SKYLINE ENERGY

SINGLE-COMPRESSOR HYDROCARBON HYDRONIC HEATPUMP

INSTALLATION AND OPERATING GUIDE

SX-11CCZA, SX-13CCZA, SX-15CCZA, SX-17CCZA, SX-18ZA & SX-19ZA

PCB version CG248008, LCD version CG248009

APRIL 2019

Simplified rules for sizing your heat-pump.

- Calculate how many kW are required

- Look at the climatology of the location to establish the duration of 0°C to +4°C. Don't just look at the extreme temps, look at the mean overnight temp and duration

- If the ambient air temp rarely dips below +4°C or does so for short periods then you can use this simple calculation...
  3.3 x electricity input kW = output kW.

- If the mean overnight ambient air temp is between 0°C and +4°C change the calculation to 2.5 x electricity input kW = output kW

- Skyline Energy will not warranty a heat-pump that has been undersized for its application.

Foundations & Drainage

1/ When siting the heatpump at ground level, the simplest method of mounting the heatpump is to use 2 or 3 concrete house stumps lying on their sides

2/ If a slab has been prepared, it is still best to use the stumps to raise the unit above the ground.

3/ There are many drain holes directly under the unit.

4/ Heatpumps generate a large amount of condensate. If placed over gravel or earth the condensate will drain away, but if the unit is placed over a paved area additional drainage will be required to deal with condensate.

5/ The buffertank however can be placed directly on a paved area or paving slab.

6/ If you are concerned about airflow due to installation in a pathway etc... Try mounting the heat-pump about 1 meter high on wall brackets, this will allow the cold air to fall away from the unit.

Water flow-rate in the primary circuit:

Before anything else you MUST plan to achieve the required water flow rate in the primary circuit between the heatpump and buffertank.

Adequate water flow-rate is critical to achieve maximum efficiency.

(Just because a unit is heating does not mean its running efficiently)

Avoid restrictive plumbing. Use large diameter pipes for the primary flow and return, and limit elbows and sharp bends.

The temperature rise across the heatpump inlet and outlet ports is directly proportional to the water flow-rate.

Generally, the lower the temp rise = higher flow rate = higher efficiency

Use enquiry code “A5” and “A6” to read the temperature rise which should be 4^{o}C or lower for all models.

Airflow:

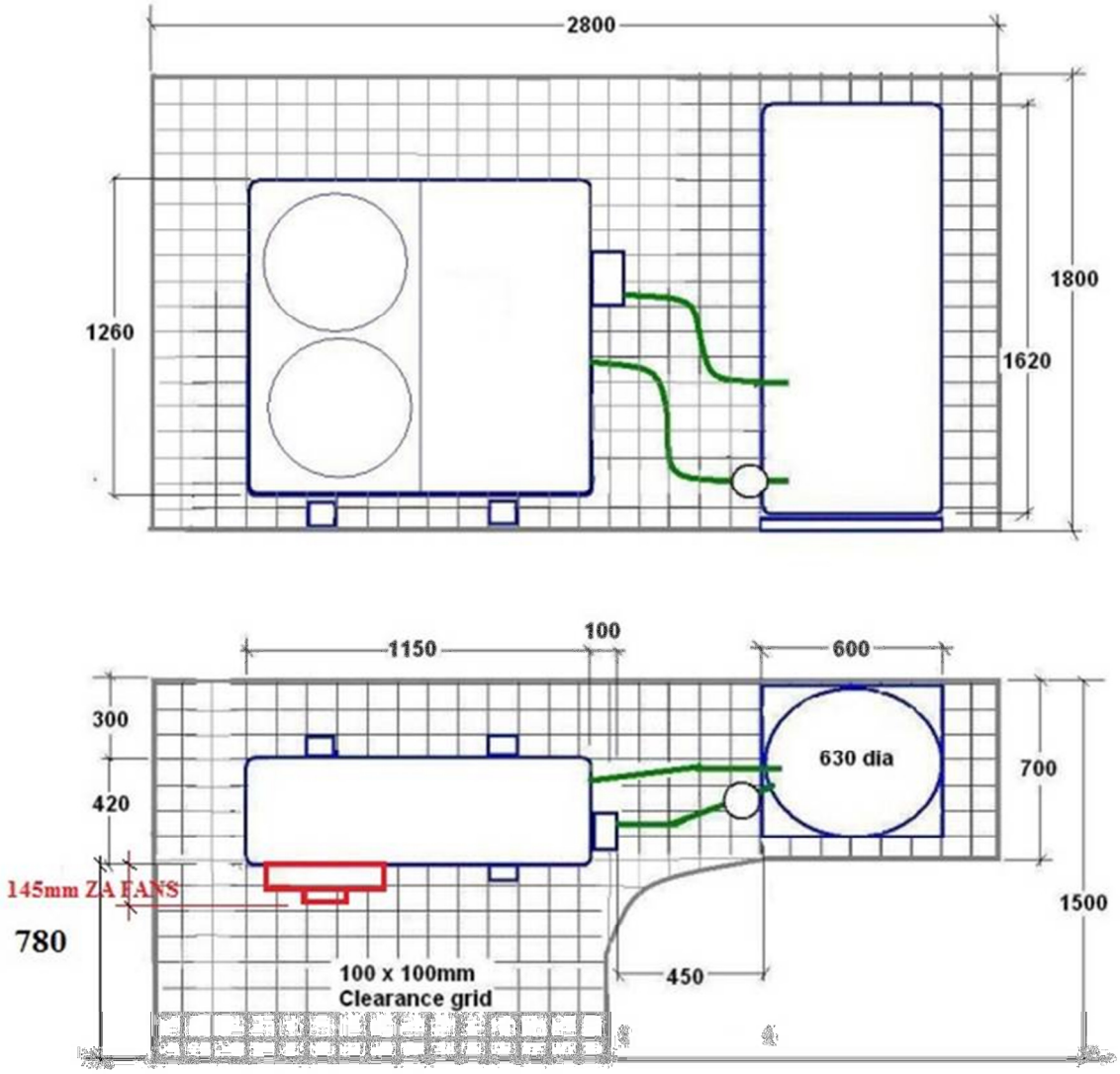
1/ **In general**, all Skyline Energy single-compressor hydrocarbon hydronic heatpumps require clearance on all sides.

2/ If possible, do not place large objects within 2 meters in front of the fans. If this is not possible, the heatpump should be sited for example, at the corner of a building where there is good airflow potential around the corner.

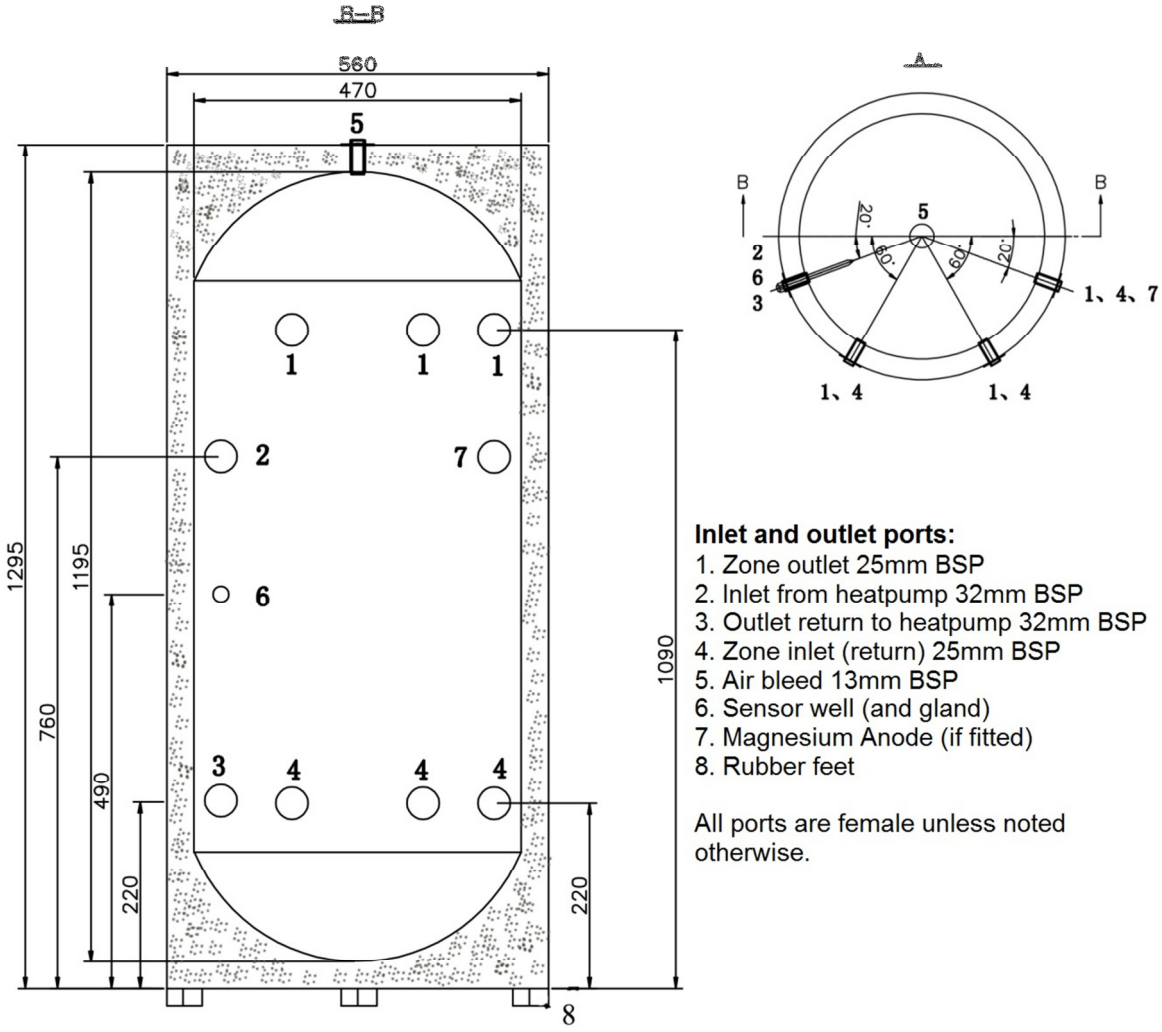
3/ Fresh air flow is critical... You must avoid the possibility of waste cold air back-feeding to the unit and driving down its efficiency.

4/ Do not place trellis in front of the fans... If the unit must be hidden, then it is best to use louvers.

5/ Do not place the unit under the building, in a garage, or any other confined space.



Buffertanks:



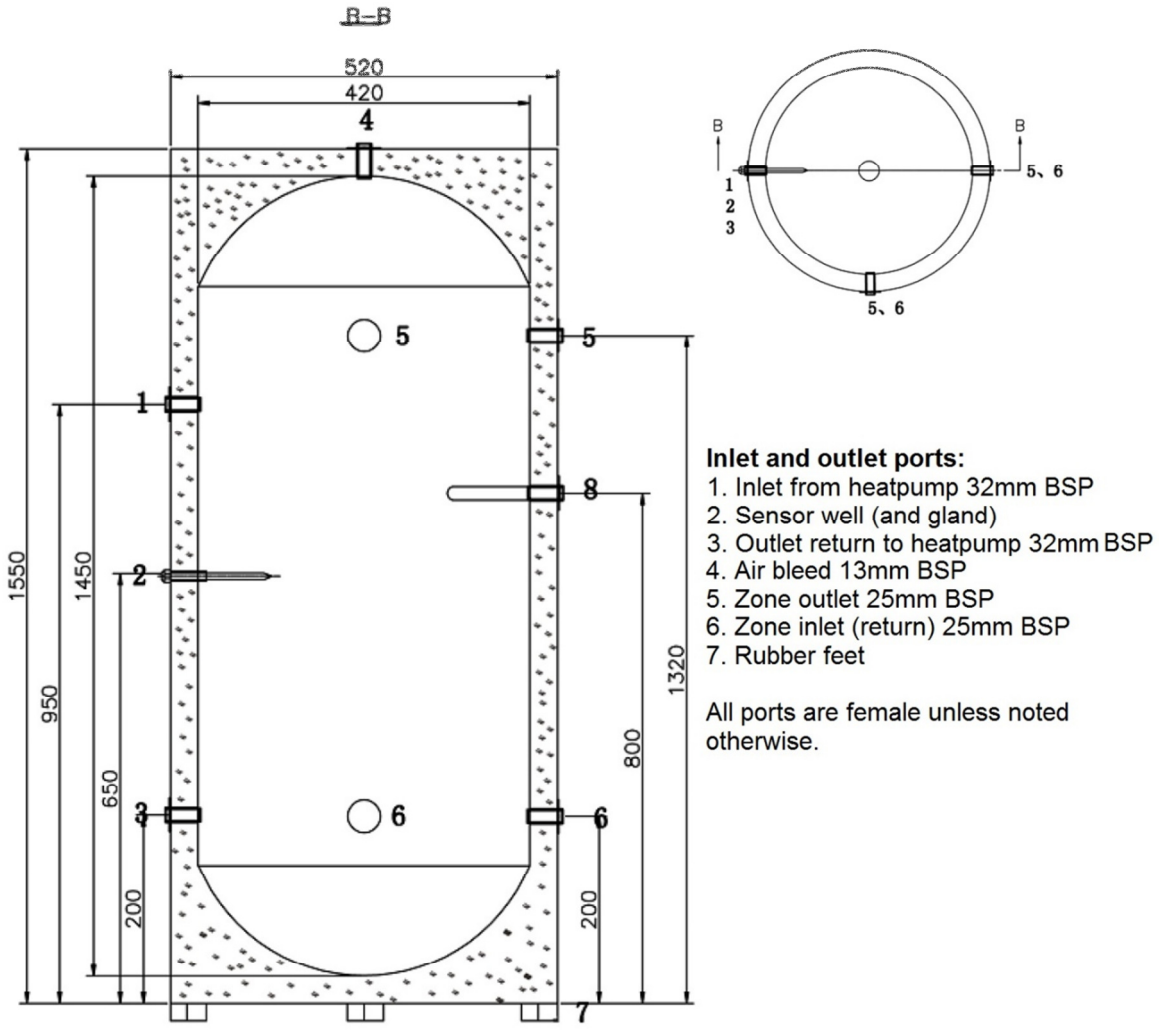
Inlet and outlet ports:

1. Zone outlet 25mm BSP
2. Inlet from heatpump 32mm BSP
3. Outlet return to heatpump 32mm BSP
4. Zone inlet (return) 25mm BSP
5. Air bleed 13mm BSP
6. Sensor well (and gland)
7. Magnesium Anode (if fitted)
8. Rubber feet

All ports are female unless noted otherwise.

Skyline Energy 200Lt 3-zone buffertank dimensions April 2019

Buffertanks: (continued)

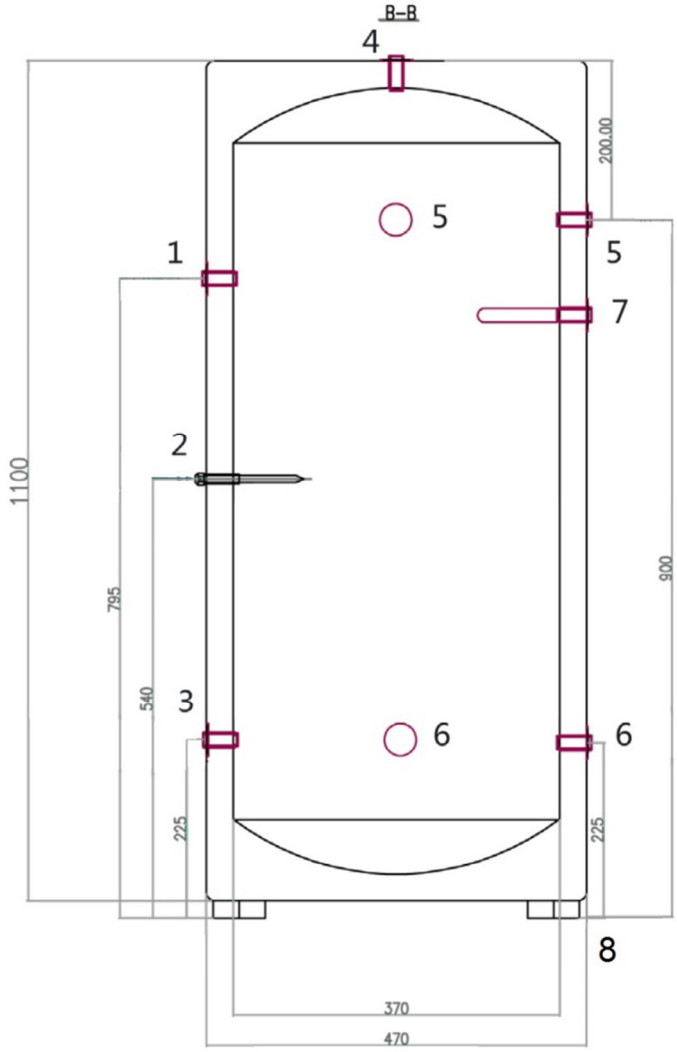


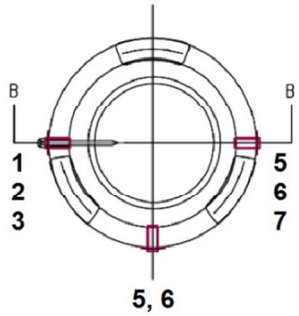
Inlet and outlet ports:
1. Inlet from heatpump 32mm BSP
2. Sensor well (and gland)
3. Outlet return to heatpump 32mm BSP
4. Air bleed 13mm BSP
5. Zone outlet 25mm BSP
6. Zone inlet (return) 25mm BSP
7. Rubber feet

All ports are female unless noted otherwise.

Skyline Energy 200Lt 2-zone buffertank dimensions April 2019

Buffertanks: (continued)





Inlet and outlet ports:

1. Inlet from heatpump 32mm BSP
2. Sensor well (and gland)
3. Outlet return to heatpump 32mm BSP
4. Air bleed 13mm BSP
5. Zone outlet 25mm BSP
6. Zone inlet (return) 25mm BSP
7. Magnesium Anode (where fitted)
8. Rubber feet

All ports are female unless noted otherwise.

Skyline Energy 100Lt 2-zone buffertank dimensions April 2019

Electrical install notes:

1/ Room thermostat wiring to be 1.0mm or 1.5mm TPS.

2/ Room thermostats to be placed in a horizontal wall plate @ 1500mm above floor level.

3/ Locate room thermostats away from heat sources e.g. ovens, radiators, aircons or sunlight.

4/ The minimum capacity circuit breaker is as per the table, but be aware of higher than normal grid voltage that can make the units draw more current than posted. If circulation pumps are on the same circuit, they will add to the load.

5/ Power supply is to be connected to the enclosure with the 2 pole RCD

6/ Thermostats to be connected their relevant test switch.

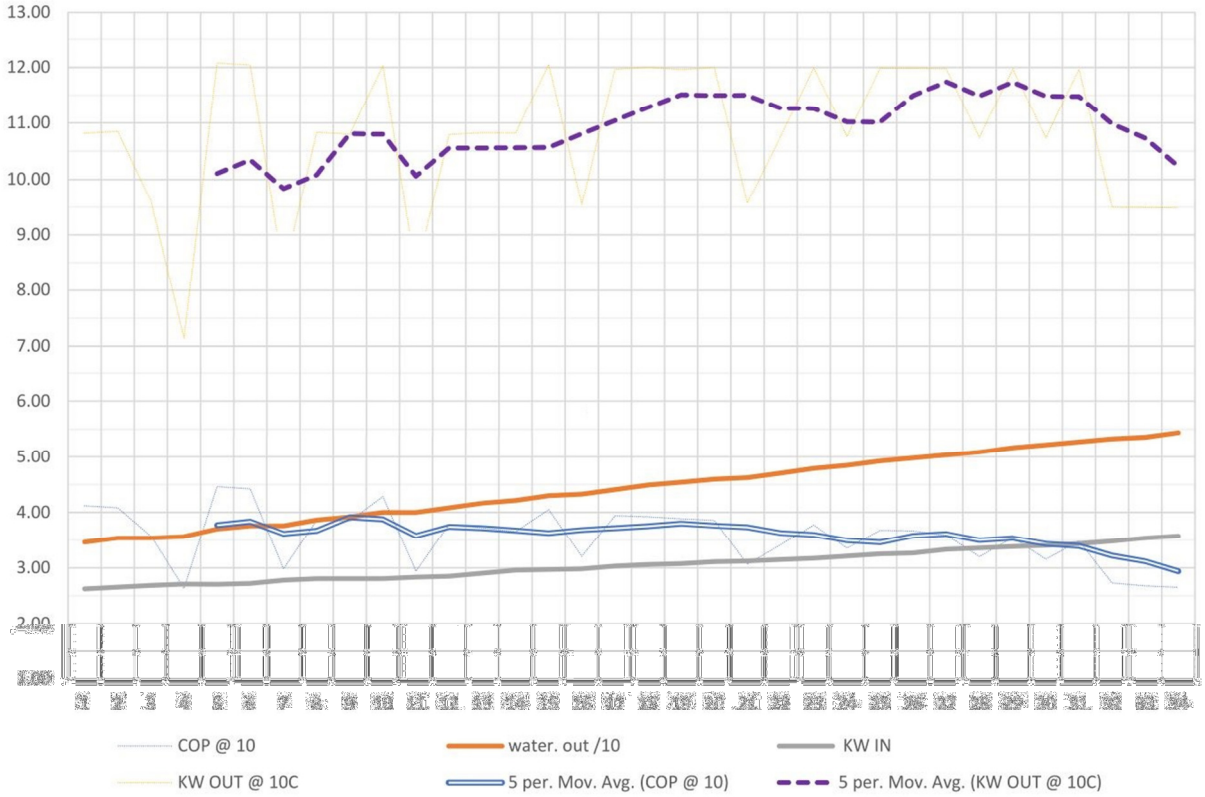
7/ Although the control panel indicates a Flow-switch is installed, there is no flow-switch and its input is bridged-out.

8/ The “Stat test” switch is provided to bridge-out the room themostats during commissioning and testing... Holding the stat test switch closed for about 15 seconds will energise the controller and energise the latch relay if the buffertank water temperature is lower than the programmed start up temperature.

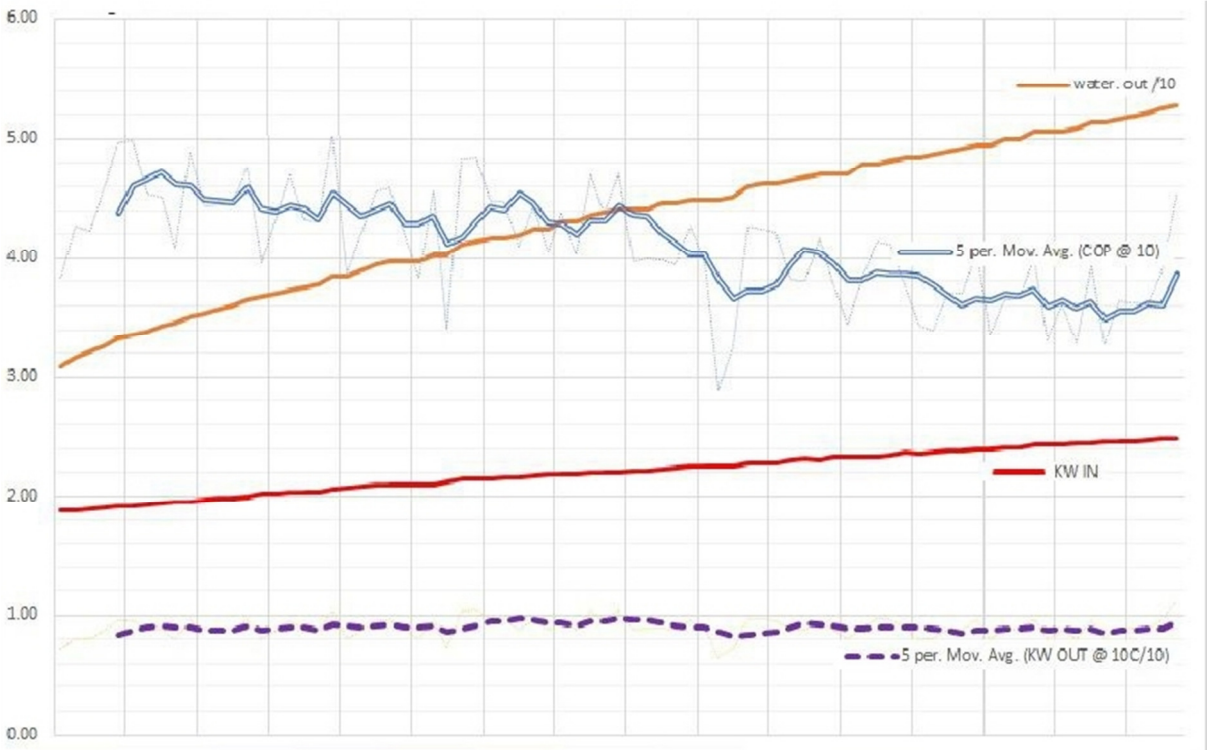
9/ Latest models have GPOs fitted for the pumps

10/ The buffertank water temperature sensor MUST be pushed to the bottom of the sensor-well or it will read low. Best to fill the back of the gland with foam to make sure the cable is clamped... Be aware that sensors tend to migrate out of the sensor-well if not secured in firmly.

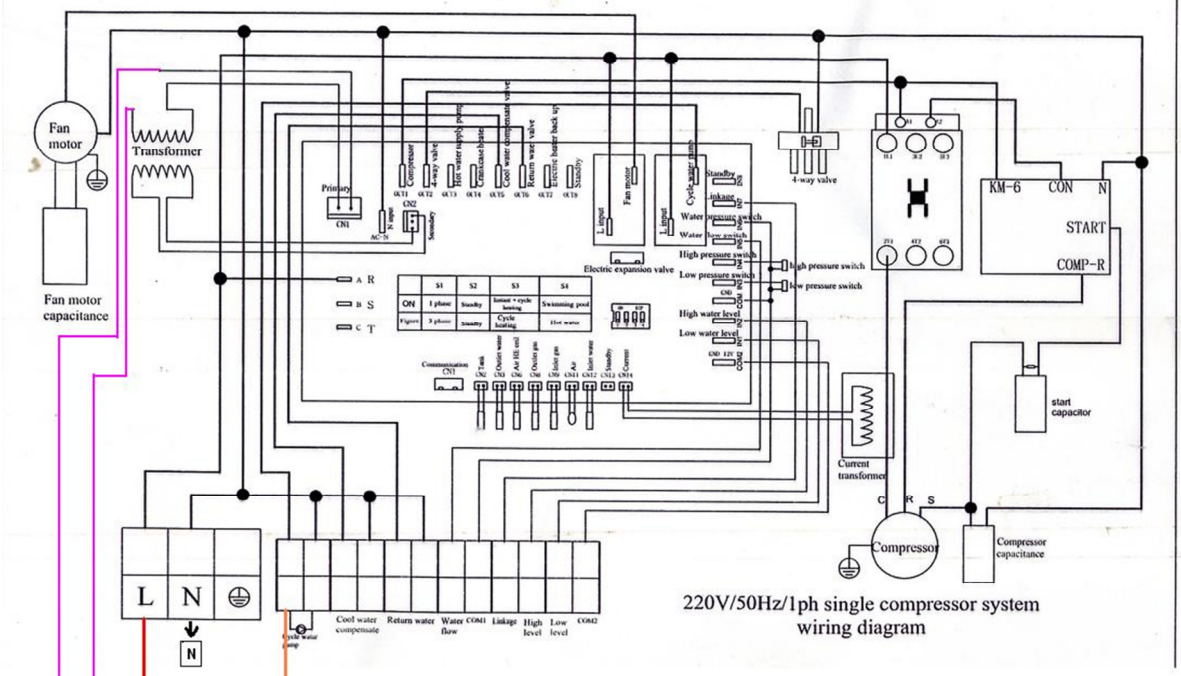
Skyline Energy SX-17CCZA hydrocarbon hydronic heatpump performance graph 25-2-18

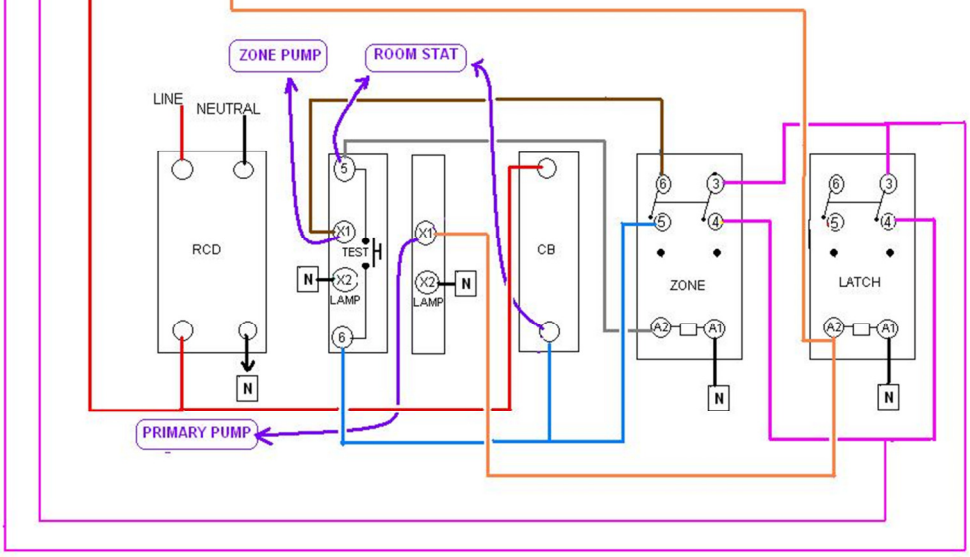


Skyline Energy SX-13CCZA hydrocarbon hydronic heatpump performance graph



Error	Meaning	Error	Meaning	Error	Meaning	Error	Meaning	Error	Meaning
01E	Wrong phase	06E	Low pressure	16E	Air HE coil temp sensor	25E	Water level switch	37E	Load side inlet / outlet water temp difference over large
02E	Lack phase	09E	Communication	18E	Outlet gas temp sensor	27E	HE outlet water temp sensor		
03E	Water flow switch	11E	Time limit	21E	Air temp sensor	29E	Inlet gas temp sensor		
04E	Anti-freeze protect	12E	High outlet gas temp	22E	Return water temp sensor	31E	Water pressure switch		
05E	High pressure	15E	Tank temp sensor	23E	Over cold protect when cooling	35E	Compressor over current	44E	Air temp too low





*Specifications:

MODEL	SX-11CCZA	SX-13CCZA	SX15-CCZA	SX-17CCZA
OUTPUT @ 10C	7.5kW	9kW	10kW	12kW
INPUT KW*(AVG)	2.2kW	2.3kW*	2.8kW*	3.0kW*
INPUT AMPS*	10.5A*	12A*	14A*	16A*
CIRCUIT SIZE	16	20	25	32
SOFT START	N/A	OPTIONAL	YES	YES
HEIGHT	1300	1300	1300	1300
DEPTH	650	650	650	650
WIDTH	1270	1270	1270	1270
POWER SUPPLY	230V 1PH	230V 1PH	230V 1PH	230V 1PH
REFRIGERANT TYPE	Hydrocarbons	Hydrocarbons	Hydrocarbons	Hydrocarbons
REFRIGERANT BLEND	Minus 50	Minus 50	Minus 50	Minus 50
COMPRESSOR	ZR-28K3E	ZR-34K3E	ZR-40K3E	ZR-47K3E
FLOW RATE	40Lt/min	40Lt/min	40Lt/min	40Lt/min
PRESSURE DROP	45kpa	45kpa	45kpa	45kpa
PIPE SIZE	25mm	25mm	25mm	25mm
PRIMARY PUMP MODEL	GPD32-9	GPD32-9	GPD32-9	GPD32-9
PRIMARY PUMP WATTS	300W	300W	300W	300W
C.O.P. @ 10C	3.6	3.95	3.6	3.7
SOUND LEVEL @ 3M	54db	54db	54db	54db

NOTES:

- kW input and output, and amps are rated at 230 volt... Higher supply voltages can drive the imput current a lot higher than specified.
- * Circulation pump loads are not included in kW input ranges, however an allowance for these loads has been made in circuit size recommendations
- *Specifications are subject to change without notice – contact Skyline Energy for support.

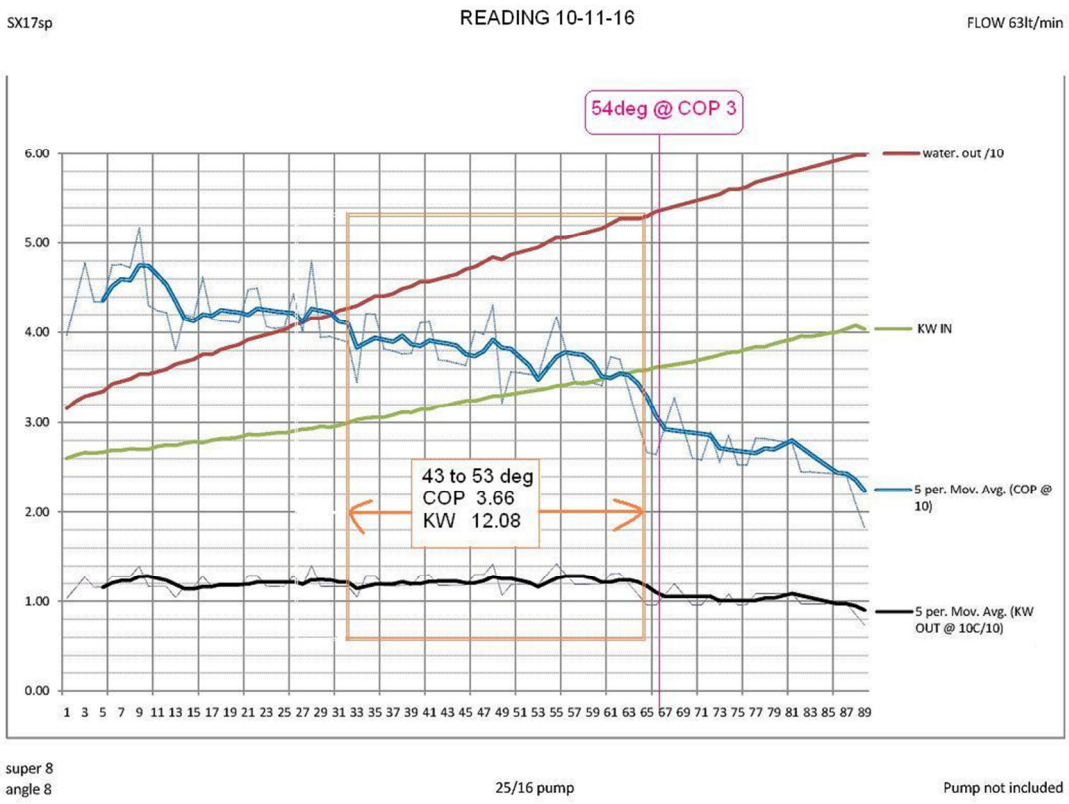
Real World Testing:

Unlike most heat-pump manufacturers, we test every unit in the ambient temperature range where they are really meant to operate.

We test and fine-tune EVERY unit prior to dispatch and ensure that it's C.O.P. is as high as possible.

Claims by others of C.O.P.'s of 4 or 5, may be correct in a lab with a standard test condition of 20°C ambient and a water temp of 15°C, but the C.O.P.'s of these units will be much lower at lower ambient air temperature and higher starting/returning water temperatures.

Most other brands of heatpumps are set-up specifically for pool heating or potable hot water heating under a variety of climatic conditions. Our heatpumps are set-up specifically for hydronic and are fine-tuned to operate specifically between 35°C to 55°C water temperature, and -5°C to +15°C ambient air temperature.



Sound level – locating the heatpump:

1/ High capacity heatpumps can create relatively high noise, so please be considerate of neighbours when locating the heatpump. A good location would be behind a solid barrier such as a shed, garage, water tank etc...

2/ Do not site a sidedraft unit with its fans facing toward close neighbours.

3/ Sound will dissipate more rapidly the higher the unit is installed. On a steeply sloping property, uphill is better than downhill.

4/ The buffertank can be installed right next to the heatpump, or 40meters or more away. The primary flow & return lines to and from the buffertank should be well insulated to ensure minimal heatloss. Ensure the correct water flowrate is maintained and a booster-pump, and possibly larger diameter pipe may be necessary to overcome friction loss. Flowrate is critical to efficiency and must be kept within specs.

5/ Placing the heatpump close to a carport or veranda can amplify sound level.

6/ Skyline Energy will not be responsible for poor placement of heatpumps that create noise problems.

Configurations:

1/ The heatpump and buffertank can be sited side-by-side or the heatpump located 50 or more metres from the buffertank, but in all cases the primary flow and return water pipes should be of adequate size, and the primary circulation pump of adequate size to provide the required water flow rate.

2/ The primary flow and return water pipes should be well insulated, and if trenched they must be sealed inside an outer casing such as flexible unslotted drainage pipe, or stormwater pipe to keep the insulation dry and minimise heat-loss.

3/ The primary water circulation pump can be placed at the tank or heatpump, and in some models they may be installed inside the heatpump cabinet.

4/ Heatpump control systems are usually fixed to the cabinet, but systems can be ordered for remote location such as a plantroom.

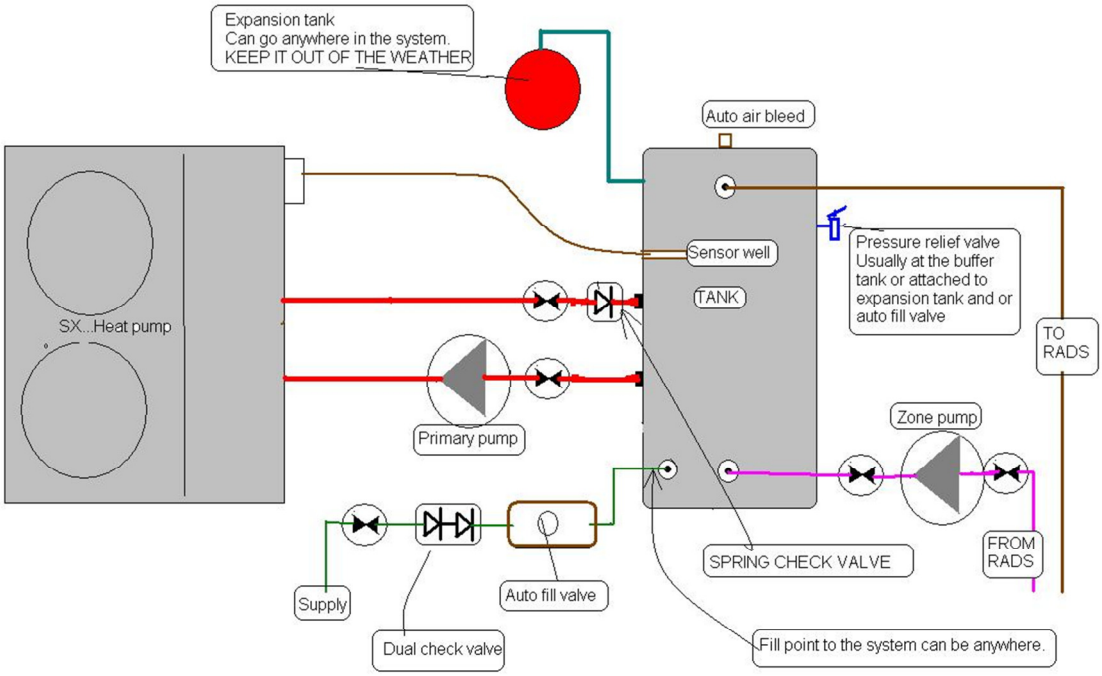
5/ Multi-zoned systems with multiple zone connections to the buffertank, should always have the buffertank placed as close as possible to a floorcoil manifold, radiator manifold etc. Only single zoned systems may have the buffertank placed remotely from the manifold/radiator system.

6/ The expansion tank sub-system (pressure gauge, pressure relief valve, cold-fill valve etc.) can be placed anywhere in the system, but more commonly fitted close to the buffertank.

7/ Buffertanks, all circulation pumps, expansion sub-systems etc, should all be installed sheltered from the weather if possible, to minimise heat-loss and increase service life. *(They can be installed fully exposed to weather but it is best practice to maximise efficiency.)*

8/ Heatpumps must be installed where continuous fresh air is available, generally they should not be in any enclosed space. If this can not be avoided, then clean airflow is required through ductwork, or at the very least through unobscured mesh or louvered wall/enclosure.

Typical installation diagram:



Bleeding and Buffertank:

1/ The most common failure at commissioning is created by excess air, an air blockage causing no water flow.

2/ If the compressor shuts down about 20 seconds after starting
95% CHANCE, YOU HAVE AN AIR-LOCK

3/ After initial commissioning, the auto air bleed valve on the top of the tank should expel most of the air.

4/ Other places for bleeding are the floorcoil manifolds, radiators, and the big Silver screws on the pumps.

5/ It is good practice to place an auto air bleed valve at any high points in the plumbing.

Onsite-testing heatpump output:

1/ There is an onsite test to prove the efficiency of the system, measuring the time it takes for the buffertank to heat. This test will always give a slightly lower result because of the losses that will be in any buffertank system. Our test rig has so much plumbing, pumps, valves, flow meter with minimal insulation that the tank warm-up calculation provides a result typically 20% less that the standard skyline test across the heat exchanger.

2/ How to do a site test

a/ Load the system without running the heatpump to get the buffertank water temperature down to about 35^{o}C. Can do this by pressing the power key to stop the heatpump operating, and then increase the room thermostat to call for heat.

b/ When the buffertank water temperature is down to about 35^{o}C Press the power key on the heat-pump to display the heat icon.

c/ Turn off the room thermostat.

d/ Close the zone valve(s) to isolate the load (house) from the buffertank as the primary water flow and return circuit circulation pump will tend to push water through the zones and add extra load.

e/ Now there is known heatload, equivalent to the capacity of the buffertank + primary plumbing + heat pump. (Typically about 10Lt more than the capacity of the buffertank)

f/ Time the duration for the water in the buffertank to rise by 10^{o}C

g/ After the test, remember to OPEN THE ZONE VALVE(S).

Onsite-testing heatpump output - continued:

Formula to Calculate Kilojoules;

4816 x LOAD x RISE / 1000/60/TIME = **kW OUTPUT**

LOAD = Tank capacity plus plumbing

TIME = Duration of test

RISE = 10C

4186 x 210 x10/1000 = 8790kj

EXAMPLE:

200Lt buffertank +10Lt plumbing, **LOAD = 210**

Temperature rise was 10C, **RISE= 10**

4186 x 210 x10/1000 = 8790kj

Conversion kj to kW;

Stopwatch says it took 15 minutes, **TIME= 15**

8790/60/15 = **9.77kW output**

Typical side-draught-model heatpump installations:


SKYLINE ENERGY
Skyline Energy
1300 552 976

Skyline Energy 200Lt buffertank
Stainless Steel (2-zone or 3-zone):

Typical 200Lt 2-zone buffertank installation:

Shut off valve... Dual check valve... Auto fill valve...

typical

Operation:

1/ The system is primarily driven from the room thermostat(s).

2/ Room thermostat(s) directly controls the zone circulation pump(s) and may kickstart the buffertank controller.

3/ Zone pump delivers water to the floorcoils or radiators.

4/ When the room thermostat(s) call for heat, the buffertank controller fires-up and will make a decision based on the buffertank water temperature, to energize the primary circulation pump and start the heatpump.

5/ The buffertank controller will stay latched ON once a decision to start the heatpump has been made. The buffertank controller will only stop the heatpump after the buffertank water temperature has reached its set temperature, regardless of the room thermostat turning on or off.

6/ The room thermostat cannot stop the heatpump, it can only start the heatpump when the buffertank water temperature is lower than the set temperature differential.

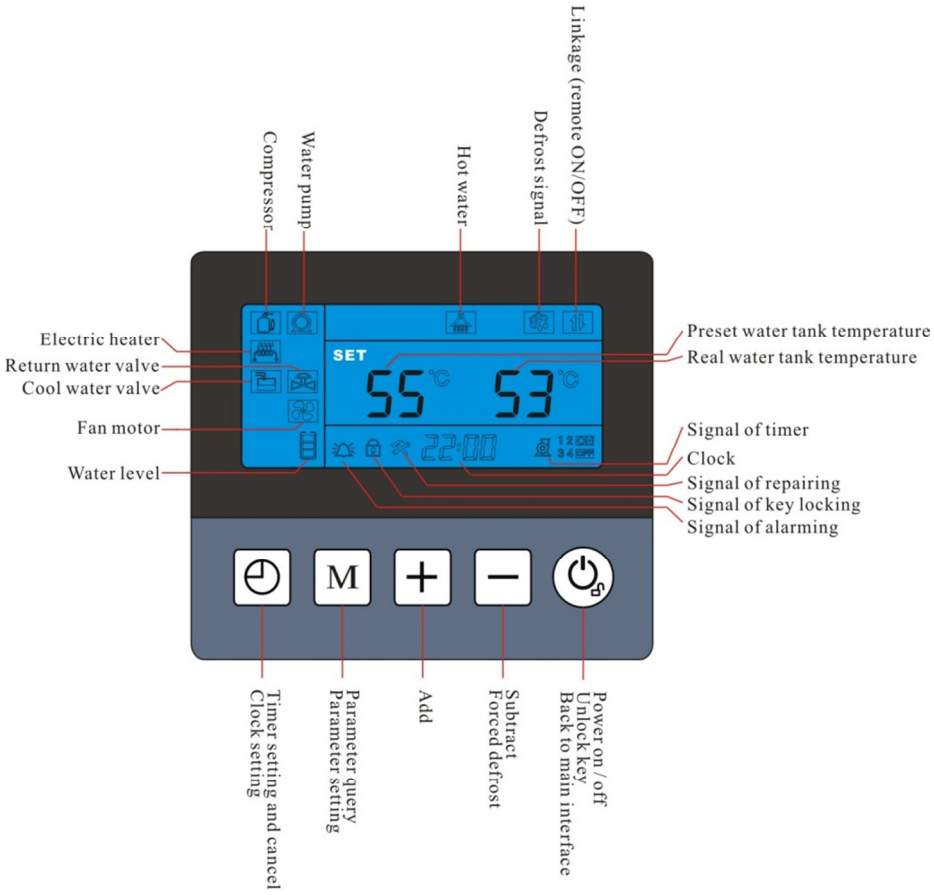
7/ The “latching” procedure described above is designed to prevent the heat-pump “short-cycling” when a room thermostat turns off and on rapidly.

8/ The “test” switch provided next to the controllers is a simple bridge across the room thermostat. It will only do what the room thermostat will do and is used for convenient commissioning and fault-finding.

9/ **Important. The system will not operate unless the “power” button on the controller needs has been pushed, state is ON, and the “water heat” icon is displayed.** 

Part 1: Operating panel introduction

1. Display interface



2. Buttons function

Clock M + - power

2.1 “Power” button

● Press and hold the **Power** button for 1 second to turn ON and turn OFF (change State to ON Off) the heatpump. (water heat icon is displayed when ON)

● Press the **Power** button at any time to quickly exit to home screen .

● Press and hold the **Power** button for 5 seconds to unlock other buttons.

2.2 “M” button

● Under main interface, press the **“M”** button to query the working status parameters

2.3 “+”and “-“ buttons

● Press the **“+”** and **“-“** buttons to navigate through the query parameters and pages, and to change the setting values when in the settings interface.

● Combine the **“M”** and the **“+”** and **“-“** buttons to query and set parameters

● When the heatpump is ON and the water heat icon is displayed, press the **“+”** and **“-“** buttons to change the “set” water temperature

2.4 “clock” button

● Press the **“clock”** button for 10seconds to enter the clock setting interface

● Press the **“clock”** button to enter the timer ON/OFF setting, and combine with the **“+”** and **“-“** buttons to set the timer.

3. Operating

3.1 Parameters query and setting

①Working status parameters query

To enter the working status query section, press the **"M"** button, and scroll through the parameter settings display.

Working status parameters (table 1)

Code	**Parameter**
No code	Water tank temp (°C)
A1	Air heat exchanger1 lowest tube temp (°C)
A2	Inlet gas temperature of compressor 1 (°C)
A3	Outlet gas temperature of compressor 1 (°C)
A4	Ambient air temperature (°C)
A5	Outlet water temperature (°C)
A6	Inlet/return water temperature (°C)
A7	Reserved
A8	Compressor 1 current (Amps)
A9	Electric expansion valve 1 open degree
A10	Reserved
B1	Air heat exchanger 2 lowest tube temp (°C)
B2	Inlet gas temperature of compressor 2 (°C)
B3	Outlet gas temperature of compressor 2 (°C)
B8	Compressor 2 current (Amps)
B9	Electric expansion valve 2 open degree
C1	Reserved
E1～E6	History error code

Error code (table2)

Error code	**Parameter**
Er01	Wrong phase error
Er02	Lack phase error
Er03	Water flow switch error **(NOT USED)**
Er05	Outlet gas pressure of compressor 1 is too high error
Er06	Inlet gas pressure of compressor 1 is too low error
Er07	Outlet gas pressure of compressor2 is too high error
Er08	Inlet gas pressure of compressor 2 is too low error
Er09	Communication error
Er11	Time limit for locking heatpump reached
Er12	Outlet gas temp of compressor 1 too high error
Er13	Outlet gas temp of compressor 2 too high error
Er15	Buffertank temp sensor error
Er16	Air heat exchanger 1 lowest tube temp sensor error
Er17	Air heat exchanger 2 lowest tube temp sensor error
Er18	Outlet gas temp sensor of compressor 1 error
Er19	Outlet gas temp sensor of compressor 2 error
Er21	Ambient air temp sensor error
Er22	Return water temp sensor error of water tank
Er25	Water level switch error
Er27	Outlet water temp sensor error
Er29	Inlet gas temp sensor of compressor 1 error
Er30	Inlet gas temp sensor of compressor 2 error
Er35	Compressor 1 current too high error
Er36	Compressor 2 current too high error
Er44	Ambient temp too low protection
Er45	Outlet water temp too high error

②User parameters query and setting (works in both ON and OFF state)

To enter the USER parameters query and settings interface:

◆ Under the main interface, press and hold the **"M"** button for 3seconds, then press **"+"**and **"-"** buttons, to scroll through settings.

◆ To change a setting, enter the interface as described above, navigate to the parameter you want to change, press the **"M"** button again, and press **"+"**and **"-"** buttons to increase or decrease the value, then press the **"M"** button again to save the new setting and return to the query interface.

◆ Under USER parameters query interface and setting interface, if there is no button press for 30 seconds the system will automatically quit user parameter query or setting interface, and return to main interface, (you can also press "Power" button to immediately return to the main interface also)

USER parameters query and setting (table 3)

Code	Meaning	Setting range	Factory setting
///	Buffertank water temp setting	20℃～F1 value	55℃ (SET at the main interface)
L2	Compressor restart temperature drop	2℃～25℃	5℃
L3	Preset buffertank water temperature of heating mode	30℃～ F1 value	55℃
L4	Reserved		
L5	Ambient air temperature below which electric heater is allowed to start (NOT USED)	-25℃～25℃	NOT USED
L6	Return water temperature from buffertank	20℃～65℃	
L7	Buffertank temperature below which allow to compensate cool water	20℃～60℃	20℃ (20℃: compensate cool water is not limited by water tank temperature)
L8	Compressor current	0～40A	0 （0: will not detect current）
L9	Reserved		

③Factory parameters query and setting (works in both ON and OFF state)

To enter the FACTORY parameters query and settings interface:

◆ Under main interface, press **"Power"** button and **"+"** button at the same time for 3 seconds, enter factory parameters password interface, will display "0.0.0.0", press **"clock"** button, to jump between the four figures of password, press **"+"** or **"-"** buttons, to change the value the four figures, their value should be "0.8.1.4", then press **"M"** button to confirm password, if password is correct, will enter factory parameter query interface

◆ At factory parameter query interface, press **"M"** button to enter current parameter setting state, press **"+"** or **"-"** buttons to change current parameter value, then press **"M"** button, to return to query state.

◆ At factory parameter query interface and setting interface if there is no button press for 30 seconds the system will automatically quit FACTORY parameter query or setting interface, and return to main interface, (you can also press "Power" button to immediately return to the main interface also)

FACTORY parameters query and setting (table 4)

Code	Meaning	Setting range	Factory setting	Remarks
H2	Ambient air temperature below which heat pump will stop working to protect	-30℃ ～0℃	-10℃	
H3	Defrost period setting	20min ～ 90min	55min	
H4	Air HE lowest tube temp below which system will enter defrost	-15℃ ～ -1℃	-3℃	
H5	Longest defrosting time setting	5min ～20min	8min	
H6	Air HE lowest tube temp above which system will quit defrost	1℃ ～40℃	13℃	
H7	The temp difference between ambient temp and air HE lowest tube temp higher than which system will enter defrost	0℃ ～+15℃	2℃	
H8	Ambient temp below which system will enter defrost	0 ～ 20℃	10℃	
P1	Action period setting of electric expansion valve	20s ～90s	30s	
P2	Target superheat temp setting	-5℃ ～10℃	4℃	
P3	Outlet gas temp at which EEV will adjust to keep the temp	80℃ ～110℃	95℃	
P4	EEV open degree when defrosting	2 ～50	50	
P5	Min open degree of EEV	2 ～ 30	12	
P6	EEV choice for automatically and manually	0 （manual） \1 （auto）	1	
P7	EEV step by manual	2～45	35	
F1	Upper limit of water tank temp setting	30℃ ～90℃	60℃	
F2	Circulating water pump choice when only electric heater working	0/1	1	0 ：work/1 ：not work
F3	Temp difference of displaying temp and real temp of water tank	-5℃ ～15℃	2℃	
F4	Water flow switch installing way choice	0 /1	0	0:independent/1 ： share
F5	Water pump working state when heat pump standby	0/1	1	0: non-stop 1: stop
F6	Outlet water temp too high protection at heating mode	35℃ ～85℃	62℃	
F7	Reserved			
F8	Outlet gas temp setting for too high protection	100℃～126℃	115℃	

Remarks: F4 only valid for cascade connection way.

④Time limit setting

To enter the time limit setting parameters query and settings interface, the process is same as factory parameter query and setting, password is "8.5.6.3"

Time limit query and setting (table 5)

Code	Meaning	Setting range	Initial value	Remarks
FF	Limited weeks after which heat pump will not allowed work	0～99	0	The unit is "week" "0"means not time limited

3.2 Other operation

①Clock setting

◆ At main interface, press "clock" button for 5 seconds, enter clock setting interface

◆ At clock interface, press "clock" button, then "hour" flash, press "+"or "-"button， can set hour.

◆ After finish setting hour, press "clock" button, then "minute" flash, now press "+"or"-"button， can set minute.

◆ After finish setting minute, press "clock" button, to confirm clock setting, and back to main interface.

◆ At clock setting interface, if there is not operation within 30seconds, system will confirm clock setting and back to main interface automatically.

◆ At clock setting interface, press "power" button, can confirm current clock setting and back to main interface.

②Timer setting and cancelling (ON/OFF timer)

◆ At main interface, press **"clock"** button, enter timer group setting.

Now press "+"or"-"button, can switch timer groups, there are 4 groups ON/OFF timer.

◆ When group 1 ON timer flashing, press "clock" button, enter group 1 ON timer "hour" setting interface, "hour" flash, then press "+"or"-"button， then can set "hour" for group 1 ON timer.

◆ After finish setting "hour", press "clock" button, then "minute" flash, then press "+"or"-"button，can set "minute" for group 1 timer.

◆ After finish setting group 1 ON timer "minute", press "clock" button, enter group 1 OFF timer setting, same way like ON timer setting..

◆ After finish setting group 1 ON/OFF timer, press "clock" button, confirm group 1 setting, and enter group 2 ON/OFF timer setting, same way like group 1 setting.

◆ At timer interface, if there is not operation within 30seconds, then confirm current timer setting, and back to main interface (this setting can be remembered if electricity is cut off)

◆ At timer interface, press "clock" button, confirm current timer setting, and back to main interface.

◆ Other groups ON/OFF timer setting are same way like group1.

◆ Remarks: 1 and 2 timers are heat pump ON/OFF timer, 3 timer is for return water, 4 timer is for compensating cool water.

◆ How to cancel timer?

At timer interface, press "clock" button for 5seconds, when the ON and OFF signal disappear, then press "power" button to confirm, can cancel current group ON/OFF timer.

③ Lock keys and unlock keys

◆ At locking state, press “power” button for 3seconds, buzzer will give a voice of “Di”, keys will be locked.

◆ If there is not operation within 60seconds constantly, will lock keys automatically.

④Forced defrosting

◆ At ON status, press “-”for 3seconds, enter forced defrost.

◆ To quit forced defrost, there are two ways.

a. Automatic quitting: when defrost time reach H5 setting, can quit forced defrost.

b. Forced quitting: Press “power”button， after power off, 3minutes later, will quit forced defrost completely.

⑤Remove history error code

At the interface of query history error code, press “power” and “M” button together for 5seconds, can remove all the history error code.

⑥One-click restore function

Under power off status, press “power” and “-“ button together for 5seconds, can restore factory setting.

Part 2. Working modes:

1. Heating mode

◆Water tank temp ≤ Water tank preset temp L3-Compressor restart temp drop setting L2, start to heat.

◆Water tank temp ≥ water tank preset temp L3, stop heating.

2. Defrost mode：

2.1 Conditions of entering defrost when heating：

◆Ambient temp≤H8 value， and air heat exchanger lowest tube temp≤H4 value, and lasts for ≥ 3min；

◆Compressor total working time≥H2 value， and lasts for≥5min

◆(Ambient temp － Air heat exchanger lowest tube temp)≥preset temp H7， and lasts for more than 30sec.

When heating, when all of above conditions are met, system will enter defrost.

2.2 Conditions of quitting defrost when heating：

When air heat exchanger lowest tube temp＞H6 value, or defrosting time reach H5, system quit defrost.

2.3 Defrost running：

①When defrost entering conditions are met, will work as below:

◆Compressor and fan motor stop working.

◆At 30sec, four way valve get electricity, electric heater start.

◆At 60sec, compressor starts.

②When defrost quitting conditions are met, will work as below:

◆Compressor stop working

◆At 55sec, four way valve losses electricity, electric heater stop working (according to electric heater controlling logistic to judge if electric heater continues to work)

◆At 60sec, fan motor starts.

◆At 65sec, compressor start, recover normal heating mode.

◆Compressor total working time will be reset, and re-timing.

2.4 Quit defrost abnormally：

◆Turn off heat pump when defrosting, system will quit defrost at once first, then heat pump stop working.

◆There are error happen and heat pump stop working to protect when defrosting, system will quit defrost at once, and stop working.

◆When defrosting, system doesn't detect low pressure protection.

Part 3. Each electrical component controlling

1. Compressor

◆Compressor start / stop according to hot water tank real temperature and preset temp.

◆After compressor stops, should need at least 3min, then it can restart again.

◆After compressor start, should work at least 2min first, then can stop. (Except turned off or there is error).

◆There is not 3min protection for the first time starting.

2. Four - way valve

◆When heating, 4-way valve lose electricity.

◆ Four way valve delay 2min to change direction after compressor stop.

◆ When defrosting and forced defrosting, 4-way valve get electricity, refer to defrosting process.

3. Circulating water pump

◆When system request power on, water pump start at once；

◆ When system request power off， water pump delay 30s to stop after compressor stop；

◆ When defrost, water pump doesn't stop.

4. Fan motor

◆after water pump worked for 30s, fan motor start；When heat pump powers off, fan motor and compressor stop at the same time.

◆When defrosting, fan motor doesn't work, refer to defrosting process.

5. Auxiliary electric heater

5.1 Starting conditions：

◆At heating mode

◆Ambient temperature ≤ L5 setting.

◆Water tank temperature < water tank preset temperature - L2.

◆Low level switch connects.

When all of above conditions are met, electric heater starts.

5.2 Stopping conditions:

◆ Water tank temp ≥ water tank preset temp when heating.

◆ Water tank temp sensor damaged and controller show error code.

◆ Ambient temp ≥ parameter L5+2℃；

◆ Water level switch has error

◆ Low level switch disconnects

Any of above condition is met, electric heater stops.

5.3 When defrosting, forced defrosting, secondary anti-freeze, electric heater is forced to start.

5.4 Except there is water level error, hot water tank temp sensor error, when there is other temp error, high and low pressure error protection, electric heater will start.

6. Return water vale (When L6=20℃, return water function is invalid)

6.1 Condition of return water valve open (should met at the same time):

◆ Low water level switch connects

◆ Water tank temp ≥ preset return water temp L6 + 5

◆ Return water temp ≤ L6 – 5

6.2 Condition of return water valve close (meet any below condition):

◆ Low water level switch disconnects

◆ Water tank temp ＜ preset return water temp L6 + 5

◆ Return water temp ＞ L6

7. Cool water compensating valve

7.1 After compensate cool water manually, before high water level switch connects, the cool water compensating valve opens all the time, until high water level switch connects, this valve will recover normal controlling function.

7.2 When select there is not cool water compensating timer, system can compensate cool water at any time.

7.3 When select there is cool water compensating timer, system can compensate cool water only in cool water compensating timer period.

7.4 Cool water compensating controlling as below:

①When low water level switch is disconnecting, cool water compensating valve open.

②When low water level switch connects, and high level switch disconnects, according to below work.

◆Water tank temp ≥ preset cool water compensating temp L7, cool water compensating valve open to compensate.

◆When water tank temp ≤ preset cool water compensating temp L7-5， cool water compensating valve close.

③When high water level switch connects, cool water compensating valve closes.

④When heat pump is under off state, cool water compensating valve is not allowed to pen,

⑤When defrost, cool water compensating valve is forced to close.

8. Electric expansion valve

Because of electric expansion valve working is very complicated, here will not descript how it working.

Part 4. Error and protections

1. Communication error and protection

◆ Within 20seconds at the first time power on heat pump, if PC board can't get signal from operating panel all the time, operating panel can't exit from whole show. PCB will not conduct, system will work according to "the last time working status parameters that operating panel input" only.

◆ In the process of power on, if operating panel can't get signal from PC board constantly for 10seconds, system will judge this communication error, and display Er:09, heat pump work according to former preset temperature, when communication recover, Er:09 will disappear.

2.Three phase protection（only valid for 3phase heat pump）

When power on, system will check the three phase live line, if there is wrong phase or lack of phase, system will enter phase protection, and turn off all output and display error code, only after remove error and re-supply electricity, system will back to normal work.

3. Ambient air temperature sensor error

◆After heat pump power on, if detect ambient temperature sensor is short circuit or open circuit, system will judge ambient temperature sensor error, heat pump continue to work.

◆When this error happens, relative anti-freeze condition will be invalid.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:21.

4. Water tank temperature sensor error

◆After heat pump power on, if detect hot water tank temperature sensor is short circuit or open circuit, system will judge hot water tank temperature sensor error, heat pump will stop working.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:15.

5. Outlet water temperature sensor error

◆After heat pump power on, if detect outlet water temperature sensor is short circuit or open circuit, system will judge outlet water temperature sensor error, heat pump will stop working.

◆When this error happens, relative anti-freeze condition will be invalid.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:27.

6. Return water temperature sensor error

◆After heat pump power on, if detect return water temperature sensor is short circuit or open circuit, system will judge return water temperature sensor error, heat pump will continue to work.

◆When this error happens, return water function will be invalid.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:22.

Remarks:

Return water temp sensor is water tank return water temp sensor from hot water system.

7. Air heat exchanger lowest tube temperature sensor error

◆After heat pump power on, if detect air heat exchanger lowest tube temperature sensor of is short circuit or open circuit, system will judge air heat exchanger lowest tube temperature sensor error, heat pump will continue to work.

◆When this error happens, electric expansion valve controlling will be changed to by manual.

◆This error can recover automatically. Defrost will be only according to time (defrost period according to H3)

◆When this error happen, operating panel will alarm, system 1 display Er:16, system 2 display Er:17.

8. Inlet gas temperature sensor error

◆After heat pump power on, if detect inlet gas temperature sensor is short circuit or open circuit, system will judge inlet gas temperature sensor error, heat pump will continue to work.

◆When this error happens, electric expansion valve controlling will be changed to by manual.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, system 1 display Er:29, system 2 display Er:30.

9. Outlet gas temperature sensor error

◆After heat pump power on, if detect outlet gas temperature sensor is short circuit or open circuit, system will judge outlet gas temperature sensor error, heat pump will stop working.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, system 1 display Er:18, system 2 display Er:19.

10. Outlet gas pressure is too high protection

◆When standby, detect outlet gas pressure switch, if disconnects, system will enter high pressure protection, and heat pump stop working to protect.

◆When working, if detect outlet gas pressure switch disconnects for 10seconds, system will enter high pressure protection, and heat pump stop working.

◆If this problem happen 3times within 30minutes, system will not recover normal working unless cut off electricity (the first two times can recover automatically)

◆When this error happen, operating panel will alarm, and system 1 display Er:05, system 2 display Er:07

11. Inlet gas pressure is too low protection

◆When standby, detect inlet gas pressure switch, if disconnects, system will enter low pressure protection, and heat pump stop working to protect.

◆After compressor has started for 3min, if detect inlet gas pressure switch disconnects for 10seconds, system will enter low pressure protection, and heat pump stop working.

◆If this problem happen 3times within 30minutes, system will not recover normal working unless cut off electricity (the first two times can recover automatically)

◆When this error happen, operating panel will alarm, and system 1 display Er:06, system 2 display Er:08.

12. Outlet gas temperature is too high protection

◆1 minute after compressor start, detect outlet gas temperature, if the temperature ≥115℃ constantly for 10sec, then system will stop working to protect.

◆When detect outlet gas temperature ≤ L10-30℃, then system quit the protection.

◆If this error happen 3times within 30minutes, system will not recover normal working unless cut off electricity (the first two times can recover automatically)

◆When this error happen, operating panel will alarm, and system 1 display Er:12, system 2 display Er:13.

13. Outlet water temperature too high protection at heating mode

◆At heating mode, after compressor has running for 5min, when detect outlet water temperature ≥62℃ (F11), then system will enter too heat protection, compressor and fan motor stop working, water pump continue to work.

◆When detect outlet water temperature ≤F11-5℃, then system quit the protection.

◆When this error happen, operating panel will alarm, and display Er:45.

14 Water flow protection

◆1 minute after circulating water pump start, detect water flow switch, if the water flow switch disconnect constantly for 10sec, then system will stop working to protect.

◆After this error happen, if error doesn't recover, system will start circulating water pump to detect water flow per 5min, when this error happen 3times constantly, system will not start circulating water pump, until detect water flow switch connects, then will start circulating water pump again,

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:03.

15. Compressor current is too small or too large protection

◆6 seconds after compressor start, detect compressor current, if current ≤1A and lasts for 6sec, or current ≥L8 and lasts for 6sec, system will stop working to protect.

◆When this error happen, operating panel will alarm, and display Er:35.

16. Ambient temperature too low protection

◆When ambient temperature <H2, compressor and fan motor will stop working. Hot water tank electric heater will start.

◆When this error happen, operating panel will alarm, and display Er:44.

◆When ambient temperature ＞H2+2, quit the protection, compressor and fan motor start, hot water tank electric heater will work according to normal condition.

17. Anti-freeze protection in winter

◆Under standby or power off state, when ambient temperature <2℃, enter 1st step anti-freeze protection, circulating water pump will start to work for 5minutes per 40min. When outlet water temperature ≤ 4℃, circulating water pump needn't wait for 40min, can start water pump at once.

◆Under standby or power off state, When ambient temperature <2℃ and hot water tank temperature ≤4℃, enter 2nd step anti-freeze protection, heat pump will start to heat. When hot water tank temperature ≥15℃, stop heating, or when ambient temperature ≥8℃, system will quit the 2nd step anti-freeze.

◆At the process of anti-freeze, if detect outlet water temperature≤2℃, LCD show error code Er:04, when detect outlet water temperature≥4℃, quit the error, this error only display, no other function.

◆If there is hot water tank temp sensor error, entering 1st step anti-freeze will be only according to ambient temperature, and only 1st step anti-freeze is valid.

◆If there is ambient temperature sensor error, enter 1st step anti-freeze protection, when hot water tank temperature ≤4℃, enter 2nd step anti-freeze protection.

◆ If both ambient temperature and outlet water temperature have error, system will only enter 1st step anti-freeze, start water pump automatically.

18. Water level switch error

◆Under standby or power off state, if detect high water level switch connects, but low water level switch disconnects, then judge water level switch has error, heat pump will stop working to protect.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:25.

Part 5. Other functions

1. Power-off memory function.

◆System will memory the preset working mode and all parameters when power off.

◆When power on again, can resume the working status and parameters setting automatically.

2. Power on / off at fixed time

◆Fixed power on time and fixed power off time can be set.

◆Detailed information can be consulted wired panel operating part.

3. Forced defrosting function

◆Forced defrosting condition can be entered by operating wired panel.

◆Detailed information can be consulted operating panel introduction.

4. Error query and memory function

◆At query interface, when show “Er”, press “+”button or “-”button, can check history error.

◆Error code is recorded according to time sequence.

◆At least 6 history error codes can be recorded, and these history error codes can be remembered even power supply is cut off.

5. Time limit setting by password

◆Installer can set limited running time, when heat pump total running time reach preset time, heat pump will be locked, can't start to work anymore.

◆Time limit setting can be removed, details can be consulted operating panel introduction.

6. Water tank temperature display correction function

◆If F3 setting is 0, water tank temperature display correction function is invalid.

◆If F3 setting is not 0, water tank temperature display temp = water tank real temp + F3

7. When electric heater working only, circulating water pump can be forced to start.

If F2 setting is 1, when electric heater start, circulating water pump will start 3sec in advance. When electric heater stops, circulating water pump will delay 3sec to stop. Factory setting of F2 is 1.

8. Reserved ports on PC board

Programming port: convenient to download the site program.

Rs485 port: Open type RS485-RTU protocol port, convenient to extend system function. Such as, add remote telephone controlling module, heat pump can be controlled by telephone. If connect RS485 port to computer, heat pump can be controlled by controlling centre of computer.

Part 6. Details of PC board

1. DIP switch

Switch code	1	2	3	4
Off (figure side)	3phase	Heating + cooling	Air source	Hot water
ON	1phase	Only heating	Water source	Swim pool

Other DIP switch

Heat pump No	**Switch 5**	**Switch 6**	**Switch 7**	**Switch 8**

#1	0FF	0FF	0FF	0FF
#2	0FF	0FF	0FF	0N
#3	0FF	0FF	0N	0FF
#4	0FF	0FF	0N	0N
#5	0FF	0N	0FF	0FF
#6	0FF	0N	0FF	0N
#7	0FF	0N	0N	0FF
#8	0FF	0N	0N	0N
#9	0N	0FF	0FF	0FF
#10	0N	0FF	0FF	0N
#11	0N	0FF	0N	0FF
#12	0N	0FF	0N	0N
#13	0N	0N	0FF	0FF
#14	0N	0N	0FF	0N
#15	0N	0N	0N	0FF
#16	0N	0N	0N	0N

2. Output and input port

No	Digital input	Digital output	Analog input	Analog output
1	Water flow switch		Water tan temperature sensor	Electric expansion valve 1
2	High pressure switch 1	Compressor 2	Outlet water temperature sensor	Electric expansion valve 2
3	High pressure switch 2	Compressor 1	air heat exchanger lowest tube temperature sensor 2	

4	Low pressure switch 1	Electric heater	air heat exchanger lowest tube temperature sensor 1	
5	Low pressure switch 2	Return water valve	Outlet gas temperature sensor 1	
6	Linkage switch	Cool water compensating valve*	Outlet gas temperature sensor 2	
7	3phase A		Inlet gas temperature sensor 1	
8	3phase B		Inlet gas temperature sensor 2	
9	3phase C	Four way valve	Ambient temp sensor	
10		Water pump	Return water temp sensor	
11			Compressor 1 current	
12			Compressor2 current	