

HK3 V6

Hydro-cooling container &Dry-Wet Tower
Product Manual

Jan. 2024





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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 HK3** container liquid 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.

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ANTSPACE HK3 V6 Hydro-cooling container & Dry-Wet Tower Product Manual

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Change History

Version	Change Items	Before Changing	After Changing	Change Time	Change By
V1.0.9	Initial version	/	/	2023.09.03	
V1.1.0	9.3.6	1	Table 9-1,table 9-2	2024.01.02	
V1.1.1	Combined user manual and installation guide			2024.01.09	
V1.1.2	Modification of user manual format	/	/	2024.01.17	



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ANTSPACE HK3 V6 Hydro-cooling container & Dry-Wet Tower Product Manual



1 About This Document

This manual mainly introduces the working principle, fault handling, and maintenance methods of the ANTSPACE HK3V6 liquid cooling system.

1.1 Application Scope

This manual is applicable to the HK3V6 model. Unless otherwise specifie d in the following text, the installation and operation methods of the product will be briefly introduced using the version of the cooling tower as an example.

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:

- Possess certain professional knowledge in electronics, electrical wiring, and machinery, and be familiar with electrical and mechanical schematic diagrams.
- Familiar with the composition and working principles of liquid cooling systems and related products.
- It should have received professional training related to the installation and trial operation of electrical products.
- It should have the ability to respond urgently to hazards or unexpected situations that occur during installation or trial operation.
- Familiar with the relevant standards and specifications of the country/region where the project is located.

1.3 Use of Manual

Please read the manual carefully before using the 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

Relevant safety regulations must be followed during product installation, trial operation, operation, and maintenance. Unreasonable use or incorrect operation may result in:

- Harm the life and personal safety of the operator or third party.
- Damaged products or other property belonging to the operator or third parties.
- To avoid the above hazards, please strictly follow the safety precautions in the manual.
- The safety precautions in this manual do not include all the standards that should be followed, and are only a supplement to all safety precautions. All work should be carried out based on the actual situation on site.
- For any loss caused by violation of the general safety operation requirements, safety standards, and safety precautions in the instructions, BITMAIN will not bear any responsibility.
- Local laws, regulations, and specifications should be followed when installing, operating, and maintaining equipment. The safety precautions in the manual are only a supplement to local laws, regulations, and norms.



3 ANTSPACE HK3V6 Container Liquid Cooling System Overview

The container liquid cooling system aims to continuously provide cooling liquid 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.

There are three types of heat dissipation options for container liquid cooling systems: evaporative cooling (dry wet combined cooling tower), water-water heat exchange (plate exchange component), and forced air cooling (dry cooling tower). The internal cooling medium can be selected according to the local environmental temperature, such as suitable antifreeze, deionized water, or pure water.



4 ANTSPACE HK3V6 Container Liquid Cooling System Composition

and Working Principle

4.1 System Composition

Table 4-1 Main components of container liquid cooling system

Sub system	Function	Main components
Pumping station	Transport and monitor the cooling liquid 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 screen, 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
Mainfold system	Flow distribution and transportation	Main fold, elbows, hoses, chucks, valves, and other related accessories
Accessories	Supporting components and spare accessories required for the use of container liquid cooling system	Screws, miniature circuit breakers, aviation plugs, clamps, rubber hoses and other related accessories
Dry wet tower	Transfer heat from the load to the atmosphere	Spray pumps, coolers, air inlet grilles, fans, and other related accessories
Plate heat exchanger component (optional)	Transfer heat from the load to the cold side water	Plate heat exchangers, sensors, valves, and other related accessories
Dry tower (optional)	Transfer heat from the load to the atmosphere	Stainless steel heat exchanger components, valves, pressure gauges, and other related accessories

4.2 Working Principle

Pump Station

The pump station provides two cooling liquids that meet the requirements for temperature, pressure, flow rate, and medium to the liquid distributor components. After two stages of liquid separation, the water separator delivers the cooling liquid to the water-cooled plate, which takes away the heat inside the equipment.

The heated cooling liquid 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 liquid is then transported to the water-cooled plate again through the pump station and water separator 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 liquid 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 liquid 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 liquid with high temperature from the water-cooled plate and low-temperature air, and the cooling liquid with reduced water temperature enters the system again through the pump unit for heat dissipation.

Plate Heat Exchanger

During the operation of a plate heat exchanger, a thin rectangular fluid channel is formed between each heat exchange plate. The cold and hot heat exchange media enter these narrow and tortuous flow channels through the holes at the four corners of the plate. The ripples on the plate enhance the stiffness of the plate and also enhance the turbulence of the fluid. Two types of media form a parallel flow or a reverse flow between the plates, and heat exchange is carried out through the intermediate layer plates to achieve the purpose of use.

Dry Tower

Similar to the dry wet tower, the dry tower uses a power fan to force air convection to achieve heat exchange between the air and the internal circulating medium, thereby achieving overall heat dissipation.

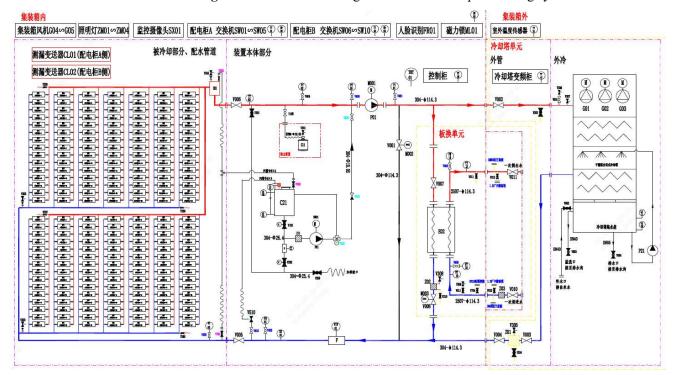


Figure 4-1 Schematic diagram of container liquid cooling system

5 ANTSPACE HK3V6 Container Liquid Cooling System Performance Index Requirements

 Table 5-1 System performance index requirements

SN	Items	Performance index	Remarks		
Environment					
	Working temperature	-35∼40°C	Outdoor		
1	Working temperature	5~40°C	Indoor (controllable temperature range by adjusting the fan)		
2	Working humidity	10~90%			
3	Storage temperature	-35∼70°C			
4	Storage humidity	5~95%			
5	Altitude	≤2000m			
		Container technology			
1	External dimensions (L×W×H) (mm)	6058×2438×2896			
2	High computing power server capacity	210 S19 Hydro 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	Operating power	1047~1050	Excluding dry wet tower power consumption		
6	Input voltage and power	400V±5%,60Hz/50Hz			
7	Transport weight	8T	Excluding high computing power servers and cooling liquid		
8	Operating weight	12T	Including high computing power servers and cooling liquid		
9	Main switch capacity of distribution cabinet (A)	1200A	The container liquid 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		

SN	Items	Performance index	Remarks
11	Standard power (kW)	1047	Excluding cooling tower power consumption
12	Maximum power (kW)	1050	Excluding cooling tower power consumption
13	Single unit rated current (A)	≤10	The container liquid cooling system includes two distribution cabinets, each with a 1200A main switch
14	Provided interface (cooling tower)	DN125 (nominal size 139.7- ISO 2852)	
15	Provided interface (heating & plate exchanger interface)	DN100 (GB/T 9119-2010 PN16 DN100)	
16	Flow rate (m³/h)	≥85	
		Dry wet tower	
1	Туре	Dry wet tower	
2	External dimensions (L×W×H) (mm)	6058×2438×2896	Excluding cage ladder
3	Heat dissipation capacity (kW)	1000	
4	Operating water temperature	35°C±1°C	@Wet-bulb temperature =28°C
5	Box certification	China Classification Society Certification	
6	Safety certification	NFPA 79:2021 UL 508A:2018 R8.21 CSA C22.2 No. 14-18 ANSI/ISO 12100:2012	
7	Operating power (kW)	14~28	
8	Transport weight	7 T	
9	Operating weight	12 T	
10	Provided interface (container)	DN125 (nominal size 139.7- ISO 2852)	
11	Liquid supply pipe interface	DN40 (internal thread)	
12	Drainage pipe interface	DN65 (internal thread)	
13	Noise@25°C, 16m	70dBA	
14	Water consumption	1∼1.3m³/h	

6 ANTSPACE HK3V6 Container Liquid Cooling Structural Views

6.1 External View of Container Liquid Cooling System

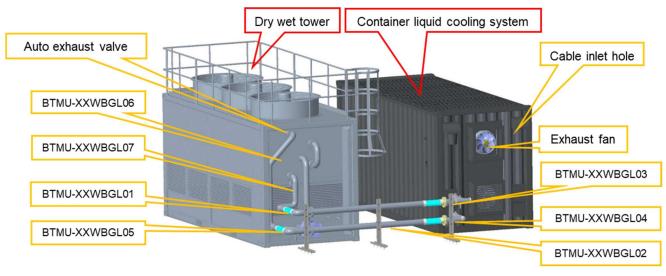


Figure 6-1 External view of container liquid cooling system

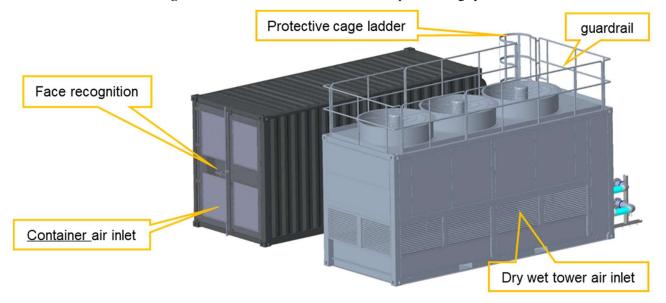


Figure 6-2 External view of container liquid cooling system

6.2 Internal View of Container Liquid Cooling System

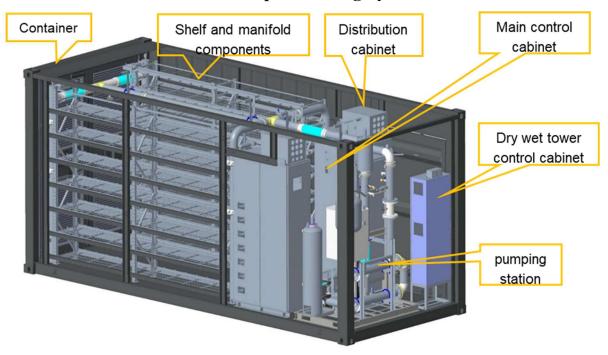


Figure 6-3 Internal view of container

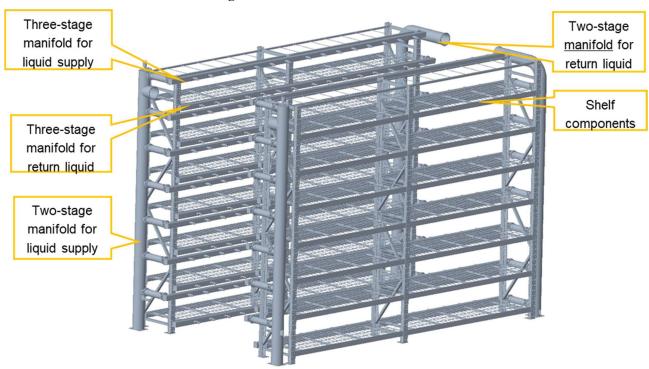


Figure 6-4 Internal view of manifold components

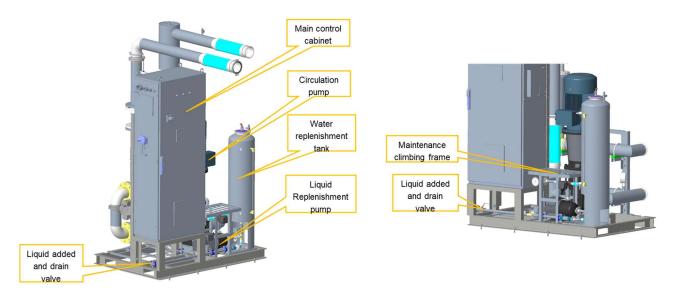


Figure 6-5 Internal view of pumping station

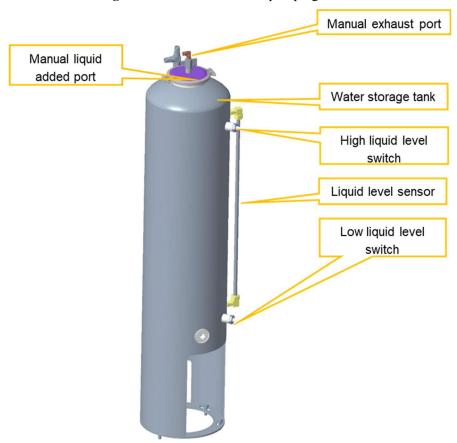


Figure 6-6 Water storage tank

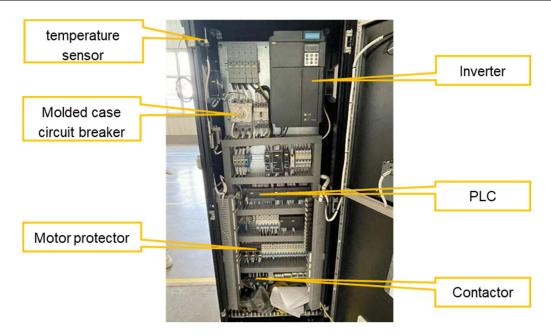


Figure 6-7 Internal view of main control cabinet

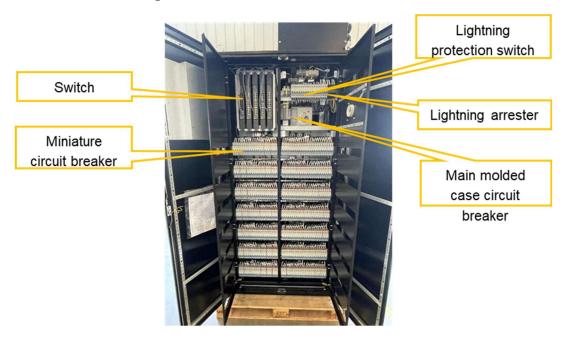


Figure 6-8 Internal view of distribution cabinet

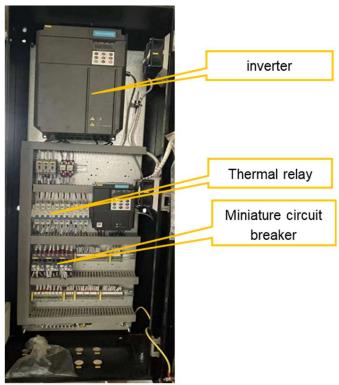


Figure 6-9 Internal view of cold tower control cabinet

7 Installation of ANTSPACE HK3 V6

7.1 ANTSPACE HK3V6 Container Liquid Cooling System Composition

The ANTSPACE HK3 V6 container liquid cooling system mainly consists of containers, cooling towers, intermediate connecting pipelines, and other related components, as shown in **Figure 7-1** Liquid cooling system composition. Its functions are shown in

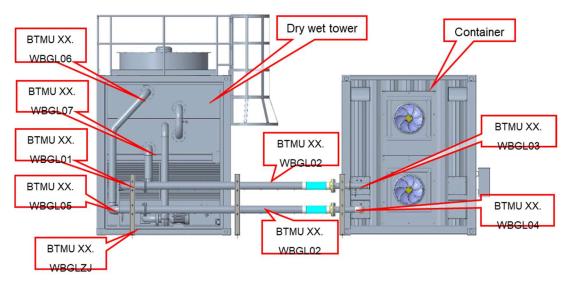


Figure 7-1 Liquid cooling system composition

Table 7-1.

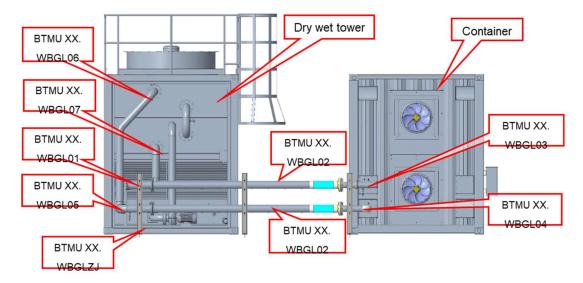


Figure 7-1 Liquid cooling system composition

Table 7-1 Functional description of components

SN	Module	Function	Remarks
1	Cooling tower	Heat exchange unit, which exchanges heat between the heated coolant and the atmosphere, and then transports it to the container after cooling down.	1 set
2	Container	The container includes pump sets, distribution cabinets, water distributors, shelves, etc., used to distribute water, electricity, and power to the mining machine.	1 set
3	BTMU XX.WBGL01	Dry wet tower inlet water pipeline.	1 PCS
4	BTMU XX.WBGL02	Connect the dry wet tower and container	2 PCS
5	BTMU XX.WBGL03	Container inlet water pipeline.	1 PCS
6	BTMU XX.WBGL04	Container outlet water pipeline.	1 PCS
7	BTMU XX.WBGL05	Dry wet tower outlet water pipeline.	1 PCS
8	BTMU XX.WBGL06	Dry wet tower outlet water pipeline.	1 PCS
9	BTMU XX.WBGL07	Dry wet tower inlet water pipeline.	1 PCS
10	BTMU XX.WBGLZJ	External pipeline fixing bracket.	3 PCS

7.2 Installation and Connection of Container Liquid Cooling and Cooling Tower

Place the container on the ground with a certain bearing strength (capable of bearing a weight of 25 tons and a ground level of $\pm 1^{\circ}$). The cooling tower is installed on the side of the container, and the distance between them is required to be 2 m. The cooling tower, container, and connecting pipelines are installed on site as shown in **Figure 7-2**

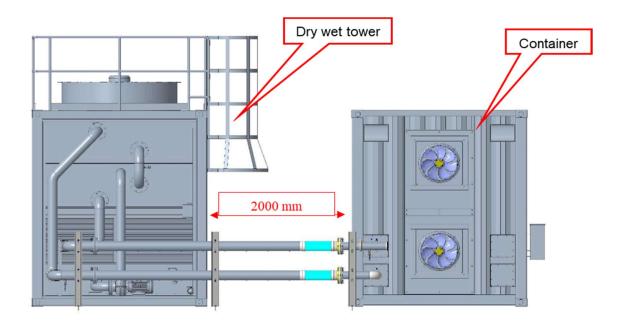


Figure 7-2 Location of container and cooling tower

7.3 Installing Exhaust Fans for Container Liquid Cooling

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 **Figure 7-3** (a) from the container accessories wooden box, unpack it and perform installation:

- 1) Installed at the rear door of the container, as shown in Figure 7-3(b)
- 2) Remove the protective sealing plate on the rear door.
- 3) Secure the fan assembly as a whole to the rear door using bolts (M10 outer hexagonal bolts).

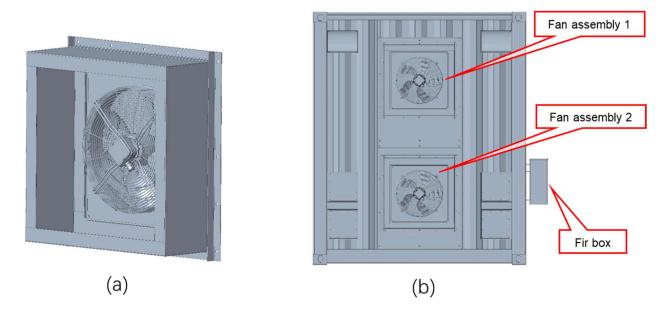


Figure 7-3 (a) Schematic diagram of fan assembly, (b) Installation diagram of container fans

7.4 Container Liquid Cooling System Pipeline Connection

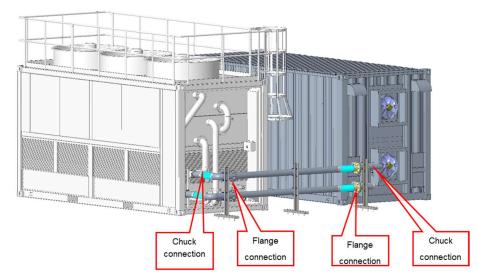


Figure 7-4 Installation diagram of external pipelines

7.4.1 Pipeline connection:

- 1. Firstly, take out six pipelines numbered "BTMU XX-WBGL01", "BTMU XX-WBGL02", "BTMU XX-WBGL03", "BTMU XX-WBGL04", "BTMU XX-WBGL05", "BTMU XX-WBGL06", "BTMU XX-WBGL06", "BTMU XX-WBGL07", "BTMU XX-WBGLZJ" and three sets of pipeline fixing brackets from the wooden box. Then, take out the flange sealing gasket, chuck gasket, connecting bolt (M16×75), high-pressure clamps (ISO 114.3 and ISO 141.3) and U-shaped clamp components and other accessories.
- 2. Find two water supply and return pipelines (with an outer diameter of 114.3) in the container, labeled as BTMU XX WBGL03 (with filter Z01) and BTMU XX WBGL04. Connect the pipelines to the two water supply and return ports with high-pressure clamps (ISO 114.3/304/PN16) in combination with the chuck sealing gasket (ISO 114.3). It should be noted that the sealing gasket should not be damaged, worn, or deformed. External pipeline 03 (BTMUXX WBGL03) is connected to the inlet of the container system on the upper side, and BTMUXX WBGL04 is connected to the outlet of the container system on the lower side. After the connection is completed, fix them with a pipeline bracket and a DN100 U-shaped clamp.
- 3. Connect the above pipelines according to the requirements in Figure 7-4.

There are 10 connections in total: 6 flange connections, 8 single connection points, and 1 DN125 sealing gasket is required for each connection; 4 chuck connections, 1 connection point at a single location, and 1 ISO 141.3 chuck sealing gasket is required for each connection.

It should be noted that the sealing gasket should not be damaged, worn, or deformed;



Caution

After the pipeline is connected, please check whether the filter **Z01** screen of the external pipeline **06** is intact.

7.4.2 Fixed pipelines and external pipeline brackets

After connecting the intermediate pipeline, it is necessary to fix the pipeline and external pipeline bracket:

1. Fix the external pipeline bracket.

The pipeline needs to be tightly attached to the bracket for fastening. The external pipeline bracket is fixed to the ground using expansion screws (M12 * 80), and the ground needs to be drilled in advance using an electric drill.

- 2. Use U-shaped pipeline clamps (DN125/M12/304) to secure the pipeline to the external pipeline bracket.
- 3. Check if the connection points are loose and mark all threaded connection points with a line (black and blue double marking is recommended).

8 ANTSPACE HK3V6 Container Liquid Cooling Use and Operation

8.1 Safety Rules

8.1.1 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.

8.1.2 Precautions for Use

1) 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.

- 2) 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.
- 3) Equipment should avoid wiring midway and is strictly prohibited from being used in parallel with other equipment.
- 4) If there are any abnormalities in the equipment (such as stink, etc.), it should be shut down, disconnected from the power supply, and inspected.
- 5) 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.



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.

- 6) Circuit breaker MCB-A1 can only cut off power to distribution cabinet A.
- 7) Circuit breaker MCB-A2 can only cut off power to distribution cabinet B.



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.

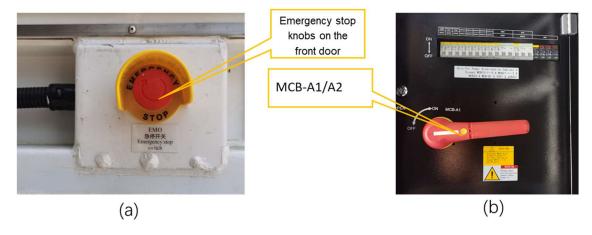


Figure 8-1 (a) Emergency stop knobs on the front door

(b) Location of MCB-A1/A2

- 8) The circuit breaker QFWCU can only power off the main control cabinet.
- 9) 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:
- a) Firstly, disconnect the micro circuit breakers of 210 high computing power servers.
- b) After an interval of 10 seconds, disconnect the main power supply of the main control cabinet.
- c) Then disconnect the main switches of the two distribution cabinets.



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.







Figure 8-2 (a) Distribution cabinet circuit breakers (b)Internal of the main control cabinet (c)The main circuit breaker of the distribution cabinet

- d) If necessary, also disconnect the main switch at the transformer end. Remember to strictly follow the above requirements for the closing sequence of switches.
- 10) It is strictly prohibited to open the protective cover on the fan.
- 11) It is strictly prohibited to touch the fan blades directly to test whether the fan is rotating, or to rotate the fan blades by hand.
- 12) It is prohibited to operate the equipment with wet hands, otherwise it may cause electric shock accidents. It is prohibited to put debris inside the equipment to ensure that the fire passage is always unobstructed.



Warning

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

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:

8.2.1 Preparation Before Pressurization

- 1) Prepare hoses and air pumps (recommended brand: OUTSTANDING, model 2200W-40L. Selection basis: the internal volume of the system is about 1.5 m³, 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);
- 2) Connect the external pipelines according to the previous chapters.

- 3) Check if all the plugs on the automatic exhaust valves on the internal and external connection pipelines of the container are closed. Automatic exhaust values include V302&V303 on the water distributor 7, V301 on the degassing tank, V304 on the expansion tank, manual exhaust valve V701, and cooling tower exhaust valve V306. By screwing the top nut of the automatic exhaust valve, the automatic exhaust valve can be opened/closed.
- 4) Check whether the safety valve ball valve V410 and expansion tank ball valve V105 are closed, and check whether each liquid filling and drain valve is closed. The water distributor has 4 drain valves (V205-V208), the pump station has 1 filling/drain valve (V104), 1 drain valve (V201), and 1 filling valve (V209).

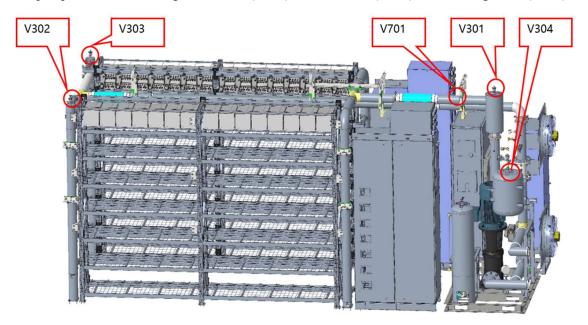


Figure 8-3 Location of the exhaust valve in container system

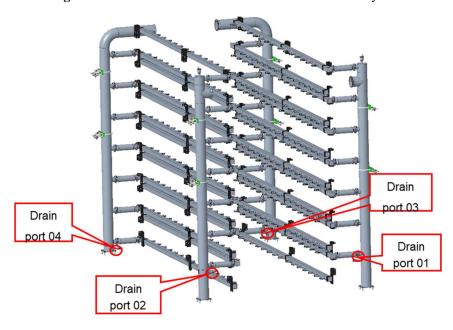


Figure 8-4 Water distributor drain port

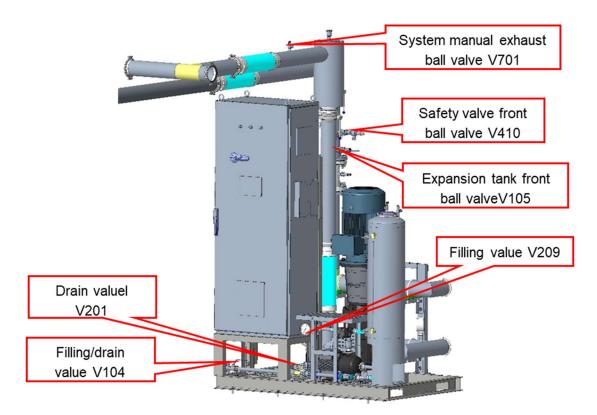


Figure 8-5 Schematic diagram of pump station valves

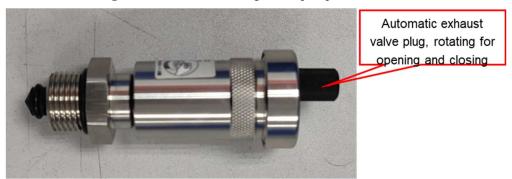


Figure 8-6 Automatic exhaust valve

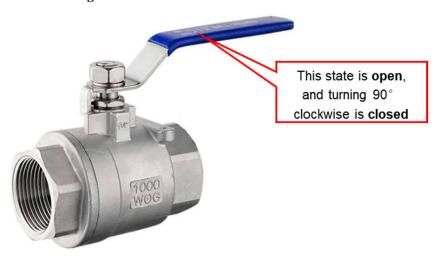


Figure 8-7 Schematic diagram of valve opening and closing

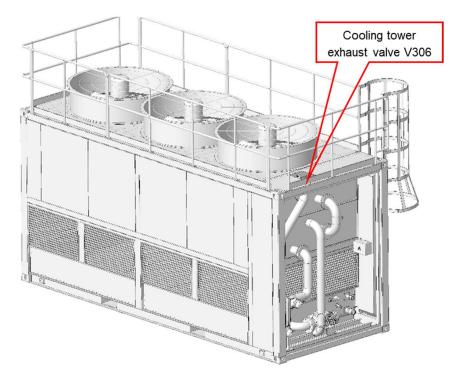


Figure 8-8 Cooling tower exhaust valve position

8.2.2 Pressurization Steps

- Check again that the exhaust valve plugs and ball valves are closed.
 Close the filling/drain ball valve V104, the expansion tank front valve V105, and the safety valve front valve V410, as shown in Figure 8-7 Schematic diagram of valve opening and closing
- 2).
- 3) Open all mini ball valves on the water distributor.
- 4) Connect to any quick connection port with the air pipe and close the corresponding ball valve of this circuit.

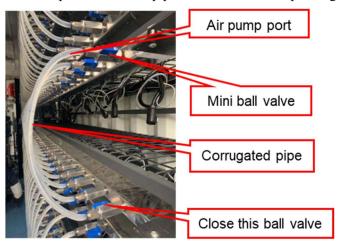


Figure 8-9 System pipeline connection ball valve

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

6) The key inspection.

The key inspection areas are as follows:

- 1) The connection between the quick connector and the mini ball valve.
- 2) The connection between the quick connection ball valve and corrugated pipes.
- 3) The connection between the mini ball valve and the water distributor.
- 4) The connection between the quick connector and computing power server.
- 5) Each flange/chuck/threaded/welded connection.

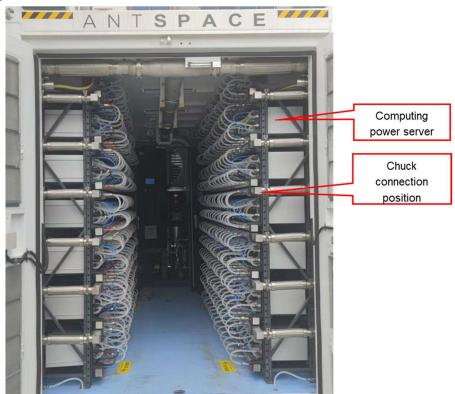


Figure 8-10 System chuck connection

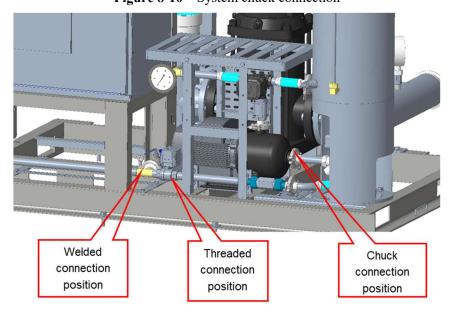


Figure 8-11 System leakage point inspection

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.

8.3 System Liquid Replenishment

During the installation of the external pipeline, it is necessary to check whether the filter Z01 in the external pipeline 06 is intact.

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 liquid to the system with a liquid filling pump. When the return pressure reaches the required value, stop adding liquid to the system. Switch the pipeline switch, and start the liquid filling pump to add liquid to the water tank. When the liquid level in the water tank reaches the required height, switch the pipeline switch, and the system will automatically run.

The specific liquid filling procedure is as follows:

- 1) **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 liquid filling).
- 2) **System liquid replenishment:** Replenish the system with liquid filling pump P11.
- 3) Water tank replenishment: Replenish the water tank with liquid filling pump P11.
- 4) **Regular replenishment of water tank:** Replenish the water tank with the liquid filling pump P11 or through the manual filling port on the top of the water tank.

8.3.1 Preparation

- 1) Prepare the coolant.
- 2) Connect the external pipeline according to the previous chapters.

Check if all the plugs on the automatic exhaust valves on the internal and external connecting pipelines of the container are open (see 错误!未找到引用源。and Figure 8-7 Schematic diagram of valve opening and closing

3)).

Open the filling valve V209 and close the drain valve V201 (see Figure 8-3 Location of the exhaust valve in container system

and Figure 8-4 Water distributor drain port

- 4)).
- 5) Open the exhaust ball valve V702 on the top of the water tank to ensure that the water tank is connected to atmospheric pressure (as shown in Figure 8-12).

6) Open the manual exhaust valve **V701** of the system and connect the PU pipe to the quick connector on the water tank (to accelerate the first liquid filling).

Switch the exhaust valve of the cooling tower to the manual exhaust valve (as shown in **Figure 8-12** Water tank valve

7)).

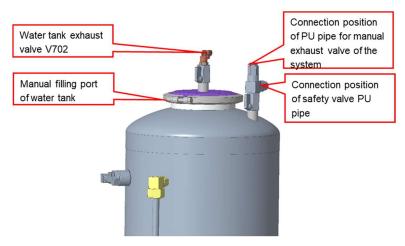


Figure 8-12 Water tank valve

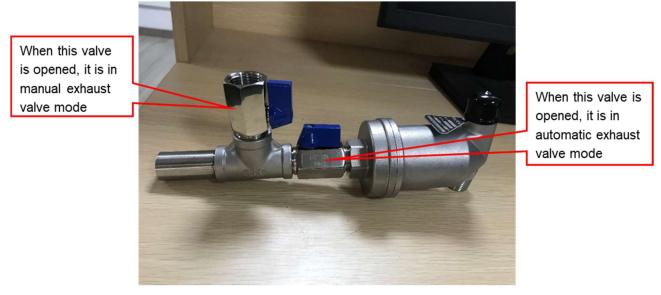


Figure 8-13 Cooling tower exhaust valve

8.3.2 System and Water Tank Replenishment

- 1) Replenish the system and water tank C21 with the liquid filling pump P11.
- 2) Find an external water source (with a certain pressure), and connect the hose to liquid filling/drain port V104 on the container. Fill the connecting pipeline with liquid for the first liquid filling (until water flows out). Find the liquid filling port outside the container and plug in the hose (at the side door of the container). Then, connect the external water tank to the liquid filling pump P11.

3) Open the exhaust valve of the liquid filling pump (Allen wrench), switch to manual mode on the touch screen, and open the solenoid valve **V202**. After water is discharged, close the manual exhaust valve of the liquid filling pump.

Close solenoid valve **V202**, switch to manual mode on the touch screen, and open the "Manual Liquid Replenishment" mode "External → System" of the liquid filling system, which means adding liquid to the system.

Open "External → C21", which means adding liquid to the water tank **C21** externally, as shown in **Figure 8-14**Distribution of solenoid valves in the liquid filling system

4).

- 5) When adding liquid to the system, pay attention to whether there is water flowing out of the exhaust valve of the cooling tower and the manual exhaust valve of the system. When there is water flowing out, it indicates that the system has been fully filled. Then, close the manual exhaust valve of the cooling tower, open the automatic exhaust valve, and close the manual exhaust valve 701 of the system.
- 6) When the static pressure reaches 0.7 bar (refer to **Figure 8-16**, touch screen reading) or above, the circulation pump can be started for 10 seconds (without stopping the liquid filling pump), and then the circulation pump can be stopped.
- 7) Continue to add liquid and repeat for twice to ensure that 1.3-1.5 tons of coolant are added.
- 8) When the static pressure reaches 1.0-1.5 bar, stop adding liquid (observe the reading of the main interface pressure sensor **PT02**, as shown in **Figure 8-16**).
- 9) Turn on the circulation pump **P01** again to circulate the coolant in the system, ensuring that all automatic exhaust valves are in **open** state.
- 10) Due to the first liquid filling and the presence of gas in the system, the discharge of gas during the water pump circulation will cause a decrease in pressure in the system. At this time, the liquid filling function is turned on, and the water tank replenishes the system to ensure that the return pressure is between 1.0 and 1.5 bar.
- 11) After the above operation is completed, the system back pressure (pressure gauge **PI03**/return pressure sensor **PT02**) will be stabilized at **1-1.5** bar and for normal operation. Automatic mode can be turned on and the computing power server can be turned on for operation.

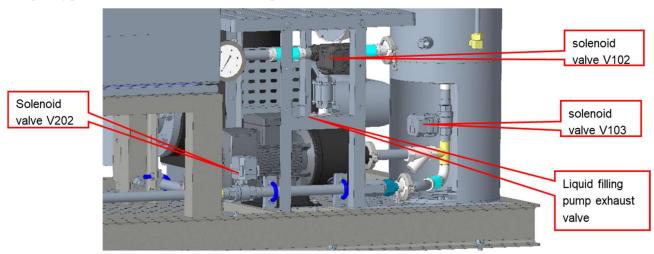




Figure 8-14 Distribution of solenoid valves in the liquid filling system

Figure 8-15 Liquid filling system interface

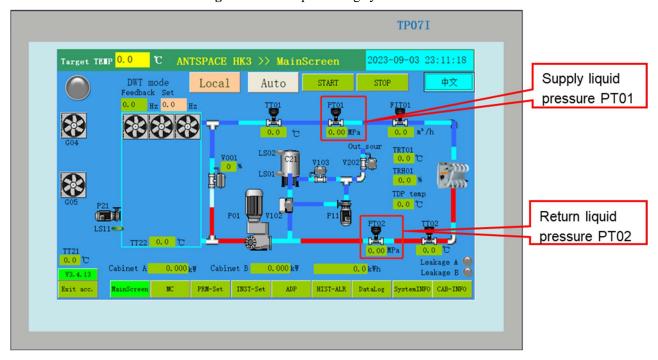


Figure 8-16 System operation interface

8.3.3 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 liquid filling, connect the liquid filling pump P11 to an external water source (with a certain pressure; fill the connecting pipeline), turn on the liquid replenishment mode, and externally add liquid 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 8-12**), and manually add liquid 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 500kW 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 professional qualified personnel, and the operation process must not only comply with the requirements of this manual, but also comply with the local electrical and safety regulations of the project.



Danger

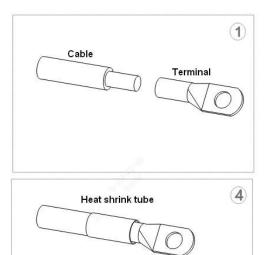
The specification and quantity of equipment input cables must meet the requirements of local electrical regulations. If necessary, please consult a qualified electrical engineer.

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 have a diameter of 17mm. Two M12 bolts are reserved for N copper bars, and M12 bolts are reserved for PE copper bars.



Caution

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



Hot air gun

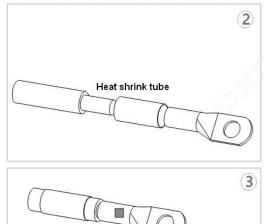


Figure 8-17 Stripping and crimping

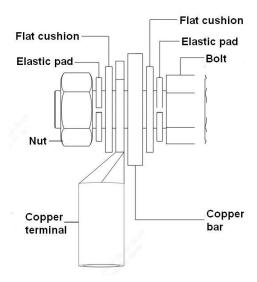


Figure 8-18 Select copper wire

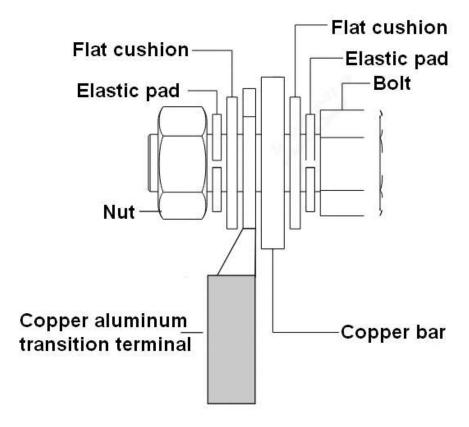


Figure 8-19 Select aluminum wire

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 8-20 Cable connection diagram

The cables are connected from the upper two openings on one side of the container exhaust fan, as shown in **Figure 8-21** (**note**: it is necessary to use rainproof cloth and cover in 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).

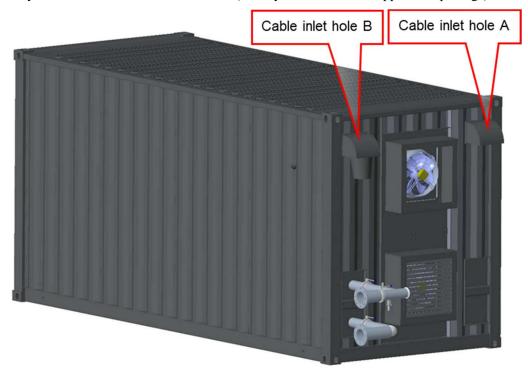


Figure 8-21 Cable inlet holes

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

Three-phase electric power from the transformer must be accessed by qualified personnel. When adjusting the phase sequence, the front-end voltage of the external transformer input terminal must be powered off before operation (the white light on the front of the main control cabinet does not light up, and the input line voltage is measured to be 0V using a multimeter). It is prohibited to adjust the phase sequence with power at any time.

Due to the separation of the cooling tower and container, there are also three heat dissipation fans, a spray pump, a liquid level sensor, and a temperature sensor above the cooling tower.

After the positions of the cooling tower and container are fully determined, it is necessary to wire four motors and two sensors. The liquid level sensor and temperature sensor have been required to be installed in the designated positions. The indicating point (depression) of the liquid level sensor must face upwards.

One end of the cable container for the cold tower fan, spray pump, liquid level sensor, and temperature sensor is already connected to the terminal inside the cold tower control cabinet, and the other end is reserved inside the container. When it is necessary to flip the wire to the side of the cooling tower, the corrugated pipe metal joint, 10 meter weather resistant metal corrugated pipe, and 5 stainless steel straps in the equipment should be first identified.

All cable wiring locations are at the junction box on the side wall of the cooling tower. The order of the three cooling fans and spray cooling pumps is not specified. The wiring sequence is U, V, W (from left to right). The location of the cooling fan and junction box See **Figure 8-22**. The liquid level sensor is installed as shown in

Figure 8-22 Location of the fans and wiring box

below. The wiring diagram is shown in **Figure 8-23** Location of the liquid level switch and temperature sensor

The wiring steps are as follows:

- 1: Disassemble the screw sleeve of the metal joint and divide it into two parts: the screw sleeve and the metal joint.
- 2: The end of the metal joint should be connected to a 10 meter weather resistant metal corrugated pipe and form a whole.
- 3: Inside the container, pass 6 cables through the screw sleeve and then through the reserved outlet hole (located at the bottom right of the inlet and outlet liquid pipe intersection).

- 4: Thread these 6 cables through one side of the metal joint and the other side of the corrugated pipe.
- 5: Insert the metal joint into the reserved outlet hole of the container, where the outer part of the container is a metal joint and the inner part is a screw sleeve. Tighten the screw sleeve to the metal joint end and tighten it to a fixed torque to achieve good sealing effect.
- 6: When laying out metal corrugated pipes outdoors, they should follow the lower one of the interconnecting pipelines between the container and the cooling tower, and be fixed with 5 stainless steel straps included in the accessories.
- 7: The other end of the cable should be connected to the junction box left by the cooling tower. The correct wiring sequence should correspond one by one between the number tube of the cable and the number of the terminals in the junction box.
- 8: After the wiring is completed, it is necessary to start and debug the operation to ensure its correctness and good wiring.



Danger

Fan wiring in addition to the location of the junction box, but also need to confirm that the fan itself wiring is connected, need to enter the top from the cooling tower ladder to confirm, not confirmed before the prohibition of power.

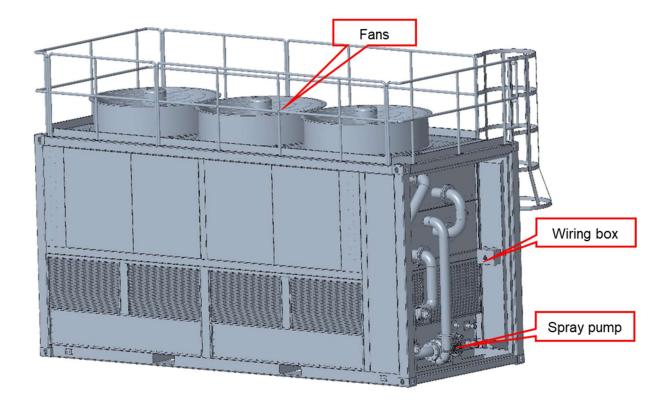


Figure 8-22 Location of the fans and wiring box

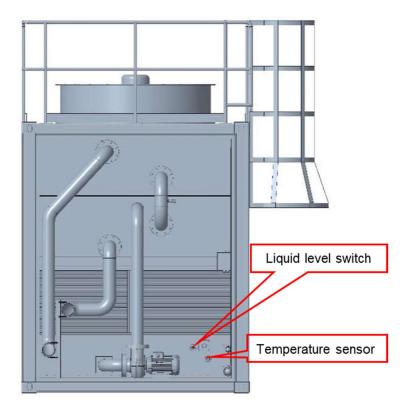


Figure 8-23 Location of the liquid level switch and temperature sensor

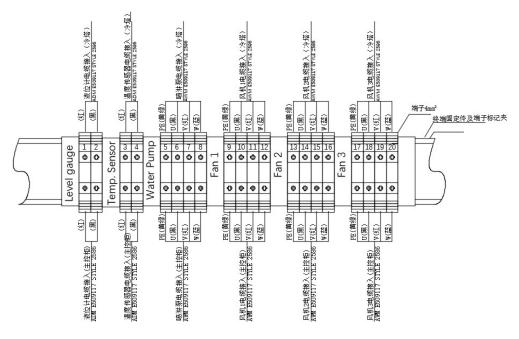


Figure 8-24 Wiring diagram of the cooling tower

8.5 System Power-on and Power-off

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

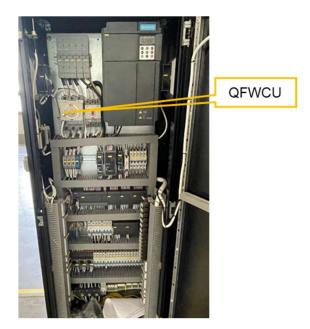


Figure 8-25 Internal view of the main control cabinet

8.5.1 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	\rightarrow	XD11, XD12, XD13, L1, L2, L3
2	QFKR1	XD11 L1	\rightarrow	Power monitor L1
3	QFKR2	XD12 L2	\rightarrow	Power monitor L2
4	QFKR3	XD13 L3	\rightarrow	Power monitor L3
5	QFHL1	XT1 L1	\rightarrow	Power indicator light (white)
6	QFHL2	XD11 L1	\rightarrow	Closing indicator light (green)
7	QFD1	L1,N	\rightarrow	Backup power supply
8	QFaSW	XD11 L1	\rightarrow	Distribution cabinet switch power supply
9	QFbSW	XD11 L1	\rightarrow	Distribution cabinet switch power supply
10	QFVF01	XD11,XD12,XD13 L1,L2,L3	\rightarrow	Main pump frequency converter R, S,
11	-QFVF02	XD11,XD12,XD13 L1,L2,L3	\rightarrow	Cold tower fan frequency converter R, S, T
12	-QFG01	Cold tower fan frequency converter U, V, W	\rightarrow	Cooling tower fan front thermal relay - FRG01 1,3,5

SN	Name	Starting point	Direction	End point
13	-QFG02	Cold tower fan frequency converter U, V, W	\rightarrow	Cooling tower fan front thermal relay - FRG02 1,3,5
14	-QFG03	Cold tower fan frequency converter U, V, W	\rightarrow	Cooling tower fan front thermal relay - FRG03 1,3,5
15	-QFVF03	XD11,XD12,XD13 L1,L2,L3	\rightarrow	Cold tower spray pump frequency converter R, S, T
16	QFCTMF	EV_L1+	\rightarrow	Power supply 24V+
17	QFV1	EV_L+	\rightarrow	KAKV102, KAGV102
18	QFV08	EV_L+	\rightarrow	V008 power supply+
19	QFP1	XD13 L3	\rightarrow	PLC power supply P1, pin 2
20	QFPZ1	PLC power supply P1, pin 5	\rightarrow	P1_L+
21	QFP2	L1.4	\rightarrow	P2 SDR-480-24 pin L
22	QFPZ2	P2 SDR-480-24 pin V+	\rightarrow	Container lighting RCT4D
23	QFRDC	P2 SDR-480-24 pin V+	\rightarrow	Distribution cabinet fan
24	QFMF	P2 SDR-480-24 pin V+	\rightarrow	Cabinet radiator
25	QFP3	L1.4	\rightarrow	SDR-75-12V P3 pin L
26	QFPZ3	SDR-75-12V P3 pin V+	\rightarrow	Face recognition power supply, door magnetic switch power supply
27	QFP4	L1.4	\rightarrow	MDR-20-5 P4 pin L
28	QFPZ4	MDR-20-5 P4 pin V+	\rightarrow	Main control module NanoPi-R4S
29	QFRST	EV_L+	\rightarrow	Main distribution cabinet A shunt release RCT4D

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

SN	Name	Starting point	Direction	End point
1	MCB-A1	L1,L2,L3	\rightarrow	Main busbar L1,L2,L3
2	MCB24-1	L1	\rightarrow	Power indicator light HL1 X1
3	MCB24-2	Power indicator light HL1 X2	\rightarrow	L3
4	MCB25-1	L4	\rightarrow	Closing indicator light HL2 X1
5	MCB25-2	Closing indicator light HL2 X2	\rightarrow	L6
6	MCB-B1	L1,L2,L3	\rightarrow	SPD1
7	MCB21-1	L1	\rightarrow	1#PMM V1

SN	Name	Starting point	Direction	End point
8	MCB21-2	L2	\rightarrow	1#PMM V2
9	MCB21-3	L3	\rightarrow	1#PMM V3
10	MCB26	XRDC		Cooling fan L+ in the cabinet
11	MCB15-1, 2, 3, 4, 5			Switch circuit breaker
12	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	L1,L2,L3	\rightarrow	Main busbar L1,L2,L3
2	MCB27-1	L1	\rightarrow	Power indicator light HL3 X1
3	MCB27-2	Power indicator light HL3 X2	\rightarrow	L3
4	MCB28-1	L4	\rightarrow	Closing indicator light HL4 X1
5	MCB28-2	Closing indicator ligh HL4 X2	\rightarrow	L6
6	MCB-B2	L1,L2,L3	\rightarrow	SPD2
7	MCB22-1	L1	\rightarrow	2#PMM V1
8	MCB22-2	L2	\rightarrow	2#PMM V1
9	MCB22-3	L3	\rightarrow	2#PMM V1
10	MCB29	XRDC		Cooling fan L+ in the cabinet
11	MCB16-1, 2, 3, 4, 5			Switch circuit breaker
12	MCB8-1, 14-15			High computing power server circuit breaker

8.5.2 Precautions for First Power of the System

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 AC400V \pm 5%, 50/60Hz.

A

Danger

After the system wiring is completed, it is necessary to use a multimeter to measure whether there is a short circuit between the phase lines between the input A/B distribution cabinets, between the phase lines and zero lines, between the phase lines and ground lines, and between the zero lines and ground lines directly. If there is a display with a resistance of 0Ω , the short circuit must be checked before being powered on, otherwise the system may have a risk of short circuit explosion and electric shock.

8.5.3 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.

1: 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 liquid 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.

2: After the main control cabinet is powered on, according to the operation process of the control system, it is only when the liquid 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.

The power on sequence of the distribution cabinet is as follows:

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.



Caution

Please refer to **Table 7-1** for the corresponding device and switch position numbers.

8.5.4 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 liquid 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 case of emergency, please press the emergency stop button on the front of the distribution cabinet. The emergency stop button on each distribution cabinet controls the power supply of this distribution cabinet. After pressing it, this distribution cabinet will be powered off, but the switch, lightning arrester, and electricity meter display will not be powered off. Opening the door panel must be operated by professional personnel.



Caution

Press the emergency stop button. After troubleshooting and before powering on again, it is necessary to rotate the emergency stop switch clockwise to release it. The main switch of the distribution cabinet and the main control cabinet should be moved to the OFF position before re closing.

8.5.5 Personnel Responsibility Division

Responsibilities of general operation and maintenance personnel:

General power on/off work (disconnecting or merging circuit breakers), system startup 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 startup 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

It is strictly prohibited to plug or unplug the communication cable between the touch screen and PLC under live state, otherwise it may cause damage to the touch screen or PLC communication serial port.



Caution

The touch panel operation password is "1000"

8.6.1 Mode Switching Interface

After the system is powered on, the screen displays as , and this mode defaults to cold tower mode.

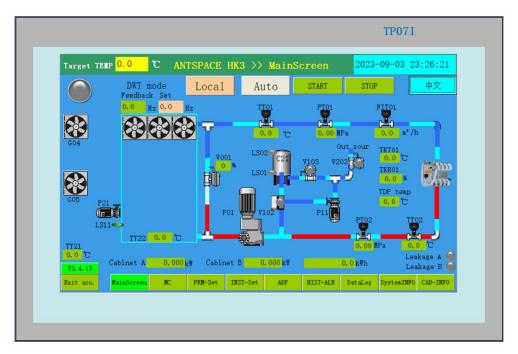


Figure 8-26 Screen display interface

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.

When the water cooling system is adapted to board to board components, it is necessary to first switch to board to board mode.

The switching method is to click on the version number at the bottom left of the cold tower mode interface, such as V3.4.11, and the interface will jump to the mode selection interface, as shown below **Figure 8-27**.

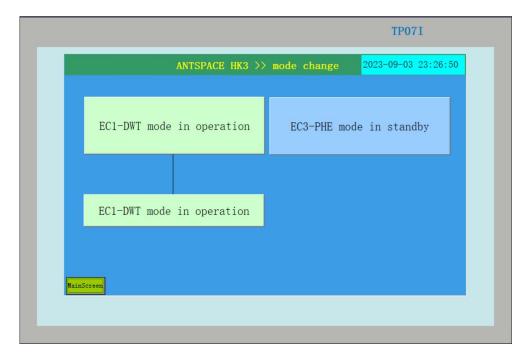


Figure 8-27 Mode selection interface (EC3-PHE mode in standby)

Click the "EC3-PHE mode in standby" button, and the interface button will jump to "EC3-PHE mode in operation", as shown in **Figure 8-27**. Click the "Main Screen" button at the lower left corner of the interface to enter the Home interface of board change mode, as shown in **Figure 8-28**.

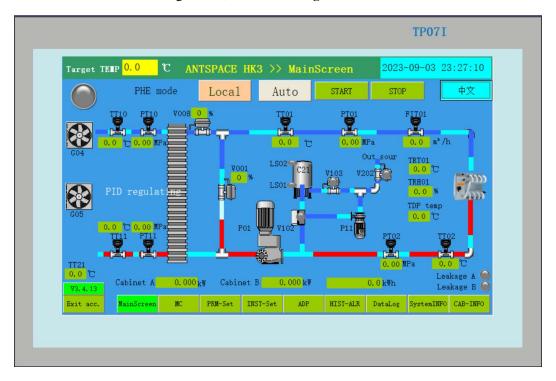


Figure 8-28 Home interface of EC3-PHE mode

8.6.2 Main Screen Interface

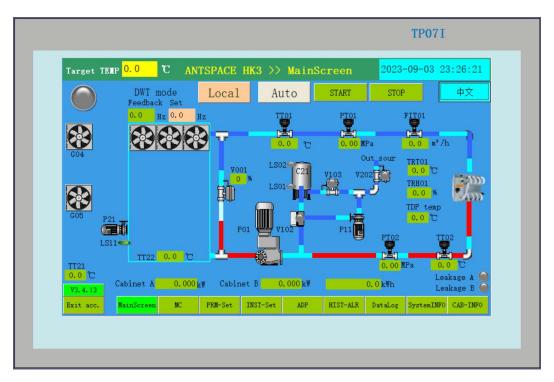


Figure 8-29 Main Screen Interface

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

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

Click the "PRM-Set" button to enter the parameter setting interface.

Click the "INST-Sets" button to enter the instrument settings interface.

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

Click the "HIST-ALR" button to enter the historical alarm interface.

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

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

Click the "CAB-INFO" 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 0.05Mpa, 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.

8.6.3 Manual Control Interface

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



Figure 8-30 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 liquid, 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.

8.6.4 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 8-31 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 8-31**. If there are any differences, they need to be reset according to the figure. The parameter setting interface allows manual settings of automatic liquid replenishment parameters, V001 electric butterfly valve opening, container fan operating parameters, cold tower fan operating parameters, and spray pump operating parameters. In addition, through the buttons in the manual liquid replenishment box in the parameter setting interface, manual liquid replenishment can be performed for different operating conditions of the system.

TP07I 2023-09-03 23:35:27 ANTSPACE HK3 >> INST-Set UL ALR-VLU Low ALR-VLU High ALR-VLU UH ALR-VLU Equipment Mark 50.0 55. 0 **TT01** 0.10 0. 15 0.32 0.36 **I**Pa **∏**Pa PT01 25.0 FIT01 m³/h 0.02 0.05 **I**Pa PT02 **I**Pa 55. 0 **TT41** C TT43 55. 0 \mathbf{c} TT45 55. 0 TT22 0.0 C HIST-ALR DataLog SystemINFO CAB-INFO

8.6.5 Instrument Setting Interface

Figure 8-32 Instrument setting interface

The alarm thresholds for supply and return liquid temperature, supply and return liquid 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 8-32** are the default initial alarm values. For the first startup, it is necessary to check whether the parameter setting interface is consistent with **Figure 8-32**. 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.

8.6.6 Alarm Display Interface

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

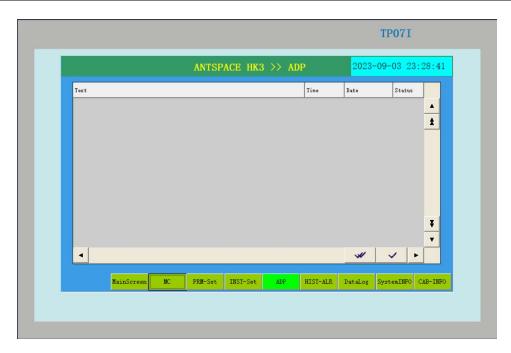


Figure 8-33 Alarm display interface

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

8.6.7 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.

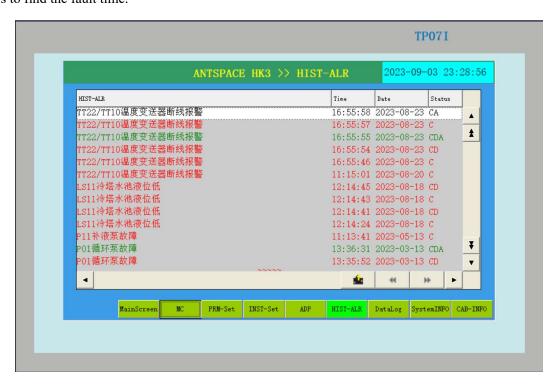


Figure 8-34 Historical Alarm Interface (Example, non real situation)

8.6.8 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.

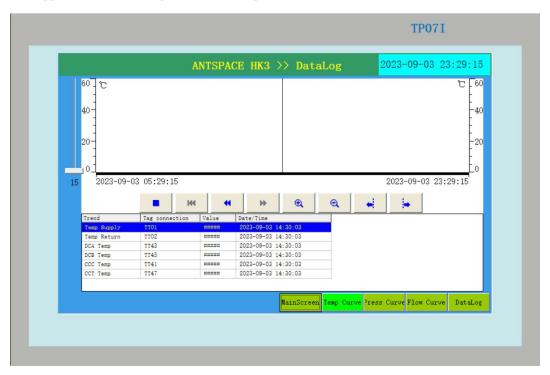


Figure 8-35 Temperature curve interface

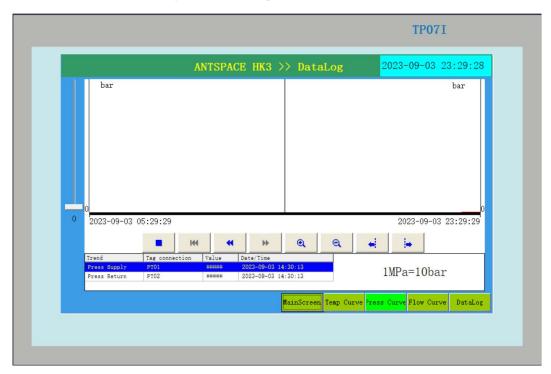


Figure 8-36 Pressure curve interface

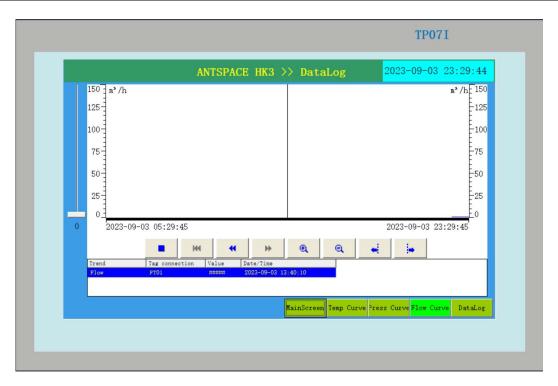


Figure 8-37 Flow curve interface

8.6.9 System Information Interface

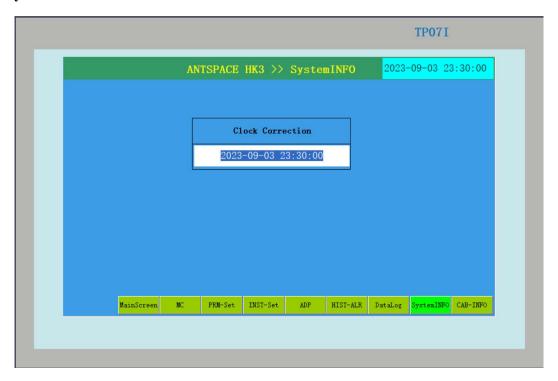


Figure 8-38 System Information Interface

The system information interface can set the system clock.

8.6.10 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.

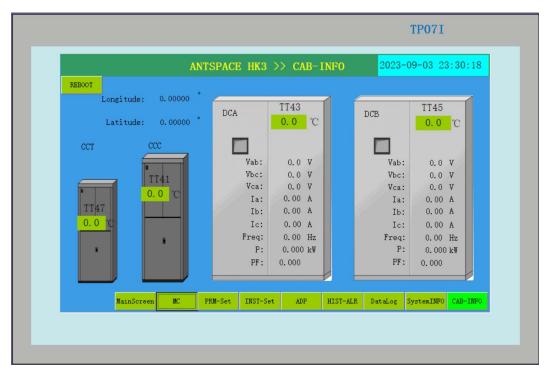


Figure 8-39 Cabinet Information Interface

8.7 ANTSPACE HK3V6 Container Liquid Cooling System On-site Installation Summary

SN **Installation steps** Remarks Location and lifting of containers The cooling tower is installed on the side of the container, 1 and cooling towers on site with a distance of 2 m between them 2 Installation of container exhaust fans Installation of connecting pipeline 3 between container and cooling tower Water-cooled container power 4 distribution Water-cooled container After gas detection for 7 bar/12 h, liquid detection for 7 5 pressurization operation bar/30 min Liquid filling operation for water-Preparation - system liquid replenishment - water tank 6 cooled containers liquid replenishment - regular replenishment of water tank

 Table 8-4
 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**. After installation is completed, the control mode can be changed to **Automatic**. Click **One Click Start** and the system will automatically run.

9 ANTSPACE HK3V6 Container Liquid Cooling System Conventional Faults and Troubleshooting

 Table 9-1
 List of common faults and troubleshooting methods

Type	Causes	Solution	Remarks
	1: Phase failure	Check for phase loss in the main power supply	
Power failure	2: Overvoltage 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
	3: Undervoltage	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 undervoltage value	and undervoltage values of the power monitor before leaving the factory, or the set values did not match the actual values on site.
	4: Phase error Adjust the phase sequence of the power lines connecting the distribution cabinet to the main control cabinet		
Low liquid level alarm	The liquid level in the water tank inside the container is low	Replenish the water tank inside the container	
Circulatio n pump failure	pump (low return parameters are normal (pressure and flow will		Warning: after the system is powered on, the circulation pump is prohibited from running idle when there is no liquid in the system.

Туре	Causes	Solution	Remarks
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 8-30 press the right reset button. 5: Start the exhaust fan after an interval of 2-3 minutes.	
Liquid replenish	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 8-30 press the right reset button. 5: After an interval of 2-3 minutes, start the replenishment pump again	Warning: after the system is powered on,
ment pump failure	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 liquid tank.t 4: After troubleshooting, Reference Figure 8-30 press the right reset button. 5: After an interval of 2-3 minutes, start the replenishment pump again.	the replenishment pump cannot idle when there is no liquid in the system.

Туре	Causes	Solution	Remarks
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). 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 8-30 press the right reset button. 5: Start the spray pump after an interval of 2-3 minutes.	Warning: after the system is powered on, the spray pump cannot idle when there is no liquid in the system
1# cooling fan failure		1: Turn off the circuit breaker (QFVF02) in the main control cabinet first.	
2# cooling fan failure		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	
3# 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	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 8-30	
		press the right reset button. 5: After an interval of 2-3 minutes, turn on the cooling fan again.	
Leakage alarm	There is liquid leakage from the inlet and outlet of the high computing power server to the floor, wetting the leakage sensor.	1: Find areas on the floor where there is liquid. 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 and corrugated pipe, then clean the leaking site and wipe the leaking monitoring tape dry.	

Type	Causes	Solution	Remarks
Cold tower liquid level low alarm	The water level inside the cooling tower decreases	Timely replenish the cooling tower and reset the fault	After a low liquid 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, onsite operation and maintenance personnel are requested to replenish the liquid in a timely manner after seeing the alarm.
	1: Cooling fan not running	Check whether the fan operates normally and whether the power supply circuit of the fan is normal	
High liquid	2: Spray pump not running	Check whether the spray pump operates normally and whether the power supply circuit of the spray pump is normal	
supply temperatur e alarm	3: Temperature sensor damaged	Replace the temperature sensor. The alarm value for high liquid supply temperature can be set on the screen as needed	
	4: Abnormal water level in the cooling tower	Check the water level of the cooling tower to ensure normal water replenishment	
High liquid supply temperatur e alarm	After the high liquid supply temperature alarm occurred, the operation and maintenance personnel did not handle it in a timely manner, resulting in a continuous increase in the liquid 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 liquid supply temperature alarm. The alarm value for high liquid supply temperature can be set on the screen as needed.	
High	1: Filter clogged	Clean the filter element	
liquid supply pressure alarm	2: Liquid supply and return valve malfunction or incomplete opening	Open the liquid supply and return valves	

Туре	Causes	Solution	Remarks
	3: Pressure sensor failure	Replace the pressure sensor	
Low	1: Insufficient cooling liquid in the water tank	Replenish the water tank with cooling liquid	
return liquid	2: Replenishment pump failure	Check the cause of the malfunction of the replenishment pump	
pressure alarm	3: Pressure sensor failure	Replace the pressure sensor	
	4: Leakage	Check for system leaks	
Low	1: Liquid supply and return valve malfunction or incomplete opening	Open the liquid supply and return valve	
liquid supply	2: Dirty and clogged filter	Clean the filter element	
flow alarm	3: Flow sensor failure	Replace the flow sensor	
	4: Leakage	Check for system leaks	
Condensat ion alarm	environmental 1		The logic set in the program is: when the dew point temperature value is greater than the supply liquid temperature value - 5°C, the system will prompt a condensation alarm
	1: There is air in the system	Please ask on-site operation and maintenance personnel to open the exhaust valve for exhaust	
Pressure display fluctuates	2: System liquid 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	
	1: Sensor damage	Replace the sensor	
No pressure	2: Loose cables	Check the wiring circuit of the pressure sensor and tighten it	
display	3: The PLC acquisition channel is damaged	Replace the module corresponding to the PLC sensor.	

Туре	Causes	Solution	Remarks
The pump is running, but the	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 liquid flowing out, and repeat 2-3 times (refer to the user manual for specific operations)	
flow rate	2: Filter clogged	Clean the filter element	
is insufficien t	3: Insufficient system coolant (low return pressure)	Replenish the system	
	1: Motor burnt out	Replace the fan.	
Fan not running	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	
	1: Water pump cavitation	Check the pressure on the liquid inlet side (return pressure or pressure gauge) and replenish the liquid in a timely manner	
Nain and	2: Pump shaft connection issue	Check the mechanical connection of the pump shaft	
Noise and abnormal noise	3: Insufficient lubrication of motor shaft	Adding lubricating oil	
	4: Safety valve action	Check if there is too much liquid in the water tank, unable to release pressure in a timely manner, and discharge excess liquid from the water tank	
Water pump shaft seal leakage		Replace the water pump shaft seal	

10 ANTSPACE HK3V6 Container Liquid 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.

10.2 Preventive Maintenance

10.2.1 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.

10.2.2 Application Check

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

1) Check if the connections of the liquid 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

2) Check if the return liquid pressure (back pressure) is low.

Inspection requirements: the return liquid 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, liquid replenishment is required.

Inspection method: visual inspection and data comparison

3) Check the liquid supply system and record temperature, pressure, and other data every half a day.

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

Inspection method: visual inspection and data comparison.

4) Check 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.

10.3 Regular Inspections

10.3.1 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:

- 1) Cooling tower spray pump suction filter, cleaning cycle is once a month.
- 2) The filter in the internal circulation pipeline of the pump unit liquid supply system has a cleaning cycle of once a month (or as needed).
- 3) 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:

- 1) Cut off the main power supply of the equipment.
- 2) Referring to **Figure 10-1**, close the maintenance butterfly valves in the system, open the drain ball valve below the pipeline filter component, and drain the local liquid in the pipeline.

A

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, approximately 10L of coolant is discharged. A 20L container needs to be prepared. The discharged coolant cannot be directly added to the water tank for reuse without treatment.

3) After finding the position of the filter, open the manual exhaust valve and manual drain valve, remove the clamp connection, and take out the pipeline filter element from the handle.

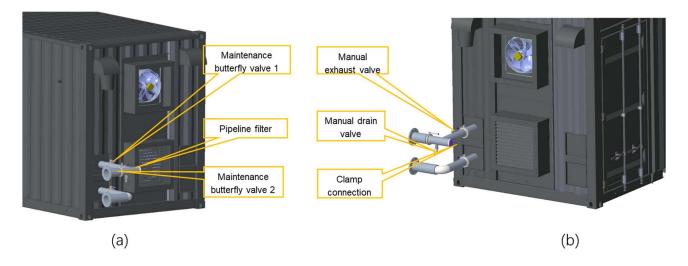


Figure 10-1 Location of butterfly valves and pipeline filters for pipeline maintenance

4) Remove and clean (or replace) the filter screen inside the filter. Reference

5)



Figure 10-2 Remove the pipeline filter

- 5) Install the cleaned filter screen, tighten the clamp with a wrench, and close the valve
- 6) After the equipment is powered on again, fill the system replenishment tank with coolant.



Caution

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

10.3.2 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.

10.3.3 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 liquid cooling system.



Caution

Daily operation checks need to pay attention to whether there is abnormal noise, abnormal readings, and system operation alarm information during system operation. Timely eliminate any abnormal situations.

10.3.4 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 is running with approximately 1500L of coolant. Please prepare sufficient storage capacity in advance for coolant discharge.

Operation Steps:

- a) Find the position of the discharge valve (Figure 10-3).
- b) Connect the drain hose to the drain ball valve and tighten it with a hose clamp; Guide the hose outside the equipment and open valve V202 (**Figure 10-3**) to drain the system.

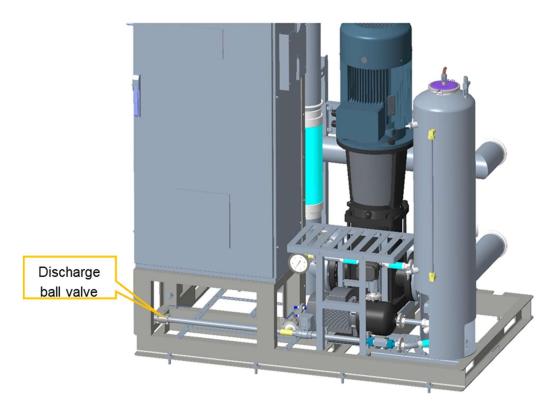


Figure 10-3 Location of discharge ball valve in pump station

10.3.5 Water Tank Level Inspection

The system monitors the liquid levels in two water tanks (inside the container and in the cooling tower). When the liquid 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 liquid 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 liquid 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).

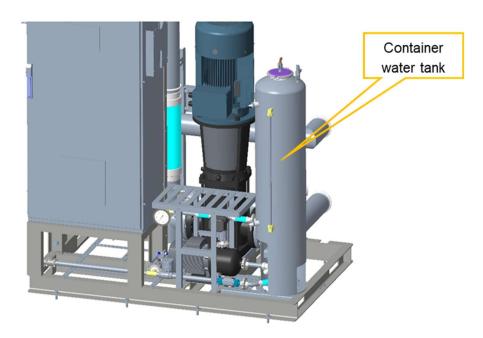


Figure 10-4 Container water tank

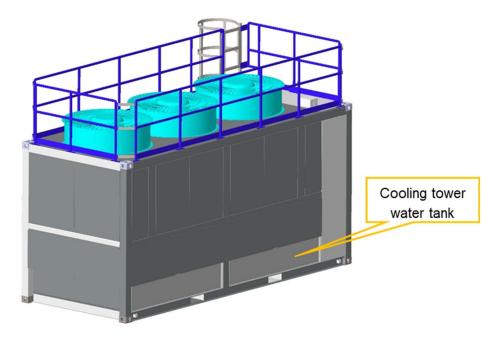


Figure 10-5 Cooling tower water tank

10.3.6 Maintenance Of Coolant

- 1) As the core unit of the container liquid cooling system, it is recommended to regularly track and record the coolant, at least once a year (PH value is tested every six months).
- 2) When purchasing coolant, it is necessary to focus on the relevant parameters in **Table 10-1**. If the requirements are not met, it is necessary to consider refilling and replacing the coolant as appropriate.
- 3) Regular testing of coolant focuses on PH value, and it is not recommended to use it 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).
- 4) The coolant needs to be regularly tested, paying attention to 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, as an increase indicates that contact corrosion has already occurred.
- 5) It is recommended to regularly add corrosion inhibitors according to the supplier's requirements to maintain the coolant.



Danger

Antifreeze must be configured strictly for the lowest possible ambient temperatures, and if it is not configured as required by the instructions

We are not responsible for the occurrence of ambient temperatures below the freezing point of the antifreeze, causing the heat exchanger to freeze and crack!

 Table 10-1
 Recommended standards for coolant testing

Items	Reference stand	Remarks	
Color	Significant color		Visual inspection
Exterior	No odor, sedimer	nt, or suspended solids	Visual inspection
Freezing point	<local minimum<="" td=""><td>m freezing temperature</td><td></td></local>	m freezing temperature	
Boiling point	108°C (low temp	erature type))	
PH value	7-9		
Reserve alkalinity	≥4ml (organic formula) ≥9ml (including inorganic formula)		
Total hardness	<120 mg/l		
	В	<20mg/kg	
	Si	<20mg/kg	
Main element content	P	<20mg/kg	
	Mo	<20mg/kg	
	Ca	<20mg/kg	

Items	Reference standards		Remarks
	A13+	<50mg/L	
	Fe2+	<50mg/L	
	Cu2+	<50mg/L	

 Table 10-2
 Glycol Refrigerant Concentration vs. Freezing and Boiling Points

Glycol conce		
Mass concentration %	Volume concentration %	Freezing point °C
0.0	0.0	0.0
5.0	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 10-3
 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	<5ppm	TC9.9/Intel 632983			
Bacterial community	<100 CFUs/ml	TC9.9/Intel 632983			
Total hardness (as CaCO3)	<20ppm	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 understa		

Index	Deionized water	Reference standards	Remarks
			the reasons behind the sharp increase in conductivity trend during circuit operation.
Residues after evaporation	50ppm	TC9.9/Intel 632983	
Turbidity	<20 NTU	TC9.9/Intel 632983	
Iron content	0.1ppm	Industry standards	
Copper content	10ppb	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	

Note 1:

Table 10-1 Recommended standards for coolant testing is for the working environment temperature is below 0 °C working conditions need to use the media requirements, if the working environment temperature is higher than 0 °C for a long time, you can use deionized water / pure water as the secondary side of the internal circulation medium, corresponding to the media requirements see **Table 10-3** Recommended standards for deionized water.

Note 2:

To ensure long-term reliable operation, when using deionized water/or purified water as the internal circulation medium, it is necessary to replace the internal coolant every 1-2 months.



Danger

When using deionized water as the internal circulation medium, please strictly follow the use of greater than 0 °C in order to use the environment, otherwise, below the freezing point, accidental power outages will lead to the system's internal pipeline icing, resulting in pipe blowout.

The use of deionized water/pure water must be tested regularly for coolant pH, conductivity and related index parameters and recorded, and when it exceeds the requirements of Table 10-3 or changes abnormally, it must be replaced with new deionized water/pure water that meets the requirements in a timely manner.

10.3.7 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:

1) 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 2) 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 at least twice a year, and the specific situation should be increased according to the local water quality situation of the project.

Table 10-4 Recommended standards for spray water

Cooling Water Quality					
T4			Reference value	Inclination	
Items		Reference value	Corrosion	Scaling	
Benchmark items	PH (25°C)	uS/cm	6.5~8.0	О	О
	Conductivity (25°C)		<800	О	О
	Cl-	mg(Cl-)/L	<200	О	
	SO2-	mg(SO2-)/L	<200	О	
	Acid consumption (Ph=4.8)	mg(CaCO3)/L	<100		О
	Full hardness	mg(CaCO3)/L	<200		О
Reference items	Fe	mg(Fe-)/L	<1.0	О	О
	S2-	mg(S2-)/L	Not allowed to be detected	О	
	NH+	mg(NH+)/L	<1.0	О	
	SiO2	mg(SiO2)/L	<50		О
Note: O represents factors related to corrosion or scaling tendency.					

- 3) 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;

- 7) Flammable materials such as fillers and water collectors are strictly prohibited from coming into contact with open flames during use or maintenance;
- 8) 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;
- 9) 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;
- 10) PVC fillers should be washed regularly and should not be operated under conditions where the cooling water temperature is higher than 50°C.



Warning

When the system is running, if the water temperature is significantly higher than the set value, please check the cooling tower coil for severe scaling, which affects the performance of the cooling tower. The cooling tower tray needs to be descaled.

10.3.8 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 efficiency.

For the three-phase asynchronous motor supporting the water pump of water-cooled container products, the maintenance of the motor bearings can be carried out according to this instruction.

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

 Table 10-5
 Bearing model

Model	Bearing	Quantity	Lubrication oil addition cycle		Conservated
Model			2P	4P	Grease model
160	DE:7309B	17	20001-	5400h	Polyrex EM
160	NDE:6309ZC3	1/	2000h		



Danger

This system uses a 2P main pump, so the lubrication oil addition cycle is 2000 hours. After continuous operation for about 83 days, bearing grease must be added or 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;

Attention: If different grades of lubricating grease are mixed, the consistency will change greatly. It is prohibited to mix different grades of lubricating grease. If other brands of grease are to be used, the motor bearings must be removed and the original grease cleaned, otherwise there is a risk of burning the motor bearings.

11 ANTSPACE HK3V6 Container Liquid Cooling System Safety

Instructions



Danger

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

(1) 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.

- (2) 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 0.3 Ω , otherwise there may be a dangerous situation that may cause personal injury or death.
- (3) 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.
- (4) Before starting the machine, be sure to check if the valve (if present) is open.
- (5) 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;

11.3 Attention

- 1. Non professional authorized personnel are prohibited from opening the door of the distribution cabinet
- 2. 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.