NØRDIS

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Ultima 2

R290 Heat Pump Air-to-Water



INSTALLATION MANUAL

Outdoor units models:

HLT206MONO1S / HLT209MONO1S / HLT212MONO1S / HLT212MONO3S / HLT216MONO1S / HLT216MONO3S / HLT220MONO3S

Indoor units models:

HLT293S / HLT293S/250 / HLT293S/200B50 / HLT Control Box

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A3

Before operating this product, please read instructions carefully and keep this manual for the future use.

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1. BEFORE USE

1.1 Important Safety Notice

Cautions:

1. Do not use any means to accelerate the defrosting process or to clean the appliance other than those recommended by the manufacturer.
2. The appliance must be stored in a room without continuously operating ignition sources, such as open flames, operating gas appliances, or operating electric heaters.
3. Do not pierce or burn any part of the refrigerant circuit.
4. Be aware that refrigerant may be odourless.
5. The appliance must be installed, operated, and stored in a room with a floor area greater than X m^2. Refer to the specification sheet for the minimum required area.
6. Refrigerant pipework should be kept to the minimum required length. Refer to the specification sheet for the applicable installation requirements.
7. Areas containing refrigerant pipework must comply with applicable national regulations concerning flammable refrigerants and gas safety.
8. Servicing must be carried out only in accordance with the manufacturer's recommendations.
9. The appliance must be stored in a well-ventilated area where the room size complies with the minimum area specified for operation.
10. Any work procedure that may affect safety must be carried out only by suitably qualified and competent personnel.

General Notice

1. ***Transport of equipment containing flammable refrigerants***

Transportation must comply with all applicable transport regulations.

2. ***Equipment marking and safety signs***

Equipment marking and safety signage must comply with applicable local regulations.

3. ***Disposal of equipment containing flammable refrigerants***

Disposal must comply with applicable national regulations.

4. ***Storage of equipment/appliances***

Equipment must be stored in accordance with the manufacturer's instructions.

5. ***Storage of packaged (unsold) equipment***

Packaging must provide sufficient protection to prevent mechanical damage that could cause refrigerant leakage. The maximum number of units permitted to be stored together must comply with applicable local regulations.

6. Information on Servicing

1) Checks to the Work Area

Before starting work on systems containing flammable refrigerants, appropriate safety checks must be carried out to minimise the risk of ignition.

When repairing the refrigeration system, the following precautions must be observed before work begins.

2) Work Procedure

Work must be carried out according to a controlled procedure designed to minimise the risk of flammable gas or vapour being present during servicing.

3) General Work Area

All maintenance personnel and other persons working in the area must be informed about the nature of the work being carried out.

Work in confined spaces should be avoided whenever possible. The work area must be isolated from the surrounding area and kept free from flammable materials and other hazards.

4) Checking for the Presence of Refrigerant

The work area must be checked with an appropriate refrigerant detector before and during servicing to ensure that potentially flammable atmospheres are detected.

Leak detection equipment must be suitable for use with flammable refrigerants and must be non-sparking, adequately sealed, or intrinsically safe.

5) Fire Extinguisher

If hot work is to be performed on refrigeration equipment or associated components, appropriate fire-extinguishing equipment must be readily available.

A dry powder or CO_2 fire extinguisher should be located close to the work and refrigerant charging area.

6) No Ignition Sources

When work involves opening pipework that contains or has contained flammable refrigerant, no ignition sources may be used in a manner that could create a fire or explosion risk.

All possible ignition sources, including smoking, must be kept at a safe distance from the installation, repair, removal, or disposal area where refrigerant may be released.

Before work begins, inspect the surrounding area to ensure that no flammable hazards or ignition sources are present. “No Smoking” signs must be displayed where required.

7) Ventilation

Before opening the refrigerant circuit or performing hot work, ensure that the work area is outdoors or adequately ventilated.

Ventilation must be maintained throughout the work. Any released refrigerant should be safely dispersed and, where possible, discharged outdoors.

8) Checks to Refrigeration Equipment

When electrical components are replaced, the replacement parts must be suitable for the intended application and meet the correct specifications.

The manufacturer’s maintenance and service instructions must always be followed. If necessary, contact the manufacturer’s technical department for assistance.

For systems using flammable refrigerants, verify that:

- The refrigerant charge is suitable for the size of the room in which refrigerant-containing components are installed.
- Ventilation systems and outlets operate correctly and are not obstructed.
- Where an indirect refrigeration circuit is used, the secondary circuit is checked for the presence of refrigerant.
- Equipment markings remain visible and legible.

- Refrigerant piping and components are positioned or protected so that they are not exposed to substances that may cause corrosion.

9) Checks to Electrical Equipment

Repairs and maintenance of electrical components must include initial safety checks and appropriate inspection procedures.

If a fault is found that could compromise safety, the electrical supply must not be connected until the fault has been corrected.

If immediate repair is not possible but operation must continue, a suitable temporary solution must be implemented and reported to the equipment owner.

Initial safety checks must include verification that:

- Capacitors are safely discharged to avoid the possibility of sparking.
- No live electrical components or wiring are exposed during charging, refrigerant recovery, or system purging.
- Protective earthing continuity is maintained.

7. Repairs to Sealed Components

1) Before removing sealed covers or opening sealed components, disconnect all electrical power supplies to the equipment. If electrical power is absolutely necessary during servicing, continuous leak detection must be provided at the most critical location to warn of a potentially hazardous condition.

2) Particular attention must be paid to ensure that servicing does not reduce the level of protection provided by the enclosure.

This includes checking for:

- Damaged cables
- Excessive numbers of electrical connections
- Terminals that do not comply with the original specification
- Damaged seals
- Incorrectly installed cable glands

Ensure that all equipment is securely mounted.

Seals and sealing materials must remain in good condition and continue to prevent the ingress of flammable atmospheres. Replacement parts must comply with the manufacturer's specifications.

Note: Silicone sealants may affect the performance of certain types of refrigerant leak detection equipment. Intrinsically safe components do not necessarily need to be isolated before servicing.

8. Repairs to Intrinsically Safe Components

Do not apply permanent inductive or capacitive loads to a circuit unless it has been confirmed that the permissible voltage and current ratings of the equipment will not be exceeded.

Only intrinsically safe components may be worked on while energised in the presence of a flammable atmosphere.

Test equipment must have the correct electrical rating.

Only replacement parts specified by the manufacturer may be used. Incorrect replacement parts may create an ignition risk in the event of refrigerant leakage.

9. Cabling

Check that electrical cables are not exposed to:

- Wear
- Corrosion
- Excessive pressure
- Vibration
- Sharp edges
- Other adverse environmental conditions

The inspection must also consider the effects of ageing and continuous vibration from compressors, fans, or other components.

10. Detection of Flammable Refrigerants

Potential ignition sources must never be used to locate or detect refrigerant leaks.

A halide torch or any other leak detector using an open flame must not be used.

11. Leak Detection Methods

Electronic leak detectors suitable for flammable refrigerants must be used.

Detector sensitivity must be appropriate and, where necessary, recalibrated in a refrigerant-free environment. The detector must not itself present an ignition source. Leak detection equipment must be suitable for the refrigerant being used and set according to the appropriate percentage of the refrigerant's **Lower Flammability Limit (LFL)**. Leak detection fluids may be used with most refrigerants. However, detergents containing chlorine must be avoided because chlorine may react with the refrigerant and corrode copper pipework.

If a refrigerant leak is suspected:

- Remove or extinguish all open flames.
- Eliminate potential ignition sources.
- Ventilate the area adequately.

If a leak requiring brazing is found, the refrigerant must be completely recovered from the system or safely isolated in a section of the system away from the repair area.

The system must then be purged with **oxygen-free nitrogen (OFN)** before and during brazing.

12. Refrigerant Removal and Evacuation

When opening the refrigerant circuit for repairs or other work, standard refrigeration procedures must be followed, with additional precautions due to the flammability of the refrigerant.

The following procedure must be used:

1) Recover the refrigerant.
2) Purge the circuit with inert gas.
3) Evacuate the system.
4) Purge again with inert gas.
5) Open the circuit by cutting or brazing.

The refrigerant must be recovered into suitable recovery cylinders.

The system must be purged with **oxygen-free nitrogen (OFN)** to ensure safe working conditions. This process may need to be repeated several times.

Compressed air or oxygen must never be used for purging.

Ensure that the vacuum pump outlet is located away from ignition sources and that adequate ventilation is provided.

13. Charging Procedures

In addition to standard refrigerant charging procedures, the following requirements apply:

- Prevent cross-contamination between different refrigerants.
- Keep hoses and charging lines as short as practical.
- Keep refrigerant cylinders upright.
- Ensure that the refrigeration system is properly earthed before charging.
- Label the system when charging is completed, if not already labelled.
- Take particular care not to overcharge the system.

Before charging, the system must be pressure-tested with OFN.

After charging, perform a leak test before commissioning. A final leak test must also be carried out before leaving the installation site.

14. Decommissioning

Before decommissioning, the technician must be fully familiar with the equipment and its operation.

All refrigerant should be recovered safely.

Where required, oil and refrigerant samples should be taken before recovery for possible analysis and future reuse.

Before starting:

a) Become familiar with the equipment and its operation.

b) Electrically isolate the system.

c) Ensure that:

- Suitable mechanical handling equipment is available for refrigerant cylinders, where required.
- Appropriate personal protective equipment is available and used correctly.
- Refrigerant recovery is supervised by a competent person.
- Recovery equipment and cylinders comply with applicable standards.

d) Pump down the refrigerant system, where possible.

e) If a vacuum cannot be achieved, use a suitable manifold arrangement to recover refrigerant from all sections of the system.

f) Place the recovery cylinder on calibrated weighing scales before recovery.

g) Operate the recovery machine in accordance with the manufacturer's instructions.

h) Do not fill recovery cylinders beyond **80% of their liquid capacity**.

i) Do not exceed the maximum working pressure of the cylinder, even temporarily.

j) After recovery is complete, remove the cylinders and equipment from the site promptly and ensure all isolation valves are closed.

k) Recovered refrigerant must not be charged into another system unless it has been properly cleaned and checked.

15. Labelling

Equipment must be labelled to indicate that it has been decommissioned and emptied of refrigerant.

The label must be dated and signed.

The equipment must also retain appropriate warning labels indicating that it contains **flammable refrigerant**.

16. Refrigerant Recovery

When refrigerant is removed from a system for servicing or decommissioning, it must be recovered safely.

Use only recovery cylinders specifically designed and approved for the refrigerant being recovered. Ensure that a sufficient number of cylinders is available for the complete system charge.

Recovery cylinders must:

- Be clearly labelled for the refrigerant being recovered.
- Be equipped with pressure relief valves and shut-off valves in good working condition.
- Be evacuated before use and, where practical, cooled before recovery.

Recovery equipment must:

- Be suitable for flammable refrigerants.
- Be maintained in good working condition.
- Be used in accordance with the manufacturer's instructions.

Calibrated weighing scales must also be available. Recovery hoses must be in good condition and fitted with leak-tight disconnect couplings.

Before use, verify that the recovery machine has been properly maintained and that associated electrical components are suitably protected against ignition in the event of refrigerant release.

Recovered refrigerant must be returned to the refrigerant supplier in the correct recovery cylinder and handled in accordance with applicable waste-transfer requirements.

Do not mix different refrigerants in recovery equipment or recovery cylinders.

If compressors or compressor oil are removed, they must first be evacuated sufficiently to ensure that no flammable refrigerant remains dissolved in the oil.

Only electrical heating may be used to warm the compressor body during this process.

Oil removed from the system must be handled and disposed of safely.

1.2 Preliminary Information

Thank you for purchasing our heat pump.

This manual provides detailed instructions for the correct installation of your heat pump. Please keep this manual in a safe and easily accessible location for future reference.

Disclaimer

Strict compliance with the instructions provided in this manual is essential for the safe and reliable operation of the system and for the safety of all persons involved in its installation, operation, maintenance, and servicing.

The manufacturer accepts no liability for damage, loss, or injury resulting from improper use, incorrect installation, unauthorised modification, or mishandling of the product, including but not limited to:

- Purchasing, installing, or operating the product for purposes other than those for which it was designed.

- Carrying out unauthorised work on the unit or its components without prior written approval from the manufacturer.
- Installation of the system by persons who are not properly trained, qualified, or licensed.
- Failure to use appropriate personal protective equipment, such as safety glasses and protective gloves, during installation, maintenance, or servicing.
- Operating the system outside its specified ambient temperature range of **-25°C to 43°C**.

Safety

If you are unsure about any installation procedure, contact your local distributor or authorised service representative for advice.

Only approved accessories intended for use with this product may be installed.

All electrical work must be carried out by a qualified and authorised electrician in accordance with applicable regulations.

The manufacturer accepts no responsibility for alterations or modifications made to the product without prior written approval.

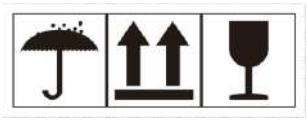
The unit has been designed in accordance with applicable safety requirements and is safe to operate when installed, operated, and maintained as intended.

Carefully read the following sections, which contain important safety precautions and installation requirements. These instructions must be followed to ensure safe installation and reliable operation of the system.

2. SAFETY PRECAUTIONS

2.1 Meaning of warnings and symbols

The following symbols are very important. Please make sure you understand their meanings, as this affects the product and your personal safety.

	It means that there is no fire source allowed around the unit, because the refrigerant of the unit is flammable. If the heat pump has a refrigerant leak, there may be a fire source around it, which may cause a fire or explosion.
	Electricity is dangerous. When repairing or inspecting the unit, the main power supply must be disconnected first and wait for more than 1 minute before repairing the unit to prevent electric shock.
	Be careful of lightning strikes. When installing the unit, be sure to ground the unit and make sure it is actively grounded to prevent the unit from being directly damaged when it is struck by lightning.
	Maintenance reminder: When repairing the unit, you need to consult the manual or maintenance guide first, and be careful of fire during the maintenance process.
	Transportation and storage instructions indicate that the unit cannot be exposed to rain, placed upside down, or horizontally during this process.
	The non-recyclable indicator means that the unit cannot be recycled directly and needs to be recycled and disassembled by professionals or companies;
	Recyclable packaging materials and possible hazards.

2.2 Safe operation guidelines

Warning Caution Prohibition



The installation, dismantlement and maintenance of the unit must be performed by qualified personnel. It is forbidden to do any changes to the structure of the unit. Otherwise injury of person or unit damage might happen.



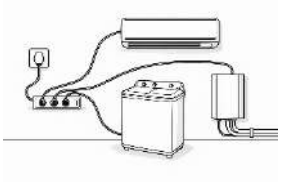
To avoid electrical shock, make sure to disconnect the power supply 1 minute or more before servicing the electrical parts. Even after 1 minute, always measure the voltage at the terminals of main circuit capacitors or electrical parts and, before touching, make sure that those voltages are lower than the safety voltage.



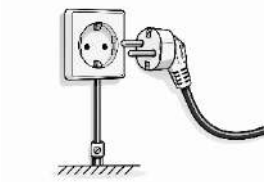
Be sure to read this manual before use.



For sanitary hot water, please always add a mixture valve before water tap and set it to proper temperature.



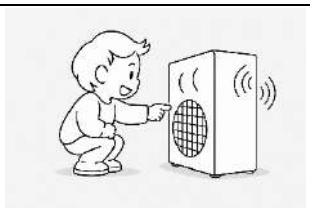
Use a dedicated socket for this unit, otherwise malfunction may occur.



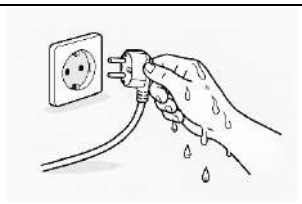
The power supply to the unit must be grounded.



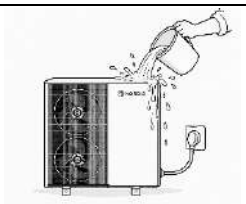
This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.



Do not touch the air outlet grill when fan motor is running.



Do not touch the power plug with wet hands. Never pull out the plug by pulling the power cable.



Water or any kind of liquid is strictly forbidden to be poured into the product, or may cause electric creepage or breakdown of the product.



When the power cord gets loose or damaged, always get a qualified person to fix it.



Please select the correct fuse or breaker as per recommended. Steel wire or copper wire cannot be taken



Be aware fingers might be hurt by the fin of the coil.

	as substitute for fuse or breaker. Otherwise, damages maybe caused.	
 It is mandatory to use a suitable circuit breaker for the heat pump and make sure the power supply to the unit corresponds to the specifications. Otherwise the unit might be damaged.	 Disposal of Scrap Batteries (if there is). Please discard the batteries as sorted municipal waste at the accessible collection point.	 Installation of a residual current device (RCD) having a rated residual operating current not exceeding 30 mA is advisable.

	This marking indicates that this product should not be disposed with other household wastes throughout the EU. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.

2.3 Special safety instructions for R290 refrigerant

Warning: This unit is filled with R290 (Propane), a flammable refrigerant. Strict adherence to the following safety regulations is mandatory during transportation, installation, and maintenance.

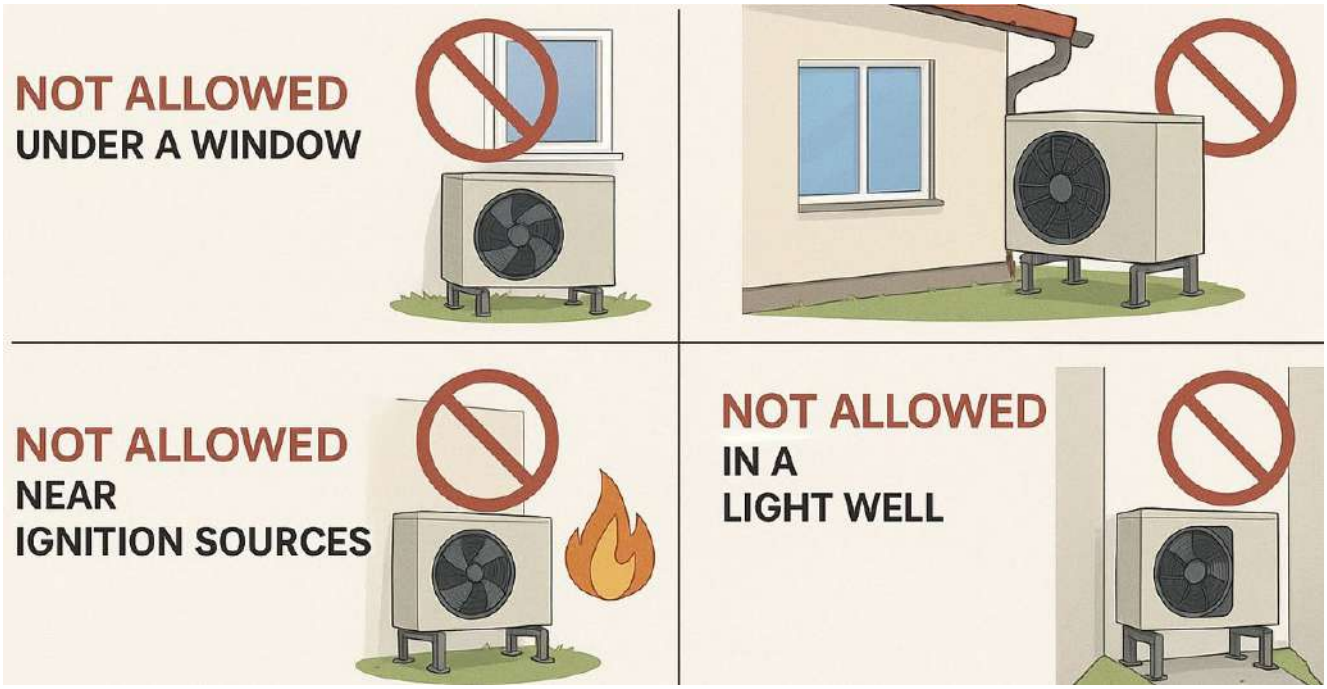
A. Transportation and handling

- Upright Position: Ensure the unit remains upright during transportation. Secure the unit firmly to prevent excessive shaking or tipping.
- Leak Check: Before unloading, use a refrigerant leak detector to ensure there is no leakage.
- Ventilation: If a leak is detected, stop immediately, open windows/doors to ventilate the area, and wait for the gas concentration to drop before moving the unit.
- No Smoking: Smoking is strictly prohibited during the transportation and handling process.

B. Installation requirements

- Site Inspection: The installation site must be well-ventilated and far from heat sources or flammable/explosive environments.
- Safety Zone: Ensure there are no combustible materials within a 2-meter radius of the heat pump. In case of accidental leakage, ventilate immediately and ensure no ignition sources are introduced.
- Ignition Source Control: No open flames or heat sources exceeding 370°C (e.g., welding, smoking, operating gas appliances) are allowed in the installation area.
- Anti-Static Measures: Technicians must take anti-static precautions, such as wearing pure cotton clothing and cotton gloves, to prevent static sparks.

- Fire Fighting Equipment: The installation site must be equipped with at least two types of fire extinguishers (Dry Powder, CO2, or Foam). They must be placed in a visible, easily accessible, and designated location.
- Safety Signage: After installation, post conspicuous warning signs such as "No Smoking" or "No Open Flames" around the heat pump.



C. Maintenance and repair

- Safety Check: Before starting any repair work, use a handheld combustible gas detector to confirm that the R290 concentration is within the safe range.
- Refrigerant System Repair: If the repair involves the refrigerant circuit or replacing components:
  - Strictly follow the evacuation procedure.
  - Vacuum Requirement: You must evacuate the system for at least 30 minutes and hold the vacuum for 10 minutes to ensure no refrigerant remains before any brazing/welding operation.
- Electrical Repair: Disconnect the main power supply before repairing electrical components. If power supply is necessary for testing, perform continuous leak detection at the most critical points. Avoid any metal collisions or operations that could generate sparks.

D. Required Tools for R290

Standard tools may cause sparks. Only use the following specialized tools:

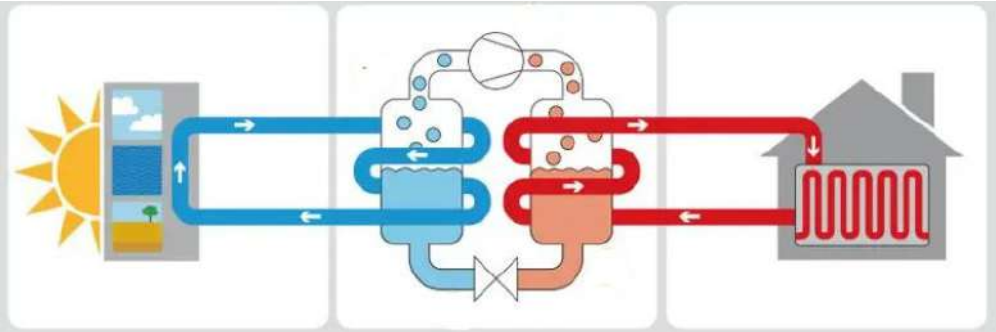
- Vacuum Pump: Explosion-proof type. Vacuum capability should be lower than 10 Pa.
- Charging Equipment: Dedicated explosion-proof charging scale with high precision (error margin < 5g).
- Leak Detector: A detector specifically calibrated for combustible refrigerants.
- Pressure Gauge:
  - For R290: Standard R22 pressure gauges can be used (or dedicated R290 gauges).
- Fire Extinguisher: Always carry a fire extinguisher during installation and maintenance. Ensure Dry Powder, CO2, or Foam extinguishers are available on-site.

3. PRODUCT OVERVIEW

3.1 Heat pump principle description

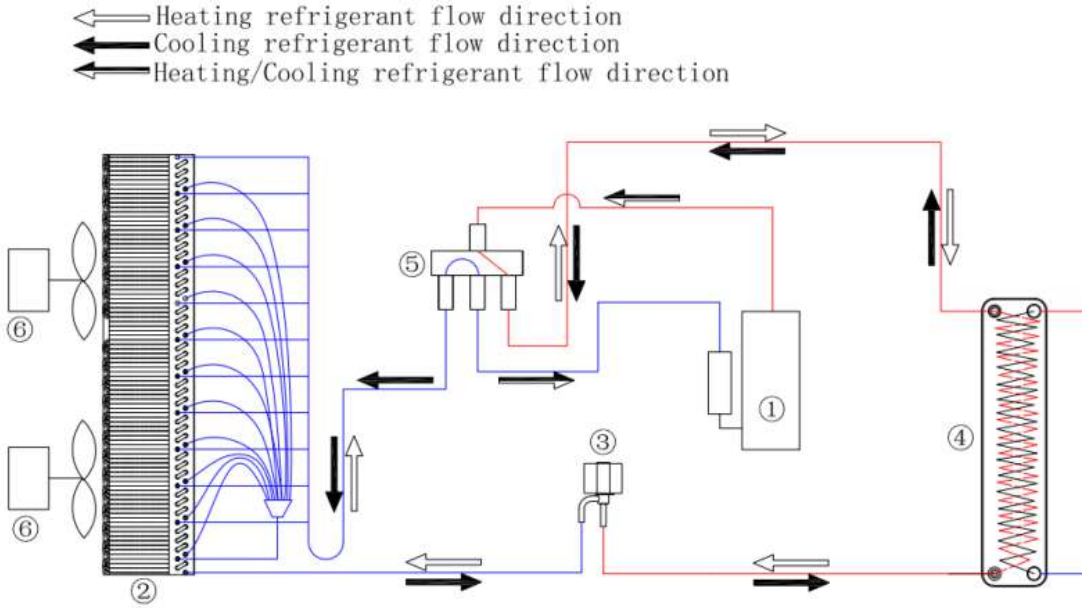
3.1.1 Basic concepts

An air source heat pump is a device that uses air in the environment as a heat source or cold source, drives a compressor to work with a small amount of electricity, and thus produces cold/hot air or cold/hot water. It follows the working principle of the reverse Carnot cycle and realizes the heat transfer from a low temperature heat source to a high temperature heat source.



Heat source Heat pump Terminal

3.1.2 Refrigerant system description



1. Compressor
2. Evaporator
3. Electronic expansion valve
4. Condenser
5. Four-way valve
6. DC fan

Working principle

Basic components

It consists of four major components: compressor, condenser, throttling device and evaporator.

Working cycle process

Compression process: Low temperature and low pressure gaseous refrigerant is sucked into the compressor, after being compressed by the compressor, becomes high temperature and high pressure gaseous refrigerant. The compressor consumes electrical energy in this process, doing work on the refrigerant, raising its temperature and pressure.

Condensation process: High temperature and high pressure gaseous refrigerant enters the condenser, exchanges heat with water, releases heat and condenses into high pressure liquid refrigerant. For example in winter, the condenser of the air source heat pump will transfer heat to the indoor water circuit for heating

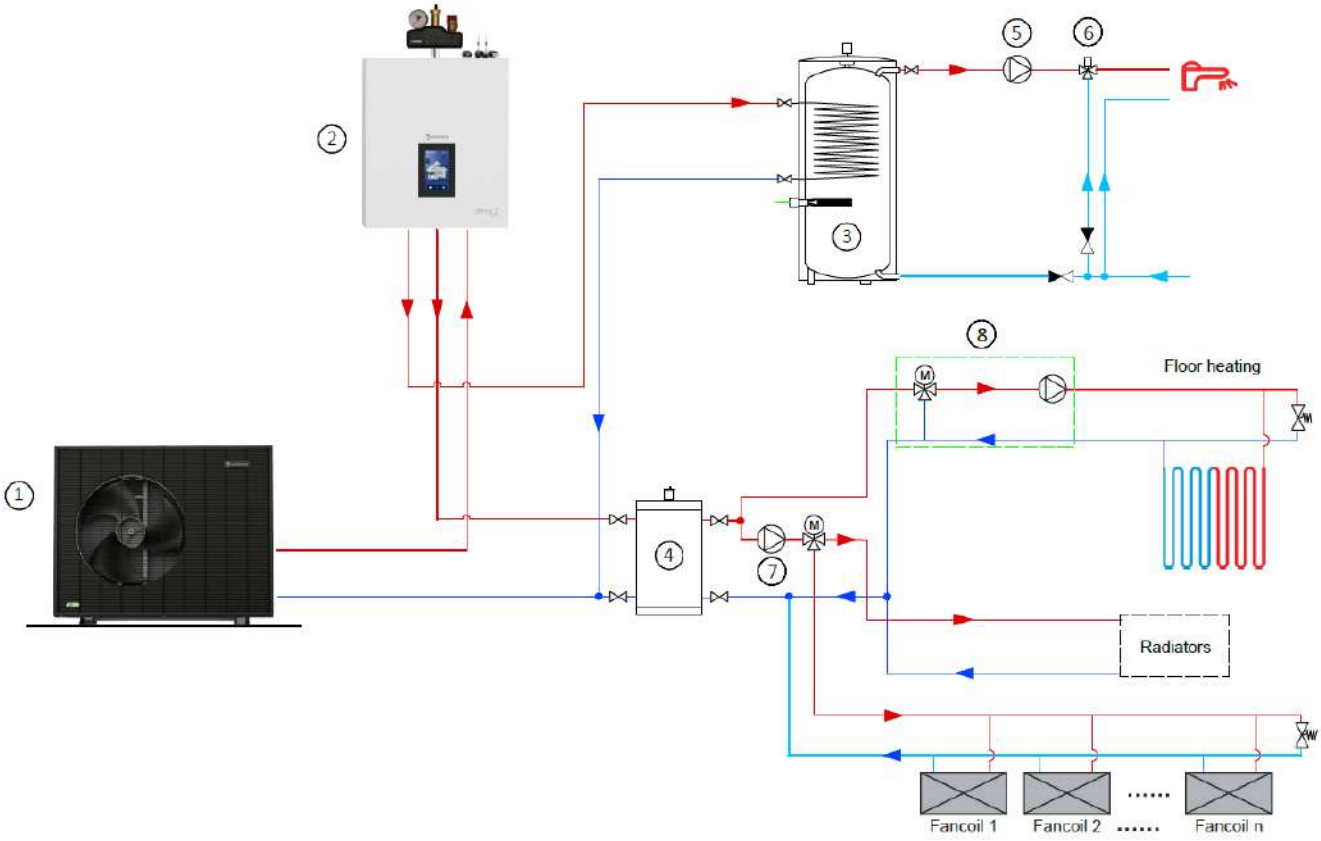
Throttling process: High pressure liquid refrigerant passes through throttling devices such as electronic expansion valves, and its pressure and temperature drop sharply, turning into low temperature and low pressure liquid.

Evaporation process: The low temperature and low pressure liquid refrigerant passes through the evaporator, absorbs heat from the outside low temperature air, and then evaporates, turning into low temperature and low pressure liquid refrigerant. The process is to obtain heat from the air.

Description of sensor in refrigerant system

- **Compressor Discharge Temperature Sensor:** Real time detection of exhaust temperature, automatic adjustment of the refrigerant system, including frequency adjustment and opening adjustment. Meanwhile, there is a shutdown mechanism for over high exhaust temperature protection to prevent over-heating damage of the compressor.
- **Compressor Suction Temperature Sensor:** Real time detection of suction temperature, adjustment of the electronic expansion valve of the refrigerant system to ensure that the suction superheat of the system is controlled within a safe range and prevent liquid hammer damage to the compressor.
- **Outdoor Coil Temperature Sensor:** Real time detection of the outer coil temperature. In the heating mode, it is used to detect the temperature of the evaporator and determine whether the unit needs defrosting; in the cooling mode, it detects the temperature of the condenser and determines whether the unit has poor heat exchange.
- **Outdoor Ambient Temperature Sensor:** Real time detection of the ambient temperature where the heat pump is located. The heat pump automatically adjusts the frequency according to the current ambient temperature to control the maximum output of the unit and ensure that the heat pump works within the allowed ambient temperature range.
- **High Pressure Sensor:** Real time detection of the high pressure in the refrigerant system for system pressure protection. During the operation of the unit, due to various abnormal situations, the system pressure rises. When the pressure sensor detects that the high pressure is too high, system adjustment will be carried out first.
- **Low Pressure Sensor:** Real time detection of the low pressure in the refrigerant system for system pressure protection. During the operation of the unit, due to various abnormal situations, the system pressure drops. When the pressure sensor detects that the low pressure is lower than the low pressure protection value, the unit will immediately shut down for protection.
- **High Pressure Switch:** A mechanical protection switch for over high pressure protection of the refrigerant system.

3.1.3 Water system description



1. Outdoor Unit
2. Indoor Unit
3. Domestic Hot Water
4. Buffer Tank
5. Hot Water Recirculation Pump
6. Manual Mixing Valve
7. Heating Circuit Secondary Pump
8. Underfloor Heating Mixing St

How it works

The heat generated by the heat pump is distributed according to the current system demand for domestic hot water (DHW), space heating, or cooling. The system automatically switches the water flow to the required circuit using circulation pumps and 3-way valves.

Domestic Hot Water Operation

When there is a demand for DHW, the heat pump transfers heat to the domestic hot water tank through the hydraulic circuit and DHW 3-way valve until the required tank temperature is reached.

If the distance between the DHW tank and the hot water outlets is relatively long, an additional DHW recirculation pump can be installed. By operating according to a timer or other control logic, the pump circulates hot water through the DHW distribution pipework, helping maintain the pipe temperature close to the tank temperature and reducing the waiting time for hot water at the outlets.

Space Heating and Cooling Operation

When there is a demand for space heating or cooling, the heat pump transfers thermal energy to the buffer tank. The water temperature in the buffer tank is maintained according to the required system conditions.

Downstream of the buffer tank, the system can operate with one or two heating/cooling circuits.

Heating/cooling circuit 1

This configuration is intended for a system with one type of heat emitter, for example:

- Underfloor heating
- Fan coil units
- Radiators

In this configuration, one circulation pump is normally used for the distribution circuit, and the heat pump water temperature is set according to the requirements of the connected heat emitters.

Heating/cooling circuit 2

This configuration is used when two heat distribution systems require different water temperatures.

For example, the heat pump can operate at the higher water temperature required by radiators or fan coil units, while the underfloor heating circuit uses a mixing valve assembly to reduce the supply water temperature to the required level.

Typical operating temperatures are:

- Underfloor heating: approximately 30–36°C
- Fan coil units / radiators: approximately 40–55°C

This arrangement allows two circuits with different temperature requirements to operate simultaneously while maintaining suitable supply temperatures for each circuit.

Description of sensor in water system

- **Heating/Cooling Temperature Sensor (TC):** In DHW/heating/cooling or heating/cooling systems, this sensor measures the water temperature in the buffer tank. It is used to determine whether the buffer tank has reached the target temperature.
- **Domestic Hot Water Temperature Sensor (TW):** In DHW/heating/cooling systems, this sensor measures the water temperature in the DHW tank. It is used to determine whether the tank has reached the target DHW temperature.
- **Inlet Water Temperature Sensor:** Measures the water temperature at the inlet of the plate heat exchanger. It is mainly used for capacity and energy-efficiency calculations and for anti-freeze protection.
- **Outlet Water Temperature Sensor:** Measures the water temperature at the outlet of the plate heat exchanger. It is mainly used for capacity and energy-efficiency calculations, anti-freeze protection, and high-temperature protection.
- **Indoor Coil Temperature Sensor:** Measures the refrigerant pipe temperature at the plate heat exchanger. It is mainly used to evaluate the heat-exchange performance of the plate heat exchanger.
- **Mixing Temperature Sensor 1:** Installed in the water pipe downstream of the mixing valve. It serves as the temperature control sensor for Mixing Circuit 1, typically used for the underfloor heating circuit.
- **Mixing Temperature Sensor 2:** Installed in the water pipe downstream of the mixing valve. It serves as the temperature control sensor for Mixing Circuit 2, typically used for the higher-temperature heating circuit.
- **Room Temperature Sensor:** Mainly used for room-temperature compensation and room-based temperature control.

4. PRODUCT SPECIFICATIONS

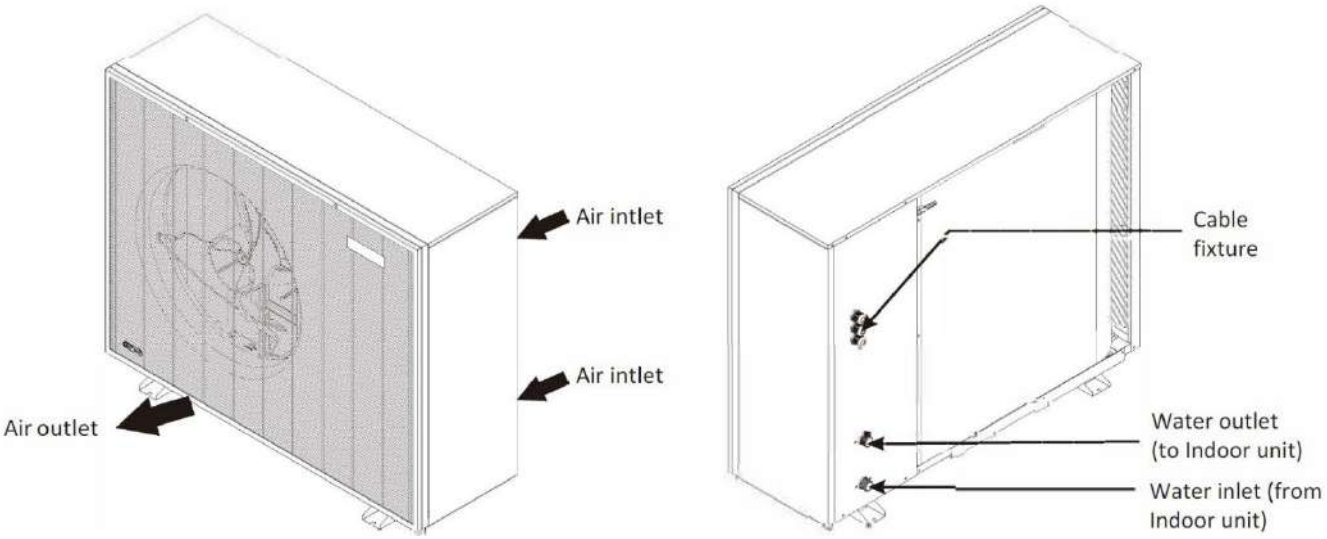
4.1 Outdoor units' specifications

Outdoor Unit Model				HLT206 MONO1S	HLT209 MONO1S	HLT212 MONO1S	HLT212 MONO3S	HLT216 MONO1S	HLT216 MONO3S	HLT220 MONO3S
Compatible Indoor Unit without DHW Tank				HLT293S						
Compatible Indoor Unit with DHW and Buffer Tanks				HLT293S/200B50				-		
Compatible Indoor Unit with DHW Tank				HLT293S/250						
Seasonal Energy (According to EN14825:2022)										
ErP	Energy Class-Heating (35°C / 55°C)			A+++ / A+++						
	SCOP (35°C / 55°C)			5,18/3,91	5,23/3,89	5,48/4,12	5,62/4,14	5,51/4,04	5,35/4,03	5,29/4,10
	Rated Heat Output (Prated) (35°C / 55°C)		kW	5,70/5,64	7,34/7,31	9,83/9,60	9,74/9,72	13,3/12,0	13,1/12,4	15,7/14,4
	Seasonal Space Heating Efficiency (35°C / 55°C)		%	204/153	206/153	216/162	222/163	217/159	211/158	209/161
	Annual Energy Consumption (35°C / 55°C)		kWh	2275/2979	2901/3881	3706/4812	3579/4852	4974/6153	5082/6360	6111/7270
	Sound Pressure Level 1m		dB (A)	36	36	37	37	41	41	45
	Sound Power Level		dB (A)	49	49	50	50	55	55	59
Nominal Capacity and Nominal Input (According to EN14511:2022)										
Heating	Heating Capacity Min./Max.	A7/W35	kW	2,17/6,43	2,9/9,6	3,7/12,2	3,7/12,2	5,3/15,9	5,3/15,9	5,9/19,0
	Heating Power Input Min./Max.		kW	0,44/1,22	0,55/1,90	0,67/2,46	0,67/2,46	0,97/3,24	0,97/3,24	1,19/4,35
	C.O.P Max.		W/W	5,28	5,21	5,63	5,63	5,49	5,49	4,94
	Heating Capacity Min./Max.	A7/W45	kW	1,91/6,10	2,7/9,2	3,5/11,6	3,5/11,6	4,9/15,2	4,9/15,2	5,5/18,3
	Heating Power Input Min./Max.		kW	0,59/1,46	0,69/2,38	0,83/2,94	0,83/2,94	1,22/3,80	1,22/3,80	1,44/5,15
	C.O.P Max.		W/W	4,18	3,87	4,04	4,04	4,02	4,02	3,84
Cooling	Cooling Capacity Min./Max.	A35/W18	kW	3,66/7,44	3,4/9,0	6,3/12,2	6,3/12,2	7,8/15,3	7,8/15,3	9,1/18,4
	Cooling Power Input Min./Max.		kW	0,66/1,83	0,81/2,46	1,16/2,95	1,16/2,95	1,57/4,12	1,57/4,12	1,80/5,77
	E.E.R Max.		W/W	5,54	4,17	5,38	5,38	4,97	4,97	5,04
	Cooling Capacity Min./Max.	A35/W7	kW	2,47/5,94	2,3/7,0	3,3/9,2	3,3/9,2	5,2/12,1	5,2/12,1	6,2/12,4
	Cooling Power Input Min./Max.		kW	0,68/1,75	0,88/2,34	1,19/2,78	1,19/2,78	1,65/3,79	1,65/3,79	1,85/4,06
	E.E.R Max.		W/W	3,65	2,99	3,32	3,32	3,19	3,19	3,33
Specifications are subject to change without notice, For actual device specifications, see the stickers on the device,										

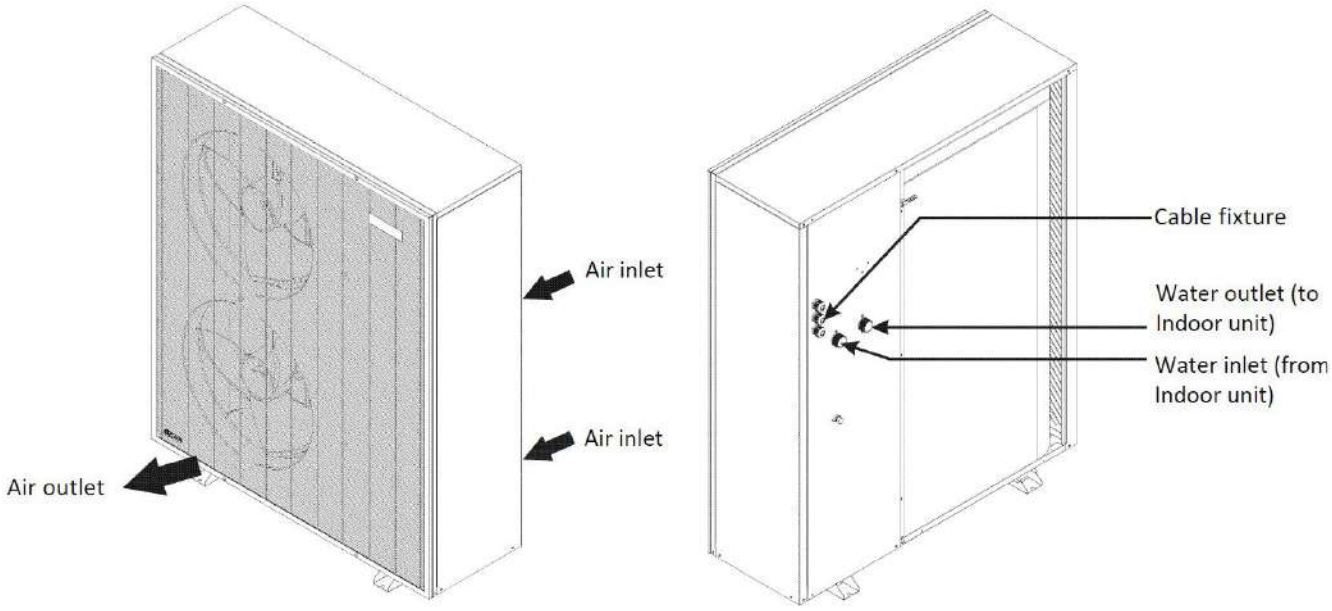
Outdoor Unit Model				HLT206 MONO1S	HLT209 MONO1S	HLT212 MONO1S	HLT212 MONO3S	HLT216 MONO1S	HLT216 MONO3S	HLT220 MONO3S
Power Supply			V/Ph/Hz	220-240/1/50			380-415/3/50	220-240/1/50	380-415/3/50	380-415/3/50
Circuit Breaker			A	C16	C16	C25	C16	C32	C16	C20
Power Cable*			mm²	3x2,5	3x2,5	3x4,0	5x2,5	3x6,0	5x2,5	5x4,0
Operation limits	Ambient Temperature Range		°C	-25 ~ 43						
	Heating Water Temperature Range		°C	20 ~ 75						
	Cooling Water Temperature Range		°C	7 ~ 25						
Refrigerant side	Refrigerant	Type / Amount	- / kg	R290 / 0,85	R290 / 0,9	R290 / 1,2	R290 / 1,2	R290 / 1.75	R290 / 1,75	R290 / 1,9
	Rotary Compressor	Quantity		1						
	Four-way valve + EEV			Sanhua						
	Fan	Quantity		1				2		
		Airflow	m³/h	2850	3280	3300	3300	6300	6300	6300
		Rated Power	W	62	116	172	172	62 x 2	62 x 2	62 x 2
Water Side	Plate Heat Exchanger	Quantity		1						
	Piping Connection		Inch	G1"				G1-1/4"		
	Allowable Water Flow - Min./Rated/Max.		l/s	0.17/0,24/0,31	0,27/0,38/0,50	0,40/0,57/0,75	0,40/0,57/0,75	0.50/0.72/0.93	0,50/0,72/0,93	0,67/0,96/1,24
			l/min	10,2/14,4/18,6	16,2/22,8/30	24/34,2/45	24/34,2/45	30/43.2/55.8	30/43,2/55,8	40,2/57,6/74.4
			m³/h	0,61/0,86/1,12	0,97/1,37/1.8	1,44/2,05/2,7	1.44/2.05/2.7	1.8/2.59/3.35	1,8/2,59/3,35	2,41/3,46/4,46
	Water Flow Meter			Vortex						
	Circulation Pump (Head, m)			Grundfos (9)						Grundfos (12)
Dimensions	Net Dimensions (W x D x H)		mm	1258x440x830	1260x395x1030	1260x395x1030	1260x395x1030	1260x420x1550	1260x420x1550	1347x442x1458
	Net Weight		kg	110	125	140	155	200	215	230

*The selection of power supply cable cross-sectional areas shall comply with local electrical safety requirements.
Specifications are subject to change without notice. For actual device specifications, see the stickers on the device.

HLT206MONO1S / HLT209MONO1S / HLT212MONO1(3)S



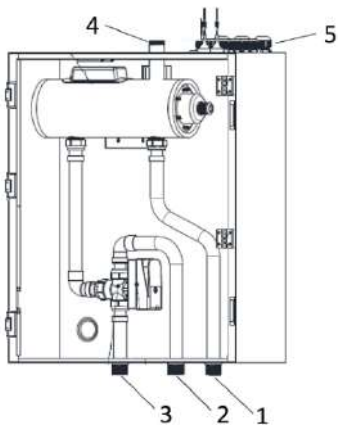
HLT216MONO3S / HLT220MONO3S



4.2 Indoor units' specifications

4.2.1 Indoor unit without DHW tank

Indoor Unit Model without DHW tank			HLT293S						
Compatible Outdoor Units			HLT206 MONO1S	HLT209 MONO1S	HLT212 MONO1S	HLT212 MONO3S	HLT216 MONO1S	HLT216 MONO3S	HLT220 MONO3S
Power Supply		V/Hz/Ph	380-415/50/3						
Circuit Breaker		A	C16						
Power Cable		mm²	5x2,5						
Backup Heater		kW	9 (3+6)						
Sound Pressure Level 1m		dB(A)	20						
3-way Diverting Valve			LK Systems						
Water Side	Piping Connection	Inch	G1"						
	Water Pressure Drop	kPa	22						
	Water Temperature Range	°C	7 ~ 75						
Dimensions	Net Dimensions (L x D x H)	mm	550x260x650						
	Net Weight	kg	32						
Specifications are subject to change without notice. For actual device specifications, see. See the stickers on the device.									

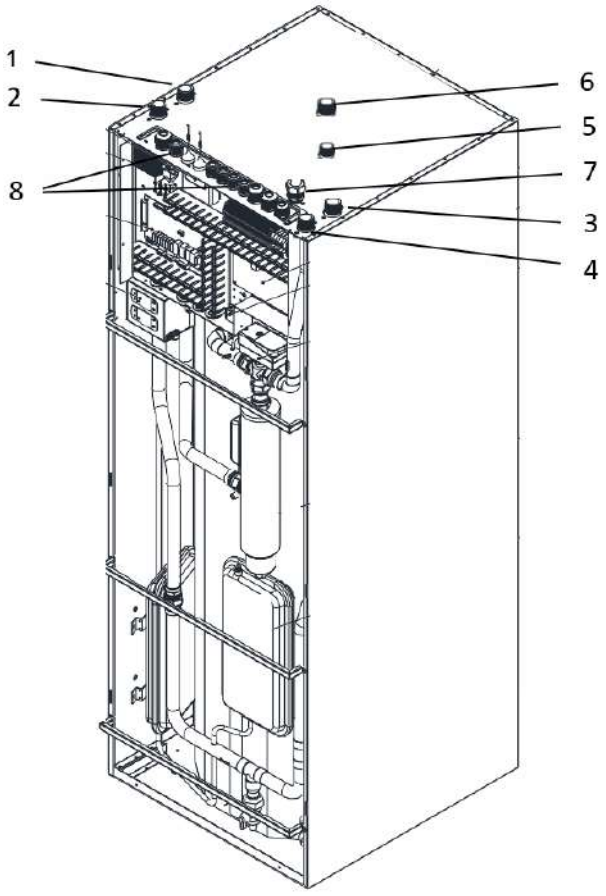


No	Name
1	From outdoor unit
2	To heating/cooling system
3	To DHW
4	Safety group connection
5	Cable glands

4.2.2 Indoor unit with DHW tank

Indoor Unit Model with DHW tank				HLT293S/250						
Compatible Outdoor Units				HLT206 MONO1S	HLT209 MONO1S	HLT212 MONO1S	HLT212 MONO3S	HLT216 MONO1S	HLT216 MONO3S	HLT220 MONO3S
Power Supply			V/Hz/Ph	380-415/50/3						
Circuit Breaker			A	C16						
Power Cable*			mm²	5x2,5						
Backup Heater			kW	9 (3+6)						
Sound Pressure Level 1m			dB (A)	20						
3-way Diverting Valve				LK Systems						
Expansion vessel			l	10 (2 x 5)						
DHW tank		Volume	l	250						
		Material		Duplex 2205 SS						
Water Side	Piping Connection		Inch	G1"						
	DHW Inlet Connection		Inch	G3/4"						
	DHW Outlet Connection		Inch	G1"						
	Water Temperature Range		°C	7 ~ 75						
Dimensions	Net Dimensions (L x D x H)		mm	600x710x1720						
	Net Weight		kg	115						

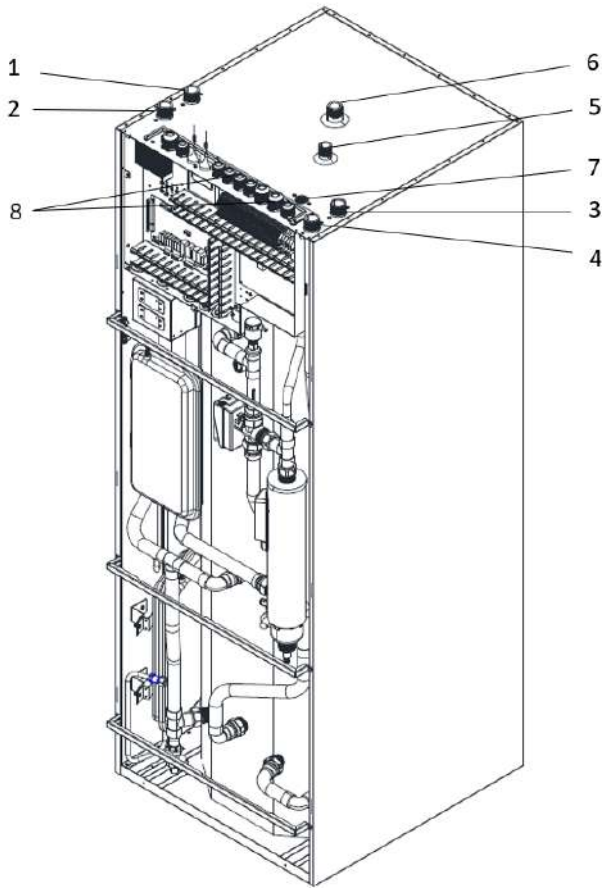
*The selection of power supply cable cross-sectional areas shall comply with local electrical safety requirements.
Specifications are subject to change without notice. For actual device specifications, see the stickers on the device.



No	Name
1	From outdoor unit
2	To outdoor unit
3	From system
4	To system
5	Cold water supply
6	To DHW system
7	Safety group connection
8	Cable glands

4.2.3 Indoor unit with DHW and buffer tanks

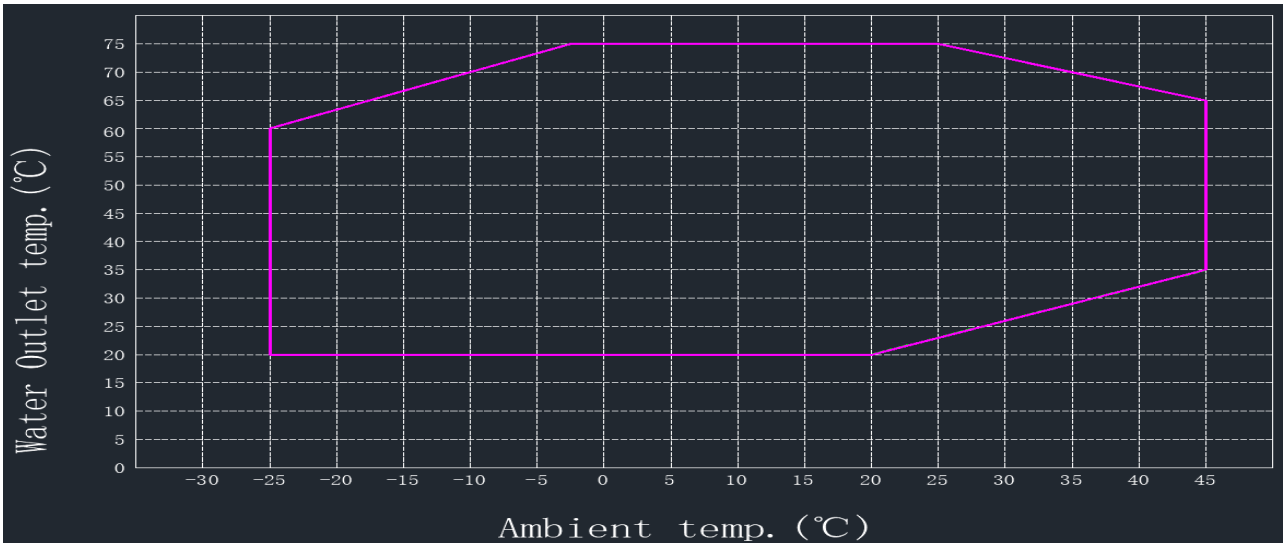
Indoor Unit with DHW and Buffer Tanks				HLT293S/200B50			
Compatible Outdoor Units				HLT206 MONO1S	HLT209 MONO1S	HLT212 MONO1S	HLT212 MONO3S
Power Supply			V/Hz/Ph	380-415/50/3			
Circuit Breaker			A	C16			
Power Cable*			mm²	5x2,5			
Backup Heater			kW	9 (3+6)			
Sound Pressure Level 1m			dB (A)	20			
3-way Diverting Valve				LK Systems			
Expansion vessel			l	10 (2 x 5)			
DHW tank		Volume	l	200			
		Material		Duplex 2205 SS			
Buffer tank		Volume	l	50			
		Material		Duplex 2205 SS			
Water Side	Piping Connection		Inch	G1"			
	DHW Inlet Connection		Inch	G3/4"			
	DHW Outlet Connection		Inch	G1"			
	Water Temperature Range		°C	7 ~ 75			
Dimensions	Net Dimensions (L x D x H)		mm	600x710x1720			
	Net Weight		kg	160			
*The selection of power supply cable cross-sectional areas shall comply with local electrical safety requirements. Specifications are subject to change without notice. For actual device specifications, see the stickers on the device.							



No	Name
1	From outdoor unit
2	To outdoor unit
3	From system
4	To system
5	Cold water supply
6	To DHW system
7	Safety group connection
8	Cable glands

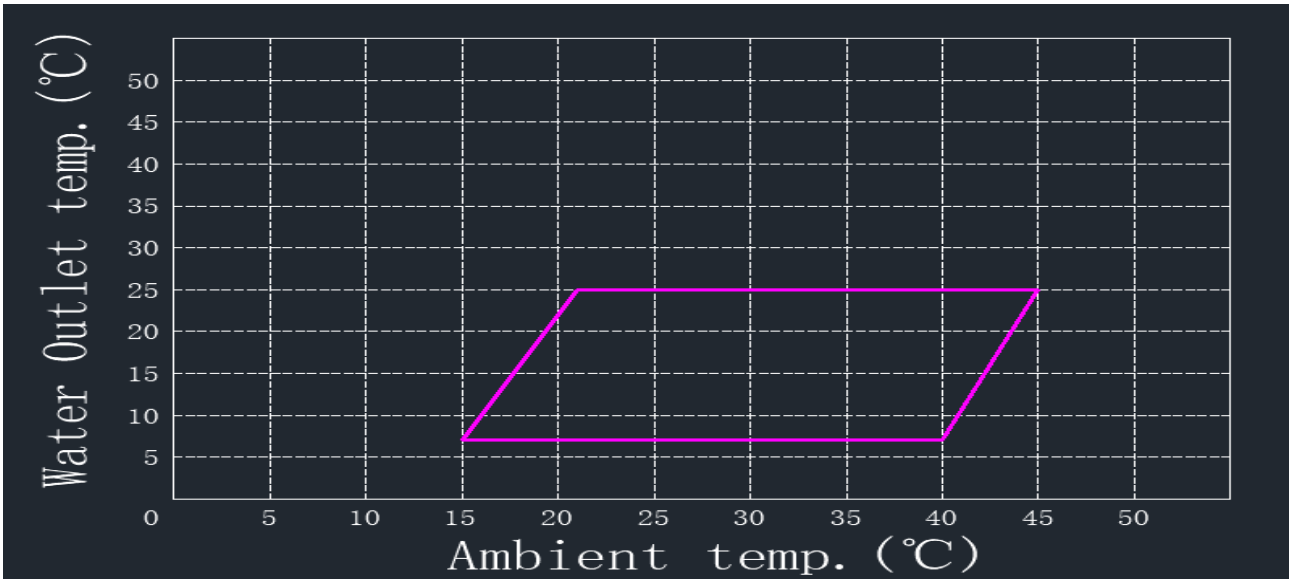
4.3 Heat pump operating ranges

4.3.1 Heating/DHW modes



Note: When the heat pump is in heating operation or hot water operation, in order to ensure the safe operation of the compressor system. The permissible working water temperature is different. The unit is only allowed to work at the maximum working water temperature between -3 ℃ and 25 ℃.

4.3.2 Cooling mode

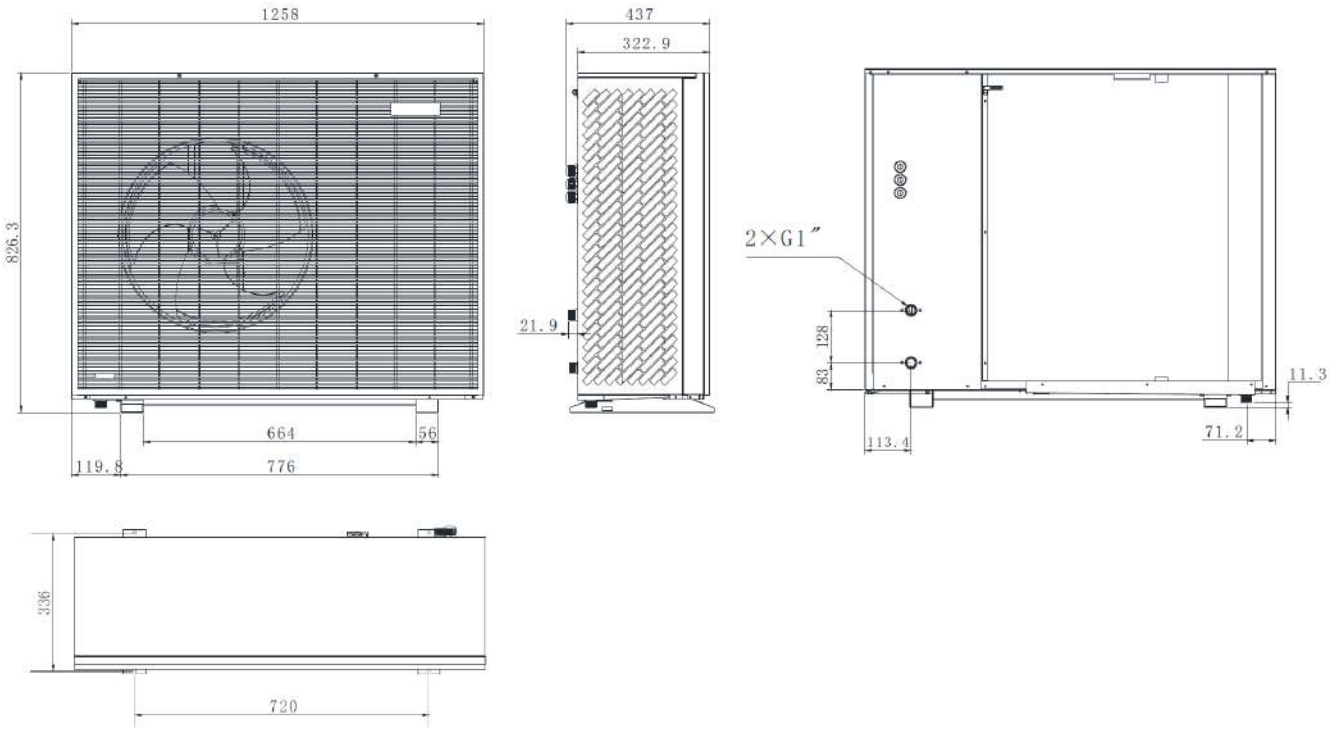


5. DRAWINGS

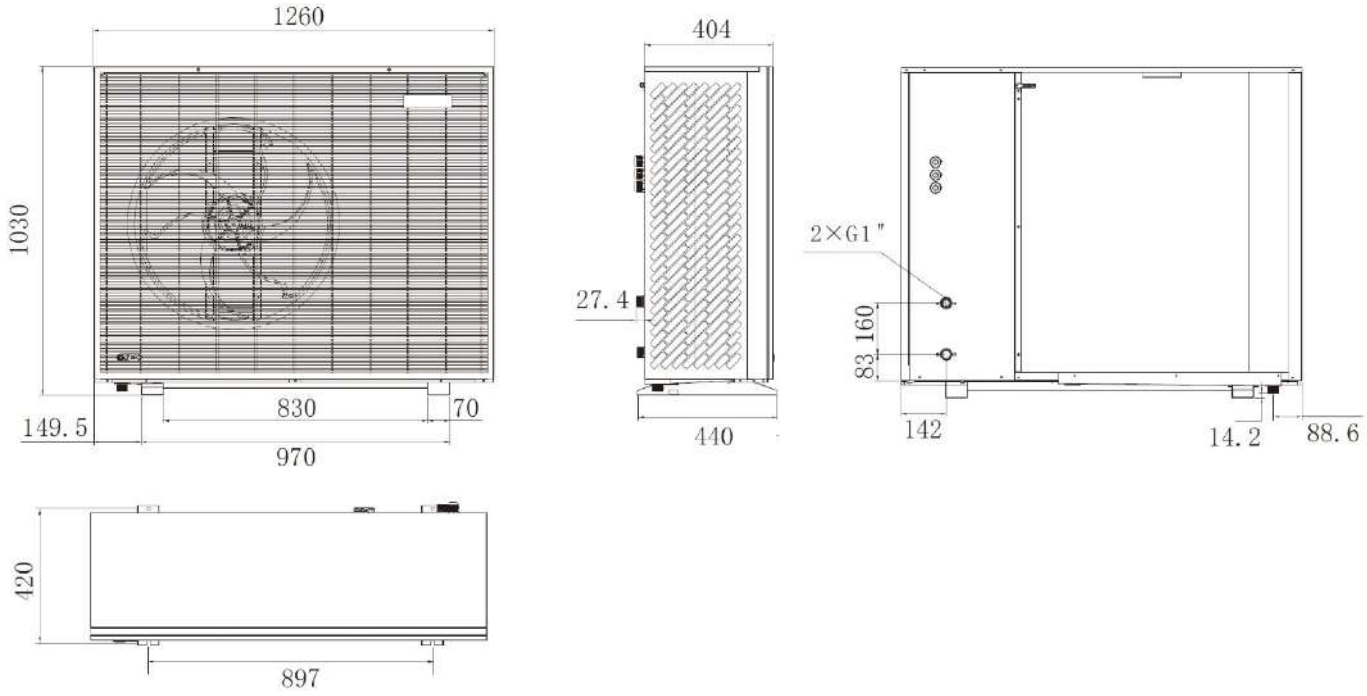
5.1 Three-view dimensions

5.1.1 Outdoor units

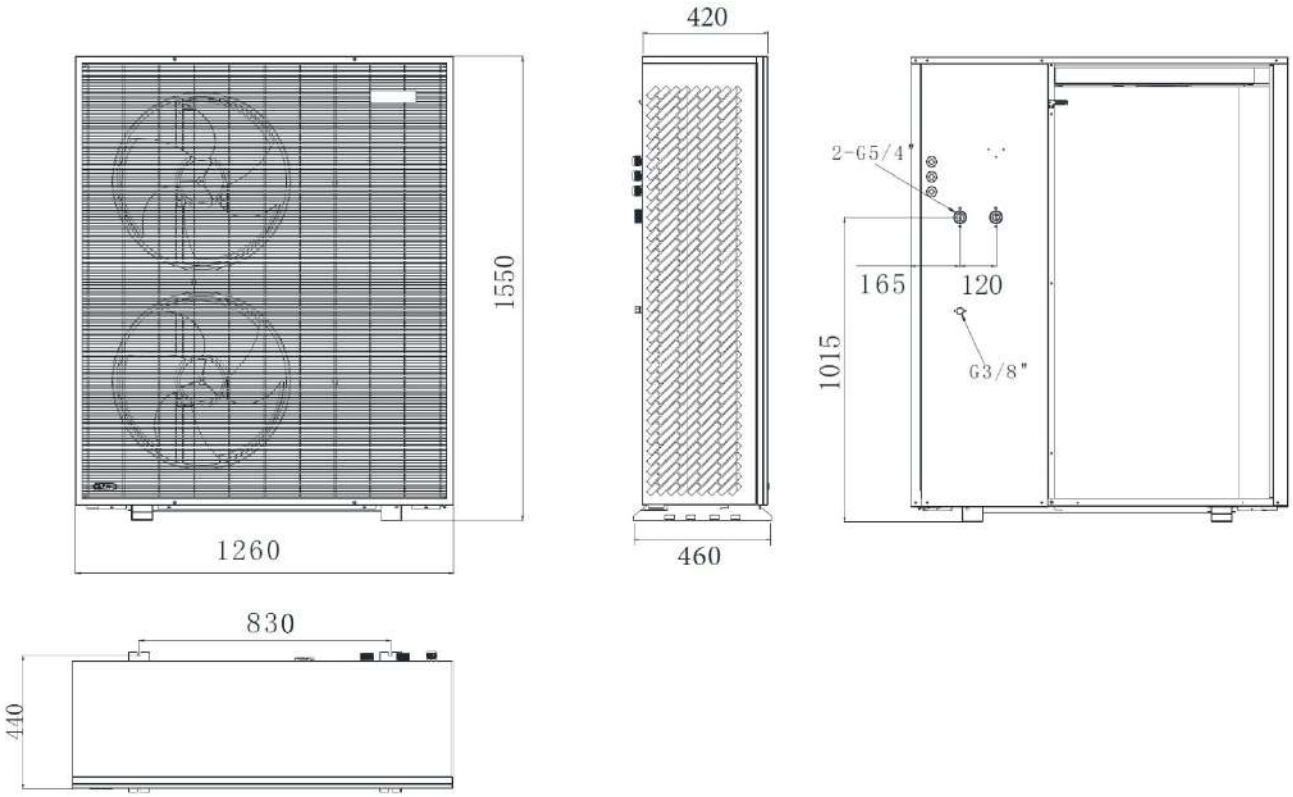
HLT206MONO1S



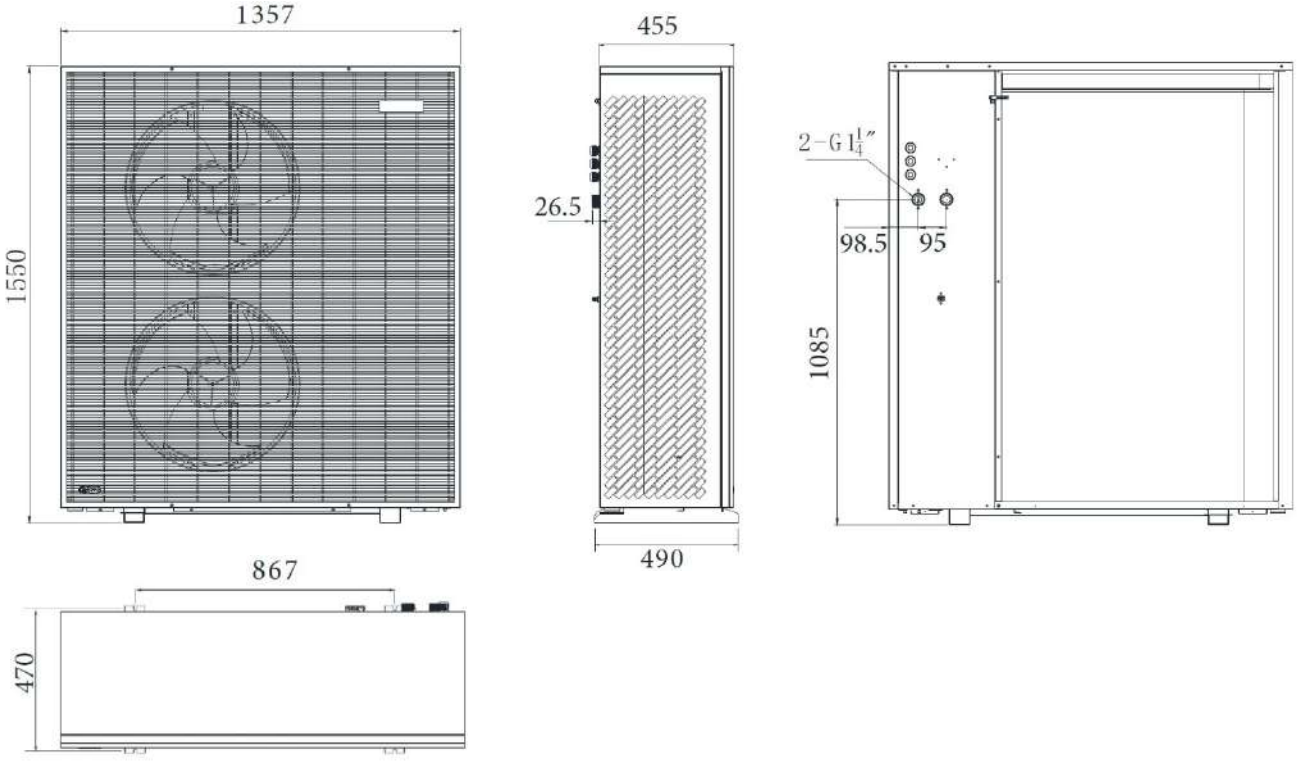
HLT209MONO1S / HLT212MONO1(3)S



HLT216MONO3S

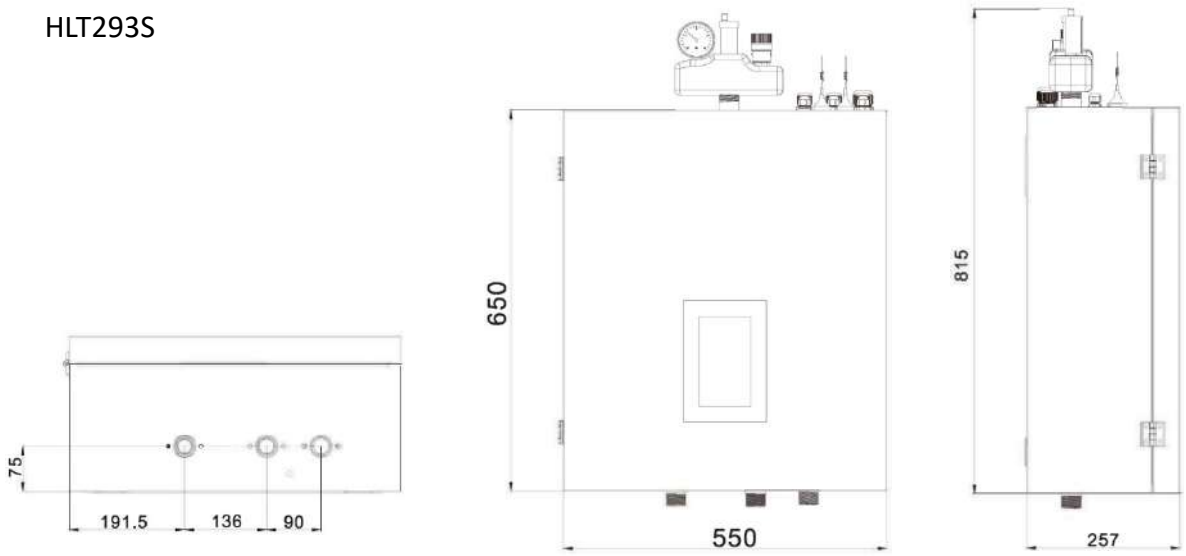


HLT220MONO3S



5.1.2 Indoor units

HLT293S

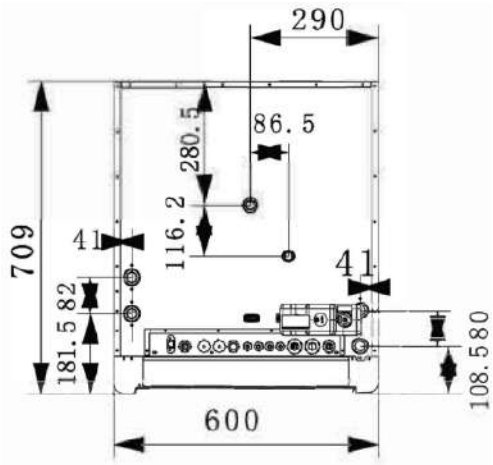


HLT293S/250

HLT293S/200B50



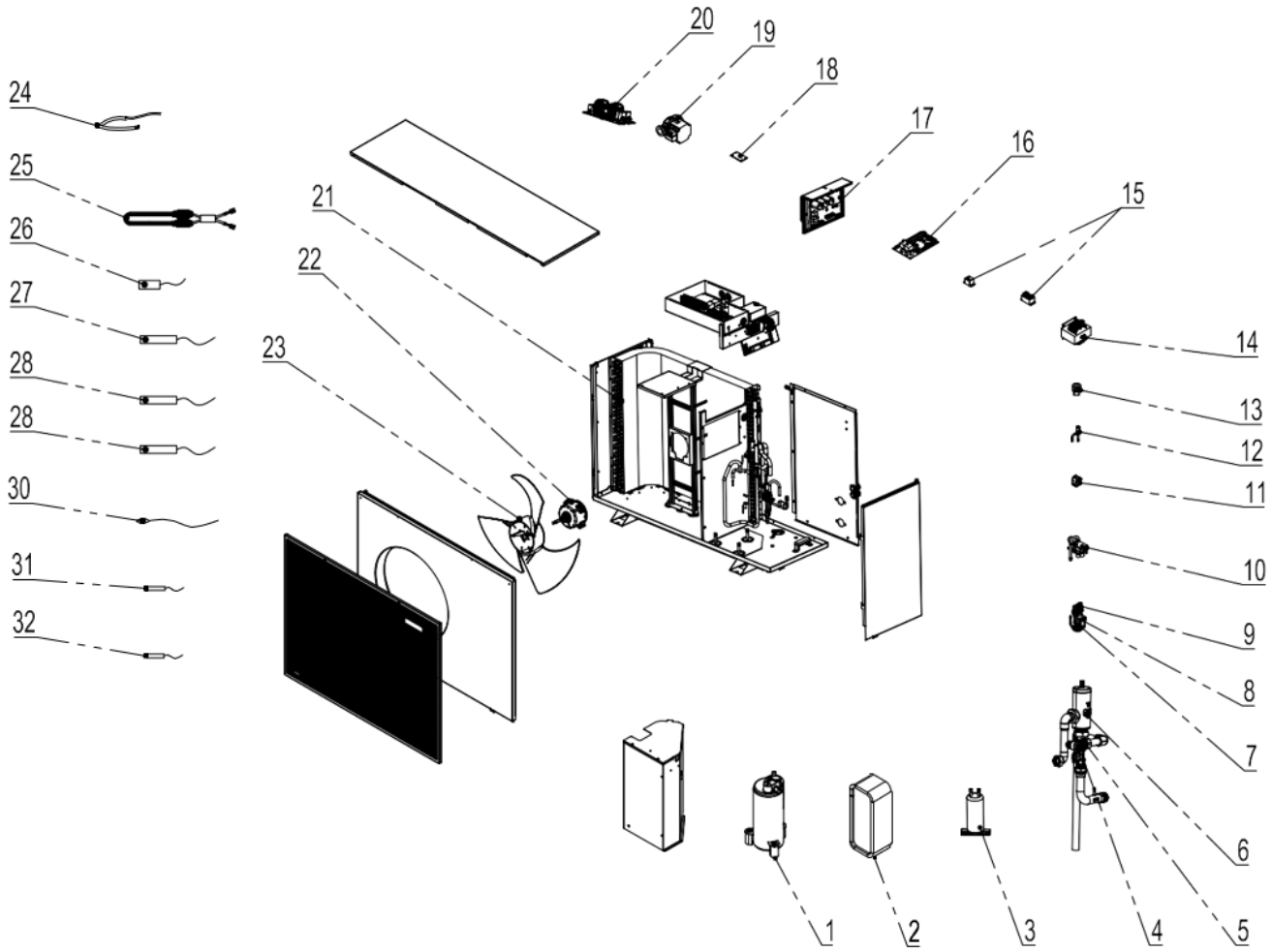
NOTE. Device height with installed safety group - 2010mm.



5.2 Exploded-view diagrams

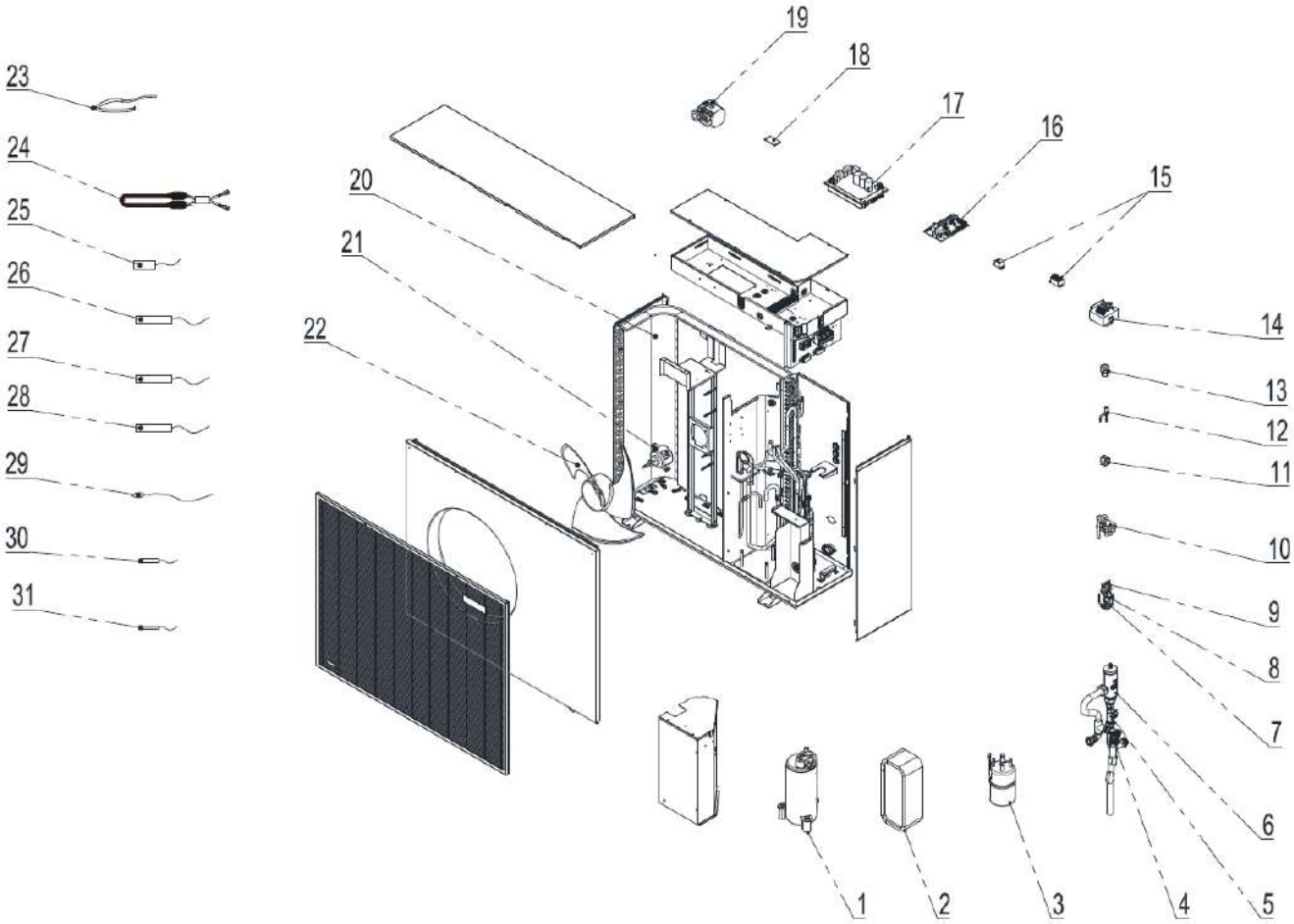
5.2.1 Outdoor units

HLT206MONO1S



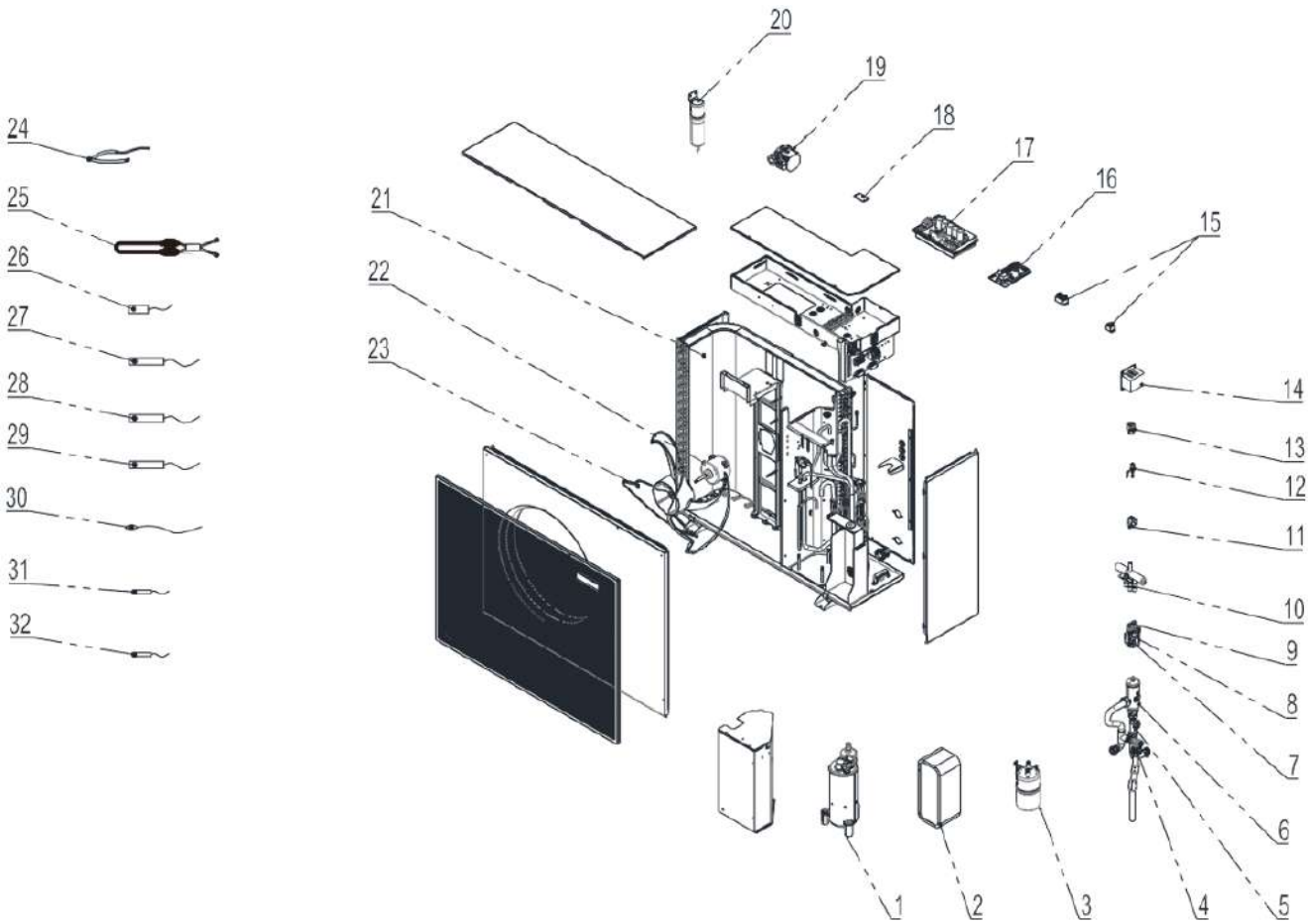
No	Name	No	Name	No	Name
1	Compressor	12	EEV	23	Fan blade
2	Plate heat exchanger	13	Coil of EEV	24	Compressor crankcase electric heater
3	Gas-liquid separator	14	Reactor	25	Bottom plate electric heater
4	Safety valve	15	Relay	26	Air discharge temperature sensor
5	Vortex flow sensor	16	Main PCB	27	Air return temperature sensor
6	Gas separator	17	Drive PCB	28	Outer coil temperature sensor
7	High pressure sensor	18	Thermostat PCB	29	Inner coil temperature sensor
8	High pressure switch	19	Water pump	30	Ambient temperature sensor
9	Low pressure sensor	20	Filter PCB	31	Inlet water temperature sensor
10	Four-way valve	21	Evaporator	32	Outlet water temperature sensor
11	Coil of four-way valve	22	Fan motor		

HLT209MONO1S



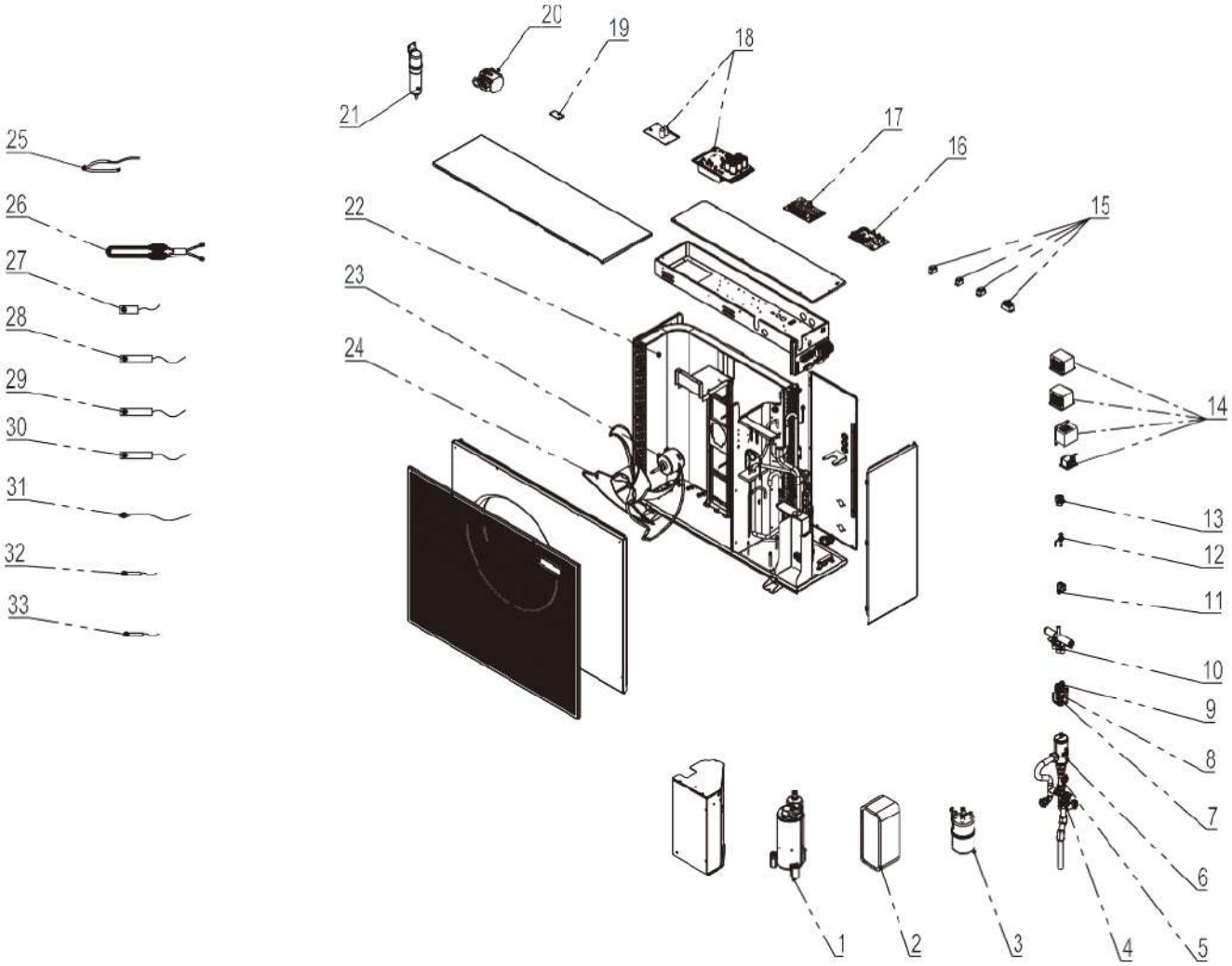
No	Name	No	Name	No	Name
1	Compressor	12	EEV	23	Compressor crankcase electric heater
2	Plate heat exchanger	13	Coil of EEV	24	Bottom plate electric heater
3	Gas-liquid separator	14	Reactor	25	Air discharge temperature sensor
4	Safety valve	15	Relay	26	Air return temperature sensor
5	Vortex flow sensor	16	Main PCB	27	Outer coil temperature sensor
6	Gas separator	17	Drive PCB	28	Inner coil temperature sensor
7	High pressure sensor	18	Thermostat PCB	29	Ambient temperature sensor
8	High pressure switch	19	Water pump	30	Inlet water temperature sensor
9	Low pressure sensor	20	Evaporator	31	Outlet water temperature sensor
10	Four-way valve	21	Fan motor		
11	Coil of four-way valve	22	Fan blade		

HLT212MONO1S



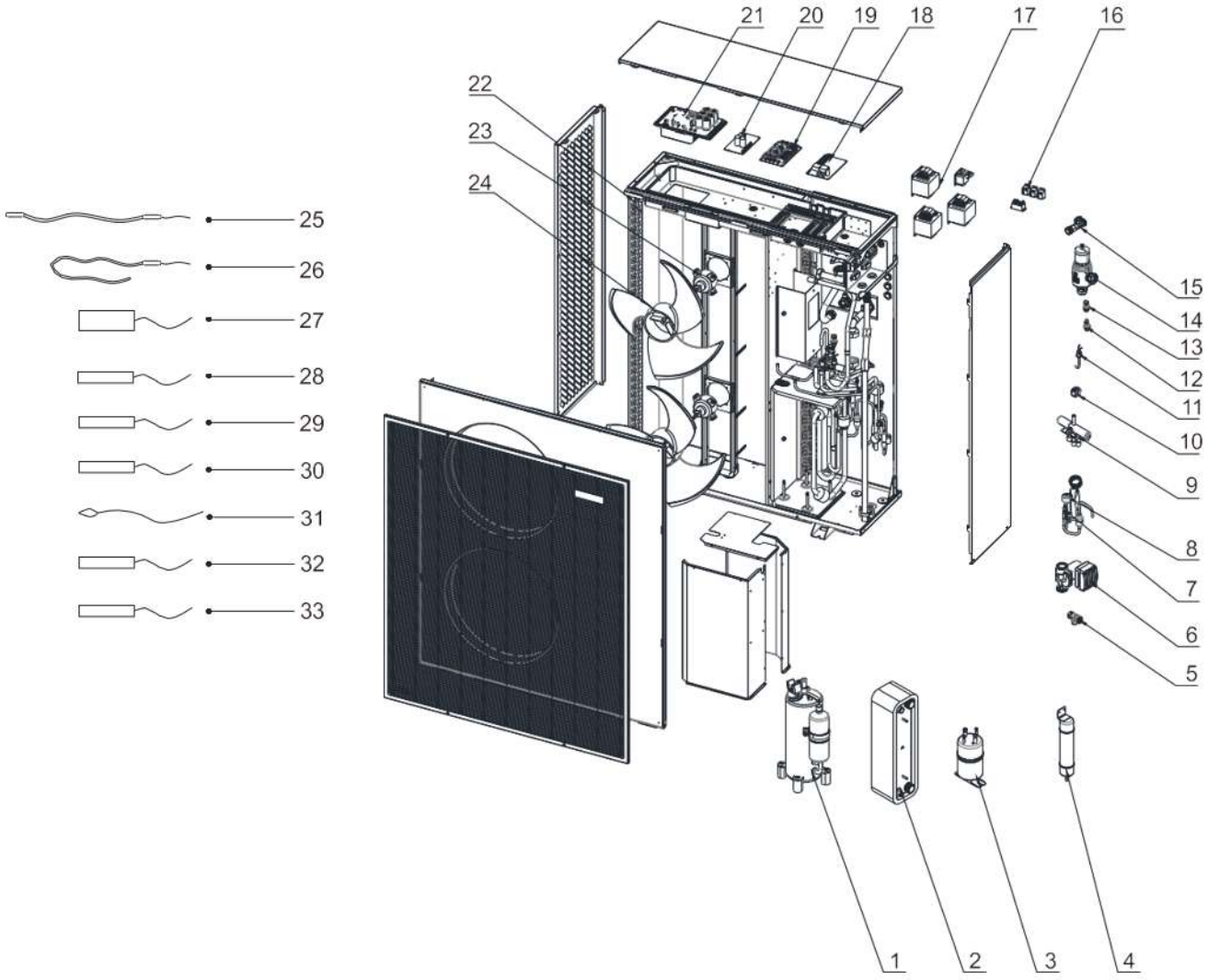
No	Name	No	Name	No	Name
1	Compressor	12	EEV	23	Fan blade
2	Plate heat exchanger	13	Coil of EEV	24	Compressor crankcase electric heater
3	Gas-liquid separator	14	Reactor	25	Bottom plate electric heater
4	Safety valve	15	Relay	26	Air discharge temperature sensor
5	Vortex flow sensor	16	Main PCB	27	Air return temperature sensor
6	Gas separator	17	Drive PCB	28	Outer coil temperature sensor
7	High pressure sensor	18	Thermostat PCB	29	Inner coil temperature sensor
8	High pressure switch	19	Water pump	30	Ambient temperature sensor
9	Low pressure sensor	20	Reservoir	31	Inlet water temperature sensor
10	Four-way valve	21	Evaporator	32	Outlet water temperature sensor
11	Coil of four-way valve	22	Fan motor		

HLT212MONO3S



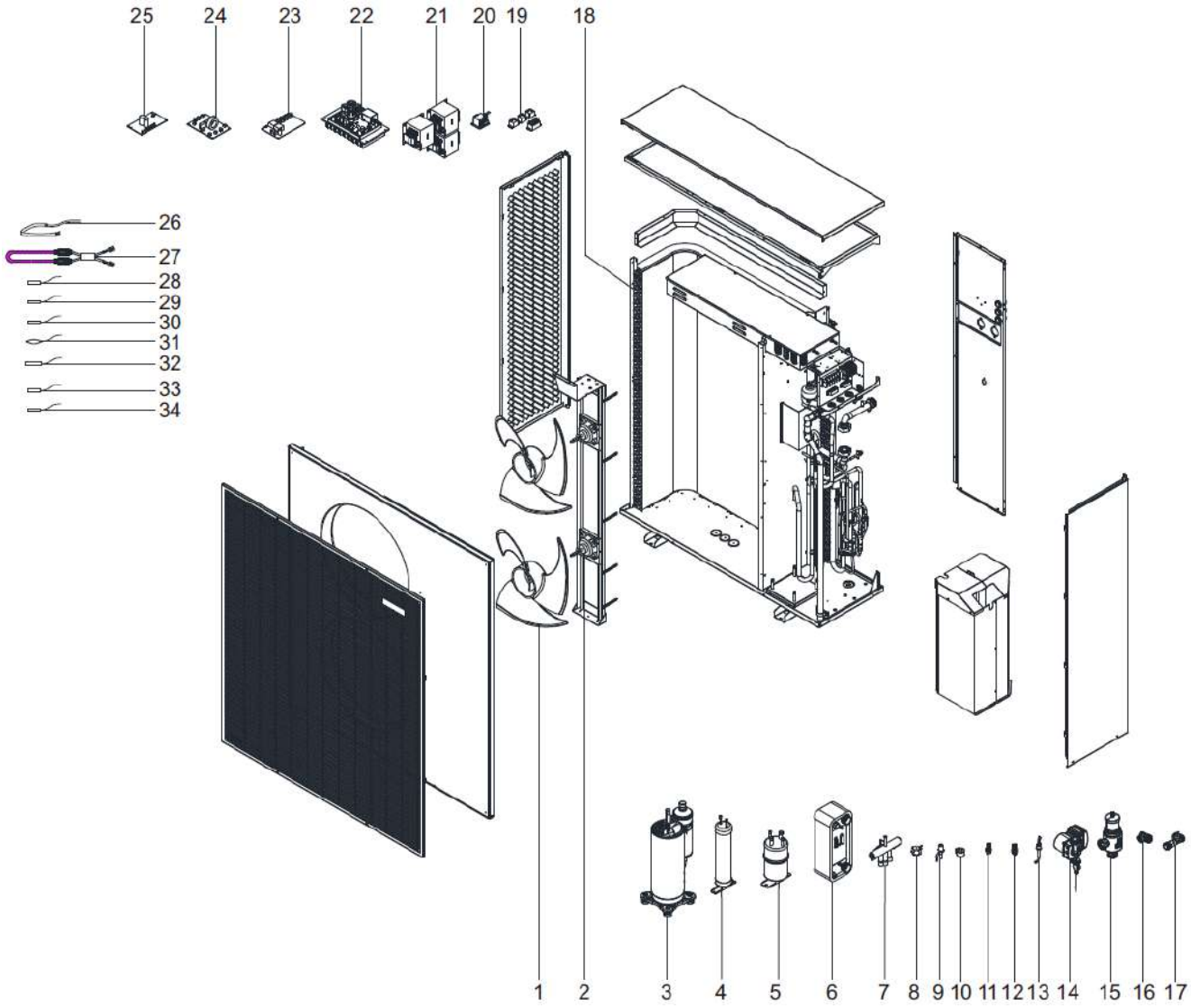
No	Name	No	Name	No	Name
1	Compressor	12	EEV	23	Fan motor
2	Plate heat exchanger	13	Coil of EEV	24	Fan blade
3	Gas-liquid separator	14	Reactor	25	Compressor crankcase electric heater
4	Safety valve	15	Relay	26	Bottom plate electric heater
5	Vortex flow sensor	16	Main PCB	27	Air discharge temperature sensor
6	Gas separator	17	Filter PCB	28	Air return temperature sensor
7	High pressure sensor	18	Drive PCB	29	Outer coil temperature sensor
8	High pressure switch	19	Thermostat PCB	30	Inner coil temperature sensor
9	Low pressure sensor	20	Water pump	31	Ambient temperature sensor
10	Four-way valve	21	Reservoir	32	Inlet water temperature sensor
11	Coil of four-way valve	22	Evaporator	33	Outlet water temperature sensor

HLT216MONO3S



No	Name	No	Name	No	Name
1	Compressor	12	High pressure sensor	23	Fan motor
2	Plate heat exchanger	13	Low pressure sensor	24	Fan blade
3	Gas-liquid separator	14	Gas separator	25	Bottom plate electric heater
4	Reservoir	15	Vortex flow sensor	26	Compressor crankcase electric heater
5	Safety valve	16	Reactor	27	Air discharge temperature sensor
6	Water pump	17	Relay	28	Air return temperature sensor
7	EEV	18	Main PCB	29	Outer coil temperature sensor
8	Coil of EEV	19	Filter PCB	30	Inner coil temperature sensor
9	Four-way valve	20	Fan drive PCB	31	Ambient temperature sensor
10	Coil of four-way valve	21	Drive PCB	32	Inlet water temperature sensor
11	High pressure switch	22	Evaporator	33	Outlet water temperature sensor

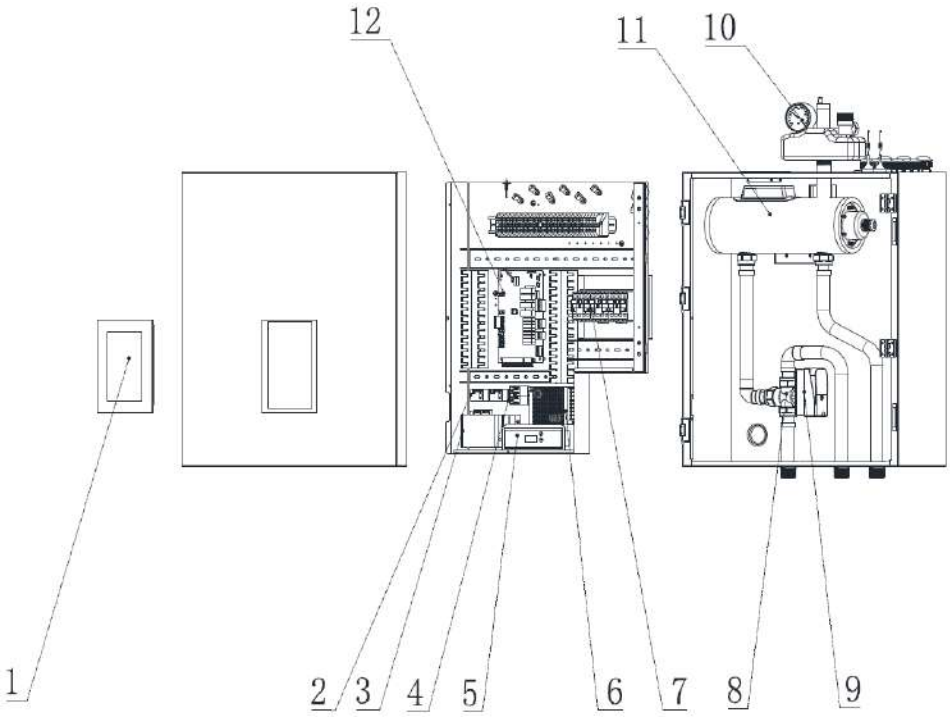
HLT220MONO3S



No	Name	No	Name	No	Name
1	Fan blade	13	High pressure switch	25	Fan drive PCB
2	Fan motor	14	Water pump	26	Compressor crankcase electric heater
3	Compressor	15	Gas separator	27	Bottom plate electric heater
4	Reservoir	16	Safety valve	28	Outer coil temperature sensor
5	Gas-liquid separator	17	Vortex flow sensor	29	Inner coil temperature sensor
6	Plate heat exchanger	18	Evaporator	30	Air return temperature sensor
7	Four-way valve	19	Relay	31	Ambient temperature sensor
8	Coil of four-way valve	20	Reactor	32	Air discharge temperature sensor
9	EEV	21		33	Inlet water temperature sensor
10	Coil of EEV	22	Drive PCB	34	Outlet water temperature sensor
11	Low pressure sensor	23	Main PCB		
12	High pressure sensor	24	Filter PCB		

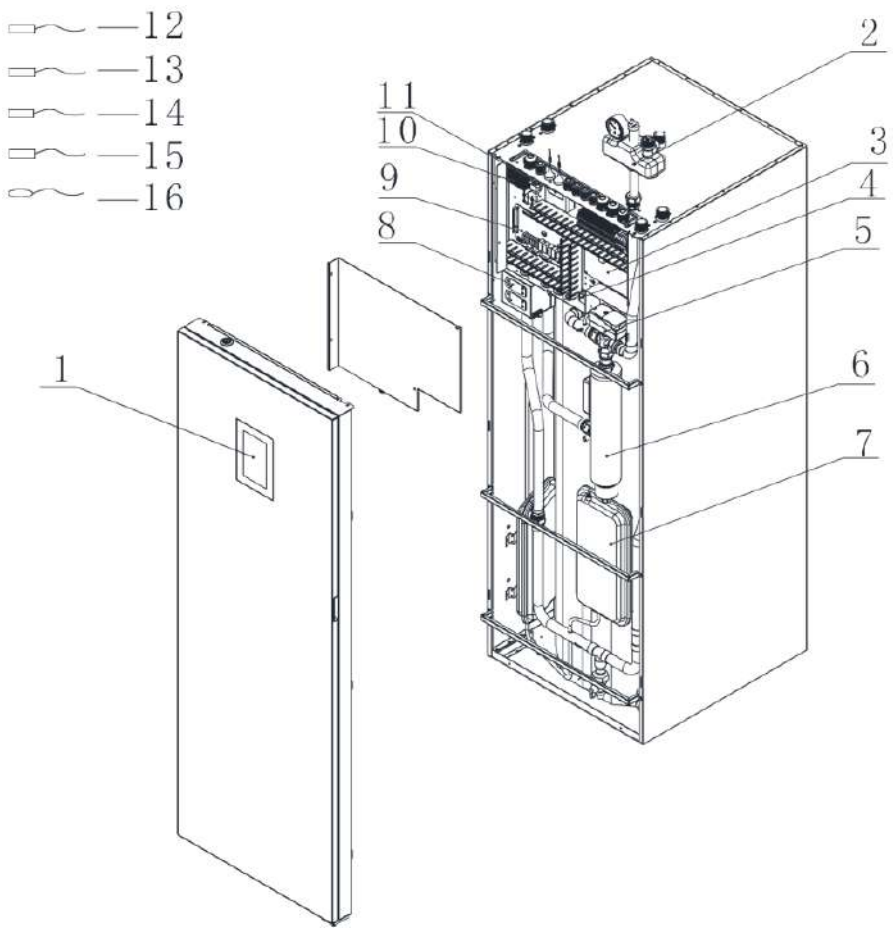
5.2.2 Indoor units

HLT293S



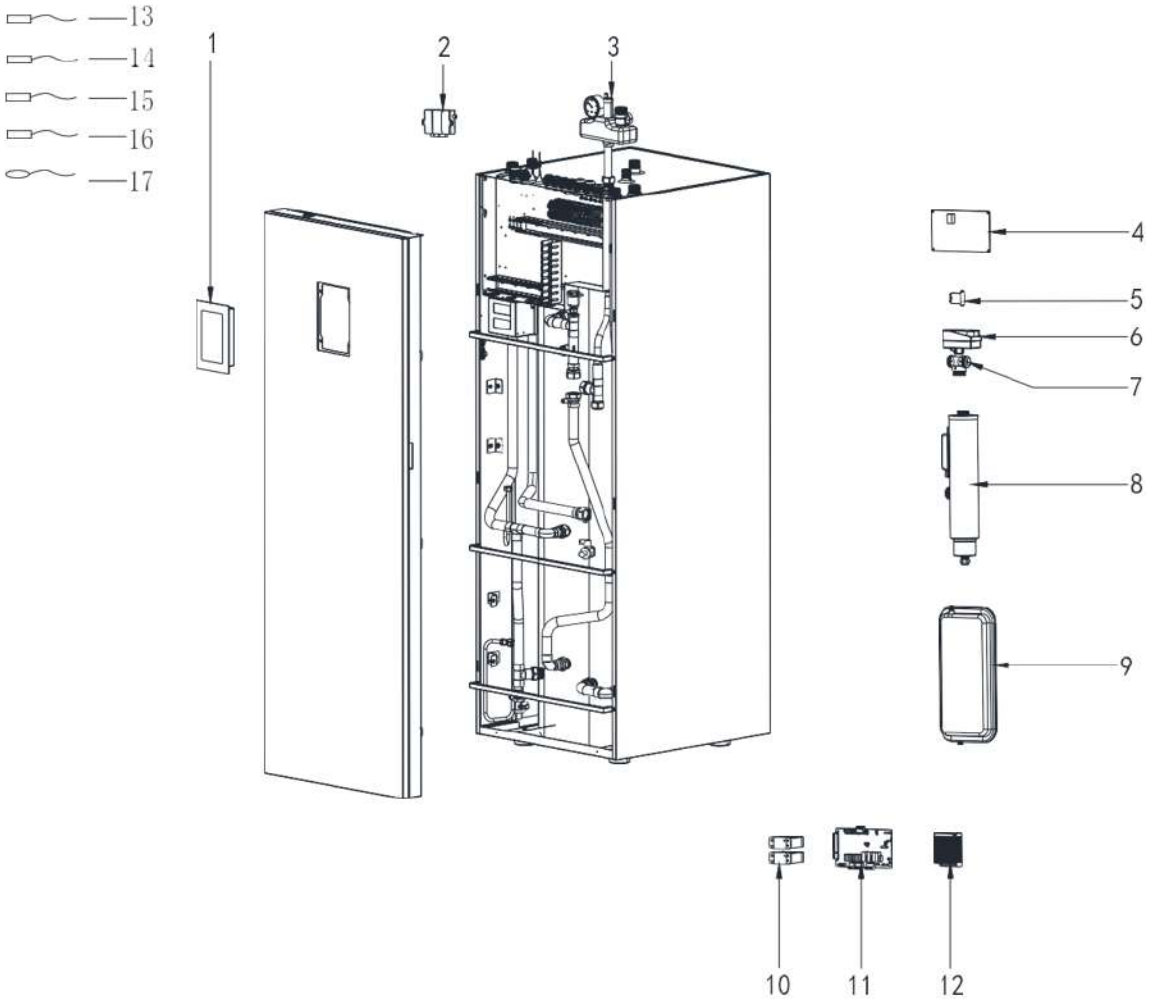
No	Name	No	Name
1	Operation panel	7	AC contactor
2	Relay 1	8	3-way valve
3	WiFi / 4G module	9	Coil of 3-way valve
4	Relay 2	10	Safety group
5	Digital thermostat for heating	11	Electric backup heater 9kW
6	AC-DC converter	12	Indoor main PCB

HLT293S/250



No	Name	No	Name
1	Operation panel	9	Indoor main PCB
2	Safety group	10	AC-DC converter
3	Relay PCB	11	WiFi / 4G module
4	Relay	12	DHW temperature sensor (TW)
5	3-way valve with coil	13	Heating/Cooling temperature sensor (TC)
6	Electric backup heater 9kW	14	Mixing water temperature sensor (TV1)
7	Expansion vessel	15	Mixing water temperature sensor (TV2)
8	Digital thermostats for heating and DHW	16	Room temperature sensor (TR)

HLT293S/200B50



No	Name	No	Name
1	Operation panel	10	Digital thermostats for heating and DHW
2	WiFi / 4G module	11	Indoor main PCB
3	Safety group	12	AC-DC converter
4	Relay PCB	13	DHW temperature sensor (TW)
5	Relay	14	Heating/Cooling temperature sensor (TC)
6	Coil of 3-way valve	15	Mixing water temperature sensor (TV1)
7	3-way valve	16	Mixing water temperature sensor (TV2)
8	Electric backup heater 9kW	17	Room temperature sensor (TR)
9	Expansion vessel		

6. ACCESSORIES

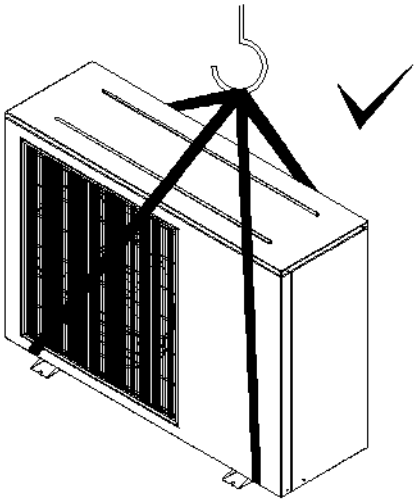
The following accessories are packed with the product, please check them in time. If there is any shortage or damage, please contact your local dealer.

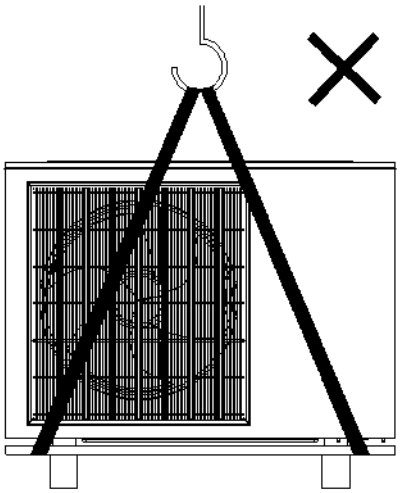
Name	HLT293S	HLT293S/250	HLT293S/200B50
User's manual	1	1	1
Safety valve assembly	1	1	1
Water connector	-	1	1
Drain pipe	1	-	-
TC - water temp. sensor for cooling and heating	1	1	-
TW - water temp. sensor for DHW	1	-	-
TV1 - water temp. sensor after mixture valve 1	1	1	1
TV2 - water temp. sensor after mixture valve 2	1	1	1
TR - room temp. sensor	1	1	1
Extension cable for temperature sensor (10m)	5	4	3
Indoor - Outdoor unit communication cable	1	1	1
Wi-Fi / 4G antennas	2	2	2
Ground wire screw	2	2	2
Indoor unit installation back panel	1	-	-
Mounting screws	2	-	-

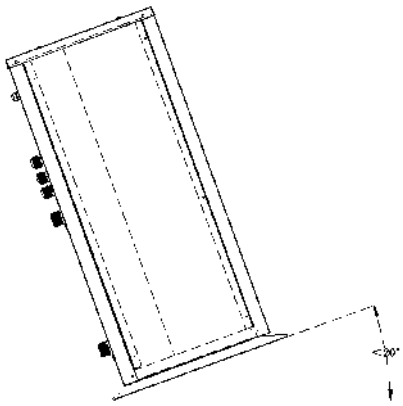
7. HANDLING REQUIREMENTS

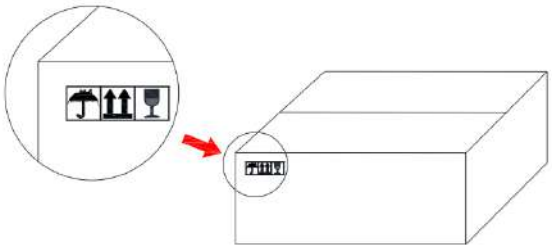
1. Ensure that the unit is kept in an upright position and securely fastened to prevent excessive movement or vibration during secondary transportation.
2. During unloading, it is recommended to use a suitable refrigerant leak detector to check for possible leakage. If a leak is detected, ventilate the area thoroughly and continue handling only after the refrigerant concentration has been reduced to a safe level. Smoking and any other potential ignition sources are strictly prohibited during handling.
3. When transporting the indoor unit, handle it with care. Do not place heavy or sharp objects on the unit, as they may damage the glass surface.
4. Unit lifting: Lift the heat pump in a stable and controlled manner to prevent excessive tilting. Avoid contact with surrounding objects during lifting. The lifting slings or ropes must have a load capacity of at least three times the weight of the unit. Secure the lifting hooks or slings at the designated lifting points and maintain a lifting angle greater than 60°. During installation and lifting, use suitable slings to secure the integrated unit. As the compressor side of the unit is heavier than the heat exchanger and fan side, take particular care to prevent the unit from tilting or overturning.

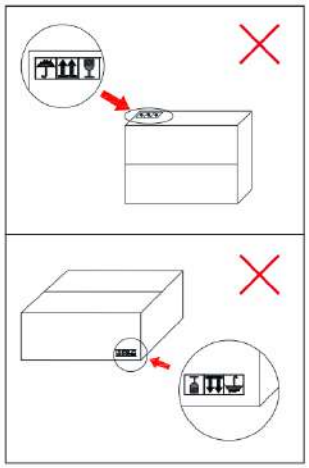
Note: Do not stand or work underneath the suspended unit. Place suitable soft protective material between the lifting slings and the unit to prevent damage to the casing.

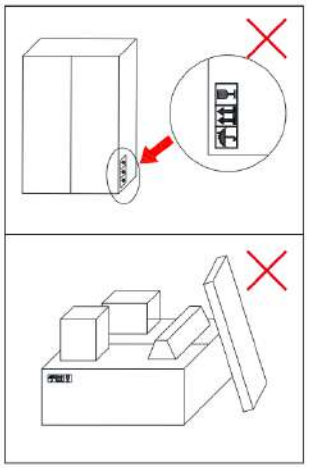












8. INSTALLATION REQUIREMENTS

8.1 Precautions for outdoor unit installation

8.1.1 Selection of outdoor unit installation position

1. The outdoor unit should preferably be installed in an open, well-ventilated location, such as at ground level, on a roof, or on a balcony. Avoid enclosed spaces that may restrict airflow and reduce heat exchange performance.

2. If the unit is installed on an elevated platform, such as a roof, consider the local wind direction and wind loads. Suitable lightning protection measures should also be provided where required.

3. Install the unit as close as practical to the power supply and hydraulic connections to simplify electrical wiring and piping installation.

4. The installation location should be away from polluted areas, excessive dust, oil fumes, and sources of high-frequency electromagnetic interference.

5. Maintain the required minimum clearances between the unit and surrounding walls, structures, or other obstacles. If a rain shelter or canopy is installed, ensure that it does not restrict airflow through the air-side heat exchanger or reduce heat exchange performance.

6. The installation foundation or mounting frame must be solid, stable, and capable of supporting the operating weight of the unit. In areas exposed to strong winds or where additional securing is required, use suitable fixing bolts to prevent movement, vibration, and unnecessary mechanical noise.

7. If condensate drainage is required, install a suitable drain pan and/or drainage pipe to direct condensate safely to an appropriate drain or drainage channel.

8. Avoid air recirculation between the unit air outlet and air inlet, as this can significantly reduce performance. Ensure sufficient free space around the air inlet and outlet. If the available space is limited, a properly designed discharge air duct may be used to direct the outlet air away from the unit.

8.1.2 Installation diagram of outdoor unit position

Recommended installation distances for outdoor units

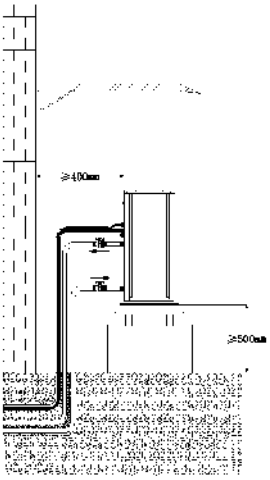


Figure 1

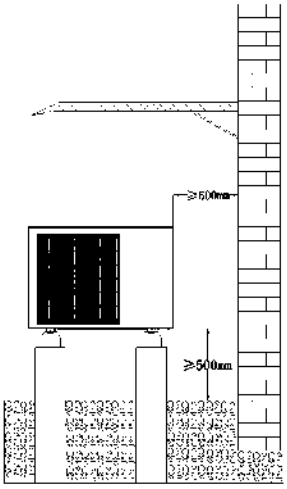


Figure 2

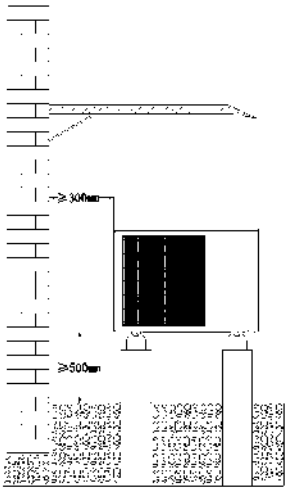
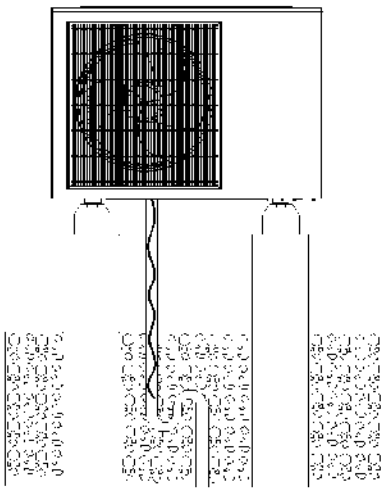


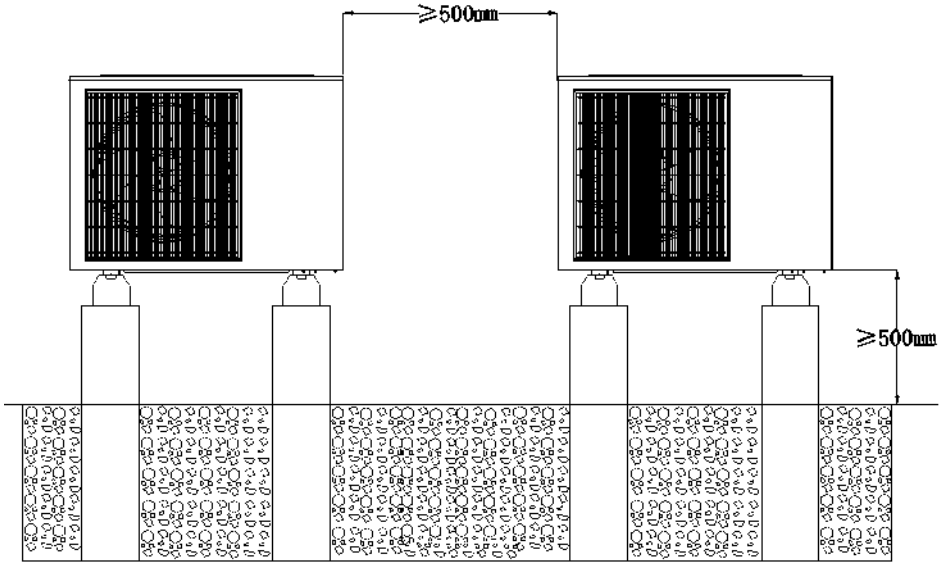
Figure3

1. Figure 1: The rear side of the unit faces the fence or wall. Maintain a minimum clearance of 400 mm between the unit and the wall, and install the unit at least 500 mm above ground level.
2. Figure 2: The service panel side of the unit faces the fence or wall. Maintain a minimum clearance of 500 mm between the unit and the wall, and install the unit at least 500 mm above ground level.
3. Figure 3: The left side of the unit faces the fence or wall. Maintain a minimum clearance of 300 mm between the unit and the wall, and install the unit at least 500 mm above ground level.

If centralized condensate drainage is required, install a suitable drain pan, drain pipe, and heating cable, as shown in the figure below.

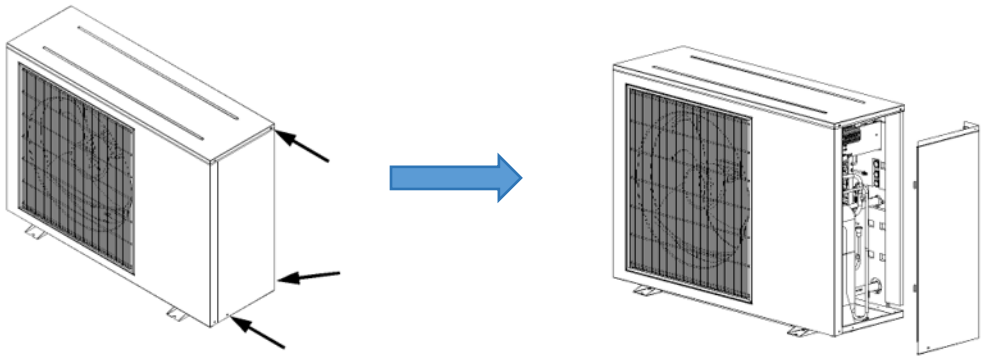


When multiple units are installed in the same area, the required minimum safety clearances between the units must also be maintained.



8.1.3 Unit disassembly and assembly instructions

1. Remove the maintenance panel of the outdoor unit.



2. Wire according to the wiring diagram (power cord, communication wire, and other functional wires).

8.2 Precautions for indoor unit installation

8.2.1 Selection of indoor unit installation position

1. Sufficient space should be reserved around the indoor unit for future maintenance and upkeep. Use the information below to determine the minimum clearance distances required for equipment servicing. A space of not less than 1m should be reserved in front of the indoor unit.

2. The indoor unit must be installed indoors. Optional locations include a dedicated computer room, enclosed balcony, basement, corridor, equipment room, or other indoor areas with ventilation and sufficient space. The ambient temperature should be 0 - 35°C, and the relative humidity should not exceed 80%. It should not be installed in an environment with volatile, corrosive, or flammable gases or liquids.

3. The installation surface must be flat, smooth, vertical, non - flammable, and must be able to bear the weight of the unit during operation.

4. The indoor unit cannot be installed in an environment with high oil stains, high fibers, or high dust.

5. The indoor unit cannot be installed in a place where electromagnetic waves can directly radiate to the electrical box. It should be kept away from electromagnetic wave radiation sources as much as possible, at least 3m or more.

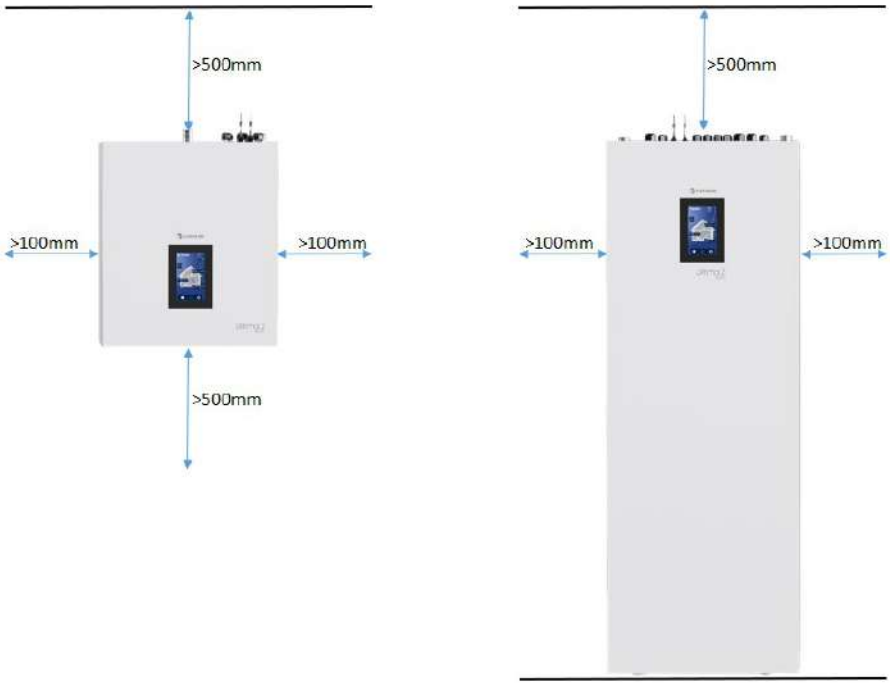
6. When installing the indoor unit, a level should be used for measurement, and the horizontal difference of the entire unit should not be greater than 5mm.

7. When installing the indoor unit by wall mounting, use expansion bolts with a specification not lower than M10. When installing the indoor unit by wall hanging, use the specified accessories and parts for installation. The main fixing parts must be fixed firmly without any looseness.

8. The indoor unit and the outdoor unit should be arranged as close as possible.

9. The installation position of the indoor unit should be as far away from bedrooms and rest rooms as possible to reduce the impact of noise on people's living and working.

Recommended installation distances for indoor units

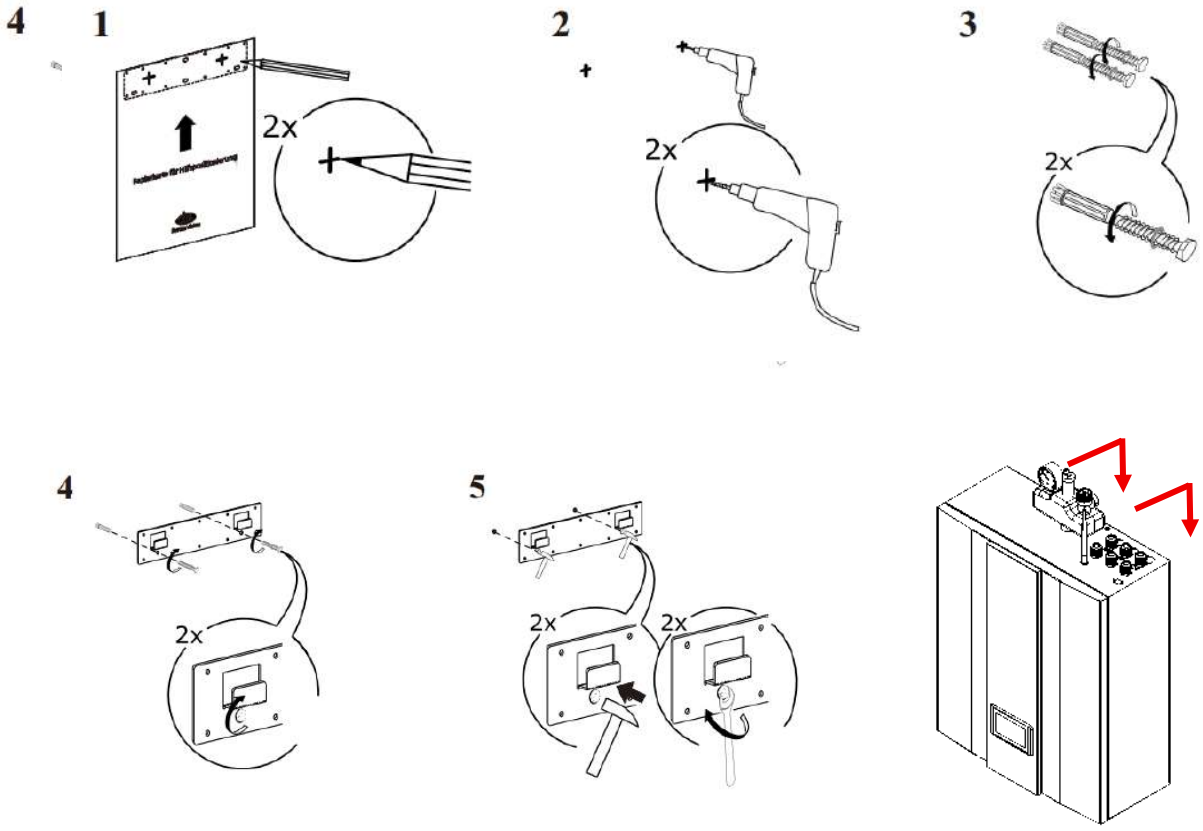


8.2.2 Unit Disassembly and Assembly Instructions

Install the Hanging Plate (Indoor without DHW tank)

1. Remove the expansion bolts and mounting plate from the accessory kit.
2. Position the mounting plate horizontally on the wall and mark the drilling points through the mounting holes.
3. Drill the holes for the expansion bolts.
4. Remove the nuts from the expansion bolts.
5. Loosely position the mounting plate on the expansion bolts. Do not fully tighten the nuts at this stage.
6. Insert the expansion bolts into the drilled holes using a hammer if necessary.
7. Tighten the nuts with a suitable wrench to securely fasten the mounting plate to the wall.
8. Hang the indoor unit on the mounting plate. Make sure the unit is properly seated and securely engaged with the mounting plate before releasing it.

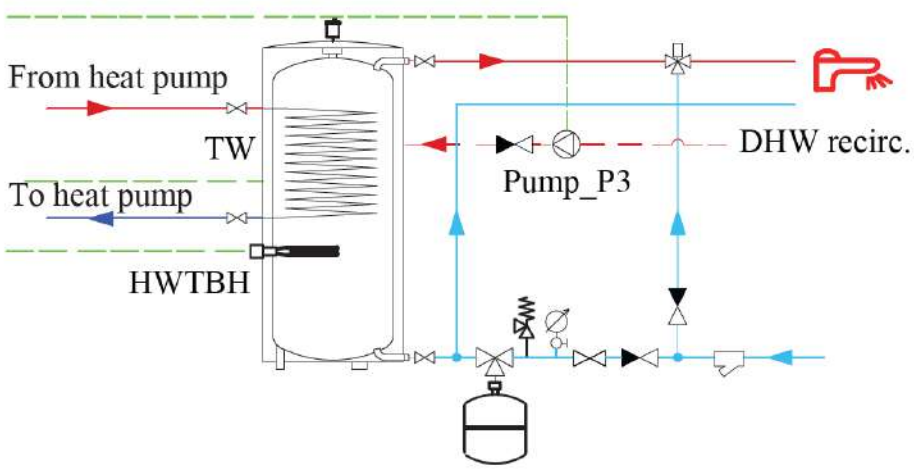
Note: For installation on a wooden wall, use the supplied self-tapping screws instead of expansion bolts. Fix the mounting plate directly to the wooden structure. The wall must be strong enough to support the weight of the indoor unit. Do not install the unit on thin, weak, brittle, or damp wooden surfaces.


4
1
2x
2
2x
3
2x
4
2x
5
2x
2x

9. HYDRONIC SYSTEM INSTALLATION REQUIREMENTS

9.1 Sanitary hot water

9.1.1 Sanitary hot water tank installation



By connecting the DHW tank coil directly to the heat pump, the domestic hot water remains hydraulically separated from the heat pump circuit, helping to ensure safe DHW operation.

The heat exchanger coil must have sufficient capacity to transfer the maximum heat output of the heat pump, based on the operating condition **A7/W45**. This solution is typically used with heat pumps with a capacity of up to approximately **14 kW**.

The main advantage of this configuration is that it allows a larger volume of domestic hot water to be stored and supplied.

The main disadvantage is that the tank coil may create significant hydraulic resistance in the heat pump circuit. If the resulting pressure drop is too high, an additional circulation pump may be required to maintain the minimum required water flow through the heat pump. Insufficient flow may reduce system efficiency or cause unstable operation and protection faults.

9.1.2 Selection of sanitary hot water tank

Model	Recommended DHW tank capacity, ltr	Heat exchanger surface area, m^2
HLT206MONO1S	150-250	≥2.0
HLT209MONO1S		
HLT212MONO1(3)S	300-500	≥2.5
HLT216MONO3S		
HLT220MONO3S		



9.2 Buffer tank

9.2.1 Buffer tank usage

Buffer tank MUST be included in the system. The whole distribution system should have no less water volume than 20ltr/kW. The buffer tank should be installed between heat pump and distribution system, in order to:

1) Heat Storage

A buffer tank stores thermal energy generated by the heat pump system. During operation, the water temperature is monitored by a temperature sensor installed in the tank. When the water reaches the set temperature, the heat pump stops, while the heating terminals can continue to receive heat from the stored water.

When the temperature in the buffer tank falls to the heat pump restart threshold, the heat pump starts operating again. This reduces frequent start-stop cycles, improves system stability, and helps meet the heating demand.

Without a buffer tank, the defrosting process may cause significant fluctuations in water temperature and reduce overall system stability.

2) Hydraulic Buffering

In a heat pump heating system without a buffer tank, insufficient system water volume or rapidly changing heating demand may cause short cycling and unstable operation. This can shorten the service life of the heat pump and trigger protection functions related to high pressure, insufficient water flow, or excessive temperature fluctuations. It may also result in intermittent or uneven heating and increased maintenance requirements.

When a buffer tank is installed, it hydraulically separates the heat pump circuit from the distribution circuit and increases the total water volume of the system. This helps stabilise water flow and temperature, reduces pressure fluctuations, and ensures more continuous and balanced heat delivery. It also supports the safe and reliable operation of the heat pump.

3) Automatic Air Venting

Air may accumulate in a heating system as a result of filling, maintenance work, temperature changes, or dissolved gases being released from the water. If the air is not properly removed, it may cause noise, poor circulation, corrosion, and unstable system operation.

When a buffer tank is installed and equipped with an automatic air vent at its highest point, air can collect in the upper part of the tank and be discharged automatically. This helps maintain stable water circulation and reliable system operation.

4) Collection of Sediment and Impurities

During system operation, sediment and impurities may accumulate due to water quality, corrosion products, installation residues, or contamination within the pipework. A suitable filter or magnetic dirt separator must therefore be installed in the system and maintained regularly.

A buffer tank may also allow some heavier particles to settle at the bottom of the tank. If the tank is equipped with a drain valve at its lowest point, accumulated sediment can be removed during system maintenance. This may reduce contamination within the system; however, it does not replace the need for suitable filtration and regular water-quality checks.

5) Improved System Stability

During winter operation, the heat pump periodically enters the defrosting mode. Heat is then temporarily extracted from the water circuit to remove ice from the outdoor heat exchanger. Without sufficient system water volume, this may cause a rapid drop in the water temperature supplied to the heating terminals.

When a buffer tank is installed, the thermal energy stored in the tank helps maintain water circulation and limit sudden temperature fluctuations during defrosting. This is particularly important in systems using fan coil units, where a reduction in water temperature can quickly lead to a noticeable drop in the supply-air temperature.

A correctly sized buffer tank therefore improves system stability, operating comfort, and defrosting performance.

In certain cases where the system does not have a buffer tank installed, please move temperature sensor TC (Heating/Cooling temperature sensor) to water return pipe to minimize the fluctuation of water temperature caused by compressor speed changes.

9.2.2 Buffer tank selection

Model	Recommended buffer tank capacity, ltr
HLT206MONO1S	30-40
HLT209MONO1S	50-60
HLT212MONO1(3)S	80-100
HLT216MONO3S	80-100
HLT220MONO3S	≥100



9.3 Water piping and fittings selection

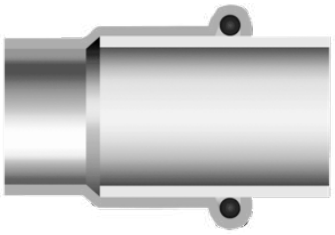
9.3.1 Pipe selection

For the water pipes in the heat pump system, mainly for the pipe diameter on the main unit side, select the corresponding specification of water pipe size according to different models. The required minimum water flow values are indicated in the specification tables.

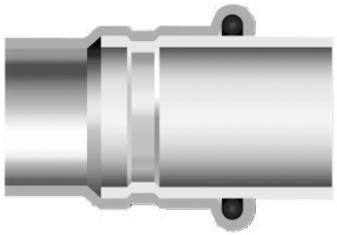
The water pipe system must have the necessary permeability to ensure the flow of water in the distribution system. It is recommended to use pipe systems in which fittings do not reduce the internal diameter (e.g. press steel/copper systems or others).

Model	Recommended pipe	
	KAN-therm Steel system	UPONOR MLC system
HLT206MONO1S	Ø28x1.5	Ø32x3.0
HLT209MONO1S	Ø28x1.5	Ø32x3.0
HLT212MONO1(3)S	Ø28x1.5	Ø32x3.0
HLT216MONO3S	Ø35x1.5	Ø40x3.5
HLT220MONO3S	Ø42x1.5	Ø50x4.0

Suitable system (full throughput)



Cross-section of a joint before pressing



Cross-section of the joint after pressing

AVOID! Inappropriate system



After connection, the water piping should be pressure tested and cleaned before use.

9.3.2 Fittings' selection

The inner diameter of the fittings should be consistent with that of the water pipe. The angle of the fitting is greater than or equal to 90°.

Correct fitting



Wrong fitting



9.3.3 Filters

A mesh filter and a magnetic filter MUST be installed on return pipe before the outdoor unit (in case of Hydrobox) or indoor unit (in case of indoor unit with DHW tank) to keep the water quality and collect impurity contained in the water. Take care to keep the water filter mesh towards the bottom. Check valves are recommended to be installed at both sides of the filters, so as to clean or change the filter in an easier way.



9.3.4 One-way valve

One way valve must be installed to water filling connector, to avoid back-flow of water when water supply stops or water pressure not enough.

9.3.5 Insulation

All pipes running hot water should be well insulated. The insulation must be tied up tightly without gap (but please don't wrap up the check valve for future maintenance).

9.3.6 Selection of an expansion vessel



An expansion vessel is generally installed in the heating water circuit and, where required, in the domestic hot water circuit. Its main purpose is to compensate for changes in water volume caused by temperature variations, stabilize system pressure, and prevent pressure surges.

The expansion vessel volume may be calculated using the following formula:

$$V = \frac{\left(P_{\max} - P_{\text{pre}}\right) \times C}{1 - P_{\text{pre}}/P_{\max}}$$

where:

- V - the required expansion vessel volume;
- P_{max} - is the maximum operating pressure of the system;
- P_{pre} - is the pre-charge pressure of the expansion vessel;
- C - is the total water volume of the system.

In practice, an expansion vessel with a slightly larger volume than the calculated value should be selected.

9.3.7 Air release valve

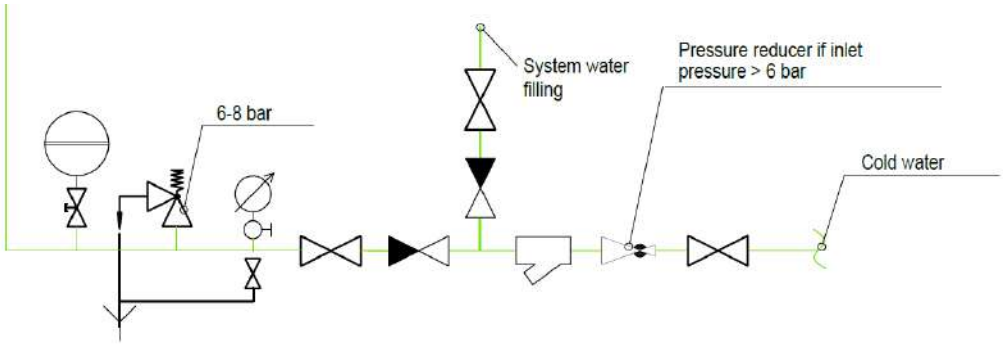


The automatic air vent should generally be installed at the highest point of the piping system or at any location where air is likely to accumulate, ensuring that trapped air can be discharged effectively. It should also be installed at the highest points of inverted U-shaped pipe sections.

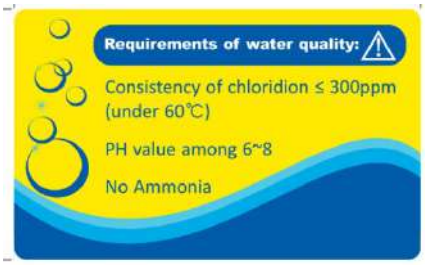
Note: To facilitate future maintenance and replacement, it is recommended to install an isolation valve beneath the automatic air vent.

9.3.8 Cold water supply for heating/cooling system and DHW tank

Please ensure enough water pressure to send the water to the required height. If the water pressure is not enough to maintain proper water flow rate for the system, please add a water pump to increase the pumping head.



9.3.9 Requirements of water quality

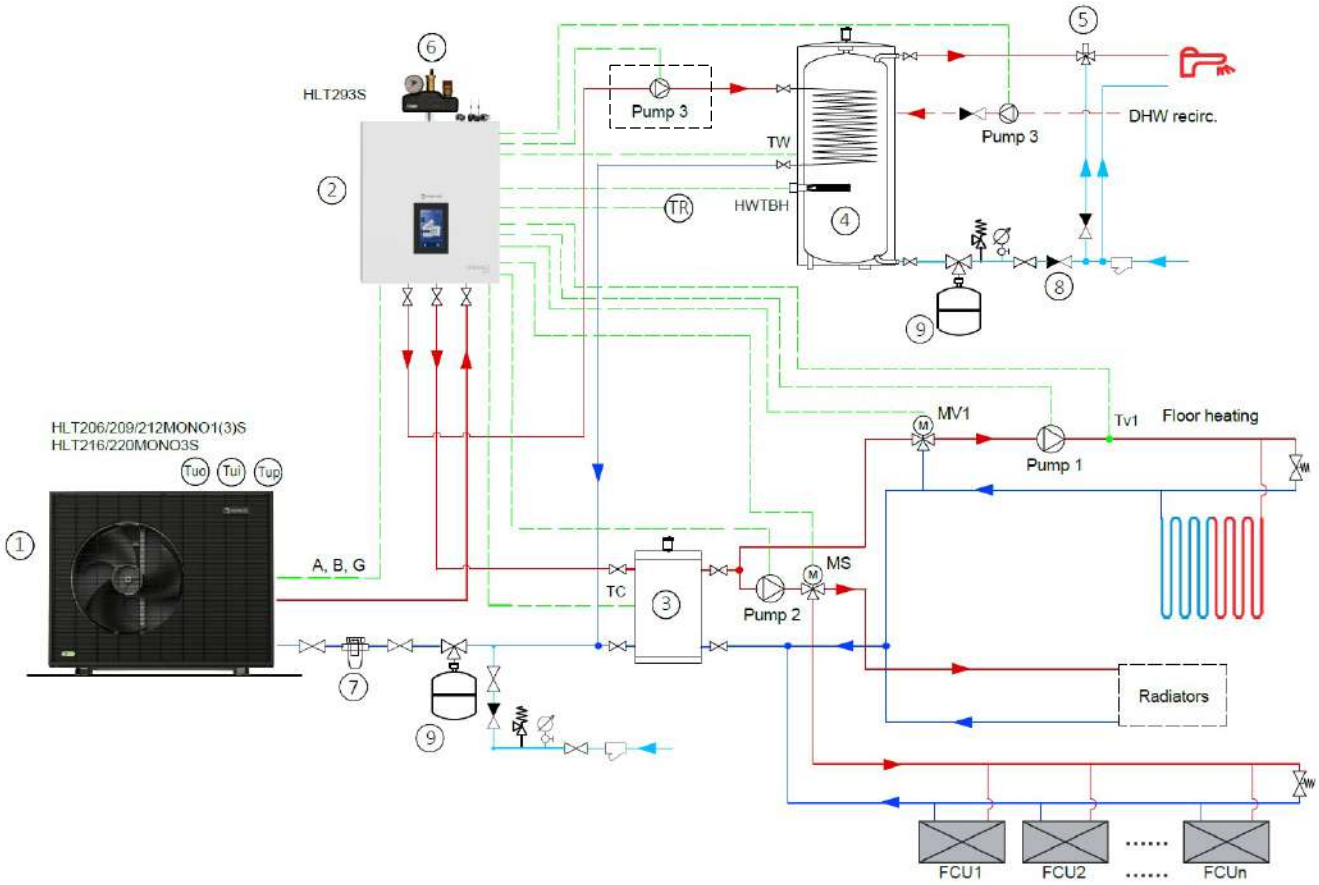


a) Chloridion element in the water should be less than 300 ppm (temperature is less than 60°C);
b) PH value of water should be from 6 to 8;
c) The water with ammonia can't be used for the unit.

If the water quality is poor or the water flow rate is insufficient, scale formation or clogging may occur after prolonged operation. This may reduce the system's heating or cooling efficiency or cause the unit to operate abnormally. Flush and treat the system water before commissioning, or use water that meets the specified quality requirements. Ensure that the water quality remains suitable to maintain efficient and reliable long-term operation.

9.4 System installation instructions

9.4.1 Heating/Cooling system - indoor without DHW tank



Item	Description
1	Outdoor unit
2	Indoor control unit
3	Buffer tank
4	DHW tank
5	DHW mixture valve
6	Safety valve kit
7	Magnetic filter
8	One-way valve
9	Expansion vessel
MS	Motorized 3-way valve 230V
MV1	Mixture valve 24V (0-10V)

Item	Description
Pump 1	Circulation pump for System 1
Pump 2	Circulation pump for System 2
Pump 3	DHW recirculation pump
Pump 3	Additional DHW circulation pump
HWTBH	DHW tank back-up heater
TW	DHW temperature sensor
TC	Heating/Cooling water temperature sensor
TR	Room temperature sensor
Tuo	Outdoor unit outlet water temperature
Tui	Outdoor unit return water temperature
Tup	Outdoor unit coil temperature
Tv1	Water temp. sensor after mixture valve 1

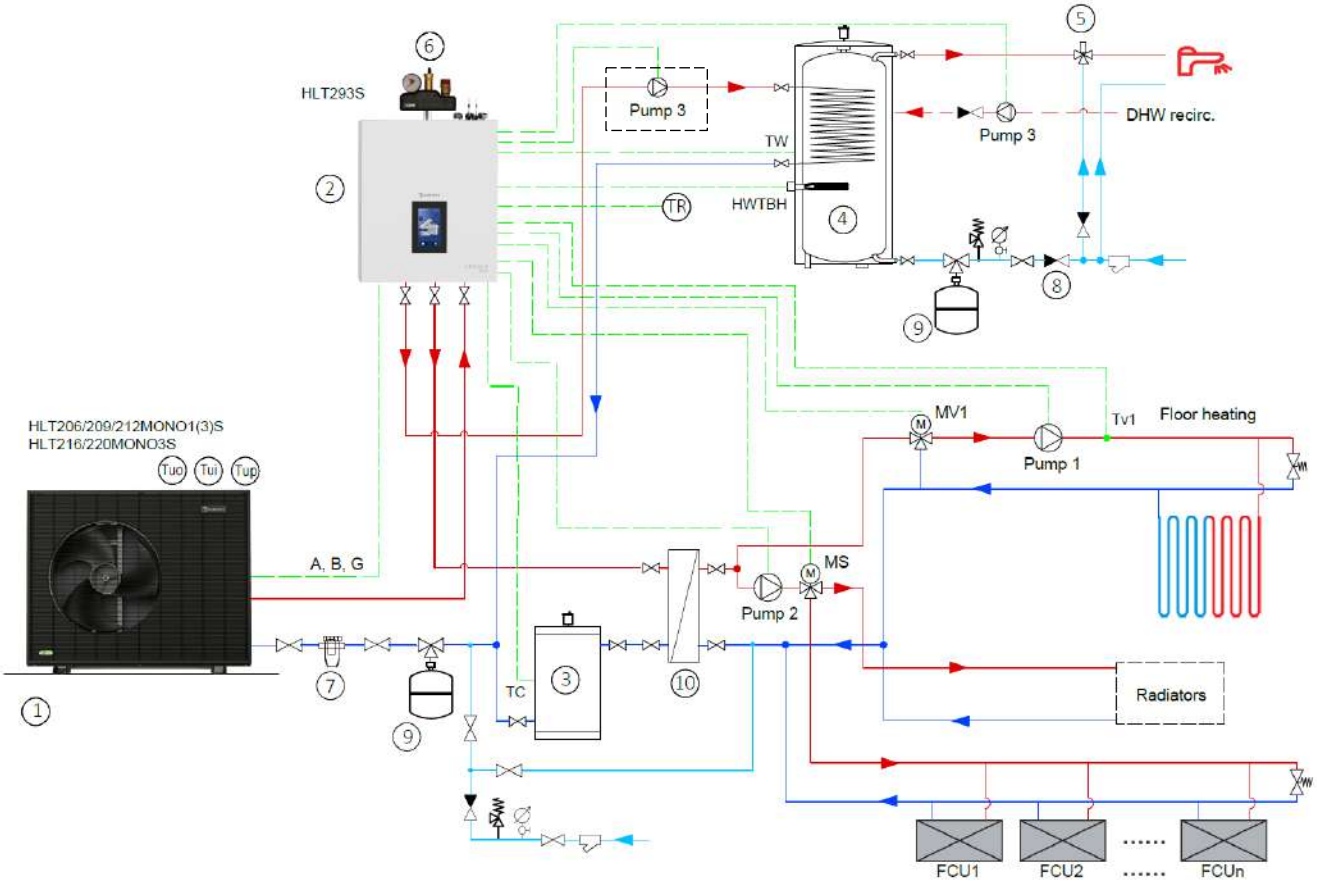
This system provides domestic hot water (DHW), space heating and cooling. The heat pump serves as the primary heat source, while the indoor unit functions as a hydraulic circuit switching module. Depending on the demand for domestic hot water or space heating, the system automatically directs the water flow to the appropriate tank.

On the DHW side, an external circulation pump (Pump 3) can be installed in the DHW distribution pipework to recirculate hot water and provide hot water at the outlets with minimal delay. It may also be installed as an additional circulation pump in the DHW piping circuit where extra circulation capacity is required.

Two heat distribution circuits can be connected downstream of the buffer tank. The high-temperature circuit is supplied directly from the buffer tank, while the low-temperature circuit uses a mixing valve assembly to reduce the water temperature before supplying the underfloor heating system.

The electric heating element installed in the indoor unit serves as an auxiliary heat source. It is activated when the heat pump output is insufficient to meet the heating demand.

9.4.2 Heating/Cooling system with heat exchanger - indoor without DHW tank



Item	Description
1	Outdoor unit
2	Indoor control unit
3	Buffer tank
4	DHW tank
5	DHW mixture valve
6	Safety valve kit
7	Magnetic filter
8	One-way valve
9	Expansion vessel
10	Heat exchanger
MS	Motorized 3-way valve 230V
MV1	Mixture valve 24V (0-10V)

Item	Description
Pump 1	Circulation pump for System 1
Pump 2	Circulation pump for System 2
Pump 3	DHW recirculation pump
Pump 3	Additional DHW circulation pump
HWTBH	DHW tank back-up heater
TW	DHW temperature sensor
TC	Heating/Cooling water temperature sensor
TR	Room temperature sensor
Tuo	Outdoor unit outlet water temperature
Tui	Outdoor unit return water temperature
Tup	Outdoor unit coil temperature
Tv1	Water temp. sensor after mixture valve 1

This system provides domestic hot water (DHW), space heating, and cooling. The heat pump serves as the primary heat source, while the indoor unit manages hydraulic switching between the DHW circuit and the space heating/cooling circuit.

A plate heat exchanger is installed in the space heating/cooling circuit to hydraulically separate the heat pump side from the building distribution side. The primary circuit consists of the heat pump, indoor unit, buffer tank, and the primary side of the plate heat exchanger. The secondary circuit consists of the secondary side of the plate heat exchanger and the connected heating/cooling distribution circuits.

Depending on the current demand, the system automatically directs the water flow either to the DHW tank or to the space heating/cooling circuit. During space heating or cooling operation, water from the heat pump flows through the buffer tank and the primary side of the plate heat exchanger. Thermal energy is then transferred through the heat exchanger to the secondary circuit, without mixing the water between the two circuits.

On the DHW side, an external circulation pump (Pump 3) can be installed in the DHW distribution pipework to recirculate hot water and provide hot water at the outlets with minimal delay. It may also be used as an additional circulation pump where extra circulation capacity is required in the DHW circuit.

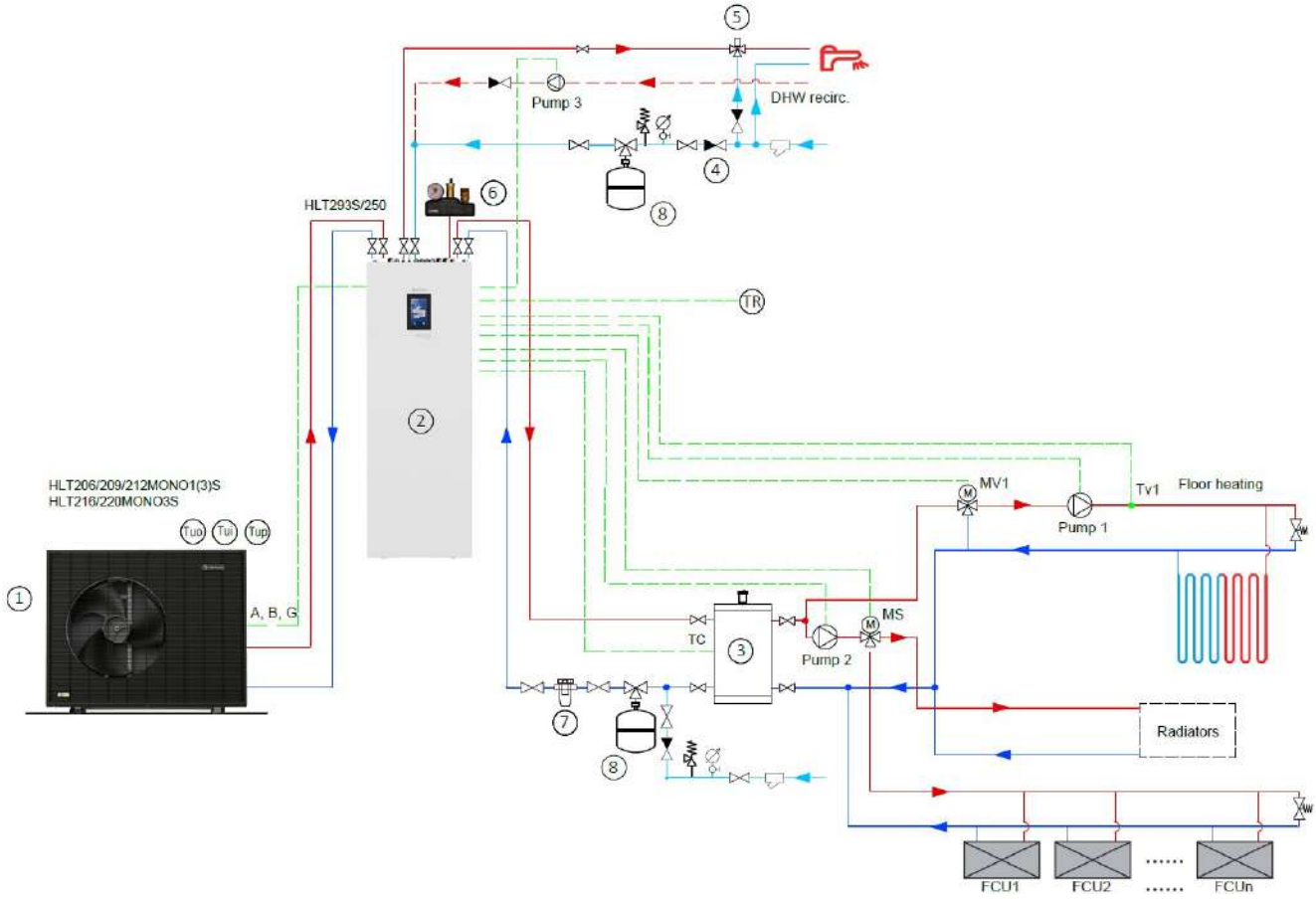
The buffer tank, located in the primary circuit, provides thermal storage and helps stabilize water flow and system operation on the heat pump side. On the secondary side of the plate heat exchanger, one or more heating/cooling distribution circuits can be connected.

Two heat distribution circuits can be used on the secondary side. The high-temperature circuit is supplied directly from the secondary circuit, while the low-temperature circuit uses a mixing valve assembly to reduce the supply water temperature before it enters the underfloor heating system.

Circulation pumps on both sides of the plate heat exchanger ensure the required water flow through the primary and secondary circuits. Their operation should be coordinated with the system heating or cooling demand to ensure efficient heat transfer through the heat exchanger.

The electric heating element installed in the indoor unit serves as an auxiliary heat source in the primary circuit. It is activated when the heat pump output is insufficient to meet the heating demand.

9.4.3 Heating/Cooling system - indoor with DHW tank



Item	Description
1	Outdoor unit
2	Indoor control unit with DHW tank
3	Buffer tank
4	One-way valve
5	DHW mixture valve
6	Safety valve kit
7	Magnetic filter
8	Expansion vessel
MS	Motorized 3-way valve 230V

Item	Description
MV1	Mixture valve 24V (0-10V)
Pump 1	Circulation pump for System 1
Pump 2	Circulation pump for System 2
Pump 3	DHW recirculation pump
TC	Heating/Cooling water temperature sensor
TR	Room temperature sensor
Tuo	Outdoor unit outlet water temperature
Tui	Outdoor unit return water temperature
Tup	Outdoor unit coil temperature
Tv1	Water temp. sensor after mixture valve 1

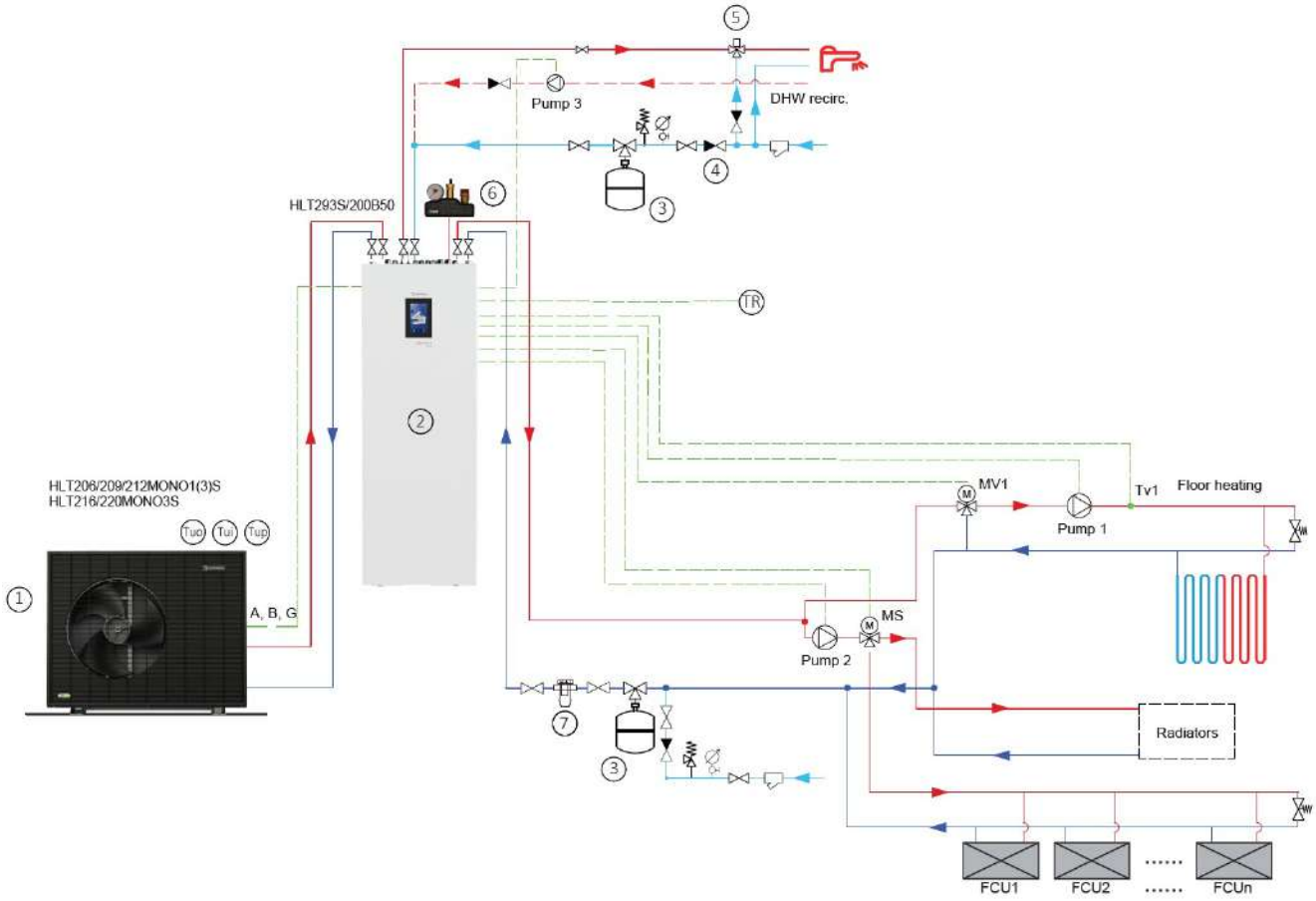
This system provides domestic hot water (DHW), space heating and cooling. The heat pump serves as the primary heat source, while the indoor unit with integrated DHW tank functions as a hydraulic circuit switching module. Depending on the demand for domestic hot water or space heating, the system automatically directs the water flow to the appropriate tank.

On the DHW side, an external circulation pump (Pump 3) can be installed in the DHW distribution pipework to recirculate hot water and provide hot water at the outlets with minimal delay.

Two heat distribution circuits can be connected downstream of the buffer tank. The high-temperature circuit is supplied directly from the buffer tank, while the low-temperature circuit uses a mixing valve assembly to reduce the water temperature before supplying the underfloor heating system.

The electric heating element installed in the indoor unit serves as an auxiliary heat source. It is activated when the heat pump output is insufficient to meet the heating demand.

9.4.4 Heating/Cooling system - indoor with DHW and buffer tanks



Item	Description
1	Outdoor unit
2	Indoor control unit with DHW and buffer tanks
3	Expansion vessel
4	One-way valve
5	DHW mixture valve
6	Safety valve kit
7	Magnetic filter
MS	Motorized 3-way valve 230V

Item	Description
MV1	Mixture valve 24V (0-10V)
Pump 1	Circulation pump for System 1
Pump 2	Circulation pump for System 2
Pump 3	DHW recirculation pump
TC	Heating/Cooling water temperature sensor
TR	Room temperature sensor
Tuo	Outdoor unit outlet water temperature
Tui	Outdoor unit return water temperature
Tup	Outdoor unit coil temperature
Tv1	Water temp. sensor after mixture valve 1

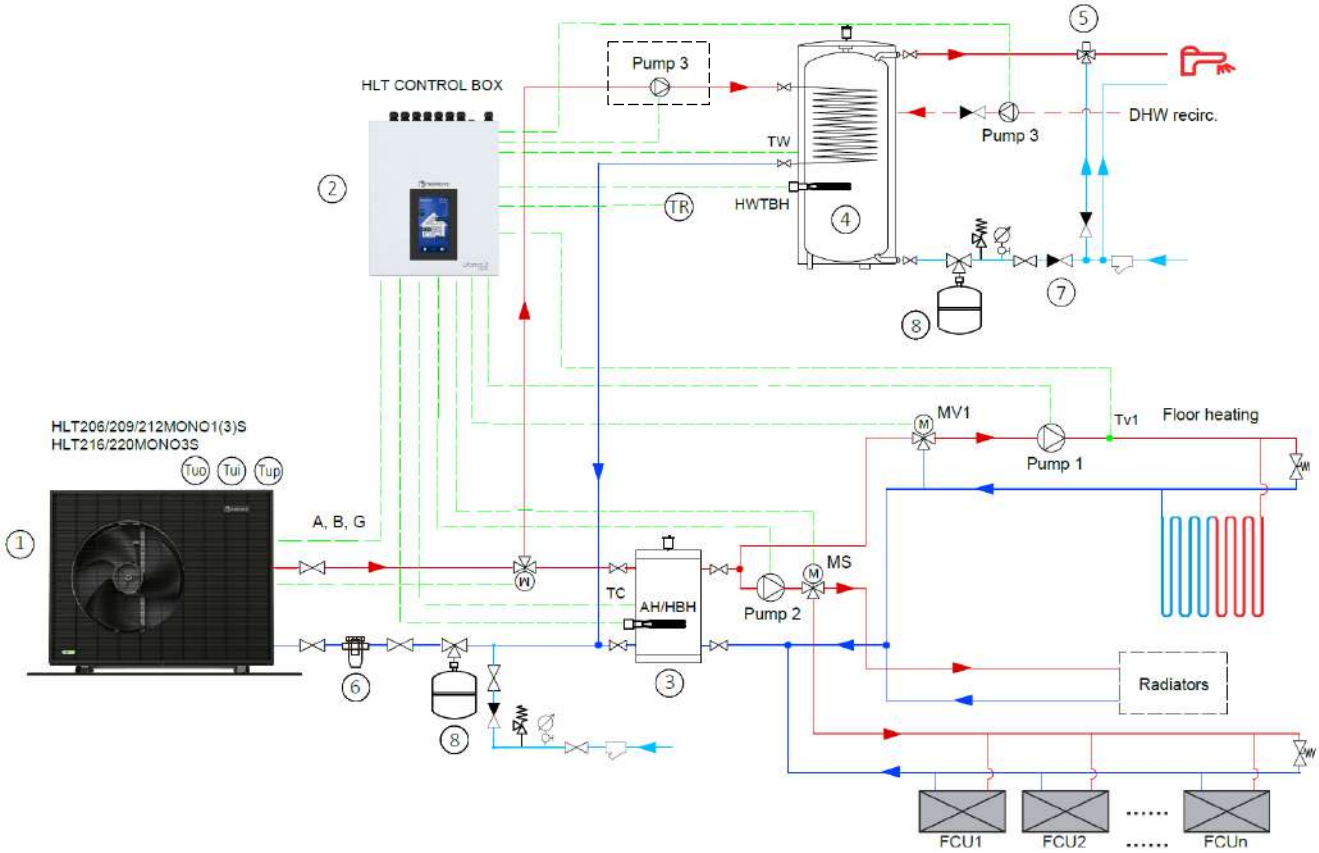
This system provides domestic hot water (DHW), space heating and cooling. The heat pump serves as the primary heat source, while the indoor unit with integrated DHW and buffer tanks functions as a hydraulic circuit switching module. Depending on the demand for domestic hot water or space heating, the system automatically directs the water flow to the appropriate tank.

On the DHW side, an external circulation pump (Pump 3) can be installed in the DHW distribution pipework to recirculate hot water and provide hot water at the outlets with minimal delay.

Two heat distribution circuits can be connected downstream of the indoor unit. The high-temperature circuit is supplied directly from the buffer tank integrated in indoor unit, while the low-temperature circuit uses a mixing valve assembly to reduce the water temperature before supplying the underfloor heating system.

The electric heating element installed in the indoor unit serves as an auxiliary heat source. It is activated when the heat pump output is insufficient to meet the heating demand.

9.4.5 Heating/Cooling system – control with HLT CONTROL BOX



Item	Description
1	Outdoor unit
2	Control Box
3	Buffer tank
4	DHW tank
5	DHW mixture valve
6	Magnetic filter
7	One-way valve
8	Expansion vessel
MS	Motorized 3-way valve 230V
MV1	Mixture valve 24V (0-10V)
Pump 1	Circulation pump for System 1

Item	Description
Pump 2	Circulation pump for System 2
Pump 3	DHW recirculation pump
Pump 3	Additional DHW circulation pump
HWTBH	DHW tank back-up heater
TW	DHW temperature sensor
TC	Heating/Cooling water temperature sensor
TR	Room temperature sensor
Tuo	Outdoor unit outlet water temperature
Tui	Outdoor unit return water temperature
Tup	Outdoor unit coil temperature
Tv1	Water temp. sensor after mixture valve 1

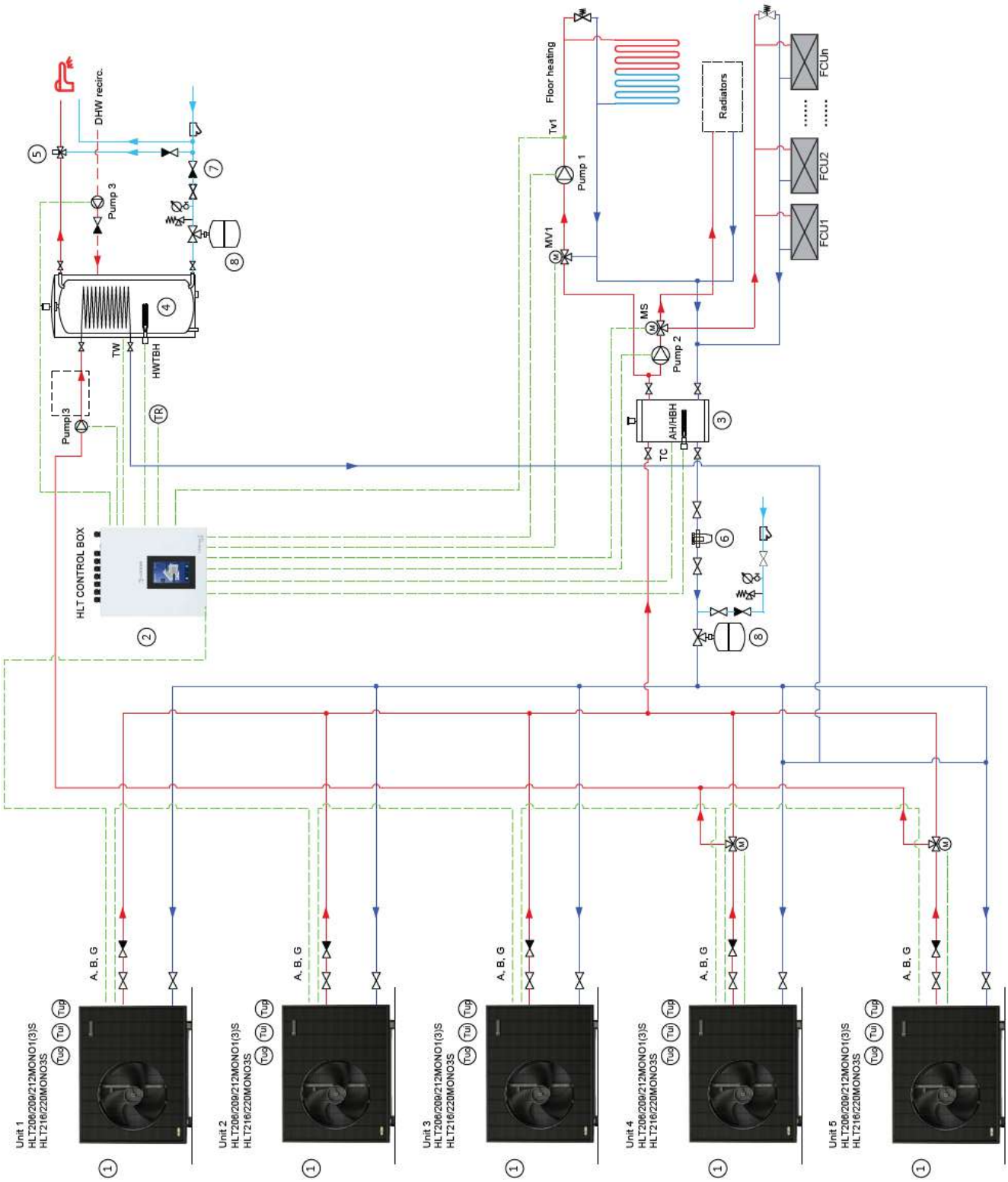
This system provides domestic hot water (DHW), space heating, and cooling. The heat pump serves as the primary heat source, while the Control Box manages the system automation and hydraulic components. Depending on the demand for DHW or space heating, the system automatically directs the water flow to the appropriate circuit or tank. The DHW 3-way valve installed in the piping system is controlled by the outdoor unit.

On the DHW side, an external circulation pump (Pump 3) can be installed in the DHW distribution pipework to recirculate hot water and provide hot water at the outlets with minimal delay. It may also be used as an additional circulation pump where extra circulation capacity is required in the DHW circuit.

Two heat distribution circuits can be connected downstream of the buffer tank. The high-temperature circuit is supplied directly from the buffer tank, while the low-temperature circuit uses a mixing valve assembly to reduce the water temperature before supplying the underfloor heating system.

As the system does not include integrated electric heaters, externally installed auxiliary electric heaters can be controlled by the Control Box. They can be activated when the heat pump output is insufficient to meet the heating demand.

9.4.6 Heating/Cooling cascade system – control with HLT CONTROL BOX



Item	Description
1	Outdoor unit
2	Control Box
3	Buffer tank
4	DHW tank
5	DHW mixture valve
6	Magnetic filter
7	One-way valve
8	Expansion vessel
MS	Motorized 3-way valve 230V
MV1	Mixture valve 24V (0-10V)
Pump 1	Circulation pump for System 1

Item	Description
Pump 2	Circulation pump for System 2
Pump 3	DHW recirculation pump
Pump 3	Additional DHW circulation pump
HWTBH	DHW tank back-up heater
TW	DHW temperature sensor
TC	Heating/Cooling water temperature sensor
TR	Room temperature sensor
Tuo	Outdoor unit outlet water temperature
Tui	Outdoor unit return water temperature
Tup	Outdoor unit coil temperature
Tv1	Water temp. sensor after mixture valve 1

This cascade system provides domestic hot water (DHW), space heating and cooling using multiple heat pumps operating under coordinated control. All ULTIMA 2 series outdoor units can be combined in one cascade system, with a single HLT Control Box controlling up to 15 outdoor units.

The system initially starts half of the connected units, prioritising those with the shortest cumulative running time. These units operate at compressor frequency F7, approximately equivalent to 70% capacity, to maintain stable operation, ensure reliable oil return and limit noise.

The buffer tank temperature (TC) is checked every three minutes. If the demand is not met, additional units are started sequentially at F7. If all units are operating at F7 and further capacity is required, the system increases the compressor frequency to F10, the maximum operating frequency. Prioritising units with fewer operating hours helps distribute the workload and supports the service life of the system.

Each outdoor unit can be configured individually for its required operating modes. For example, some units can be assigned to DHW and space heating, while others provide space heating only. The three-way DHW diverting valves are controlled by the respective outdoor units, directing water flow according to the selected operating mode.

Commercial outdoor units (30–80 kW) do not have integrated circulation pumps. A separate circulation pump must therefore be installed in the pipework for each commercial unit and controlled by the corresponding outdoor unit.

10. WIRING INSTALLATION REQUIREMENTS

10.1 Wiring tips



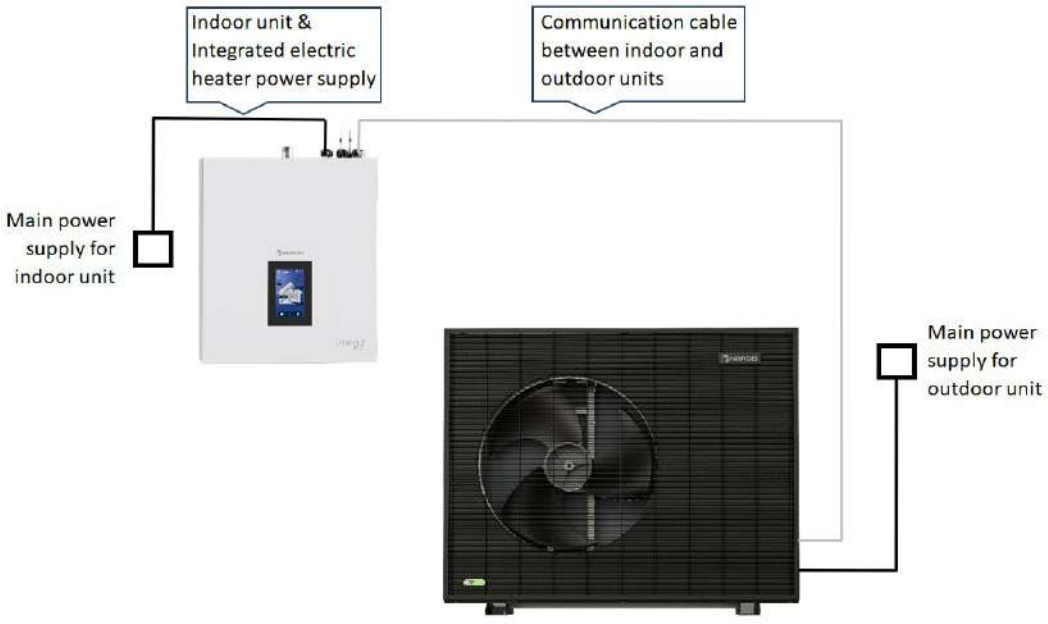
- It is recommended to use a suitable circuit breaker for the heat pump;
- The power supply to the heat pump unit must be grounded;
- The wiring should be done by professional person;
- The wiring should be completed with the local industry regulation;
- The wiring should be done after the unit is powered off;
- Cable should be fixed tightly, to ensure it won't get loose;
- Don't connect several parts of cables together to use;
- Make sure the power supply in the local complies with the power supply marked in rating label;
- Make sure power supply, cable and socket can meet the requirements of the input power of the unit;
- No fire during installation.

10.2 Basic connection of indoor and outdoor units

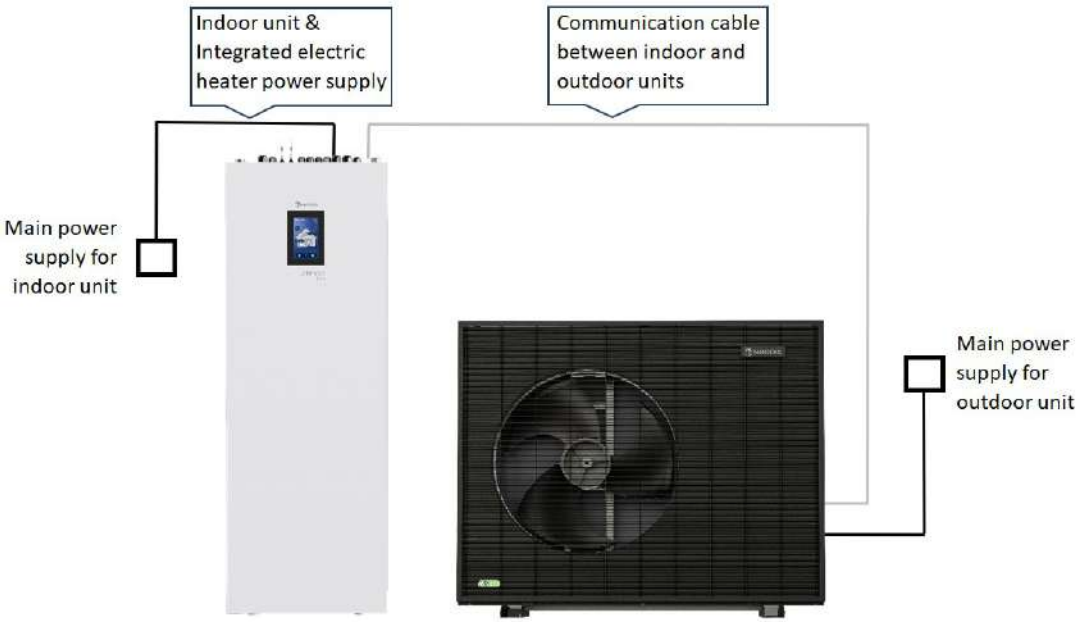
- The indoor and outdoor units must be powered separately and connected using cables that comply with the specifications indicated on the unit terminals.
- The indoor and outdoor units must be interconnected using the communication cable supplied with the unit.
- Power and communication cables must be routed through separate conduits. They must not share the same conduit.

Schematic diagram of the power supply and communication connection of the indoor and outdoor units.

HLT293S

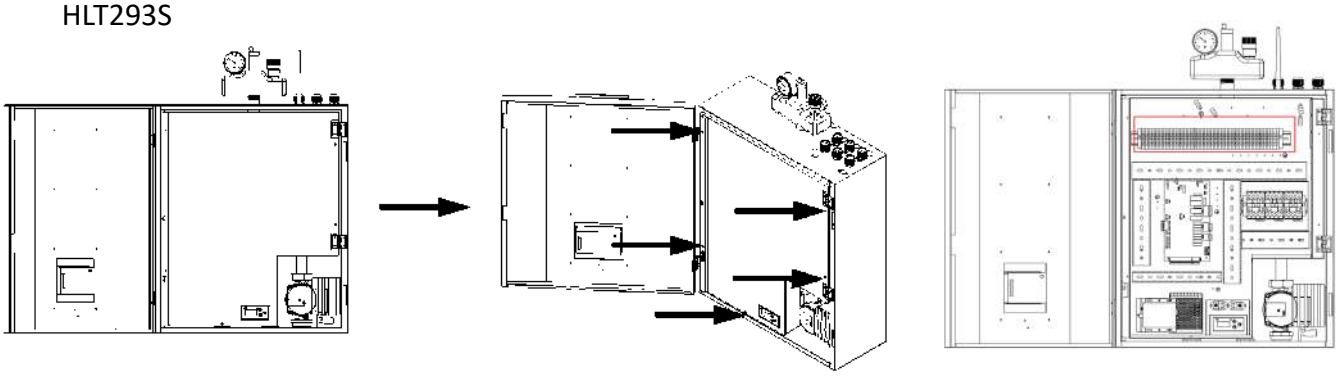


HLT293S/250
HLT293S/200B50

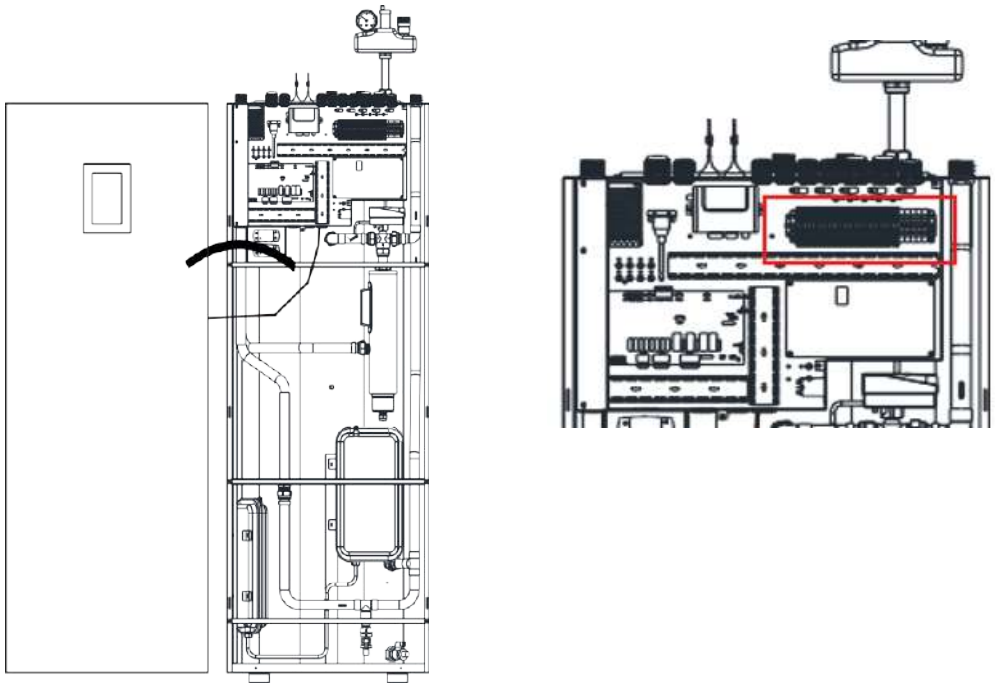


Before wiring open the indoor unit front door and take off the electrical box cover. Then connect the power cord and communication wires according to the actual application situation.

HLT293S



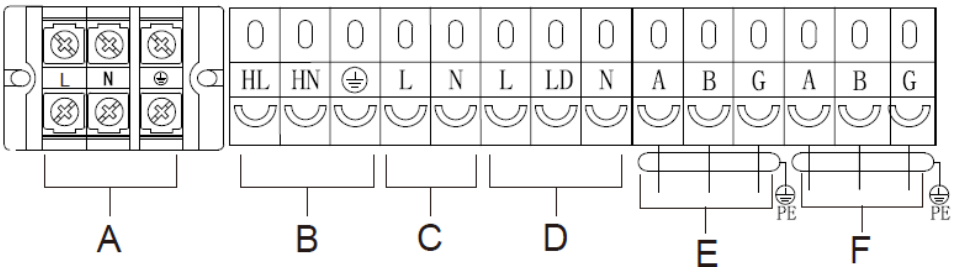
HLT293S/250 and HLT293S/200B50



10.3 Outdoor unit therminal blocks

10.3.1 Main power supply and communication cables

HLT206MONO1S / HLT209MONO1S / HLT212MONO1S



A – Unit main power supply (230V~/1/50);

B – Emergency electric heater power supply (backup power supply for emergency electric heater in case of main power supply shortages);

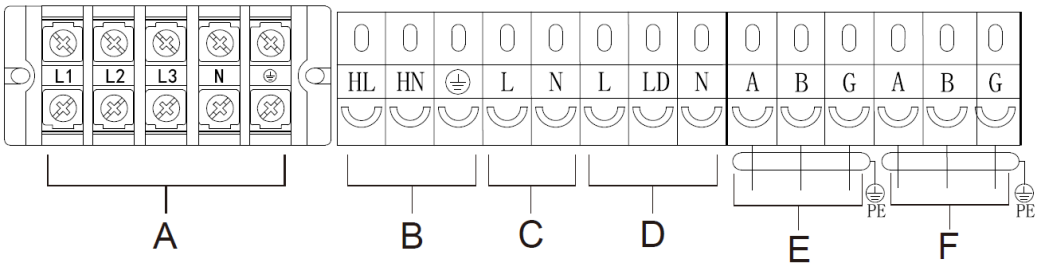
C – UPS connection (backup power supply for P0 circulation pump in case of main power supply shortages);

D – Cascade 3-way valve connection;

E – Communication cable to indoor unit;

F – Outdoor unit cascade communication cable.

HLT212MONO3S / HLT216MONO3S / HLT220MONO3S



A – Unit main power supply (400V~/3/50);

B – Emergency electric heater power supply (backup power supply for emergency electric heater in case of main power supply shortages);

C – UPS connection (backup power supply for P0 circulation pump in case of main power supply shortages);

D – Cascade 3-way valve connection;

E – Communication cable to indoor unit;

F – Outdoor unit cascade communication cable.

Emergency electric heater power supply.

Antifreeze electric heater operates to protect the outdoor plate heat exchanger, to prevent the water inside from freezing below 0°C and causing damage. It is the electric heater which is wrapped around the plate heat exchanger and its inlet and outlet pipes. The power of this electric heater is 140W.

NOTE. The emergency electric heater must be connected to a separate power source than main power source of the unit.

UPS connection.

UPS connection for P0 circulation pump. The UPS serves as an auxiliary power supply. In the event of a main power supply failure, the P0 pump operates as an AC pump at high speed for as long as UPS power is available.

Cascade 3-way valve connection.

This 3-way diverter valve is required when the outdoor unit operates as part of a cascade system. The valve controls the hydraulic flow direction by switching between the space heating/cooling circuit and the domestic hot water (DHW) circuit.

Outdoor unit cascade communication cable.

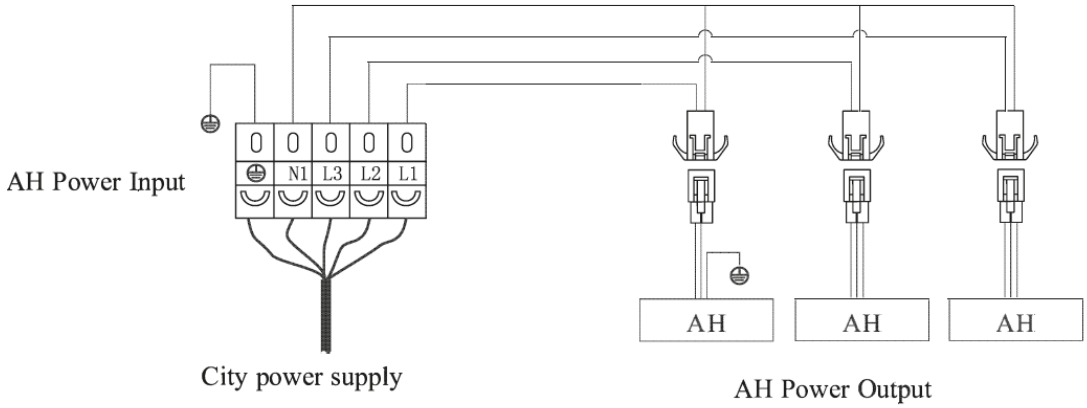
Used for data communication and control signal transmission between outdoor units connected in a cascade system.

10.4 Indoor unit therminal blocks

10.4.1 Indoor unit & Integrated electric heater power supply

Unit power supply & Power supply for integrated AH-Auxiliary heater (Power Cord: H0SVV-F 5x2.5mm2, city power input).

Unit power supply & Power supply for AH-Auxiliary heater inside unit should be connected to city power input.



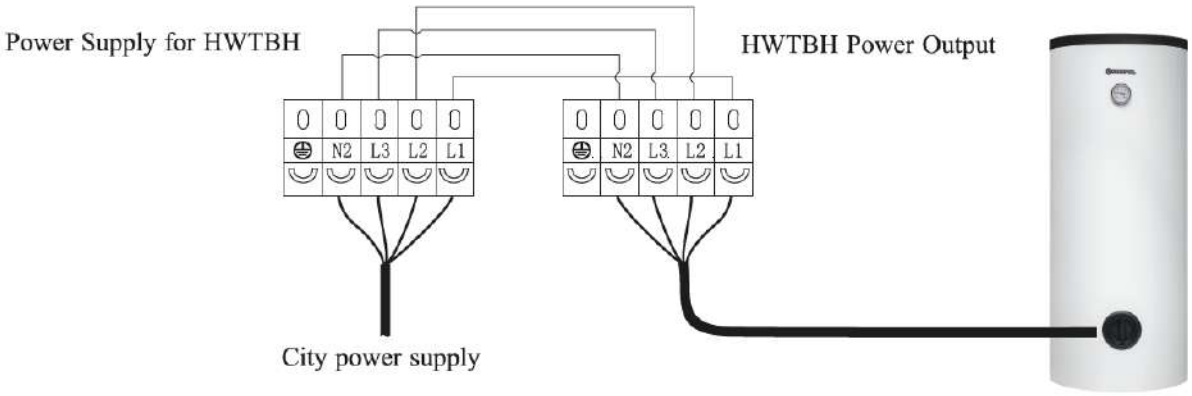
10.4.2 HWTBH (DHW tank electric heater) power supply (ONLY for model HLT293S)

If DHW tank has electric heater installed, it can be controlled by heat pump.

Power supply for HWTBH - Hot Water Tank Back-up Heater (Power Cord: H05VV-F 5x2.5mm, city power input).

In that way, city power input (1 phase or 3 phases) should be connected to terminal „Power Supply for HWTBH 5x2.5mm^2“.

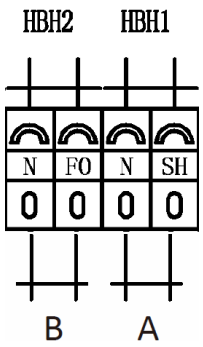
Electric heater installed in to the DHW tank must be connected to terminal "HWTBH".



NOTE: The HWTBH electric heater can be directly connected to the terminals of the unit, but the power of the electric heating per phase should be < 3000W.

10.4.3 Auxiliary heat source control

When an external device (e.g. gas boiler, pellet boiler, electrical boiler, etc.) is used as the auxiliary heat source (AHS), the control method should be selected according to the external device’s control requirements.



The heat pump can control up to two external heating sources simultaneously.

The external heating sources are connected to:

A - N–SH (HBH1) – Auxiliary Heat Source 1

B - N–FO (HBH2) – Auxiliary Heat Source 2

WARNING

These terminals provide 230 V AC low-load control outputs. Do not connect high-power electric loads directly to the HBH1 or HBH2 terminals.

If an electric heater is used, it must be connected through an external AC contactor. The heat pump output is used only to control the contactor coil. The heater must have a separate power supply and appropriate electrical protection.

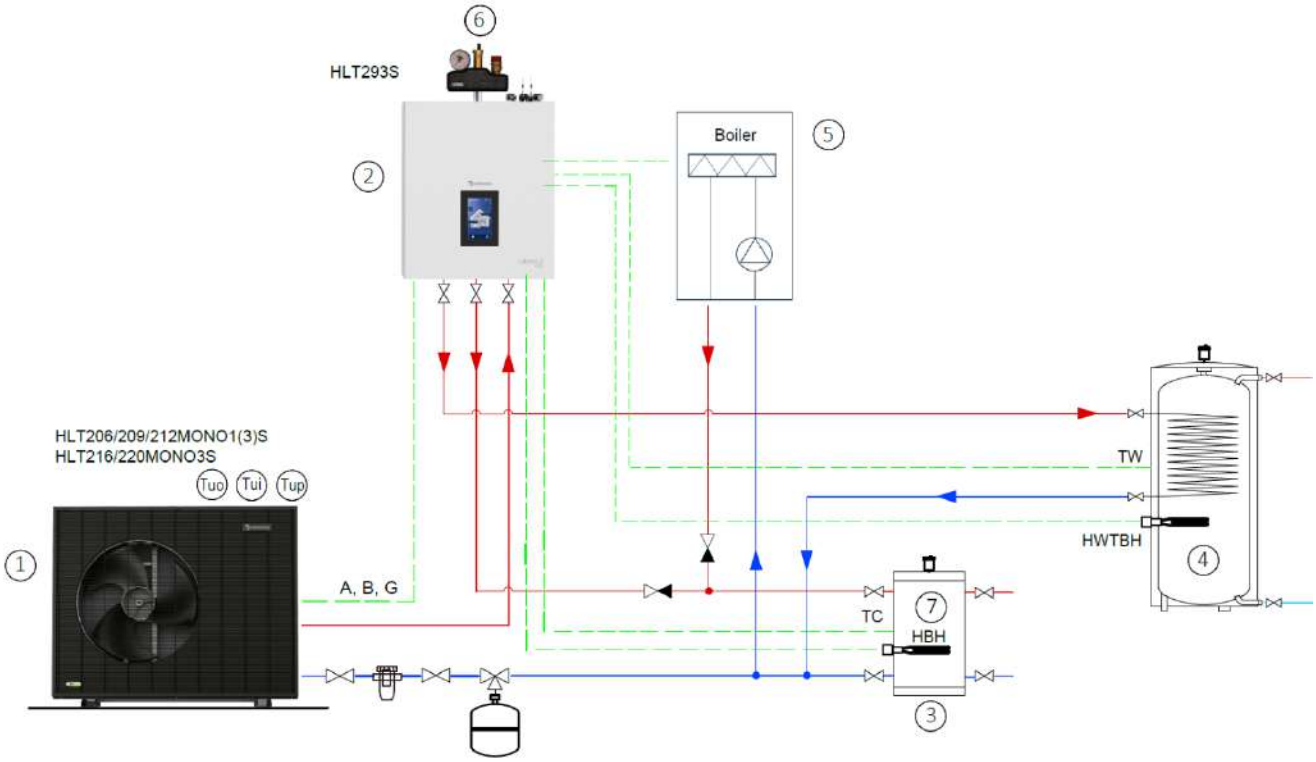
If the external heating source (ex. gas boiler) is controlled by a dry-contact input, an external relay must be used. The heat pump output energizes the relay coil, while the relay provides the required potential-free contact to the external device.

NOTE (1)

External relays, contactors, protective devices, and wiring must be selected according to the electrical specifications of the connected equipment and applicable local electrical regulations.

NOTE (2)

To enable control of the external auxiliary heat source (AHS), the “Heating ECO operation” function must be activated and the “Ambient temp. to start Heating ECO operation” value must be set. The external heating source will be enabled according to the configured ambient temperature threshold.



Item	Description
1	Outdoor unit
2	Indoor control unit
3	Buffer tank
4	DHW tank

Item	Description
5	Boiler (AHS)
6	Safety valve kit
7	Auxiliary electric heater (AHS)

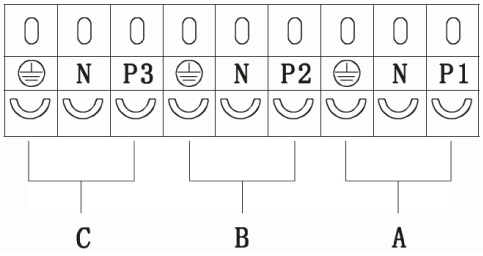
10.4.4 Circulation pump power supply

A, B, C - water pumps

A - Pump1 - circulation pump (heating/cooling, low temperature circuit)

B - Pump2 - circulation pump (heating/cooling, high temperature circuit)

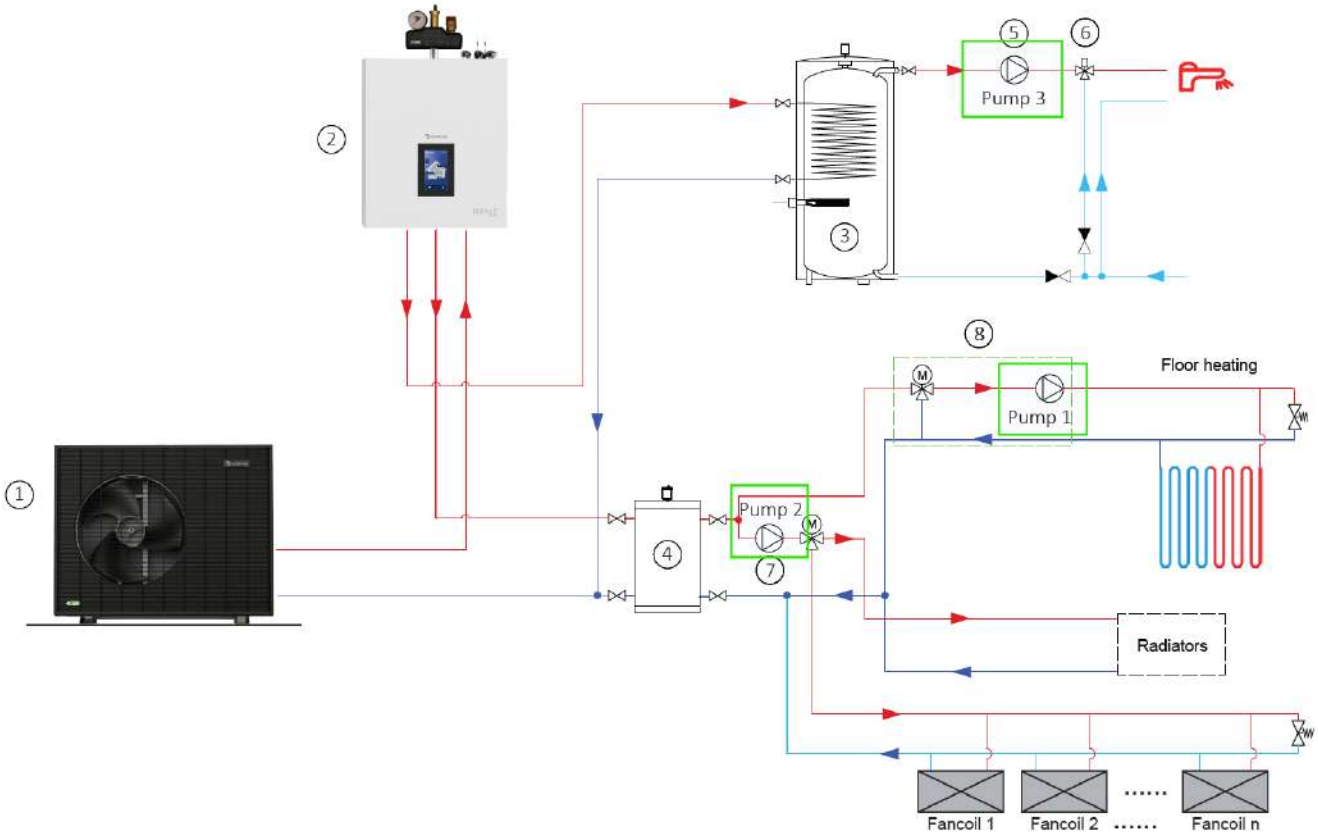
C - Pump3 - circulation pump (hot water)



NOTE: Pump0 - DC pump integrated in the indoor unit.

If there is an external water pump in heating, cooling or hot water system, it can be connected to these ports to be controlled by heat pump.

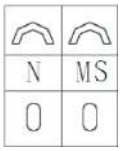
If the power of the water pumps is < 1000W, it can be directly connected to the terminal block.

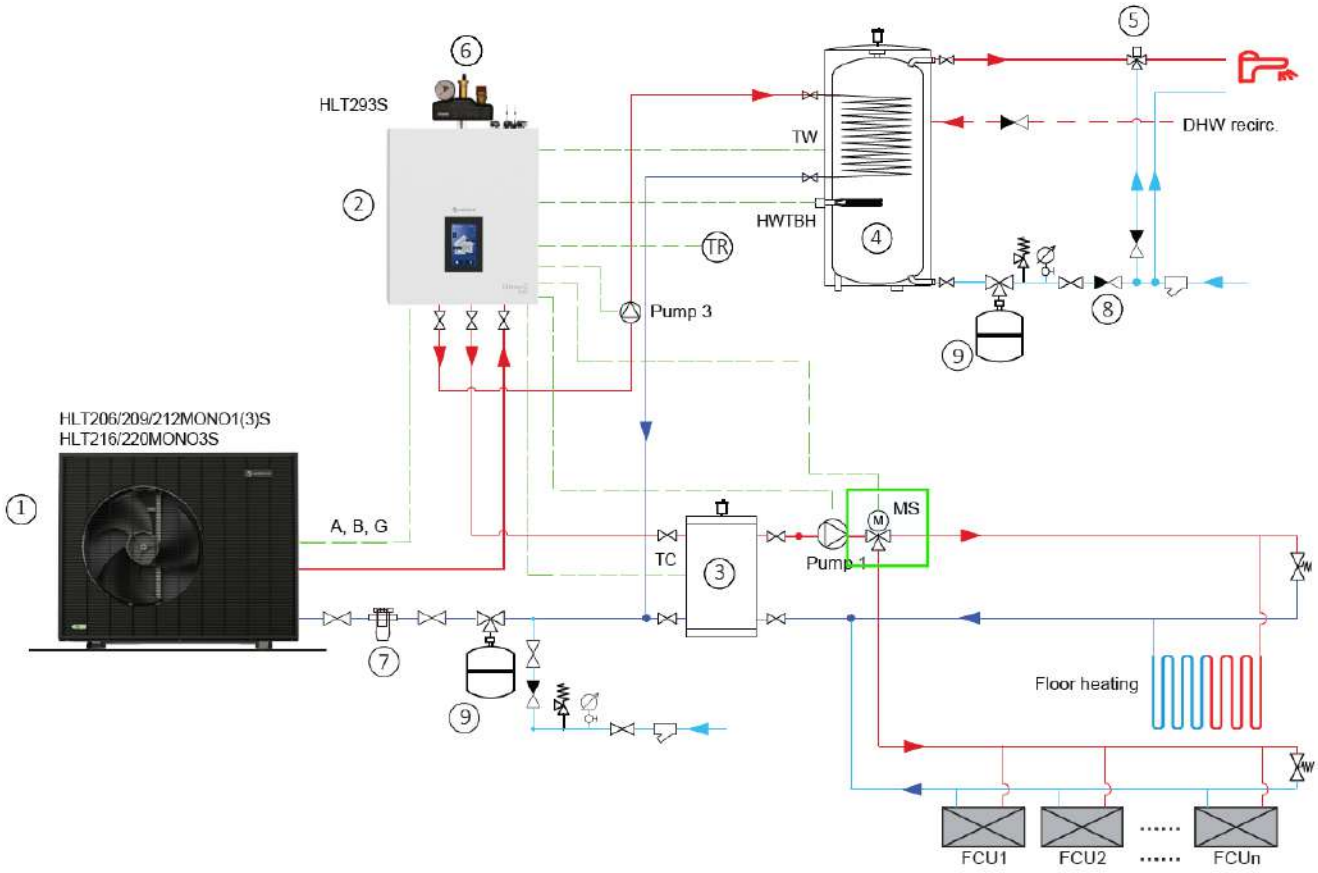


10.4.5 3-way valve connection (MS signal)

If the system includes both heating and cooling circuits, an MS 3-way valve is used to switch between them.

The valve actuator must be a two-wire 230V ON/OFF type.



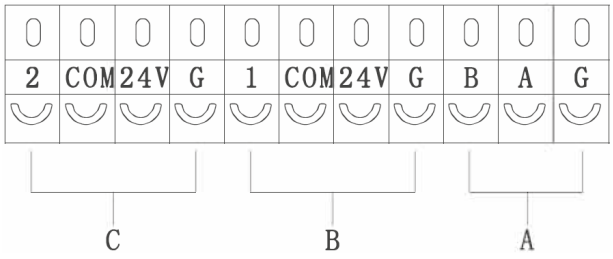


NOTE. In case, if the actuator has two live wires (2xL + N), one of which requires a permanent power supply, this wire must be connected to the main power supply.

10.4.6 Communication & Mixing valves connections

A - Signal cable to outdoor unit

Connect connectors A, B and G to the corresponding connectors A, B and G on the outdoor unit (Cable: 3x26A WG shielded).



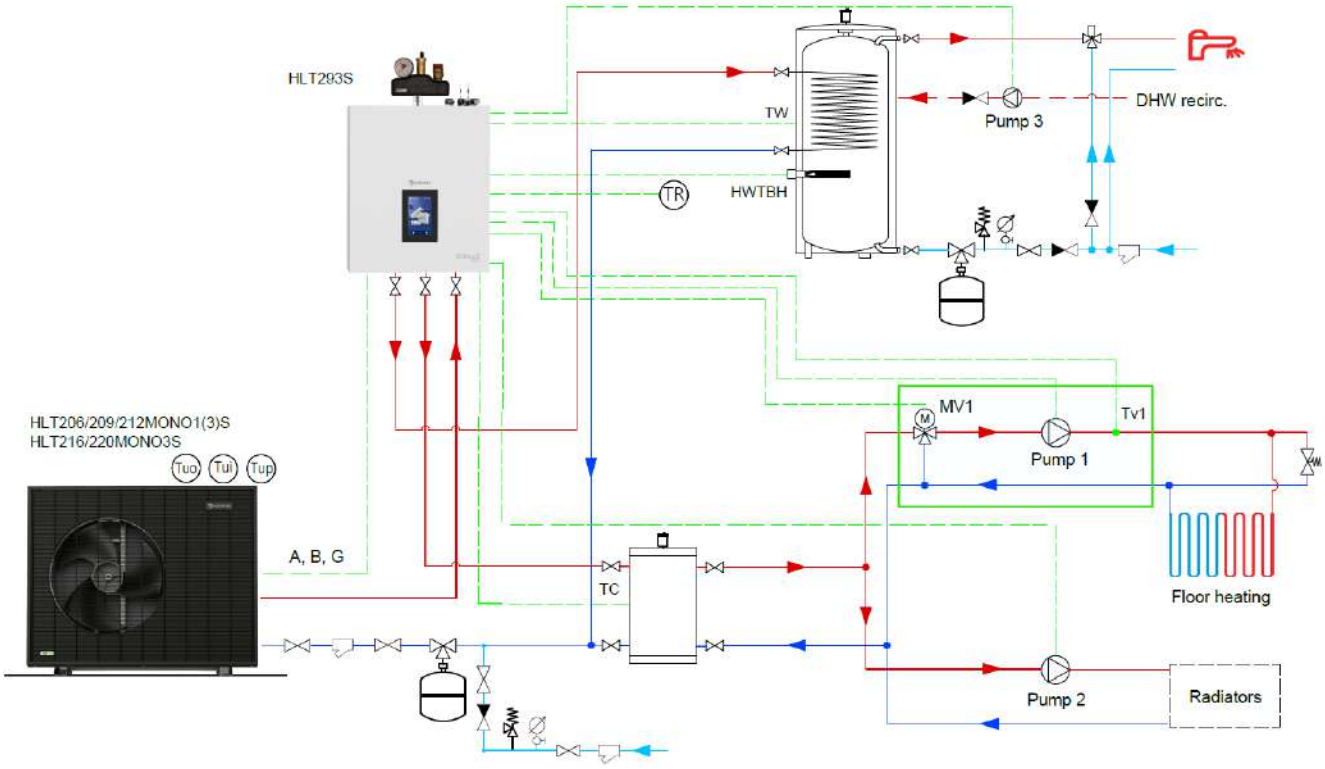
The heat pump control system can control two mixing valves simultaneously. The selection depends on the actual application situation. Generally, only one mixing valve is needed, which controls the terminal water temperature of the floor heating. For some special application systems, such as those linked with gas boilers or solar energy, two mixing valves can be used, meaning the radiators also adjust the water temperature through the mixing valves.

B, C - Motorized Water mixture valve 1&2 (actuator 24V 0-10V)

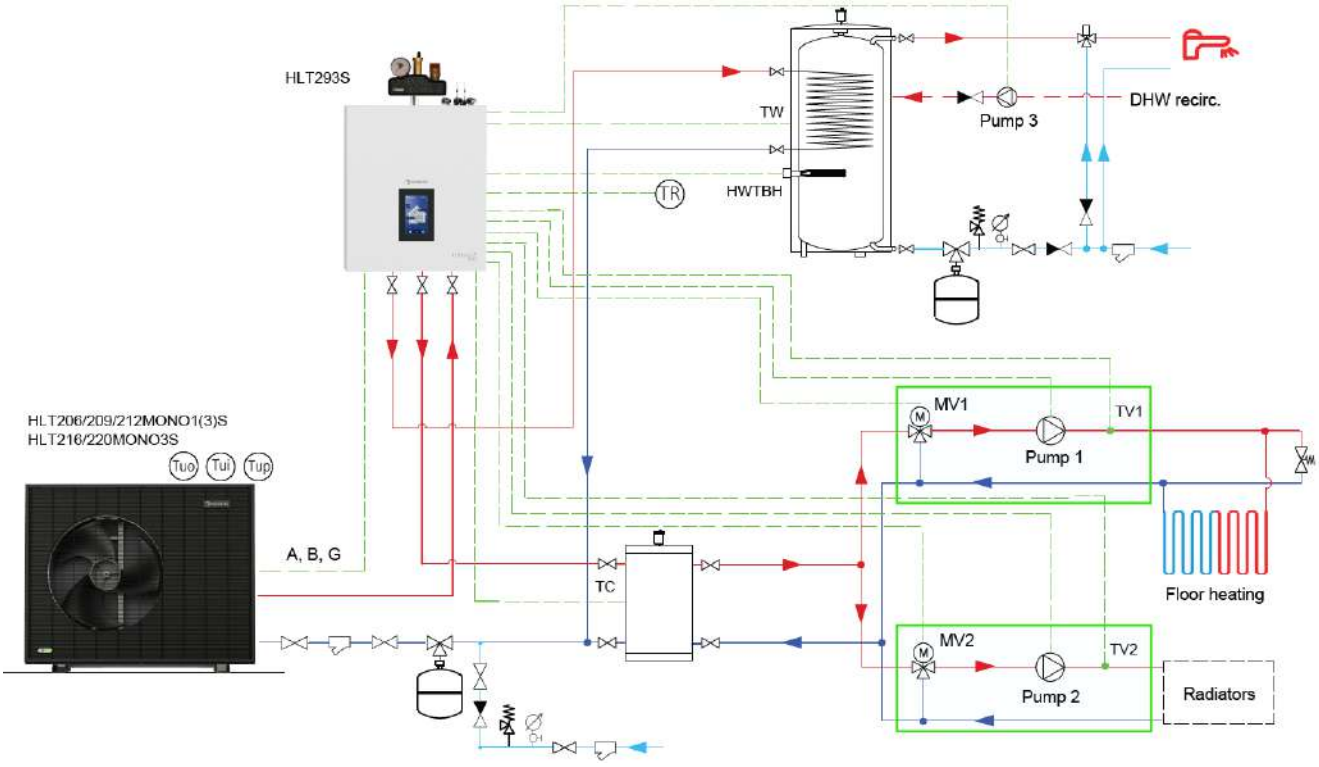
1(2), G – communication line

24V, COM – power supply

Single mixing valve wiring and system application diagram

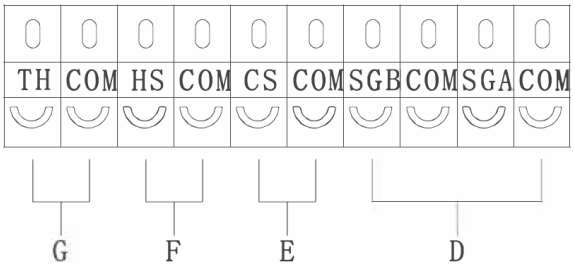


Two mixing valves wiring and system application diagram



10.4.7 SG-Ready & Cooling/ Heating switches (room thermostats)

D - SG-Ready



This function can respond to defined external control signals by smart grid, "SG Ready" is a smart tariff management scheme. This function can respond to defined external signals and adjusts heat pump's operation according to the price signals and status of the grid, which allows the heat pump to support the grid, have a lower carbon footprint and be more cost-effectiveness to operate.

E, F - Cool mode & heat mode switch-over (room thermostats)

This unit can switch over between heating and cooling functions automatically, according to ambient temperature or external signal (e.g. room thermost) input .

For system with room thermostats, thermostat for cooling operation must be connected to "COOL MODEL SWITCH" (port E) and thermostat for heating operation to "HEAT MODE SWITCH" (port F).

G - High temperature system switch (high temperature zone thermostat)

When two heating distribution systems are connected, unit should always take the set temperature for high demanding circuit, which needs higher temperature in heating and lower temperature in cooling operation, as the set temperature for the heat pump unit.

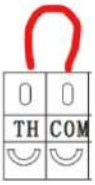
However, when this high demanding circuit is not needed or has reached the set temperature, heat pump unit can switch the heat pump set temperature to the values set for the other circuit, for better efficiency.

This set of connector is used to receive the signal from high demanding circuit, if has.

When "CLOSE" signal is received, unit works with high temperature.

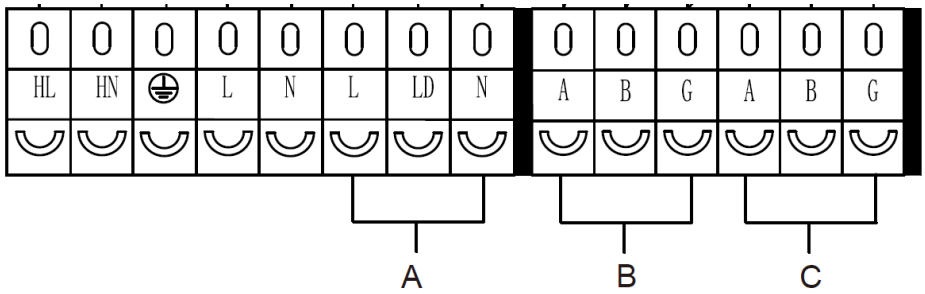
When "OPEN" signal is received, unit works with low temperature.

NOTE: In case system works without thermostats TH-COM always must be shortened if you have two temperature control (two zones). When TH-COM are disconnected, it means that there is no demand for high-temperature and the heat pump only runs at the low set water temperature, and only the water pump of system 1 is running.



10.4.8 Cascade system connections

Outdoor unit (HLT6-20MONO1(3)S)

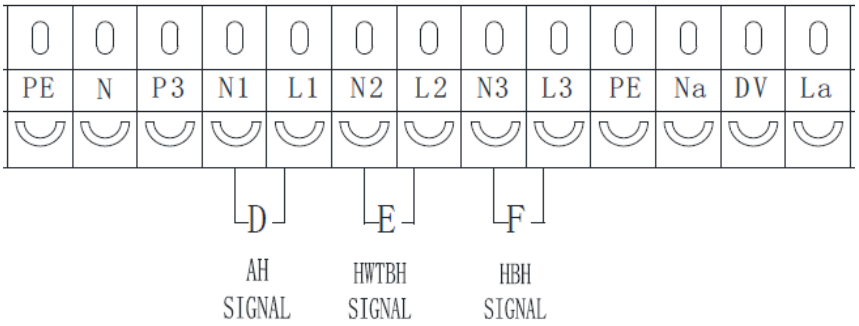


A – Cascade 3-way valve connection. Diverts from heating to DHW;

B – Communication cable the indoor unit (HLT CONTROL BOX);

C – Outdoor unit cascade communication cable. All units in the cascade system must be connected in parallel.

Indoor unit (HLT CONTROL BOX)



D - External source for heating stage 1 (AH);

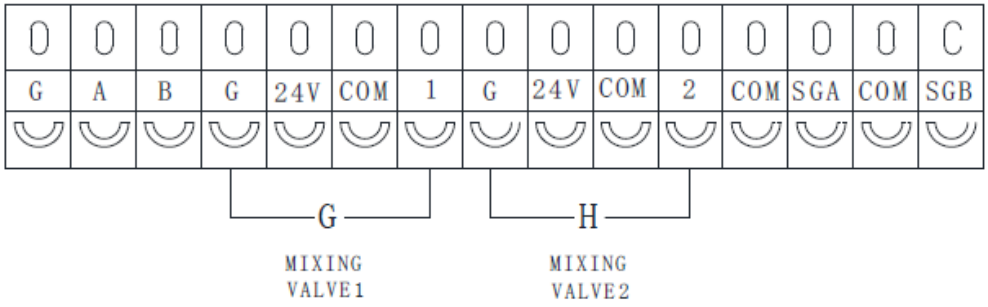
F - External source for heating stage 2 (HBH);

If an external auxiliary heater is used for space heating, it can be connected to these terminals and controlled by the heat pump. When electric heating is required, the heater with the higher priority is activated first.

E - External source for DHW (HWTBH);

If an electric heater is installed in the DHW tank, it can be connected to these terminals and controlled by the heat pump.

The terminals provide **control output only** and must not be used to supply power directly to the heater load.



G – If an underfloor heating circuit includes a mixing station, Mixing Valve 1 can be connected to these terminals.

H – If the system includes two mixing stations, Mixing Valve 2 can be connected to these terminals.

These terminals provide an **active 24 V DC, 0–10 V control signal** and must not be connected to another active signal source, such as an external current or voltage output.

10.4.9 Sensor connections

Sensors in the kit

TW - Domestic hot water temperature sensor connect to the domestic water tank (ONLY in case of HLT293S). If there is no hot water, it doesn't need to be connected.

TC - Cooling/heating temperature sensor is connected to the buffer water tank and is a necessary sensor to be connected.

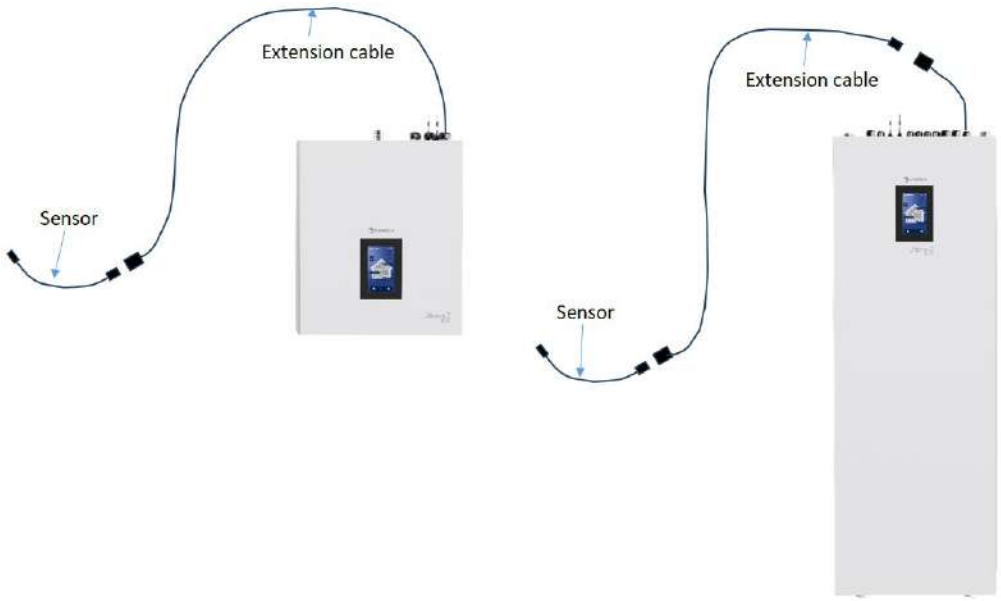
TV1/TV2 - Mixing temperature sensor only needs to be connected for systems that enable the mixing valve.

TR - Room temperature sensor only needs to be connected when the curve compensation function is enabled or the room temperature control mode is activated.

Remove all sensors and sensor extension cables from the accessories bag.

Connect each sensor to its corresponding extension cable using quick connectors. Route the extension cables into the indoor unit through the designated cable gland, then connect them to the corresponding sensor terminals or quick connectors inside the indoor unit.

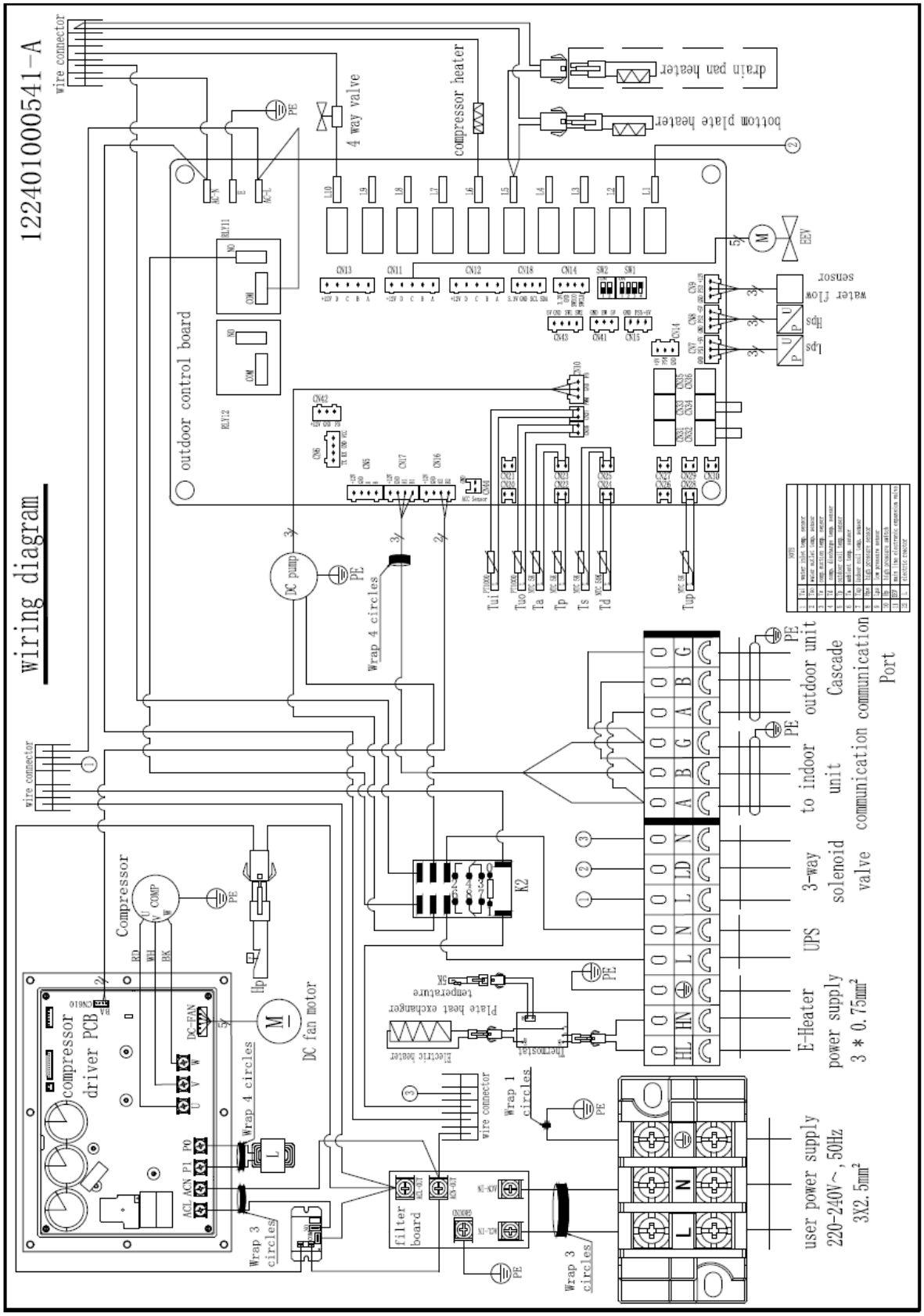
Make sure that each sensor is connected correctly and installed in its specified position. After completing all connections, securely tighten the cable gland to ensure proper cable retention and protection.



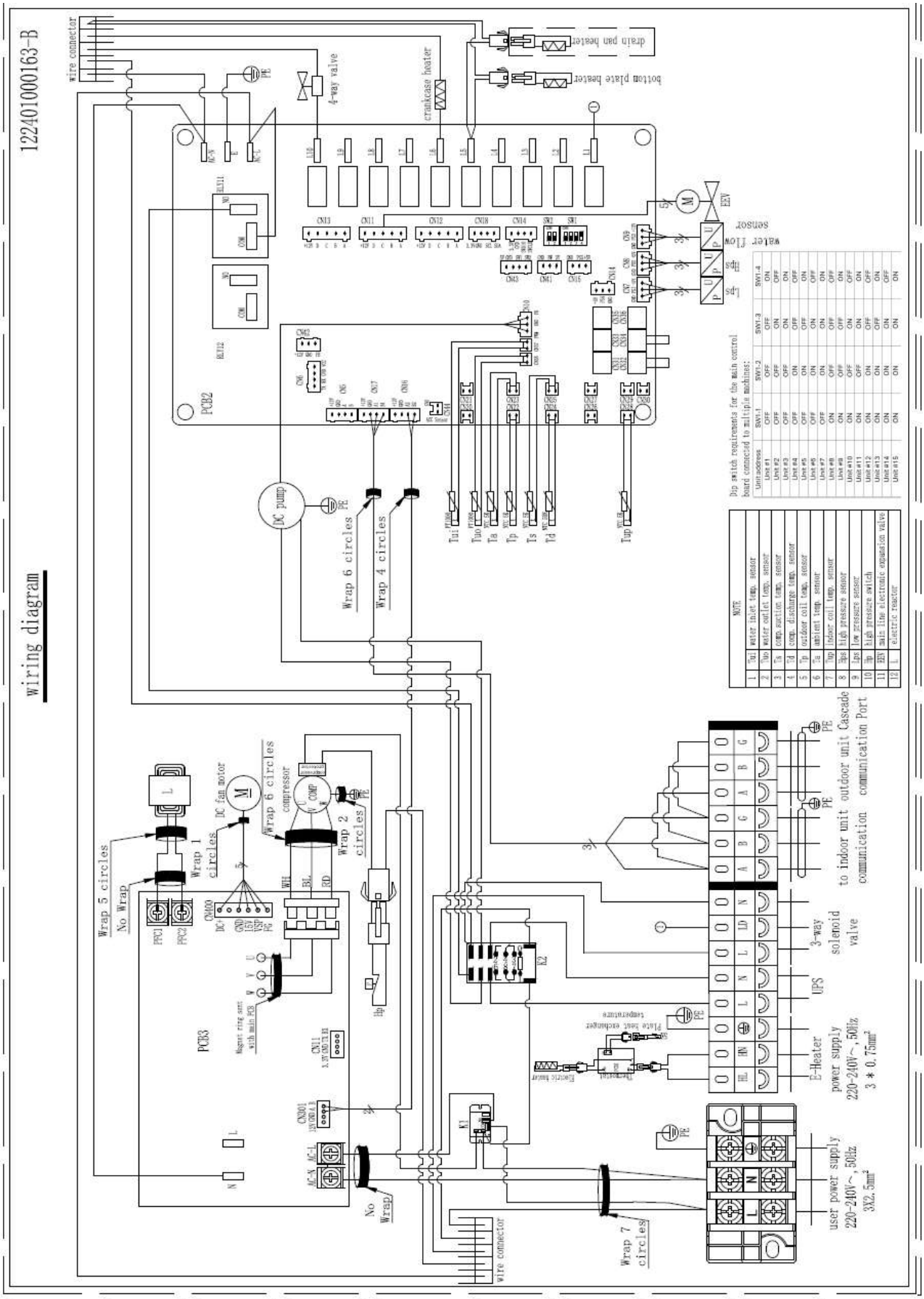
11. WIRING DIAGRAMS

11.1 Outdoor units

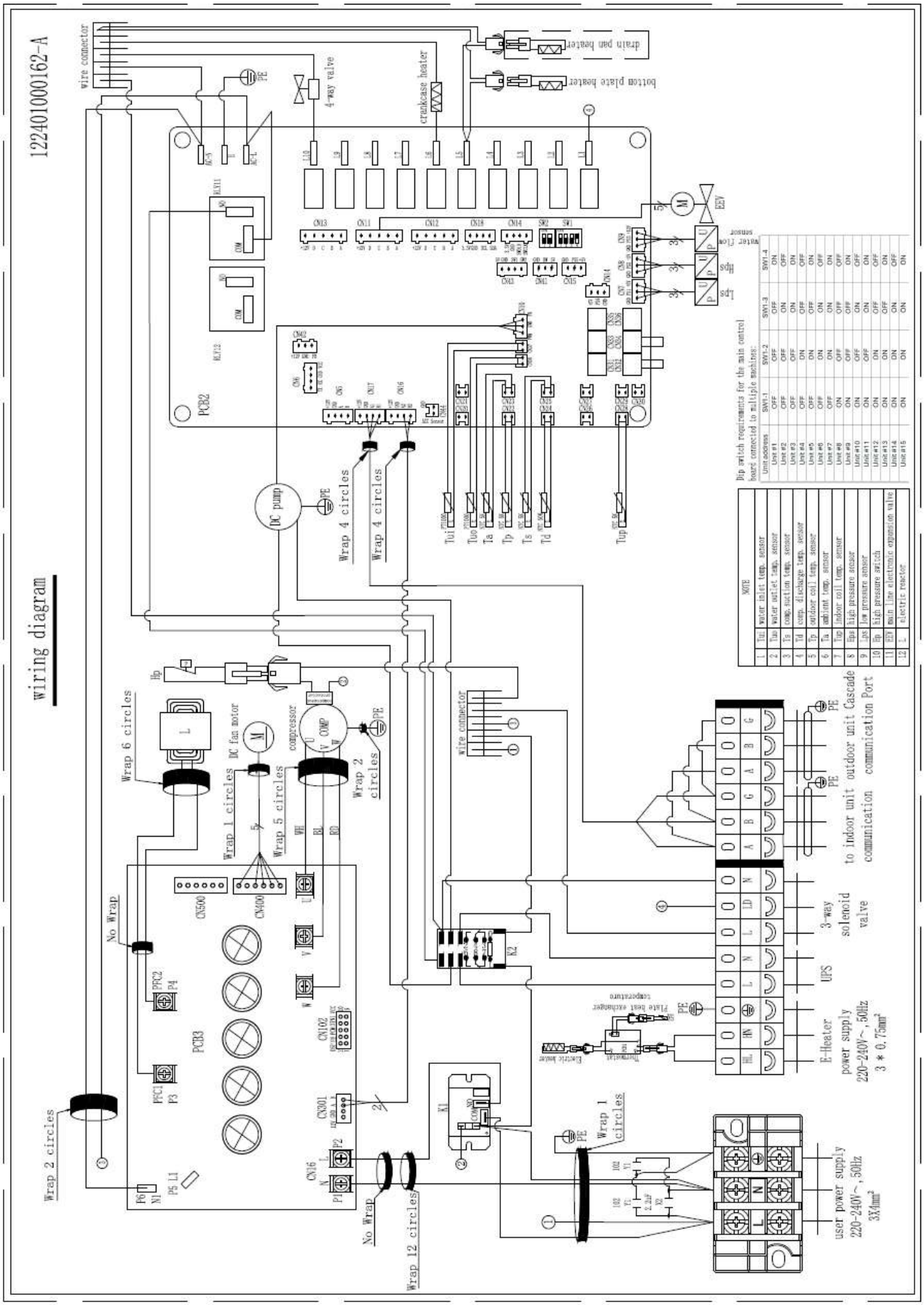
HLT206MONO1S



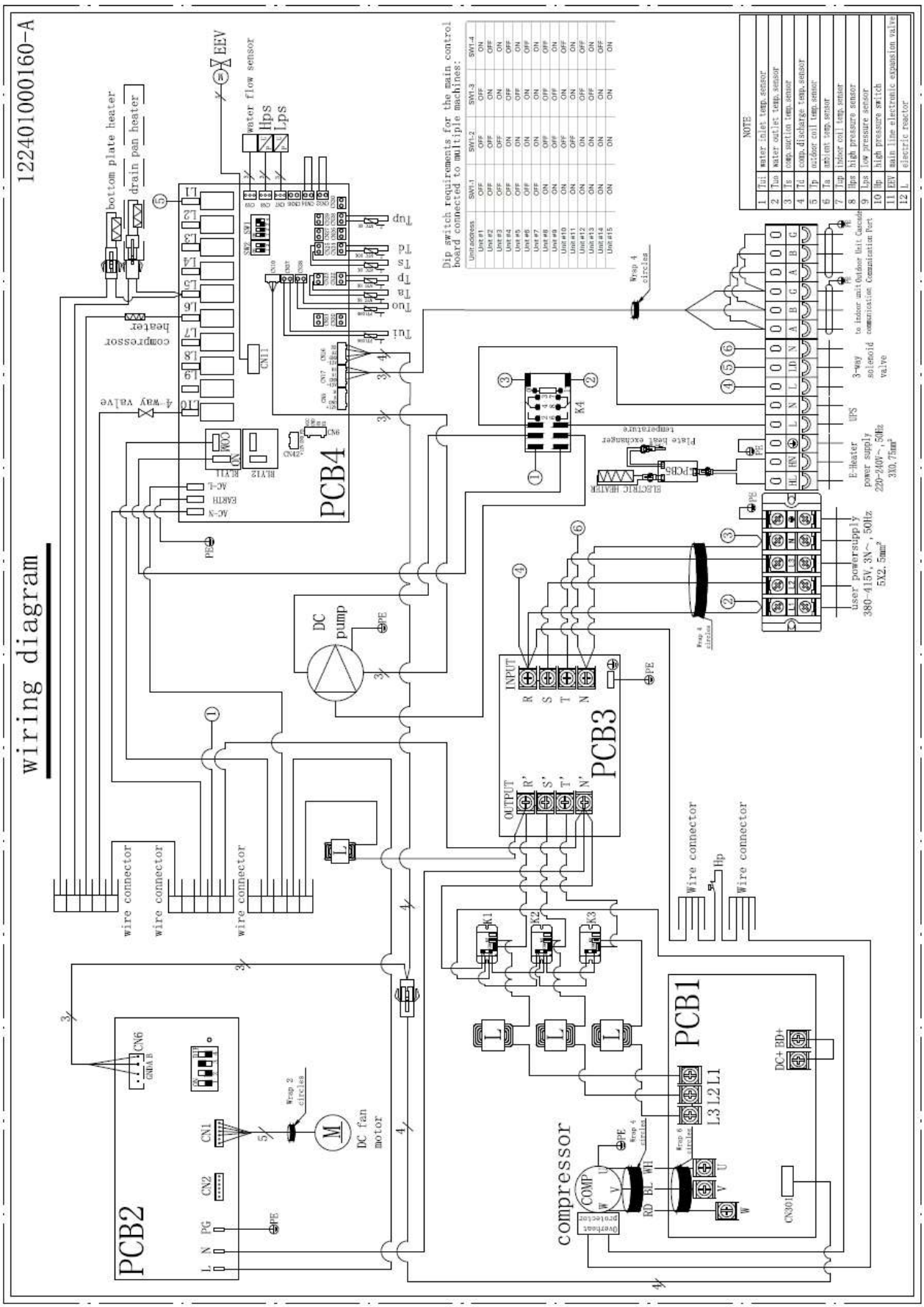
HLT209MONO1S



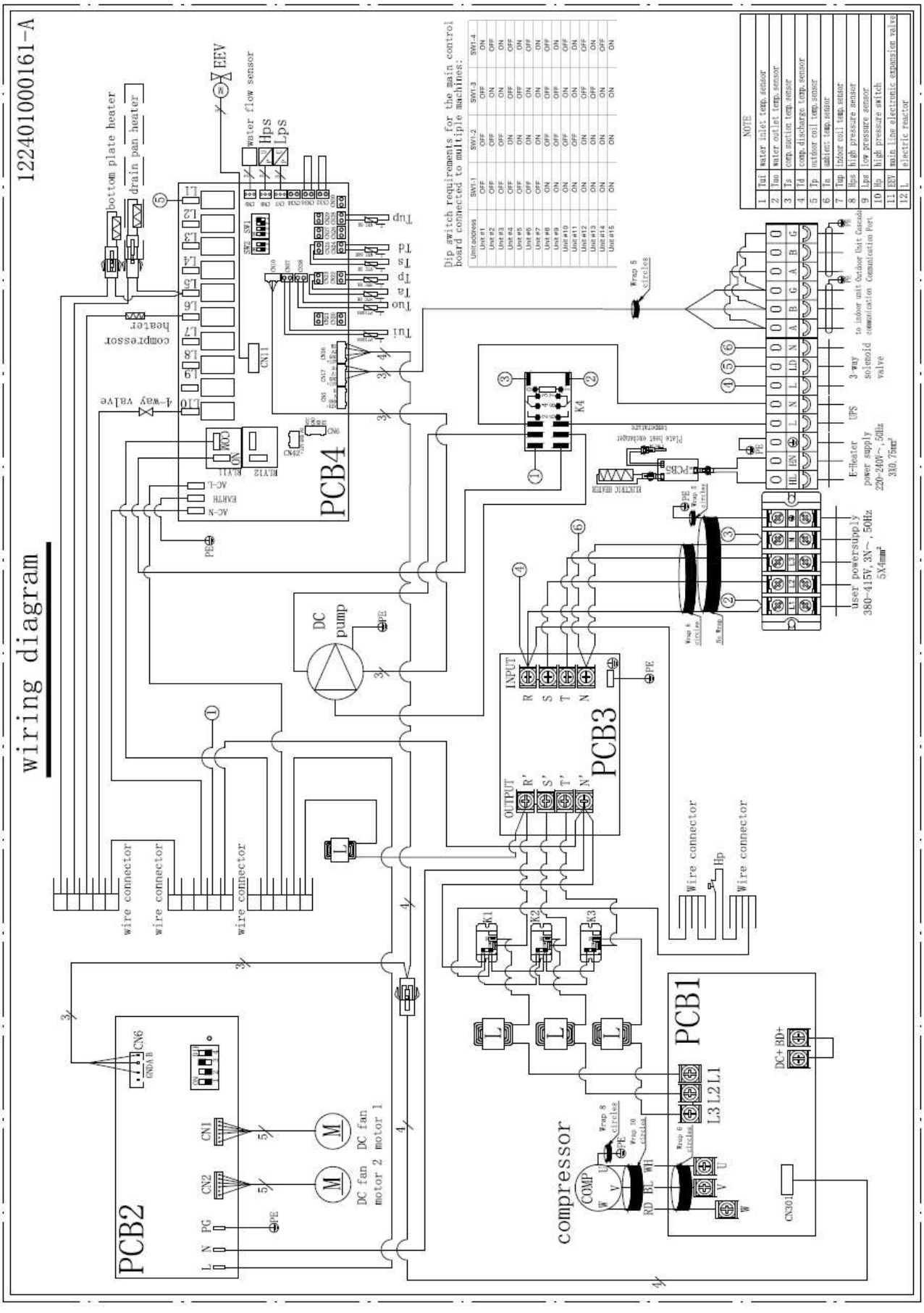
HLT212MONO1S



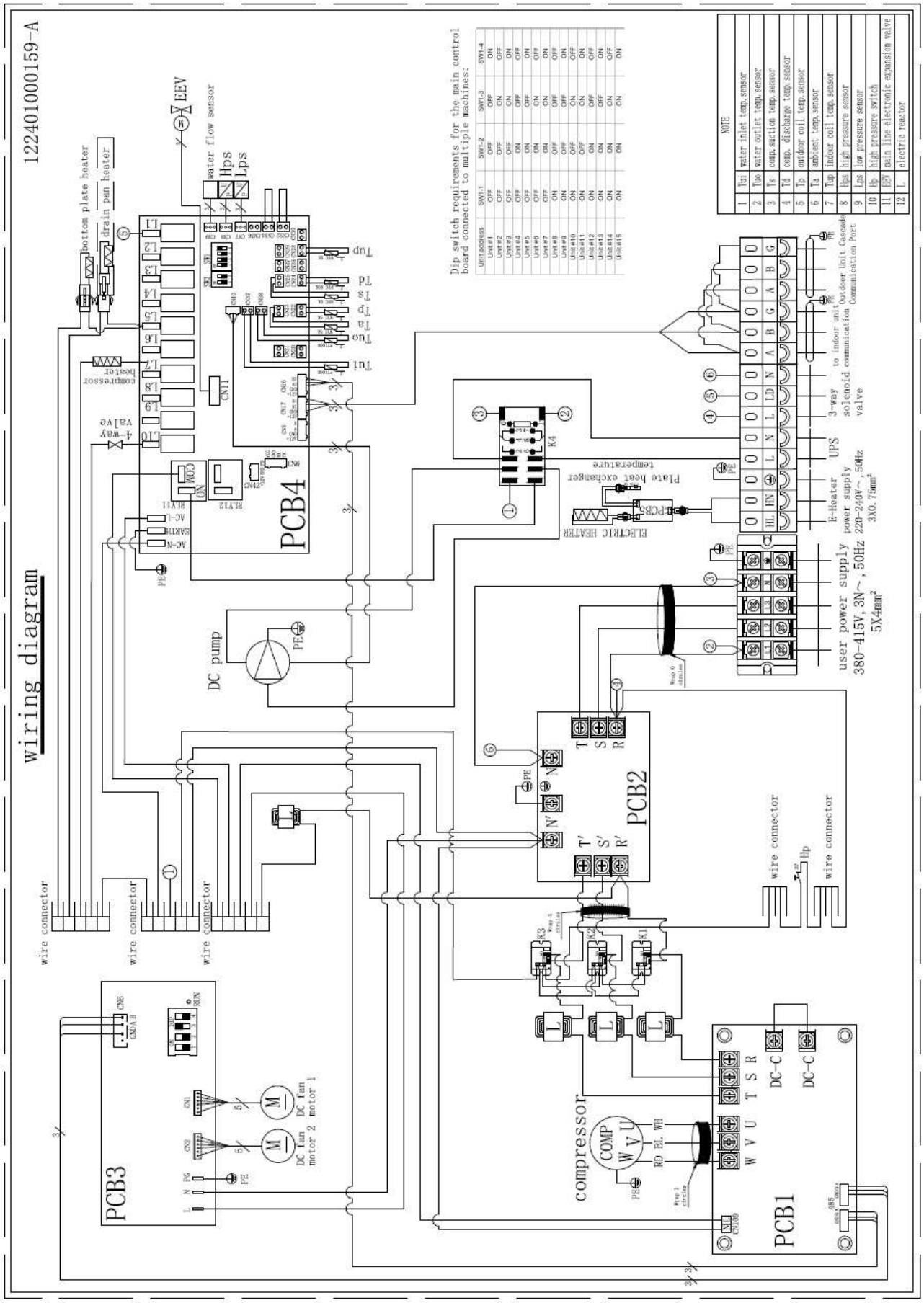
HLT212MONO3S



HLT216MONO3S

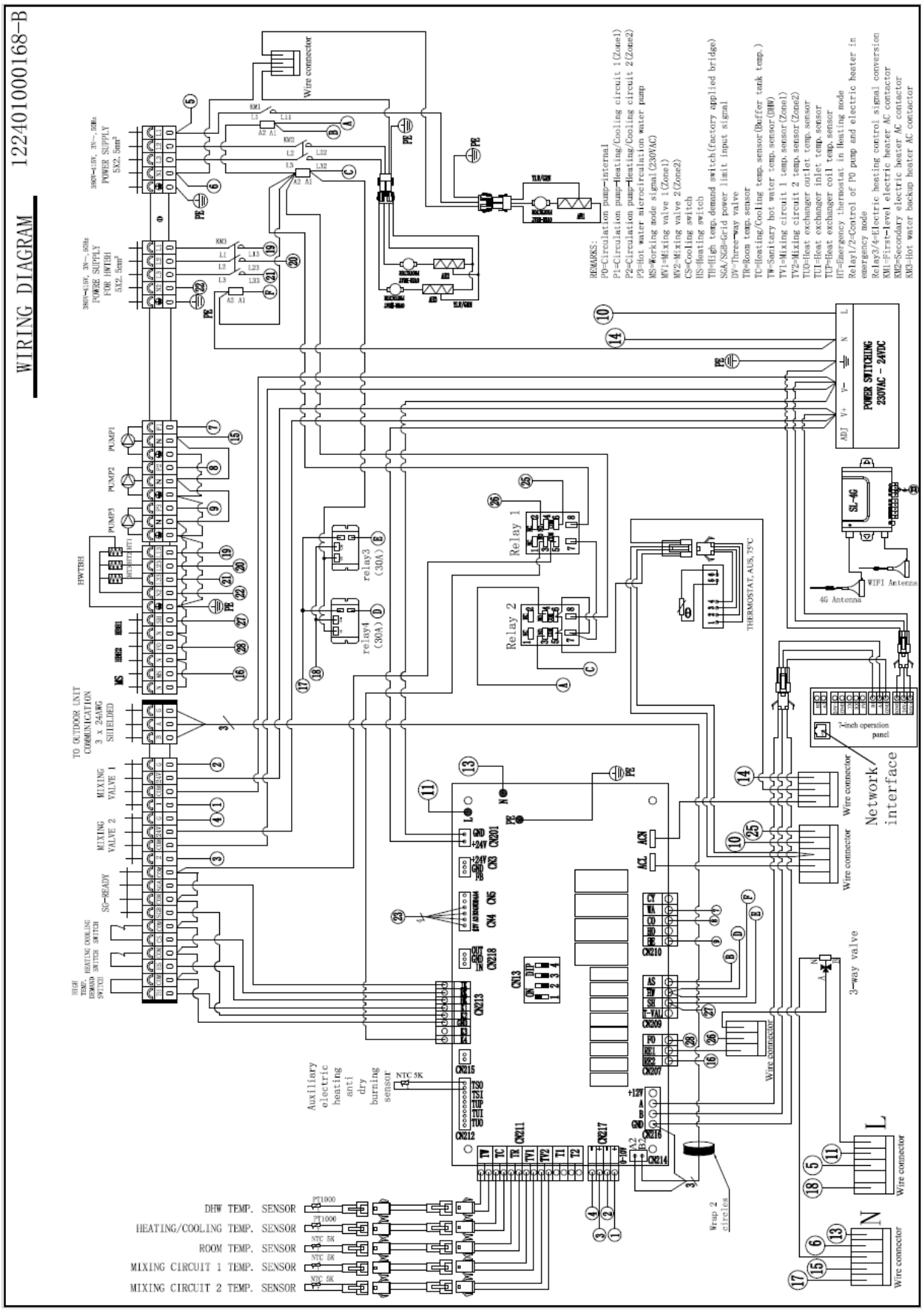


HLT220MONO3S

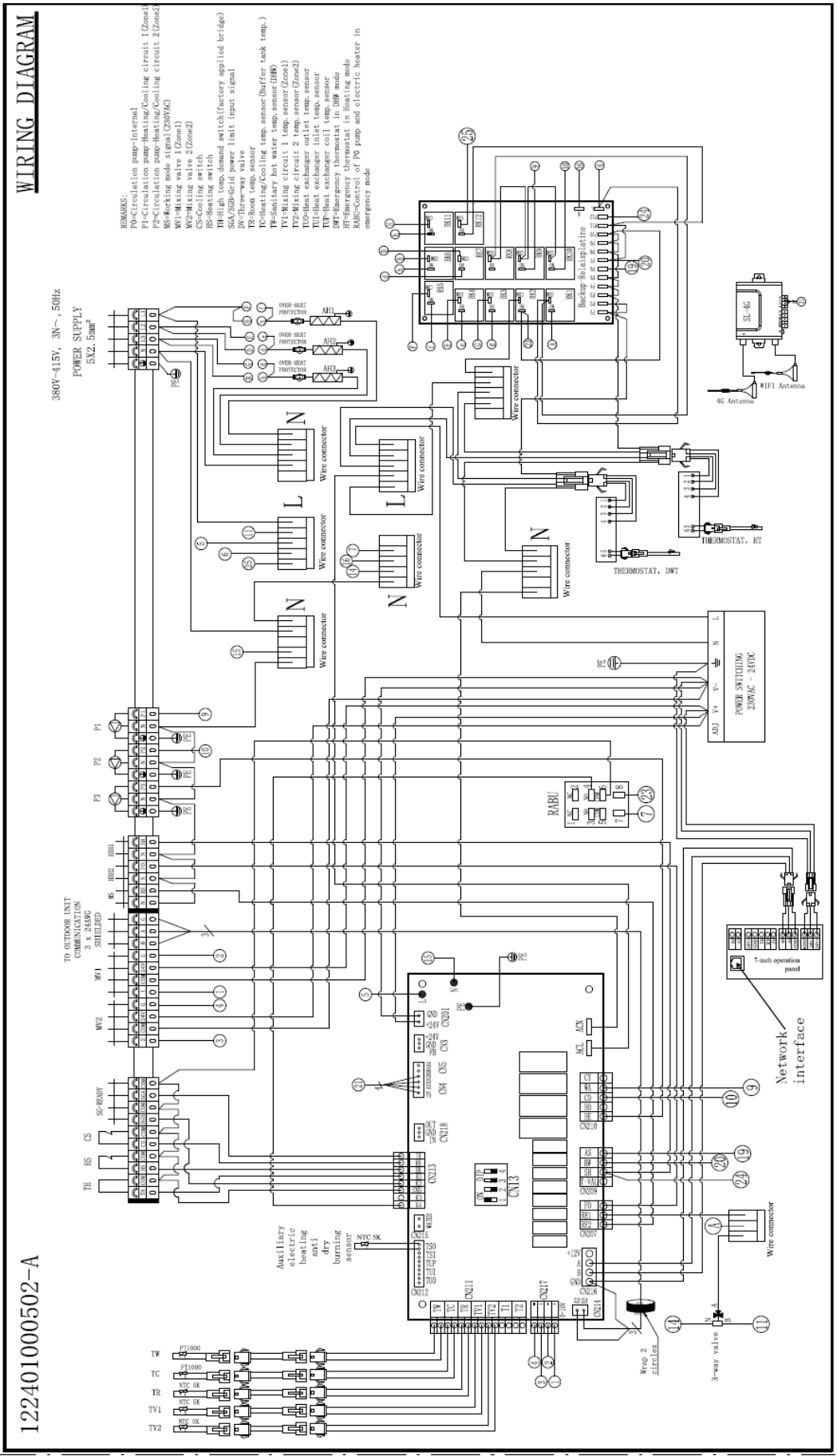


11.2 Indoor units

HLT293S



HLT293S/250 and HLT293S/200B50



12. SETTING FOR INITIAL INSTALLATION

12.1 Confirm the application mode of the water system

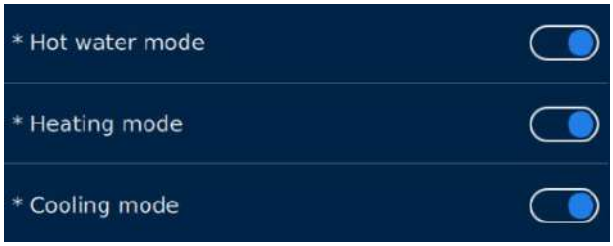
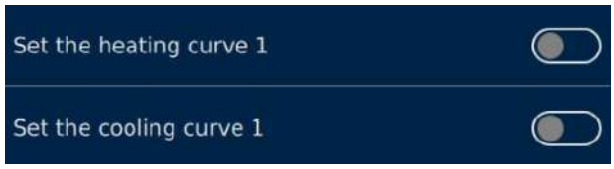
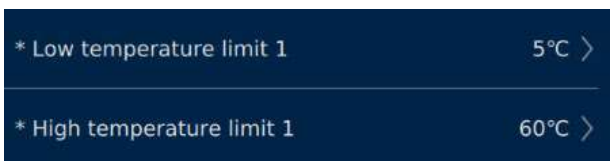
Enter the installation Installer permission level.

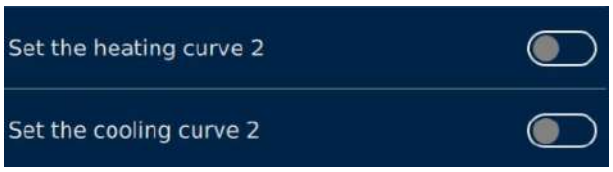
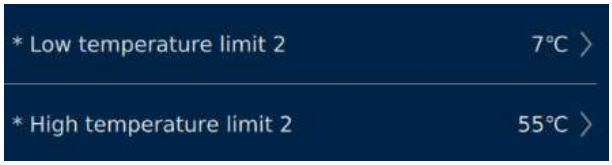
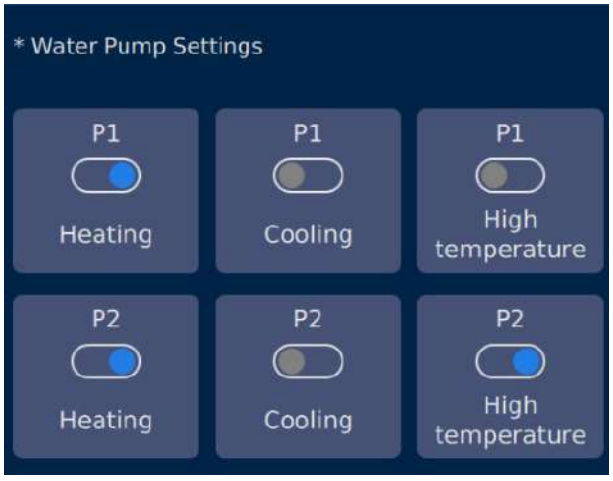
Since the controller can control many parameters, and the actual application water systems of different users are different, the parameter settings are different and need to be adjusted according to the specific needs of users.

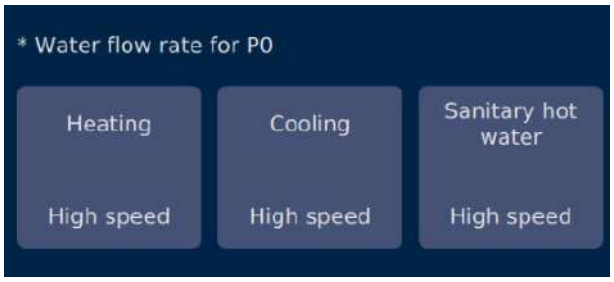
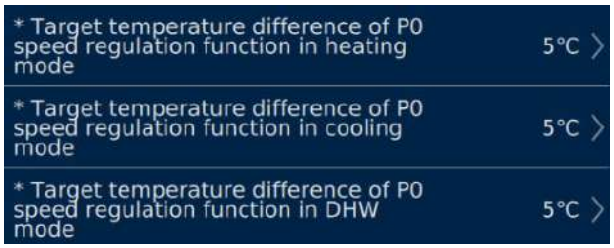
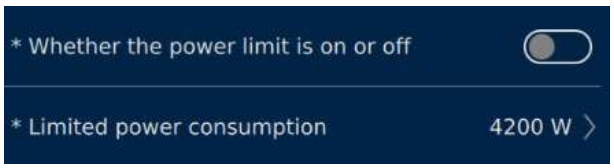
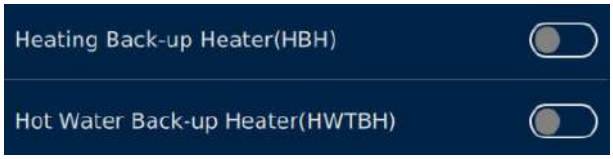
Distinguished by application categories, it can be divided into: single heating, heating + cooling, hot water + heating, hot water + heating/cooling.

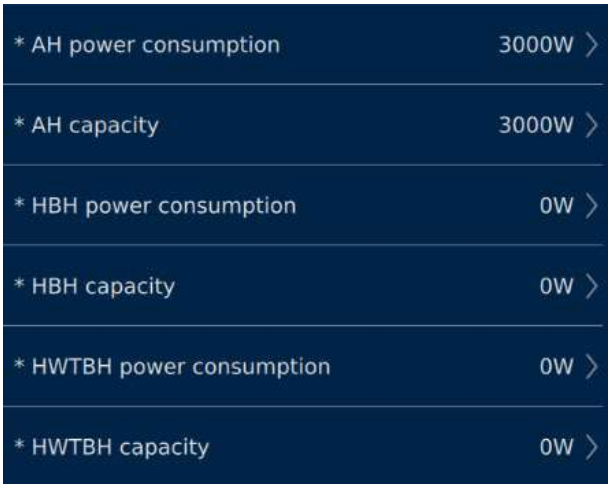
Distinguished by terminal heating, it can be divided into: single temperature system (only floor heating system or only radiator system), dual temperature system (both floor heating and radiators exist).

12.2 Basic settings and checks before commissioning

Menu	Parameters	Setting Instructions
 Working mode		Set to 1. This parameter is set for the cascade solution. If it is a single outdoor unit system, no setting is required. If it has multiple outdoor units, set according to the actual number of units.
		Setting of mode parameters: Due to factory default, only hot water and heating are configured as effective. If there is a cooling demand or no hot water demand in actual application, resetting can be carried out. For the room temperature control, generally no setting is required.
 Heating/Cooling Circuit 1		Turn on/off the curve function of System 1, which is convenient for manually adjusting and setting the water temperature for testing.
		If the system is not installed with a mixing valve, there is no need to enable it.
		Set the cooling lower limit and heating upper limit of the set water temperature in the system. Cooling: 25 - 18°C, Heating: 20 - 40°C. Generally, the heating upper limit of floor heating is within 40°C, and that of radiators can be increased to 55°C.

 Heating/Cooling Circuit 2		If there is only one temperature zone in the water system, this parameter does not need to be enabled, and the corresponding other parameters also do not need to be set.
		If the high temperature system needs to be used and enabled, turn on/off the curve function, which is convenient for manually adjusting and setting the water temperature for testing.
		In general, the mixing valve of the high temperature system does not need to be opened, unless the water system needs to use two way mixing valves, then it needs to be enabled.
		Set the cooling lower limit and heating upper limit of the set water temperature in the system. Cooling: 25 - 7°C, Heating: 20 - 55°C. Generally, the heating upper limit of floor heating is within 40°C, and that of radiators can be increased to 55°C.
 Sanitary hot water		If there is no hot water in the water system, the entire hot water menu does not need to be set. If there is a hot water system, it is necessary to set the highest set water temperature of hot water.
 Water Pump Settings		Whether the buffer water tank exists. Buffer tank is generally enabled by default;
		Working mode of the terminal secondary water pump: 1. Single system, there is no need to set the three parameters of the P2 water pump. 2. Single system and there is no cooling demand, the P1 water pump only needs to set the heating to be effective. 3. If it is a system with two circuits, it is necessary to select the operable modes of P1 and P2 as effective, and enable the high temperature function of the P2 water pump (that is, define System 2 as a high temperature system).

		Operation Modes of Circulation Pump P0 in Each Mode (Four Setting Modes) **Low speed:** The pump operates at 50% output. **Medium speed:** The pump operates at 75% output. **High speed:** The pump operates at 100% output. **Temperature difference adjustment:** The pump automatically adjusts speed according to the inlet outlet water temperature difference. **Note:** During unit commissioning, it is recommended to set to high speed mode for testing.
		Set the target temperature difference for the pump in temperature difference adjustment mode. If the pump does not enable temperature difference adjustment, no setting is needed. **Note:** During unit commissioning, it is recommended to set to high speed mode for testing.
		Sets the maximum power of the DC water pump for capacity energy efficiency calculations.
SG Ready		SG Ready If there is no demand, no setting is needed. This part is mainly for energy management control with external intelligent devices.
		Power Consumption Limit If there is no demand, no setting is needed. This part is mainly for energy management control with external intelligent devices.
Electrical&back-up heater settings		According to the installation situation, choose whether to enable the integrated el. heat heater function for heating and hot water.

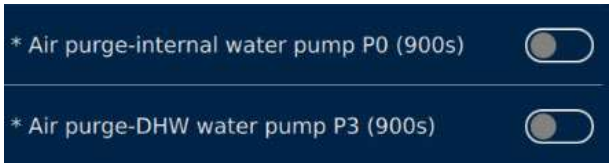
		Set the functions and capacities of auxiliary electric heating, heating standby heat source, and hot water standby heat source, facilitating the unit to calculate capacity and power.

12.3 Commissioning instructions

1. Fill water into the water supply system, and check all connections in the water system for water leakage points, and carry out water leakage treatment.

2. Power on the unit, and check the display screen for fault indications. If there are fault indications, troubleshoot the faults. This part is mainly about whether the sensors of the indoor unit are not connected, or the communication wires of the indoor and outdoor units have poor contact, or the external power supply is abnormal, leading to communication failures or sensor failures.

3. Enable the heat pump water pump air purging function. In the main interface power off state, enter the installation advanced level, then find the water pump menu setting, and turn on the automatic air purging function of the P0 water pump. At this time, the system water pump will run intermittently within 900 seconds to discharge part of the air in the water system. After the water pump completes air purging, the next step of starting up can be carried out. The same could be done with additional DHW pump (P3) if it is installed in the system.



4. Trial operation of application modes (hot water/heating/cooling). After enabling the corresponding modes, use the operation data of the water system diagram and refrigerant system diagram of the wire controller to initially judge the operation state of the unit. Observe the installation positions of the hot water temperature sensor (TW), buffer water tank temperature sensor (TC), and mixed water temperature sensor (TV). During the unit temperature rising process, check whether there are misconnections or reverse connections. Observe whether the electronic expansion valve is fully open or fully closed during the operation of the refrigerant system (except in the defrosting state). The temperature difference between the exhaust temperature and the outlet water temperature should be between 10 - 30°C. During trial operation, the secondary water pump can be turned off, and only let the heat pump heat the buffer water tank and the domestic water tank. Observe whether the two modes can automatically switch operation after reaching the temperature, to ensure the normal switching of the 3-way valve of the water circuit.

5. If the newly installed floor heating pipes have not been checked for pre-heating, the floor heating pre-heating function of the unit can be enabled. After the floor heating pre-heating is completed, deliver it to the user for use.

6. According to the user's use scenario and usage habits, enable and set relevant parameter functions (for function application and setting, refer to the function description below).

13. TEST RUN



After installation finished, please fulfill the water system with water and purge out air in the system before start-up.

13.1 Before start-up

Before the unit starts up, a certain number of verifications must be performed on the installation to ensure that the unit will operate under the best possible conditions. The check list below is not exhaustive and should only be used as a minimum reference basis:

A. Make sure fan rotates freely;
B. Inspect all water piping for flow direction;
C. Verify all system piping is correct for operation as per installation requirements;
D. Check voltage of the unit power supply and make certain voltage is within authorized limitations;
E. Make sure the unit is properly grounded;
F. Check the presence of protective and breaking devices;
G. Check all electric connections for tightness.
H. Check all piping for leaks and air is well ventilated.



If everything above is OK, the unit can start up.
If any of them fails, please fix it.

13.2 Pre-start up

A. When the installation of unit is completed, water system pipes are well connected and air purging is done, no leakage or other problems, the unit can be powered to start up.

B. Turn on the unit, press the on-off button on the operation panel to start the unit. Please check carefully if there is some abnormal noise or vibration, or the display of wired controller is normal or not.

C. After the unit is working properly for 10 minutes, without any problem, then the pre-start up is completed; If not, please refer to the Service and Maintenance chapter in this manual to solve the problems.



It is suggested not to run "heating" or "hot water" mode, when ambient temperature is over 32°C, otherwise unit may go into protection mode easily.

14. MAINTENANCE

1. Check for loose or detached components

Loose or falling off parts of the outdoor unit may lead to a decrease in the operating efficiency of the heat pump and even affect the safe operation of the heat pump. Therefore, it is necessary to regularly maintain and inspect the heat pump. This includes checking the various components of the heat pump, such as the compressor, fan, pump, outer sheet metal parts, pipe connections, etc. Make sure that they are securely installed and not loose or falling off. Please tighten or reinstall promptly the loose or falling off parts to ensure normal operation and safety of the heat pump.

2. Inspect power cable connections for overheating or discoloration

Since the heat pump is a high-power household appliance and is used all the time during the heating season. if the power supply cable is not properly selected or wired securely, it may lead to blackening of the wires under long-time operation. More serious situations may lead to a fire; therefore, it is very necessary to check the power supply cable of the heat pump on a regular basis. Below are three reference checking methods:

Observation method: Detect heat or blackening by observing changes in the appearance of the power supply cable connector. For example, if the insulating tape outside of the wire connector is yellowed and blackened, this may indicate that the temperature of the connector is already above 70°C. In addition, rainy days to observe the connector dry, or the connector on the snow melting, these also be used as a reference to determine the temperature of the connector.

Smell method: Judge the power supply cable is heat by smelling whether there is a burnt odor near the connector. If smell a burnt odor, which means the temperature of the connector is already above 70°C.

Thermometer: Infrared thermometers or semiconductor spot temperature measurements are utilized to directly measure the temperature of the connector. These instruments provide accurate temperature value and are an effective method of detecting whether a connector is hot or not.

3. Verify water system pressure is within normal range within the normal range

Since the water circuit of the heat pump is basically a closed system, that is, the water circuit is isolated from the air. The water circuit are equal to a pressurized system, which allows the circulation pump does not need to overcome the gravitational force of the water to do the work and reduce the power of the pump. At the same time, a certain amount of pressure allows the water circuit to be more efficient in the transfer of heat to result the energy-saving. If the pressure of water circuit is too low or zero, it may affect the efficient operation of the whole circuit. Although the water pressure test of the water circuit has been completed and a certain pressure has been injected into the water circuit at the first installation, the heat pump will operates high temperature water for a long time during the heating process. The water will produce a trace amount of air bubbles at high temperatures. The bubbles will be discharged into the air through the discharge valve, which will decrease the water pressure of the water circuit. The water pressure may become too low after a period of time. Therefore, checking the water pressure in the water circuit is one of the conditions to ensure the efficient operation of the unit. Generally the water pressure is between 1.0bar and 2.2bar. When the water pressure is too low, It needs to notify the installer to carry out checking and replenishment of the water. If the water pressure is too high, the unit has a pressure relief valve to automatically reduce the pressure. The pressure of relief valve is usually set at 2.5 bar.

4. Detect whether there is water flow sound in the water circuit

The water in the water circuit is basically without sound when it circulates under normal situation. If the water circuit is with air inside, it will produce water flow sound from time to time. It will cause the noise effect. when you hear the sound of water flow in the water circuit. The air is generally allowed to exit the discharge port under a non steady state water flow by starting and stopping the pump.

5. Inspect Water System Filters

The water pipe may remain some impurities during the installation of the water circuit. Or the pipe produce some rust when the water circuit is used for a long time. These impurities may be isolated by the filter. Impurities will reduce water flow when too much is left in the filter. Thus affecting the efficiency of the unit, or report the failure of the water flow. The more serious may lead to the pump jamming. So The premise for ensuring efficient operation of the heat pump is to regularly check and clean each filter in the water circuit. Generally new installation of the heat pump, from the very beginning of two days to check once and lasts about a week, and then two weeks to test again. After that, testing is done once a month to once every two months.

6. Check insulation on water pipes for damage

Since heat pumps are usually installed outdoors and connected to the indoor unit through water pipes . Part of the heat will be lost to the air if the insulation material of the connected water pipes falls off or is damaged. Causing a decrease in the indoor heating supply. Therefore, it is very important to check the outdoor water tank insulation from time to time.

7. Ensure outdoor unit surroundings are clear for airflow

Heat pump belongs to the air source heat pump. The principle is by absorbing the heat in the air, and then transferred to the indoor. But if the outdoor unit is installed in a poorly ventilated location, or there are some mess around the outdoor unit. These will affect its heat transfer capacity and reduce the efficiency of the heat pump. So it is the condition to ensure the heat pump high efficiency operating to check whether there are objects around the unit that may affect it from time to time.

8. Clean outdoor unit evaporator of dust and debris

Heat pump absorbs heat in the air, which is realized by evaporator (finned heat exchanger). But if the installation environment is more dusty or under the tree, the dust or leaves will be attached to the fins which will lead to the reduction of the heat exchange efficiency of the fins when the unit operate for a period of time. So check the fins whether with any dust or mess from time to time. You can use a broom or tong to remove the leaves. Please notify the installer to bring professional tools for cleaning if the fin is with a lot of dusts. Because the fins are sharp and it is easy to scratch your hand.



ATENTION

- The user must not modify the internal structure or electrical wiring of the unit.
- Service and maintenance must be carried out by qualified and properly trained personnel. If the unit fails to operate, disconnect the power supply immediately.
- The control system automatically monitors the unit for faults and protection conditions and displays the corresponding error code on the wired controller. Some protection conditions may reset

automatically once normal operating conditions are restored. Under normal operating conditions, the internal piping does not require routine maintenance.

- Under normal operating conditions, the surface of the outdoor heat exchanger should be inspected and cleaned regularly, typically once a month or once every three months, depending on the operating environment.
- If the unit operates in a dirty, dusty, or oily environment, the outdoor heat exchanger should be cleaned by qualified personnel using an appropriate cleaning agent to maintain the performance and efficiency of the unit.
- Regularly inspect the installation area. Make sure that the unit is securely installed and that the air inlet and air outlet of the outdoor unit are not obstructed.
- Under normal operating conditions, the internal hydraulic components do not require routine maintenance. The water filter should be inspected and cleaned regularly and replaced if it is damaged or excessively clogged. Any service or repair of the internal water circuit, including the circulation pump, should be carried out by qualified personnel.

15. TROUBLESHOOTING

15.1 Common issue diagnosis

Heat pump on, space not warming

1. Check whether the water temperature set by the heat pump is too low;
2. Check whether the heat pump has stopped due to the error;
3. Check whether the outdoor unit is seriously frosted;
4. Check whether the secondary water pump is abnormal;
5. Check whether the mixing valve is abnormal;
6. Check whether the mixed water temperature sensor is loose;
7. Check whether the water valve of floor heating or radiator is closed or damaged;

DHW not hot

1. Check whether the water temperature of the heat pump is too low or the hot water timer setting is unreasonable;
2. Check whether the heat pump has stopped due to the error;
3. Check whether the water flow is too small;
4. Check whether the outdoor unit is severely frosted;
5. Check whether the three-way valve of the water circuit is abnormal and whether water is mixed with the heating side;
1. Check whether the hot water tank is scaled

Insufficient water flow protection

1. Check whether the filter is dirty or blocked;
2. Check whether the speed setting of the circulation pump is at low speed;
3. Check whether there is air in the water circuit that has not been completely discharged;

Abnormally high electricity consumption

1. Check whether the setting heating electric heater integral time and the hot water electric heater judgment time are too small, resulting in electric heater to start up in frequently;
2.Check whether the emergency mode is turned on, which causes the electric heater to automatically turn on and keep working when the heat pump has error;
3. Check whether the outdoor unit is severely frosted and cannot be removed by the heat pump's defrost mode;
4. Check the operating status of the heat pump to see if there is any refrigerant leakage;

16. TROUBLESHOOTING TABLE

16.1 Failure codes and protection functions

Failure code	Failure name	Unit Status	Possible Reasons and Solutions
P01	Input current protection	Compressor stops	This protection is generally caused by excessive system load. You can power on again and observe the operation of the unit: 1. If the temperature difference between the inlet and outlet water is greater than 8 degrees during operation, check whether the water pump speed is set to high speed (if it is low speed, please adjust to medium speed or high speed), and also check whether the filter in the water system is blocked; 2. If it is triggered in the hot water mode, you can confirm whether the domestic water tank coil is too small (the minimum heat exchange area is $3m^2$). If it is too small, it may lead to low heat exchange capacity, so heat will continue to accumulate, and eventually due to the water temperature rises too fast and the current is too large. You can temporarily turn on the hot water ECO mode to see if it can alleviate the heat exchange problem of the water tank. If the hot water ECO mode cannot solve the problem, you need to replace the coil water tank with a larger coil area (at least $3m^2$); 3. During operation, you can observe the difference between the inner coil temperature (TUP) and the outlet water temperature (TUO). Normally, the inner coil temperature is 1 to 2 degrees lower than the outlet water temperature. If TUP is higher than TUO, it may because the heat pump is unable to exchange heat, due to fouling of the plate changer. So the current rises and causes a fault, so as long as the plate changer is descaled and cleaned, the problem can be solved; 4. When triggered in cooling mode, you can check whether the evaporator is dirty or blocked or the heat island effect is caused by the installation position, resulting in high current. You can clean the evaporator, adjust the installation location, or install a discharge duct to eliminate the heat island effect; 5. The electronic control parameters are set incorrectly, resulting in false alarms of the unit. At this point you can try to upgrade the main PCB EEPROM settings. 6. Check whether the input voltage is normal. If it is lower than the rated voltage by more than 10%, the over current protection may be triggered. Please contact the power supplier to adjust the power supply voltage.
P02	Compressor phase current protection	Compressor stops	When the driver PCB detects that the compressor phase current exceeds the compressor phase protection current value, the unit will report a fault and shutdown. 1. If the temperature difference between the inlet and outlet water is greater than 8 degrees during operation, check whether the water pump speed is set to high speed (if it is low speed, please adjust to medium speed or high speed), and also check whether the filter in the water system is blocked; 2. If it is triggered in the hot water mode, you can confirm whether the domestic water tank coil is too small (the minimum heat exchange area is $3m^2$). If it is too small, it may lead to low heat exchange capacity, so heat will continue to accumulate, and eventually due to the water temperature rises too fast and the current is too large. You can temporarily turn on the hot water ECO mode to see if it can alleviate the heat exchange problem of the water tank. If the hot water ECO mode cannot solve the problem,

			you need to replace the coil water tank with a larger coil area (at least 3m^2); 3. During operation, you can observe the difference between the inner coil temperature (TUP) and the outlet water temperature (TUO). Normally, the inner coil temperature is 1 to 2 degrees lower than the outlet water temperature. If TUP is higher than TUO, it may because the heat pump is unable to exchange heat, due to fouling of the plate changer. So the current rises and causes a fault, so as long as the plate changer is descaled and cleaned, the problem can be solved; 4. When triggered in cooling mode, you can check whether the evaporator is dirty or blocked or the heat island effect is caused by the installation position, resulting in high current. You can clean the evaporator, adjust the installation location, or install a discharge duct to eliminate the heat island effect; 5. The electronic control parameters are set incorrectly, resulting in false alarms of the unit. At this point you can try to upgrade the main PCB EEPROM settings. 6. Check whether the input voltage is normal. If it is lower than the rated voltage by more than 10%, the over current protection may be triggered. Please contact the power supplier to adjust the power supply voltage.
P03	IPM module protection	Compressor stops	During compressor operation, the IPM module is detected to be over-temperature protected (the protection value is generally 95-100 degrees) or over-current protected, and the unit reports a fault and shutdown; 1. Refer to the P02 troubleshooting method 2. In cooling mode, please check whether the fan is running normally (whether the speed is low, such as below 500 rpm) or only one fan is running in the dual fan system, if yes please refer to the handling of fan failure, check and replace the motor if needed. If the speed is low, contact the manufacturer for further investigation; 3. In cooling mode, you can check whether the evaporator is dirty or blocked or the heat island effect is caused by the installation position, resulting in high current. You can clean the evaporator, adjust the installation location, or install a discharge duct to eliminate the heat island effect; 4. Change for drive PCB
P05	High pressure switch protection	Compressor stops	1. Please check error history to see if the high pressure value is higher than 42 Bar when unit report this error; if so, please check the value of high pressure sensor (please refer to High Pressure Sensor Failure section for description). If the most recent HV protection was less than 41 bar, the HV pressure sensor may be faulty, try replacing the HV switch. 2. Check if there is insufficient heat dissipation on the high-pressure side (condensing side) Data recording, after confirming the temperature difference between the inlet and outlet water, shut down and re-power the unit. Then the following judgments are made: -2.1. Confirm that the temperature difference between the water inlet and outlet is within 5 degrees, if it exceeds 8 degrees, please check whether the water pump is set to low speed, if yes please try to let the water pump run at medium or high speed, to ensure that the water flow is within the normal range; also please check the filters in the water system, whether there is a dirty blockage, and then clean it; -2.2. Confirm the temperature difference between the outlet water temperature and the TC temperature or TW temperature. Normally, the outlet water temperature will be 3 to 5 degrees higher than the TC or TW, if it is more than 5 degrees, please check whether the installation position of the TC and TW sensors is installed in an inappropriate position, the TC

			or TW should be installed in the middle and upper part of the water tank as far as possible; -2.3. During the operation of the unit, observe whether the temperature of the inner coil is higher than the temperature of the outlet water. If the temperature of the inner coil is higher than the temperature of the outlet water by more than 3 degrees, check if there is fouling of the plate changer. As long as the plate changer is descaled and cleaned, the problem can be solved; there is scaling in the plate exchange, and it is necessary to clean the water side of the plate exchange to remove the scale; -2.4. If it occurs in cooling mode, please check for poor ventilation around the unit, you can compare the value between ambient temp. Sensor and real ambient temp, if the difference between the two values is more than 5 degrees, there may be poor ventilation, and you can consider adding an air guide to the unit. So that hot air can be vented in a timely manner; Please check if evaporator is blocked by dirt, clean the evaporator. 3. If all of above solutions cannot solve the problem, the EEV may be abnormal, please refer to the "Electronic Expansion Valve Investigation Part".
P06	High pressure protection	Compressor stops	1. Determine if there is insufficient heat dissipation on the high-pressure side (condensing side). After recording the data and confirming the temperature difference between the inlet and outlet water and the outlet water temperature at the time of the unit's protection shutdown, power down and restart the unit to allow the unit to run again, and make the following judgments during the operation process: 1.1. Confirm that the temperature difference between the inlet and outlet water of the unit is within 5 degrees, if it exceeds 8 degrees, please check whether the running gear of the water pump is set to low speed, and try to let the water pump run at medium or high speed to ensure that the water flow is within the normal range; check the filters in the water system, whether there is a dirty blockage, and then clean it; 1.2. Confirm the temperature difference between the outlet water temperature of the unit and the TC temperature or TW temperature, under normal circumstances, the outlet water temperature will be 3 to 5 degrees higher than the TC or TW, if it is more than 5 degrees, please check whether the installation position of the TC and TW sensors is checked off or installed in an inappropriate position, the TC or TW should be installed in the middle and upper part of the water tank as far as possible; 1.3. During the operation of the unit, observe whether the temperature of the inner coil is higher than the temperature of the outlet water. If the temperature of the inner coil is higher than the temperature of the outlet water by more than 3 degrees, there is scaling in the plate exchange, and it is necessary to clean the water side of the plate exchange to remove the scale; 1.4. If it occurs in cooling mode, check for poor ventilation around the unit, check the evaporator of the outdoor unit for dirt and blockage, and clean debris from the outdoor heat exchanger; Check for poor ventilation around the outside unit, compare the outdoor temperature sensor display and the measured outdoor temperature on site to see if there is a big difference, if the difference between the two is more than 5 degrees, there may be poor ventilation, and you can consider adding an air guide to the unit. Circle so that hot air can be vented in a timely manner; 2. If the above troubleshooting is unable to solve the problem, the electronic expansion valve of the refrigerant system may be abnormal,

			please refer to the "Electronic Expansion Valve Investigation Part".
P07	Compressor preheating protection	Standard function, doesn't need any treatment	When the unit is powered on, if the ambient temperature is lower than -5 degrees, the unit will warm up for 30 minutes, report the protection, system will turn on the compressor electric heat tape, and the unit will not be allowed to turn on. There is no need to deal with it, just leave the unit to warm up for 30 minutes, but with the current version of the program, the line controller will not report a P07 fault;
P08	High compressor discharge temperature protection	Compressor stops	1. Examine the factors of insufficient refrigerant: -1.1. Under the standby mode which longer than 30 mins, check the refrigerant pressure value, and confirm whether there is serious leakage of refrigerant quantity initially. The judgment way is: whether the saturation temperature corresponding to the pressure value currently displayed, is the same as the ambient temperature, and if it is lower than the ambient temperature by more than 5 degrees, it can be judged that there is a leakage of refrigerant basically; -1.2. For split units, check whether the refrigerant piping exceeds 15 meters and the refrigerant is not replenished; if so, replenish the refrigerant according to the length of the piping; -1.3. You can try to start the machine, and observe the change of low pressure, if the low pressure is too low (i.e. the evaporating temperature is lower than the ambient temperature by more than 10 degrees), and the running time is more than 5 minutes, you can initially judge that it is suspected that the refrigerant is leaking, and you can temporarily add approx. 100-200g of refrigerant to see whether the low pressure of the system is rising or not. And whether the discharge temperature is dropping. If so, you can find the leakage point in the unit, and make up for the leakage. Re-evacuate the unit and refill the refrigerant according to the refrigerant quantity on the nameplate; 2. Examine the factors of insufficient heat transfer Please check the error history, if there is no high pressure protection, the effect of poor heat exchange can be ruled out. 3. Sensor problem: Pull out the sensor from the PCB, and use a multimeter to test the function of the resistance, measure the resistance of the sensor, and compare with the table of 50K temperature - resistance table, if there is a large deviation, then replace the discharge temperature sensor; 4. If the above troubleshooting fails to solve the problem, the electronic expansion valve of the refrigerant system may be abnormal, please refer to "Electronic Expansion Valve Troubleshooting Part".
P09	Outdoor evaporator coil temperature sensor protection	Compressor stops	1. In cooling mode, please confirm whether the fan motor is running normally (whether the speed is low, such as less than 500 rpm) or only one fan is running in the dual fan system. If yes, please refer to the solution of fan motor failure, investigate and replace the motor. If the speed is low, please contact the manufacturer for further investigation; 2. In cooling mode, you can check whether the evaporator is dirty or blocked or the heat island effect is caused by the installation position, resulting in high current. You can clean the evaporator, adjust the installation location, or install a discharge duct to eliminate the heat island effect; How to replace the motor: please refer to the motor replacement video
P10	Input voltage over-under-voltage protection	Compressor stops	1. Using a multimeter, measure whether the voltage between LN line is normal nor not, and the voltage range of the single phase unit should be in the range of 140V-270V. 2. Disconnect the power, unplug the DC fan from the PCB, and then re-power to confirm whether the voltage detection abnormality is caused by the damage of the motor. If the fault is cleared, then replace the DC fan,

			if the fault is not cleared, then replace the main PCB;
P11	Ambient temperature over range shutdown protection	Compressor stops	1. Through the multimeter, test if the ambient temperature sensor resistance value corresponding to temperature resistance table, if there is a deviation, then replace the sensor 2. Confirm whether the current actual ambient temperature reaches the limitation point of heat pump ambient temperature. If so, please wait for the ambient temperature reach to a normal range, and the unit will back to normal; 3. Check whether the installation position of the ambient sensor is blocked by ice or exposed to direct sunlight, if so, please protect the ambient temperature sensor, to prevent icing or exposure to direct sunlight; 4. Check whether there is any heat island effect (cold island effect) in the installation position of the unit, and adjust the installation position or install an discharge duct to eliminate the heat island or cold island effect;
P12	Environmental frequency limiting protection (EFLP)	Compressor still run	This error will not show in display, but if target water temperature have a big difference with real water temperature, and unit could not running in high speed, you can consider if it because the ambient temperature is too high, so frequency is limited. You can confirm the accuracy of the ambient temperature check according to the troubleshooting of P11;
P13	Low pressure switch protection	Compressor stops	When the unit has been up and running for 3 minutes, if a low voltage switch disconnection is detected, a fault is reported; According to F11 low pressure checking this error, since the unit does not have low pressure switch, this protection does not normally occur. If it does, follow the wiring diagram to check whether the reserved input port has not been shorted, resulting in a false alarm;
P23	Insufficient water flow protection	Compressor stops	1. Check if the system displays a water flow value that is near or less than the minimum allowable water flow while the pump is running, if yes please check the reasons of insufficient water flow, and find the relative solution. 1.1. Check that the water system is completely emptied, if the water pressure is above 2 bar, if all valves are opened, if the filter is clogged. 1.2. Check that the water pump operates normally, and water flow is in the correct direction after switching on. 1.3. In running condition, wait for the compressor run for 5 minutes, if the water inlet and outlet temperature difference is in a reasonable range, then remove the water flow sensor, clean it and reinstall it, then restart the unit to exclude the possibility of foreign objects interfering with the detection of the water flow sensor. If the problem still cannot be solved, replace the water flow sensor and restart the unit. 2. If the water flow display value is 0, then check whether the water flow sensor is not contact well; If it is OK, and find the terminal of water flow sensor according to the wiring diagram. Under the condition of interrupt the power supply, then use a multimeter (DC level), measuring the water flow sensor power supply is 24V or not. When the water pump is running, the water flow sensor feedback voltage is higher than 0. If yes, then if the supply of water flow is not 24V, if yes then replace the indoor PCB. If the water flow sensor feedback voltage is equal to 0, pull out the water flow sensor cable from the water flow sensor body, and measure whether the terminals at both ends of the connecting wire are on or not. If not, replace the cable; If yes, change the body.
F01	Outdoor ambient temperature sensor	Compressor stops	1.1. Poor connect: find the connector of the ambient temp. sensor according to the wiring diagram, then check whether the sensor terminal and outdoor main PCB terminal have poor connect, pull the sensor out again and install it back in after checking, if the fault code is cleared, then

	failure		pull the sensor lead towards the electrical box to ensure that there is no pulling influence between the sensor terminal and the PCB terminal. If the fault is not cleared, check according to steps as below. 1.2. Sensor fault: pull out the sensor from the outdoor main PCB, then measure the resistance value of the sensor by multimeter. If there is no resistance value or the resistance value is infinite, it means that the sensor is damaged. Therefore, the sensor should be replaced according to the video. 1.3. Outdoor main PCB fault: pull the sensor out of the outdoor main PCB and re-wire a spare sensor, then observe whether the fault on the control panel is cleared. If the fault is not cleared, it means that the outdoor main PCB is damaged and the outdoor main PCB should be replaced according to the video. 2. Change the wiring of the sensor in PCB's ports: trade the wiring of the ambient temp. sensor and outdoor coil temp. sensor (or other sensors except the discharge temp. sensor), and check whether the ambient temp. displayed on the controller is normal. If yes, then it can be confirmed that the sensor contact is poor. If the fault is still F01, then the outdoor main PCB may be faulty (need to replace it). If the fault becomes other sensor failure, it can be confirmed that the ambient temp. sensor is faulty (need to replace this faulty sensor). Note: after troubleshooting by this method, the sensor plug must be restored to its original position.
F02	Outdoor evaporator coil temperature sensor failure	Compressor stops	1.1. Poor connect: find the connector of the outdoor coil temp. sensor according to the wiring diagram, then check whether the sensor terminal and the outdoor main PCB terminal have poor connect, pull the sensor out again and install it back in after checking, if the fault code is cleared, then pull the sensor lead towards the electrical box to ensure that there is no pulling influence between the sensor terminal and the PCB terminal; if the fault is not cleared, check according to steps as below. 1.2. Sensor fault: pull out the sensor from the outdoor main PCB, then measure the resistance value of the sensor by multimeter. If there is no resistance value or the resistance value is infinite, it means that the sensor is damaged. Therefore, the sensor should be replaced according to the video (video link); 1.3. Outdoor main PCB fault: pull the sensor out of the outdoor main PCB and re-wire a spare sensor, then observe whether the fault on the controller is cleared. If the fault is not cleared, it means that the outdoor main PCB is damaged and the outdoor main PCB should be replaced according to the. 2. Change the wiring of the sensor in PCB's ports: trade the wiring of the ambient temp. sensor and outdoor coil temp. sensor (or other sensors except the discharge temp. sensor), and check whether the outdoor coil temp. displayed on the controller is normal. If yes, then it can be confirmed that the sensor contact is poor. If the fault is still F02, then the outdoor main PCB may be faulty (need to replace it). If the fault becomes other sensor failure, it can be confirmed that the outdoor coil temp. sensor is faulty (need to replace this faulty sensor), Note: after troubleshooting by this method, the sensor plug must be restored to its original position;
F03	Compressor discharge temperature sensor failure	Compressor stops	1.Sensor fault: pull out the sensor from the outdoor main PCB, then measure the resistance value of the sensor by multimeter. If there is no resistance value or the resistance value is infinite, it means that the sensor is damaged. Therefore, the sensor should be replaced according to the video. 2.Poor connect: find the connector of the discharge temp. sensor according to the wiring diagram, then check whether the sensor terminal

			and the outdoor main PCB terminal have poor connect, pull the sensor out again and install it back in after checking, if the fault code is cleared, then pull the sensor lead towards the electrical box to ensure that there is no pulling influence between the sensor terminal and the main PCB terminal; Then turn on the unit and count the 10mins running time. During the operation of the unit, check whether the display of the discharge temp. on the system diagram of the controller is normal or not. If the discharge temp. can rise normally and is higher than the water outlet temp., then the problem of the poor contact is solved. if the discharge temp. has been below 0℃ for 10 minutes, then it is necessary to check according to step 3. 3. Outdoor main PCB fault: pull out the sensor from the outdoor main PCB and re-wire a spare sensor (50K), if the ambient temp. is less than 0℃ at this time, please hold the spare sensor in hand until the temp. is raised to more than 30℃. Then observe whether the discharge temp. displayed on the system diagram of the controller is higher than 0℃. if so, it means that there is no problem with the outdoor main PCB. if not, it means that the outdoor main PCB is damaged and should be replaced. 4. Loosening or falling off of the sensor probe: according to the video of replacing the discharge temp. sensor, disassemble the unit and check whether the discharge temp. sensor is loose from the sensor install pipe and falls off, if so, retighten it;
F04	Outdoor Suction temperature sensor failure	Compressor stops	1.1. Poor connect: find the connector of the suction temp. sensor according to the wiring diagram, then check whether the sensor terminal and PCB terminal have poor connect, pull the sensor out again and install it back in after checking, if the fault code is cleared, then pull the sensor lead towards the electrical box to ensure that there is no pulling influence between the sensor terminal and the PCB terminal; if the fault is not cleared, check according to steps as below. 1.2. Sensor fault: pull out the sensor from the outdoor main PCB, then measure the resistance value of the sensor by multimeter. If there is no resistance value or the resistance value is infinite, it means that the sensor is damaged. Therefore, the sensor should be replaced according to the video (video link); 1.3. outdoor main PCB fault: pull the sensor out of the outdoor main PCB and re-wire a spare sensor, then observe whether the fault on the controller is cleared. If the fault is not cleared, it means that outdoor main PCB is damaged and should be replaced according to the vide. 2. Change the wiring of the sensor in PCB's ports: trade the wiring of the ambient temp. sensor and suction temp. sensor (or other sensors except the discharge temp. sensor), and check whether the suction temp. displayed on the controller is normal. If so, then it can be confirmed that the sensor contact is poor. If the fault code is still display F04, then outdoor main PCB may be faulty (need to replace it). If the fault becomes other sensor failure, it can be confirmed that the suction temp. sensor is faulty (need to replace this faulty sensor), Note: after troubleshooting by this method, the sensor plug must be restored to its original position;
F05	Evaporating pressure sensor failure	Compressor stops	1. If the unit reports the fault codes both of F05 and F06 at the same time, measure the voltage of pressure sensor port by multimeter (DC gear, in the case of normal connection between the sensor and the outdoor main PCB), and measure the voltage between GND and +5V. if the measure voltage is 0 or less than 4V, it means that the outdoor main PCB is damaged and should be replaced. 2. When the unit is in standby, if the delta pressure value between low pressure and high pressure shows more than 10%, then can be checked according to steps 3.1,3.2 or 4;

			If there is no obvious difference between the display of low pressure value and high pressure value, startup the unit and observe its running. If the low pressure drops to 0 bar quickly (within 90 seconds) after the compressor is started, then refer to the troubleshooting of electronic expansion valve. If only report the fault code of F05, there are two ways to troubleshoot the fault as below. 3.1 Poor connect: find the connector of the low pressure sensor according to the wiring diagram, then check whether the sensor terminal and the outdoor main PCB terminal have poor connect, pull the sensor out again and install it back in after checking, if the fault code is cleared, then pull the sensor lead towards the electrical box to ensure that there is no pulling influence between the sensor terminal and the PCB terminal. If the fault is not cleared, check according to step 3.2. 3.2. Sensor or connecting line fault: in the case of the unit is powered on but not switched on, measure the voltage of pressure sensor port by multimeter (DC gear, in the case that sensor and PCB is connected normally), and measure the voltage between GND and PS, if there is no PS voltage, either the sensor or the sensor connecting line is damaged. Therefore, please replace the sensor connecting line firstly. If the fault code is not cleared after the replacement, the sensor also needs to be replaced. 4. outdoor main PCB problem: pull the pressure sensor out of the outdoor main PCB and re-wire a spare pressure sensor (no need to install in the pipe), observe whether the fault code on the controller is cleared or not. If the fault is not cleared, it means that the outdoor main PCB is damaged and need to be replaced.
F06	Condensing pressure sensor failure	Compressor stops	1. If the unit reports the fault codes both of F05 and F06 at the same time, measure the voltage of pressure sensor port by multimeter (DC gear, in the case of normal connection between the sensor and the outdoor main PCB), and measure the voltage between GND and +5V. if the measure voltage is 0 or less than 4V, it means that the outdoor main PCB is damaged and should be replaced. 2. When the unit is in standby, if the delta pressure value between low pressure and high pressure shows more than 10%, then can be checked according to steps 3.1,3.2 or 4; If there is no obvious difference between the display of low pressure value and high pressure value, startup the unit and observe its running. If the low pressure drops to 0 bar quickly (within 90 seconds) after the compressor is started, then refer to the troubleshooting of electronic expansion valve. If only report the fault code of F06, there are two ways to troubleshoot the fault as below. 3.1 Poor connect: find the connector of the high pressure sensor according to the wiring diagram, then check whether the sensor terminal and the outdoor main PCB terminal have poor connect, pull the sensor out again and install it back in after checking, if the fault code is cleared, then pull the sensor lead towards the electrical box to ensure that there is no pulling influence between the sensor terminal and the PCB terminal. If the fault is not cleared, check according to step 3.2. 3.2. Sensor or connecting line fault: in the case of the unit is powered on but not switched on, measure the voltage of pressure sensor port by multimeter (DC gear, in the case that sensor and PCB is connected normally), and measure the voltage between GND and PS, if there is no PS voltage, either the sensor or the sensor connecting line is damaged. Therefore, please replace the sensor connecting line firstly. If the fault code is not cleared after the replacement, the sensor also needs to be

			replaced. 4. outdoor main PCB problem: pull the pressure sensor out of the outdoor main PCB and re-wire a spare pressure sensor (no need to install in the pipe), observe whether the fault code on the controller is cleared or not. If the fault is not cleared, it means that the outdoor main PCB is damaged and need to be replaced.
F07	High pressure switch failure	Compressor stops	1. When the unit is in standby, if the delta pressure value between the low pressure and the high pressure shows more than 10% in control panel, then measure the gas pressure by pressure gauge (connect the compressor discharge side via high-pressure needle valve, if there are no high-pressure needle valve, connect to the low-pressure needle valve), if there have obvious deviation between the high-pressure sensor detection value and gauge's measurement value, the high pressure sensor need to be replaced. 2. If there is no obvious difference between the value of the low pressure and high pressure, replace the high pressure switch. Note: Replace the high-pressure switch, set the maximum water temperature that the system is allowed to run the unit. Then observe the change of high pressure value during the operation, and observe whether there is still report F08 because of the high pressure protection not timely, and check whether the refrigerant system and the hydro system is abnormal;
F09	DC fan failure (one)	Compressor still working	The unit with only one fan (Capacity ≤ 12kW): If the fan motor startup failed when the outdoor main PCB send fan's running command, the unit will report DC fan A failure, then the unit will shut down. The unit with 2 fans (Capacity ≥ 15kW): If the fan motor startup failed when the outdoor main PCB send fan's running command, the unit will report DC fan A failure, then the unit will keep running but compressor frequency will be limited. 1. Confirm that the fan blade is not jammed by something. 2. Power off the unit, then confirm that the fan blade can turn or not, if not, replace the fan motor. 3. Power off the unit, check whether the terminal is loose or poor contact on the PCB or transfer joint, pull out the terminal out and install it back in again. 4. Power on and startup the unit, measure the voltage supplied to the DC fan port via multimeter (DC voltage) 4.1. Check the voltage between VCC and GND is 15VDC or not, if the measure value is bigger than 18VDC, replace the outdoor PCD and fan motor. 4.2. If the voltage of VCC is normal, wire the spare fan motor with outdoor main PCB, and stand up the heat pump to check whether the motor can run normally, if normal, power off the unit and install the motor; if abnormal, replace the outdoor main PCB. Two-fan unit: 1. Check base on the same 4 steps as above. 2. If one of the two fan is running normally, power off the unit, and wire the two fan ports inversely (fan motor A connect fan B port, fan motor B connect fan A port), then re-power and startup the unit, observe the fan's operation. If the failed fan is still failure, replace its motor. If the otherwise normal fan is not running, replace the fan motor driver board. 3. If both two fans do not run, check the voltage of VCC is normal by step 4.1, remove the two failed motor and wire the spare motor to fan A port of the fan motor driver board, power on and startup the unit, observe whether the motor can run normally; then power off again, and wire the
F10	DC fan failure (two)	Compressor stops	

			spare motor to fan B port, re-power and startup the unit, observe whether the motor can run normally. If the spare motor does not operate on either port, replace the fan motor driver board. If the spare motor operate normally on both ports, reinstall the fan motor A, and startup the unit, if the fan A does not operate, fan motor A is damaged; Then remove the fan motor A, and re-install the fan motor B, startup the unit, if the fan B does not operate, fan motor B is damaged, the damaged fan motor should be replaced.
F11	Evaporation pressure too low fault	Compressor stops	1. When unit is off, read refrigerant pressure value from display (unit should stay standby >30min) for first judgement if serious leakage happens. If saturation temperature corresponding to the displayed refrigerant pressure is at same level of ambient temperature, it is fine. If it is lower than ambient temperature for more than 5℃, leakage could happen. 2. For split units, check whether the refrigerant piping exceeds 15 meters and the refrigerant has not been replenished; if so, replenish the refrigerant according to the length of the piping; 3. Start the unit and observe the change of low pressure. If the low pressure is too low (i.e., the evaporating temperature is lower than the ambient temperature by more than 10 degrees), and the running time is more than 5 minutes, it can be preliminary judged as a potential leakage. Fill about 100 to 200g to see whether the low pressure of the system is increased. If yes, proceed leakage test on the system. After finding out leakage point and fixing it, vacuum the heat pump system. Then recharge the unit with correct amount of refrigerant based on info from nameplate.
F12	Condenser pressure overload fault	Compressor stops	High pressure protection (P06) happens three times within 30min. Unit stops and failure can only be cleared by re-powering. 1.High pressure too high problem in heating mode: 1.1. Insufficient water flow: Check whether the temperature difference between the inlet and outlet water temperature of the unit is between 3 and 5 degrees. If it is far more than 5 degrees (e.g., more than 8 degrees) and the system operated normally before, check the filters in the water system to see if there is any dirty blockage and clean them. If it is a newly-installed system, check whether the pump is set to run at low speed, and try to run the pump at a medium or high speed to ensure that the water flow is in a normal range. Ensure that system is done with air purge properly. Check whether the water pressure of the system is far below 2.0 bar and whether there is any abnormality in the water system that leads to excessive water resistance of the system; 1.2. Sensor reading deviation: Check the temperature difference between the unit's water outlet temperature and the TC temperature or TW temperature. Under normal circumstances, the water outlet temperature will be 3 to 5 degrees higher than the TC or TW. If it exceeds 5 degrees, please check whether the TC and TW sensors are not well in position or the installation position is not suitable. TC or TW should be installed in the upper part of the tank; 1.3. Heat exchanger scaling: In the process of unit operation, observe whether the temperature of the indoor coil is more than 5 degrees higher than the water outlet temperature. If so, there can be scaling in the plate exchange, cleaning will be needed to remove the scale if so; 2. Cooling mode with high pressure problem: Check whether the evaporator of the outdoor unit is dirty and blocked or there is poor heat dissipation around the external unit. If so, consider adding a wind guide ring to the unit, so that the hot air can be discharged in a timely manner; 3. If the above solution fails to solve the problem, the electronic expansion valve of the refrigerant system may be abnormal. Please refer

			to "Electronic Expansion Valve detection".
F13	Room temperature sensor failure	Compressor stops / still run	1.Poor contact: Based on unit wiring diagram, find the connection of the temperature sensor. Check contact between sensor terminals and PCB terminals if it is poor. If yes, pull the sensor out and plug it back in. If the fault is cleared, pull the sensor leads toward the electrical box to ensure that there is no tension between the sensor terminals and PCB terminals. If the fault is not cleared, then check according to point 2; 2.Main control board problem: Pull the sensor out from control board and reinsert a new sensor to see whether the failure on display is cleared or not. If the fault is not cleared, it means that the main control board is damaged. Please replace the main control board. If it is cleared, first test the intermediate connecting wire whether there is a short circuit or a broken circuit. If yes, replace the intermediate connecting wire. If no, replace the room temperature sensor;
F14	Sanitary hot water temperature sensor failure	Compressor stops	1. Check if sensor is in place. If not, put sensor back and insulate it. 2.Poor contact: Based on unit wiring diagram, find the connection of the temperature sensor. Check contact between sensor terminals and PCB terminals if it is poor. If yes, pull the sensor out and plug it back in. If the fault is cleared, pull the sensor leads toward the electrical box to ensure that there is no tension between the sensor terminals and PCB terminals. If the fault is not cleared, then check according to point 3; 3.Main control board problem: Pull the sensor out from control board and reinsert a new sensor to see whether the failure on display is cleared or not. If the fault is not cleared, it means that the main control board is damaged. Please replace the main control board. If it is cleared, first test the intermediate connecting wire whether there is a short circuit or a broken circuit. If yes, replace the intermediate connecting wire. If no, replace the hot water temperature sensor;
F15	Cooling / heating water temperature sensor failure	Compressor stops	1.Poor contact: Based on unit wiring diagram, find the connection of the temperature sensor. Check contact between sensor terminals and PCB terminals if it is poor. If yes, pull the sensor out and plug it back in. If the fault is cleared, pull the sensor leads toward the electrical box to ensure that there is no tension between the sensor terminals and PCB terminals. If the fault is not cleared, then check according to point 2; 2.Main control board problem: Pull the sensor out from control board and reinsert a new sensor to see whether the failure on display is cleared or not. If the fault is not cleared, it means that the main control board is damaged. Please replace the main control board. If it is cleared, first test the intermediate connecting wire whether there is a short circuit or a broken circuit. If yes, replace the intermediate connecting wire. If no, replace the TC temperature sensor;
F16	Unit water outlet temperature sensor failure	Compressor stops	Note: For split unit, indoor control board and water outlet temperature sensor are in indoor unit. For monoblock unit, indoor control board is in indoor unit and water outlet temperature sensor is in outdoor unit. 1.Poor contact: Based on unit wiring diagram, find the connection of the temperature sensor. Check contact between sensor terminals and PCB terminals if it is poor. If yes, pull the sensor out and plug it back in. If the fault is cleared, pull the sensor leads toward the electrical box to ensure that there is no tension between the sensor terminals and PCB terminals. If the fault is not cleared, then check according to point 2; 2.Main control board problem: Pull the sensor out from control board and reinsert a new sensor to see whether the failure on display is cleared or not. If the fault is not cleared, it means that the main control board is damaged. Please replace the main control board. If it is cleared, then check according to point 3 ; 3. Sensor problem：

			3.1. For split unit, pull sensor out from control board and use multimeter to detect resistance of sensor. If the resistance value is infinite or no resistance value, then replace the sensor. 3.2. For monoblock unit, check according to 3.1. While for unit with an intermediate connection cable (and the indoor panel is not inside the outside unit), the status of the intermediate connection cable should also be checked;
F17	Unit water inlet temperature sensor failure	Compressor stops	Note: For split unit, indoor control board and water outlet temperature sensor are in indoor unit. For monoblock unit, indoor control board is in indoor unit and water outlet temperature sensor is in outdoor unit. 1.Poor contact: Based on unit wiring diagram, find the connection of the temperature sensor. Check contact between sensor terminals and PCB terminals if it is poor. If yes, pull the sensor out and plug it back in. If the fault is cleared, pull the sensor leads toward the electrical box to ensure that there is no tension between the sensor terminals and PCB terminals. If the fault is not cleared, then check according to point 2; 2.Main control board problem: Pull the sensor out from control board and reinsert a new sensor to see whether the failure on display is cleared or not. If the fault is not cleared, it means that the main control board is damaged. Please replace the main control board. If it is cleared, then check according to point 3； 3. Sensor problem： 3.1. For split unit, pull sensor out from control board and use multimeter to detect resistance of sensor. If the resistance value is infinite or no resistance value, then replace the sensor. 3.2. For monoblock unit, check according to 3.1. While for unit with an intermediate connection cable (and the indoor panel is not inside the outside unit), the status of the intermediate connection cable should also be checked;
F18	Indoor coil temperature sensor failure	Compressor stops	Note: For split unit, indoor control board and water outlet temperature sensor are in indoor unit. For monoblock unit, indoor control board is in indoor unit and water outlet temperature sensor is in outdoor unit. 1.Poor contact: Based on unit wiring diagram, find the connection of the temperature sensor. Check contact between sensor terminals and PCB terminals if it is poor. If yes, pull the sensor out and plug it back in. If the fault is cleared, pull the sensor leads toward the electrical box to ensure that there is no tension between the sensor terminals and PCB terminals. If the fault is not cleared, then check according to point 2; 2.Main control board problem: Pull the sensor out from control board and reinsert a new sensor to see whether the failure on display is cleared or not. If the fault is not cleared, it means that the main control board is damaged. Please replace the main control board. If it is cleared, then check according to point 3； 3. Sensor problem： 3.1. For split unit, pull sensor out from control board and use multimeter to detect resistance of sensor. If the resistance value is infinite or no resistance value, then replace the sensor. 3.2. For monoblock unit, check according to 3.1. While for unit with an intermediate connection cable (and the indoor panel is not inside the outside unit), the status of the intermediate connection cable should also be checked;
F19	Water flow meter failure	Compressor stops	1.Check whether the water flow sensor connecting cable of the outdoor unit is loose or disconnected, find out the water flow sensor terminal according to the wiring diagram, pull it out and then plug it back in again, if the failure can't be cleared, carry to step 2.

			2.When the P0 water pump is running, use a multimeter (DC voltage gear), test the voltage of the water flow port, whether the voltage between GND port and 12V port is 12V, and whether the voltage between GND port and PS3 port is ＞0. If the voltage is ＞0, replace the outdoor main PCB, if the voltage is =0, replace the water flow sensor; 1. When the pump is running, check if the value of water flow is close to or less than the minimum allowable flow rate of the unit. If so, refer to failure code S02: water flow switch protection, to find out the reason of insufficient of water flow in the system and then solve the problem.
F20	Refrigerant leakage protection three times failure	Compressor stops	1.When unit is in Off state, check the refrigerant pressure value in standby state through operation panel (standby time should more than 30 minutes), to confirm whether there is a serious leakage of refrigerant firs. The judgment: whether the saturation temperature that corresponding to the current displayed refrigerant pressure value is the same as the ambient temperature, and if the refrigerant pressure value is lower than the ambient temperature by more than 5 ℃, then can judge that there is a leakage of refrigerant basically; 2.Check whether the refrigerant system have leakage problem, use refrigerant leakage detector, check inside the compressor cabinet, check if the refrigerant detection box has leakage alarming, if so, can double check where the leakage point is, if not, carry out the check in step 3; 3. Replace the refrigerant detector(sensor), and then repower the unit, to analyze the way according to step 4; 4. Observe the change of low pressure, if the low pressure is too low (i.e. the evaporating temperature is lower than the ambient temperature by more than 10 ℃), and the operation time of the unit is more than 5 minutes, it can judge there is a leakage point. Can temporarily supplemented with 100-200g refrigerant to see if the low pressure will have rebound, if so, re-vacuum the unit and re-inject the refrigerant according to the refrigerant amount on the nameplate;
F21	Mixture valve 1 temperature sensor failure	Unit keep on working, mixture valve 1 output fixed to 0.	1.Poor contact: find the interface of the temperature sensor according to the wiring diagram, check if the sensor terminals and PCB terminals is poor contact, pull it out and then plug it back in again, if the failure is cleared, then pull longer the sensor toward the electrical box to ensure here is no tension between the sensor terminals and PCB terminals; if the failure is not cleared, then check according to step 2; 2.Main PCB problem: pull the sensor out of the circuit board and plug in a temporary sensor, observe whether the failure on the operation panel is cleared or not, if the failure is not cleared, it means that the main PCB is damaged, replace the main PCB: if the failure is cleared, first check if the intermediate connecting wire is in short circuit or in broken circuit, if there is, replace the intermediate connecting wire, if there is not, replace the room temperature sensor;
F22	Mixture valve 2 temperature sensor failure	Unit keep on working, mixture valve 2 output fixed to 0.	1.Poor contact: find the interface of the temperature sensor according to the wiring diagram, check if the sensor terminals and PCB terminals is poor contact, pull it out and then plug it back in again, if the failure is cleared, then pull longer the sensor toward the electrical box to ensure here is no tension between the sensor terminals and PCB terminals; if the failure is not cleared, then check according to step 2; 2.Main PCB problem: pull the sensor out of the circuit board and plug in a temporary sensor, observe whether the failure on the operation panel is cleared or not, if the failure is not cleared, it means that the main PCB is damaged, replace the main PCB: if the failure is cleared, first check if the intermediate connecting wire is in short circuit or in broken circuit, if there is, replace the intermediate connecting wire, if there is not, replace the room temperature sensor;
F27	Indoor	Compressor	Accessories and tools: indoor main PCB

	EEPROM failure	stops	1.Replace the indoor PCB;
F28	Water pump PWM signal feedback failure	Compressor stops	1. Check whether the water pump PWM signal cable is loose or poor contact, when unit is in Off state, pull it out and then plug it back in again, and then repowered and run the unit, observe whether the failure is cleared after the water pump runs for 2 minutes. At the same time, within 2 minutes, use DC voltage gear of the multimeter to measure if the feedback voltage of the water pump PWM terminal on the indoor main PCB is ＞0V, if so, replace the indoor main PCB, if not, replace the PWM signal cable, if still cannot clear the failure, replace the water pump;
F29	Mixture valve 1 failure	Unit keep on working, mixture valve 1 output fixed to 0.	1.Check whether the actual TC temperature for heating is lower than the mixing water temperature in the water system diagram of the operation panel, if so, check the installation position of the mixing water temperature sensor; or check if the floor of the room is exposed to direct sunlight so resulting in a high mixing water temperature, if so, can ignore this failure, because when there is no direct sunlight exposed, after the mixing water temperature drops the failure will be cleared automatically; 2.Check whether the actual TC temperature for heating is higher than the mixing water temperature in the water system diagram of the operation panel, if so, keeping checking as following: 2.1. According to the wiring diagram, use a multimeter (DC voltage gear) to measure whether the 24V power supply of the mixing valve is normal or not, if not normal, check whether the connecting cables between the mixing valve and the main PCB is loose or disconnected; 2.2. Power off and restart the unit, according to the wiring diagram, use a multimeter (DC voltage gear) to measure if the control signal of water mixing valve decrease from 5V down to 0V in the way about every 20 seconds decrease 0.5V, if so, higher the setting temperature of the mixing temperature (5℃ higher than the current mixing temperature). Then test if the mixing valve control signal increase in about every 20 seconds increase 0.5V, at the same time, observe if the mixing water temperature have tendency to increase, if not, either the mixing valve coil is abnormal, or the mixing valve is stuck. 3. Replace the valve coil. When unit is in Off state, replace the cables and coil. If there is an extension cable in the middle, can first check if the extension cable is poor contact: disconnect both ends of the extension cable, in one end of the cable connect 0V and 10V together, and connect 0V with 24V together, then use the on and off gear of multimeter to measure the other end of the cable between 0V and 10V, 0V and 24V to see whether it is conducting, if it is conducting, replace the valve coil, if it not conduct, replace the intermediate connecting cable first then repeat the operation in step 2.2;
F30	Mixture valve 2 failure	Unit keep on working, mixture valve 2 output fixed to 0.	1.Check whether the actual TC temperature for heating is lower than the mixing water temperature in the water system diagram of the operation panel, if so, check the installation position of the mixing water temperature sensor; or check if the floor of the room is exposed to direct sunlight so resulting in a high mixing water temperature, if so, can ignore this failure, because when there is no direct sunlight exposed, after the mixing water temperature drops the failure will be cleared automatically; 2.Check whether the actual TC temperature for heating is higher than the mixing water temperature in the water system diagram of the operation panel, if so, keeping checking as following: 2.1. According to the wiring diagram, use a multimeter (DC voltage gear) to measure whether the 24V power supply of the mixing valve is normal or not, if not normal, check whether the connecting cables between the mixing valve and the main PCB is loose or disconnected; 2.2. Power off and restart the unit, according to the wiring diagram,

			use a multimeter (DC voltage gear) to measure if the control signal of water mixing valve decrease from 5V down to 0V in the way about every 20 seconds decrease 0.5V, if so, higher the setting temperature of the mixing temperature (5℃ higher than the current mixing temperature). Then test if the water mixing valve control signal increase in about every 20 seconds increase 0.5V, at the same time, observe if the mixing water temperature have tendency to increase, if not, either the mixing valve coil is abnormal, or the mixing valve is stuck. 3. Replace the valve coil. When unit is in Off state, replace the cables and coil. If there is an extension cable in the middle, can first check if the extension cable is poor contact: disconnect both ends of the extension cable, in one end of the cable connect 0V and 10V together, and connect 0V with 24V together, then use the on and off gear of multimeter to measure the other end of the cable between 0V and 10V, 0V and 24V to see whether it is conducting, if it is conducting, replace the valve coil, if it not conduct, replace the intermediate connecting cable first then repeat the operation in step 2.2;
E02	Communication between outdoor main control PCB and module PCB	Compressor stops	1.Cut the power of unit and open the outdoor unit's electrical box. According to the wiring diagram, check whether the communication cable between the outdoor main PCB and driver PCB is loose. Reinsert the communication cable and ensure that it is correctly inserted into the communication ports. 2.Restart the unit and observe if there are indicator lights blinking on the driver PCB. Use a multimeter (set to AC voltage mode) to measure the input voltage of the driver PCB (L+N for single-phase unit, L1+L2+L3 for three-phase unit) to verify its consistency with the power supply. If the power supply is normal for each phase, replace the driver PCB. 3.If the communication failure persists even after replacing the driver PCB, replace the outdoor main PCB.
E03	Compressor phase current failure (open/short circuit)	Compressor stops	Accessories and tools: driver PCB. Multimeter Replace the compressor driver PCB with a new one.
E04	Compressor phase current overload (over current)	Compressor stops	1.If the failure occurs on a new unit and the compressor can reach frequency above 60Hz during operation, try to update the EEPROM of outdoor main PCB to avoid problem caused by incorrect settings. 2.If the compressor is not working at all after unit is ON, the problem can be caused by defective driver PCB. Please try to replace the driver PCB. 3.If the compressor starts but shakes unusually with speed below 60Hz while this failure occurs, compressor can be defective with a locked rotor. Restart the unit and try to gently tapping the bottom of the compressor during startup. If the issue persists, replace the compressor (before doing so, if possible, try to replace the compressor driver PCB for check)
E05	Compressor driver failure	Compressor stops	Check if the wires from the compressor driver PCB to the compressor are securely connected. If the connection is loose, fasten the cables and restart the unit. If compressor is still not functioning, unplug the wires on the compressor and measure the resistance between the different terminals of compressor (between U&V / V&W / U&W) to verify if resistance between different terminals are same or if any circuit is open: 1.If resistance values between different compressor terminals are tested almost equal, try to replace the driver PCB. If the compressor still cannot start or shakes unusually after startup with speed below 60Hz while E05 failure happens, compressor can be defective with a locked rotor. Restart the unit and try to gently tapping the

			bottom of the compressor during startup. If the issue persists, replace the compressor. 2. If resistance values between different compressor terminals are tested unequal or there is any open circuit, compressor is damaged. Replace the compressor.
E06	Module VDC over high / low voltage failure	Compressor stops	1.Use a multimeter to check if the voltage of the power terminal (L1/L2/L3 for three-phase models) is within normal range: 160V-260V for single-phase and 340V-420V for three-phase. 2.Power off the unit and disconnect the DC fan motor from outdoor main PCB. Repower the unit to check whether the abnormal voltage detection is caused by defective fan motor. If the failure is cleared, replace the DC fan motor. If the issue persists, replace the compressor driver PCB
E07	AC current failure	Compressor stops	1.Restart the unit. After compressor starts, check if the evaporating temperature is much lower than normal range (more than 10℃ below ambient) or if the discharge temperature rises obviously higher than normal range (more than 35℃ above water temperature). If yes, it may indicate refrigerant leakage. Try to charge the system with certain amount of refrigerant and observe if it works better. 2.For split unit, check whether the refrigerant pipe is over 15 meters and additional refrigerant is charged. If not, charge refrigerant according to the length of piping. 3.Use a multimeter to test the live wire of the power input cable of the outdoor unit and check whether the running current is less than 4A when the unit is standby. If it exceeds 4A, or if running current is less than 1A when the unit starts and runs at above 50Hz, the Main PCB can be defective. Try to replace it.
E08	EEPROM failure	Compressor stops	When the outdoor main PCB chip cannot read the parameters or there is a parameter verification error, unit will report a failure and be shut shown. Accessories and tools: Outdoor main PCB. Multimeter Power off and restart, if the fault still cannot be cleared after restarting, then replace the Outdoor main PCB;
S01	Indoor coil anti-freezing protection in cooling	Compressor stops	1.Check the temperature difference between the inlet and outlet water of the unit. If it exceeds 8 ℃, check and clean the filter of the water system. Try to adjust the water pump speed to high-speed operation if possible. 2.Check if the outlet water temperature is 7°C or lower. If yes, check and confirm Tc sensor is installed correctly. 3.When unit is off, check the refrigerant pressure value (standby time should be more than 30 minutes) to determine if there is any refrigerant leak. Check if the saturation temperature corresponding to the current pressure value is consistent with the current ambient temperature. If it is lower than the outdoor ambient temperature by more than 5℃, there can be a refrigerant leak. 4.For split unit, check whether the refrigerant pipe is over 15 meters and additional refrigerant is charged. If not, charge refrigerant according to the length of piping. 5.Restart the unit and observe the changes of low-pressure value. If the corresponding refrigerant evaporating temperature falls within the range of 4-6℃, the unit will work with limited compressor speed. If the low-pressure value becomes too low (evaporating temperature below 1℃) and the running time exceeds 3 minutes, while EEV fully open in this period, there is most likely a refrigerant leak. In this case, please charge 100 to 200g of refrigerant and check if the low-pressure of the system rises. If yes, check and fix the leakage of system and then vacuum the unit and recharge the refrigerant according to the product label.

			6.If the above troubleshooting are not functioning, the failure can be caused by EEV. Please refer to the "electronic expansion valve troubleshooting section".
S02	Too small water flow rate	Compressor stops	When the system pump (P0) starts to run for ≥ 20 seconds, and the water flow switch is open ≥ 10 seconds, unit will report a failure and be shut shown; 1.Check whether system is well done with air purge, whether the water pressure is above 2 bar, whether all valves are open, and whether the filter is blocked or not. 2.Check whether the water pump is running correctly and the water flows in the correct direction after the unit is turned on. 3.Disconnect the water flow switch from the wiring and replace the water flow switch with a jumper on control board. Then turn the unit on. If the failure still happened, replace the indoor main PCB. 4.1 If the unit can run normally after replacing the water flow switch with a jumper on board, observe whether the inlet and outlet water temperature △T is within a reasonable range (if the compressor running below 50Hz, the inlet and outlet water temperature △T should not be more than 5 degrees; if it is above 65Hz, the inlet and outlet water temperature △T should not be more than 8 degrees. Otherwise, the water flow in the system is insufficient. In order to protect the unit, check the condition of air purging, water resistance, water pressure, etc). 4.2 If the inlet and outlet water temperature △T is within a reasonable range, take down the water flow switch and reinstall it after cleaning. If the problem still cannot be solved, replace the water flow switch and restart the unit.
S03	Water flow switch failure	The unit cannot be activated.	After the system pump (P0) stops running and the water flow switch is detected to be closed for 5 minutes, unit will report a failure and be shut shown; 1.Check if the water flow switch port is closed by jumper instead of cables of flow switch. If so, restore water flow switch wiring. If not, follow point 2; 2.Water flow switch checking: When unit is off or stops, pull the water flow switch cable out from the indoor PCB and use a multimeter (on/off) to check the water flow switch. If it's open, replace the indoor PCB, if it's closed, check the water flow switch further (Close the water pipe valve outside the unit, take out the water flow switch and check whether the water flow switch is stuck or damaged. If it cannot be repaired, then replace it.) 3.External factors: Whether there is an external water pump working in the same water system. If so, the system water pump should be adjusted to synchronize it with the external water pump. (if the external water pump is running all the time);
S04	Indoor unit communicati on failure	Compressor stops	Whenever there is no communication between the operation panel and the indoor main PCB for 2 minutes, unit will report a failure and be shut shown; 1. Confirm the situation of communication failure: If there is no communication as soon as the power is on, check according to 2.3.4; if the communication is normal after the power is on, but become abnormal after the outdoor unit starts, check whether there is a G cable with the A/B communication terminal of the outdoor unit. If yes, please connect the G line of the outdoor unit to the G port at the communication port of the indoor PCB, and then restart the unit. If the communication failure still exists, check whether the communication wire between the indoor and outdoor is separated from the strong power. 2.Wiring problem: According to the wiring diagram, check whether the A/B port of the communication line has been reversed or has poor

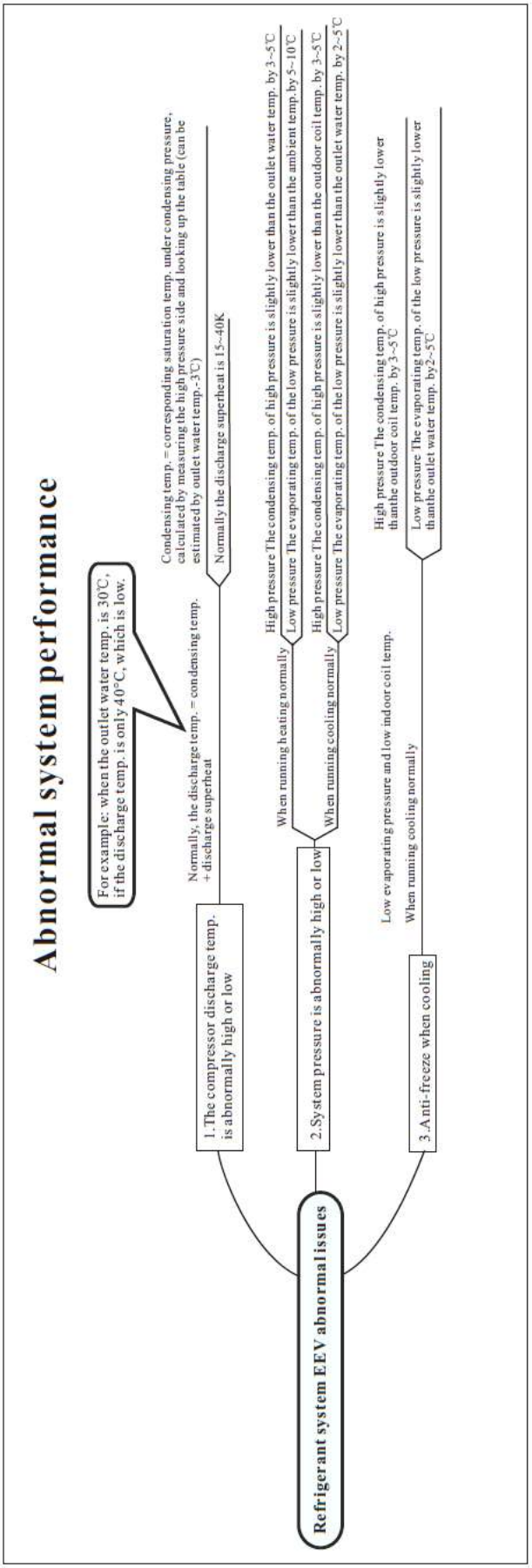
			contact. Use a multimeter (on/off gear) to test the communication line between the operation controller and the indoor PCB when unit is off; 3.Power supply problem: Check whether the power supply of the indoor PCB is normal (24VDC and the motherboard has a blinking light); 4.Hardware problem: Replace with a new one;
S05	Outdoor unit communication failure	Compressor stops	Whenever there is no communication between the operation panel and the indoor main PCB for 2 minutes, unit will report a failure and be shut shown; 1.Confirm the situation of communication failure, if there is no communication as soon as the power is on, check according to 2.3.4; if the communication is normal after the power is on, but become abnormal after the outdoor unit is running, then confirm whether there is a G on the A/B communication terminal of the outdoor unit, if yes, please connect the G line of the outdoor unit to the G port at the communication port of the indoor main PCB, and then restart the unit, if the communication failure still exists, check whether the communication wire in the indoor and outdoor is separated from the strong power, please contact the manufacturer. 2.Wiring problems: check whether the A/B port of the indoor and outdoor unit communication line has not been connected to the reverse or poor contact, use a multimeter (on and off gear), in the case of the unit power-off, short circuit the A/B on one end and measure the connection on the other end, if the disconnection, then replace the communication line; 3.Power supply problem: Check whether the power supply of the outdoor board is normal (230VAC and the main board has a blinking light; 4.Disconnect the power, unplug the DC fan from the main PCB, and reapply the power to verify that the communication failure is not caused by a damaged motor. 5.Hardware problem with the operation panel itself, replace with a new one;
S06	Water outlet temperature too low protection in cooling	Compressor stops	1.Restart operation, before displaying S06, confirm the inlet and outlet water temperature △T through the system diagram on the operation panel. If it is greater than 8 degrees, check whether the pump speed is setting to high speed (if it is low, adjust it to medium or high speed), and also check whether the filters in the water system are clogged or not; 2.Whether the set temperature is low (whether less than 10 degrees), during operation, observe the difference between the TC temperature and the outlet water temperature, if the outlet water temperature is more than 2 degrees lower than the TC, it is recommended that the set temperature be increased to more than 12 degrees to ensure that the outlet water temperature won't drop too low;
S07	Water outlet temperature too high protection in heating / hot water	Compressor stops	1. Restart the unit, when S07 happens, check the inlet and outlet water temperature and water tank TW sensor value. If the inlet water temperature of the heat pump is higher than the TW value (normally, the TW is always higher than the inlet water temperature of the heat pump), the coil of the water tank can be too small which leads to the low heat exchanging capacity and causes S07. For temporary solution, the hot water ECO mode can be turned on to see if it is possible to alleviate the heat exchange problem of the water tank. If the problem cannot be solved, it is necessary to replace the coil of water tank with a larger area as recommended; Coexistence of heating and hot water modes. 1.Observe the inlet and outlet water temperature △T of heat pump, if it is more than 8 degrees, please check whether the speed setting of the water pump is high speed. If it is low speed, please adjust it to medium or

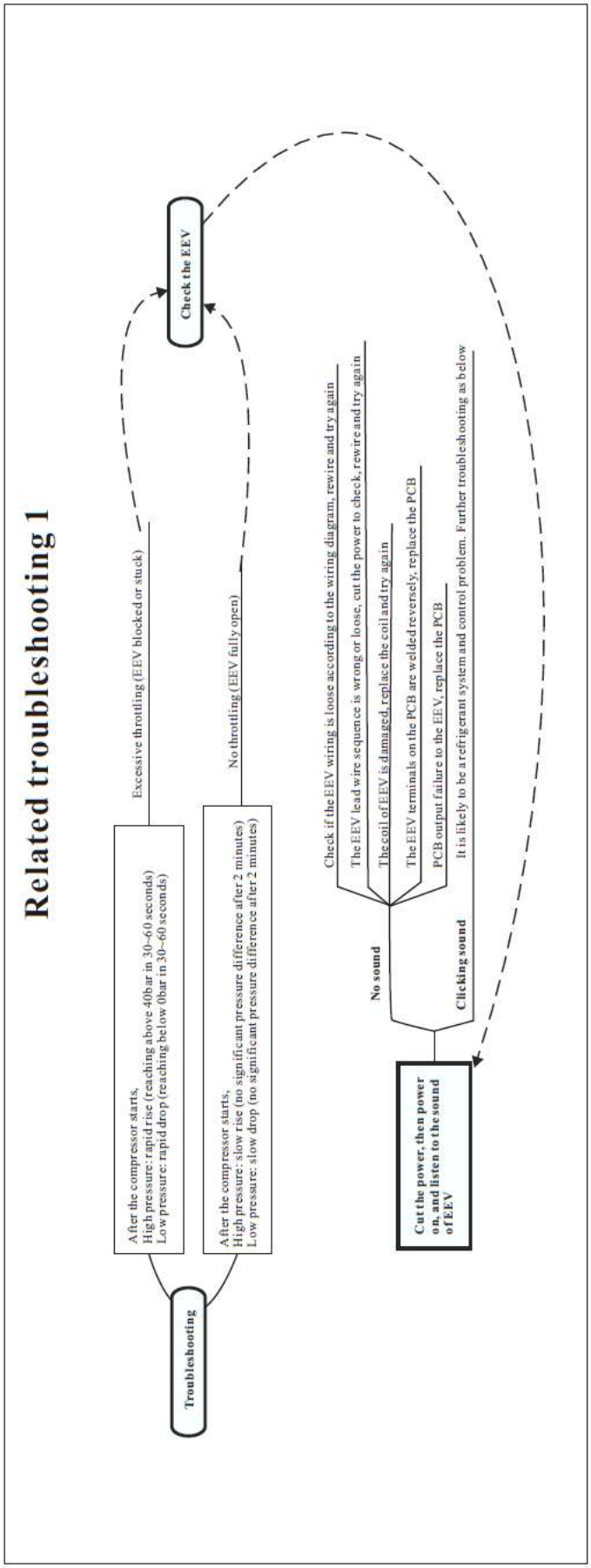
			high speed. And at the same time, please check whether the filter in the water system is clogged; 2.Check the difference between the TC temperature and the outlet water temperature. If the temperature difference is more than 5 degrees (the outlet water temperature is higher than the TC), check whether the TC temperature sensor is installed in the middle or upper part of the buffer tank;
S08	Defrosting Failure	Compressor stops	1.If the ambient temperature is below 0℃ and the water temperature is below 10℃, when the unit starts up and runs for the first time with defrost, water outlet temp can be too low can result in this protection. 2.Restart heating mode and observe the inlet and outlet water temperature △T during the heating operation. If it's more than 8 ℃ and the set temperature is low (below 30 ℃), check whether the water pump speed is high speed (if it is low, please adjust to medium or high speed). Also check whether the filter is clogged in the water system. It is better to increase the set temperature to more than 32 degrees; 3.Check whether the unit is with heavy frost (evaporator frost thickness greater than 8mm or ice fully covers), resulting in defrost time too long which cause the water temperature too low. In this case, manually remove the frost on the evaporator with hot water, and then check the cause of serious frost; 4. If the unit is newly installed, the distribution system is floor heating and fully open, it's recommended to close 2/3 of the water pipes of the floor heating to let the heat pump raise the water temperature as soon as possible. After the water temperature goes above 30 degrees, then open some more water loops. Keep this cycle constantly to raise the water temperature of heat pump to medium temperature.
S09	Defrost outlet water temperature too low protection	Compressor stops	During defrost, if TUO < 15 degrees, unit will report a failure and stop defrosting; 1.If the ambient temperature is below 0℃ and the water temperature is below 10℃, when the unit starts up and runs for the first time with defrost, water outlet temp can be too low can result in this protection. 2.Restart heating mode and observe the inlet and outlet water temperature △T during the heating operation. If it's more than 8 ℃ and the set temperature is low (below 30 ℃), check whether the water pump speed is high speed (if it is low, please adjust to medium or high speed). Also check whether the filter is clogged in the water system. It is better to increase the set temperature to more than 32 degrees; 3.Check whether the unit is with heavy frost (evaporator frost thickness greater than 8mm or ice fully covers), resulting in defrost time too long which cause the water temperature too low. In this case, manually remove the frost on the evaporator with hot water, and then check the cause of serious frost; 4. If the unit is newly installed, the distribution system is floor heating and fully open, it's recommended to close 2/3 of the water pipes of the floor heating to let the heat pump raise the water temperature as soon as possible. After the water temperature goes above 30 degrees, then open some more water loops. Keep this cycle constantly to raise the water temperature of heat pump to medium temperature.
S10	Water flow switch failure	Compressor stops	When the unit has 3 consecutive S02 protection within 30 minutes, S10 will be reported. Refer to the troubleshooting of water flow switch protection (S02).
S11	Cooling anti-freeze failure	Compressor stops	When the unit has 3 consecutive S02 protection within 30 minutes, S10 will be reported. Refer to the troubleshooting of cooling anti-freeze protection (S01).
S12	Floor-curing operation	Unit keep on working	During the operation of floor preheating, the running time of a certain stage exceeds the specified time, S12 will be reported and unit will exit

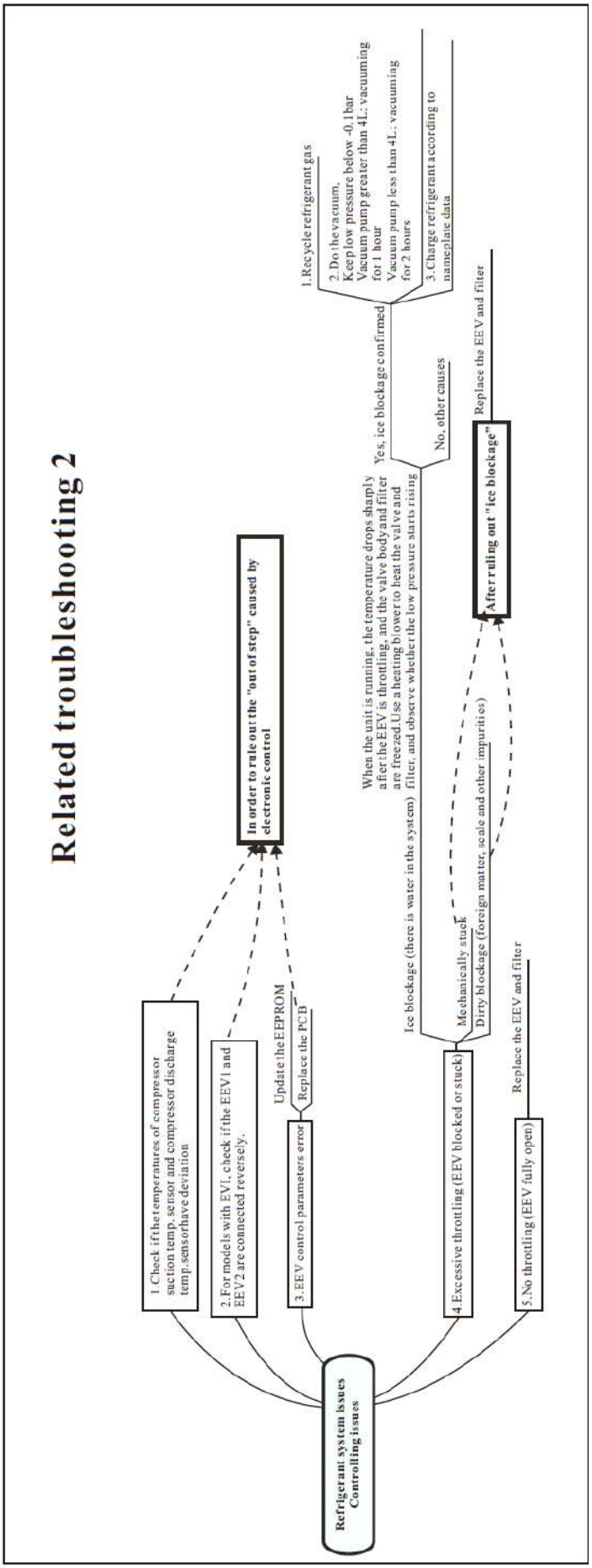
	failure		preheating operation, while the unit can still operate in normal modes; 1. Check the recorded data of floor preheating to figure out where the anomaly is. Depending on the conditions of floor drying at site, choose if unit should run floor preheating again; 2. Tc (Heating/cooling Temp. Sensor) installation position is not suitable which results in temperature reading deviation. Check whether the temperature difference between Tc (Heating/cooling Temp. Sensor) and the actual temperature is too much (over 2℃);
S13	Four-way valve operation fault	Compressor stops	1.When unit is off, check the value of ambient temperature and the outdoor coil temperature through the operation panel and confirm if they are of same value. If yes, follow the next steps. If not, use a hot wet towel or wet paper napkin wrapped around the ambient temperature sensor and check the change of ambient temperature through operation panel. If the ambient temperature remains without change while outdoor coil temperature changes, these two sensors can be connected oppositely. Please correct them according to the wiring diagram; 2.Wiring Problems: According to the wiring diagram, check whether the wiring of four-way valve coil is fine on PCB; 3.When the unit is running for heating and the air blowing outdoor unit is hot, four-way valve coil can be defective. Alternatively, by switching back and forth between the heating and the cooling modes (running for about 3 minutes in each mode), listen to the four-way valve if there is a sound of "Da". If not, replace the four-way valve coil. If yes, check the surface of four-way valve whether it is uneven which may result in that pin of valve does not work. If so, the four-way valve needs to be replaced.
S14	Three-way valve operation fault	Compressor stops	1.Check and confirm if water connections of the heating and DHW are wrongly connected. Try to reverse the control signal lines of the three-way valve which are for heating and DHW, then observe whether the unit will operate normally; 2.Check and confirm if Tc (heating/cooling temp. sensor) and Tw (DHW temp. sensor) are connected oppositely. Pull out the Tw sensor from water tank and then hold it in hand and observe whether the hot water temperature sensor value follows the change. If the change is on Tc value instead of Tw, reverse the Tc and Tw sensor connections according to the wiring diagram. 3.Check if the Tc or Tw sensors has fallen off, causing the inaccurate temperature reading. If yes, install the Tc or Tw sensor correctly;
S21	Water flow failure	Compressor stops	When the unit has 3 consecutive insufficient water flow protection (P23) within 30 minutes, S21 is reported and unit is shut down and cannot be startup unless re-power. 1. Check if the system displays a water flow value that is near or less than the minimum allowable water flow while the pump is running, if yes please check the reasons of insufficient water flow, and find the relative solution. 1.1. Check that the water system is completely emptied, if the water pressure is above 2 bar, if all valves are opened, if the filter is clogged. 1.2. Check that the water pump operates normally, and water flow is in the correct direction after switching on. 1.3. In running condition, wait for the compressor run for 5 minutes, if the water inlet and outlet temperature difference is in a reasonable range, then remove the water flow sensor, clean it and reinstall it, then restart the unit to exclude the possibility of foreign objects interfering with the detection of the water flow sensor. If the problem still cannot be

			solved, replace the water flow sensor and restart the unit. 2. If the water flow display value is 0, then check whether the water flow sensor is not contact well; If it is OK, and find the terminal of water flow sensor according to the wiring diagram. Under the condition of interrupt the power supply, then use a multimeter (DC level), measuring the water flow sensor power supply is 24V or not. When the water pump is running, the water flow sensor feedback voltage is higher than 0. If yes, then if the supply of water flow is not 24V, if yes then replace the indoor PCB. If the water flow sensor feedback voltage is equal to 0, pull out the water flow sensor cable from the water flow sensor body, and measure whether the terminals at both ends of the connecting wire are on or not. If not, replace the cable; If yes, change the body.

16.2 EEV troubleshooting






Related troubleshooting 2
Refrigerant system issues
Controlling issues
1. Check if the temperatures of compressor suction temp. sensor and compressor discharge temp. sensor have deviation
2. For models with EVI, check if the EEV1 and EEV2 are connected reversely.
3. EEV control parameters error
Update the EEPROM
Replace the PCB
4. Excessive throttling (EEV blocked or stuck)
Ice blockage (there is water in the system)
Mechanically stuck
Dirty blockage (foreign matter, scale and other impurities)
5. No throttling (EEV fully open)
Replace the EEV and filter
In order to rule out the "out of step" caused by electronic control
When the unit is running, the temperature drops sharply after the EEV is throttling, and the valve body and filter are freezed. Use a heating blower to heat the valve and filter, and observe whether the low pressure starts rising
Yes, ice blockage confirmed
1. Recycle refrigerant gas
2. Do the vacuum.
Keep low pressure below -0.1bar
Vacuum pump greater than 4L: vacuuming for 1 hour
Vacuum pump less than 4L: vacuuming for 2 hours
3. Charge refrigerant according to nameplate data
No, other causes
After ruling out "ice blockage"
Replace the EEV and filter