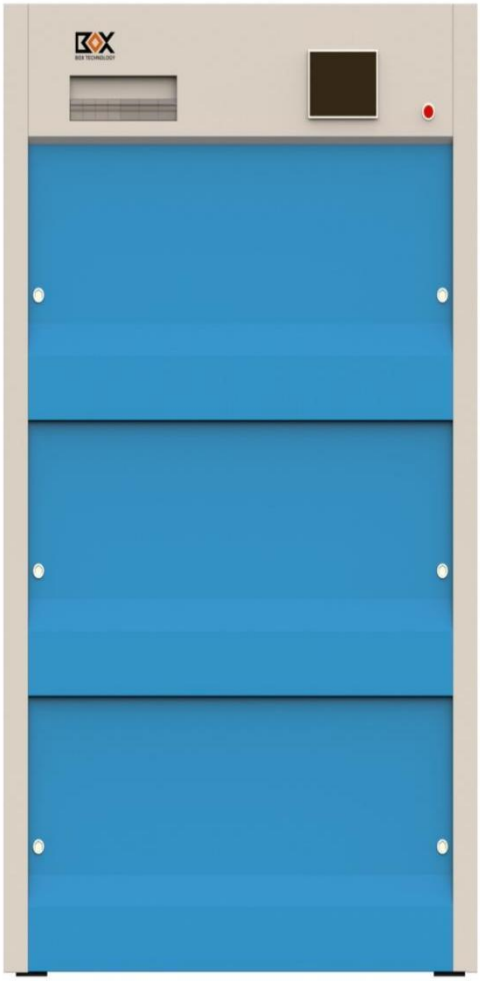
Instructions

of

DTC-120-D2 Immersion Liquid Cooling Box



I. Introduction

Name: 120KW Immersion Liquid Cooling Box

Order quantity (MOQ): 1

Dimension: 107*132.5*214cm

Inner dimension: 85.7*73.7*48.4cm

Packaged size: 116*160*220cm

Net weight: 610kg

Packaged weight: 690kg

Parameters: Take S19 series as an example, 24 sets can be cooled in 120KW in terms of their size and power.

Major switch capacity: 189A

Rated current: 167A

Input voltage: 380V~415V AC 50/60HZ

Working power (excluding servers): 1.2KW

Max operating power: 121.2KW

Oil amount: 825 L(without miners), 540L (24 miners running)

Installation cables at least should be:

415V: copper cable 70mm²; aluminum cable 95mm²

380V: copper cable 70mm²; aluminum cable 95mm²

Email:

Tel:

1. Immersion Liquid Cooling Technology

The load of servers is required to get increasingly demanding with scale of dater centers growing and raising number of rigs deployed, thus making it no longer possible to meet the cooling requirement of a data center by the traditional air cooling technology. To solve the problem, plenty of enterprises have introduced the immersion liquid cooling technology into their data centers.

This technology is having severs immersed in the liquid cooling box where a certain amount of coolant is poured. The built-in pump drives the cooling liquid to circulate in the box and it is transferred to one end of the water sink by the heat from running miners to exchange heat with circulating water. And then the cooled liquid flows back into the box to absorb the heat of servers. The whole process repeats again and again.

The technology simplifies the cooling process of a data center, greatly decreasing the operating costs.

2. Liquid Cooling Box

With quality coolant, heat exchanging becomes more efficient and safer. With a brazed plate heat exchanger, the whole machine runs more efficiently and reliably. With a famous brand circulation pump, breakdown is reduced to ensure the box works well. With a visible man-machine interaction interface, it is easy for users to operate the equipment. Besides, users are able to download a cellphone app to remotely monitor its operation.

The production materials include 304 stainless steel. Joint welding ensures the machine to be stable in operation and corrosion-resistant, and have no oil leakage.

3. Workable Places

The box has no special environmental requirements, which works at any sites, especially a best choice for places where people want to be quiet and flexible in position.

4. Parameters

Item	Name	Unit	Qty
Box Frame	Cooling pool	Piece	3
	Cooling pool frame	Piece	1
	Cover	Piece	3
	Primary filter	Piece	6
Electrical Control System	PDU	Piece	6
	Thermal overload relay	Piece	3
	AC contactor (water pump)	Piece	3
	AC contactor (PDU)	Piece	3
	Circuit breaker	Piece	7
	Insulated cable	m	20
	PLC	Piece	1
	Man-machine interface	Piece	1
Cooling System	Brazed plate heat exchanger	Piece	3
	Circulation pump	Piece	3
	Secondary filter	Piece	3
Network System	Network cable	m	75
	Switch board	Piece	2
	Registered Jack	Piece	24
Remarks	**Configuration is adjustable based on customers' needs.**		

II. Key Advantages

1. **Close to mute state**

With miners completely immersed in cooling liquid, noise is extremely low. Liquid cooling is considerably better in noise reduction than air cooling.

2. Effective overclocking

Miners can get a 40%-60% overclocking.

3. Energy saving and environmental protection

Immersion cooling technology can dissipate 80-90% of server heat, tremendously reducing the energy consumption. PUE is low to 1.2. This betters working environment and temperature for the CPU and memory.

4. Stable performance and longer life service

The immersion liquid cooling technology is better in heat dissipation. The environment of no noise, zero dust, less breakdown and static damage prolongs the life of the server.

5. Modular design

The modular design makes it possible for various combination.

6. Waste heat recycling

With the help of waste heat recovery technology, heat generated from the data center can be recycled in an efficient manner, like heat supply, hot water supply, and making profits by heat supply, etc.

III. Structure

IV. Installation Notes

1. Confirm and adjust the position of individual machine according to the diagram;
2. Connect circuits in line with the specifications;
3. Connect the waterway to the main pipe road based on the specifications, and make sure there is no water leakage;
4. Place in servers to get access to network and power, and make sure they are well-connected;
5. Pour cooling oil into the box, and ensure there is no leakage and overflow;
6. Connect the whole system and start commission.

V. Key Components

1. Brazed plate heat exchanger

Working principle: Its heat exchanging area is offered by a thin corrugated metal plate under stamping force. With fluid going into passages between plates through the sophisticated connectors, the cooling medium and heating medium flow backward all the way inside adjacent channels to exchange heat. Both media fail to flow out of the machine due to welded edges.

Besides, the exchanger's plates are welded at the connection so as to bear pressure from the media.

Advantages: Compared with the traditional exchanger of soldering and brazing, the plate-type heat exchanger is more efficient in exchanging heat. The compact structure makes it easy for users to make an installation in any limited space and reduces parts for the whole system, thus benefiting customers most by saving operation costs.

2. Canned pump

Advantages:

(1) Reliable safety

The design of one seal ring for both stator and rotor makes them have no chance to reach any materials. No risk of leakage will happen even if seal rings get damaged.

(2) Complete seal.

No dynamic seal on the structure but static seal only on the pump makes it impossible to incur any leakage. Such a pump is designed for transportation of inflammable, explosive, valuable, poisonous, erosive and radioactive liquids.

(3) Compact structure covering less area.

Removal and assembly have no need of finding the center with the pump and motor as a whole unit. No high requirements are asked for the base and foundation. And users don't have to spend much time on daily maintenance, reducing expenses therefrom.

(4) Stable operation, low noise, no demand for lubricating oil. The design without the rotating bearing and motorized fans makes it unnecessary to add any lubricant, decreasing noise.

(5) Wide application. It works under circumstances like high temperature and pressure, and vice verse.

3. Electric control system:

PLC, cellphone APP and liquid crystal display (LCD).

Advantages:

(1) WIFI access is in option.

(2) LCD makes the display clearer and more complete.

(3) Touch buttons offer users massive convenience in settings. More easily, customers can operate it through an APP on cellphone under the mode of WIFI.

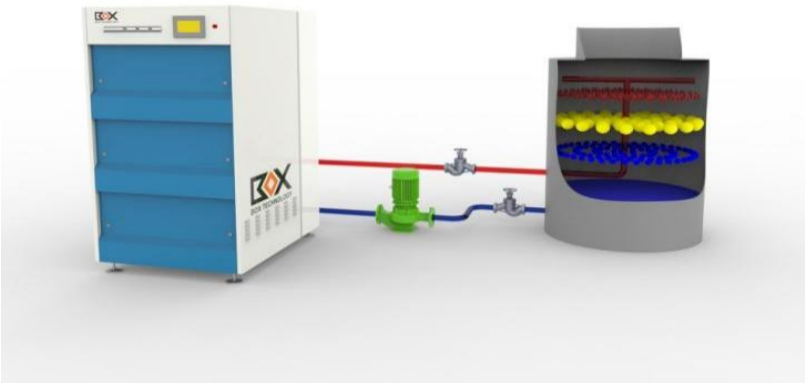
(4) Simple installation and commission, high cost performance. It is equipped with an alarm of super-high temperature to monitor and control liquid levels and temperature on a real-time basis.

(5) With the protection devices of electricity leakage, the system provides reliable and efficient technical support for equipment protection and personal safety.

VI. Common Failures and Solutions

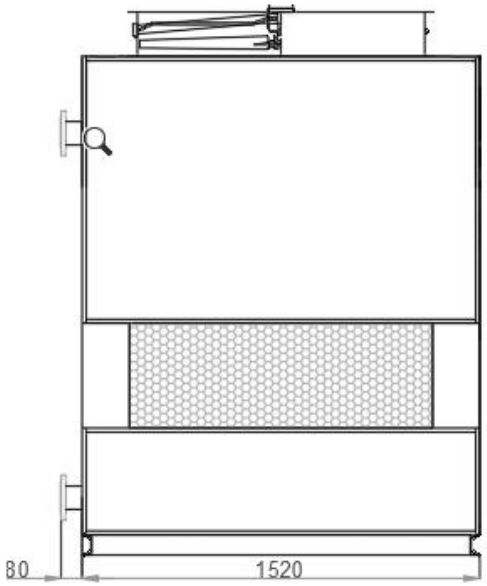
Failures	Causes	Solutions
1. Pump does not work	a. In/out valve is not opened; and pipe and flow channel impeller are blocked. b. The motor runs in a wrong direction, operating slowly due to phase missing.	a. Remove the blockage, and open the valve. b. Adjust and tighten motor wire connection. Check and make sure the whole equipment is wired.
2. Pump produces noise and vibration	a. Pipe line support problems b. Scratching c. Unstable voltage	a. Fix pipe lines b. Check and solve the problem c. Stabilize voltage
3. Water/oil leakage	a. Water leakage b. Oil leakage	a. Check connectors, tighten welded joints or re-weld the place where it is needed. b. Ditto

Cooling Tower Parameters, Installation and Maintenance



I. Parameters

Cooling Tower Parameters Sheet	
Dimension mm	1600*1440*2200
Water m^3/h	40
Draught fan capacity KW	1.5
Fluid	Purified water
Water quality (PH)	6.8～7.5
Water entering pipe diameter	DN80
Water exiting pipe diameter	DN80
Drainage pipe diameter	DN40
Overflow pipe diameter	DN40
Automatic water replenishing pipe diameter of floating ball	DN25
Above-said parameters are adjustable based on local ambient conditions and customers' needs.	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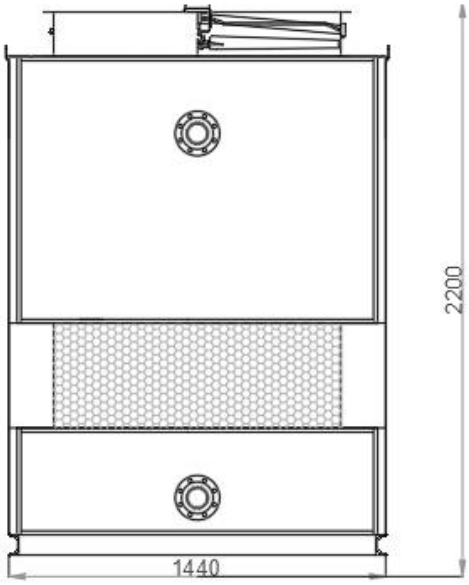
1520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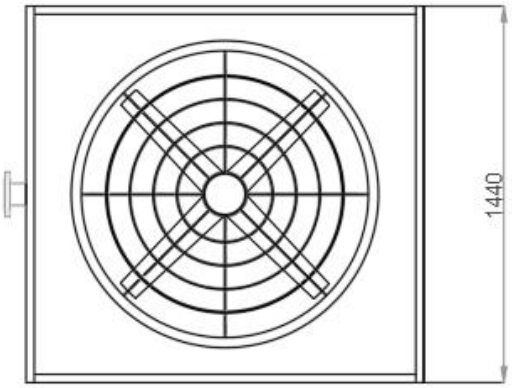
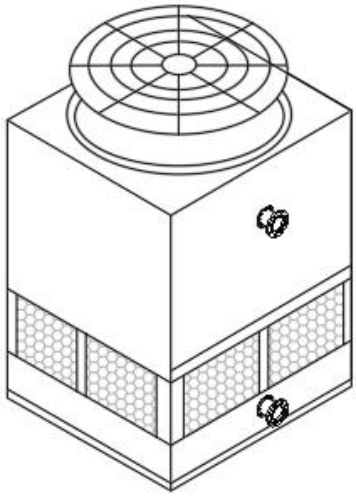

1440



II. Installation Instructions

1. The place where the cooling tower is placed should be well-ventilated, and free from building effects, dusts and hot current.
2. No oxygen fuel gas welding, electric welding and other open fires are allowed on the top of cooling tower, so as to avoid fires.
3. The elevation of each side is required to be aligned, with the elevation error no greater than 10mm.
4. Each component must have screw bolts connected, especially the driving components (fan, motor and rotating distributor), and each and every one of them must be fastened.
5. The installed motor's connecting the power requires the leading wire of the automatic motor wiring box to be hung as a U-shape, to prevent rains from entering the box along with power wire. The hole of exiting wire has to be sealed.
6. The oil level of reducer needs to be normal. And its belt should be tight.
7. The fan blades must be flexible in rotation, with no collision.
8. Draught fan rotation should be clockwise when looked down from the tower top, with air drawing up.

III. Matters Needing Attention

1. Inlet & outlet pipe lines and water pool need completely washing before use, to clean off wastes inside the tower and prevent the pipe from blockage.
2. Water from rivers or water with impurity substances is not allowed to pour into the cooling tower, which is more likely to block pipe and heat exchanger.
3. Users are required to add softening agent to tap water based on its quality, so as to prevent pipe from blockage owing to scale formation.

4. Open the water valve when the draught fan is running. And regulate pump flow amount, entering voltage, electric current, voltage, vibration and noise value according to the specifications.

5. Circulating water should come from tap water or clean water, without oil stains and impurities. And its turbidity is banned from exceeding 50mmg/.

6. As a key cooling device, the cooling tower should be taken care by a person who has duties to record in/out water temperature, flow amount, and meteorological parameters.

V. Maintenance

1. Power cutting is necessary before maintenance, with a person checking electric brake to prevent accidents.

2. Once-a-year examination and maintenance is essential for the tower.

3. Motor also should be maintained.

4. Filling materials inside the tower should be cleaned if scales are more enough, or it decreases cooling efficiency.

5. Anti-rusting paints should be applied to steel holders inside the tower if necessary, which prolongs the service life.

6. The water tower should be covered by a piece of oilcloth in case of long-time no use, to stop dirty things from entry and inner filling materials from aging.

V. Real Product Pictures

V. Operational Manual

Ⅰ. To power up the system: turn on all the 7 micro circuit breakers (MCB) on the front panel of the equipment, shown as follows:

(1) “Power 1” circuit breaker: general power supply for severs in the first drawer.

(2) “Power 2” circuit breaker: general power supply for severs in the second drawer.

(3) “Power 3” circuit breaker: general power supply for severs in the third drawer.

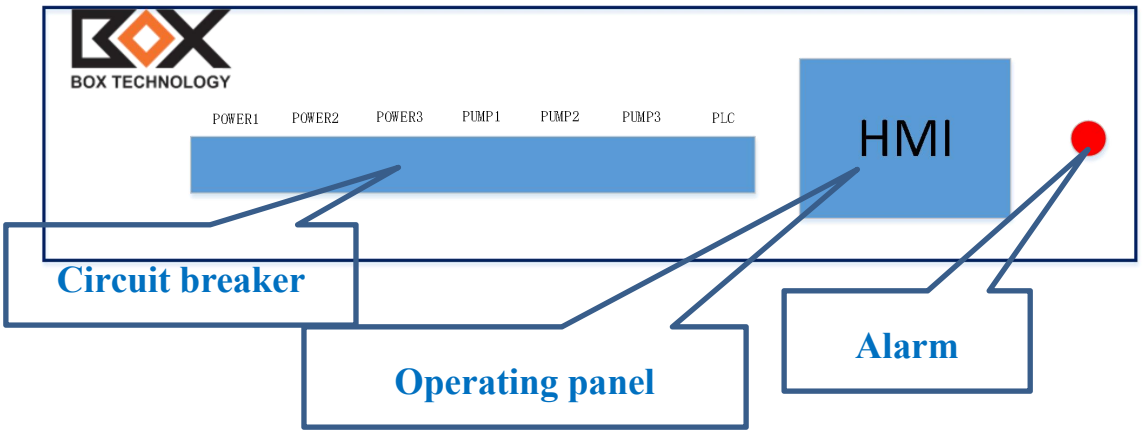
(4) “Pump 1” circuit breaker: power supply for circulating pump of the first drawer.

(5) “Pump 2” circuit breaker: power supply for circulating pump of the second drawer.

(6) “Pump 3” circuit breaker: power supply for circulating pump of the third drawer.

(7) “PLC” circuit breaker: general power supply for the control loop of the machine.

Note: Do not manually cut off the power supply while the box is in operation. Turn off all circuit breakers if it needs to be idle for a long time.



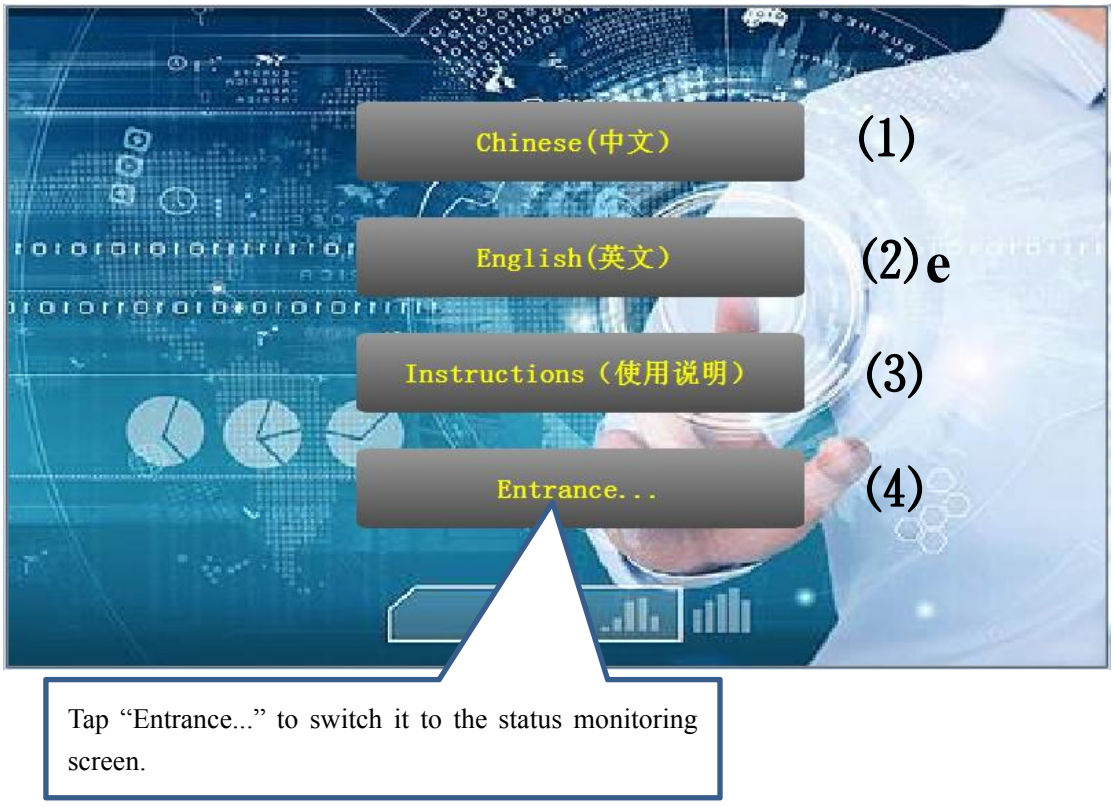
Ⅱ. Initial screen: the touch screen will enter the initial screen when the system is powered on.This screen includes 4 buttons:

(1) Chinese button: tap to switch the language to Chinese.

(2) English button: tap to switch the language to English.

(3) The Instructions button: tap and enter the “Instructions” screen.

⑷ System entry button: enter the “status monitoring” screen by tapping. As it is shown in the picture below:



After the system enters, users will see four screen settings, with their switching buttons set as: ① “status monitoring”, ② “parameter setting”, ③ “alarm browsing” and ④ “initial screen”. Switch to the screen you want by tapping the corresponding button.

III. Status monitoring screen: showing temperature and system running status, as well as starting or shutting down the system (users are required to make sure the displayed temperature is normal before starting the system). Refer to the picture below:

1. Temperature display:

① “Environmental temperature”: displaying the external temperature.

② “1# temperature”: displaying the internal temperature of the first drawer.

③ “2# temperature”: displaying the internal temperature of the second drawer.

④ “3# temperature”: displaying the internal temperature of the third drawer.

2. Starting or stopping operation of the system:

(1) “1# start” button: tap this button to start the first drawer.

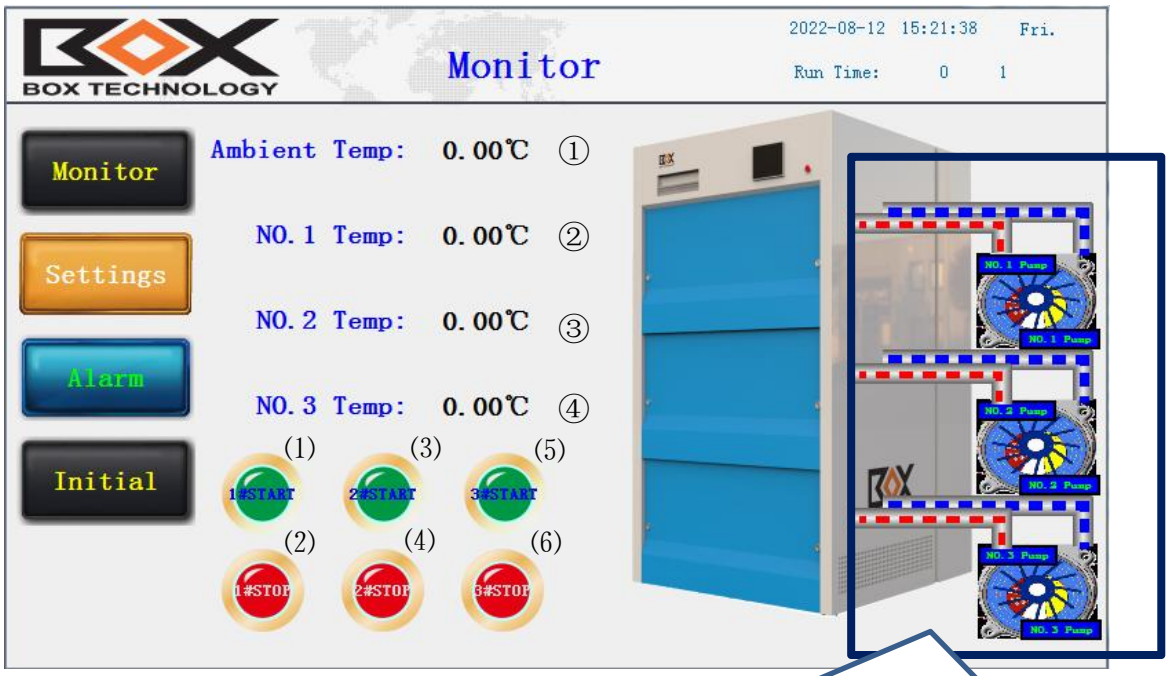
(2) “1# stop” button: tap this button to shut down the first drawer.

(3) “2# start” button: tap this button to start the second drawer.

(4) “2# stop” button: tap this button to shut down the second drawer.

(5) “3# start” button: tap this button to start the third drawer.

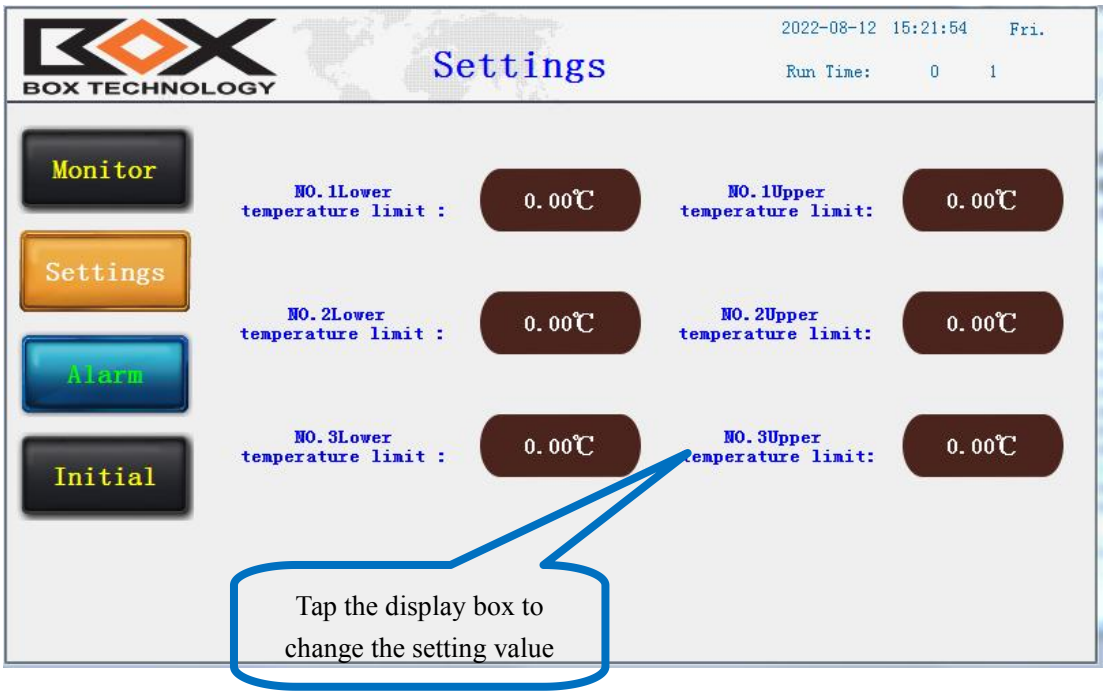
(6) “3# stop” button: tap this button to shut down the third drawer.



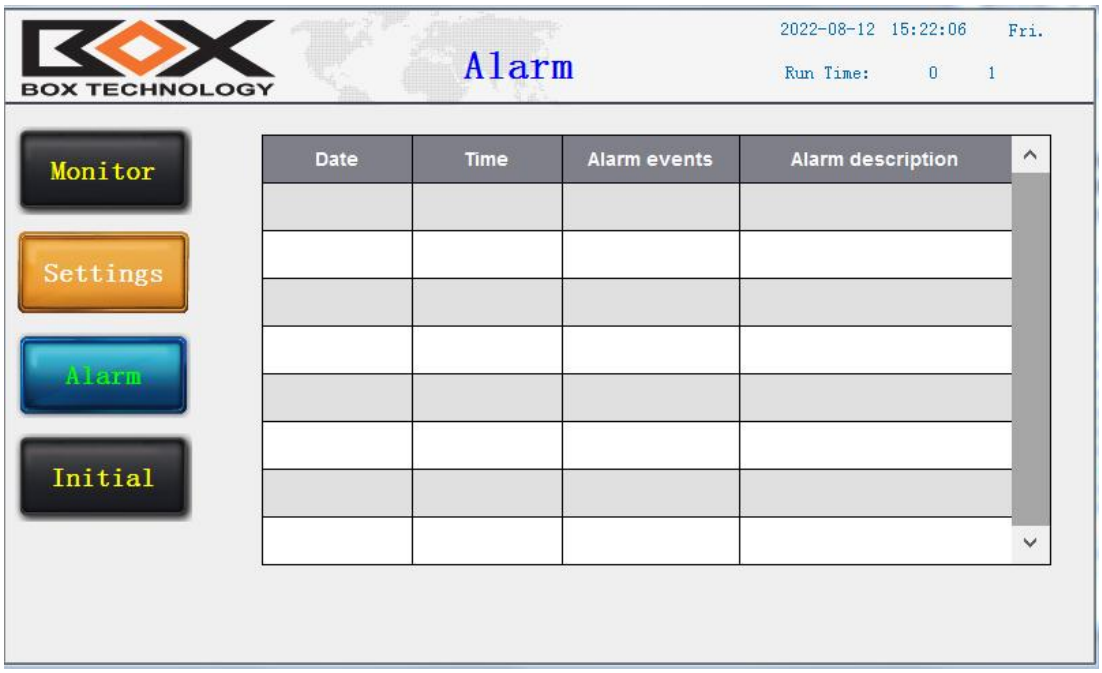
This frame shows part of the operating status indicator of the circulation pump. The pump's dynamic diagram and the pipeline fluid flowing are displayed while the circulation pump is running

Ⅳ. Parameter setting screen: where the lower and upper temperature limits of cooling box are set, shown in the picture below:

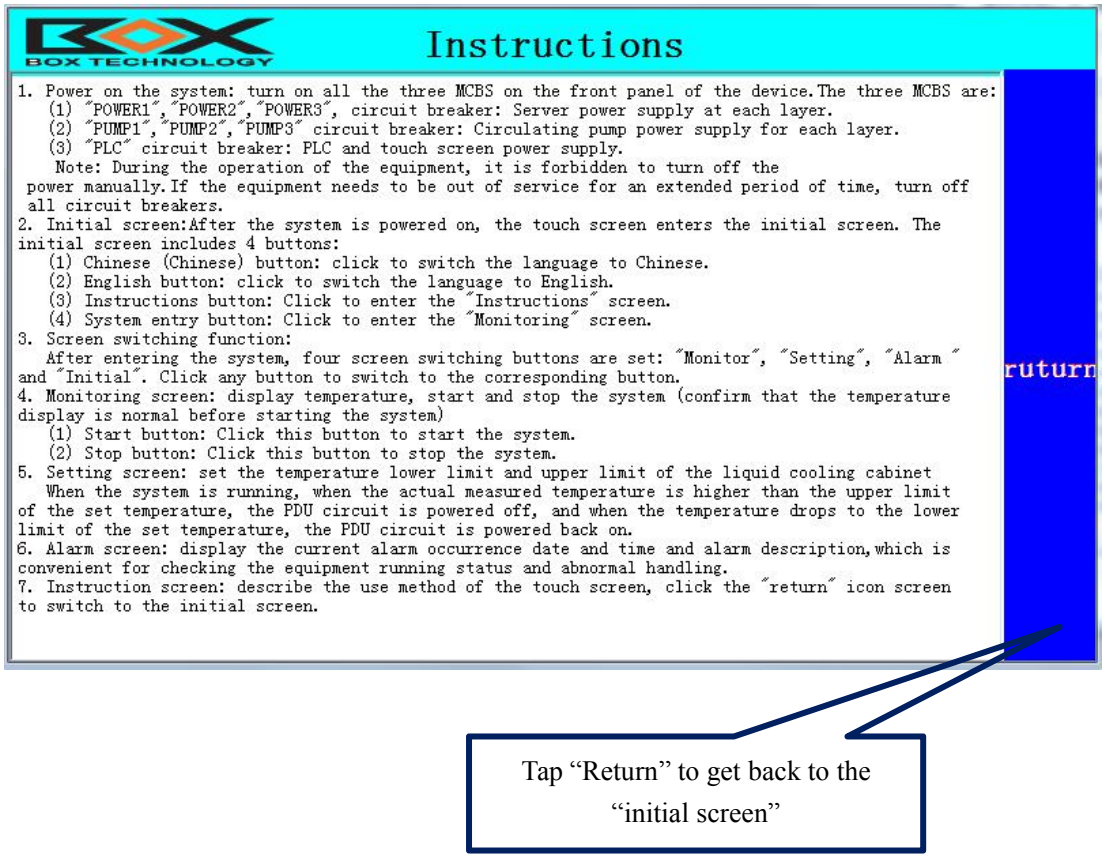
When the system is running, and the actual measured temperature is higher than the upper limit of the set temperature, the PDU circuit is powered off. It is powered back on when the temperature is below the lower limit.



IV. Alarm browsing screen: displaying the time in which the current alarm took place and alarm description, which makes it easy for users to check the running status and exception handling. As it is shown in the picture below.



Ⅵ. Instructions screen: telling how to use the touch screen. Tap “back” to switch to the initial screen.



Ⅶ. PDU Operating Instructions

1. It is a must for servers to be connected to the plug-bars in its own drawer. Connecting to that in other drawers is not allowed.

2. The three-phase load distribution should be even. The difference between the quantity of servers in each phase is ≦1.

3. The recommended way of plugging (as shown in the diagram below, the access sequence of single power server at full load (24 severs)

Access in order: Drawer 1 ⟹ Drawer 2 ⟹ Drawer 3. The access rules for each drawer are as follows:

Drawer 1: Access from phase A, and plug in successively according to the phase sequence: A⟹B⟹C⟹A.

Drawer 2: Start with which phase of this drawer is determined by the last phase of drawer 1:

① The last phase of the first drawer is A, then here start with phase B, namely, A ⟹ B⟹C ⟹ A.

② The last phase of the first drawer is B, then here start with phase C, namely, A ➡ B ➡ C ➡ A

③ The last phase of the first drawer is C, then here start with phase A, namely, A ➡ B ➡ C ➡ A

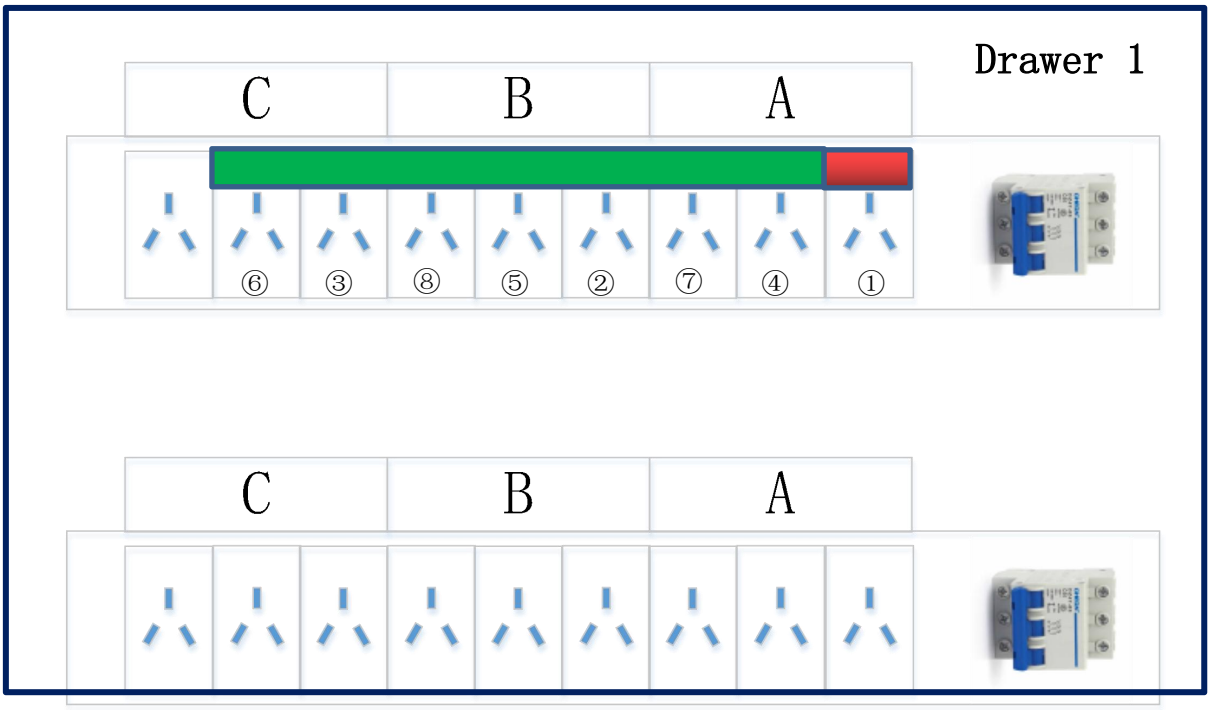
Drawer 3: Start with which phase of this drawer is determined by the last phase of drawer 2:

① The last phase of the second drawer is A, then here start with phase B, namely, A ➡ B ➡ C ➡ A.

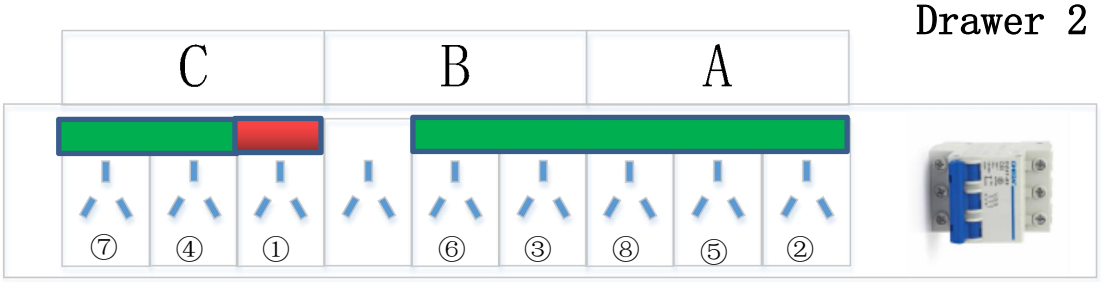
② The last phase of the first drawer is B, then here start with phase C, namely, A ➡ B ➡ C ➡ A

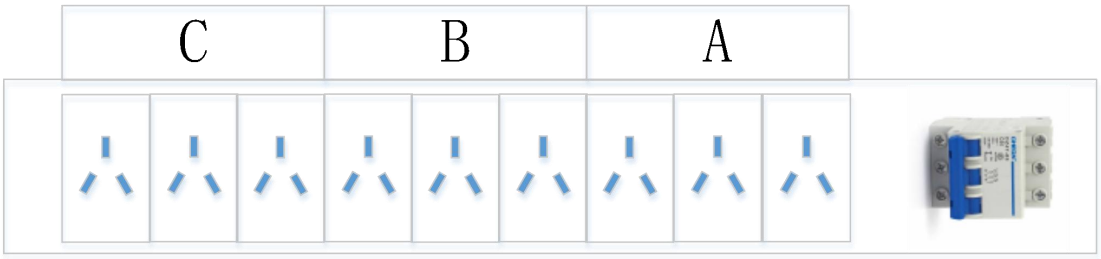
③ The last phase of the first drawer is C, then here start with phase A, namely, A ➡ B ➡ C ➡ A

：The initial phase **Numerical order: plugging sequence**



Drawer 2





Drawer 3