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AIR-COOLED MODULAR CHILLER

Preface

Introduction

Air-cooled modular chiller is a kind of central air-conditioning unit which adopts air as the cooling (or heating) source and water as cooling (or heating) heat exchange medium. As a sort of integrated equipment, it no needs cooling tower, cooling water pump, boiler and corresponding auxiliary parts for the condenser, which makes system more simple to install and convenient to maintenance, saves energy and installation space, thus it is very suitable for the regions that are short of water.

GD Chigo HVAC Air-cooled modular chillers are designed and produced on the basement of sufficiently absorbing the top technology in AC areas, adopting high quality self-control components which are made by world famous producers. Moreover, after improvement, units can run more efficiently and more stably. 30kW module adopts independent unit frame, 65kW module consists of two units and 130kW module consists of four, and also several modules can be formed into an integrated unit by connecting each module's inlet & outlet pipeline in parallel. The whole unit consists of 2-32 modules(For 130module max.16 units) and the max capacity can be achieved to 2080kW.

GD Chigo HVAC Air-cooled modular chillers can be widely applied to civilian projects and industrial projects, such as office, hotel, villa, restaurant, hospital, factory, etc. It is a wise choice for the regions where water is insufficient or there are strict limits on noise level and surroundings.

Part 1.

System Outline

1. Nomenclature




CL S-F65 QR H W / S R1 B

- **CL:Chigo light chiller system**
- **S:Condenser code**
- **F:Fixed speed compressor code**
- **65:Capacity ; Unit:kW**
- **QR:With full heat recovery;Omit:Standard model**
- **H:Heat pump ; C:Cooling only**
- **W:Outdoor unit without hydraulic modular**
- **S:380V/3PH/50Hz; Z:380-415V/3PH/50Hz; K:380V/3PH/60Hz**
- **R1:R410A; R2:R407C; Omit:R22**
- **B:The second generation**

2. Products Line-up

No	Model	Refrigerant	Net dimension		Net weight	Power supply
			(L×W×H)	(unit: mm)	(kg)	
1	CLS-F30HW/ZR1B	R410A	1160*1920*900		320	380~415V/3ph/50Hz
2	CLS-F65HW/ZR1B	R410A	2000*1920*900		610	380~415V/3ph/50Hz
3	CLS-F130HW/ZR1B	R410A	2200*2200*1100		1010	380~415V/3ph/50Hz

3. External Appearance

30kW	65kW
 A 30kW air-cooled modular chiller. It is a single vertical unit with a grey metal frame and blue horizontal louvers. The top has a circular condenser fan. A green Chigo logo is on the top left. The base has two grey access panels.	 A 65kW air-cooled modular chiller. It is a wider vertical unit with a grey metal frame and blue horizontal louvers. The top has two circular condenser fans. A green Chigo logo is on the top left. The base has three grey access panels.
130kW	
 A 130kW air-cooled modular chiller. It is a large, wide vertical unit with a grey metal frame and blue horizontal louvers. The top has two circular condenser fans. A green Chigo logo is on the top left. The base has four grey access panels.	

4. Features

4.1 Modular design, flexible combination, more convenient for installation and transportation.

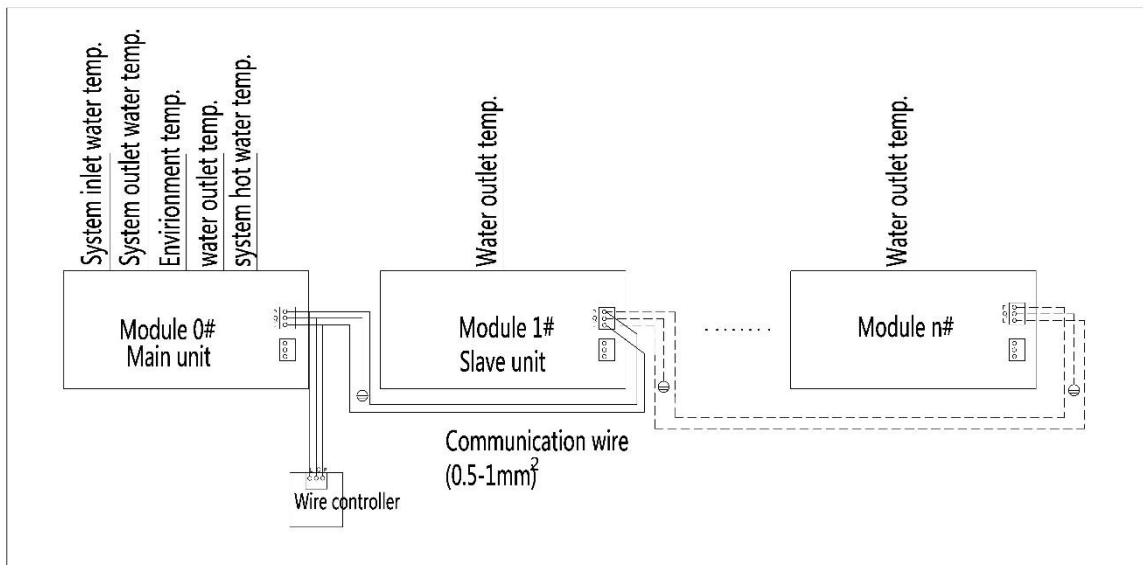
The unit adopts modular design, which can make more units connect together. The unit can combine 16 numbers of 130module at most. Meanwhile every separate module can operate as main unit, also each module can be a slave unit with modules combination, more convenient for design and installation.

4.2 The maximum combination of the system consists of 1 main unit and 31 slave units, for 130module combine 15 slave units at most.

4.3 Chilled water outlet temperature adjustable.

Chilled water Inlet temperature can be adjusted by wired controller according to customer’s demand. In cooling mode, the adjustable range from 9°C-25°C. In heating mode, the adjustable range from 26°C-46°C.

4.4 Easy connection between main unit and slave units.



4.5 Compact structure, no need cooling tower, which reducing installation cost.

4.6 Strong micro-computer intelligent control and monitor function.

4.7 System will be more reliable with new type efficient heat exchanger

Evaporator adopts tube-in-shell heat exchanger, higher reliability and efficiency, lower requirement of the water quality.

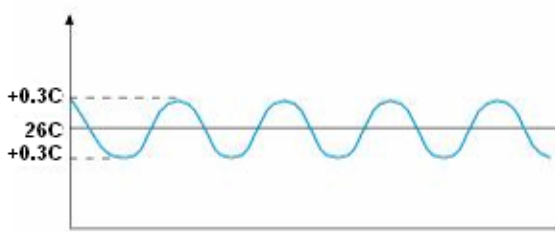
4.8 Environmental care

The R410A system meets different requirement.

- Chlorine-free and environmental friendly refrigerant, zero ozone depletion potential.
- High density refrigerant, therefore, less refrigerant required.
- Leak-tight refrigerant circuit, Brazed refrigerant connections for increased leak-tightness.

4.9 Economical operation

New design adopts electronic expansion valve precise refrigerant control in wider range. Electronic expansion valve allows operation at lower condensing pressure, adjustment can be made fast linear response, making the system more stable output, the indoor temperature more uniform, and enhance human comfortable.



The room temp fluctuation more small

4.10 Back up function

When unit is failure

- If master unit fails, all the units will stop.
- If one slave unit fails, this unit will stop but the others will keep running.
- When the master unit fails, any of the slave one can be set as the master unit by manual setting.

When unit is under protection

- If master unit's protection occurs, this system will stop.
- If slave unit's protection occurs, this unit will stop but the others will keep running.

4.11 Applicable temperature range

Mode	Ambient temperature range	Water inlet temperature range
Cooling	15°C ~48°C (-15-48 just for 65kw)	9°C ~25°C (12°C is default)
Heating	-15°C ~30°C	26°C ~46°C (40°C is default)

Chilled inlet water temperature can be adjusted by wire controller according to customer's demand.

4.12 Capacity Lineup

Model	Mode	Compress or quantity	Refrigerant	Refrigeration system	Electrical controller no.	Maximum combinations
CLS-F30HW/ZR1B	Cooling & Heating	1	R410A	1	1	32
CLS-F65HW/ZR1B	Cooling & Heating	2	R410A	1	1	32
CLS-F130HW/ZR1B	Cooling & Heating	4	R410A	2	1	16

4.13 Specification

R410A/50Hz

Model			CLS-F30HW/ZR1B	CLS-F65HW/ZR1B	CLS-F130HW/ZR1B
Power supply		V/Ph/Hz	380-415V/3N/50Hz	380-415V/3N/50Hz	380-415V/3N/50Hz
Capacity					
Cooling		KW	30	65	130
Heating		KW	35	70	132
Electrical data					
Power input	Cooling	kW	9.4	20.6	39.8
	EER		3.18	3.16	3.26
	SEER		3.81	3.86	3.95
	Heating	kW	9.8	21.3	40.8
	COP		3.57	3.28	3.23
	SCOP		/	/	/
	Max. power input	kW	15	28	60
Rated current	Cooling	A	18	38	78
	Heating	A	19	39	80
	Max. Current	A	30	51	106
Physical data					
Refrigerant	Weight	kg	7.3	13.5	30
	Refrigerant control		EXV	EXV	EXV
	Type		R410A	R410A	R410A
Compressor	Brand		COPELAND	COPELAND	COPELAND

	Type		Scroll	Scroll	Scroll	
	Model		VP144KFE-TFP-522	VP144KFE-TFP-422	VP144KFE-TFP-422	
	oil type		POE OIL			
	oil charge	kg	3.252	3.252*2	3.252*4	
	Quantity	PCS	1	2	4	
Fan motor	Quantity	PCS	1	2	2	
	Model		YDK550-6G31	YDK550-6G31	YLS160-800-8P6	
	Air flow volume	m ³ /h	12000	24000	48000	
Evaporator (Water side)	Heat-exchanger type		Shell and tube	Shell and tube	Shell and tube	
	Water pressure drop	kPa	30	30	40	
	Water inlet/outlet diameter	mm	DN40	DN65	DN65	
	Water flow volume	m ³ /h	5.16	11.18	22.36	
	Max. Pressure	System (Mpa)		4.5	4.2	4.2
		water side(MPa)		1	1	1
	Connection type		Flange connection	Flange connection	Flange connection	
Dimension (W×H×D)	Net	mm	1160*1920*900	2000*1920*900	2200*2200*1100	
	Packing	mm	1240*2060*950	2080*2060*920	2280*2360*1140	
Weight	Net	kg	320	610	1010	
	Gross	kg	350	630	1060	
Control type			Wired controller	Wired controller	Wired controller	
Sound level (semi-anechoic)		dB (A)	62	64	65	

Operation range					
Water temperature (inlet)	Cooling	°C	9-25	9-25	9-25
	Heating	°C	26-46	26-46	26-46
Water temperature (outlet)	Cooling	°C	5-17	5-17	5-17
	Heating	°C	30-50	30-50	30-50
Ambient temperature	Cooling	°C	15-48	-15-48	15-48
	Heating	°C	-15-30	-15-30	-15-30

4.14 Electric Characteristics

Model	Outdoor Unit			Application		Power Supply		Compressor			OFM		
	Hz	VOL	Ph	Min.	Max.	TOCA	MFA	LRA	RLA	Qty	W	FLA	Qty
CLS-F30HW/ZR1B	50	380~415	3	342	418	30	60	135/ 153	20.2	1	550	5.06	1
CLS-F65HW/ZR1B	50	380~415	3	342	418	51	100	135/ 153	20.2	2	550	5.06	2
CLS-F130HW/ZR1B	50	380~415	3	342	418	106	205	135/ 153	20.2	4	800	7.02	2

Remark:

TOCA: Total Over-current Amps. (A)

MFA: Max. Fuse Amps. (A)

LRA: Locked Rotor Amps. (A)

RLA: Rated Load Amps. (A)

OFM: Outdoor Fan Motor.

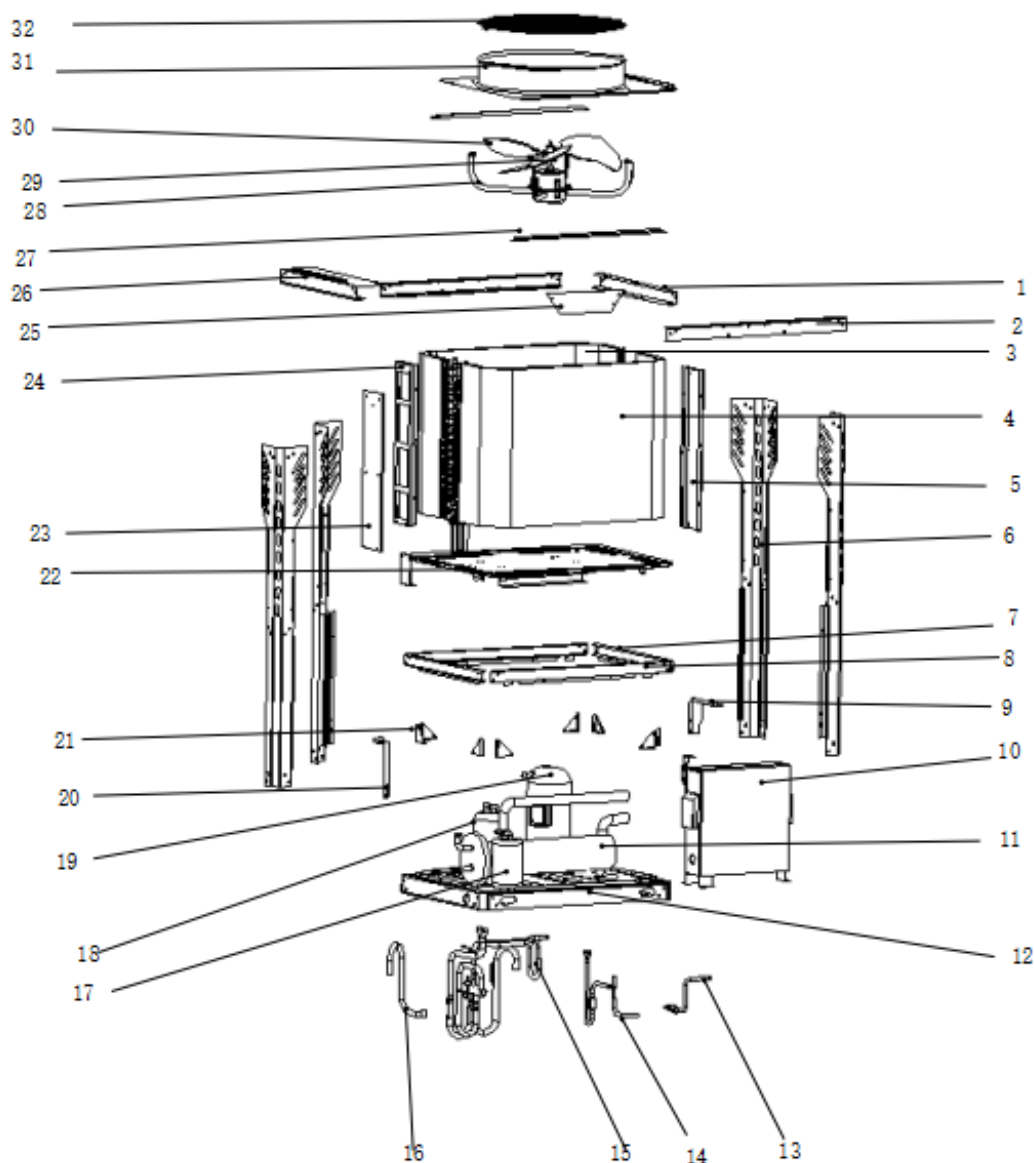
FLA: Full Load Amps. (A)

W: Rated Motor Output (W)

Voltage vibration between phases: <2%.

4.15 Explosive view

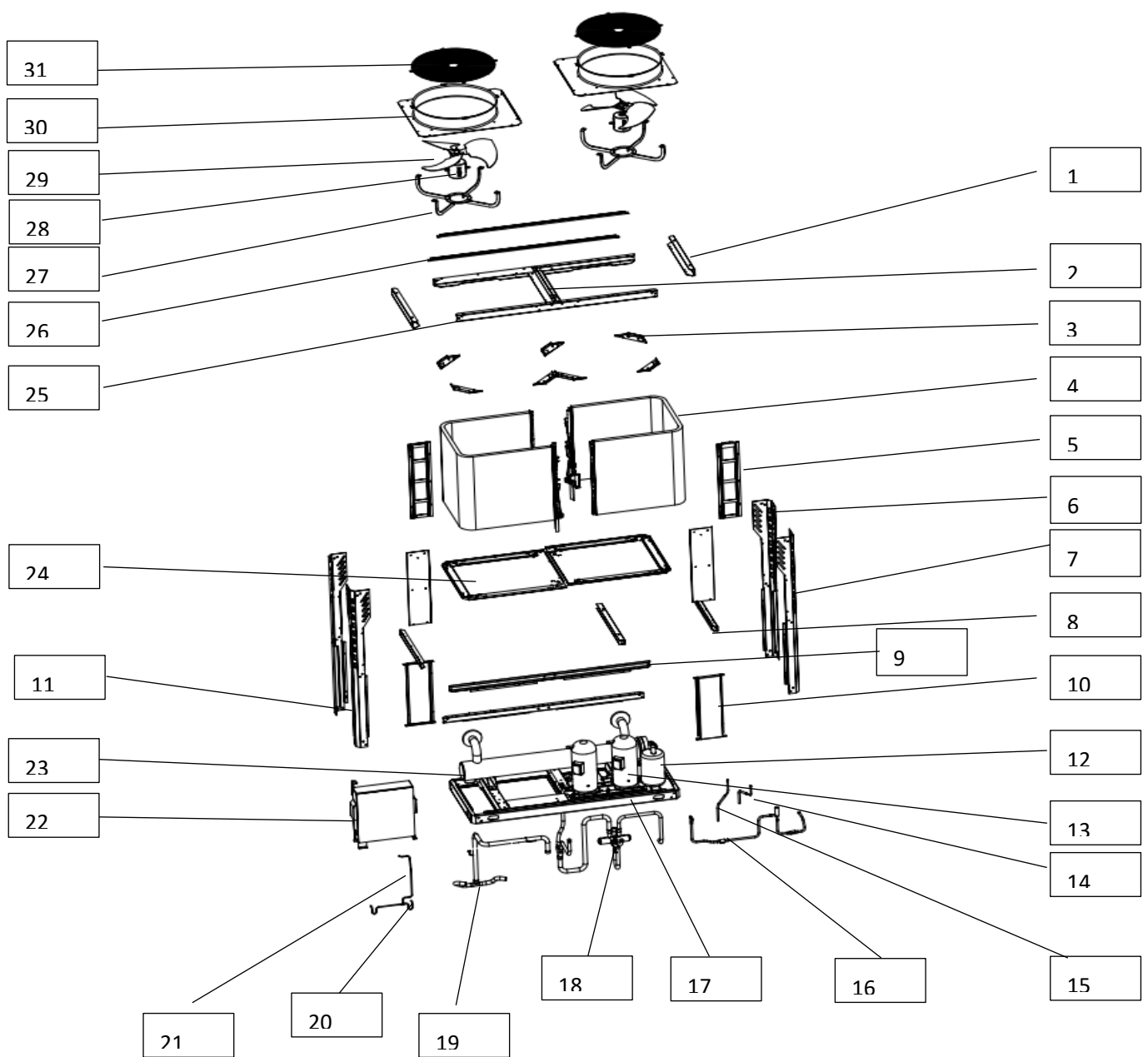
30kW



No	Name	No	Name
1	lateral support assy for Wind inlet guide	17	liquid tank
2	front support for Wind inlet guide	18	Vapour-liquid separator
3	Wind-side heat	19	compressor part

	exchanger member1		
4	Wind-side heat exchanger member2	20	throttle fix plate
5	heat exchange member connect plate2	21	triangular fix plate assy
6	Column	22	water tray sssy
7	lateral beam assy	23	Front top Column
8	front and rear beam assy	24	heat exchange member connect plate1
9	E-parts connect assy	25	LOGO plate
10	E-parts connect assy	26	lateral support assy for Wind inlet guide2
11	Water-side heat exchanger member	27	Guide ring splint
12	base assy	28	Holder for fan motor
13	oulet pipe liquid assy	29	Fan motor (left)
14	throttle assy	30	Propeller fan
15	4 - way reversing valve exhaust pipe welding assy	31	Wind inlet guide
16	Suction pipe assy	32	Top net for Wind inlet guide

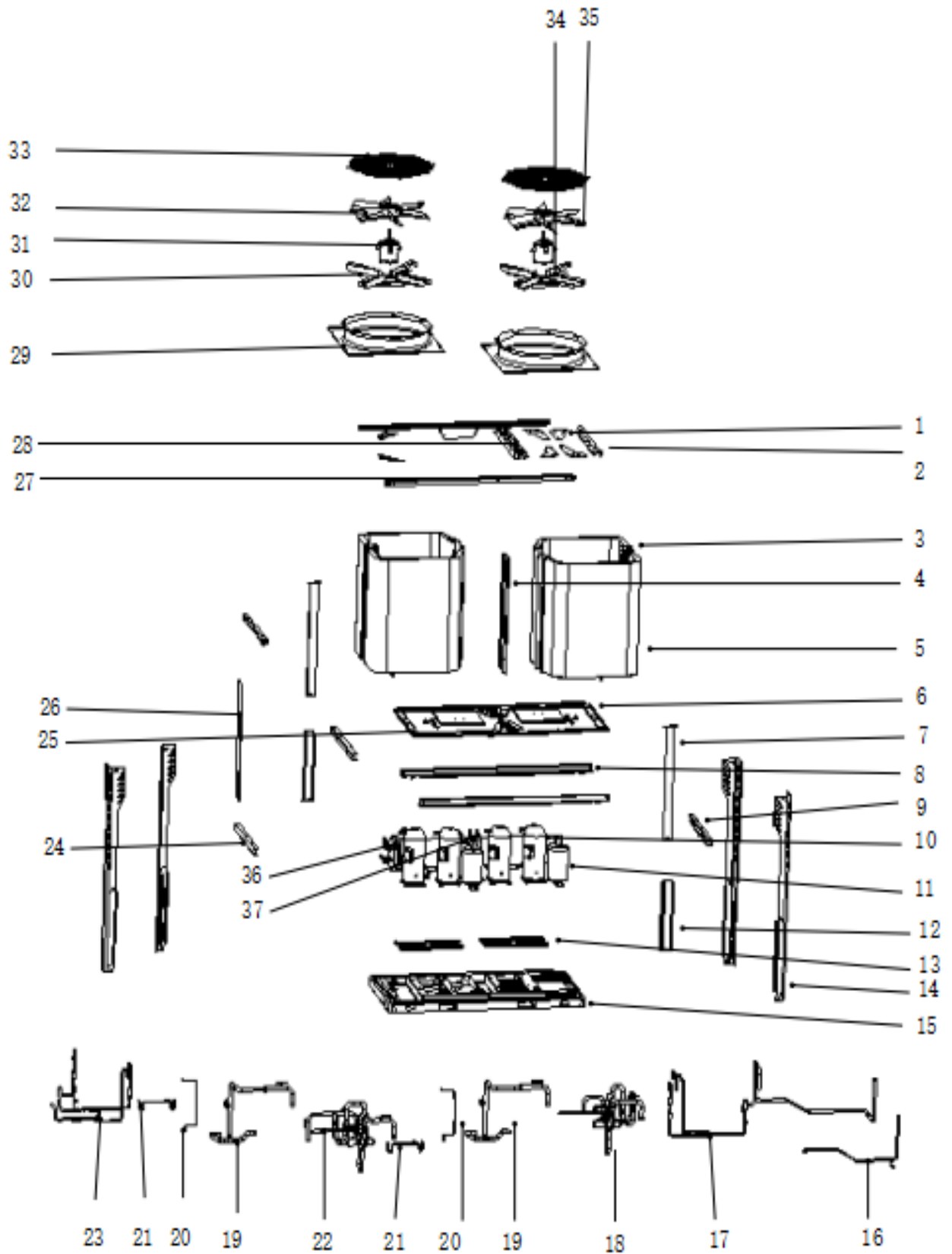
65kW



NO	Name	NO	Name
1	lateral support assy for Wind inlet guide	17	base assy
2	middle support for Wind inlet guide	18	4- way reversing valve exhaust pipe welding assy
3	top fix plate	19	Suction pipe assy 1
4	Wind-side heat exchanger member	20	Oil balance components
5	condenser plate	21	Oil balance total piping
6	Front top Column	22	E-parts, assy
7	Column	23	Water-side heat exchanger member
8	Water collector support assy	24	Water collector assy

9	lateral beam assy	25	front and rear support for Wind inlet guide
10	front and rear beam assy	26	Guide ring splint
11	Front down Column	27	Holder for fan motor
12	Vapour-liquid separator	28	Fan motor (left)
13	compressor part	29	Propeller fan
14	Pre-welding assy for condensor shunting pipe 1	30	Wind inlet guide
15	Pre-welding assy for condensor shunting pipe 2	31	Top net for Wind inlet guide
16	throttle assy		

130kW

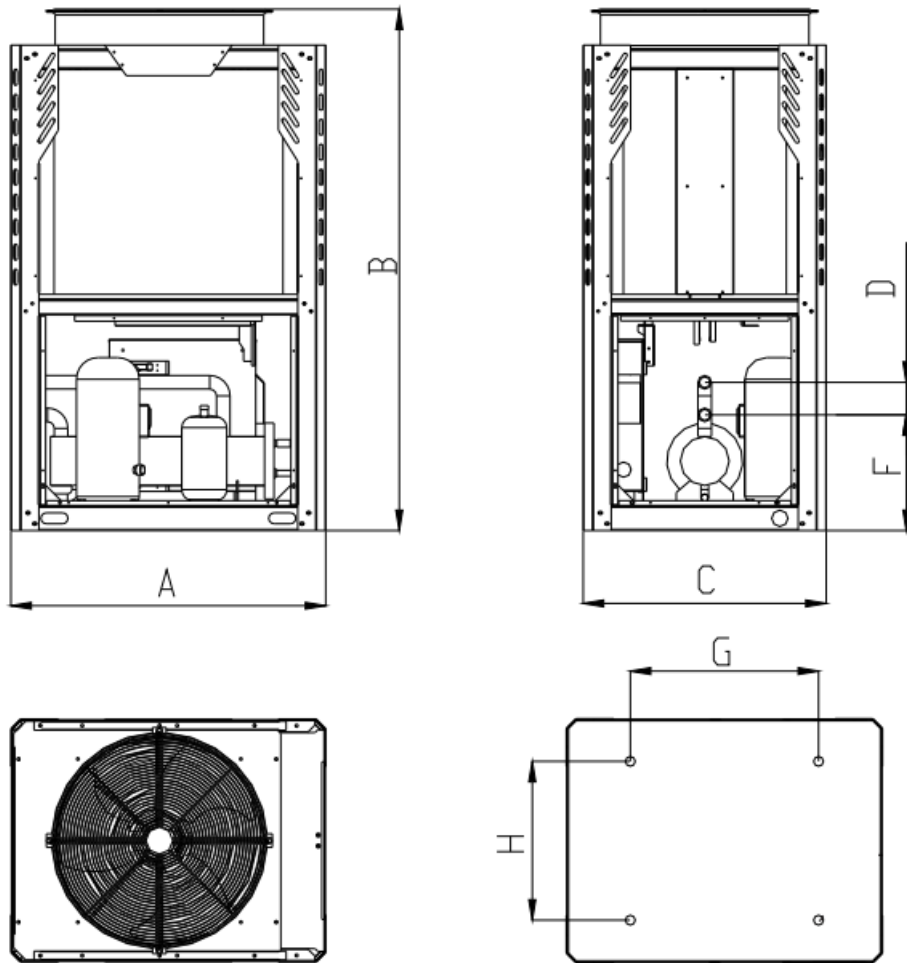


NO	Name	NO	Name
1	top fix plate 2	20	Oil balance total piping
2	lateral support assy for Wind inlet guide	21	Oil balance components
3	condenser assy1	22	4 - way reversing valve exhaust pipe welding assy 1
4	Condenser in the partition	23	throttle assy 1
5	condenser assy2	24	Water collector support assy
6	Water collector assy1	25	Water collector assy 2
7	Midel upwards to Column	26	fixing board for condenser
8	front and rear beam assy	27	front and rear support for Wind inlet guide
9	lateral beam assy	28	middle support for Wind inlet guide
10	Constant frequency compressor	29	Wind inlet guide
11	Vapour-liquid separator	30	Motor connection strip assembly
12	Midel downward to Column	31	Uniaxial outdoor three-phase motor
13	Compressor support assy	32	Propeller fan

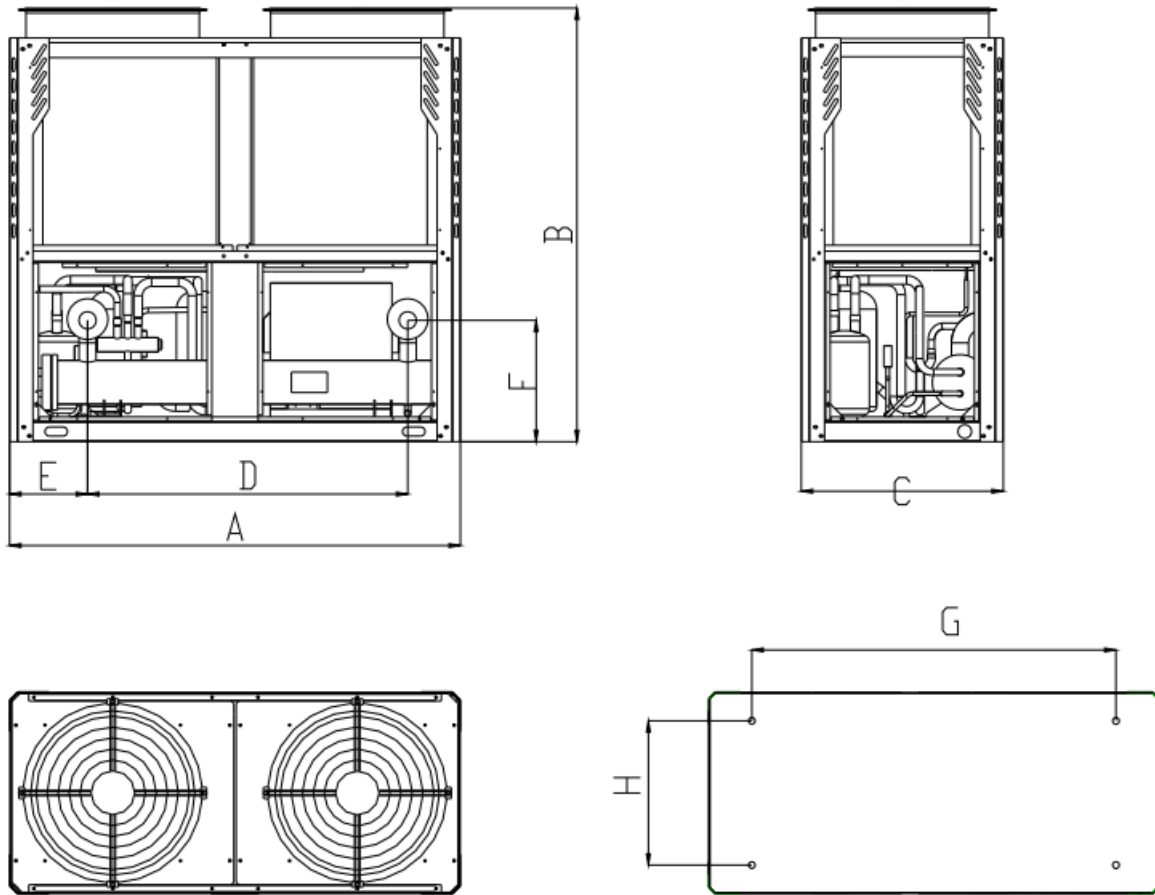
14	Column	33	Top net for Wind inlet guide
15	base assy	34	Holder assy for fan motor
16	Evaporator inlet tube assy 2	35	Propeller fan
17	throttle assy 2	36	Water-side heat exchanger member
18	4 - way reversing valve exhaust pipe welding assy 2	37	Liquid storage tank
19	Suction pipe assy 1		

4.16 Outlook drawing

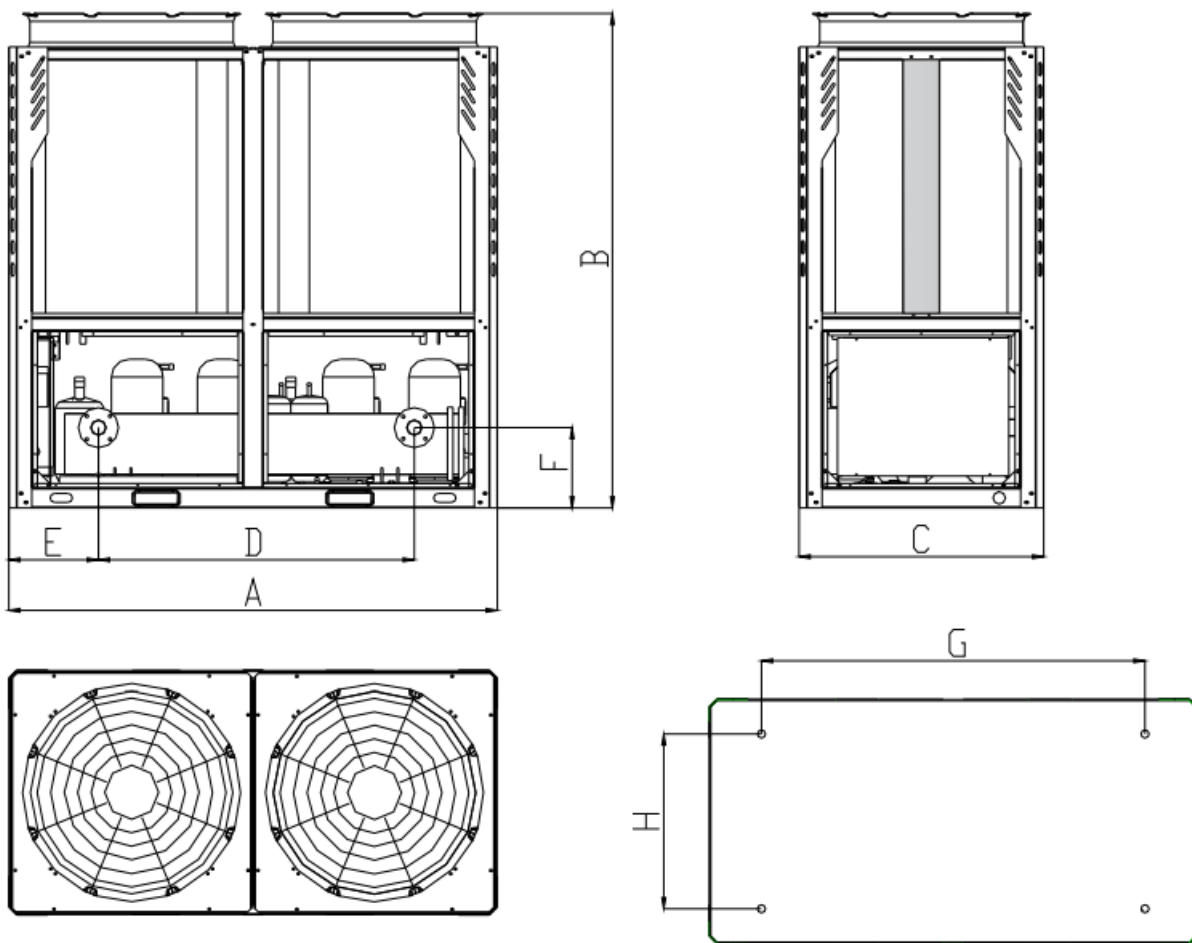
30kW



65kW



130kW



Model	A	B	C	D	E	F	G	H
30kW	1160	1920	900	120	/	426	840	850
65kW	2000	1920	900	1420	308	500	1586	850
130kW	2200	2220	1100	1420	403	306	1742	1054

5. Pipe Connection Drawing

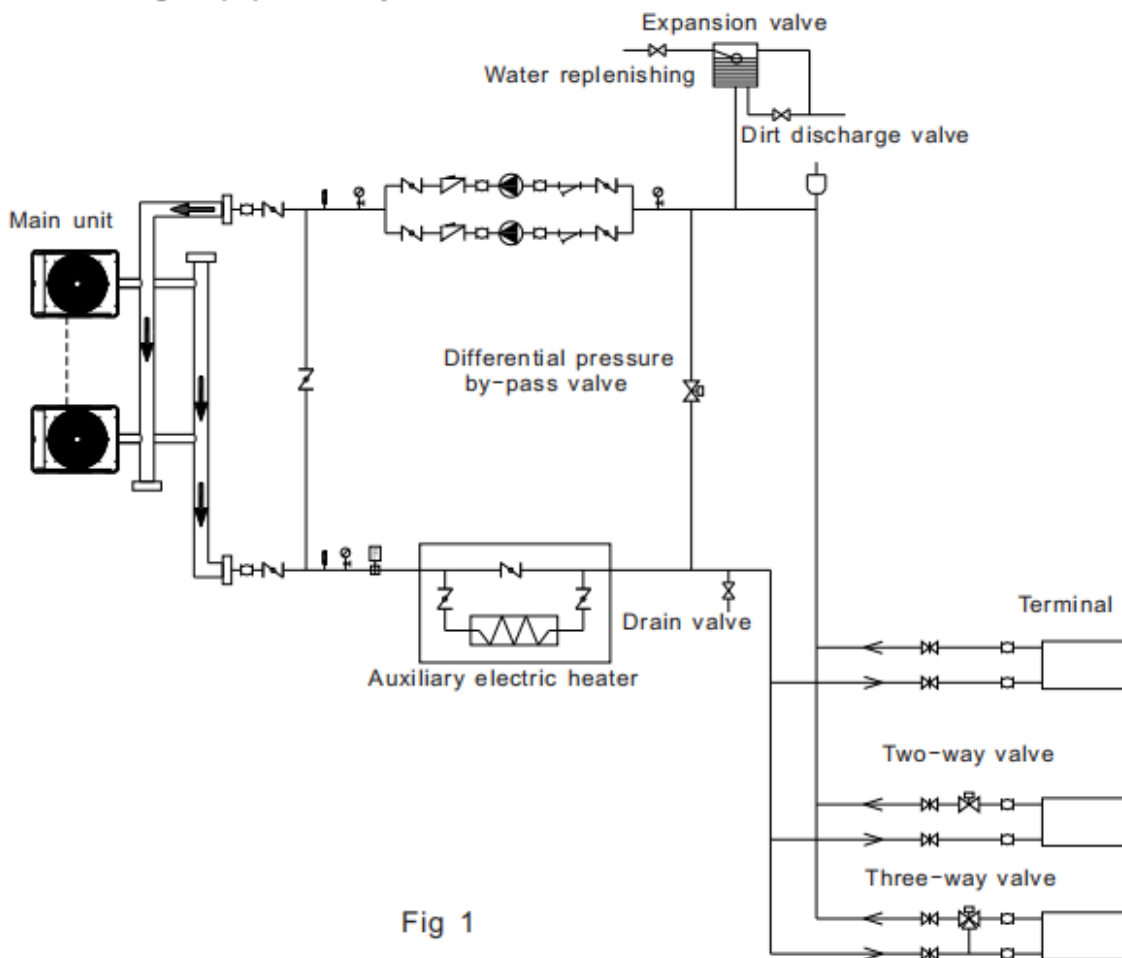


Fig 1

30Kw

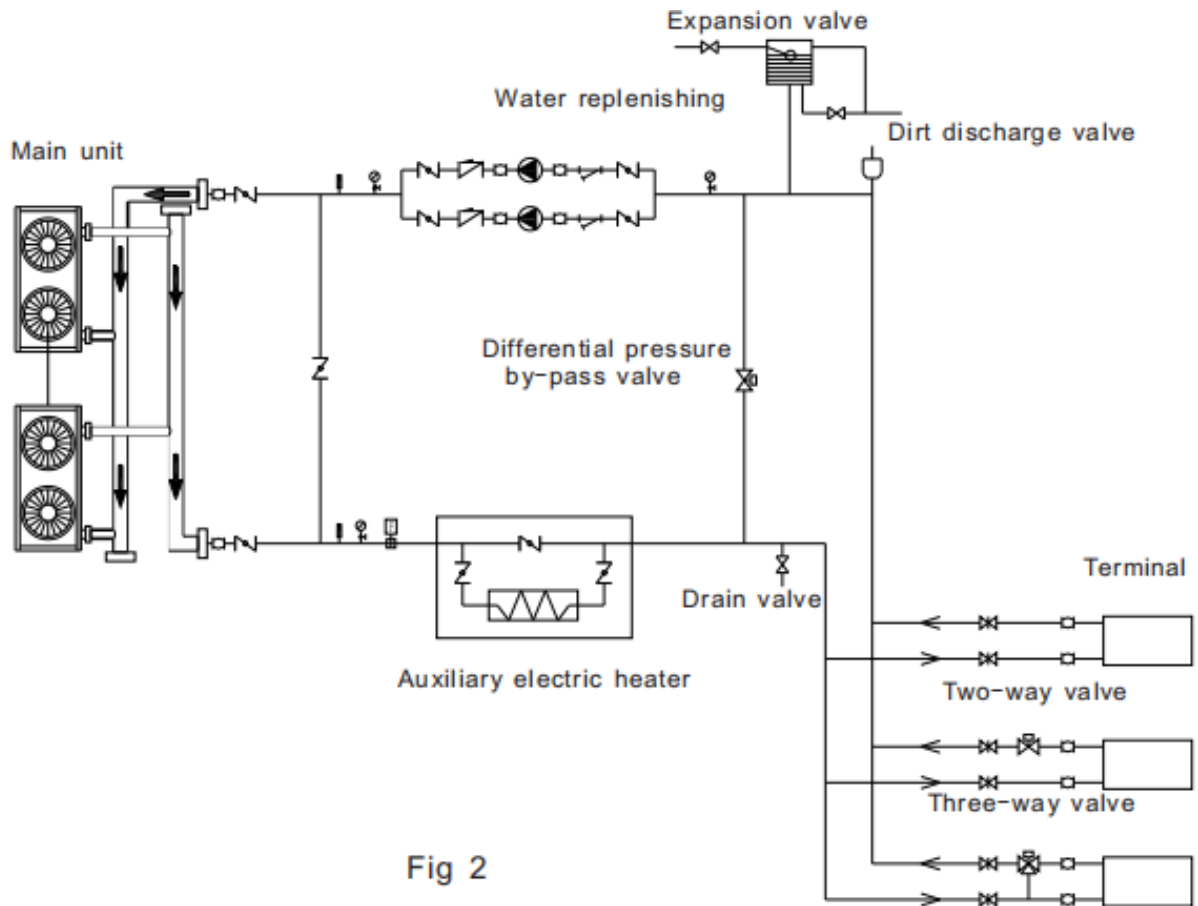
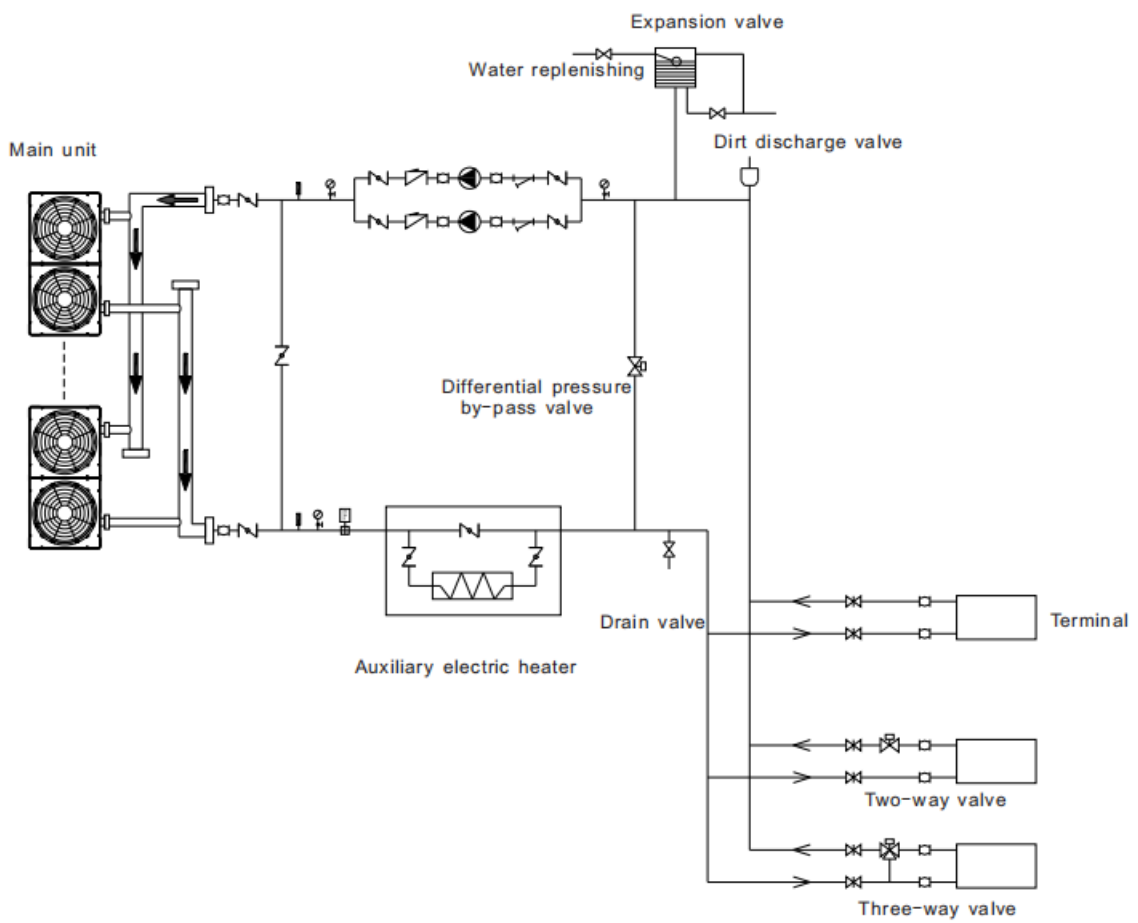












Fig 2

65Kw

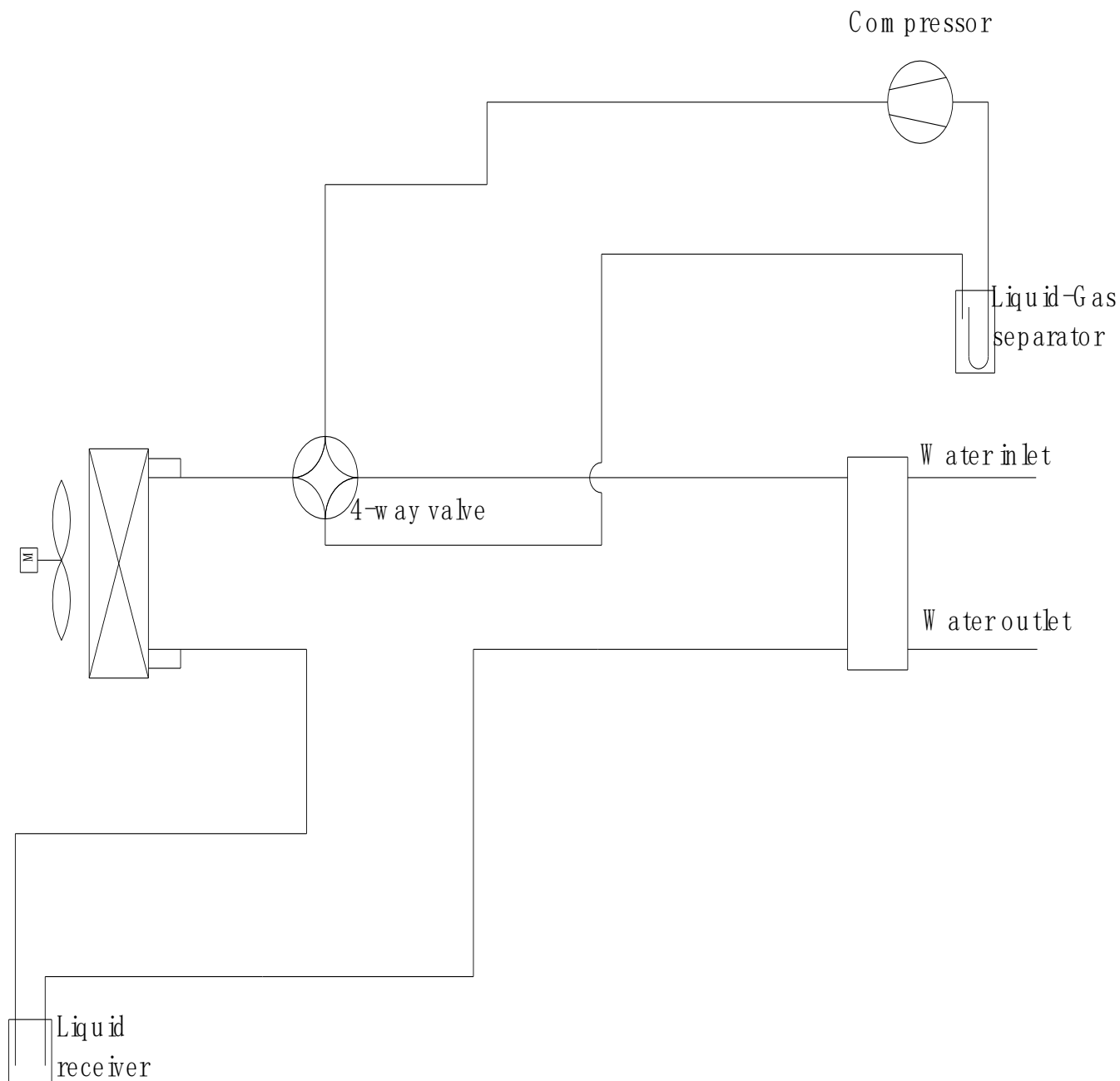


130kW

The table below describes the symbols.

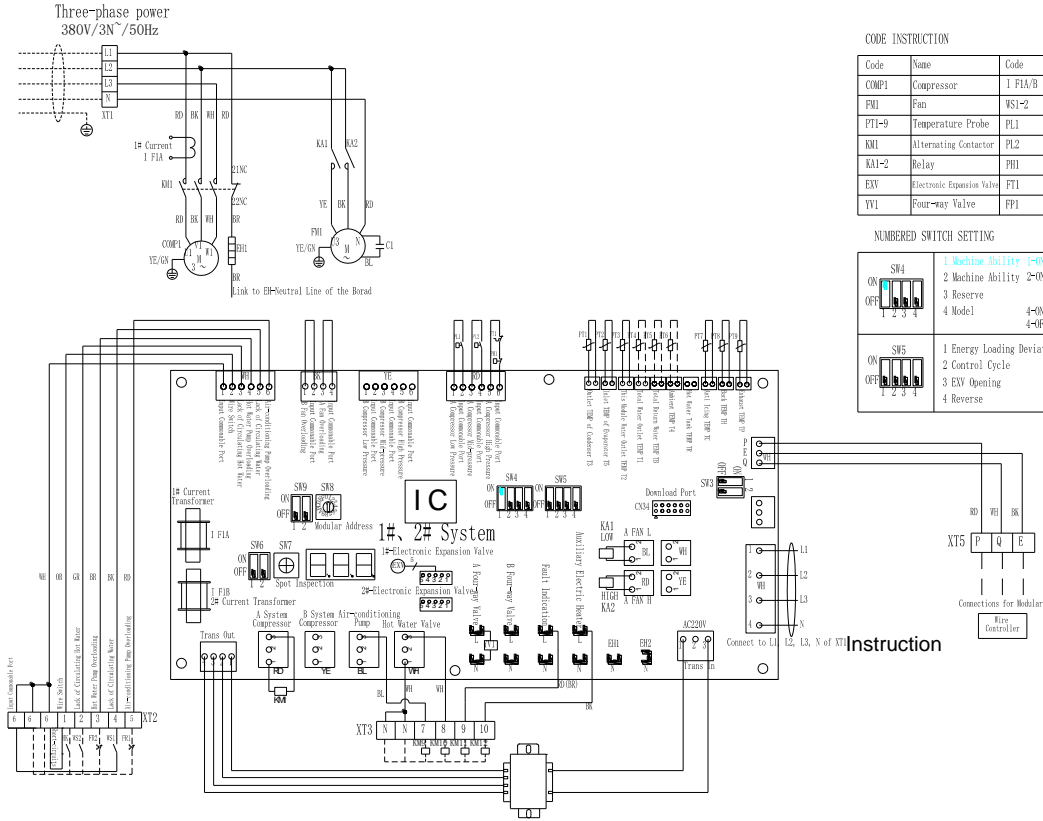
Symbol	Symbol explanation	Symbol	Symbol explanation
	Stop valve		Y-shaped filter
	Pressure gauge		Thermometer
	Water flow switch		Circulating pump
	Gate valve		Check valve
	Flexible joint		Automatic discharge valve

6. Refrigeration system drawing



7. Wiring Diagrams

7.1 30kW/R410A



CODE INSTRUCTION

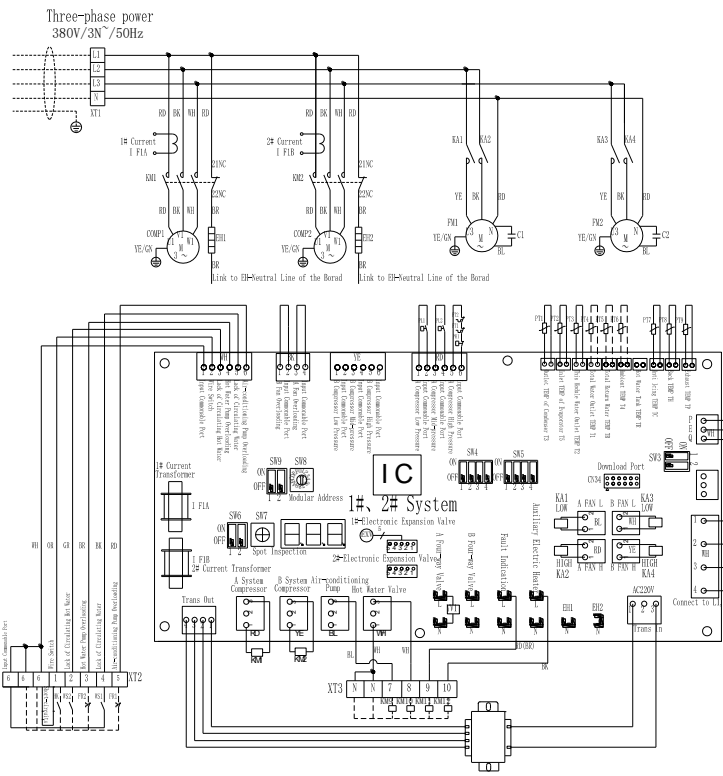
Code	Name	Code	Name	Code	Name
COMP1	Compressor	I FIA/B	Current Transformer	XT1	Power Terminal
FMI	Fan	FSI-2	Flow Switch	XT2-3	Engineering Terminal
PTI-9	Temperature Probe	PL1	Low-pressure Switch	FRI-2	Thermal Relay
KM1	Alternating Contactor	PL2	Pressure Switch	EHI	Crankcase Heater
KA1-2	Relay	PHI	High-pressure Switch	HK	Wire Switch
E1V	Electronic Expansion Valve	PT1	Exhaust Thermostat		Wire Controller
YV1	Four-way Valve	FFI	Fan Without Protective Switch		Control Panel

NUMBERED SWITCH SETTING

SW4	SW5	WIRE COLOR CODE
ON	ON	BL BLUE
OFF	OFF	BR BROWN
		GN GREEN
		OR ORANGE
		WH WHITE
		RD RED
		BK BLACK
		YE YELLOW
		GR GRAY

Instruction

7.2 65kW/R410A



CODE INSTRUCTION

Code	Name	Code	Name	Code	Name
COMP1-2	Compressor	F1A/B	Current Transformer	XT1	Power Terminal
F1-2	Fan	WS1-2	Flow Switch	MT2-3	Engineering Terminal
PT1-2	Temperature Probe	PL1	Low-pressure Switch	FRT1-2	Thermal Relay
KM1-2	Alternating Contactor	PL2	Pressure Switch	EHT1-2	Crankcase Heater
KM1-4	Relay	PH1	High-pressure Switch	W1	Wire Switch
EXV	Electronic Expansion Valve	FT1-2	Exhaust Thermostat		Wire Controller
YV1	Four-way Valve	PP1	Pressure Protective Switch		Control Panel

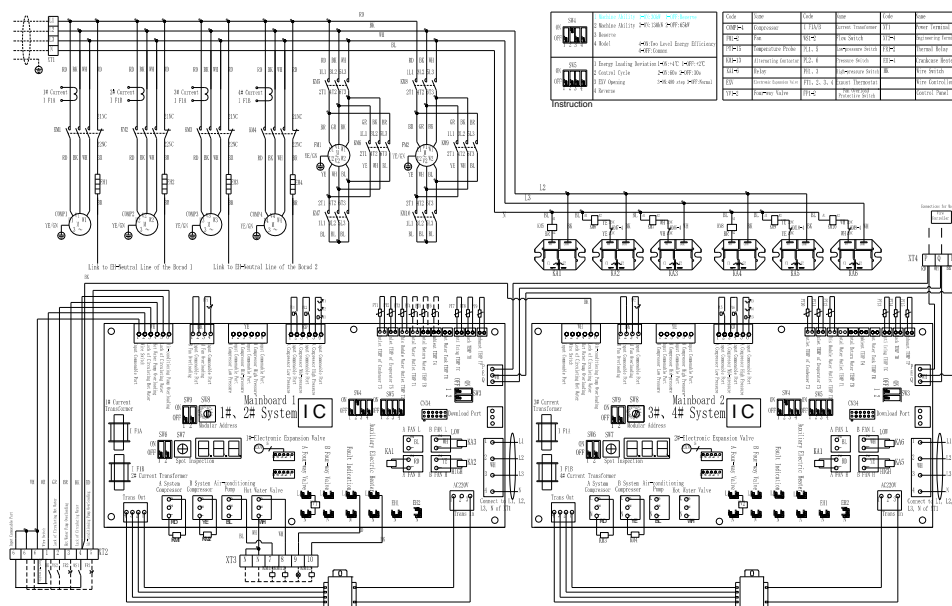
NUMBERED SWITCH SETTING

SW4	SW5
1 Machine Ability 1-ON/30kW 2-OFF/Reverse	1 Energy Loading Deviation 1-ON/+4°C 1-OFF/+2°C
2 Machine Ability 2-ON/130kW 2-OFF/65kW	2 Control Cycle 2-ON/60s 2-OFF/30s
3 Reserve	3 EXV Opening 3-ON/400 stop 3-OFF/Normal
4 Model 4-ON:Two Level Energy Efficiency 4-OFF:Common	4 Reverse

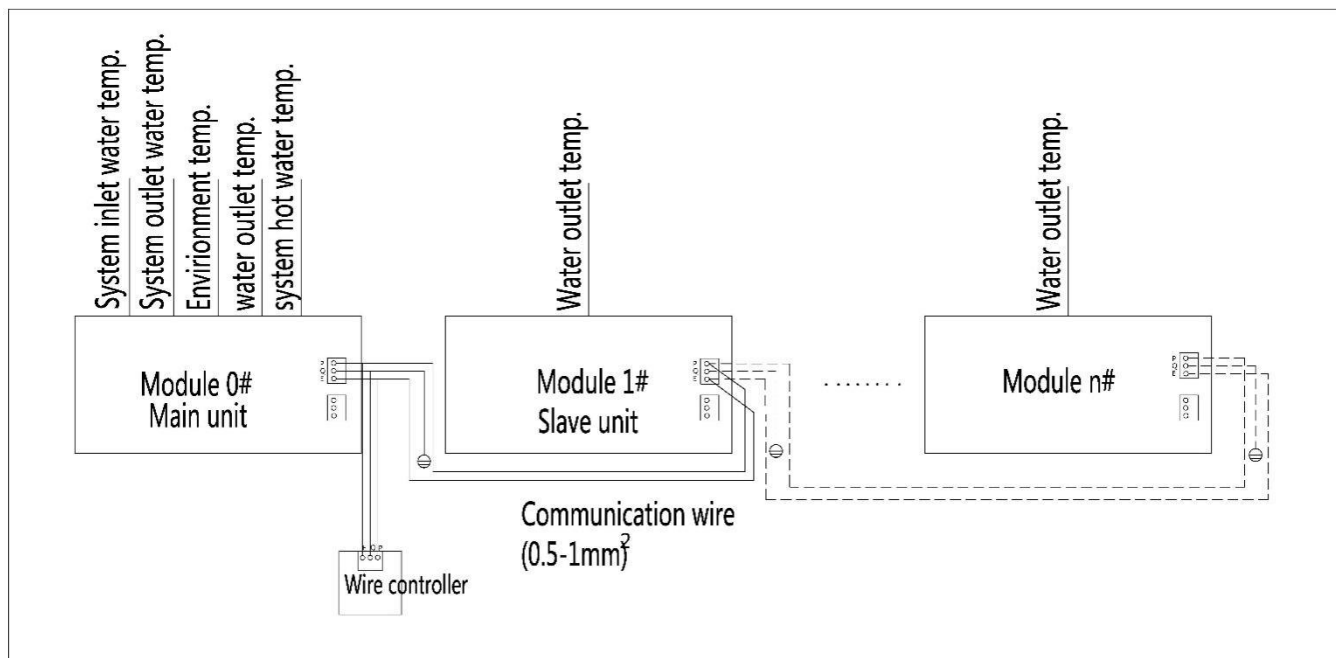
WIRE COLOR CODE

BL	BLUE
BR	BROWN
GN	GREEN
OR	ORANGE
WH	WHITE
RD	RED
BLK	BLACK
YE	YELLOW
GR	GRAY

7.3 130kW/R410A



8 Networking Communication wiring diagram



Remark:

- The number of modules in each refrigerating system is not more than 32(For 130module max. 16).
- The specification of the signal line is the two-core RVV in 2*0.5mm².

Part 2.

Trouble Shooting

1. Malfunction & Protection Codes

Codes for faults:

Cod e	Faults	Remark
E0	Power supply fault	Master unit and auxiliary unit
E1	Overloaded water pump of air conditioner	Master unit
E2	Insufficient water flow of water pump for air conditioner	Master unit
E3	Overloaded hot water pump	Master unit
E4	Insufficient water flow of hot water pump	Master unit
E5	Fault of total return water temperature sensor	Master unit
E6	Fault of total water outlet temperature sensor	Master unit
E7	Fault of outdoor ambient temperature sensor	Master unit
E8	Fault of water outlet temperature sensor for shell and tube heat exchanger unit	Master unit and auxiliary unit
E9	Fault of outlet temperature sensor for condenser	Master unit and auxiliary unit
EA	Fault of water inlet temperature sensor for shell and tube heat exchanger unit	Master unit and auxiliary unit

EC	Fault of return water temperature sensor of living hot water in heat recovery	Master unit
ED	Fault of return gas temperature sensor	Master unit
EE	Reserved	/
EF	Reserved	Master unit and auxiliary unit
L0	EEPROM error	Master unit and auxiliary unit
L1	Communication error between each module	Auxiliary unit
L2	The module quantity decrease	Master unit
L3	Address error	Master unit
L4	Communication between wired controller and main PCB	Master unit
L5	Communication fault for main board	Master unit and auxiliary unit

Protection code of unit:

Cod e	Protection	Remark
P0	Low pressure protection of system A	Master unit and auxiliary unit
P1	Medium pressure protection of system A	Master unit and auxiliary unit
P2	High pressure portection or exhaust temperature too high protection of system A	Master unit and auxiliary unit
P3	Over current protection of system A	Master unit and auxiliary unit
P4	High temperature protection of condenser A	Master unit and auxiliary unit
P5	Overload protection of fan in System A	Master unit and auxiliary unit
P6	Low pressure protection of system B	Master unit and auxiliary unit

P7	Medium pressure protection of system B	Master unit and auxiliary unit
P8	High pressure protection or exhaust temperature too high protection of system B	Master unit and auxiliary unit
P9	Over current protection of system B	Master unit and auxiliary unit
PA	High temperature protection of condenser B	Master unit and auxiliary unit
PB	Overload protection of fan in System B	Master unit and auxiliary unit
PC	Single module water outlet temperature too high protection or too low protection	Master unit and auxiliary unit
PD	Low temperature of water outlet from shell and tube heat exchanger unit	Master unit and auxiliary unit
PE	Low temperature protection for anti-icing (reserved)	Master unit and auxiliary Unit
PF	High temperature protection for compressor	Master unit and auxiliary u

2. Troubles and Solutions

Code	Error description	Reason	Troubleshooting
/	No power supply for main PCB	No power output or incorrect voltage	Check the power supply
/	Main PCB burned down	Wrong connection between L and N	Connect wire correctly, change main PCB and other burned device
E0	Three phase error	Wrong phase	Change any two power supply wire
		Lack of phase	Check power supply and wire connection
E1	Overload protection of AC side water pump	The water pipe is dirty and blocked	Clean the water pipe and filter
		Lack of water supply	Check water in water tank is enough
		Lack of water flow	Check the water pipe design, the valve is open or not
		Some air inside the water pipe	Discharge the air
		The water pump is broken	Check the water pump can work or damage
		The connector on main PCB is malfunction	Change the main PCB
E2	Lack of water flow in AC side	Water pump selection is small	Change the water pump
		The water pipe is dirty and blocked	Clean the water pipe and filter
		Lack of water supply	Check water in water tank is enough
		Lack of water flow	Check the water pipe design, the valve is open or not
		Some air inside the water pipe	Discharge the air
		The connector on main PCB is malfunction	Change the main PCB
E3	Overload protection of hot water side water	The water pipe is dirty and blocked	Clean the water pipe and filter
		Lack of water supply	Check water in water tank is enough

	pump	Lack of water flow	Check the water pipe design, the valve is open or not
		Some air inside the water pipe	Discharge the air
		The water pump is broken	Check the water pump can work or damage
		The connector on main PCB is malfunction	Change the main PCB
E4	Insufficient water flow of hot water pump	Water pump selection is small	Change the water pump
		The water pipe is dirty and blocked	Clean the water pipe and filter
		Lack of water supply	Check water in water tank is enough
		Lack of water flow	Check the water pipe design, the valve is open or not
		Some air inside the water pipe	Discharge the air
		The connector on main PCB is malfunction	Change the main PCB
E5	Fault of total return water temperature sensor	The connector of sensor is loose	Check the connector and reconnect it
		TB sensor short circuit or open circuit	Measure TB sensor resistance, if it is abnormal, replace it
		The connector on main PCB is malfunction	Change the main PCB
E6	Fault of total water outlet temperature sensor	The connector of sensor is loose	Check the connector and reconnect it
		T1 sensor short circuit or open circuit	Measure T1 sensor resistance, if it is abnormal, replace it
		The connector on main PCB is malfunction	Change the main PCB
E7	Fault of outdoor ambient temperature	The connector of T4 sensor is loose	Check the connector and reconnect it
		T4 sensor short circuit or open circuit	Measure T4 sensor resistance, if it is abnormal, replace it

	sensor	The connector on main PCB is malfunction	Change the main PCB
E8	Fault of water outlet temperature sensor for shell and tube heat exchanger unit	The connector of T2 sensor is loose	Check the connector and reconnect it
		T2 sensor short circuit or open circuit	Measure T2 sensor resistance, if it is abnormal, replace it
		The connector on main PCB is malfunction	Change the main PCB
E9	Condenser fin A temperature T3A sensor error	The connector of sensor is loose	Check the connector and reconnect it
		T3A sensor short circuit or open circuit	Measure T3A sensor resistance, if it is abnormal, replace it
		The connector on main PCB is malfunction	Change the main PCB
EA	Fault of water inlet temperature sensor for shell and tube heat exchanger unit	The connector of sensor is loose	Check the connector and reconnect it
		T3B sensor short circuit or open circuit	Measure T3B sensor resistance, if it is abnormal, replace it
		The connector on main PCB is malfunction	Change the main PCB
EC	Fault of return water temperature sensor of living hot water in heat recovery	The connector of sensor is loose	Check the connector and reconnect it
		TR sensor short circuit or open circuit	Measure TR sensor resistance, if it is abnormal, replace it
		The connector on main PCB is malfunction	Change the main PCB
ED	Fault of return gas temperature sensor	The connector of sensor is loose	Check the connector and reconnect it
		TBR sensor short circuit or open circuit	Measure TBR sensor resistance, if it is abnormal, replace it
		The connector on main PCB is malfunction	Change the main PCB
		The connector on main PCB is	Change the main PCB

		malfunction	
L0	EEPROM error	EEPROM chip error	Check the chip is loose and change the PCB
L1	Communication error between each module	Communication wire connect badly, short circuit or open circuit	Reconnect the communication wire
L2	The module quantity decrease	Communication wire is loose	Reconnect the communication wire
		Slaver unit is power off	Give power supply
L3	Address error	Master:0, slaver:1,2,3...	Change the module address
		The address is repeat	Reset the module address
		The address value is higher than PCB number	Reset the module address
		The address setting switch is error	Change the main PCB
L4	Communication between wired controller and main PCB	Wrong connection for PQE	Reconnect the wire
		Communication wire is loose	Reconnect the wire
		No power for main PCB and wired controller	Give power supply
		Communication wire and strong power wire are mixed together	Separate communication wire and strong power wire
		Communication wire is too long	Keep the wire length as short as possible
		The connectot on PCB is loose or error	Change the main PCB
L5	Communication fault for main board	Main board error	Replace the main board
P0	Low pressure protection of system A	Heat exchanger condition is not good (Heating mode)	Improve the heat exchanger condition and keep it is in good ventilation
		Outdoor fan motor is abnormal (Heating mode)	Check the fan motor and solve it

		There are some air inside the circuit (Heating mode)	Make sure there is no air inside
		Leakage or lack of refrigerant	Check the leakage and recharge refrigerant
		Low pressure switch is error	Change low pressure switch
		Lack of water flow in AC side (Cooling mode)	Check inlet and outlet water temperature and adjust water flow
		Too much furring on the Shell and tube exchanger (Cooling mode)	Clean the furring
		Malfunction for low pressure switch connector on main PCB	Change the main PCB
P1	Medium pressure protection of system A	Leakage or lack of refrigerant	Check the leakage and recharge refrigerant
		Medium pressure switch is error	Change medium pressure switch
		Lack of water flow in AC side (Cooling mode)	Check inlet and outlet water temperature and adjust water flow
		Too much furring on the Shell and tube exchanger (Cooling mode)	Clean the furring
		Malfunction for medium pressure switch connector on main PCB	Change the main PCB
P2	High pressure portection or exhaust temperature too high protection of system A	Heat exchanger condition is not good (Cooling mode)	Improve the heat exchanger condition and keep it is in good ventilation
		Outdoor fan motor is abnormal (Cooling mode)	Check the fan motor and solve it
		There are some air inside the circuit (Cooling mode)	Make sure there is no air inside
		Ambient temperature is too high (Cooling mode)	Turn off the uint
		Too much refrigerant	Discharge some refrigerant
		The circuit is blocked	Check there is no block

		High pressure switch is error	Change high pressure switch
		Lack of water flow in AC side (Heating mode)	Check inlet and outlet water temperature and adjust water flow
		Too much furring on the Shell and tube exchanger (Heating mode)	Clean the furring
		Lack of water flow in hot water side (Heating water mode)	Check inlet and outlet water temperature and adjust water flow
		Too much furring on the Shell and tube exchanger (Heating water mode)	Clean the furring
		Leakage or lack of refrigerant	Check the leakage and recharge refrigerant
		Malfunction for high pressure switch connector on main PCB	Change the main PCB
P3	Over current protection of system A	Compressor is error	Check the compressor resistance is normal
		High voltage or low voltage, phase imbalance	Check voltage is in operation range
		Water pipe is dirty or blocked (Heating or heating water mode)	Clean water pipe and filter
		Lack of water (Heating or heating water mode)	Check water in water tank is enough
		Lack of water flow (Heat or heating water mode)	Check the water pipe design, the valve is open or not
		Some air inside the water pipe (Heat or heating water mode)	Discharge the air
		The water pump is broken (Heat or heating water mode)	Check the water pump can work or damage
P4	High temperature protection of condenser A	Temperature sensor T3A sensor error	Measure the T3A sensor resistance to check it is normal, if abnormal, replace it
		Heat exchanger condition is not	Improve the heat exchanger condition and

		good (Cooling mode)	keep it is in good ventilation
		Outdoor fan motor running is abnormal (Cooling mode)	Check the fan motor and solve it
P6	Low pressure protection of system B	Heat exchanger condition is not good (Heating mode)	Improve the heat exchanger condition and keep it is in good ventilation
		Outdoor fan motor is abnormal (Heating mode)	Check the fan motor and solve it
		There are some air inside the circuit (Heating mode)	Make sure there is no air inside
		Leakage or lack of refrigerant	Check the leakage and recharge refrigerant
		Low pressure switch is error	Change low pressure switch
		Lack of water flow in AC side (Cooling mode)	Check inlet and outlet water temperature and adjust water flow
		Too much furring on the Shell and tube exchanger (Cooling mode)	Clean the furring
		Malfunction for low pressure switch connector on main PCB	Change the main PCB
P7	Medium pressure protection of system B	Leakage or lack of refrigerant	Check the leakage and recharge refrigerant
		Medium pressure switch is error	Change medium pressure switch
		Lack of water flow in AC side (Cooling mode)	Check inlet and outlet water temperature and adjust water flow
		Too much furring on the Shell and tube exchanger (Cooling mode)	Clean the furring
		Malfunction for medium pressure switch connector on main PCB	Change the main PCB
P8	High pressure protection or exhaust temperature too	Heat exchanger condition is not good (Cooling mode)	Improve the heat exchanger condition and keep it is in good ventilation
		Outdoor fan motor is abnormal	Check the fan motor and solve it

	high protection of system B	(Cooling mode)	
		There are some air inside the circuit (Cooling mode)	Make sure there is no air inside
		Ambient temperature is too high (Cooling mode)	Turn off the unit
		Too much refrigerant	Discharge some refrigerant
		The circuit is blocked	Check there is no block
		High pressure switch is error	Change high pressure switch
		Lack of water flow in AC side (Heating mode)	Check inlet and outlet water temperature and adjust water flow
		Too much furring on the Shell and tube exchanger (Heating mode)	Clean the furring
		Lack of water flow in hot water side (Heating water mode)	Check inlet and outlet water temperature and adjust water flow
		Too much furring on the Shell and tube exchanger (Heating water mode)	Clean the furring
		Leakage or lack of refrigerant	Check the leakage and recharge refrigerant
		Malfunction for high pressure switch connector on main PCB	Change the main PCB
P9	Over current protection of system B	Compressor is error	Check the compressor resistance is normal
		High voltage or low voltage, phase imbalance	Check voltage is in operation range
		Water pipe is dirty or blocked (Heating or heating water mode)	Clean water pipe and filter
		Lack of water (Heating or heating water mode)	Check water in water tank is enough
		Lack of water flow (Heating or	Check the water pipe design, the valve is

		heating water mode)	open or not
		Some air inside the water pipe (Heating or heating water mode)	Discharge the air
		The water pump is broken (Heating or heating water mode)	Check the water pump can work or damage
PA	High temperature protection of condenser B	Temperature sensor T3A sensor error	Measure the T3A sensor resistance to check it is normal, if abnormal ,replace it
		Heat exchanger condition is not good (Cooling mode)	Improve the heat exchanger condition and keep it is in good ventilation
		Outdoor fan motor running is abnormal (Cooling mode)	Check the fan motor and solve it
PC	Single module water outlet temperature too high protection or too low protection	Lack of water flow in AC side (Heating mode)	Check inlet and outlet water temperature and adjust water flow
		Lack of water flow in hot water side (Heating water mode)	Check inlet and outlet water temperature and adjust water flow
		Water is too dirty in AC side (Heating mode)	Clean water system and keep water clean
		Water is too dirty in hot water side (Heating water mode)	Clean water system and keep water clean
		T2 sensor error	Measure the sensor resistance, replace it if abnormal
		T2R sensor error	Measure the sensor resistance, replace it if abnormal
		Lack of water flow in AC side (Cooling mode)	Check inlet and outlet water temperature and adjust water flow
PF	High temperature protection for compressor	Over high air expelling pressure	
		High pressure switch error	Upon error have been confirmed place replace a new one

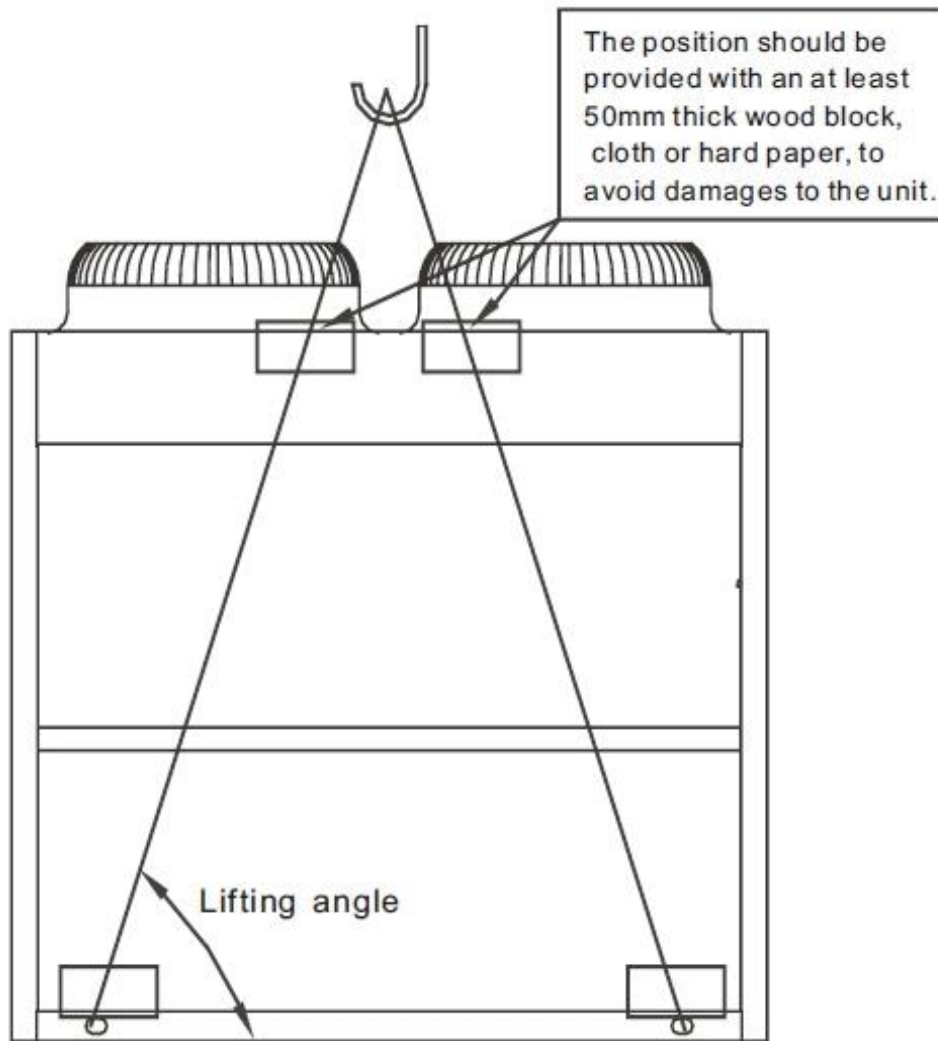
Part 3. Installation

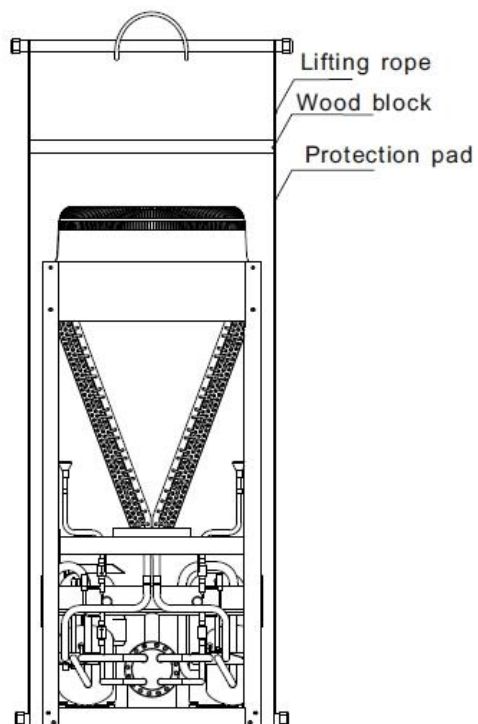
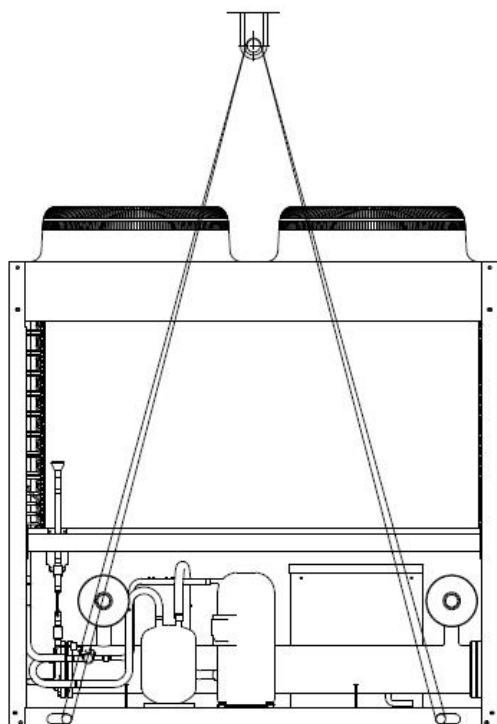
1. Transportation and Foundation Installation

1.1 Transportation

The angle of inclination should not be more than 15° when carrying the unit, to avoid over turn of the unit.

- 1.1.1 Rolling handling: several rolling rods of the same size are placed under the base of the unit, and the length of each rod must be more than the outer frame of the base and suitable for balancing of the unit.
- 1.1.2 Lifting: the strength lifting rope (belt) can bear should be 4 times the weight of the unit. Check the lifting hook and ensure that it is firmly attached to the unit, and the lifting angle should be more than 60°. To avoid damages to the unit, the contact position of the unit and lifting rope should be provided with an at least 50mm thick wood block, cloth or hard paper. Any person is not allowed to stand below the unit when lifting it.

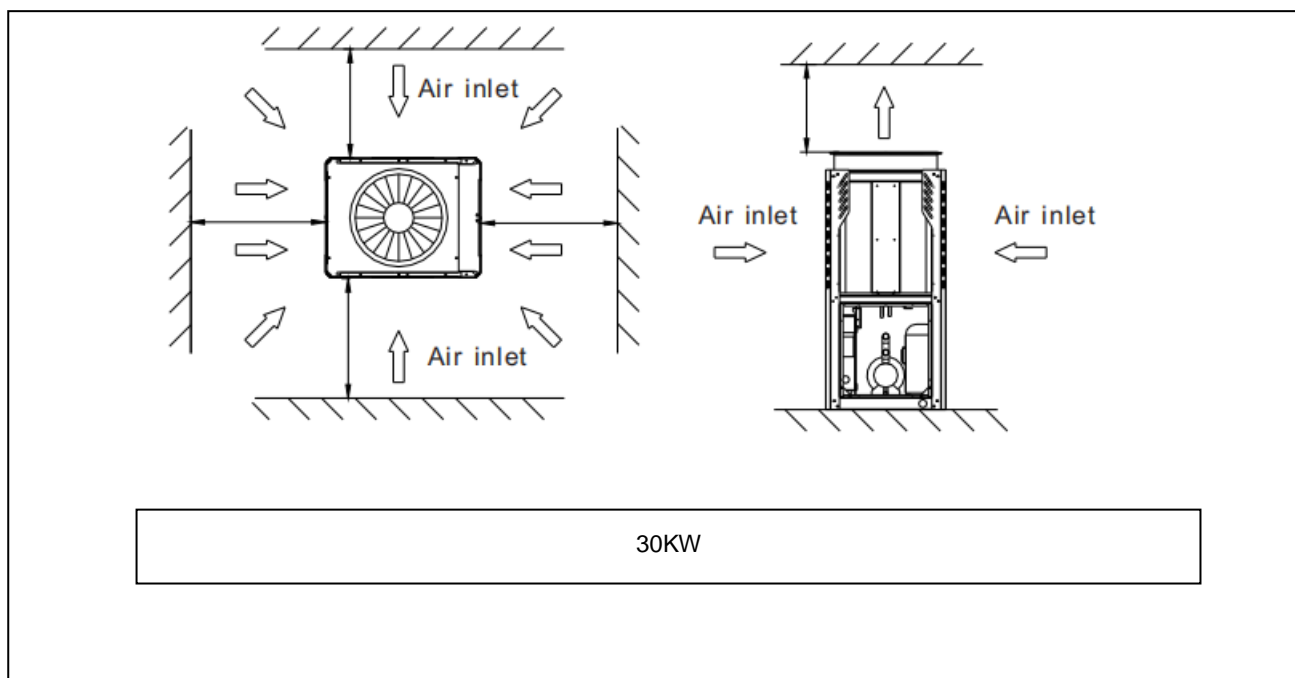


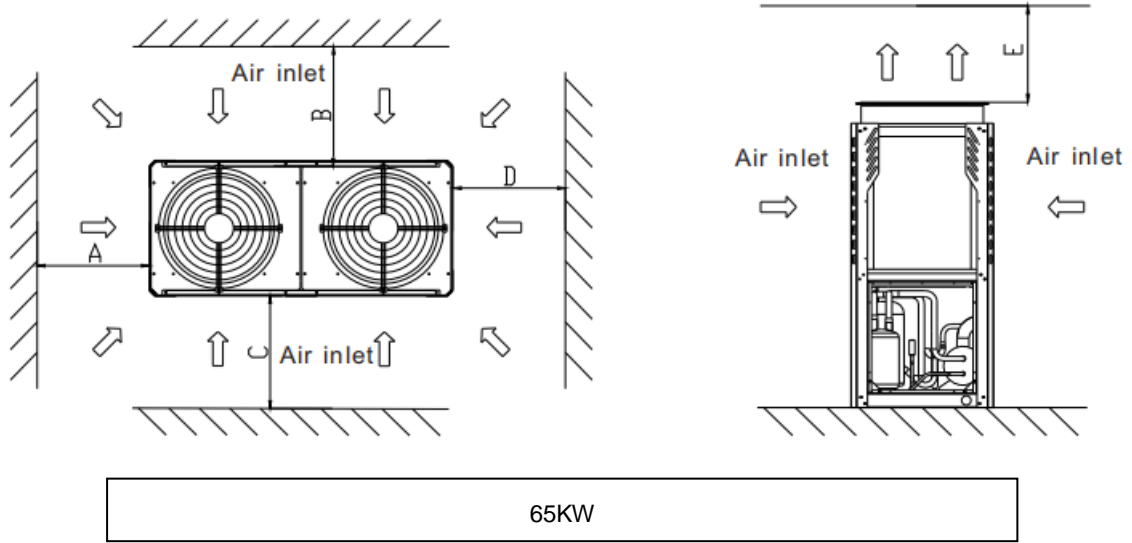


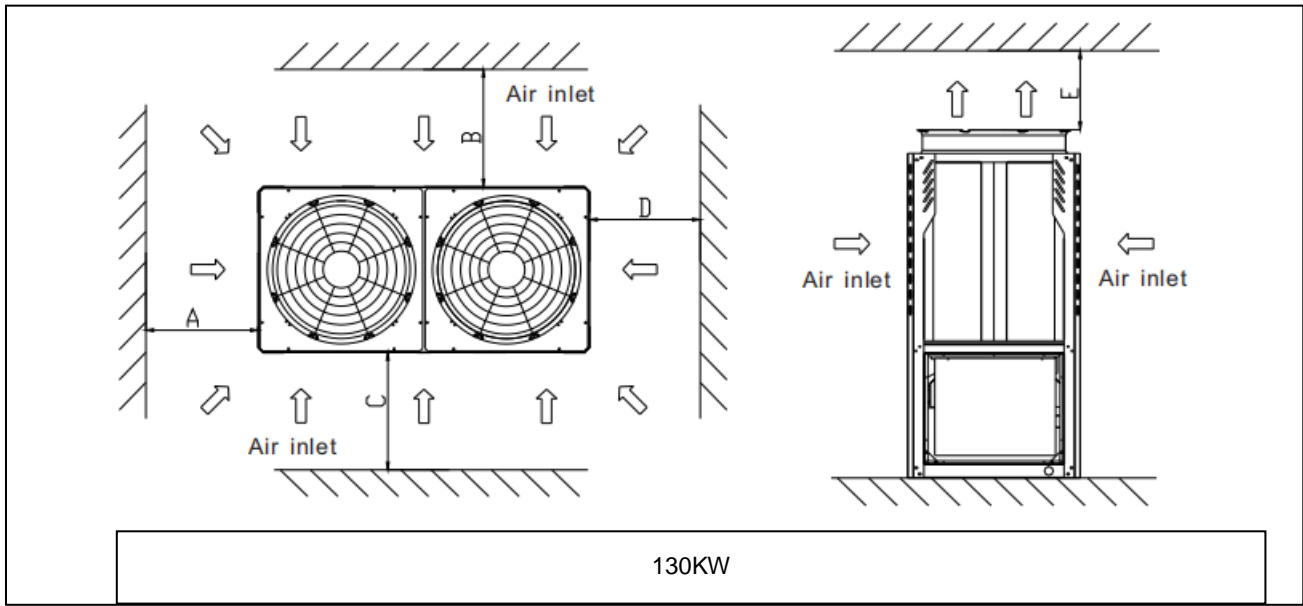
1.2 Installation space

1.2.1 Requirements of arrangement space of the unit

- 1) To ensure adequate airflow entering the condenser, the influence of descending airflow caused by the high-rise buildings around upon the unit should be taken into account when installing the unit.
- 2) If the unit is installed where the flowing speed of air is high, such as on the exposed roof, the measures including sunk fence and Persian blinds can be taken, to prevent the turbulent flow from disturbing the air entering the unit. If the unit needs to be provided with sunk fence, the height of the latter should not be more than that of the former; if Persian blinds are required, the total loss of static pressure should be less than the static pressure outside the fan. The space between the unit and sunk fence or Persian blinds should also meet the requirement of the minimum installation space of the unit.
- 3) If the unit needs to operate in winter, and the installation site may be covered by snow, the unit should be located higher than the snow surface, to ensure that air flows through the coils smoothly.







The recommend space parameter

Module	Installation space (mm)				
	A	B	C	D	E
30kW, 65kW, 130kW	≥1500	≥2000	≥2000	≥1500	≥8000

1.2.2 Space requirements for parallel installation of multiple modular units

To avoid back flow of the air in the condenser and operational faults of the unit, the parallel installation of multiple modular units can follow the direction A and D as shown in the figure above, the spaces between the unit and the obstacle are given in the figure above, and the space between adjacent modular units should not be less than 300mm; the installation can also follow the direction B and C as shown in the figure above, the spaces between the unit and the obstacle are given in the figure above, and the space between adjacent modular units should not be less than 600mm; the installation can also follow the direction combination of A and D, and B and C, the spaces between the unit and the obstacle are given in the figure above, the space between adjacent modular units in the direction A and D should not be less than 300mm, and the space between adjacent modular units in the direction B and C should not be less than 600mm.

If the spaces mentioned above cannot be met, the air passing from the unit to the coils may be restricted, or back flow of air discharge may occur, and the performance of the unit may be affected, or the unit may fail to operate.

1.3 Installation Foundation

The unit should be located on the horizontal foundation, the ground floor or the roof which can bear operating weight of the unit and the weight of maintenance personnel. Refer to the operating weight parameters in

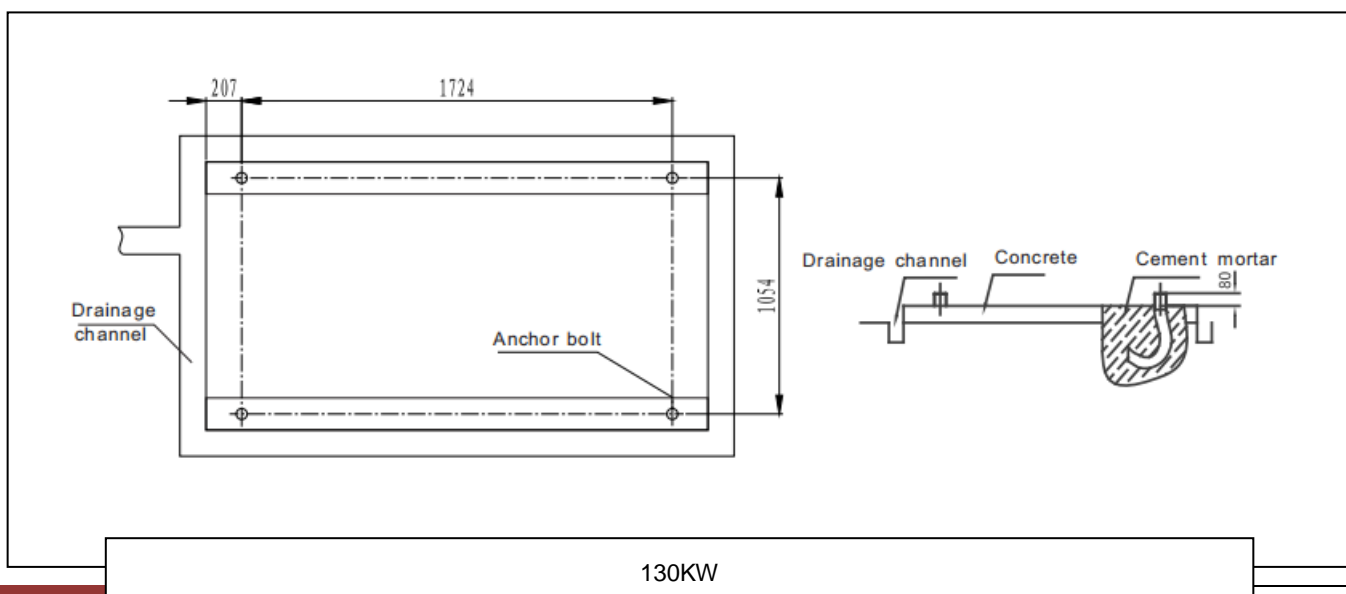
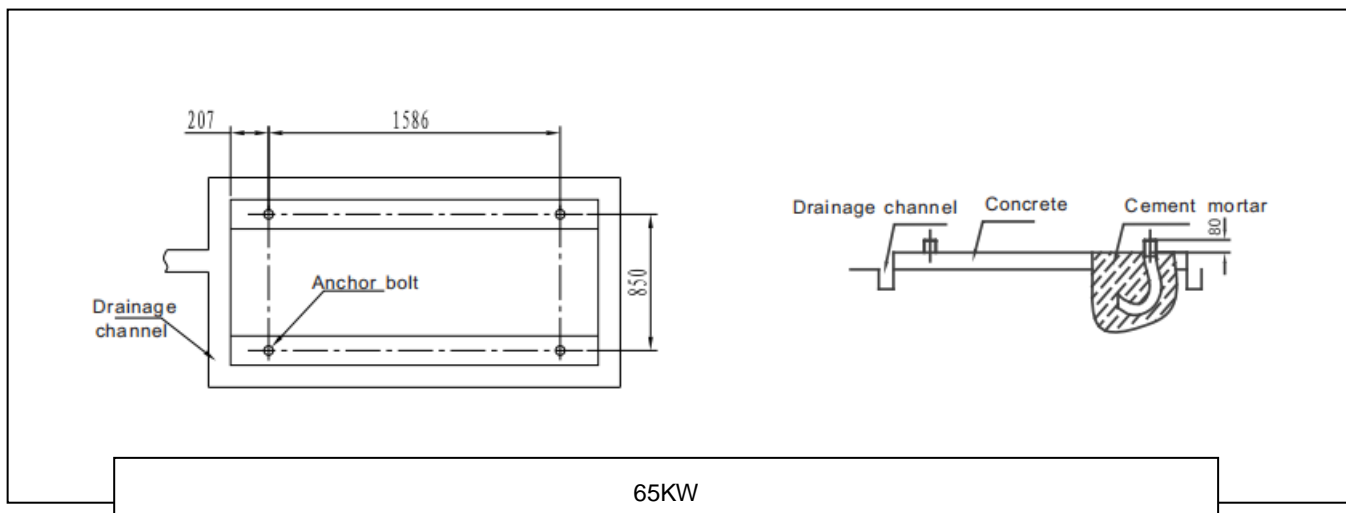
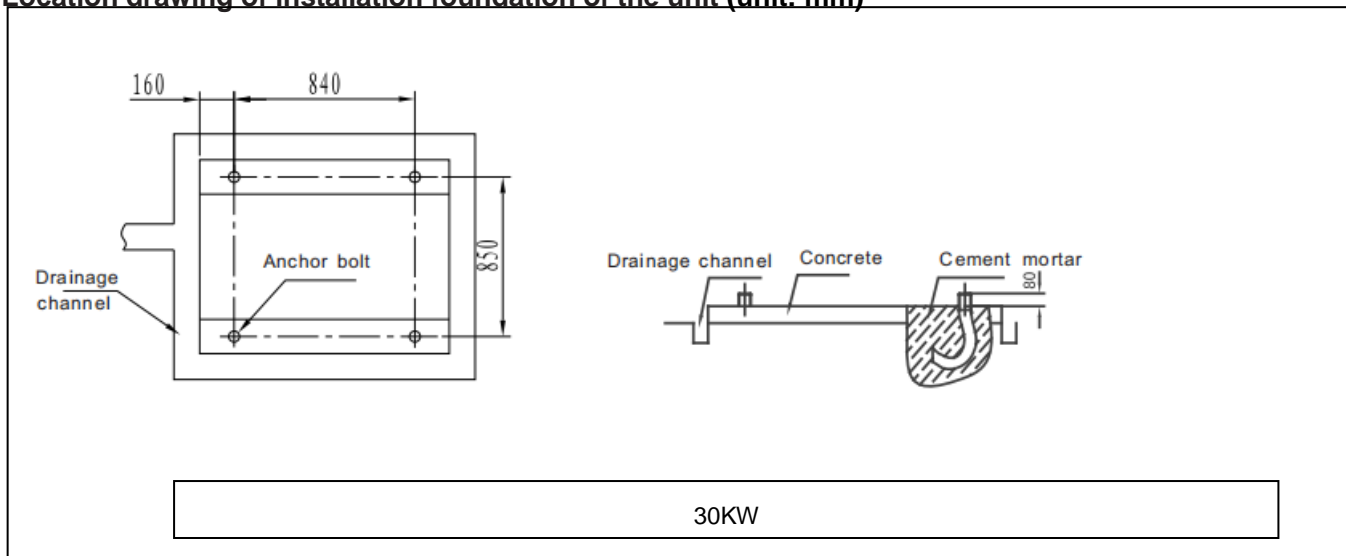
specification table.

If the unit is located so high that it is inconvenient for maintenance personnel to conduct maintenance, the suitable scaffold can be provided around the unit.

The scaffold must be able to bear the weight of maintenance personnel and maintenance facilities.

The bottom frame of the unit is not allowed to be embedded into the concrete of installation foundation.

Location drawing of installation foundation of the unit (unit: mm)



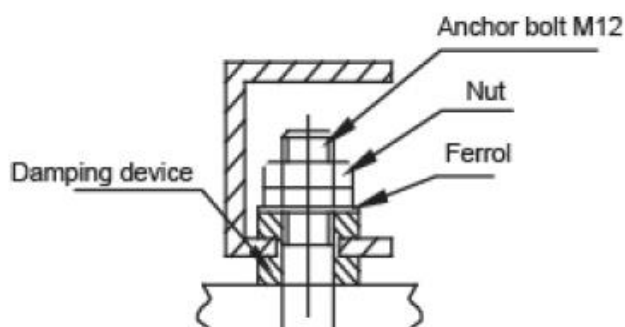
1.4 Installation of damping devices

Damping devices must be provided between the unit and its foundation.

By means of the $\Phi 15\text{mm}$ diameter installation holes on the steel frame of the unit base, the unit can be fastened on the foundation through the spring damper. See upper pictures (Schematic diagram of installation dimension of the unit) for details about center distance of the installation holes. The damper does not go with the unit, and the user can select the damper according to the relevant requirements. When the unit is installed on the high roof or the area sensitive to vibration, please consult the relevant persons before selecting the damper

Installation steps of the damper

Step	Content
1	Make sure that the flatness of the concrete foundation is within $\pm 3\text{mm}$, and then place the unit on the cushion block.
2	Raise the unit to the height suitable for installation of the damping device. Remove the clamp nuts of the damper.
3	Place the unit on the damper, and align the fixing bolt holes of the damper with the fixing holes on the unit base.
4	Return the clamp nuts of the damper to the fixing holes on the unit base, and tighten them into the damper.
5	Adjust the operational height of the damper base, and screw down the leveling bolts. Tighten the bolts by one circle to ensure equal height adjustment variance of the damper.
6	The lock bolts can be tightened after the correct operational height is reached.



2. Water System Installation

**Notice:**

- After the unit is in place, chilled water pipes can be laid.
- The relevant installation regulations should be abided with when conducting connection of water pipes.
- The pipelines should be free of any impurity, and all chilled water pipes must conform to local rules and regulations of pipeline engineering.

2.1 Basic requirements of connection of chilled water pipes

No.	Content
1	All chilled water pipelines should be thoroughly flushed, to be free of any impurity, before the unit is operated. Any impurity should not be flushed to or into the heat exchanger.
2	Water must enter the heat exchanger through the inlet; otherwise the performance of the unit will decline.
3	The inlet pipe of the evaporator must be provided with a target flow controller, to realize flow-break protection for the unit. Both ends of the target flow controller must be supplied with horizontal straight pipe sections whose diameter is 5 times that of the inlet pipe. The target flow controller must be installed in strict accordance with "Installation & Regulation Guide for Target Flow Controller". The wires of the target flow controller should be led to the electric cabinet through shielded cable. The working pressure of the target flow controller is 1.0MPa, and its interface is 1 inch in diameter. After the pipelines are installed, the target flow controller will be set properly according to the rated water flow of the unit.
4	The pump installed in the water pipeline system should be equipped with starter. The pump will directly press water into the heat exchanger of the water system.
5	The pipes and their ports must be independently supported but should not be supported on the unit.
6	The pipes and their ports of the heat exchanger should be easy to disassemble for operation and cleaning, as well as inspection of port pipes of the evaporator.
7	The evaporator should be provided with a filter with more than 40 meshes per inch at site. The filter should be installed near to the inlet port as much as possible, and be under heat preservation.
8	The by-pass pipes and by-pass valves as shown in the figure of "Connection drawing of pipeline system" must be mounted for the heat exchanger, to facilitate cleaning of the outside system of water passage before the unit is adjusted. During maintenance, the water passage of the heat exchanger can be cut off without disturbing other heat exchangers.
9	The flexible ports should be adopted between the interface of the heat exchanger and on-site pipeline, to reduce transfer of vibration to the building.
10	To facilitate maintenance, the inlet and outlet pipes should be provided with thermometer or manometer. The unit is not equipped with pressure and temperature instruments, so they need to be purchased by the user.
11	All low positions of the water system should be provided with drainage ports, to drain water in the evaporator and the system completely; and all high positions should be supplied with discharge valves, to facilitate expelling air from the pipeline. The discharge valves and drainage ports should not be under heat preservation, to facilitate maintenance.
12	All possible water pipes in the system to be chilled should be under heat preservation, including inlet pipes and flanges of the heat exchanger.
13	The outdoor chilled water pipelines should be wrapped with an auxiliary heating belt for heat preservation, and the material of the auxiliary heat belt should be PE, EDPM, etc., with thickness of 20mm, to prevent the pipelines from freezing and thus cracking under low temperature. The power supply of the heating belt should be equipped with an independent fuse.
14	When the ambient temperature is lower than 2°C, and the unit will be not used for a long time, water inside the unit should be drained. If the unit is not drained in winter, its power supply should not be cut off, and the fan coils in the

	water system must be provided with three-way valves, to ensure smooth circulation of the water system when the anti-freezing pump is started up in winter.
15	The common outlet pipelines of combined units should be provided with mixing water temperature sensor.



Warning:

For the water pipeline network including filters and heat exchangers, dreg or dirt may seriously damages the heat exchangers and water pipes.

The installation persons or the users must ensure the quality of chilled water, and de-icing salt mixtures and air should be excluded from the water system, since they may oxidize and corrode steel parts inside the heat exchanger.

2.2 Water Quality

Water quality control

When industrial water is used as chilled water, little furring may occur; however, well water or river water, used as chilled water, may cause much sediment, such as furring, sand, and so on. Therefore, well water or river water must be filtered and softened in softening water equipment before flowing into chilled water system. If sand and clay settle in the evaporator, circulation of chilled water may be blocked, and thus leading to freezing accidents; if hardness of chilled water is too high, furring may occur easily, and the devices may be corroded. Therefore, the quality of chilled water should be analyzed before being used, such as PH value, conductivity, concentration of chloride ion, concentration of sulfide ion, and so on.

Applicable standard of water quality for the unit

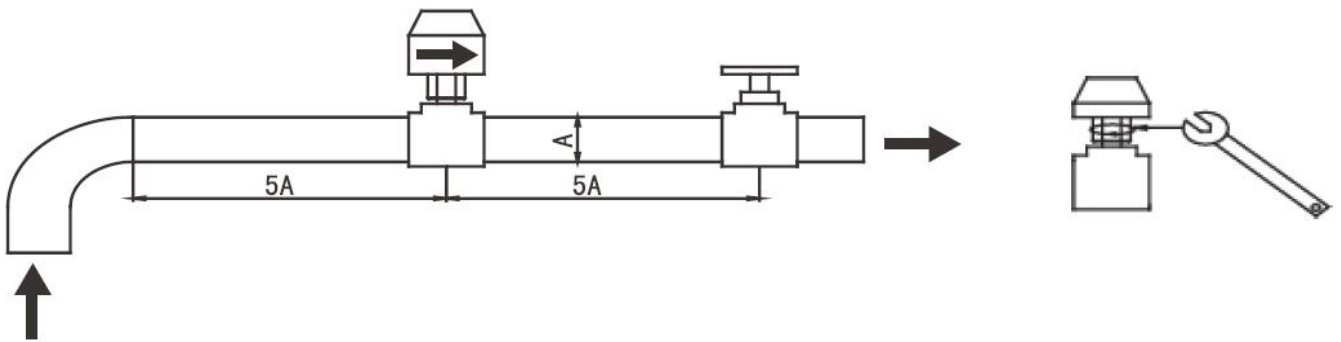
PH value	Total hardness	Conductivity	Sulfide ion	Chloride ion	Ammonia ion	Sulfate ion	Silicon	Iron content	Sodium ion	Calcium ion
7~8.5	<50ppm	<200µV/cm(25°C)	No	<50ppm	No	<50ppm	<30ppm	<0.3ppm	No requirement	<50ppm

2.3 Installation & regulation guide for target flow controller

- Please carefully check flow switches before conducting installation of the target flow controller. Packing should be in good condition, and the appearance should be free of damage and deformation. If any problem, please contact the manufacturer.
- Flow switches can be installed in the horizontal pipeline or the vertical pipeline with upward flowing direction but cannot be mounted in the pipeline with downward flowing direction. The inlet water of gravity should be taken into account when flow switches are installed in the pipeline with upward flowing direction.
- Target flow controller must be installed on a section of straight-line pipeline, and it's both ends must be supplied with straight-line pipes whose length is at least 5 times diameter of the pipe. In the meanwhile, the fluid flowing direction in the pipeline must be consistent with the direction of arrow on the controller. The connection terminal should be located where wiring connection can be easily done.

- Pay attention to the following items when conducting installation and wire connection:
 - ◆ Collision of the wrench with the soleplate of the flow switch is prohibited, since such collision may cause deformation and failure of the flow switch.
 - ◆ To avoid electric shock and damages to the devices, the power supply should be cut off, when wires are connected or adjustment is done.
 - ◆ When wiring connection is conducted, adjustment of other screws except connection terminals of micro switches and ground screws is prohibited. In the meanwhile, over great force should not applied when wires of micro switches are connected, otherwise micro switches may suffer displacement, thus leading to failure of flow switches.
 - ◆ Special grounding screws should be used for earth connection. Bolts should not be installed or removed at will; otherwise flow switches may suffer deformation and failure.
 - ◆ Flow switches have been set at minimal flow value before leaving the factory. They should not be adjusted below the setting value at the factory, or they may suffer failure. After installing flow switches, please press the flow switch lever several times to check them. When the lever is found not to respond with “clatter”, rotate the screw in a clockwise direction, until “clatter” occurs.
 - ◆ Be sure to determine the model of target slice according to the rated flow of the unit, the diameter of the outlet pipe and the adjustment range of the target slice of the flow switch. Besides, the target slice should not contact with other restrictors in the pipeline or on the inner wall of the pipeline, or the flow switch cannot be reset normally.
- Determine whether the flow switch and the system connected with it are in good operation according to the measured value by flow meter, namely, when the measured value on flow meter is less than 60% of rated water flow of the unit, the target flow controller should be cut off and observed for 3 working periods, and it should be covered with flow switch shell timely.

Schematic diagram of target flow controller



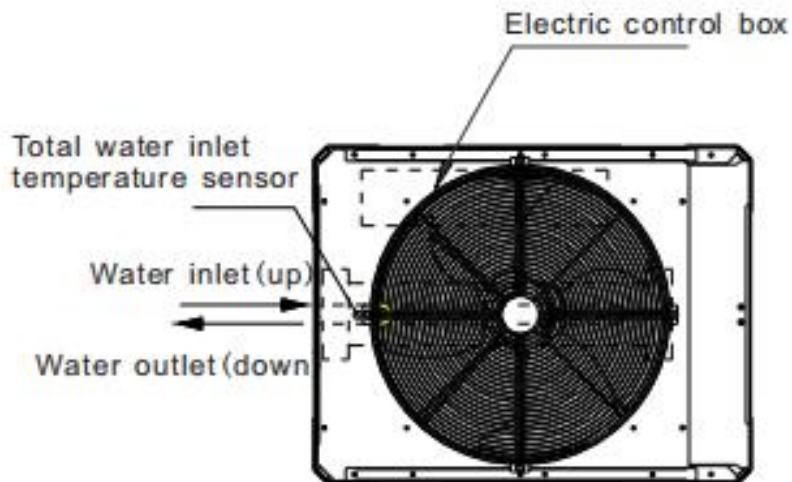
3. Installation of water system pipeline

The total outlet water pipe diameter after combined as below table:

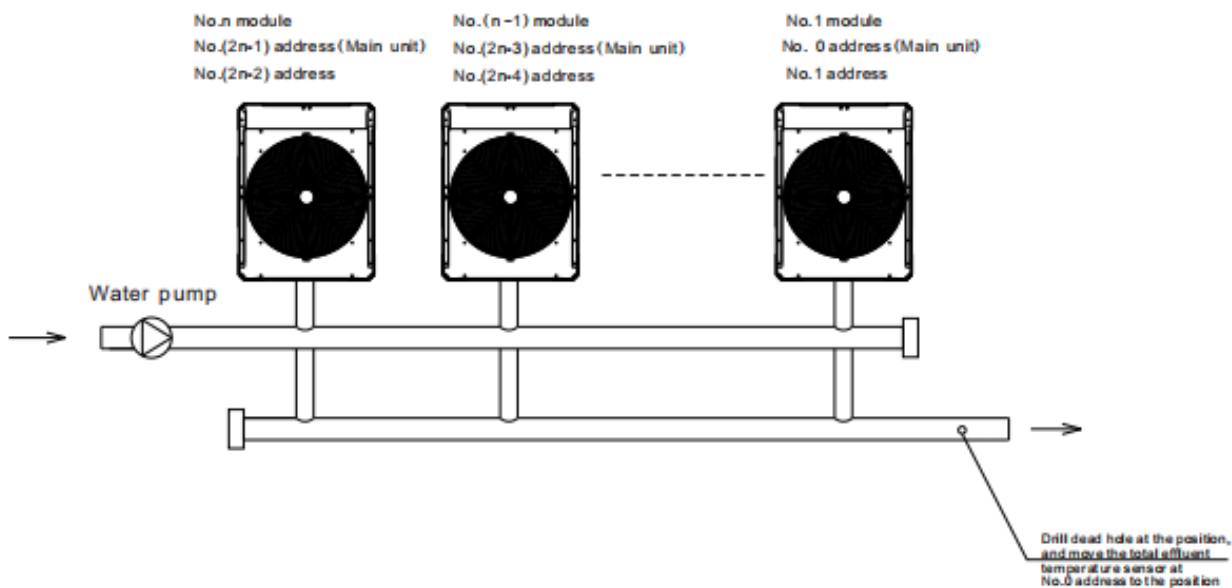
Total cooling capacity (Unit model x quantity)kW	Total inlet and outlet water pipe diameters (nominal diameter)	Total cooling capacity (Unit model x quantity)kW	Total inlet and outlet water pipe diameters (nominal diameter)	
(30×1=) 30	DN40	(130×6=) 780	DN150	
(65×1=) 65		(130×7=) 910		
(130×1=) 130	DN65	(65×11=) 715		
(30×2=) 60		(65×12=) 780		
(65×2=) 130		(65×13=) 845		
(30×3=) 90		(65×14=) 910		
(30×4=) 120		(30×23=) 690		
(30×5=) 150		(30×24=) 720		
(65×3=) 195		(30×25=) 750		
(30×6=) 180	DN80	(30×26=) 780		
(30×7=) 210		(30×27=) 810		
(130×2=) 260		(30×28=) 840		
(130×3=) 390	DN100	(30×29=) 870		DN200
(65×4=) 260		(30×30=) 900		
(65×5=) 325		(130×8=) 1040		
(65×6=) 390		(130×9=) 1170		
(30×8=) 240		(130×10=) 1300		
(30×9=) 270		(130×11=) 1430		
(30×10=) 300		(65×15=) 975		
(30×11=) 330		(65×16=) 1040		
(30×12=) 360		(65×17=) 1105		
(30×13=) 390		(65×18=) 1170		
(130×4=) 520		(65×19=) 1235		
(130×5=) 650		(65×20=) 1300		
(65×7=) 455		(65×21=) 1365		
(130×4=) 520		(65×22=) 1430		
(130×5=) 650	(30×31=) 930			
(65×7=) 455	(30×32=) 960			
(65×8=) 520	(130×12=) 1560	DN250		
(65×9=) 585	(130×13=) 1690			
(65×10=) 650	(130×14=) 1820			
(30×14=) 420	(65×23=) 1495			
(30×15=) 450	(65×24=) 1560			
(30×16=) 480	(65×25=) 1625			
(30×17=) 510	(65×26=) 1690			
(30×18=) 540	(65×27=) 1755			
(30×19=) 570	(65×28=) 1820			
(30×20=) 600	(130×15=) 1950			
(30×21=) 630	(130×16=) 2080	DN300		
(30×22=) 660	(65×29=) 1885			
	(65×30=) 1950			
	(65×31=) 2015			
		(65×32=) 2080		

3.1 30kw

Installation of single-module water system pipeline

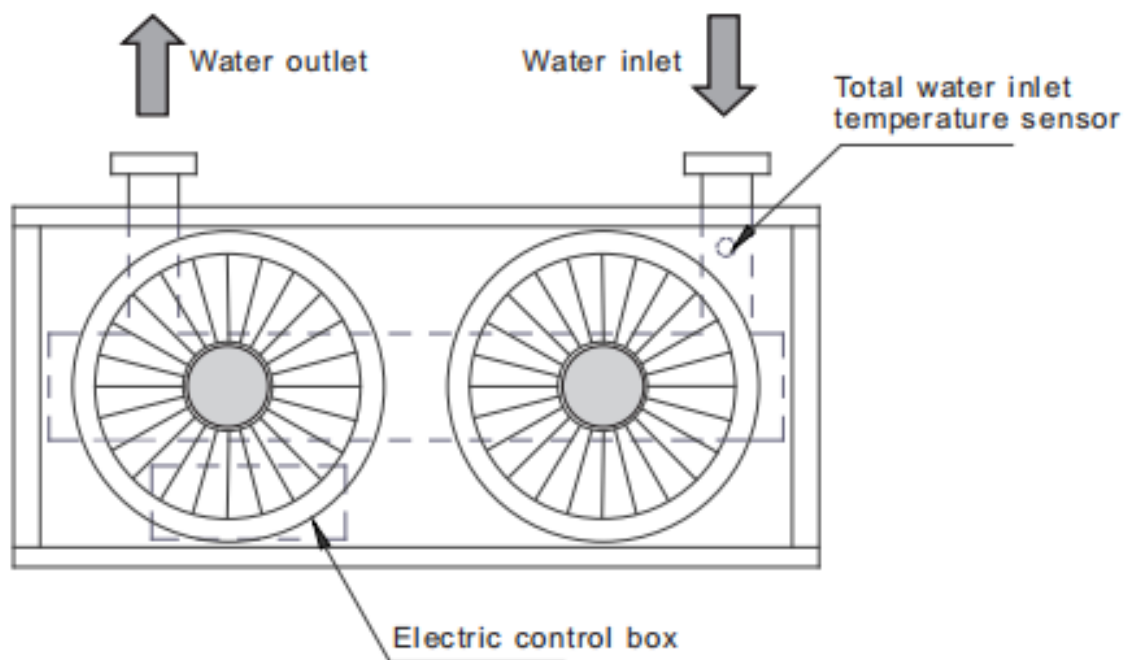


Installation of multi-module water system pipeline



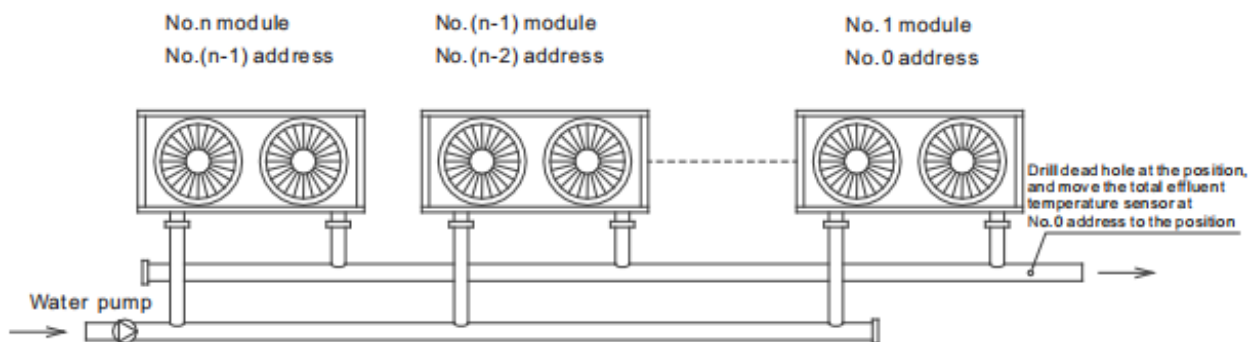
3.2 65kw

Installation of single-module water system pipeline



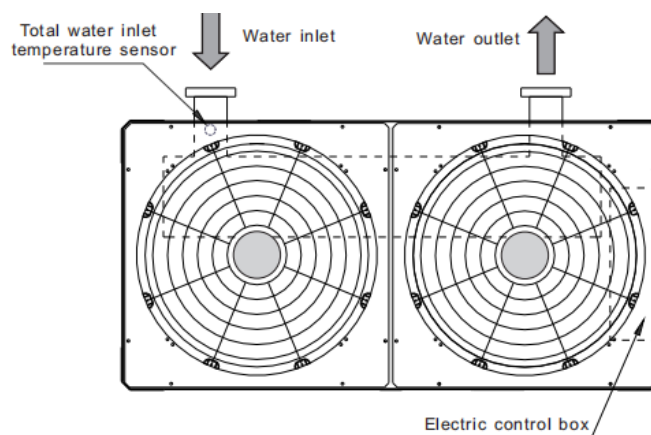
Installation of multi-module water system pipeline

3.2.1 Installation mode I (recommended installation mode)



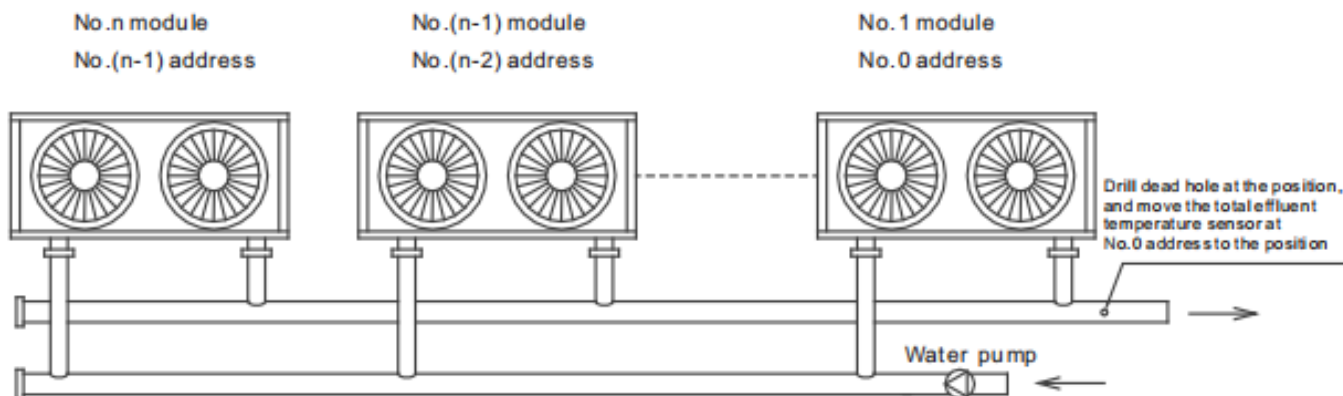
3.3 130kw

Installation of single-module water system pipeline



Installation of multi-module water system pipeline

3.3.1 Installation mode I (recommended installation mode)



**Notices:**

- For installation of multi-module, please drill a dead hole($\Phi 9\text{mm}$) at the total water outlet pipeline, and move the total water effluent temperature sensor at No.0 address to the hole.

Please pay attention to the following items when installing multiple modules:

- Each module corresponds to an address code which cannot be repeated.
- Main water outlet temperature sensing bulb, target flow controller and auxiliary electric heater are under control of the main module.
- One wired controller and one target flow controller are required and connected on the main module.
- The unit can be started up through the wired controller only after all addresses are set and the aforementioned items are determined. The wired controller is $\leq 50\text{m}$ away from the outdoor unit.

4. Wiring Installation

All wiring installation should be done by qualified person.

4.1 Precautions:

- The air-conditioner should apply special power supply, whose voltage should conform to rated voltage.
- Wiring construction must be conducted by the professional technicians according to the labeling on the circuit diagram.
- Only use the electric components specified by our company, and require installation and technical services from the manufacturer or authorized dealer. If wiring connection fails to conform to electric installation norm, failure of the controller, electronic shock, and so on may be caused.
- The connected fixed wires must be equipped with full switching-off devices with at least 3mm contact separation.
- Set leakage protective devices according to the requirements of national technical standard about electric equipment.
- After completing all wiring construction, conduct careful check before connecting the power supply.
- Please carefully read the labels on the electric cabinet.
- The user's attempt to repair the controller is prohibited, since improper repair may cause electric shock, damages to the controller, and so on. If the user has any requirement of repair, please contact the maintenance center.

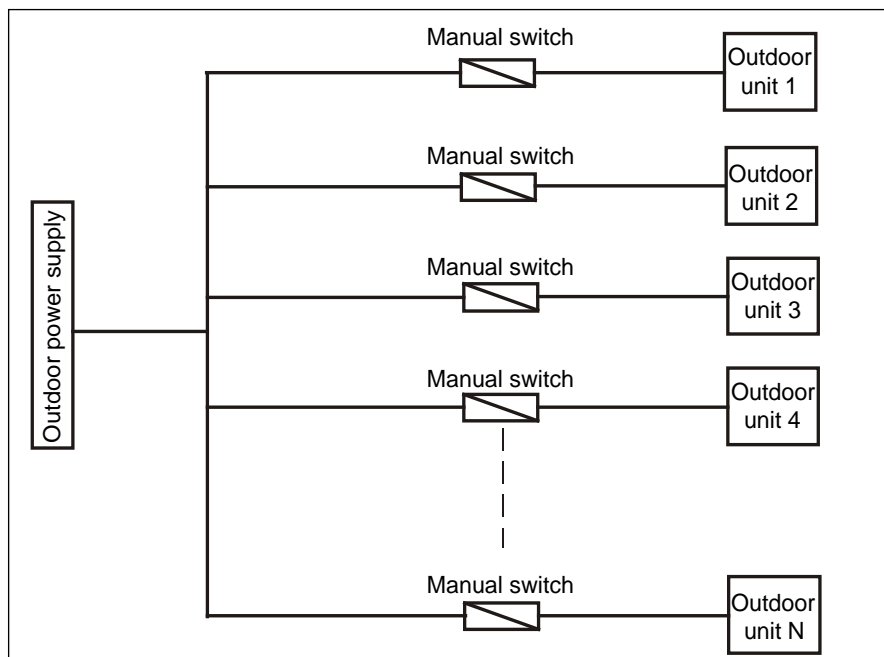
4.2 Requirements of Wiring Connection

- No additional control components are required in the electric cabinet (such as relay, and so on), and the power supply and control wires not connected with the electric cabinet are not allowed to go through the electric box. Otherwise, electromagnetic interference may cause failure of the unit and control components and even damages to them, which thus lead to protective failure.
- All cables led to the electric box should be supported independently but by the electric box.
- The strong current wires generally pass the electric box, and 220-240V alternating current may also pass the control board, so wiring connection should conform to the principle of separation of strong current and weak current, and the wires of power supply should be kept more than 100 mm away from the control wires.
- Only use rated power supply for the unit, and the maximum allowable range of voltage is 380V~415V.
- All electric wires must conform to local wiring connection norm. The suitable cables should be connected to power supply terminal through wiring connection holes at the bottom of the electric cabinet. According to Chinese standard, the user is responsible for providing voltage and current protection for the input power supply of the unit.

- All power supplies connected to the unit must pass one manual switch, to ensure that the voltages on all nodes of electric circuit of the unit are released when the switch is cut off.
- The cables of correct specification must be used to supply power for the unit. The unit should use independent power supply, and the unit is not allowed to use the same power supply together with other electric devices, to avoid over-load danger. The fuse or manual switch of the power supply should be compatible with working voltage and current of the unit. In case of parallel connection of multiple modules, the requirements of wiring connection mode and configuration parameters for the unit are shown in the following figure.
- Some connection ports in the electric box are switch signals, for which the user needs to provide power, and the rated voltage of the power should be 380-415VAC. The user must be aware that all power supplies they provided should be obtained through power circuit breakers (provided by the user), to ensure that all voltages on the nodes of the provided power supply circuit are released when the circuit breakers are cut off.
- All inductive components provided by the user (such as coils of contactor, relay, and so on) must be suppressed with standard resistance-capacitance suppressors, to avoid electromagnetic interference, thus leading to failure of the unit and its controller and even damages to them.
- All weak current wires led to the electric box must apply shielded wires, which must be provided with grounding wires. The shield wires and power supply wires should be laid separately, to avoid

electromagnetic interference.

- The unit with which are connected grounding pipelines, lightning
Improper may cause please earth unit is firm



must be provided grounding wires, not allowed to be with the wires of gas fuel water pipelines, conductors or telephones. earth connection electric shock, so check whether connection of the or not frequently.

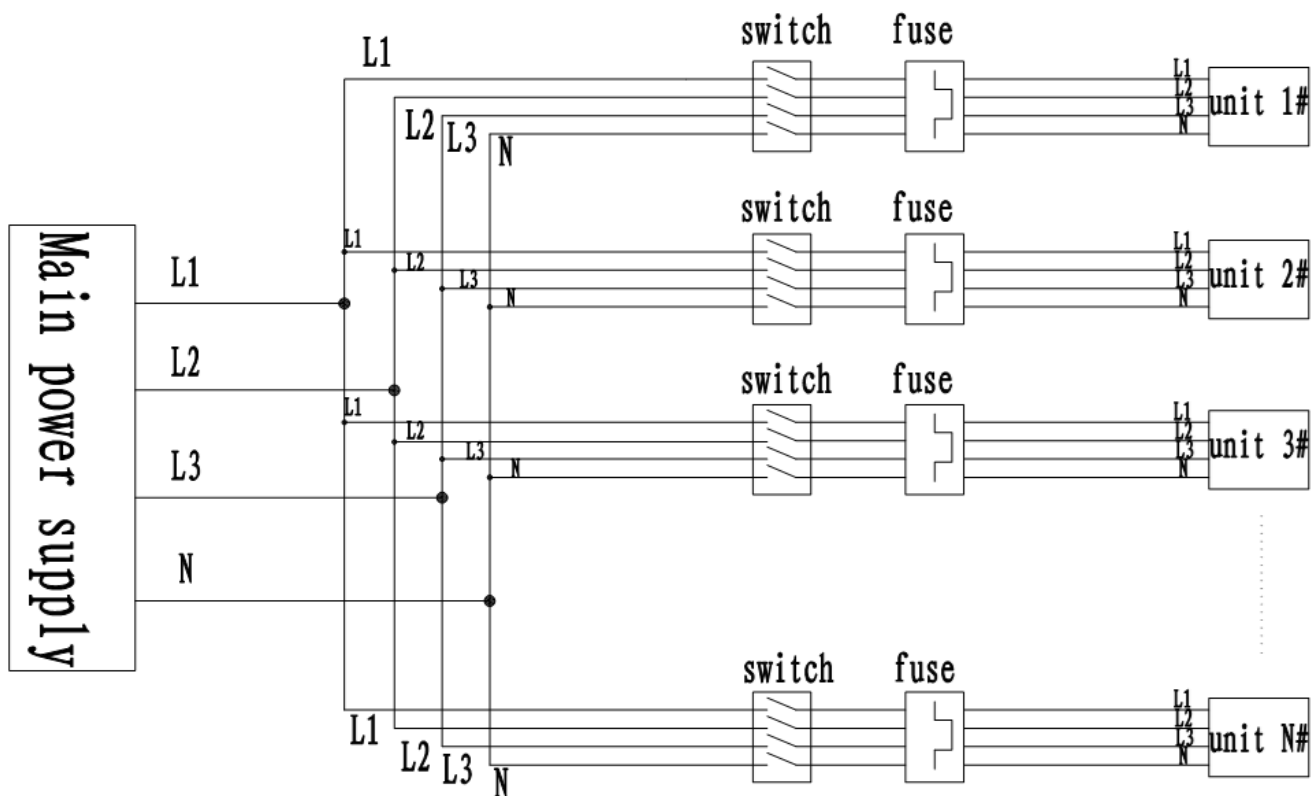
**Notes:**

- CLS-F30HW/ZR1B module only 32 modular units can be combined at most.
- CLS-F65HW/ZR1B module only 32 modular units can be combined at most.
- CLS-F130HW/ZR1B module only 16 modular units can be combined at most.

4.3 Wiring Steps

Step	Content
1	Check the unit and ensure that it is connected with grounding wires correctly, to avoid leakage, and the grounding devices should be mounted in strict accordance with the requirements of electrical engineering rules. The grounding wires can prevent electric shock.
2	The control box of the main power switch must be mounted in a proper position.
3	Wiring connection holes of the main power should be provided with glue cushion.
4	The main power and neutral wires and grounding wires of power supply are led into the electric box of the unit.
5	The wires of the main power must pass the bonding clamp.
6	Wires should be connected firmly to the connection terminals L1, L2, L3, N.
7	Phase sequences must be consistent when the wires of the main power.
8	The main power should be located out of easy reach of non-professional maintenance personnel, to avoid mal-operation and improve safety.

4.4 Field wiring



5. Trial Operation

5.1 Points for Attention Prior to Trial Run

After the water system pipeline is flushed several times, please make sure that the purity of water meets the requirements; the system is re-filled with water and drained, and the pump is started up, and then make sure that water flow and the pressure at the outlet meet the requirements.

The unit is connected to the main power 12 hours before being started up, to supply power to the heating belt and pre-heat the compressor. Inadequate pre-heating may cause damages to the compressor.

Set up the wired controller. See details of the manual concerning setting contents of the controller, including such basic settings as refrigerating and heating mode, manual adjustment and automatic adjustment mode and pump mode. Under normal circumstances, the parameters are set around standard operating conditions for trial run, and extreme working conditions should be prevented as much as possible.

Carefully adjust the target flow controller on the water system or the inlet stop valve of the unit, to make the water flow of the system be 90% of the water flow specified as below Table.

5.2 Check Items Table After Installation

Checking Items	Description	Yes	No
Whether Installing Site Is Meet for Requirement	Units are fixed mounting on level base.		
	Ventilating space for heat exchanger at the air side is meeting for requirement.		
	Maintenance space is meeting for requirement.		
	Noise and vibration is meeting for requirement.		
	Sun radiation and rain for snow proof measures are meeting for requirement.		
	External physical is meeting for requirement.		
Whether Water System Is Meeting for Requirements	Pipe diameter is meeting for requirement.		
	The length of system is meeting for requirement.		
	Water discharge is meeting for requirement.		
	Water quality control is meeting for requirement.		
	Flexible tube's interface is meeting for requirement.		
	Pressure control is meeting for requirement.		
	Terminal insulation is meeting for requirement.		
	Wire capacity is meeting for requirement.		
	Switch capacity is meeting for requirement.		
	Fuse capacity is meeting for requirement.		
	Voltage and frequency are meeting for requirement.		
Whether Electrical Wiring System Is Meeting for Requirement.	Connecting tightly between wires.		
	Operation control device is meeting for requirement.		
	Safety device is meeting for requirement.		
	Chained control is meeting for requirement.		
	Phase sequence of power supply is meeting for requirement.		

5.3 Trial Operation

- Start up the controller and check whether the unit displays a fault code. If a fault occurs, remove the fault first, and start the unit according to the operating method in the “unit control instruction”, after determining that there is no fault existing in the unit.
- Conduct trial run for 30 min. When the influent and effluent temperature becomes stabilized, adjust the water flow to nominal value, to ensure normal operation of the unit.
- After the unit is shut down, it should be put into operation 10 min later, to avoid frequent start-up of the unit. In the end, check whether the unit meets the requirements according to the contents in upper table.

 **CAUTION**

- The unit can control start-up and shut-down of the unit, so when the water system is flushed, the operation of the pump should not be controlled by the unit.
- Do not start up the unit before draining the water system completely.
- The target flow controller must be installed correctly. The wires of the target flow controller must be connected according to electric control schematic diagram, or the faults caused by water breaking while the unit is in operation should be the user’s responsibility.
- Do not re-start the unit within 10 min after the unit is shut down during trial run.
- When the unit is used frequently, do not cut off the power supply after the unit is shut down; otherwise the compressor cannot be heated, thus leading to its damages.
- If the unit is not in service for a long time, and the power supply needs to be cut off, the unit should be connected to the power supply 12 hours prior to re-starting of the unit, to pre-heat the compressor.

Trail run and operation data

Temperature

The table below contains the measurable temperatures.

Measurement	Value
Inlet water temperature	Standard cooling :9~25°C Standard heating:26~46°C
Outdoor temperature	Standard cooling:15~48°C Standard heating:-15~30 °C

Voltage Current

The table below contains the measurable voltage.

Measurement	Value
Power supply voltage	Within ±10% of the rated voltage.

Phase imbalance	Within $\pm 2\%$ of the rated voltage.
Control circuit voltage	380V AC for main electromagnetic switches,

Current The table below contains the currents and fuses.

Unit	Maximum current(A)	Fuse
30kW	30A	60
65kW	51A	100
130kW	106A	205

Part 4. Maintenance

1. For Maintenance

1.1 Maintenance for main components:

Close attention should be paid to the discharge and suction pressure during the running process. Find out reasons and eliminate the failure if abnormality is found.

Control and protect the equipment. See to it that no random adjustment be made on the set points on site.

Regularly check whether the electric connection is loose, and whether there is bad contact at the contact point caused by oxidation and debris etc., and take timely measures if necessary. Frequently check the work voltage, current and phase balance.

Check the reliability of the electric elements in time. Ineffective and unreliable elements should be replaced in time.

1.2 Water quality inspection and dirt remove

According to the local water quality, please inspect the water regularly. We recommended you to respect it a half year a time and change the circulate water two years a time.

After long-time operation, calcium oxide or other minerals will be settled in the heat transfer surface of the water-side heat exchanger. These substances will affect the heat transfer performance when there is too much scale in the heat transfer surface and sequentially cause that electricity consumption increases and the discharge pressure is too high (or suction pressure too low). Organic acids such as formic acid, citric acid and acetic acid may be used to clean the scale. But in no way should cleaning agent containing chlorine acid or fluoride should be used as the water-side heat exchange is made from stainless steel and is easy to be eroded to cause refrigerant leakage. Pay attention to the following aspects during the cleaning and scale-removing process:

- Water-side heat exchanger should be done by professionals.
- Clean the pipe and heat exchanger with clean water after cleaning agent is used. Conduct water treatment to prevent water system from being eroded or re-absorption of scale.
- In case of using cleaning agent, adjust the density of the agent, cleaning time and temperature according to the scale settlement condition.
- After pickling is completed, neutralization treatment needs to be done on the waste liquid. Contact relevant company for treating the treated waste liquid.
- Protection equipments (such as goggles, gloves, mask and shoes) must be used during the cleaning

process to avoid breathing in or contacting the agent as the cleaning agent and neutralization agent is corrosive to eyes, skins and nasal mucosa.

1.3 Winter shutdown

For shutdown in winter, the surface of the unit outside and inside should be cleaned and dried. Cover the unit to prevent dust. Open discharge water valve to discharge the stored water in the clean water system to prevent freezing accident (it is preferable to inject antifreeze in the pipe).

1.4 Replacing parts

Parts to be replaced should be the ones provided by our company. Never replace any part with different part.

First startup after shutdown

The following preparations should be made for re-startup of unit after long-time shutdown:

- Thoroughly check and clean the unit.
- Clean water pipe system.
- Check pump, control valve and other equipments of water pipe system.
- Fix connections of all wires.
- It is a must to electrify the machine before startup.

1.5 Refrigeration system

Determine whether refrigerant is needed by checking the value of suction and discharge pressure and check whether there is a leakage. Air tight test must be made if there is a leakage, or part of refrigerating system is replaced. Take different measures in the following two different conditions from refrigerant injection.

1.5.1 Total leakage of refrigerant. In case of such situation, leakage detection must be made on the pressurized nitrogen used for the system. If repair welding is needed, welding cannot be made until all the gas in the system is discharged. Before injecting refrigerant, the whole refrigeration system must be completely dry and of vacuum pumping.

- Total leakage of refrigerant. In case of such situation, leakage detection must be made on the pressurized nitrogen used for the system. If repair welding is needed, welding cannot be made until all the gas in the system is discharged. Before injecting refrigerant, the whole refrigeration system must be completely dry and of vacuum pumping.
- Remove air from the system pipe with vacuum pump. The vacuum pumping lasts for above 3 hours. Confirm that the indication pressure in dial gauge is within the specified scope.
- When the degree of vacuum is reached, inject refrigerant into the refrigeration system with refrigerant bottle. Appropriate amount of refrigerant for injection has been indicated on the nameplate and the table of main technical parameters. Refrigerant must be injected from the low pressure side of system.
- The injection amount of refrigerant will be affected by the ambient temperature. If the required amount has not been reached but no more injection can be done, make the chilled water circulate and start up the unit for injection. Make the low pressure switch temporarily short circuit if necessary.

1.5.2 Refrigerant supplement. Connect refrigerant injection bottle on the fluoride nozzle at low-pressure side and connect pressure gauge at low pressure side.

- Make chilled water circulate and start up unit, and make the low pressure control switch short circuit if necessary.

- Inject refrigerant slowly into the system and check suction and discharge pressure.

 **CAUTION**

- Connection must be renewed after injection is completed.
- Never inject oxygen, acetylene or other flammable or poisonous gas to the refrigeration system at leakage detection and air tight test. Only pressurized nitrogen or refrigerant can be used.

1.6 Disassembling compressor

Follow the following procedures if compressor needs to be disassembled:

- Cut off the power supply of unit.
- Remove power source connection wire of compressor.
- Remove suction and discharge pipes of compressor.
- Remove fastening screw of compressor.
- Move the compressor.

1.7 Auxiliary electric heater

When the ambient temperature is lower than 2°C, the heating efficiency decreases with the decline of the outdoor temperature. In order to make the air-cooled heat pump stably run in a relatively cold region and supplement some heat lost due to de-frosting. When the lowest ambient temperature in the user's region in winter is within 0°C~10°C, the user may consider using auxiliary electric heater. Please refer to relevant professionals for the power of auxiliary electric heater.

1.8 System anti-freezing

In case of freezing at the water-side heat exchanger interval channel, severe damage may be caused, i.e. heat exchange may be broken and appears leakage. This damage of frost crack is not within the warranty scope, so attention must be paid to anti-freezing.

1.8.1 If the unit that is shut down for standby is placed in an environment where the outdoor temperature is lower than 0°C, the water in the water system should be drained.

1.8.2 Water pipe may be frozen when the chilled water target flow controller and anti-freezing temperature sensor become ineffective at running, therefore, the target flow controller must be connected in accordance with the connection diagram.

1.8.3 Frost crack may happen to water-side heat exchanger at maintenance when refrigerant is injected to the unit or is discharged for repair. Pipe freezing is likely to happen any time when the pressure of refrigerant is below 0.4Mpa. Therefore, the water in the heat exchanger must be kept flowing or be thoroughly discharged.

2. Periodical check

Electrical checks

Inspection checks and actions	Remark
Check that all electrical wiring is properly connected and securely tightened.	/
Check the electrical components for damage or loss.	/
Check if the power supply corresponds with the identification label of the unit.	/
Check the operation of the circuit breaker and the earth leak detector of the local supply panel.	/
Check the operation of the safety devices.	No operation can cause damage of the unit.

Refrigerant checks

Inspection checks and actions	Remark
Check the refrigerant system. If the unit leaks, please contact your supplier.	/

Water checks

Inspection checks and actions	Remark
Check the water condition. Drain the water from the air release plug. If the water is dirty, please replace all water in the system.	Dirty water causes a cooling capacity drop as well as corrosion of the water heat exchanger and pipe.
Check the water connection.	/
Check the water velocity.	/
Check the function of the flow switch.	The evaporator probably freezes up if the flow switch cannot operate.
Make sure that there is no air mixed in water pipes.	Even if air is removed at the beginning, sometimes air can enter later.
Check the water filter.	If dirty and is stopped.

Noise checks

Inspection checks and actions	Remark
Check for any abnormal noise. Locate the noise producing section and search the cause.	If the cause of the noise cannot be located, contact your supplier.

Part 5. Wired Controller

INTRODUCTION OF WIRE CONTROLLER

I: Overview

Basic operating conditions of wired controller

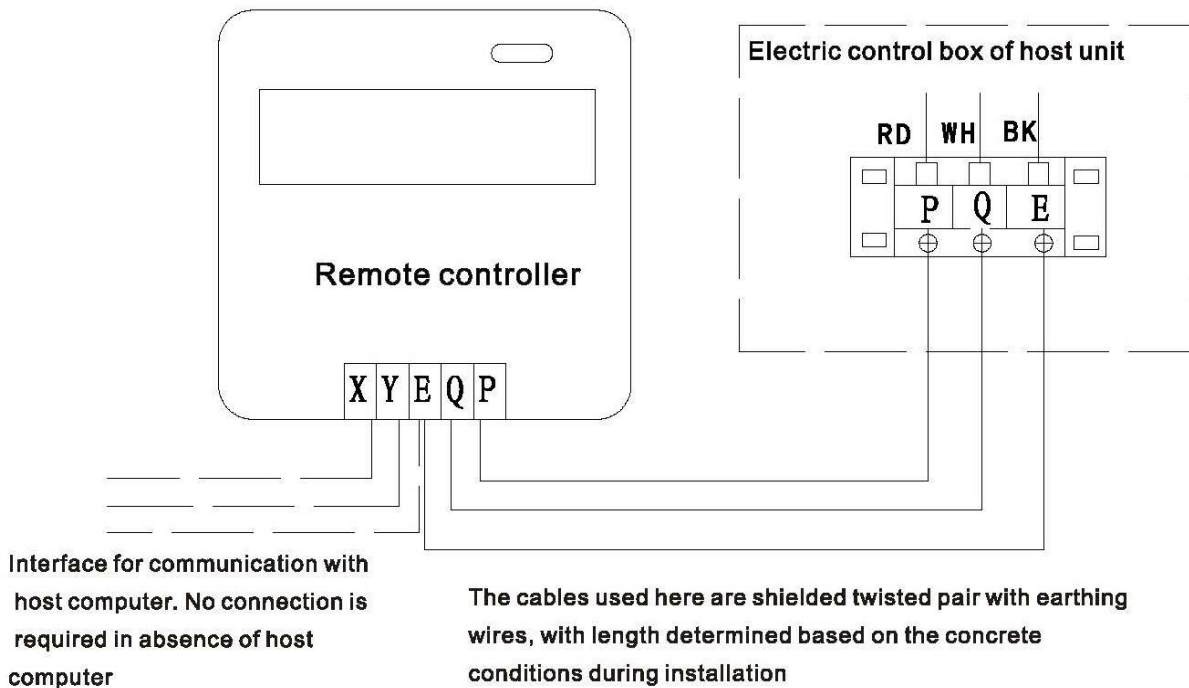
- 1) Applicable voltage range: AC 220V±10%, from a power adapter (AC220V/AC9.5V).
- 2) Ambient temperature for operating: -15°Cæ+43°Cæ
- 3) Ambient humidity for operating: RH40% - Rh90%.
- 4) Electric control safety in compliance with GB4706.32-2004 and GB/T7725-2004.

Features: The wired controller mainly has the following features:

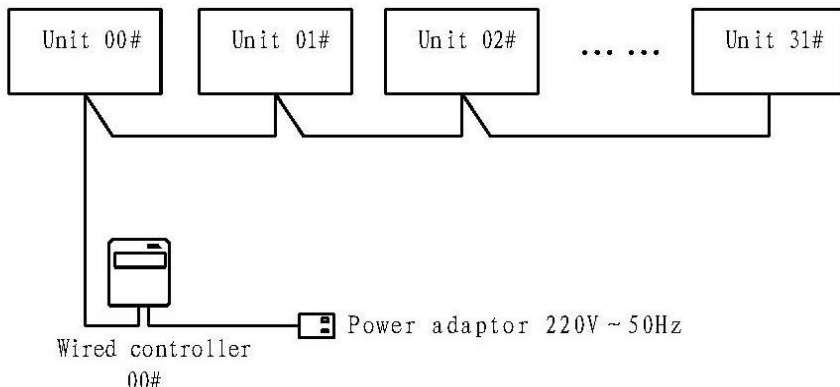
- 1) It is connected with the master unit via the terminals P, Q and E, and is connected with host computer via the terminals X, Y and E;
- 2) It is operated via buttons and allows for setting of working mode;
- 3) It has liquid crystal display;

Installation:

When installing the wired controller, connect it with P, Q and E on the master unit. At the same time, connect the power adaptor in accessories with the black plug at the bottom of wired controller.



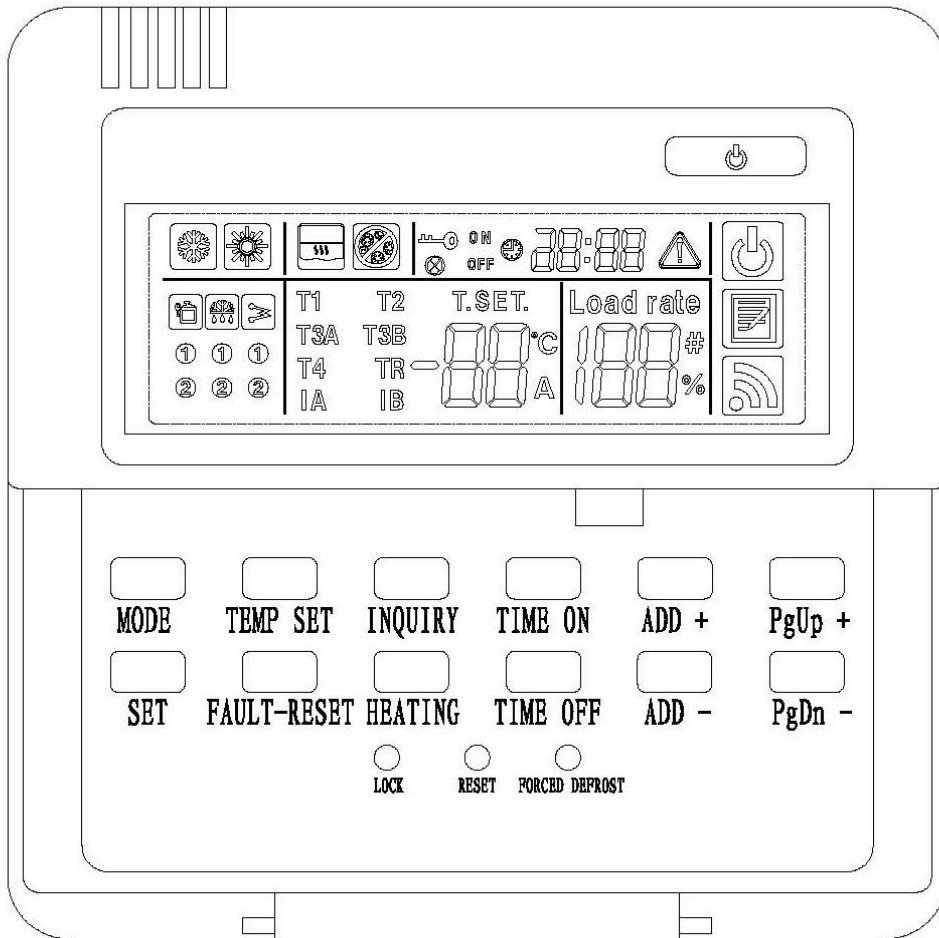
The installation diagram is shown as follows:



Explanations of contents on LCD of wired controller and buttons:

	Cooling mode		Heating mode		Water heater mode
	Anti-freezing mode		Operating state: It turns on during normal running, and turns off when shutdown		Inquiry state
	Host computer communication		Fault		ON/OFF Timer
	Running state of compressor		Defrosting state (during heating)		Flashing: The unit is being preheated Always on: The numbers indicate the startup state of electric heater
	Key invalid		Key locked		Unit address and load rate
	Inquiry data and temperature setting	T1 T2 T3A T3B T4 TR IA IB	T1: System water outlet temperature T2: Unit water outlet temperature T3A: Temperature of fin in System A T3B: Temperature of fin in System B T4: Ambient temperature TR: Temperature of return water of living hot water IA: Current of compressor in System A IB: Current of compressor in System B		

Explanations of contents on LCD of wired controller and buttons



II. Definitions of buttons on wired controller

There are ON/OFF, MODE, INQUIRY, TIME ON/TIME OFF, TEMP SET, SET, HEATING, FAULT-RESET, ADD+/ADD -, PgUp + / PgDn - (for temperature increase/decrease), RESET (concealed), LOCK (concealed), PARA SET (concealed).

A. ON/OFF

With the lamp slowly flashing in the standby state, press ON/OFF switch, then the power on lamp will stay on and the wired controller will enter the state of power-on.

The current temperature of return water, timer setting and so on will be displayed at the same time. When the wired controller is in the state of power-on, press ON/OFF switch, the lamp will disappear and simultaneously, a message of power-off will be sent. The lamp will flash quickly when unit fault occurs or when it is under protection state.

B. MODE

It is used for selecting the operating mode in standby state. There are cooling and heating modes available. Mode checking shall be done in the state of power-on. This button becomes invalid in normal operating state.

C. INQUIRY

Pressing this button allows to inquire the addresses of 0-31# modules (0# state by default). After entering the inquiry state, press "ADD +" or "ADD -" to inquire the message of former or latter module.

After selecting a master unit for inquiry, pressing "PgUp +" and "PgDn -" to inquire the state message of selected master unit. The inquiry sequence is: total water outlet temperature T1→unit water outlet temperature T2→outdoor pipe temperature of System A T3A→outdoor pipe temperature of System B T3B→ambient temperature T4→return water temperature of hot water and living water pump (in case the system has heat recovery function) TR→current of compressor in System A IA→current of compressor in System B IB→fault → protection → total water outlet temperature T1...


There are many fault protection codes of master unit. During enquiry of fault protection message, the wired controller only displays the fault message of the largest code and one protection message.

D. TIME ON/OFF

Press "TIME ON" only in standby state can set automatic power-on. At this time, hour set will flash at 2Hz frequency. Adjust hour set by pressing "PgUp +" and "PgDn -". Press "TIME ON" again to adjust minute set. Minute set will flash at 2Hz frequency. Press "PgUp +" and "PgDn -" to adjust minute set. If there is no action within 10 seconds after entering the time setting status, the setting will be exited.

Automatic power-off setting is available by pressing "TIME OFF" in power-on state. Set power-off time as mentined above Automatic power-on is invalid when the unit is running, and automatic power-off is invalid in standby state. Cycle timing is unavailable.

E. TEMP SET



Total return water temperature setting is available in cooling and heating modes, and temperature setting of water tank or pool is available in water heating mode. Press TEMP SET to enter the control temperature setting interface-. The nixie tube will show the current temperature setting and flash continuously.

Press "PgUp +" and "PgDn-" to adjust the setting of control temperature.

F. SET

After completion of setting, press SET. The wired controller will immediately send the command to the master unit and return to the home page. Press SET in inquiry state to return to the home page directly.

G. HEATING (reserved function)

Press HEATING in heating mode to enable forced startup of electric heating, and the icon  on the LCD will turn on. Press HEATING again to disable electric heating, and  will disappear. HEATING is unavailable in other modes. Such function is invalid to the air cooled unit.

H. FAULT-RESET

When the unit suffers from a failure of automatic reset or requiring power-on again, press FAULT-RESET to clear the fault, and the unit will start working again.

I. ADD +

Press "ADD +" in enquiry state, select the next unit to display the operating state of such unit. 00# will be selected after pressing "ADD +" if 31# unit has been reached.

Press "ADD +" when setting the address of wired controller, follow the method as mentioned above.

J. ADD-

Press "ADD-" in enquiry state to select the former unit to display the operating state of such unit. 31# will be selected after pressing "ADD-" if 00# unit has been reached.

Press "ADD-" when setting the address of wired controller; follow the method as mentioned above.

K. PgUp + and PgDn - (temperature increase/decrease)

On the home page, pressing "INQUIRY" and PgUp + and PgDn - allows to inquire the operating parameters of each address module.

On the temperature setting page, pressing PgUp + and PgDn - allows to increase and decrease temperature. While setting automatic power-on/power-off, press PgUp + and PgDn - to adjust the time setting of automatic power-on/power-off.

L. RESET (concealed)



Pressing RESET with a small round bar with diameter of 1mm will cancel the current setting, and the wired controller will enter the reset mode to recover the default setting.

M. FORCED DEFROST (concealed)

Press FORCED DEFROST with a small round bar with diameter of 1 mm, select the address of unit to defrost, and press "SET". The corresponding unit will start defrosting. Exit of forced defrosting is the same as that of normal defrosting.

Forced defrosting can be enabled by pressing FORCED DEFROST only in heating and water heating modes. It is invalid in cooling mode.

N. LOCK (conceal)

Pressing LOCK with a small round bar with diameter of 1 mm will lock the buttons of wired controller,  will display on LCD, and no operation is effective in this mode. Pressing LOCK again to unlock,  will disappear and normal operation of wired controller is available.

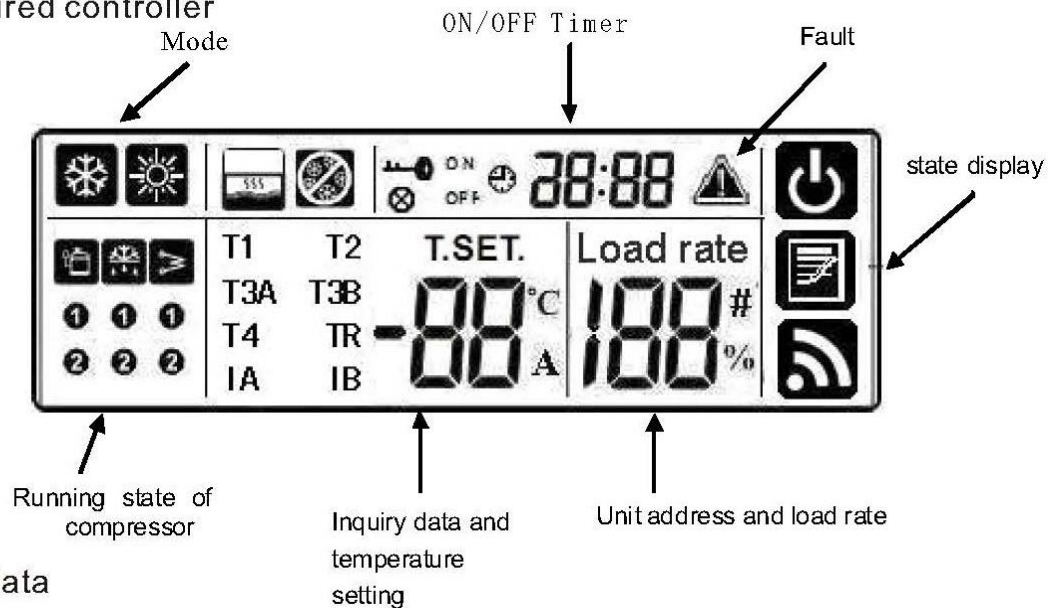
O. Memory function switch

1 and 2 contacts of DIP switch on wired controller are at OFF position by default. The wired controller has no memory function by default, and the parameters will recover to the default setting in power-on state every time. When applied as a wired controller of conventional air-cooled heat pump unit, standby state, cooling mode, and setting temperature - 12°C will be displayed.

When both 1 and 2 contacts of this DIP switch are at ON position, the memory function of wired controller will be enabled, and the wired controller will recover the state before powerdown.

III. Display figure 1 of wired controller:


1. LCD of wired controller





2. General data


1). General data display on all pages.

2). Whether or not to choose memory function shall be decided upon the selection of DIP switch. The memory function is disabled when both DIP switches are at OFF position. The default data displayed in power-on state every time include standby state, cooling mode and setting temperature -45°C; the memory function is enabled when both DIP switches are at ON position. Once powered on, the unit will work under the operating mode, setting temperature and other settings set before powerdown.

3). If the unit system is in operating state, namely there are more than one unit in operating state,  will display; if the unit system is in power-off state, nothing will display.

4). The startup load rate of compressor, i.e. ^{Load rate} , will display on LCD once turned on.

5).  will display in case the host computer network is in control state. Otherwise, it will disappear.

6).  Will show when the wired controller is locked or the buttons are locked, and it will disappear when the controller or buttons are unlocked.

3. Data processing

The data display region is divided into two parts at middle and lower part of the screen, and the data shall display on 2 pieces and a half 7-segment LED nixie tubes respectively.

1). Temperature display

This part is used to display the return water temperature of hot water and living water pump, ambient temperature T4, outdoor pipe temperature T3A of System A, outdoor pipe temperature T3B of System B, unit water outlet temperature T1, total return water temperature and setting temperature TS. "--" will display and "C" will turn on simultaneously in absence of valid data. The temperature of water tank is displayed on the home page by default.

2). Current display

This part is used to display the compressor current IA of unit system A or the compressor current IB of unit system B. "--" will display and "A" will turn on simultaneously in absence of valid data.

3).Fault display

This part is used to display the general fault alarm data of the unit or the fault alarm data of unit. "E-" will display when no fault is present.

4).Protection display

This part is used to display the general system protection data of the unit or the system protection data of unit. "P-" will display when no fault is present.

5).Unit No. display

This part is used to display the address No. of unit selected currently, from 0 to 31. At the same time, "#" turns on.

4.Inquiry display

1).When entering the inquiry page for the first time, 0# unit is selected by default, and the 1st page of state data is displayed.

2).Pressing "PgUp +" or "PgDn -" will show the contents of the other pages.

3).The 1st page to the 8th page at the left region of data display show the total water outlet temperature T1, unit water outlet temperature T2, outdoor pipe temperature T3A of System A, outdoor pipe temperature T3B of System B, ambient temperature T4, return water temperature of hot water and living water pump (in case the system has heat recovery function) TR, compressor current IA of System A, and compressor current IB of System B respectively.

4).The 1st page at the right region of data display shows the unit No.

5).The fault code of current unit is displayed from the 9th page at the right region of data display.

Pressing "PgUp +" allows display of fault code at the next priority level at most, and the code after the second one will not show. In absence of a fault, "E-" will display and the next page will show the protection code.

6).The protection code will show in the left region of data display after all the fault codes have been displayed.

Pressing "PgUp +" allows display of protection code at the next priority level at most, and the code after the second one will not display. In absence of protection, "P-" will display and the next page will show the contents of the first page.

7).When all pages of inquiry data have been displayed, pressing "PgUp +" will return to contents of the first page; pressing "PgDn -" on the first page will display the contents of the final page.

8).Pressing "ADD +" or "ADD -" allows selection of unit addresses for inquiry of operating states of different units.

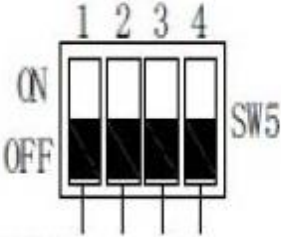
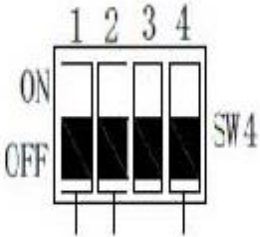

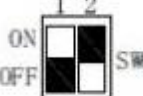


9).Wait for the wired controller to receive the latest data of unit at any time when entering the inquiry page to display or modify the selected unit. Before the data is received, only "--" shows at the left region of data display, the unit address No. shows at the right region, "PgUp+" and "PgDn-" are disabled, until the wired controller receives the communication data of this unit.

IV.Overview of main board functions

Description of address DIP switch

<p>When the address DIP switches are at OFF position at the same time, the module address setting range is 0 0 # - 1 5 # (the black color denotes 2 DIP switch entities)</p>		<p>When the address DIP switches are at ON at the same time, the module address setting range is 16# - 31# (the black color denotes 2 DIP switch entities)</p>	
SR1	Description	SR1	Description
0	Master unit (Unit 00#)	0	Auxiliary unit (Unit 16#)
1	Auxiliary unit (Unit 01#)	1	Auxiliary unit (Unit 17#)
2	Auxiliary unit (Unit 02#)	2	Auxiliary unit (Unit 18#)
3	Auxiliary unit (Unit 03#)	3	Auxiliary unit (Unit 19#)
4	Auxiliary unit (Unit 04#)	4	Auxiliary unit (Unit 20#)
5	Auxiliary unit (Unit 05#)	5	Auxiliary unit (Unit 21#)
6	Auxiliary unit (Unit 06#)	6	Auxiliary unit (Unit 22#)
7	Auxiliary unit (Unit 07#)	7	Auxiliary unit (Unit 23#)
8	Auxiliary unit (Unit 08#)	8	Auxiliary unit (Unit 24#)
9	Auxiliary unit (Unit 09#)	9	Auxiliary unit (Unit 25#)
A	Auxiliary unit (Unit 10#)	A	Auxiliary unit (Unit 26#)
B	Auxiliary unit (Unit 11#)	B	Auxiliary unit (Unit 27#)
C	Auxiliary unit (Unit 12#)	C	Auxiliary unit (Unit 28#)
D	Auxiliary unit (Unit 13#)	D	Auxiliary unit (Unit 29#)
E	Auxiliary unit (Unit 14#)	E	Auxiliary unit (Unit 30#)
F	Auxiliary unit (Unit 15#)	F	Auxiliary unit (Unit 31#)

V.Description of DIP switch (only tested at the beginning of power-on)

<p>DIP switch for capacity regulation (the black color denotes the DIP switch entity)</p>	<p>1-Loading deviation: ON: +4° C OFF: +2° C</p> <p>2-Control period: ON: 30s OFF: 60s</p> <p>3-Opening of electronic expansion valve: ON: 480 steps OFF: Normal regulation</p> <p>4-Reserved</p> 	
<p>DIP switch for model selection (the black color denotes the DIP switch entity)</p>	<p>1-Heat recovery selection: ON: Unit with heat recovery OFF: Unit without heat recovery</p> <p>2-Reserved</p> <p>3-Refrigerant selection: ON: R410A OFF: R22</p> <p>4-Model selection: ON: Unit at Class 2 energy efficiency OFF: Normal unit</p> 	
<p>DIP switch for defrosting interval SW6 (the black color denotes the DIP switch entity)</p>		<p>Defrosting interval of 20 mins</p>
		<p>Defrosting interval of 25 mins</p>
		<p>Defrosting interval of 30 mins</p>
		<p>Defrosting interval of 35 mins</p>

VI. Protection function (refer to “Service and Maintenance” for detail codes)

1). Power supply protection

Phase loss and dislocation of 3 phase power supply (only detected during power-on).

The related unit will be stopped when power supply protection is active.

2). Water pump overload protection

All the units will be stopped when water pump overload protection is detected;

3). Insufficient water flow protection

Detection of insufficient water flow will begin after the water pump is started for 30s; when the switch is disconnected for 15s continuously, an alarm “insufficient water flow of air conditioner” will occur. All the units will be stopped in case of an alarm of insufficient water flow;

4). Compressor running protection

A time delay of 180s is needed for restart of the compressor. The running time shall reach 180s for unloading of compressor (not required for shutdown).

5). Communication fault

When the main board and the wired controller fail to communicate with each other continuously for 2 mins, the side that is unavailable for communication will trigger an alarm L4 “communication fault between master unit and wired controller”, and all the units will be stopped until the main board and wired controller can communicate with each other and then automatic startup will be enabled.

In order to avoid communication interference when possible, the communication cables shall be 0.5mm² 2-core shielded cables. When the unit is far away from the wired controller, 120 Ω matching resistor may be connected with P and Q at the side of main board in parallel.

When the main board fails to communicate with the auxiliary unit continuously for 2 mins, the auxiliary unit will trigger an alarm “communication fault between modules”, and the slave suffering from a communication fault will be stopped. When the main board detects that the number of connected machines decreases, an alarm L2 “the number of modules decreases” will be triggered, and the auxiliary unit failing to communicate with the master unit will be stopped. When the main board detects that the maximum number of address equals or is larger than the number of connected machines, the unit can control and run normally, but an alarm L3 “Address fault” will occur.

6). High pressure/overload protection

If “High pressure/overload of compressor” is detected during running of the compressor, the switch will be disconnected for 3s continuously; for the system under defrosting, the related compressor will be stopped; in other conditions, an alarm “High pressure/overload of compressor” will be triggered, and the related system will be stopped. (The rule of simultaneous startup and shutdown applies to the fan).

7).Low pressure protection and medium pressure protection

Detection of "low pressure of compressor" and "medium pressure of compressor" will be started after the compressor has been started for 60s. After the switch has been disconnected for a period: If the compressor is in mode of defrosting, no alarm will be triggered. Re-detection of the low pressure switch will be started after a time delay of 60s after defrosting is exited. If the compressor is not in mode of defrosting, an alarm of "Low pressure of compressor" or "Medium pressure of compressor" will be triggered, and the related system will be stopped. (The rule of simultaneous startup and shutdown applies to the fan) When confirming the low pressure and medium pressure alarms, the low pressure switch and medium pressure switch will be disconnected for a certain period. In case of cooling mode, they will be disconnected for 5s continuously, and an alarm will occur. Once disconnected for 30s in heating mode, an alarm will occur;

8).Over temperature protection of fin

In the cooling mode and with the fin temperature probe at normal state, detect the temperature of fin after the unit is powered on: when the temperature of fin is $>65^{\circ}\text{C}$, an alarm of over temperature will occur;when the temperature of fin is $\leq 55^{\circ}\text{C}$,the over temperature protection of fin will be disabled. The related system will be stopped when over temperature protection of fin is active. (The rule of simultaneous startup and shutdown applies to the fan) An alarm will occur after 3s elimination of jitter.

An alarm will occur after 3s elimination of jitter;

9).Module water outlet temperature protection

Start detection after the module is selected to run for the first time: when the module water outlet temperature is $\geq 65^{\circ}\text{C}$, an alarm will occur to warn that the water outlet temperature of related module is too high; when the module water outlet temperature is $\leq 55^{\circ}\text{C}$, the module water outlet over temperature protection will be disabled; the related module will be stopped when supercooling (overheating) protection is active. The module will be allowed to work again after resetting. An alarm will occur after 3s elimination of jitter;

10).Current protection

I: Measured current; IP: Compressor protection current, set at 28A;

When the measured current I of a system is \geq the protection current IP, the related system will be stopped (the rule of simultaneous startup and shutdown applies to the fan), and an alarm will occur for over-current protection.

VII. Enquiry of main board

Normal display contents of nixie tube:


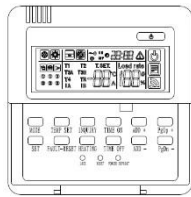
1). The number of connected machines will be displayed in standby state. 0 displays before the compressor is started, and the compressor startup load rate of this module will show after the compressor is started.

2). The number of started machines will be displayed after the system is started.

The chip of outdoor system is equipped with a button for enquiry, which allows observation of running state of the outdoor system. It also facilitates maintenance for the engineering technicians. Displayed contents of enquiry: Mode (1 Cooling, 2 Heating, 8 Standby, 4 Water heating) → Number of machines connected → Total water outlet temperature T1 → Water outlet temperature of this unit T2 → Ambient temperature T4 → Total water outlet temperature TB → Return water temperature of hot water and living water TR → Fin temperature of System A T3A → Current of System A IA → Opening of electronic expansion valve in System A EVEA → Fin temperature of System B T3B → Current of System B IB → Opening of electronic expansion valve in System B EVEB → Fault → Protection (Only the largest fault and protection codes will be shown) → Number of machines connected → --- (it indicates ending) → Mode → (...)

Appendix

1. Accessories

Item	Name of accessory	Type	Qty	Shape	Usage
1	Installation and owner's manual	---	1		Installation and using instruction.
3	Wired controller		1		Control the system.

2. Temperature-Resistance Characteristic Sheet

Suiting for pipe temperature sensor, ambient temperature sensor, inlet water temperature sensor and outlet water temperature sensor.

Sensor characteristic sheet

Unit: Temp:°C, Resistance :KΩ

Temp.	Resistance	Temp.	Resistance	Temp.	Resistance	Temp.	Resistance
-20	106.732	12	18.646	44	4.387	76	1.321
-19	100.552	13	17.743	45	4.213	77	1.276
-18	94.769	14	16.888	46	4.046	78	1.233
-17	89.353	15	16.079	47	3.887	79	1.191
-16	84.278	16	15.313	48	3.735	80	1.151
-15	79.521	17	14.588	49	3.59	81	1.113
-14	75.059	18	13.902	50	3.451	82	1.076
-13	70.873	19	13.251	51	3.318	83	1.041
-12	66.943	20	12.635	52	3.191	84	1.007
-11	63.252	21	12.05	53	3.069	85	0.974
-10	59.784	22	11.496	54	2.952	86	0.942
-9	56.524	23	10.971	55	2.841	87	0.912
-8	53.458	24	10.473	56	2.734	88	0.883
-7	50.575	25	10	57	2.632	89	0.855
-6	47.862	26	9.551	58	2.534	90	0.828
-5	45.308	27	9.125	59	2.44	91	0.802
-4	42.903	28	8.721	60	2.35	92	0.777
-3	40.638	29	8.337	61	2.264	93	0.753

-2	38.504	30	7.972	62	2.181	94	0.73
-1	36.492	31	7.625	63	2.102	95	0.708
0	34.596	32	7.296	64	2.026	96	0.686
1	32.807	33	6.982	65	1.953	97	0.666
2	31.12	34	6.684	66	1.883	98	0.646
3	29.528	35	6.401	67	1.816	99	0.627
4	28.026	36	6.131	68	1.752	100	0.609
5	26.608	37	5.874	69	1.69	101	0.591
6	25.268	38	5.63	70	1.631	102	0.574
7	24.003	39	5.397	71	1.574	103	0.558
8	22.808	40	5.175	72	1.519	104	0.542
9	21.678	41	4.964	73	1.466	105	0.527
10	20.61	42	4.763	74	1.416		
11	19.601	43	4.571	75	1.367		