GREE
Change for life

Service Manual

A series modular air-cooled chillers (heat pumps) with integrated hydraulic modules

T1/ R32 /50Hz

Contents

SAFETY NOTICE

The following symbols are used in this document to alert the reader to potential of hazard.

⚠ WARNING indicates a potentially hazardous situation which, if not avoided, could result in damage to the machine as well as death or serious injury.

⚠ CAUTION identifies a hazard which could lead to minimal or moderate damage to the machine as well as death or serious injury.

⃠ BAN indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

❗ COMPLIANCE identifies a hazard which could lead death or serious injury as well as damage to the property.

PREFACE

Thank you for selecting Gree's A Series Inverter Modular Air-cooled Chiller (Heat Pump). Please read this instruction manual carefully before installing and using the product, we hereby instruct as below:

This Manual is applied to A Series Inverter Modular Air-cooled Chiller (Heat Pump), specifying operation safety requirements, basic principles and implementation approaches for construction fulfillment, construction debug, after-sale maintenance and repairs. All works must be performed in accordance with the relevant national (and local) safety requirements and User's Manual, which if not abided, could result in potential damage to the air conditioner, and even serious injury or death.

Product

1 Product information

1.1 Introduction

1.1.1 Lineup

Model	Product code	Cooling capacity	Heating capacity	Power supply	Refrigerant	Appearance
LSQWRF 35VMP1/NhA-M	EL01500910	33	36	380–415VAC 3Ph 50Hz	R32	
LSQWRF 60VMP1/NhA-M	EL01500900	60	65			
LSQWRF 100VMP1/NhA-M	EL01501050	100	105			
LSQWRF 130VMP1/NhA-M	EL01501020	130	131			

1.1.2 Nomenclature

LS	QW	R	F	60	V	M	P1	/	Nh	A	-	M
1	2	3	4	5	6	7	8		9	10		11

No.	Code description	Options
1	Unit	LS: chiller
2	Compressor type	QW: hermetic scroll/rotary type
3	Unit function	Omit: cooling only
		R: heat pump
4	Cooling method of condenser	F: air-cooled
5	Rated cooling capacity	Rated cooling capacity = number (kW)
6	System type	Omit: fixed frequency, V: inverter
7	Assembly method	M: modular
8	Integrated hydraulic module	P1: water pump
9	Refrigerant type	Nh: R32
10	Design code	A-Z alphabetic order
11	Power code	M: 380–415VAC 3Ph 50Hz

LSQWRF35VMP1/NhA-M indicates an inverter modular air-cooled chiller with a fully enclosed rotary compressor and an integrated water pump, featuring 33kW cooling capacity and using R32 refrigerant.

1.1.3 Product features

The all-inverter modular air-cooled chillers work outstandingly by virtue of their major features stated below.

(1) Excellent compatibility

The all-inverter modular air-cooled chillers can be constructed of multiple single units with the same structure or capability (33kW, 60kW, 100kW and 130kW). For LSQWRF35VMP1/NhA-M, it has only one cooling system; for LSQWRF60VMP1/NhA-M, LSQWRF100VMP1/NhA-M and LSQWRF130VMP1/NhA-M, it has two independent systems. Different models shall not be modularized, but the same not more than 3 sets are allowed.

(2) Comfort and energy saving

The inverter can quickly respond to load change and lead to decreased water temperature fluctuation and better comfort.

(3) Ultra quiet operation

The high-efficiency and low-noise fan blades and motor as well as the optimized air passage can greatly lower operation noise of the unit. Besides, the quite mode can provide the user a ultra-quiet environment.

(4) Powerful self-protection

It is equipped with the top-end microcomputer control system which is capable of providing well-rounded protection and self-diagnosis.

(5) High reliability

It is constructed of well-designed refrigeration parts and well-designed system, structure and electric control, adequately guaranteeing reliable operation.

(6) Remote ON/OFF

Convenience is maximized when all units can be started and stopped via a centralized controller that sends signals to a dry contact switch at each floor, with no need for manual operation of control cabinets.

(7) Equilibrium running

It indicates each compressor will run alternately so as to extend their service life.

1.1.4 Nominal operating conditions

Item	Water side		Air side	
	Water flow $m^3/(h \cdot kW)$	Leaving water temperature (°C)	Dry bulb temperature (°C)	Wet bulb temperature (°C)
Cooling	0.172	7	35	-
Heating		45	7	6

1.1.5 Operation range

The unit should work within the specified operation range as shown in the table below:

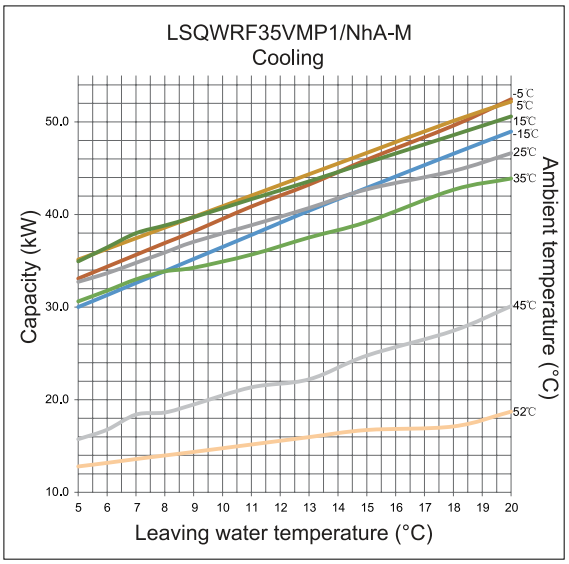
Item	Water side		Air side
	Leaving water temperature (°C)	Water temperature difference (°C)	Ambient DB temperature (°C)
Cooling	5~20	2.5~6	-15~52
Heating	35~50	2.5~6	-20~40

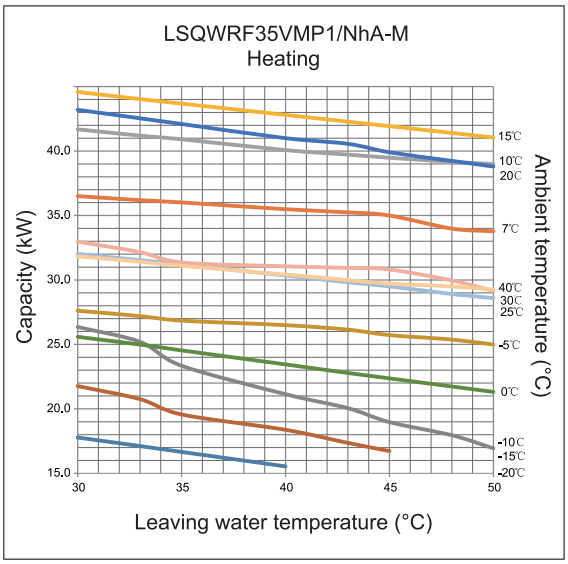
Maximum and minimum entering water pressures

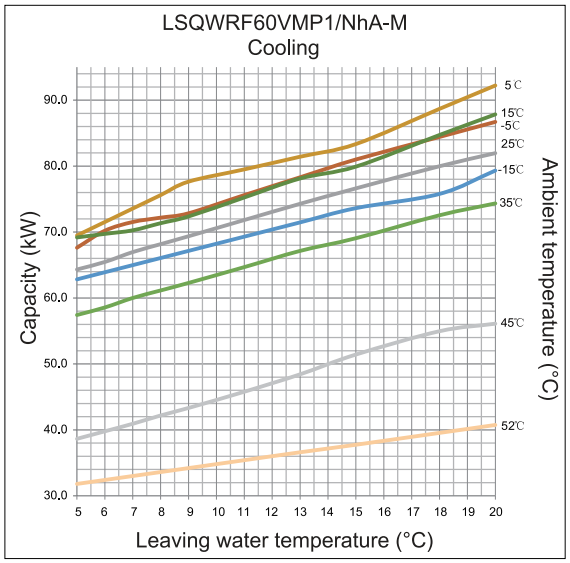
Item	Minimum entering water pressure	Maximum entering water pressure
Cooling	0.06MPa	0.6MPa
Heating		

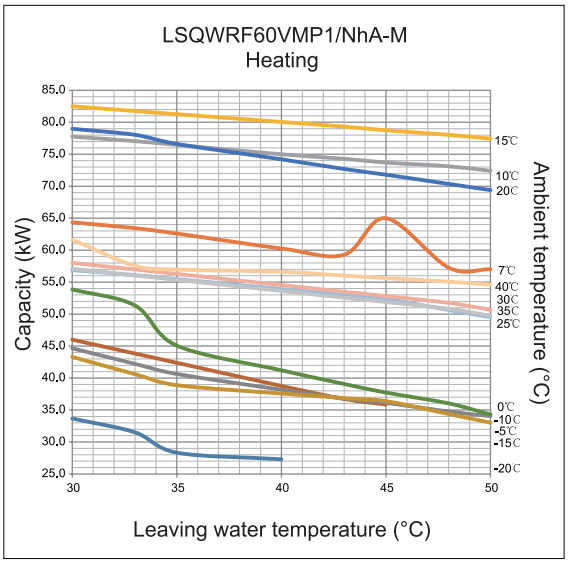
1.2 Performance correction curves

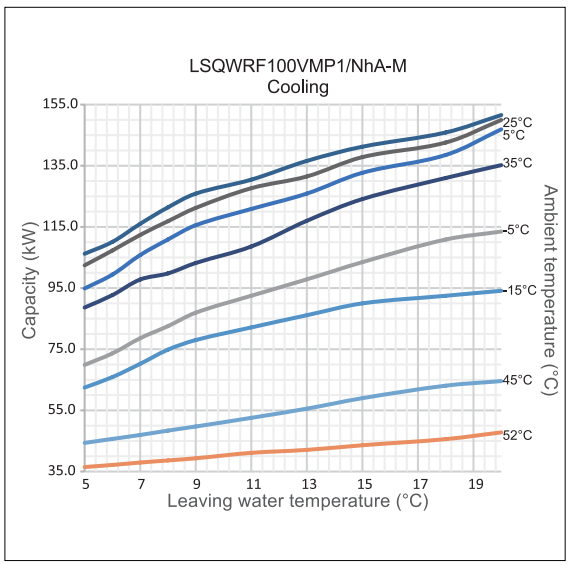
Here are curves indicating the unit performances in cooling and heating states.

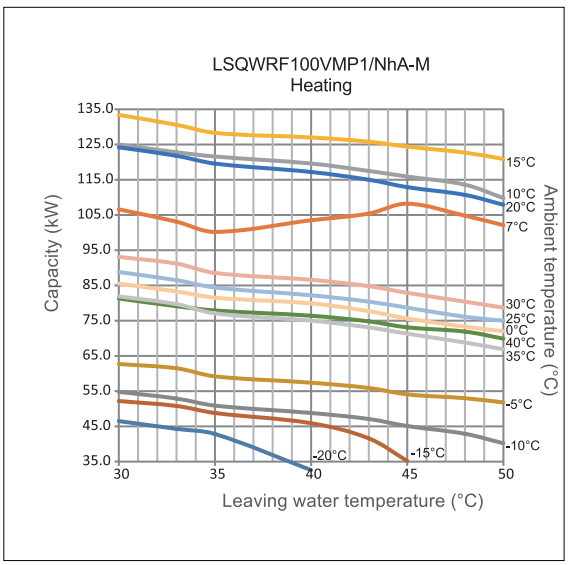


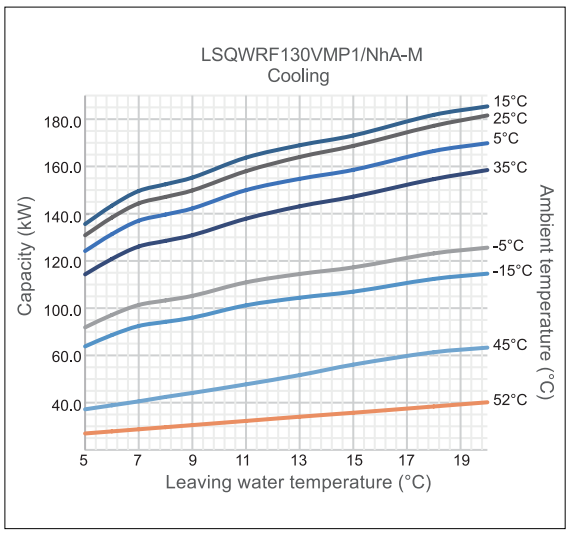


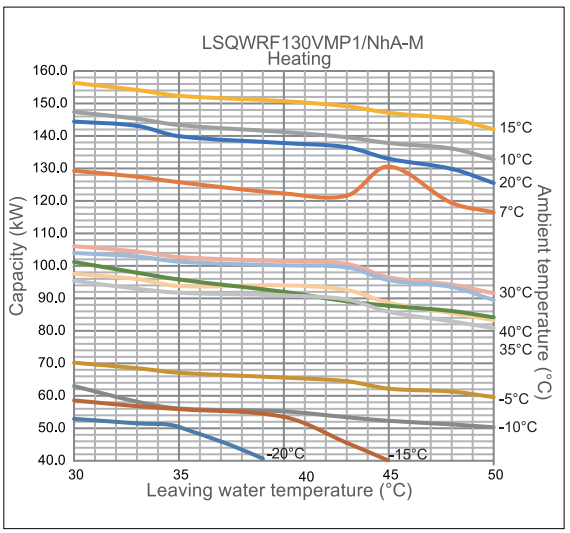

LSQWRF60VMP1/NhA-M
Cooling
Capacity (kW)
Ambient temperature (°C)
Leaving water temperature (°C)
5℃
15℃
-5℃
25℃
-15℃
35℃
45℃
52℃


LSQWRF60VMP1/NhA-M
Heating
Capacity (kW)
Ambient temperature (°C)
Leaving water temperature (°C)
15℃
10℃
20℃
7℃
40℃
30℃
35℃
25℃
0℃
-10℃
-5℃
-15℃
-20℃


LSQWRF100VMP1/NhA-M
Cooling
Capacity (kW)
Ambient temperature (°C)
Leaving water temperature (°C)
25°C
5°C
35°C
-5°C
-15°C
45°C
52°C


LSQWRF100VMP1/NhA-M
Heating
Capacity (kW)
Ambient temperature (°C)
Leaving water temperature (°C)
15°C
10°C
20°C
7°C
30°C
25°C
0°C
40°C
35°C
-5°C
-10°C
-20°C
-15°C

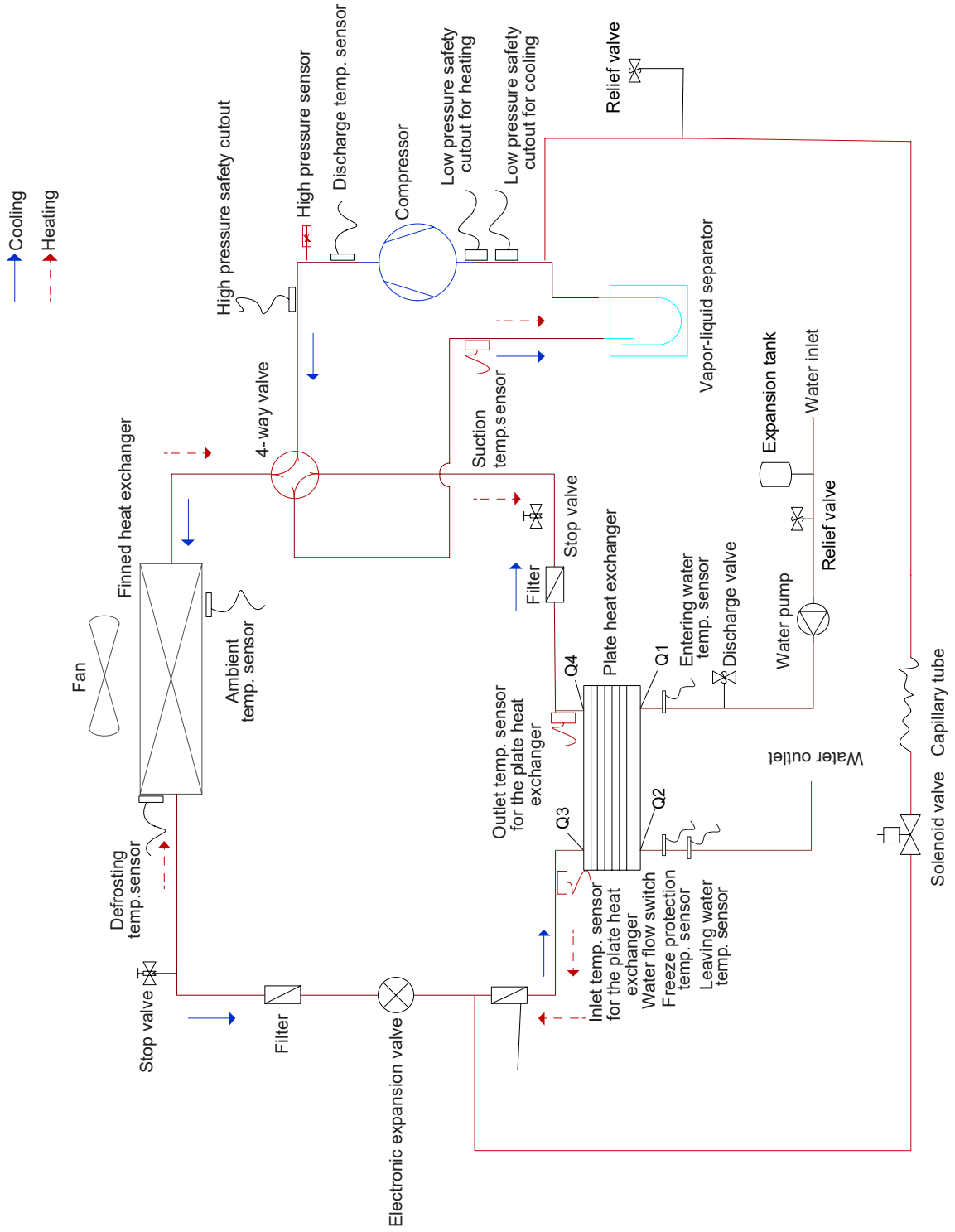

LSQWRF130VMP1/NhA-M
Cooling
Capacity (kW)
Ambient temperature (°C)
Leaving water temperature (°C)
15°C
25°C
5°C
35°C
-5°C
-15°C
45°C
52°C


LSQWRF130VMP1/NhA-M
Heating
Capacity (kW)
Ambient temperature (°C)
Leaving water temperature (°C)
15°C
10°C
20°C
7°C
30°C
40°C
35°C
-5°C
-10°C
-20°C
-15°C

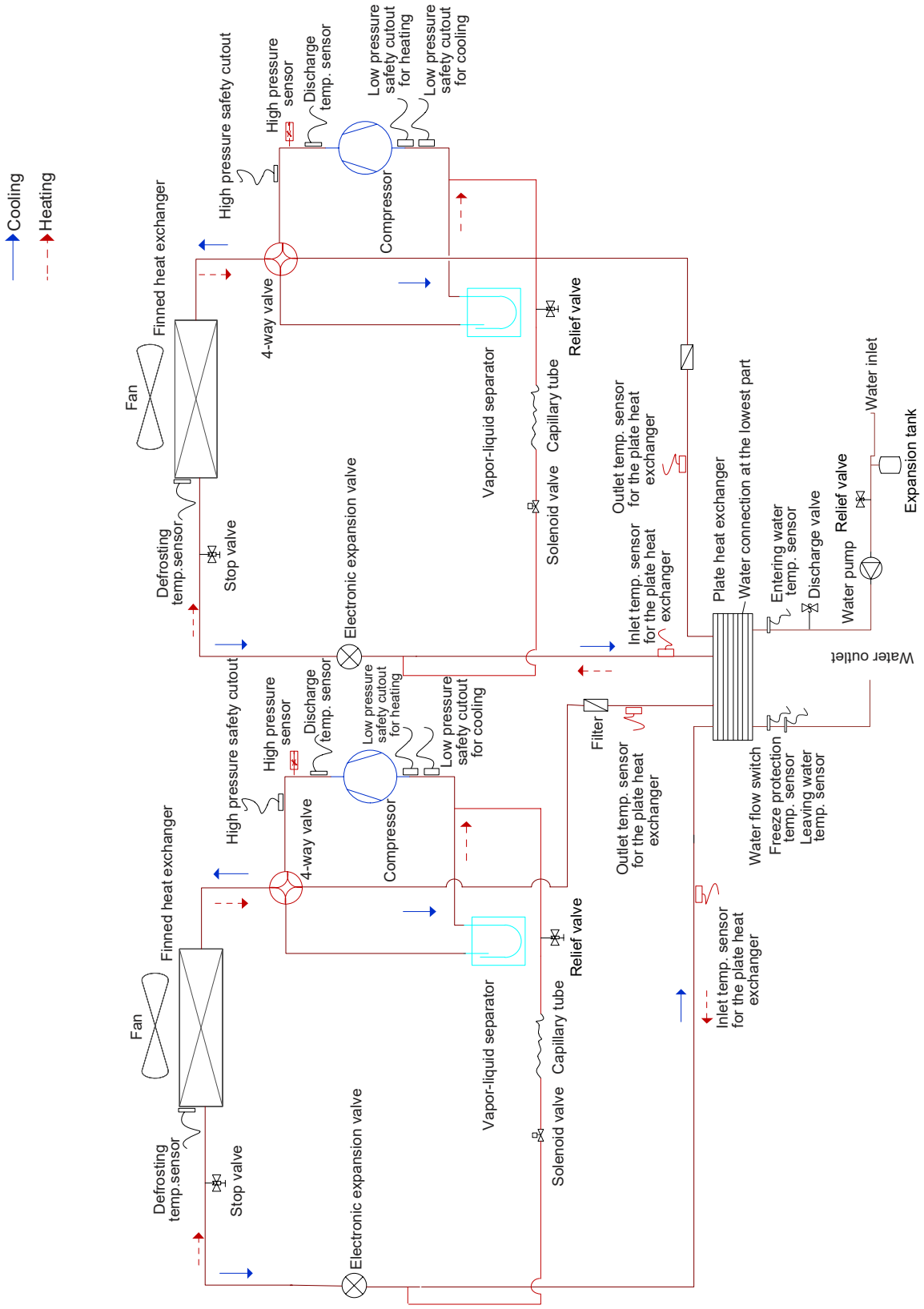
1.3 Working principle

Here are diagrams below to present the constituents and refrigerant flow of the system.

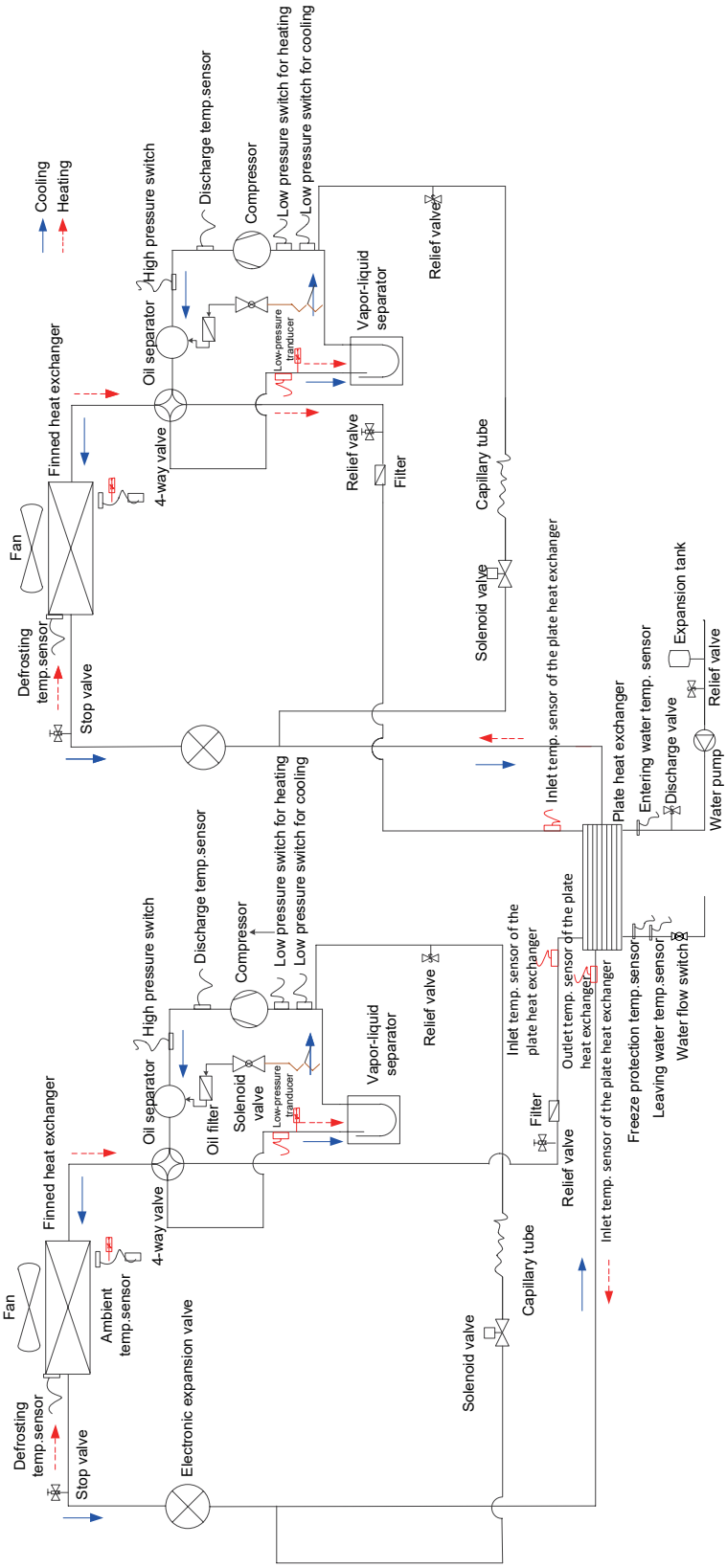
(1) LSQWRF35VMP1/NhA-M



(2) LSQWRF60VMP1/NhA-M



(3) LSQWRF100VMP1/NhA-M, LSQWRF130VMP1/NhA-M



1.4 Specifications

Model			LSQWRF35 VMP1/NhA-M	LSQWRF60 VMP1/NhA-M	LSQWRF100 VMP1/NhA-M	LSQWRF130 VMP1/NhA-M
Cooling capacity		kW	33	60	100	130
Heating capacity		kW	36	65	105	131
Rated cooling power		kW	11.4	21.1	32.0	44.0
Rated heating power		kW	10.9	19.7	30.2	41.6
Sound level		dB(A)	64	66.4	70.0	72.0
Power supply			380-415V AC 3Ph 50Hz			
Operation control			The microcomputer implementing fully automatic control, displaying the operation state and giving an alarm			
Safety control			High-pressure and low-pressure safety cut-out, high-discharge temperature cutout, freeze protection, overflow control, phase safety device, water flow safety control, pressure sensor cutout, temperature sensor cutout, compressor overheating control			
Compressor	Type		Fully enclosed rotary type compressor			
	Quantity		1	2	2	2
	Starting mode		Inverter			
Water side heat exchanger			Plate-type heat exchanger			
Water flow volume		m^3/h	5.68	10.32	17.2	22.36
The highest bearing pressure		MPa	4.6		1.0	1.0
Connection method			By external threads			
Connection thread			G1 1/4 external thread	G2 external thread	DN65	DN65
Air side	Air-side heat exchanger		High-efficiency finned coil heat exchanger			
	Rated power of fan	W	750×2	750×2	1500×2	1500×2
	Airflow volume	m^3/h	$2\times0.63\times10^4$	$2\times1.2\times10^4$	4.5×10^4	4.5×10^4
Outline dimension	Width	mm	1340	2200	2235	2235
	Depth	mm	802	937	1283	1283
	Height	mm	1605	1675	2355	2355
Net weight		kg	323	609	1016	1016
Operating weight		kg	355.3	669.9	1117.6	1117.6

Model	Power supply	Compressor quantity	MRC (A)	NRC (A)	Fan quantity	NRC (A)
LSQWRF35VMP1/ NhA-M	380V-415V AC 3Ph 50Hz	1	25	20.9	2	0.7
LSQWRF60VMP1/ NhA-M	380V-415V AC 3Ph 50Hz	2	56	36	2	1.28
LSQWRF100VMP1/ NhA-M	380V-415V AC 3Ph 50Hz	2	58	34.09	2	4.0
LSQWRF130VMP1/ NhA-M	380V-415V AC 3Ph 50Hz	2	58	34.09	2	4.0

Notes:

(a) MRC: maximum running current (A)

(b) NRC: nominal running current (A)

1.5 Scope of supply

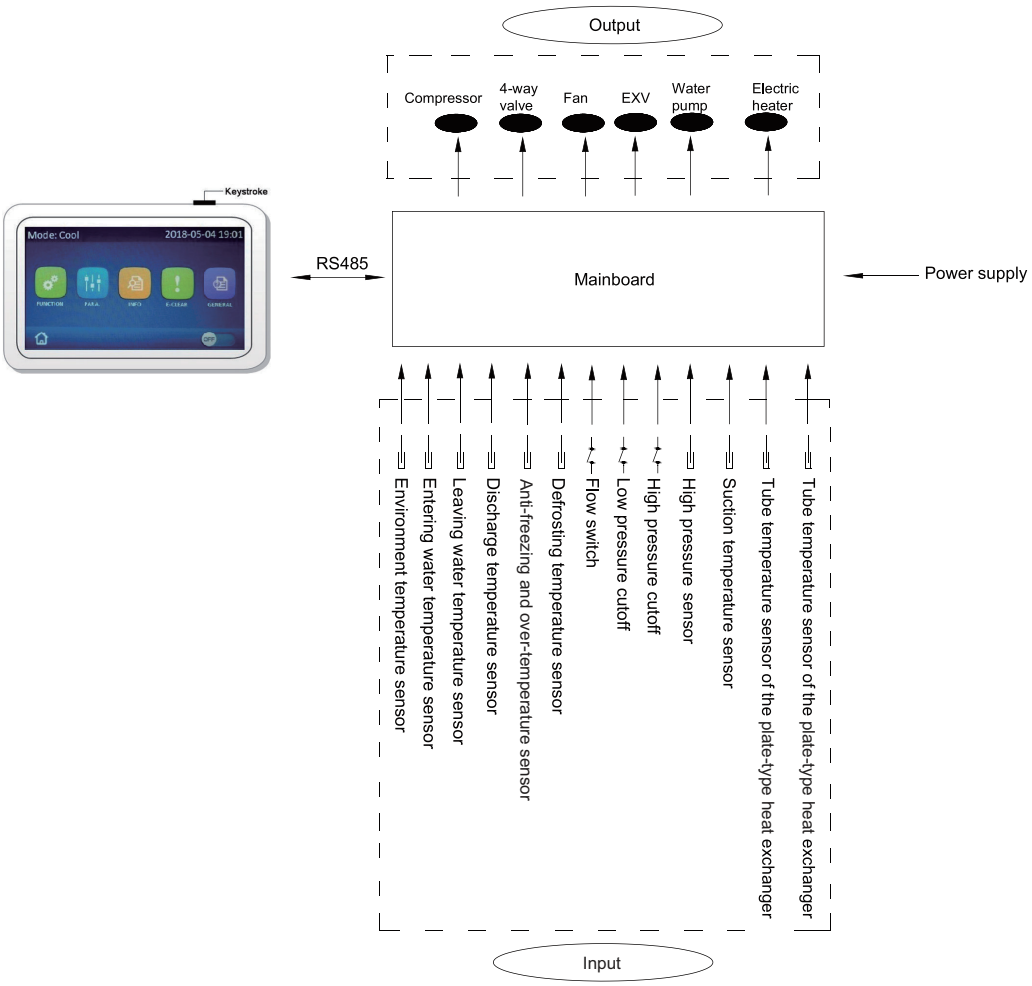
Item	Heat pump
Modules	S
Three-wire control lines (8m)	S
Accessories for the unit CF492	P (Additionally purchased)
Electric control cabinet	O
Auxiliary electric heater	O
Power lines	O
Control lines	O
Connecting hose	O
Thermometer	O
Pressure gauge	O
Water pump	S

S= standard; O= field-supplied; P= additionally purchased

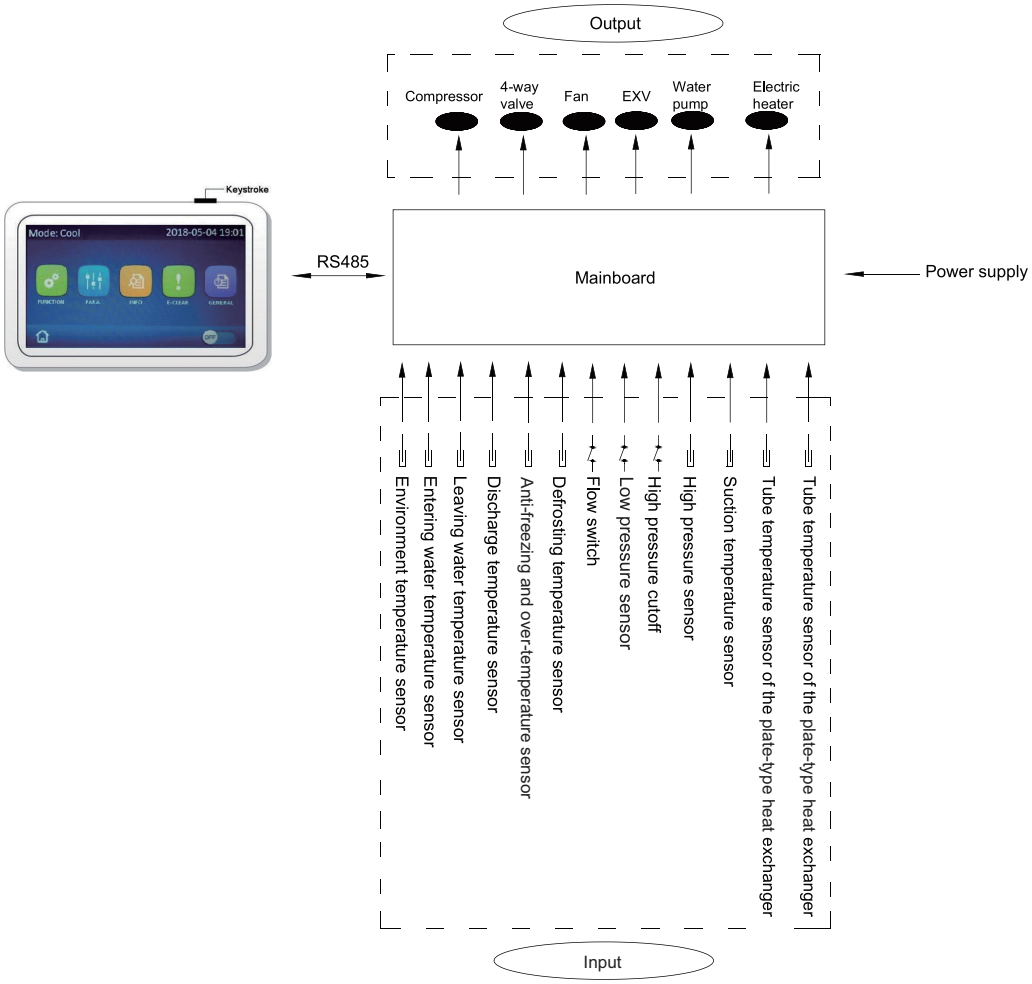
Unit Control

2 Unit control

2.1 Schematic diagram



LSQWRF35VMP1/NhA-M/LSQWRF60VMP1/NhA-M



LSQWRF100VMP1/NhA-M/LSQWRF130VMP1/NhA-M

Description:

(1) A water flow cutout is used to judge the water flow rate. When the flow rate is too low, it will trip off, and the control board will send this signal to the display and the water pump. Then, the display will tell there is an error, the water pump will stop and the unit will stop or will not start.

(2) A high/low pressure cutout is used to judge the system pressure. When the system pressure is too high/low, it will trip off, and the control board will send this signal to the display. Then, the display will tell there is an error and the unit will stop or will not start.

(3) The low pressure sensor is used to detect the compressor gauge pressure. When a low pressure is detected, the low pressure switch of the system opens, and the display panel shows a fault. During a fault, the corresponding alarm symbol is displayed in the 'Fault Inquiry' on the display panel, and the main board sends a shutdown command to stop the unit and protect the compressor. If the low pressure switch recovers, the alarm symbol will be automatically cleared twice within 1 hour. The third time it is detected, manual clearing is required to restore normal operation.

(4) An ambient temperature sensor is used to detect the temperature of the environment where the unit is which will determine whether to start or stop the fan and determine the steps of the electronic expansion valve when initializing. When this sensor fails, the control board will detect and send this signal to the display. Then, the display will tell there is an error and the unit will stop or will not start.

(5) A discharge temperature sensor is used to detect the discharge temperature. When the sensed temperature is too high or this sensor fails, the control board will detect and send this signal to the display. Then, the display will tell there is an error and the unit will stop or will not start.

(6) An entering water temperature sensor is used to detect the temperature of the entering water which will determine whether to start or stop the compressor and the auxiliary electric heater. When this sensor fails, all compressors of the unit will stop.

(7) Defrost temperature sensor is used to detect the liquid tube temperature of fins serving the condenser, which will determine whether to start the fan. When the sensed temperature is too high or this sensor fails, the control board will detect and send this signal to the display. Then, the display will tell there is an error and the unit will stop or will not start.

(8) An anti-freezing and overheating prevention temperature sensor is used to detect the water temperature. When it fails, compressors and fans of the corresponding unit will stop.

(9) A leaving water temperature sensor is used to detect the leaving water temperature. When this sensor fails, compressors and fans of the corresponding unit will stop.

(10) An air temperature sensor on plate-type heat exchanger is used to detect the air temperature. When this sensor fails, the compressor in a cooling state will have to be stopped and the display will tell there is an error. If the sensor fails in a heating state, only the display will tell an error. This sensor is only applicable to units LSQWRF35VMP1/NhA-M and LSQWRF60VMP1/NhA-M.

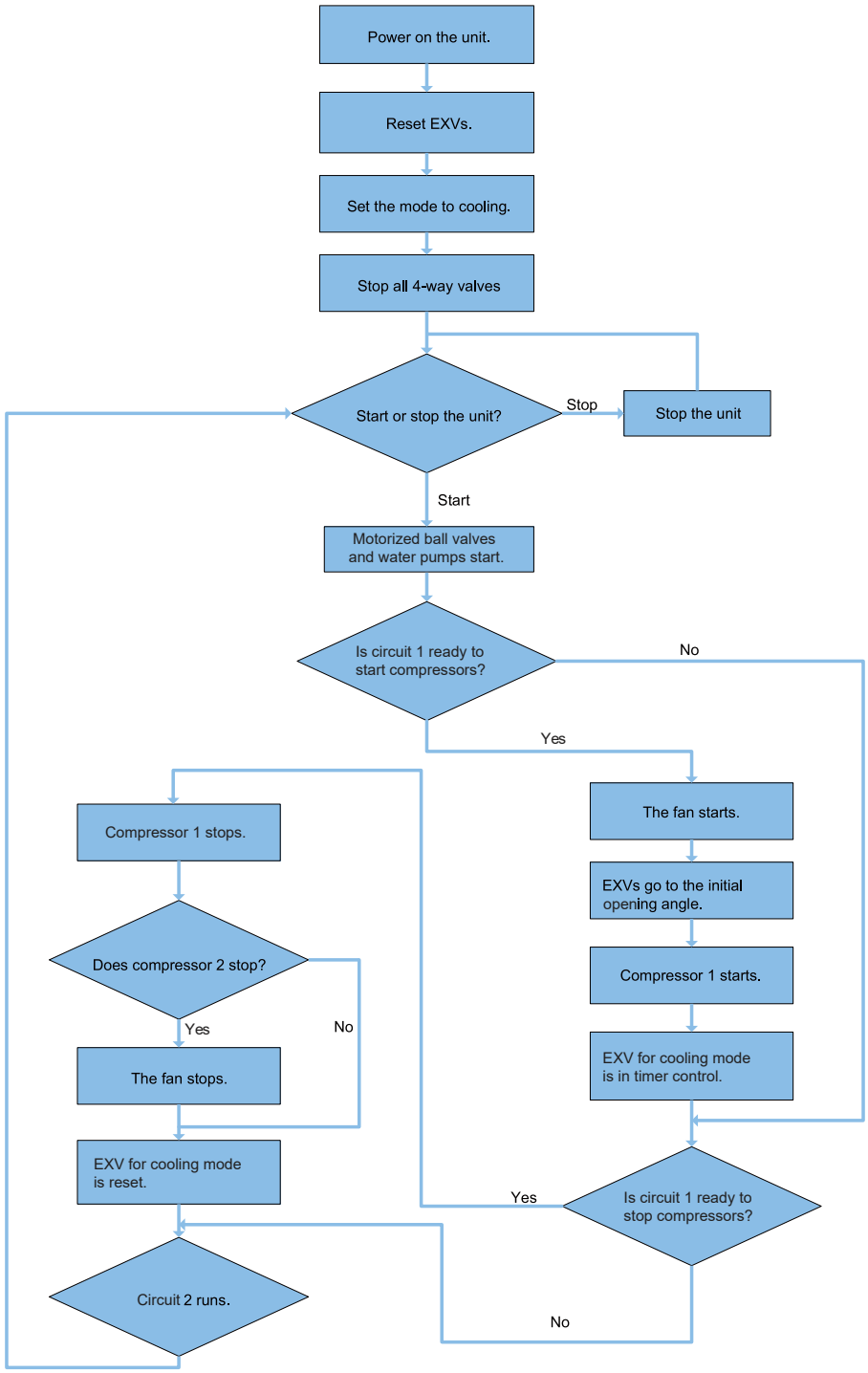
(11) An liquid temperature sensor on plate-type heat exchanger is used to detect the liquid temperature. When this sensor fails, the compressor in a cooling state will have to be stopped and the display will tell there is an error. If the sensor fails in a heating state, only the display will tell an error.

(12) A suction temperature sensor is used to detect the suction temperature. When this sensor fails, the compressor in a cooling state will have to be stopped and the display will tell there is an error. If the sensor fails in a heating state, only the display will tell an error.

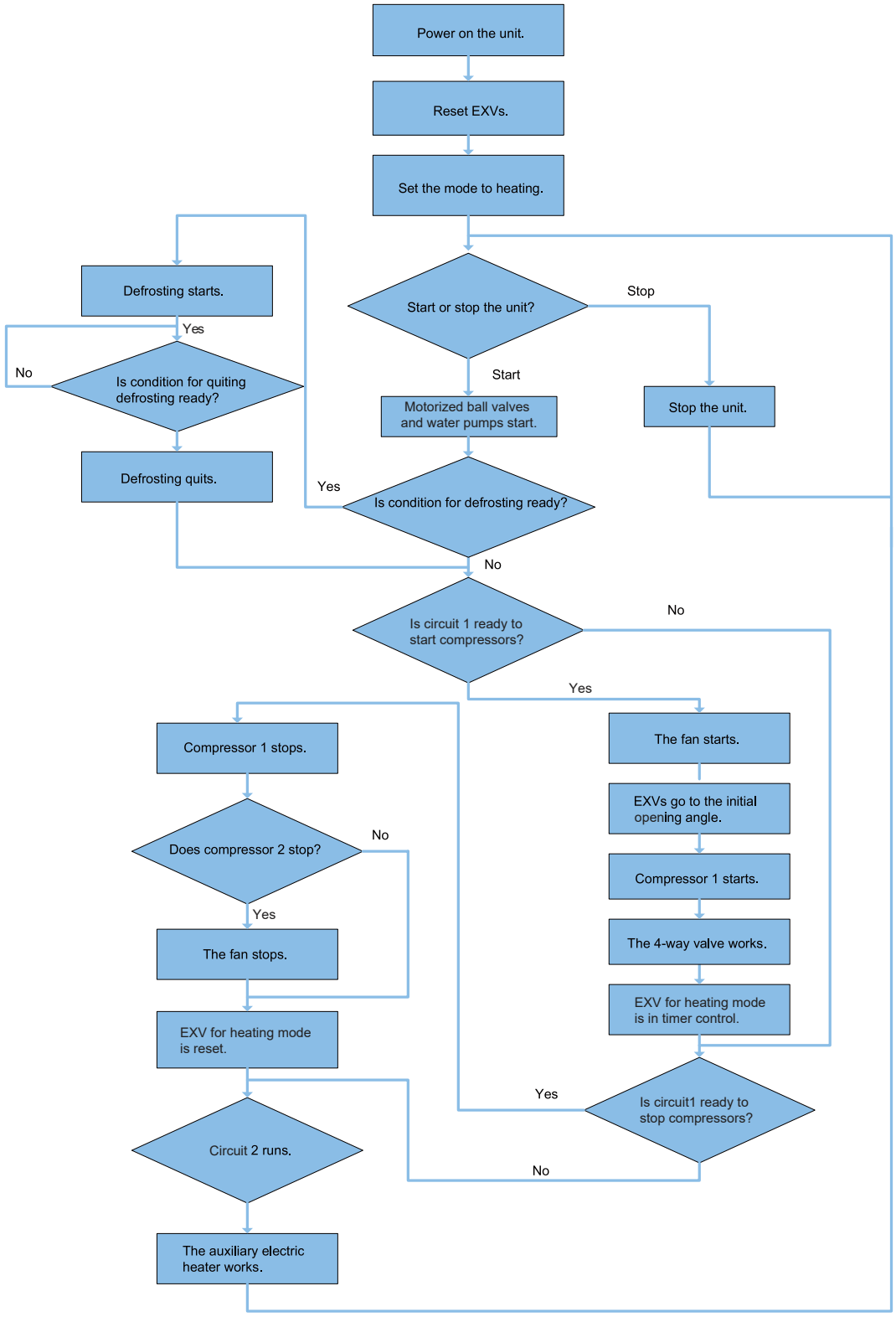
(13) High-pressure sensor is used to detect the discharge pressure. When the detected temperature is too high, control the compressor to regulate the frequency of discharge.

2.2 Operation flowchart

2.2.1 Cooling



2.2.3 Heating


Power on the unit.
Reset EXVs.
Set the mode to heating.
Start or stop the unit?
Stop
Stop the unit.
Start
Motorized ball valves and water pumps start.
Is condition for defrosting ready?
Yes
No
Defrosting starts.
Yes
Is condition for quiting defrosting ready?
No
Defrosting quits.
Is circuit 1 ready to start compressors?
No
Yes
Compressor 1 stops.
Does compressor 2 stop?
No
Yes
The fan stops.
EXV for heating mode is reset.
Circuit 2 runs.
The auxiliary electric heater works.
The fan starts.
EXVs go to the initial opening angle.
Compressor 1 starts.
The 4-way valve works.
EXV for heating mode is in timer control.
Is circuit1 ready to stop compressors?
Yes
No

2.3 Key control logics

2.3.1 Cooling operation

◆ Freeze protection

For each single unit, when the leaving water temperature is lower than the anti-freezing setpoint, freeze protection will work; when the leaving water temperature go higher than the normal value, freeze protection will be removed.

When the anti-freezing temperature and the leaving water temperature are between the anti-freezing setpoint and the normal value, the unit will keep the current operation status.

◆ Shutdown

Manual and timer shutdown: compressors, fans and then water pumps will stop.

Shutdown at the set temperature: compressors and fans will stop but water pumps will still be working.

Shutdown due to malfunction: compressors and fans will stop but water pumps will still be working.

2.3.2 Heating operation

◆ Over-temperature protection for heating

For each single unit, when the leaving water temperature goes higher than the anti-over-temperature setpoint, over-temperature protection will work and the operation frequency of the compressor (or dual compressors) will be lowered until the leaving water temperature is lower than the setpoint. Stop compressors one by one if the operation frequency has been recorded the lowest and the leaving temperature remains above the setpoint for 1 minute.

With the leaving water temperature back to normal, over-temperature protection will be removed. If it occurs with a reduced frequency, the compressor should be controlled by the water temperatures for working as normal.

◆ Control to the auxiliary electric heater

When the control function of the auxiliary electric heater has been activated through the control panel, the unit is able control the auxiliary electric heater.

The auxiliary electric heater is able to work automatically as long as there is no fault of the flow switch and all entering and leaving water temperature sensors work normally.

When the control function of the auxiliary electric heater has been activated through the control panel, the auxiliary electric heater will not work any more.

When all entering and leaving water temperature sensors are faulty, the auxiliary electric heater will stop working.

When any flow switch fails, the auxiliary electric heater will stop working.

When over-temperature protection for heating works but the auxiliary electric heater is still required for operation, it will work continuously when its heating task is finished.

◆ Shutdown

Manual or timing shutdown: compressor stops firstly, and the auxiliary electric heater secondly, and then the fan and the water pump stop.

Shutdown upon the temperature set point: the compressor and the fan stop firstly, while the water pump keeps running.

Shutdown upon errors: the compressor stops firstly and the fan stops, while the water pump keeps running.

2.3.3 Control to the compressor

“First on, first off”/ “first off, first on” control indicates the numbered compressor which is started/ stopped firstly will then be stopped/started firstly.

2.3.4 Control to the fan

The fan will start when the unit is turned on and will stop when the compressor is turned off. During defrosting, the fan does not work but will back to working when defrosting exists.

2.3.5 Control to the 4–way valve

At the cooling mode, the 4–way valve will not work when the unit goes for defrosting or the unit is off. At the heating mode, the 4–way valve will work when the unit is turned on or defrosting quits.

2.3.6 Control to the water pump

The water pump of a unit starts if need be, and it stops or stands idle if there is not need for water pump operation .

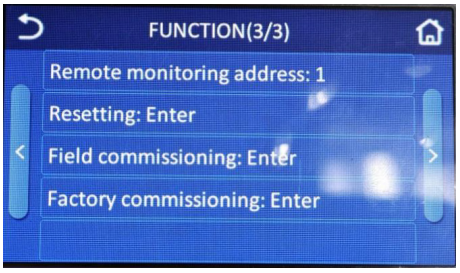
There are 3 speeds for the water pump. the corresponding frequency of speed 1 is 40Hz, speed 2 is 45Hz, and speed 3 is 50Hz. Among them, speed 3 is the highest. Under the standard mode of the unit, speed 1 and speed 2 are available.

If the pipe in the water system is quite long and the resistance is large, the minimum operating speed and standby speed of the water pump can be raised. If speed 3 (the highest) is required, please be sure whether the noise on site is acceptable.

See the following statement for how to set the pump speed.

(1) Click the "Function" key.

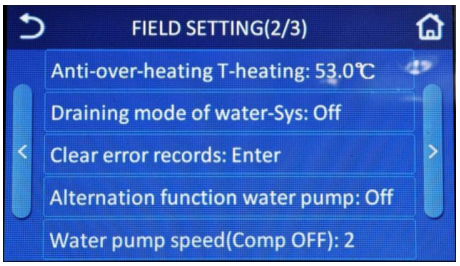
(2) Turn to the third page and enter the "Field commissioning" option.



(3) Enter correct passwords at the pop-up box as shown below.

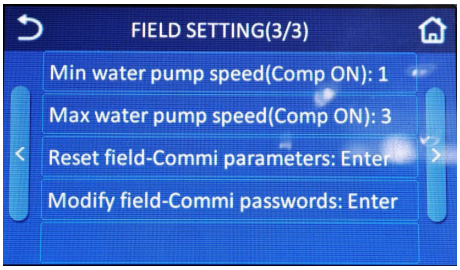
(4) Go to the "Field commissioning" page

(5) Click the "Setting" key and turn to the second page of "FIELD SETTIGN", and then click "Water pump speed" to set the standby speed of the water pump.



(6) Click the "Setting" key and turn to the third page of "FIELD SETTIGN" to set "Min water pump speed" and "Max water pump speed".

When the minimum speed and the maximum of the water pump are set to the same (for example, both are set to 1), the water pump will run at a constant speed according to the set speed (I. e. speed 1); when the minimum speed of the water pump is set to speed 1 and the maximum gear is set to speed 2, the unit will adjust the speed between speed 1 and speed 2 according to the water temperature conditions.



2.3.7 Control to the electronic expansion valve

The electronic expansion valve will be initialized when the controller is powered on for the first time.

After the compressor has been started, the electronic expansion valve starts to adjust its opening angle.

2.3.8 Protection

◆ Recoverable protection

The unit will stop when it receives no signal from the controller. Once there is any communication fault for any unit, all compressors of this unit will stop and then the water pump will follow.

◆ Irrecoverable protection

(1) Protection against high pressure for the compressor 1/2

When it is detected that the high pressure cutoff of the compressor 1/2 is tripped off, compressor 1/2 will stop immediately. If both compressors are closed, their fans will be delayed to stop. In this case, the control panel will display an alarm symbol, which should be cleared manually for resuming normal operation.

(2) Protection for the flow switch

When it is detected that a flow switch of a modular unit is cut out (normally it should be off), the unit will stop; when protection mechanism works on a flow switch of a modular unit, the compressors and water pumps within the system are forced to stop.

(3) Fault of communication

When a single unit does not receive any signal from the controller, this unit will stop automatically. For the unit with communication fault, when all its compressors stop and then the water pump will follow.

(4) Protection against phase loss/reversal

When there is phase loss or reversal for power supply, power for the main board will be cut off directly. In this case, there is nothing for the main board..

2.4 Introduction to controller

Please refer to the owner's manual of the controller before use.

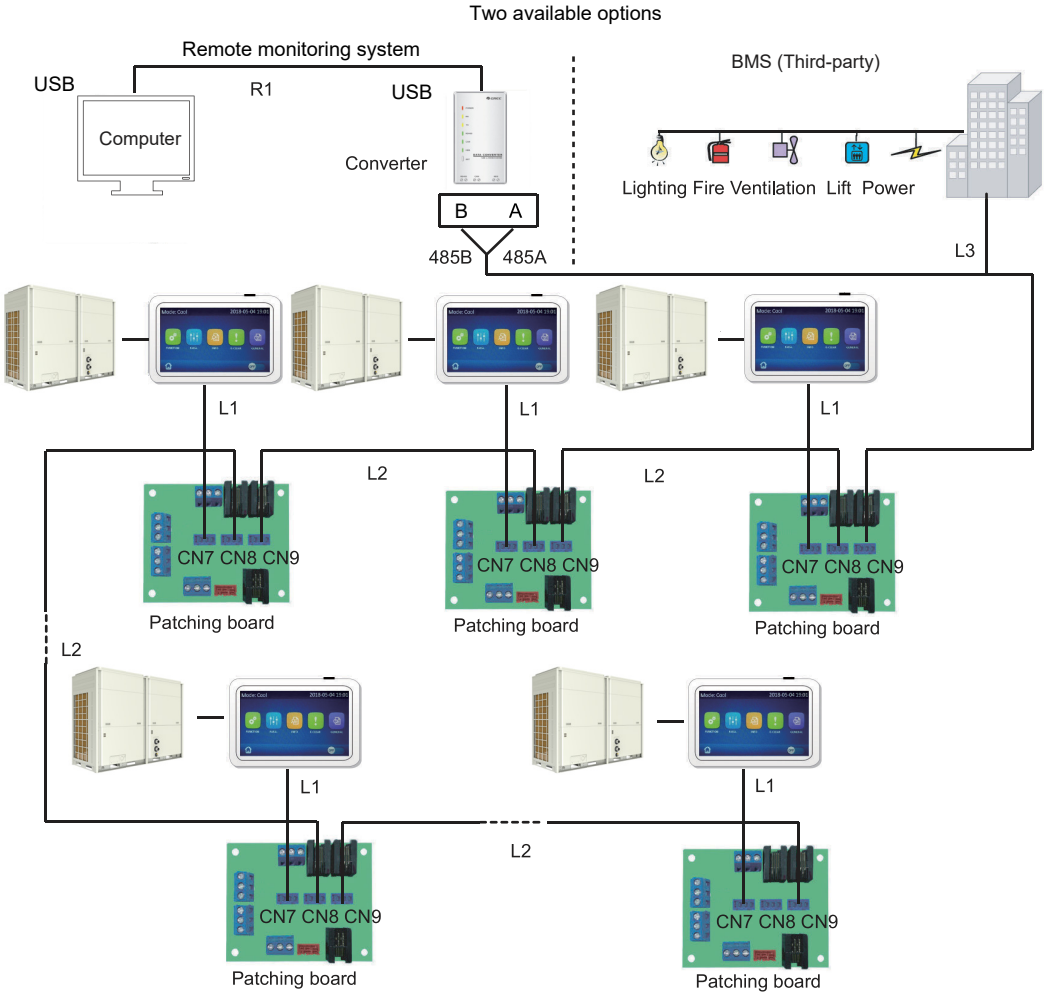
2.5 Smart management system

2.5.1 Long-distance monitoring/BMS interface

This long-distance monitoring system allows users through a computer to remotely monitor up to 255 variable-frequency modular-type chillers, including turning on/off the units, setting parameters, giving alarms for malfunctions, which is an efficient tool for management of intelligent air conditioning systems for modern buildings.

2.5.2 Network of the long-distance monitoring system

Net topological diagram



Note: the system as shown in the figure above consists of 1 to 3 single units depending on the actual demand of the project.

From the topological diagram above, the long-distance monitoring system consists of 3 parts:

The first part is the BMS and the converter used to convert USB signals from the BMS into RS485 signals of the long-distance monitoring network.(It is required only when USB is used for the BMS)The second part refers to the communication network including the communication lines and the connected hardware.

The second part refers to the communication network, that is, the communication lines and the connected hardware.

The third part is the patching board responsible for the data exchange between the air conditioning system and the monitoring PC. When there is only one unit, the patching board is not required and RS485 signal lines from BMS can be directly connected to the BMS port of the control panel. When there are multiple units, signal lines from BMS are required to connected to the BMS port through the patching board.

Communication lines

Line code	Description	Type
L1	Category– 5 twisted pairs, two four-wire connectors, one for the communication patching board, the other for the unit.	S
L2	Category-5 twisted pairs, two four-wire connectors	S
L3	Category-5 twisted pairs, one four-wire connector for the communication patching board, the other connector for gree USB data converter.	O
R1	USB data line	S

S=standard; O=field-supplied; P=optional

2.5.3 Hardware

Parts list

Name	Model	Code	Remarks	Type
Opto-isolated repeater	/	/	A repeater is required every 800m communication distance or every 30 communication nodes (controller).	O
GREE USB data converter	Long-distance monitor assy ME40-00/B	MC200062	It can be provided when USB is used for the BMS.	P
Accessory XE73-25/G	XE73-25/G	NC20700050	The unit controller provides languages switchover including Chinese, English and Italian.	P
Accessory CF492	CF492	EN01200230	The unit controller provides English and many EU languages like Italian. Refer to the owner’s manual of the product for details.	P

Name	Model	Code	Remarks	Type
Remote monitoring kit	CF614	EN01200180	It is required when several units forms a network. It is intended to connect two or three communication lines. Other main parts: communication patching board (with fixed support), connection line	P

S=standard; O=field-supplied; P=optional

Notes:

(a) When distance between the output of the BMS system or the output of the GREE USB data converter to CN2 of the display panel exceeds 800m, an opto-isolated repeater is required to reinforce signals.

(b) The opto-isolated repeater is also required between the CN4 of the display panel and the main board for extending the communication distance.

2.5.4 Model selection instructions

◆ Rules for model selection

Supply scope

Item	Model	Type	Remarks
Remote monitoring kit	CF614	P	It is required when several units forms a network.
GREE USB data converter	Long-distance monitor assy ME40-00/B	P	It can be provided when USB is used for the BMS.
Opto-isolated repeater	\	O	A repeater is required every 800m communication distance or every 30 communication nodes (control panels).
4–core (2–core) category 5 twisted pairs	\	O	Its length depends on the actual demand.

S=standard; O=field-supplied; P=optional

Selection of parts quantity

Item	Communication patching board	GREE USB data converter	Opto-isolated repeater
Modular type chiller	One patching board for one unit	• It can be provided when USB is used for the BMS. • The GREE USB data converter is not required when the unit is directly connected to the BMS system.	A repeater is required every 800m communication distance or every 30 communication nodes (control panels).

◆ Examples of model selection

Example 1

This project consists of 3 LSQWRF60VMP1/NhA-M, one control panel and BMS. The maximum communication distance is within 800m. The BMS interface is USB and one converter is required.

Name	Code	Quantity
Air conditioning system	EL01500900	1 (3 LSQWRF60VMP1/NhA-M)
GREE USB data converter	MC200062	1

Example 2

This project consists of 7 groups LSQWRF60VMP1/NhA-M, six groups including 3 and the other including 1. Seven control panels are required. The communication distance is larger than 800m but be or less than 1600m. One repeater is required for somewhere the communication distance is over 800m. The BMS interface is RS485.

Name	Code	Quantity
A series modular air-cooled chillers (heat pumps)	EL01500900	19 LSQWRF60VMP1/NhA-M
Accessory CF492	EN01200230	7
Remote monitoring kit	EN01200180	6
Opto-isolated repeater RS485	\	1

Example 3

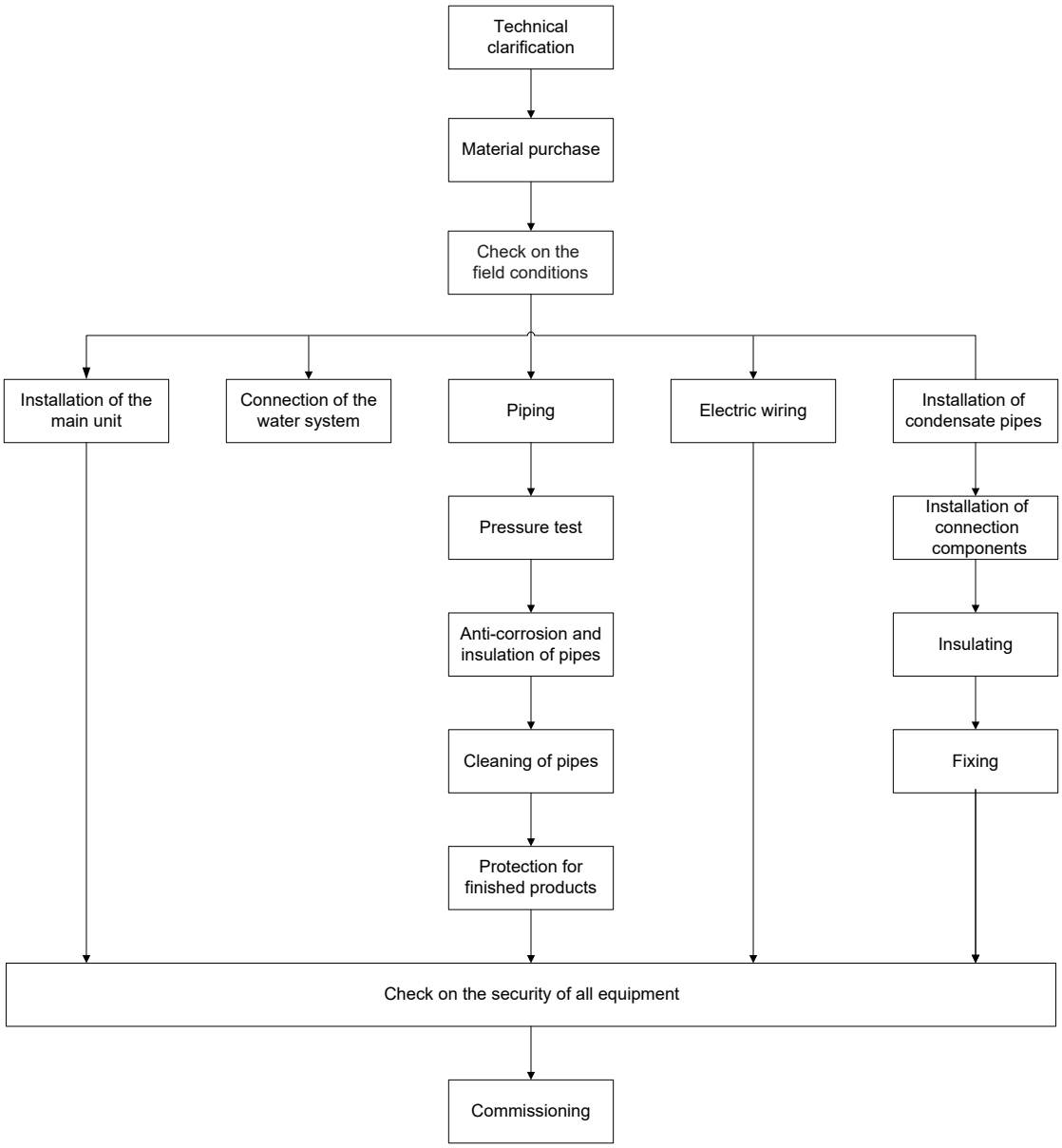
This project consists of 35 air conditioning systems including 103 LSQWRF60VMP1/NhA-M units. Among then, there are 34 air conditioning systems which consists of 3 LSQWRF60VMP1/NhA-M. The remaining consists of 1 LSQWRF60VMP1/NhA-M. Totally 35 control panels are required. A repeater is required for somewhere the communication distance is over 800m but less than 1600m and when the communication nodes (control panels) exceeds 35. The BMS interface is USB. Besides, one converter is required.

Name	Code	Quantity
A series modular air-cooled chillers (heat pumps)	EL01500900	103 LSQWRF60VMP1/NhA-M
Accessory CF492	EN01200230	35
Remote monitoring kit	EN01200180	34
Opto-isolated repeater RS485	\	2
GREE USB data converter	MC200062	1

Unit Installation

3 Unit installation

3.1 Installation flowchart



3.2 Preparations before installation

3.2.1 Precautions for installation

⚠ WARNING

- Installation should be performed by qualified service personnel, or improper installation would lead to unusual opera tion, water leakage, electric shock or fire hazard.
- The unit should be installed on the foundation which is capable of supporting the unit, or the unit would fall off or even lead to personal injury.
- All electric installation should be done by electrician in accordance with local laws and regulations, as well as the User's Manual and this Service Manual. Besides, the special power lines should be used, as any improper line would lead to electric shock or fire hazard.
- All electric lines should be safe and secured reliably. Be sure the terminal board and electric lines will not be affected by any external force, or it would lead to fire hazard.
- The electric lines between the indoor and outdoor units should run properly to make the cover of the electric box secured tightly, or it would cause the terminal board overheated or cause electric shock or fire hazard.
- Cut off the power supply before touching any electric element.

⚠ CAUTION

- The unit should be grounded properly and the ground line is not allowed to connect with the gas line, water line, lightning rod or phone line.
- The breaker should be installed, or it would lead to electric shock.
- The drain pipe should be installed in accordance with the Installation, Startup and Maintenance Manuall and this Service Manual to ensure free drainage, and the drain pipe should be insulated against condensation. Once the drain pipe is installed improperly, it would lead to water leak which then will damps the ceiling and furniture.
- Do not place the unit where there is oil fog, like kitchen, or the plastic would be aged, broken off or the polluted evaporator would lead to water leak and poor performance.
- Do not place the unit where there is corrosive gas (like sulfur dioxide), or the corroded copper tubes or welded joint would lead to refrigerant leakage.
- Do not place the unit where there is inflammable gas, carbon fiber, inflammable dust or volatile combustible, as they would lead to fire hazard.

⚠ CAUTION

- Always use safety outfits at the construction site.
- No smoking and no drunken operation are allowed at the construction site.
- Wear no gloves and tighten the cuff when operating the machinery and electrical equipment. Do not maintain it during operation.
- Use the abrasive-disk cutter and stand at the side of the rotating abrasive disk.
- Clean the opening when installing the riser pipe, and then cover it tightly. Do not throw down any material.
- The use of the electric and gas welders should be approved firstly. Once used, a fire extinguisher should be prepared and a service man should be there always. There should be no inflammable and explosive substances around the welding site.
- A platform should be set up when working high above the ground.

3.2.2 Importance of installation

See the table below for problems occurred frequently and impacts.

No.	Typical problems	Impact
1	Inadequate space for installation	It would lead to harder maintenance, poor ventilation, poor heat exchanging or even abnormal operation.
2	Improper piping of the water system	The unit would fail to run normally.
3	Improper cleaning for water piping	It would make foreign matters enter the water system, which then would lead to heavy scaling on the heat exchanger, cracked or leaked heat exchanger.
4	Mis-wiring of power lines	It would damage the electric element and lead to safety hazards.
5	Mis-wiring of communication lines	It would lead to abnormal communication.
6	Improper protection to the communication lines	The unit would fail to run with the communication fault.
7	Poor insulation for the chilled water lines	Missed, cracked, unqualified insulation and insulation with inadequate thickness would lead to poor heat exchanging.
8	Unqualified vibration reduction measures	Unqualified vibration reduction measures would lead to in creased vibration and noise, or even abnormal operation.
9	No protective sleeve for the wall-thru water pipes	Water leak would be led to by friction between the wall-thru pipe and the wall.
10	Improper arrangement of equipment and pipes	Improper arrangement would make the machine room look messy.

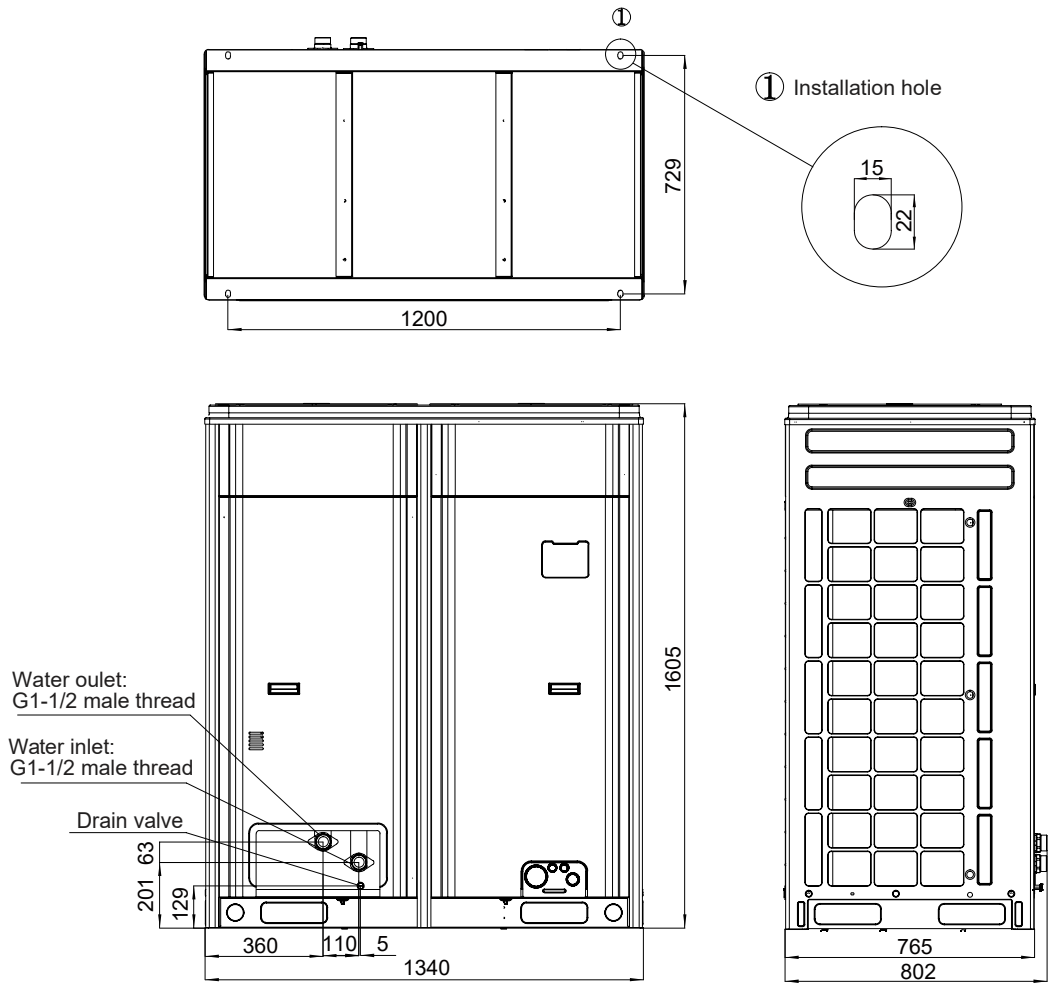
Service providers should be qualified and know special requirements on installation for certain so as to guarantee installation quality. Otherwise, service personnel should be properly trained and licensed before servicing.

3.3 Installation instructions

3.3.1 Outline dimensions

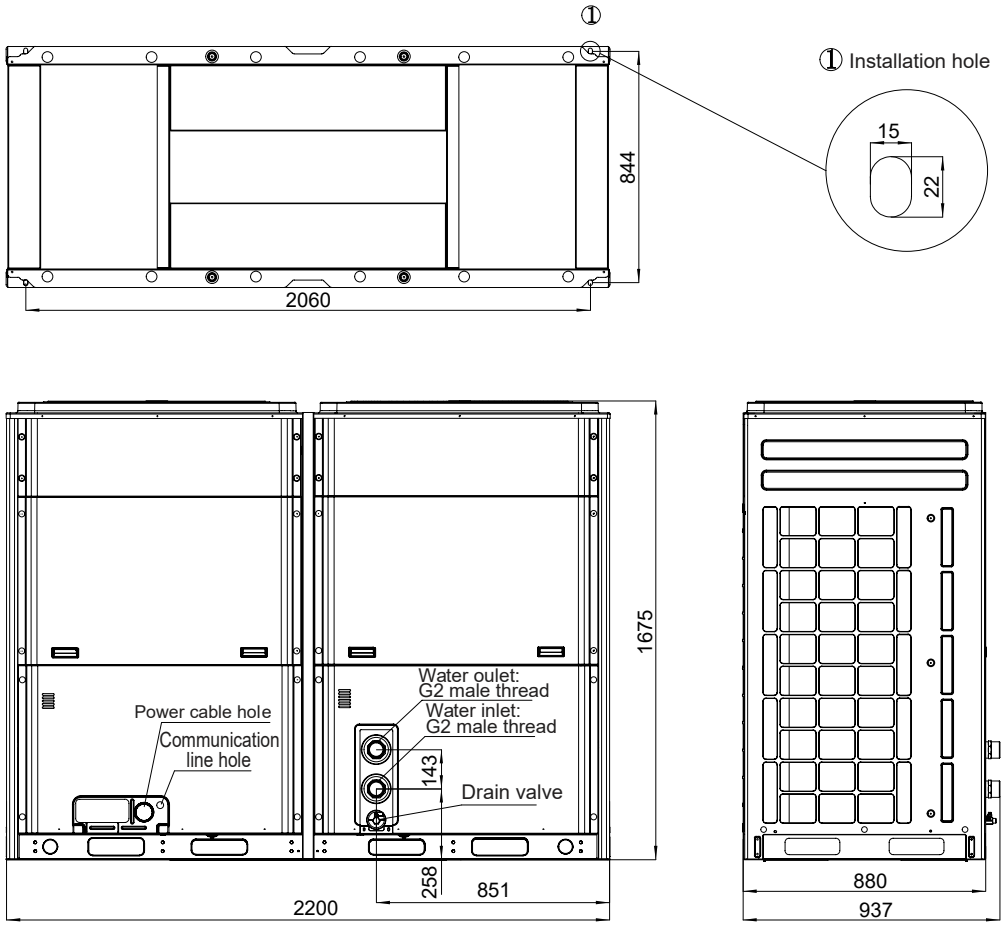
(1) LSQWRF35VMP1/NhA-M

(unit: mm)

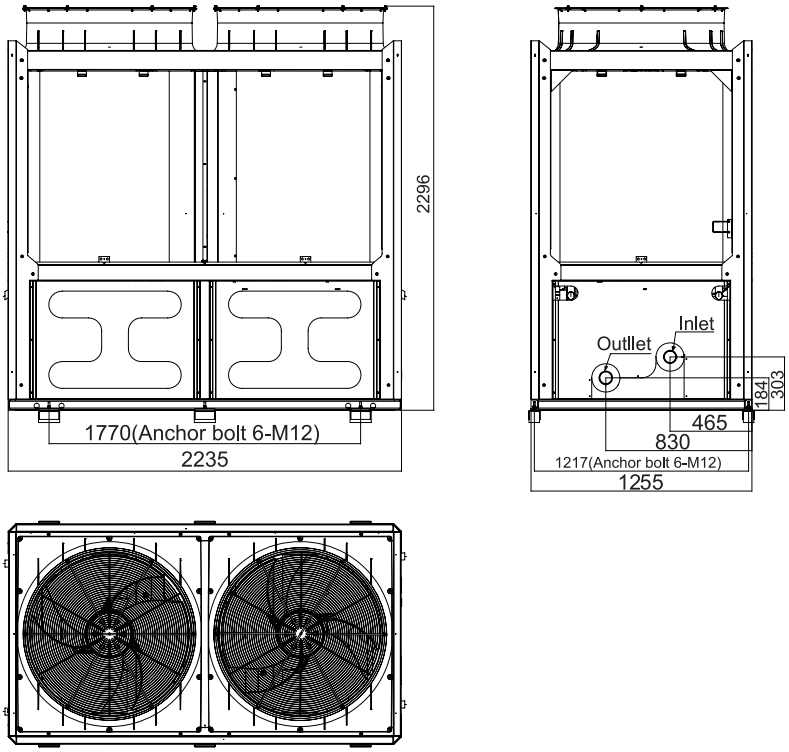


(2) LSQWRF60VMP1/NhA-M

(unit: mm)



(3) LSQWRF100VMP1/NhA-M, LSQWRF130VMP1/NhA-M



3.3.2 Precautions for installation

(1) Pipelines and electric lines should be correctly connected.

(2) Rubber pads and rubber flexible connectors should be used during installation for noise and vibration reduction.

(3) Under subzero climate, when the heat pump runs for cooling, anti-freeze liquid is required.

(4) Dedicated lugs should be used for lifting. During lifting, proper protection should be taken so as to avoid pipelines from being damaged.

3.3.3 Installation environment

(1) The unit should not be installed within 25m of the residence; otherwise a sound insulating wall should be set up.

(2) When the unit is to be installed at the roof, the foundation should be located at the heel posts. If the floor is quite thin, or there is vip rooms under the floor, the spring vibration damper is required.

(3) Fire, inflammably, corrosive gas and waste gas should be avoided around the unit. Also, the unit cannot be installed around the chimney and discharge fan.

(4) Ventilation should be in good condition and no air flow would be trapped.

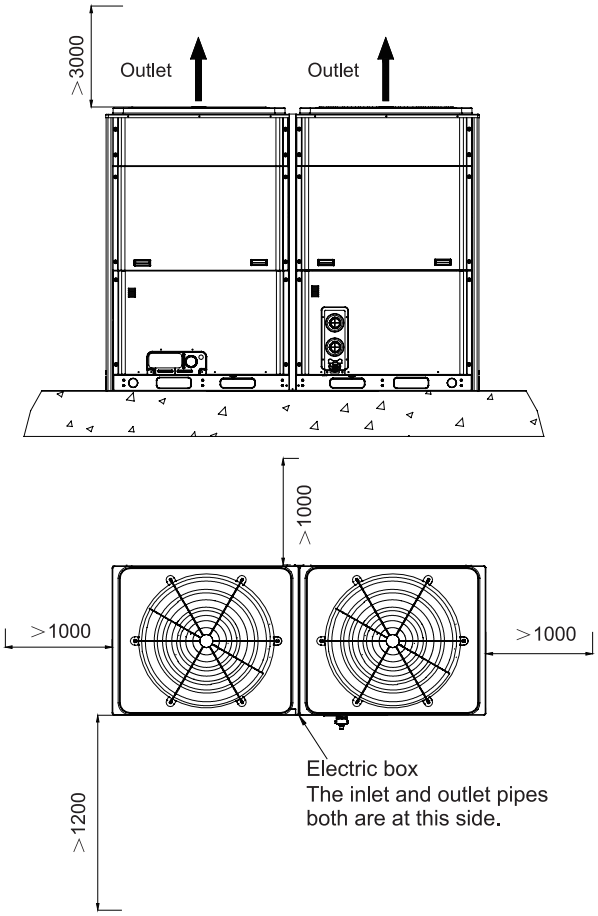
3.3.4 Installation and service space

The interval between each single unit should be larger than 0.5m so that there is enough space for entering air and maintenance. The distance between the unit and any barrier should be or larger than 1m so as to keep good ventilation around the unit.

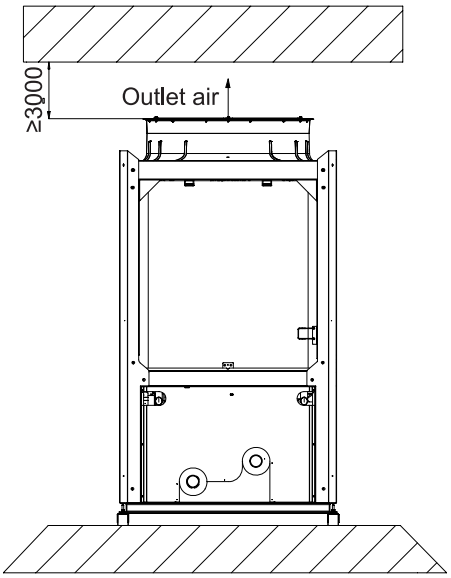
If possible, a suncover can be set up 3m ahead of the unit.

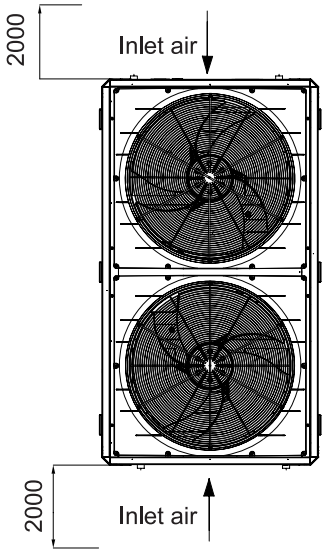
■ Installation space for the single unit

(Unit: mm)



(Unit: mm)

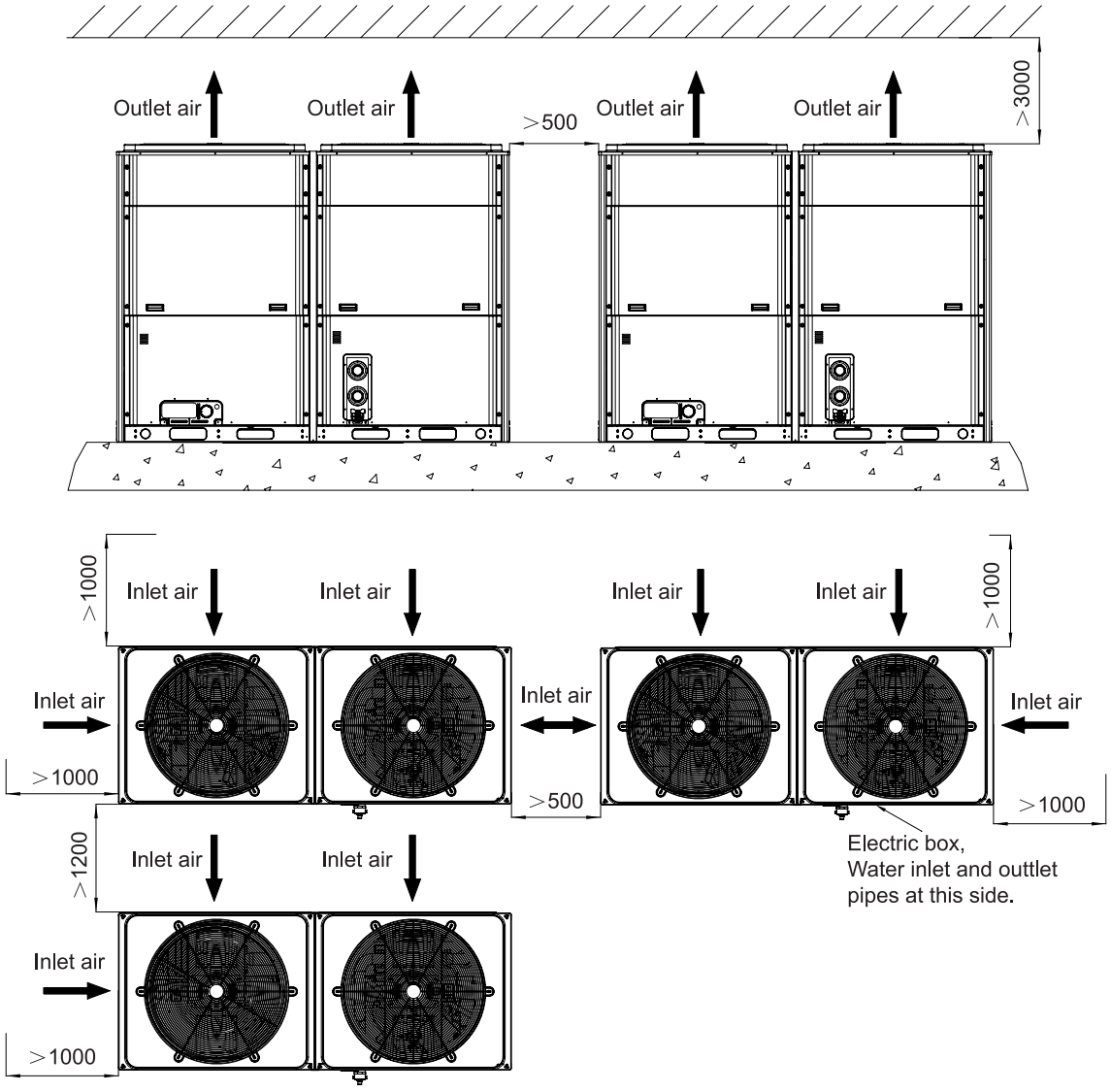




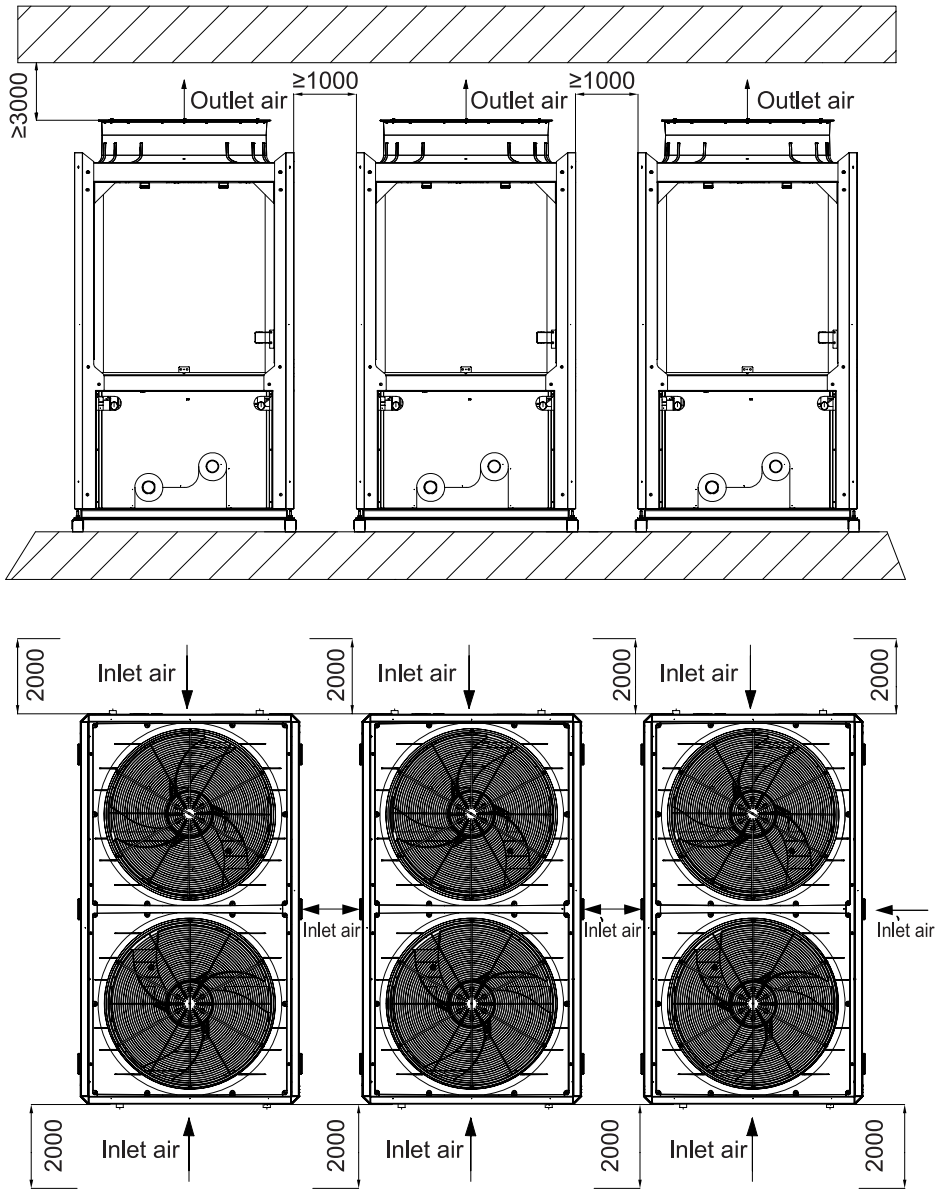
Note: the unit shall be equipped with shock-absorbing rubber pad (provided by the user), and then fixed on the ground or roof with bolts. The above figure is just for reference, not in actual scale.

■ Installation space for modularised units

(Unit: mm)



(Unit: mm)



Note: the unit shall be equipped with shock-absorbing rubber pad (provided by the user), and then fixed on the ground or roof with bolts. The above figure is just for reference, not in actual scale.

3.3.5 Installation foundation

(1) The installation foundation should be designed by qualified designers.

(2) The foundation should be made of cement or steel structure and be capable of supporting the weight of the unit. Additionally, the upper surface should be kept level. It would be better to keep drain grooves around the foundation.

(3) The installation should be secure enough, and its surface should be smooth.

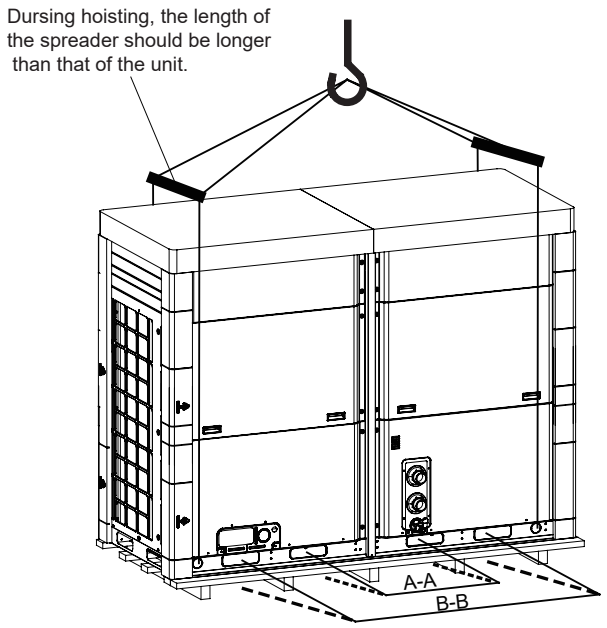
3.3.6 Handling and lifting

Handling and lifting of the main unit should be performed by a qualified installation team. During lifting, the main unit should be kept stable both horizontally and vertically.

Each unit will undergo a series of strict factory inspections and tests to guarantee the expected performance and quality. However, special attention should be paid during handling and shipping to prevent the control system and the piping system from being damaged.

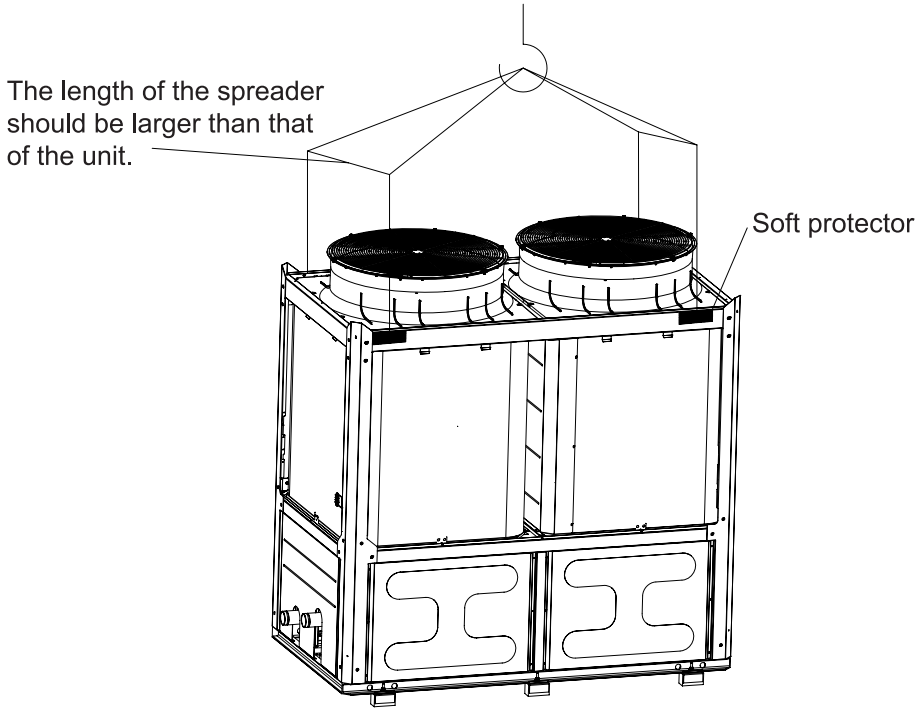
The unit should be moved by the forklift or hoisting machine. During lifting, the canvas lifting or steel ropes in use should be of enough strength and go through the based and then bundled tightly. The unit should be lifted stably from four corners. Meanwhile, be sure there should be protective pads to prevent lifting ropes contacting with the unit. The inclination angle during lifting should be less than 15 degree. The unit should be moved softly and severe collision and forced drag are not allowed. Please do lifting as shown in the figure below for units with similar structure.

(1) LSQWRF35VMP1/NhA-M, LSQWRF60VMP1/NhA-M



During transport by the forklift ,the symmetric holes should be used at the A-A or B-B base of the unit itself, or at the wooden base.

(2) LSQWRF100VMP1/NhA-M, LSQWRF130VMP1/NhA-M



3.3.7 Placement of the main unit

(1) Place the unit on the foundation.

(2) There should be no clearance between the foundation and the baseboard of the unit.

(3) Lift the unit, put the rubber pad on the foundation and then place the unit on the rubber pad. After that, be sure the horizontal slope of the unit can't exceed 1/1000. If so, take an adjustment by stuffing spacers into the clearance between the foundation and the baseboard of the unit until the slope is satisfactory.

3.4 Piping and insulation

3.4.1 Installation of the water system

Considerations stated below shall be taken for the water system.

(1) Each water inlet and outlet should be labeled properly to avoid misconnection.

(2) A flexible connector should be used at the chilled water outlet to reduce vibration transmission.

(3) It is required to install check valves for water entering and elaving pipes of each unit. Check valves can be replaced with motorised ball valves according to the customers' needs. The switched two-way type or 3-point floating type motorised ball valve is acceptable. Wiring should be conducted as described in the section 6.1 of the user's manual.

(4) A manometer, a thermometer and a gate valve shall be installed at the chilled water inlet/outlet. Moreover, a drain valve shall be installed at the outlet and an air release valve shall be installed at the inlet. At the highest point of the water system, another release valve shall be installed, while at the lowest point of the water system, another drain valve shall be installed to facilitate drainage.

(5) The water inlet/outlet pipe should be tightly insulated to reduce heat loss and dewing. When pipes are exposed under 0°C, a electric heater shall be installed.

(6) There surely be some foreign matters in the water system which would generate scale on the surface of the heat exchanger, so a filter shall be installed upstream of the water pump.

(7) The unit shall be bypassed during flushing to prevent drain out from entering the system.

(8) Under ultra-low temperature in winter, showdown at night will cause the evaporator and pipeline frozen up, so it is highly recommended to add alcohol and propanol mixture in chilled water. Do not cut off the power supply when the unit is turned off, otherwise the freeze protection does not work. Alternatively, cut off the power supply and drain the water system thoroughly.

(9) In case a low load protection occurs, when a unit is required to run under its low load, the minimum capacity of its water system should be ensured. Check out the capacity of the water system in the section 4.9. When several units work in a modular way, the minimum capacity of the modular water systems should be the sum of the minimum one of each model. A water tank should be required for water piping of low capacity, otherwise the capacity of a unit will be not consistent with its loads, thus resulting in low load protection and reduced service life.

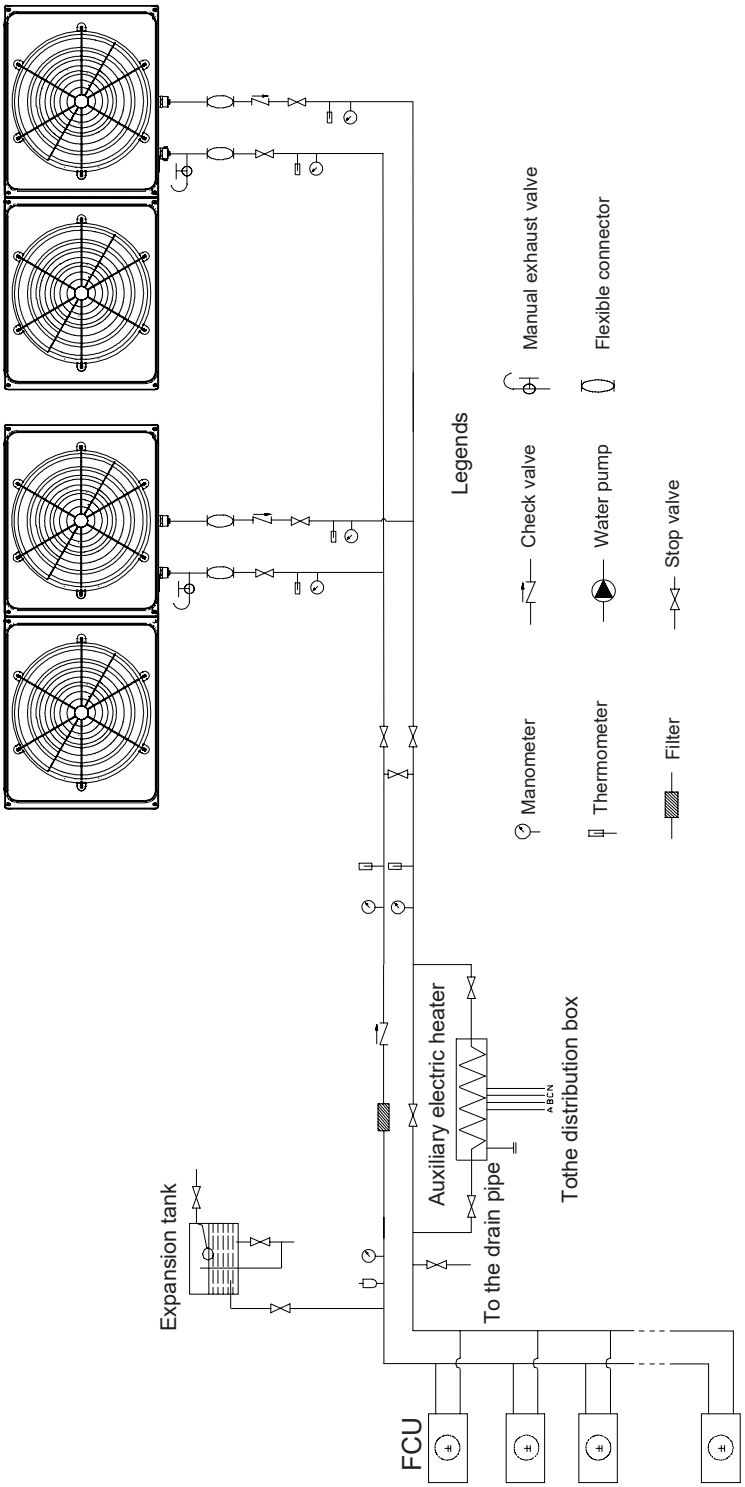
(10) The water flow volume must meet the requirements described in the secion 2, otherwise, the plate heat exchanger is likely to be damaged by freezing.

(11) The chilled water pipe of the water system should be filled with water of over 10°C via a make-up water pipe, and discharge valves are opened to get the chilled water pipe completely evacuated. The unit can be started after the water runs for 4 successive hours.

⚠ NOTE

Do not treat the unit with saline mixture to prevent corrosion.

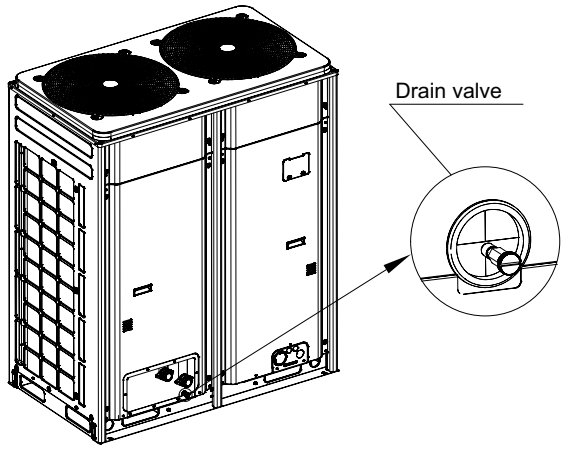
See the diagram below to install the water system.



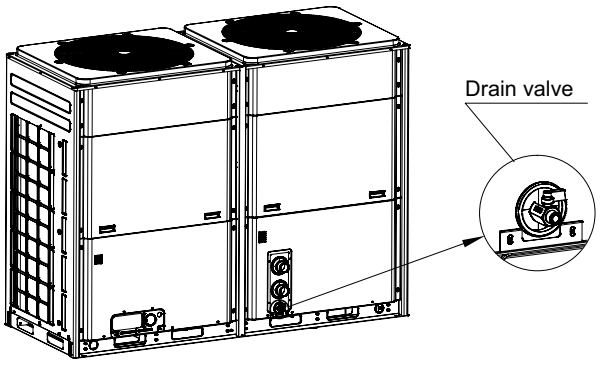
Follow the procedures below to drain the water system.

(1) Loosen screws around the panel and then take down it.

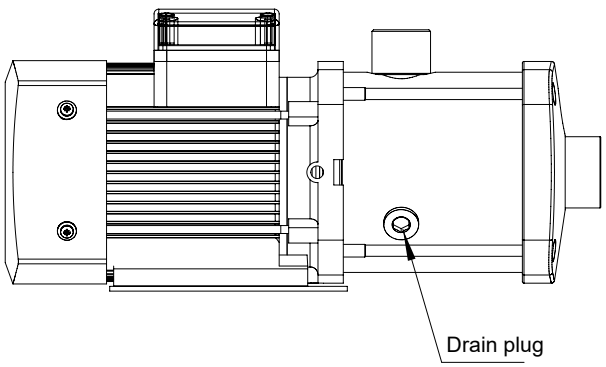
(2) Remove anticlockwise the blind plug located at the bottom of the heat exchanger to let the chilled water flow out, after that, tighten the blind plug and reinstall the panel. (Note: place the drainage equipment beneath the drain pipe to prevent pollution caused by the drain water.



Drain valve for LSQWRF35VMP1/NhA-M



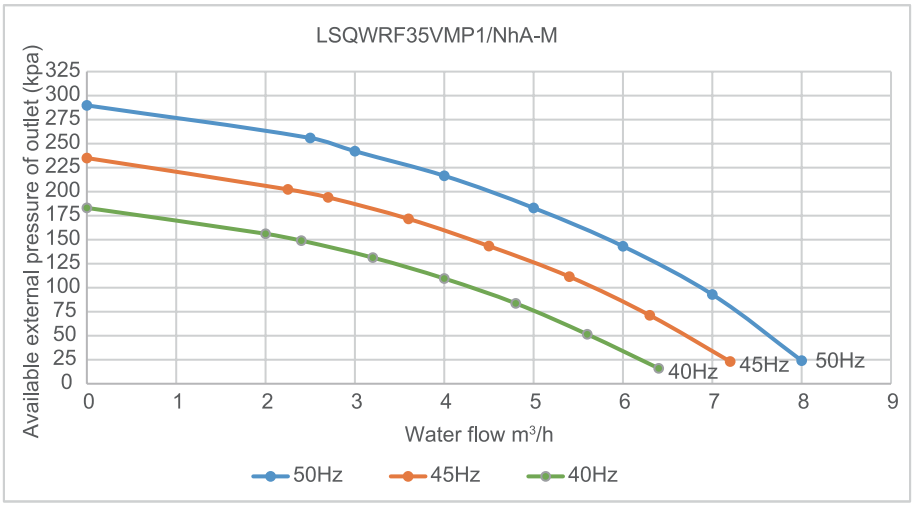
Drain valve for LSQWRF60VMP1/NhA-M

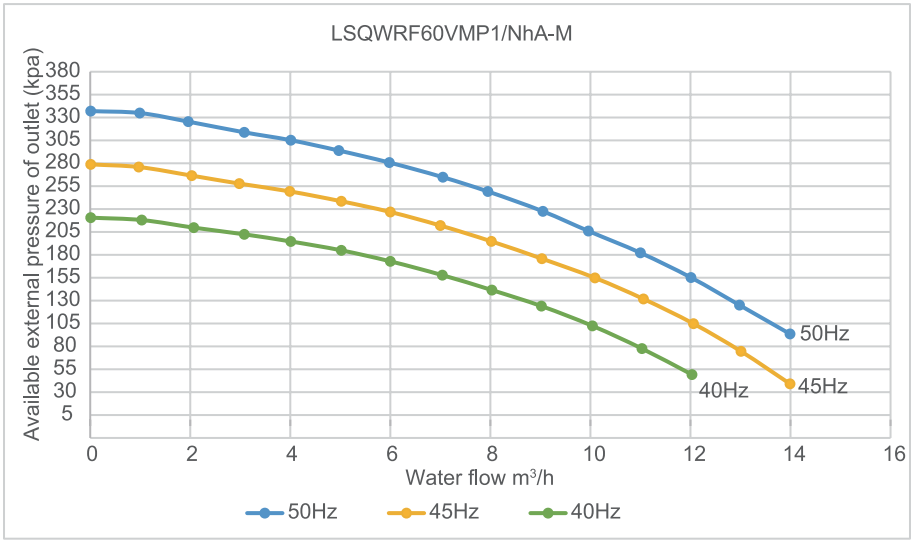


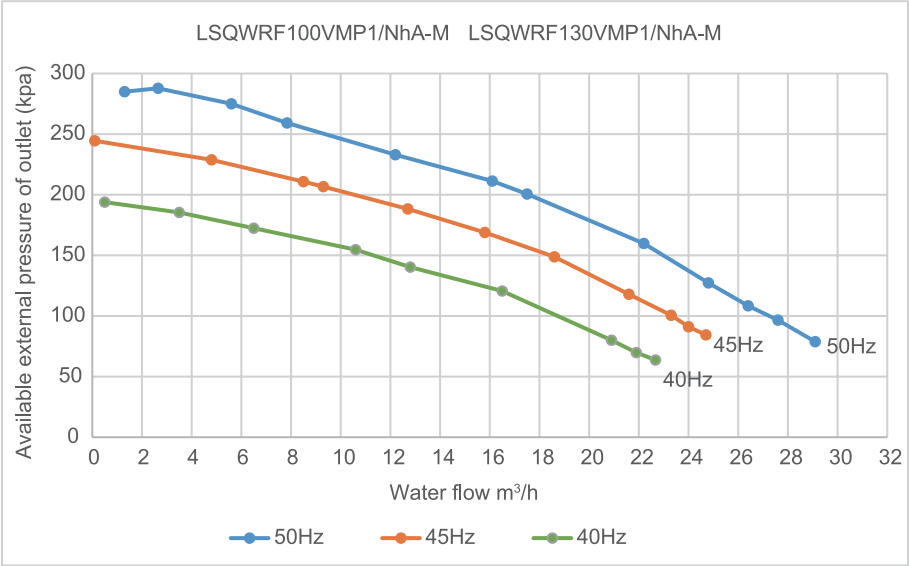
⚠ NOTE

Keep the purge valve of the water system open in order to drain the evaporator and condenser completely.

3.4.2 Water volume and pump capacity (with a pump)







Notes:

See the curve above for the maximum external static pressure. The water pump is of variable frequency. And during operation, the water pump will adjust its output based on the actual load.

There are 3 speeds for the water pump. the corresponding frequency of speed 1 is 40Hz, speed 2 is 45Hz, and speed 3 is 50Hz. Among them, speed 3 is the highest. Under the standard mode of the unit, speed 1 and speed 2 are available.

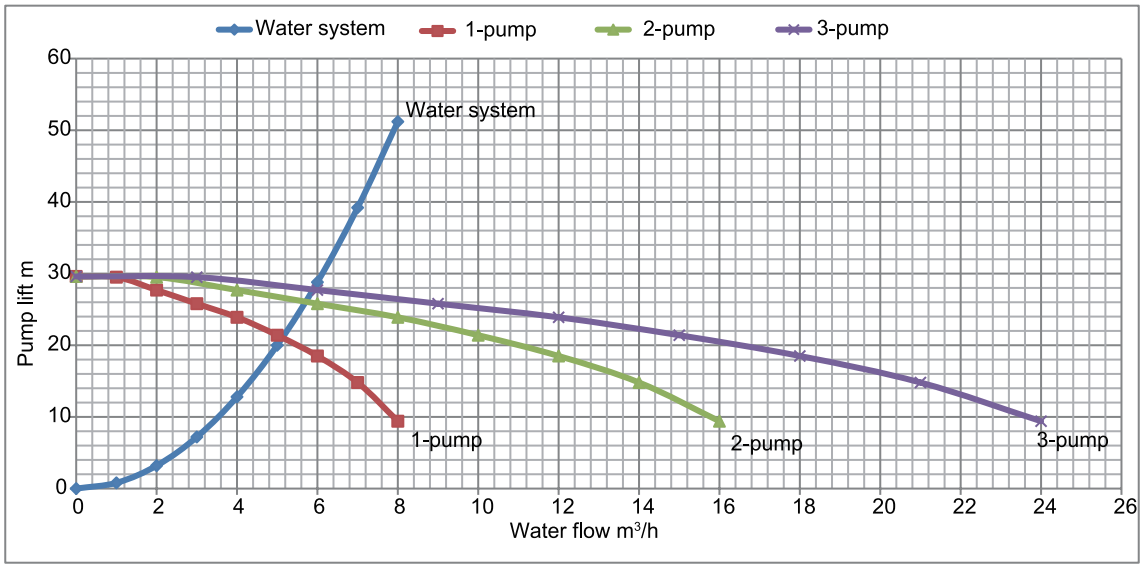
The noise value of the water pump will be different under different speed. The higher the operating speed is, the greater the noise is;

If the water pump is noisy, the maximum operating speed and standby speed of the water pump can be lowered under the condition that the water flow switch will not come into protection.

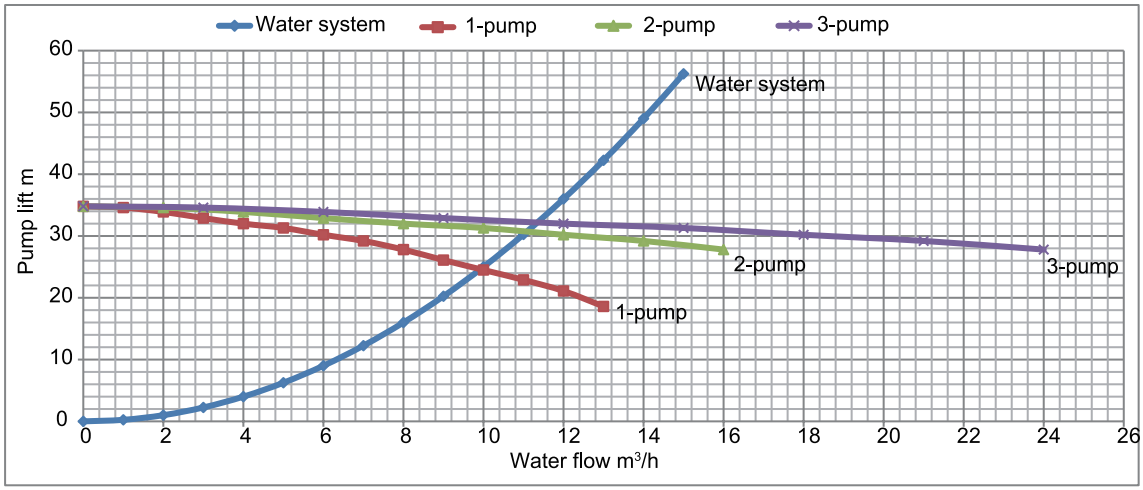
If the pipe in the water system is quite long and the resistance is large, the minimum operating speed and standby speed of the water pump can be raised. If speed 3 (the highest) is required, please be sure whether the noise on site is acceptable. For more details, please contact after-sales technicians.

3.4.3 Water flow-pump lift curves for water pumps in parallel

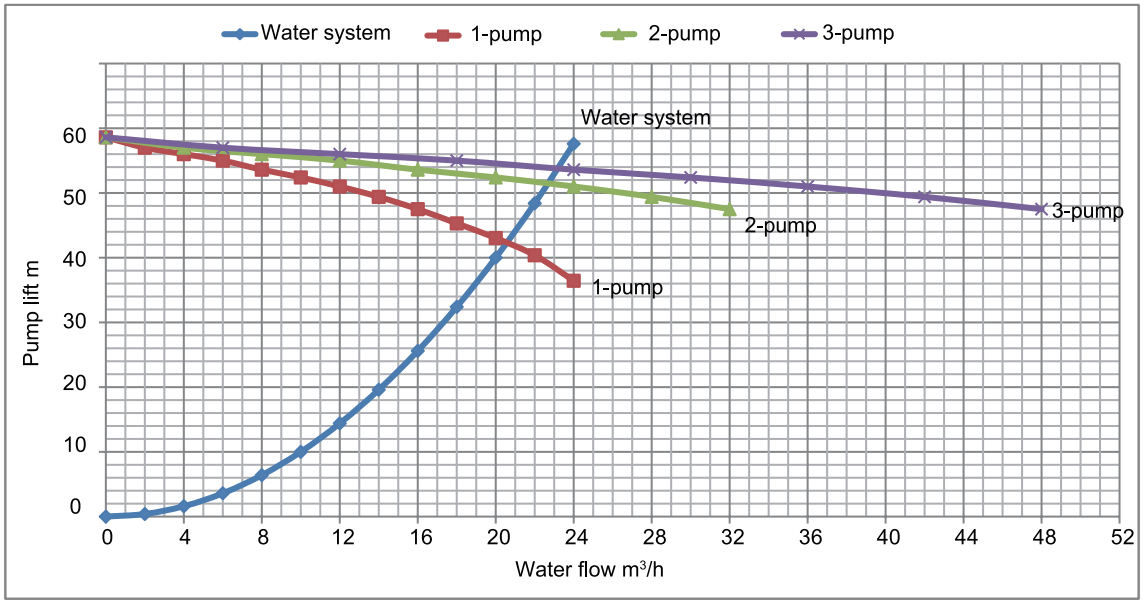
Water Pump CHM5-40



Water Pump CHM10-30



Water Pump CHM20-20

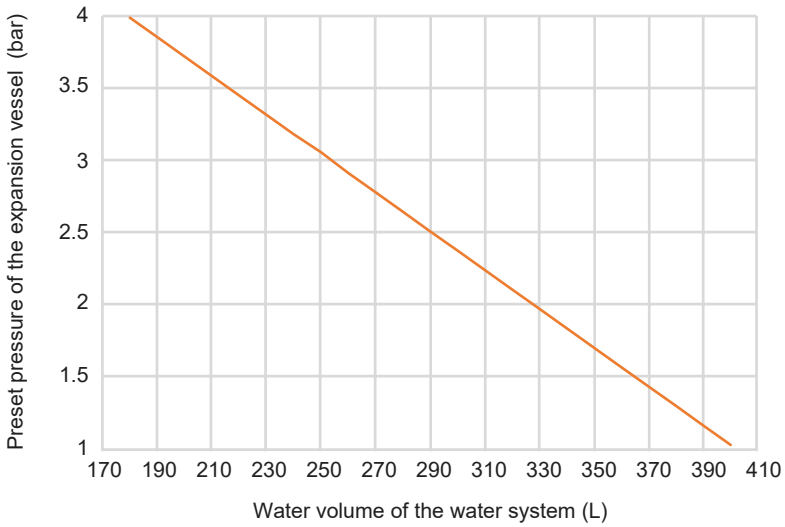


Notes:

Flow rate-pump lift curves are as shown in figures above for units with multiple water pumps in parallel. Due to different pipe arrangement, as the actual water resistance of the pipe system will be different, the curves as shown above are for reference only.

3.4.4 Water volume and expansion vessel pressure

LSQWRF35VMP1/NhA-M



Notes:

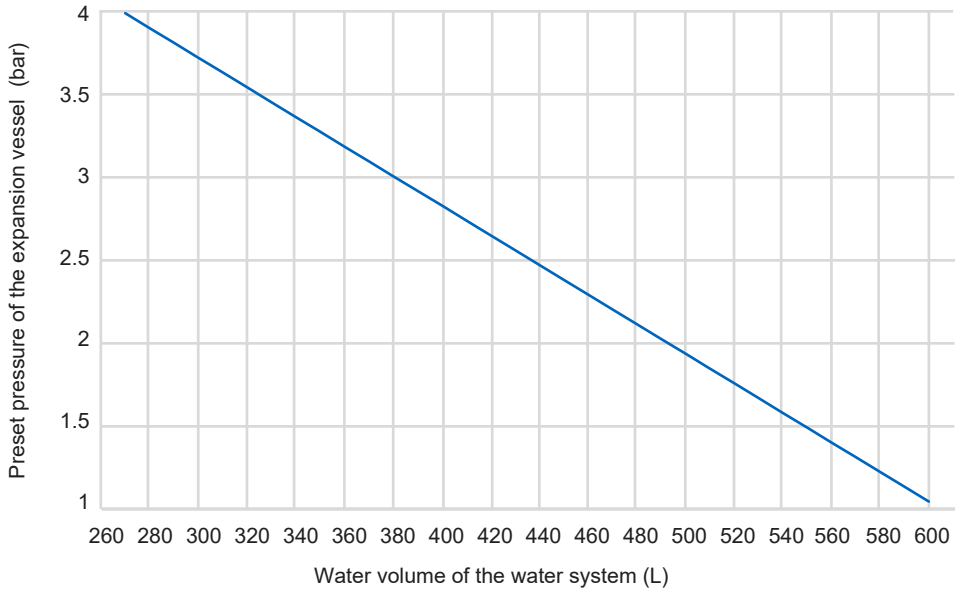
(a) The expansion vessel is 8 liters and 1.5-bar pre-pressurized;

(b) Total water volume of 365 liters is default; if total water is changed because of installation condition, the pre-pressure should be adjusted to secure proper operation. If the indoor unit is located at the highest position, adjustment is not required;

(c) Minimum total water volume is 180 liters;

(d) Installers need to use nitrogen gas to preset the pressure.

LSQWRF60VMP1/NhA-M



Notes:

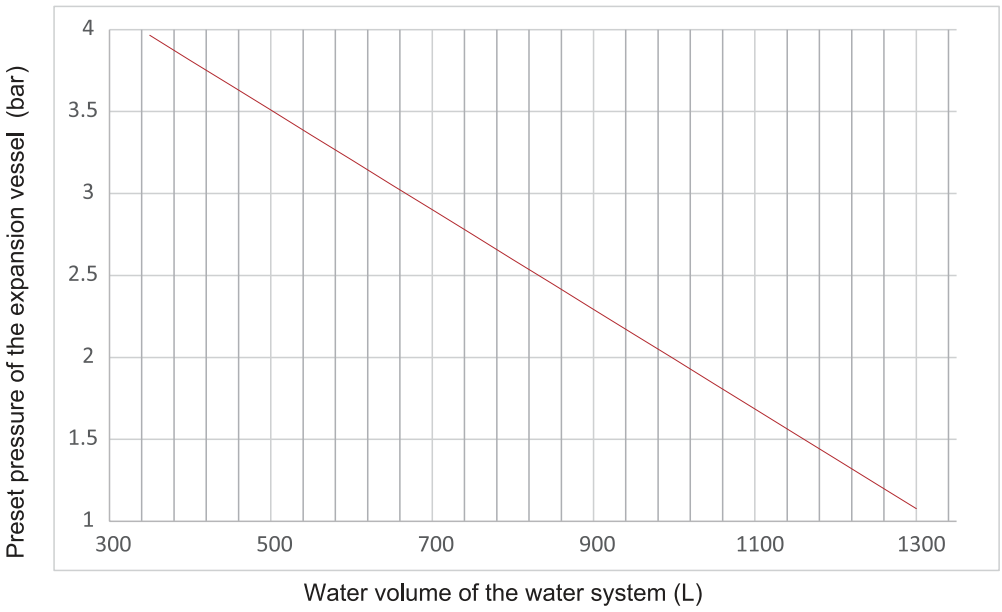
(a) The expansion vessel is 12 liters and 1.5-bar pre-pressurized;

(b) Total water volume of 545 liters is default; if total water is changed because of installation condition, the pre-pressure should be adjusted to secure proper operation. If the indoor unit is located at the highest position, adjustment is not required;

(c) Minimum total water volume is 270 liters;

(d) Installers need to use nitrogen gas to preset the pressure.

100kW/130kW



Notes:

(a) The expansion vessel is 24 liters and 1.5-bar pre-pressurized;

(b) Total water volume of 1150 liters is default; if total water is changed because of installation condition, the pre-pressure should be adjusted to secure proper operation. If the indoor unit is located at the highest position, adjustment is not required;

(c) Minimum total water volume is 350 liters;

(d) Installers need to use nitrogen gas to preset the pressure.

3.4.5 Selection of expansion vessel

Formula:

$$V = e \cdot C / [1-a(1+P_1)/ (1+P_2)]$$

V— Volume of expansion vessel

C— Total water volume

P_1— Pre-set pressure of expansion vessel

P_2— The maximum pressure during running of the system (that is the opening pressure of safety valve.)

e—The expansion factor of water (the difference between the expansion factors of the original water temperatures and those of the highest water temperatures.)

a=0.9454

Water expansion factors in different temperatures	
Temperature (°C)	**Expansion factor e**
0	0.00013
4	0
10	0.00027
20	0.00177
30	0.00435
40	0.00782
45	0.0099
50	0.0121
55	0.0145
60	0.0171
65	0.0198
70	0.0227
75	0.0258
80	0.029
85	0.0324
90	0.0359
95	0.0396
100	0.0434

3.4.6 Requirements on piping

The piping slope should meet design and construction regulations and the flexible pipe is not allowed to be longer than 150mm.

Pipes which go through the dilatation joint and the settlement joint should be protected with the flexible joint.

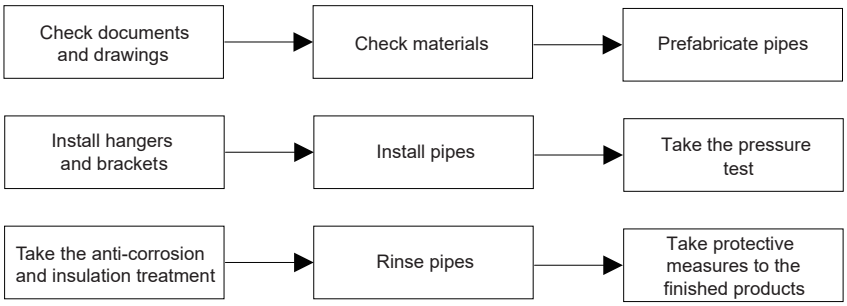
No matter which connection is used, welding, threaded connection or flange connection, the connection joint can't be in the wall, floor or sleeve pipe.

The riser pipe should be installed vertically. When the floor height is or less than 5m, a pipe clip is required. When the floor height is or larger than 5m, at least 2 pipe clips should be required. The installation height of the pipe clip is 1.8m. For the main riser pipe, it should be secured with the fixed bolster to support the weight of the riser pipe.

See the table below for the installation standards of the pipes.

Item		Allowable deviation	Inspection method
Straightness	DN≤100mm	2L‰, max. 40mm	By the ruler, tape measurement
	DN>100mm	3L‰, max. 60mm	
Verticality		25L‰, max. 25mm	By the ruler, tape measurement
Interval of parallel pipes		15mm	By the ruler, tape measurement
Parallelism of parallel pipes		3mm	By the ruler, tape measurement

Piping flowchart



(1) Check documents and drawings

1) Check the process flow, construction procedures and quality requirements in accordance with drawings and technical data.

2) Check the installation location, installation height, arrangement, and installation space of pipes in accordance with equipment drawings and building drawings.

(2) Check materials

3) Before installation, check for the mode of the valves, clean them and then take the strength and air-proof tests.

4) Pipes should be cleaned with a steel brush or abrasive paper. After that, seal the pipe ends and keep both the internal and external surface dry.

5) Pipes should be painted twice with anti-rust paint without any curtaining and voids.

(3) Prefabricate pipes

6) Make out the installation drawing which clearly indicates the branch pipes, pipe diameter, reduced pipes, location of valves, installation dimensions etc. Then, prefabricate pipes in accordance this installation drawing. Pipes should be processed with dedicated cutting machine, leaving no burrs at the pipe ends. After that, pipes should be cleaned to prevent sands and dusts from damaging the joint.

7) Pipe supports should be prefabricated in accordance with design requirements. The contact part between supports and pipes should be separated with wood blocks which has taken anti-corrosion treatment and is as thick as the insulation.

(4) Install hangers and brackets

8) The supporting beam should be fastened to the wall, pillar or other building structure. It should be placed horizontally with the top surface parallel with the center line of the pipe.

9) Pattern, installation, interval and standard height of supports for metal pipes should meet corresponding design requirements and codes.

10) Supports should be installed securely and contact the pipe closely. Separate supports are required at the connection joint between the pipe and the equipment.

11) Supports for chilled and cooling water pipes as well as main and branch pipes in the machine room should be anti-vibration.

12) When a single-bar hanger is used, anti-vibration hangers should be set up every 15m and at the pipe ends, valves, tee joints and elbows.

See the table below for the interval of brackets.

Diameter (mm)		15	20	25	32	40	50	70
Max interval between brackets (m)	**Insulated pipe**	1.5	2	2.5	2.5	3	3.5	4
	Non-insulated pipe	2.5	3	3.5	4	4.5	5	6
Max interval between brackets (m)	**Insulated pipe**	5	5	5.5	6.5	7.5	8.5	9.5
	Non-insulated pipe	6.5	6.5	7.5	7.5	9	9.5	10.5

⚠ NOTE

It is applicable to the pipes with working pressure less than 2.0 and insulation density less than 200kg/m^3 or without any insulation.

(5) Install pipes

Supply and return water pipes with the diameter of being or being less than DN32 should be thread connected, and pipes with the diameter of being or larger than DN40 should be welded. Those which must be detachable should be flange connected. Before installation, foreign matters inside the pie should be removed.

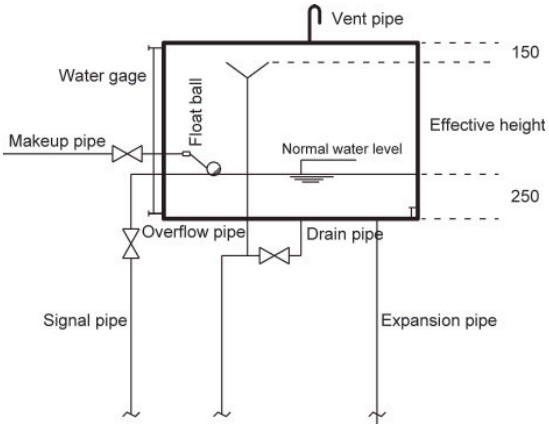
Threads should be processed by the threading machine.

Use lead oil and oakum as stuffing materials and remove those outside of the threads after pipes have been installed.

Threads should be clean and at least 90% threads should be intact. Two or three spirals of threads shoud be exposed at the connection joint after installation without any exposed stuffing. Galvanized pipes should be protected and local damage should take anti-corrosion treatment.

3.4.7 Installation of the expansion tank

An expansion water tank should be installed for the closed-circuit water system to buffer water expansion and constriction as well as avoid effects on the water pipes caused by makeup water.



(1) After the full water test, surface of the water tank should be de-rusted, finished and treated with ant-corrosion measure. The artificial anti-rust class should be st3.

(2) After that, when water tank temperature is below 30°C, it should be painted with red lead rust-proof paint twice. When the temperature is among 30~70°C, it should be painted with chloroethylene 4~5 times. When the temperature is among 70~95°C, it should be painted with heat-resistant anti-rust paint 4~5 times. Do not do directly welding on the water tank with surface treatment.

(3) The water tank should be installed horizontally and placed at a bar support which should go 100mm beyond at each side of the base plate. Height of the bar support should be no less than 300mm.

(4) When water pipes are installed in the room without the heating system, the water tank, expansion pipe, circulating pipe, and signal pipe all should be insulated.

(5) The installation height of the expansion water tank should be in the way that the lowest level of the water tank is at least 1m above the highest point of the water system.

(6) For the mechanical circulating air-to-water system, in order to keep the expansion water tank and water system run normally, the expansion pipes of the expansion water tank should connect to the suction inlet of the circulating water pump. For the gravity circulating system, the expansion pipes should connect to the top of the main supply water riser pipe.

(7) For the two-pipe air conditioning system, when there is only one expansion water tank for chilled and hot water, its effective volume should be figured out based on the heating conditions.

(8) When the water tank is or higher than 1500mm, it should have ladders both inside and outside of the water tank. When the water tank is or higher than 1800mm, it should have two glass gauges to indicate the water level.

(9) The circulating pipe should be connected to the main return pipe. Horizontal distance between the connection point to the constant-pressure point should be no less than 1500~3000mm.

3.4.8 Installation of condensate pipes

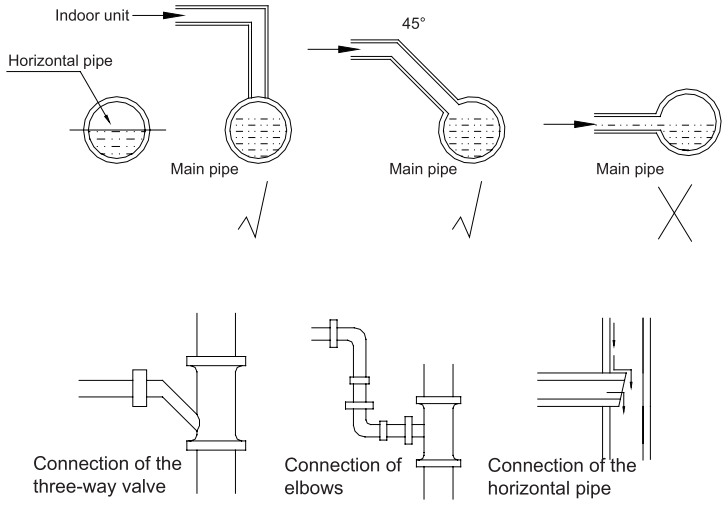
Setup → insulating → fastening

⚠ NOTE

- Adverse slope is not allowed for the slope larger than 1%.
- It can't connect with the rain water pipe, sewage pipe or other pipes.
- The elbow ventilator should be installed at the highest point of the condensate pipe to prevent foreign matters coming into the drain pipe.
- The S-shaped trap and flexible joint are necessary.
- The diameter of the pipes should be suitable.
- The wall-thru or floor-thru pipes should be protected by the steel sleeve. Do not put seams inside the sleeve. The steel sleeve should keep flush with floor, or 20mm above the floor for the floor-thru pipes. The steel sleeve is not allowed to affect the slope of the pipe and can't be used as the support of the pipe. Clearance between the pipe and the sleeve should be stuffed by flexible non-inflammable material.

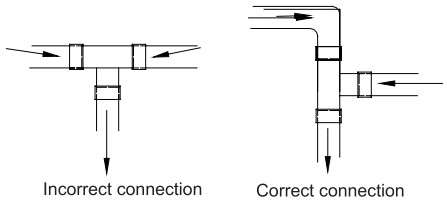
(1) Setup

The condensate pipes should be at least 300mm away from the electric box of the unit. For special space, its installation location should be approved by the corresponding designers.



Connection of the main pipe and the branches

When the three-way valve is used for the condensate pipe, its straight two connectors should be kept at the same level as shown in the figure below.



Tee joint

When there are several indoor units at the same floor, their condensate is usually drained out through one main pipe. In this case, the branches pipe for each unit should be located higher than the main pipe. The size of the condensate pipe is determined by the capacity and number of the indoor units.

Size of the tee drain pipe should match with the running capacity of the unit.

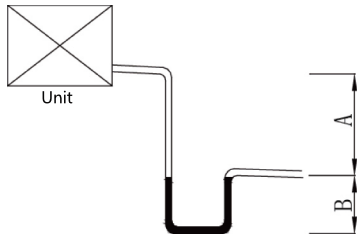
As pressure at the water outlet is quite large, an water trap is required for the drain pipe, which is applicable to the horizontal type air handing units and the indoor units of the duct type air conditioners.

A=P+25mm

B=P/2+25mm

P indicates the the passive pressure (mmH_2O, $1mmH_2O$=9.80665pascals) .

The pipe diameter should be or larger than 32mm.

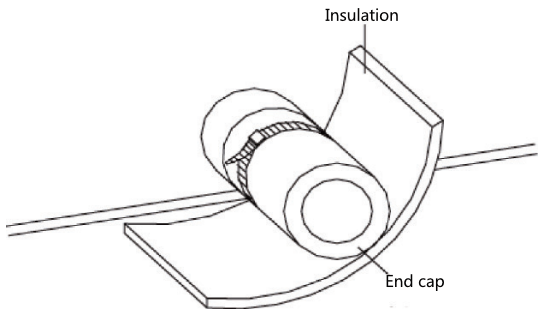


Water trap

(2) Insulating

The extended drain pipe should be insulated and special care must be paid to the elbows. See the table below for the thickness of the insulation.

Drain pipe (mm)	Thickness of insulation (mm)
All	≥15



Insulation should be thickened at humid areas.

(3) Fastening

The insulating tube is just required to be bundled and fastened at the supporting bracket.

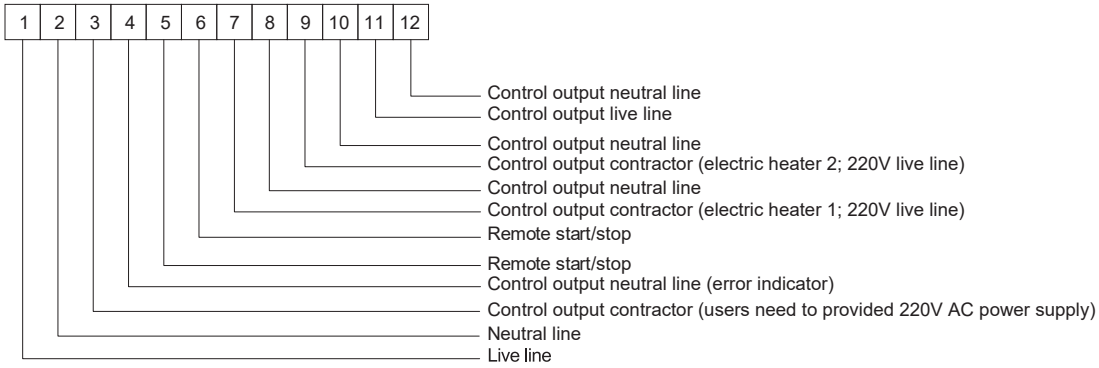
3.5 Electrical connection

3.5.1 Safety precautions

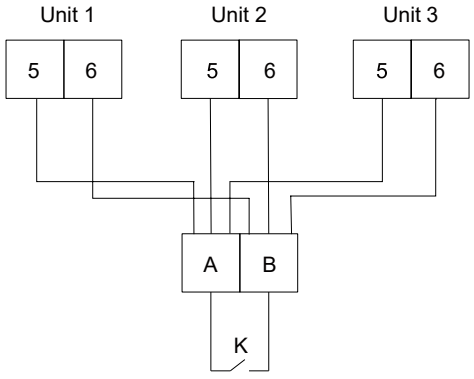
⚠ NOTE

- The electricians should be licensed.
- The air conditioning is Class I appliances and should be grounded reliably.
- The grounding resistance should comply with local applicable standard(s).
- The yellow-green line is for grounding. Do not use it for other purpose or cut it off or fixed with the self-tapping screw, other wise it would lead to electric shocks.
- The power supply should be reliably grounded and do not connect the ground line to a) running water lines; b) gas lines; c) blow-off lines; d) other unreliable places.
- Do not make the power lines and communication lines entwined and arrange them separately with a distance no less than 20cm, otherwise it would lead to abnormal communication.
- Do not wire improperly power lines and communication lines. When the power line is wired to the communication port, it would make the main board burnt out.

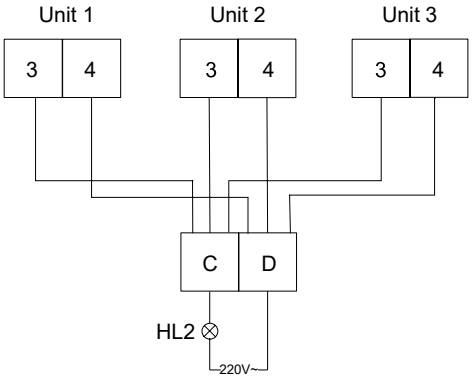
3.5.2 External connection



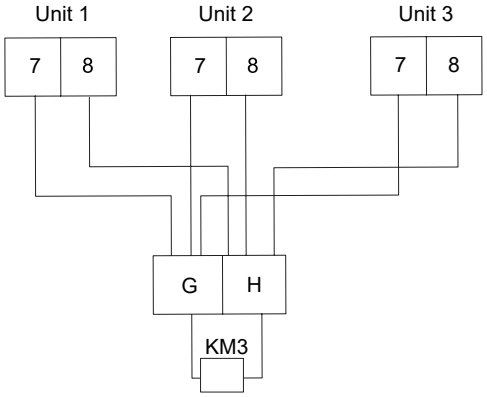
Note: the output control lines of the AC contactors for the error indicator, auxiliary electric heater 1, auxiliary electric heater 2 can be wired to the corresponding wiring board of all units, while those for the error indicator and dry contact switch should be wired to the corresponding wiring board of all units as shown in the figure below.



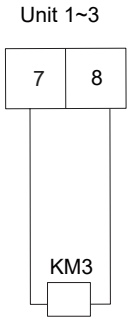
When external passive contact switch is available for multiple units, the wiring terminals (5 and 6) of each unit should be wired to the terminals (A and B) for a dry contact switch.



When it is required to display errors of several units, the wiring terminals (3 and 4) of each unit should be wired to the wiring terminals (C and D) of the error indicator HL2. (If it is required to display the error of each unit independently, then the error indicator of each unit should be wired independently to the corresponding error output wiring terminals (3 and 4) of each unit.



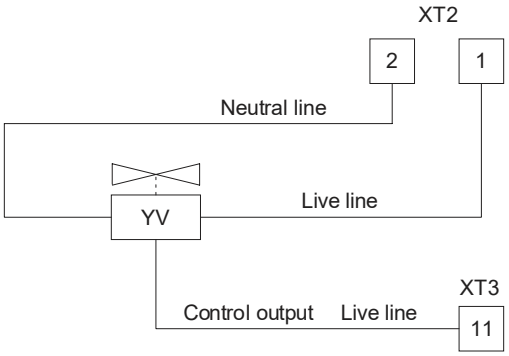
When one auxiliary electric heater serves more than one modules, its wiring terminals (7 and 8) are connected to terminals (G and H) for an AC contactor KM3.



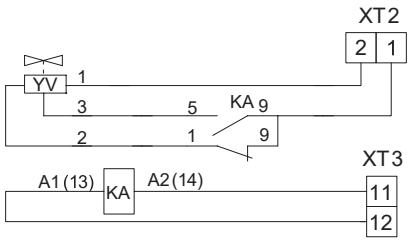
When multiple modules have direct control over one auxiliary electric heater, its AC contactor is wired to AC contactor (KM3 or KM4) of any one module.

Motorised ball valves should be wired as desribed below. They work with the power specification of 220V (10A).

Example 1: If the project uses a switched two-way electric ball valve, wiring will be conducted as described in the diagram below.



Example 2: If the project uses a 3-point floating type 2-way motorised ball valves, wiring will be conducted as described in the diagram below.



If users prefer a different type of motorised ball valve,please follow the corresponding specification manual to finish the electrical connection. Note that motorised ball valves should be protected against water when they are installed outdoors.

3.5.3 Specification of power supply

See the table below for selection of the power lines and the air switches.

Model	Power supply	Min. sectional area of the power cable (mm^2)			Capacity of the air switch (A)
		Live line	Neutral line	Earth line	
LSQWRF35VMP1/ NhA-M	380V-415V AC 3Ph 50Hz	6	6	6	32
LSQWRF60VMP1/ NhA-M	380V-415V AC 3Ph 50Hz	16	16	16	63
LSQWRF100VMP1/ NhA-M	380V-415V AC 3Ph 50Hz	25	16	16	100
LSQWRF130VMP1/ NhA-M	380V-415V AC 3Ph 50Hz	35	16	16	125

Notes:

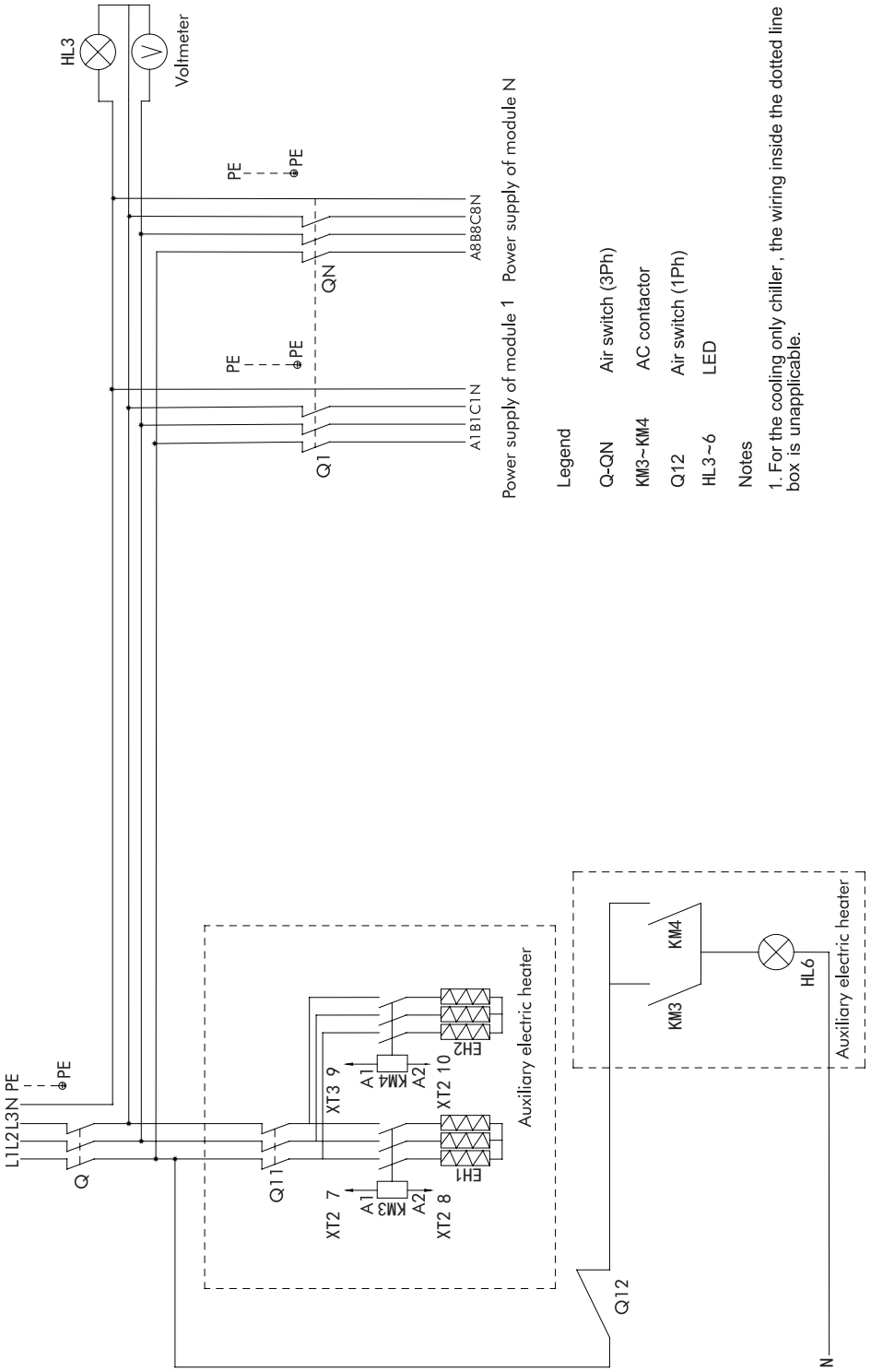
(a) The specifications of the air switch and power cables listed in the table above are determined based on the maximum power (maximum amperage) of the unit.

(b) The specifications of power cables listed in the table above are confirmed according to a condition that exposed conduit-guarded multi-core copper cables (e.g. JYV copper cables consisting of PV insulated cables and a PVC cable jacket) are used at an ambient temperature of 45°C and resistible to a working temperature of 90°C (GB/T 16895.15-2002). If the working condition changes, data should be modified be subject to the related national standard.

(c) The specifications of the air switch listed in the table above are confirmed according to a condition that an air switch used at an ambient temperature of 40°C. If the working condition changes, data should be modified to be subject to the related national standard.

(d) The allowable deviation of the power voltage used by the unit is ±10%, otherwise the unit would fail. If the power supply voltage cannot meet the requirements, please use a voltage stabilizer to be provided by the user.

3.5.4 Wiring of the electric control cabinet



3.5.5 Field wiring

Follow the safety codes below.

(1) All wiring shall comply with applicable codes and engineering requirements.

(2) All field wiring shall be performed by qualified electricians.

(3) Never perform wiring before the power supply is cut off.

(4) Any damage caused by the improper external wiring shall be at the installer's expense.

⚠ WARNING

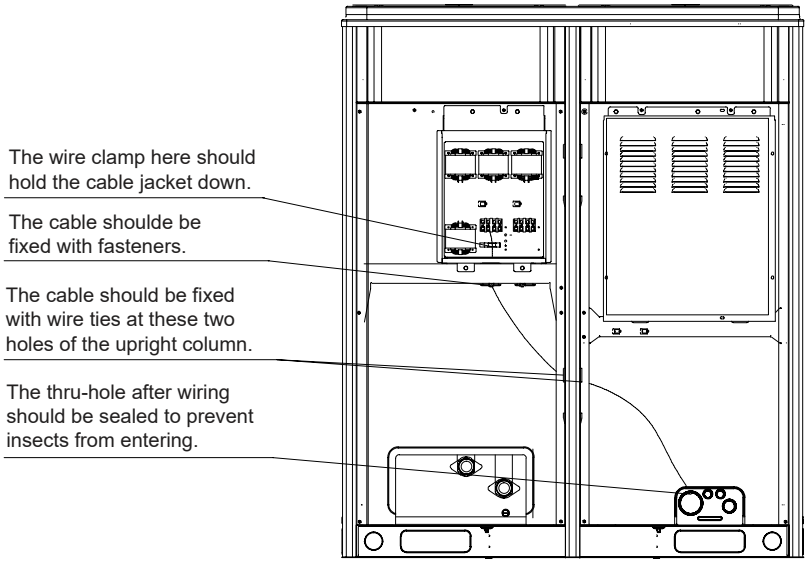
Only copper conductors are allowed.

Follow the procedures below to wire the power lines to the electric box.

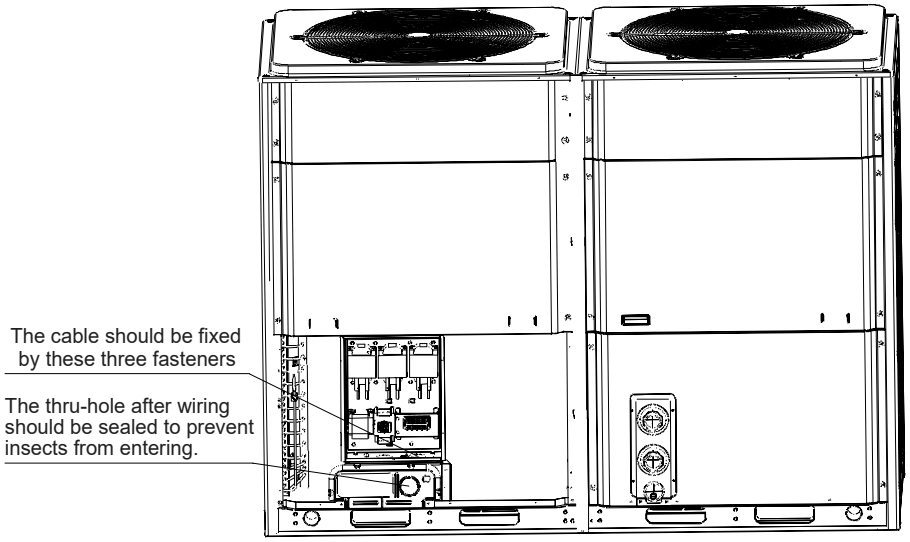
(1) The power cord must be routed inside the conduit.

(2) The power cord must enter the electric box through a rubber or plastic ring to avoid any damaged caused by the sharp edge of the metal sheet.

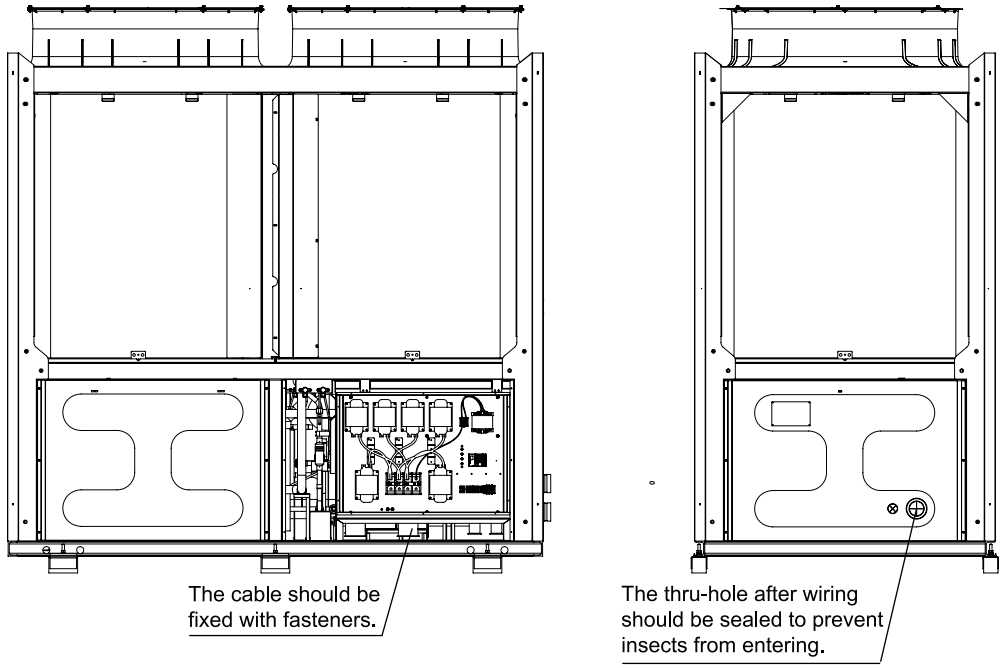
(3) The power cord close to the electric box must be attached securely to prevent the terminal block of the electric box affected by the outside force. The power cord shall be installed with a suitable cord anchorage against cord loosing. See the wiring diagrams below for external wiring.



LSQWRF35VMP1/NhA-M



LSQWRF60VMP1/NhA-M



LSQWRF100VMP1/NhA-M/LSQWRF130VMP1/NhA-M/

(4) The unit shall be grounded reliably and never connect the ground wire with the gas fuel pipe, water pipe, lightening rod or telephone line.

(5) After wiring, O-rings should be tightened to prevent coming of insects.

Follow the procedures below to connect control lines.

(1) The field supplied control line shall be at a minimum 1mm^2.

(2) The electric box will send the control signal (220 AC, 5A) to control the auxiliary electric heater; however, never do not drive them directly through the control signal but through their AC contactors.

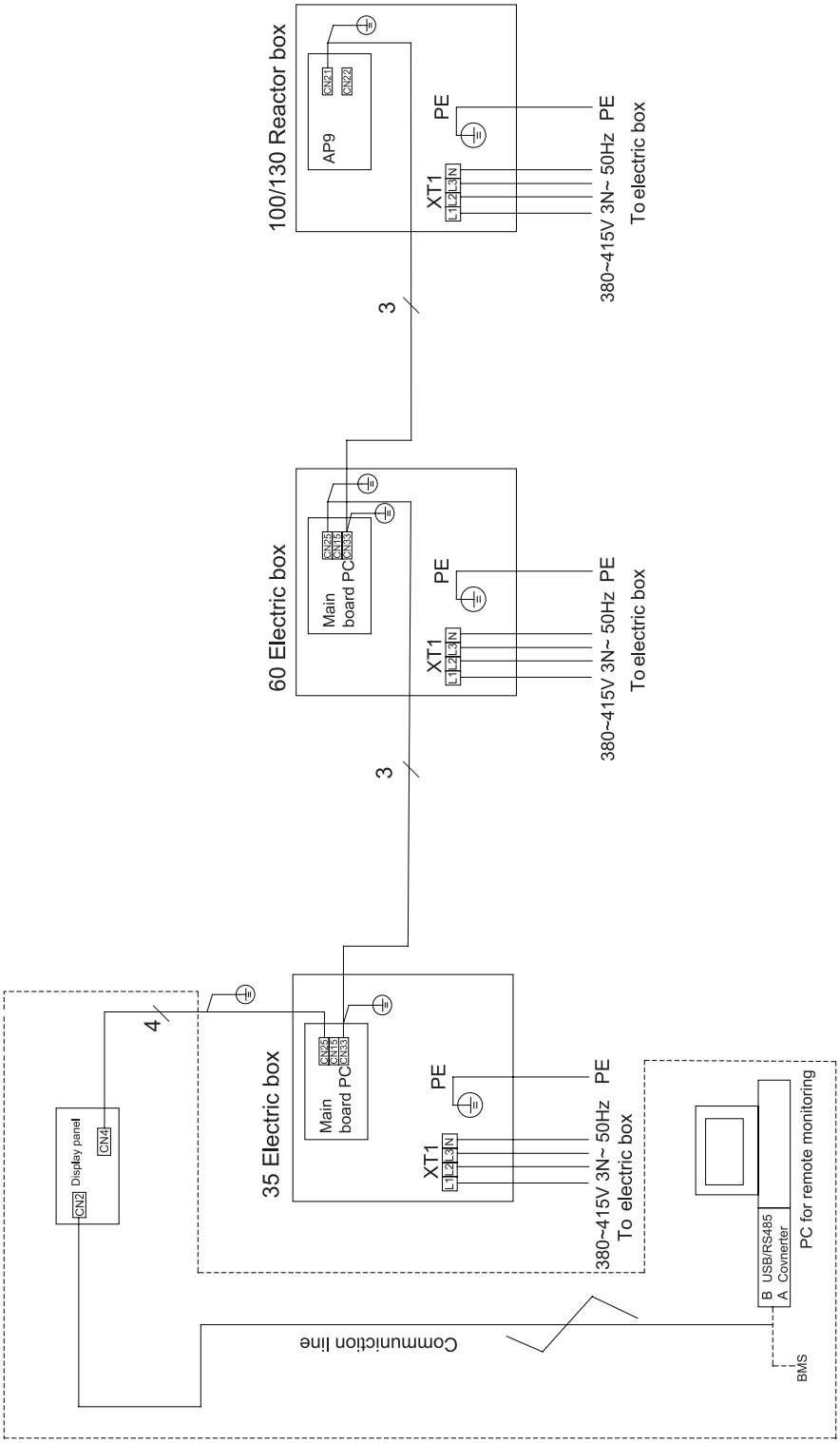
(3) Switching signals (220VAC, 2A) for the error indicators are available for the electric box.

(4) The remote switch control signal is available for the electric box and please pay attention to the input passive dry contact.

(5) A reasonable length of the control line should be left outside the unit and the rest should be bundled and fed into the electric box.

(6) The connection line of the display panel and main board is reliably grounded through the main board. Beside, communication lines between units also should be grounded.

3.5.6 Networking and wiring between units



Notes:

(a) This series allows a maximum of 3 modules as a whole.

(b) As shown in the diagram above, CN33 and CN25 of all modules are connected by a three-core four-pin shielded communication line whose ground wires of both ends will be linked to the terminal near the main board.

(c) As shown in the diagram above, CN4 on the display panel is connected to a CN25 on a main board of any unit by a four-core shielded communication line whose ground wire will be linked to the terminal near the main board.

(d) The power lines should be connected to L1, L2, L3, and N at XT1 through a piece of four-core rubber sleeve cable as shown in the figure above.

(e) Remote monitoring system: Gree provides Modbus protocol, and users are allowed to do further development according to the protocol. Note: the remote monitoring equipment is enclosed by the dotted lines. If the number of control panels exceeds 30 or the communication cable exceeds 800 meters, photoelectric isolation repeaters are required. Photoelectric isolation repeaters, communication cable (category V twisted pair by Gree) and patching boards are optional.Besides, the monitoring computer should be provided by the user.

3.5.7 Jumper caps

When it is required to replace the main board, be sure the main board can match with the applicable jumpers.

Jumper cap list

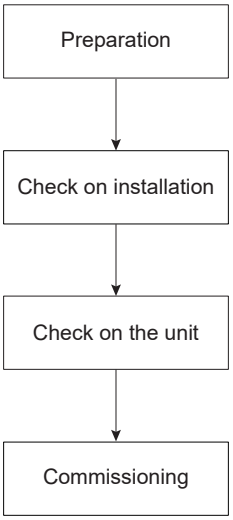
Model	Code	Jumper no.	Matched compressor
LSQWRF35VMP1/NhA-M	4202021912		QXFS-H80zN345H
LSQWRF60VMP1/NhA-M	4202021914		QXFS-H80zN345H
LSQWRF100VMP1/NhA-M	4202021913		DD110PHDG-D1S6
LSQWRF130VMP1/NhA-M	4202021915		DD110PHDG-D1S6

Test Operation, Troubleshooting and Maintenance

4 Test operation, troubleshooting and maintenance

4.1 Commissioning

4.1.1 Flowchart of commissioning



4.1.2 Safety precautions for commissioning

⚠ WARNING

- Safety measures should be taken during indoor operation. Any commissioning and service personnel should grasp and observe safety regulations of construction work.
- Refrigeration mechanic, electricians, welders and other technicians of other special work all should be licensed.
- Power supply should be cut off before any operation to the unit. Meanwhile, please observe required safety operation.
- All installation and operation should comply with design requirements of this product and local safety requirements.
- Never force the compressor to run by electrifying it directly.

4.1.3 Preparation before commissioning

(1) Manual of installation instructions

(2) Certificate of qualification

(3) Electric wiring diagrams

(4) Sheet of saturated temperature and pressure

4.1.4 Check before commissioning

◆ Check the completeness

(1) Is the surface of the unit in good condition?

(2) Is there leak at any pipe connector?

(3) Is any part damaged?

◆ Check installation of the unit

Do the installation location, installation foundation and maintenance space comply with corresponding requirements?

◆ Check the water system

(1) Is the water flow direction in the condenser and evaporator correct?

(2) Are the chilled water pipes clean? Is there any foreign matter trapped in the joints? Is the water quality satisfactory?

(3) Is the insulation of the chilled water pipes in good condition?

(4) Are the manometer and thermometer connected correctly (Is the manometer at a right angle with the water pipe, and is the thermometer's probe inserted into the water pump)? Do the initial values of the manometer and thermometer comply with requirements before commissioning?

(5) Is the leaving water flow switch installed correctly? Is this flow switch correctly wired to the electric control cabinet?

(6) Star the unit and see: is the water pressure stable? do the reading values of water pressure change slightly? Is the running ampere in the rated range? If not, just handle all of them.

(7) Does the water makeup device of the expansion water tank work well? Does the automatic exhaust valve work well? For the hand exhaust valve, open it to exhaust air inside the system.

◆ Check the work load

(1) Are the air handling units connected correctly?

(2) Do all diffusers work smoothly?

(3) Are the tightness and insulation of the conditioned space in good condition?

(4) Does the required load match with the capacity of the unit?

⚠ WARNING

- Do not check the power supply without any proper detection device and preventive measures, or it would lead to severe in juries or even death.
- Each single unit should be supplied with dedicated power lines. After wiring, check the following items one by one.
  1) Is the size of the air switch proper?
  2) Does all electric installation meet corresponding electric standards or codes?
  3) Is all wiring correct?
  4) Are all interlocks work well?
  5) Do all contacts work well?
  6) Are the power supply and insulation in good condition?
  7) Is the setpoint of the control and protection elements correct?

4.1.5 Check for initial run

Check for initial run should be performed by four steps as shown below when the unit is ready for initial run.

◆ Check on communication

Check if the displayed number of modules is the same as the real number. If so, it indicates communication goes normal. If not, take the following inspections.

(1) Are all connected units powered on?

(2) Does each single unit have a unique address?

(3) Is there any single unit which has not been detected by the control? Is the communication line of the mainboard connected correctly or is the communication line itself non-defective?

◆ Check on a single unit

(1) Commission one single unit first and stop all others.

(2) Do the compressor, fans and the 4-way valve run normally without any unusual noise?

(3) Is the voltage phase difference lower than ±2%?

(4) Voltage phase difference = (phase difference between the max and average voltage)/(average voltage)×100%.

(5) Start up this single unit.

(6) Do its compressor, fans and the 4-way valve run normally without any unusual noise?

(7) Check other units one by one in the same way.

◆ Check on the water flow of a single unit

In order to prevent the water temperature changing too quickly, it is suggested to open all terminal units in commissioning, and observe and record the pressure drop of the manometers at the outlet and inlet pipes. Also, adjust the flow control valves or shut-off valves to make the flow meet application requirements.

When the environmental temperature is available, let the unit perform cooling (>15°C). When the unit has run stably for 10 minutes, the normal difference of the entering and leaving water should be 4-6°C.

(1) If the temperature difference is larger than 4-6°C, raise it by reducing the water flow of other units.

(2) If the temperature difference is smaller than 4-6°C, ignore it in the event that the difference of other units is suitable, and reduce the water flow of this unit in the event that the difference of other units is also unsuitable.

(3) Check for the water flow of other units one by one in the same way.

◆ Check on operation of the whole unit

(1) Check the difference of the entering and leaving water temperature of each unit when the whole unit has been in operation. If temperature adjustment fails, reconsider the capacity of the selected water pump.

(2) Start up the whole unit under the full load. When the whole unit has run stably for one hour, check if the water temperature and the air conditioning effect meet the user’s requirements.

(3) Observe and record the entering and leaving water temperature, condensing and evaporating pressure. Then, stop the unit and check the setpoint of each parameter on the control panel. After that, complete the commissioning date sheet.

(4) When the unit comes to the protection state, diagnose it and and seek solutions.

4.2 Troubleshooting

4.2.1 Diagnostics

Diagnostic name	Affects signal source	Description
High pressure protection	High pressure cutout	When the pressure is too high or the current exceeds the setpoint, the corresponding compressor will stop and the indicating LED on the control panel will light on and the error information will be displayed on the error log. The error must be manually cleared for normal operation of next time.
Low pressure protection	Low pressure cutout	• When it is detected the low-pressure cutout of the compressor is opened frequently, the compressor will be shut down immediately. • Meanwhile, the error information will be displayed. The error must be manually cleared for normal operation of next time.
Low pressure protection	Low pressure sensor	If the system pressure is lower than the set value, the corresponding compressor would stop. In this case, the display panel would display the corresponding fault and then the compressor could resume normal operation only after the fault has been manually cleared.
High discharge protection	Discharge temperature sensor	When it is detected that the discharge temperature exceeds the setpoint, the compressor will be shut down immediately. Meanwhile, the error information will be displayed among the error log. The error must be manually cleared for normal operation of next time.

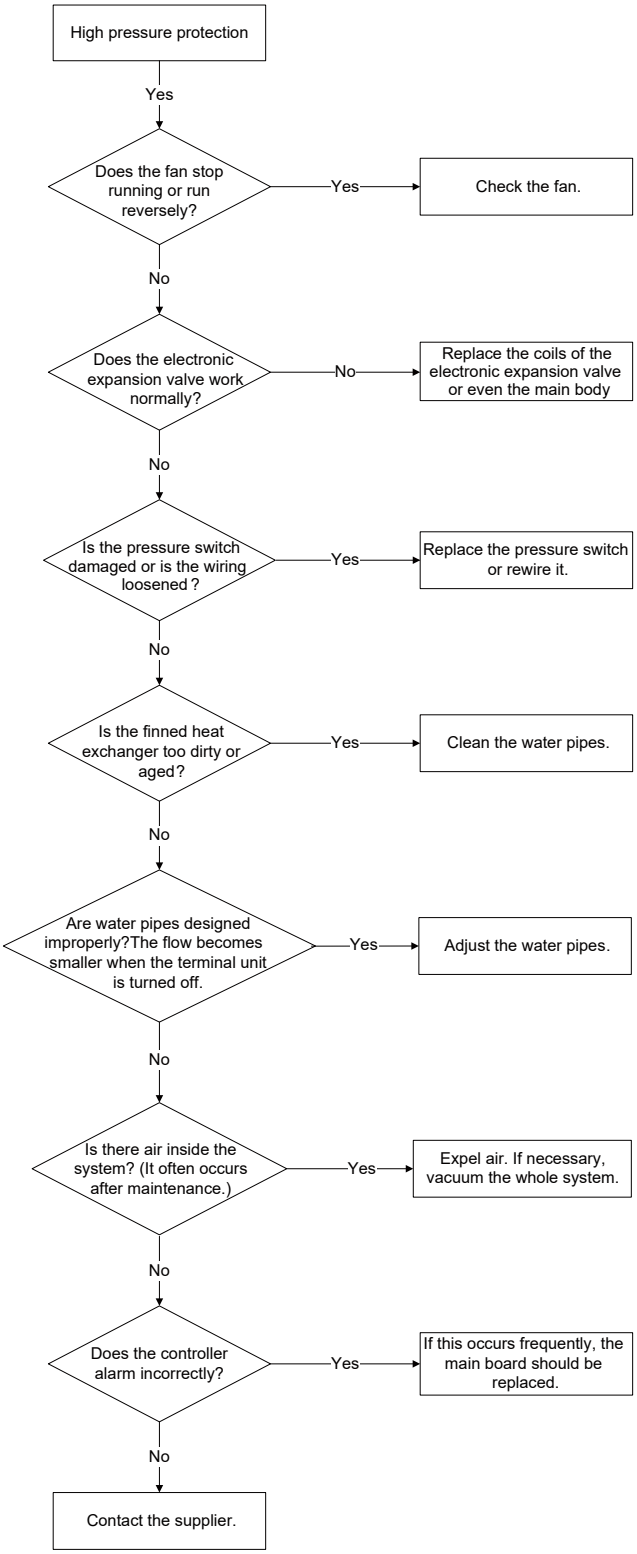
Diagnostic name	Affects signal source	Description
Temperature sensor protection	Temperature sensor	• When the entering water temperature fails, all compressors and fans of the corresponding single unit will stop. When the discharge temperature sensor fails, the display panels will tell “Discharge temperature sensor X error”. • In this case, the unit can be started normally only when it has been unlocked. When the antifreeze temperature sensor or leaving water temperature sensor fails, the display panel will display this error. In this case, the unit can resume normal operation only when the error is cleared manually.
Communication fault	Main board	When the single unit fails to receive signals from the control panel, it will automatically be shut off.
Phase loss/reversal protection	Phase protector	When phase loss/reversal occurs, the phase protector will cut off the power supply to the main board.
Protection for the water flow switch	Contact	When a single unit detects its flow switch is open, this module will automatically be shut down. When all flow switches are closed, the water pump will stop.
Protection for the compressor IPM module	Drive board of the compressor	When it is detected that the compressor IPM current or temperature is higher than the setpoint, the compressor will be stopped immediately and the control panel will display this error.
Protection for the fan IPM module	Drive board of the fan	When it is detected that the fan IPM current or temperature is higher than the setpoint, the compressor will be stopped immediately and the control panel will display this error.

Error Name	Error Code
Jumper cap error	C5
High pressure protection	E1
Anti-freezing protection	E2
Low pressure protection	E3

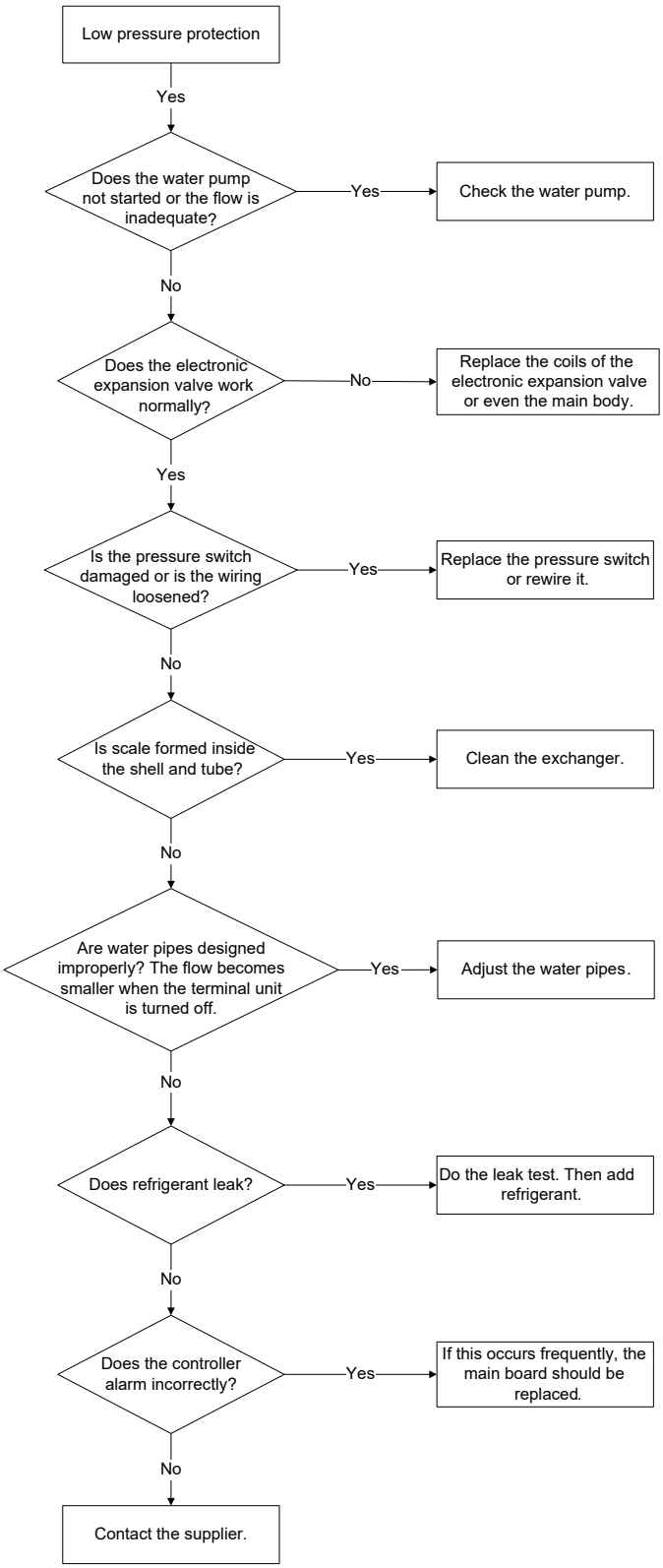
Error Name	Error Code
High discharge temperature	E4
Compressor over-current	E5
Communication error	E6
Flow switch protection	EC
Superheating protection (unavailable for the cooling only unit)	Ed
Fan motor over-current protection	EF
Defrosting temperature sensor	d6
Ambient temperature sensor error	F3
Discharge temperature sensor error	F4
Anti-freezing temperature sensor error	d3
Entering water temperature sensor error	F8
Leaving water temperature sensor error	F9
Discharge temperature sensor error	dp
Radiator or IPM module or PFC module over-temperature	P8
IPM error	H5
DC busbar input under-voltage or voltage dip	PL
DC busbar input over-voltage	PH

4.2.2 Flow chart of troubleshooting

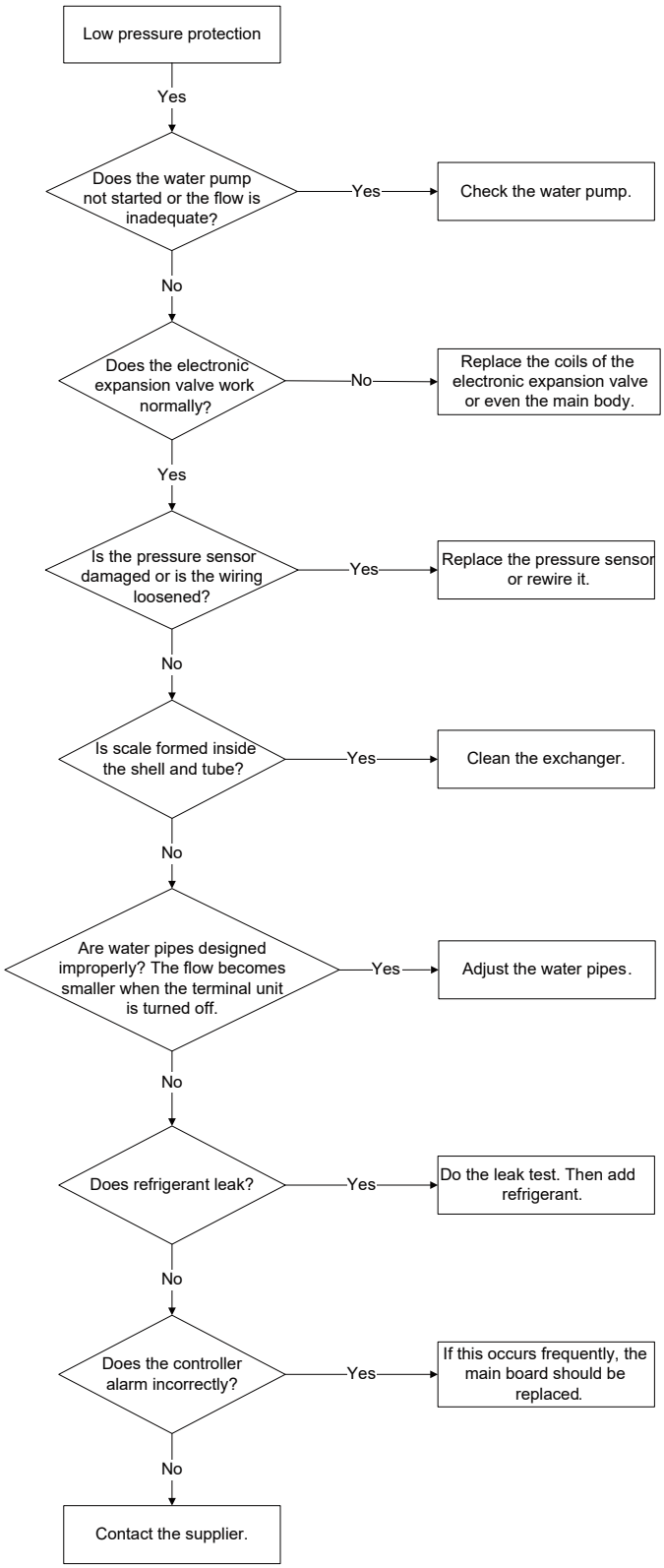
(1) High pressure protection



(2) Low pressure protection

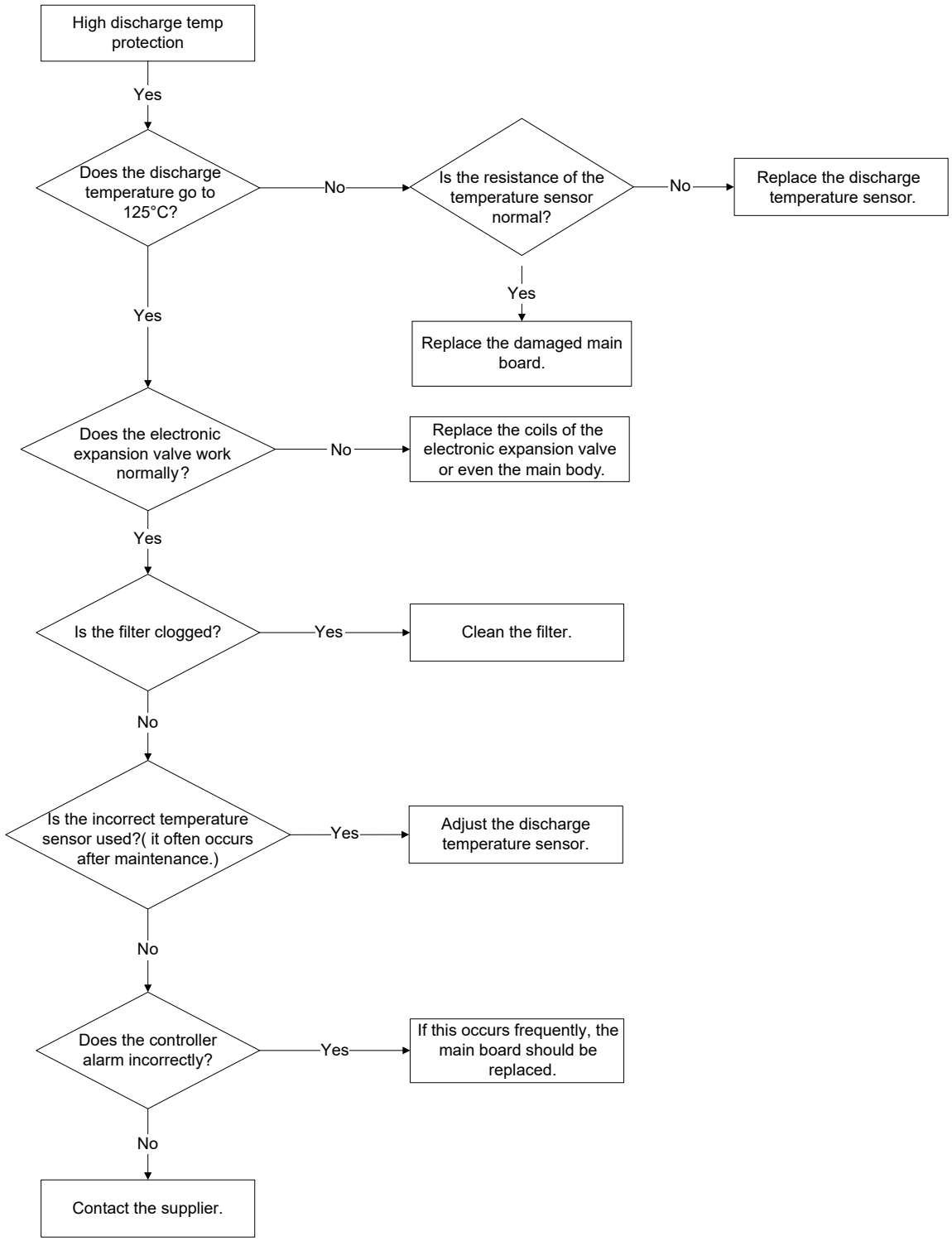


(3) Low pressure sensor

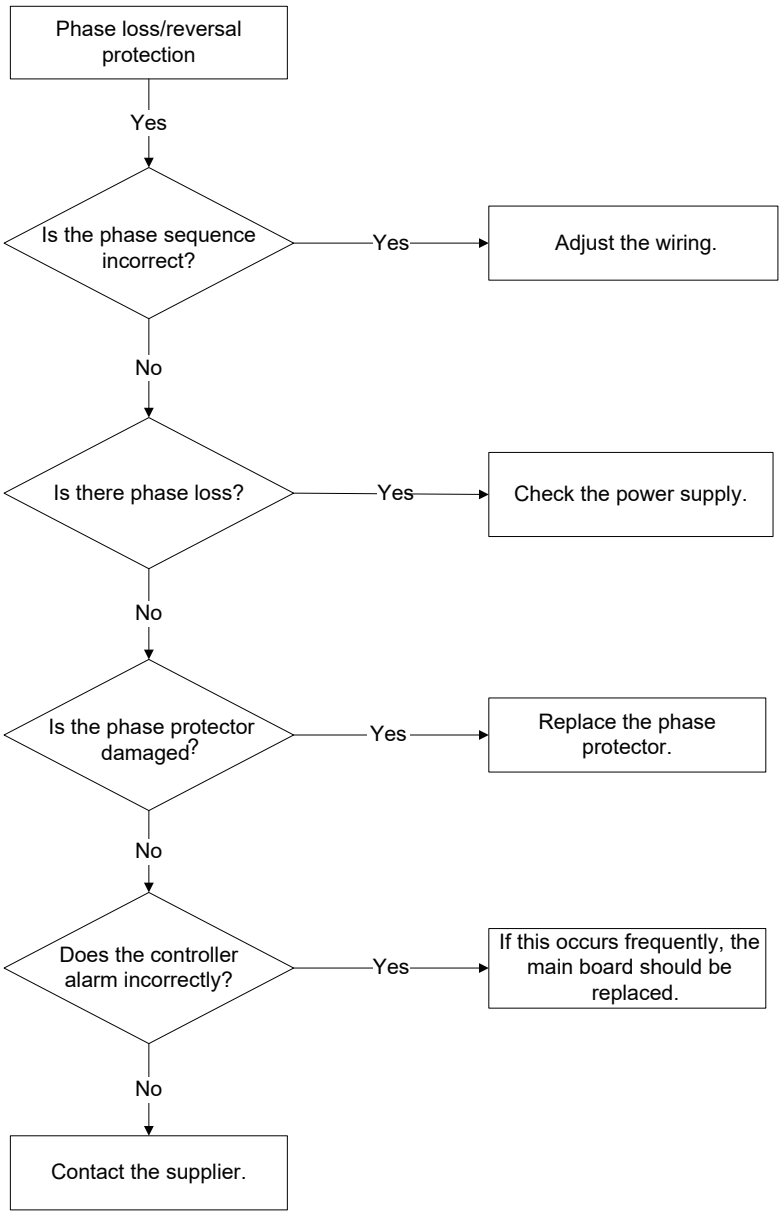


Note: it is applicable to units LSQWRF100VMP1/NhA-M and LSQWRF130VMP1/NhA-M.

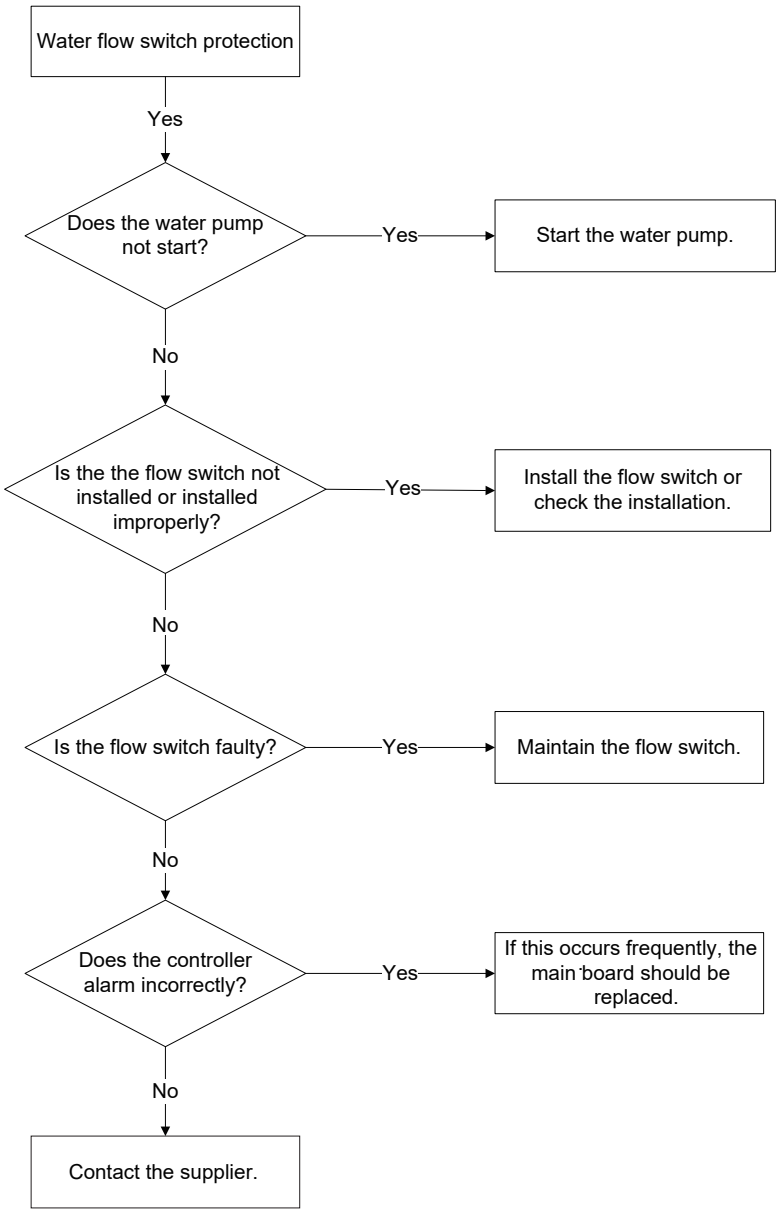
(4) High discharge protection



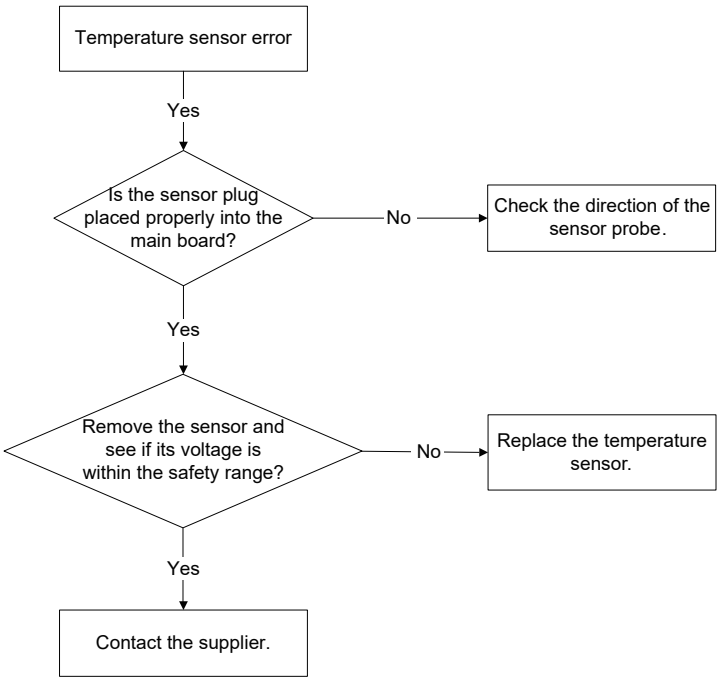
(5) Phase protection



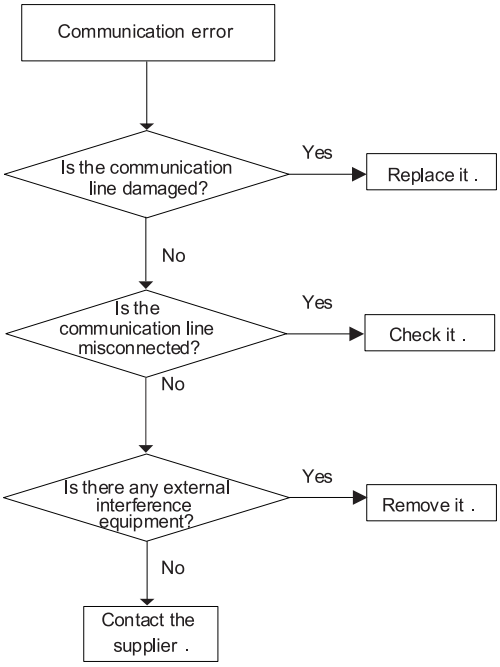
(6) Water flow switch protection



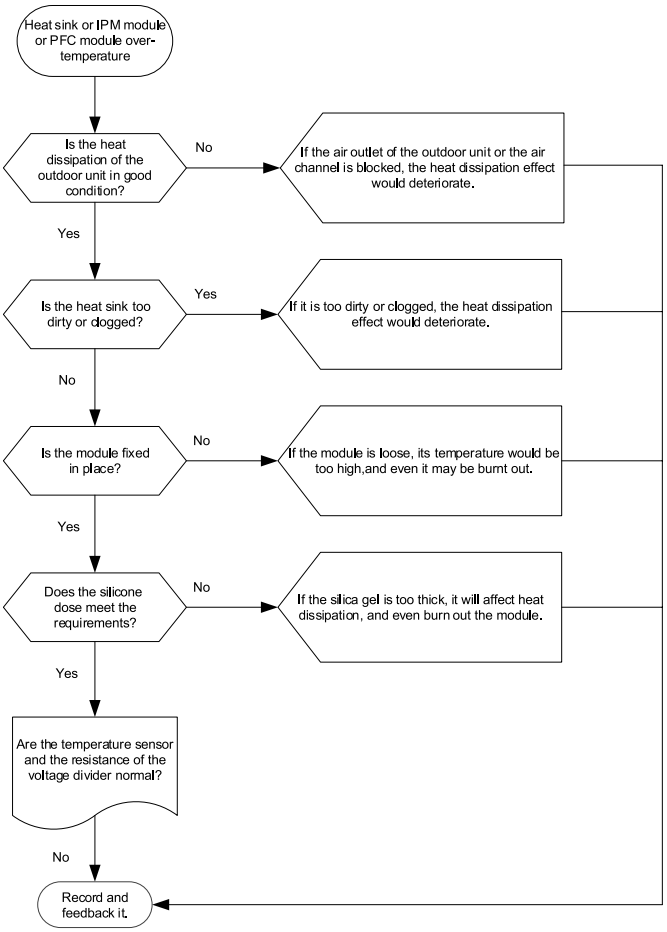
(7) Temperature sensor error



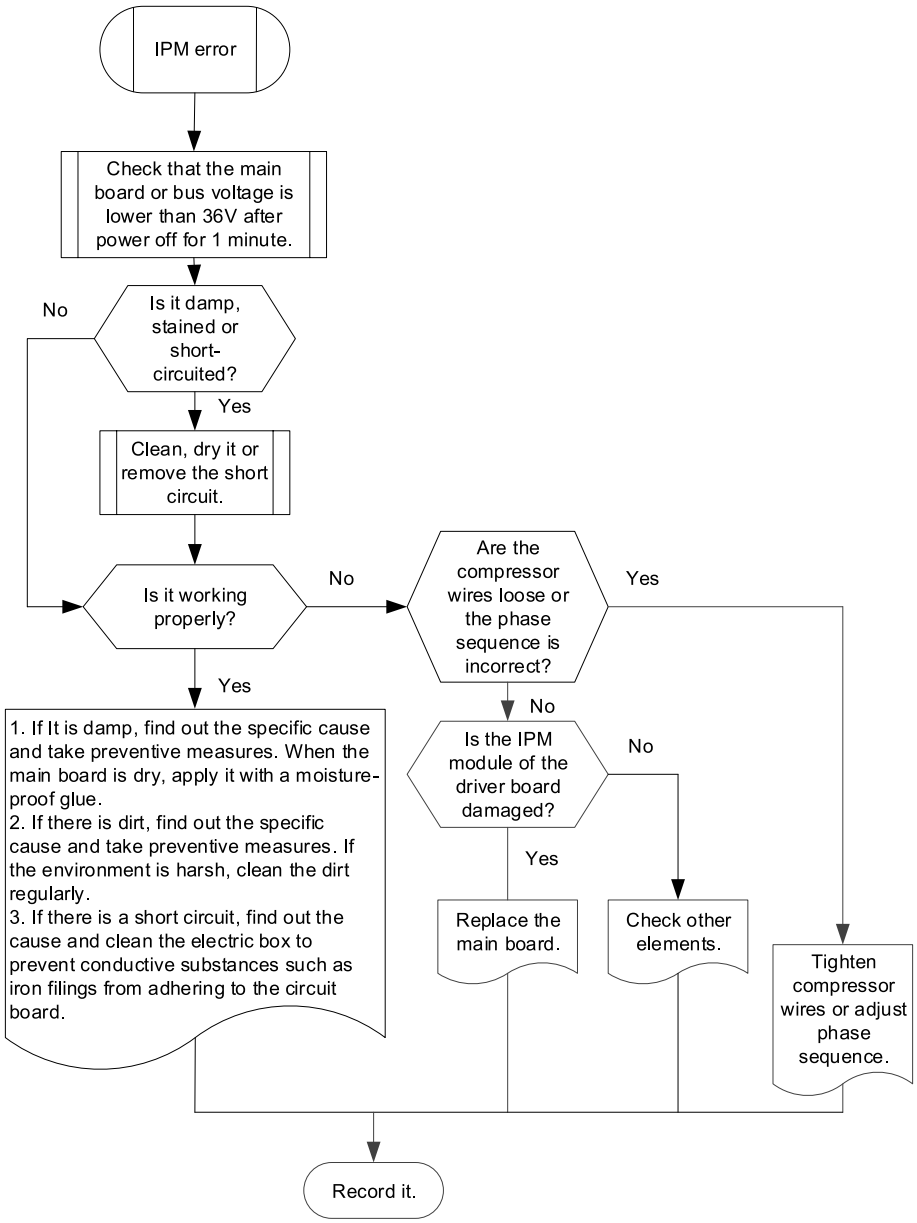
(8) Communication error



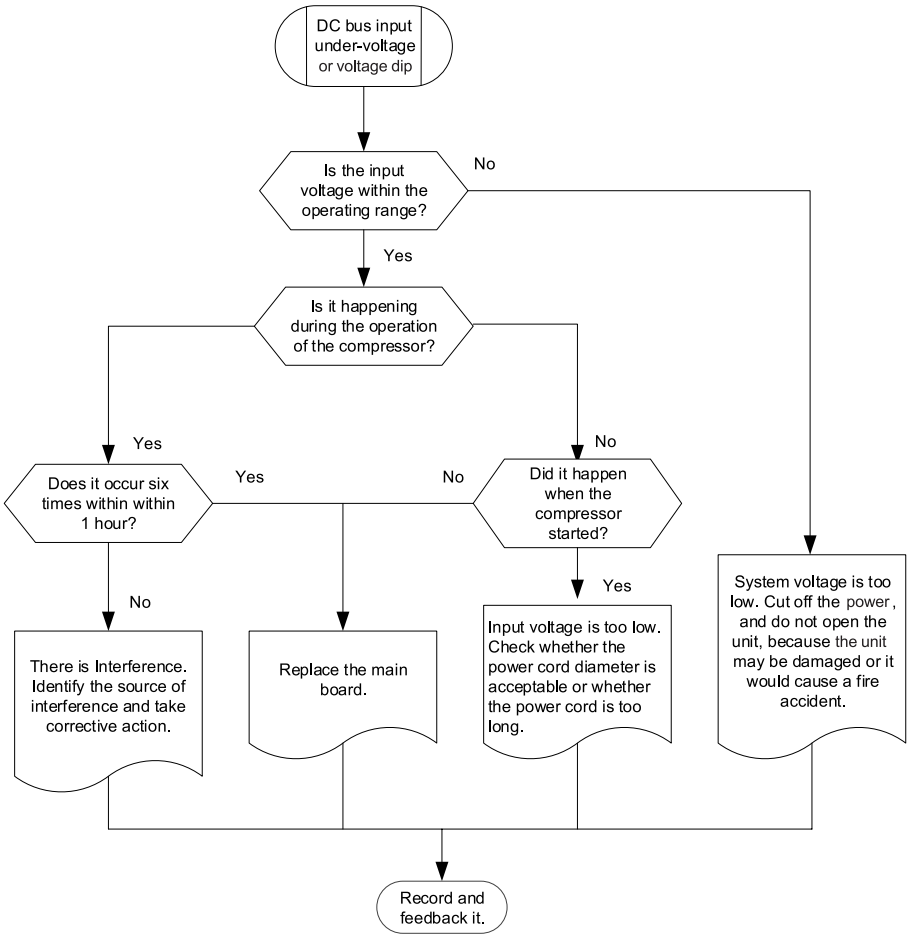
(9) Heat sink or IPM module or PFC module over-temperature



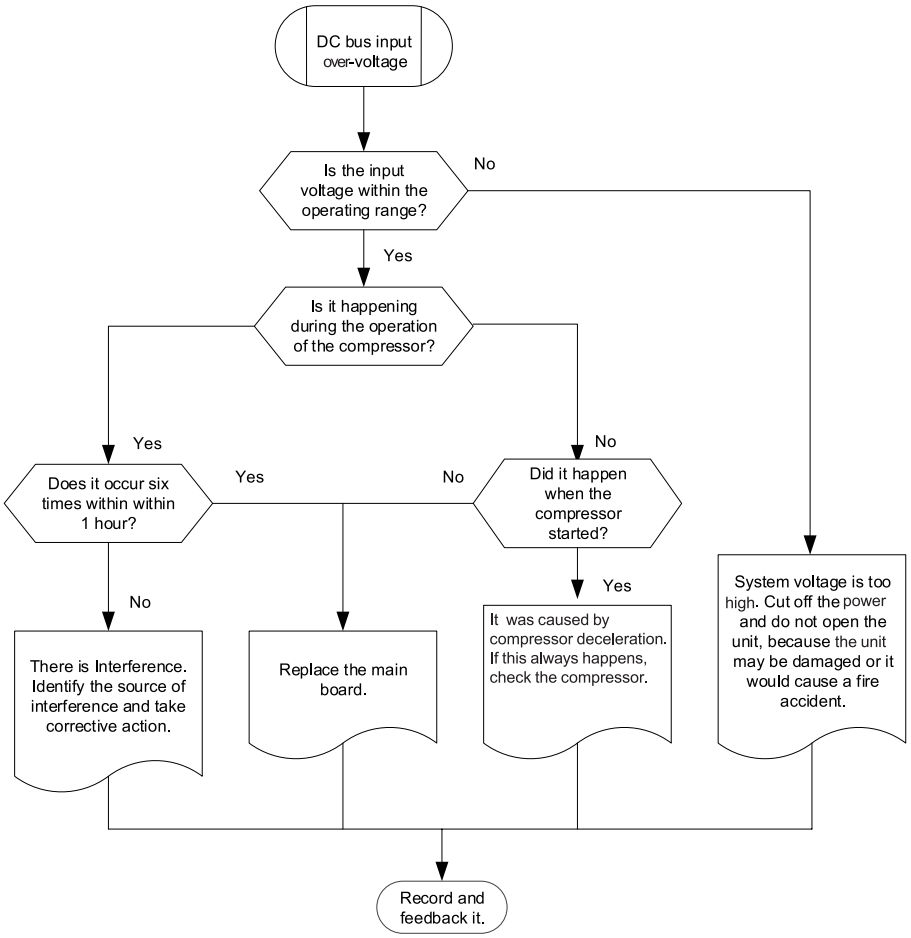
(10) IPM error


IPM error
Check that the main board or bus voltage is lower than 36V after power off for 1 minute.
No
Is it damp, stained or short-circuited?
Yes
Clean, dry it or remove the short circuit.
Is it working properly?
No
Are the compressor wires loose or the phase sequence is incorrect?
Yes
Yes
1. If It is damp, find out the specific cause and take preventive measures. When the main board is dry, apply it with a moisture-proof glue.
2. If there is dirt, find out the specific cause and take preventive measures. If the environment is harsh, clean the dirt regularly.
3. If there is a short circuit, find out the cause and clean the electric box to prevent conductive substances such as iron filings from adhering to the circuit board.
No
Is the IPM module of the driver board damaged?
No
Yes
Replace the main board.
Check other elements.
Tighten compressor wires or adjust phase sequence.
Record it.

(11) DC bus input under-voltage or voltage dip

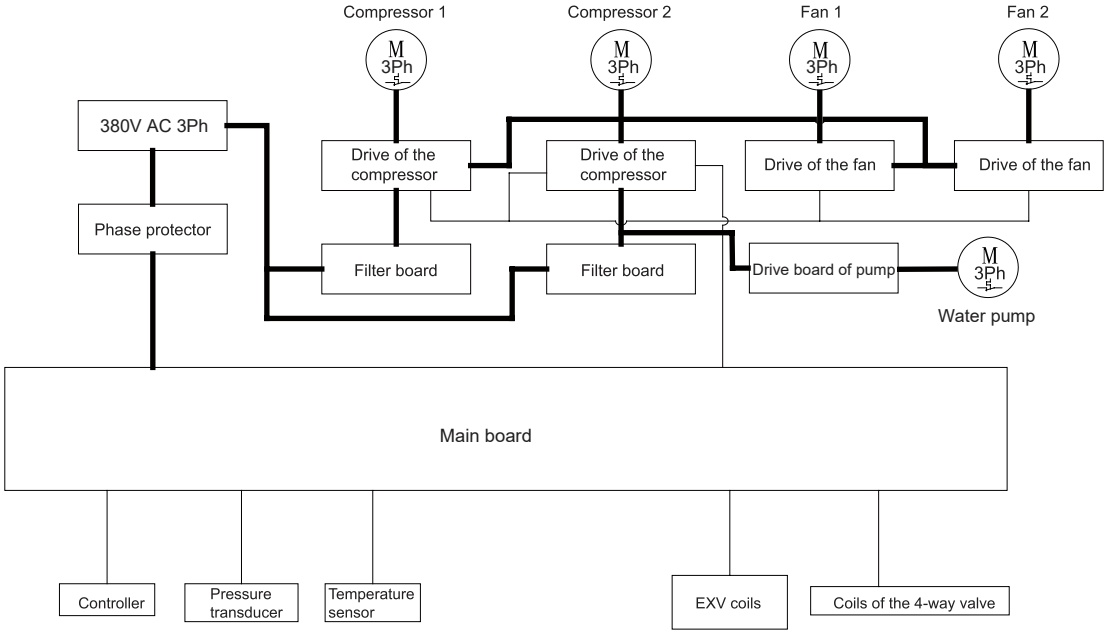


(12) DC bus input over-voltage



4.3 Power distribution

4.3.1 Power distribution logic



Note: Bold lines indicate the main circuit and slim lines indicate the control circuit.

Protection conditions: phase loss or reversal of the power input for the phase protector.

Action result: No power for the controller and ON/OFF operation is failed.

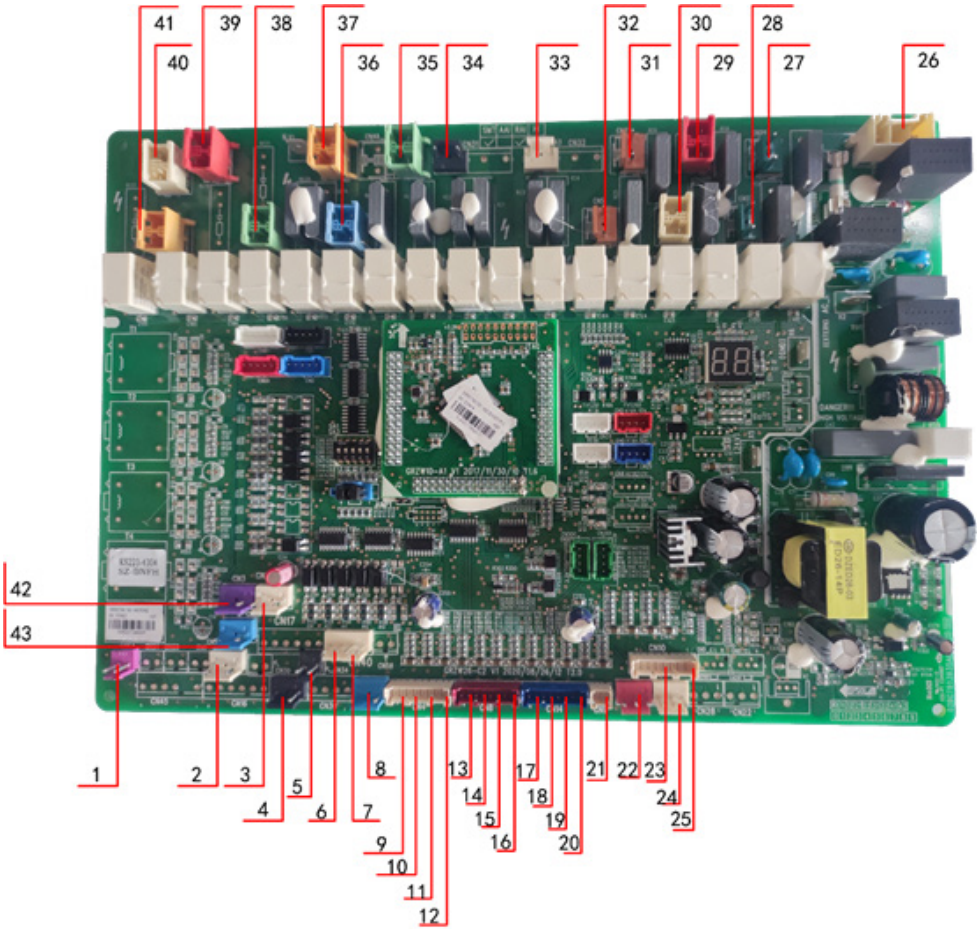
Handling: interchange the wiring sequence and check if the voltage of the 3-phase power supply is normal.

4.3.2 Introduction to main electrical elements

Image	Name	Description
	Phase loss/reversal protector	It is used to check if the phase sequence of the power supply is correct or if there is power loss.
	Intermediate relay	It is used to switch signals between running and fault indicators.

4.3.3 Main board

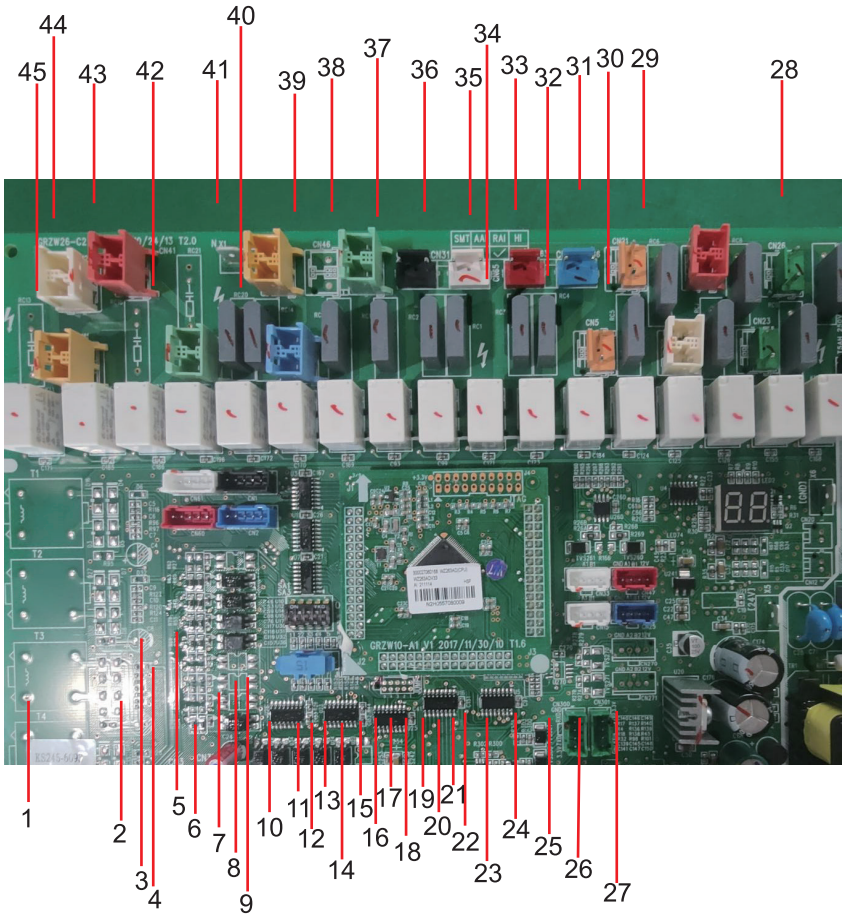
(1) LSQWRF35VMP1/NhA-M/LSQWRF60VMP1/NhA-M



No.	Name
1	Water flow switch
2	System 2 low-pressure switch for heating
3	System 1 high-pressure switch
4	System 1 low-pressure switch for heating
5	External passive contact switch
6	Preserved
7	Preserved
8	System 1 low-pressure switch for cooling
9	System 1 discharge temp. sensor
10	System 1 defrosting temp. sensor
11	Anti-freezing temp. sensor
12	Leaving water temp. sensor
13	System 2 discharge temp. sensor
14	System 2 defrosting temp. sensor
15	Preserved
16	Inlet water temp. sensor

No.	Name
17	System 2 suction temp. sensor
18	System 1 suction temp. sensor
19	System 2 plate-type heat exchanger suction temp. sensor
20	System 1 plate-type heat exchanger suction temp. sensor
21	Outdoor ambient temp. sensor
22	System 1 high pressure sensor
23	System 2 plate-type heat exchanger leaving water temp. sensor
24	System 2 high pressure sensor
25	System 1 plate-type heat exchanger leaving water temp. sensor
26	220V input
27	COMP2 band heater 2
28	COMP2 band heater 1
29	4-way valve 2
30	4-way valve 1
31	COMP1 band heater 2
32	COMP1 band heater 1
33	Bottom band heater 2
34	Bottom band heater 1
35	Motorized ball valve
36	Auxiliary electric heater 1
37	Auxiliary electric heater 2
38	Electric heater for plate-type heat exchangers
39	Error indicating
40	Solenoid valve 2
41	Solenoid valve 1
42	System 2 high-pressure switch
43	System 2 low-pressure switch for cooling

(2) LSQWRF100VMP1/NhA-M/LSQWRF130VMP1/NhA-M



No.	Name
1	Water flow switch
2	Preserved
3	System 2 high-pressure switch
4	Preserved
5	System 1 high-pressure switch
6	Preserved
7	External passive contact switch
8	Preserved
9	Preserved
10	Preserved
11	System 1 discharge temp. sensor
12	System 1 defrosting temp. sensor
13	Anti-freezing temp. sensor
14	Leaving water temp. sensor
15	System 2 discharge temp. sensor
16	System 2 defrosting temp. sensor
17	Preserved
18	Inlet water temp. sensor

No.	Name
19	System 2 suction temp. sensor
20	System 1 suction temp. sensor
21	System 2 plate-type heat exchanger suction temp. sensor
22	System 1 plate-type heat exchanger suction temp. sensor
23	Outdoor ambient temp. sensor
24	System 1 high pressure sensor
25	System 2 high pressure sensor
26	System 1 low pressure sensor
27	System 2 low pressure sensor
28	220V input
29	Cooling fan
30	COMP2 band heater 1
31	4-way valve 2
32	4-way valve 1
33	Preserved
34	COMP1 band heater 1
35	Oil return solenoid valve 2
36	Bottom band heater 2
37	Oil return solenoid valve 1
38	Bottom band heater 1
39	Motorized ball valve
40	Auxiliary electric heater 1
41	Auxiliary electric heater 2
42	Electric heater for plate-type heat exchangers
43	Error indicating
44	Solenoid valve 2
45	Solenoid valve 1

4.4 Replacement of main parts

4.4.1 Brief introduction

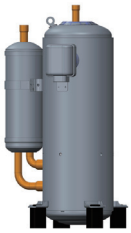
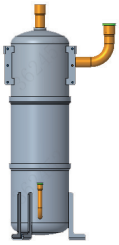
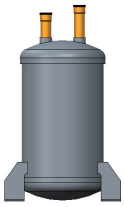
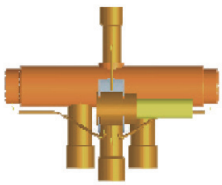
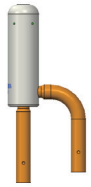
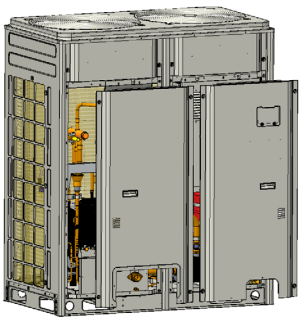
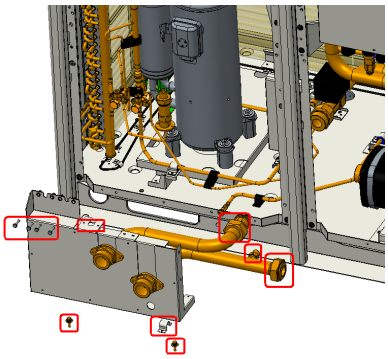
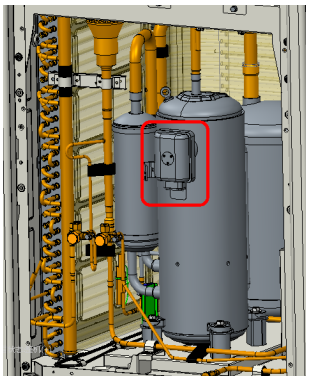
Image	Name	Function
	Compressor	It is the power source of the whole system, used to compress low-pressure and low-temperature refrigerant to be high-pressure and high-temperature gas.
	Oil separator	The oil separator is installed at the discharge port of the compressor. Oil droplets and airflow discharged at high speed collide with the net or obstacle or pipe wall to allow the oil droplets to adhere to the net or obstacle to separate the oil droplets from the gas, and return the separated oil to the compressor.
	Vapor-liquid separator	It is intended to separate refrigeration oil from liquid refrigerant.
	Four-way valve	It is used to control the flow direction of refrigerant for either heating or cooling.
	Plate-type heat exchanger	It is used to deliver heat exchange between the refrigerant and the second refrigerant.

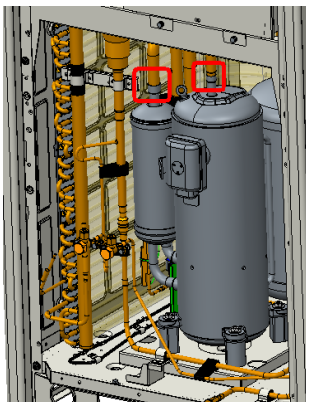
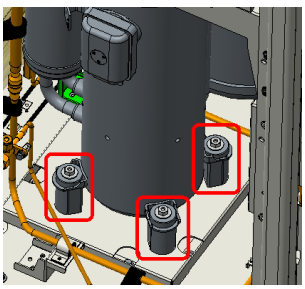
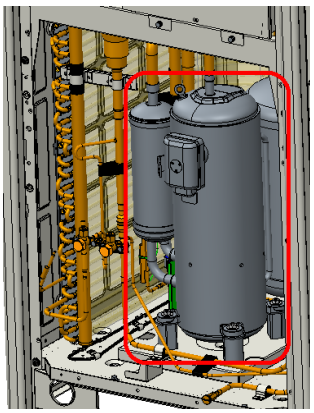
Image	Name	Function
	Finned heat exchanger	At the cooling mode, it is intended to turn the high-temperature high-pressure refrigerant vapor into refrigerant liquid by releasing heat to the cooling medium. At the heating mode, it is intended to vaporize refrigerant liquid by absorbing heat from the cooling medium.
	Electronic expansion valve	It is intended to control refrigerant flow rate to make it match with the required load and make the refrigerant flowing into the evaporator evaporate completely.

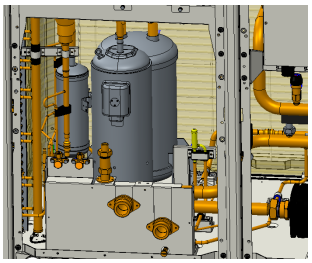
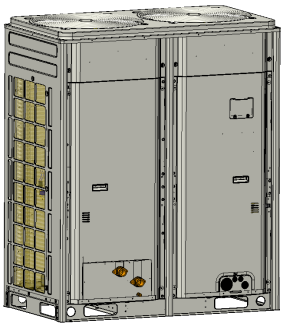
4.4.2 Replacement instructions

(1) LSQWRF35VMP1/NhA-M

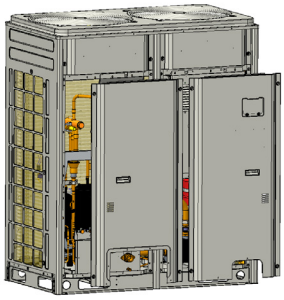
Replacement of the compressor		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
1. Remove the front panels.		• Remove screws at the front pane. • Loosened screws should be put together to avoid loss. • Pull the front panel upwards and then remove it. • Properly keep the removed front panel to avoid from being damaged. • Note: there are two clasps at each panel for connecting with side panels.

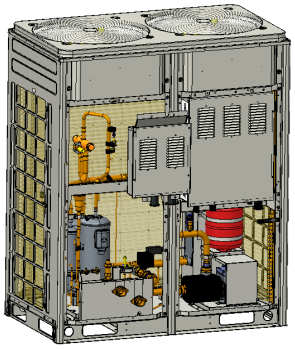
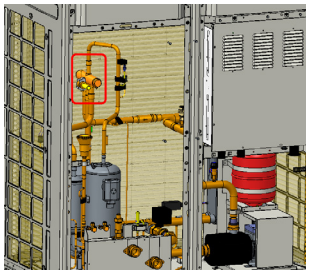
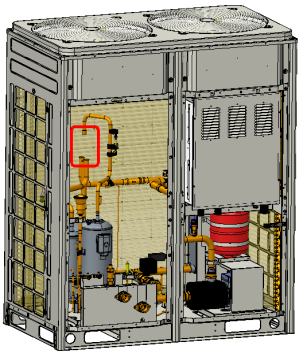
<table>
<tr><td colspan="3">Replacement of the compressor</td></tr>
<tr><td colspan="3">Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.</td></tr>
<tr><th>Steps</th><th>Image</th><th>Instructions</th></tr>
<tr><td>2. Remove sheet-metal parts and pipes before the compressor.</td><td>  </td><td>• Unscrew the entering water pipe with an adjustable spanner to take it away from the water pump.
• Unscrew the leaving water pipe with an adjustable spanner to take it away from the plate-type heat exchanger.
• Unscrew the weaved hose with an adjustable spanner to take it away from the entering water pipe of the water pump.
• Take screws and bolts out of the sheet-metal part.
• Dispatch the sheet-metal part and water pipes.
• Collect all rubber sealing washers, bolts, nuts, screws and gaskets after removing them to prevent loss.
• Note: Double-ended adjustable spanners are recommended to avoid damage to the pipelines.</td></tr>
<tr><td>3. Remove power lines and the electric heater.</td><td>  </td><td>• Remove the insulation of the compressor.
• Loosen screws of power lines with a screwdriver.
• Draw out power lines.
• Draw out the electric heater.
• Note: power lines and their terminals should be numbered to avoid incorrect rewiring.</td></tr>
</table>

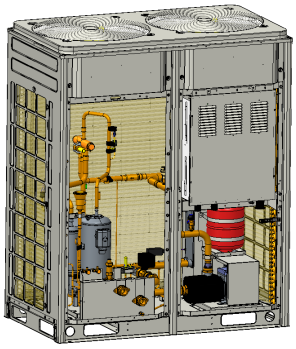
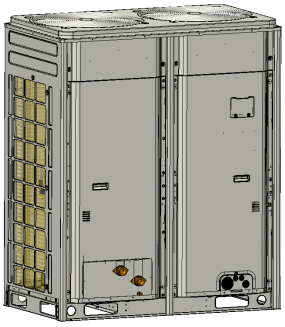
Replacement of the compressor		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
4. Disconnect power lines to the compressor.		• Desolder pipes quick to avoid deformation. • Keep the replaced compressor complete for further analysis.
5. Loosen screws at feet of the compressor.		• Loosen screws at feet of the compressor with a adjustable or box spanner. • Loosened screws should be put together to avoid loss.
6. Replace the compressor with a new one.		• During replacement, care must be taken to not damage rubber pads. • Seal the replaced compressor to prevent moisture entering; • Place a new compressor at the rubber pads. Steel bushing is required for rubber pads. • Tighten the steel bushing with screws.

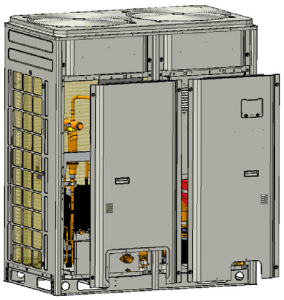
Replacement of the compressor		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
7. Reconnect the suction line, the discharge line, other pipes and electric lines. Then, check for normal operation of the compressor.		• Reconnect and resolder the suction and discharge lines. Do charge nitrogen during soldering. • After soldering, charge high-pressure nitrogen for the leak test. • Power on the unit and start it through a AC contact for 2 to 3 seconds. • When the compressor runs reversely, it would generate harsh noise.
8. Put back the front panels.		Put back front panels and tighten screws.

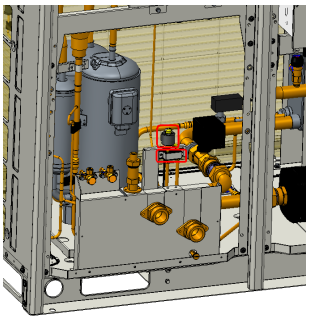
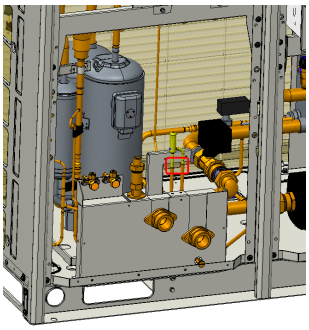
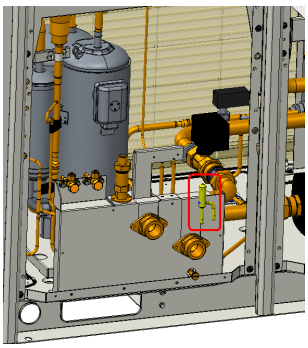
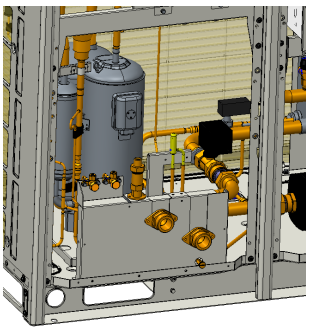
Note: there would be trapped oil inside the compressor during replacement, which would not affect its reliability but increase resistance to the rotors and then consume more power. In order to expel it, it would be better to install another valve at the lower point of the suction line. After that, run the compressor for ten minutes and then open this valve until no oil comes out. Repeat this operation twice for normal oil level.

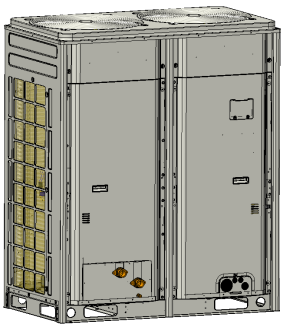
Replacement of the 4–way valve		
Note: be sure power supply has been cut off and refrigerant has been reclaimed before replacement.		
Steps	**Image**	**Instructions**
1. Remove the front panel.		• Remove screws at the front panel; • Loosened screws should be put together to avoid loss. • Pull the front panel upwards and then remove it. • Properly keep the removed front panel to avoid from being damaged. • Note: there are two clasps at each panel for connecting with side panels.

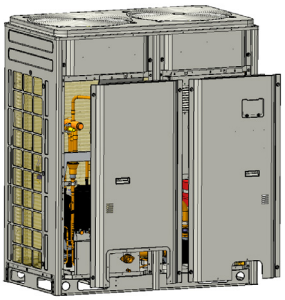
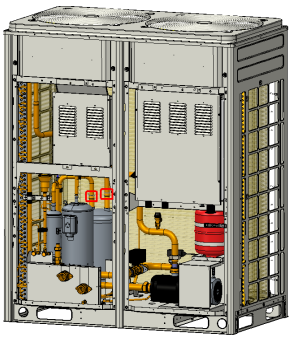
Replacement of the 4–way valve		
Note: be sure power supply has been cut off and refrigerant has been reclaimed before replacement.		
Steps	**Image**	**Instructions**
2. Remove the electric control box.		• Disconnect electric lines inside and outside of the electric box. • Protection measures should be taken to the internal elements to prevent them from being damaged.
3. Record the direction of the 4–way valve before desoldering. The multi-system unit can not take other system as a example.		• Remember installation direction before replacement. • Remove coils. • Wrap it with wet cloth to keep its completeness for further analysis. • Desolder the 4–way valve.
4. Replace it with a new one and clean the system.		• Do use the one with the same model for replacement. The one with different model can be used after being approved by relative technicians. • Wrap it with wet cloth. • Reconnect the main body with four pipes as before. • Solder the pipelines with a soldering gun. • Do charge nitrogen during desoldering.

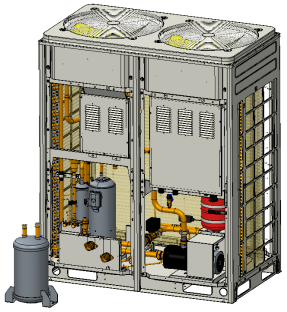
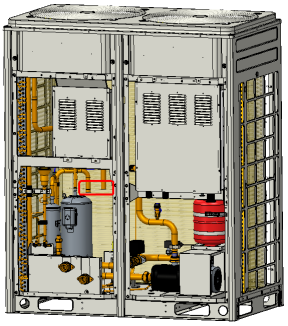
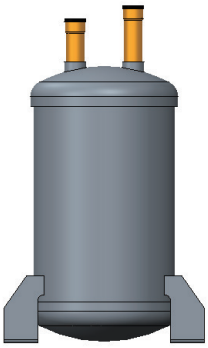
Replacement of the 4–way valve		
Note: be sure power supply has been cut off and refrigerant has been reclaimed before replacement.		
Steps	**Image**	**Instructions**
5. Vacuum the system and recharge refrigerant.		• Keep the vacuum degree to -1.0bar. Vacuuming period would be longer for the repaired unit. • Charged refrigerant should be the same as that stated at the nameplate.
6. Put back the front panels.		Put back front panels and tighten screws.

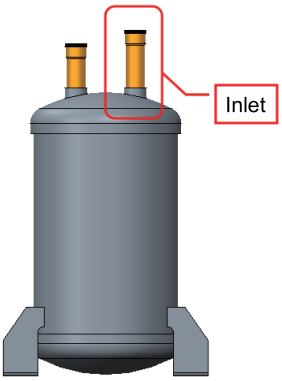
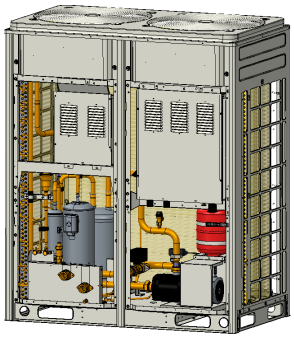
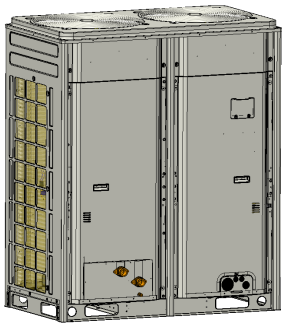
Replacement of the electronic expansion valve		
Note: check the whole system, pipelines and electric lines, cut off power supply and reclaim refrigerant before replacement.		
Steps	**Image**	**Instructions**
1. Reclaim refrigerant and remove the middle panel.		• Cut off power supply of the unit. • Reclaim refrigerant. • Remove the middle panel.

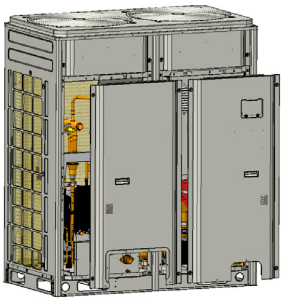
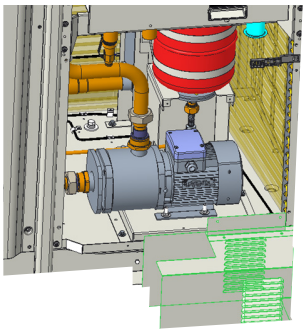
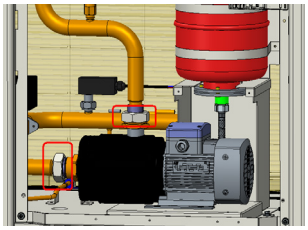
Replacement of the electronic expansion valve		
Note: check the whole system, pipelines and electric lines, cut off power supply and reclaim refrigerant before replacement.		
Steps	**Image**	**Instructions**
2. Take out the coils, pipe clamps and rubber pads.		• Take out coils. • Loosen screws and take out pipe clamps and rubber pads. • Wrap the valve with wet cloth to prevent the sliding block from being burn out. In this case, care must be taken to not let water enter the pipe.
3. Desolder connection pipes.		• Desolder connection pipes and then disconnect them with the main body of the valve. • Do charge nitrogen during desoldering. • Protection measures should be taken during soldering to prevent surrounding objects from being burnt out.
4. Take out the main body.		Take out the main body of the electronic expansion valve.
5. Replace it with a new one.		• Solder pipes. • Do charge nitrogen during soldering; • Protection measures should be taken during soldering to prevent surrounding objects from being burnt out.

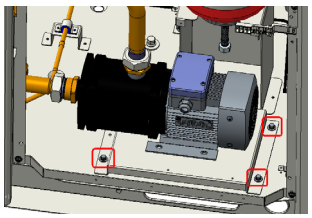
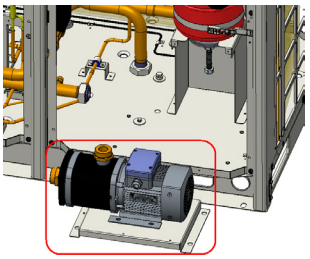
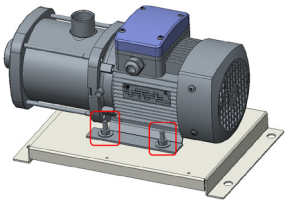
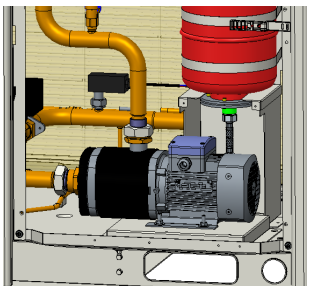
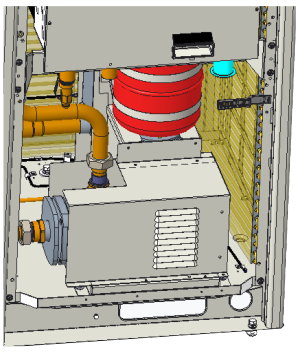
Replacement of the electronic expansion valve		
Note: check the whole system, pipelines and electric lines, cut off power supply and reclaim refrigerant before replacement.		
Steps	**Image**	**Instructions**
6. Tighten coils, pipe clamps and rubber pads; vacuum the system; recharge refrigerant and then put back the panel.		• The bulge of the coil should match with the re cess of the main body of the valve. • Keep the vacuum degree to -1.0bar. Vacuuming period would be longer for the repaired unit. • Charged refrigerant should be the same as that stated at the nameplate. • Power off the unit and then power it on again. • Put back the panel.

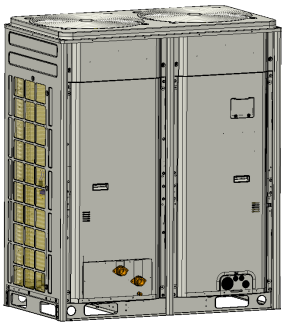
Replacement of the vapor-liquid separator		
Note: properly reclaim refrigerant, prepare tools and keep good ventilation.		
Steps	**Image**	**Instructions**
1. Remove front panels.		• Remove screws at the front panel. • Loosened screws should be put together to avoid loss. • Pull the front panel upwards and then remove it. • Properly keep the removed front panel to avoid from being damaged. • Note that there are two clasps at each panel for connecting with side panels.
2. De-solder connection pipes.		De-solder connection pipes with a soldering gun.

Replacement of the vapor-liquid separator		
Note: properly reclaim refrigerant, prepare tools and keep good ventilation.		
Steps	**Image**	**Instructions**
3. Take out the vapor-liquid separator.		Loosen fixed screws and take out the vapor-liquid separator.
4. Clean the system by charging nitrogen.		• Connect a nitrogen line. When its size is quite large, use adhesive tape for help to keep nitrogen naturally go into the vapor-liquid separator. • Clean the system by charging nitrogen.
5. Replace it with a new one.		Install the new vapor-liquid separator as per reverse steps as stated above.

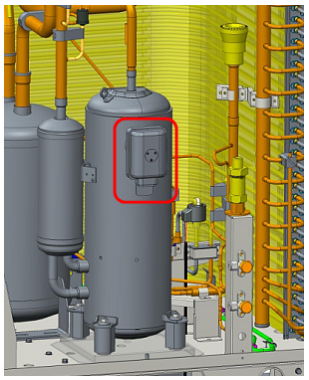
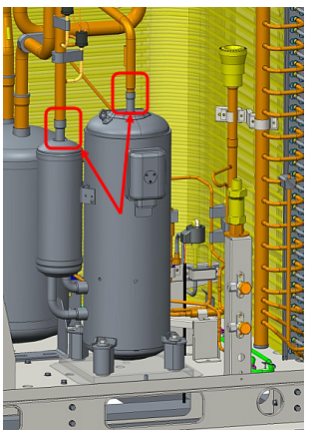
Replacement of the vapor-liquid separator		
Note: properly reclaim refrigerant, prepare tools and keep good ventilation.		
Steps	**Image**	**Instructions**
6.When it is required to add lubricating oil, charge it from the inlet of the vapor-liquid separator before soldering.		Charge lubrication oil from the inlet of the vapor-liquid separator and then do soldering.
7. Reconnect pipes; vacuum the system; recharge refrigerant and then put back the panel.		• Solder pipes and do charge nitrogen during soldering. • Keep the vacuum degree to -1.0bar. Vacuuming period would be longer for the repaired unit. • Charged refrigerant should be the same as that stated at the nameplate.
6. Put back the front panels.		Put back front panels and tighten screws.

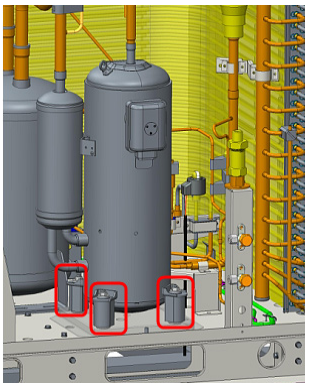
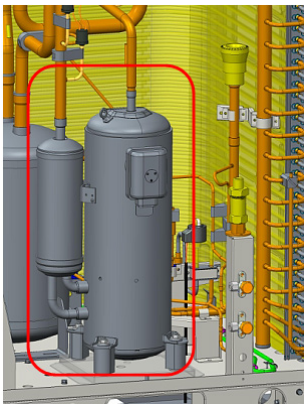
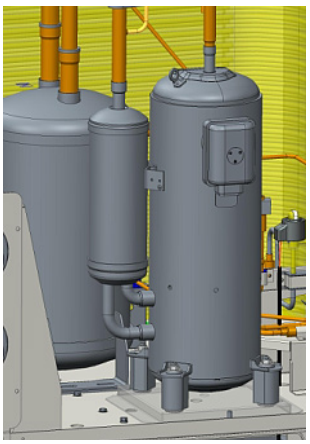
Replacement of water pump		
Note: be sure power supply has been cut off and water pipelines are drained before servicing.		
Steps	**Image**	**Instructions**
1. Remove the front panel.		• Remove screws at the front panel; • Loosened screws should be put together to avoid loss. • Pull the front panel upwards and then remove it. • Properly keep the removed front panel to avoid from being damaged. • Note: there are two clasps at each panel for connecting with side panels.
2. Remove the side panel and bracket.		Take off the bracket.
3. Take off nuts and electric lines.		• Disconnect the entering water pipe of the water pump with an adjustable spanner. • Disconnect the leaving water pipe of the water pump with an adjustable spanner. • Collect rubber sealing washers after removing to avoid loss. • Remove the electric lines. • Note: couble-ended adjustable spanners are recommended to avoid damage to the pipelines; electric lines and their terminals should be numbered to avoid incorrect rewiring.

Replacement of water pump		
Note: be sure power supply has been cut off and water pipelines are drained before servicing.		
Steps	**Image**	**Instructions**
4. Loosen the pump bracket and bolts.		• Unscrew four bolts of the bracket with an adjustable spanner or socket spanner. • Collect the bolts after removing to avoid loss.
5. Take away the water pump and its bracket.		Take them outside the unit.
6. Remove fixing botls.		• Unscrew the water pump with an adjustable spanner or socket spanner. • Collect all bolts and nuts after removing to avoid loss.
7.Connect a new pump and pipes.		• Fix a new pump and the bracket with an adjustable spanner or socket spanner. • Fix the pump, bracket to the chassis. • Connect the new pump and water pipes. Use sealing washers and sealants to prevent leaks.
8. Fix the bracket.		Screw the bracket.

Replacement of water pump		
Note: be sure power supply has been cut off and water pipelines are drained before servicing.		
Steps	**Image**	**Instructions**
9. Put back the front panels.		Put back front panels and tighten screws.

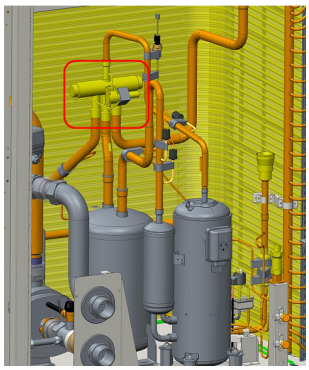
(2) LSQWRF60VMP1/NhA-M

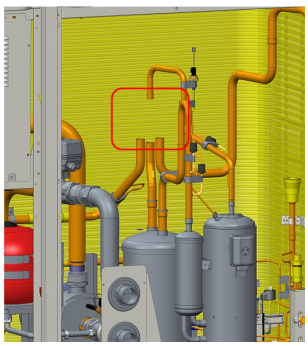
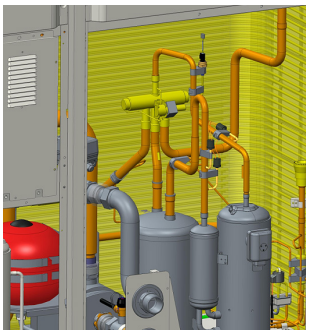
Replacement of the compressor		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
1. Remove the front panels.		• Remove screws at the front panel. • Loosened screws should be put together to avoid loss. • Pull the front panel upwards and then remove it. • Properly keep the removed front panel to avoid from being damaged. • Note: there are two clasps at each panel for connecting with side panels.
2. Remove power lines and the electric heater.		• Remove the insulation of the compressor. • Loosen screws of power lines with a screwdriver. • Draw out power lines. • Draw out the electric heater. • Note: electric lines and their terminals should be numbered to avoid incorrect rewiring.
3. Disconnect power lines to the ompressor.		• Desolder pipes quick to avoid deformation. • Keep the replaced compressor complete for further analysis.

Replacement of the compressor		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
4. Loosen screws at feet of the compressor.		• Loosen screws at the feet of the compressor with an adjustable or box spanner. • Loosened screws should be put together to avoid loss.
5. Replace the compressor with a new one.		• During replacement, care must be taken to not damage rubber pads. • Seal the replaced compressor to prevent moisture entering. • Place a new compressor at the rubber pads. Steel bushing is required for rubber pads. • Tighten the steel bushing with screws.
6. Reconnect the suction line, the discharge line, other pipes and electric lines. Then, check for normal operation of the compressor.		• Reconnect and resolder the suction and discharge lines. Do charge nitrogen during soldering. • After soldering, charge high-pressure nitrogen for the leak test. • Power on the unit and start it through an AC contact for 2 to 3 seconds. • When the compressor runs reversely, it would generate harsh noise.

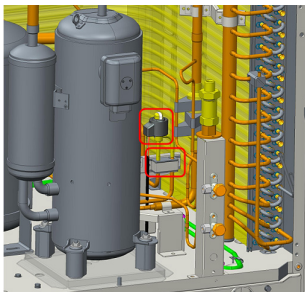
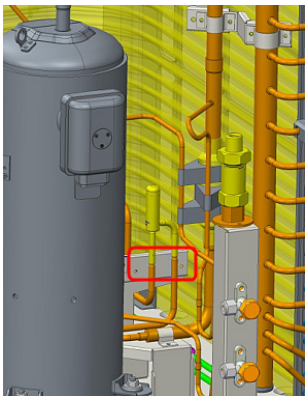
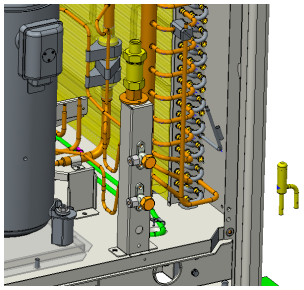
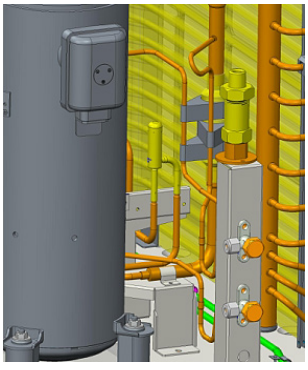
Replacement of the compressor		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
7. Put back the front panels.		Put back front panels and tighten screws.

Note: there would be trapped oil inside the compressor during replacement, which would not affect its reliability but increase resistance to the rotors and then consume more power. In order to expel it, it would be better to install another valve at the lower point of the suction line. After that, run the compressor for ten minutes and then open this valve until no oil comes out. Repeat this operation twice for a normal oil level.

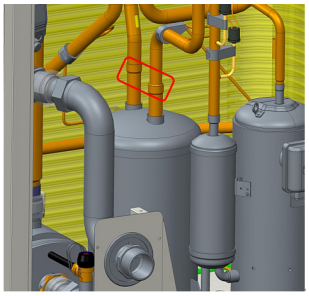
Replacement of the 4–way valve		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
1. Remove the front panel.		• Remove screws at the front panel. • Loosened screws should be put together to avoid loss. • Pull the front panel upwards and then remove it. • Properly keep the removed front panel to avoid from being damaged. • Note: there are two clasps at each panel for connecting with side panels.
2. Record the direction of the 4–way valve before de-soldering. The multi-system unit cannot take other system as a example.		• Remember installation direction before replacement. • Remove coils. • Wrap it with wet cloth to keep its completeness for further analysis. • Desolder the 4–way valve.

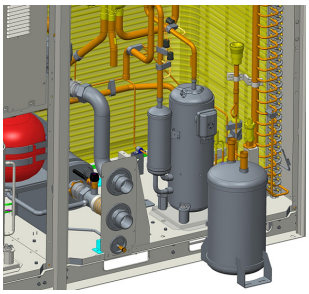
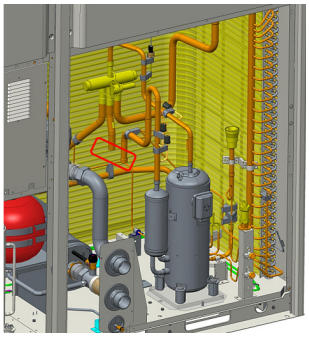
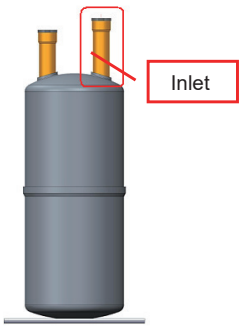
Replacement of the 4–way valve		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
3. Replace the 4-way valve.		• The model of a new 4-way valve should be the same as that of the old one. If you are not sure that their models are identical, you need to ask professional technicians for assistance. • Wrap the new 4-way valve with a wet towel. • Connect the valve and four pipes in accordance with the direction of the 4-way valve coil. • Solder the pipes. • Note: charge nitrogen during soldering.
4. Vacuum the system and recharge refrigerant.		• Keep the vacuum degree to -1.0bar. • Vacuuming period would be longer for the repaired unit. • Charged refrigerant should be the same as that stated at the nameplate.

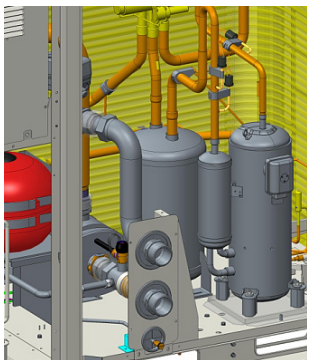
Replacement of the electronic expansion valve		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
1. Reclaim refrigerant and remove the middle panel.		• Cut off power supply of the unit. • Reclaim refrigerant. • Remove the middle panel.

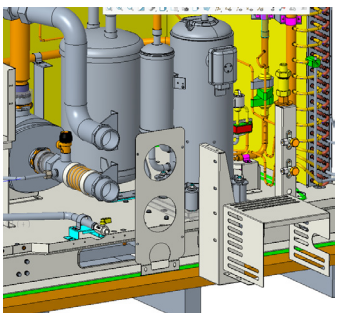
Replacement of the electronic expansion valve		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
2. Take out the coils, pipe clamps and rubber pads.		• Take out coils. • Loosen screws and take out pipe clamps and rubber pads. • Wrap the valve with a wet towel to prevent the sliding block from being burn out. In this case, care must be taken to not let water enter the pipe.
3. Desolder connection pipes.		• Desolder connection pipes and then disconnect them with the main body of the valve. • Do charge nitrogen during desoldering. • Protection measures should be taken during soldering to prevent surrounding objects from being burnt out.
4. Take out the main body.		Take out the main body of the electronic expansion valve.
5. Replace it with a new one.		• Solder pipes. • Do charge nitrogen during soldering. • Protection measures should be taken during soldering to prevent surrounding objects from being burnt out.

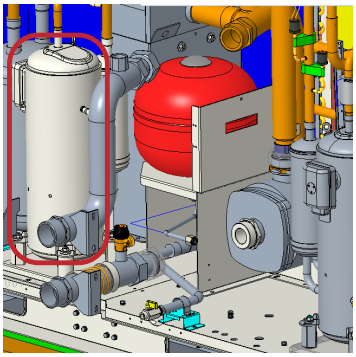
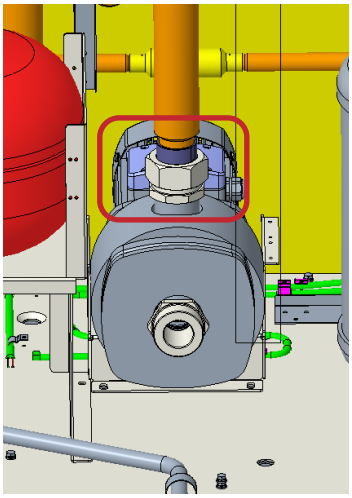
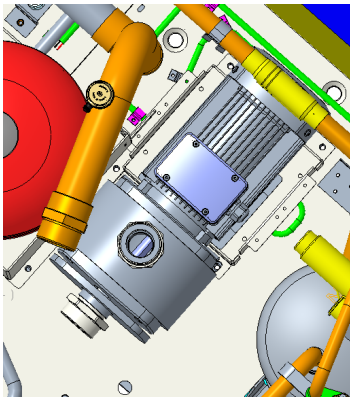
Replacement of the electronic expansion valve		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
6. Tighten coils, pipe clamps and rubber pads; vacuum the system; recharge refrigerant and then put back the panel.		• The bulge of the coil should match with the recess of the main body of the valve. • Keep the vacuum degree to -1.0bar. Vacuuming period would be longer for the repaired unit. • Charged refrigerant should be the same as that stated at the nameplate. • Power off the unit and then power it on again. • Put back the panel.

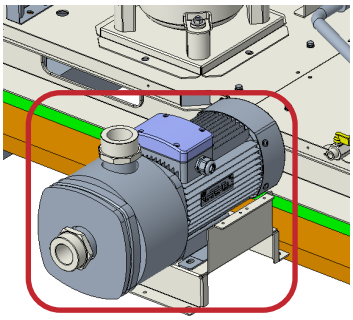
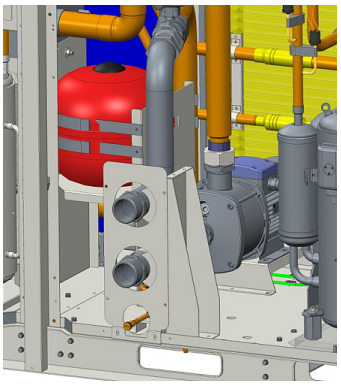
Replacement of vapor-liquid separator		
Note: properly reclaim refrigerant, prepare tools and keep good ventilation.		
Steps	**Image**	**Instructions**
1. Remove front panels.		• Remove screws at the front panel. • Loosened screws should be put together to avoid loss. • Pull the front panel upwards and then remove it. • Properly keep the removed front panel to avoid from being damaged. • Note: there are two clasps at each panel for connecting with side panels.
2. De-solder connection pipes.		De-solder connection pipes with a soldering gun.

Replacement of vapor-liquid separator		
Note: properly reclaim refrigerant, prepare tools and keep good ventilation.		
Steps	**Image**	**Instructions**
3. Take out the vapor-liquid separator.		Loosen fixed screws and take out the vapor-liquid separator.
4. Clean the system by charging nitrogen.		• Connect a nitrogen line. When its size is quite large, you need to use adhesive tape for help to keep nitrogen naturally go into the vapor-liquid separator. • Clean the system by charging nitrogen.
5. Replace it with a new one.		Install the new vapor-liquid separator as per reverse steps as stated above.
6.When lubricating oil is needed, you need to charge it from the inlet of the vapor-liquid separator before soldering.		Charge lubrication oil from the inlet of the vapor-liquid separator and then do soldering.

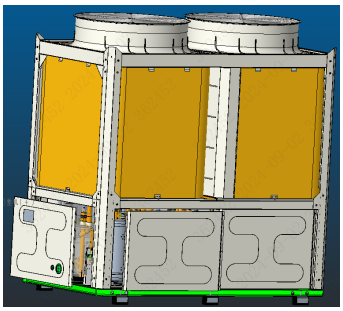
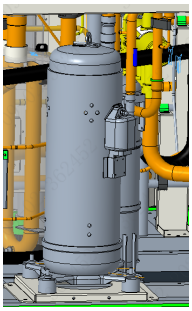
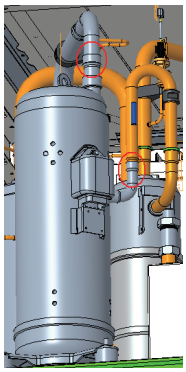
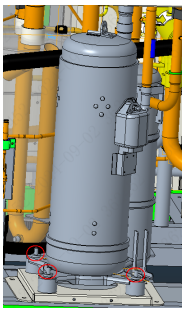
Replacement of vapor-liquid separator		
Note: properly reclaim refrigerant, prepare tools and keep good ventilation.		
Steps	**Image**	**Instructions**
7. Reconnect pipes; vacuum the system; recharge refrigerant.		• Solder pipes and do charge nitrogen during soldering. • Keep the vacuum degree to -1.0bar. Vacuuming period would be longer for the repaired unit. • Charged refrigerant should be the same as that stated at the nameplate.

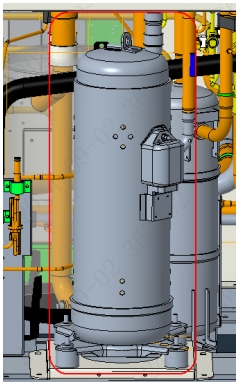
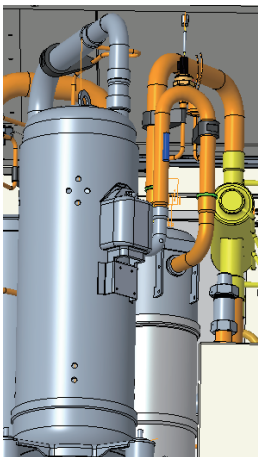
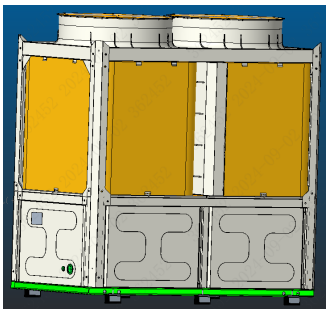
Replacement of water pump		
Note: be sure power supply has been cut off and water pipelines are drained before servicing.		
Steps	**Image**	**Instructions**
1. Remove the front panel.		• Remove screws at the front panel; • Loosened screws should be put together to avoid loss. • Pull the front panel upwards and then remove it. • Properly keep the removed front panel to avoid from being damaged. • Note: there are two clasps at each panel for connecting with side panels.
2. Remove the side panel and bracket.		• Take off the side panel of the entering and leaving wtaer pipes, and then the brackets nearby. • Take off the droplet eliminator of the water pump.

Replacement of water pump		
Note: be sure power supply has been cut off and water pipelines are drained before servicing.		
Steps	**Image**	**Instructions**
3. Remove the entering and leaving water pipe assemblies.		• Take out the connection hose between the expansion tank and entering water pipe with a spanner. • Dispatch entering water pipe assembly. • Dispatch leaving water pipe assembly. • Collect rubber sealing washers after removing to avoid loss. • Note: Double-ended adjustable spanners are recommended to avoid damage to the pipelines.
4. Take off nuts and electric lines.		• Disconnect the leaving water pipe of the water pump with an adjustable spanner. • Collect rubber sealing washers after removing to avoid loss. • Remove the electric lines. • Note: Double-ended adjustable spanners are recommended to avoid damage to the pipelines. Mark electric lines in different colors in accordance with corresponding terminals to prevent improper connection.
5. Loosen the pump bracket and bolts.		• Unscrew four bolts of the bracket with an adjustable spanner or socket spanner. • Collect the bolts after removing to avoid loss.

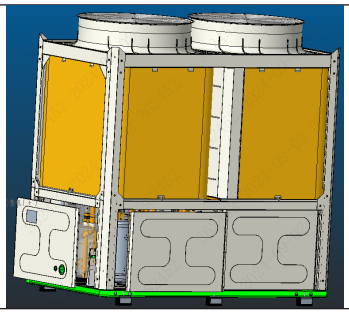
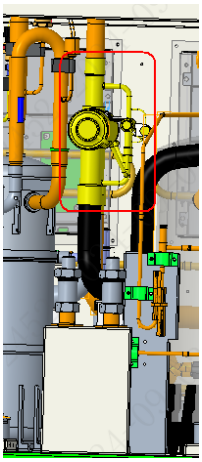
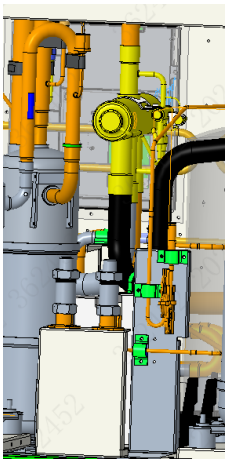
Replacement of water pump		
Note: be sure power supply has been cut off and water pipelines are drained before servicing.		
Steps	**Image**	**Instructions**
6. Take away the water pump and its bracket.		Take them outside the unit.
7.Connect a new pump and pipes.		• Fix a new pump and the bracket with an adjustable spanner or socket spanner. • Fix the pump, bracket to the chassis. • Connect the new pump and water pipes. Use sealing washers and sealants to prevent leaks.
8. Check the connection of the water pump and pipes; put back the front panels.		Put back front panels and tighten screws.

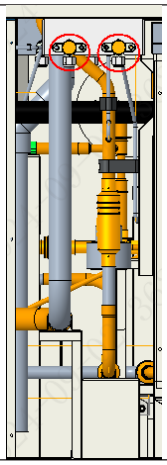
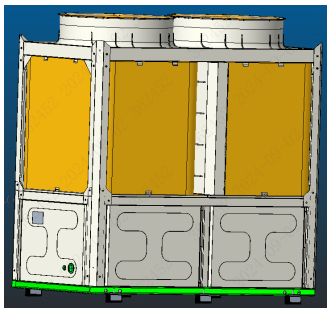
(3) LSQWRF100VMP1/NhA-M, LSQWRF130VMP1/NhA-M

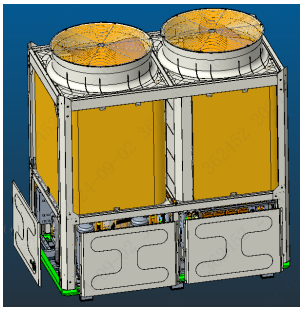
Replacement of the compressor		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
1.Remove the side panel.		• Remove screws at the side panel. • Loosened screws should be put together to avoid loss. • Take down the side panel. • Properly keep the removed panel.
2.Remove power lines and the electric heater.		• Remove the insulation of the compressor. • Loosen screws of power lines with a screwdriver. • Draw out power lines. • Draw out the electric heater. • Note: electric lines and their terminals should be numbered to avoid incorrect rewiring.。
3. Disconnect pipeline of the compressor.		• Desolder pipes as quickly as possible to avoid deformation. • Keep the replaced compressor complete for further analysis.
4.Loosen screws at feet of the compressor.		• Loosen screws at the feet of the compressor with an adjustable or box spanner. • Loosened screws should be put together to avoid loss.

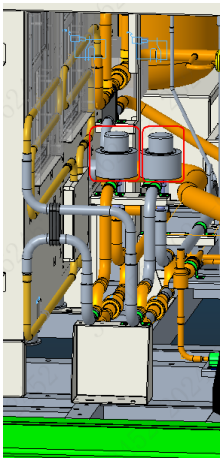
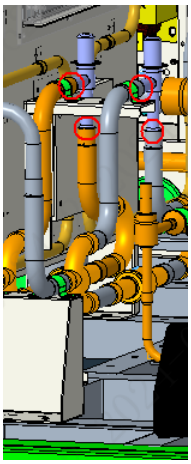
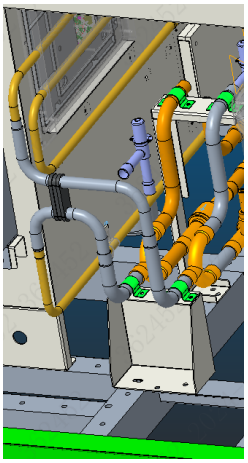
5.Replace the compressor with a new one.		• During replacement, care must be taken to not damage rubber pads. • Seal the replaced compressor to prevent moisture entering. • Place a new compressor at the rubber pads. Steel bushing is required for rubber pads. • Tighten the steel bushing with screws.
6.Reconnect the suction line, the discharge line, other pipes and electric lines. Then, check for normal operation of the compressor.		• Reconnect and resolder the suction and discharge lines. Do charge nitrogen during soldering. • After soldering, charge high-pressure nitrogen for the leak test. • Vacuum the system to keep the vacuum degree to-1.0bar. As the unit is in maintenance, so the vacuum time should be longer; • The name and amount of refrigerant to be filled shall be in accordance with the requirements indicated by the unit nameplate.; • Power on the unit and start it through an AC contact for 2 to 3 seconds. • When the compressor runs reversely, it would generate harsh noise.
7.Put back the side panels.		• Put back the side panel and tighten screws.

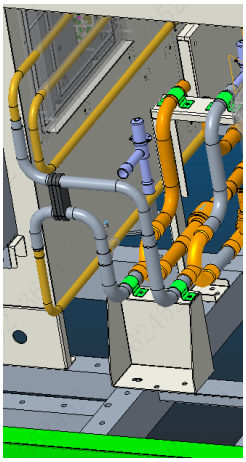
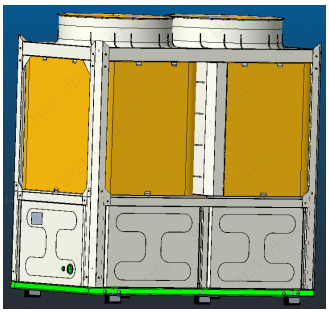
Note: there would be trapped oil inside the compressor during replacement, which would not affect its reliability but increase resistance to the rotors and then consume more power. In order to expel it, it would be better to install another valve at the lower point of the suction line. After that, run the compressor for ten minutes and then open this valve until no oil comes out. Repeat this operation twice for a normal oil level.

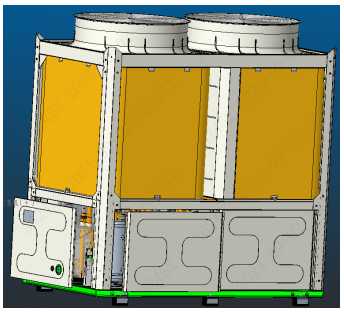
Replacement of the 4–way valve		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
1.Remove the side panel		• Remove screws at the side panel. • Loosened screws should be put together to avoid loss. • Take down the side panel. • Properly keep the removed panel.
2.Record the direction of the 4–way valve before de-soldering. The multi-system unit cannot take other system as a example.		• Remember installation direction before replacement. • Remove coils. • Wrap it with wet cloth to keep its completeness for further analysis. • Desolder the 4–way valve.
3.Replace the 4-way valve.		• he model of a new 4-way valve should be the same as that of the old one. If you are not sure that their models are identical, you need to ask professional technicians for assistance. • Wrap the new 4-way valve with a wet towel. • Connect the valve and four pipes in accordance with the direction of the 4-way valve coil. • Solder the pipes. • Note: charge nitrogen during soldering.

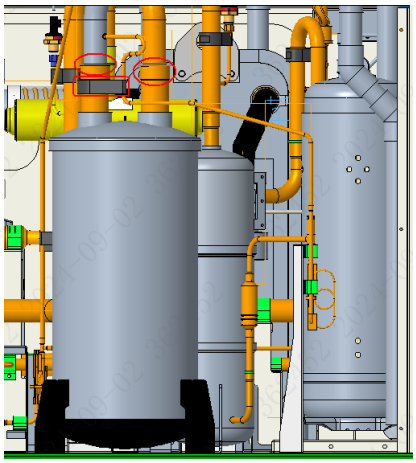
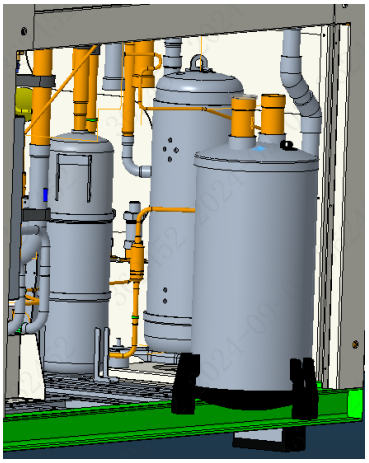
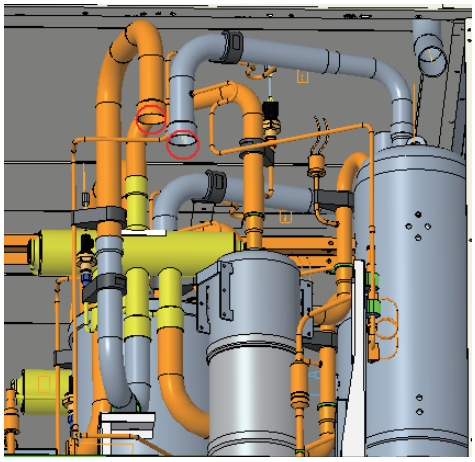
4. Vacuum the system and recharge refrigerant.		• Keep the vacuum degree to -1.0bar. Vacuuming period would be longer for the repaired unit. • Charged refrigerant should be the same as that stated at the nameplate.
5.Put back the side panel.		• Put back the side panel and tighten screws

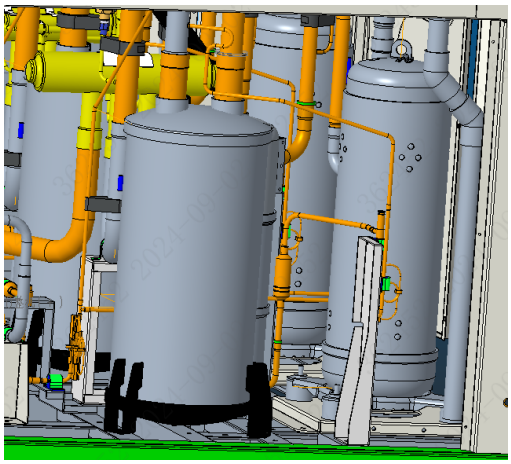
Replacement of the electronic expansion valve		
Note: be sure there is no refrigerant inside the system and power supply has been cut off before replacement.		
Steps	**Image**	**Instructions**
1.Reclaim refrigerant and remove the middle panel.		• Cut off power supply of the unit. • Reclaim refrigerant. • Remove the middle panel.

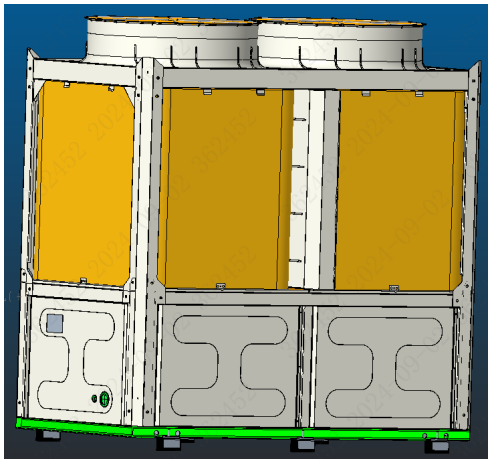
2.Take out the coils, pipe clamps and rubber pads.		• Take out coils. • Loosen screws and take out pipe clamps and rubber pads. • Wrap the valve with a wet towel to prevent the sliding block from being burn out. In this case, care must be taken to not let water enter the pipe.
3.Desolder connection pipes.		• Desolder connection pipes and then disconnect them with the main body of the valve. • Do charge nitrogen during desoldering. • Protection measures should be taken during soldering to prevent surrounding objects from being burnt out.
4.Take out the main body.		• Take out the main body of the electronic expansion valve.

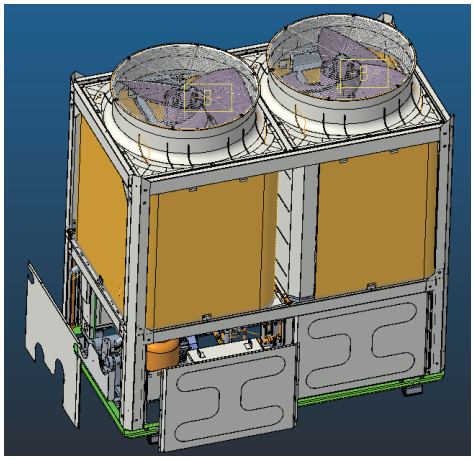
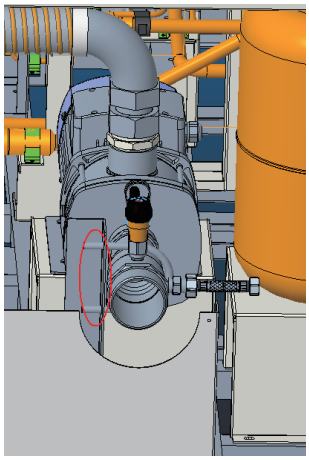
5.Replace it with a new one.		• Solder pipes. • Do charge nitrogen during soldering. • Protection measures should be taken during soldering to prevent surrounding objects from being burnt out.
6.Tighten coils, pipe clamps and rubber pads; vacuum the system; recharge refrigerant and then put back the panel.		• The bulge of the coil should match with the recess of the main body of the valve. • Keep the vacuum degree to -1.0bar. Vacuuming period would be longer for the repaired unit. • Charged refrigerant should be the same as that stated at the nameplate. • Power off the unit and then power it on again. • Put back the panel.

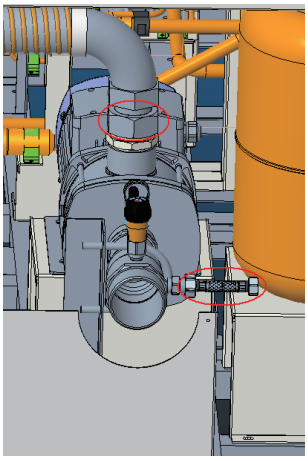
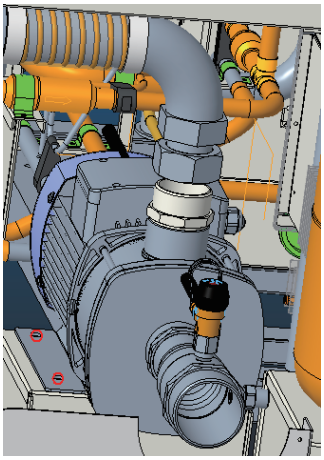
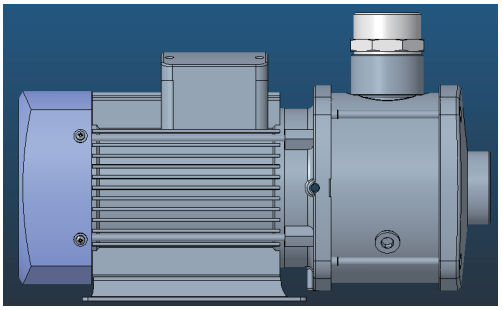
Replacement of vapor-liquid separator		
Note: properly reclaim refrigerant, prepare tools and keep good ventilation.		
Steps	**Image**	**Instructions**
1.Remove the side panel.		• Cut off power supply of the unit. • Reclaim refrigerant. • Remove the middle panel.

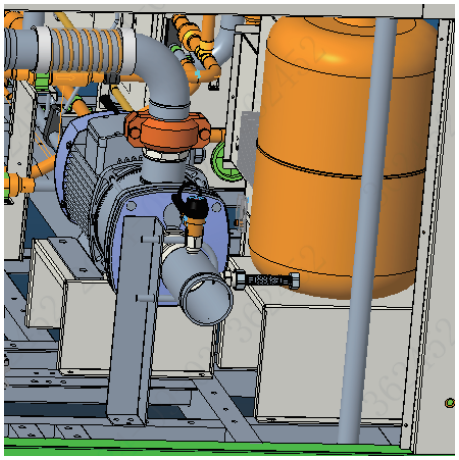
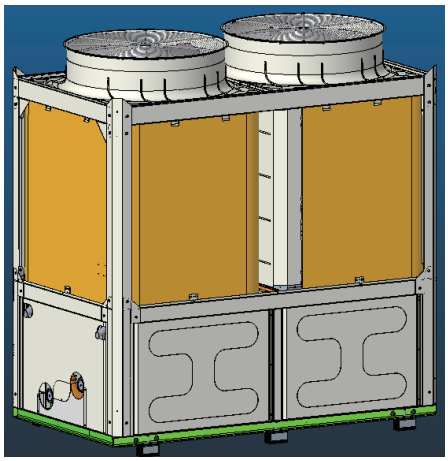
2.De-solder connection pipes.		• Remove the pipe fixing block on the vapor-liquid separator first. • De-solder connection pipes with a soldering gun.
3.Take out the vapor-liquid separator.		• Loosen fixed screws and take out the vapor-liquid separator.
4.Clean the system by charging nitrogen.		• Connect a nitrogen line. When its size is quite large, you need to use adhesive tape for help to keep nitrogen naturally go into the vapor-liquid separator. • Clean the system by charging nitrogen.

5.Replace it with a new one.		• Install the new vapor-liquid separator as per reverse steps as stated above.
6.When lubricating oil is needed, you need to charge it from the inlet of the vapor-liquid separator before soldering.		• Charge lubrication oil from the inlet of the vapor-liquid separator and then do soldering.
7.Reconnect pipes; vacuum the system; recharge refrigerant.		• Solder pipes and do charge nitrogen during soldering. • Keep the vacuum degree to -1.0bar. Vacuuming period would be longer for the repaired unit. • Charged refrigerant should be the same as that stated at the nameplate.

8.Put back the side panel.		• Put back the side panel and tighten screws

Replacement of water pump		
Note: be sure power supply has been cut off and water pipelines are drained before servicing.		
Step	**Image**	**Instructions**
1.Remove the side panel.		• Cut off power supply of the unit. • Reclaim refrigerant. • Remove the middle panel.。
2.Remove the pipe clamps and brackets		• Remove the pipe clamps and brackets at the entering water pipe.

3. Remove the entering and leaving water pipe assemblies.		• Take out the connection hose between the expansion tank and entering water pipe with a spanner. • Dispatch entering water pipe assembly. • Dispatch leaving water pipe assembly. • Collect rubber sealing washers after removing to avoid loss. • Note: Double-ended adjustable spanners are recommended to avoid damage to the pipelines.
4.Take off nuts and power lines.		• Draw out the power lines; • Please mark the power lines color and corresponding terminal code to avoid making mistakes when restoring the wiring. • Remove 4 bolts fixing the water pump bracket with a movable spanner or sleeve spanner; • The removed bolts should be placed together to prevent loss.
5.Take away the water pump and its bracket.		• Take them outside the unit.

6.Connect a new pump and pipes.		• Fix the new water pump bracket to the pump with a movable spanner or sleeve spanner; • Connect the water inlet and outlet pipes to the new water pump, and connect the expansion tank pipeline; • Fix the new water pump and pipe clamps firmly with bolts; • Connect the power lines and start the new pump for testing. • Note: When Threaded connection the water pipe and water pump, please pay attention to apply thread sealant to prevent water leakage.
7.Check the connection of the water pump and pipes; put back the front panels.		• Put back front panels and tighten screws.

4.5 Routine maintenance

4.5.1 Repairs to refrigerant leakage

When soapsuds often used to detect leakage of a refrigeration system is applied to possible leakage points. If there are bubbles, leaks occur and need repairs by brazing. If soapsuds does not work, an electronic leak detector is an alternative. Intake and exhaust pressures indicate refrigerant charge. If leaks exist or parts are going to be replaced, leakage test must be taken. Refrigerant charges in two following cases should be treated in different manners.

(1) Full leaks

A leak test for the system must be taken with high-pressure nitrogen (15~20 kg) or refrigerant. If brazing is needed, gases in the system must be evacuated. The system must be treated with vacuum pumping before refrigerant charges.

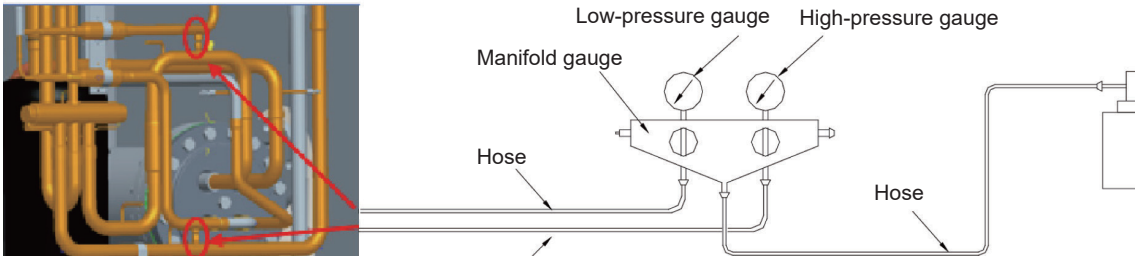
8) Connect evacuation pipes with refrigerant nozzles at low-pressure and high-pressure sides;

9) Vacuumize the system piping by a vacuum pump.

Procedures (one system as an example):

Step 1: Remove the high-pressure nitrogen that was used for the leak test.

Step 2: Fix pressure gauges to refrigerant nozzles of high-pressure and low-pressure valves (note: vacuum pumping should be done with both valves in the meantime.). Either of two dials must register low pressures since only its readings indicate vacuum.



Vacuum pumping

Step 3: Turn on switches at low-pressure and high-pressure sides. Start a vacuum pump let it continues for 0.5~1.0 hour after the reading of a pressure gauge falls to -1bar.

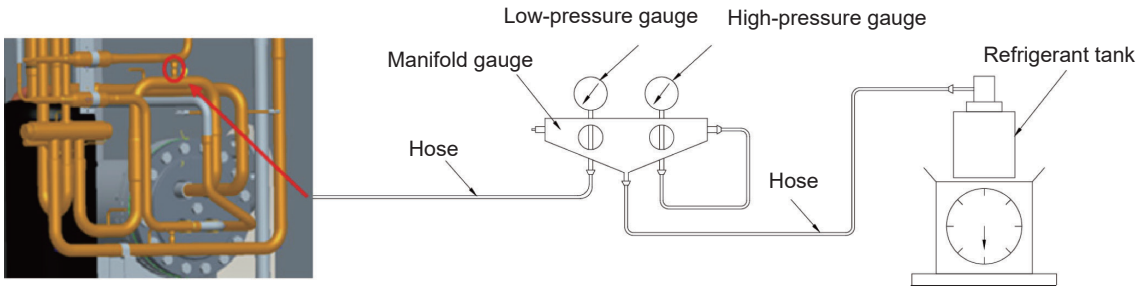
Step 4: Close the valves connected to the vacuum pump shown in the figure above and then shut down the pump. (Notice: it must be done in this order, or gases will enter the system again.)

Step 5: Take a pressure test to make sure that the pressure of the system is no less than 80Pa and will not noticeably rebound within 1 hour.

Up to now, vacuum pumping has been finished.

3) Keep the pressure for 30 minutes, and charge refrigerant when the pressure is no more than 100Pa. Start charging according to the proper volume indicated by the nameplate and main technical parameters table.

(2) Recharge refrigerant



Charging process

Excessive or deficient refrigerant may cause abnormal operation, malfunction or damage to a compressor, so charge volume must comply with the requirements on the unit nameplate which have been decided in strict tests; The figure may serve as a reference; a charge process is as follows (one system as an example):

Step 1: Place a refrigerant container on an electronic scale and connect the container and the pressure gauges by a flexible tube.

Step 2: Remove gases inside the flexible tube—half turning the shut-off valve of the container, loosen the joint device between the flexible tube and pressure gauge; tighten the joint device when a sound is sent out for 5s.

Step 3: Power up and down the electronic scale to enable it to reset.

Step 4: Ensure that the flexible tube has been evacuated and the scale reset, turn on all valves connecting refrigerant containers and the unit; charge refrigerant required by the nameplate to prevent oil dilution caused by excessive charging, and inhibit a capacity decline of the unit induced by insufficient charging; when the unit is running, make sure it is gaseous refrigerant (as possible as it can be) from a refrigerant container (that cannot be turned upside down) that is injected into refrigerant nozzles on intake lines; when the unit powered down, be sure to charge refrigerant via the refrigerant nozzle at the high-pressure side (if there is no nozzle at the high-pressure side, low-pressure side is an alternative.) in case of liquid slug.

4.5.2 Air removal

When there is air trapped in the system, expel them before charging refrigerant. The whole system must be vacuumed in accordance with the steps stated below.

(1) Connect pipes for vacuuming at both the low and high pressure sides.

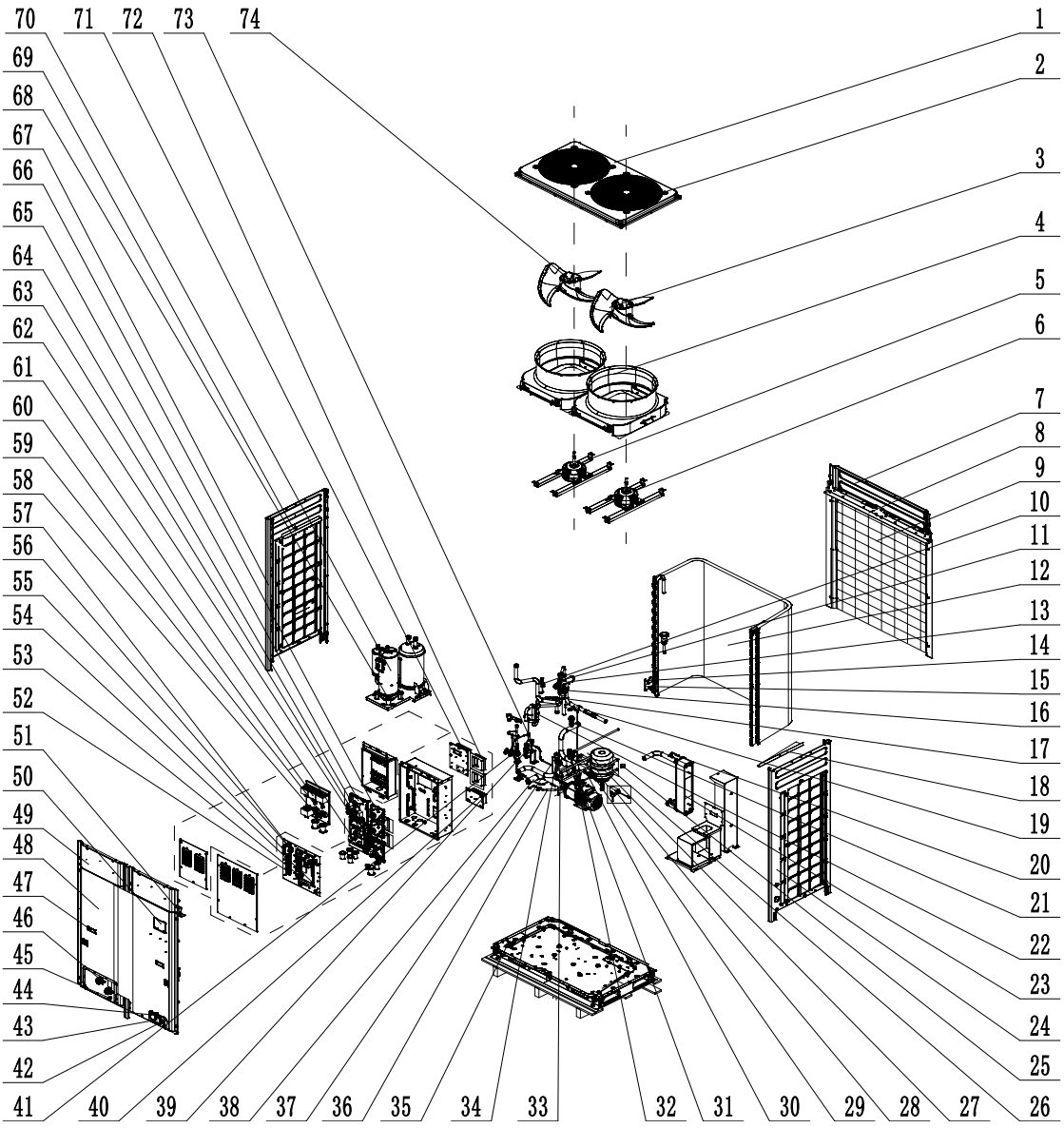
(2) Start the vacuum pump for vacuuming.

(3) When it reaches the targeted vacuum degree, charge refrigerant into the system. See the nameplate for type and charging mount of refrigerant. Do charging from the low pressure side. A manifold gauge should be connected to both the low and high pressure sides.

(4) Refrigerant charging would be affected by environment temperature. If refrigerant is undercharged, start the water pump to circulate chilled water and meanwhile start the unit for refrigerant adding. In this case, vapor refrigerant should be charged.

4.6 Exploded views and parts lists

■LSQWRF35VMP1/NhA-M



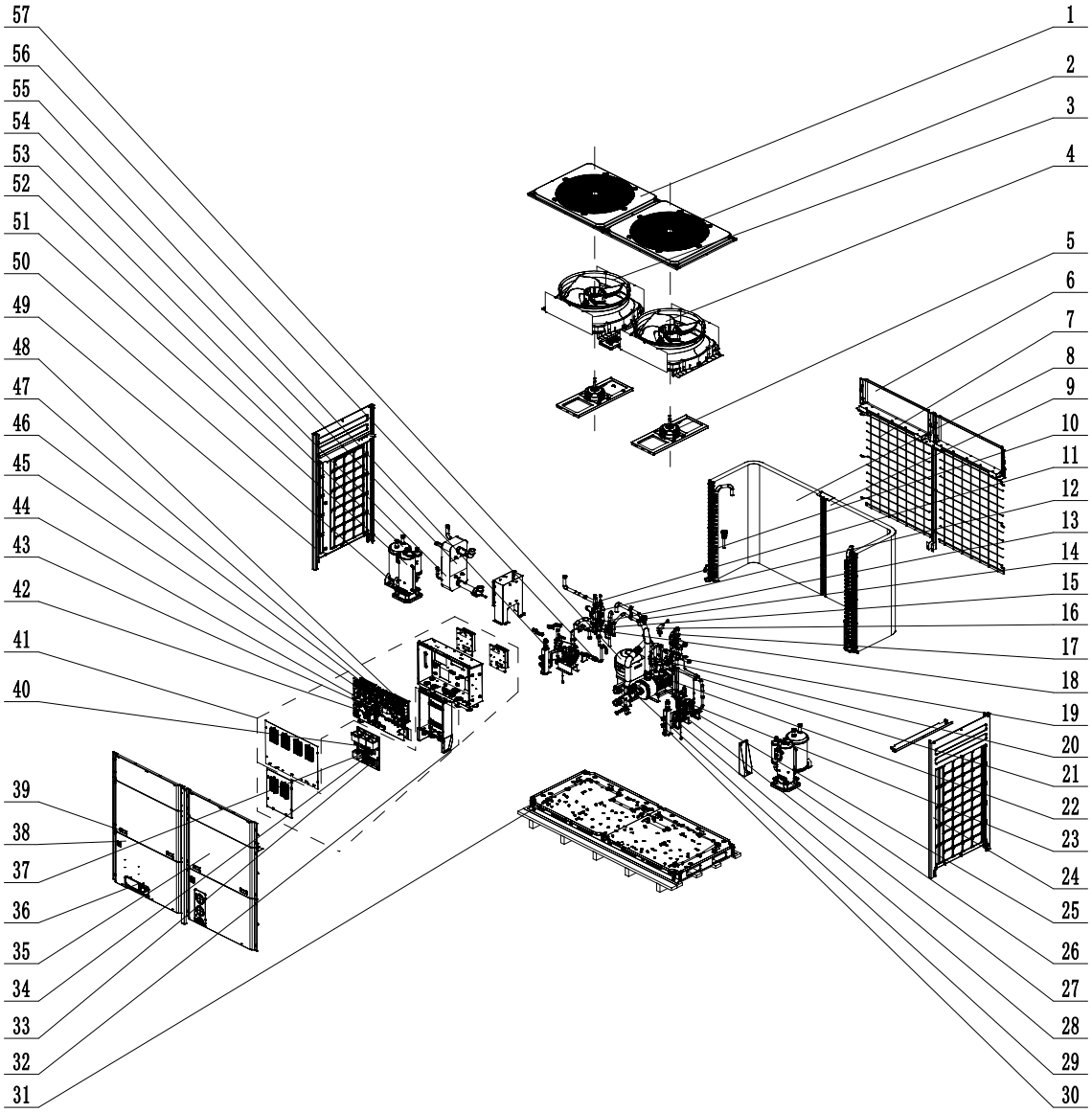
■LSQWRF35VMP1/NhA-M (EL01500910) parts list

No.	Name	Quantity
1	Top Cover Sub-assy	1
2	Rear Grill	2
3	Axial Flow Fan	2
4	Diversion Circle	2
5	Motor Support Sub-Assy	2
6	Brushless DC Motor	2
7	Upper Cover Plate (back)	1
8	Upper Cross Beam Sub-Assy	1
9	Rear Grill	1

No.	Name	Quantity
10	Pressure Protect Switch	1
11	Pressure Sensor	1
12	Condenser Assy	1
13	4-Way Valve	1
14	Temp Sensor Sleeving	3
15	One Way Valve	1
16	Pressure Protect Switch	1
17	Pressure Protect Switch	1
18	Air Guard	1
19	Filter	1
20	Temp Sensor Sleeving	5
21	Auto Air Outlet Valve	1
22	Sensor Insert	4
23	Heating Sheet	2
24	Left Side Plate	1
25	Heat Insulator	7
26	Expansion Drum	1
27	O-Ring	1
28	Flow switch	1
29	Drainage Pipe Sub-assy	1
30	Temperature Sensor Support	1
31	Relief Valve	1
32	Water Pump	1
33	Water Pipe Connector	1
34	Electronic Expansion Valve	1
35	Electrical Heater (Chassis)	1
36	Heat Insulating Hose	0.9 meter
37	Electric expand valve fitting	1
38	Heat Insulating Hose	1
39	Electromagnetic Valve	1
40	Radiator	1
41	Cut-off valve 1/4(N)	2
42	Gland Bush	1
43	Sealing plate (right side)	1
44	Wire conduit	1
45	Drainage Pipe Sub-assy	1
46	Pipe connector	2
47	Handle	2
48	Front Panel (right)	1
49	Top Cover (front)	1
50	Sealing plate (right side)	1
51	Upper Cross Beam Sub-Assy	1
52	Terminal Board	2

No.	Name	Quantity
53	Main Board	1
54	Fixed Mount	1
55	Phase Reverse Protector	1
56	Guide Strip	0.05 meter
57	Terminal Baffle	2
58	Insulation Gasket	1
59	Terminal Board	2
60	Reactor	4
61	Filter Board	1
62	Drive board	1
63	Reactor	1
64	Rectifier	1
65	Main Board	1
66	Main Board	2
67	Right Side Plate	1
68	Electrical Heater	2
69	Air Guard	1
70	Compressor and Fittings	1
71	Radiator	1
72	Radiator	2
73	Magnet Coil	1
74	Axial Flow Fan nesting	2

■LSQWRF60VMP1/NhA-M



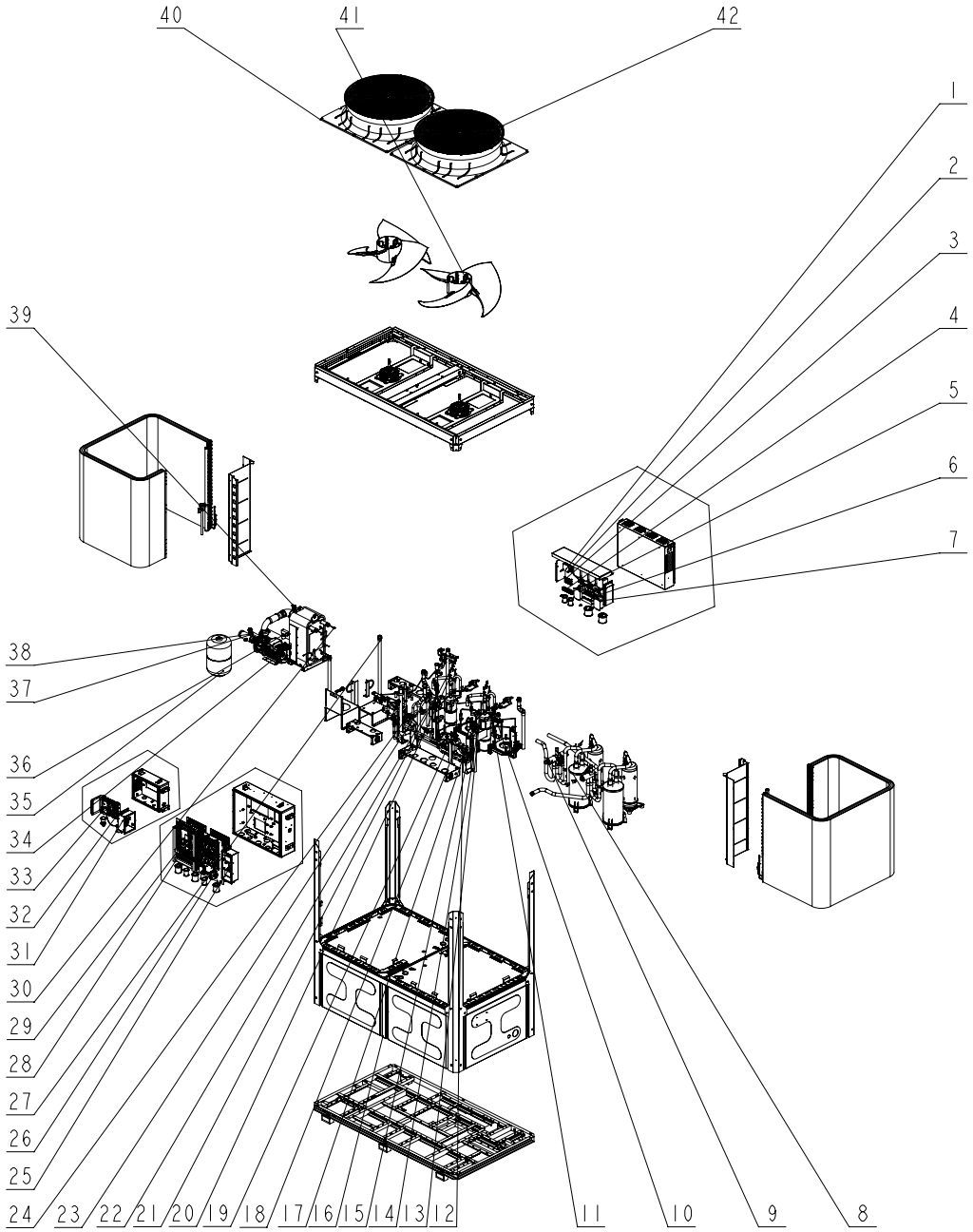
■LSQWRF60VMP1/NhA-M (EL01500900) parts list

No.	Name	Quantity
1	Coping	2
2	Rear Grill	2
3	Diversion Circle	2
4	Axial Flow Fan	2
5	Brushless DC Motor	2
6	Top Cover	4
7	Rear Grill 1	2
8	Condenser Assy	1
9	Condenser Assy	1
10	One Way Valve	2

No.	Name	Quantity
11	Pressure Sensor	1
12	4-Way Valve	2
13	Pressure Protect Switch	1
14	Auto Air Outlet Valve	1
15	Pressure Protect Switch	1
16	Steam current Switch	1
17	Pressure Sensor	1
18	Pressure Protect Switch	1
19	Pressure Protect Switch	1
20	Pressure Protect Switch	1
21	Pressure Protect Switch	1
22	Water Pump	1
23	Magnet Coil (electromagnetic valve)	2
24	Right Side Plate	1
25	Electromagnetic Valve	2
26	Electrical Heater	2
27	Electronic Expansion Valve	2
28	Electric Expand Valve Fitting	1
29	Relief Valve	1
30	Cut-off valve 1/4(N)	4
31	Electrical Heater (Chassis)	2
32	Electric Box Assy	1
33	Terminal Board	1
34	Terminal Board	1
35	Left Front Panel	2
36	Bottom Cover Plate	1
37	Reactor	1
38	Left Front Panel	1
39	Handle	4
40	Reactor	3
41	Electric Box Assy	1
42	Phase Reverse Protector	1
43	Main Board	2
44	Main Board	1
45	Filter Board	2
46	Fixed Mount	1
47	Main Board	1
48	Main Board	2
49	Left Side Plate	1
50	Electrical Heater	2
51	Compressor and Fittings	2
52	Gas-liquid Separator	2

No.	Name	Quantity
53	Plate-type Heat Exchanger	1
54	Heating Sheet	2
55	Relief Valve	2
56	Strainer	1
57	Expansion Drum	1

■LSQWRF100VMP1/NhA-M, LSQWRF130VMP1/NhA-M



No.	Name	Quantity
1	Reactor	1
2	Terminal Board	1
3	Communication Interface Board	1
4	Terminal Board	1
5	Terminal Board	1
6	Terminal Board	1
7	Reactor	6
8	Gas-liquid Separator	2
9	4-Way Valve	2
10	Relief Valve	2
11	Pressure switch	1
12	Bidirection Strainer	3
13	Oil Separator	2
14	Pressure Sensor	1
15	Electromagnetic Valve	1
16	Front Panel	4
17	Electromagnetic Valve	2
18	One Way Valve	4
19	Current Divider	4
20	Pressure Sensor	1
21	Cut-off valve 1/4(N)	4
22	Pressure Sensor	1
23	Electric Expand Valve Fitting	1
24	Strainer	4
25	Reactor	2
26	Phase Reverse Protector	1
27	Drainage Pipe Sub-assy	2
28	Terminal Board	3
29	Main Board	1
30	Nozzle for Adding Freon	2
31	Reactor	1
32	Radiator	1
33	Main Board	2
34	Temperature Probe	3
35	Expansion Drum	1
36	Steam current Switch	1
37	Drainage Pipe Sub-assy	1

No.	Name	Quantity
38	Relief Valve	1
39	Auto Air Outlet Valve	1
40	Streamlined Dome	2
41	Axial Flow Fan	2
42	Rear Grill	2

4.7 Maintenance

4.7.1 Requirements for maintenance

The unit has undergone a series of strict tests prior to delivery to ensure qualified performance, however, in order to keep reliable performance and extend its service life, the unit should be maintained routinely and periodically by the qualified service personnel.

Routine maintenance items
Is there any unusual noise and vibration?
Is there any unusual noise and vibration for the compressor in operation? Is there any unusual smell?
Do the operating pressure, voltage and current keep normal? If not, figure out the cause and then eliminate it?
Are all temperature sensors and pressure transducers installed securely?

Periodic maintenance items
Is any wiring loosened and insulated securely?
Does any electric element work reliably? If not, change it timely?
Does any throttling valve and control valve leaks? Can any valve be opened or closed flexibly? Is any filter clogged?
Is the temperature setpoint proper?
Is there a large amount of condensate at the chilled water pipe or the condensate pipe? Is insulation layer damaged?

◆ Requirements on water quality and cleaning

Industrial water used as chilled water produces little scale, but well or river water will bring much scale, sand and other sediment which then would block up the chilled water flow and make the evaporator frozen up. Therefore, it is necessary to filter or chemically soften water before it flows into the water system and also take analysis to quality. Once it is found water quality is dissatisfactory, and then only industrial water is available.

Water quality requirement						
Items			Cold/hot water		Trend	
			Circulating water	Makeup water	Corrosion	Scalelike sediment
Basic items	pH (25°C)		6.8-8.0	6.8-8.0	○	○
	Electrical conductivity (25°C)	μs/cm	<400	<300	○	○
	Cl-	mg (Cl-)/L	<50	<50	○	
	SO_4^{2-}	mg (SO_4^{2-})/L	<50	<50	○	
	Acid consumption (pH4.8)	mg ($CaCO_3$) /L	<50	<50		○
	Total hardness	mg ($CaCO_3$) /L	<70	<70		○
Other items	Fe	mg (Fe) /L	<1.0	<0.3	○	○
	S^{2-}	mg (S^{2-}) /L	Undetectable	Undetectable	○	
	NH^{4+}	mg (NH^{4+})/L	<1.0	<0.3	○	
	SiO^2	mg (SiO_2)/L	<30	<30		○
NOTE: "○" indicates possible corrosion or scaling.						

Even though water quality is under strict control, calcium oxide or other minerals will gradually accumulate on the surface of the evaporator. Then, it will reduce the heat exchange efficiency of the evaporator and consequently lead to poor performance of the unit.

Therefore, the pipe system should be cleaned periodically. Oxalic acid, acetic acid and formic acid can be used as the organic cleaning agent, but the strong chloracid is not allowed as it will corrode the copper tube of the heat exchanger and then lead to water and refrigerant leakage.

(1) Preparation of materials and tools

Several bags of environmental friendly scale remover, or similar cleaning liquid.

(2) Cleaning instructions

10) Estimate the required amount of scale remover in accordance with the system water volume and severity of scailing.

11) Add the scale remover to the water tank and the scale remover.

12) Start through the contact the water pump every 10 minutes and spread the scale remover in water more quickly and widely.

13) After that, follow the steps below.

- Let the water pump run for another 1-2 hour(s).
- 1-2 hours later, change the cleaning solution to anti-rusting agent. Then, drain the water system and check the water quality. If water is cloudy, then it indicates the cleaning effect is satisfactory.
- Open the water inlet to see if scale on the shell and tube has been removed. If not, clean the shell and tube separately again by the skilled serviceman and then rinse them. If there is still sand, scale and other foreign matters at the bottom of the shell and tube, let cleaning solution in from the inlet pipe and then let the foul water out through the drain outlet.
- Fully charge the water system and let it run for another 1-2 hour(s).

- Stop the unit to drain up waste solution. If impossible, drain it with making up water at the same time until all waster solution has been drained out completely (at this time water is transparent and PH is 7).
- Repeat steps last two steps above.
- Clean or change the filters in the water system.
- See if the difference between the entering and leaving water temperature is improved.

⚠ NOTE

- Although the cleaning agent is innocuous, but care also should be taken not to let it spill into eyes.
- The serviceman with injuries on the hand is not allowed to take this task.

Before and after cleaning, observe the running status of the unit, summarize the cleaning effect and record the running parameters.

◆ Cleaning of the finned heat exchanger

In order to keep fins work efficiently, be sure there are no leaves, cotton wool, insects, and other contaminants on the outer layer of fins, or they would lead to more energy consumption and high discharge pressure. Generally, fins should be cleaned after the unit has run for 6-12 months, or more frequently when the environment is polluted more seriously.

(1) Cut off the power supply.

(2) Clean with high-pressure air fins against the direction of the inlet air, or clean with high-pressure water fins at the direction upright with that of the fins but care must be taken to control the water pressure to prevent the fins from being pulled down and protect each electric element. If fins stick with oily matters, clean fins with neutral detergent solution.

(3) The vacuum cleaner and nylon brush also can be used to remove dust and foreign matters on the surface of the heat exchanger.

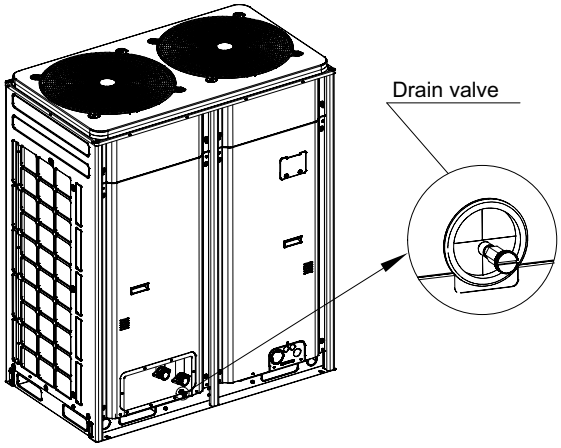
4.7.2 Freeze protection in winter

When the unit is not going to be used for a long time, clean and dry the internal and external surfaces of the unit, and then it would be better to wrap it. Under the subzero climate, the unused unit should be drained completely so that the plate-type heat exchanger would not be frozen up. Instead, the other way is adding some antifreeze into water to keep the water temperature no less than 0°C.

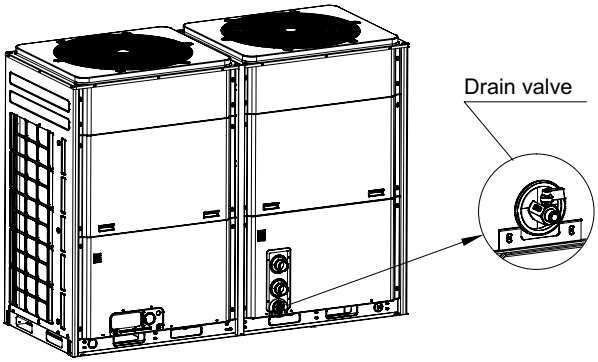
See the following steps for how to drain water out.

(1) Loosen screws on the front panel and then remove the front panel

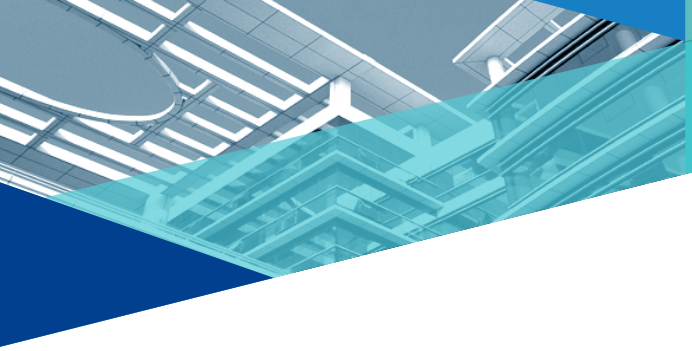
(2) Draw out the blind plug counter clockwise to let the chilled water flow out freely until no water stays in. After that, place the blind plug back. (Note: put the container for foul water beneath the drain pipe to prevent foul water from polluting the site).



Drain valve for LSQWRF35VMP1/NhA-M



Drain valve for LSQWRF60VMP1/NhA-M



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