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Liebert® DM Chilled Water Series

User Manual

EMERSON
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LIEBERT_DM Chilled Water Series Cooling Unit

User Manual

Version: V1.0
Revision date: Nov. 03, 2012
ROM: 31012828

Emerson Network Power provides customers with technical support. Users may contact the nearest Emerson local sales office or service center.

Emerson Network Power Co., Ltd.
Address: No.1 Kefa Rd., Science & Industry Park, Nanshan District 518057, Shenzhen China
Homepage: www.emersonnetworkpower.com.cn
E-mail: support@emersonnetwork.com.cn

Contents

Chapter 1 Overview

This chapter mainly introduces the model description, product profile, main parts, optional parts and environment requirement of Liebert_DM chilled water series cooling unit.

1.1 Model description

The model description of Liebert_DM chilled water series cooling unit is as shown in Fig. 1-1

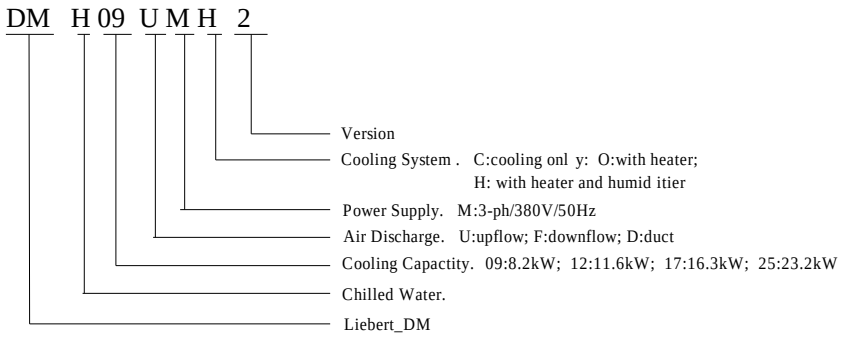


Fig.1- 1 Model description

1.2 Product introduction

The Liebert_DM chilled water series cooling unit is a small precise environment control system. It is especially designed for the cooling of electronic equipment and applicable to the environment control of equipment room or computer room. It is highly reliable and able to provide a proper running environment for the precision equipment, such as sensitive equipment, industry process equipment, communication equipment and computer.

The Liebert_DM chilled water series cooling unit is equipped with microprocessor and able to automatically switch functions according to the setting values of the program and the indoor environment conditions.

1.3 Key parts

The unit is composed of such key parts as chilled water coil, fan, microprocessor, screen and water flow regulating valve. For the optional parts, please refer to 1.4 Options.

Chilled water coil

Fin type heat exchanger is adopted. The chilled water coil is designed and verified for specific models to ensure the distribution evenness of chilled water in all the loops and maximize the heat exchange efficiency.

Fan

Centrifugal fan of high efficiency and high reliability is adopted, which features large blast volume, long air supply distance, direct drive and convenient maintenance.

Microprocessor

User interface of simple operation is provided. Multi-level password protection, auto power recovery, high/low voltage protection and phase loss protection are provided. Expert level failure diagnosis system is configured to automatically display the failure contents and facilitate the equipment maintenance by the service personnel.

Water flow regulating valve

The water flow regulating valve can regulate the chilled water flow according to the cooling demand. The water flow regulating valve adopts union swivel for the connection with the system pipes, which is convenient for the onsite installation and maintenance.

Filter

High polymer dust absorption filtering material is adopted. It has compact structure and is easy for maintenance.

1.4 Options

1.4.1 Remote monitor

The Liebert_DM chilled water series cooling unit adopts the standard protocols of Ministry of Information Industry. For details, please refer to Centralized Power Equipment, Air Conditioning and Environment Monitoring and Management System for Communication Stations, Part III: Protocol for Front-end Intelligent Equipment. It realizes the communication with the host computer through the RS485 port and is controlled by the host software. For details about the monitoring software of Emerson, SiteMonitor, please refer to Appendix IV Introduction to SiteMonitor Monitoring Software.

1.4.2 Energy-saving card

The Liebert_DM chilled water series cooling unit adopts external energy-saving card to monitor the maximum temperature in the room. The energy-saving card is deployed in the place with large thermal load and high temperature. This cooling unit can be equipped with up to 4 energy-saving cards. When the temperature values measured by all the energy-saving cards are lower than the setting value of “sleep temperature”, and only the internal fan needs to run, if “sleep mode” is set as “enabled”, the cooling unit will shut down the internal fan and enter the sleep mode, so as to realize energy efficiency.

1.5 Environmental requirement

1.5.1 Operating environment

The operating environment shall meet the standards of GB4798.3-90. For details, please refer to Table 1-1.

Table 1-1 Requirement of operating environment

Item	Requirement
Installation	Vertical installation, with the installation base ≥150mm
Ambient temperature	Indoor temperature: 4ºC~40ºC Chilled water inlet temperature: 5ºC~12ºC
altitude	<1000m, derated when it is more than 1000m
Operating voltage range	3N~380V (-15%~+20%) , 50Hz

1.5.2 Storage environment

The storage environment shall meet the standards of GB4798.3-1996. For details, please refer to Table 1-2.

Table 1-2 Requirement of storage environment

Item	Requirement
Storage environment	Indoor, clean (free of dust)
Ambient humidity	5%RH~85%RH
Ambient temperature	-20ºC~+54ºC
Storage time	No more than 6 months in total (transportation plus storage), performance needs to be reevaluated after 6 months

Chapter 2 Mechanical Installation

This chapter will describe the mechanical installation of the Liebert_DM chilled water series cooling unit in detail, including unpacking inspection, unit installation and pipe installation.

2.1 Unpacking inspection

Move the equipment to the place closest to the final installation site before unpacking.

In case any loss or damage of any parts is discovered during inspection, the same shall be reported to the carrier immediately. Concealed damages noted shall also be reported to the carrier and the local office of the goods supplier. Please do not accept the damaged equipment.

2.2 Installation precaution

1. The Liebert_DM chilled water series cooling unit adopts standalone installation mode. The unit must be installed on the ground of the equipment room or computer room.

2. Before installing the equipment, check if the installation environment meets the relevant requirements as specified in 1.5 Environmental Requirement. And check if the building needs to be reformed for the pipe laying, wiring and ventilation pipe mounting.

3. Install the equipment strictly according to the design drawing, and reserve corresponding installation/maintenance space. Please refer to the engineering dimensions provided by the manufacturer.

2.3 System installation layout

2.3.1 General layout

The general layout of the system is as shown in Fig.2-1.

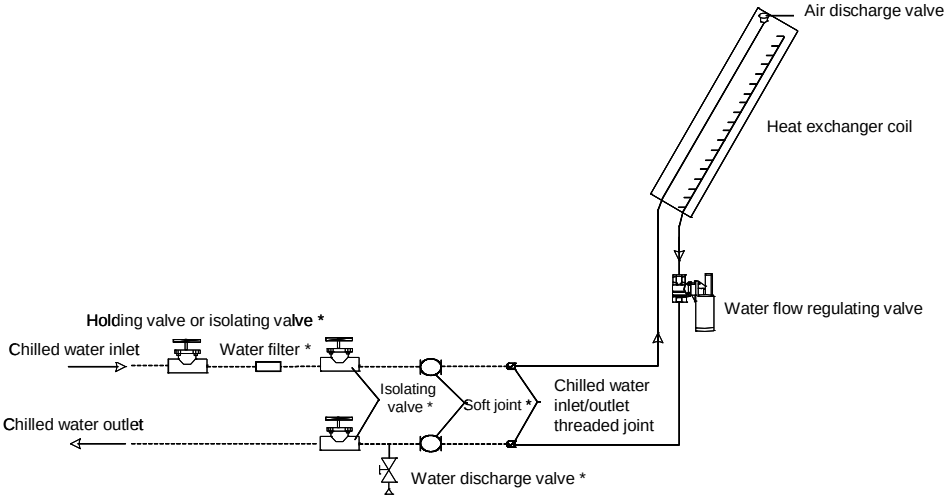


Fig.2-1 General layout diagram

Note

1. ———————— : Pipeline provided by the manufacturer.

2. — ·— — — — : Pipeline laid onsite (by the technical staff)

3.*: These components are not provided by Emerson Network Power Co., Ltd, but they are recommended to be used for the normal operation of the system and maintenance.

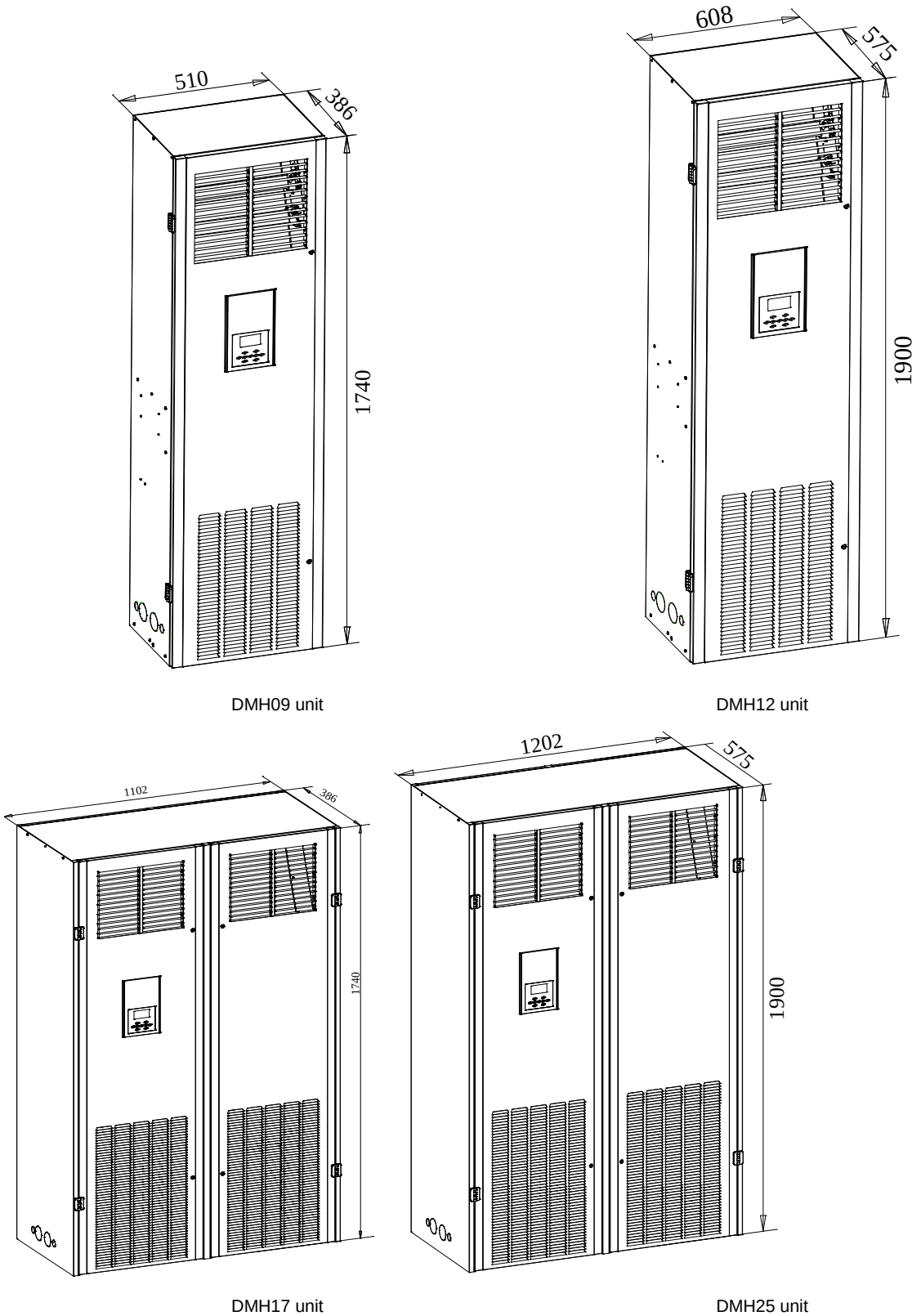
4. After finishing the installation, air discharge must be carried out before pouring water so as to ensure the heat transfer effect of the heat exchanger.

5. In winter in the northern region, the air conditioning unit must be emptied of water to prevent frosting the heat exchanger if it will be idle for a long time.

2.3.2 Mechanical parameters

Dimensions (mm)

For the mechanical parameters of the unit, please refer to Fig.2-2 and Table 2-1.



DMH09 unit

DMH12 unit

DMH17 unit

DMH25 unit

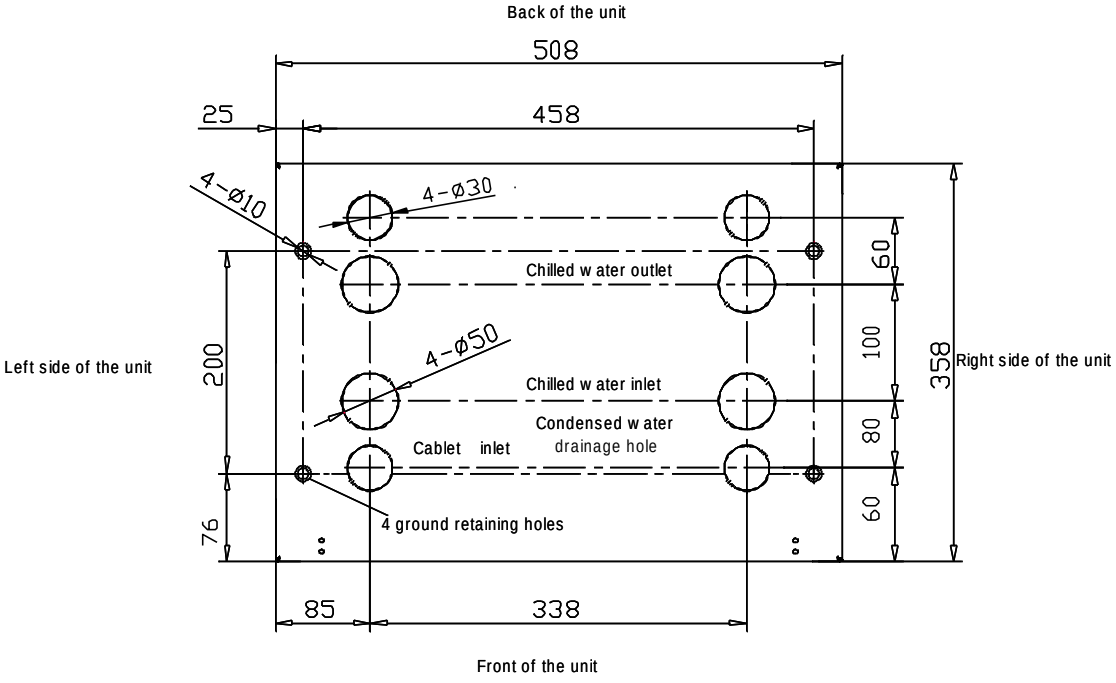
Fig.2-2 Outline dimensions of the units (unit: mm)

Table 2-1 Outline dimensions and weights of the units

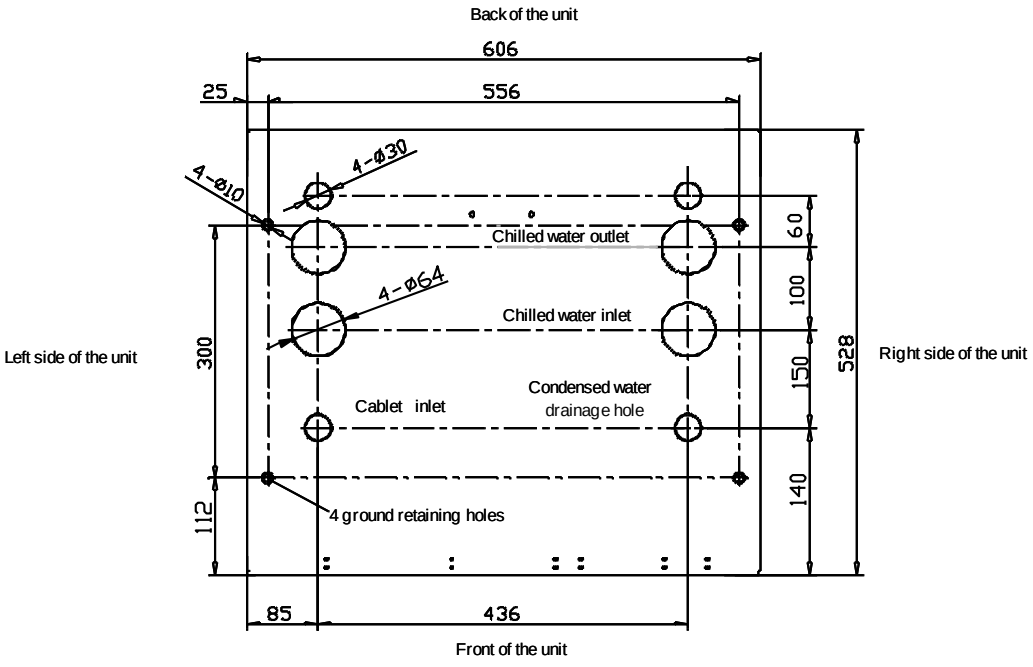
Product model	Size (W×D×H) (mm)	Net Weight (kg)
DMH09	510×386×1740	≤90
DMH12	608×575×1900	≤127
DMH17	1102×386×1740	≤169
DMH25	1202×575×1900	≤210

Base cutting position and dimensions

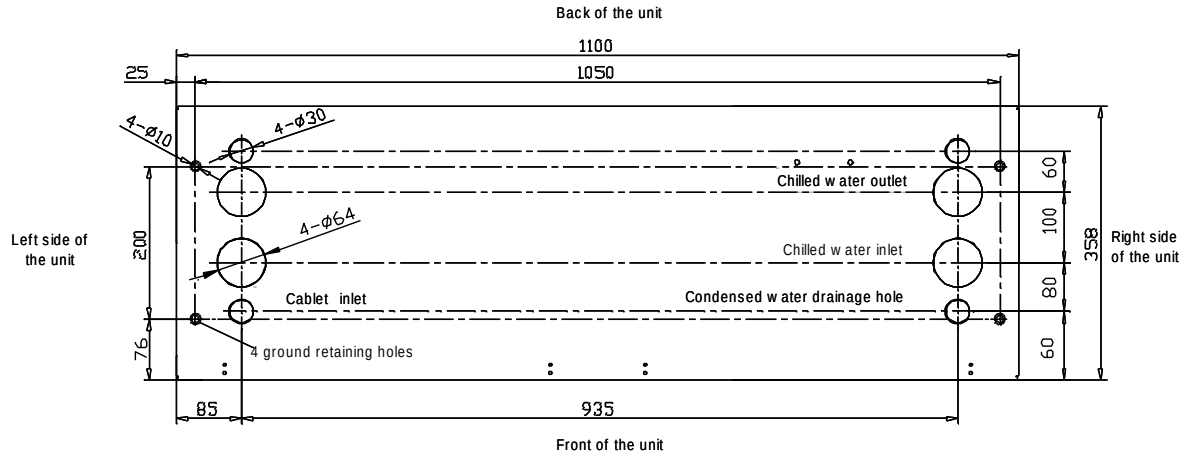
The base cutting position and dimensions are as shown in Fig.2-3.



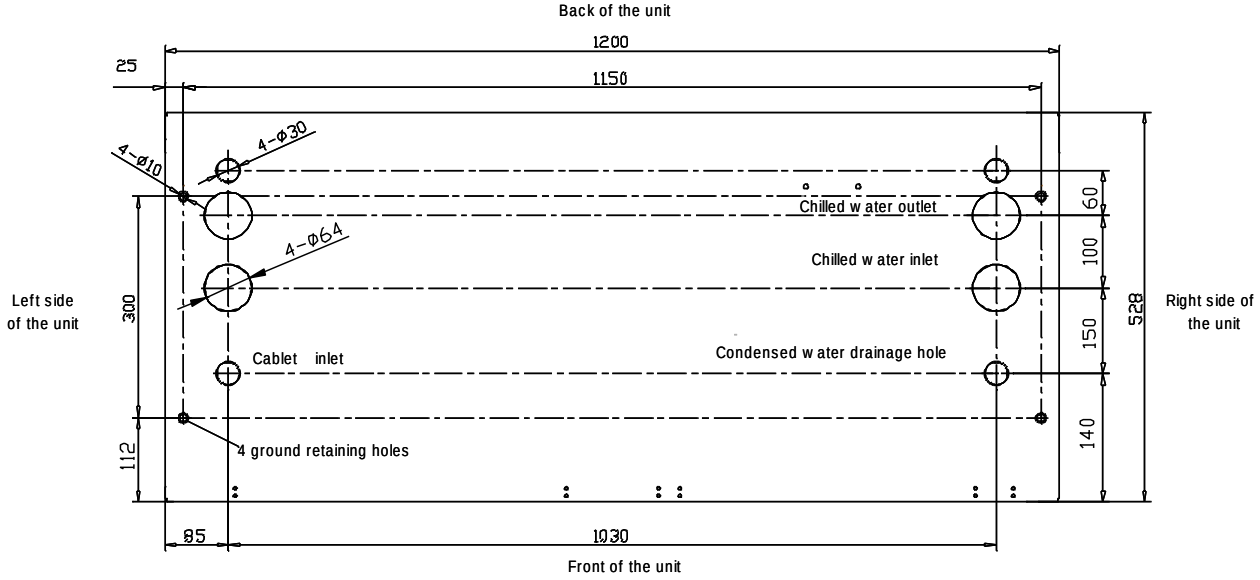
Base cutting position of DMH09 unit



Base cutting position of DMH12 unit



Base cutting position of DMH17 unit

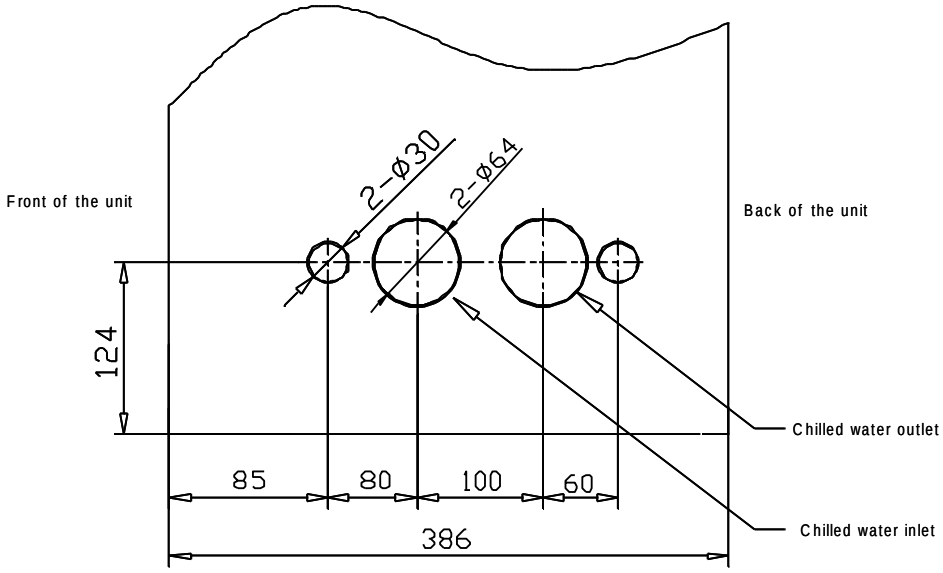


Base cutting position of DMH25 unit

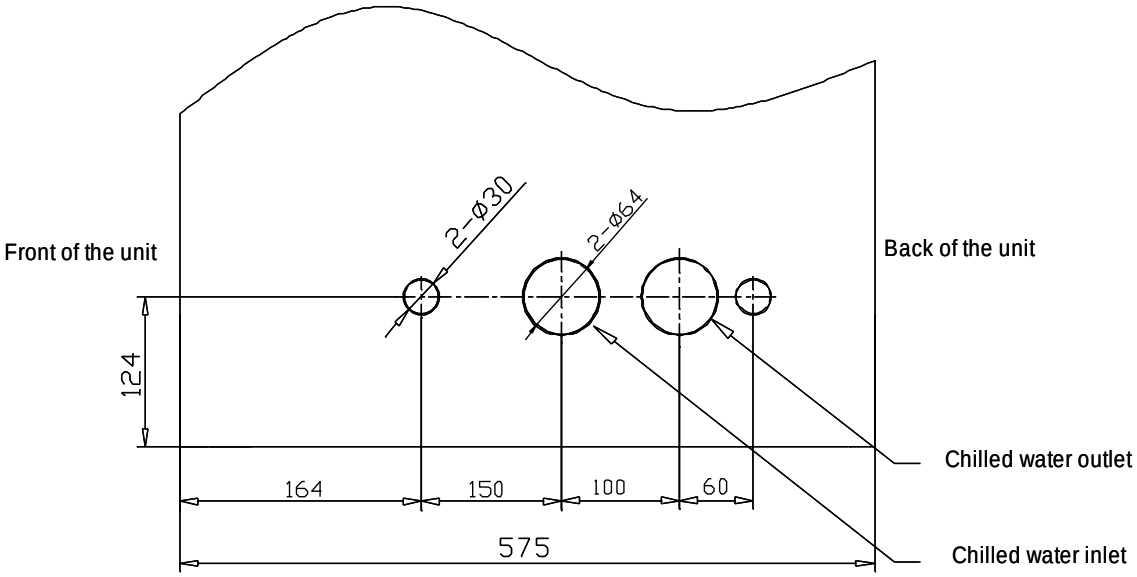
Fig.2-3 Base cutting position and dimensions (unit: mm)

Side plate cutting position dimensions

If it is unable to lay pipes and cables from the base, side connection may be adopted. The position and size of the knock-out holes are as shown in Fig.2-4. The inlet and outlet can be selected according to the actual situation, but any two of the pipes, power cables and signal cables shall not enter/exit the unit through the same hole.



DMH09/DMH17 side



plate

DMH09/DMH25 side plate

Fig.2-4 Side plate knock-out hole (unit: mm)

2.4 Unit installation

2.4.1 Equipment room requirement

The detailed requirements on equipment room are as follows:

1. The equipment room shall have good thermal insulation and air-tight damp course.

Note

To ensure the normal operation of the environment control system in the air conditioning room, damp proof and thermal insulation are the most important factors.

2. The outdoor air shall be prevented from entering the equipment room. The entry of the outdoor air will increase the cooling and dehumidification load of the system. It is suggested to maintain the absorption amount of the outdoor air below 5% of the air circulating in the equipment room.

3. All the doors and windows shall be air-tight, and the gaps shall be as small as possible.

2.4.2 Installation space requirement

Note

The DMH chilled water series cooling unit will produce condensed water. If there exists any water leakage, the adjacent precision equipment may be damaged. Therefore, the cooling unit shall not be installed near the precision equipment, and drainage pipe shall be provided at the installation site.

The detailed requirements on installation site are as follows

1. To ensure the normal operation of the unit, spacious and open place shall be selected as the installation site.

2. The unit shall not be installed in the narrow space. Otherwise, the air flow will be blocked, and the cooling cycle will be shortened, causing return airflow short circuit and air noise.

3. The unit shall not be installed in cavity or at the end of the slender room.

4. To avoid crossover of airflow, unbalanced load and competitive operation, do not install several units side by side.

5. To facilitate the routine maintenance, do not install any equipment (e.g., smoke detector) above the cabinet.

6. A maintenance clearance of at least 600mm shall be reserved in front of the cooling unit.

The unit installation position diagram is as shown in Fig.2-5.

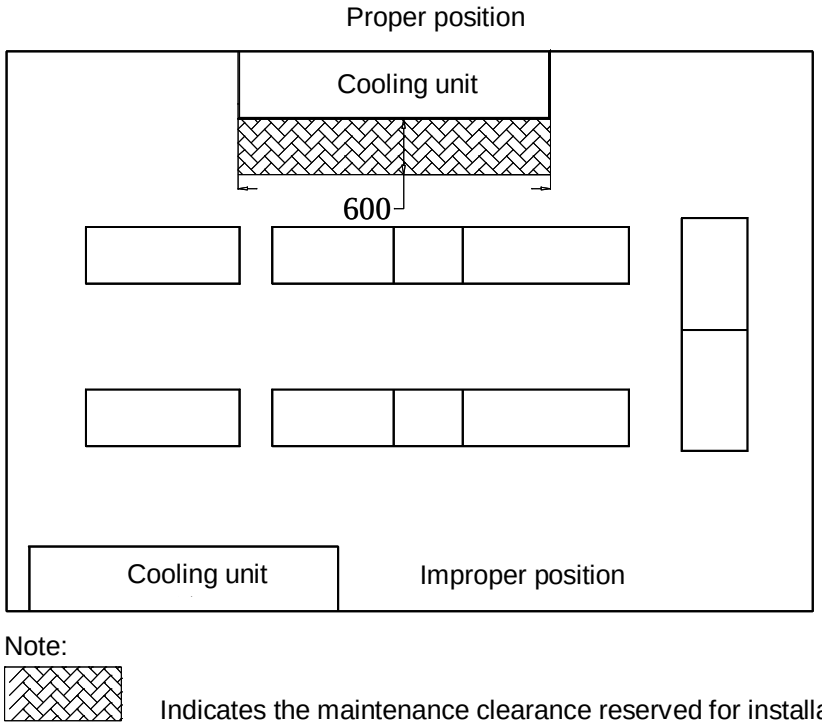
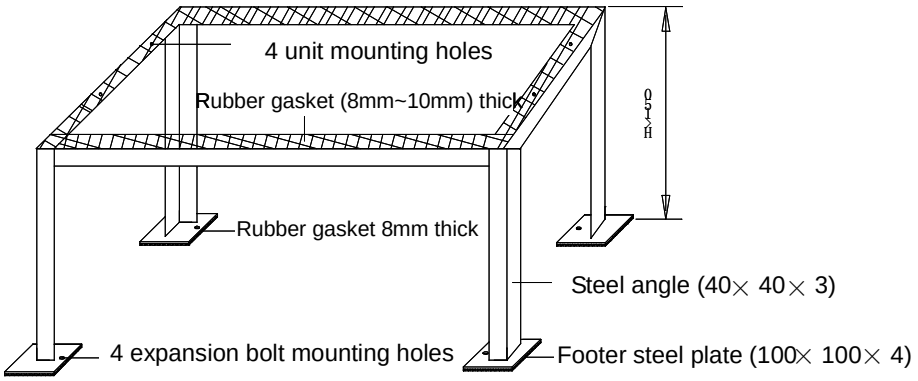
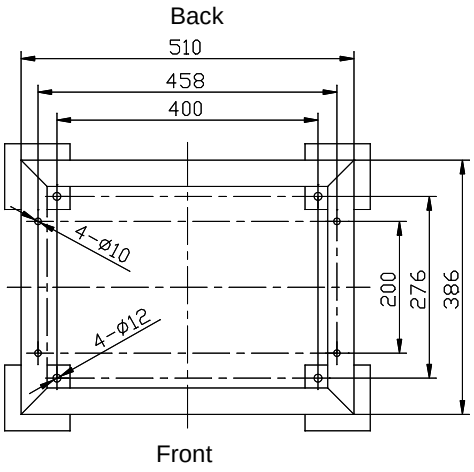


Fig.2-5 Unit installation position diagram Installation steps

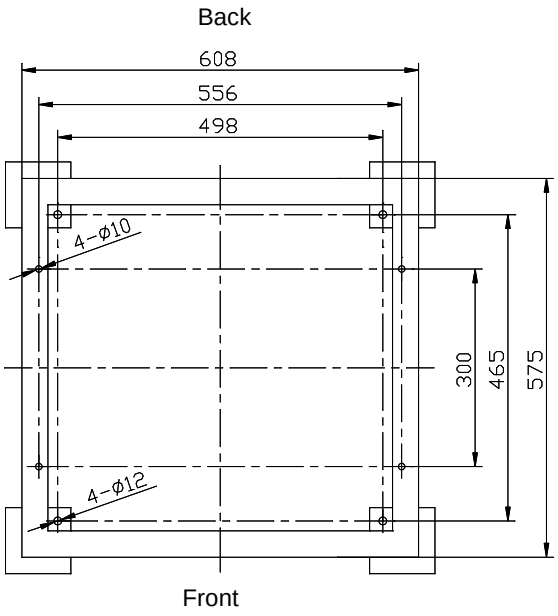
1. Use the M10X20 expansion bolts to fix the self-made installation base to the selected unit installation position. The installation base and size are as shown in Fig.2-6.



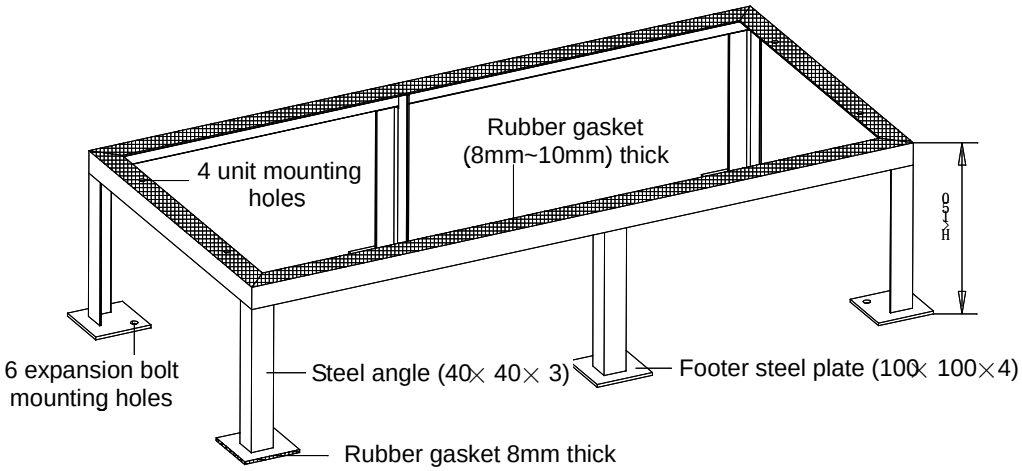
Schematic diagram for DMH9/DMH12 unit installation base



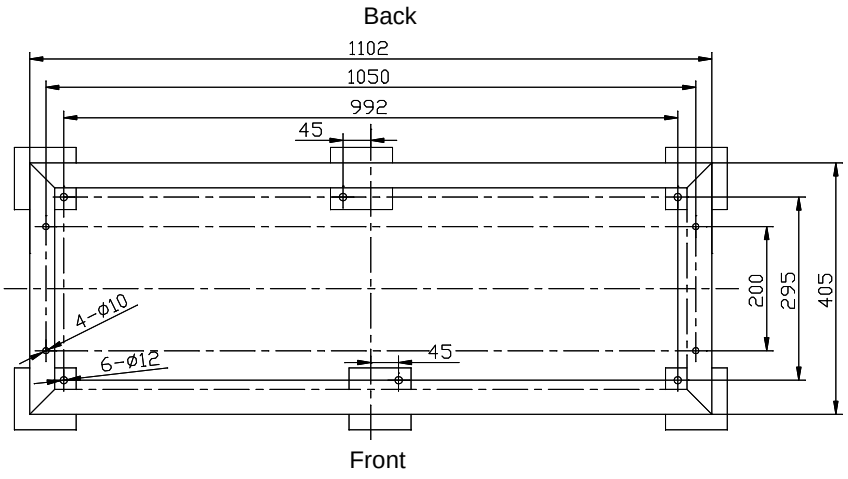
Top view of DMH9 unit installation base



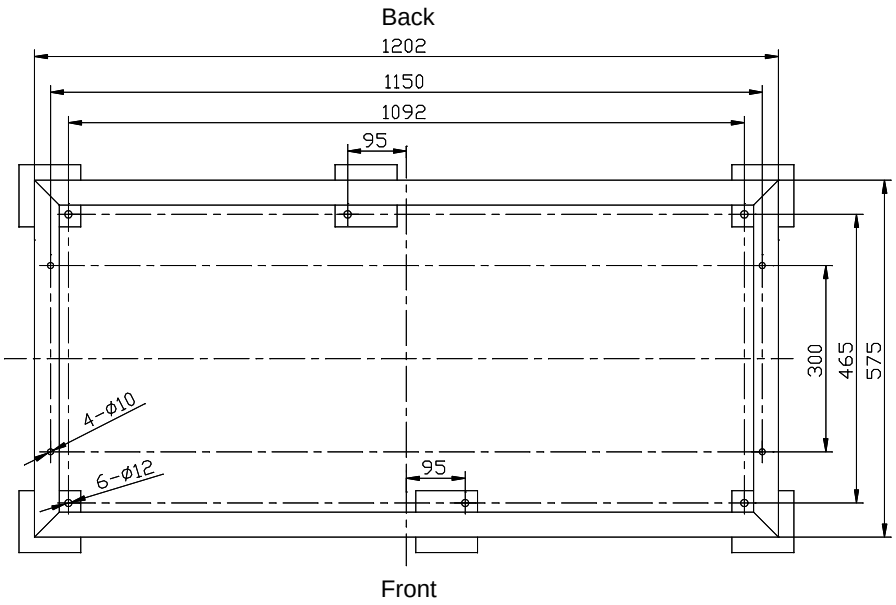
Top view of DMH12 unit installation base



Schematic diagram for DMH17/DMH25 unit installation base



Top view of DMH17 unit installation base



Top view of DMH25 unit installation base

Fig.2-6 Installation base (unit: mm)2. Apply a layer of 8mm~10mm thick rubber gasket to the base, as shown in Fig. 2-6.

3. Place the unit on the installation base and fix it with M8X70 bolts.

2.5 Installation of unit pipes

The pipes to be connected include:

1. Drainage pipe of the unit:

2. Inlet and outlet pipes of chilled water.

Connection of the drainage pipe

The external diameter of the condensed water drainage pipe of the unit heat exchanger is 19mm. The condensed water drainage pipe is fixed to the right side of the unit base. It shall be connected to a water pipe with the inner diameter of 19 mm and fixed with pipe hoop.

Note

1. A Φ19 pipe hoop is delivered as an option for connecting the drainage pipe.

Connection of chilled water inlet and outlet pipes

The chilled water inlet and outlet pipes are connected to the chilled water unit through threaded joint, as shown in Fig. 2-7.The inlet and outlet pipes should be connected according to labels on the unit. Please do not reverse the connection. The chilled water inlet and outlet pipes can be connected through the bottom plate or the side plate. For the pipe inlet and outlet position, please refer to Fig. 2-3 and Fig. 2-4. The chilled water inlet and outlet pipes should have soft connector at the unit connections. The chilled water inlet pipes should be equipped with the water filter with over 60 meshes to facilitate the clearance of impurities in the pipes. The chilled water inlet and outlet pipes need to be equipped with several isolating valves, which can cut off water sources during the period of maintenance. One of the isolating valves can be balance valve. Chilled water system with a balance valve would be more efficient and more accurate in controlling water distribution. For detailed distribution, please refer to Fig. 2-2.Water pressure should be able to overcome the water pressure drop caused by all the components of water system. Considering the possibility that water pressure drop would increase due to incrustant and impurities resulted from long-time running of the system. Therefore, when choosing the head components (e.g. pump), we should consider making 20% ~ 25% redundancy. The weight of water pipes connected with the unit should not be assumed by the unit. The chilled water inlet and outlet pipes must be kept warm. Table 2-2 shows the connecting dimensions of chilled water inlet and outlet pipes of various units.

Note

Be careful when connecting the chilled water inlet and outlet pipes. Before the operation, please read carefully the following precautions:

1. Remove the dust shield.

2. Wipe the connecting base and threaded surface carefully with clean cloth.

3. Wind hemp thread or Teflon tape evenly on the threaded surface.

4. Tighten the threaded joint, ensuring accurate alignment of the threads.

5. Draw a vertical line from the male connector to the female connector with a marker.

6. Verify the sealing status by filling it with nitrogen or water. If any leakage is found, tighten it immediately or reconnect the joint.

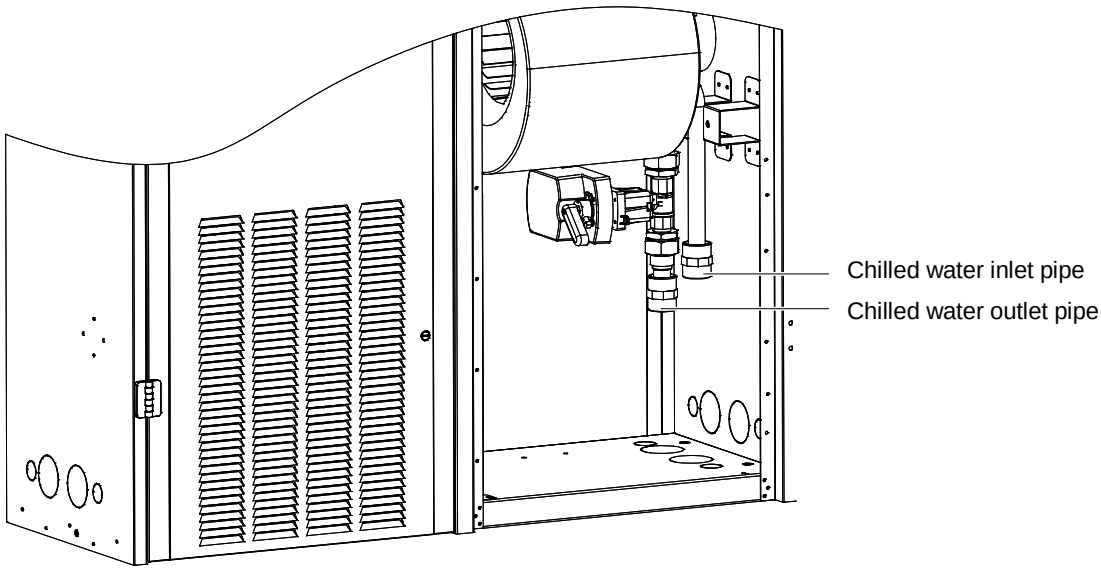


Fig.2-7 Schematic diagram for connection of chilled water pipeTable2-2 External diameter and specifications for chilled water inlet and outlet pipes

Product model	External diameter for chilled water inlet and outlet pipes (mm)	Specifications for threaded joint of chilled water inlet and outlet pipes
DMH09	25	G 1″
DMH12	25	G 1″
DMH17	32	G 1-1/4″
DMH25	32	G 1-1/4″

2.6 Items for inspection

After the mechanical installation, check and verify that:

1. Certain clearance has been reserved around the unit for maintenance;
2. The equipment is vertically erected, and the fastening pieces have been locked;
3. The pipes connecting the unit have been connected;
4. The chilled water pump has been installed (if necessary);
5. The drainage pipe has been connected;
6. The joints for chilled water inlet and outlet pipes have been tightened and there is no leakage;
7. The equipment installation has been completed, and the foreign materials inside and around the equipment (e.g., transportation materials, structural materials, tools, etc.) have been cleared.
8. Rotate the fan blade to check if the fan rotates smoothly without any noise.

After all the above items have been inspected and confirmed, carry out the electric installation.

Chapter 3 Electric Installation

This chapter introduces the electric installation of the Liebert_DM chilled water series cooling unit, including the task description, precautions, unit wiring and items for inspection.

3.1 Task description

The wires to be connected onsite include:

1. The unit power cable: 3×L+N+PE.
2. The unit monitor control cable (if remote monitoring is configured).
3. The energy-saving card connecting wire (if energy-saving card is configured).

3.2 Precautions

1. The connection of all the power cables, control cables and grounding cables shall comply with the national and local electrician regulations.
2. For the full load current, please refer to the equipment nameplate. The cable size shall comply with the local wiring rules.
3. Main power requirement: 380Vac, 50Hz, 3×L+N+PE.
4. The electric installation must be carried out by the trained and qualified personnel.
5. Before connecting the circuit, measure the input power voltage with the voltage meter to ensure that the power supply has been disconnected.

3.3 Connection of unit power cable

Open the unit front door, and then you can see the electric control box of the unit. Insert the unit power cable through the through-hole, and connect one end to the unit power input terminals L1, L2, L3, N and PE (fix the cable with cable tie), and the other end to the external AC power, as shown in Fig.3-1 and Fig.3-2. When selecting the cables, please refer to the maximum running current value on the unit nameplate.

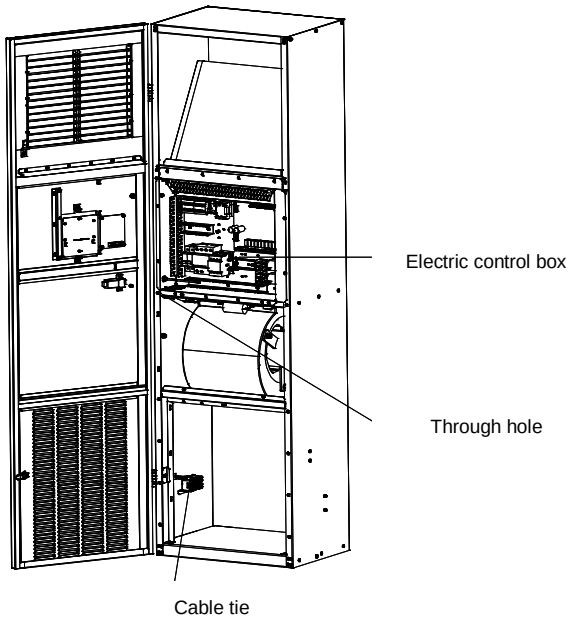


Fig.3-1 Connecting position of unit power cable

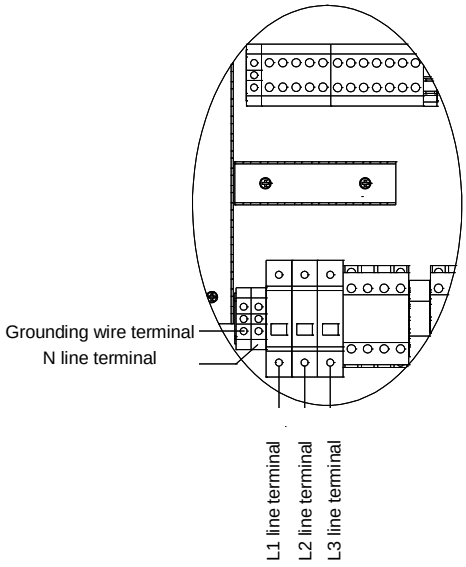


Fig.3-2 Amplified view of power connecting terminal

Note

1. Only the copper wire can be used, all the wires shall be firmly connected.
2. Ensure that the power supply voltage is equal to the rated voltage on the equipment nameplate.
3. Install a disconnecting switch before the unit power input, so that the power supply can be easily disconnected for equipment maintenance. Connect the power cable to the disconnecting switch first, and then to the equipment.
4. The equipment has high voltage. Power supply shall be cut off before performing any maintenance inside the equipment.

3.4 Connection of control cable

3.4.1 Connection of control terminal

The control terminals are on the PCB of the electric control box, as shown in Fig.3-3.

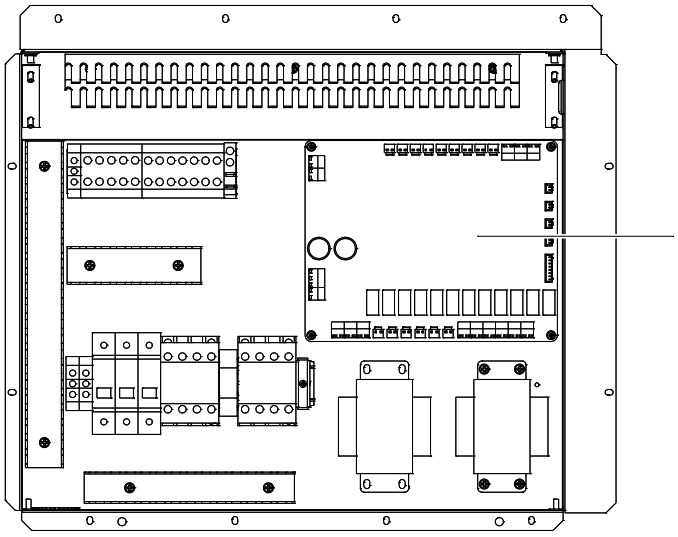


Fig.3-3 Position of the control terminals The arrangement of the control terminals is as shown in Fig.3-4.

Note

Before connecting the control cables, the operator shall prepare corresponding antistatic measures.

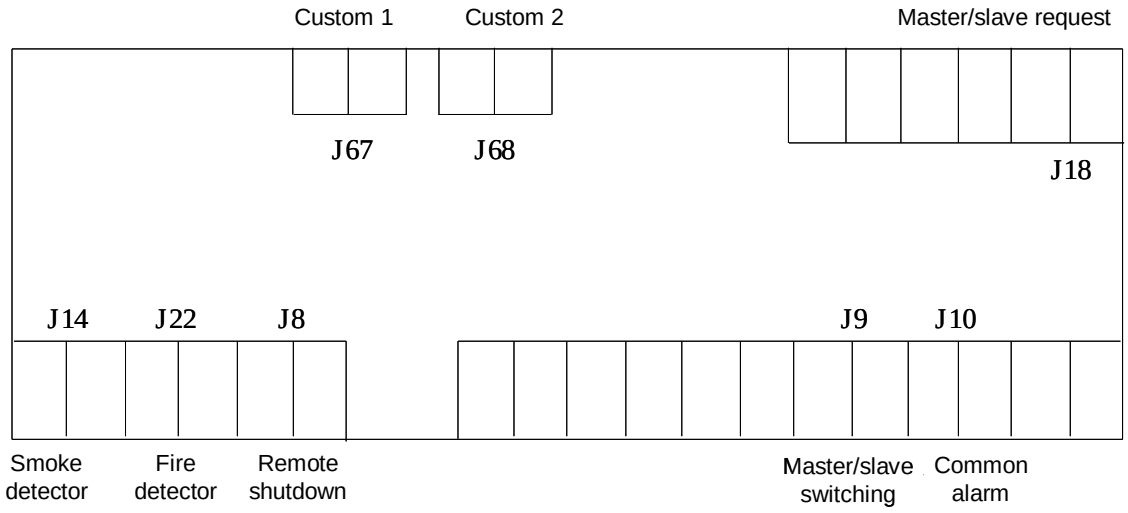


Fig.3-4 Arrangement diagram of control terminals

Remote shutdown, smoke detector and fire detector terminals

Remote shutdown terminal J8, smoke detector terminal J14 and fire detector terminal J22 can be used to control the remote startup/shutdown of the unit and the connection of the external smoke detector and fire detector, so that the cooling unit can stop operation at special times. If the inputs of the three terminals are shorted, and the power input switch of the cooling unit is closed, the cooling unit has normal output. If any of the three terminals is disconnected, the cooling unit will stop output. The three terminals are shorted before delivery. If the control cables for smoke detector, fire detector or remote startup/shutdown need to be connected onsite, remove the short circuited wire and connect the external controller, smoke detector and fire detector respectively to J8, J14 and J22.

Custom 1 and custom 2 terminals

Custom 1 terminal J67 and custom 2 terminal J68 can be connected to the alarm signals beyond the cooling system. Any external alarm can be connected to the custom terminal if it has normally open dry contact. After connecting external alarm signals to the custom terminals, you should set the corresponding customized alarm trigger conditions through the microprocessor. For details, please refer to the customized alarm in 5.6.2 alarm menu. When there is no external alarm, the input status of the custom terminal is consistent with the setting. When the external alarm occurs, the input status of the custom terminal is inconsistent with the setting, the cooling unit will generate audible alarm, and the microprocessor LCD will display the corresponding alarm contents. If computer with Emerson monitoring software is connected, the alarm will also be displayed on the computer.

If power supply surge protector is configured, custom 1 terminal J67 will be connected to the surge protector alarm signal upon delivery. The alarm is set as NC.

Common alarm terminals.

The common alarm relay connected to the common alarm terminal J10 has a group of normally open dry contacts. When there exists critical alarm, the contacts are closed. It can be used to trigger remote alarms, send signals to the building management system or dial the paging system automatically.

Master/slave switching and Master/slave request terminals

The Master/slave switching terminal J9 and Master/slave request terminal J18 are used to connect the two cooling units working in master/slave mode. The connecting method is as shown in Fig.3-5.

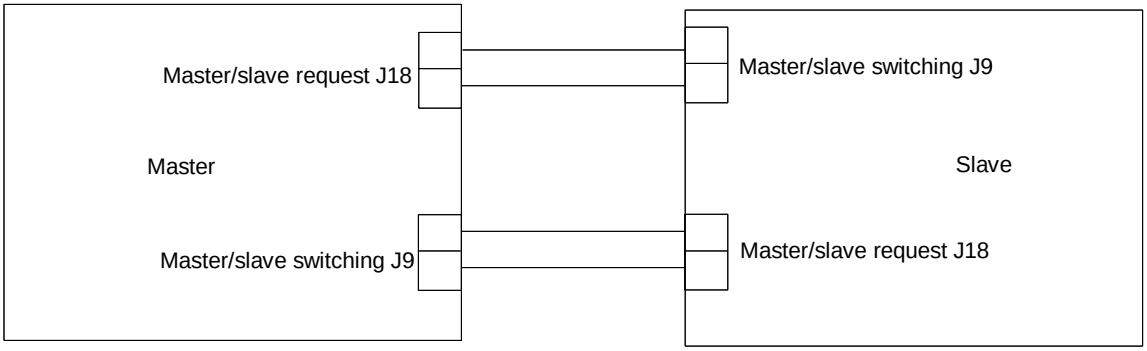


Fig.3-5 Schematic diagram for the connection of Master/slave operating mode

Connection of monitoring cable

The RS485 port of the Liebert_DM chilled water series cooling unit is located at the back of the unit front door and connected to the upstream unit with the twisted communication cable. The position of the RS485 port is as shown in Fig.3-6.

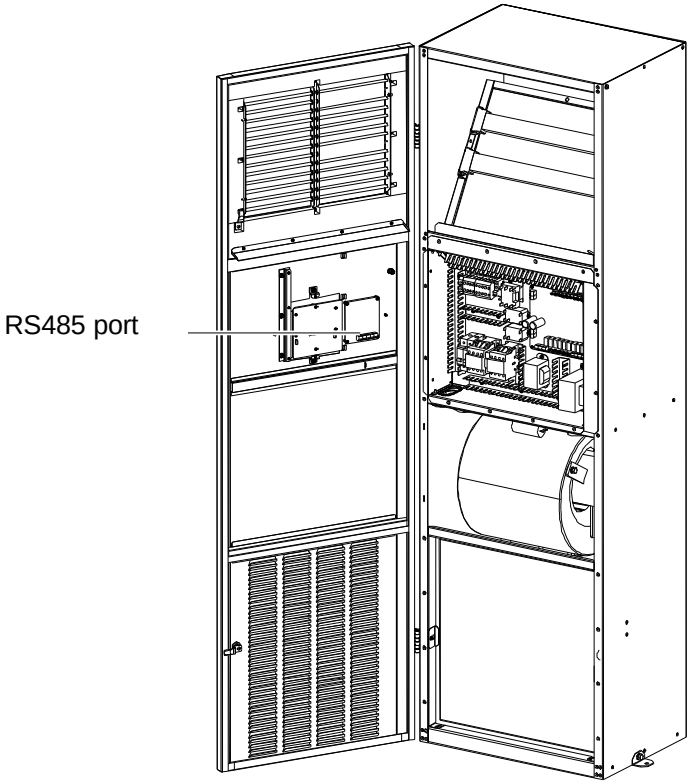


Fig.3-6 Position of the RS485 port

The simultaneous monitoring of several Liebert_DM chilled water series cooling units can be realized through the RS485 bus. Fig.3-7 is the schematic diagram for the networking of two Liebert_DM chilled water series cooling units monitored simultaneously through the RS485 bus, taking Emerson SiteMonitor software as the example.

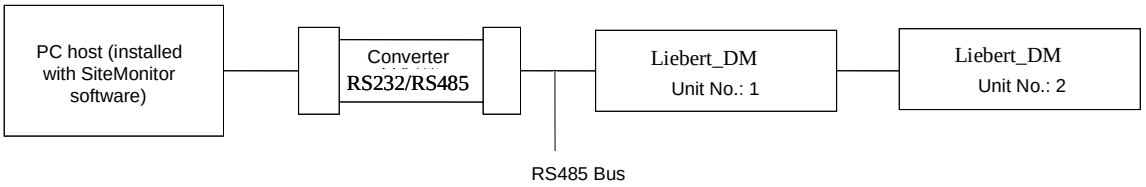


Fig.3-7 Schematic diagram of the networking for monitoring two cooling units

Connection of energy-saving card

The energy-saving card is as shown in Fig.3-8.

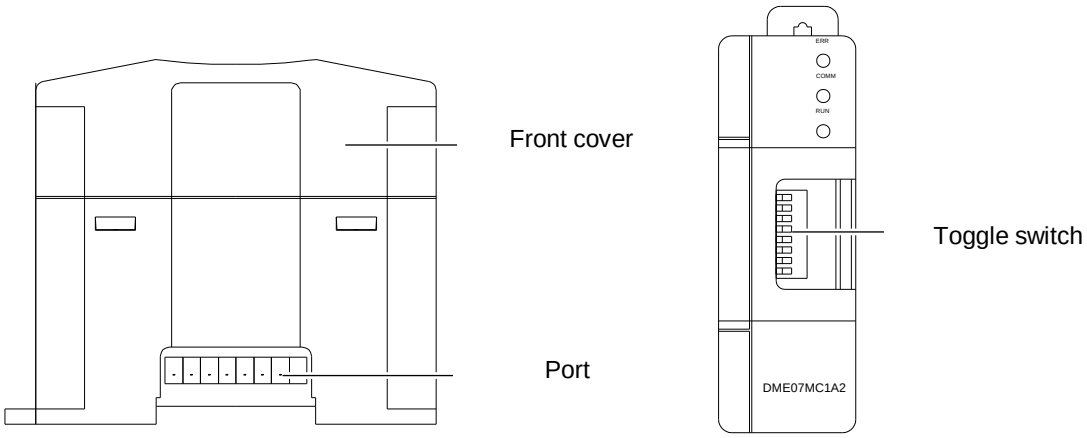


Fig.3-8 Energy-saving card

The energy-saving card adopts 4-core shielded cable for connection, and the recommended cable size shall be no less than 20AWG (0.52mm^2) .The reliable grounding of the shielded cable and the energy-saving card shall be ensured to enhance the immunity capacity. All the wires shall be firmly connected.

Use the energy-saving card according to the following procedures:

1. Open the front cover of the plastic enclosure of the energy-saving card and take out the energy-saving card board through the slot of the plastic enclosure. The board is as shown in Fig.3-9.

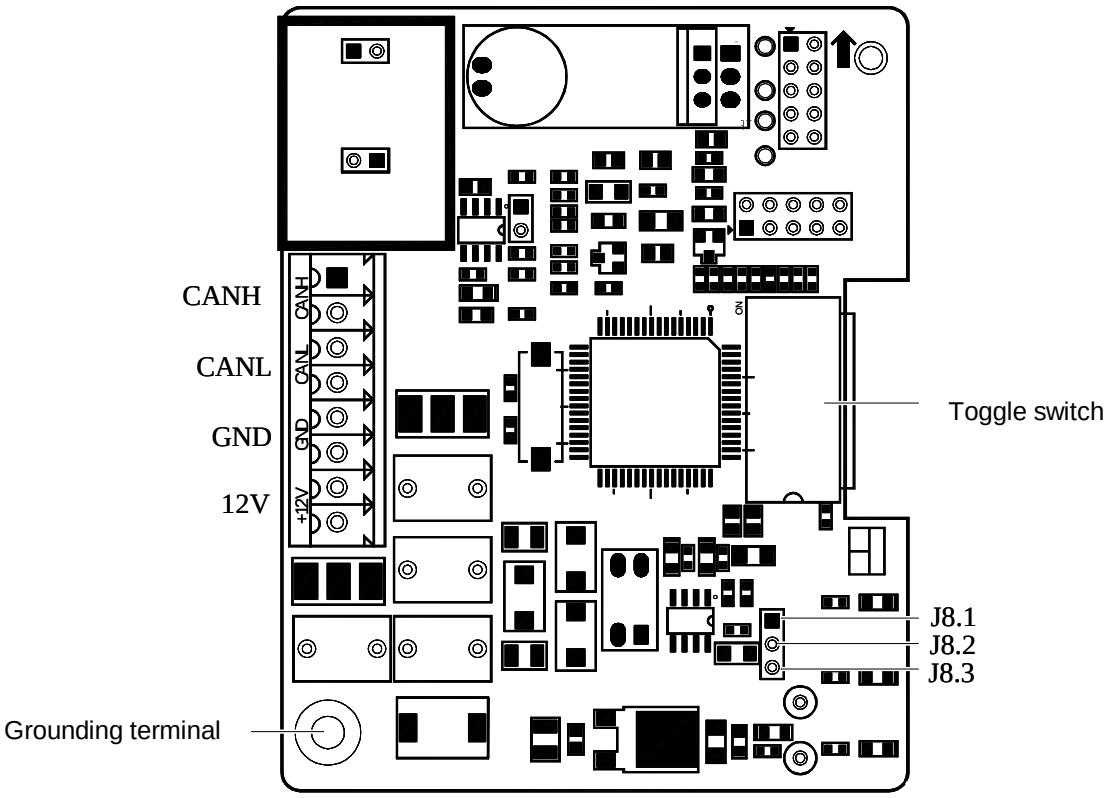


Fig.3-9 Energy-saving card board

2. Short circuit J8.1 and J8.2 of the energy-saving card at the far end, and short circuit J8.2 and J8.3 of other energy-saving cards.

3. Reliably ground the energy-saving card.

4. Insert the energy-saving card along the slot into the plastic enclosure and close the front cover.

5. Use 4-core shielded cables to connect the Liebert_DM control board at the back of the unit front door to the 12V, GND, CANH and CANL ports of the energy-saving card.

6. Use the 4-core shielded cables to connect 12V, GND, CANH and CANL ports of the energy-saving cards in turn (if there is more than one energy-saving card).

7. Reliably ground the shielded cable.

8. Set Bits 1 and 2 of the toggle switch as the energy-saving card address, and other bits as 0 (ON is 0, OFF is 1)

9. Use screws or the slot on the enclosure of the energy-saving card to fix the energy-saving card to the place with large thermal load in the room.

10. Enter the “sleep mode” menu to check if the temperature of the energy-saving card is normal.

Fig.3-10 and Fig.3-11 are the connection schematic diagrams of single energy-saving card and several energy-saving cards respectively.

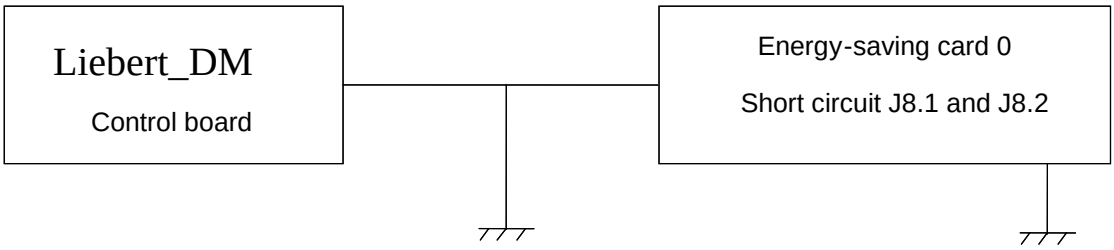


Fig.3-10 Connection of single energy-saving card

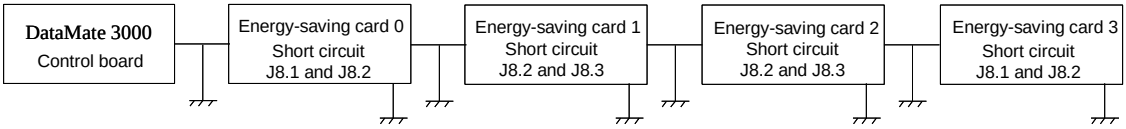


Fig.3-11 Connection of several energy-saving cards

3.6 Items for inspection

After the electric installation is completed, the system shall meet the following requirements:

1. The electric loop of the system shall have no open circuit or short circuit.
2. The power supply voltage is equal to the rated voltage on the equipment nameplate.
3. The cables to the circuit breaker, power cable and grounding cable have been connected.
4. The circuit breaker and fuse have the proper rated value.
5. The control cable has been connected.
6. All the cables and circuit connectors have been fixed, and the tightening screws are not loose.

When the above items have been checked and verified, close the electric cover and carry out startup inspection and function test.

Chapter 4 System Test

This chapter introduces the startup inspection and function test of the Liebert_DM chilled water series cooling unit.

4.1 Startup inspection

Before starting the system, check the part status according to Table 4-1.

Table 4-1 Items for inspection before startup

Item	Inspection requirement
Panel	There is no damage, the insulation is intact, and the appearance is clean
Screen	All the screens are installed in place, there is no damage, and the appearance is clean
Power supply	Measure and record the voltage value before powering up the system. The power supply wire shall not be loose.
Fan	There is no obstacle at the inlet and outlet zones.

If the inspection result is OK, power up and run the system. The items for inspection after power-up are as shown in Table 4-2.

Table 4-2 Items for inspection after startup

Item	Inspection requirement
Fan	The fan has correct rotation. Record the rated full load current and actual current of the fan motor.
Others	Record the user set value. Record the return air temperature, absorption pressure, exhaust pressure, compressor current and air supply temperature.

4.2 Function test

Note

The cooling unit has high voltage inside. Please cut off the power supply to the equipment before the test and operate under the guidance of the professional maintenance personnel of Emerson or other trained and qualified maintenance personnel.

Cooling function commissioning

Adjust the temperature setting value according to 5.6.3 setting point, so that it is 5ºC (9℉) lower than the indoor ambient temperature. At this time, the control system shall be able to trigger the cooling demand, and the water flow regulating valve will open. After running for at least 3 minutes, adjust the temperature setting value to 5ºC (9℉) higher than the indoor ambient temperature. If the water flow regulating valve is closed, it indicates that the cooling function is normal.

Dehumidification function commissioning

Adjust the humidity setting value according to 5.6.3 setting point, so that it is 10% lower than the indoor relative humidity (the temperature setting is the same as the indoor ambient temperature). At this time, the control system shall be able to trigger the dehumidification demand, the water flow regulating valve will open, and the fan will switch to low speed. After running for at least 3 minutes, adjust the humidity setting value to 10% higher than the indoor relative humidity. If the water flow regulating valve is closed, it indicates that the dehumidification function is normal.

Note

Adjust the temperature setting value to the default value or initial setting value after the test.

Chapter 5 Microprocessor

This chapter introduces the features, appearance, LCD, control keys, control interface and menu structure of the microprocessor of Liebert__DM cooling unit.

Note

Because the Liebert_DM Air cooling and chilled water series units share the same model of microprocessor, the contents related to the compressor control are applicable to the Air cooling series unit only.

5.1 Features

The microprocessor has the following features:

1. It adopts menu operation and is able to monitor and display the running status of the precision cooling unit, helping to maintain the environment conditions within the set range.
2. It adopts 128×64 lattice blue backlighting LCD and features simple UI operation.
3. It has multi-level password protection and is able to effectively prevent unauthorized operation.
4. It has such functions as power recovery, high/low voltage protection, phase loss protection, and auto phase switching upon reverse phase.
5. Component running time can be accurately displayed through menu operation.
6. Expert level failure diagnosis system is configured to automatically display the failure contents and facilitate the equipment maintenance by the service personnel.
7. It can store 30 history alarms.
8. It is configured with RS485 port, adopting standard communication protocol of the Ministry of Information Industry.

5.2 Appearance

The microprocessor panel is as shown in Fig.5-1.

Fig.5-1 Microprocessor panel

5.3 Display

The LCD adopts Chinese menu and blue backlight. When the system is in normal operation, the LCD will display the indoor temperature and humidity (users may select whether to display humidity or not. For the setting method, please refer to 5.6.5 system setting), equipment output status (cooling, heating, dehumidification, humidification), unit property (single unit, master unit, slave unit), unit running status (running, standby, locked), alarm message and current time, as shown in Fig.5-2.

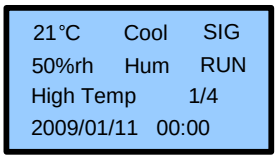


Fig.5-2 Display

More detailed information of the part running status or alarm may be obtained from the main menu. When browsing the menu, the current menu will be highlighted. When modifying the setting, the currently modified part will be highlighted.

5.4 Control key

5.4.1 Function description

The microprocessor has 9 control keys, as shown in Fig.5-3.

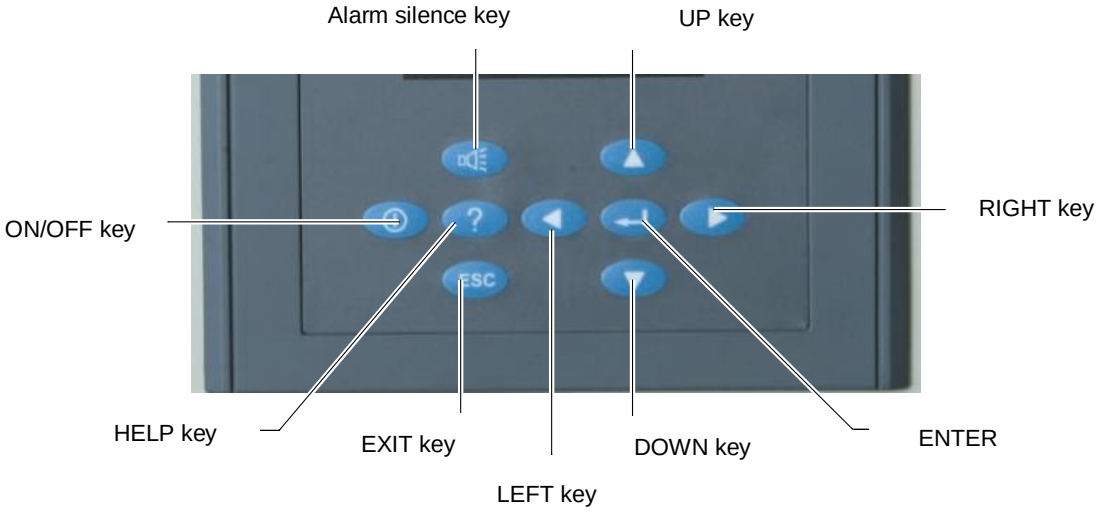


Fig.5-3 Control key

The functions of the control keys are listed in Table 5-1.

Table 5-1 Control key function description

Control key	Function description
ON/OFF key	Turn on or off the unit
HELP key	Display the help description
EXIT key	Exit the current menu interface to normal interface or upper level menu interface. When you are modifying the parameter, if you press this key, the modification will be abandoned.
LEFT key	Move the existing bit for modification of the parameter setting value to the left.
DOWN key	Move down the cursor in the menu or reduce the displayed parameter setting value. If the parameter has several options, when you press this key, the relevant options will be scrolled. When the menu is displayed in several screens, press this key, the screen will be scrolled down.
ENTER key	Enter the selected menu interface or confirm the parameter setting value
RIGHT key	Move the existing bit for modification of the parameter setting value to the right.
UP key	Move up the cursor in the menu or increase the displayed parameter setting value. If the parameter has several options, when you press this key, the relevant options will be scrolled. When the menu is displayed in several screens, press this key, the screen will be scrolled up.
Alarm silence key	Clear the alarm prompt interface on the LCD and silence the alarm sound.

5.4.2 Operation example

Example 1: Enter the password and enter the main menu

After the system starts up, you can enter the main menu on the normal interface through the following operations:

1. Press ENTER and enter the password interface.
2. Press ENTER on the password interface to highlight the password entering position.
3. Press UP or DOWN key to modify the password bit value.
4. Press ENTER to confirm the password and enter the main menu interface.

Example 2: Modify the parameter

Take the high temperature alarm item of the alarm output menu as an example.

1. Press UP or DOWN key on the main menu interface to move the cursor to alarm menu.
2. Press ENTER to enter the alarm menu interface.
3. Press UP or DOWN key on the alarm menu interface to move the cursor to alarm output.
4. Press ENTER to enter the alarm output interface.
5. Press UP or DOWN key on the alarm output interface to move the cursor to high temperature alarm.
6. Press ENTER to highlight the high temperature alarm parameter.
7. Press UP or DOWN key to select the parameter.

Note

If a numeric value is set, press the LEFT or RIGHT key, the cursor will move to the bits for modification.

8. After selecting the parameter, press ENTER for confirmation, and the parameter becomes valid.
9. Press EXIT to return to the upper level menu interface.

Note

After changing the parameter, if you don't press ENTER for confirmation, the high temperature alarm parameter will remain the same.

5.5 Control interface

5.5.1 Shutdown interface

When the unit is in standby mode after power-up, the LCD displays the shutdown interface, as shown in Fig.5-4. If the user presses the ON/OFF key to shut down the unit during the running process of the unit, the LCD also displays the shutdown interface. Press LEFT, RIGHT and ENTER keys on this interface, you can select Chinese or English display language.

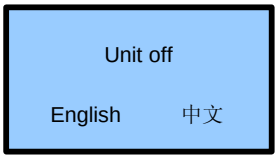


Fig.5-4 Shutdown interface

5.5.2 Startup interface

When the unit is started up, or when it is in auto startup state, or when ON/OFF key is pressed to start the unit on the shutdown interface, the LCD will display the startup interface, as shown in Fig.5-5.

Fig.5-5 Startup interface

5.5.3 Normal interface

After startup, when 10s (default setting) of hot startup delay is passed or ENTER key is pressed, the normal interface will be displayed, as shown in Fig.5-6. The normal interface displays the current temperature, humidity, equipment running status (cooling, heating, dehumidification, humidification), unit property (single unit, master, slave), unit running status (running, standby, locked), alarm message and the current date and time.

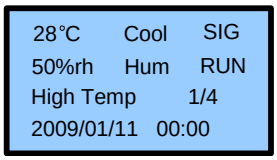


Fig.5-6 Normal interface

5.5.4 Password interface

Press ENTER on the normal interface, the password interface will display, as shown in Fig.5-7.

Fig.5-7 Password interface

There are three levels of password for entering the menu, as shown in Table 5-2.

Table 5-2 Password level

Password level	user	Initial password	Remark
Level 1	Common operator	0001	User of this level is able to browse all the menu information, but he/she can only set the temperature/humidity setting point (as shown in Fig.5-17), and cannot modify any other value or setting.
Level 2	Maintenance e personnel		User of this level is able to set all the parameters
Level 3	Manufacturer's technician		

For the detailed operation of password entry, please refer to 5.4.2 Operation example.

If wrong password is entered, you cannot change any setting value, you can only browse the menu contents. At this time, you can press EXIT key to return to the normal interface and then press ENTER to enter the password interface.

Note

Directly press ENTER rather than entering the password on the password interface, you can view the setting value of the menu, but cannot change any parameter.

5.6 Menu structure

5.6.1 Main menu

Enter the password and press OK on the password interface, the main menu will be displayed, as shown in Fig.5-8. For the menu structure, please refer to Appendix II Menu structure diagram. When any menu item is selected, this menu item will be highlighted. The menu items include settable parameter and unsettable parameter. For the detailed

operation of parameter setting, please refer to 5.4.2 Operation example. The setting range of all the settable parameters is shown in appendix III List of parameters.

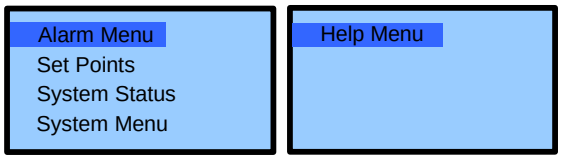


Fig.5-8 Main menu interface

The menu items in the main menu interface are as shown in Table 5-3.

Table 5-3 Main menu description

Item	Description
Alarm menu	To set the alarm parameter, inquire the alarm history record and alarm status record
Setting point	To set the temperature/humidity setting value and the temperature/humidity precision
System Status	To inquire the ambient temperature/humidity, system output status, system running record; to inquire and set the system time
System menu	To set the system parameter and system option, calibrate the sensor, change the password, output system diagnosis, and restore to leave-factory value
Help menu	To inquire the manufacturer information, product information and maintenance information

5.6.2 Alarm menu

Enter the alarm menu on the main menu. This menu is displayed in two screens, as shown in Fig.5-9. Press the UP or DOWN key, the menu items will be scrolled up or down.

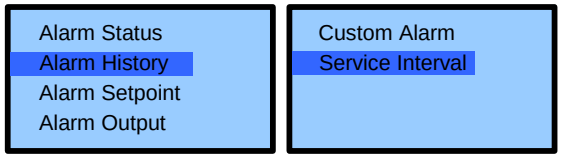


Fig.5-9 Alarm menu

Alarm status

The alarm status menu is used to monitor the current alarm status of the cooling unit and it will prompt “no alarm” or the alarm status information.

The alarm status information includes XX/YY, alarm type, and alarm occurrence time, as shown in Fig.5-10. XX is the alarm number, indicating the alarm status record no. of the current alarm. YY is the total number of the alarm status records.

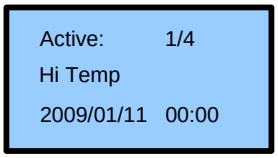


Fig.5-10 Alarm status menu

Note

1. The no. of the latest alarm is 1. When several alarms occur, press UP or DOWN key, the relevant alarm status information will be scrolled up or down.
2. Up to 25 pieces of alarm status record can be stored, which will be automatically cleared upon power loss.

Alarm history

The alarm history menu is used to search the history alarm information of the cooling unit, including XX/YY, alarm type, alarm occurrence time, and alarm ending time (if the current alarm has not ended, “alarm not ended” will be displayed), as shown in Fig.5-11. XX is the alarm number, indicating the alarm history record no. of the current alarm. YY is the total number of the alarm history records.

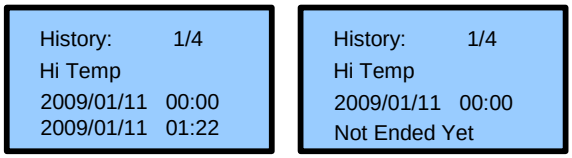


Fig.5-11 Alarm history menu

Note

1. When several alarms occur, press UP or DOWN key, the relevant alarm history information will be scrolled up or down.
2. Up to 50 pieces of alarm status record can be stored, which will not be cleared upon power loss.

Alarm setting point

The alarm setting point can be saved permanently. The alarm setting point menu interface is as shown in Fig.5-12.For the parameter setting range, please refer to appendix III list of parameters.

Note

It is suggested not to change the default value of the alarm setting point. If it is necessary, perform the relevant operation under the instruction of the trained and qualified personnel.

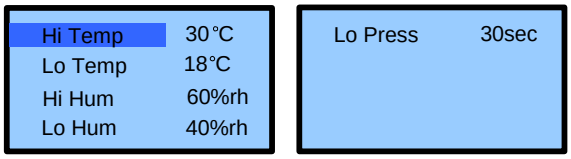


Fig.5-12 Alarm setting point menu

Alarm output

The alarm output setting can be saved permanently. The alarm output menu interface is as shown in Fig.5-13.

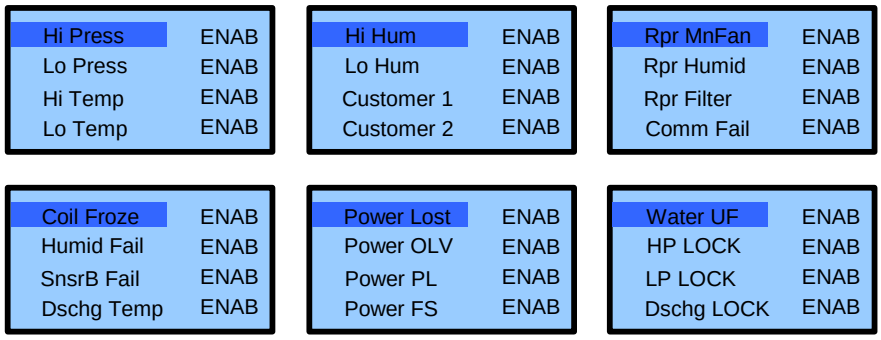


Fig.5-13 Alarm output menu

The alarm output items can be set as enabled, suspended or disabled. The alarm output logic is as shown in Table 5-4.

Table 5-4 Alarm output logic

Set value	Alarm history record	Alarm status record	Alarm sound	Alarm prompt
Enabled	Available	Available	Available	Available
Suspended	Available	Available	None	Available
Disabled	None	None	None	None

Note

The high voltage alarm, low voltage alarm and high temperature alarm in the alarm output are critical failure alarms and cannot be set as disabled. They can only be set as enabled or suspended.

Customized alarm

The customized alarm can be saved permanently. The customized alarm menu interface is as shown in Fig.5-14.

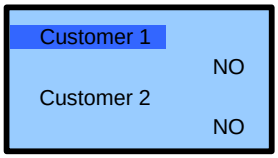


Fig.5-14 Customized alarm menu

The cooling unit has two customized alarms: customized alarm 1 and customized alarm 2, which correspond to control terminals J67 and J68 respectively (refer to Fig.3-4 for the position).

The customized alarm can be set as NO or NC according o the property of the alarm signal connected to control terminals J67 and J68. If power supply surge protector is configured, customized alarm 1 terminal J67 will be connected to the surge protector alarm signal upon delivery. The alarm is set as NC.

Maintenance cycle

The maintenance cycle is set for the parts in need of regular maintenance (e.g., main fan, humidifier and screen). When the running time of the relevant part reaches the set maintenance cycle, alarm will be triggered to remind the maintenance personnel to maintain the system or the relevant parts.

The maintenance cycle setting can be saved permanently. The maintenance cycle menu interface is as shown in Fig.5-15. For the parameter setting range, please refer to appendix III list of parameters.

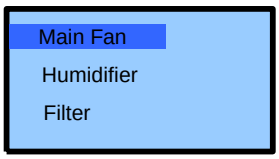


Fig.5-15 Maintenance cycle menu

The main fan, humidifier and screen have the same submenus. Take the main fan as an example, the menu interface is as shown in Fig.5-16.

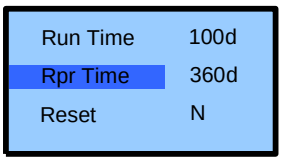


Fig.5-16 Maintenance cycle submenu of main fan

The running time indicates the elapsed running time of the part, which cannot be changed, but is automatically accumulated by the equipment. Replacement time indicates the recommended running time of the part, which can be changed (it is suggested to use the default value or configure according to the actual situation).Replacement confirmation indicates whether the existing part has been maintained or replaced. If YES is selected for replacement confirmation, the running time of the existing part will be automatically cleared, and the equipment will automatically recalculate the running time of the new part.

5.6.3 Setting point

You can enter the setting point menu from the main menu interface, as shown in Fig.5-17.

The setting point can be saved permanently. For the parameter setting range, please refer to appendix III list of parameters.

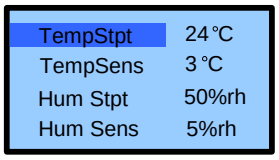


Fig.5-17 Setting point menu

5.6.4 System status

You can enter the system status menu from the main menu interface, as shown in Fig.5-18.

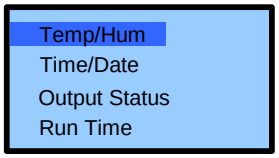


Fig.5-18 System status menu

Ambient temperature and humidity

The ambient temperature/humidity menu displays the indoor temperature, humidity and outdoor temperature in real time, and the displayed value has one figure after the decimal point reserved, as shown in Fig.5-19.

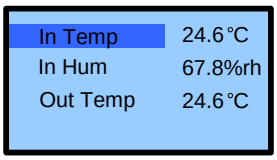


Fig.5-19 Ambient temperature and humidity menu

Time and date

The time and date menu displays the current system time of the equipment in the following mode: YY/MM/DD and HOUR/MINUTE/SECOND, as shown in Fig.5-20.

When the time and date are successfully changed, the interface will automatically refresh with the changed system time and date. If the change fails, the current system time and date will not be changed.

Fig.5-20 Time/date menu

Output status

The output status menu interface is as shown in Fig.5-21.You can inquire the output status of the equipment in this menu.

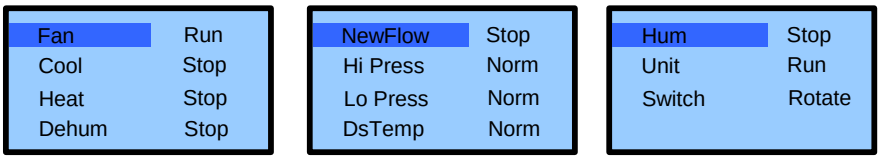


Fig.5-21 Output status menu

Note

The switching reason will be displayed only when the master is switched to the slave. The switching reasons include master/slave switching and polling.

Running time

The running time menu is as shown in Fig.5-22.You can inquire the running time of the equipment in this menu.

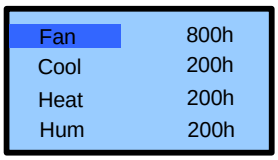


Fig.5-22 Running time menu

5.6.5 System menu

You can enter the system menu from the main menu interface, as shown in Fig.5-23.

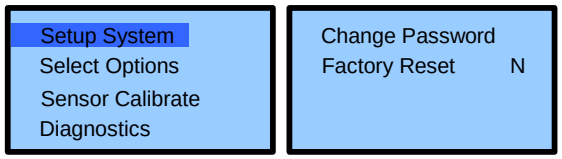


Fig.5-23 System menu

System setting

The system setting can be saved permanently. The menu interface is as shown in Fig.5-24.Except for the remote monitoring, multi-unit joint control and delay time, other submenus do not have lower level submenus. For the parameter setting range, please refer to appendix III list of parameters.

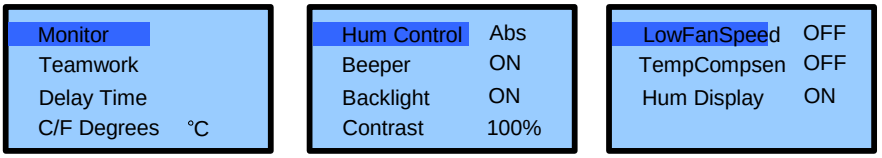


Fig.5-24 System setting menu

1. Remote monitoring

The remote monitoring menu is as shown in Fig.5-25.The unit number can be set as 1~244, and the default value is 1.

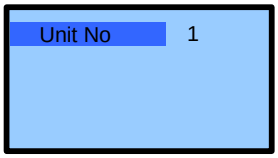


Fig.5-25 Remote monitoring menu

2. Multi-unit joint control

The multi-unit joint control menu is as shown in Fig.5-26.The Liebert_DM chilled water series cooling unit does not provide multi-unit joint control function, and this parameter cannot be set.

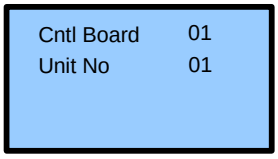


Fig.5-26 multi-unit joint control submenu

3. Delay time

The delay time menu is as shown in Fig.5-27.

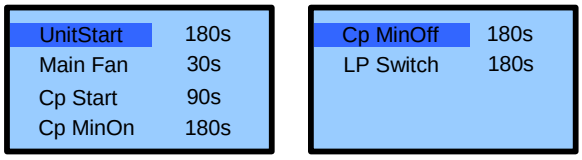


Fig.5-27 Delay time submenu

Optional functions

The optional function setting can be saved permanently. The optional function menu interface is as shown in Fig.5-28. For the parameter setting range, please refer to appendix III list of parameters.

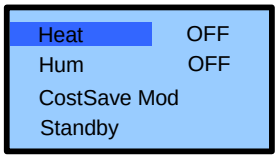


Fig.5-28 Optional function menu

The energy-saving mode and master/slave have lower level submenus. The detailed description is as follows:

1. Energy-saving mode

The energy-saving mode menu interface is as shown in Fig.5-29.

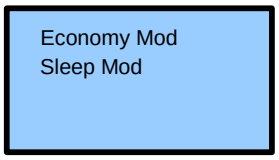


Fig.5-29 Energy-saving mode menu

The economic mode submenu interface is as shown in Fig.5-30.

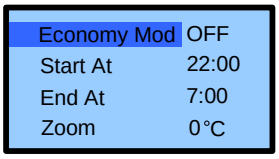


Fig.5-30 Economic mode menu

The sleep mode submenu interface is as shown in Fig.5-31.

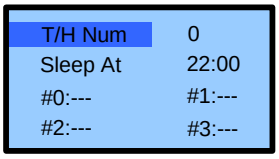


Fig.5-31 Sleep mode menu

Note

The sleep mode can be enabled only when the number of energy-saving cards is larger than 0 Only the Liebert_DM chilled water series cooling unit with more than 1 energy-saving card can enter the sleep mode (this energy-saving card is exclusive for the Liebert_DM chilled water series cooling unit). In the master/slave mode, the master and slave cannot share the same energy-saving card.

2. master/slave

The master/slave menu interface is as shown in Fig.5-32.

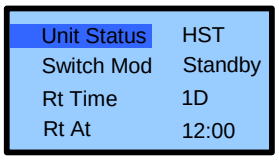


Fig.5-32 Master/slave submenu

Note

In the master/slave mode, one unit must be set as the master. If the two units are set as slave, neither of the two units can operate normally.

Sensor calibration

The sensor calibration menu allows the technician to calibrate the temperature or humidity sensor with the reference instrument (precision: 0.1ºC or 0.1%RH), and the sensor calibration setting will be saved permanently. The sensor calibration menu is as shown in Fig.5-33. For the parameter setting range, please refer to appendix III list of parameters.

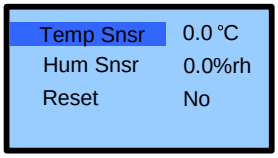


Fig.5-33 Sensor calibration menu

Note

If the sensor reset setting is set as YES, the temperature and humidity sensor calibration value will be reset to default value.

Output diagnosis

The output diagnosis menu is used to display the output status of the cooling unit parts, including main fan, compressor, electric heater and humidifier. The output diagnosis menu interface is as shown in Fig.5-34.

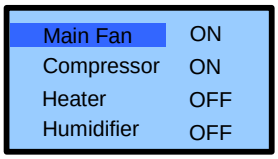


Fig.5-34 Output diagnosis menu

If the main fan is subject to output diagnosis, the main fan will output according to the output diagnosis status, and the outputs of other parts are all disabled. If the part for output diagnosis is not the main fan, the main fan must be turned on, and the relevant part will output according to the output diagnosis status, while all the other outputs will be disabled.

The output diagnosis has time limit. If the output diagnosis status remains the same for certain period of time (15 seconds for compressor, 5 minutes for other components) after it enters the output diagnosis, the system will automatically exit from output diagnosis and resume normal operation.

Change Password:

The change password setting can be saved permanently. The change password menu interface is as shown in Fig.5-35.

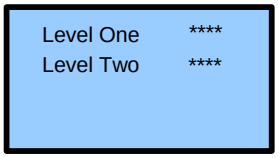


Fig.5-35 Change password menu

Restore to leave-factory value

In the system menu, you can move the cursor to “Restore to leave-factory value” by pressing UP or DOWN key, and then press ENTER, press UP or DOWN key to select YES or NO, and then press ENTER for confirmation. If YES is selected, all the system setting values will be restored to leave-factory values, but the running time record, alarm history record and other relevant information will not be cleared.

Note

Because “Restore to leave-factory value” will clear all the setting values set by the user, please use this function carefully.

5.6.6 Help menu

You can enter the help menu from the main menu interface, as shown in Fig.5-36. The version information and barcode information are not available to the users.

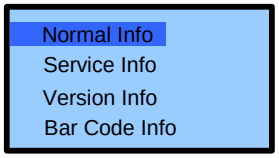


Fig.5-36 Help menu

General information

The general information menu is used for the inquiry of manufacturer information, product information and operation help, as shown in Fig.5-37.

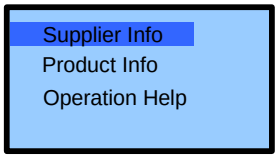


Fig.5-37 General information interface

1. The manufacturer information interface is as shown in Fig.5-38.

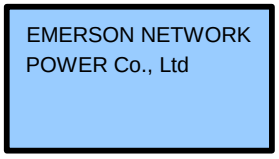


Fig.5-38 Manufacturer information

2. The product information interface is as shown in Fig.5-39.

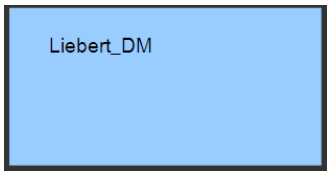


Fig.5-39 Product information

3. The operation help information is not available to the users.

Maintenance information

The maintenance information menu interface is as shown in Fig.5-40.

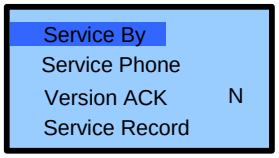


Fig.5-40 Maintenance information

Press UP or DOWN key to move the cursor to Maintenance Conformation, and then press LEFT or RIGHT key to select YES, and press ENTER for confirmation, the maintenance record (including the maintenance personnel and maintenance time) will be automatically recorded to the Maintenance Record.

Press UP or DOWN key to move the cursor to Maintenance Record, and then press ENTER, you can inquire the history maintenance information, as shown in Fig.5-41.

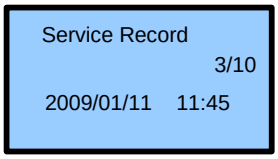


Fig.5-41 Maintenance record

Chapter 6 System Maintenance

This chapter describes the system maintenance of the Liebert_DM chilled water series cooling unit, including the electric inspection, unit maintenance and maintenance checklist.

Note

1. During the equipment maintenance, the circuit breaker shall be disconnected, and the equipment power supply shall be cut off, unless power supply is needed for the commissioning.
2. Even when the power supply of the unit is disconnected, the fan or other live component may still have dangerous voltage. Therefore, during the maintenance, the power supply of the circuit breaker shall be disconnected.

6.1 Electric inspection

The interface board, control board and temperature/humidity sensor board shall be subject to appearance inspection once every half a year to check if the electric connection is loosened and if the circuits are rusted.

The microprocessor has 3 circuit boards which are jointly responsible for the failure detection and input/output of the system.

Check the following items one by one during the maintenance:

1. Carry out electric insulation test on the system, so as to detect and correct any unqualified contact.
2. Check if the pull-on of the contactors is flexible, or if there is any obstacle.
3. Clean the electric and control components with brush or dry compressed air.
4. Check if there is any arcing or burnt sign upon the pull-on of the contacts.
5. Tighten the electric contacts.
6. Check if there is temperature rise on the contacts or the circuit breaker and the contactors.

Note

It is prohibited to plug and unplug the circuit boards under live conditions. Live plugging/unplugging will produce huge transient current, which may cause unrepairable damage to the circuit. All the maintenance on the control board must be carried out after the microprocessor is powered down.

6.2 Unit maintenance

6.2.1 Filter

The filter is a consumable for routine maintenance, and its replacement cycle is directly related to the sealing status and cleanness of the equipment room. To ensure the normal and effective operation of the equipment, the filter shall be inspected monthly, replaced or cleaned when the cleanness is poor.

The unit filter is installed at the front of the unit. Open the front door, remove the clips at the two sides of the filter with a screwdriver, and then you can directly take out the screen, as shown in Fig.6-1.

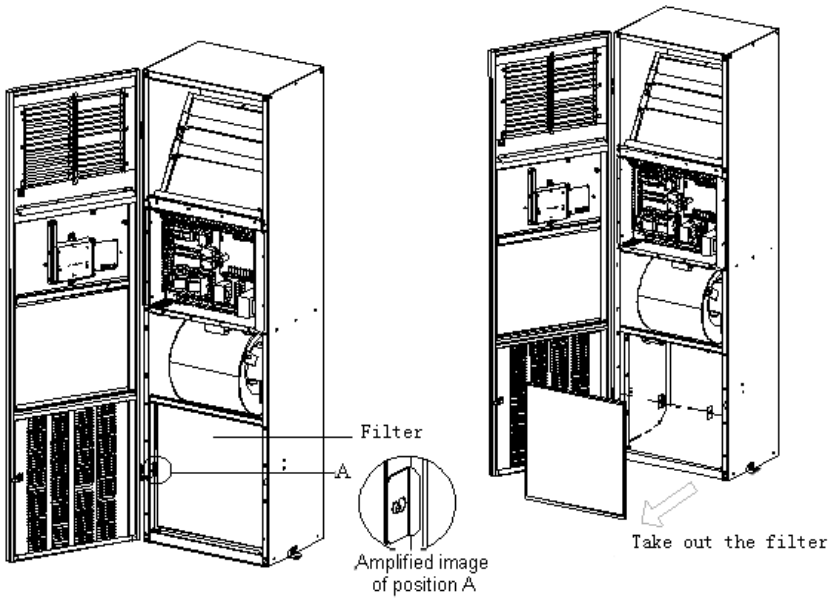


Fig.6-1 Take out filter

6.2.2 Fan

The monthly inspection of the fan components includes the motor operating status, fan impeller status, fixing of the fan components and the fit clearance between the fan and impeller.

The operating status of the motor bearing and fan blades shall be checked monthly. If any damaged blade is found, the fan impeller shall be replaced in time.

Check if the blades are firmly fixed to the motor rotator, and if the rotating blades will cause friction on the nearby metal parts.

The fan components run for 24 hours a day uninterruptedly. Any abnormal factors that will block the airflow shall be removed in time, so as to avoid the damage to the cooling system and other system components because of the reduction of the blast volume.

6.2.3 Drainage pipe

To ensure the normal operation of the drainage pipe, the defrosting pan shall be inspected regularly. There shall be no small foreign objects or leakage in the drainage pipe.

6.2.4 Water flow regulating valve

The water flow regulating valve collects the cooling demand signal to adjust the opening of the valve, so as to control the water flow that passes the heat exchanger coil. When the load is heavy, it allows more water flow, while if the load is light, it will request for reducing the water flow. The regulating valve is composed of the valve body, connector and actuator, as shown in Fig.6-2.

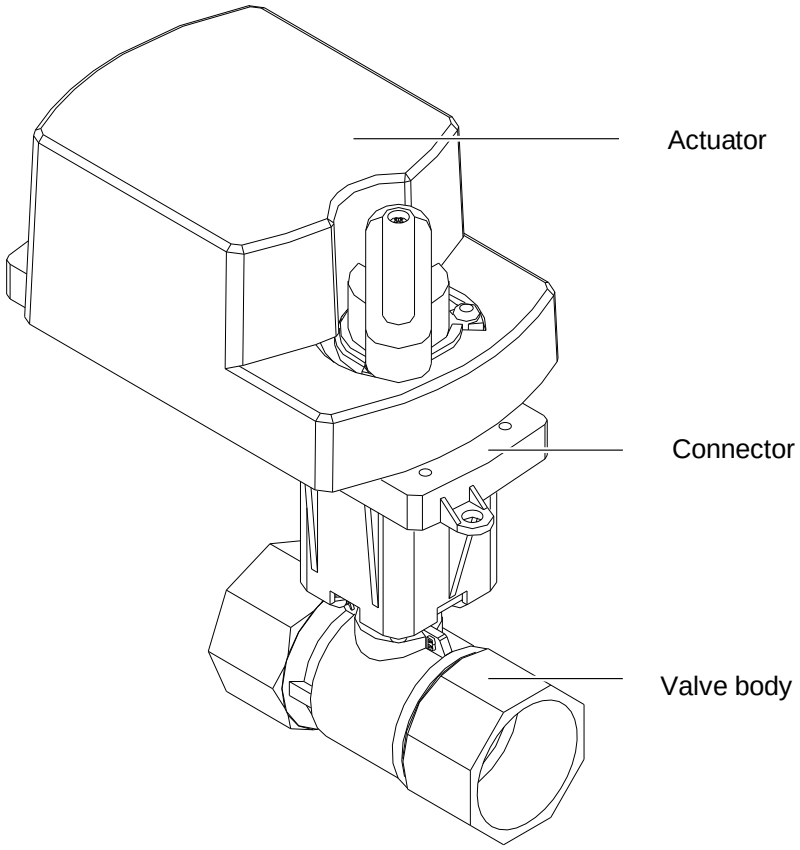


Fig.6-2 Water flow regulating valve

Adjusting method

The water flow regulating valve will automatically adjust the opening of the valve according to the cooling demand, so as to ensure that the temperature and humidity within the air conditioning room are controlled within the precision range.

When the cooling demand is big, the valve would open wider and the water flow increases.

When the cooling demand is small, the valve would open narrower and the water flow decreases.

Test function

When there is refrigeration and dehumidification requirement, the valve would open to allow for water flow. When there is no refrigeration or dehumidification requirement, the valve would close and there is no water flow.

6.3 Maintenance checklist

Note

To ensure the normal operation of the equipment, routine maintenance and inspection shall be carried out regularly.

Table 6-1 Maintenance checklist

Liebert_DM cooling unit			
Date		Maintenance personnel:	
Equipment model:		Number on the unit body:	
Type	Objects for maintenance	Items for inspection	Maintain or not
Monthly maintenance item	Screen	Airflow obstacle	
		Inspect the screen	
		Clean the screen	
	Fan	The blades have no foreign objects and rotate freely	
		The bearing runs freely	
	Drainage system (including condensed water pump)	Check and clean the equipment drainage pipe, humidifier and defrosting pan, condensed water pump and building drainage pipe	
	Water flow regulating valve	Check the water flow	
		Check the hydraulic resistance	
Items for maintenance every half a year	Screen	Airflow obstacle	
		Inspect the screen	
		Clean the screen	
	Fan	The blades have no foreign objects and rotate freely	
		The bearing runs freely	
		Check and fasten the circuit connector.	
	Chilled water coil	Clean water pipe system.	
		Check whether there is leakage in water system.	
	Electric control	Check the circuit connectors	
		Check if the board surface is corroded.	
		Examine fuse and circuit breaker.	
		Check the control program	
		Check the contactor pull-on status	
Note:			
Signature:			

Copy this form to facilitate the record.

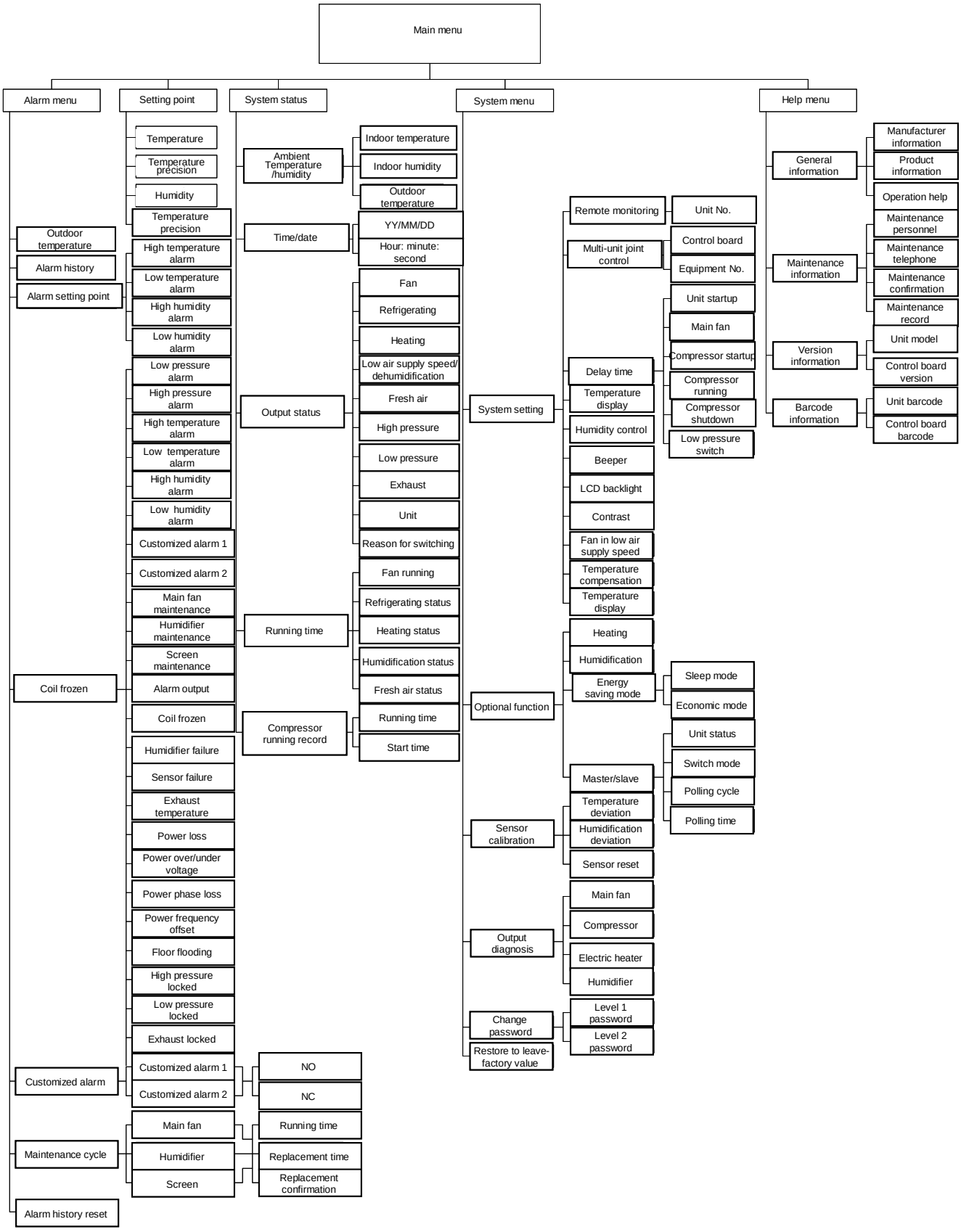
Chapter 7 Failure Diagnosis and Troubleshooting

This chapter introduces the failure diagnosis and troubleshooting of the Liebert_DM chilled water series cooling unit. For the failure diagnosis and troubleshooting measures, please refer to Table 7-1.

Table 7-1 Failure Diagnosis and Troubleshooting

Failure symptom	Potential causes	Handling measures
The equipment cannot be started	The equipment has not been connected to the power supply	Check the equipment input voltage
	The control voltage circuit breaker has been disconnected (on the transformer)	Detect the short circuit and reset the circuit breaker
	The water level of the condensed water pump is too high, and the water level switch relay is closed.	Check if the drainage pipe and pipeline are blocked, and if the condensed water pump is damaged.
	The crossover cable is mis-connected	Check the crossover cable of the interface board
Unable to refrigerate	The 24V power supply to the water flow regulating valve is disconnected	Check if the voltage between terminal 9 and terminal 10 is 24Vac±2Vac.If yes, check the water flow regulating valve. If not, check the 24V transformer and the fuse of the circuit.
	The 0-10V control signal of the water flow regulating valve is lost	Check if there exists a voltage higher than 0V but lower than 10V between terminal 9 and terminal 11. If yes, check the water flow regulating valve. If not, check the control board and interface board.
	The filter is blocked	Clean or replace the filter
	The chilled water temperature is too high	Check the supply water temperature
The fan cannot be started	The fan contactor has poor contact	Check if the voltage of J79 or J78 of the interface board is 24Vac±2Vac.If yes, check the contactor.
	The fan input cable is loosened	Check if the cable connection in the fan power supply circuit is in proper conduction.
The display is abnormal	Static interference	When there exists static interference, power cycle the system.
	The connection between the keypad board and the control board is loosened	Power down the system and tighten the connection of the two boards, and then power up.
There is no display, the key has no reaction, but the equipment operates normally	The output of the keypad board and the control board is interrupted	Check the connection between the keypad board and the control board
	Keypad board failure	Replace the keypad board
There is no display, the key has no reaction, all the equipment outputs are closed	Low power supply voltage	Check the power supply voltage
	The communication between the control board and the interface board is interrupted	Check the connection between the control board and the interface board
High temperature alarm	The setting value of the high temperature alarm is improper	Reset the setting value of the high temperature alarm
	The load indoor exceeds the designed capacity of the equipment	Check the room sealing or further expand the system capacity
Low temperature alarm	The setting value of the low temperature alarm is improper	Reset the value
	The operating current of the heater is improper	Check the heater operating status
High humidity alarm	The setting value is improper	Reset the value
	The room does not have dampness resistant measures	Check the dampness resistant measures of the environment
Low humidity alarm	The setting value is improper	Reset the value
Maintenance alarm	It is time for maintenance	Maintain the corresponding part and reset the alarm

Appendix 1 Menu Structure Diagram



Appendix 2 List of Parameters

menu			Parameter name	Default value	Setting range
Alarm menu	Alarm setting point		High temperature alarm	30ºC	The larger of (the temperature setting points +5ºC, 28ºC) ~45ºC
			Low temperature alarm	18ºC	5ºC~the smaller of (the temperature setting points -5ºC, 18ºC)
			High humidity alarm	60%RH	The larger of (the humidity setting points +10%, 65%) ~90%RH
			Low humidity alarm	40%RH	10%RH~the smaller of (the humidity setting points -10%, 5%)
			Alarm output (minor alarm)	Enabled	Disabled, enabled
			Alarm output (critical alarm)	Enabled	Suspended, enabled
			Customized alarm	None	None, other alarm
	Customized alarm		Customized alarm 1	Normally open	Normally open, normally closed
			Customized alarm 2	Normally open	Normally open, normally closed
	Maintenance cycle	Main fan	Replacement cycle	360 days	180 days to 720 days
			Replacement confirmation	N	Y, N
		Screen	Replacement cycle	180 days	90 days to 360 days
			Replacement confirmation	N	Y, N
Setting point			Temperature	24ºC	15ºC~35ºC
			Temperature precision	3ºC	1ºC~5ºC
			Humidity	50%RH	20%RH~80%RH
			Humidity precision	5%RH	1%RH~10%RH
System menu	System setting	Remote monitor	Unit no.	1	1~254
		Multi-unit joint control	Control board	0	0~15
			Equipment No.	0	0~15
		Delay time	Unit startup	10 seconds	10 seconds to 240 seconds
			Main fan	30 seconds	10 seconds to 240 seconds
	System setting		Temperature display	ºC	ºC, ℉
			Humidity control	relative	Relative, absolute
			Beeper	On	Off, on
			LCD backlight	On	Off, on
			Contrast	30%	28%~38%
			Fan in low air supply speed	Off	Off, on
			Temperature compensation	Off	Off, on
			humidity display	On	Off, on
	optional function		heating	N	Y, N
			Humidificaton	N	Y, N
	Optional function _ energy-saving mode _ economic mode		Economic operation	N	Y, N
			Starting time	22: 00	18: 00~3: 00
			Ending time	7: 00	5: 00~10: 00
			Precision amplification	0ºC	0ºC~ (high temperature - temperature precision -temperature setting-1)
	Optional function _ energy-saving mode _ sleep mode		Qty. of energy-saving cards	0	0~4
			Sleep temperature	27ºC	15ºC~40ºC

menu		Parameter name	Default value	Setting range
System menu	Optional function _ mater/slave	Unit status	Single unit	Single unit, master
		Switching mode	Master/slave	Master/slave, polling
		Polling cycle	1 day	1 day to 7 days
		Polling time	12: 00	0: 00~23: 00
	Sensor calibration	Temperature deviation	0.0ºC	-5.0ºC~5.0ºC
		Humidity deviation	0.0%RH	-10.0%RH~10.0%RH
		Sensor reset	N	Y, N
	Output diagnosis	Main fan	On	On, off
	Change Password:	Level 1 password	0001	0000~9999
		Level 2 password	0002	0000~9999
System menu		Restore to leave-factory value	N	Y, N

Appendix 3 Introduction to SiteMonitor Software

SiteMonitor is the equipment monitoring software developed by Emerson. It can monitor the UPS, cooling units (CM+, Liebert_DM, Deluxe) and LTS series static transfer system (STS) developed by Emerson, control and handle various environment parameter values (such as temperature, humidity, smoke detector, flooding, infrared signal) through the equipment room signal adaptor and other relevant options.

SiteMonitor can run on Windows, Linux, Solaris, AIX or HP-UX operating system, and can be accessed through WEB browser. You can log on this software through any connected computer to carry out equipment monitoring and maintenance management. The software interface is as shown in Fig.1.

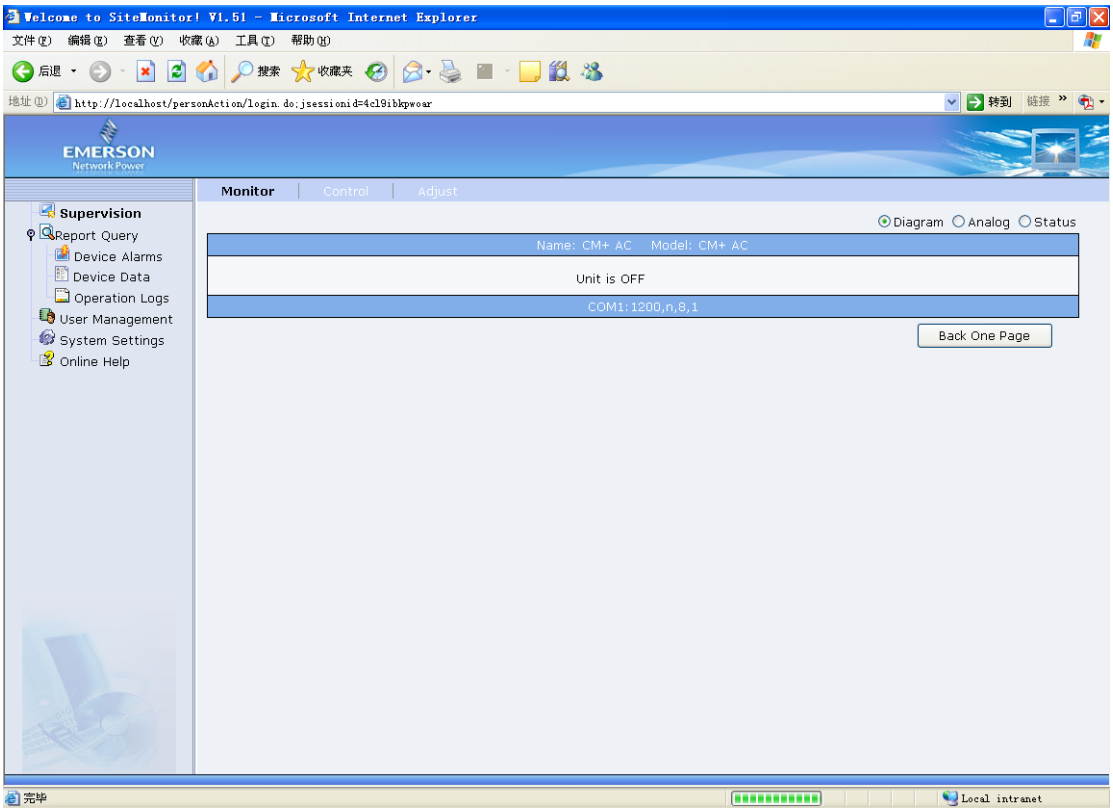


Fig. 1 Software interface

Its main functions include:

Simple and quick installation. It supports such operating systems as Windows, Linux, Solaris, AIX and HP-UX and provides cross-platform management.

Auto search and configuration of equipment, eliminating the trouble of manual configuration.

Inquiry of existing data. It can be used to inquire the existing running data and alarm data of the equipment.

Alarm notice. When the equipment has alarm, it will notify the user by sending email, SMS or making phone call.

Remote control. It can provide remote control for the equipment with remote control functions.

Remote regulating. It can provide remote regulating for the equipment with remote regulating functions.

Real time monitoring of equipment room environment. It can monitor the environment parameters (including temperature, humidity, smoke, flooding, infrared signal, etc.) and the power parameters (including three-phase AC power and DC power).

Convenient report lookup. It can provide equipment alarm report, running data report and operation record report, and support the multi-page display of reports and data export function.

Powerful personnel management function. It can be used to add, modify and delete personnel information and grant different software operation authorities to different personnel according to their work nature.

Powerful online backup and recovery function. It can quickly back up and restore the system data without affecting other users.

Note

1. SiteMonitor supports and works together with safe shutdown software to protect the computer data. For detailed information, please refer to User Manual for Safe Shutdown Software (Windows) and User Manual for Network Safe Shutdown Software (UNIX & Novell Netware).

2. For detailed description about SiteMonitor, please refer to User Manual of SiteMonitor Monitoring Software.

Appendix 4 Symbol Table for Toxic/Hazardous Substances and Elements

Part name	Toxic/hazardous substance or element					
	Lead	Mercury	Cadmium	Hexavalent chromium	Polybrominated biphenyls	Polybrominated diphenyl ethers
	Pb	Hg	Cd	Cr^{6+}	PBB	PBDE
Cabinet	×	○	○	○	○	○
Cooling component	×	○	○	○	○	○
Fan unit	×	○	×	○	○	○
Electric control unit	×	○	×	○	○	○
Display	×	×	○	○	○	○
PCBA	×	○	○	○	○	○
Heat exchanger	×	○	○	○	○	○
Copper pipe	×	○	○	○	○	○
cable	×	○	○	○	○	○

○: It means the content of this toxic/hazardous substance in all the homogeneous materials of this part is below the limit regulated in SJ/T-11363 –2006.
It means the content of this hazardous substance in at least one homogeneous material of this part is above the limit regulated in SJ/T-11363 –006;

Emerson Network Power Co., Ltd. has always been devoted to designing and manufacturing environment friendly products. We will try to reduce and eliminate the toxic/hazardous substances in the products through continuous research. The following parts or the toxic/hazardous substances do not have reliable replacement or mature solutions due to the limitation of current technical level.
1. The lead-containing applications include: copper alloy, solder, glass resistor, and electronic ceramics.
2. The backlight lamp contains hydrargyrum.
3. The switch contact of the distribution unit contains cadmium.

Description about EFUP: This product's EFUP (which has been marked on the product body) refers to the period, which starts from the production date, when the toxic/hazardous substance or element contained in this product (battery is excluded) does not exert serious impact on environment, human body and property, under normal application terms and in compliance with the product's safety precautions.

Applicable scope: Liebert_DM Chilled Water Series Cooling Unit

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T: 1800-065345
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