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MAXI[®]
A I R C O N D I T I O N I N G



TECHNICAL MANUAL

MODULAR AIR COOLED LIQUID CHILLERS AND HEATPUMPS
WITH AXIAL FANS AND SCROLL COMPRESSORS FROM 30 kW
TO 520 kW.

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Air-cooled heat-pump module unit

1. Summarization

Maxa Commercial Digital scroll air-cooled heat-pump module unit is designed and produced on the basement of sufficiently absorbing the top technology in AC areas, adopting self-control components with high quality made by world famous producers. Moreover, after optimizing, unit can run more efficiently and more stably. One 60kW module consists of two 30kW units, and several modules can be formed into a digital scroll air-cooled heat-pump module unit by connecting each module's inlet & outlet pipeline in series. The whole unit consists of 1-8 modules (or 2-16 units) and the max capacity is 480kW(520kW).

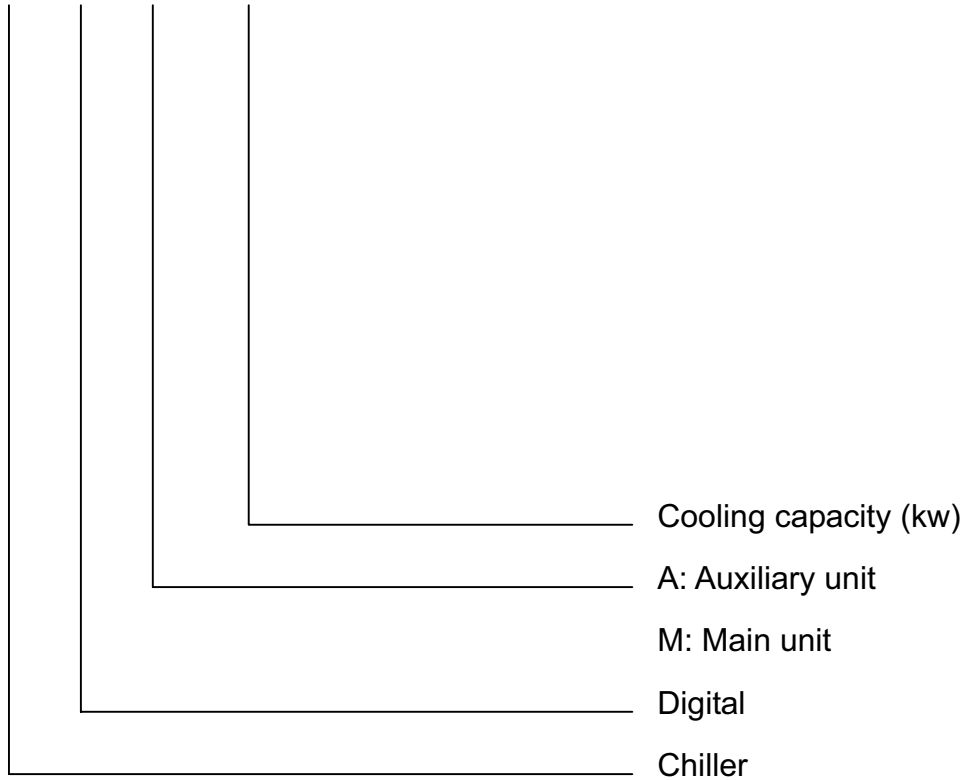
Maxa Commercial Digital scroll air-cooled heat-pump module unit can be used widely in civil construction of AC engineering and industrial engineering, such as hotel, villa, restaurant, hospital, factory, etc. It is a wise choice for areas where water is insufficient or there are strict limits on noise level and surroundings.

Relevant noun description:

- Unit——one independent outdoor unit, including two entire refrigeration system and one electric controller.
- Main controller ——every electric control system of unit can accomplish the following functions independently: Mode input; Data collection; Output interface control; Failure alarm analyzing.
- Digital scroll air-cooled heat-pump module unit——a unit consists of one or more(1÷8) than one modules (2÷16 units).
- Wire Controller——the interface between the module and human, it can receive the operation command and sent them to main controller, meanwhile receive the running state data and display them.

2. Nomenclature

C D – M 30



3. View of 30kW module (composed by just one basic unit)



View of 65kW module (composed by two basic unit)

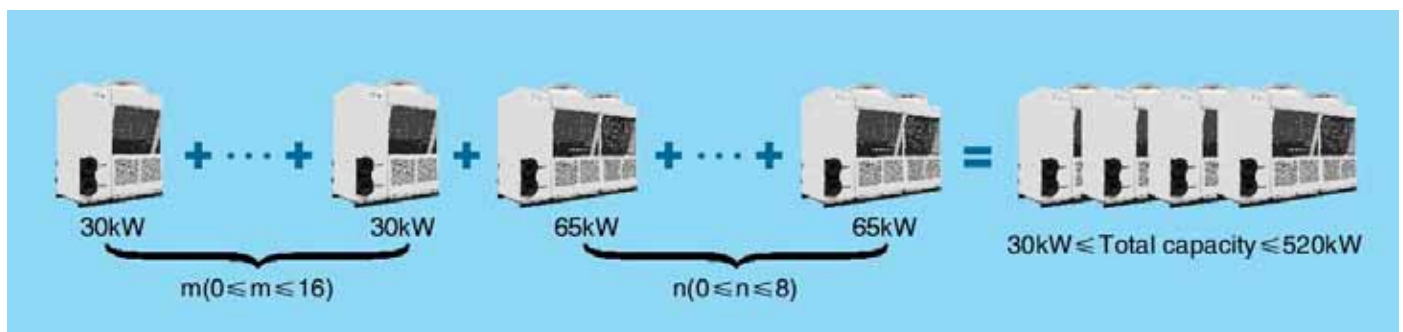


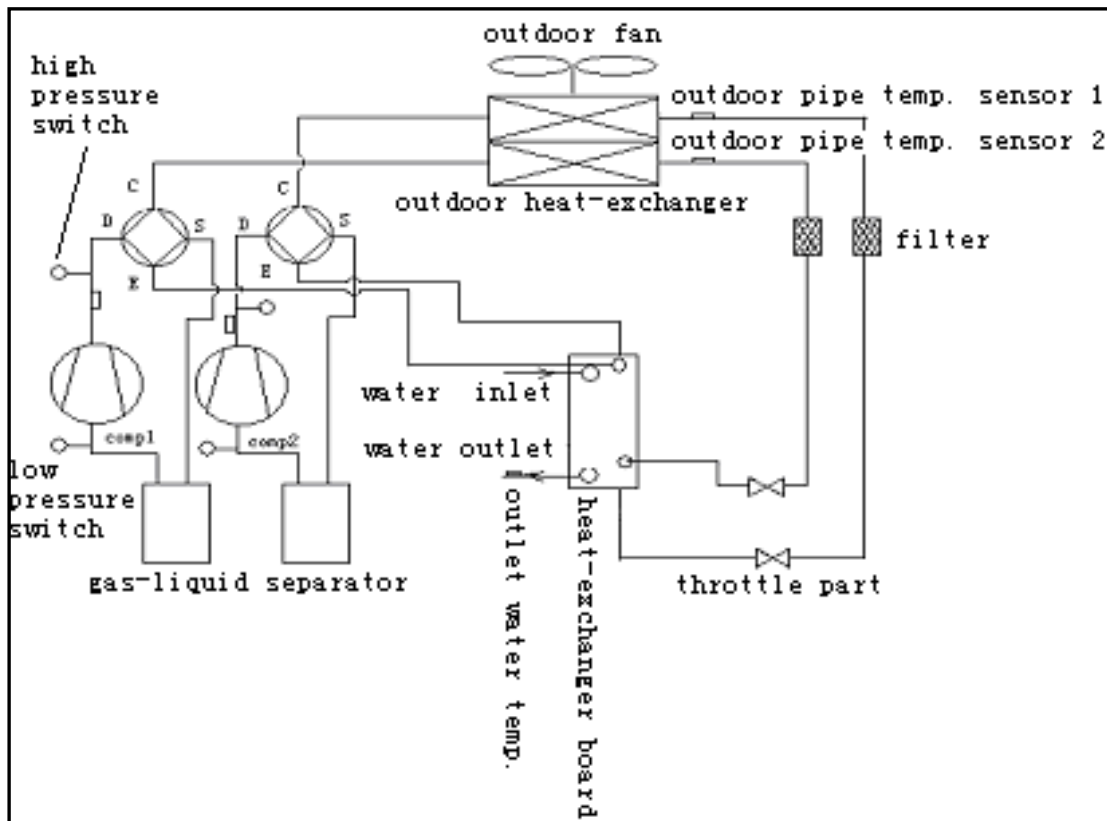
4. Principle of system

Basic unit “Main and Auxiliary” from 30kW of cooling capacity is equipped with two independent refrigerant circuits, with two compressors (1 digital, 1 fixed), just one plate heat exchanger and just one control main board.

Basic unit “Main” from 65kw is the melt of two basic units of 30kW, so it is composed by 4 independent refrigerant circuits, 4 compressors (1 digital, 3 fixed), 2 plate heat exchanger and 2 control main boards.

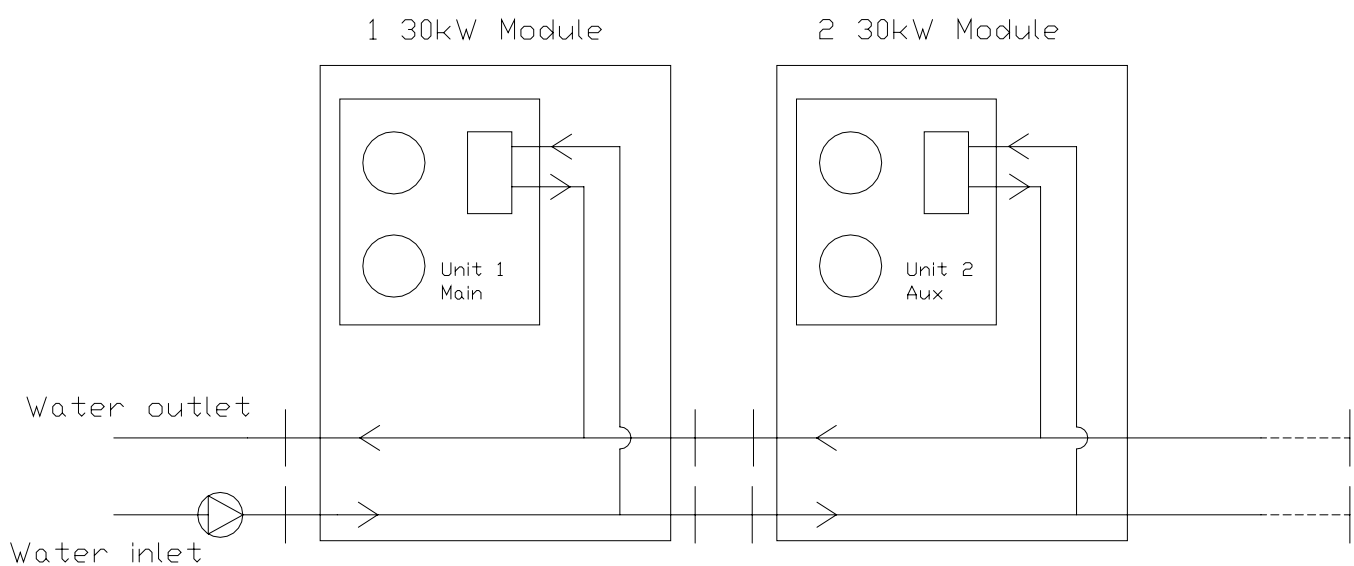
Basic unit “Auxiliary” from 65kw is the melt of two basic units of 30kW, so it is composed by 4 independent refrigerant circuits, 4 fixed compressors, 2 plate heat exchanger and 2 control main boards.



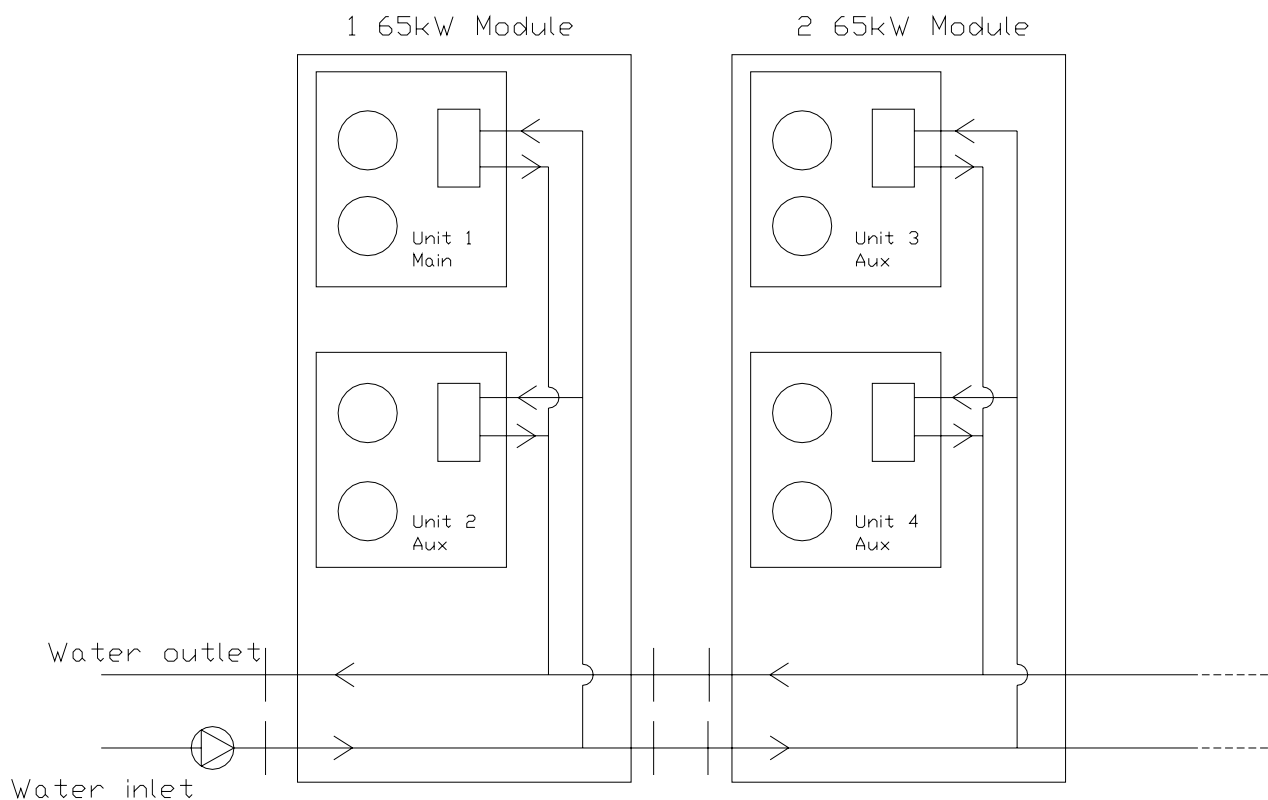


Numbers of modules can be assembled together into a large unit by connecting each own inlet & outlet pipeline in series; can be connected together modules from 30kW and from 65kW of cooling capacity until 16 units and 520kW of cooling capacity; here below you can see the connection principle:

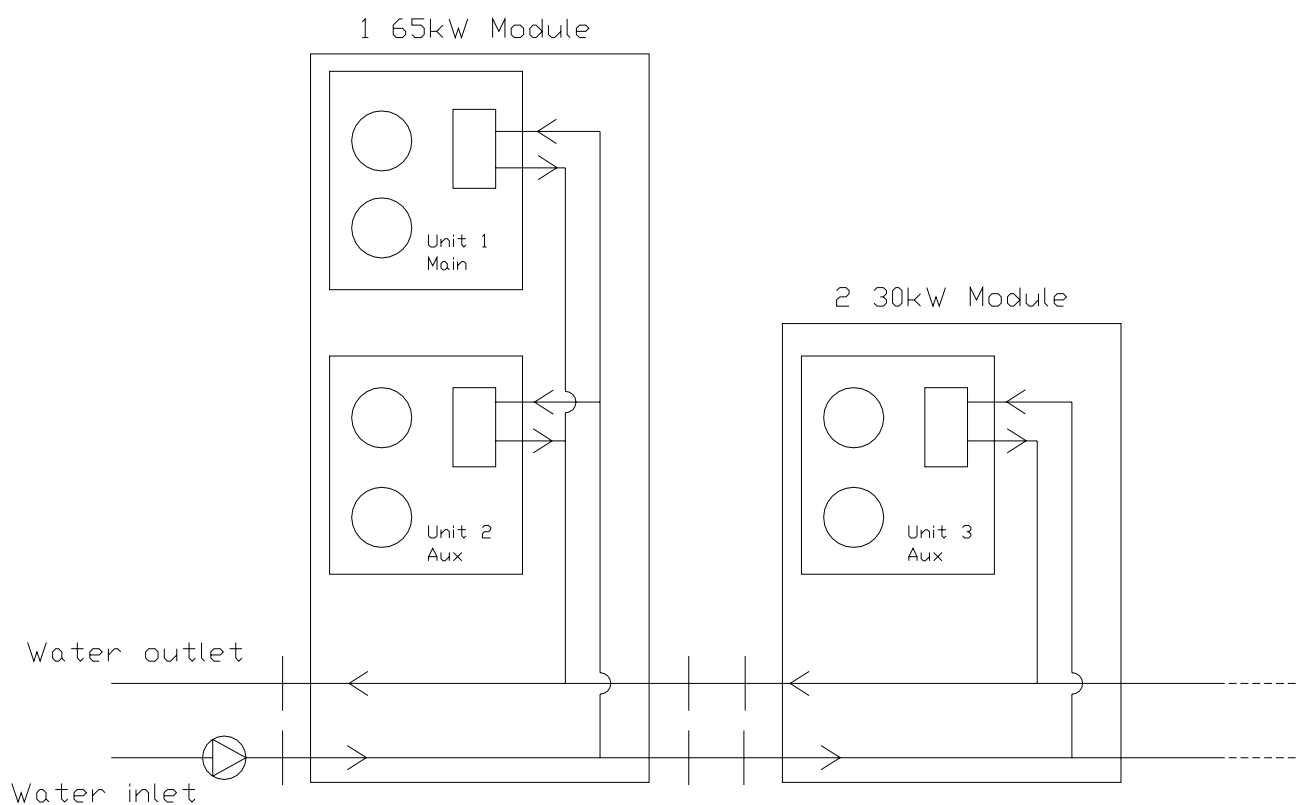
Two modules 30kW connected in series



Two modules 65kW connected in series

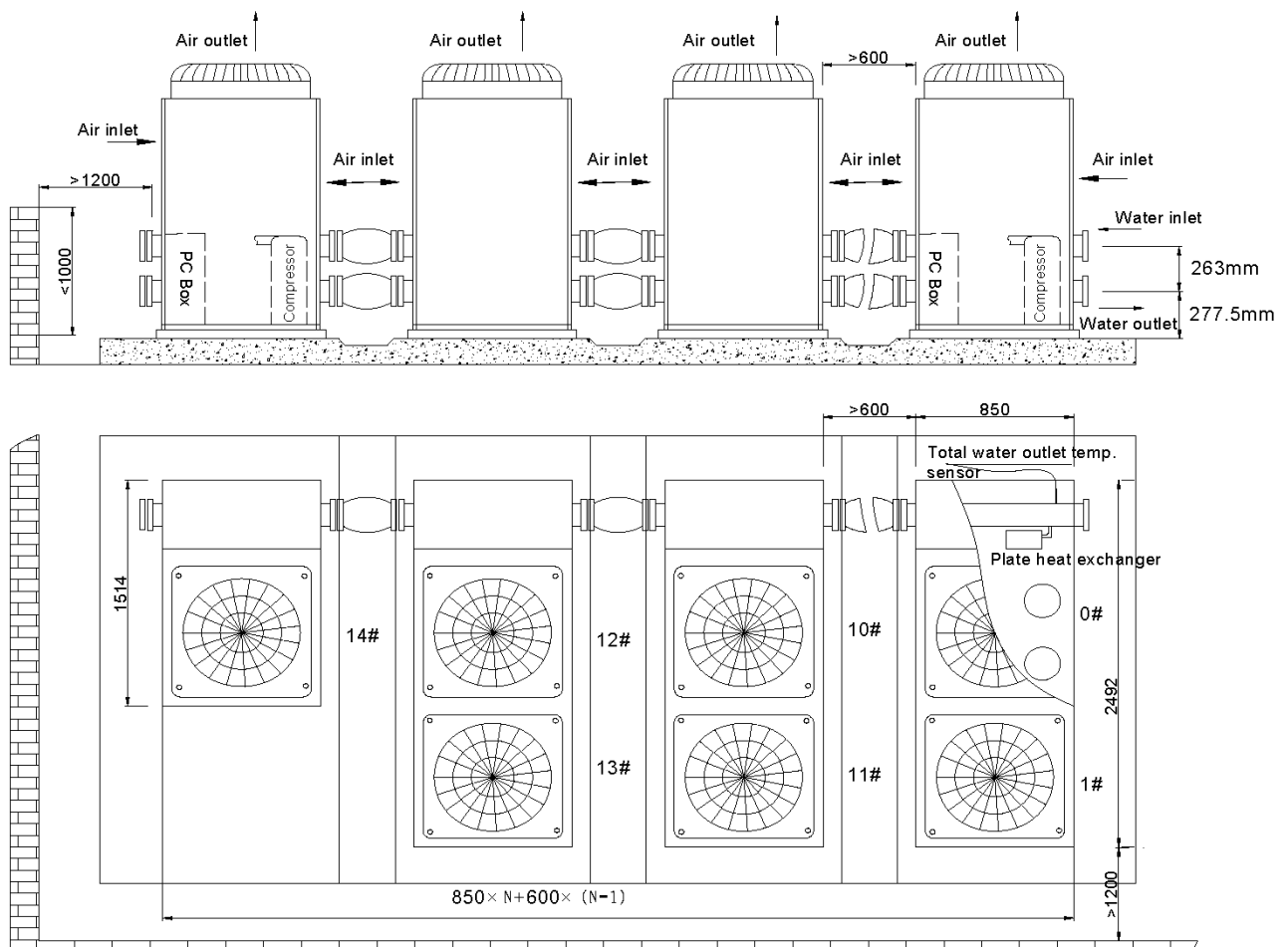


Two modules, one of 65kW and one of 30kW connected in series



To correctly operate the unit and ensure normal and safe running when the outdoor Temp is under 0°C in winter, the following should be noticed:

- If the unit will not be used for a long time, please drain water away to prevent the plate heat-exchanger from freezing.
- If it is used frequently, it is absolutely forbidden to switch off the power, because the unit has auto anti-freeze function. Moreover, in order to protect the plate heat-exchanger from freezing in case the unit stops at night, and it must add some anti-freeze mixture to water system such as glycol or propylene glycol.
- Water flow switch should be installed correctly; otherwise, the unit may be damaged. What's more, the water flow switch should be Queried periodically if it is work normally.
- If malfunctions occur, it is absolutely forbidden to turn on the unit before the problems are solved. At the same time, please drain water away to prevent the plate heat-exchanger from freezing.



5. Specification

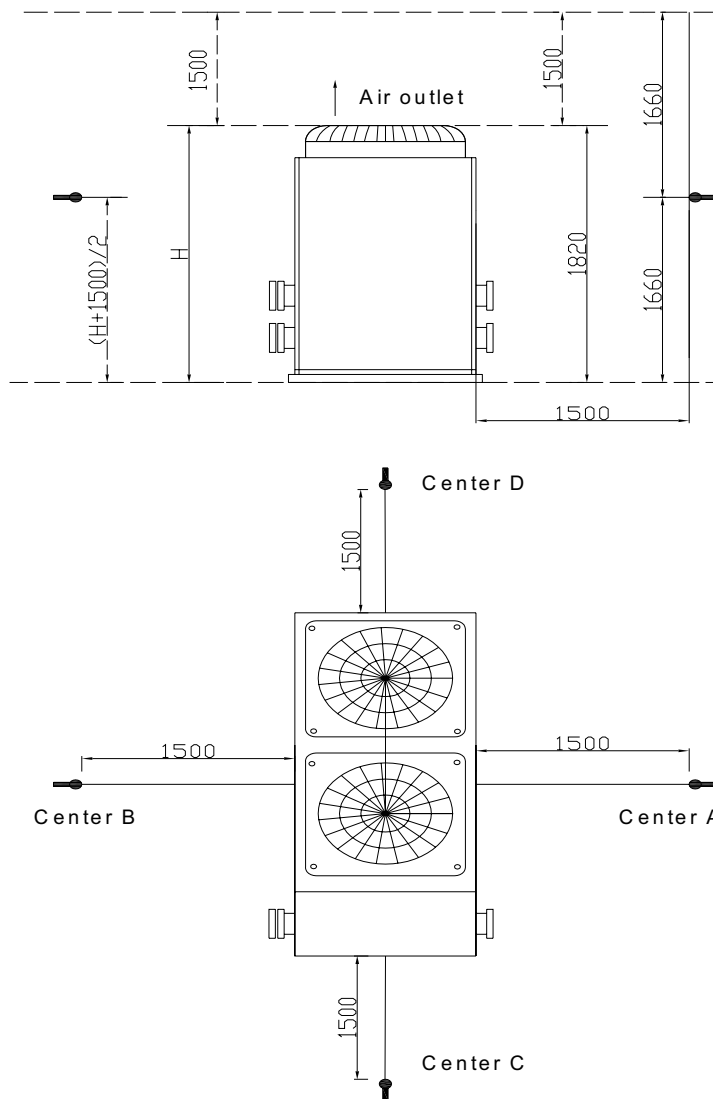
Model		CD							
		30	65	95	130	160	195	225	260
Cooling Capacity	KW	65	95	130	160	195	225	260	240
	*1000 kcal/h	55.9	81.7	111.8	137.6	167.7	193.5	223.6	206.4
Heating capacity	KW	69	101	138	170	207	239	276	256
	*1000 kcal/h	59.34	86.86	118.68	146.2	178.02	205.54	237.36	220.2
Cooling input kW		10	21.5	31.5	43	53	64.5	74.5	86
Heating input kW		9.8	21	30.8	42	51.8	63	72.8	84
Power		380V 3N~ 50Hz							
Control type		Wire control							
Safety protection device		High/low-pressure switch, anti-frost switch, water-flow switch, over-load protection, and power phases sequence protection.							
30kW master+65kW master+ 65 kW auxiliary modules		1+0+0	0+1+0	1+0+1	0+1+1	1+0+2	0+1+2	1+0+3	0+1+3
Compressor input kW		9	18.5	27.5	37	46	55.5	64.5	74
Refrigerant		R407C							
Refrigerant kg		4.5*2	4.5*4	4.5*6	4.5*8	4.5*10	4.5*12	4.5*14	4.5*16
Water system	Water flow volume m ³ /h	1.45	3.11	4.56	6.62	7.67	9.33	10.78	12.44
	Water resistance loss kPa	29.4							
	Waterside heat-exchanger	Welding, stainless steel, plate heat exchanger							
	Max. Pressure MPa	1.0							
	Water inlet/outlet pipeline diameter	133mm							
Air side heat exchanger	Type	Fin coil							
	Air flow volume *10 ³ m ³ /h	12	24	36	48	60	72	84	96
	Fan motor input kW	0.7*1	0.7*2	0.7*3	0.7*4	0.7*5	0.7*6	0.7*7	0.7*8
Dimension (mm)	L mm	1514	2492	2492	2492	2492	2492	2492	2492
	W mm	850	2300	3450	4600	5750	6900	8050	9200
	H mm	1820							
Packaging dimension (mm)	30kW master	1620x1034x2041							
	65kW master	2612x1034x2041							
	65 kW auxiliary	2612x1034x2041							
Total weight kg		440	700	1140	1400	1840	2100	2540	2800
Optional auxiliary heater kW		7.5	15	22.5	30	37.5	45	52.6	60

Model		CD							
		290	325	355	390	420	455	485	520
Cooling Capacity	KW	325	355	390	420	455	485	520	240
	*1000 kcal/h	279.5	305.3	335.4	361.2	391.3	417.1	447.2	206.4
Heating capacity	KW	345	377	414	446	483	515	552	256
	*1000 kcal/h	296.7	324.22	356.04	383.56	415.38	442.9	474.72	220.2
Cooling input kW		96	107.5	117.5	129	139	150.5	160.5	172
Heating input kW		93.8	105	114.8	126	135.8	147	156.8	168
Power		380V 3N~ 50Hz							
Control type		Wire control							
Safety protection device		High/low-pressure switch, anti-frost switch, water-flow switch, over-load protection, and power phases sequence protection.							
30kW master+65kW master+ 65 kW auxiliary modules		1+0+4	0+1+4	1+0+5	0+1+5	1+0+6	0+1+6	1+0+7	0+1+7
Compressor input kW		83	92.5	101.5	111	120	129.5	138.5	148
Refrigerant		R407C							
Refrigerant kg		4.5*16	4.5*20	4.5*22	4.5*24	4.5*26	4.5*28	4.5*30	4.5*32
Water system	Water flow volume m ³ /h	13.89	15.56	17	18.67	20.11	21.78	23.22	24.89
	Water resistance loss kPa	29.4							
	Waterside heat-exchanger	Welding, stainless steel, plate heat exchanger							
	Max. Pressure MPa	1.0							
	Water inlet/outlet pipeline diameter	133mm							
Air side heat exchanger	Type	Fin coil							
	Air flow volume *10 ³ m ³ /h	108	120	132	144	156	168	180	192
	Fan motor input kW	0.7*9	0.7*10	0.7*11	0.7*12	0.7*13	0.7*14	0.7*15	0.7*16
Dimension (mm)	L mm	2492	2492	2492	2492	2492	2492	2492	2492
	W mm	6650	6650	8100	8100	9550	9550	11000	11000
	H mm	1820							
Packaging dimension (mm)	30kW master	1620x1034x2041							
	65kW master	2612x1034x2041							
	65 kW auxiliary	2612x1034x2041							
Total weight kg		3240	3500	3940	4200	4640	4900	5340	5600
Optional auxiliary heater kW		67.5	75	82.5	90	97.5	105	112.5	120

3. surrounding Temp. of unit work is shown as follows :

Name	Cooling operation	Heating operation
Water-outlet temperature	7°C ÷ 12°C	45°C ÷ 50°C
Air-side heat-exchanger Air-inlet temperature	17°C ÷ 43°C	-10°C ÷ 21°C

6. Sound pressure level

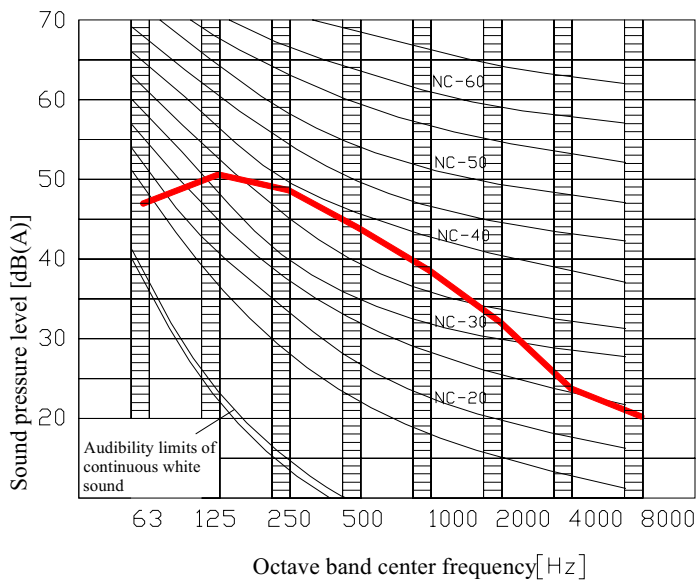
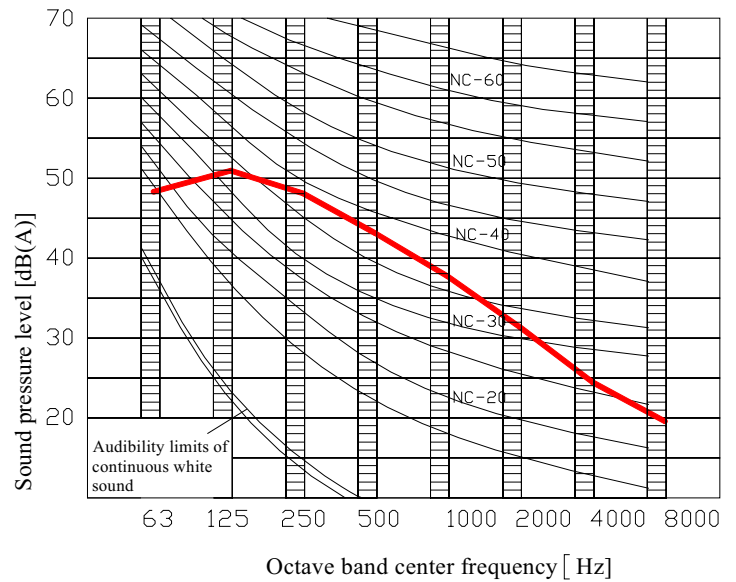
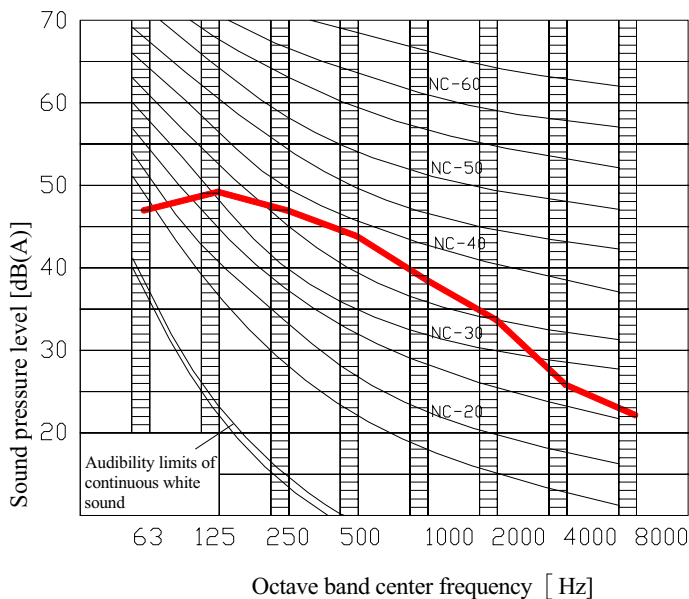
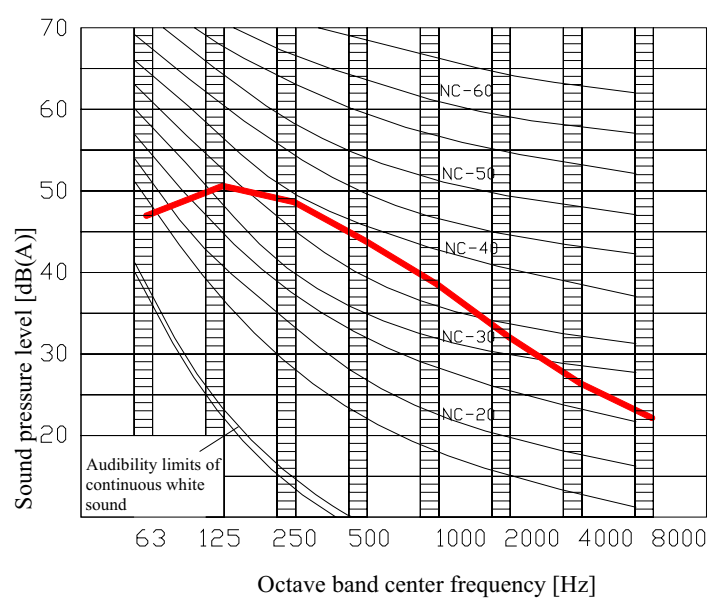


Note: Sound pressure level is measured on each side at 1500mm distance and 1660mm height.

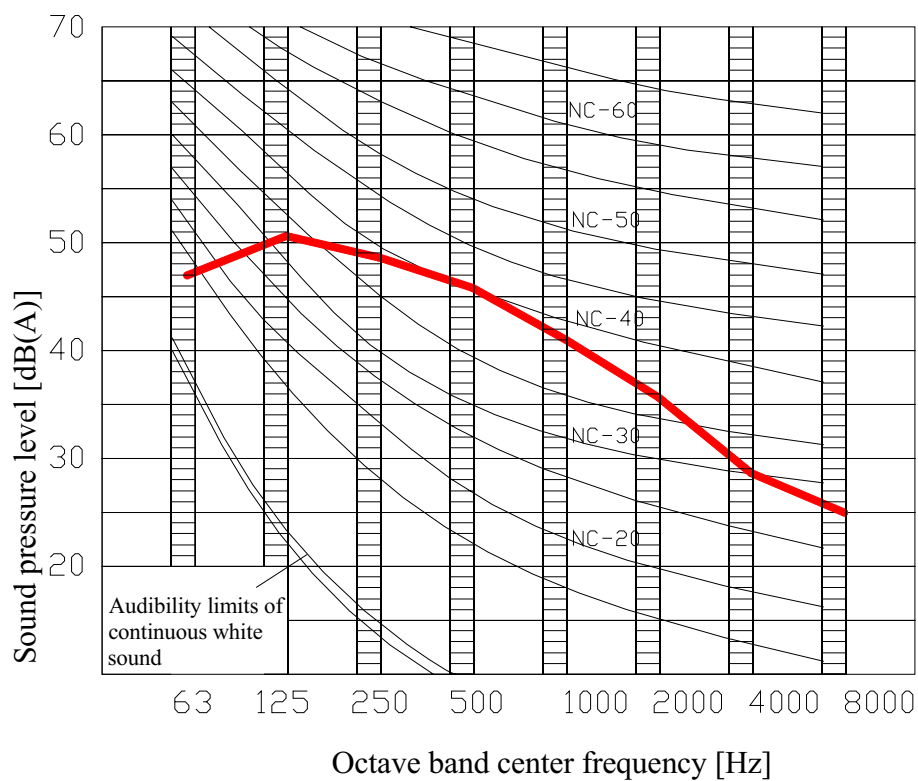
This drawing shows the testing way of single module. When there are some module units combined, the testing points on the side will be the center on the side of combined unit system.

Noise specification(30KW & 65KW)

Capacity range (kW)	Noise dB(A)				
	Center A	Center B	Center C	Center D	Surface average noise
30	50.2	51.0	49.3	50.2	50.2
65	51.0	51.9	49.3	50.2	50.7

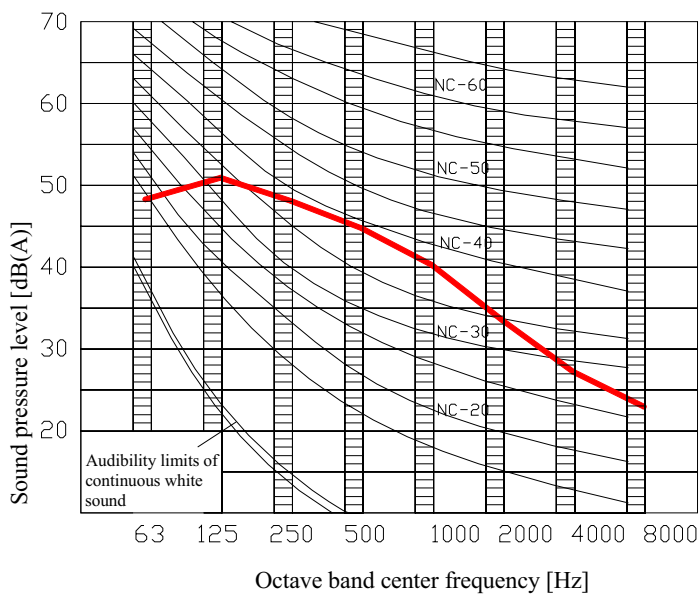
CD 30 Octave bandwidth analysis
Center A

Center B

Center C

Center D


CD30 Average sound pressure level on surface

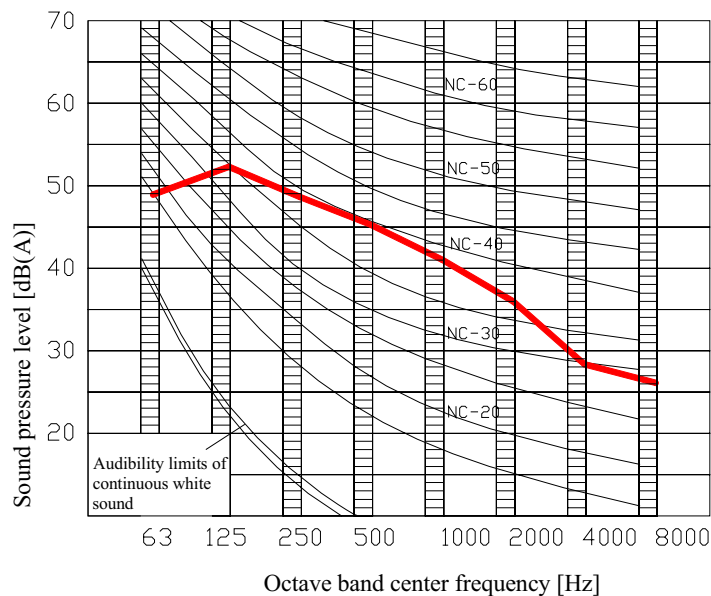


CD 65 Octave bandwidth analysis

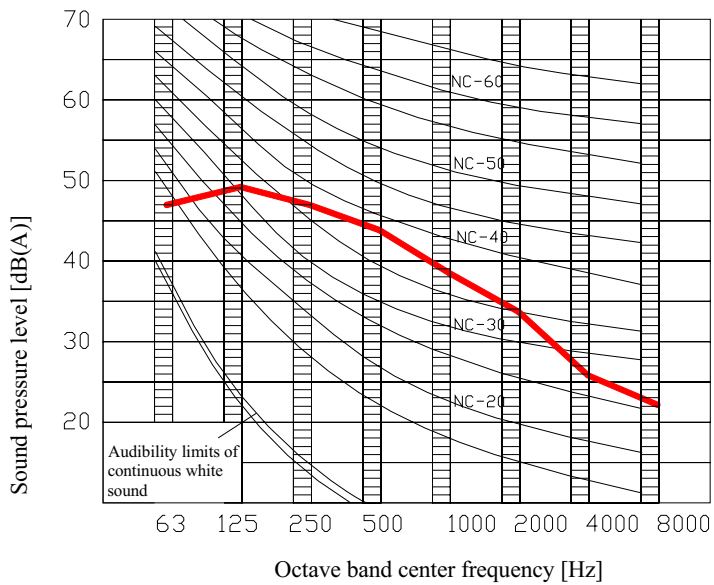
Center A



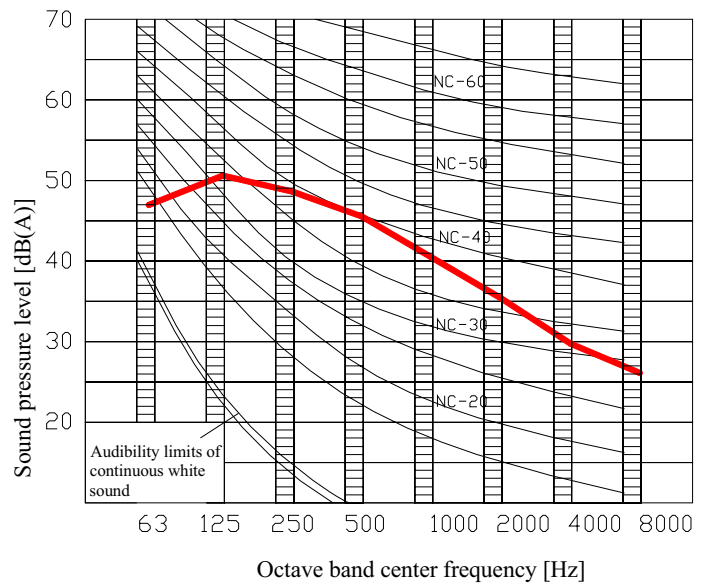
Center B



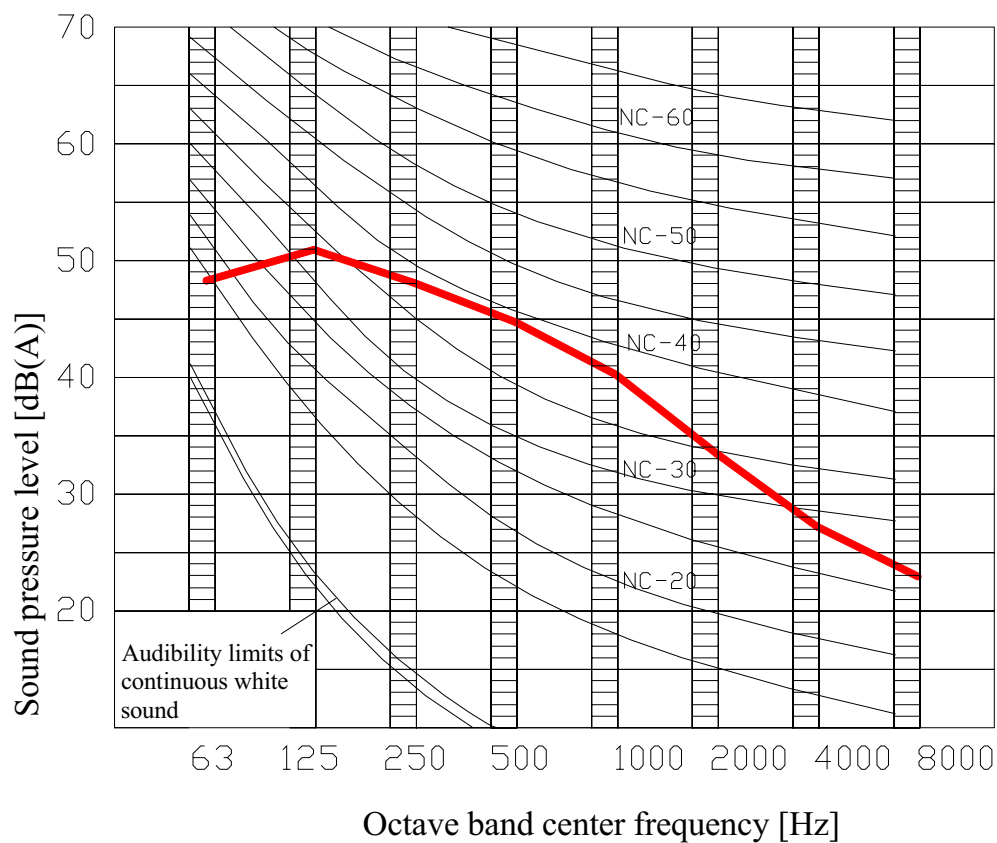
Center C



Center D



CD65 Average sound pressure level on surface



7. Digital scroll compressor

Digital scroll compressor is made up of following components: fixed vortex plate, movable vortex



plate, motor, suction and discharge pipe、PWM(Pulse Width Modulation) solenoid valve and so on. It differs from ordinary scroll compressor: the compressor utilizes the axial flexible sealed technology and PWM solenoid valve to precisely adjust the axial moving range of the stator scroll plate. And there is an additional connecting bypass at the suction inlet connected with the middle pressure bore at the floating sealed point of axial stator. When PWM solenoid valve is turned on, the pressure in middle pressure bore is released. The pressure in compress bore is higher than on the stator. The stator axis of the compressor will move upward a little. So the unload is achieved.

When the solenoid is turned off, the stator is pressed down. Then the seal and upload is achieved. The compressor plate can adjust the ratio of on and off freely to achieve the output of “0-1”, that is Digital Scroll Compressor.

7.1 Flexible

The stator and rotor can move axially and radial in certain space and can separate under normal condition.

7.2 Axial flexible sealed

There is about 1mm space for stator to move axially. Normally, under the action of gas pressure (discharge pressure and middle pressure of compressor chamber), the stator and rotator can combine tightly and form the sealing surface.

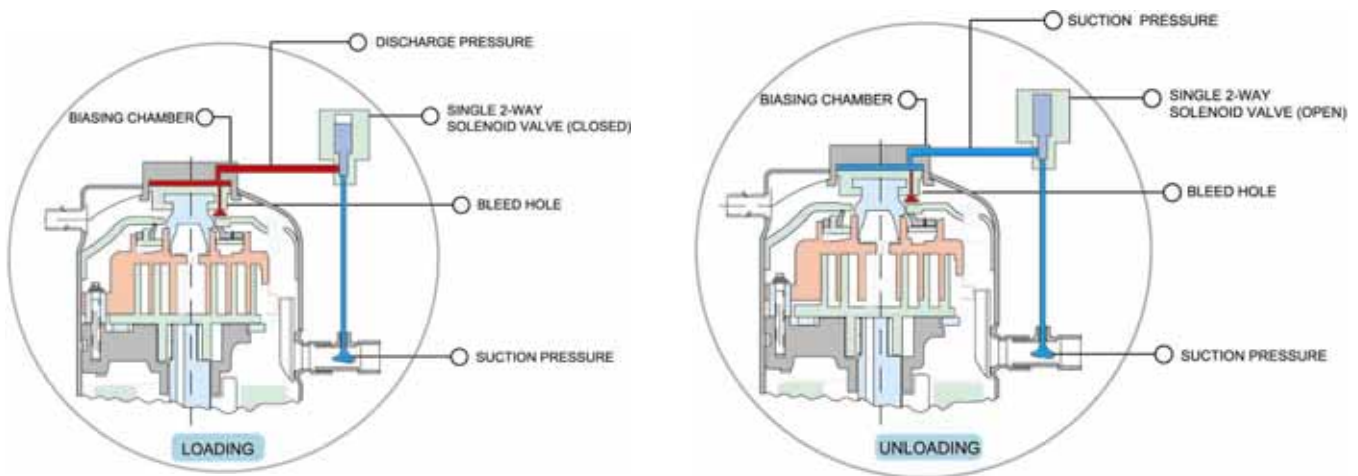
7.3 Pulse width modulate (PWM)

During half period of output voltage, the output voltage wave is divided into some pulse waves. Due to the average output voltage and pulse duty ratio (pulse width dividing the pulse period is duty ratio) is direct ratio, when modulating the frequency, not change the pulse width but change the pulse duty ratio, thus realize variable frequency and variable voltage.

7.4 Principle of Digital Scroll Compressor

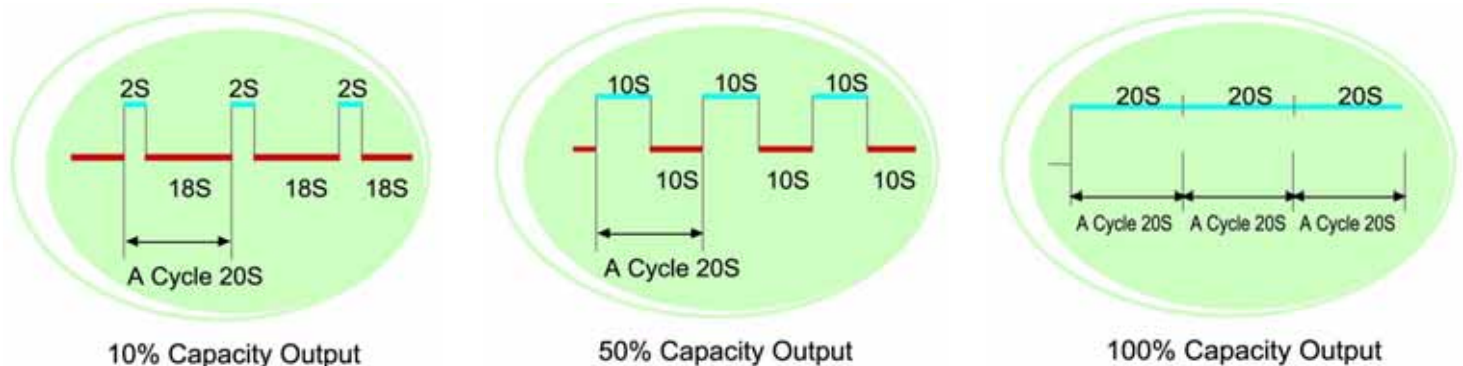


The fixed vortex plate on the top is allowed to move upwards about 1 mm during the operation of the Digital Scroll. Lifting the top vortex plate ensures that there is no pumping through the vortex plate, and there is no mass flow through the compressor. This is the period of zero capacity for the compressor. This state is called the “Unloading State” of the compressor. The “Loading State” is the normal state when the scrolls are operating normally like a standard scroll and the capacity is 100%. It is important to point out that there is no bypass of gas in this operation. The principle of achieving modulation is by alternately lifting and engaging the top vortex plate. A cycle time consists of a “Loading State” time and “Unloading State” time. The duration of these 2 time segment determine the capacity modulation of the compressor.



Example: the total capacity is 10HP, cycle time is 20 seconds. If the output power is 5HP(50%of total capacity),the compressor modulation is $(10 \text{ sec.} \times 100\% + 10\text{sec.} \times 0\%)/20\text{sec.} = 50\%$. The loading state time is 10 seconds and the unloading state time is 10 second. If the output power is 2HP(20%of total capacity),the compressor modulation is 20%, the state time is 4 sec. and the

unloading state time is 16 sec. the rest can be deduced by analogy. The following is schematic diagram when output capacity is respectively 10%, 50% and 100%.



8. The capacity control of the new modular chiller

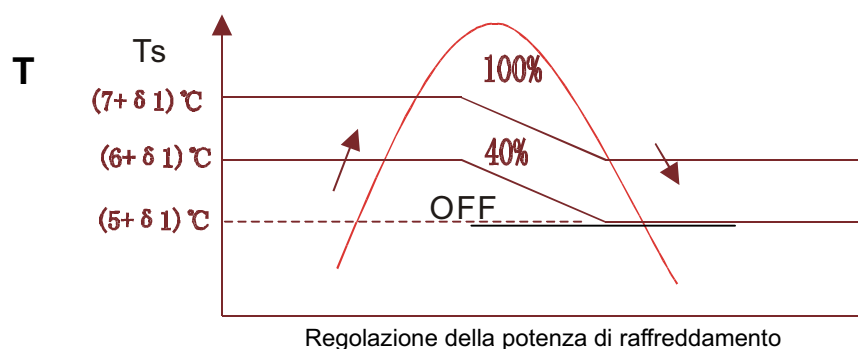
(1) Capacity adjustment of the system.

Only the main unit can control the capacity output according to the temperature of total output water (T_s).

1. Cooling capacity adjustment

Please preset T_s ($T_s = 7, 8, 9, 10, 11, 12^\circ\text{C}$). T_s is 7°C in default.

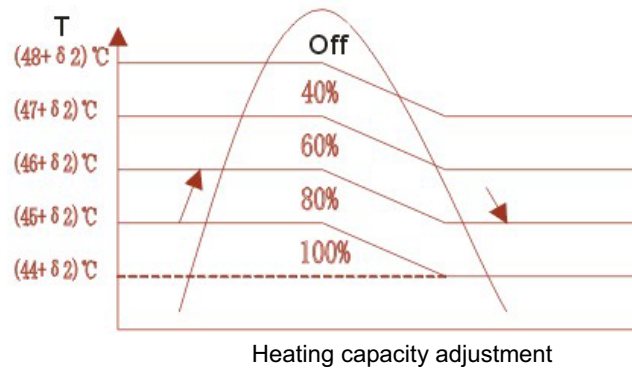
At first, the main unit will calculate $\delta 1$ ($\delta 1 = T_s - 7$), then adjust the capacity output according to T ($T = 5, 6, 7^\circ\text{C}$) + $\delta 1$ (T means the real temperature of total outlet water). The detail of cooling capacity adjustment is as following chart:



2. Heating capacity adjustment

Please preset T_s ($T_s = 45, 46, 47, 48, 49, 50^\circ\text{C}$), T_s is 45°C in default.; At first, the main

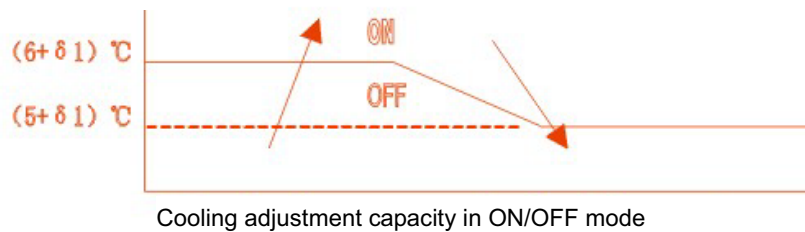
unit will calculate $\delta 2 = T_s - 45$, then adjust the capacity output according T (T=44, 45, 46, 47, 48°C) + $\delta 2$ (T means the real temperature of total outlet water). The detail of heating capacity adjustment is as following chart:



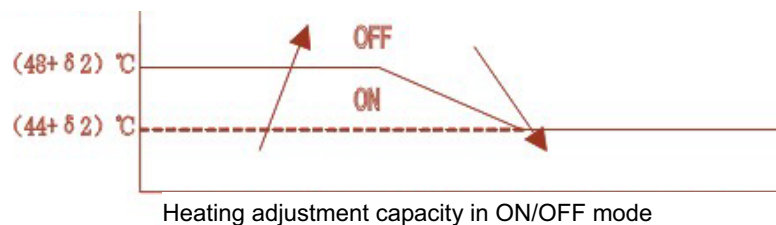
For example: If the system have 11 sets of units, when T reduce to 45°C in HEATING mode, the system will operate on 80%. So the actual operation units are 9 sets. (11*80%=8.8, adopts 9), and the main unit will stop two units which address is highest.

(2) Capacity adjustment of every one unit

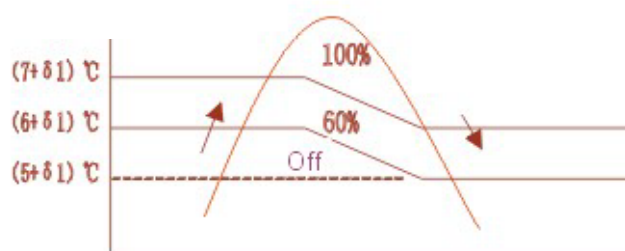
Temperature of heat exchanger



Temperature of plate heat exchanger

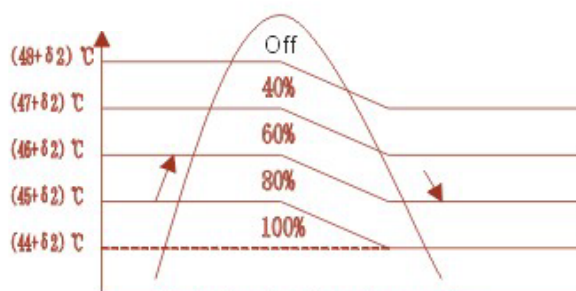


Temperature of plate heat exchanger



Cooling capacity adjustment with digital control unit

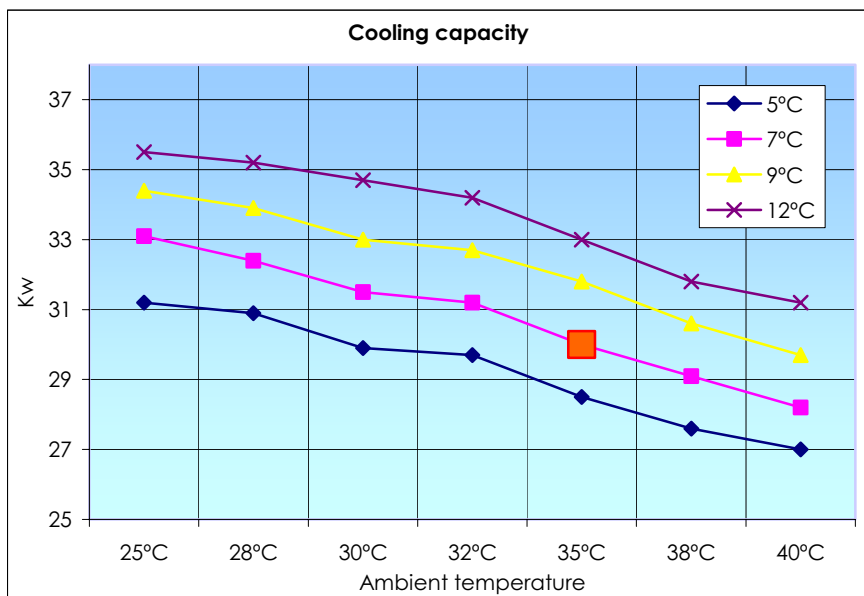
Temperature of plate heat exchanger



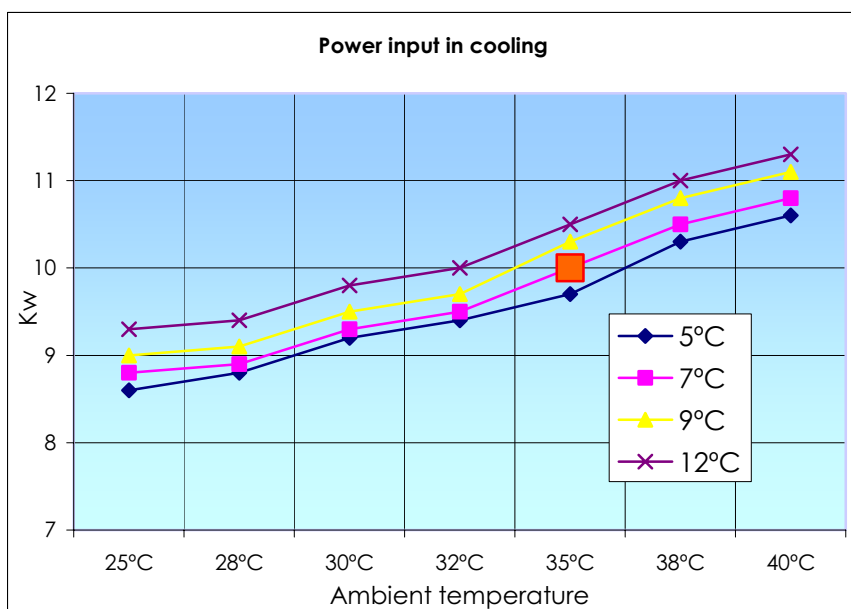
Heating capacity adjustment with digital control unit

8.1. Heating and cooling capacity mod. 30 Kw

	Cooling capacity				Power input			
	Outlet water temperature				Outlet water temperature			
Ambient temp. °C	5°C	7°C	9°C	12°C	5°C	7°C	9°C	12°C
25	31.2	33.1	34.4	35.5	8.6	8.8	9	9.3
28	30.9	32.4	33.9	35.2	8.8	8.9	9.1	9.4
30	29.9	31.5	33	34.7	9.2	9.3	9.5	9.8
32	29.7	31.2	32.7	34.2	9.4	9.5	9.7	10
35	28.5	30	31.8	33	9.7	10	10.3	10.5
38	27.6	29.1	30.6	31.8	10.3	10.5	10.8	10.8
40	27	28.2	29.7	31.2	10.6	10.8	11.1	11.1

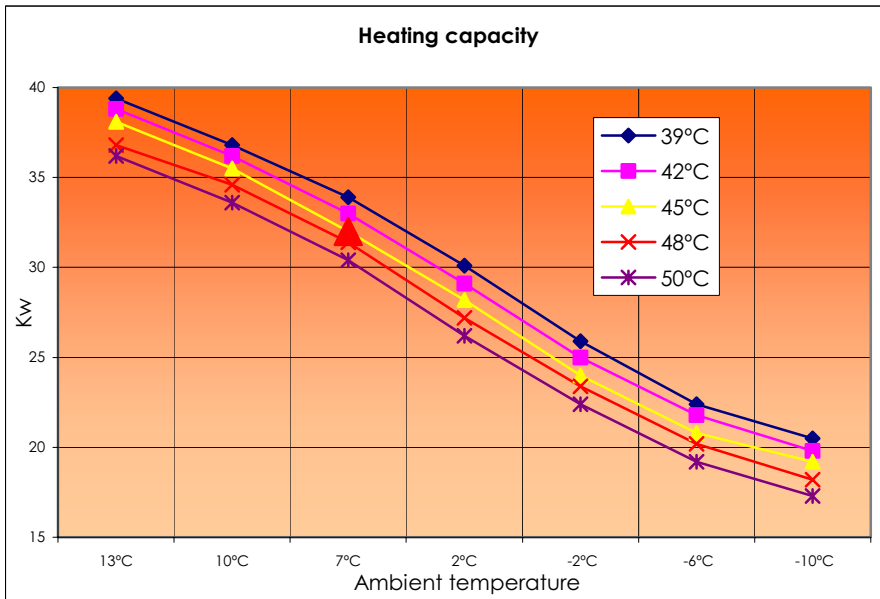


The diagram shows the capacity progress among ambient temperature and outlet water temperature of 5°C, 7°C, 9°C, 12°C

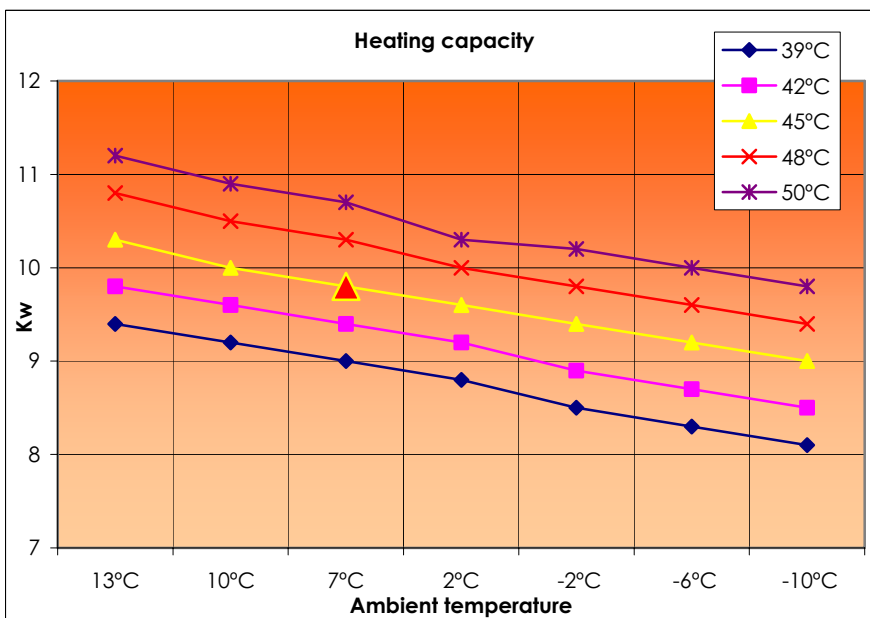


The diagram shows the power input progress among ambient temperature and outlet water temperature of 5°C, 7°C, 9°C, 12°C

Ambient temp. °C	Heating capacity					Power input				
	Outlet water temperature					Outlet water temperature				
	39	42	45	48	50	39	42	45	48	50
13	39.4	38.8	38.1	36.8	36.2	9.2	9.6	10	10.5	11.2
10	36.8	36.2	35.5	34.6	33.6	9.4	9.8	10.3	10.8	10.9
7	33.9	33	32	28.8	30.4	9.0	9.4	9.8	10.3	10.7
2	30.1	29.1	28.2	27.2	26.2	8.8	9.2	9.6	10	10.3
-2	25.9	25	24	23.4	22.4	8.5	8.9	9.4	9.8	10.2
-6	22.4	21.8	20.8	20.2	19.2	8.3	8.7	9.2	9.6	10
-10	20.5	19.8	19.2	18.2	17.3	8.1	8.5	9.0	9.4	9.8



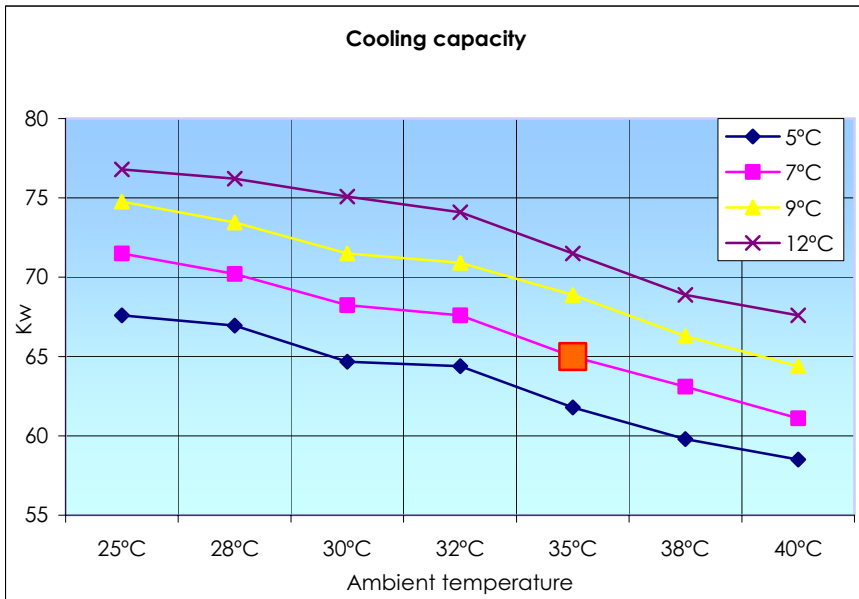
The diagram shows the capacity progress among ambient temperature and outlet water temperature of 39°C, 42°C, 45°C, 48°C, 50°C



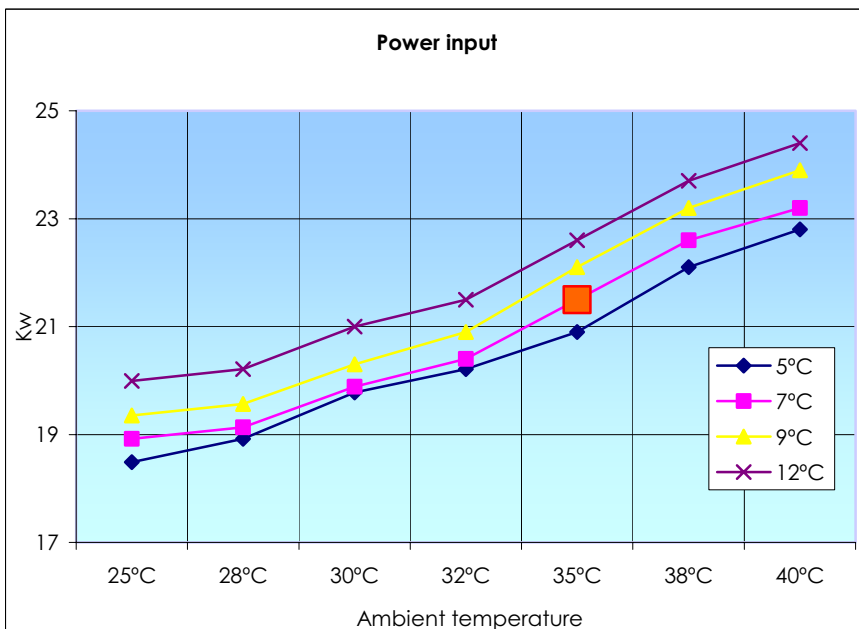
The diagram shows the power input progress among ambient temperature and outlet water temperature of 39°C, 42°C, 45°C, 48°C, 50°C

8.2. Cooling and heating capacity mod. 65 Kw

Ambient temp. °C	Cooling capacity				Power input			
	Outlet water temperature				Outlet water temperature			
	5°C	7°C	9°C	12°C	5°C	7°C	9°C	12°C
25	67.6	71.5	74.75	75.4	18.49	18.92	19.35	19.995
28	66.95	70.2	73.45	76.70	18.92	19.135	19.565	20.21
30	64.675	68.25	71.5	75.075	19.78	19.8875	20.3	21.0
32	64.4	67.6	70.9	74.1	20.21	20.4	20.9	21.5
35	61.8	65	68.9	71.5	20.9	21.5	22.1	22.6
38	59.8	63.1	66.3	68.9	22.1	22.6	23.2	23.2
40	58.5	61.1	64.4	67.6	22.8	23.2	23.9	23.9

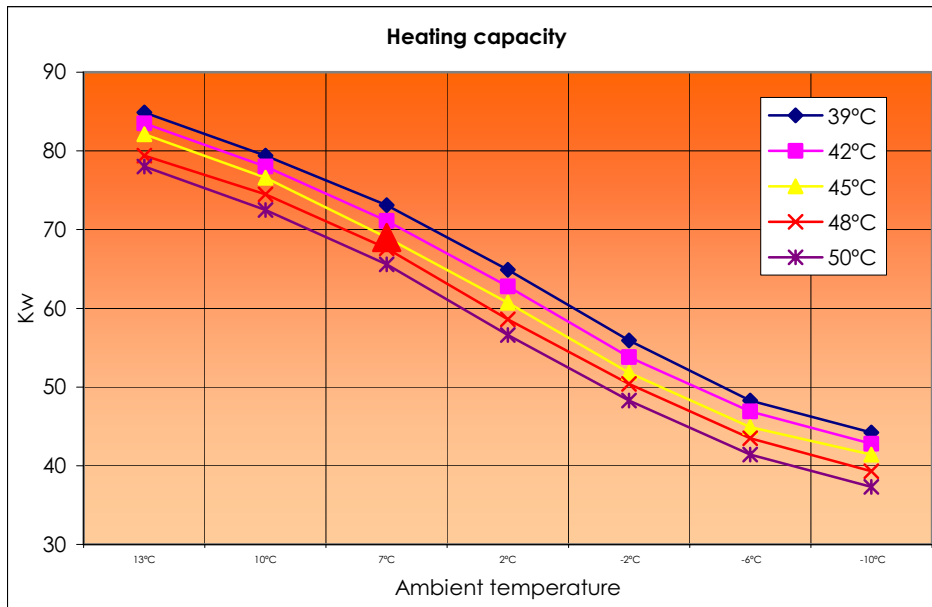


The diagram shows the capacity progress among ambient temperature and outlet water temperature of 5°C, 7°C, 9°C, 12°C

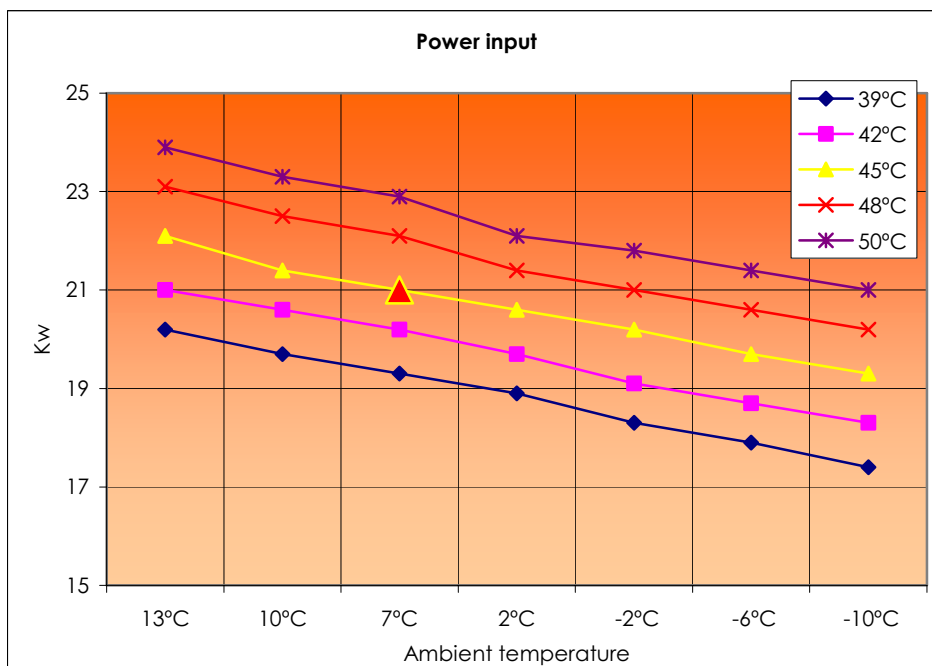


The diagram shows the power input progress among ambient temperature and outlet water temperature of 5°C, 7°C, 9°C, 12°C

Ambient temp. °C	Heating capacity					Power input				
	Outlet water temperature					Outlet water temperature				
	39	42	45	48	50	39	42	45	48	50
13	84.9	83.5	82.1	79.4	78.0	20.2	21	22.1	23.1	23.9
10	79.4	78.0	76.6	74.5	72.5	19.7	20.6	21.4	22.5	23.3
7	73.1	71.1	69	67.6	65.6	19.3	20.2	21	22.1	22.9
2	64.9	62.8	60.7	58.6	56.6	18.9	19.7	20.6	21.4	22.1
-2	55.9	53.8	51.8	50.4	48.3	18.3	19.1	20.2	21	21.8
-6	48.3	46.9	44.9	43.5	41.4	17.9	18.7	19.7	20.6	21.4
-10	44.2	42.8	41.4	39.3	37.3	17.4	18.3	19.3	20.2	21



The diagram shows the capacity progress among ambient temperature and outlet water temperature of 39°C, 42°C, 45°C, 48°C, 50°C



The diagram shows the power input progress among ambient temperature and outlet water temperature of 39°C, 42°C, 45°C, 48°C, 50°C

8.3 Principle of Digital Scroll Compressor

Scroll system controls refrigerant output by the ratio of loading and unloading time of compressor, and adjustment of loading time could be “stepless”. Furthermore, no need to change speed, and no need to worry about lubrication failures, which realizes the wide-range capacity adjustment of compressor. This can save the transformer cost and consumption, decrease the interference of higher harmonic wave upon power transmission system, enlarge the work condition range of compressor.

Summurizing:

- ◆ Widen capacity range from 10% to 100%;
- ◆ Stepless energy adjustment with higher SEER and lower energy consumption;
- ◆ The PWM solenoid valve can be used 40 million times on average, about 30 years;
- ◆ High reliability and compressing ratio by utilizing axial flexible sealing technology;
- ◆ Outstanding SEER approved by JIS and ARI;
- ◆ With the unique flexible technology, remarkably enhancing the abilities of anti-liquid pumping and anti-rubbing, which can prevent the compressor from liquid pumping in most of cases;
- ◆ Free of electromagnetic disturbance;
- ◆ Free of additional oil recycling equipment, achieve longer pipeline and higher drop difference design.

9. Features

■ Easy assembling

- ◆ Each module has independent structure, protect function, refrigeration system, power supply and control system. When some problems occur in one of unit (auxiliary unit), others can keep running normally.
- ◆ Unit can be assembled by variable modules (up to 8) according to different capacity requirement and the capacity can reach to 480kW ($8 \times 60\text{kW}$).
- ◆ Modules can be installed closely or within a certain distance according to different space requirement.
- ◆ Compact structure, easy maintenance.
- ◆ Simple and elaborate structure module design, reasonable pipeline arrangement, and good effect.
- ◆ Opening module structure design is beneficiary for the air flowing into condenser and maintenance.

■ Easy control, energy saving

- ◆ When unit is running, the controller can automatically adjust each module's capacity output or turn on, shut down the corresponding modules according to the system requirement.
- ◆ Each unit applies dual compressors that can achieve the best effect of energy saving by further elaborated adjustment.
- ◆ Micro computer controller can ensure the system running with high efficiency by the auto control functions such as intelligent defrosting, problems analyzing, energy management, anti-freeze inspecting and running mode, etc.

■ Orderly starting, intelligent memorizing

- ◆ When unit turns on, the controller can automatically start corresponding modules successively according to actual capacity requirement.
- ◆ The controller can automatically store start sequence and running hours of each module, so if running hours of one module has reached the pre-set standard, system will shut off this module, and start another. The module with shorter time to energize will be turned on first in the next operation, so it can be achieved to make a balance among modules to extend the life of system.

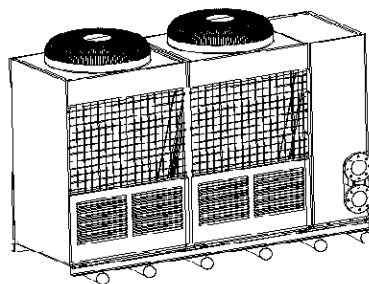
■ Remote & internet control.

- ◆ Each unit has one electric control system, which can accomplish independently the such functions as order input, control output, trouble solving, protection, etc.
- ◆ The communication between system and human can be achieved by linear controller, which can receive the customers' operation orders and send them to main controller, as well as collect the running data and display them on the screen.
- ◆ Matched RS485 communication interface achieve the remote monitoring function, furthermore it can be connected to Internet by using the reserved computer interface.

10. Unit installation

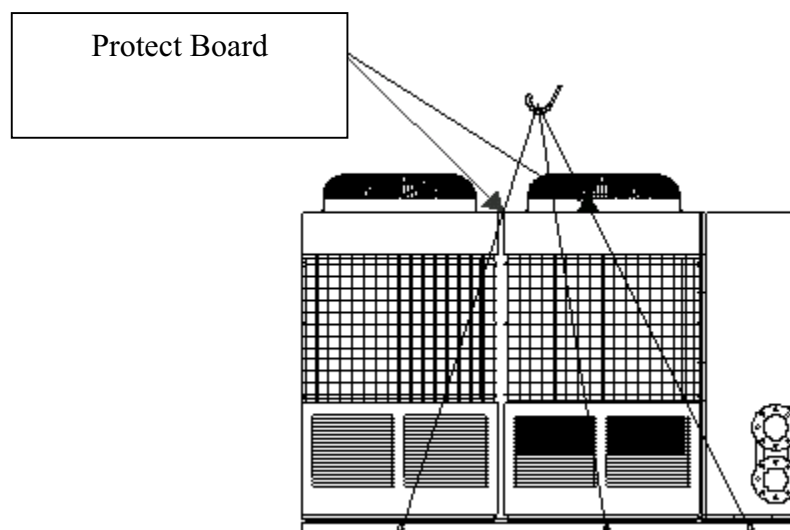
■ Transportation

- ◆ Be sure that the package will be transported safely, unpack until arrive at installation site
- ◆ The leaning angle during the transportation should be smaller than 15 degree to prevent the module from rolling over.
- ◆ When transporting the module with rolling bars, it is recommended to use 6 bars under the module, each one should be a bit longer than the width of basement to keep the module's in balance.



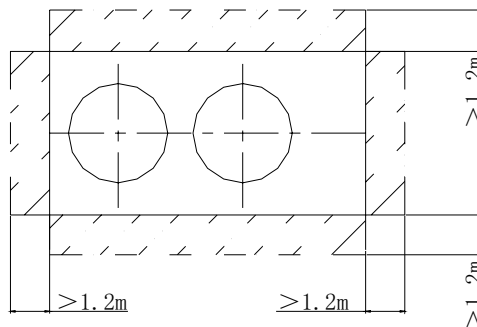
- ◆ Sling the module with steel wire, be sure that the wire could bear the weight 3 times heavier than that of the module, and Query whether if it hooks to module tightly. The hanging angle should be bigger than 60 degrees.

Notice: it is absolutely forbidden to stand under the module while hanging, please use soft board to protect the module surface which contact the steel wire from scratch and distortion.



■ Required installation places

- ◆ Clean, bright and well ventilated place such as roof, balcony or courtyard.
- ◆ Places without the interference of lampblack, steam and other kind of heat source.
- ◆ Places where it is convenient for pipeline installation and water draining with the least influence to surroundings, which is caused by noise and cool or heat wind.
- ◆ Places close to electric power.
- ◆ Places with solid basement to prevent noise and vibration.
- ◆ Ensure there is sufficient space for maintenance, and the required room is shown as follow. Query if there are any barriers that may block the airflow. The wall around the module should be not higher than 1m (from the bottom of module). It is recommended to cover the module to prevent from raindrop and snow, but the space between the cover and the top of module should be more than 2m.



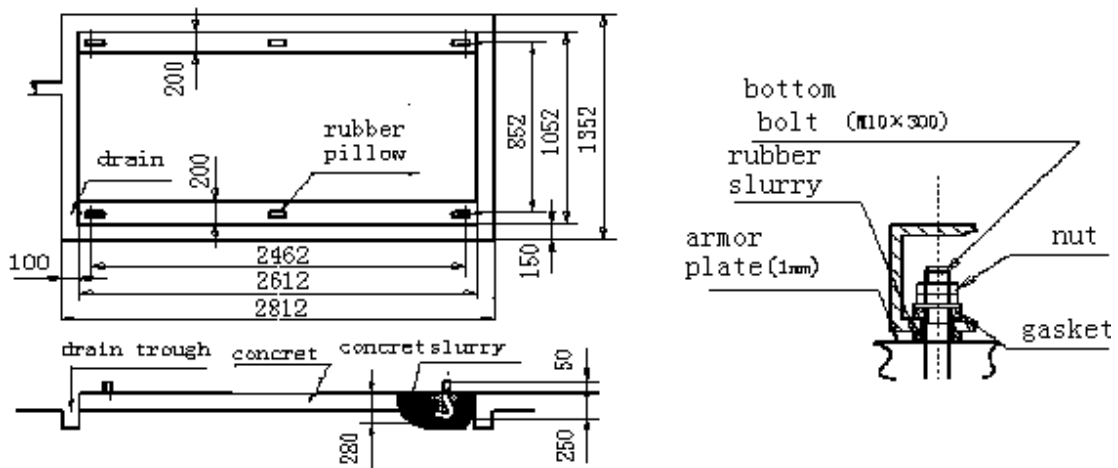
- ◆ When installing modules in parallel, it is suggested to leave sufficient space among modules for maintenance.

■ Installation foundation

- ◆ Before installation, it should consider the structure and prefabrication of the basement, especially when installing.
- ◆ When stalling on the top floor or middle, the floor intensity and noise preventing should be considered. It is preferable to communicate with building designer before installation.
- ◆ The drainage channel must be made around the basement to ensure the water can be drained away fluently.
- ◆ In order to avoid the vibration and noise caused by module, a pad must be set between the module and the basement to reduce vibration. Moreover, the module should be installed on the plane, and a shockproof basement can be adopted if necessary.
- ◆ It is recommended to take some measures to prevent the movement caused by long-term running, earthquake or typhoon.

■ Installation reference

The installation basement for main module is shown as follows; the auxiliary module is the same as the main one. 60mm distance should be left between modules. The weight that the concrete can support should be 1.5 to 2 times of the weight of modules when the modules are installed on the ground.



11. Water system installation

Every pipeline's joint has marks of water-outlet and water-inlet mark. The following should be noticed when connecting pipelines:

- The water passage is narrow due to the adoption of plate heat exchanger, so it is easily jammed by particles or dust, which may cause freezing and damage the system. To prevent this problems, the users should try to install a Y shape filter with 20 item reticulation at the inlet of chilled-water or cooled-water near the module.
- The water pipeline should be cleaned before connecting to the unit, then dismantle the filter and install again. After confirming the water pipeline is clean, the connection can be done.
- The soft connector should be used at the inlet (outlet) water pipe to avoid vibration.
- To ensure turn on the water pump first and then the unit, the water switch should be installed on the inlet pipeline and connect its wire to terminal W1 and W2 of main unit.
- Water discharge switch should be installed at the outlet pipe, and gas discharge valve should be installed at the inlet water pipe. When the unit works normally, the handler of valve must be taken away to ensure the valve can't be opened. If the water discharge valve is opened when the unit is running, water breaking-off will occur.
- The freeze-water pipeline should be covered with adequate heat-insulating material to keep the chilled-water temp. and prevent dewing.

- In the cold winter, if the unit stops at night, the water in plate heat exchanger and pipeline may freeze, which will damage the device and pipeline. To prevent freezing, it is absolutely forbidden to switch off the power of the unit (the unit has auto anti-freeze function). If it is still likely to freeze, it must drain away all water in the water pipe. If it is difficult to drain water, some anti-freeze mixture such as glycol or propylene glycol can be adopted. **Notice: it is absolutely forbidden to use salt mixture, which would corrode the system and cause damage.**
- When using industrial water as chilled-water, it seldom scales. However if adopting the water from well or river, it will produce much deposit such as scale and sand. So the water should be filtered and intenerated through some equipment before flowing into the freeze-water system. If there is sand or mud deposited in the evaporator, it will jam the flow of chilled-water, which will cause freezing. So it is important to test the water's PH value, conductivity, concentration of chlorine hydronium, concentration of sulfur hydronium, etc.

The following is the standard of water quality:

PH value:	6.5~8.0	Total rigidity:	<50ppm
Conductivity:	<200 μ V/cm (25℃)	Sulfur hydronium:	None
Chlorine hydronium:	<50ppm	Ammonia hydronium:	None
Vitriol hydronium:	<50ppm	xi:	<30ppm
Iron thickness	<0.3ppm	Natrium hydronium:	None
Calcium hydronium:	<50ppm		

12. Wiring

All wiring installation must be done by qualified person.

Precautions:

- The power supply must be stable when the unit is running. Considering all voltage-drop factors, the running voltage needed by the system should be kept within $\pm 10\%$ range of the rating. Too high or too low voltage will have bad effect on the unit.
- The difference of voltage among phases should be not more than 2% of the rating, and the max current difference among phases should be less than 3% the rating to prevent compressor from overheating.
- The frequency of the power should be kept within $\pm 2\%$ of the rating.
- The lowest starting voltage should be more than 90% of the rating.
- The compressor may be unable to start if the wire is too longer, so the length of the wire should be limited to ensure the voltage-drop between the two ends of the wire is less than 2% of the

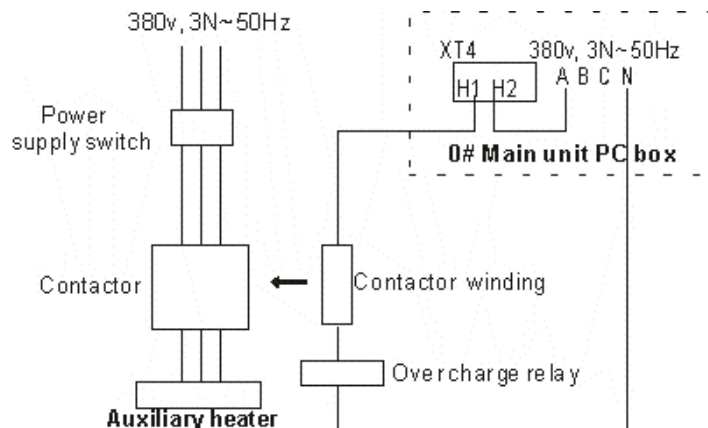
rating. If it is unavailable to shorten the wire, thicker wire is available.

- All wire must conform to concerning national standards and well insulated. The insulation between terminals and modules should be Queried by 500v high resistance meter and its insulation resistance should be not less than 10 MΩ.
- For safety, according to the concerning standards, unit should be grounded well to prevent electric shock.
- The running current, input power and other parameters on the nameplate might be different from the actual situation, which is decided by the actual load and cooling water temp., so it is recommended to select power source, transformer, fuse switch and the size of the wire in the consideration of the worst condition.
- In order to control the compressors conveniently as well as independently and avoid the damage caused by the short circuit, it is necessary to equip the suitable no-fuse air switch for each inlet wire.
- One module consists of two units, each unit's main power should be wired independently and the detail is shown as follow:

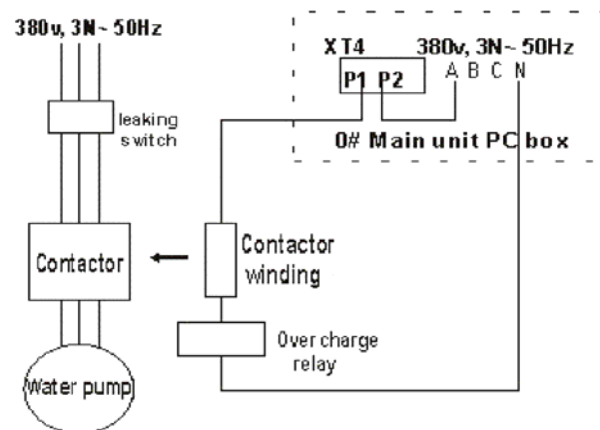
Model \ Items	Power	The minimal diameter Of wire(mm ²) (metal tube, vinylite)		Hand switch (A)		Creepage protector
		Power wire (<30m=	Earthing wire	Volum e	Fus e	
CD-30 CD-65	380V 3N~ 50Hz	10	6	50	36	100mA

- Water flow switch control wire connection: water flow switch wires (prepared by costumes) are connected to **main unit's W1, W2 terminals.**

- Auxiliary electric heater control wire connection: the control wire of AC contactor must pass the **main unit's H1, H2 terminals** as below:



- Water pump control wire connection: the control wire of AC contactor must pass **P1, P2 terminals of main unit** as below:



Notice: Water flow switch, water pump and auxiliary electric heater can just be connected to the main unit controller which is set as 0 addresses.

12. Debugging

■ Preparation

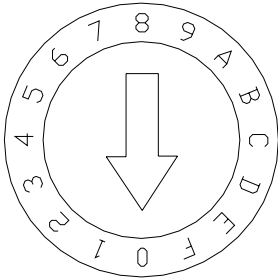
After cleaning the water system pipeline for several times, ensure the water is clean, then pump and drain again, and start the pump to ensure the flow and the pressure of inlet and outlet pipeline is qualified.

Notice: the water pump is under the control of the main unit, so when the water system is running, it can make the control circuit of water pump AC contactor electrify by temporarily wiring, thus to make the water pump running.

Warning: it is absolutely forbidden to start the pump by the control of main unit before the water system has been adjusted well.

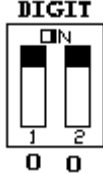
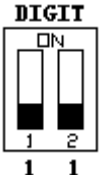
- ◆ Please set the address switch on the unit controller according to the rule below.

Warning: address switch setting must be done without any electric supply and when the unit is electrified, setting is absolutely forbidden.

Unit address setting	Corresponding table between address code and unit address																																		
 <ul style="list-style-type: none"> ● 0 presents NO. 0 main unit, 1~F in turn presents NO 1 ~ 15 auxiliary units.(respectively) ● One module consists of two units, so there are two addresses for each module. ● Address of each unit should not be repeated; otherwise modules would be unable to start due to protection. So it must set the switch to different address code. 	<table> <tr> <th>Address code</th><th>Unit address</th></tr> <tr><td>0</td><td>NO. 0 main unit</td></tr> <tr><td>1</td><td>NO. 1 auxiliary unit</td></tr> <tr><td>2</td><td>NO. 2 auxiliary unit</td></tr> <tr><td>3</td><td>NO. 3 auxiliary unit</td></tr> <tr><td>4</td><td>NO. 4 auxiliary unit</td></tr> <tr><td>5</td><td>NO. 5 auxiliary unit</td></tr> <tr><td>6</td><td>NO. 6 auxiliary unit</td></tr> <tr><td>7</td><td>NO. 7 auxiliary unit</td></tr> <tr><td>8</td><td>NO. 8 auxiliary unit</td></tr> <tr><td>9</td><td>NO. 9 auxiliary unit</td></tr> <tr><td>A</td><td>NO. 10 auxiliary unit</td></tr> <tr><td>B</td><td>NO. 11 auxiliary unit</td></tr> <tr><td>C</td><td>NO. 12 auxiliary unit</td></tr> <tr><td>D</td><td>NO. 13 auxiliary unit</td></tr> <tr><td>E</td><td>NO. 14 auxiliary unit</td></tr> <tr><td>F</td><td>NO. 15 auxiliary unit</td></tr> </table>	Address code	Unit address	0	NO. 0 main unit	1	NO. 1 auxiliary unit	2	NO. 2 auxiliary unit	3	NO. 3 auxiliary unit	4	NO. 4 auxiliary unit	5	NO. 5 auxiliary unit	6	NO. 6 auxiliary unit	7	NO. 7 auxiliary unit	8	NO. 8 auxiliary unit	9	NO. 9 auxiliary unit	A	NO. 10 auxiliary unit	B	NO. 11 auxiliary unit	C	NO. 12 auxiliary unit	D	NO. 13 auxiliary unit	E	NO. 14 auxiliary unit	F	NO. 15 auxiliary unit
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F	NO. 15 auxiliary unit																																		

◆ Digital scroll modular and Normal scroll modular can be selected according to DIGIT switch.

Notice: the DIGIT switch has been set well in the factory and need to change only for CD30-M as auxiliary unit.

	<p>“00” presents to select digital compressor (as the main unit.)</p>
	<p>“11” presents to select constant compressor (as the auxiliary unit.)</p>

- ◆ Please turn on the main power 12 hours before starting to preheat the compressor. If the compressor is not preheated enough, it may be damaged.
- ◆ Adjust carefully the water flow switch on water system or close valve at inlet to ensure the water flow volume is 90% of the rating.
- ◆ Query if any component of the unit is loose and the unit has no distortion and rupture.
- ◆ Before starting, please Query carefully if the power voltage and wiring are right. Query if the power sequence is correct. If not, it needs to be exchanged. Query if the connecting part is tight and fasten once again.
- ◆ Connect the water flow switch correctly to the control cycle.
- ◆ Put the Temp. sensor to the right position, and then fasten it well to prevent from falling off.

■ Testing

- ◆ Turn on the unit by wire controller. If there is ERROR Code displayed, please first eliminate the malfunction; confirm there is no malfunction before restarting.
- ◆ After 30 minutes, when the temp of water is stable, adjust the water flow volume to nominal value to ensure the unit running normally.
- ◆ When the unit is working, Query the Running Current, Running Pressure, Water Pressure, Water flow Volume, Water Temp. Difference between inlet and outlet water, What's more, adjust the water flow volume according to the actual conditions to ensure the unit running normally.
- ◆ Optimizing the setting parameters according to the local weather and concerning operation references.
- ◆ After the unit stops, start the unit 10 minutes later to prevent the unit from starting frequently. Query if the control and protection devices are normal according to the following table:

Models			CD						
			60	120	180	240	300	360	420
For compressor	High-pressure switch Cut off Close	MPa	Reset automatically, unadjusted 3.3 2.4						
	Low-pressure switch Cut off Close	MPa	Reset automatically, unadjusted 0.03 0.15						
Temp Sensor inside the digital compressor		-	Controlled by micro- controller When the Temp. is lower than 125℃, compressor will not work. When the Temp. is higher than 125℃, the capacity output of digital compressor will decrease to 40%. When the Temp. is higher than 140℃,compressor will stop. After the malfunction disappear, compressor will restart 3 minutes later.						
Over-current protection		A	18						
Heating belt Capacity		W	Each compressor has one 40						
Discharge Temp. Protection Cut off Close		℃	130 90						
Anti-freeze Protection Switch		℃	Controlled by micro- controller (one every cycle.) 3						

■ Notices

- ◆ Because the water pump is under the control of main unit, it is forbidden to start the pump by the main unit when cleaning water system pipeline.
- ◆ Before finishing draining water out from pipeline, it is forbidden to start unit.
- ◆ Install the water flow switch correctly; otherwise water shortage accident will happen.
- ◆ During test-running, do not restart the unit by manual in 4 minutes after the unit stops.
- ◆ In the season when the unit needs to be frequently used, don't switch off power after the unit stops. Otherwise, the compressor can't be preheated, which may damage the compressor.
- ◆ After a long time without electrifying, please pre-electrify the unit 12 hours in advance to preheat the compressors.

13. Maintenance

To ensure the unit can reliably run for a long time, debugging and maintenance should be done by the qualified persons. The items below should be noticed especially.

■ Warning

- ◆ If it is on fire, switch off the main power at once and eradicate the fire with extinguisher.
- ◆ The unit can't be operated near the flammable gas to prevent fire or explosion.

■ Caution

- ◆ Maintain unit regularly according to the reference to keep unit in a good condition.
- ◆ Do not touch the discharge pipeline to avoid any scald.
- ◆ If malfunction causes the unit stop, please refer to the "Troubles and solutions" part of this manual or contact with us to find out the reason. After the malfunction is eliminated, the unit can be restarted again. It is absolutely forbidden to forced restart the unit without solving the problems. If refrigerant or chilled water (cooling water) has leakage, it must shut down all switches. If the unit can't be stopped by the controller, it must switch off the main power to stop the unit.
- ◆ Do not use any iron wire, copper wire instead of the demanded fuse, otherwise it will cause the fire and damage the system.
- ◆ Don't make the protection device short-circuited, otherwise it may cause accident.

■ Maintenance for main components

- ◆ During running, please notice the discharge pressure and suction pressure. If there is anything abnormal, please find out the reason and eliminate the malfunction.
- ◆ Don't adjust the control and protection devices at random.
- ◆ Query the wire connection regularly to confirm there is no any loose or bad contact caused by oxidation or other reasons. Please frequently Query the work voltage, current and phases balance.
- ◆ Query the reliability of the electric components, and replace the invalid and the unreliable in time.

■ Descaling

After a long term running, the surface of the heat exchanger of waterside will form calcium oxide and other mineral. Those kinds of material will decrease the heat transfer efficiency, cause more power consumption and higher discharge pressure (or lower suction pressure). These materials can be cleaned by formyl, citric acid, vinegar acid, etc, but any liquid which contains chlorine acid or fluoride ingredient is forbidden. Because the pipe is made of stainless steel, it is easy to be rotted by such material.

- ◆ Cleaning work of waterside heat exchanger should be operated by the professional, please contact with our local MAXA service center.
- ◆ After cleaning by chemical liquid detergent, scour the pipeline with clean water and heat the exchanger again. Pre-dispose the water to avoid rotting and forming of the scale again.
- ◆ On the condition of using chemical liquid detergent, please select the intensity, cleaning time and Temperature of the liquid according to the actual situation.
- ◆ After cleaning, the waste liquid should be neutralized, so please contact the professional company to get the further disposal for the waste.
- ◆ Detergent and neutralization liquid are harmful to human beings, so it is necessary to use some protective device, such as special glasses, gloves, shoes, mask, etc.

■ Turn off the unit in winter

When turning off the unit in winter, clean and dried the inner and outer surface of the unit, then cover them to prevent dust. Open the water discharge valve, drain away the water in heat exchanger of water side and water pipe to prevent freeze. It is recommended to inject some anti-freeze material into the water pipe.

■ First start after the unit stops

The following must be done when restarting the unit after a long-term vacancy:

- ◆ Query and clean unit thoroughly.
- ◆ Clean the water system pipeline.
- ◆ Query water pump, adjust switch and other devices of the water system.
- ◆ Tighten all the wire connections.

■ Accessory replacement

Only MAXA accessory can be used and please don't use any different one.

■ Refrigeration system

Query the discharge and suction pressure to determine whether the unit needs to recharge or not. Take leakage test for the system; if there is leakage or some components needs to be replaced, leakage test is necessary. When recharging refrigerant, two cases must be separated:

◆ The refrigerant has leaked out totally

In this case, leakage test must be done by using nitrogen ($15\sim 20\text{ kgf/cm}^2$) or refrigerant. If necessary, welding should be done after all gas of the system is discharged out.

- 1) Connect the vacuum pump pipeline to the refrigerant charging hole.

- 2) Vacuum refrigerant pipeline more than 15 minutes and confirm it achieve $-1.0 \times 10^5 \text{Pa}$ (-76cmHg) .
- 3) After having achieved the designated vacuity, add refrigerant to the system from the cylinder, corresponding volume of the refrigerant can be got from the nameplate and parameters table. It should be noticed that charging just be allowed from the liquid pipeline side.
- 4) The volume charged into the system will vary from different surrounding Temperature, if the designated volume can't be achieved, unit can be started for recharging while the water system is running. Wire the low-pressure switch to short circuit if necessary.

Notice: rewiring the connection after charging.

◆ **Additional refrigerant charge**

Connect refrigerant cylinder to the refrigerant charging hole and mount a pressure detector on the gas side pipeline.

- 1) Recycle the chilled-water, then start unit, take low-pressure control switch to short circuit if necessary.
- 2) Charge the refrigerant into the system slowly, and Query the discharge and suction pressure.

Warning: it is absolutely forbidden to charge the oxygen, acetylene or other gas which is poisonous or flammable into the system for leak hunting or leakage test, just nitrogen or refrigerant is allowed.

■ Remove compressor

If it is necessary to remove the compressor, please operate with the sequence below:

- 1) Switch off the power
- 2) Remove the electric wire
- 3) Remove the suction and discharge pipeline
- 4) Loosen the fixing bolts.
- 5) Remove the compressor.

■ Auxiliary electric heater

When the outdoor Temperature (is) below 0°C , the condenser outside will frost, which will cause the heat transfer efficiency come down, for the reason above, when using unit in the areas where the lowest Temp is between $-10^{\circ}\text{C} \sim 0^{\circ}\text{C}$ in the winter, it is recommended to select the auxiliary electric heater to supply the additional heat. Select the heater with the reference of "Specification Table", if the Temp below -10°C , the higher power-input can be selected.

■ System anti-freeze

If plate heat exchanger is frozen, the exchanger will be damaged; when system is in standby mode, according to T3 temperature, if it is $< +2^{\circ}\text{C}$, pump starts and after 2 minutes all the online units start working in heating mode in order to avoid plate heat exchanger freezing.

During anti-freeze process display will show Pb, until total water temperature reaches 15°C .

After 2 minutes pump will stop.

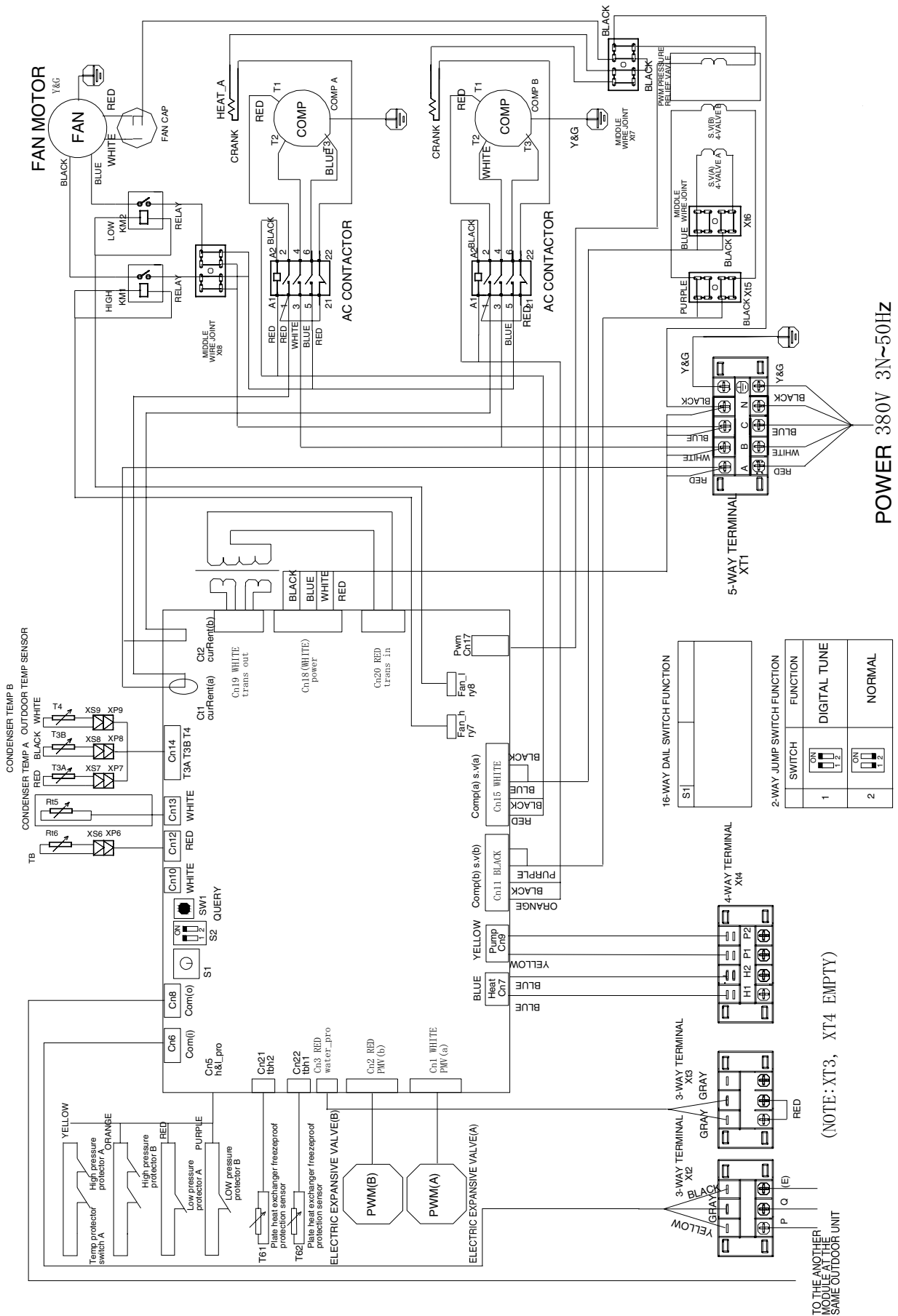
14. Troubles and solutions

Troubles	Possible reasons	Solutions
High discharge pressure (Cooling)	Air or other gas enter the system Fins are dirty or jammed by some obstacles The condenser wind flow is insufficient or motor fail High suction pressure Refrigerant over-charged High surrounding Temp	Discharge the gas from refrigerant charging hole, re-vacuuming if necessary Clean the fins of condenser Query the condenser motor, repair it if necessary Refer to the "high suction pressure" part. Discharge the additional refrigerant Measure the surrounding Temp
Low discharge pressure (Cooling)	Surrounding Temp is lower Refrigerant leak or insufficient Low suction pressure	Measure the surrounding Temp Leak hunting or recharging Refer to the "low suction pressure"
High suction pressure (Cooling)	Refrigerant over-charged High Temp of the inlet chilled-water	Discharge the additional Query the heat insulation of water pipeline
Low suction pressure (Cooling)	Insufficient of water flow Low Temp of inlet chilled-water Refrigerant leak or insufficient Scaling in the evaporator	Measure the Temp difference between inlet and outlet water, adjust the water flow Query installation Leak hunting or recharging Descaling
High discharge pressure (Heating)	Water flow Insufficient Air or other gas enter the system Scaling in the heat exchanger of waterside High Temp of outlet cooling water High suction pressure	Measure the Temp difference between inlet and outlet water, adjust the water flow Discharge the gas from refrigerant charging hole, re-vacuuming if necessary. Descaling Query the water Temp Refer to "high suction pressure" part

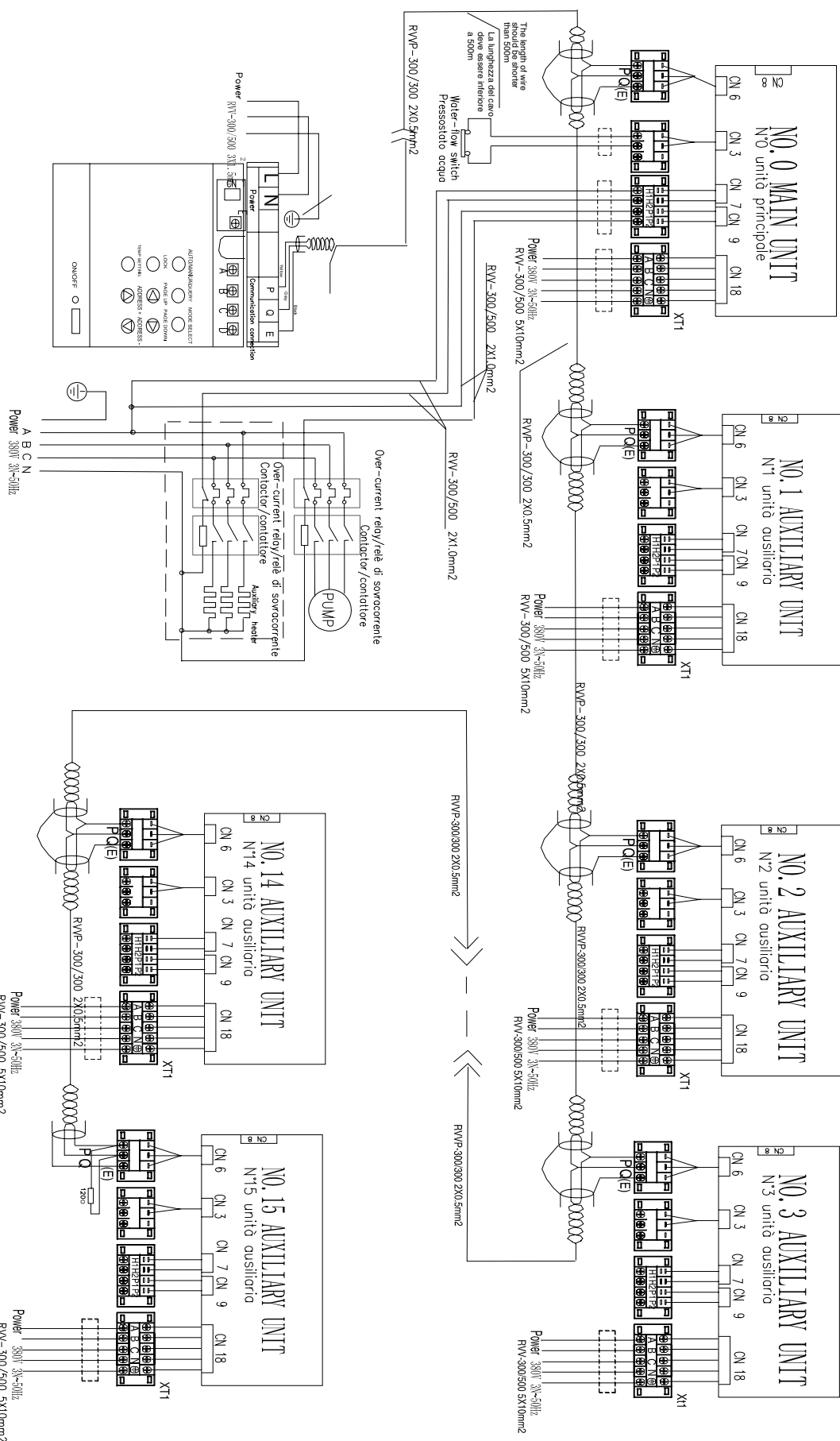
Low discharge pressure (Heating)	Low Temp of cooling water Refrigerant leak or insufficient Low suction pressure	Query the Temp of cooling water Leak hunting or recharging Refer to “low suction pressure” part
High suction pressure (Heating)	High surrounding Temp Refrigerant over-charged	Measure the surrounding Temp Discharge the additional
Low suction pressure (Heating)	Refrigerant insufficient Air flow insufficient Short cycle of air flow Defrosting insufficient	Recharging Query the running direction of the fan Find the reason caused short cycle, then eliminate it four-ways value or heat-sensitive resistance failure, replace them if necessary
Compressor stop by anti-freeze protection (Cooling)	Chilled-water insufficient Air enter the water system failure of the heat-sensitive resistance	Failure of the water pump or water flow switch, maintain or replace them if necessary Discharge the air If failure confirmed, replace it.
Compressor stop by High-pressure protection	High discharge pressure High-pressure switch failure	Refer to “high discharge pressure” If failure confirmed, maintain or replace it if necessary
Compressor stop by the overload protection	High-pressure both of discharge and suction High or low voltage, single phase or unbalance of the phases short circuit of the motor or terminals Over-load component failure	Refer to “high discharge pressure” or “low suction pressure” parts. Query the voltage which should never exceed or below 20V to the rating. Query the motor and the corresponding resistance of the terminals Replace it
Compressor stops by the inner Temp sensor or high discharge	High or low voltage High discharge pressure or low suction pressure Components failure	Query the voltage which should never exceed or below 20V to the rating. Refer to “high discharge pressure” and “low suction pressure” parts.

Temp protection.		Query the inner Temp sensor, when the motor is cool
Compressor stop by the low-pressure protection	Filter jammed before (or after) electric expansion valve Low-pressure switch failure Low suction pressure	Replace filter If failure confirmed, replace it. Refer to “low suction pressure” part.
Abnormal noise cause by compressor	Compressor liquid pumping caused by the entrance of liquid refrigerant. Compressor aging	Adjust the refrigerant volume Query expansion valve and suction gas degree of superheat. Replace compressor
Other abnormal noise	Panel bolt loosed Insufficient strength of the installation foundation.	Fix all components Refer to “Unit installation ” part
Compressor can't start	Current relay open, burning the fuse. Open circuit of the control wire High or low-pressure protection Contactor wire burn out Wrong phases sequence Water system failure Failure code displayed by the linear controller.	Replace the invalid components Query the control system connection Refer to the parts above about the failures caused by suction and discharge pressure Replace the invalid components Exchange any two of three phases with each other. Query water system Confirm the type of failure and take the corresponding measure.
Airside heat exchanger over-frosted	Four-ways valve or heat-sensitive resistance failure. Short cycle of the air flow	Query the system, replace them if necessary Query the system; eliminate the failure causing short cycle.

16. Electric control figure (auxiliary unit)



17. Unit electric control & communication figure for 30KW unit

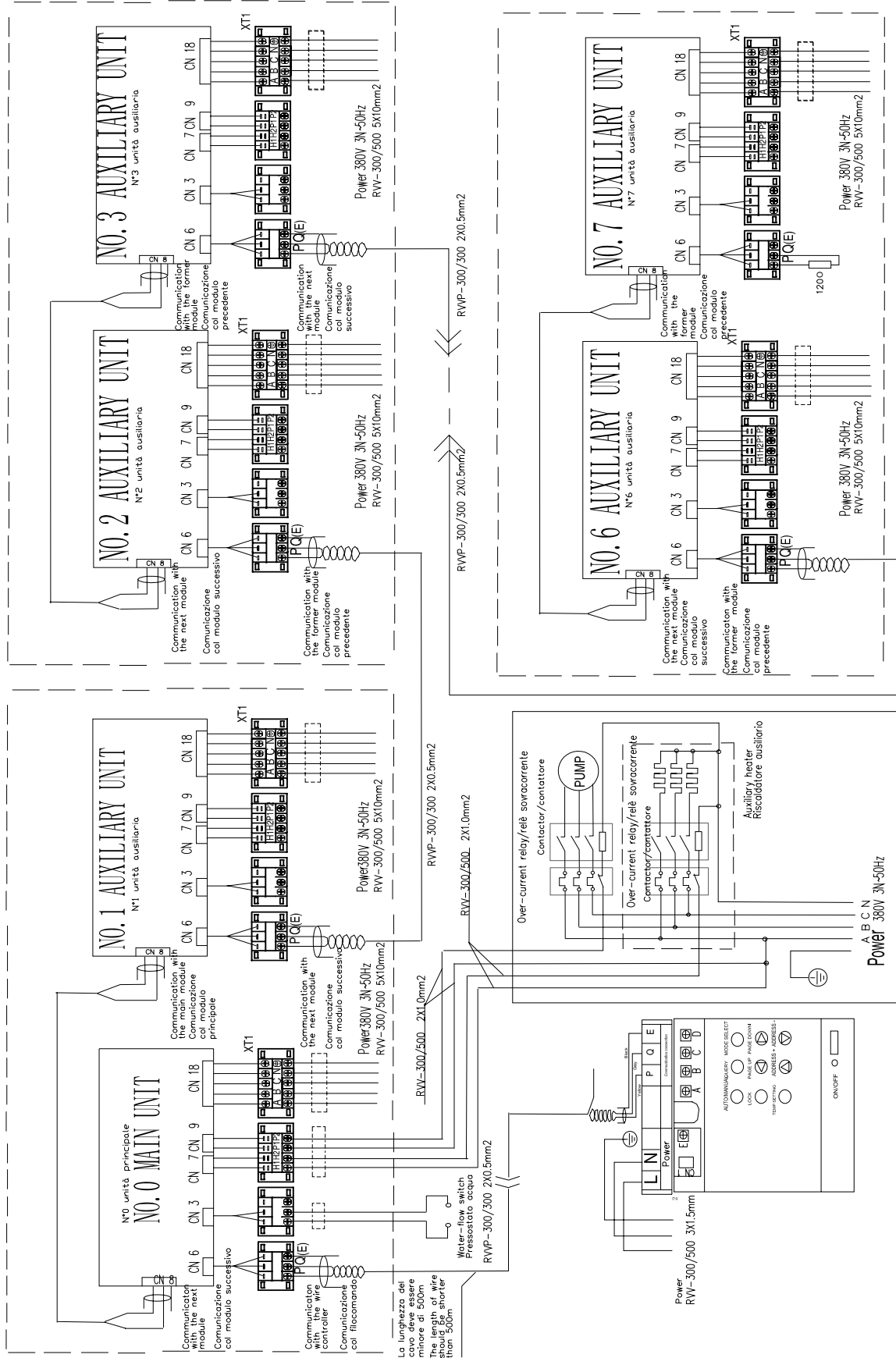


Note: The wiring diagram of auxiliary heater is just for reference, please follow the instructions of corresponding auxiliary heater products. Please choose such accessory as power wire, switch of water pump and auxiliary heater according to the actual parameter of products and national standards

The wiring terminal P,Q, and E on the back of Wire Controller are corresponding to the Terminal P,Q, and E of Wiring Board in Main Module

The metal plate of contactor installation box should be grounded

18. Unit electric control & communication figure for 65KW unit

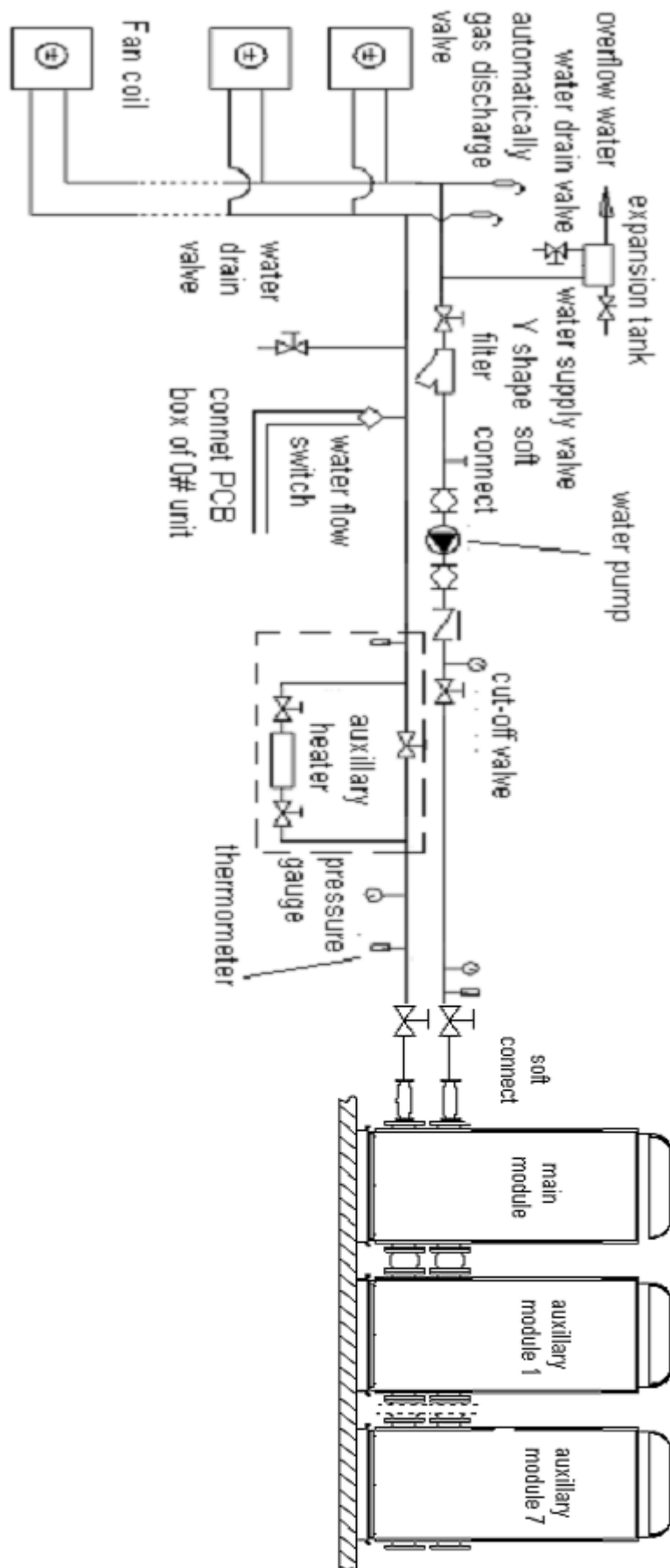


Note: The wiring diagram of auxiliary heater is just for reference, please follow the instructions of corresponding auxiliary heater products. Please choose such accessory as power wire, switch of water pump and auxiliary heater according to the actual parameter of products and national standards

The wiring terminal P,Q, and E on the back of Wire Controller are corresponding to the Terminal P,Q, and E of Wiring Board in Main Module

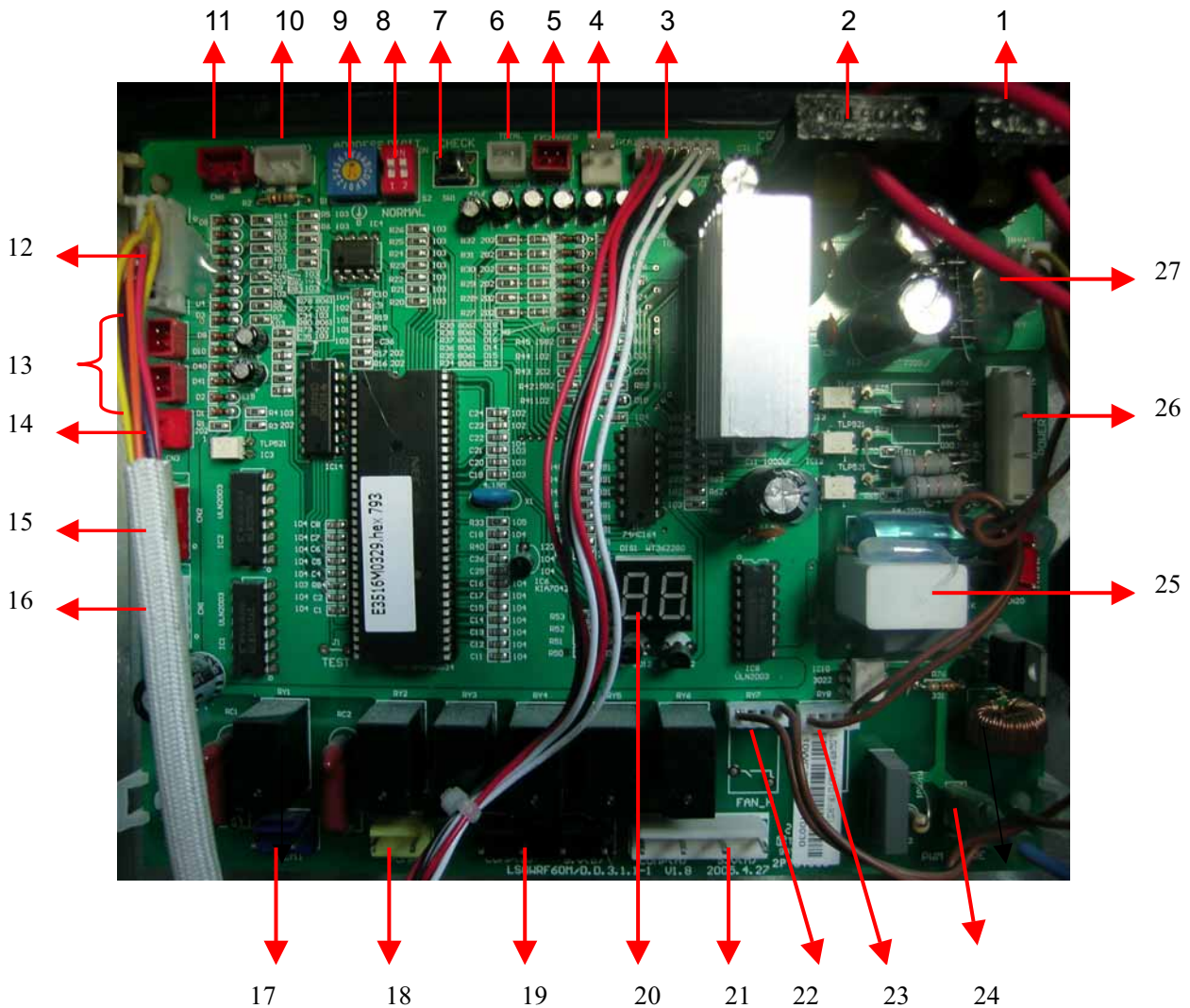
The metal plate of contactor installation box should be grounded

19. Installation system figure



Unit electric controller

1. Outlook view



Notice:

■ Failure

When main unit fails, the unit stops as well as the others stop too.

When auxiliary unit fails, this unit stops while the others keep running.

■ Protection

When main unit's protection acts, the unit stops while the others keep running.

When auxiliary unit's protection acts, this unit stops while the others keep running.

2. Components description

1——Compressor B current detection (Protection code P5)

2——Compressor A current detection (Protection code P4)

The current will not be detected at the first 5 seconds when starting, after that, if the current is exceeds the pre-set protection standard, (18A for both of digital and constant), compressor will stop, and restart 3 minutes later.

3——T4: Outdoor Temperature sensor (failure code E7).

T_{3B}: Condenser B tube Temperature sensor (failure code E6, protection code P7).

T_{3A}: Condenser A tube Temperature sensor (failure code E5, protection code P6).

◆ T4

If any one system needs to start the outdoor fan, the fan will be started by the unit electric controller. The fan has two speed levels: high and low which all depends on the T4 Temperature.

◆ T_{3B}、T_{3A}

◆ When unit electric controller detects the Temperature of T_{3B} or T_{3A} are higher than 65°C, the corresponding system will stop, then restart after the Temperature is lower than 60°C or less. Meanwhile the other system keeps running without any influence.

◆ T4、T_{3B}、T_{3A}

The alarm will work if the voltage detected by the Temperature sensor is less than 0.05V or more than 4.95V.

- If main unit sensor of fails: all units will stop.
- If auxiliary unit sensor fails: this unit will stop while the others keep running.

4——System A compressor discharge gas Temperature sensor (failure code E8, protection code P8) is only available for main unit.

5——T61,T62 Outlet water Temperature sensor of plate heat exchanger (failure code E4).

Capacity output will adjust according to the outlet water Temperature of the plate heat exchanger both in cooling and heating models.

(Auxiliary unit) constantly adjusting range: ON and OFF;

(Main unit) digitally adjusting range: OFF, 40%, 60%, 80% and 100%.

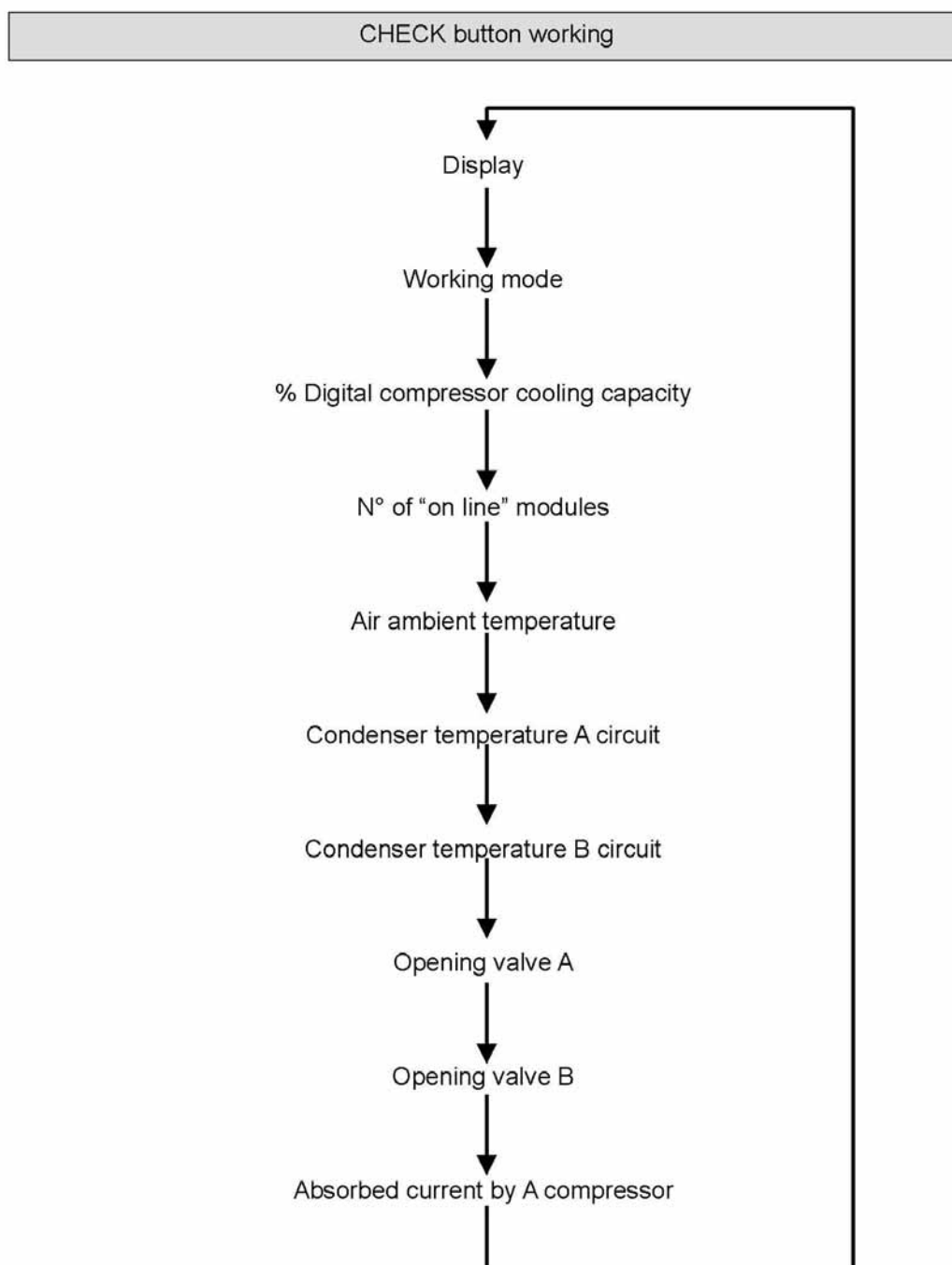
6——T3 Total outlet water Temperature sensor (failure code E3), just valid for main unit.

Adjust the Capacity output adjustment according to the outlet water Temperature of the

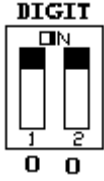

plate heat exchanger both in cooling and heating modes

Adjusting range: OFF, 40%, 60%, 80% and 100%.

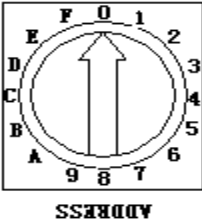
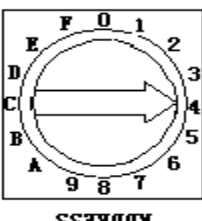
7—QUERY It can be achieved by QUERY to observe the running condition of the outdoor systems. The corresponding data will be shown as follows:



8——DIGIT Digital compressor selecting switch.

	<p>“00” presents selecting digital compressor (as the main unit.)</p>
	<p>“11” presents selecting constant compressor (as the auxiliary unit.</p>

9——ADDRESS

	<p>0 presents NO. 0 main unit</p>
	<p>1~F presents NO 1~15 auxiliary units respectively</p>

10——COM(O)485 communication port (failure code E2).

11——COM(I) 485 communication port (failure code E2).

P, Q, E points of COM (O) and COM (I) are connected with each other for RS-485 communication.

- ◆ If failure occurs between the linear controller and main module, all the units stop.
- ◆ If failure occurs between main unit and auxiliary unit, the auxiliary unit with communication failure will stop, and then the number of units online detected by the linear controller will decrease; "EA" will be displayed and the indicator lights will flash.

12——System A high-pressure protection & discharge gas Temperature switch protection (protection code (P0),

System B high-pressure protection & discharge gas Temperature switch protection (protection code (P2),

System A low-pressure protection (protection code P1)

System B low-pressure protection (protection code P3)

- ◆ Constant compressor: discharge Temperature switch is connected in series with high-pressure switch.

Digital compressor: double protection of discharge Temperature Switch and discharge Temperature Sensor, discharge Temperature Switch is connected in series with high-pressure switch, and the discharge Temperature Sensor has its own interface.

Digital compressor has discharge Temperature sensor (which is invalid for the constant), protection is depending on the discharge Temperature (DLT), and it will act for three Temperature areas if the sensor is ok (failure code E8 means sensor absent): **safe area** without protection when DLT below 125°C; **yellow area** appears in the condition that the capacity dropping down to 40% of the rating, when DLT is higher than 125°C for 10 minutes. If DLT is lower than 125°C, protection will eliminate, on the other hand, if DLT keeps increasing to 140°C or more, it enter **red area** when the compressor stop and restart 3 minutes later if the problem has been solved.

13——TBH1,TBH2 Temperature sensor on the face 1 and 2 of the plate heat exchanger

14——Water flow Query (failure code E0 for main unit, E9 for auxiliary unit) which is just valid for main unit.

- ◆ Main unit: main unit controller will display E0 when water flow is abnormal 3 times continuously. It will be recovered by re-electrifying meanwhile main board displaying E0 (after 3 times' Querying).
- ◆ Auxiliary: (preserved, be wired to short circuit when producing).

15——System B electric expansion valve.

16——System A electric expansion valve.

EXV can adjust the refrigerant flow according to different running models and capacity requested by surrounding.


17——HEAT auxiliary heater.

- **Notice: the actual figure of controller of the heater is not the 220V power supply but the ON/OFF switch!**

On heating mode, when the total outlet water is below 45°C, the switch closes; on the other hand, when the Temperature is above 50°C, the switch opens to stop heating.

18—— WATER PUMP

✧ **Notice: the actual figure of controller of the pump is not the 220V power supply but the ON/OFF switch!**

- ◆ Water pump will start at once after receiving the opening order and keep running during the whole running term of the system.
- ◆ Pump will close 2 minutes later after all the units having been shut down on cooling or heating mode.
- ◆ Pump can be closed directly on the pump mode. 

19——System B compressor

Earthing wire

System B four-way valve

Earthing wire

20——Digital tube

- ◆ On waiting mode: display unit address.
- ◆ On running mode:
 - Main unit display the current capacity of the digital compressor as **40, 60, 80** and **10**.
(Notice “**10**” is followed by “.”)
 - Auxiliary unit display **10**. (Notice “**10**” is followed by “.”)
- ◆ On failure or protection mode: display failure code or protection code.

21——System A compressor;

Earthing wire

Four-way valve of system A

Earthing wire

22——High speed of outdoor fan, controlled by T4.

23——Low speed of outdoor fan, controlled by T4.

24——PWM, used for digital compressor capacity adjustment. (Just valid for main unit).

25——Transformer input, 220V/AC.

26——Power input by three-phase four-wire system (E1 for failure code).

A, B, C phases should be supplied together with the 120 degree angle difference among three phases. If it is not qualified, it may cause phases sequence failure or phases absent

failure then the corresponding code will be displayed until the power get right. **Notice:** phases sequence failure or phases absent failure are just Queried at the beginning of electrifying. During the running, they will not be detected.

27——Transformer output

3. Failure & protection codes

Failure & protection codes

E0	Water flow detecting failure (third)
E1	Phases sequence failure
E2	Communication failure
E3	Total outlet water Temperature sensor failure
E4	Plate heat exchanger outlet water Temperature sensor failure
E5	Condenser A tube Temperature sensor failure
E6	Condenser B tube Temperature sensor failure
E7	Outdoor Temperature sensor failure
E8	System A digital compressor discharge gas Temperature
E9	Water level detecting failure (first two failures)
EA	Auxiliary units decreased detected by main unit
Eb	Plate heat exchanger low temperature antifreezing sensor 2 failure
EC	Communication failure between main unit and auxiliary unit
ED	Communication failure between linear controller and modules
EE	Communication failure between linear controller and computer
EF	Plate heat exchanger low temperature antifreezing sensor 2 failure
P0	System A high-pressure protection or discharge gas Temperature protection
P1	System A low-pressure protection
P2	System B high-pressure protection or discharge gas Temperature protection
P3	System B low-pressure protection
P4	System A current protection
P5	System B current protection
P6	System A Condenser high-Temperature protection
P7	System B Condenser high-Temperature protection
P8	System A digital compressor discharge gas temperature protection
Pb	System anti-freeze protection
Pc	Digital compressor discharge Temperature protection, when it is above 125℃
PE	Plate heat exchanger low temperature protection

Wire controller

1. Outlook view

■ Figure of display (front view)

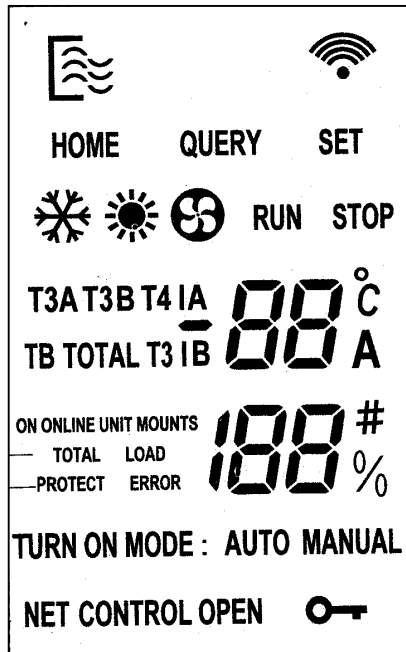
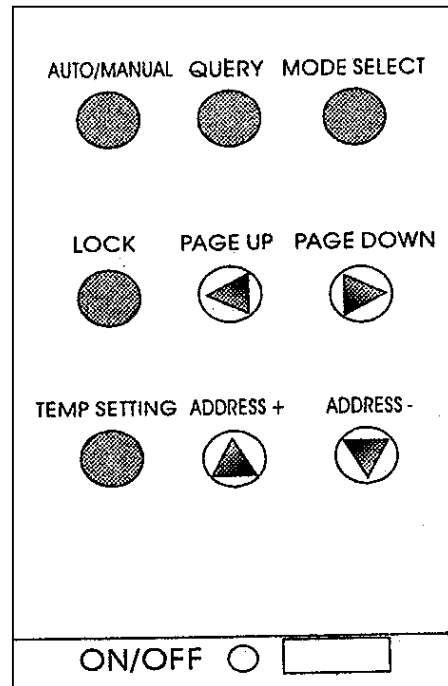
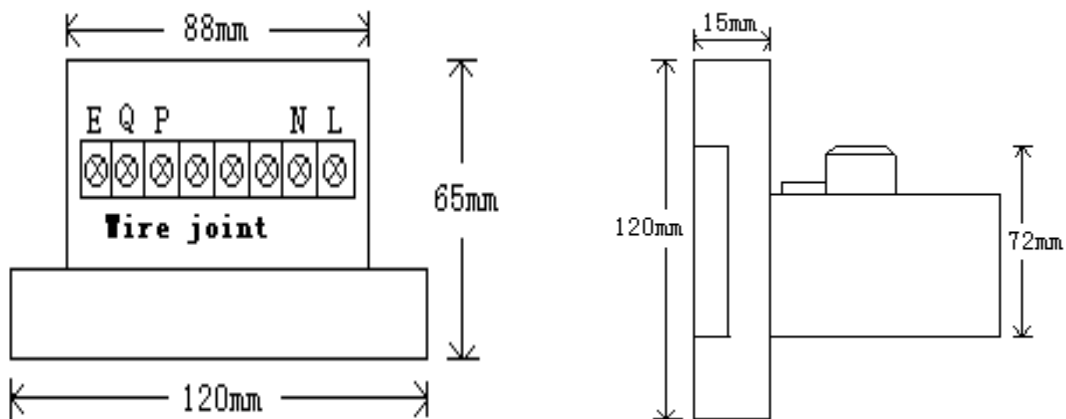



Figure of buttons arrangement (front view)



■ Dimension:






Notice:

- ◆  Wire controller earthing mark on the rear of the controller.
- ◆ The P, Q, E terminals of main unit and wire controller are connected one-to-one.
- ◆ Three-core wire is used as the electric wire, and the model is RVV-300/500 3×1.5mm².
- ◆ Dual-core shield wire is used as the communication wire, and the model is RVVP-300/300 2×0.5mm².
- ◆ Connect a 120Ω resistance between P, Q port of 15th auxiliary unit.
- ◆ Install the wire controller referring to the “dimension” above.



2. Pattern& buttons description

■ Pattern description

1——Running state (display on all pages).

- ◆ If there are more than one unit working, these will display in cycle: , , ;
- ◆ No display, when unit is off.


2——Communication state (display on all pages)

- ◆ While communicating normally with main unit, these will display in cycle: (blank), , .
- ◆ No display, when communication with main unit fails.

3——Computer network controlling state (display on all pages).

- ◆ Under the control of network, display **Net Control Opening** ;
- ◆ No display without the controlling of network.

4——Locking state (display on all pages)

- ◆ If wire controller or the buttons are locked, display .
- ◆ No display when it is unlocked.

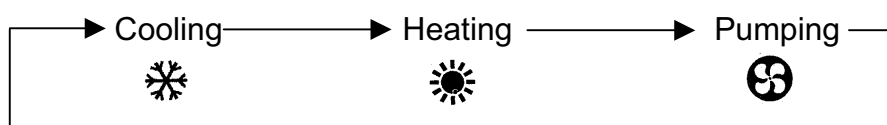
■ Buttons description

1——**Query** .

Press **Query** button when the unit is off or locked, it will enter Querying mode and display working data of the unit selected, unit 0# is default and displayed on the first page.

2——**Mode**

- ◆ When unit is off, press **Mode** button and enter the mode setting state, and the mode will change in cycle by every pressing in the sequence below:



- ◆ If unit is on, working mode can't be changed when pressing **Mode** button.

3——**Page up**

It is just available on the **main page** and **Query page**, the data on the former page will

display when pressing, if current page is 1ST, the last page will display when pressing again.

4—Page down

Just be available on the **main page and Query page**, the data on the next page will display when pressing, if current page is the last, the 1ST page will display when pressing again.

5—Auto/manual.

Only be available on the **mode page**, two modes will appear alternatively by every pressing.

If you choose auto mode, the numbers of units can't be changed, which is maximum.

6—Address up

Pressing on the main page, it will enter the Query page and select 0# unit, and display page 1 as default.

- ◆ When pressing on Query page, it will select the next unit, and display its data. If it is 15# unit, 0# unit will be selected when pressing again.
- ◆ When the system is off, if you choose manual mode, the number of the online units will increase 1 by every pressing, and return to 1 if the number has reached to the maximum. On the other hand, if there is no unit online, the number is 0, which can't be changed by pressing; if you choose auto mode, the number can't be changed as well.

7—Address down

- ◆ Pressing on main page, it will enter Query page and select 0# unit and displaying page 1 as default.
- ◆ Pressing on the Query page, it will select the unit before the current one and display its working data. If it is already 0# unit, 15# will be selected when pressing again.
- ◆ When the system is off, if you choose manual mode, the number of the online units will decrease by 1 by every pressing, and return to online units' number if the current number is 1. On the other hand, if there is no unit online, the number is 0, which can't be changed by pressing; if choosing auto mode, the number is equal to the number of the online units, which also can't be changed by pressing.

8—ON/OFF

Pressing **ON/OFF**, the information about ON/OFF, Mode, Manual/Auto and selected unit's number, etc. will be sent to main unit, and waiting for the response as well as displaying those information. If there is no unit online, no unit can be controlled and button will be

invalid. On the other hand, if there are some units running (including manual/auto state), pressing **ON/OFF** means OFF, and Mode, Manual/Auto, Address Up/Down buttons are invalid; if unit is off, pressing **ON/OFF** means ON, and Mode, Manual/Auto, Address Up/Down buttons are valid.

After turning off unit by Pressing **ON/OFF**, all of running information will be preserved in next start (including Mode and Manual/Auto state).

ON/OFF is valid for any state, but it will not work if you re-press the **ON/OFF** when the information of last operation is being conveyed, you have to wait for not more than 5 seconds to re-operate.

9——Lock.

- ◆ If wire controller is not locked by net compute, pressing **Lock** for more than 5 seconds, buttons will shift from the unlock to lock or vice verse.
- ◆ If wire controller is locked by net compute, pressing **Lock**, **Manual/Auto** and **Mode** simultaneously for more than 10 seconds, the controller will be unlocked and buttons will be unlocked as well if they were locked before.
- ◆ If wire controller or buttons are locked, all buttons except the buttons about unlocking operation (**Lock**, **Manual/Auto** and **Mode**) are invalid.

3. Basic operating conditions

- ◆ Voltage input: single phase 198V -- 242V
- ◆ Frequency: 50Hz
- ◆ Ambient Temp. : -15℃ ~ +43℃
- ◆ Ambient humidity: RH40%-RH90%

4. Functions description

1——Electrify/Reset

After electrifying or resetting wire controller, firstly, all the display segments on the crystal display will be on for 2 seconds and off for 1 second, then work normally. Wire controller enters default page: Mode setting page. Default setting is: Cooling, Auto, On, and the flashing indicator lights with waiting mode. If there is no operation for 8 seconds, it will quit from waiting

mode and the indicator lights will be off, then return to home page.

2—Mode setting

- 1) Mode setting page can be selected by the local wire controller button operation, and under this page, you can set the number of the unit which needs to operate.
 - A) On Auto mode, the mode setting is for the whole unit. The number of the units is that of the online unit which can not be changed. The unit for start or stopping is selected by electric controller of the main unit.
 - B) On Manual mode, the mode setting is for the online unit and the number of the unit can be changed. After setting, the ON/OFF of the actual unit is controlled by wire controller. If you choose turning on unit, units will start in the sequence from low address to high address until achieving the number selected. If you choose turning off unit, units will be turned off in the sequence from high address to low address until achieving the number selected including the units which delays to start during unit running term.
 - C) When choosing Manual mode to start unit, units will start every 6s' interval in the sequence from low address to high address (the units which has started are free of this 6s limit) until achieving the number selected. If one unit fails, wire controller will be turned off it, and start the next unit in the sequence from low address to high address. If there is no unit available, the controller will just turn off the failed one and display corresponding failure code. When the failed one recovers, it will restart, meanwhile the replacement will be turned off.
 - D) When choosing Manual mode to start unit, if one unit compressor fails and stops, it will be restart 3 minutes later, so the start orders of this unit and the others with higher address need to delay for 3 minutes to send, which can avoid multi-compressors starting simultaneously.
 - E) Choosing Manual mode to close unit, units will be turned off in the sequence from high address to low address.
 - F) Starting water pump on Manual mode is only available for the main unit. Main unit can't be replaced when the it fails.
 - G) The water pump working mode is just available for the main unit while there is no water pump mode in auxiliary unit. After setting, irrespective of the number of unit, the wire controller only sends the order to main unit to start up, while the auxiliary units keep off.
 - H) The current setting information can not be sent to the main unit until pressing CONFIRM. Once pressing CONFIRM, the mode setting light will be turned on, and the order will be sent. The light will be off after it receive the response.

2) Host Computer mode setting (preserved) Epigyny

If the mode information sent by host computer is appropriate to the current mode, then the mode setting information will be sent to main unit and computer will get the response. On the contrary, if it is conflict with current mode or mode setting fails; wire controller will send corresponding failure code to (host) computer.

- A) If setting the unit which has certain address to start for the first time, it will start the selected unit while stop the others. After that, you can start or stop the selected unit without influencing the others.
- B) If stopping certain unit that has address, it will stop the selected one without influencing the others.
- C) If setting the address as broadcast mode, the starting and stopping operation will be available for all units.
- D) Once turning off the selected unit, the working mode of the unit will turn to manual mode, meanwhile, a failed unit can not be replaced by others while working.
- E) If setting the number of units by AUTO mode or MANUAL mode, the operation is the same as local wire controller operation.

3) Mode setting operation

A) Running mode set by wire controller

Three modes can be selected when starting at the first time: cooling, heating and pumping.

All kinds of setting modes can be selected when the unit is off.

If unit is running on cooling, heating, or pumping mode, only the corresponding start mode is valid. The others modes are invalid.

B) Mode setting by computer and wire controller simultaneously. (preserved)

If it is necessary to set mode by computer and wire controller at the same time, computer order is in priority.

3——Data display

Display area is divided into two areas, upper and lower. Each area consists of 2 group of 2.5-bit 7-segment LED.

1) Temperature display:

- ◆ Total outlet water temperature of unit
- ◆ Outlet water temperature of Plate heat exchanger
- ◆ condenser tube temperature T_{3A} (of system A)
- ◆ condenser tube temperature T_{3B} (of system B)

- ◆ Outdoor temperature T4

Available displaying range: -15℃~70℃, display 70℃ if it is higher than 70℃, if there is no valid data to show, display "--" and turn on **C**.

2) Current display

- ◆ System A compressor current IA
- ◆ System B compressor current IB

Available displaying range: 0A~99A, display 99A if it is more than 99A, if there is no valid data to show, display "--" and turn on **A**.

3) Loading rate display

- ◆ Total system loading rate
- ◆ Unit system A compressor (main unit) loading rate

Available displaying range: 0%~100%, (but only 0% (off) and 100% (on) for constant compressor)

4) Failure display

- ◆ Total unit failure alarm
- ◆ Unit failure alarm

Available displaying range: E0~EF, E for failure, 0~F for failure code, if it is free of failure, display "E-", and turn on **#**.

5) Protection display

- ◆ Total unit protection
- ◆ Each unit system protection

Available display range: P0~PF, P for system protection, 0~F for protection code, display P-" when without protection and turn on **#**

6) Unit address display

- ◆ Current selected unit address

Available range: 0~15

7) Online units & running units display

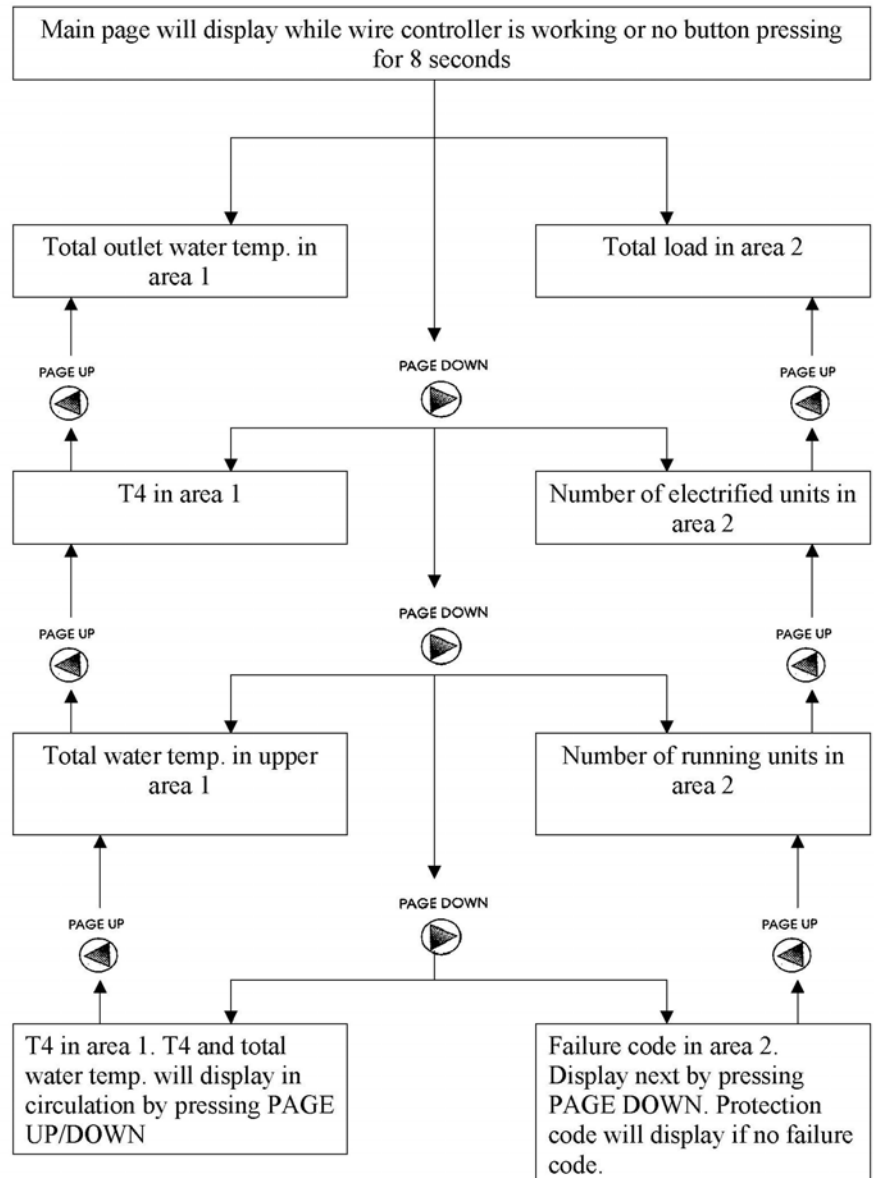
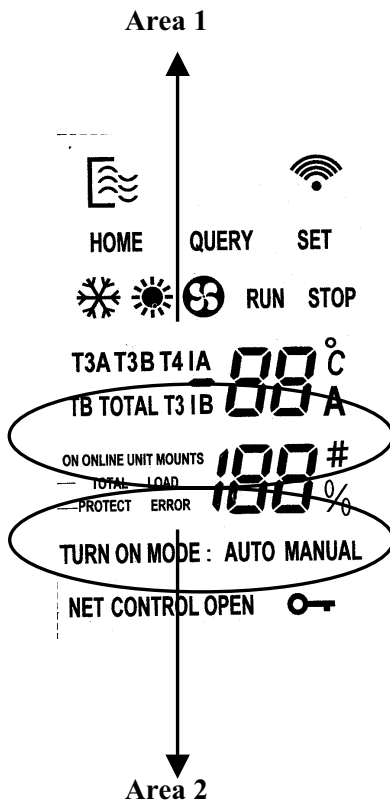
- ◆ Total online units
- ◆ Running units

Available range is 0~16.

4——Home page display

Home page consists of numbers of pages, and have no definite number.

- 1) Display page 1 as Default, show other pages in cycle by pressing page up/down button.
- 2) The total outlet water temp is shown on page 1 in the upper area. Then the total outlet water temp and T4 display in cycle according to the page sequence.
- 3) The number of online unit and running units are displayed in lower area on page 1 and 2 respectively.
- 4) Failure codes are shown in the lower area from page 3. 4 failure codes can be displayed by paging down. If there are more than 4, the rest will not be displayed. If there is no failure, then only one page displays "E-" and the next page displays protection code.
- 5) After having displayed failure codes, protection code will be available. Fewer than 4 (include 4) protection codes can be displayed in lower display area by pressing page up/down button, if there are more than 4 failure codes, the rest will be unavailable to display. If there is no protection, only one page displays "P-", then the next page returns to page 1.
- 6) It will return to page 1 if pressing page down when all the data has been displayed. The last page will be displayed if pressing page up from page 1.

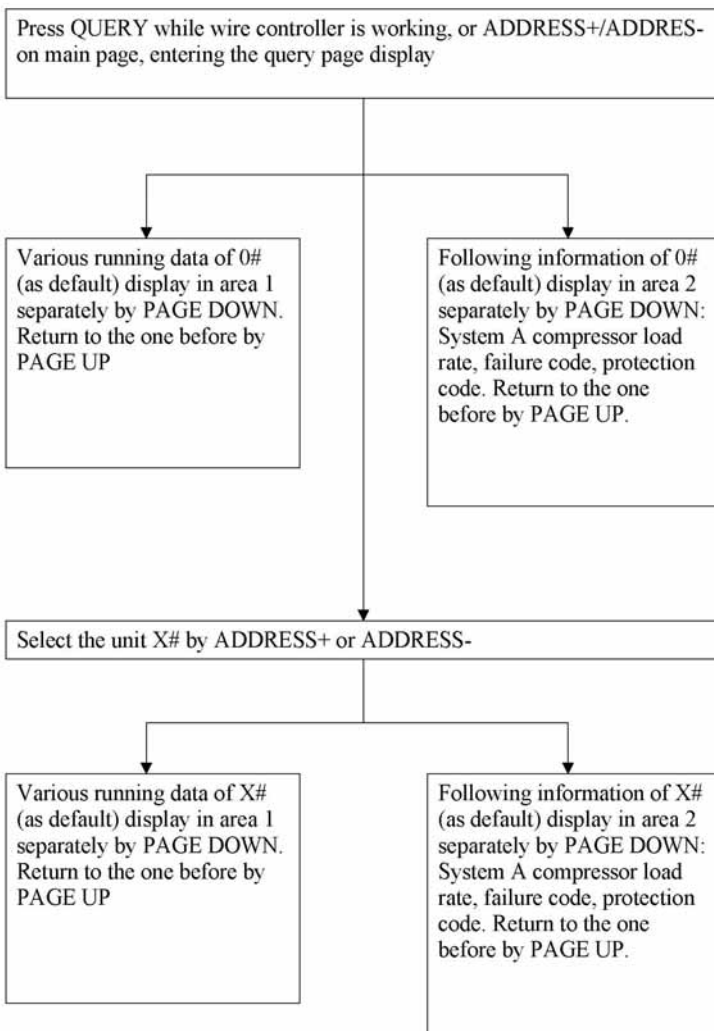
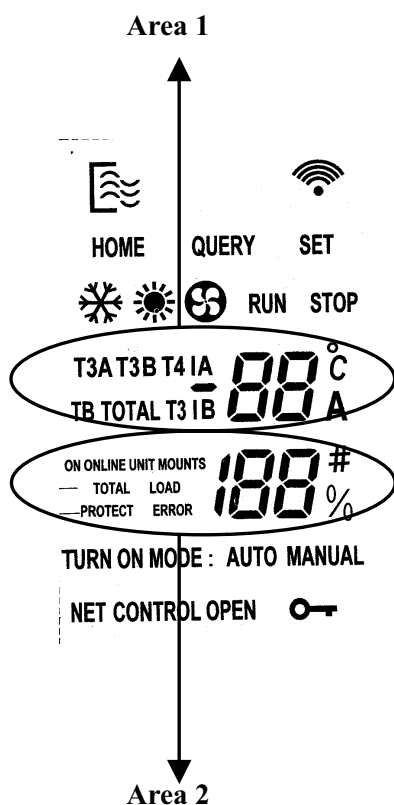


5—Query page display

Query pages consist of definite numbers of pages.

- 1) 0# unit is selected as default when entering Query page at the first time, then page 1 will be displayed. Other pages could be achieved by pressing page up/down.
- 2) Following information are shown in the upper area from page 1 to 5 respectively: plate heat exchanger outlet water Temp. , system A condenser tube Temp. , system B condenser tube Temp. , system A compressor current and system B compressor current. If the pages are more than 5, the rest will display the content of page 1.
- 3) The lower area on the display will show current unit address and compressor loading rate of system A on page 1 and 2 respectively.

- 4) Failure codes of current unit are shown in the lower area from page 3. 4 failure codes can be displayed by paging down. If there are more than 4, the rest will not be displayed. If there are no failure, then only one page displays “E-” and the next page displays protection code.
- 5) After having displayed failure codes, protection code will be available. Fewer than 4 (include 4) protection codes can be displayed in lower display area by paging up/down, if there are more than 4 failure codes, the rest will be unavailable to display. If there is no protection, only page displays “P-”, then the next page returns to page 1.
- 6) It will return to page 1 if pressing page down when all the data has been displayed. The last page will be displayed if paging up from page 1.
- 7) Pressing “Address Down” and “Address Down” can select the unit address and inquiry the data of different units.
- 8) Whenever entering Query page or changing the selected unit, it is necessary to wait for latest data from corresponding unit. Before receiving any data, the upper area display “—” and the lower area displays the unit address, paging up and down is unavailable. Such situation will last until the wire controller receives the data.



6—Running mode setting page display

Only one page for this situation.

- 1) Usually, the upper area is blank. After setting the running mode, it will show whether the mode setting is successful or not. It will turn blank when the displaying time is over.
- 2) In manual mode, lower display area shows current running units address from 1 to current online units' number. If there is no unit online, it will display 0; in Auto mode, it will display the number of online unit.

7—Communication with units

Wire controller can receive all units' running data, if there is no any mode setting information, it will sent inquiry order to main unit; if there is some information sent by computer or local controller, it will be sent to main unit. Wire controller will not send the data in delayed interval until it receives the data of main unit.

Whenever there is 10s' communication blank with main unit, it will be regarded as communication failure and the corresponding code is "EC", and the failure will be cleared after the communication recovers. Code "ED" stands for the communication data mistake either with main unit or with auxiliary units. It will be cleared after the failure recovers.

8—Communication with computer (preserved)

Usually, wire controller is ready for receiving the data sent by computer.

- ◆ Wire controller will under the control of network after it receives the data sent by computer and displays "network control opening". Failing receiving the data for 1 minute, it will be out of the control of network.
- ◆ If there are some frame error or data Querying errors, they will cause communication failure between wire controller and computer, whose code is "EE". It will be cleared after the communication recovers.
- ◆ When receiving the unit inquiry order from computer, wire controller will communicate with main module unit and send the corresponding running data to computer.
- ◆ When receiving the order for setting module unit or running mode of the system, wire controller will send the setting information as well as local setting information of wire controller to main module unit and the corresponding result to computer.
- ◆ When receiving the lock or unlock order, wire controller will be in the corresponding state

and the locking state will be sent to computer.

9——Failure alarm operation

- ◆ When there is protection or failure, wire controller indicator light will flash with 5Hz' frequency. Pressing QUERY and PAGE UP/DOWN can inquiry the corresponding module and codes.
- ◆ When there is failure in any unit or in the communication with main unit or with computer, the indicator light will flash with 5Hz frequency, the light will be off after all the failure are cleared.)it should be point out that wire controller failure indicator light and operation light share one light.
- ◆ If main unit fails, all units will stop in the sequence from high address to low address, on auto mode, all units include main unit will be turned off by main unit simultaneously; on manual mode, all units include main unit will be turned off by wire controller at the same time. After the failure has been eliminated, main unit and wire controller will recover the corresponding units independently.

Note: If system protection occurs, the wire controller indicator light will not give alarm. You can detect whether there is protection or not via QUERY. When the system is working, the indicator light will be on constantly.

MAXA[®]

A I R C O N D I T I O N I N G

Via Gettuglio Mansoldo (Loc. La Macia)
37040 Arcole
Verona - Italy

Tel. +39 - 045.76.36.585 r.a.
Fax +39 - 045.76.36.551 r.a.
www.maxa.it
e-mail: maxa@maxa.it

The data indicated in this manual is purely indicative. The manufacturer reserves the right to modify the data whenever it is considered necessary.

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