ARCTIC HEAT PUMPS

INSTALLATION & INSTRUCTION MANUAL

HIGH TEMPERATURE AIR TO WATER HEAT PUMP

CONTENTS

HIGH TEMPERATURE AIR TO WATER HEAT PUMP

User Guide

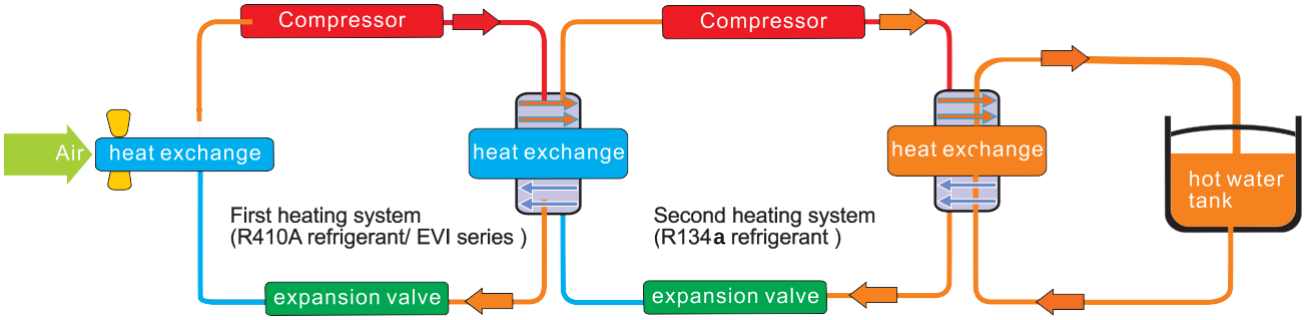
- This manual contains the necessary information for the proper installation, commissioning, use, and maintenance of the units.
- In order to use this product in the safest/best operation, please read these instructions carefully before installation and use.
- Heat pumps are a highly specialized appliance, improper installation may cause damage. Professionals required. Follow the prompts to install. Please contact us directly with any questions.

Special Warnings

- This heat pump must be installed by qualified and experienced technicians/trade-persons. Improper Installation of this heat pump may cause damage.
- This heat pump must be installed in accordance with local wiring regulations including an isolating switch from the supply mains and grounded power supply consistent with the power specification of this heat pump.
- When doing a self-installation, the wrong action could result in fire, electric shock, injury, leakage, etc.
- During installation, please check the distribution power capacity, switches, and sockets to confirm it meets our heat pump power supply requirements. Please refer to nameplate or technical data sheet on the installation instruction for further details.
- When connecting to power, the unit must have a reliable ground connection. Confirm that the ground wire is effective. Improper installation may result in personal injury.
- Before testing, the water system must be filled. Test the hot water side and air-conditioning side of water pump independently. After confirming the water system is normal, exit the water pump testing mode. You can then set the desired operating mode to enter normal state of unit testing/operation.
- The water above 52℃ may hurt the skin, the tank hot water needs to be mixed with cold water before use.
- Inserting any tool within the heat pump is strictly prohibited. This could hit the fan and result in damage or an accident to the person or unit.
- During installation, please install filter in the heat pump inlet to make sure unit inlet water is clean.
- The parameters of the heat pump have been pre-set at the factory. We recommend that you leave these parameters as set.
- When the unit needs to be moved or re-installed, please ask a qualified professional installation company for help.
- Any self-modification or repair is prohibited. If repairs are not done properly, it could result in fire, electric shock, injury, and leakage. Contact an agent or professional to repair.

HIGH TEMPERATURE AIR TO WATER HEAT PUMP

Working principle and function introduction



This heat pump unit is designed with a two-stage heating structure. The first heating system is using R410A refrigerant. When in low ambient temperature, it can still maintain its high efficiency. It provides the EVI low temperature technology to make the units working temperature extend to -30℃ for extremely low outdoor environments. The second heating system is using R134a low pressure refrigerant. The system pressure of the heat pump can stay at a safe level when the hot water temperature reaches 75℃. The evaporator side of the second heating system is also the condensing side of the first heating system, so the heating performance of the heat pump system can greatly improve the energy efficiency. Users can get high temperature hot water even under low outdoor temperature.

Specification

Technical Parameters of Arctic Air to Water Heat Pumps

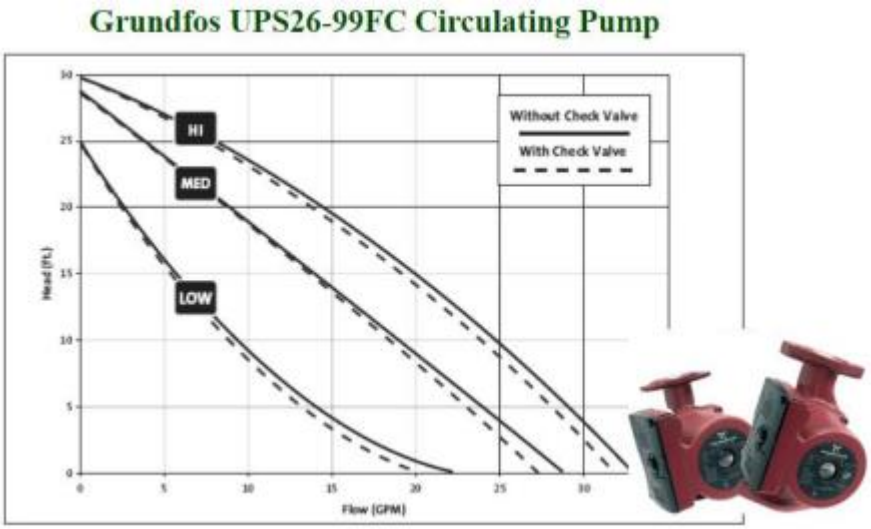
Model		MAHRW	030ZA/(BEH2)
Power supply		V/P/Hz	208~230/1/60
Free	Heating capacity	kW	2.9~14.0
	COP range	W/W	1.5~16.0
Ambient 7℃ Water outlet 75℃	Heating capacity	kW	12.4
	Power input	kW	5.1
	Current input	A	23.2
Ambient -12℃ Water outlet 75℃	Heating capacity	kW	9.2
	Power input	kW	4.7
	Current input	A	21.1
Maximum power input		kW	6.5
Maximum current input		A	29.4
Maximum water outlet temperature		℃	85
Rated water flow volume		m^3/h	2.12
Rated water pressure drop		kPa	40
Water connections (external threaded)		inch	1"
Refrigerant			R410A+R134a

Testing conditions:
Heating: outdoor temperature DB/WB: 7/6℃, outlet water temperature: 75℃.
Heating: outdoor temperature DB/WB: -12/-14℃, outlet water temperature: 75℃.
The power/current input does not include water pump power/current input.

Recommended Circulation Pump (External)

Technical Specifications UPS26-99FC (240 VAC):

- Voltage: 230vac
- Amperage at Speed 1: 1.3 Amps
- Amperage at Speed 2: 1.5 Amps
- Amperage at Speed 3: 1.8 Amps
- Hertz: 60Hz
- Phase: 1
- Watts at Speed 1: 150W
- Watts at Speed 2: 179W
- Watts at Speed 3: 197W
- Max Pressure: 145 psi
- Max Temperature: 230F
- Min Temperature: 36F
- Flow Range: 0-33 GPM
- Head Range: 0-29 ft
- Horsepower: 1/6HP
- Body: Cast Iron
- Connections: Flanged, ½", ¾", 1", 1-1/4"



Additional Note:

- The Grundfos 26-99 pump can handle a pressure drop of around 23ft of head at a flow rate of 9GPM.

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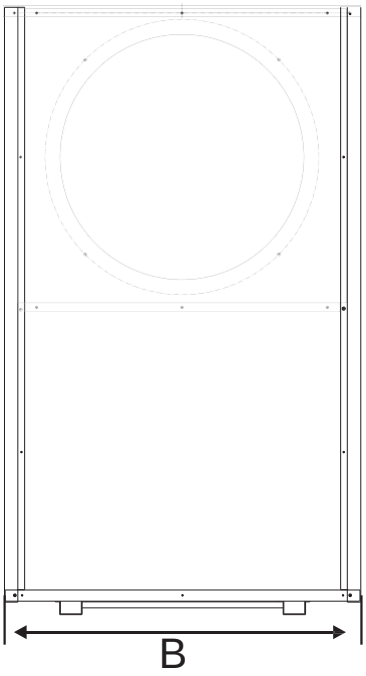
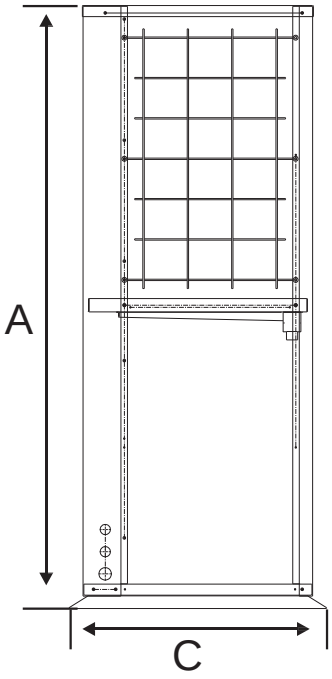
Product appearance and installation dimension





Model: MAHRW030ZA/(BEH2)

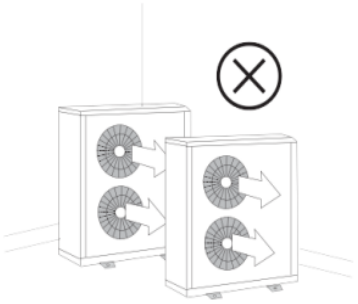
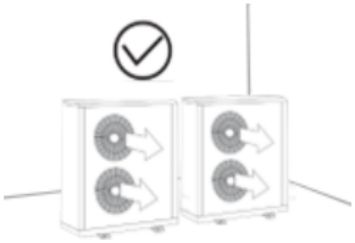
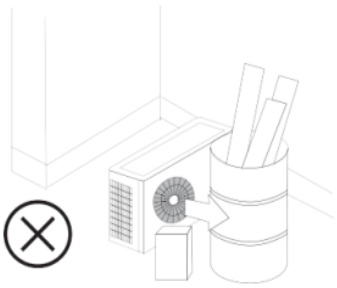
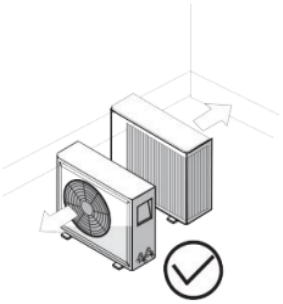
Symbol		(mm)/(inches)
A	Height	1360mm/53.5”
B	Length	824mm/32.4”
C	Width	580mm/22.8”
	Weight	139kg

Heat Pump Installation

Unit installation position

This heat pump requires good air flow through the fin coils for maximum efficiency. To avoid poor ventilation, the air outlet of the unit should not be allowed to deflect back to the air inlet.

Please keep enough space around the heat pump for repairs and maintenance.

Wrong	Right
	
	

Installation and Space Requirements

- The installation position should have **good ventilation**.
- Try to **minimize direct sunlight** onto the unit.
- The installed heat pump **should not make extraneous noises** or rattling sounds.
- The outlet air position should not face a prevailing wind direction, or this will reduce performance efficiency.
- Try to position the heat pump so the outlet air does not discharge directly onto a fence or towards a neighbor. Try for at least 4ft of distance.
- Water from rain or defrost mode will be discharged through a drain hole in the base plate. So, **the unit must be raised in freezing climates to avoid ice buildup**.
  Make sure to install a leakage protection switch. Not doing so could result in electric shock.
- The installation position should **not be located next to flammable materials, explosive materials, or open flames.**
- The heat pump should be **protected from oil** (such as engine oil in a factory environment), **salt** (such as sea spray or salty air) and**/or sulfides** (that may be present in the air from industrial activity or a thermal spring).
- The heat pump should ideally be installed on a **raised stand**, preferably secured to a concrete pad. Alternately, the heat pump can be installed on a balcony, ledge, wall, or roof provided there is a suitable load-bearing platform in place capable of supporting the weight of the unit and not transmitting vibration noise.
- There should be a **drainpipe** or channel from the heat pump to take the condensate water away from the unit.
- **Before installation**, you should not expose the unit to water or other moisture, it may cause short-circuit to the electrical components.
- Do not install the control panel in a **wet environment** which may cause the control panel to malfunction.
- If unit in the room **leaks refrigerant in the installation process**, please open the room for ventilation immediately.
- When the installation is completed, confirm that there is no leakage of refrigerant.
- In cold regions where the heat pump will be used primarily for heating, the unit **needs** to be **raised off the ground** 18-24” to allow ice accumulation below the drain hole, otherwise drain pan will become plugged.

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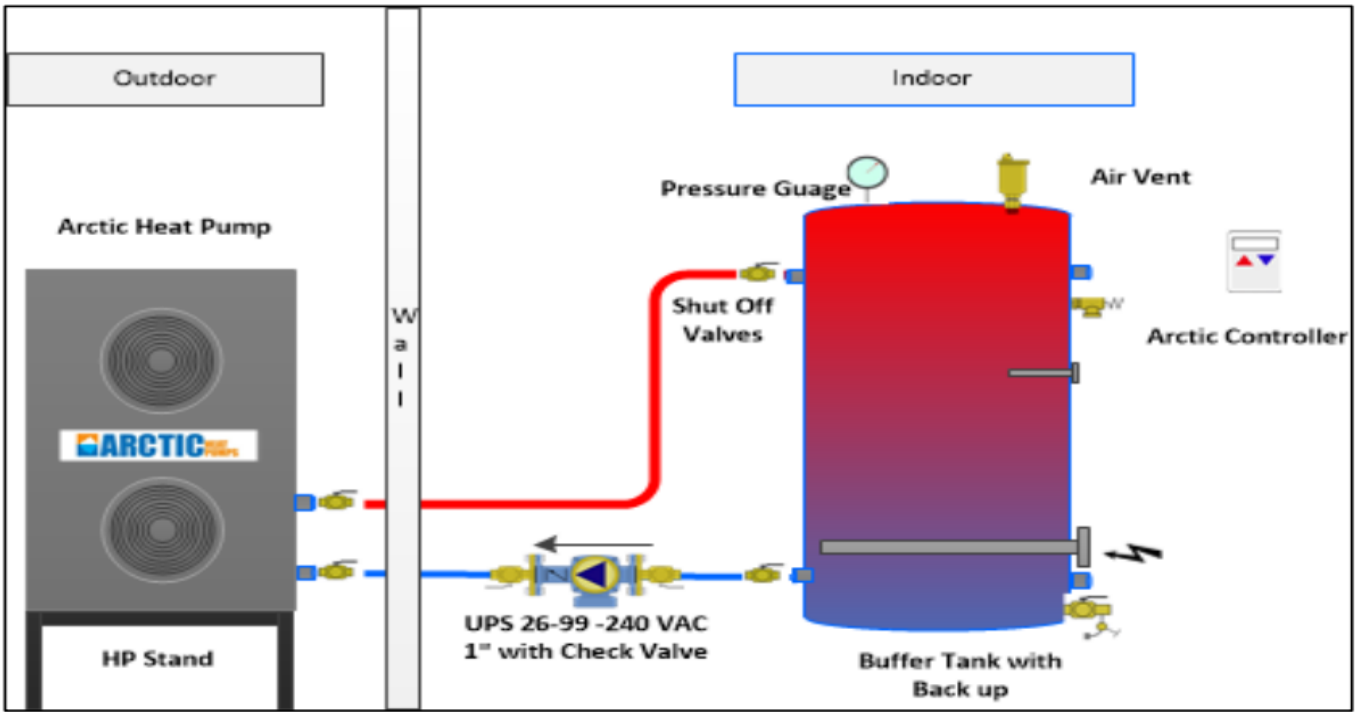
Elevate Heat Pump in Freezing Climate

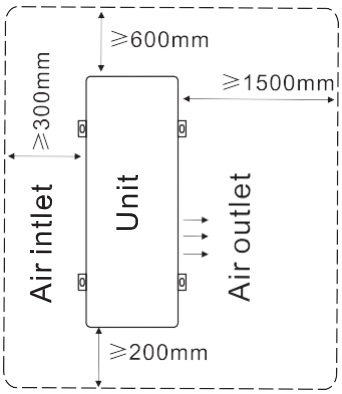
Drain Hole

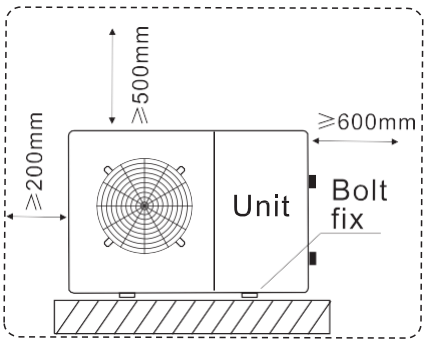


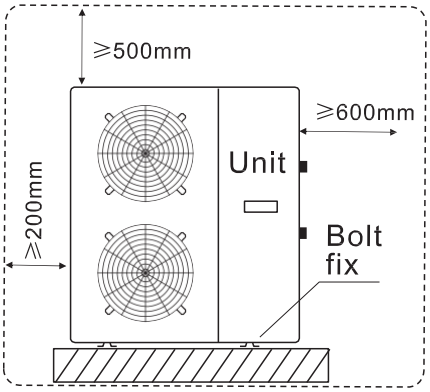
Basic Layout

HIGH TEMPERATURE AIR TO WATER HEAT PUMP

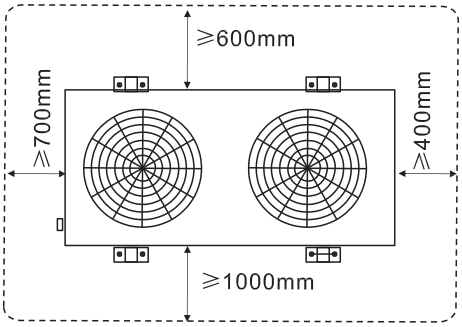
A. Side fan type installation space requirements:

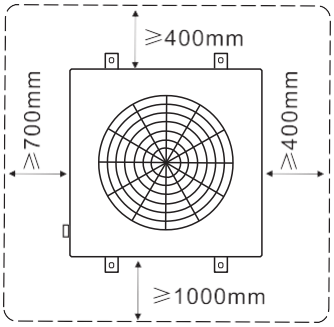


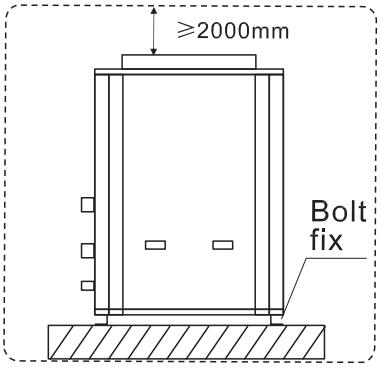




B. Top fan type installation space requirements:

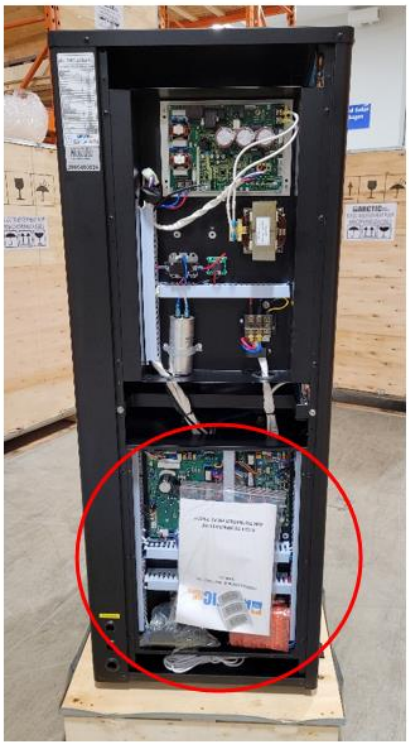






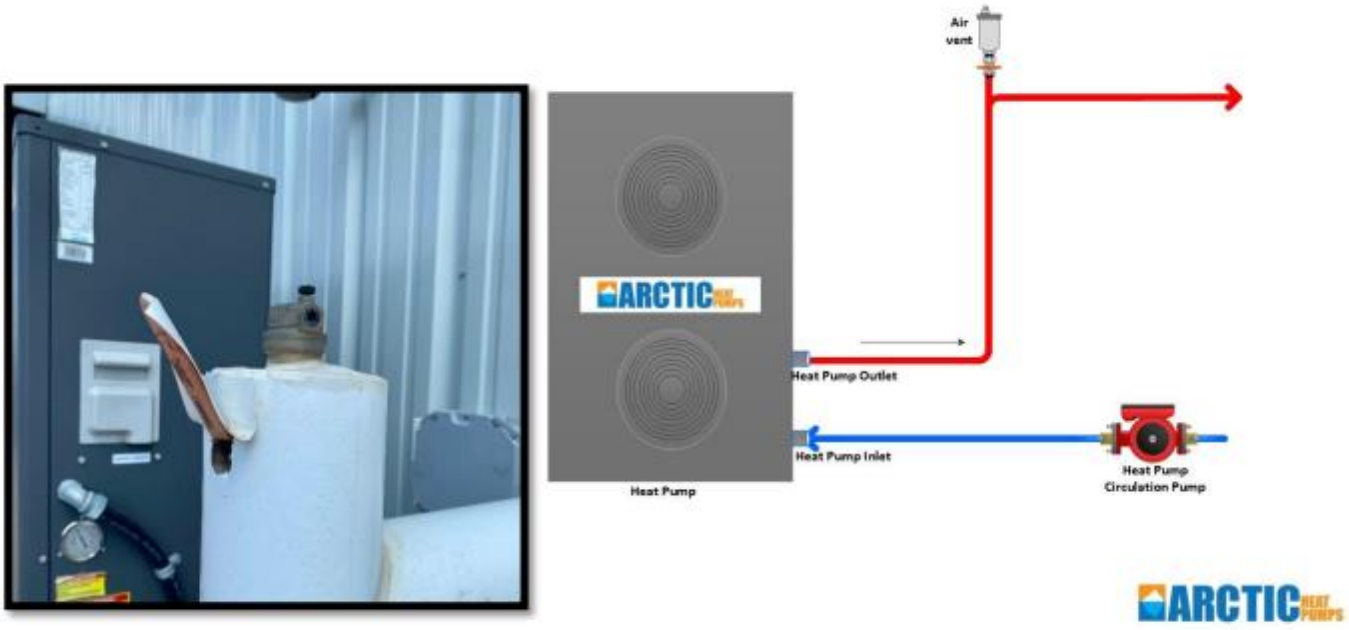
Accessing Additional Heat Pump Parts

In addition to the Heat Pump, you will get 4 rubber anti-vibration pads for the unit to sit on as well as 2 brass thread adapters to convert the threads to NPT. Remove the main door located on the side of the unit (see below) and the parts will be located inside the unit. There will also be 2 High Temperature washers for use with the brass thread adaptors along with the Manual.



Automatic Air Venting

Automatic air vents should be installed on the system at all possible locations of an air lock. This is typically on top of the tank, on the outlet line of the heat pump, and at the highest point of the system. Most in-floor hydronic manifolds also have air vents built into them. There are many brands of automatic air vents, but they all accomplish the same task of removing air from the system. It is good practice to install shut off valves for all air vents should they need to be closed off or replaced.



Typical air vent installation and shut off valve on the outlet line of the heat pump

Caleffi ½“ air vent and Ivar manifold with built in air vent

Buffer Tank (water tank) Installation

- The Buffer tank should be **installed indoors and as close to the heat pump as possible** (Maximum 50ft).
- When there is a chance of freezing, **glycol water mixture** should be used in the buffer tank.
- The buffer tanks should be **installed on a concrete pad** and comply with local codes, so the tanks remain upright and stable.
- Some building codes require seismic restraint. **Consider restraining the buffer tanks** with stainless steel bands.
- Ensure the specification label is visible.
- A pressure limiting valve (pressure release valve) must be fitted with buffer tanks, consult local building codes.
- A **pressure and temperature relief valve** must be supplied with the domestic hot water tank, consult local building codes.
- A tempering (mixing) valve for hot water supply to bathrooms may be required by some local codes.
- A **drain** must be included to allow full and complete draining of the tank.
- It is recommended that the hot water outlet pipes are **fully insulated with weatherproof insulation** such as Armaflex or equivalent, to prevent heat loss externally.
- The hot water outlet pipes should be **angled down by 15 degrees minimum** for the first 250mm (10 inches) after exiting from the hot water storage or buffer tanks. This will create a heat trap that will avoid any thermal siphoning from the tanks.
- Fill the storage and buffer tanks by opening the pressure release or air release valve on top of the tank to **release buildup of air pressure in the tank** as fluid volume enters. Check all pipes for any signs of leaks. Power should not be turned on until the tanks are filled completely with water.

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Installation of Indoor Heating Equipment

- Indoor heating equipment such as fan coils, radiator heating or floor heating, should be **installed in accordance with relevant regulatory requirements,** engineering design drawings, and the manufacturer's installation instructions.
- Use **flexible piping** to connect the heat pump and indoor heating and cooling equipment, such as PEX or flexible stainless steel or flexible copper.

Water Pipe Connections

- Water pipe material should be heat resistant and rust-proof. This can be stainless steel, copper, aluminum, hot water PEX pipes, etc., according to local standards.
- The pipework of the system should follow the relevant standards, and transition to match the connection size of the heat pump.
- The hot water storage and buffer tank drain port and pressure and temperature relief valve should be installed to allow for proper drainage according to relevant standards.
- The pump is installed **INDOORS** located on the water inlet line (lower line) **with arrow on pump flowing to the heat pump.** Be sure to add an **isolation shut off valves** to service pump in the future.
- The hot water storage and buffer tank must be installed with an isolating valve to allow for maintenance.
- The water pipes should be arranged with minimal bends to reduce pressure loss in the system.
- The water inlet must be fitted with a **one-way check valve** (found in the UPC 26-99fc pump) and isolating valves for service
- After all the pipes are connected, the system should be tested at water supply pressure for 24 hours to ensure that the system does not leak and is without debris. Then insulate relevant hot and cold-water pipes, and their plumbing fittings.
- To discharge all air from the water pipeline, the water supply return pipe should have an automatic air bleeding valve installed at the highest point.
- An **expansion tank must be installed** into the system to absorb expansion of the closed loop as temperature increases in the system. It should be installed on the suction side of the pump.
- Automatic water valve and stop valve should be installed indoors to prevent water pipes and valves from cracking in winter.
- The metal pipe must be at least 50mm in thickness of glass fiber or high-density fire-retardant PE for thermal insulation and moisture. PPR water pipe can be 30mm thickness of glass fiber or high-density fire-retardant PE for thermal insulation and moisture to prevent cold, heat loss, and condensation.
- It is recommended to install, in the water flow and return, a thermometer and water pressure gauge to enable monitoring of key operational parameters.

Note On Choosing Piping Sizes:

These notes are based on Type L copper pipe to ASTM Standards & VIPERT™ piping to ASTM standards

- **The flow velocities are too high to use 1" PEX for the heat pump loop. Stick to 1" copper or 1.25" PEX pipe.**
- 1" Copper piping should be used unless the head pressures exceed the limit of the circ pump in which case the piping should be upsized to **1.25".**
- If the piping distance between the heat pump and the buffer tank exceeds 50ft (there and back) you should upsize from **1" copper to 1.25".**
- For PEX pipe the head pressures are higher. You should only use **1.25" PEX** which is good up to about **50ft of pipe** at 9GPM.
- If your system comprises of more than one heat pump you should always upsize to **1.25" piping** and if the runs are quite long should go to **1.5" piping**. If installing more than 2 heat pumps (3 or 4) a **2"** header should be utilized.
- Remember to consider any **3-way valve head pressures** when choosing piping sizes. The valves CV can be used to determine the head loss through the valve.

Flow Rate	Ft of Head / 100 feet of Copper pipe				
USgpm	½"	¾"	1"	1.25"	1.5"
0.80	1.69				
1.00	2.47				
1.50	4.97				
2.00	8.19	1.39			
2.50	12.10	2.04			
3.00		2.81			
3.50		3.67	1.06		
4.00		4.64	1.34		
4.50		5.70	1.65		
5.00		6.86	1.98		
5.50		8.11	2.34		
6.00		9.46	2.73	1.00	
6.50		10.89	3.14	1.16	
7.00		12.42	3.58	1.32	
7.50			4.04	1.48	
8.00			4.53	1.66	
8.50			5.04	1.85	
9.00			5.57	2.05	
9.50			6.13	2.25	0.98
10.00			6.71	2.46	10.8
10.50			7.32	2.68	1.17
11.00			7.95	2.92	1.27
11.50			8.60	3.15	1.38
12.00			9.27	3.40	1.49
13.00				3.01	1.71
14.00				4.46	1.95

Note:

- Tubing pipeline should have separate pressure test, must not test with hot water unit or tanks.
- The water pipes should be **subjected to a pressure test** of twice the operating pressure before operation of the heat pump.
- The recommended pressure of the heat pump loop should be **11-20 psi or 0.2-0.7MPa**.
- The water system allowed working temperature range is 5-80℃.
- A **drainage pipe** should be installed to drain from the pressure/temperature relief valve.
- The pressure/temperature relief valve should be **periodically exercised** by gently pulling the lever up. This will help to remove possible accumulation of calcium carbonate and ensure that the valve is working properly.
- **Install** one-way (check) valves, shut off valves, pressure/temperature relief valves, and any other plumbing fittings consistently with the marked flow direction and in **accordance with relevant local standards.**
- The pressure relief device discharge pipe should be installed in frost-free environment.

Electrical Wiring Notes

- The heat pump should use a dedicated power cable with voltage and current capacity following electrical code given the voltage and amperage rating of the heat pump and circulating pump.
- The unit power cable must be copper cable, the cable diameter must meet the maximum starting current requirement of the unit.
- Outdoor rated disconnect must be installed near the heat pump as per local codes.
- The power cable for the heat pump must be outdoor rated and protected in a metal jacket or conduit.
- The heat pump power supply circuit must have a grounding wire, which should connect with a reliable and effective external ground wire.
- Wiring must be installed by a qualified electrician with reference to the circuit diagram.
- The layout of power wires/cables and control cables should be neat, well supported and with power and control cables separated so they cannot interfere with each other.
- When power lines and control cables are parallel, the wires must be placed inside conduit, with appropriate distance between the cables.
- For electrical connection of the heat pump, pull the following wiring through the wiring hole of the electrical box, then connect to the appropriate terminals in the electrical box according to wiring diagram:

  · Power cable (240 VAC)
  · Digital Controller cable
  · Electric back up heater switch control cable
  · Pump cable (240 VAC)
  · Optional 3-way Valve cable (240 VAC)

Electrical Wire Selection – Warning

- The internal compressor motor insulation does not protect the compressor against all possible conditions. Please be sure that the system is properly grounded when installed in the field.
- To avoid fire, electric shock, and other accidents, only use the power supply voltage indicated on the label.
- To protect the power cables, they should be secured appropriately so that they cannot become damaged, and people cannot trip over them. Outdoor rated wire should be used from the disconnect to the heat pump.
- Dedicated circuits should be used to avoid overloading breakers from other appliances.
- Check to ensure your electrical cable and fuse rating is appropriate for the power load and is properly grounded.

Power wiring as follows (single unit):

Model:	Wire Specifications	Voltage
MAHRW030ZA/(BEH2)	6.0mm² 2 wire+GND	208~230V/1PH/60Hz

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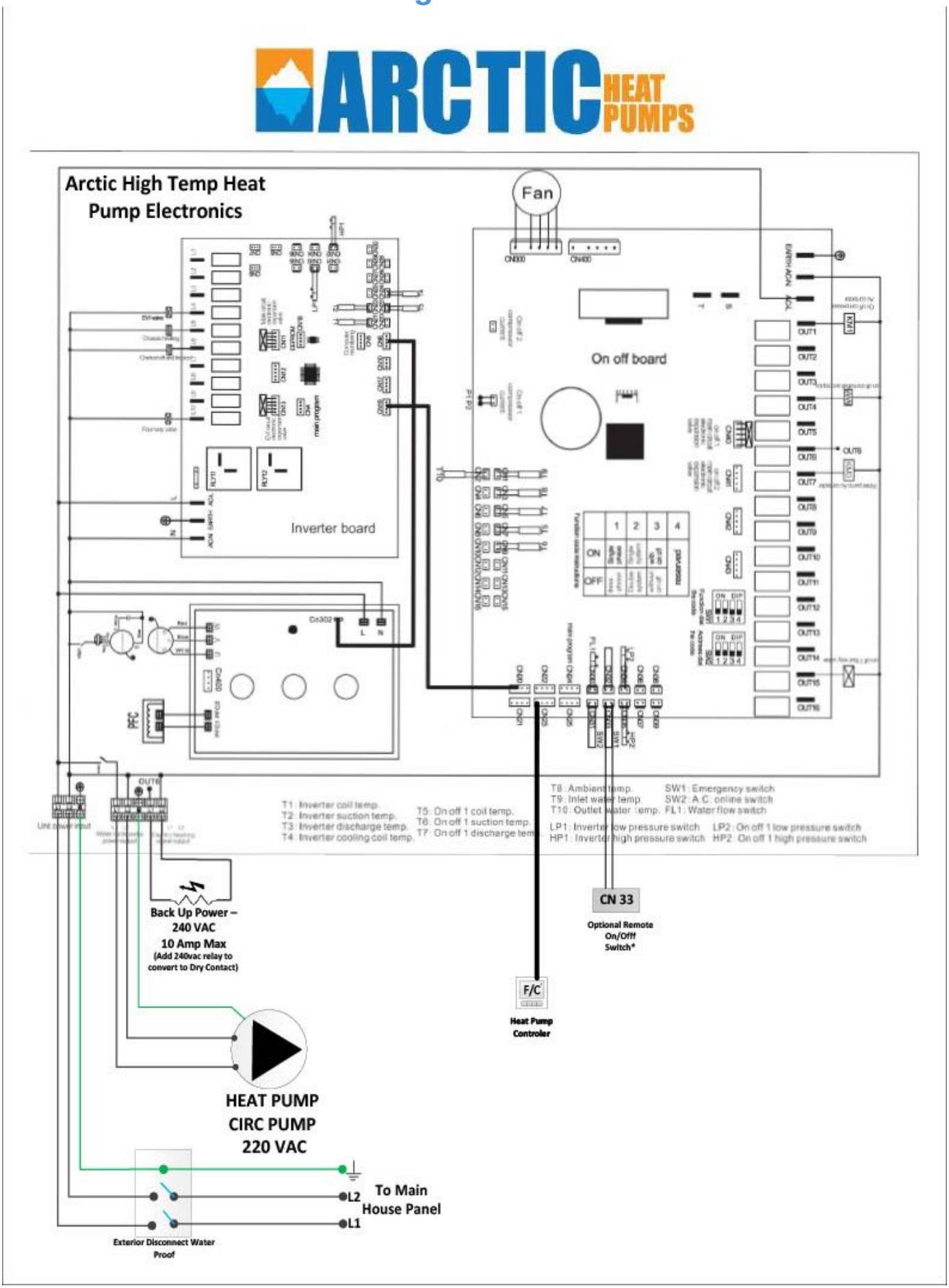
Wiring Connections



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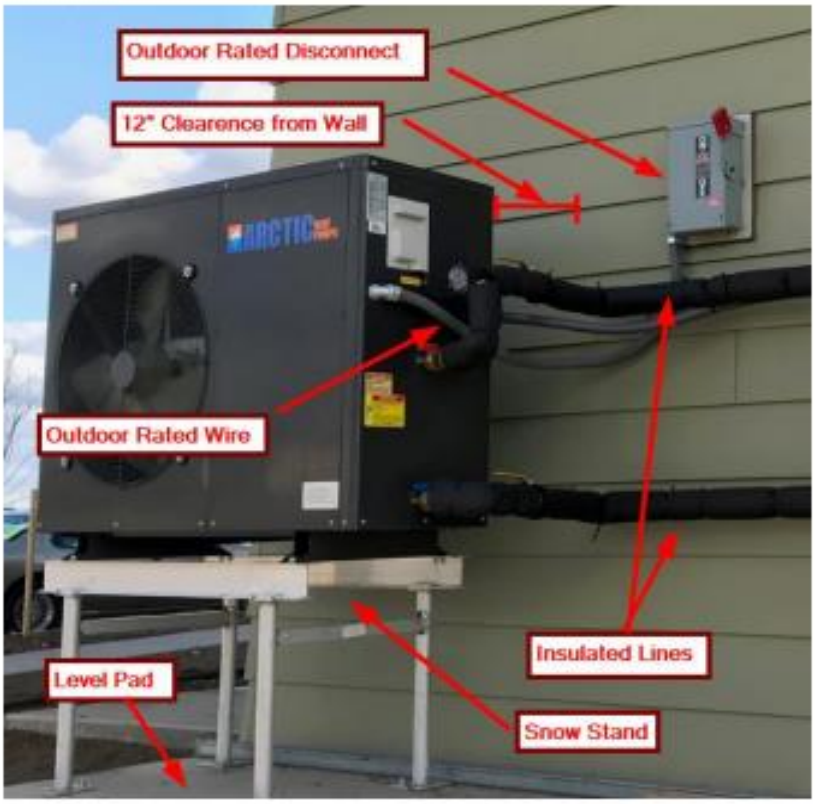
Trial operation (should be operated by professionals)

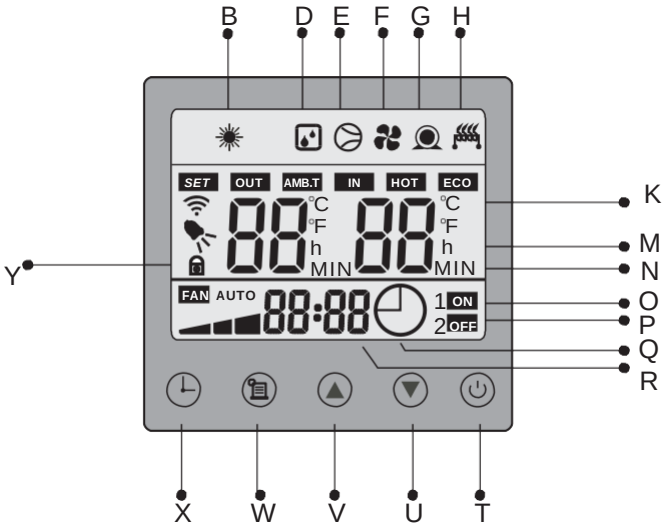
- **Check before trial operation:**
  - Check the entire pipe system. Ensure the system is full and all air is completely removed.
  - Check whether the valves are open throughout the system.
  - Check the power supply and distribution system.
  - Check whether the power supply voltage is correct (240V), the power connection screws are tight, supply power complies with the wiring diagram and heat pump specifications, and the equipment is properly grounded.
  - Press and hold the on/off button on the digital controller. The water pump should start immediately, and the compressor should start shortly after. Observe and determine if there is any abnormal sound during operation. If so, stop the unit and determine the cause. The heat pump should be restarted only when the cause has been fixed and there is no more abnormal sound.
  - Check whether the input power and current of the unit are within the parameters laid out in this manual under “Parameters” If not, stop the heat pump and check it.
  - Observe whether the outlet water temperature is normal. Should be 2-6 degrees above the inlet temp.
  - The parameters of the heat pump controller have been pre-set at the factory. We recommend that you leave these parameters as set.



The Use of the Wired Controller

1. The User interface and function shown below

symbol	icon	Instructions
B		Heating mode icon
D		defrost mode icon
E		Compressor run icon
F		Fan run icon
G		Pump run icon
H		Auxiliary electrical heating icon
K	℃	The temperature icon
M	h	Hours icon
N	MIN	Minutes icon
O		Timing ON icon
P		Timing OF icon
Q		Set the time icon
R	88:88	Time icon
T		The unit switch
U		Down button icon
V		Up button icon
W		Function button icon
X		Timing button icon
Y		Lock icon

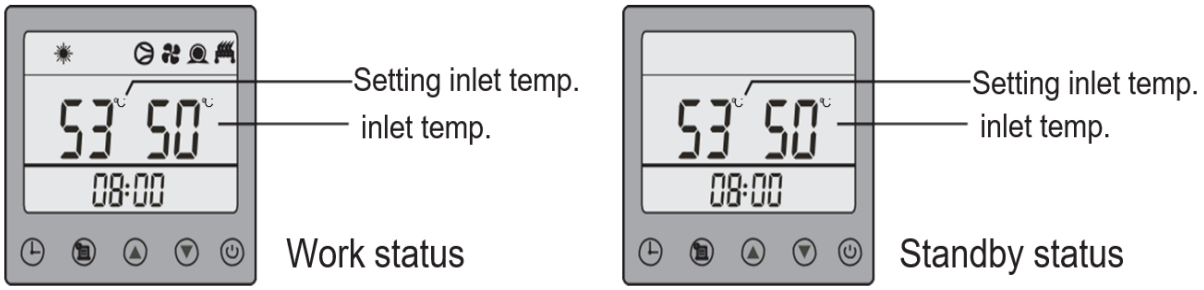


Wired Controller Operations

Keyboard Locking / Unlocking Operation

If no buttons are pressed on the controller for 30 seconds, the units will switch to locked mode automatically and the lock icon will display on wired controller. This means that the keys (buttons) are locked. To unlock, long-press the on/off button for 3 seconds.

Under standby status, (electric power is present, but unit is not operational) the display will look as shown in the figure below on the right. Press the on/off button to turn the unit on. The operation mode icon will display on the wired controller as shown on the left diagram Work Status. Long-press the on/off button again, and the unit will turn off and show Standby status.



2.1 Modifying the Temperature Setting

While in work status, **short pressing** the button or button, will modify the temperature setting. If in air condition mode, it will modify the setting of the **returning inlet temperature** to the heat pump.

2.2 Mode Select Operation

While in Work status, long press the ▲ button to change the operational mode.

Heating mode

2.3 Clock setting

Short press the time button ◷ and the time of the wire controller will flash. At this time press the ◷ button to confirm, and the hours will be flashing. Press ▲ or ▼ to change the hours. Press the ◷ button again to change the minutes. When correct, press the ◷ button to set the new time and exit setting.

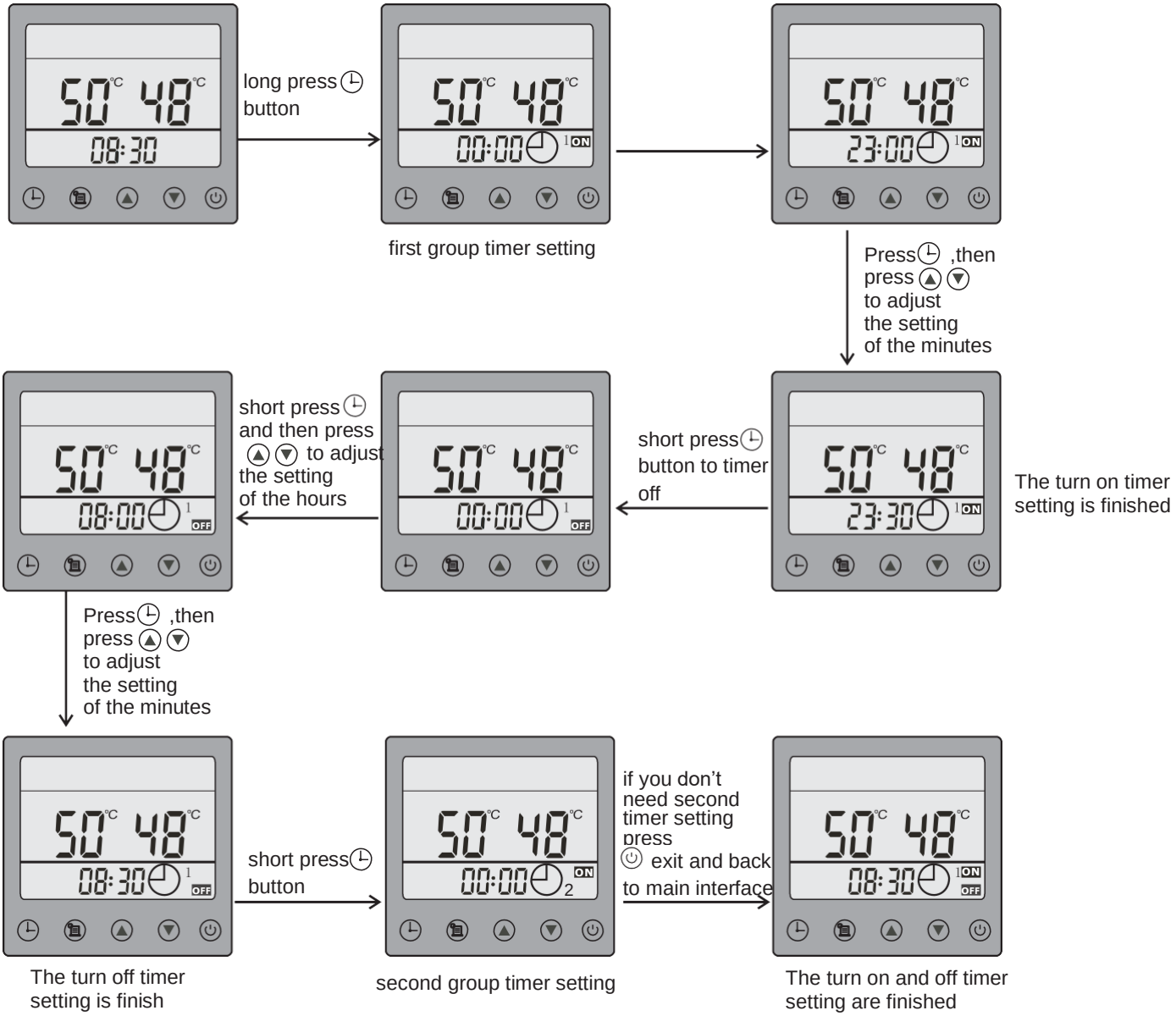
2.4 Forced Defrost

In the heating mode, press ▼ and 📋 at the same time to run defrost mode, then the icon 💧 will flash.

2.5 Timer ON/OFF Settings

While in **standby status**, long press ◷ button for 10 seconds, you will hear a “beep” sound. The icons ◷ “ON” and the hours will flash. At this time, press ◷ and the hours will flash, and then you can press ▼▲ to change the time for hours. Short press ◷ again, the time for minutes will flash, press ▲▼ to change the time for minutes. Now you have finished the units on-time setting

Then short press short press the ◷ and the ◷ “OFF” icons and hours will flash. Press ▲▼ to change the off-time hours. Short press ◷ again and the off-time minutes can be changed. Short press ◷ button one more time to finish the timer settings and exit.



2.6 Canceling Timer Operation

Canceling the timer operation implies that the time will not interrupt the operation of the heat pump. To cancel the timer, long press the button entering the timer setting and then press the button. Unit will cancel the group 1 time "ON". Next the group 1 timer and "OFF" will be flashing, press to cancel group 1 timer "OFF" setting. Repeat steps for canceling timer 2.

Checking of State Parameters

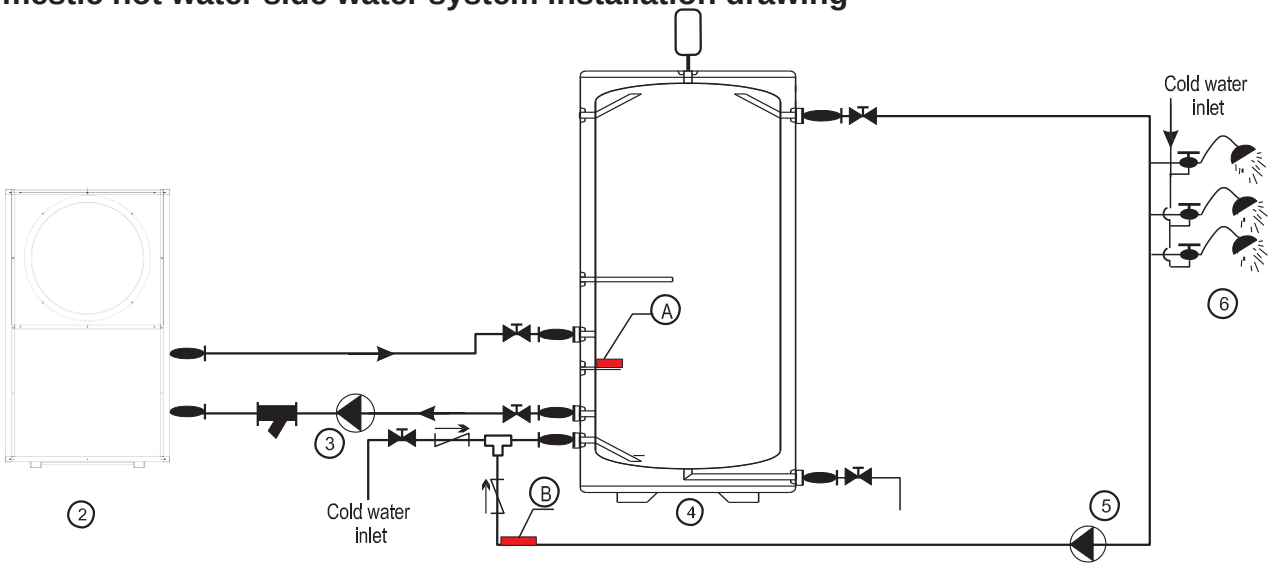
In the main interface Press to enter the state parameter interface. Then, press or button to navigate the state parameters.

Display	Meaning
O2	Inlet water temp.
O3	Out water temp.
O4	Ambient temp.
O6	System 1 inverter auxiliary elec. expansion value opening
O8	System 2 inverter auxiliary elec. expansion value opening
A1	System 1 inverter discharge temp.
A2	System 1 inverter coil temp.
A3	System 1 inverter suction temp.
A4	System 1 inverter input ac current
A5	System 1 inverter main elec. expansion value opening
A6	System 1 inverter cold coil temp.
A7	System 1 inverter Dc bus voltage
A8	System 1 inverter IPM module temp.
A9	System 1 inverter real-time power
A10	System 1 inverter Dc motor speed
A11	System 1 inverter High pressure value
A12	System 1 inverter High pressure value
A13	System 1 inverter input ac voltage
A14	System 1 inverter Actual frequency of compressor
A15	System 1 inverter EE Coding high
A16	System 1 inverter EE Coding low
B1	System 1 on off discharge temp.
B2	System 1 on off coil temp.
B3	System 1 on off suction temp.
B4	System 1 on off Compressor current
B5	System 1 on off main elec. expansion value opening
B10	On off dc fan speed
B13	On off input ac voltage
B15	On off EE Coding high
B16	On off EE Coding low
C1	System 2 inverter discharge temp.
C2	System 2 inverter coil temp.
C3	System 2 inverter suction temp.
C4	System 2 inverter input ac current
C5	System 2 inverter main elec. expansion value opening
C6	System 2 inverter cold coil temp.
C7	System 2 inverter Dc bus voltage
C8	System 2 inverter IPM module temp.
C9	System 2 inverter real-time power
C10	System 2 inverter Dc motor speed
C11	System 2 inverter High pressure value
C12	System 2 inverter Low pressure value
C13	System 2 inverter input ac voltage
C14	System 2 inverter Actual frequency of compressor
C15	System 2 inverter EE Coding high
C16	System 2 inverter EE Coding low
d1	System 2 on off discharge temp.
d2	System 2 on off coil temp.
d3	System 2 on off suction temp.
d4	System 2 on off Compressor current
d5	System 2 on off main elec. expansion value opening

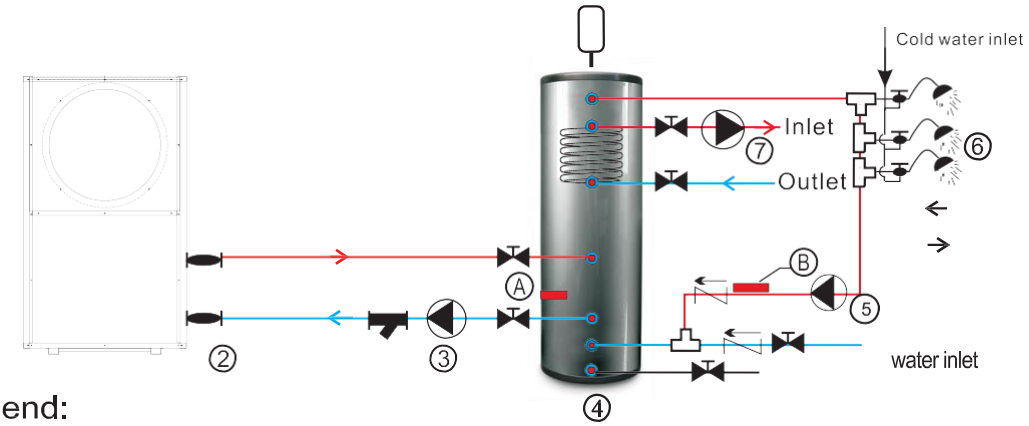
Installation Sketch

1. Water system installation drawing

A. Domestic hot water side water system installation drawing



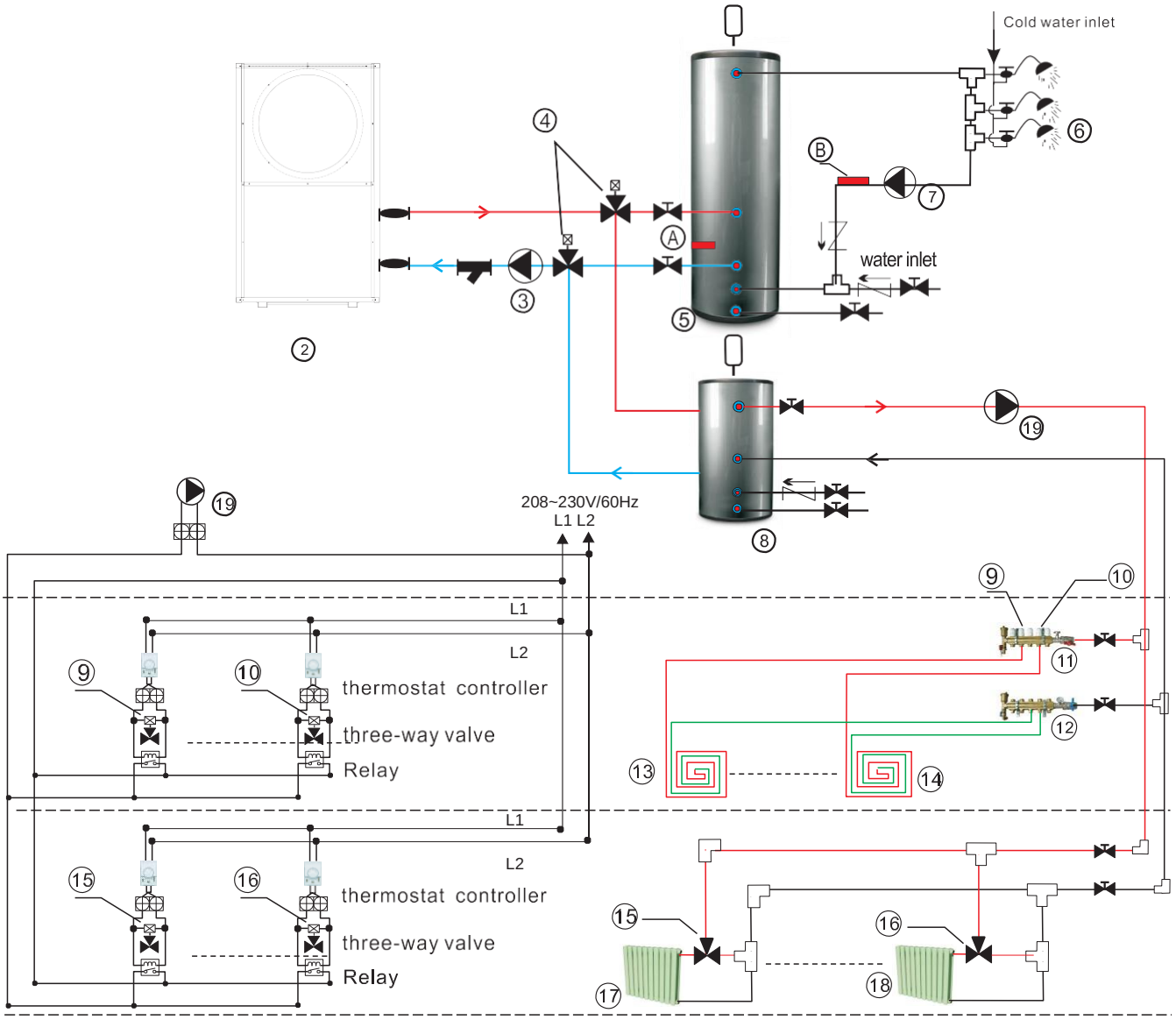
B. Hot water side and floor heating side system installation drawing without three-way valve



Legend:

Globe valves	Shower head	⑦ Floor heating cycle pump
Electric driven two-way valve	② Indoor unit	Ⓐ Hot water tank temp.
Check valve	③ Water cycle pump	Ⓑ Water supply return temp.
Water pressure switch	④ Hot water tank	
Water temp. sensor	⑤ Water supply cycle pump	
Expansion Tank	⑥ Bath room	

C. Hot water side and floor heating side system installation drawing with three-way valve



Legend:

- Flexible connectors
- Globe valves
- Electric three-way valve
- Check valve
- Thermostat
- Expansion Tank
- Water cycle pump
- ② Indoor unit
- ③ Hot water cycle pump
- ④ Water system three way valve
- ⑤ Hot water tank
- ⑥ Bath room
- ⑦ Water supply return cycle pump
- ⑧ Buffer tank
- ⑨ Room 1 electrothermal actuator
- ⑩ Room 2 electrothermal actuator
- ⑪ Water distribution device
- ⑫ Water collection device
- ⑬ Room 1 floor heating
- ⑭ Room 2 floor heating
- ⑮ Room 3 electric three way valve
- ⑯ Room 4 electric three way valve
- ⑰ Room 3 Radiators
- ⑱ Room 4 Radiators
- ⑲ Floor heating cycle pump
- Ⓐ Hot water tank temp.
- Ⓑ Water supply return temp.

Maintenance and Repair

Notes

- Check whether the exhaust equipment is running normally. Avoid cutting the water supply that makes air entering the system, or it will influence the performance and reliability of the unit. The water filter should be cleaned regularly. Keep the water clean in case of any damage to the unit due to filter's dirty and jam.
- Keep the unit in a dry environment that is clean and well ventilated. Clean the evaporator fins regularly (once per 1-2 months) to maintain high exchange efficiency and to save energy.
- The unit has self-diagnosis built into it and as such will display error codes on the control display if any items need attention.
- Check regularly the performance of all the parts in the unit. Check whether the working pressure of the refrigerant system is normal. Repair and change the parts timely if there's any abnormity.
- Check regularly the wiring of the power and electric system is tightened and to see if the electric parts perform abnormally or smells. Repair and change the parts timely if there's any abnormity.
- Care of the unit if the unit stops for a long time: Discharge all the water in the pump and throughout the piping in case of frost and freezing. Discharge the water from the water pump and tube exchanger bottom drain. Check the unit thoroughly and fill water into the inlet system before the unit is powered on again.
- Check the unit operation of every process and the operational pressure of the refrigerant system.
- Check the power supply and cable connection regularly to see if there is anything abnormal or bad smells from the electrical components.

HIGH TEMPERATURE AIR TO WATER HEAT PUMP

Antifreeze Protection for Cold Climates

In most heating climates antifreeze protection is of great importance to the operation security and service life of the unit. Therefore, please be sure to follow the instructions below:

- The hot water piping must be well insulated to reduce heat loss.
- Limit the distance of the piping run into the house. Shorter pipes will lose less heat.
- Ensure the drain plug on the bottom of the heat pump pan is elevated 24” so that ice buildup does not plug the drain.
- The unit is equipped with both drain pan and compressor low temperature supplemental heating trace to ensure proper operation in low temperature.
- Polypropylene glycol should be used in an appropriate ratio corresponding to the lowest possible ambient temperature. (see table below)
- System pressure drop will increase by 25% with 35% water to glycol mixture so this must be considered when sizing circulation pumps.

Percent Glycol Concentration Required			
Temperature		For Freeze Protection	For Burst Protection
C	F	Volume %	Volume %
-7	20	18	12
-12	10	29	20
-18	0	36	24
-23	-10	42	28
-29	-20	46	30
-34	-30	50	33
-40	-40	54	35
-46	-50	57	36
-51	-60	60	37

WARNING: DO NOT EXCEED 50% GLYCOL AS THE FLUID WILL BE TOO VISCOUS AND PREVENT THE CIRCULATION PUMPS FROM WORKING

HIGH TEMPERATURE AIR TO WATER HEAT PUMP

Malfunction/Error Code Tables:

Code	Malfunction indication	Reason	Solution
E 01	System 1 inverter system discharge temperature fault	System1 inverter system temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 02	System 1 on/off system discharge temperature fault	System 1 on off system discharge temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 03	System 2 inverter system discharge temperature fault	System 2 inverter system discharge temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 04	System 2 on/off system discharge temperature fault	System 2 on off system discharge temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 05	System 1 inverter system coil temperature fault	System 1 inverter system coil temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 06	System 1 on/off system coil temperature fault	System 1 on off system coil temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 07	System 2 inverter system coil temperature fault	System 2 inverter system coil temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 08	System 2 on/off system coil temperature fault	System 2 on off system coil temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 09	System 1 inverter system suction temperature fault	System 1 inverter system suction temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 10	System 1 on/off system suction temperature fault	System 1 on off system suction temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 11	System 2 inverter system suction temperature fault	System 2 inverter system suction temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 12	System 2 on/off system suction temperature fault	System 2 on off system suction temperature sensor disconnect or short circuit	Check and replace temperature sensor

HIGH TEMPERATURE AIR TO WATER HEAT PUMP

E 18	Water outlet temperature fault	Water outlet temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 19	Water inlet temperature fault	Water inlet temperature sensor disconnect or short circuit	Check and replace temperature sensor
E 21	Wire controller communication fault	Fail connection between controller and main board	Check the communication line between controller and main board
E 22	Ambient temperature fault	Ambient temperature sensor disconnects or short circuit	Check and replace temperature sensor
E 39	Board communication fault	Inverter main board 1 and on/off main board communication fault	Check the communication line between inverter main board 1 and on off main board
E 40	Ambient temperature fault	Inverter main board 2 and on/off main board communication fault	Check the communication line between inverter main board 2 and on off main board
E 41	Board communication fault	Inverter main board 1 and drive board communication fault	Check the communication line between inverter main board 1 and drive board
E 42	Board communication fault	Inverter main board 2 and drive board communication fault	Check the communication line between inverter main board 2 and drive board
E 43	EE fault	Inverter board 1 EE fault or inverter drive board 1 EE fault	Contact the distributor
E 44	EE fault	Inverter board 2 EE fault or inverter drive board 2 EE fault	Contact the distributor
P 01	Water flow fault	Lack of water or water flow is low	Check water system, water pump and water flow switch are normal
P 02	System 1 inverter high pressure protection	System 1 inverter system high pressure protection switch discharge	1. Check if water inlet temperature is high or blocked 2. Check if the fan blade is dirty or not, which will affect the heat transfer efficiency for heat exchanger 3. Check if there is too much refrigerant 4. Check if the water tank temperature setting is too high or low
P 03	System 1 on off system high pressure protection	System 1 on off system high pressure protection switch discharge	1. Check if water inlet temperature is high or blocked 2. Check if the fan blade is dirty or not, which will affect the heat transfer efficiency for heat exchanger 3. Check if there is too much refrigerant 4. Check if the water tank temperature setting is too high or low
P 04	System 2 inverter high pressure protection	System 2 inverter system high pressure protection switch discharge	1. Check if water inlet temperature is high or blocked 2. Check if the fan blade is dirty or not, which will affect the heat transfer efficiency for heat exchanger 3. Check if there is too much refrigerant 4. Check if the water tank temperature setting is too high or low
P 05	System 2 on off system high pressure protection	System 2 on off system high pressure protection switch discharge	1. Check if water inlet temperature is high or blocked 2. Check if the fan blade is dirty or not, which will affect the heat transfer efficiency for heat exchanger 3. Check if there is too much refrigerant 4. Check if the water tank temperature setting is too high or low
P 06	System 1 inverter system low pressure protection	System 1 inverter system low pressure protection switch discharge	1. Check if the unit is leaking refrigerant 2. If refrigerant leak is confirmed, fix the leakage point, vacuumize the system and fill with refrigerant according to the nameplate/technical label
P 07	System 1 on off system low pressure protection	System 1 on off system low pressure protection switch discharge	1. Check if the unit is leaking refrigerant 2. If refrigerant leak is confirmed, fix the leakage point, vacuumize the system and fill with refrigerant according to the nameplate/technical label

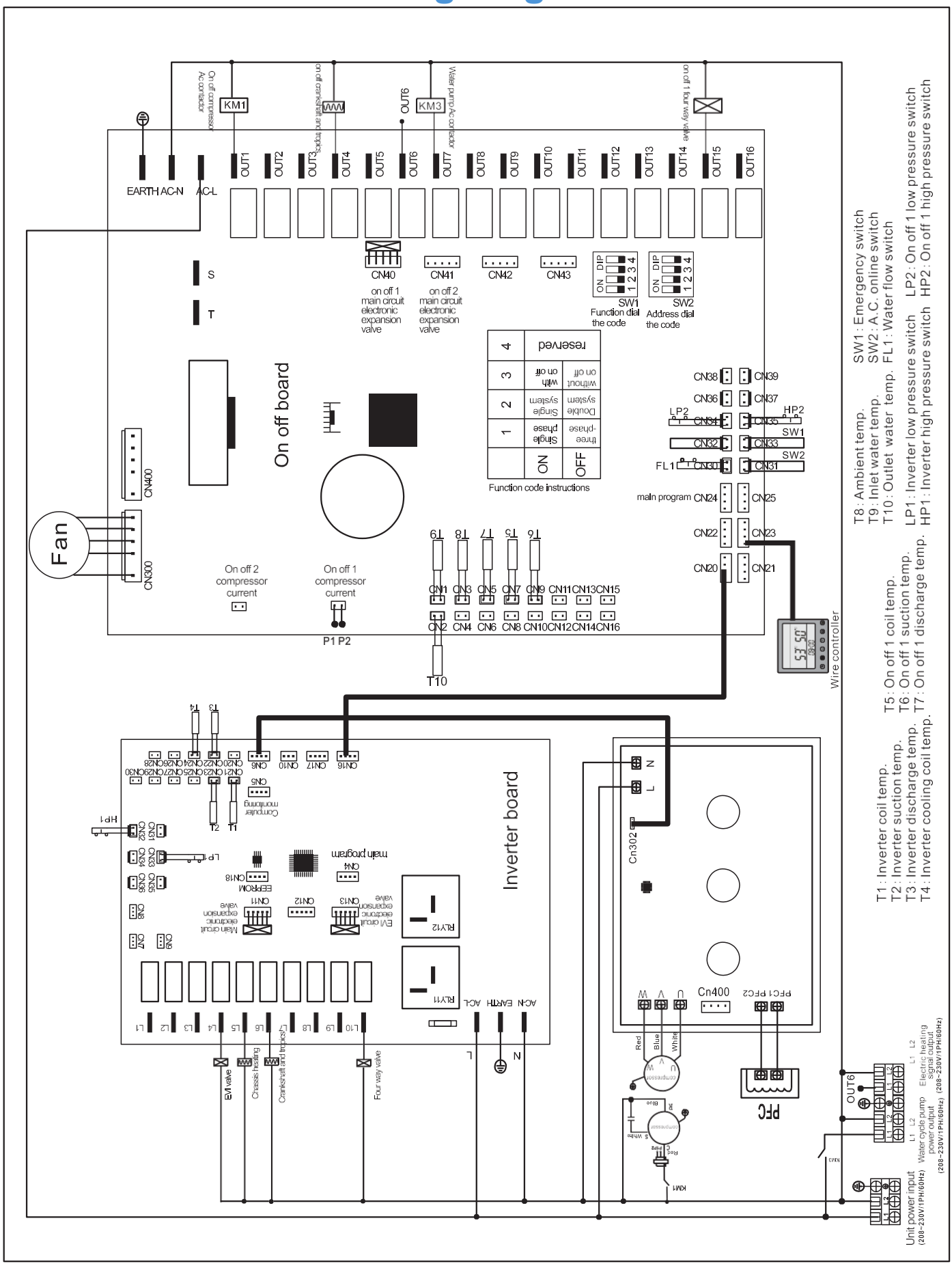
P 08	System 2 inverter system low pressure protection	System 2 inverter system low pressure protection switch discharge	1.Check if the unit is leaking refrigerant 2. If refrigerant leak is confirmed, fix the leakage point, vacuumize the system and fill with refrigerant according to the nameplate/technical label
P 09	System 2 on off system low pressure protection	System 2 on off system low pressure protection switch discharge	1.Check if the unit is leaking refrigerant or not 2.If refrigerant leak is confirmed, fix the leakage point, vacuumize the system and fill with refrigerant according to the nameplate/technical label
P 10	Phase fail	On off system board phase protection or on off system board AC voltage too high or too low protection	Check if the unit power supply is normal
P 11	System 1 inverter system discharge temperature too high protection	System 1 inverter system's discharge temperature is higher than 105°C	1.Check if the system's water is clean, make sure there is no liquid which corrodes pipes 2. If refrigerant leak is confirmed, fix the leakage point, vacuumize the system and fill with refrigerant according to the nameplate/technical label
P 12	System 1 on off system discharge temperature too high protection	System 1 on off system's discharge temperature is higher than 105°C	1.Check if the system's water is clean, make sure there is no liquid which corrodes pipes 2. If refrigerant leak is confirmed, fix the leakage point, vacuumize the system and fill with refrigerant according to the nameplate/technical label
P 13	System 2 inverter system discharge temperature too high protection	System 2 inverter system's discharge temperature is higher than 105°C	1.Check if the system's water is clean, make sure there is no liquid which corrodes pipes 2. If refrigerant leak is confirmed, fix the leakage point, vacuumize the system and fill with refrigerant according to the nameplate/technical label
P 14	System 2 on off system discharge temperature too high protection	System 2 on off system's discharge temperature is higher than 105°C	1.Check if the system's water is clean, make sure there is no liquid which corrodes pipes 2. If refrigerant leak is confirmed, fix the leakage point, vacuumize the system and fill with refrigerant according to the nameplate/technical label
P 15	Water inlet and outlet temperature difference too large protection	Not enough water flow, water pressure too low	1.Check if water flow becomes low 2.Check if the unit runs normal, or if discharge temperature, system pressure is normal.
P 16	Over-cooling protection	Unit's cooling mode cannot run normally, and water outlet temperature too low	1. Check if water flow becomes low 2. Check if the unit runs normal, or if discharge temperature, system pressure is normal.
P 17	Winter anti-freezing protection	Ambient temperature is below 0°C	Unit will start anti-freezing protection automatically, please keep the unit in stand by state, do not turn off the power
P 19	System 1 inverter system compressor AC current protection	Unit's working condition is not good, or compressor cannot run normally	1.Check the compressor connection line is normal and compressor runs normal 2.Check if unit's working condition is normal
P 20	System 1 on off system compressor AC current protection	Unit's working condition is not good, or compressor cannot run normally	1.Check the compressor connection line is normal and compressor runs normal 2.Check if unit's working condition is normal
P 21	System 2 inverter system compressor AC current protection	Unit's working condition is not good, or compressor cannot run normally	1.Check the compressor connection line is normal and compressor runs normal 2.Check if unit's working condition is normal
P 22	System 2 on off system compressor AC current protection	Unit's working condition is not good, or compressor cannot run normally	1.Check the compressor connection line is normal and compressor runs normal 2.Check if unit's working condition is normal
P 31	Inverter board 1 cooling coil overheat protection	Inverter board 1 cooling coil overheat protection and unit stop	Check if there is a refrigerant leak
P 32	Inverter board 2 cooling coil overheat protection	Inverter board 2 cooling coil overheat protection and unit stop	Check if there is a refrigerant leak

P 33	Inverter board 1 cooling indoor coil anti-freezing protection	Inverter board 1 cooling indoor coil anti-freezing protection and unit stop	Check if there is a refrigerant leak
P 34	Inverter board 2 cooling indoor coil anti-freezing protection	Inverter board 2 cooling indoor coil anti-freezing protection and unit stop	Check if there is a refrigerant leak
P C	Ambient temperature too low protection	Ambient temperature too low protection	Contact the distributor
r 01	Inverter board 1 IPM temperature too high protection	System's drive board fault	Contact the distributor
r 02	Inverter board 1 compressor start abnormal	System's drive board fault	Contact the distributor
r 06	Inverter board 1 compressor phase current protection and unit stop	System's drive board fault	Contact the distributor
r 10	Inverter board 1 AC voltage too high or too low protection/Three phase drive board wrong phase protection	System power supply fault	Contact the distributor
r 11	Inverter board 1 DC bus voltage too high, too low protection	System's drive board fault	Contact the distributor
r 13	Inverter board 1 IPM modular fault	System's drive board fault	Contact the distributor
r 20	Inverter board 1 compressor fault/protection	System's drive board fault	Contact the distributor
r 25	Inverter board 2 IPM temperature too high protection	System's drive board fault	Contact the distributor
r 26	Inverter board 2 compressor start abnormal	System's drive board fault	Contact the distributor
r 27	Inverter board 2 compressor phase current protection and unit stop	System's drive board fault	Contact the distributor
r 28	Inverter board 2 AC voltage too high or too low protection/Three phase drive board wrong phase protection	System power supply fault	Contact the distributor
r 29	Inverter board 2 DC bus voltage too high, too low protection	System's drive board fault	Contact the distributor
r 30	Inverter board 2 IPM modular fault	System's drive board fault	Contact the distributor
r 31	Inverter board 2 compressor fault/protection	System's drive board fault	Contact the distributor

Malfunction/Solution Table:

Malfunction	Reason	Solution
The unit can't run	1.Power failures 2. The unit wire loose 3. The unit power fuse burns out.	1. Shut down and check the power 2.Check the reason and repair 3.Check and change the power fuse
The water pump can run but can't circulate and is noisy	1. The water system is lack of water 2. There's air in the system. 3. The water system valve doesn't open entirely 4. The water filter is dirty and jam	1.Check the water supplement equipment and supply water into the system. 2.Exhaust the air from the water system 3.Clean the water filter or exhaust the air from system 4.Clean the water filter
The cooling capacity is too low and the compressor works continuously without pause.	1. Refrigerant is insufficient 2. Thermal insulation of the water system is poor 3. Thermal discharge of the exchange is poor 4. Water flow volume is insufficient	1.Check the leakage and add refrigerant 2.Enhance the thermal insulation of the pipe route 3.Clean the exchanger and improve the condensation condition 4. Clean the water filter
The compressor exhausted pressure is too high	1.Too much refrigerant 2.Thermal discharge of the exchange is poor	1. Discharge surplus refrigerant 2. Clean the exchanger and improve the condensation condition
The compressor suction pressure is too low	1. Refrigerant is insufficient 2. The filter and or capillary tube jam 3. Water flow volume is insufficient 4. Capillary tube of expansion valve sensor bulb breakdown	1.Check the leakage and add refrigerant 2.Change the capillary tube or filter 3.Clean the exchanger and improve the condensation condition 4.Change the expansion valve
Compressor noisy	1.Refrigerant enter into the compressor 2.Compressor damaged	1.Check the reason and solve the malfunction 2.Change the compressor
Compressor can't work	1. Power failure 2. Compressor control damaged 3. Wire loose 4. Compressor overload protection 5. Return water temperature setting incorrect 6. Water flow volume is insufficient	1.Check the power and solve the malfunction 2.Change control 3.Check loose reason and repair 4. Compressor overload protection 5. Reset the return water temperature 6. Clean the water filer and exhaust the air from the system
Fan can't work	1 Fan relay damaged 2.Motor is burnt out	1. Change the fan relay 2. Change the fan motor
The compressor run but no refrigeration	1. The refrigerant leak out 2. Plate exchanger freezes 3. Compressor failure	1.Check the leakage and add refrigerant 2.Check the reason and change the plate exchanger 3.Change the compressor
Low water temperature protection to the unit	1.Water flow volume is insufficient 2.Temperature control setting is too low	1.Clean the water filter and exhaust the air from the system 2.Re-set
Few water flow volume protection to the unit	1.Water flow volume is insufficient 2.Flow switch	1.Clean the water filter and exhaust the air from the system 2.Change the flow switch

Wiring diagram



HIGH TEMPERATURE
AIR TO WATER HEAT PUMP