Chapter 1 General Description

B series module type air cooling (heating) water chiller LSQWRFM/B（LSQWFM/B being a single cooling series）is composed of multiple cooling (heating) water unit modules, which may be completely the same in the form and performance, or may be not. It has features as follows: the name cooling capacity of each unit module may be 40kW, 60kW, 80kW and130kW respectively. Among them, each unit has two completely independent cooling systems, i.e. two sets of compressors, one set of pipe type evaporator and two sets of fin type condensers. The system may consist of 1~8 module combination, forming a B series module combination product with multiple specifications and multiple types, with a cooling capacity of 40~1040kW.

B series module is of a compact structure, small external dimensions and a low hoisting cost. The air cooling design save facilities for the users such as cooling tower and cooling water pump, reducing the civil engineering investment.

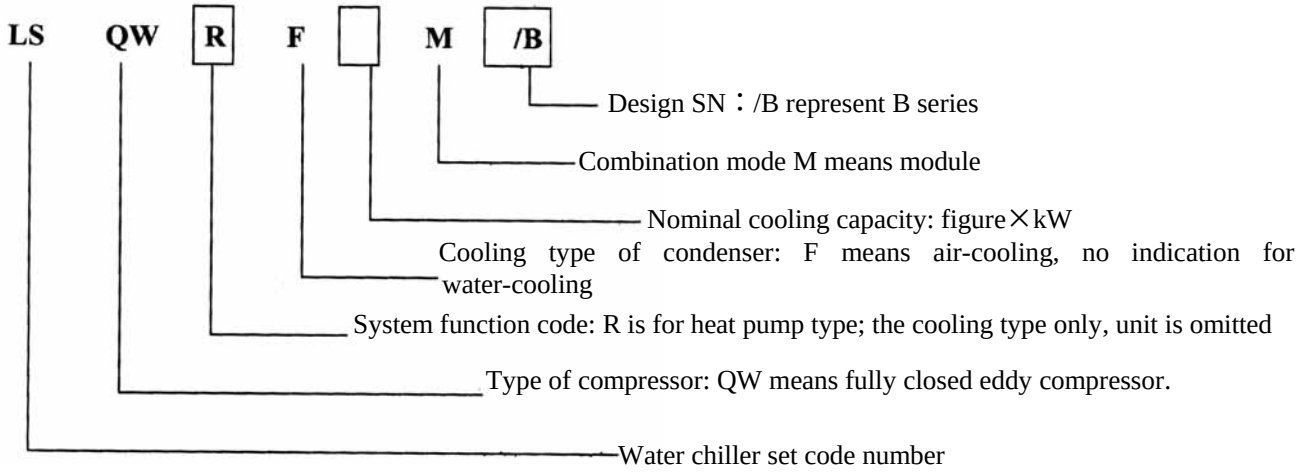
B series module adopts the most up-to-date, whole Chinese microcomputer control sub-system for intelligent control of the operation of the system. It can excite automatically the relative sets of unit modules in accordance with the load. As a result, the energy adjustment of multiple level and the uniform distribution among the unit modules can be realized, and the best matching of system output and the load can be obtained in the changing process of minimum load to maximum load. The best energy saving operation thus comes into reality. At the same time, it has a far end monitor function. There is a monitor interface preserved for the user in the display panel of Chinese controller. The user may connect through the interface to the central computer in the room within 1000m, where the central computer

may connect as much as five sets of unit modules, realizing separation of man and machine, and remote monitor, facilitating greatly the users.

B series module air cooling water chiller can be applied extensively in the newly built or reconstructed air conditioning projects for large or small industrial and civil buildings, such as hotels, apartments, restaurants, dining rooms, office buildings, shopping centers, theaters and cinemas, gymnasiums, factory buildings, hospitals and many other buildings. It is particularly suitable for the use in the sites where there are higher requirements on noise control and environments, or where it is not allowed to install boilers, or particular location where it is very difficult to install cooling tower. In these locations, the module air-cooling water chiller will be the most ideal choice.

1.1 Model Expression and Example

1.1.1 Model Expression



1.1.2 Example

Model example:

LSQWF60M/B means that it is B series module air-cooling, water chiller set. The name cooling capacity is 60kW, adopting fully closed eddy compressor.

LSQWRF60M/B means that it is B series module air-cooling, cold (heat) water chiller (heater) set. The name cooling capacity is 60kW, adopting fully closed eddy compressor.

1.2 The outline picture of the system and example of combination

1.2.1 The outline picture

The outline picture of LSQW(R) F40M/B

The outline picture of LSQW(R) F60M/B, LSQW(R) F80M/B

The outline picture of LSQW(R) F130M/B

1.2.2 The example of combination

(1) 4 sets of LSQWRF130M/B combining into system with a cooling capacity of 520kW

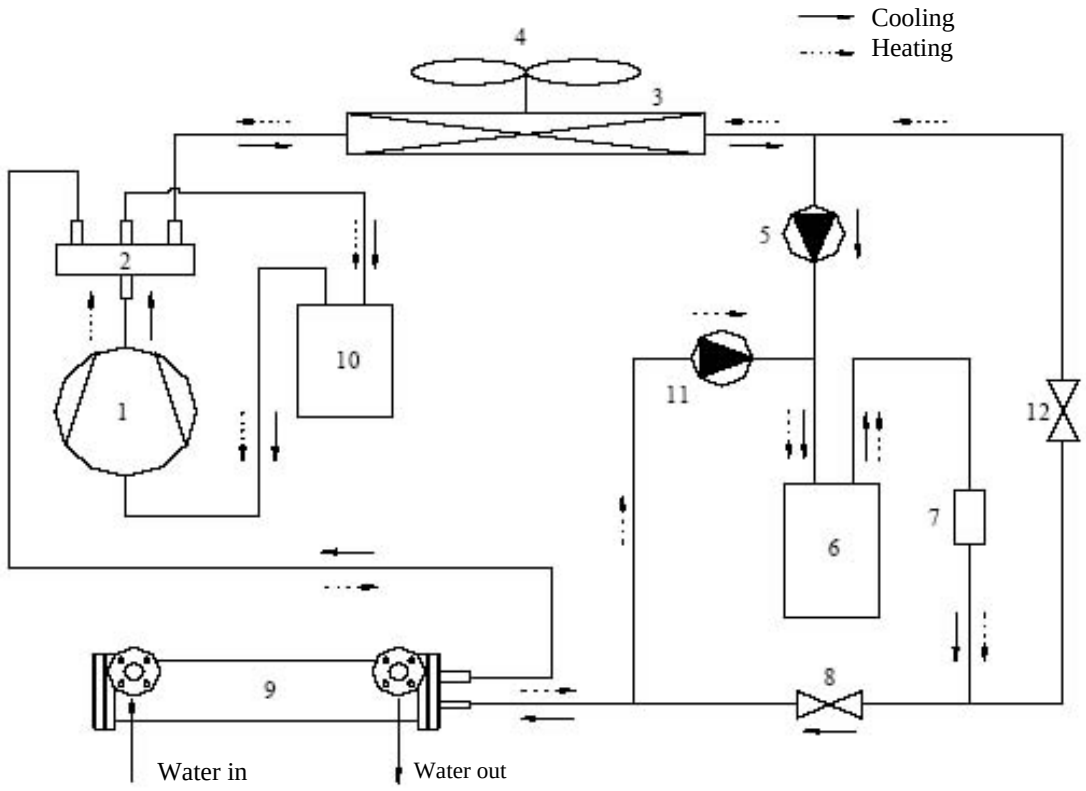
(2) 4 sets of LSQWRF60M/B combining into system with a cooling capacity of 240kW

(3) 4 sets of LSQWRF130M/B and one set LSQWRF60M/B combining into system with a cooling capacity of 580kW

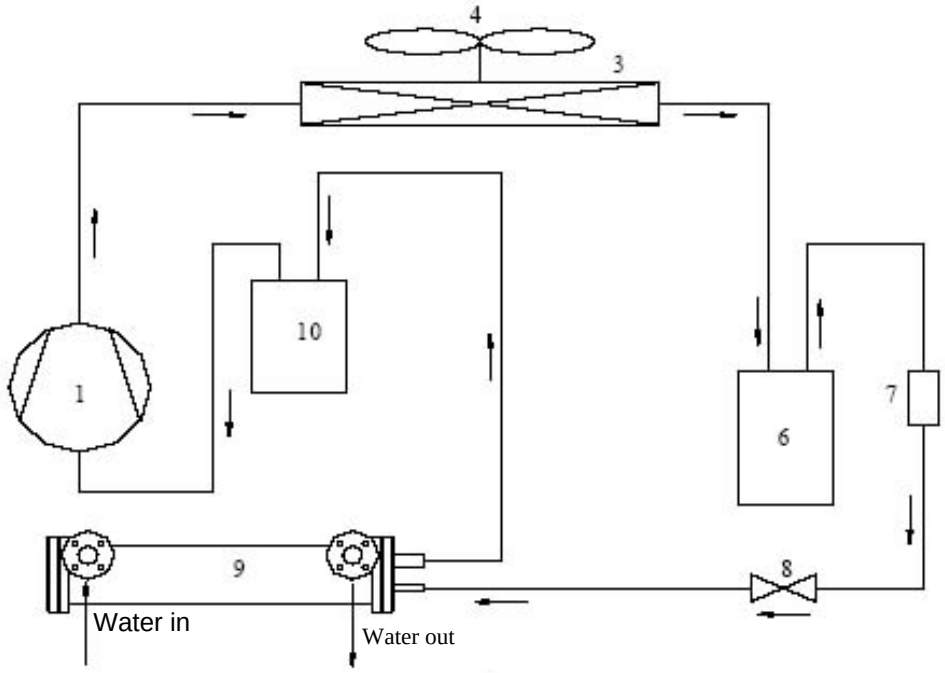
1.3 Operation principle and system diagram

Cooling circulation: The low-pressure and over-heated refrigerant steam from the evaporator (fin type) is sucked by compressor, and is compressed into the high-temperature and high-pressure over-heated steam. It is then heat-sank to the environment from the condenser (cooling type heat exchanger) and condensed into the saturated or over-cooled refrigerant liquid. Then it is throttled and pressure-declined in the expansion valve and flows into the evaporator (shell pipe heat exchanger). After absorbing the heat in the refrigerant water and gasified, it is sucked by the compressor and compressed again, starting a new circulation. In this way, the refrigerant water passing through the evaporator is cooled down, and then is delivered to the air conditioning area.

Heating pump circulation: The refrigerant direction is reversed by four-way reversing valve. The compressed high-temperature and high-pressure refrigerant steam is compressed by the compressor, and is directly discharged into the plate heat exchanger, emitting the heat to refrigerant water and producing the heating effect. The condensed refrigerant liquid is throttled and pressure-declined by the expansion valve, sucking the heat from the environment in the air-cooling heat exchanger and is vaporized. Then it is sucked into the compressor and compressed, forming heat pump circulation.



Cooling (heating) water chiller



Cooling water chiller

1 Compressor 2 4-way valve 3 Air side heat exchanger
4 Fan 5 Check valve 1 6 High-pressure liquid accumulated tank
7 Filter 8 Cooling expansion valve 9 Shell pipe heat exchanger
10 Gas and liquid separator 11 Check valve 2 12 Heating expansion valve

Attached diagram 1 Block diagram of B series module

1.4 Installation space of the system

1.4.1 Installation requirements

To ensure a normal operation of the system and to prevent failure, the installation should be carried out by technician having certain knowledge of air conditioner and relative experiences. Please read carefully the operation manual prior to the installation.

The system has been produced through strict quality control system and has passed through strict performance test before delivery. Please follow the operation manual in the installation, operation and maintenance so that the normal operation and long life can be ensured for the system.

1.4.1.1 Acceptance and check

The user should organize personnel to carry out unpacking and acceptance after the system is delivered to the destination as stipulated in the contract.

a) Check if the documents and auxiliaries affiliated to the system are complete in accordance with the packing list.

b) Check for the type and specifications of the system in accordance with the documents affiliated with to the system.

c) Check if there is any damage to the system and if the parts and spares are complete.

d) Check if the refrigerant filled into the system is leak.

In case there is any damage or problem found after the above acceptance, please describe the case to the local representative office of the company in time so as to solve the problem properly.

Remarks: Protection measures should be adopted after the system is unpacked and checked. It is recommended not to unpack the system too early to prevent the system from being damaged!

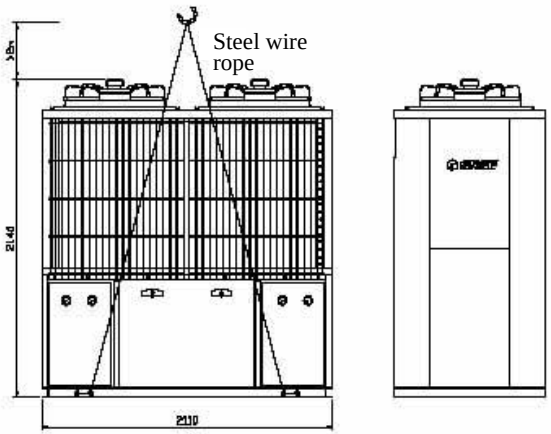
1.4.1.2 Transport and hoisting

Each system has passed through strict inspection and test before delivery so that the performance and quality can be ensured for the system. It is recommended that the user should be very careful during the installation and transport to prevent damaging the control sub-system and the piping.

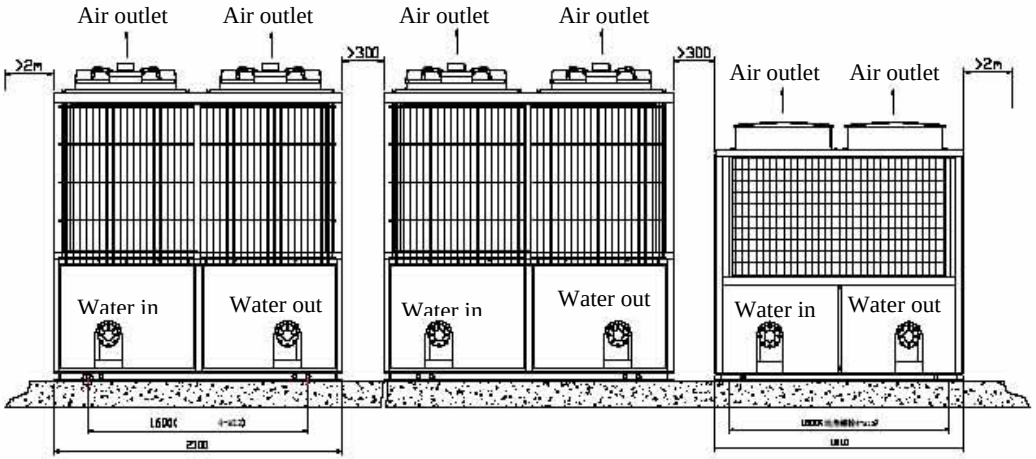
It is recommended that the user should transport the system to the installation location as near as possible prior to the unpacking and the system should be kept upright. To transport the unpacked system, please follow the methods given below:

a) Move the system with rolling bars: Place three rolling bars of the same size under the base plate of the system, with each bar being 1/5 longer than the width of the system and the system should be kept balanced.

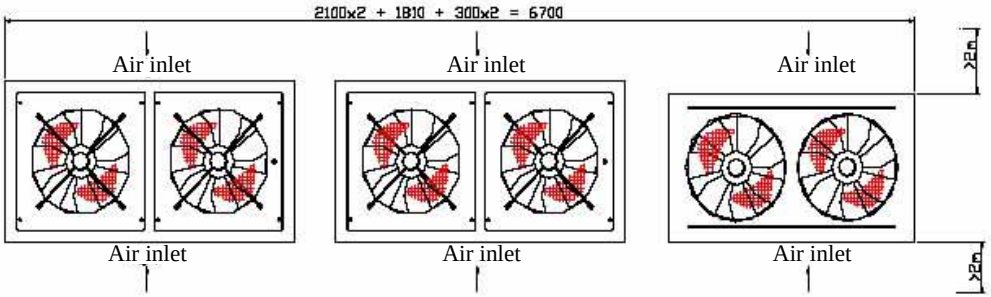
b) Hoisting（refer to Attachment Diagram 2）



Hoisting method: Pass the steel wire rope through the corresponding hole in the diagram and hoist it together with a hook.



The underneath of the system should be placed with shock absorbing rubber pad (prepared by the users), and then, fix it on the ground or roof with screw bolt.



Attached diagram 1 Outline dimensions for installation

1.4.2 Installation location and combination

1.4.2.1 Installation location and foundation

Under each unit module, rubber shock absorbing pad should be placed on the outdoor ground or a flat roof, and then, fix with screw bolt. Or place the system in parallel on two parallel channel steel or I shape steel of an enough strength, with the operation face neatly placed and fixed with screw bolt. The separation between the adjacent unit modules should be 30~60cm.

1.4.2.2 Space for maintenance and ventilation

Good ventilation should be ensured around the system and the minimum distance from the obstacle should not be less than 2m. If the condition allows, it is recommended to set up a sunshine shade 2m from the top of the system.

1.4.2.3 Combination of unit module system

a) Combination of unit module system may be in the form as recommended in the Attachment Diagram 3.

b) The shell piping evaporator inside all the unit modules may be connected with rubber joint flange and the user water pipe.

c) The power line passes through the side hole of the system and is connected to the power connector board inside the electric controller box. The electric connection between the units is referenced to the connection instructions for control system.

1.4.3 Connection of cooling water piping

The connection section of piping is stuck with inlet/outlet mark and hence it is required to operate according to the description given in the mark. The following should be observed during pipe connection:

(1) Flexible joint is used for the inlet/outlet cooling water pipes of the system so that no vibration will be transferred during the system operation.

(2) To ensure that the water pump is turned on prior to turning on the system, a water flow switch should be installed for the pipe and should be interlocked with the controller of the compressor.

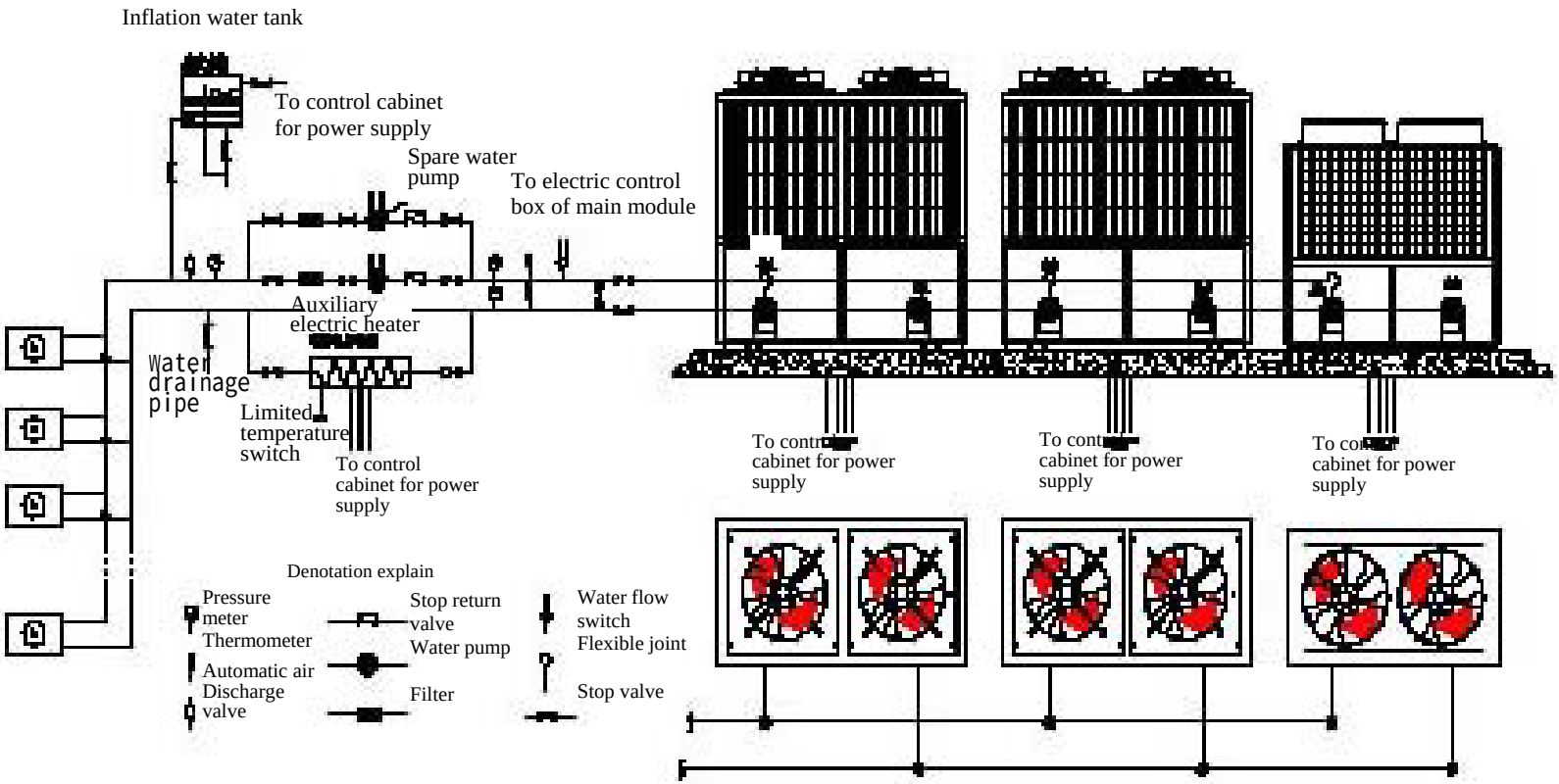
(3) A water discharge valve should be installed for the outlet pipe and an air discharge valve should be installed for the inlet pipe. It is recommended to remove the valve handle so that the valve can not be opened. Otherwise, water disconnection accident may happen when the system is operating with the discharge valve opened.

(4) Heat insulation measure should be adopted for cooling pipe to prevent condensing and dissipating of cooling or heating volume.

(5) The system equipment and piping may be frozen and damaged due to water freezing inside the shell pipe evaporator and piping at night when the system stopped operation in winter in a very low environment temperature. To prevent freezing, the pump should be operating even when the system stopped operating. The safest method is to discharge the water completely from the piping, or to add alcohol and propanol mixture inside the water to avoid freezing.

Remarks: Never use salt mixture, otherwise, the system may be corroded and the equipment may be damaged.

Attached Fig. 3 is the schematic diagram of installation for the system and the cooling water piping sub-system.



Attached diagram 3 Schematic diagram of installation for cooling sub-system of the system

1.4.4 Water quality control

The scale will be hardly produced when industrial water is used for cooling. However, much scale and sediment such as sand will be resulted if water from a well or a river is used, causing less water flow when they are accumulated on the evaporator and leading to frozen accident. Hence water of this kind should be filtered out prior to entering the cooling system and should be softened with equipment for water softening. Prior to application, it is required to analyze the PH value, conductivity rate, Cl-ion density and sulfuric acid ion density. The following is the water standard meeting the water quality of the system:

PH value：6.5~8.0
Conductivity：<200μV/cm(25℃)
Cl-ion：<50ppm
Sulfuric acid ion：<50ppm
Fe amount：<0.3ppm
Basic ion：<50ppm
Total hardness：<50ppm
S-ion：Non
Amino ion：Non
Si：<30ppm
Na ion：no requirement

1.4.5 Remarks for installation

(1) It is not allowed for indoor installation of the system. If there is a requirement for indoor installation, it is required that the minimum distance of outlet vent from the ceiling of the building should be greater than 1.5m and there should be enough air flow and ventilation facility.

(2) R22 refrigerant is used in the system, which is not inflammable and free of poison. However, the refrigerant is of a greater gravity than the air, it will be spread on the floor in case leakage occurs. That is why it is required to have good ventilation if the system is installed in a closed room to prevent stuffing accident.

(3) The system should be turned off immediately and the service personnel should be contacted timely in case leakage occurs. In this case, the site should be free from flame. Otherwise, harmful gas may be dissolved when the refrigerant contacts the flame.

1.5 Types and technical specifications of the system

1.5.1 List of performance parameters of the system

Type		LSQWFM				LSQWRFM			
		40	60	80	130	40	60	80	130
Name		Air cooling water chiller system of module type				Air cooling (heating) water chiller system of module type			
Cooling capacity	kW	40	60	78	130	40	60	78	130
Heating capacity	kW	\				42	64	82	140
Name cooling consumed total power kW		13.1	18.5	24.0	40.0	13.1	18.5	24.0	40.0
Name heating consumed total power kW		\				12.7	18.2	23.3	38.8
Noise	dB(A)	64	67	69	72	64	67	69	72
Power supply		3N-380V 50HZ							
Running control		Microcomputer full automatic control, operation status display and abnormal status alarm							
Safety device		High and low pressure switch, anti-freezing switch, over current protection switch, phase sequence protector, over heat protection device for compressor and software delay starting protection for compressor.							
Compressor	Type	Fully sealed eddy flexible compressor							
	Power kW	6.3 x2	8.8 x2	10.9 x2	18.4 x2	6.3 x2	8.5 x2	10.9 x2	18.4 x2
Refrigerant		R22							
Charge volume kg		6.3x2	9.5X2	12.7x2	19X2	6.3x2	9.5X2	12.7x2	20X2
Water system	Water flow m^3/h	6.9	10.6	13.4	22.3	6.9	10.6	13.4	22.3
	Water resistance loss k Pa	5.9	9.84	14.76	8.37	5.9	9.84	14.76	8.37
	Water side heat exchanger Heat exchanger of high efficiency and shell type								
	Max. pressure tolerance MPa								1
	Inlet pipe dia.mm	60.5	73	73	89	60.5	73	73	89
Air side heat exchanger	Type	High efficient fin type coil							
	Air flow m^3/h	1.9×10^4	2.8×10^4	3.7×10^4	5.6×10^4	1.9×10^4	2.8×10^4	3.7×10^4	5.6×10^4
	Fan motor power kW	0.60	1.50	2.30	3.20	0.60	1.50	2.30	3.20
Outline dimensions	Length mm	1810	2110	2110	2410	1810	02110	2110	2410
	Width mm	1000	1100	1100	1900	1000	1100	1100	1900
	Height mm	1740	2140	2140	2240	1740	2140	2140	2240
Total weight of system kg		600	950	1100	1700	600	950	1100	1800
Optional for user	Auxiliary electrical heating power kW	\				15	15	30	30

Remarks：1. The design standards of the system is GB/T18430.1-2001

2. The above cooling/heating capacity is obtained in the name working condition.

The name working condition：

Item	Water side status		Air side status	
	water inlet temp (℃)	water outlet temp (℃)	Dry bulb temp (℃)	Wet bulb temp (℃)
Rated cooling	12	7	35	24
Heat pump heating	40	45	7	6

1.5.2 Cooling capacity correction

◇ Cooling capacity correction coefficient under different environmental temperature and outlet temperature of cooling water.

Cooling capacity correction coefficient					
Outlet temperature of cooling water ℃	Ambient temp℃				
	25	30	35	40	45
5	1.07	1.00	0.94	0.84	0.81
6	1.10	1.03	0.97	0.87	0.83
7	1.14	1.07	1.00	0.91	0.86
8	1.17	1.10	1.03	0.94	0.88
9	1.20	1.13	1.06	0.98	0.91
10	1.23	1.16	1.09	1.01	0.93
11	1.27	1.19	1.12	1.04	0.96
12	1.31	1.23	1.15	1.07	0.99
13	1.34	1.26	1.17	1.09	1.01
14	1.37	1.29	1.20	1.12	1.03
15	1.41	1.32	1.23	1.14	1.06

Calculation of actual cooling capacity of the system:

Actual cooling capacity = Cooling capacity correction coefficient×Name cooling consumed total power kW

Where：——Cooling capacity correction coefficient can be obtained from the list of cooling capacity correction coefficient. Name cooling consumed total power kW

——Name cooling consumed total power kW can be obtained from the list of performance parameters.

1.5.3 Heating capacity correction

◇Heating capacity correction coefficient under different environmental temperature and outlet temperature of heating water.

Heating capacity correction coefficient under different							
Outlet temperature of heating water℃	Ambient temp℃						
	15	10	7	5	0	-5	-10
30	1.23	1.10	1.03	0.99	0.89	0.81	0.73
35	1.21	1.09	1.02	0.98	0.87	0.79	0.70
40	1.20	1.08	1.01	0.96	0.86	0.77	0.68
45	1.19	1.07	1.00	0.95	0.84	0.75	0.67
50	1.17	1.05	0.98	0.94	0.83	0.74	0.64

Calculation of actual heating capacity of the system:

Actual heating capacity = Heating capacity correction coefficient×Name heating consumed total power kW

Where：——Heating capacity correction coefficient can be obtained from the list of heating capacity correction coefficient.

——Name heating consumed total power kW can be obtained from the list of performance parameters.