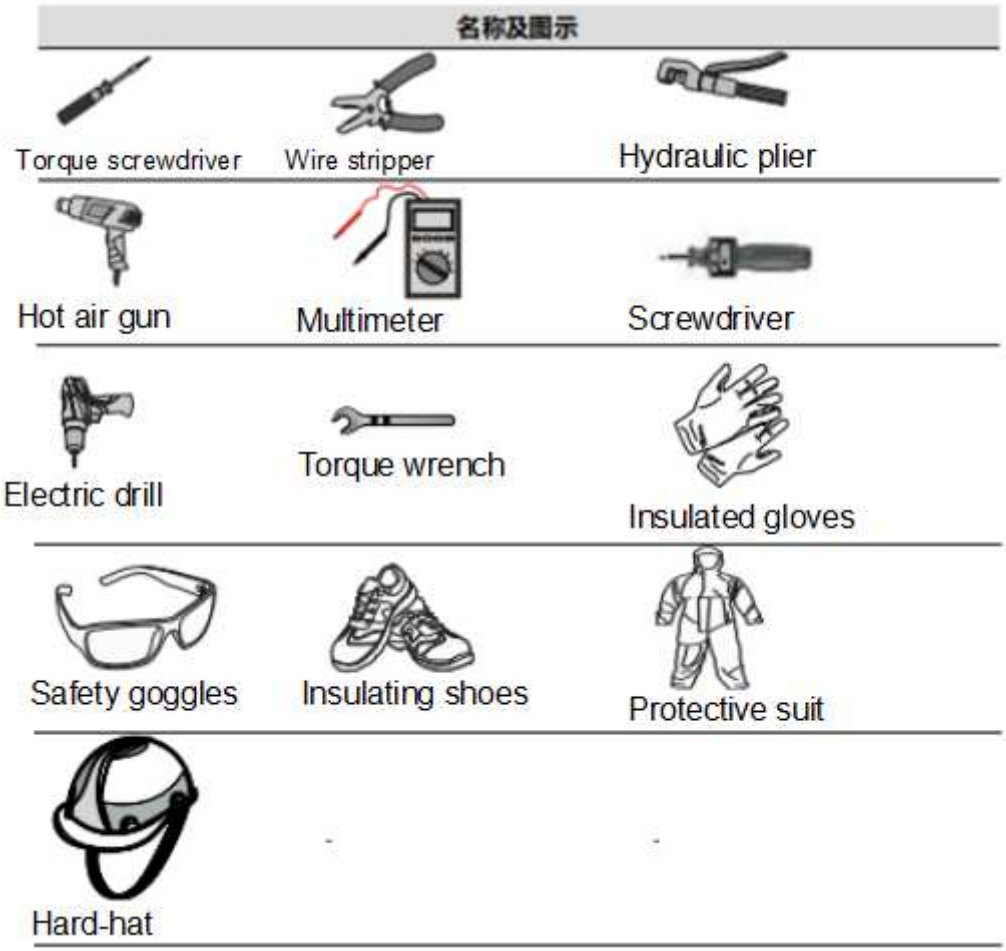


Figure 7-2 Tool Requirements

7.4 Product Hoisting & Securing

1) Preparation before hoisting

The transportation weight of product is 14 tons. Please use a safe and reliable crane with sufficient safety margin in the lifting arm.

Warning

Ensure the use of a professional crane operated only by qualified personnel. Failure to do so may result in injury to personnel or damage to the product!

Danger

Improper lifting procedures may result in personal injury!

- Keep a safe distance of 5m to 10m from the operating area (beneath the crane arm or beneath lifted or moving machinery) to prevent accidents.
- Ensure the use of a professional crane operated only by qualified personnel.
- Cease lifting operations during adverse weather conditions such as heavy rain, fog, or strong winds.

2] During hoisting

a. Make sure all sling connections are secure.

b. Make sure the product remains stable and without deviation throughout the hoisting process.

c. Hoist the product vertically, avoid dragging on the ground or top of lower-layer products, and refrain from pushing or dragging the product on any surface.

d. After hoisting off the support surface, pause to inspect the connection between the sling and the product. Only proceed with hoisting process after confirming a secure connection.

e. When placing the product in position, gently release it for a smooth landing. Avoid placing the product outside the vertical landing area by swinging the spreader.

f. The placement site should be solid, level, well-drained, and free from obstacles or protrusions.

g. During hoisting, take care to avoid scraping or scratching the product.

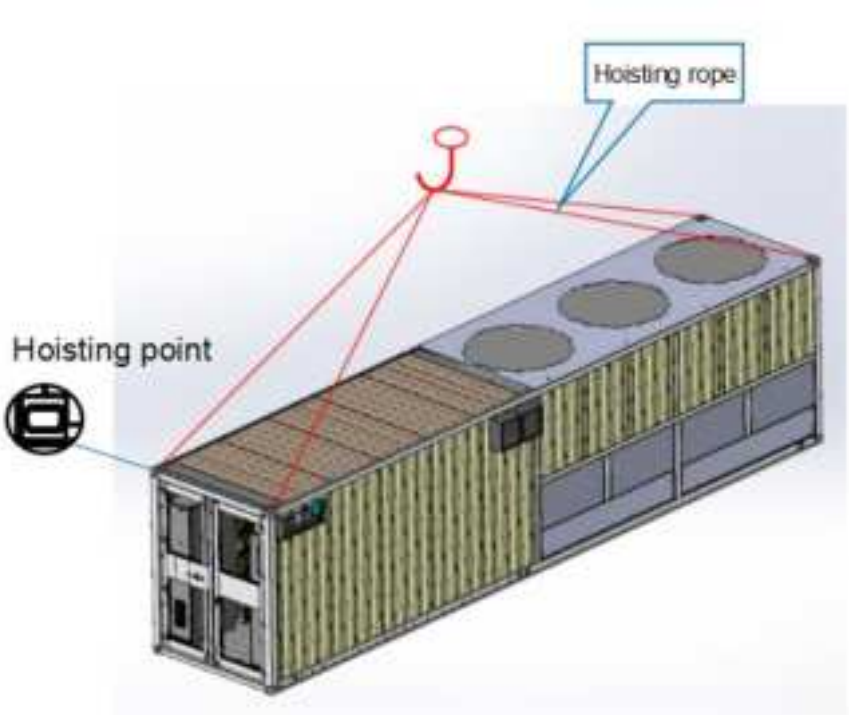


Figure 7-3 Hoisting Diagram

Warning

Lift the product smoothly and steadily, and avoid any vibration, impact, flipping, or prolonged suspension. Failure to do so may result in injury to personnel or damage to the product!

3) Securing the product

a. Secure the product after hoisting it to the installation position.

b. Secure it by welding.

c. Weld the bottom of the product to the foundation. After completion, apply anti-corrosion treatment to the welded areas.

7.5 Product Disassembly & Assembly

1) Removal of side sealing panels when opening box

a. Remove the sealing panels labeled for removal around the box.

b. Use a utility knife to cut through the sealing adhesive around the panels.

c. Remove the sealing panels on the top of the box.

d. Use a screwdriver or electric tool to remove the sealing panels around the box perimeter.

See the following steps illustrated below:

Figure 7-4 Schematic for Removing Side Sealing Panels

2) Removal of fan sealing panels:

a. Use a Phillips screwdriver or electric tool to remove the sealing panels at fan port.

b. Remove the sealing adhesive around the edges.

c. Unscrew and remove the fan power cable.

See the following steps illustrated below:

Figure 7-5 Schematic for Removing Fan Sealing Panels

3) Removal of accompanied cooling tower components

Removal steps:

a. Remove the right side sealing panel of the box and dismantle the louver.

b. Remove the water tank side panel labeled for removal on the right side.

c. Cut off the wire inside the box that is used to secure the fan and lift it out, along with the fence and screw fittings.

d. The forklift operation and the assistance of 4-5 people inside the box are required for fan removal. The appropriate protective gear (e.g. safety helmets and gloves) shall be worn.

e. Refer to the parts list for the quantity of accessories (a copy is included inside the box).

Refer to the following diagrams below:

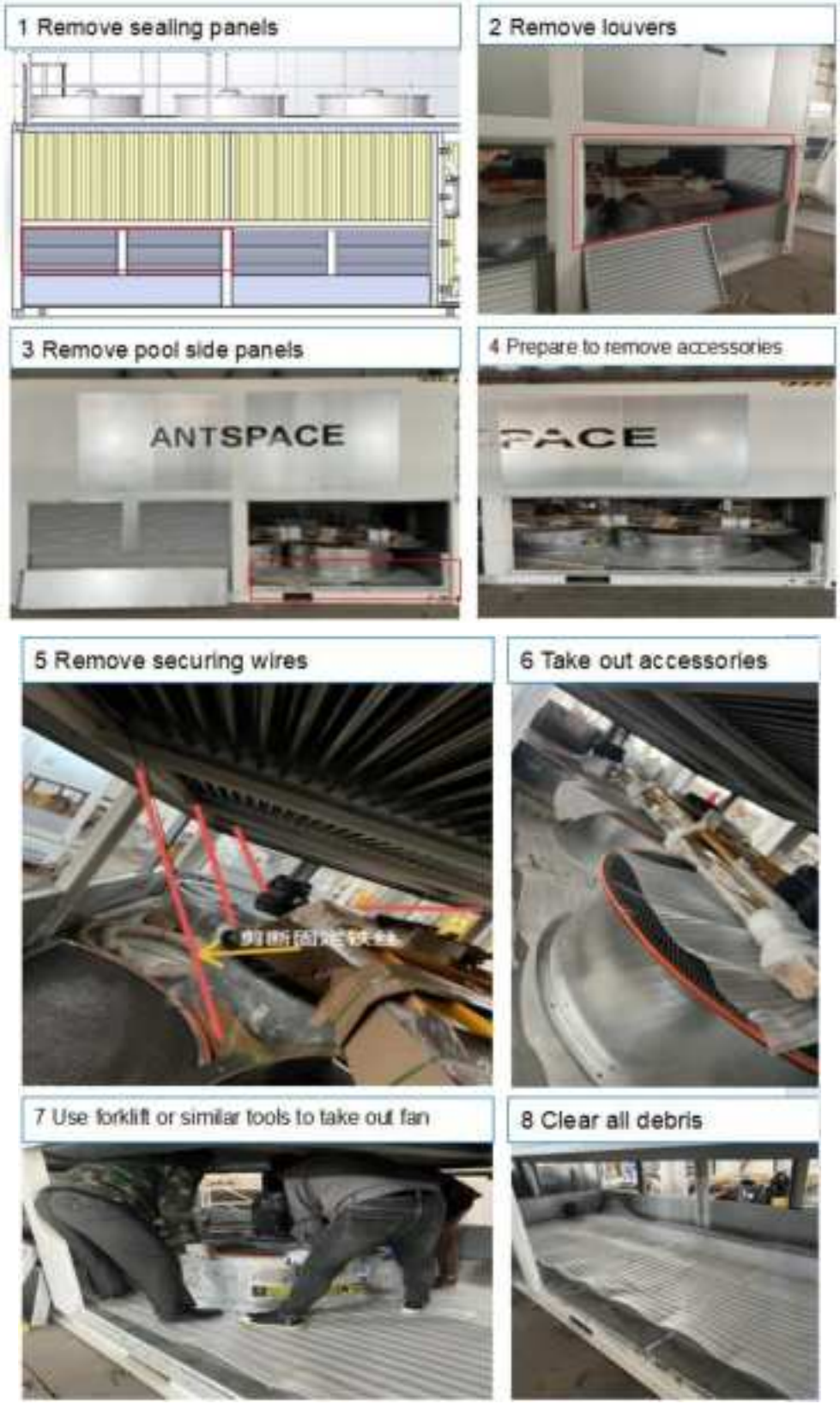


Figure 7-6 Schematic for Removing Provided Accessories

Danger

- Fan weight: 260kg
- Improper handling may result in injury to personnel! Protective articles must be worn.
- Handle with care when removing side panels to avoid causing damage!
- Dispose of excess packaging waste in compliance with local regulations for recycling or disposal!

4] Installation of water tank side panel

Preparation:

a. Take out the butyl rubber sealant and caulking gun from the accessory package.

b. Prepare a wrench or electric tool.

c. Wear appropriate protective articles.

Install by following the steps in the diagram below:

Figure 7-7 Schematic for Side Panel Installation

Warning

- Ensure the butyl adhesive is applied thoroughly to prevent any gaps, as which could lead to the risk of water leakage upon adhesion failure.
- Apply the butyl adhesive uniformly without interruption or gaps at the sealant joints to prevent any leakage.

5) Fan installation

a. After removing the fan from the tank, lay it flat on the ground. Attach the cable hook to the hoisting lugs on both sides of the fan, then hoist it vertically to the installation position on the box top.

b. Prepare a wrench or electric tool for installation.

c. Wear appropriate protective articles when working at heights.

Figure 7-8 Schematic for Fan Installation

Caution

- Ensure correct alignment of the fan junction box with the direction of the top cable outlets to avoid cable length inadequacies.
- Use cable ties to securely fasten the fan cables.

Fence installation

a. Lift the fence, cage, ladder, and accessories included in the parts list to the top of the box for installation.

b. Prepare a wrench or electric tool for installation.

c. Wear appropriate protective articles when working at heights.

Refer to the installation schematic below:

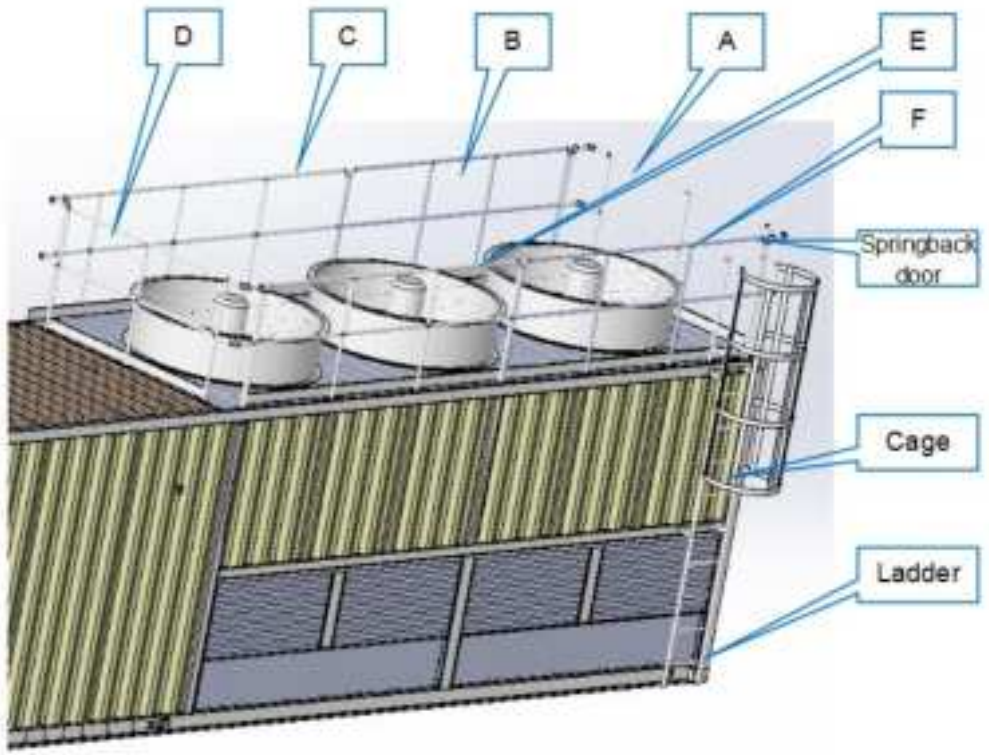


Figure 7-9 Schematic for Fence Installation

Warning

- Personal protective equipment (e.g., distribution safety ropes, safety helmets) is mandatory for high-altitude work.
- Install conspicuous warning signs or safety barriers around the equipment to prevent accidents due to mishandling.

7] Installation of spray pump strainer

a. Prepare the necessary tools and components for installation: Ø4.2*16 self-tapping screws, strainer.

Figure 7-10 Schematic of Strainer Installation Tools and Materials

b. Secure the strainer to the flange pipe at the inlet of water pump using self-tapping screws. As shown in the following picture:

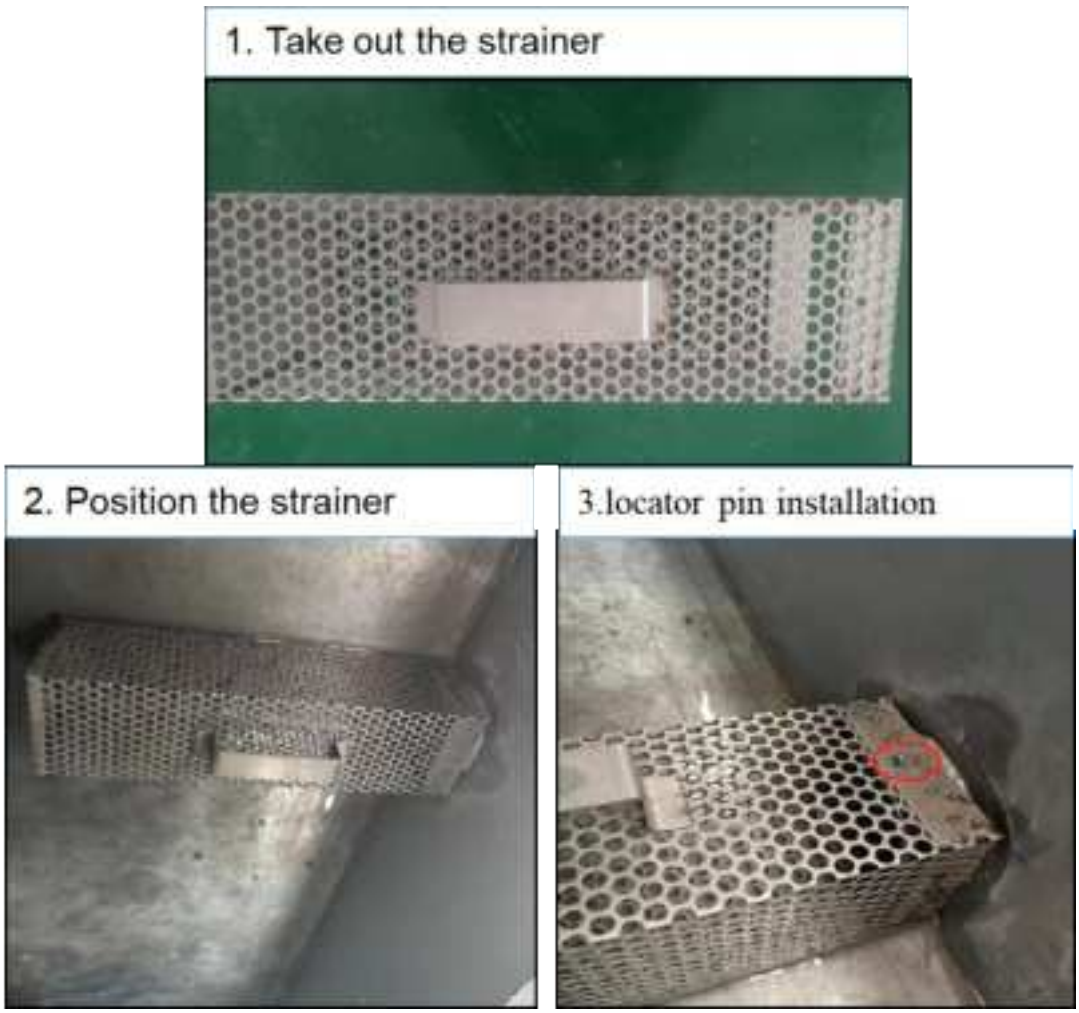


Figure 7-11 Schematic for Strainer Installation

8) Installation of container exhaust fans

After determining the relative position of the container and the cooling tower, take out the

container exhaust fan assembly (exhaust fans G04&G05, louvers, and insect proof nets are integrated, as shown in 错误!未找到引用源。 from the container accessories wooden box, unpack it and perform installation:

1) Installed at the rear door of the container,
2) Remove the protective sealing panel on the rear door.
3) Secure the fan assembly as a whole to the rear door using bolts (M10 outer hexagonal bolts).

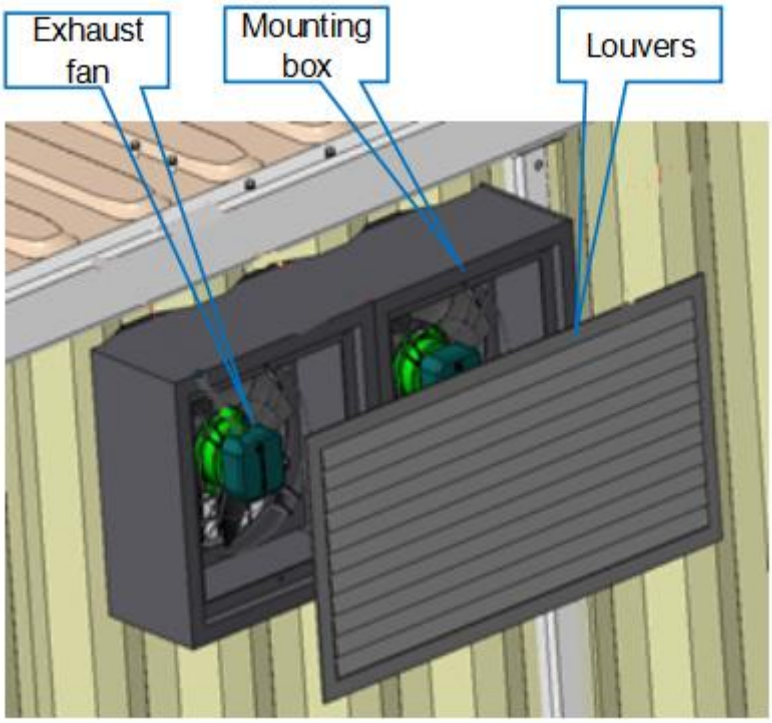


Figure 7-12 Schematic of Fan Assembly

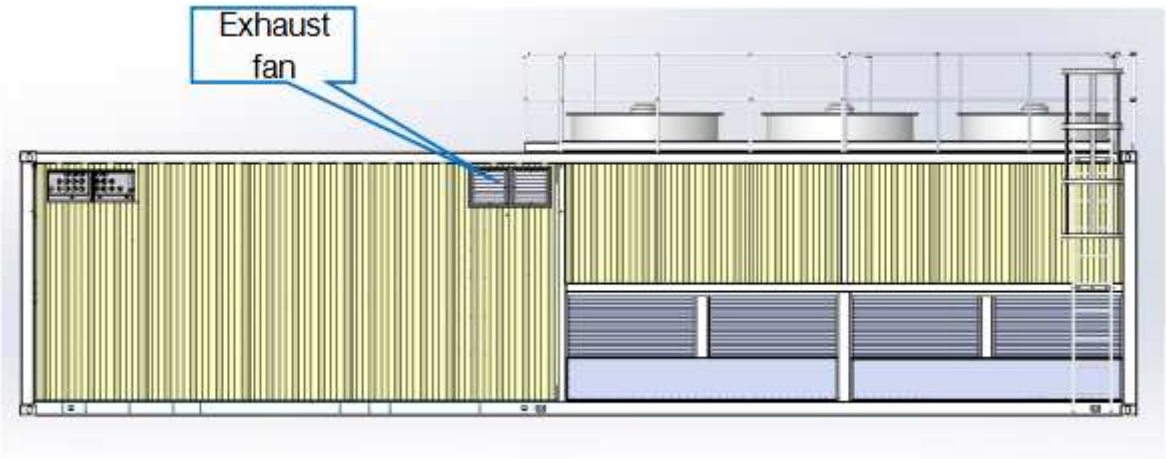


Figure 7-13 Schematic of Container Fan Installation

9) Installation of ambient temperature measuring box of container

Remove the rain cover of ambient temperature measuring box from the provided container accessories and install it, as shown in Figure 7-14.

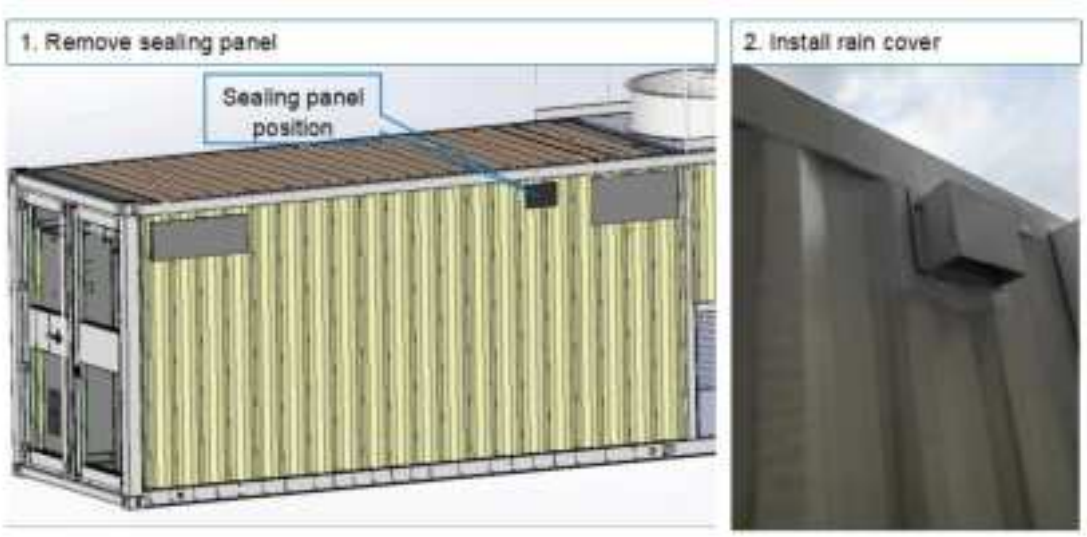


Figure 7-14 Schematic of Rain Cover

8 ANTSPACE HW5 Container Water Cooling System Use and Operation

8.1 Safety Rules

1) Hazard level

Danger

Inside the device is a live label, and it is prohibited to open protective panels with live labels. Even in case of power outage, non professionals are prohibited from opening the cover plate.

2) Precautions for Use

Filtered coolant should be used as the cooling medium, and there should be no floating or particulate matter in the supply circulation system.

Warning

The cooling medium should be produced by a reputable manufacturer and should not be mixed by oneself. Otherwise, we will not be responsible for any problems that may arise. It is recommended to use organic cooling liquid (inorganic cooling liquid contain P, Si, B, Mo, nitrate, etc., which can generate sediment over time). Recommended manufacturers of cooling liquid include Great Wall, Shell, etc. The coolant model is selected based on the minimum temperature of the project location.

Warning

It is prohibited to add tap water or exceed the specified coolant in the system. The system operation should have regular monitoring of the coolant. Once the coolant properties change, a new coolant must be replaced.

a. When the ambient temperature is below 0°C, the water in the collection tank and spray pipeline must be completely drained to prevent freezing and damage to the equipment.

b. Equipment should avoid wiring midway and is strictly prohibited from being used in parallel with other equipment.

c. If there are any abnormalities in the equipment (such as stink, etc.), it should be shut down, disconnected from the power supply, and inspected.

d. There are emergency stops on the entrance doors and container doors of distribution cabinets A and B. When an emergency occurs, pressing the emergency stop will

immediately disconnect the power circuit breaker. After an emergency reset, first turn the main circuit breaker to the OFF position and then power on again.

e. Circuit breaker MCB-A1 can only cut off power to distribution cabinet A.

f. Circuit breaker MCB-A2 can only cut off power to distribution cabinet B.

Warning

All emergency stop buttons used in this system are rotary release type. After the emergency stop button is pressed and confirmed and confirming that the system is functioning properly, it is necessary to rotate the emergency stop button clockwise to release it. Then, the main switch of the distribution cabinet and the main control cabinet can be closed. Before closing the switch, it needs to be turned to the OFF position and then re-closed.

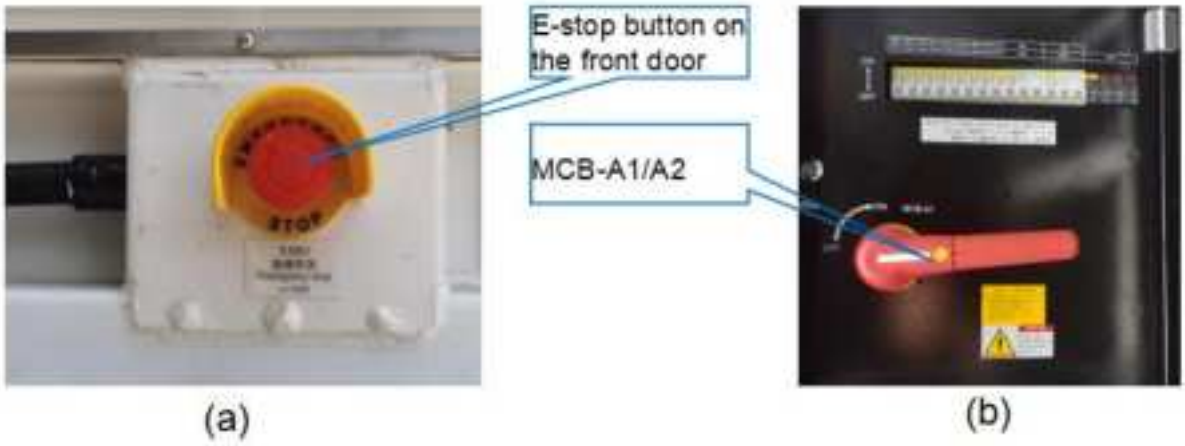


Figure 8-1 (a) Emergency stop knobs on the front door (b) Location of MCB-A1/A2

Danger

The silk screen on the inner door of the power distribution cabinet indicates which switches are still live after the main switch is powered off. Please read carefully before operation. Avoid causing electric shock accidents.

g. The circuit breaker QFWCU can only power off the main control cabinet.

h. To prevent danger, when repairing a single high computing power server, the power switch corresponding to the serial number of the high computing power server in the distribution cabinet must be disconnected, and then the power interface, network cable interface, and water supply interface of the corresponding high computing power server must be unplugged. Finally, the power source of the high computing power server must be unplugged to repair the high computing power server. If it is necessary to power off the entire container equipment, the steps are as follows:

- Firstly, disconnect the micro circuit breakers of 210 high computing power servers.
- After an interval of 10 seconds, disconnect the main power supply of the main control cabinet.
- Then disconnect the main switches of the two distribution cabinets.
- Disconnect the main switch at the transformer end, if necessary. Be sure to adhere strictly to the specified sequence when shutting down the switches.

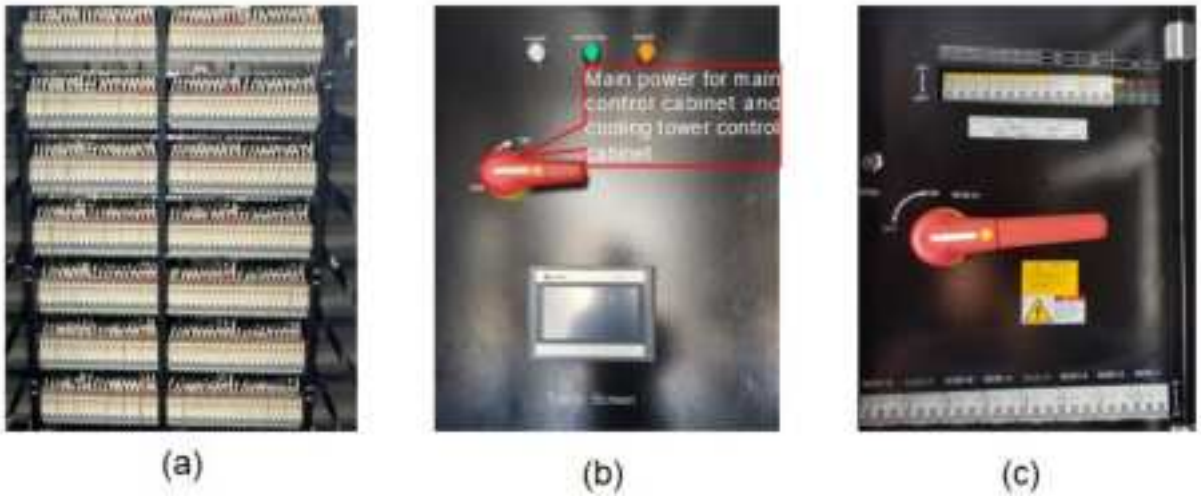


Figure 8-10 (a) Distribution cabinet circuit breakers (b)Internal of the main control cabinet (c)The main circuit breaker of the distribution cabinet

Caution

Since the container lighting circuit is led out from the main control cabinet, if you want to perform the above operation, please bring a portable lighting tool.

Warning

If the device is not working for a long time, please disconnect the main power supply.

Never attempt to open the protective cover on the fan;

Avoid using your hands to check if the fan is rotating or to manually spin the fan blades.

Do not operate the equipment with wet hands to prevent the occurrence of electric shock accidents. Also, refrain from placing any foreign objects inside the equipment to ensure clear access to fire exits at all times.

8.2 System Pressurization

After the on-site installation of equipment and pipelines is completed, a 7 bar air pressure

test should be conducted first, with the pressure maintained for at least 12 hours. Then conduct a 7 bar water pressure test, with the pressure maintained for at least 30 minutes. Check if there is any leakage in each pipeline and interface. If there is no leakage and the pressure reading decreases by less than 5%, it indicates that the on-site installation inspection is qualified. The pressurization process is as follows:

1) Preparation Before Pressurization

a. Prepare hoses and air pumps (recommended brand: OUTSTANDING, model 2200W-40L. Selection basis: the internal volume of the system is about 1.5 m^3, and the air pump with corresponding exhaust volume is selected according to time requirements; the maximum output air pressure is required to be above 8 bar, and 10 bar is optimal).

b. Check if all plugs or ball valves on the automatic exhaust valves on the internal and external connecting pipelines of the container are closed (the automatic exhaust valves can be opened/closed by rotating the top cap of the automatic exhaust valves). (Refer to Figure 10-3 to Figure 10-7).

c. Check if the safety valve ball valve V410 and the expansion tank ball valve V104 are closed, and if all filling/discharge valves are closed.

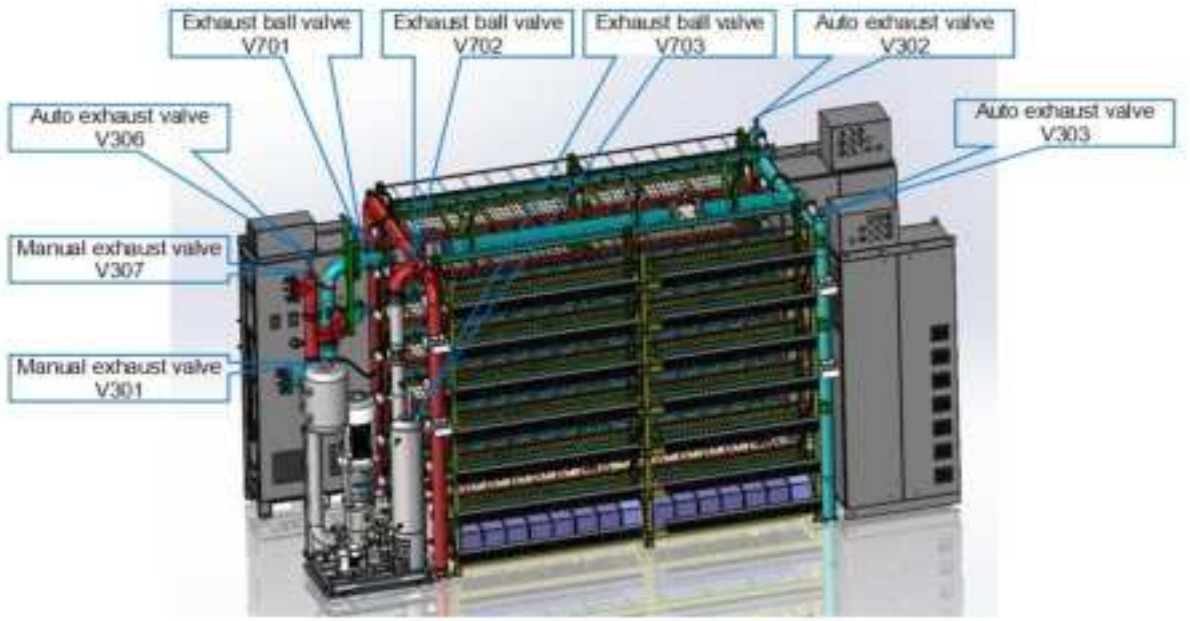


Figure 8-11 Location of the exhaust valve in container system

Figure 8-12 Manifold drain port

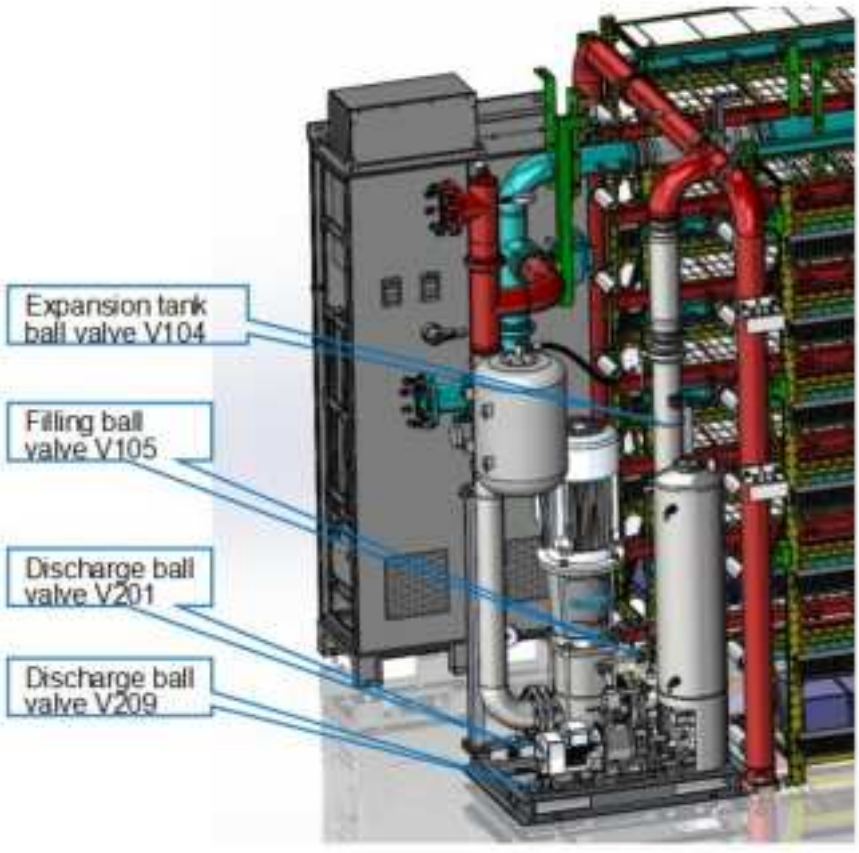


Figure 8-13 Schematic diagram of pump station valves

Figure 8-14 Automatic exhaust valve

Figure 8-15 Schematic diagram of valve opening and closing

2) Pressurization Steps

a. Check again that the exhaust valve plugs and ball valves are closed.

b. Close valves V104, V105, V201, V701, V702, etc. (isolating the water tank, expansion tank, and replenishment pump to prevent air pressure leakage).

c. Open all mini ball valves on the manifold.

d. Connect to any quick connection port with the air pipe and close the corresponding ball valve of this circuit.

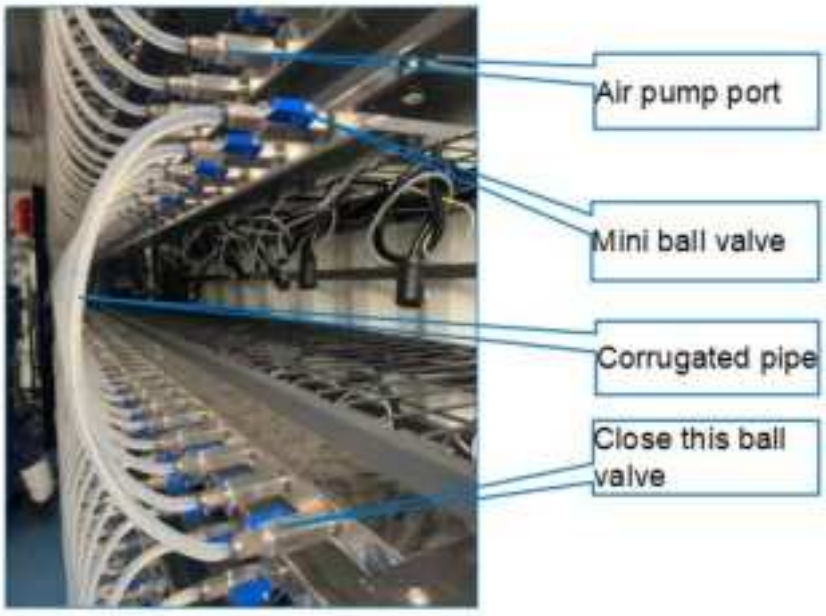


Figure 8-8 System pipeline connection ball valve

e. Use an air compressor to pressurize to 7 bar and stabilize for more than 12 hours, and check for any leakage points.

f. The key inspection.

The key inspection areas are as follows: The connection between the quick connector and the mini ball valve. The connection between the quick connection ball valve and corrugated pipes. The connection between the mini ball valve and the manifold. The connection between the quick connector and computing power server. Each flange/chuck/threaded/welded connection.

The inspection method is as follows: Check for leaks by seeing, listening and touching. Add water to one of soap, laundry detergent, and detergent to make soap solution, and apply it to suspected leakage points, especially at the joints. The areas with bubbles and bulges are the leakage points.

g. Perform another pressurization.

Once the high computing power server is online, conduct another check for gas-liquid mixing. Maintain pressure at 7 bar for over 2 hours, to check for any potential leakage points at the above-mentioned locations.

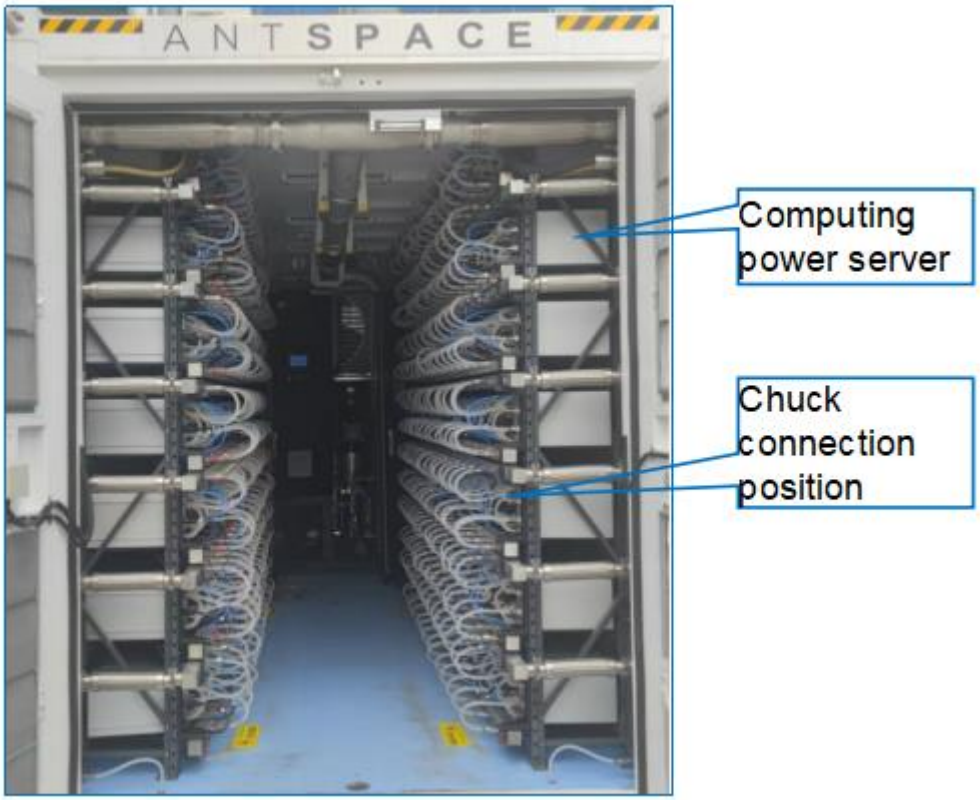


Figure 8-9 System chuck connection

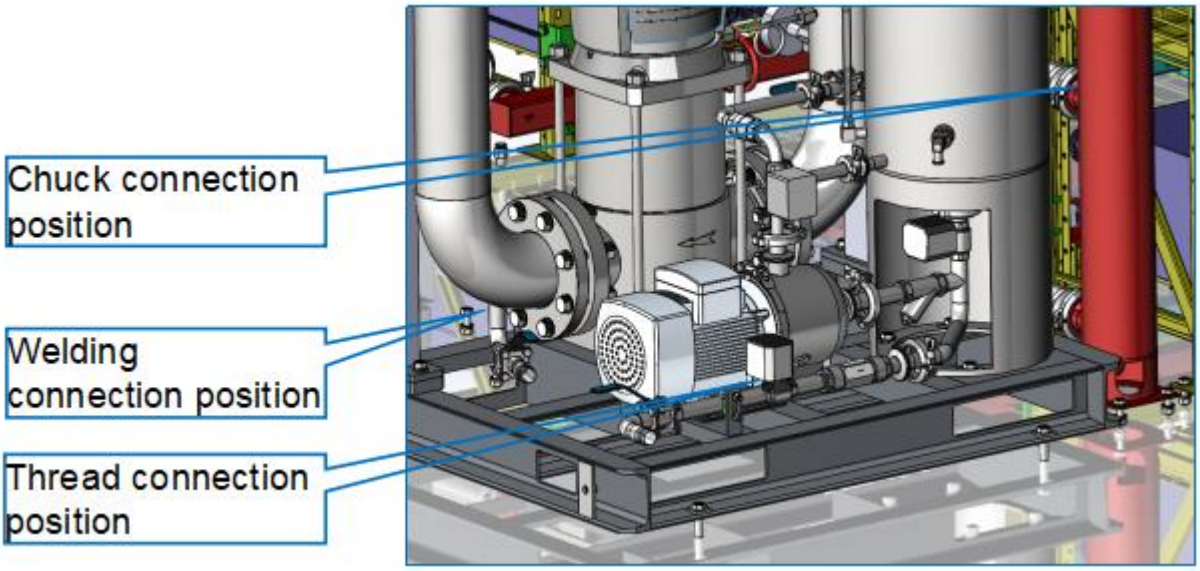


Figure 8-10 System leakage point inspection

8.3 Replenish the system

The spray water inside the cooling tower adopts tap water or softened water, and a tap water pipe (DN40) is installed on site. It is recommended to choose appropriate antifreeze or purified water based on local climate conditions as the circulating media in cooling tower and container. Firstly, add Water to the system with a Water filling pump. When the return pressure reaches the required value, stop adding Water to the system. Switch the pipeline switch, and start the Water filling pump to add Water to the water tank. When the Water level in the water tank reaches the required height, switch the pipeline switch, and the system will automatically run. The specific Water filling procedure is as follows:

The system replenishment involves four steps:

I. Preparation: Prepare materials and tools, and open all exhaust valves of the system (open the manual exhaust valve of the system and the manual exhaust valve on the cooling tower for the first Water filling).

II. System Water replenishment: Replenish the system with Water filling pump P11.

III. Water tank replenishment: Replenish the water tank with Water filling pump P11.

IV. Regular replenishment of water tank: Replenish the water tank with the Water filling pump P11 or through the manual filling port on the top of the water tank.

1) Preparation

a. Prepare the coolant.

b. Check if all plugs on the automatic exhaust valves on the internal pipelines of the container are open (refer to Figure 8-11 Location of the exhaust valve in container system).

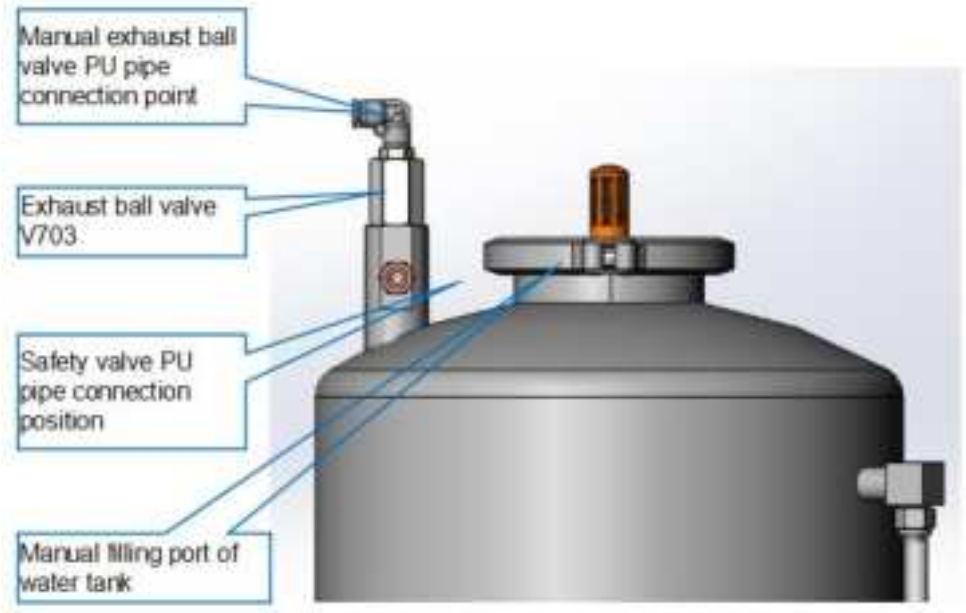


Figure 8-11 Water tank valve

2] System and Water Tank Replenishment

a. Locate the external filling port of the container (at the side door of the container), ensure it is clean, and connect a hose. Connect the external coolant to the replenishment pump inlet (liquid needs to be injected into the pump head for the first filling). (Refer to Figure 8-13).

b. According to Figure 8-13, switch to the "Open" mode from "External -> System".

c. During system replenishment, when PT02 reaches above 0.07 MPa (refer to Figure 8-14: Touchscreen reading), the circulation pump can be started for 10 seconds (the replenishment pump does not need to stop), then stop the circulation pump.

d. Continue to add Water and repeat for twice to ensure that 1.3-1.5 tons of coolant are added.

e. When the static pressure reaches 1 bar, switch to the "Closed" mode from "External -> System" (observe the reading of the pressure sensor PT02 on the main interface, see Figure 8-14 below).

f. Then, start the circulation pump again to circulate the medium in the system, to ensure all air vents are in the open position.

g. According to Figure 8-13, switch to the "Open" mode from "External -> C21".

h. Observe the water level gauge of the water tank, and switch to the "Closed" mode from "External -> C21" when it reaches the appropriate position.

i. After completing the above operations, the system back pressure (PT02) will stabilize at 0.1~0.15 MPa, and the system can operate properly.

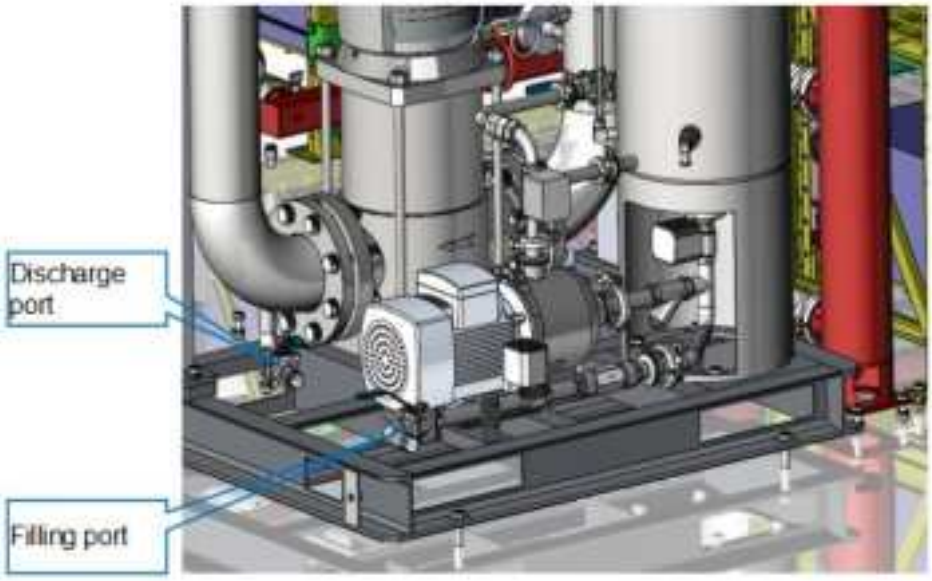


Figure 8-16Illustration of Replenishment Hose Interface

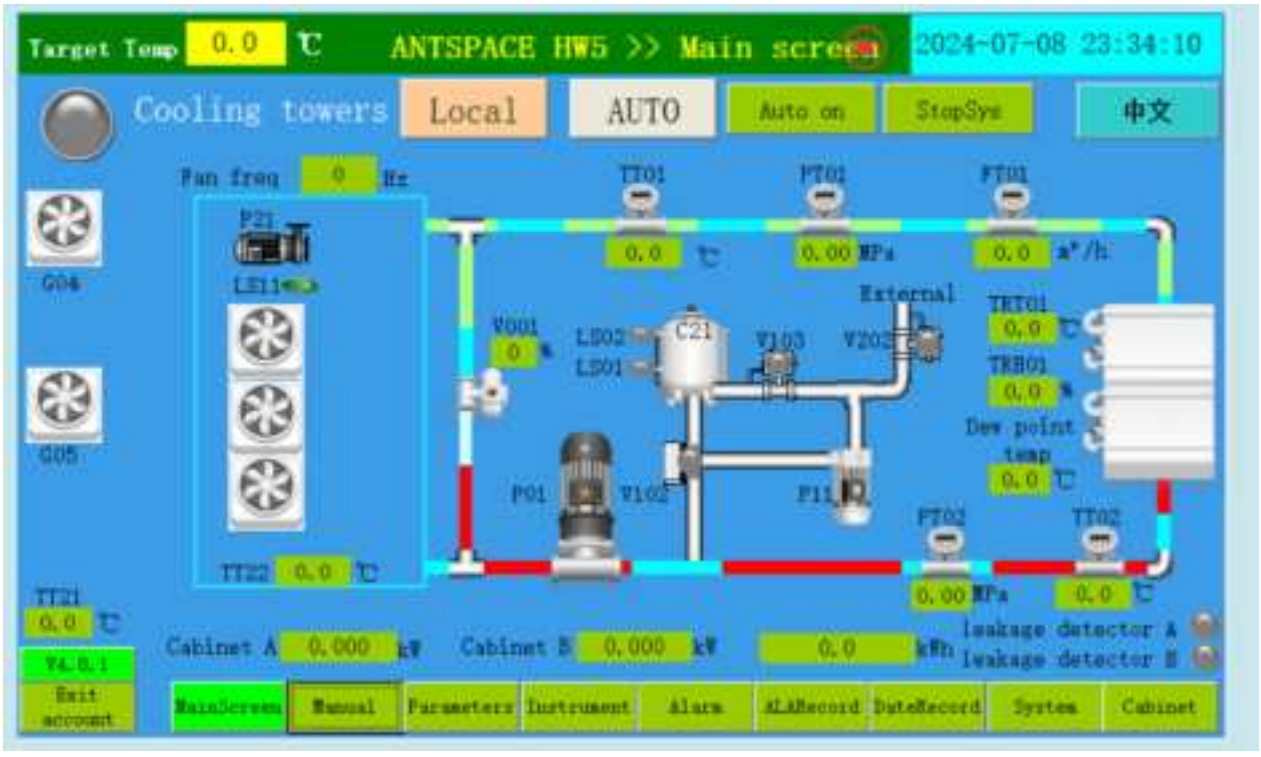


Figure 8-17 Water filling system interface

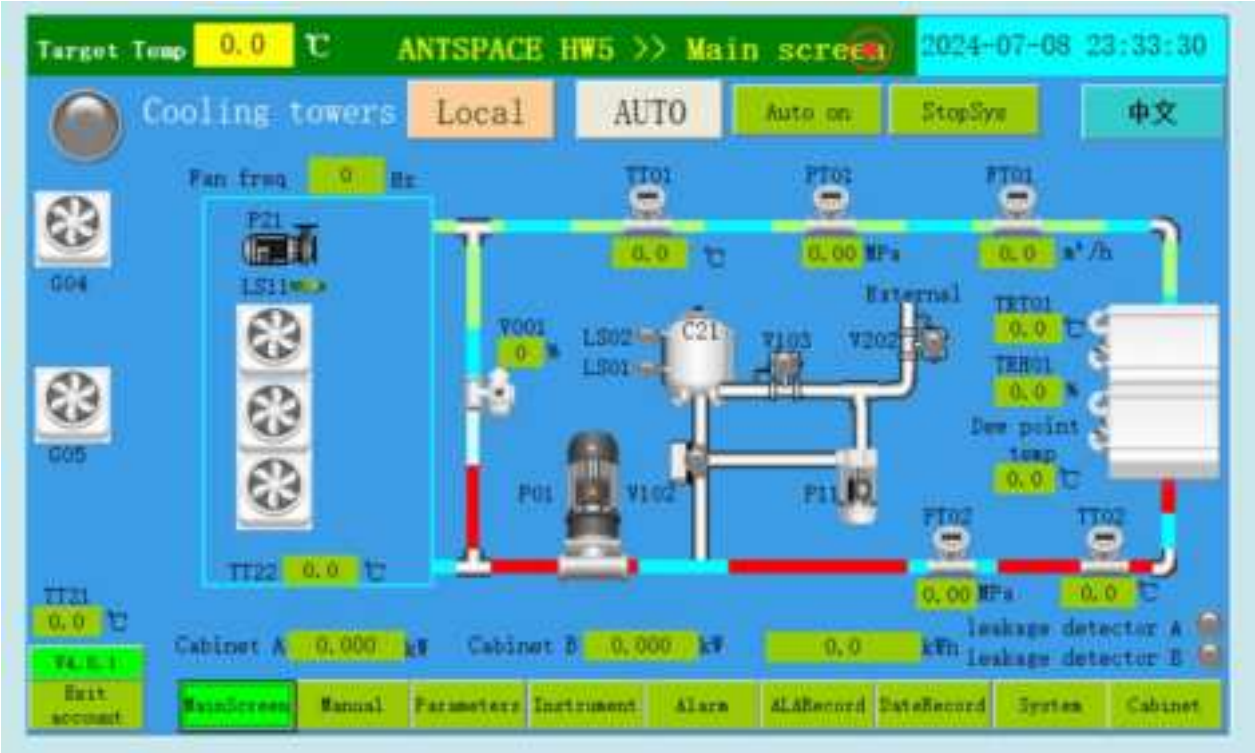


Figure 8-18 System operation interface

3) Regular Replenishment of Water Tank

When water tank C21 needs to be replenished with a small amount of coolant, the following methods can be referred to:

Method 1: Same as the first Water filling, connect the replenishment pump P11 to an external water source (with a certain pressure; fill the connecting pipeline), turn on the Water replenishment mode, and externally add Water to the water tank C21.

Method 2: open the installation chuck of the exhaust valve on the top of the water tank (refer to Figure 8-11 Water tank valve), and manually add Water from the manual filling port to the inside of the water tank.

8.4 Electrical Wiring

The electrical system requirement for the equipment is TN-S three-phase five wire system. Due to the two distribution cabinets (A/B cabinets) inside the equipment, in order to ensure safe and stable operation of the equipment, two 1200A three-phase five wire cables (with a rated current of 1200A for the main switch) should be prepared in advance on site.

Danger

Electrical connections must be operated by professionally qualified personnel. In addition to complying with the requirements of this manual, the operation procedures must also comply with the relevant local electrical regulations and safety regulations of the project.
Unqualified personnel are strictly prohibited from making electrical connections to the equipment.
The specifications and quantity of equipment input cables must comply with local electrical regulations. Please consult a qualified electrical engineer when necessary.
Three M16 bolts are reserved for the L1, L2, and L3 input copper bars on the top of the A/B cabinet, and the middle hole of the cable fixing terminal is specified to be 17mm in diameter. Reserve two M12 bolts for the N copper bar and reserve M12 bolts for the PE copper bar.

Caution

The fixing torque of M16 bolts is 100N.m, and the fixing torque of M12 bolts is 80N.m, or refer to the electrical standards of the project. Be sure to ensure reliable electrical connections. .

Stripping and crimping diagram as follows:

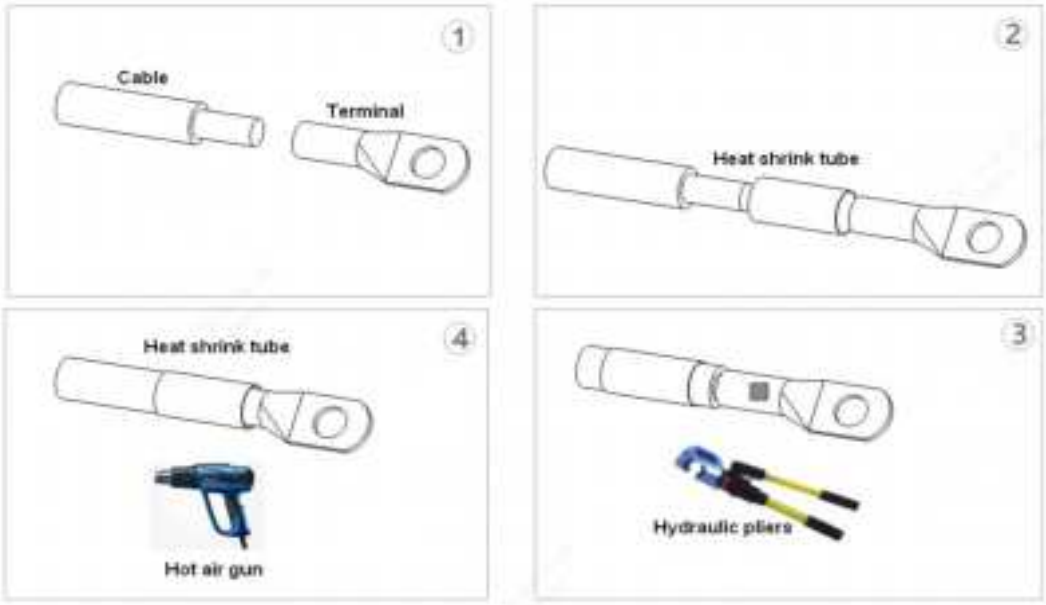


Figure 8-19 Stripping and crimping

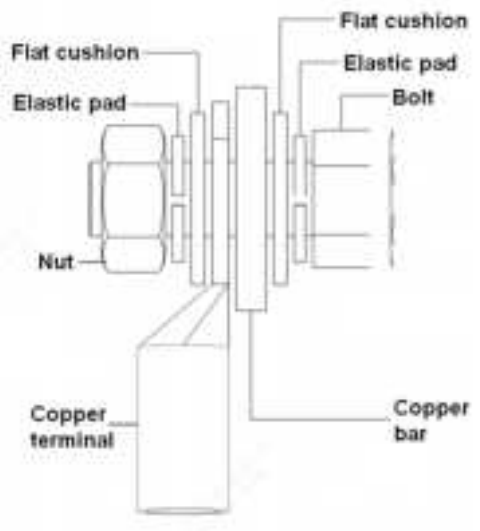


Figure 8-20 Select copper wire

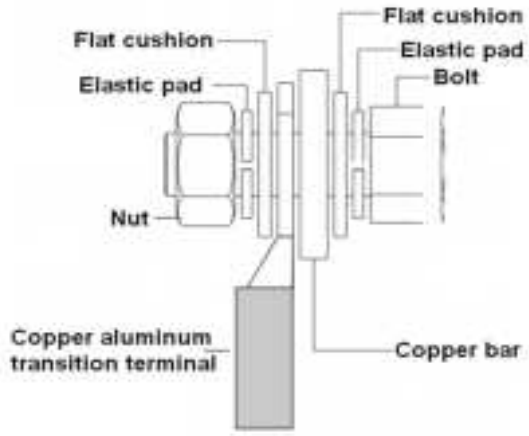


Figure 8-17 Completion of wiring

After the wiring is completed and the bolts are fixed according to the torque, use a marking pen to mark the nut head for subsequent inspection.

Figure 8-18 Cable connection diagram

The cable wires are typically routed through the two openings at the upper left side of the container. Refer to Figure 8-19 for the specific locations (Note: it is necessary to use rainproof cloth and cover from the accessories for protection). The cables are connected from the top junction boxes of the two distribution cabinets and extend all the way to the corresponding copper bars. They are installed and fixed with screws (already installed at the copper bar openings).

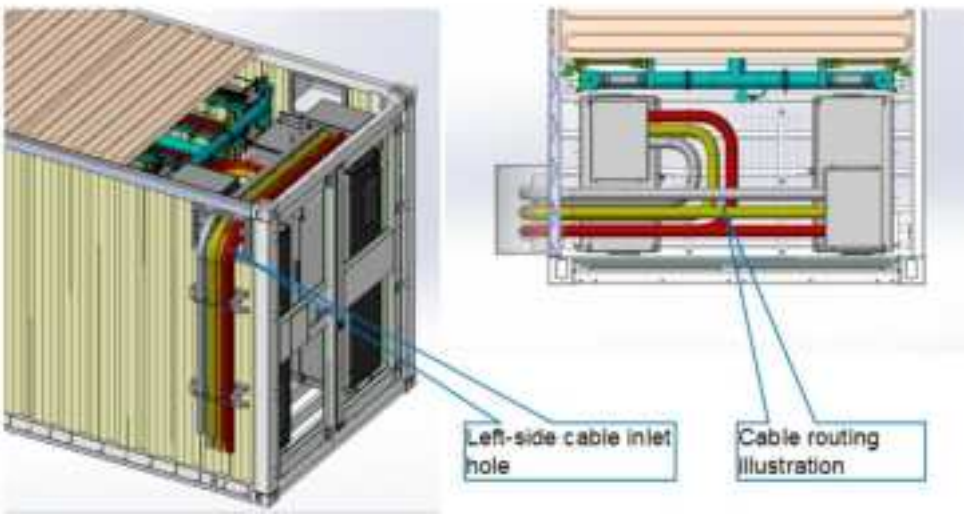


Figure 8-19 Illustration of Left Cable Entry

Considering the uncertainty of cable planning at the site, cables can also be routed through two openings on the upper right side of the container. Please refer to Figure 8-20 for the specific locations (Note: it is necessary to use rainproof cloth and cover from the accessories for protection). If opting for cable entry from the right side, it's essential to prepare by retrofitting the cable tray along the designated route aligned with entry port B (as illustrated in Figure 8-21). The cables will connect from the top terminal boxes of the two distribution cabinets, extending to their respective copper bars, and securely fastened using screws already positioned at the copper bar openings.

Caution

Before crimping the terminals, ensure the waterproof gland is threaded through the cable, as the cable terminal width may exceed the diameter of the gland heads of distribution cabinet.

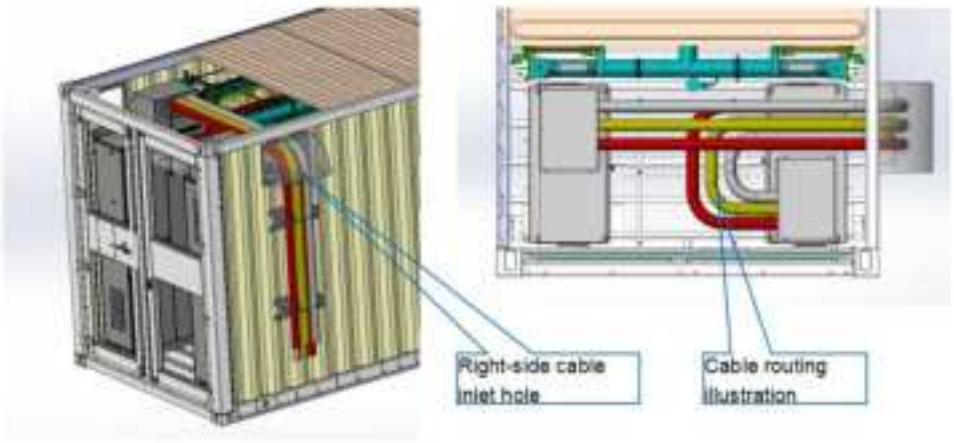


Figure 8-20 Illustration of Right-side Cable Entry

There are grounding studs on both sides of the container, and the distribution cabinet should also be reliably grounded. Therefore, it is chosen to reliably ground the shell of the container and the shell of the distribution cabinet. When leaving the factory, the phase sequence of the equipment has been determined. After the equipment arrives at the site, it only needs to adapt to the phase sequence of the on-site substation.

The operation is as follows: connect the L1, L2, L3, N, PE three-phase and five wires of the substation to the distribution cabinet, power on the main switch of the main control cabinet, and observe whether there is a power failure alarm on the LCD screen; If there is a power failure alarm, please adjust the phase sequence of the three phases connected to the main control cabinet L1, L2, L3; If there is no fault alarm on the LCD screen, it can operate normally.

Danger

Only qualified personnel should handle the three-phase electricity originating from the transformer. When adjusting the phase sequence, the power must be disconnected from the input end of the external transformer before operation (the white light on the front of the main control cabinet is OFF, and the input line voltage is measured as 0V using a multimeter).

Under no circumstances should phase sequence adjustments be made while power is ON.

8.5 System Power-on and Power-off

The switch in the main control cabinet are shown in the following figure:

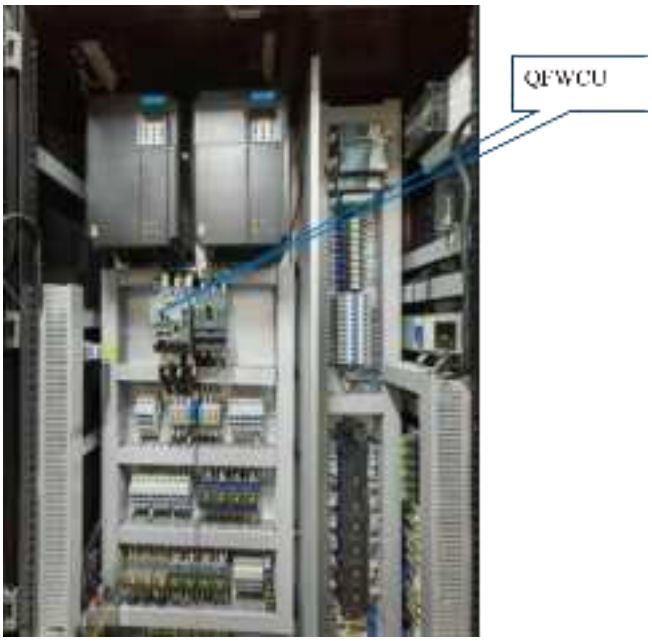


Figure 8-21 Internal view of the main control cabinet

1) Functional Description of Circuit Breakers

Table 8-1 Functional description of circuit breakers in the main control cabinet

SN	Name	Starting point	Direction	End point
1	QFWCU	Power incoming XT1 L1, L2, L3	→	XD11, XD12, XD13 L1, L2, L3
2	QFKR1	XD11 L1	→	Power monitor L1
3	QFKR2	XD12 L2	→	Power monitor L2
4	QFKR3	XD13 L3	→	Power monitor L3
5	QFHL1	XT1 L1	→	Power indicator light (white)
6	QFHL2	XD11 L1	→	Closing indicator light (green)
7	QFD1	L1, N	→	Backup power supply

8	QFaSW	XD11 L1	→	Distribution cabinet switch power supply
9	QFbSW	XD11 L1	→	Distribution cabinet switch power supply
10	QFVF01	XD11, XD12, XD13 L1, L2, L3	→	Main pump frequency converter R, S, T
11	QFVF02	XD11, XD12, XD13 L1, L2, L3	→	Cooling tower fan frequency converter R, S, T
12	QFG01	Cooling tower fan frequency converter U, V, W	→	Cooling tower fan front thermal relay - FRG01 1, 3, 5
13	QFG02	Cooling tower fan frequency converter U, V, W	→	Cooling tower fan front thermal relay - FRG02 1, 3, 5
14	QFG03	Cooling tower fan frequency converter U, V, W	→	Cooling tower fan front thermal relay - FRG03 1, 3, 5
15	QFG04	XD11, XD12, XD13 L1, L2, L3	→	KMG04 1, 3, 5
16	QFG05	QFG04 1, 3, 5	→	KMG05 1, 3, 5
17	QFP11	QFG05 1, 3, 5	→	KMP11 1, 3, 5
18	QFPS	XD11 L1	→	Electrical power sockets
19	-QFP21	XD11, XD12, XD13 L1, L2, L3	→	KMP21 1, 3, 5
20	QFP1	XD13 L3	→	PLC power supply P1, pin 2
21	QFPZ1	PLC power supply P1, pin 5	→	P1_L+
22	QFP2	XD11 L1	→	P2 SDR-480-24 pin L
23	QFPZ2	P2 SDR-480-24 pin V+	→	XDC24V terminal block:

				Container lighting RCT4
24	QFRDC	QFPZ2 1	→	A Distribution cabinet fan
25	QFMF	QFRDC 1	→	Cabinet radiator
26	QFP3	XD11 L1	→	SDR-75-12V P3 pin L
27	QFPZ3	SDR-75-12V P3 pin V+	→	XDC12V terminal block: Power supply for face recognition and door magnetic switch
28	QFP4	XD11 L1	→	MDR-20-5 P4 pin L
29	QFPZ4	MDR-20-5 P4 pin V+	→	XDC5V terminal block: Main control module NanoPi-R4S
30	QFV1	P2 SDR-480-24 pin +V EV_L+	→	KAKV102
31	QFRST	KAKV102 5 (EV_L+)	→	Main distribution cabinet A shunt release terminal

Table 8-2 Function description of circuit breakers in distribution cabinet A

SN	Name	Starting point	Direction	End point
1	MCB-A1	External L1, L2, L3	→	Main busbar L1, L2, L3
2	MCB24	MCB-A1 1, 5	→	Power indicator light HL1 X1, X2
3	MCB25	Main busbar L4, L6	→	Closing indicator light HL2 X1, X2
4	MCB-B1	L1, L2, L3	→	SPD1 L1, L2, L3
5	MCB21	L1, L2, L3	→	1# PMM smart meter V1, V2, V3

6	MCB26	XRDC	→	Cooling fan L+ in the cabinet
7	MCB15-1，2，3，4，5			Switch circuit breaker
8	MCB1-1, 7-15			High computing power server circuit breaker

Table 8-3 Function description of circuit breakers in distribution cabinet B

SN	Name	Starting point	Direction	End point
1	MCB-A2	External L1, L2, L3	→	Main busbar L1, L2, L3
2	MCB27	MCB-A2 L1, L3	→	Power indicator light HL3 X1, X2
3	MCB28	Main busbar L5, L6	→	Closing indicator light HL4 X1, X2
4	MCB-B2	L1, L2, L3	→	SPD2 L1, L2, L3
5	MCB22	L1, L2, L3	→	2# PMM smart meter V1, V2, V3
6	MCB29	XRDC		Cooling fan L+ in the cabinet
7	MCB16-1，2，3，4，5			Switch circuit breaker
8	MCB8-1，14-15			High computing power server circuit breaker

2] Precautions for the first System Power-on

After the entire system wiring is completed, the equipment can be powered on for debugging. However, before powering on, it is necessary to use a multimeter to measure whether there is a short circuit between phase wires, between phases wire and neutral wire, between phase

wire and ground wire, and between neutral wire and ground wire of the two power supplies. If not, it means it can be powered on normally. If any of the above short circuits exist, the fault should be identified first and then powered on. After the front-end of the system is powered on (the system itself is not yet powered on, and the main switch of the distribution cabinet and main control cabinet are not closed), it is necessary to measure the voltage of the front-end to see if it meets the power requirements of the equipment.

The power requirement for this device is AC 400V ± 5%, 50/60Hz.

Danger

After the system wiring is completed, a multimeter needs to be used to measure the direct connection between the phase wires between the input A/B power distribution cabinets, between the phase wires and the neutral wire, between the phase wires and the ground wire, and between the neutral wire and the ground wire. Is there a short circuit phenomenon? If there is a display showing that the resistance is 0, the short circuit must be checked before powering on, otherwise the system may be at risk of short circuit failure and electric shock.

3] System Power-on Sequence

After the front-end of the system is powered on and the voltage meets the requirements of the device, the system can be powered on at this time.

a. Firstly, power on the main control cabinet.

When the main control cabinet door is opened, first open QFWCU, and then open all circuit breakers inside the main control cabinet. QFP1 and QFPZ1 are switches for 24V power supply in PLC, QFP2 and QFPZ2 are switches for system 24V power supply, QFP3 and QFPZ3 are switches for 12V power supply, and QFP4 and QFPZ4 are switches for 5V power supply. After powering on, the screen and PLC on the cabinet door begin to work.

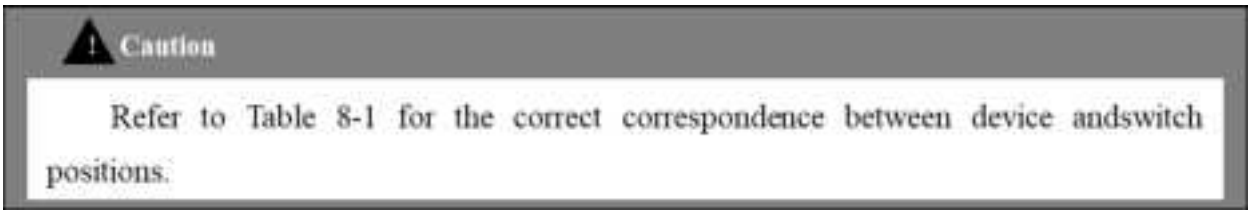
When the main control cabinet door is closed and the system needs to be powered on, first open all miniature circuit breakers and one molded case circuit breaker QFVF02 inside the cabinet, then close the cabinet door and open QFWCU through the cabinet door operating handle. At this point, the equipment has been powered on.

Trained electricians can operate the system through a touch screen, set parameters, modify thresholds, change operating modes (automatic/manual), start and stop a certain motor separately, or operate automatically. At this point, the Water cooling system can be run first, and the supply temperature can be controlled within the required temperature range before meeting the conditions for starting the high computing power server.

b. Powering up the distribution cabinet

After the main control cabinet is powered on, according to the operation process of the control system, it is only when the Water supply temperature is maintained near the target temperature that the high computing power server can be turned on. At this point, the circuit breakers in distribution cabinets A and B can be opened to start powering on the high computing power server.

First open MCB-A1 and A2, then other circuit breakers, and then start rows of high computing servers in an orderly manner as required. Due to a total of 210 high computing power servers, there are a total of 14 rows. When starting a high computing power server, the next row should be started at an interval of 20 seconds after starting one row (15 high computing power servers), and so on.



4] System Power-off Sequence

When the system needs to power off for some reason, as required, first disconnect the power supply of the high computing power server to ensure that the water temperature before and after the power outage is consistent, which is equivalent to protecting the power module of the high computing power server. After the power outage of the high computing power server, the Water cooling system is manually stopped through the touch screen. At this time, the water temperature will slightly rise, but it has no impact on the system. Finally, disconnect the main power supply of the main control cabinet and distribution cabinet, leaving the entire system in a completely powered-off state.

The above practice is a safe power outage behavior. However, when a serious fault occurs in the system, the emergency stop button on the inner door of the container can be directly pressed, causing the main circuit breaker of the distribution cabinet and the main circuit breaker of the main control cabinet to trip instantly, leaving the system in a completely powered off state, facilitating professional maintenance work.

Danger

In an emergency, please press the emergency stop button on the front of the power distribution cabinet. The emergency stop button on each power distribution cabinet controls the power supply of the power distribution cabinet. When pressed, the power distribution cabinet is powered off, but the switch, lightning protector, and electric meter display There will be no power outage, and professionals must be responsible for opening the door panel.

Caution

Press the emergency stop, and before re-powering after troubleshooting, you need to rotate the emergency stop switch clockwise to release, the main switch of the distribution cabinet, and the main control cabinet switch first move to the OFF position and then re-close.

5) Personnel Responsibility Division

Responsibilities of general operation and maintenance personnel: General power on/off work (disconnecting or merging circuit breakers), system start up and shutdown (touch screen button operation), network cable detection and replacement.

Professional electrician responsibilities: General power on and off work (disconnecting or merging circuit breakers), system start up and shutdown (touch screen button operation), network cable detection and replacement. When the equipment experiences short circuits, phase loss, reverse phase, sensor no display, corresponding equipment no response after circuit breaker closing, and abnormal motor operation, professional electricians are required to operate.

8.6 Touch Screen Operation

Danger

Note: It is strictly prohibited to plug or unplug the communication cable between the touch screen and PLC while the power is on, otherwise the touch screen or PLC communication serial port will be damaged!

Caution

The touch screen operation password is "1000".

1) Mode Switching Interface

After the system is powered on, the screen displays as Figure 8-22 Screen display interface, and this mode defaults to Cooling tower mode.

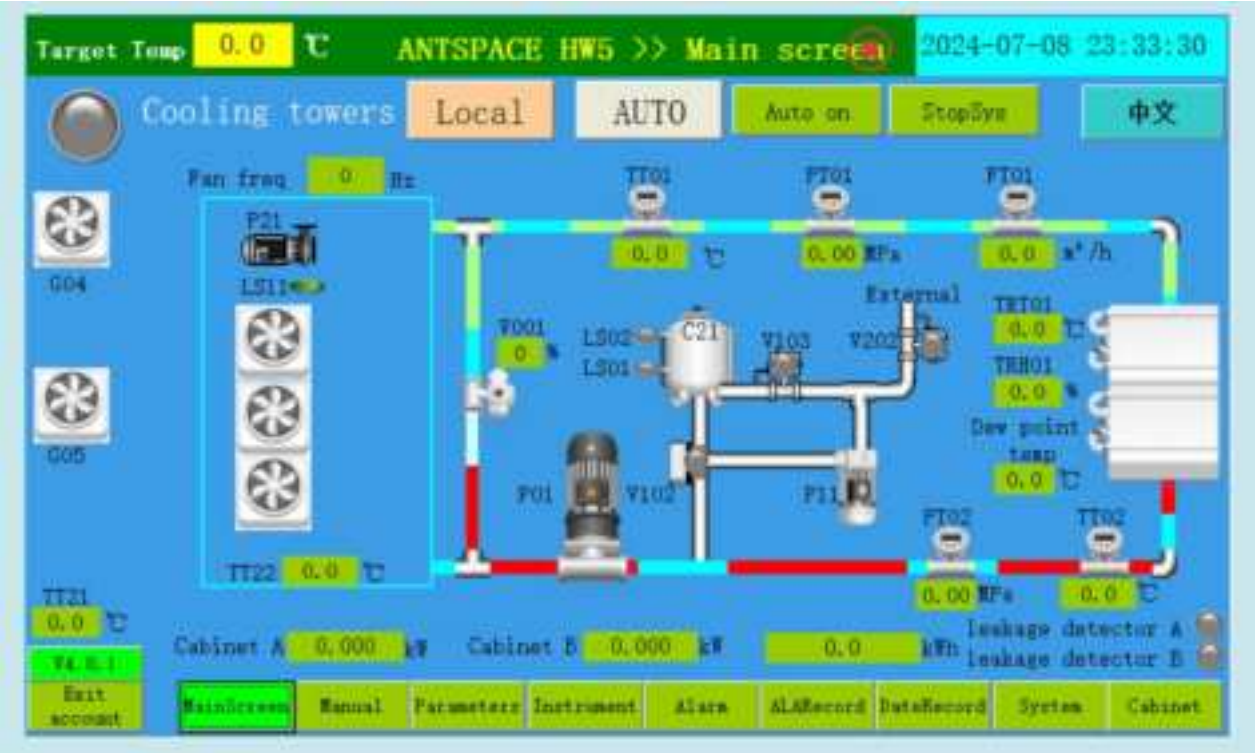


Figure 8-22 Screen display interface

The screen display device has control modes of "Auto/Manual", "Local/Remote", target temperature (settable), total fault display, and analogue quantity display. The system can set the operation control mode of the device through the main screen.

2] Main Screen Interface

Figure 8-23 Main interface

When in the Cooling tower mode, manual control is used for debugging and automatic control is used for system operation.

Click the "Manual" button to enter the manual control interface.

Click the "Parameters" button to enter the parameter setting interface.

Click the "Instrument" button to enter the instrument settings interface.

Click the "Alarm" button to enter the fault alarm interface.

Click the "ALA Record" button to enter the historical alarm interface.

Click the "Data Record" button to enter the data information interface.

Click the "System" button to enter the system information interface.

Click the "Cabinet" button to enter the power and positioning information interface.

The remote control mode can only be effective when the unit is in automatic mode, and the priority is lower than local control.

When the system needs to run automatically, it is necessary to ensure that the internal pressure (PT01/PT02) of the system is higher than 0.05 MPa, and then set all parameters in the parameter setting interface. Then click on "START" on the main screen, and the motors in the system will execute in the order of automatic control logic. When you need to close, click on

'STOP' on the Home interface.

3] Manual Control Interface

When the device needs to be debugged with Water, it is necessary to adjust the device control mode to the "MC" position, and then enter the "manual control" interface, as shown in the following figure:

Figure 8-24 Manual control interface

At this point, the motor and frequency converter to be operated can be started by jogging. In general, when the system needs to add Water, it is necessary to manually start and corresponding electric valves, make-up pumps, and circulation pumps. However, before starting, it is necessary to ensure that the motor runs in the correct direction.

Therefore, after powering on, turn on the 1 # exhaust fan and observe its running direction. When the wind blows out of the container, it indicates positive rotation. Before the equipment leaves the factory, all motors have been debugged and turned forward. Therefore, it is only necessary to observe the operating status of one motor. When the motor reverses, it is necessary to adjust the phase of the three-phase power input of QFWCU, that is, change the phase sequence of the two cables.

4] Parameter Setting Interface

The parameters in the system have been set, and the screen is as follows (which will be displayed in the real screen):

Figure 8-25 Parameter setting interface

After the unit is turned on, the above parameter values have been set to the initial default values. For the first start up, it is necessary to check whether the parameter setting interface is consistent with Figure 8-25 Parameter setting interface25. If there are any differences, they need to be reset according to the figure. The parameter setting interface allows manual settings of automatic Water replenishment parameters, V001 electric butterfly valve opening, container fan operating parameters, cooling tower fan operating parameters, and spray pump operating parameters. In addition, through the buttons in the manual Water replenishment box in the parameter setting interface, manual Water replenishment can be performed for different operating conditions of the system.

5) Instrument Setting Interface

Figure 8-26 Instrument setting interface

The alarm thresholds for supply and return Water temperature, supply and return Water pressure, flow rate, temperature inside the main control cabinet, temperature inside the distribution cabinet, and cold side pressure difference can be set through the instrument setting interface. The values shown in Figure 8-26 Instrument setting interface are the default initial alarm values. For the first start up, it is necessary to check whether the parameter setting interface is consistent with Figure 8-26 Instrument setting interface. If there are any differences, they need to be reset according to the figure. If modifications are needed, please ask the operation and maintenance personnel to determine the possible problems before making the modifications, and confirm that they do not affect the system operation before making certain modifications to the parameters.

6] Alarm Display Interface

After the system is running, if there is a fault in the system, it will be displayed on this screen.

After the fault occurs, the yellow alarm light will light up. The fault form will be displayed on the alarm display interface. At this point, first analyze the cause of the fault, then troubleshoot it, and finally click on "Reset" in the manual control interface.

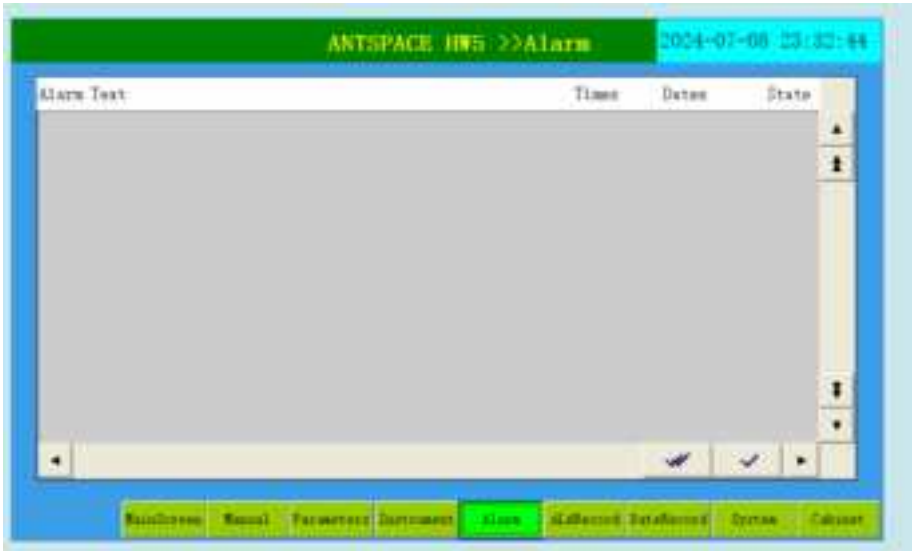


Figure 8-21 Alarm display interface

7] Historical Alarm Interface

The alarm information in the system will be saved on this screen through time records, making it convenient for users to find the fault time.

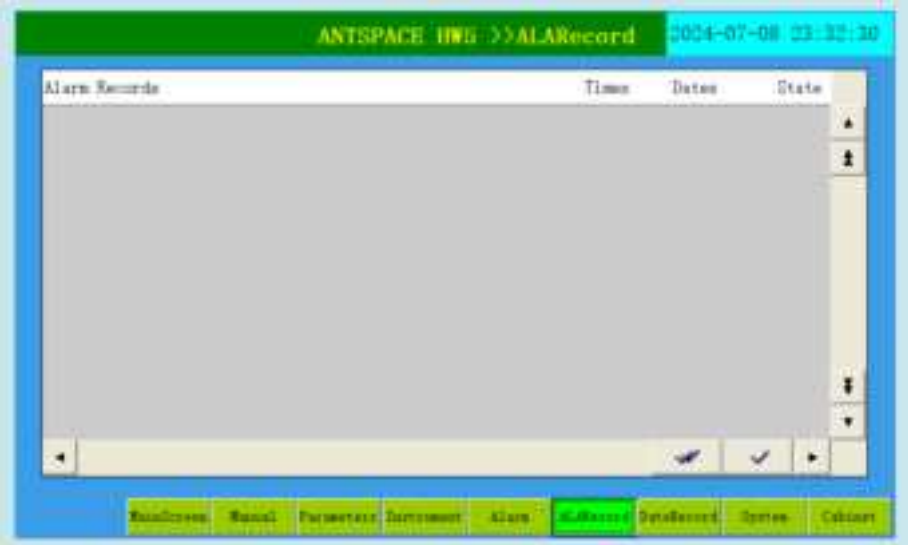


Figure 8-22 Historical Alarm Interface (Example, non real situation)

8) Data Log Interface

This screen can display information such as supply temperature, return temperature, supply pressure, return pressure, and supply flow rate. Each parameter corresponds to a different colour.

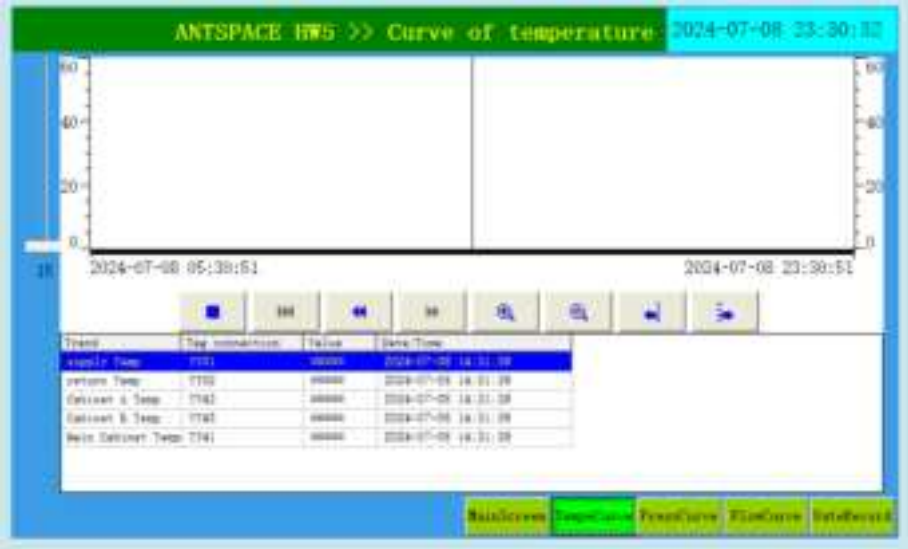


Figure 8-29 Temperature curve interface

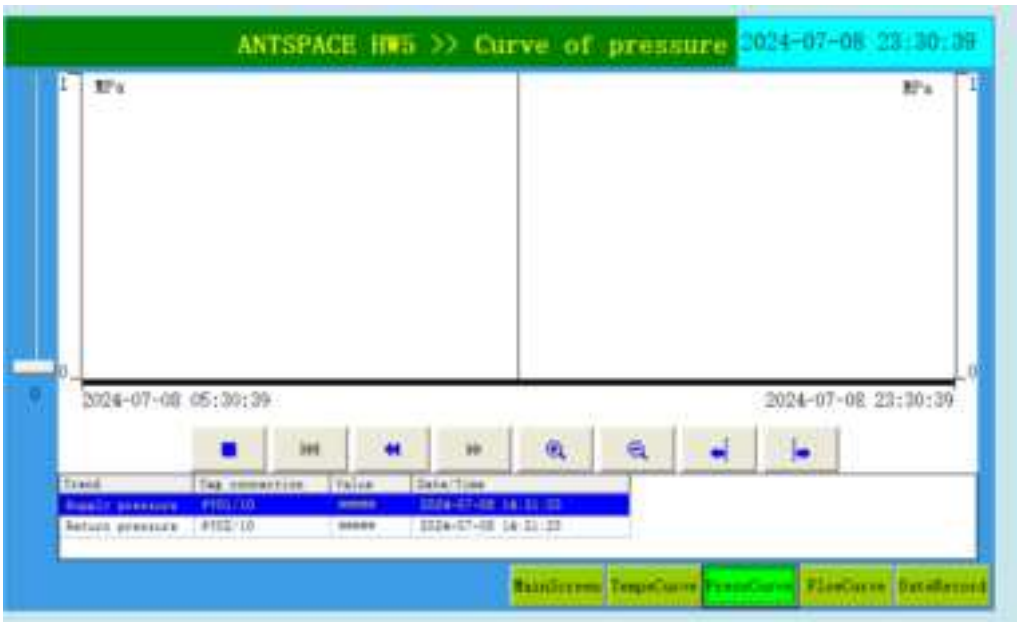


Figure 8-30 Pressure curve

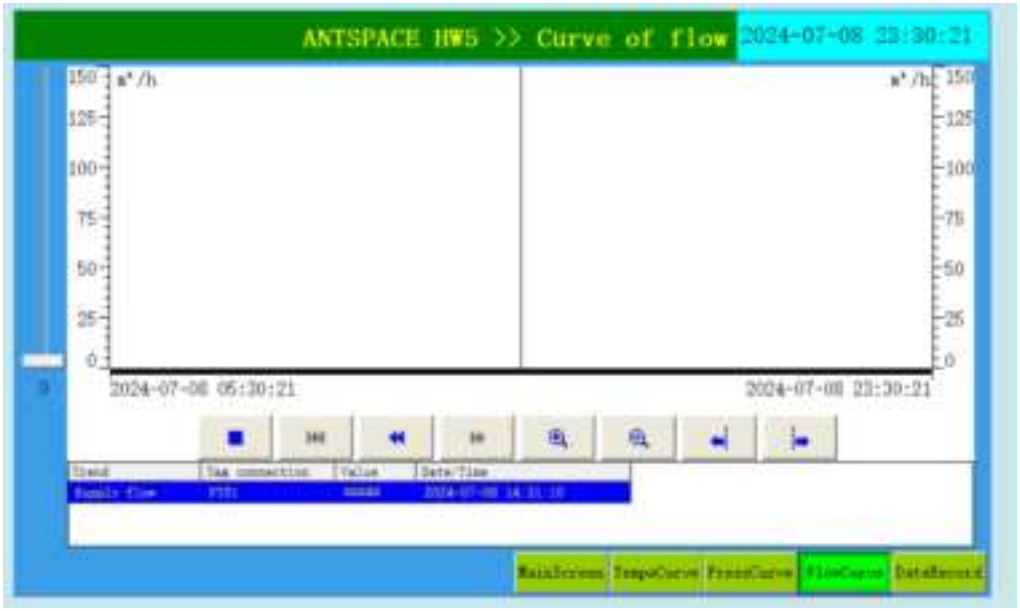


Figure 8-31 Flow curve interface

Figure 8-32 System information interface

The system information interface can set the system clock.

9) Cabinet Information Interface

The screen can display the ambient temperature in three cabinets, the power quality information used in two distribution cabinets, and the longitude and latitude information of the equipment. Among them, power information and latitude and longitude information are used for debugging and display, and the reading format is floating point.

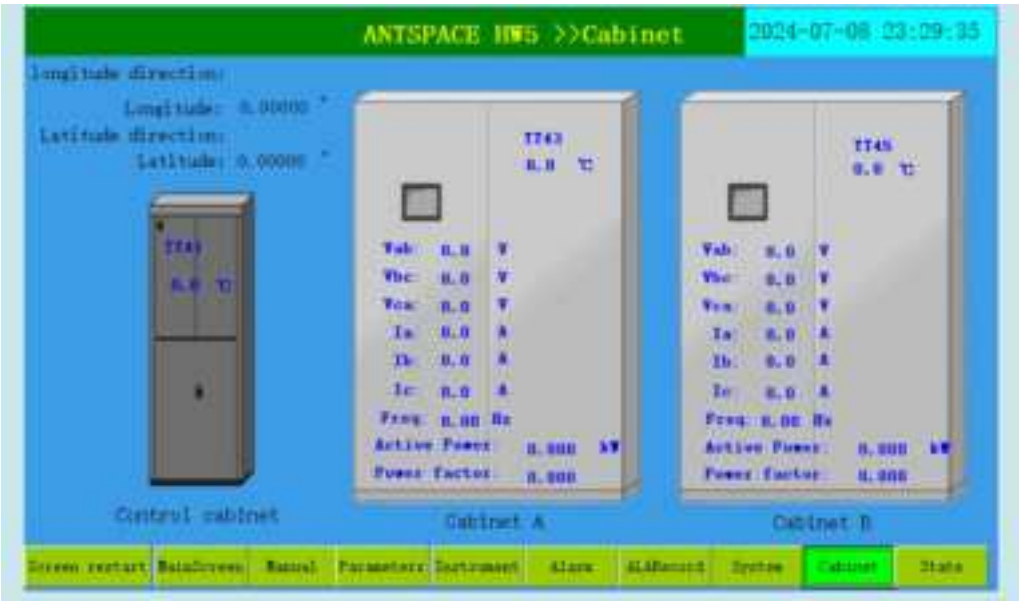


Figure 8-33 Cabinet information interface

8.7 ANTSPACE HW5 Container Water Cooling System On-site Installation Summary

1) On-site Installation Summary

After the equipment is transported to the site, it needs to be installed in the order shown in Table 8-4 On-site installation summary. After installation is completed, the control mode can be changed to automatic. Click One Click Start and the system will automatically run.

Table 8-4 On-site installation summary

S/N	Installation steps	Remarks
1	Container positioning, lifting, and securing	
2	Installation of cooling tower fan	
3	Installation of container exhaust fans	
4	Water cooling container power distribution	Reasonable alignment, standardized wiring, torque calibration, power-up inspection
5	Water cooling container pressurization operation	After gas detection for 7 bar/12 h, Water detection for 7 bar/30 min
6	Water filling operation for water cooling containers	Preparation - system Water replenishment - water tank Water replenishment - regular replenishment of water tank

2] On-site Installation Inspection

The following items need to be verified after installation. Can only start power on after completely qualified.

Table 8-5 Checklist after installation

Item	Content	Confirmation
Container	Proper installation, no tilt. Stand on a horizontal hard floor, leave room for maintenance. All the debris inside removed (cable ties, thrums, etc.).	□ Confirmed
Fan	Correct installation according to component functions.	□ Confirmed
Plugging part	Plugging parts and fixings in and outside the container removed. No debris inside.	□ Confirmed
Rain cover	Proper installation above the inlet.	□ Confirmed
Internal pipeline connection	Reliably fix the clamp and pipe of the replenishment port. Fixation of circulating system pipeline. No loosen. The pressure drop of the pipeline meets the requirements.	□ Confirmed
Cable connection	Correct connection of cooling tower cables. Connect unit cables to the PDC through inlet under the rain cover.	□ Confirmed
Inlet and outlet pipes	Correct connection of the pipeline between container and cooling tower.	□ Confirmed
Electrical inspection	Supply voltage is within the rated voltage range on the nameplate. No damage on the cable. No open circuit, short circuit or wrong connection in system electrical circuit. Ensure correct connection of all cables in the upper and lower electric control boxes. Ensure the external main power circuit breaker is rated correctly according to current value. Fasten all cable and connectors. No loosen with fasten bolts.	□ Confirmed

9 ANTSPACE HW5 Container Water Cooling System Conventional Faults and Troubleshooting

Table 9-5 List of common faults and troubleshooting methods

Type	Causes	Solution	Remarks
Power failure	1: Phase failure	1: Check for phase loss in the main power supply	
	2: Overvoltage	2: Turn off the upper level circuit breaker QFWCU (in the main control cabinet) to ensure that the main control cabinet is not electrified. Use a flat screwdriver to increase the overvoltage value	The reason for this situation is that the equipment did not adjust the overvoltage and under voltage values of the power monitor before leaving the factory, or the set values did not match the actual values on site.
	3: Under voltage	3: Turn off the upper level circuit breaker QFWCU (in the main control cabinet) to ensure that the main control cabinet is not electrified, and use a flat screwdriver to reduce the under voltage value	
	4: Phase error	4: Adjust the phase sequence of the power lines connecting the distribution cabinet to the main control cabinet	
Low Water level alarm	The Water level in the water tank inside the container is low	Replenish the water tank inside the container	

Circulation pump failure	Water pump idling, under pressure (low return pressure), etc. cause circulation pump overflow	1: Turn off the circuit breaker (QFWCU) in the main control cabinet first. 2: Reset the motor protector (corresponding to FR1) in the main control cabinet (manually press RESET in the motor protector). 3: Check whether the system operating parameters are normal (pressure and flow will report faults first), and troubleshoot problems according to alarm faults. 4: After troubleshooting, reference Figure 8-24 Manual control interface press the right reset button. 5: Start the circulation pump again after an interval of 2-3 minutes.	Warning: after the system is powered on, the circulation pump is prohibited from running idle when there is no Water in the system.
1#/2# exhaust fan failure	The current of the exhaust fan is too high, and there may be strips in the fan blades that hinder the operation of the fan	1: Turn off the circuit breaker (QFWCU) in the main control cabinet first. 2: If there are debris in the fan blades, first clean them up; If there are no debris and there is no reason for fan failure, the manufacturer needs to be contacted. 3: Reset the motor protector in the main control cabinet (1# exhaust fan corresponds to QFG04; 2# exhaust fan corresponds to QGF05) (manually turn the knob of the motor protector to the vertical position, that is, switch on). 4: After troubleshooting, reference Figure 8-24 Manual control interfacepress the right reset button. 5: Start the exhaust fan again after an interval of 2-3 minutes.	

Water replenishment pump failure	1: Overload caused by dirty and blocked Y-type filter replacement	1: Turn off the circuit breaker (QFWCU) in the main control cabinet first. 2: Reset the motor protector (corresponding number QFG11) in the main control cabinet (manually turn the knob of the motor protector to the vertical position, which is the closing). 3: Clean the Y-shaped filter. 4: After troubleshooting, reference Figure 8-24 Manual control interface press the right reset button. 5: Start the replenishment pump again after an interval of 2-3 minutes.	After the system is powered on, the replenishment pump cannot idle when there is no Water in the system.
	2: The position of the suction port of the replenishment pump is too low, resulting in overload	1: Turn off the circuit breaker (QFWCU) in the main control cabinet first. 2: Reset the motor protector (corresponding number QFG11) in the main control cabinet (manually turn the knob of the motor protector to the vertical position, which is the closing). 3: Lower the external water suction port below the cooling Water tank; 4: After troubleshooting, reference Figure 8-24 Manual control interface press the right reset button. 5: Start the replenishment pump again after an interval of 2-3 minutes.	After the system is powered on, the replenishment pump cannot idle when there is no Water in the system.
Spray pump failure	Dirty and clogged filter at the water tank suction port causing overload	1: Turn off the circuit breaker (QFWCU) in the main control cabinet first. 2: Reset VF03 in the cooling tower control cabinet (manually turn the knob of the motor protector to the vertical position, that is, switch on).	After the system is powered on, the spray pump cannot idle when there is no Water in the system

		3: Check if the filter in the cooling tower water tank is dirty or blocked, and clean it after it is dirty or blocked 4: After troubleshooting, reference Figure 8-24 Manual control interface press the right reset button. 5: Start the spray pump again after an interval of 2-3 minutes.	
1# cooling fan failure	The current of the exhaust fan is too high, and there may be strips in the fan blades that hinder the operation of the fan	1: Turn off the circuit breaker (QFVF02) in the main control cabinet first. 2: If there are debris in the fan blades, first clean them up; If there are no debris and there is no reason for fan failure, the manufacturer needs to be contacted. 3: Reset the motor protector in the main control cabinet (1# fan corresponds to QFG01; 2# fan corresponds to QFG02; 3# fan corresponds to QFG03) (manually turn the knob of the motor protector to the vertical position, which means that it is closed). 4: After troubleshooting, reference Figure 8-24 Manual control interface press the right reset button. 5: Start the cooling fan again after an interval of 2-3 minutes.	
2# cooling fan failure			
3# cooling fan failure			
Leakage alarm	There is Water leakage from the inlet and outlet of the high computing power server to the floor, wetting the	1: Find areas on the floor where there is Water. 2: Above this area, carefully search for any leakage from the inlet and outlet of the high computing power server. 3: After finding the leaking area, handle it by replacing the quick plug	

	leakage sensor.	and corrugated pipe, then clean the leaking site and wipe the leaking monitoring tape dry.	
Cooling tower Water level low alarm	The water level inside the cooling tower decreases	Timely replenish the cooling tower and reset the fault	After a low Water level alarm in the cooling tower occurs, the system starts timing. After about 50 minutes, the spray pump stops spraying. To avoid overheating of the high computing power server due to the spray pump stopping spraying, on-site operation and maintenance personnel are requested to replenish the Water in a timely manner after seeing the alarm.
High Water supply temperature alarm	1: Cooling fan not running	Check whether the fan operates normally and whether the power supply circuit of the fan is normal	
	2: Spray pump not running	Check whether the spray pump operates normally and whether the power supply circuit of the spray pump is normal	
	3: Temperature sensor damaged	Replace the temperature sensor. The alarm value for high Water supply temperature can be set on the screen as needed	
	4: Abnormal water level in the	Check the water level of the cooling tower to ensure normal water	

	cooling tower	replenishment	
High Water supply temperature alarm	After the high Water supply temperature alarm occurred, the operation and maintenance personnel did not handle it in a timely manner, resulting in a continuous increase in the Water supply temperature	Before identifying the cause, it is possible to consider shutting down some high computing power servers, reducing the load, and then finding the cause of the high Water supply temperature alarm. The alarm value for high Water supply temperature can be set on the screen as needed.	
High Water supply pressure alarm	1: Filter clogged	Clean the filter element	
	2: Water supply and return valve malfunction or incomplete opening	Open the Water supply and return valves	
	3: Pressure sensor failure	Replace the pressure sensor	
Low return Water pressure alarm	1: Insufficient cooling Water in the water tank	Replenish the water tank with cooling Water	
	2: Replenishment pump failure	Check the cause of the malfunction of the replenishment pump	
	3: Pressure sensor failure	Replace the pressure sensor	
	4: Leakage	Check for system leaks	

Low Water supply flow alarm	1: Water supply and return valve malfunction or incomplete opening	Open the Water supply and return valves	
	2: Dirty and clogged filter	Clean the filter element	
	3: Flow sensor failure	Replace the flow sensor	
	4: Leakage	Check for system leaks	
Condensation alarm	High environmental humidity	After the on-site operation and maintenance personnel see the alarm message, they only need to increase the target value of the supply Water temperature by 5°C to prevent condensation.	The logic set in the program is: when the dew point temperature value is greater than the supply Water temperature value - 5°C, the system will prompt a condensation alarm
Pressure display fluctuates	1: There is air in the system	Please ask on-site operation and maintenance personnel to open the exhaust valve for exhaust	
	2: System Water shortage	If the return pressure is lower than the set value, the replenishment pump will automatically replenish the system	
	3: Sensor damage	Replace the sensor	
No pressure display	1: Sensor damage	Replace the sensor	
	2: Loose cables	Check the wiring circuit of the pressure sensor and tighten it	

	3: The PLC acquisition channel is damaged	Replace the module corresponding to the PLC sensor.	
The pump is running, but the flow rate is insufficient	1: There is air at the water pump suction port	Open the exhaust port above the water pump suction port with a wrench, wait until there is even Water flowing out, and repeat 2-3 times (refer to the user manual for specific operations)	
	2: Filter clogged	Clean the filter element	
	3: Insufficient system coolant (low return pressure)	Replenish the system	
Fan not running	1: Motor burnt out	Replace the fan.	
	2: Loose cables	Under live conditions, use a multimeter to check the power supply of the fan and tighten it when power is cut off.	
	3: Circuit breaker tripped	Close the circuit breaker	
Noise and abnormal noise	1: Water pump cavitation	Check the pressure on the Water inlet side (return pressure or pressure gauge) and replenish the Water in a timely manner	
	2: Pump shaft connection issue	Check the mechanical connection of the pump shaft	
	3: Insufficient lubrication of	Adding lubricating oil	

	motor shaft		
	4: Safety valve action	Check if there is too much Water in the water tank, unable to release pressure in a timely manner, and discharge excess Water from the water tank	
Water pump shaft seal leakage		Replace the water pump shaft seal	

10 ANTSPACE HW5 Container Water Cooling System Maintenance

10.1 Overview

Preventive maintenance refers to the maintenance carried out at predetermined intervals or according to prescribed guidelines to reduce the probability of product failure or prevent functional degradation, mainly including adjustments, regular inspections, and necessary repairs. Familiarize equipment maintenance and operators with the performance, structural principles, usage methods, and precautions of the product, so that the equipment can perform its intended functions. Ensure proper maintenance to keep the equipment in good working condition.

10.2 Preventive Maintenance

1] Operator Monitoring

Operators monitor the status of equipment during normal use, with the aim of identifying potential faults.

Once the operator discovers a system malfunction alarm, they should quickly conduct fault confirmation and inspection to find the cause of the malfunction.

2] Application Inspection

During normal use of the equipment, operators conduct regular inspections as planned to determine whether the product performs the specified functions.

a. Inspect if the connections of the Water supply and return pipelines, power lines, etc. are correct.

- Inspection requirements: No leakage at all pipelines and connections, and no damage to cables.
- Inspection method: visual inspection

b. Inspect if the return Water pressure (back pressure) is low.

- Inspection requirements: the return Water pressure is higher than 0.05MPa (observe the Home interface of the touch screen or the pressure gauge), and if the pressure is lower than this value, Water replenishment is required.
- Inspection method: visual inspection and data comparison

c. Inspect the Water supply system and record temperature, pressure, and other data every half a day.

- Inspection requirements: Record the supply/return Water temperature, supply/return Water pressure, and supply Water flow data, and observe whether the data tends to stabilize during long-term operation.
- Inspection method: visual inspection and data comparison

d. Inspect the fault alarm status of the system, such as temperature, pressure, flow rate, etc. (the above fault status is displayed in the fault alarm interface on the touch screen), and record it every half a day.

- Inspection requirements: Check the system alarm points and follow the instructions for troubleshooting.
- Inspection method: visual inspection and on-demand testing.

e. After verifying the normal operation of the container, inspect the reliability of cable connections in the A/B distribution cabinets and main control cabinet. This inspect should be performed after the initial operation or relocation, and subsequently every six months during normal operation.

- Inspection requirements: Check if cable junctions are securely fastened and if there is any abnormal temperature rise.
- Inspection method: Visual inspection and use of a handheld infrared detector to check for abnormal temperatures at junctions. If the displayed temperature exceeds 70°C or is 30°C higher than the ambient temperature, the connection points should be inspected and re-secured.

10.3 Regular Inspections

1) Maintenance of Filters

The system is divided into internal circulation and external circulation, with the internal circulation medium being coolant and the external circulation medium being tap water. The system has set up a filter to filter the internal and external circulation, and the filter needs to be cleaned after the system has been running for a period of time.

The filter is divided into three parts, and the corresponding cleaning time requirements are

as follows:

- Cooling tower spray pump suction filter, cleaning cycle is once a month.
- The filter in the internal circulation pipeline of the pump unit Water supply system has a cleaning cycle of once a month (or as needed).
- The Y-shaped filter in the internal circulation pipeline of the pump unit replenishment system has a cleaning cycle of once every six months (or as needed).

The cleaning method is to wash with clean water and rinse thoroughly before use.

Operation steps:

a. Cut off the main power supply of the equipment.

b. Referring to Figure 10-23 Location of butterfly valves and pipeline filters for pipeline maintenance, close the maintenance butterfly valves in the system, open the discharge ball valve below the pipeline filter component, and discharge the local Water in the pipeline.

Caution

The discharged coolant needs to be stored in a clean container, and the coolant discharge must comply with local discharge standards. After the butterfly valves at both ends of the filter are closed, about 10L of coolant will be discharged. A 20L container is required. The discharged coolant cannot be directly added to the water replenishing tank for reuse without treatment.

c. Locate the position of the filter as shown in Figure Figure 10-23 Location of butterfly valves and pipeline filters for pipeline maintenance

d. Once the filter is located, open the manual exhaust valve and manual discharge valve, remove the clamp connections, and remove the filter element from the handle.

e. Remove and clean (or replace) the filter screen inside the filter. Reference Figure 10-24 Remove the pipeline filter.

f. Install the cleaned filter screen, tighten the clamp with a wrench, and close the valve.

g. After the equipment is powered on again, fill the system replenishment tank with coolant.

Warning

Warning: Before powering on, ensure that the butterfly valve from Figure 10-1 is restored to the open position to prevent pump damage due to excessive system pressure.

Caution

The coolant discharged from the filter cannot be directly added to the rehydration water tank.

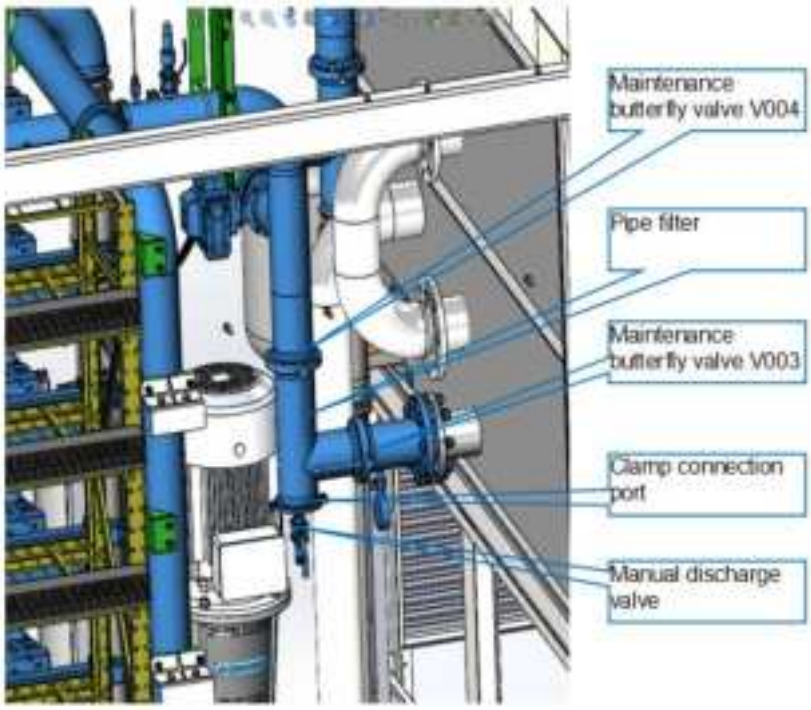


Figure 10-23 Location of butterfly valves and pipeline filters for pipeline maintenance

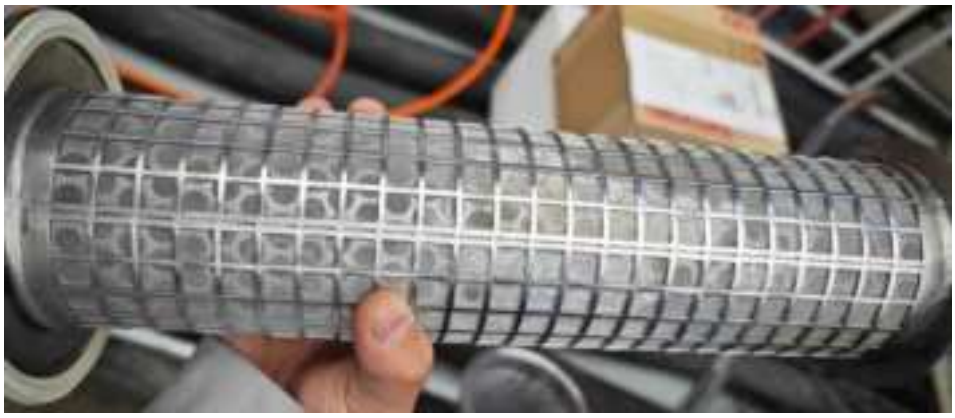


Figure 10-24 Remove the pipeline filter

2] Pipeline Leakage Maintenance

After six months of equipment operation, the pipeline network should be inspected for leakage prevention for six months. If any leakage or leakage is found, it should be immediately shut down for maintenance. Maintenance should first stop the operation of the load components on the user end, and then stop the operation of the equipment for repair. After completing the leak detection, pay attention to replenishing the system with coolant.

3] Maintenance of Electrical Components

After six months of equipment operation, it is necessary to inspect and maintain the wiring terminals and crimping screws on the electrical components of the main control cabinet inside the water pump cabinet to prevent looseness of the wiring terminals and crimping screws, which may cause poor contact and damage to the components and prevent normal operation of the equipment, thereby affecting the operation of the entire container water cooling system.

Caution

Daily operation inspection needs to pay attention to whether there is abnormal noise in system operation, abnormal reading display, and system operation alarm information. If there are any abnormalities, eliminate them promptly.

4] Coolant Drainage

After 1-2 years of operation of the system and water tank, there may be some debris in the system pipeline, and the system coolant should be promptly drained and replaced.

Caution

The system operates with about 1500L of coolant. Please prepare sufficient storage volume in advance for sewage discharge.

Operation Steps:

a. Find the location of the discharge ball valve (Figure 10-25 Location of discharge ball valve in pump station).

b. Connect the discharge hose to the discharge ball valve and tighten it with a hose clamp; Guide the hose outside the equipment and open valve V202 (Figure 10-25 Location of discharge ball valve in pump station) to discharge the system.

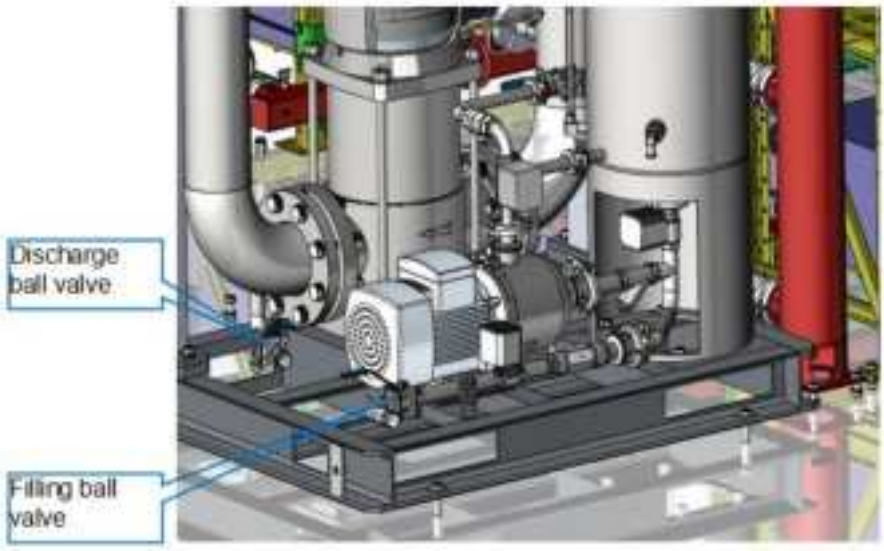


Figure 10-25 Location of discharge ball valve in pump station

5) Water Tank Level Inspection

The system monitors the Water levels in two water tanks (inside the container and in the cooling tower). When the Water level in the water tank falls below the required value, the system touch screen will give an alarm indicating that the water tank level is low. At this time, it is necessary to promptly check for faults and replenish the coolant. Even if there is no alarm for the water tank level, it should be checked regularly on a daily basis: The Water level in the water tank inside the container needs to be checked once a week after stable operation. If the water tank does not reach 2/3 of the limit, it needs to be replenished in a timely manner. The Water level of the cooling tower water tank is required to be checked once a day, and water shutdown is not allowed (unless dry cooling mode is adopted in winter, at which time the internal water of the cooling tower needs to be drained).

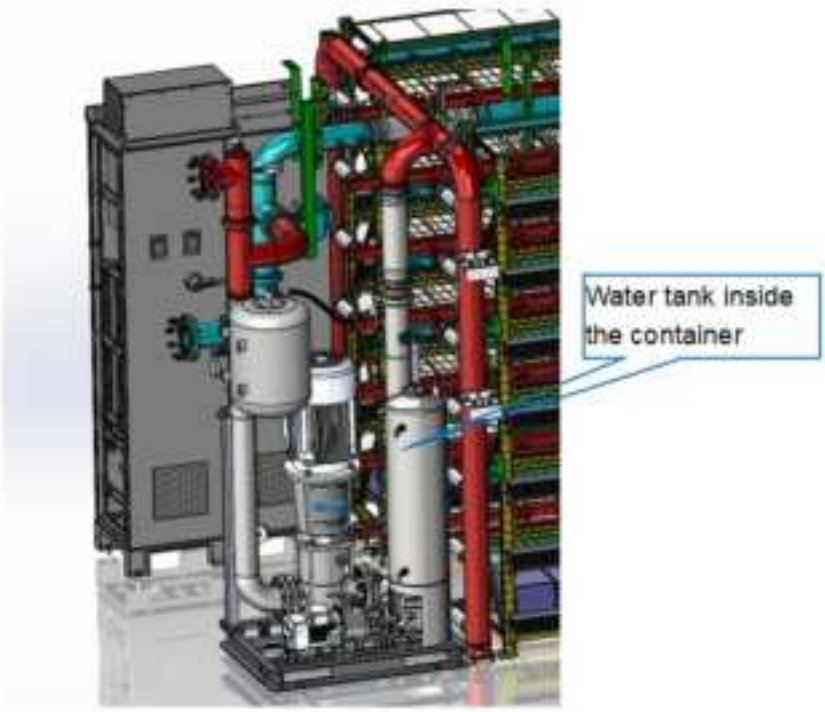


Figure 10-26 Container water tank

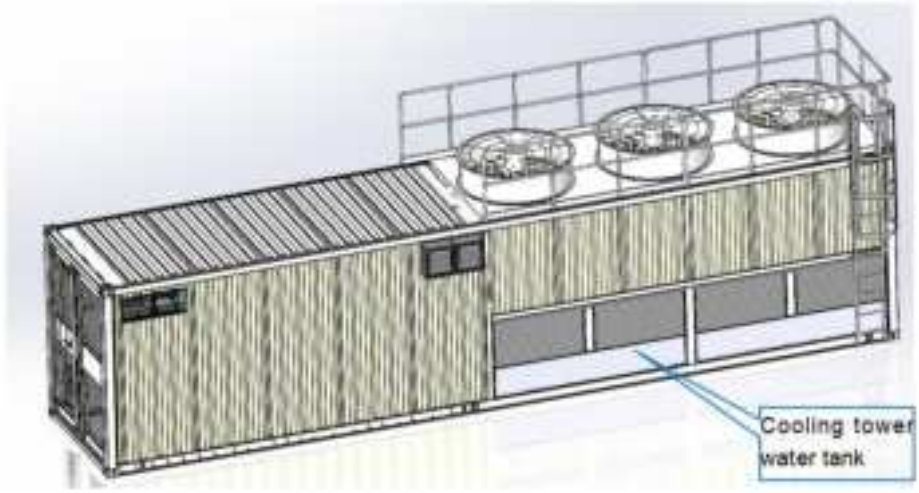


Figure 10-27 Cooling tower water tank

Maintenance of Coolant

As the core unit of the container Water cooling system, it is recommended to regularly track and record the coolant, at least once a year (PH value is tested every six months).

When purchasing coolant, it is necessary to focus on the relevant parameters in

Danger

The antifreeze must be configured strictly in accordance with the lowest possible temperature in the environment. If the antifreeze is not configured according to the instructions and the ambient temperature is lower than the freezing point of the antifreeze, causing the heat exchanger to freeze and crack, our company will not bear any responsibility!

Table 10-6 Recommended standards for coolant testing. If the requirements are not met, it is necessary to consider refilling and replacing the coolant as appropriate.

Primary focus during regular inspection of coolant should be PH value. It is not recommended to be used when the PH value is below 7 (a PH indicator can be added to the coolant. When the PH is below 6.8, the coolant will change color for easy observation); The inspection method is shown in the table below;

Secondary focuses during regular inspection of coolant include freezing point, ethylene glycol ratio, total hardness, etc. In the later stage, attention should be paid to whether the content of elements such as Al, Fe, Cu increases or not, as an increase indicates that contact corrosion has already occurred; The inspection method is shown in the table below;

It is recommended to regularly add corrosion inhibitors according to the supplier's requirements to maintain the coolant.

Danger

The antifreeze must be configured strictly in accordance with the lowest possible temperature in the environment. If the antifreeze is not configured according to the instructions and the ambient temperature is lower than the freezing point of the antifreeze, causing the heat exchanger to freeze and crack, our company will not bear any responsibility!

Table 10-6 Recommended standards for coolant testing

Items	Index	Recommended reference standards for inspection
Color	Significant color	Visual inspection
Exterior	No odor, sediment, or suspended solids	Visual inspection

Freezing point	＜Local minimum freezing temperature		
Boiling point	108°C (low temperature type))		
PH value	7-9		
Reserve alkalinity	≥4ml (organic formula) ≥9ml (including inorganic formula)		
Total hardness	<120 mg/l		
Main element content	B	<20mg/kg	
	Si	<20mg/kg	
	P	<20mg/kg	
	Mo	<20mg/kg	
	Ca	<20mg/kg	
	Al^{3+}	<50mg/L	
	Fe^{2+}	<50mg/L	
	Cu^{2+}	<50mg/L	

Table 10-7 Glycol Refrigerant Concentration vs. Freezing and Boiling Points

Glycol concentration		Freezing point ℃
Mass concentration %	Volume concentration %	
0	0	0
5	4.4	-1.4
10	8.9	-3.2
15	13.6	-5.4
20	18.1	-7.8
25	22.9	-10.7
30	27.7	-14.1
35	32.6	-17.9
40	37.5	-22.3
45	42.5	-27.5
50	47.6	-33.8
55	52.7	-41.1
60	57.8	-48.3

Table 10-8 Recommended standards for deionized water

Index	Deionized water	Reference standards	Remarks
PH value	8.5-9.5	Intel 632983	
Sulfide	<1 ppm	TC9.9/Intel 632983	
Sulfate	<10 ppm	TC9.9/Intel 632983	
Chloride	<5 ppm	TC9.9/Intel 632983	
Bacterial community	<100 CFUs/ml	TC9.9/Intel 632983	
Total hardness (as $CaCO_3$)	<20 ppm	TC9.9/Intel 632983	

Conductivity	<20us/cm (reference value, not mandatory)	TC9.9	High conductivity is not necessarily unacceptable, such as 1000us/cm, as corrosion inhibitors and fungicides will both lead to an increase in water conductivity. It is necessary to understand the reasons behind the sharp increase in conductivity trend during circuit operation.
Residues after evaporation	50 ppm	TC9.9/Intel 632983	
Turbidity	<20 NTU	TC9.9/Intel 632983	
Iron content	0.1 ppm	Industry standards	
Copper content	10 ppm	Industry standards	
Carbon steel corrosion rate	3mpy (0.075mm/a)	GB/T 50050-2017	
Corrosion rate of copper or stainless steel	0.2mpy (0.005mm/a)	GB/T 50050-2017	

Caution

Table 10-1 provides for the medium requirements for working environments with temperatures below 0°C. If the working environment temperature is consistently above 0°C, deionized water or purified water can be used as the secondary side internal circulation medium, with corresponding requirements listed in Table 10-3.

Caution

To ensure long-term reliable operation, when using deionized water or purified water as the internal circulation medium, check every 1-2 weeks and replace the internal coolant every 1-2 months.

Danger

When using deionized water as the internal circulation medium, please strictly comply with the usage environment above 09C. Otherwise, if the temperature is below freezing point, unexpected power outage will cause the internal pipes of the system to freeze and cause the pipes to burst.

When using deionized water/pure water, the pH value, conductivity and related index parameters of the coolant must be regularly tested and recorded. When the requirements in Table 10-3 are exceeded, or there are abnormal changes, new deionized water/pure water that meets the requirements must be replaced in time.

7] Maintenance of Cooling Towers

After the cooling tower is put into operation, it is necessary to regularly check the operation status and pay attention to the following points:

After the cooling tower enters the water, it must be strictly controlled. Damaged water pipes and nozzles should be replaced in a timely manner to avoid affecting the water distribution effect or damaging the water spraying device. If there are any debris, it should be removed in a timely manner.

The suspended solids content of spray water is generally controlled below 20mg/L. When the suspended solids content increases, water quality treatment agents should be appropriately added for treatment. For long-term operation, scale inhibitors should be considered. The water quality requirements are shown in the table below (refer to GB/T18430.1-2007). It is recommended to replace the spray water every 1-2 months, and the specific situation should be increased according to the local water quality situation of the project.

Table 10-9 Recommended standards for spray water

Cooling Water Quality					
Items			**Reference value**	**Inclination**	
				Corrosion	**Scaling**
Benchmark items	PH (25°C)	uS/cm	6.5~8.0	O	O
	Conductivity (25°C)		<800	O	O
	Cl^-	mg(Cl^-)/L	<200	O	
	SO^{2-}	mg(SO^{2-})/L	<200	O	
	Acid consumption (Ph=4.8)	mg($CaCO_3$)/L	<100		O
	Full hardness	mg($CaCO_3$)/L	<200		O
Reference items	Fe	mg(Fe^-)/L	<1.0	O	O
	S^{2-}	mg(S^{2-})/L	Not allowed to be detected	O	
	NH^+	mg(NH^+)/L	<1.0	O	
	SiO_2	mg(SiO_2)/L	<50		O
Note: O represents factors related to corrosion or scaling tendency.					

If abnormal phenomena are found in the fan system, it should be immediately stopped for inspection and troubleshooting. The blades should be repaired or replaced based on the actual erosion and wear situation to ensure that the cooling tower is in good operating condition.

During the use of the cooling tower, if excessive water loss is found, manual replenishment

devices should be used in a timely manner to replenish water. In addition, check whether the water collector is damaged and whether the water collection tank is leaking.

It is required to clean the inside and outside of the tower once a year to prevent the accumulation of dirt from affecting the smooth flow of water.

After the cooling tower is shut down, the residual water in the water collection tank and pipelines must be emptied. If the shutdown time is long, the entire tower should be inspected to ensure safe and normal operation next time.

Flammable materials such as fillers and water collectors are strictly prohibited from coming into contact with open flames during use or maintenance.

Under the freezing point temperature in winter, the system will switch to dry cooling mode. At this time, it is necessary to drain the residual water in the water collection tank and pipelines to prevent equipment damage caused by icing.

The filters inside the water collection tank need to be cleaned once a month to prevent damage to the spray pump caused by dirt and blockage.

Warning

When the system operating water temperature is significantly higher than the set value, please check whether the cooling tower coil is seriously scaled.
Scale will affect the performance of the cooling tower. Cooling tower coils need to be descaled.

8) Maintenance of Water Pump

In order to maintain the original performance of the rolling bearings of the water pump motor and ensure long-term use in good condition, it is necessary to inspect and maintain the bearings according to the specified time to prevent faults, ensure reliable operation, and improve efficiency and benefits. For the three-phase asynchronous motor supporting the water pump of water cooling container products, the maintenance of the motor bearings can be carried out according to this instruction.

The bearing models of the motor supporting the circulation pump product in the current system are shown in the table below:

Table 10-10 Bearing model

Model	Bearing	Quantity	Lubrication oil addition cycle	Grease model

			Poles 2P	Poles 4P	
160	DE:7310 NDE:6309	1	2000h	5400h	MOBIL#2

Danger

This system uses a 2P main pump, so the refueling cycle is 2000h. Bearing grease must be added after about 83 days of continuous operation, or it must be added regularly as needed.

The method for adding lubricating grease to bearings of SHIMGE water pumps can be found in the following video link: Website: http://100gs.shimge.com/wap/blbxgdjlxbwh_8/2.html;

Danger

It is forbidden to mix different brands of grease, otherwise the motor bearing may be burned. If other brands of grease need to be used, you must dismantle the motor bearing and clean out the original grease.

11 ANTSPACE HW5 Container Water Cooling System Safety Instructions

Danger

If the container liquid cooling system is not used for a long time, the main power supply should be turned off. After a long power outage, normal power-on procedures should be followed.

11.1 Maintenance

Only qualified and authorized personnel are allowed to carry out maintenance and other operations on the electrical system.

11.2 Operation

Before starting the cooling system inside the container, a fire extinguisher should be equipped.

Caution

Due to transportation and regulatory limitations, the system is not equipped with a fire extinguisher during shipment. Before operating the system, please provide a fire extinguisher that complies with local regulations of the project. The fire extinguisher bracket must be fixed on the left side of the equipment entrance label on site.

The equipment must have at least two reliable grounding positions, and the protective grounding resistance should be verified to ensure continuity. Its value should be less than 0.1 Ω, otherwise there may be a dangerous situation that may cause personal injury or death.

Only clean the equipment after shutting down and turning off the power, otherwise it may cause electric shock or injury. Do not use water to clean the equipment, otherwise it may cause electric shock.

Before starting the machine, be sure to check if the valve (if present) is open.

Safety clauses for operation of distribution cabinets and main control cabinets:

Before operating the distribution cabinet A/B and main control cabinet, it is necessary to ensure that the cabinet door is locked to prevent personal injury such as electric shock, and to prevent salt mist, moisture, dust or other conductive substances from entering the interior of the

distribution cabinet and main control cabinet.

When powering on, it is prohibited to touch the single board, cables, terminals, modules, sensors and other equipment inside the cabinet to avoid safety accidents.

If there is a malfunction, odor, or abnormal sound, please close the main circuit breakers MCB-A1, MCB-A2, and QFWCU of the three cabinets, or press the emergency stop button on the container door and two cabinets, otherwise it may cause electric shock or fire accidents.

When the container system is at risk of rapid freezing under abnormal operating conditions, an air pump must be used to remove the cooling water in the system as soon as possible. For air pumps, refer to the recommended model in Chapter 10.2.1).

11.3 Caution

a. Nonprofessional authorized personnel are prohibited from opening the door of the distribution cabinet

b. Only when the main circuit breaker is in the OFF position can the distribution cabinet door be opened.

Danger

The main circuit breaker is in the OFF position, and the front end of the main circuit breaker is live. Unauthorized and professional personnel are prohibited from opening the protective board.

Before using this equipment, please read this manual carefully. If you have any difficulties or problems, please consult authorized personnel from the factory for assistance.