emerald

Troubleshooting and service manual

Hot Water Heat Pump All-In-One Select

HPA1-S220, HPA1-S220E
HPA1-S270, HPA1-S270E

IMPORTANT NOTICE

Please read this manual before servicing the product and retain for future use. Not following the instructions may result in the product not functioning as intended.

Installer information

Installer information

Installer company:

Contact number:

Installer full name:

Install date:

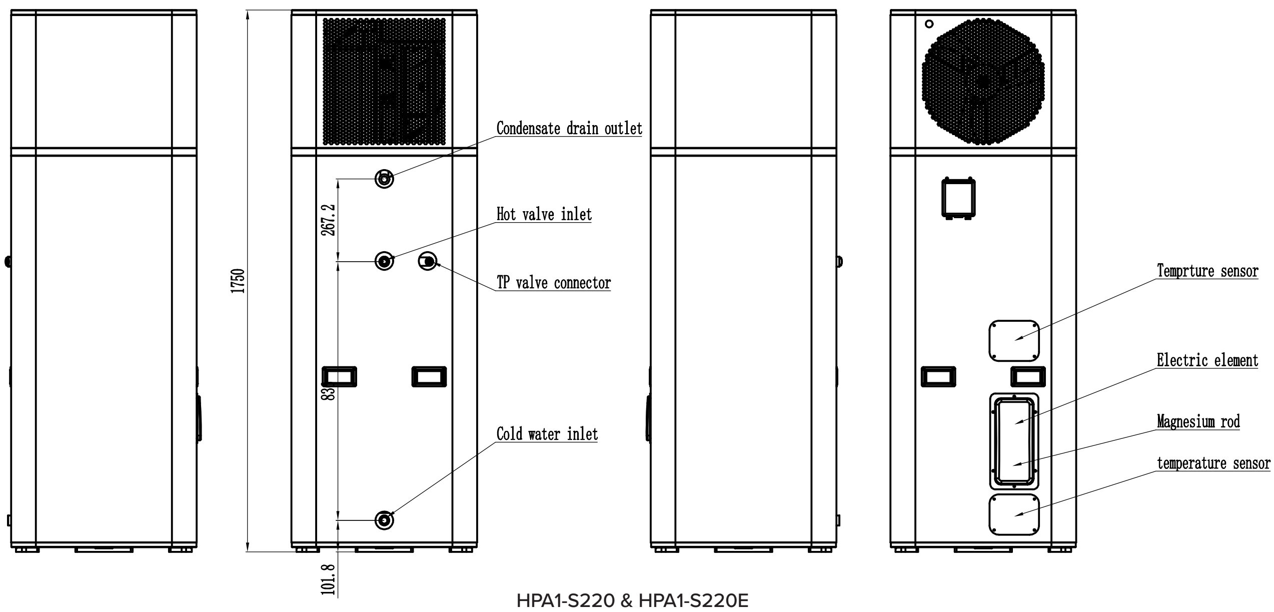
Notes:

Installation guide

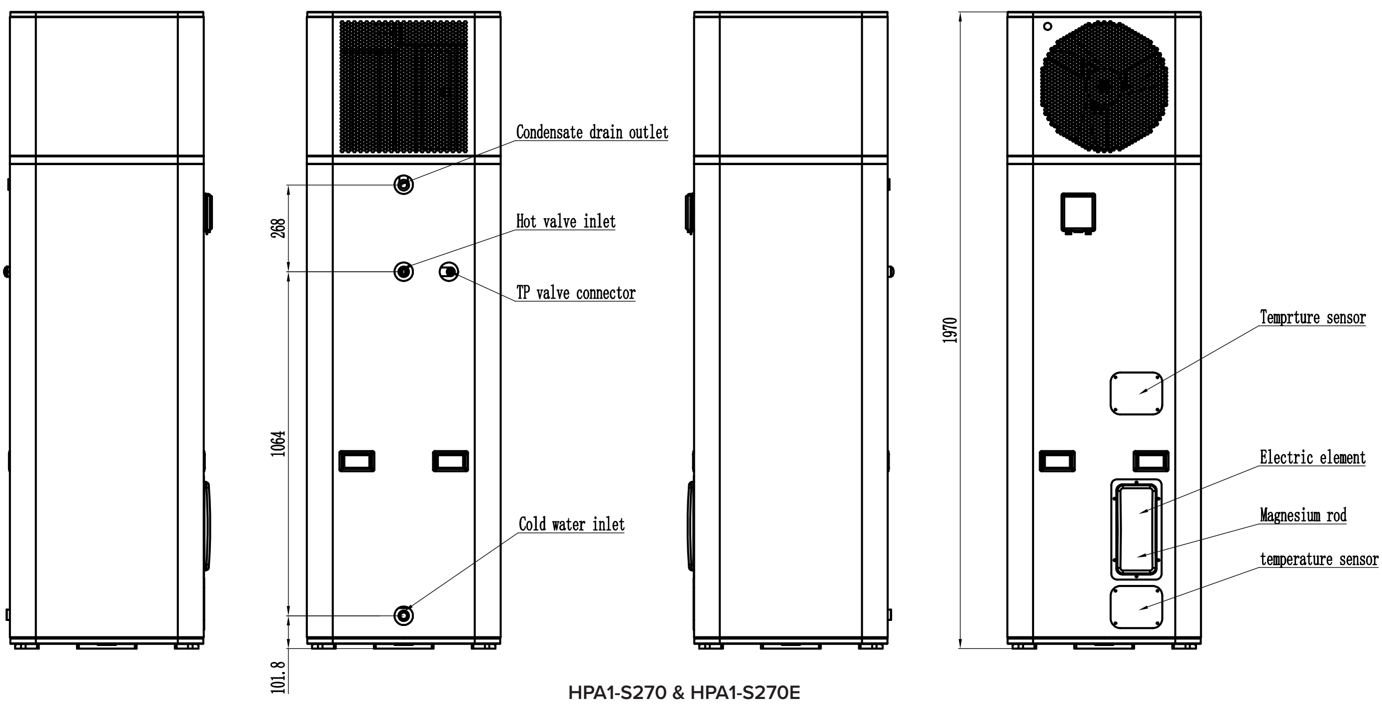
Product introduction

Measurements and structural drawing

Model	Weight (kg)	Dimension (mm)	Power supply
HPA1-S220	118	600×600×1750	220V-240V/ 50Hz
HPA1-S220E	118	600×600×1750	220V-240V/ 50Hz
HPA1-S270	132	600×600×1970	220V-240V/ 50Hz
HPA1-S270E	132	600×600×1970	220V-240V/ 50Hz



HPA1-S220 & HPA1-S220E
(The electric heating element is not included in HPA1-S220)



HPA1-S270 & HPA1-S270E
(The electric heating element is not included in HPA1-S270)

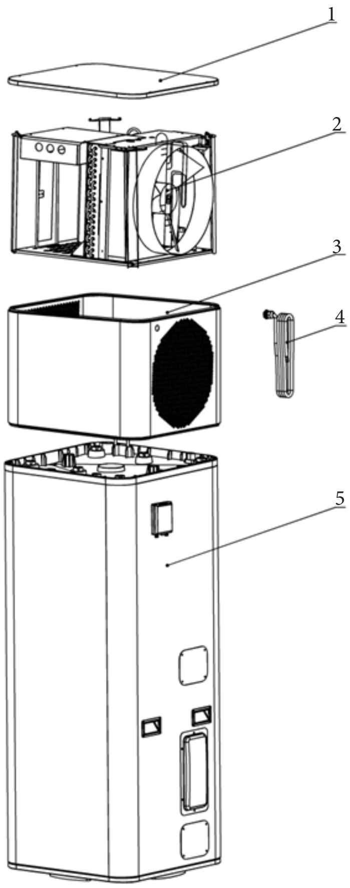
Product introduction

Emerald model (residential)		HPA1-S220E	HPA1-S220	HPA1-S270E	HPA1-S270
Power supply		220V~240V/50HZ/1Phase			
Water tank volume		220L	220L	270L	270L
Optional running modes		Standard / Boost / E-Heater	Standard / Boost	Standard / Boost / E-Heater	Standard / Boost
Electric heating element		1kW	N/A	1kW	N/A
Heating capacity	Standard mode (Heat pump only)	2.8kW	2.8kW	2.8kW	2.8kW
Rated input power		0.68kW	0.68kW	0.63kW	0.63kW
COP for heat pump		4.19	4.19	4.41	4.41
Recharge rate		58L/h	58L/h	58L/h	58L/h
Sound level at 1m		50dB(A)	50dB(A)	50dB(A)	50dB(A)
Heating capacity	Boost mode (Heat pump + Electric heater)	3.8kW	2.8kW	3.8kW	2.8kW
Rated input power		1.68kW	0.68kW	1.63kW	0.63kW
COP for heat pump		4.19	4.19	4.41	4.41
Recharge rate		79L/h	58L/h	79L/h	58L/h
Heating capacity	E-Heater mode (Electric heater only)	1.0kW	N/A	1.0kW	N/A
Rated input power		1.0kW	N/A	1.0kW	N/A
COP for heat pump		N/A	N/A	N/A	N/A
Recharge rate		21L/h	N/A	21L/h	N/A
Max current (under boost mode)		8.8A	4.7A	8.7A	4.5A
Refrigerant		R290 (350g)		R290 (450g)	
Compressor		GMCC /Non-Inverter/Rotary			
Fan motor		Non-DC Inverter			
Inner tank		Enamel/2.5mm tank wall/3.0mm dome			
Inner tank diameter		φ540mm			
Tank insulation		Polyurethane / 35mm-157mm			
Inner tank design		Concave			
Fan type		Axial			
Expansion valve		EEV			
Defrost		4-way valve			
Emerald APP		Available			
TPR valve		850kPa			
Rated outlet water temperature		60°C			
Max outlet water temperature (heat pump)		70°C			
Working range with element		-15°C-46°C			
Working range without element		-7°C-46°C			
IP class		IPX4			
Electric shock proof class		I			
Unpacked dimension		600mm*600mm*1750mm	600mm*600mm*1750mm	600mm*600mm*1970mm	600mm*600mm*1970mm
Packed dimension (outdoor unit)		650mm*680mm*1870mm	650mm*680mm*1870mm	650mm*680mm*2090mm	650mm*680mm*2090mm
Unpacked weight		118kg	118kg	132kg	132kg
Gross weight (outdoor unit)		126kg	126kg	141kg	141kg

*As per the AS/NZS 4234 modeling Standards the modes (Booster, E-Heater) are one-shot functions that will reset to Standard mode.
*Above test results are given based on the test condition ambient 20°C/15°C, Water from 15°C~55°C.
*Sound levels tested at 1 metre in a hemi-anechoic chamber.

Product introduction

Exploded view

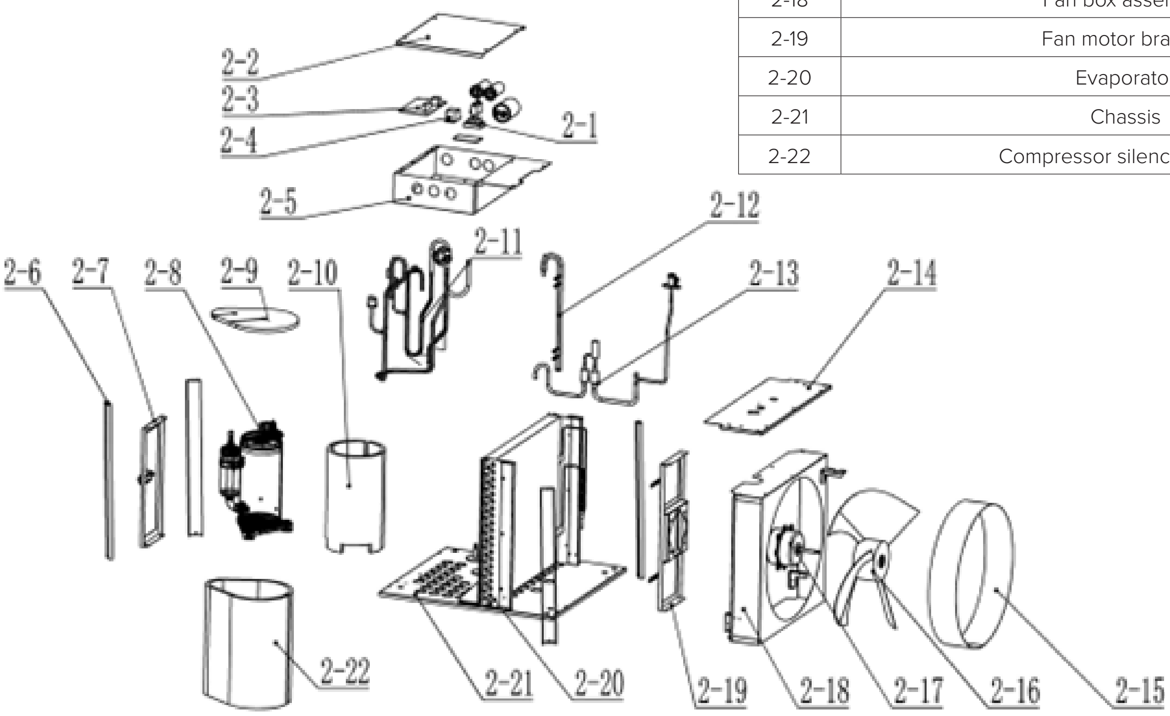


Exploded view of heat pump

No.	Description
1	Top lid
2	Host components
3	Upper end cover
4	Power cable
5	Water tank components

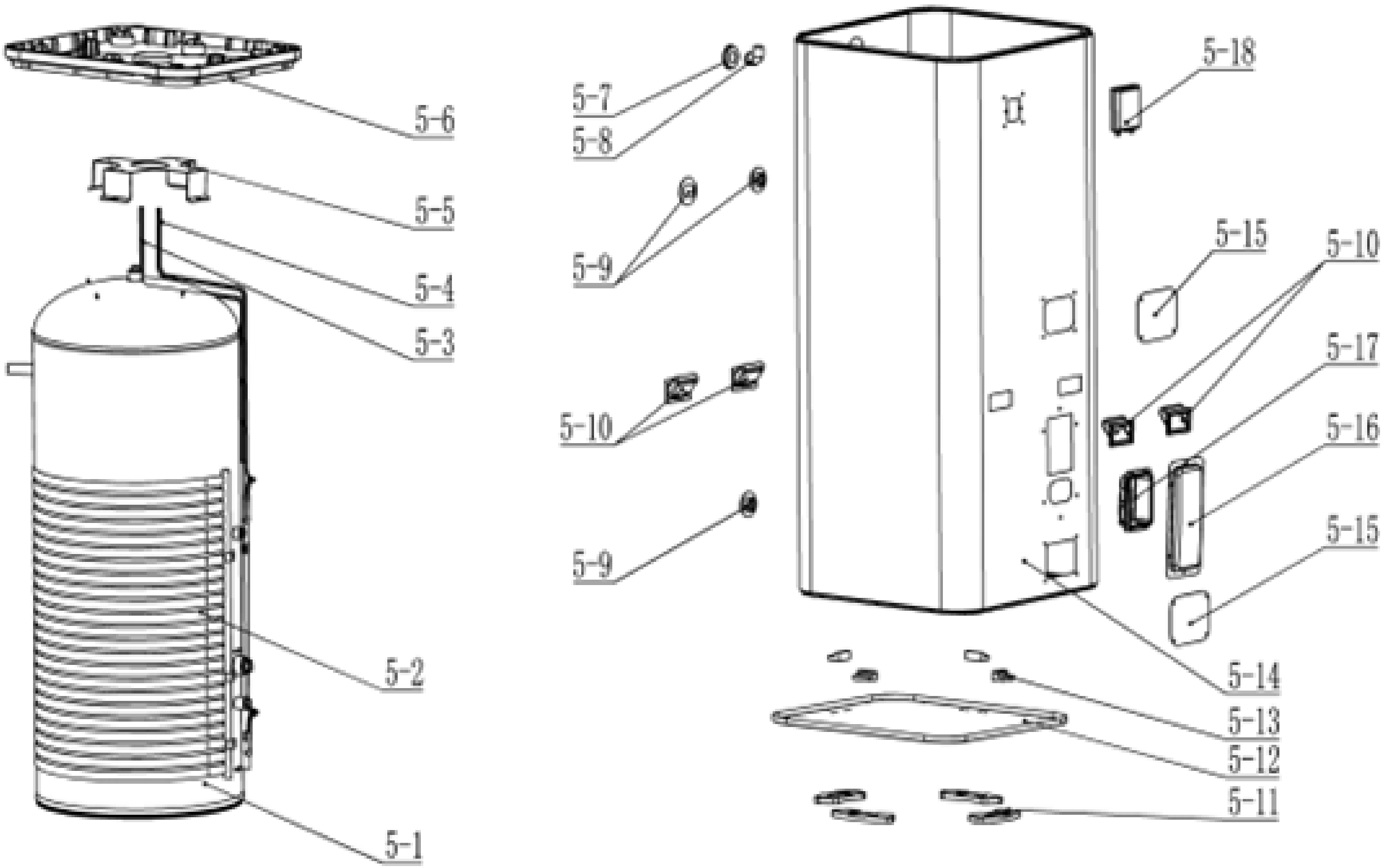
Exploded view of host components

No.	Description
2-1	Terminal block
2-2	Electric box cover
2-3	Main board
2-4	Relay
2-5	Electric box
2-6	Top cover support plate
2-7	Electrical box bracket
2-8	Compressor
2-9	Compressor silencer cotton cover
2-10	Compressor silencer cotton
2-11	4-way valve assembly
2-12	Gas collecting pipe assembly
2-13	EEV assembly
2-14	Fan box cover
2-15	Sealing sponge
2-16	Fan blade
2-17	Fan motor
2-18	Fan box assembly
2-19	Fan motor bracket
2-20	Evaporator
2-21	Chassis
2-22	Compressor silencer cotton



Product introduction

Exploded view



Exploded view of Water tank components

No.	Description
5-1	Enamel tank
5-2	Microchannel heat exchanger
5-3	Microchannel outlet
5-4	Microchannel inlet
5-5	Bottom bracket
5-6	Condensate tray

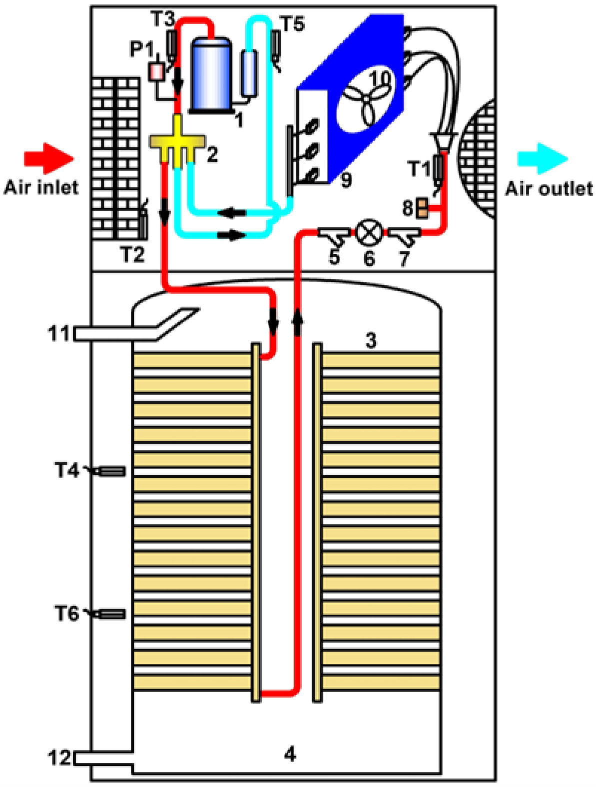
Exploded view of Water tank components

No.	Description
5-7	Decorative cover
5-8	Condensate drainage port
5-9	Decorative cover
5-10	Hand grip
5-11	Feet
5-12	Bottom tray
5-13	Position block
5-14	Outer casing
5-15	Temperature sensor cover
5-16	Electric heater cover
5-17	Thermostat waterproof box
5-18	Controller

Product introduction

System schematic diagram and performance curve

System schematic diagram



Code instruction

No.	Description
1	Compressor
2	4 Way-Valve
3	Microchannel
4	Water tank
5	Filter 1
6	EEV
7	Filter 2
8	Gas Filling valve
9	Finned exchanger
10	Fan motor
11	Hot water outlet
12	Cold water inlet
T1	Coil temperature sensor
T2	Ambient temperature sensor
T3	Exhaust gas temperature sensor
T4	Heat pump temperature sensor
T5	Suction temperature sensor
T6	Sterilization temperature sensor
P1	High pressure switch

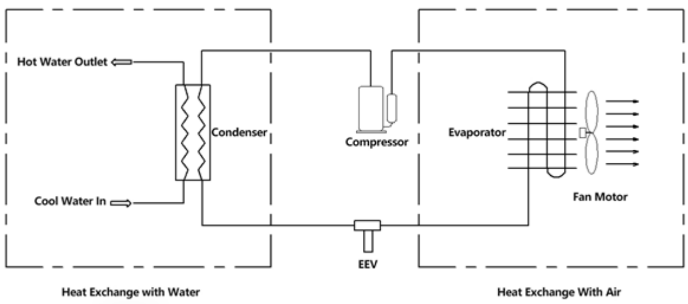
Working principle of heat pump

A heat pump system consists of four main components: the compressor, condenser, expansion (throttle) device, and evaporator.

The system operates by using electricity to power the compressor, which compresses a low-temperature, low-pressure refrigerant gas into a high-temperature, high-pressure vapour. This vapour then passes through the condenser (a microchannel heat exchanger), where it releases heat into a heat transfer medium - typically water. The heated water is then used to supply domestic hot water.

After releasing its heat, the refrigerant - now a medium-temperature, high-pressure liquid - passes through the expansion device. This reduces its temperature and pressure, turning it into a low-temperature, low-pressure liquid. It then enters the evaporator (a finned heat exchanger), where it absorbs heat from the surrounding air and vaporises. The resulting low-temperature, low-pressure gas re-enters the compressor, and the cycle repeats.

Working principle diagram



Product introduction

Introduction to heat pump system components

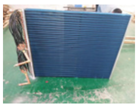
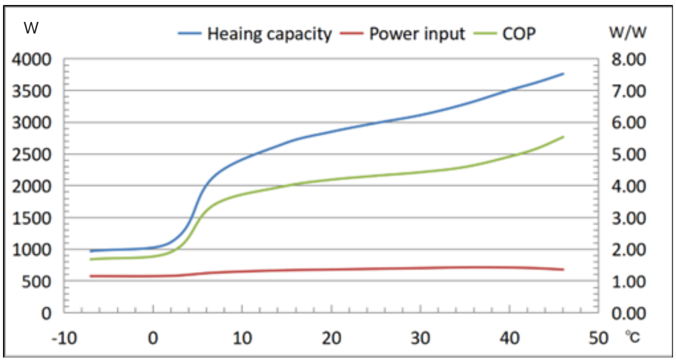
Image	Description	Function
	Compressor	Often referred to as the heart of the heat pump system, the compressor acts as a "vapour pump." It compresses low-temperature, low-pressure refrigerant vapour into high-temperature, high-pressure vapour, enabling circulation of the refrigerant throughout the system.
	Microchannel heat exchanger	This component serves dual functions, acting as both the condenser and evaporator depending on the mode. In heating mode, it functions as a condenser - converting high-temperature, high pressure refrigerant vapour into a medium temperature, high-pressure liquid, while transferring heat to the water. In cooling mode, it acts as an evaporator - converting low-temperature, low-pressure liquid refrigerant into vapour while absorbing heat from the water.
	Air side heat exchanger	A finned heat exchanger that can function as both a condenser and an evaporator. In heating mode, it serves as an evaporator - turning low-temperature, low-pressure liquid refrigerant into vapour by absorbing heat from the air. In cooling mode, it becomes a condenser - condensing high-temperature, high-pressure refrigerant vapour into liquid and releasing heat into the air.
	Electronic expansion valve	Acts as a throttling device, reducing the pressure and temperature of the refrigerant. It converts medium temperature, high-pressure liquid refrigerant into low-temperature, low-pressure liquid refrigerant before it enters the evaporator.
	4-way directional valve	Reverses the flow direction of the refrigerant, enabling the system to switch between heating, cooling, and defrost modes.
	Pressure switch	High-pressure switch: If the system's exhaust pressure exceeds the set safety threshold, this switch activates to shut down the unit and prevent potential damage.
	Temperature and pressure safety valve	Automatically opens to release excess pressure if the water system exceeds the valve's design limit. This helps prevent overpressure, protecting both the system and user safety.

Image	Description	Function
	Fan (motor + blade)	The outdoor fan creates strong airflow across the finned heat exchanger to improve heat transfer during operation.
	Gas filling valve (service)	Used during servicing to evacuate the system or to charge or discharge refrigerant.
	Overheat protector for E-heater	If the electric heater malfunctions and continues heating, the overheat protector detects excessive water temperature and cuts power to the heater for safety.

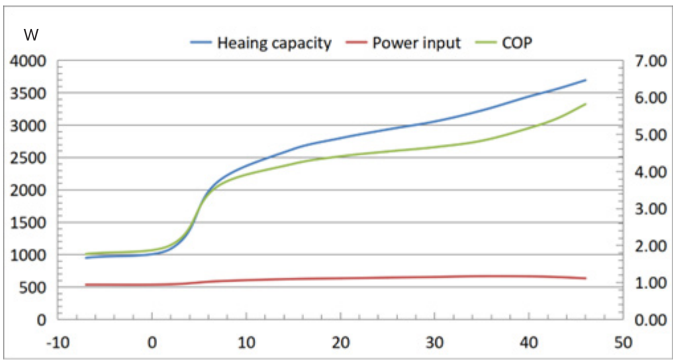
Performance curve

220L



Ambient temp.

270L



Ambient temp.

Product selection and installation

Product installation instructions and special precautions

The heat pump uses non-toxic, flammable and explosive refrigerants. Install the unit outdoors in a well-ventilated area, away from open flames.

Disclaimer

1. This product must be powered by a copper-core cable of the appropriate gauge, with a dedicated power supply and reliable earthing. If the electrical installation does not meet these requirements and causes the unit to malfunction, the company accepts no responsibility.

2. Before cleaning the unit, it must be switched off and disconnected from the power supply. The company is not liable for any electric shock or personal injury resulting from cleaning the unit while it is powered on.

3. In winter or when the ambient temperature falls below 2°C, if the unit will not be used for an extended period, please ensure that all water is drained from the tank and waterway. This prevents freezing damage caused by expanding ice. If power is lost and the unit's antifreeze protection is disabled, resulting in freezing and cracking of the components, the company is not responsible for any resulting damage.

Warning

1. Before installation, ensure the mains voltage matches the unit's required voltage and that the wire and socket can handle the unit's maximum power load.

2. Installation must be carried out by authorised dealers or qualified professionals. Improper installation can result in water leaks, fire, electric shock, or injury.

3. Any accessories or components purchased locally must be approved or supplied by the company.

4. Power connections must comply with local electricity authority regulations. Always ensure the unit is properly earthed - failure to do so may result in electric shock.

5. If the unit needs to be relocated or reinstalled, this must be carried out by authorised dealers or professionals. Improper handling or installation may cause the unit to malfunction and may result in electric shock, fire, injury, or water damage.

6. Never attempt to modify or repair the unit yourself. Unauthorised repairs can lead to serious issues such as water leakage, fire, electric shock, or personal injury. Always contact an authorised dealer or qualified technician for servicing.

7. Do not remove or tamper with any permanent labels, safety instructions, or nameplates attached to the heat pump's casing or panels.

Precautions

1. The power supply must be fitted with a leakage protection device (RCD) rated for no less than the unit's maximum operating current. Ensure reliable earthing and keep the area dry to prevent electric leakage. Regularly check that all wiring connections are secure - loose contacts can lead to overheating, equipment damage, fire, or injury.

2. In areas exposed to water or splash risk, power sockets must be installed at a height of at least 1.8 metres, out of reach of children and away from direct exposure to water.

3. During heating, it is normal for small amounts of water to drip from the pressure relief valve outlet. However, if significant leakage occurs, contact a qualified technician immediately. Do not block the relief outlet, as doing so can damage the heat pump and create a safety risk. The connected drain pipe should slope downward and be installed in a frost-free environment.

4. If the unit includes a power cord, and it becomes damaged, it must be replaced with the manufacturer's specified cord by the manufacturer, a service agent, or a similarly qualified professional.

5. If any component of the unit is damaged, only a qualified technician should carry out repairs using genuine replacement parts supplied by the company.

6. If the heat pump will be unused for more than two weeks, hydrogen may accumulate in the hot water system. As hydrogen is highly flammable, it is recommended to open the hot water tap for several minutes before using any electrical appliances connected to the system. If hydrogen is present, a hissing sound (like air escaping) may be heard as water begins to flow. Do not smoke or use open flames near the tap during this time.

7. Do not insert fingers, sticks, or any objects into the air inlet or outlet. The internal fan operates at high speed and may cause injury.

8. If any abnormality occurs (such as a burning smell), immediately switch off the power and stop using the unit. Contact the manufacturer's after-sales service department. Continuing to operate the unit in this state may result in electric shock or fire.

9. Do not install the unit in areas where flammable gases may leak. A gas leak near the unit could cause a fire.

10. Ensure the installation foundation is solid and stable for long term use. An unstable foundation may cause the unit to fall and result in injury.

Product selection and installation

Unit installation

Heat pump unit installation

Installation location requirements:

1. The unit may be installed on the ground, rooftop, dedicated platform, or any other location that can safely support its operating weight and allows for straightforward installation.

2. Select an installation site with good ventilation and unobstructed airflow. Do not install the unit in areas that are polluted or dusty, or near fire sources, substations, or high-temperature equipment. The unit must not be surrounded by open flames or extreme heat sources.

3. Ensure there is a nearby drainpipe for discharging condensate produced during operation. Insulate and heat the drain line as needed to prevent freezing and blockage.

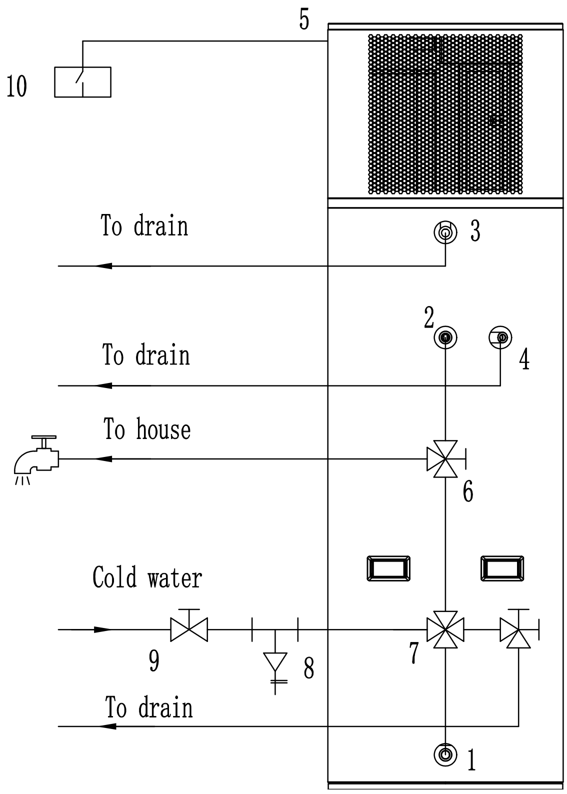
4. The installation site must comply with fire safety regulations. The main operating access path around the unit should be 1.0 to 1.2 metres wide, while other access paths must be at least 0.8 metres wide. Maintain a minimum clearance of 1.0 metre between the unit and any switchboards or other electrical devices.

5. When installing multiple units side-by-side, maintain a distance of 1.0 to 1.2 metres between each unit. The base of each unit should be elevated at least 0.1 metres above ground level.

6. A shock-absorbing device must be installed beneath the unit to prevent operational vibrations from being transmitted to the building structure.

7. The inlet/outlet connections and the supply/return water pipes must be flexibly connected to reduce vibration transmission from the unit to the building.

Diagram of waterway installation system



1	Cold water supply outlet (G 3/4" female thread)
2	Hot water outlet (G 3/4" female thread)
3	Condensing drainage Elbow*
4	TPR Valve* (G 1/2" female) (850k Pa) supplied
5	Electrical cable
6	Tempering valve (high performance recommended)
7	Expansion control valve (ECV)
8	Pressure limiting valve (500k Pa)
9	Non-return/Isolation valve
10	Isolation switch (hardwired into 10 amp circuit)

* Supplied with system

Product selection and installation

Required water quality

- Water with high levels of scale, sediment, or sand must be properly filtered before use.
- Water quality should be tested before system operation. Key indicators include pH value, conductivity, chloride ion concentration, and sulphate ion concentration.
- The acceptable water quality standards are outlined below.

PH value	Total hardness	Conductivity	Sulphate ion	Chlorine ion	Ammonia ion
7~8.5	< 50ppm	<200μV/cm(25°C)	None	< 50ppm	None
Sulfate ion	Silicon	Iron content	Sodium	Ca	
< 50ppm	< 50ppm	< 0.3ppm	No requirement	< 50ppm	

- A filter with approximately 40 mesh is recommended.

Water system installation steps

1. Install all water pipelines.
2. Perform a pressure test to check for leaks.
3. Flush and clean the water pipelines..

Water tank filling and draining steps

1. Open the TP valve at the water outlet.
2. Then open the water inlet valve to begin filling the tank.
3. During filling, monitor the TP valve for water overflow. Once water begins to overflow from the TP valve, it indicates that the air has been expelled and the tank is full.

Note: The TP valve is a safety device that protects the system by releasing hot water if the internal pressure exceeds the specified limit. Its activation pressure is set to match the system's maximum working pressure.

Pipe insulation requirements

1. All hot water pipes must be covered with thermal insulation material.
2. Fit the insulation material snugly around the hot water pipe, then secure it with cable ties.
3. Cover the insulated pipe with an outer protective layer, such as thin aluminium sheet or aluminium foil.
4. The insulation thickness should be selected based on local climate conditions. For DN20 pipes, insulation with a minimum thickness of 10 mm is recommended. Finally, wrap insulation tape around the outer layer to secure and protect it.

Electrical Wiring Precautions

1. Use an outdoor-rated power cable, and ensure the power supply voltage matches the unit's rated voltage.

2. The unit's power supply must include a grounding wire. Ensure the earth connection is secure and properly bonded to an effective external ground.

3. A leakage protection device (RCD) must be installed on the user's incoming power supply.

4. All wiring must be carried out by a qualified technician in accordance with the wiring diagram.

5. Power and signal cables must be arranged neatly and kept separate to avoid interference. Cables must not touch pipes or valves. Maintain a minimum separation of 25 mm between high- and low-voltage wiring.

6. Install the external wired controller in a dry location that is easy to access and operate. Do not install it in damp or wet environments.

7. Internal connection cables are pre-installed at the factory. Users should only check that the cables are securely connected and undamaged—no re-wiring is required.

8. If the external controller's communication cable is too short, it may be extended, but the total length must not exceed 20 metres. All connections must be tightly sealed and waterproofed.

9. High-voltage cables (such as those for the unit, water pump, electric heater, or solenoid valve) must use anti-ageing, corrosion-resistant outdoor-rated cable (e.g. H07RN-F or higher).

10. Users must supply their own power cable. A copper-core cable must be used, with a wire diameter that meets the minimum specified standards. If the user's power supply capacity is inadequate or the outdoor copper-core cable is not installed as required, resulting in the unit being unable to start or operate correctly, the company accepts no liability.

Copper core power cord:
- choose 1.5mm2 below 10A
- 10A~16A choose 2.5mm2

Important: Always ensure that the heat pump power supply is in a disconnected state before proceeding with any electrical installation work.

Electrical operations

Control

System ON/OFF control

1. Water temperature control is available when the controller is powered on.

2. If there is no heating demand, the unit will shut down immediately.

3. Once the compressor has started, it must operate for a minimum of 3 minutes before it is allowed to stop due to the water tank reaching the set temperature. Similarly, if the system changes mode (e.g. from heating to standby), the compressor will not stop due to temperature fluctuations within the first 3 minutes.

System ON/OFF decided by temperature setting

If the external ambient temperature is ≥50°C, the unit will not start. If the external ambient temperature sensor fails, operation will be determined by the following conditions:

1. If the difference between the set temperature and the current water tank temperature is greater than the deadband, heating demand is detected and the unit will start.

2. If the water tank temperature is equal to or higher than the set temperature, no heating demand is detected and the unit will stop.

3. If the water tank temperature is between the set temperature and the set temperature minus the differential, the unit maintains its current operating state. If powered on for the first time and within this range, the unit will start if there is a capacity demand.

System running mode control

Note: After operating in non-standard mode, the system will automatically return to standard mode.

Standard mode: (default factory setting).

1. The unit starts based on the monthly water temperature difference (parameter F03) - 220L and 270L units only.

2. The set temperature is fixed at 54°C for the 220L unit and 55°C for the 270L unit (parameter F01).

3. If the ambient temperature is ≤ F10, the electric heater will automatically start and run until the set temperature is reached. If the water temperature later drops to the reheat threshold, the electric heater will turn on again.

4. If the ambient temperature rises to ≥ F10 + 2°C, the electric heater will switch off automatically.

5. If the compressor fails, the electric heater will automatically operate (only applicable to models with electric heating).

Boost mode: +

1. When electric heating element is on, the icon stays on. When the element is off, the icon turns off.

2. Set the temperature range default 15-75°C (parameter F04).

3. The temperature difference during startup is 5°C (parameter F87).

4. When powered on, the heat pump and electric element operate together. Once the set temperature is reached, the system automatically returns to standard mode.
Note: For models without electric heating, only the heat pump operates.

Element mode: + (Always on)
Only available on models with electric heating

1. Pure electric heating mode, the display is always on when the electric heating is turned on, but flashes when the electric heating is turned off.

2. Set the temperature range 15-75°C (parameter F04).

3. The temperature difference during startup is 10°C (parameter F88).

4. When the required temperature difference is reached, the electric heating starts and heats the water to the target temperature, then returns to standard mode automatically.

System components control

Compressor control

Compressor start-up conditions
The compressor will start when all the following conditions are met:
1. No system faults or shutdown errors.
2. The electronic expansion valve is open.
3. A start command has been received.
4. The minimum stop/restart delay time has passed.
5. There is a heating demand.
6. The fan has been running for at least 15 seconds.

Compressor shutdown conditions
The compressor will stop if any of the following conditions are met:
1. A system fault or shutdown error occurs.
2. A stop command is received.
3. A forced stop is triggered due to a mode change.
4. There is no heating demand and the water temperature has reached the set point.

Four way valve control

1. The four-way valve is energised during refrigerant recovery and defrosting.

2. In heating mode, the four-way valve remains powered off.

3. For defrosting operation, refer to the Defrosting control section.

4. When the unit shuts down, the four-way valve powers off 120 seconds after the inverter compressor stops.

Electrical operations

Electric heating element control

Note: When F10 = -30, electric heating cannot be disabled.
When -30 < F10 < 35, enabling is valid.

General operation:
The electric heating element turns on automatically during second level antifreeze protection.

When not in antifreeze mode, the element switches off during system shutdown.

Non-stop fault protection

Element start conditions
The electric heating element will turn on when all the following are met:

1. Ambient temperature is ≤ the threshold set by parameter F10 (default -7°C). If the ambient temperature sensor fails, this condition is ignored.

2. Water tank temperature is ≤ (set temperature - temperature difference).

Element stop conditions
The electric heating element will turn off if any of the following occur:

Ambient temperature ≥ F10 + 2°C (ignored if ambient temperature sensor fails).

Water tank temperature ≥ set temperature.

Note: When Element Mode is manually activated, ambient temperature is ignored. The element will turn on/off based only on water tank temperature.

Shutdown fault protection (after 5 minutes)

Element start conditions
All the following must be met:

Water tank temperature sensor is functioning normally.

Water tank temperature ≤ (set temperature - temperature difference).

Element stop conditions
The element will stop if any of the following occur:

The water tank temperature sensor is faulty.

Water tank temperature ≥ set temperature.

Defrosting

The electric heating element activates during automatic defrosting.

It does not activate during manual defrosting.

Manual defrost

During heating operation, and the evaporator coil temp.
< the evaporator coil temperature of exiting defrost (parameter F24), default 18°C), press and hold the M+∨ keys for 5 seconds to enter into defrosting manually.

Protections

Controller communication fault protection

If the main board detects no data transmission from the controller for 30 seconds, it identifies a communication fault. The unit will display fault code "E09" and shut down for protection.

Temperature sensor failure protection

Sensor	Diagnosis	Error code	Trouble shooting
Ambient temp sensor	Detect open circuit or short circuit for 5s consecutively	E21	Stop the compressor and fan, allow to start E-heater
Evaporator coil temp sensor	Detect open circuit or short circuit for 5s consecutively	E16	Stop the compressor and fan, allow to start E-heater
Gas suction temp sensor	Detect open circuit or short circuit for 5s consecutively	E29	Stop the compressor and fan, allow to start E-heater
Gas discharge temp sensor	After compressor starts to run for 3mins, detect open circuit or short circuit for 5s consecutively	E18	Stop the compressor and fan, allow to start E-heater
Heat pump temp sensor	Detect open circuit or short circuit for 5s consecutively	E14/E15	Stop the compressor and fan, allow to start E-heater
Sterilisation temp sensor	Detect open circuit or short circuit for 5s consecutively	E27	Stop the compressor and fan, allow to start E-heater

High pressure switch protection

1. If the high-pressure switch remains open for 5 consecutive seconds, high-pressure protection will activate. The compressor will stop immediately, and fault code "E05" will be shown on the remote controller display.

2. Once shut down, if the high-pressure switch stays closed for 60 seconds, the unit will exit high-pressure protection.

3. If fault code "E05" occurs three times within 60 minutes, the unit will not auto-recover and must be reset by turning the power off and on.

4. If parameter F44 is set to 2, the high-pressure switch is disabled, and this protection will not be triggered.

5. If parameter F46 is set to 0, the fault will not lock. The unit can auto-recover when fault conditions clear, with no time limit.

Electrical operations

Anti-freeze protection

When the unit is shut down or fails to start:

1. If the ambient temperature is ≤5°C and the water tank temperature is ≤3°C for 10 seconds, anti-freeze protection will activate. The unit will be forced to start heating. If a protective shutdown fault is active, the electric heating element will be forced on.

2. Anti-freeze protection is disabled when the ambient temperature is ≥7°C or the water tank temperature is ≥15°C.

Gas discharge temperature overhigh

1. If the compressor discharge temperature reaches ≥F60+10°C (parameter F60)for 5 consecutive seconds after starting, the compressor will stop, and fault code "E12" will appear on the controller.

2. After a 1-minute shutdown, if the discharge temperature drops to ≤F60–10°C, the unit will exit this protection.

3. If this fault occurs three times within 60 minutes, the unit will not auto-recover. Power must be turned off and on to reset.

Low ambient temperature protection

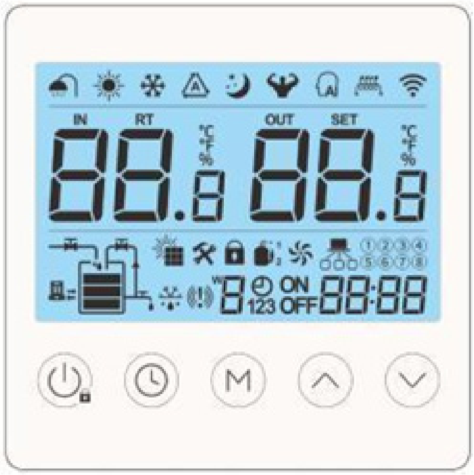
1. If the ambient temperature drops to ≤–9°C (F09–2°C), the compressor will be prevented from running.

2. When the ambient temperature rises to ≥–7°C (F09), normal operation resumes. This protection has no fault code; the fault icon will flash.

Electrical operations

Controller instruction

Controller



Button description

Button description	Function description
ON/OFF	1. Press and hold for 2 seconds to turn on/off. 2. In query mode, press to return to the main screen. 3. In settings mode, press to return to the main screen. 4. If inactive for 60 seconds, the controller will return to the main screen, turn off and lock the screen automatically. 5. To unlock from the locked main screen, press and hold for 3 seconds after a single beep.
CLOCK	1. On the main screen, tap to enter clock settings. Tap to toggle between hour and minute. 2. On the main screen, press and hold for 3 seconds to enable or disable timing mode. 3. In timing mode, tap to toggle between hour and minute. 4. In timing mode, press and hold for 3 seconds to cancel the current timer. 5. In clock settings, press and hold for 3 seconds to enable or disable the weekday function.
MODE	1. On the main screen, press and hold for 5 seconds to enter the parameter menu. 2. In parameter mode, values can be entered or saved. 3. When powered on, tap to switch between modes: Standard mode Boost mode + Element mode
UP	1. On the main screen and while powered on, tap to set the temperature. 2. On the main screen, press and hold for 3 seconds to enter query mode. 3. In query mode, tap to view the serial number. 4. In parameter settings, press the mode button to adjust values. 5. Timing and clock values can be modified in their respective settings.
DOWN	1. On the main screen and while powered on, tap to set the temperature. 2. On the main screen, press and hold for 3 seconds to enter maintenance query mode. 3. In query mode, tap to switch views and check the serial number. 4. In parameter settings, press the mode button to adjust parameters. 5. Timing and clock values can be modified in their respective settings.
ON/OFF+UP	Press and hold for 5 seconds to enter manual smart distribution network connection.
ON/OFF+DOWN	Press and hold for 5 seconds to enter manual AP distribution network connection.
MODE+DOWN	On the main screen while powered on, press and hold for 5 seconds to manually turn defrost on or off.
ON/OFF+CLOCK+UP	Press and hold for 3 seconds to reset total energy consumption.
ON/OFF+CLOCK +UP+DOWN	Within 5 minutes of power-on, in maintenance mode, press and hold the button for 5 seconds to enter program version selection.
ON/OFF+MODE +UP+DOWN	Within 5 minutes of power-on, press and hold for 5 seconds to restore factory settings.

Electrical operations

Icon description

Symbol	Status	Description
	Off	Currently in off or non-heating mode
	On	System is heating under standard mode
+	Constantly bright	System is heating under boost mode (only for models with E-heater)
+	Constantly bright	System is heating under E-heater mode (only for models with E-heater)
	Constantly bright	System is under defrost
	Constantly bright	System failures
	Constantly bright	Compressor is running
	Constantly bright	Fan motor is running
RT	Constantly bright	Current water temperature in the tank
SET	Constantly bright	Water temperature setting point
88.8	Display	Display actual water temperature, set water temperature and fault code
°C	Constantly bright	Currently showing Celsius temperature
88:88	Display	Show clock time
	Display	Timer is on
ON	Display	Timer function is activated
OFF	Display	Timer function is deactivated
	Constantly bright	The controller is locked
	Flashing	WIFI configuration
	Constantly bright	WIFI successfully connected
1 2 3	Constantly bright/Off	Timed working period 1, 2, 3, always on when setting or when the clock enters this period, and off in other situations
W8	Constantly bright	Timer setting on Monday, Tuesday, Wednesday, etc.
	Constantly bright	Enable timed work mode
ON	Constantly bright	Currently in the power-on timing working period
ON	Flashing	Currently set working hours start time
OFF	Constantly bright	Currently in the non-working period of the power-on timing
OFF	Flashing	Currently set working hours end time

Forced "defrost" operation

While the system is on, press and hold the M+ buttons for 5 seconds to activate forced defrost (coil temperature must be below the defrost exit threshold). The icon will appear during this process.

The system will automatically exit forced defrost and return to normal hot water heating when shut down or when the set time or temperature is reached. The will turn off.

System running readings query

On the main screen, press and hold or for 3 seconds to enter the running readings query mode. The temperature display will show the reading code, and the timer area will show the corresponding value.

Use or to scroll through the readings.

Press the On/Off button or wait 60 seconds with no input to automatically exit the readings display.

Back-end parameter setting

On the main screen, press and hold M for 5 seconds to enter back end parameter query mode. The parameter code will flash.

Press the M button again to enter parameter setting mode - the value will begin to flash.

Use or to adjust the value, then press the M button to confirm.

To exit without saving, press the button or wait 60 seconds without pressing any buttons.

Failure code

When a fault occurs, the fault code will cycle in the timer display area, and the icon will flash. Once the fault is resolved, the normal display will resume.

Clock setting

When the controller is on, press the button once to enter clock settings. During initial setup, you'll need to set the real-time clock (e.g. YYYY, MM, DD) using the or keys to adjust each value.

Press the button again to switch to time settings. Use the button to toggle between hours and minutes - whichever is selected will flash. Adjust values with or . After setting minutes, press the or button or wait 5 seconds without pressing any keys, to save and exit.

While in clock setting mode, press and hold the button for 3 seconds to enable or disable the weekly timer.

When the weekly timer is enabled, enter the clock setting to enter the weekly setting first, and then press the key to enter the hour setting after setting, and skip the weekly setting directly when the weekly function is turned off.

Electrical operations

Timing control overview

There are 3 timing groups (1–3), each with a start and stop time. By default, all are set to “invalid”. If the start and stop times are the same, the timer is considered invalid.

When the weekly function is enabled, timing follows a weekly cycle. When the weekly function is disabled, timing follows a daily cycle.

How to Enter Timing Settings

On the main screen, press and hold the button for 3 seconds to enable or cancel the timer.

Press the button briefly to enter the first timer setting (“1” and “ON” icons will appear). The hour will flash - use or to set the hour, then press the button to confirm and move to minutes.

After setting the start time, the “1” and “OFF” icons will appear to begin setting the stop time. Repeat the same process to set the stop time.

Once the first timing group is set, the system will automatically move to group 2, then group 3. The setup process is the same for each group.

Exiting Timing Setup

To exit without saving, press the button or leave idle for 60 seconds. The current group setting will be discarded.

Timing Display and Function

Once timing is set:

The system will automatically turn on during the set time and turn off outside the set time.

During an active time period, the “ON” icon and the current timer group number (1/2/3) will be displayed.

During an inactive time period, the “OFF” icon will appear.

Program version number check

Within 5 minutes of power-on, and while the unit is off, press and hold the button for more than 3 seconds to enter maintenance mode. The maintenance icon will appear on the screen.

Press the button once or leave idle for 60 seconds to exit maintenance mode and return to the normal display.

Press and release the button to display the product information of the main board ("r10" in the temperature display area represents the software version V1.0 of the main board), and the clock display area displays: "JBP" represents the frequency type, JdP represents the ON/OFF type.

Press and release the M key to display the product information of the controller ("d10" represents the software version V1.0), and return to the data display after 3 seconds.

After entering maintenance mode, press ++ + and hold for 5 seconds to enter the tooling mode setting:

In the tooling mode, press ++ + and hold for 5 seconds to exit the tooling mode setting:

In the tooling mode, the machine model "0" can be adjusted by press or . During the machine model adjustment process, both "JC" and "0" flash and can be confirmed by press key.

In the tooling mode , after power on and initialisation is completed, the display board will issue a setting instruction every 1 second and indicate success or failure based on the response from the mother-board. Among them, when the setting is successful, both "JC" and "0" are frequently displayed; When the setting fails, "JC" is constantly displayed and "0" flashes.

Wi-Fi configuration

Press and hold the + buttons for 5 seconds to enter manual AP mode.

Press and hold the + buttons for 5 seconds to enter manual Smart mode.

Restore factory parameter settings

Within 5 minutes of power-on, press and hold ++ + for 5 seconds to restore factory parameter settings.

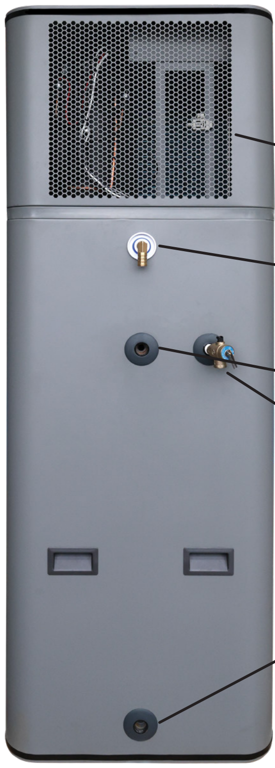
Fault diagnosis and troubleshooting

Maintenance tools

Tool	Image	Function
Phillips head screwdriver (6 inch)		Remove Phillips head screws
Slotted screwdriver (6 inch)		Remove the flat screw
Adjustable wrench (6 inch)		Remove the nut
Needle nose pliers (6 inch)		Cut wires, remove terminals, etc.
Allen wrench (6 inch)		Open stop valve etc.
Electric screw driver		Remove screws etc.
Clamp multimeter		Measure current, voltage, resistance, capacitance, etc.
Vacuum pump		Fluorine system vacuuming
Double head pressure gauge		Measurement of fluorine system pressure, vacuuming, etc.

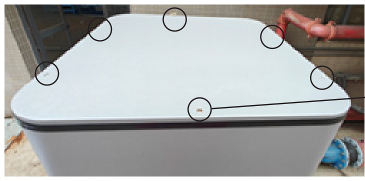
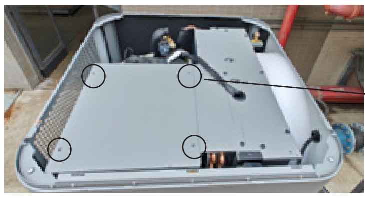
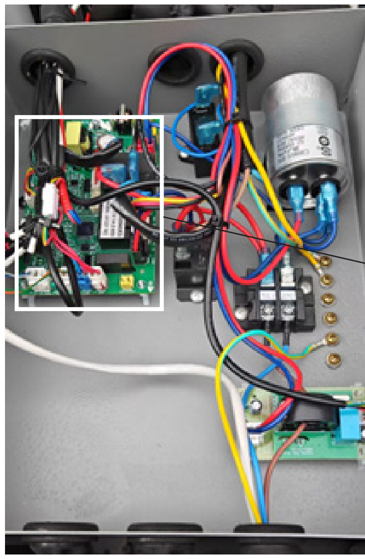
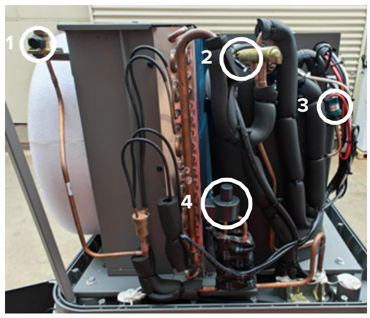
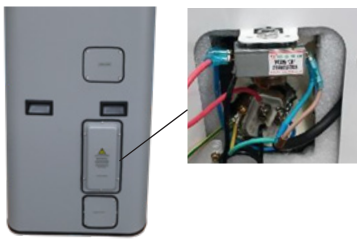
Note: Other special tools are not listed, and the above tools can guarantee basic maintenance and testing.

Unit disassembly and parts description

Image	Function
	Power cable Air exhaust grill Controller Water temp sensor E-heater Water temp sensor for legionella control
	Air intake grill Condensate drainage port Hot water outlet TPR valve port Cold water inlet

Fault diagnosis and troubleshooting

Image	Function
	Logo position same on back side
	Condensate tray

Image	Function
	Top lid screws need to be removed to detect the electrical parts and gas pipeline.
	Top lid screws need to be removed to detect the electrical parts and gas pipeline.
	Integrated board
 	Gas pipeline: 1. Stop valve 2. 4 way valve 3. High pressure switch 4. EEV 5. Compressor
	E-heater: 1. Thermostat 2. 1.0kW E-heater

Fault diagnosis and troubleshooting

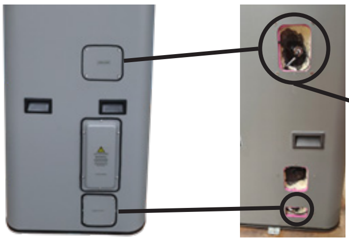
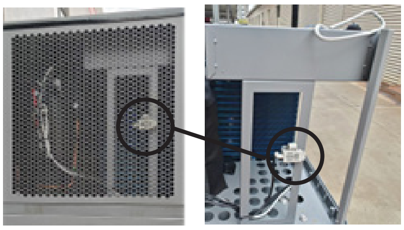
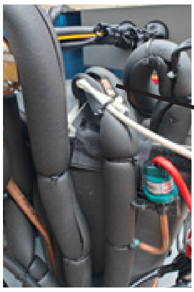
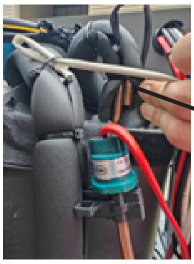
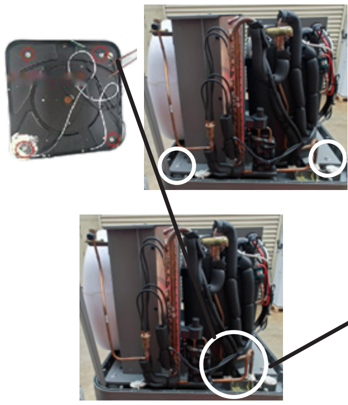
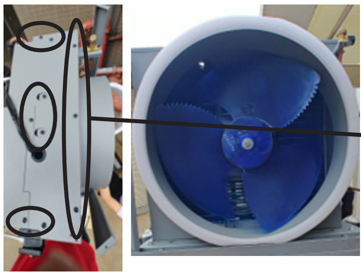
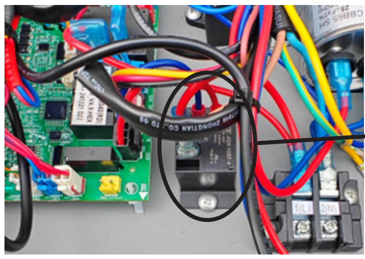
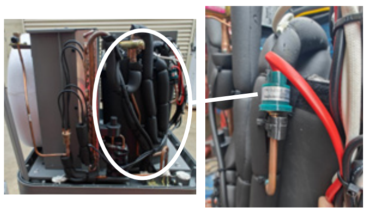
Image	Function
	Water temp sensor 5K.
	Ambient temp sensor 5K
	Gas discharge temp sensor 50K
	Gas return temp sensor 5K
	Evaporator coil temp sensor 5K
	R290 compressor: When replacing, the air must be able to circulate, and there must be no fire source. Only when the refrigeration system is exhausted can the hands-on operation be performed. The unit should be installed in a ventilated place, away from fire sources.

Image	Function
	The top unit is pre-installed, hoisted above the water tank, and fixed by bolts. Weld the top unit with tank part
	If the motor fails and needs to be replaced, the screws marked on it must be removed, the entire motor part should be lifted out, and then the motor should be replaced.
	The 1.0kW electric heater must be controlled by a relay or AC contactor - not directly from the control board.
	High pressure switch: Action value: 3.2MPa; (the resistance between the two wires is zero) Recovery value: 2.6MPa; (the resistance between the two wires is infinite)

Fault diagnosis and troubleshooting

Troubleshooting and maintenance of common fault codes

Error code list

Please see the following detailed error code table

Error code	Description
E05	High pressure switch failure
E09	Communication failure between controller and main board
E12	Gas exhaust temperature too high
E14/E15	Heat pump temp sensor failure
E27	Legionella control temp sensor failure
E16	Evaporator coil temperature sensor failure
E18	Gas exhaust temperature sensor failure
E21	Ambient temperature sensor failure
E29	Gas suction temperature sensor failure
E78	Power detection module communication failure

Running readings query

Press and hold the ⌃ or ⌄ button for 3 seconds on the main screen. This will enter the running readings query mode.

For example, "06" represents the reading code (adjustable using ⌃ or ⌄), and "22" is the corresponding reading value.

Code	Description	Range
01	High pressure switch	0=OFF,1=ON
02	Low pressure switch	0=OFF,1=ON
04	EEV opening	-
05	Evaporator coil temp	-
06	Ambient temp	-
07	Gas suction temp	-
08	Gas discharge temp	-
09	Heat pump temp	-
10	Legionella control temp	-
11	Compressor	0 = stop; 1 = run
12	4 way valve	0 = stop; 1 = run
13	High speed wind	0 = stop; 1 = run
14	Low speed wind	0 = stop; 1 = run
16	E-heater	0 = stop; 1 = run
19	System program version No.	-
24	Power detection module	0 = disconnect; 1 = closed
25	System input voltage	Measured value, unit:V
26	System input current	Measured value, unit:0.01A
27	System input power	Measured value, unit:*10W
28	Total electricity consumption	Measured value, unit:KWh

Troubleshooting

Error: E12 Gas discharge temperature overhigh

No	Cause Analysis	Diagnosis and Solution
1	Gas discharge sensor failure;	Replace gas discharge sensor
2	The system leaks gas or lacks gas;	Detect the actual gas discharge temperature of the compressor and the high side pressure of the system. If the gas discharge temperature is really high and the high pressure is really high, use soap water to check for leaks and add gas;
3	The system is blocked, mostly filter or EEV where the channel is narrow	Use nitrogen to purge the system, replace the throttling element, and add a removable filter before the throttling element.

When an E12 fault occurs, if the shutdown has exceeded ten minutes;

Steps	Operation	Tool
Step 1: Determine whether the sensor or the main board is damaged.	Power off, power on again The compressor is not started, press and hold the up button or down button for 3 seconds on the main interface to enter the query state, and check whether the reading of code 15 is the same as the ambient temperature; Not same Remove the air outlet cover, find the exhaust temperature sensor, cut off the power, and replace it with a new sensor. Start the unit to run, after running for 5 minutes, observe the difference between the running 15 parameters and the temperature of the water tank: between 30-45 degrees? Yes Finished	Phillips screwdriver or electric screwdriver
Step 2: Judge whether the system is short of refrigerant	No. Stop unit Remove the top lid, unscrew the needle valve, connect the pressure gauge, and observe whether the static pressure is normal? Abnormal Check if any leakage Normal Leakage found Leakage not found Start up and run, observe coil temperature, return air temperature, electronic expansion valve opening. Repair welding, vacuumise, add refrigerant according to the nominal value, and observe the operation. Start the machine, add refrigerant and observe the range of temperature difference between exhaust gas and water. Normal Finished Abnormal	Phillips screwdriver or electric screwdriver, pressure gauge, vacuum pump
Step 3: Replace the throttling device	The throttling device is blocked, cut off the power, release the refrigerant, weld the throttling device, replace it, evacuate it, add refrigerant according to the nameplate, start the machine, and observe the running readings. Running readings are normal Finished	Phillips screwdriver or electric screwdriver, pressure gauge, vacuum pump, welding tools

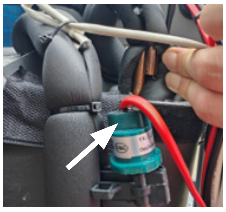
Fault diagnosis and troubleshooting

Troubleshooting

Error: E05 High pressure switch failure
(protection activated when the switch is open)

No	Cause Analysis	Diagnosis and Solution
1	High pressure switch failure	Measure the open/close of the high pressure switch, replace the high pressure switch.
2	Wiring connection issue of high pressure switch	Check if the wiring is loose, re-plug.
3	Gas pipe or gas parts are blocked	Use nitrogen to purge the system, replace the throttling element, and add a removable filter before the throttling element.

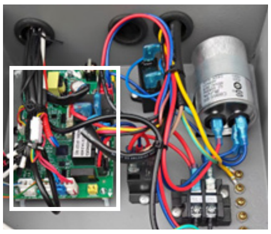
Diagnosis:

Steps	Description	Image	Tool
1	Disconnect the power supply		
2	Remove the top lid	 	Phillips screwdriver or electric screwdriver
3	To check the high-pressure switch, first disassemble the electrical box and locate the switch. Unplug the high-pressure switch wires and use a multimeter to test continuity between the two terminals. A resistance reading of 0 indicates the switch is functioning normally. If the resistance is infinite, the high-pressure switch is faulty.		Phillips screwdriver or electric screwdriver, multimeter
4	Check the connection to the high-pressure switch for any signs of damage or disconnection. If the wiring is intact and the resistance reading from the high-pressure switch is infinite, the switch is faulty and must be replaced.		
5	To release the refrigerant, first use an adjustable wrench to turn the needle valve riser counterclockwise. Connect a pressure gauge and allow the refrigerant to discharge. The discharge time should be as long as possible to ensure complete emptying. If time is limited, a vacuum pump can be used to assist once gas flow is no longer visible. Extra care must be taken when handling flammable or explosive refrigerants during evacuation. If a recovery unit is available, it is recommended to use it to safely reclaim the refrigerant.		Adjustable wrench, pressure gauge, vacuum pump
6	Once the refrigerant has been fully discharged from the system, remove the insulation from the pipeline and separate the pipes from surrounding components using an iron plate. Wrap a damp cloth around the valve body to prevent overheating during the welding process. Use appropriate welding equipment to remove the faulty high-pressure switch, then install the new switch. Visually inspect the weld to ensure it is complete and leak-free. After installation, evacuate the system for at least 30 minutes. The vacuum pump should stop discharging gas, and the pressure gauge should indicate negative one atmosphere (below 30 Pa). Use an electronic scale to recharge the system with refrigerant. Before filling, make sure to purge air from the gauge hose. When the system pressure reaches 0.3 to 0.4 MPa, use a leak detector to check for any leaks. If no leaks are found, continue charging. If refrigerant cannot be added while the system is off, start the unit and continue adding until the correct amount is reached.		Welding tools

Fault diagnosis and troubleshooting

7	After adding the refrigerant, monitor the running readings to ensure the system is operating normally. Once confirmed, turn off the power, reconnect the pipeline, and reassemble the unit. Restore power to complete the maintenance.		Phillips screwdriver or electric screwdriver

If the resistance of the high pressure switch is 0 in the third step, perform the following operations:

4	Reinsert the high-pressure switch into the main board and turn the power back on. If a high-pressure switch fault is reported at startup, this indicates an issue with the main board and it should be replaced. If the unit continues to run and the temperature exceeds 40°C, a fault will be triggered.		
5	Check whether the actual water temperature in the tank matches the temperature displayed on the controller. If the actual temperature is more than 10°C higher than the displayed value and exceeds the upper limit of 60°C, remove the water tank sensor and leave it in open air. After a few minutes, check if the controller shows the ambient temperature. If the displayed temperature does not match the ambient temperature, replace the tank's temperature sensor. If the issue persists after replacement, the main board may be faulty and should be replaced. If the displayed temperature matches the ambient temperature, the issue may be with temperature measurement accuracy. Recalibrate if needed. If there is still a large discrepancy, the sensor pipe may be affected by scale build-up, and the tank should be descaled.		Slotted screwdriver
6	If no issue is found in the fifth step, check the running readings, including coil temperature, gas return temperature, and the opening percentage of the electronic expansion valve. If the data suggests the valve is blocked, replace the electronic expansion valve.		Adjustable wrench, pressure gauge, vacuum pump
7	Turn off the unit's power before releasing the refrigerant. Use an adjustable wrench to unscrew the needle valve cover counterclockwise, then connect a pressure gauge and begin discharging the refrigerant. Allow as much time as possible for complete emptying. If time is limited, wait until there is no obvious gas discharge, then use a vacuum pump to assist with evacuation. Take extra care when handling flammable or explosive refrigerants. If a recovery unit is available, use it to safely reclaim the refrigerant. To replace the electronic expansion valve, the entire main unit must be disassembled.		
8	After the refrigerant has been fully discharged from the system, remove the insulation from the pipeline. Use an iron plate to separate the pipeline from other components, and wrap a damp cloth around the valve body to prevent overheating. Use appropriate welding tools to remove and replace the high-pressure switch. Carefully inspect the weld to ensure it is saturated and leak-free. Evacuate the system for at least 30 minutes. Once the vacuum pump stops discharging gas and the pressure gauge reads negative one atmosphere (below 30 Pa), begin recharging the system using an electronic scale. Before charging, purge air from the pressure gauge hose. As the pressure reaches 0.3 to 0.4 MPa, use a leak detector to check for any leaks. If no leaks are found, continue charging. If refrigerant cannot be added while the unit is off, start the system and continue adding until the correct amount has been reached.		Welding tool
9	After adding the refrigerant, monitor the operating parameters to ensure the system is functioning normally. Once confirmed, turn off the power, reconnect the pipeline, and reassemble the unit. Turn the power back on to complete the maintenance.		Phillips screwdriver or electric screwdriver

Fault diagnosis and troubleshooting

Error code: E09 Communication error
(controller cannot receive main board data)

No	Cause Analysis	Diagnosis and Solution
1	Main board	Replace main board
2	Communication cable failure	Check if the cable is loosen or broken
3	Controller	Replace controller

Diagnosis:

Steps	Description	Image	Tool
1	Power off and restart, does it still report E09 fault, restart several times and still report the same fault, power off.		
2	Remove the top lid.		Phillips screwdriver or electric screwdriver
3	Check whether the connection of the wired controller is loose or not making proper contact. Reconnect it securely, then power on the unit and check if communication is functioning correctly. If the issue persists, replace the communication cable. If communication is restored, the original cable was faulty. If not, continue with further testing.		Multimeter
4	Replace the normal controller, if the communication is restored, the controller is broken. If communication is not restored, otherwise continue testing.		
5	Replace the main board, power on again, and check whether the communication is normal. After the above-mentioned inspections, if the communication has not been restored, check again. After returning to normal, power off and restore the machine installation. Power on, start up.		Phillips screwdriver or electric screwdriver

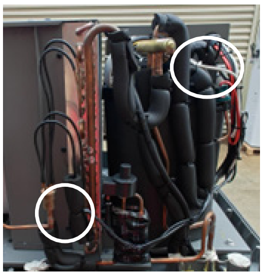
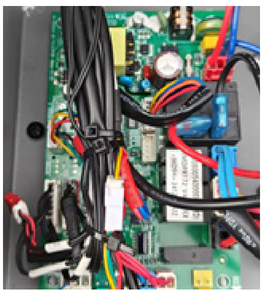
Fault diagnosis and troubleshooting

Other temperature sensor failure: Same diagnosis solution

E16	Evaporator coil temp sensor failure
E21	Ambient temp sensor failure
E18	Gas discharge temp sensor failure
E29	Gas return temp sensor failure
E14/E15	Heat pump temp sensor failure
E27	Sterilization temp sensor failure

Troubleshooting:

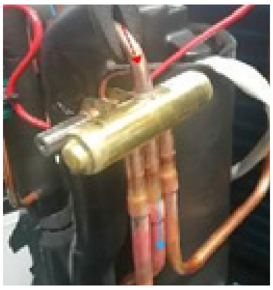
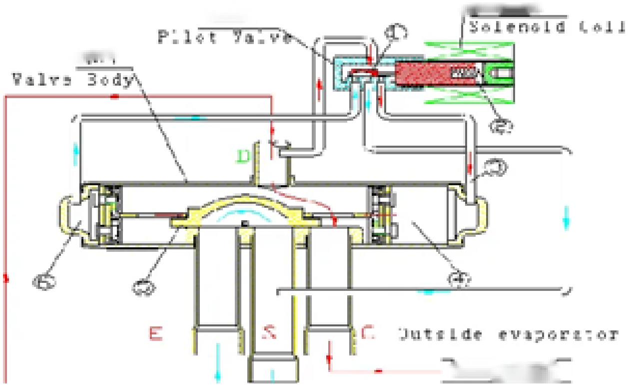
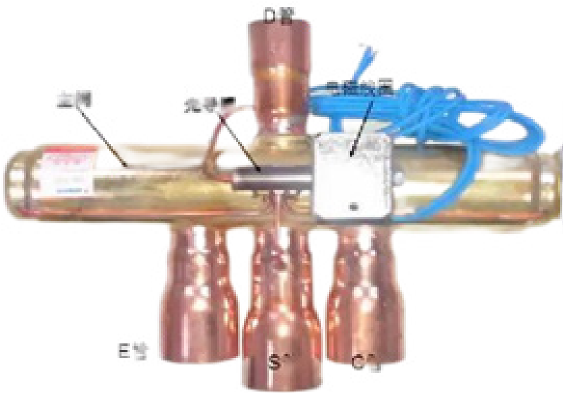
No.	Cause Analysis	Diagnosis and solution
1	Sensor failure	Replace sensor
2	Main board failure	Replace main board
3	Controller failure	Replace controller

Steps	Description	Image	Tool
1	Power off and restart, whether the fault is still reported, and the same fault is reported after restarting several times, then power off.		
2	Remove the top lid.	 	Phillips screwdriver or electric screwdriver
3	Locate the relevant sensor and measure its resistance using a multimeter. If the reading is 0 or infinite, the sensor is faulty and should be replaced. If the sensor shows a resistance value, locate its connection point on the electronic control board. Swap it with another sensor of the same type. If the fault code remains unchanged, the issue is likely with the main board or controller. If the fault code changes, the original sensor is faulty and should be replaced. If the problem appears to be with the main board or controller, replace the controller first. If the system returns to normal, the controller was at fault. If not, replace the main board. Once the issue is resolved, turn off the power, restore the system components, then power on and restart the unit.	 	Multimeter

Detection method: measure the resistance value of the sensor with a multimeter, when the resistance is 0 or infinite, report the sensor failure.

Fault diagnosis and troubleshooting

Other components:

No.	Description	Image	Component
1	The four-way reversing valve consists of two main components: the electromagnetic pilot valve and the four-way reversing valve itself. The pilot valve controls the operation of the reversing valve, and the two parts are connected by three capillary guide tubes.	  	4 way valve
2	4 way valve power-off state: tube D is connected to tube C; tube E is connected to tube S; 2.3. Coil energized state: tube D is connected to tube E; tube C is connected to tube S;		4 way valve

Fault diagnosis and troubleshooting

Common issues:

No.	Component	Issue description	Analysis
1	Compressor	1. Compressor doesn't work	1. If you can't hear the compressor running, first check whether the main board is supplying power to it. Use a multimeter to measure the voltage at the compressor terminals. If there is no voltage, inspect the compressor power cable for disconnection or damage and check the output from the main board. If the issue lies with the main board, it should be replaced. 2. If voltage is present, check whether the compressor body and nearby pipes are warm. If they remain cold, the compressor may be faulty. Disconnect power and use a multimeter to measure resistance across the compressor terminals. If the reading is infinite, the compressor is faulty and needs replacement.
2	Compressor	2. Compressor starts, power trips	1. If the compressor starts and the RCBO trips, cutting the power, use a multimeter to check the resistance of the compressor terminals. While compressor coil resistance is normally very low, you must also check for electrical leakage. Measure the insulation resistance between each terminal and the compressor casing. If there is continuity, the compressor is leaking current and is faulty - it must be replaced. 2. If the compressor is stuck and drawing excessive current, this may also cause the RCBO to trip. To confirm, test with a higher-capacity power supply. A stuck compressor typically draws high current, makes a loud noise, and causes no change in refrigerant pressure. Use a clamp meter to measure current and a pressure gauge to observe pressure changes. Also listen for unusually loud operating noise as further indication of a mechanical fault.
3	Compressor	3. The unit operates normally, but the water temperature does not rise;	1. Use a clamp meter to measure the unit's current draw. If the current is significantly lower than the rated value, it may indicate a refrigerant leak. 2. Disassemble the unit and connect a pressure gauge to check the low-side pressure. If the pressure reads 0 during operation, check the system's static pressure. If the static pressure is unusually high or unstable, this could also indicate a refrigerant shortage. Begin by inspecting the system for visible leaks. 3. If no leaks are found, recharge the refrigerant, restore the unit to normal operation, and record the service time. Monitor the unit closely. If refrigerant levels drop again soon after, perform another leak test. If no external leaks are detected, the issue may lie within the water tank heat exchanger. Pressurise the system with high-pressure nitrogen and monitor for 48 hours. A significant pressure drop indicates a leak in the heat exchanger, and the system will need to be replaced.
2	4 way valve	Cross-gas phenomenon in 4 way valve	This issue occurs when the sliding plate inside the four-way valve fails to move into the correct position. As a result, exhaust gas flows directly into the suction side, causing several symptoms: the suction pipe becomes abnormally hot, the water temperature fails to rise, suction gas temperature is high, the compressor operates with a loud noise, and exhaust pressure is elevated. In most cases, the sliding plate inside the four-way valve is damaged and needs to be replaced. As the sliding plate is made of plastic, it cannot withstand high temperatures. When replacing the four-way valve, it's essential to wrap it in a wet cloth to keep it cool during welding. Failure to do so may lead to damage and gas leakage even after replacement.

Appendix 1

NCT senor table

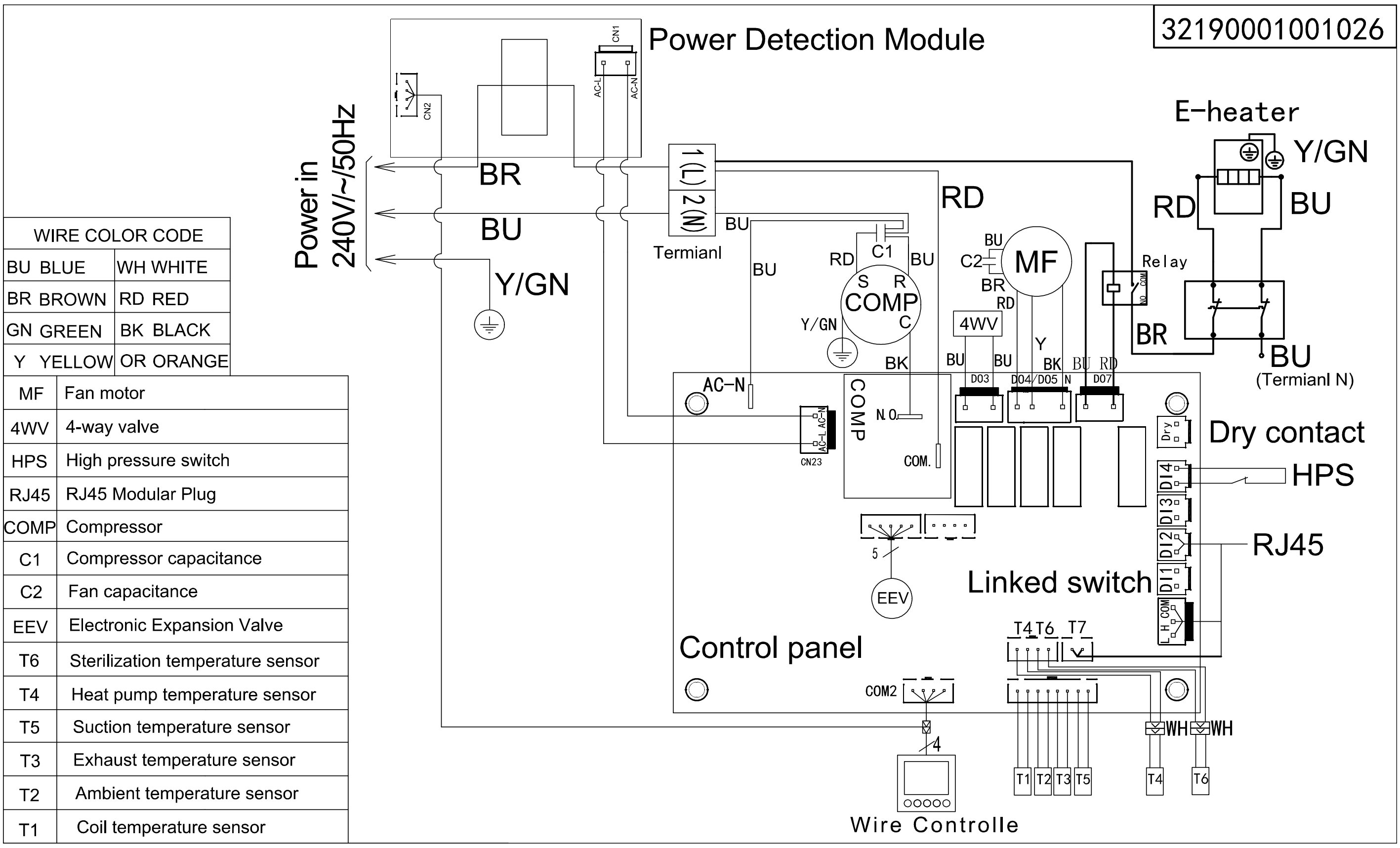
5K sensor table (Applicable to water temp sensor, evaporator coil sensor, gas suction sensor, ambient temp sensor)													
Temp. (°C)	Resistance (KΩ)	Temp. (°C)	Resistance (KΩ)	Temp. (°C)	Resistance (KΩ)	Temp. (°C)	Resistance (KΩ)	Temp. (°C)	Resistance (KΩ)	Temp. (°C)	Resistance (KΩ))	Temp. (°C)	Resistance (KΩ)
-40	108.4	-13	26.2913	14	7.7643	41	2.7692	68	1.1413	95	0.5196	122	0.2677
-39	102.3	-12	25.033	15	7.4506	42	2.6735	69	1.1008	96	0.5088	123	0.2615
-38	96.62	-11	23.8424	16	7.1813	43	2.5816	70	1.0734	97	0.4919	124	0.2554
-37	91.26	-10	22.7155	17	6.8658	44	2.4936	71	1.0412	98	0.4786	125	0.2496
-36	86.23	-9	21.6486	18	6.5934	45	2.4097	72	1.01	99	0.465	126	0.2438
-35	81.51	-8	20.638	19	6.3333	46	2.3276	73	0.98	100	0.4533	127	0.2383
-34	77.08	-7	19.6806	20	6.085	47	2.2491	74	0.9508	101	0.4418	128	0.2329
-33	72.92	-6	18.7732	21	5.8479	48	2.1739	75	0.9228	102	0.4385	129	0.2276
-32	69.01	-5	17.9129	22	5.6213	49	2.1016	76	0.8957	103	0.4273	130	0.2225
-31	65.33	-4	17.097	23	5.4048	50	2.0321	77	0.8695	104	0.4165	131	0.2175
-30	63.7306	-3	16.323	24	5.1978	51	1.9656	78	0.8441	105	0.406	132	0.2127
-29	60.3223	-2	15.5886	25	5	52	1.9016	79	0.8196	106	0.3958	133	0.2079
-28	57.118	-1	14.8713	26	4.8108	53	1.8399	80	0.7959	107	0.3859	134	0.2034
-27	54.1043	0	14.2293	27	4.6298	54	1.7804	81	0.773	108	0.3763	135	0.1989
-26	51.2686	1	13.6017	28	4.4586	55	1.7232	82	0.7508	109	0.367		
-25	48.5994	2	13.0057	29	4.2909	56	1.668	83	0.7295	110	0.3579		
-24	46.086	3	12.439	30	4.1323	57	1.614	84	0.7086	111	0.3491		
-23	43.7182	4	11.9011	31	3.9804	58	1.5636	85	0.6885	112	0.3406		
-22	41.4868	5	11.3894	32	3.8349	59	1.5142	86	0.669	113	0.3323		
-21	39.3833	6	10.9028	33	3.6955	60	1.4856	87	0.6502	114	0.3243		
-20	37.3992	7	10.4399	34	3.562	61	1.4206	88	0.632	115	0.3165		
-19	35.5274	8	9.9995	35	3.434	62	1.3763	89	0.6144	116	0.3089		
-18	33.7607	9	9.5802	36	3.3119	63	1.3336	90	0.5973	117	0.3015		
-17	32.0927	10	9.181	37	3.1937	64	1.2923	91	0.5808	118	0.2944		
-16	30.5172	11	8.8008	38	3.0809	65	1.2526	92	0.5647	119	0.2874		
-15	29.0286	12	8.4395	39	2.9727	66	1.2142	93	0.5492	120	0.2807		
-14	27.6216	13	8.0934	40	2.8688	67	1.1771	94	0.5342	121	0.2741		

Appendix 1

50K sensor table (Applicable to gas discharge temperature sensor)													
Temp. (℃)	Resistance (KΩ)	Temp. (℃)	Resistance (KΩ)	Temp. (℃)	Resistance (KΩ)	Temp. (℃)	Resistance (KΩ)	Temp. (℃)	Resistance (KΩ)	Temp. (℃)	Resistance (KΩ)	Temp. (℃)	Resistance (KΩ)
-40	1588	-12	306.29	16	75.001	44	22.648	72	8.0903	100	3.312	128	1.5165
-39	1489	-11	290.06	17	71.625	45	21.773	73	7.8193	101	3.215	129	1.4774
-38	1396	-10	274.78	18	68.416	46	20.935	74	7.5586	102	3.1214	130	1.4396
-37	1310	-9	260.4	19	65.368	47	20.134	75	7.3077	103	3.031	131	1.4028
-36	1230	-8	246.85	20	62.474	48	19.368	76	7.0667	104	2.9435	132	1.3672
-35	1156	-7	234.08	21	59.719	49	18.635	77	6.8345	105	2.8589	133	1.3327
-34	1086	-6	222.02	22	57.104	50	17.932	78	6.6109	106	2.7772	134	1.2991
-33	1021	-5	210.69	23	54.62	51	17.26	79	6.396	107	2.6982	135	1.2665
-32	959.9	-4	199.98	24	52.253	52	16.616	80	6.189	108	2.6218	136	1.2349
-31	903.1	-3	189.86	25	50	53	16.001	81	5.9894	109	2.5479	137	1.2042
-30	866.96	-2	180.34	26	47.857	54	15.41	82	5.7976	110	2.4764	138	1.1744
-29	815.7	-1	171.33	27	45.817	55	14.844	83	5.6126	111	2.4072	139	1.1455
-28	767.71	0	162.81	28	43.877	56	14.302	84	5.4346	112	2.3403	140	1.1174
-27	722.87	1	154.78	29	42.027	57	13.782	85	5.2629	113	2.2755	141	1.0901
-26	680.87	2	147.19	30	40.265	58	13.284	86	5.0974	114	2.2128	142	1.0636
-25	641.59	3	140	31	38.585	59	12.807	87	4.9379	115	2.1522	143	1.0379
-24	604.82	4	133.21	32	36.987	60	12.348	88	4.7842	116	2.0934	144	1.0128
-23	570.34	5	126.79	33	35.462	61	11.909	89	4.6359	117	2.0365	145	0.9886
-22	538.03	6	120.72	34	34.007	62	11.487	90	4.4931	118	1.9814	146	0.9649
-21	507.74	7	114.96	35	32.619	63	11.083	91	4.3552	119	1.928	147	0.942
-20	479.34	8	109.51	36	31.297	64	10.694	92	4.2222	120	1.8764	148	0.9197
-19	452.68	9	104.34	37	30.034	65	10.321	93	4.0939	121	1.8263	149	0.898
-18	427.67	10	99.456	38	28.827	66	9.9628	94	3.97	122	1.7778	150	0.8769
-17	404.17	11	94.826	39	27.677	67	9.6187	95	3.8506	123	1.7308		
-16	382.11	12	90.426	40	26.578	68	9.2882	96	3.7351	124	1.6852		
-15	361.35	13	86.262	41	25.528	69	8.9706	97	3.6238	125	1.6411		
-14	341.86	14	82.312	42	24.524	70	8.6655	98	3.5162	126	1.5983		
-13	323.53	15	78.561	43	23.566	71	8.3723	99	3.4123	127	1.5567		

Electrical connections

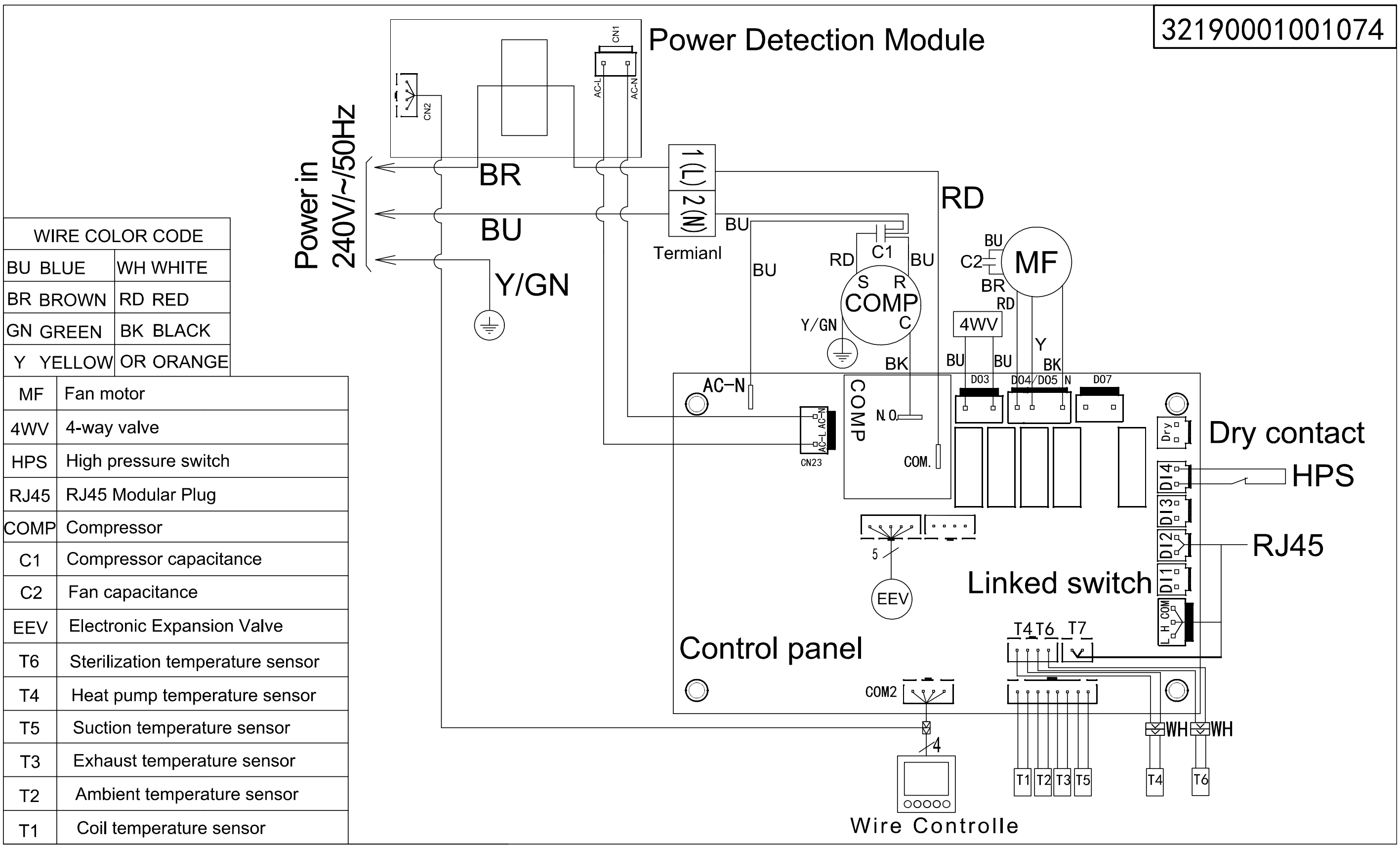
Wiring diagrams



WIRE COLOR CODE	
BU BLUE	WH WHITE
BR BROWN	RD RED
GN GREEN	BK BLACK
Y YELLOW	OR ORANGE

MF	Fan motor
4WV	4-way valve
HPS	High pressure switch
RJ45	RJ45 Modular Plug
COMP	Compressor
C1	Compressor capacitance
C2	Fan capacitance
EEV	Electronic Expansion Valve
T6	Sterilization temperature sensor
T4	Heat pump temperature sensor
T5	Suction temperature sensor
T3	Exhaust temperature sensor
T2	Ambient temperature sensor
T1	Coil temperature sensor

HPA1-S220E & HPA1-S270E



WIRE COLOR CODE	
BU BLUE	WH WHITE
BR BROWN	RD RED
GN GREEN	BK BLACK
Y YELLOW	OR ORANGE

MF	Fan motor
4WV	4-way valve
HPS	High pressure switch
RJ45	RJ45 Modular Plug
COMP	Compressor
C1	Compressor capacitance
C2	Fan capacitance
EEV	Electronic Expansion Valve
T6	Sterilization temperature sensor
T4	Heat pump temperature sensor
T5	Suction temperature sensor
T3	Exhaust temperature sensor
T2	Ambient temperature sensor
T1	Coil temperature sensor

HPA1-S220 & HPA1-S270

Notes

Notes

After sales service

If your hot water heater can not operate normally, turn off the unit and cut off the power supply at immediately.

Contact your service center or technical department.

emerald.com.au/contact

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