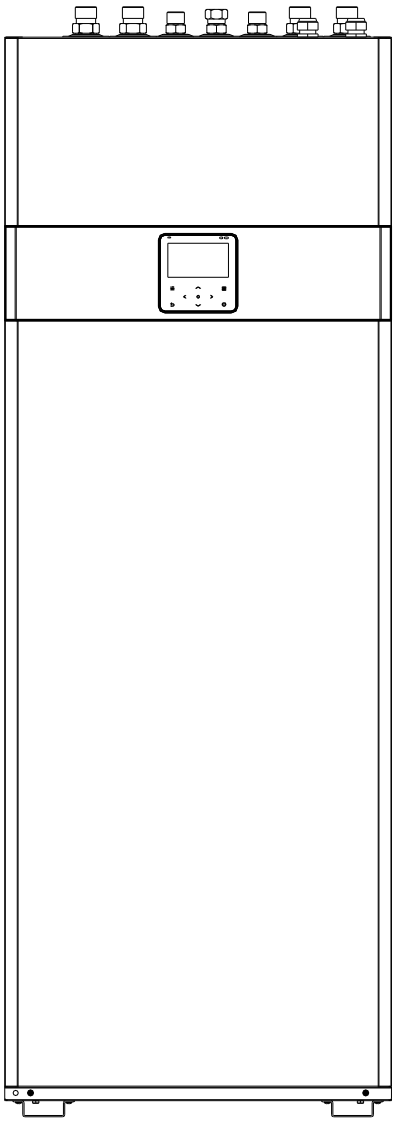
THALEOS
Energy efficiency

INSTALLATION AND OPERATION MANUAL FOR R290 A-THERMAL ALL IN ONE ATW HEAT PUM INDOOR UNIT



- For your convenience, please read this statement carefully, in accordance with the specification steps.
- Please safely keeping this manual to inspection.

CONTENTS

Note:
All the illustrations in this manual are for explanation purpose only.
Your air conditioner may be slightly different. The actual shape shall prevail.
They are subject to change without notice for future improvement.

1 SAFETY PRECAUTIONS

The precautions listed here are divided into the following types. They are quite important, so be sure to follow them carefully.
Meanings of DANGER, WARNING, CAUTION and NOTE symbols.

INFORMATION

Read these instructions carefully before installation. Keep this manual in a handy for future reference. Improper installation of equipment or accessories may result in electric shock, short-circuit, leakage, fire or other damage to the equipment.
- Be sure to only use accessories made by the supplier, which are specifically designed for the equipment and make sure to get installation done by a professional.
- All the activities described in this manual must be carried out by a licensed technician. Be sure to wear adequate personal protection equipment such as gloves and safety glasses while installing the unit or carrying out maintenance activities, contact your dealer for any further assistance.
- Any activity that requires the unit to be opened must only be carried out by your local technician.
- Comply with the corresponding local laws and regulations.
- There is a risk of fire and explosion. Ensure that there are no ignition sources, such as plug sockets, light switches, lamps, electrical switches or other permanent ignitions sources, around the product.
- Ensure that there are no ignition sources, such as plug sockets, light switches, lamps, electrical switches or other permanent ignitions sources, in the protective zone.
- Do not use any sprays or other combustible gases around the product.
- Keep all ignition sources away from around the product. In particular, open flames, hot surfaces with temperatures above 370℃, electrical devices or tools that are not free from electrical sources, static discharges.
- Equipment should be stored in a well-ventilated room to avoid mechanical damage.

NOTE

- Do not reuse the gasket that has been used.
- Installation joints between refrigeration system components shall be accessible for maintenance purposes.
- Pipes must be protected from physical damage.
- Pipeline installation should be minimized.

	**WARNING**	This symbol shows that this appliance used a flammable refrigerant. If the refrigerant is leaked and exposed to an external ignition source, there is a risk of fire.
	**CAUTION**	This symbol shows that the operation manual should be read carefully
	**CAUTION**	This symbol shows that a service personnel should be handling this equipment with reference to the installation manual.
	**CAUTION**	This symbol shows that information is available such as the operating manual or installation manual.
	**CAUTION**	This symbol shows that information is available such as the operating manual or installation manual.

This AIR-TO-WATER HYDROMODULE + TANK operates in combination with an outdoor unit containing refrigerant R290.

DANGER

- Before touching electric terminal parts, turn off power switch.
- When service panels are removed, live parts can be easily touched by accident.
- Never leave the unit unattended during installation or servicing when the service panel is removed.
- Do not touch water pipes during and immediately after operation as the pipes may be hot and could burn your hands. To avoid injury, give the piping time to return to normal temperature or be sure to wear protective gloves.
- Do not touch any switch with wet fingers. Touching a switch with wet fingers can cause electrical shock.
- Before touching electrical parts, turn off all applicable power to the unit.

1 SAFETY PRECAUTIONS

WARNING

● Tear apart and throw away plastic packaging bags so that children will not play with them. Children playing with plastic bags face danger of death by suffocation.
● Safely dispose of packing materials such as nails and other metal or wood parts that could cause injuries.
● Ask your dealer or qualified personnel to perform installation work in accordance with this manual. Do not install the unit yourself. Improper installation could result in water leakage, electric shocks or fire.
● Be sure to use only specified accessories and parts for installation work. Failure to use specified parts may result in water leakage, electric shocks, fire, or the unit falling from its mount.
● Install the unit on a foundation that can withstand its weight. Insufficient physical strength may cause the equipment to fall and possible injury.
● Perform specified installation work with full consideration of strong wind, hurricanes, or earthquakes. Improper installation work may result in accidents due to equipment falling.
● Make certain that all electrical work is carried out by qualified personnel according to the local laws and regulations and this manual using a separate circuit. Insufficient capacity of the power supply circuit or improper electrical construction may lead to electric shocks or fire.
● Be sure to install a ground fault circuit interrupter according to local laws and regulations. Failure to install a ground fault circuit interrupter may cause electric shocks and fire.
● Make sure all wiring is secure. Use the specified wires and ensure that terminal connections or wires are protected from water and other adverse external forces. Incomplete connection or affixing may cause a fire.
● When wiring the power supply, form the wires so that the front panel can be securely fastened. If the front panel is not in place there could be overheating of the terminals, electric shocks or fire.
● After completing the installation work, check to make sure that there is no water leakage.
● Do not touch the internal parts (pump, backup heater, etc.) during and immediately after operation. Touching the internal parts can cause burns. To avoid injury, give the internal parts time to return to normal temperature or, if you must touch them, be sure to wear protective gloves.

CAUTION

● Ground the unit.
● Grounding resistance should be according to local laws and regulations.
● Do not connect the ground wire to gas or water pipes, lightning conductors or telephone ground wires.
● Incomplete grounding may cause electric shocks.
- Gas pipes: Fire or an explosion might occur if the gas leaks.
- Water pipes: Hard vinyl tubes are not effective grounds.
- Lightning conductors or telephone ground wires: Electrical threshold may rise abnormally if struck by a lightning bolt.
● Install the power wire at least 3 feet (1 meter) away from televisions or radios to prevent interference or noise. (Depending on the radio waves, a distance of 3 feet (1 meter) may not be sufficient to eliminate the noise.)
● Do not wash the unit. This may cause electric shocks or fire. The appliance must be installed in accordance with national wiring regulations. If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
● Do not install the unit in the following places:
- Where there is mist of mineral oil, oil spray or vapors. Plastic parts may deteriorate, and cause them to come loose or water to leak.
- Where corrosive gases (such as sulphurous acid gas) are produced. Where corrosion of copper pipes or soldered parts may cause refrigerant to leak.
- Where there is machinery which emits electromagnetic waves. Electromagnetic waves can disturb the control system and cause equipment malfunction.
- Where flammable gases may leak, where carbon fiber or ignitable dust is suspended in the air or where volatile flammables such as paint thinner or gasoline are handled. These types of gases might cause a fire.
- Where the air contains high levels of salt such as near the ocean.
- Where voltage fluctuates a lot, such as in factories.
- In vehicles or vessels.
- Where acidic or alkaline vapors are present.
● This appliance can be used by children 8 years old and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they are supervised or given instruction on using the unit in a safe manner and understand the hazards involved. Children should not play with the unit. Cleaning and user maintenance should not be done by children without supervision.
● Children should be supervised to ensure that they do not play with the appliance.
If the supply cord is damaged, it must be replaced by the manufaturer or its service agent or a similarly qualified person.
● DISPOSAL: Do not dispose this product as unsorted municipal waste. Collection of such waste separately for special treatment is necessary. Do not dispose of electrical appliances as municipal waste, use seperate collection facilities. Contact your local goverment for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substance can leak into the groudwater and get into the food chain, damaging your health and well-being.
● The wiring must be performed by professional technicians in accordance with national wiring regulation and this circuit diagram. An all-pole disconnection device which has at least 3mm seperation distance in all pole and a residualcurrent device(RCD) with the rating not exceeding 30mA shall be incorporated in the fixed wiring according to the national rule.
● Confirm the safety of the installation area (walls, floors, etc.) without hidden dangers such as water, electricity, and gas, before wiring/pipes.
● Before installation, check whether the user's power supply meets the electrical installation requirements of unit (including reliable grounding, leakage, and wire diameter electrical load, etc.). If the electrical installation requirements of the product are not met, the installation of the product is prohibited until the product is rectified.
● Product installation should be fixed firmly. Take reinforcement measures, when necessary.

2 ACCESSORIES

2.1 Accessories Supplied With the Unit

Installation Fittings		
Name	Shape	Quantity
Installation and owner's manual(this book)		1
Operation manual		1
Technical data manual		1
Y-shape filter		1
Drian hose		1
Energy label		1
Rubber water plug		1
Clamp		3

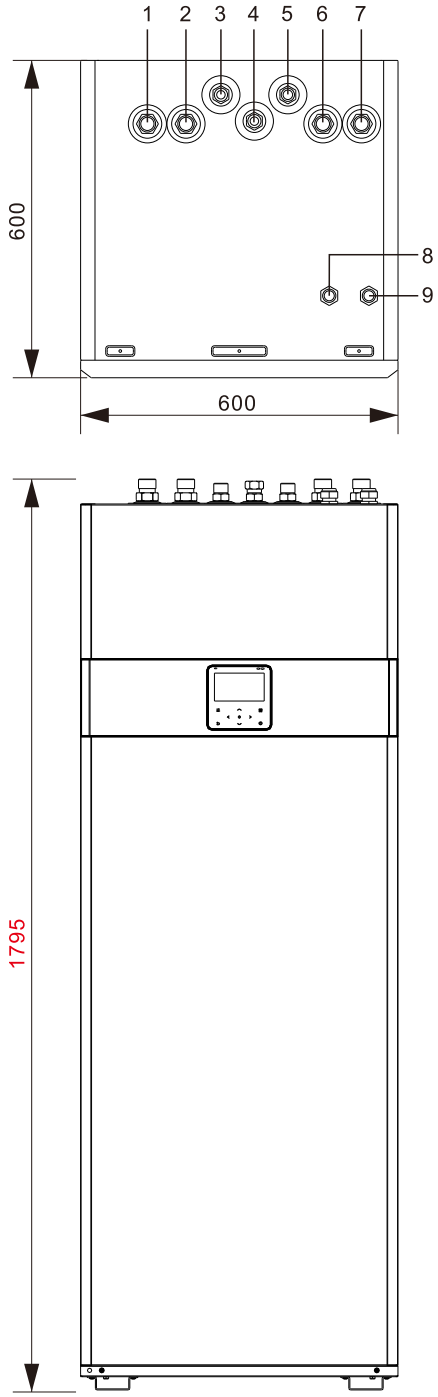
3 INSTALLATION SITE

WARNING

● Do not install indoor units near bedrooms; Be sure to adopt adequate measures to prevent the unit from being used as a shelter by small animals.
● Install it in a garage, service room, hallway, basement or laundry room.
● Please take timely measures to prevent the unit from being used as a shelter for small animals.
● Small animals that come into contact with electrical components may cause faults, smoke or fire. Instruct customers to keep the area around the unit clean.
● Connect the top pipe or fill the water tank immediately after removing the wooden structure, so that the machine will not overturn.
● Select an installation site where the following conditions are satisfied and one that meets with your customer's approval.
- Safe places which can bear the unit's weight and vibration and where the unit can be installed at an even level.
- Places where there is no possibility of flammable gas or product leak.
- The equipment is not intended for use in a potentially explosive atmosphere.
- Places where the space for maintenance operations is well secured.
- Places where the units' piping and wiring lengths come within the allowable ranges.
- Places where water leaking from the unit cannot cause damage to the location (e.g. in case of a blocked drain pipe).
- Do not install the unit in places often used as a work space. In case of construction work (e.g. grinding etc.) where a lot of dust is created, the unit must be covered.
- Do not place any object or equipment on top of the unit (top plate).
- Do not climb. sit or stand on top of the unit.
- Be sure that sufficient precautions are taken in case of refrigerant leakage according to relevant local laws and regulations.
- Don't install the unit near the sea or where there is corrosion gas.
● When installing the unit in a place exposed to strong wind, pay special attention to the following.
- Indoor units should be installed indoors, in waterproof places.
● Indoor units shall be mounted on the ground in a location that meets the following requirements:
- The location of the facility is frost-free.
- The space around the unit is suitable for maintenance tasks.
- There are condensate drain and pressure relief valve discharge supplies.
● When the unit is running in cooling mode, condensate may fall off the inlet and outlet pipes. Make sure that the falling condensate does not damage your furniture and other appliances.

4 INSTALLATION PRECAUTIONS

4.1 Dimensions



Code	Assembly	Code	Assembly
1	Circular hot water import	6	Space heating (cooling) inlet water
2	Cycle cold water outlet	7	Space heating (cooling) outlet water
3	Domestic hot water outlet	8	Engineering wiring reserved port
4	Domestic hot water recirculation inlet (blocked by the nut).	9	Engineering wiring reserved port
5	Domestic cold water inlet		

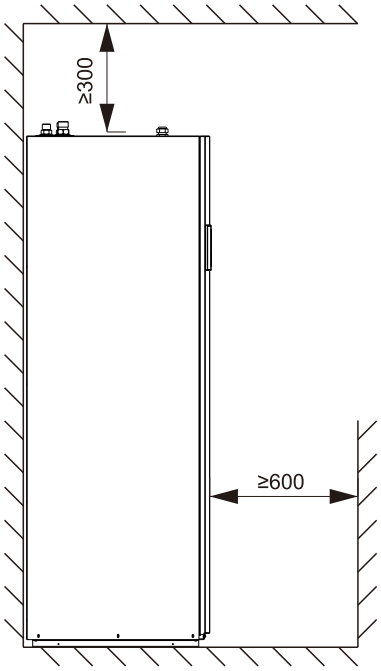
4 INSTALLATION PRECAUTIONS

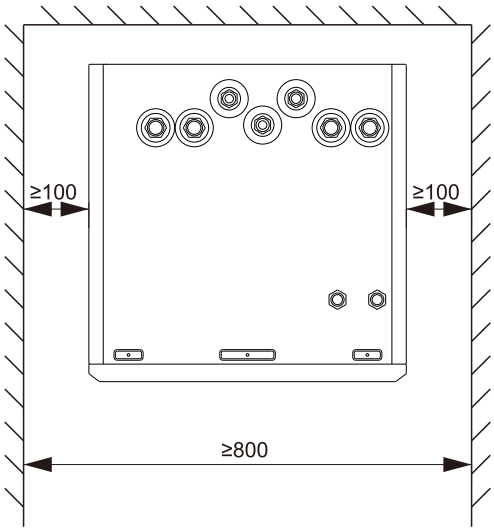
4.2 Installation Requirements

- The inner unit is packed with cardboard lids and corners.
- The unit shall be inspected at the time of delivery and any damage shall be notified immediately to the carrier's claim agent.
- Check that all accessories of indoor unit are included
- Close the unit as much as possible to the final installation position in the original package to avoid damage during transportation

4.3 Servicing Space Requirements

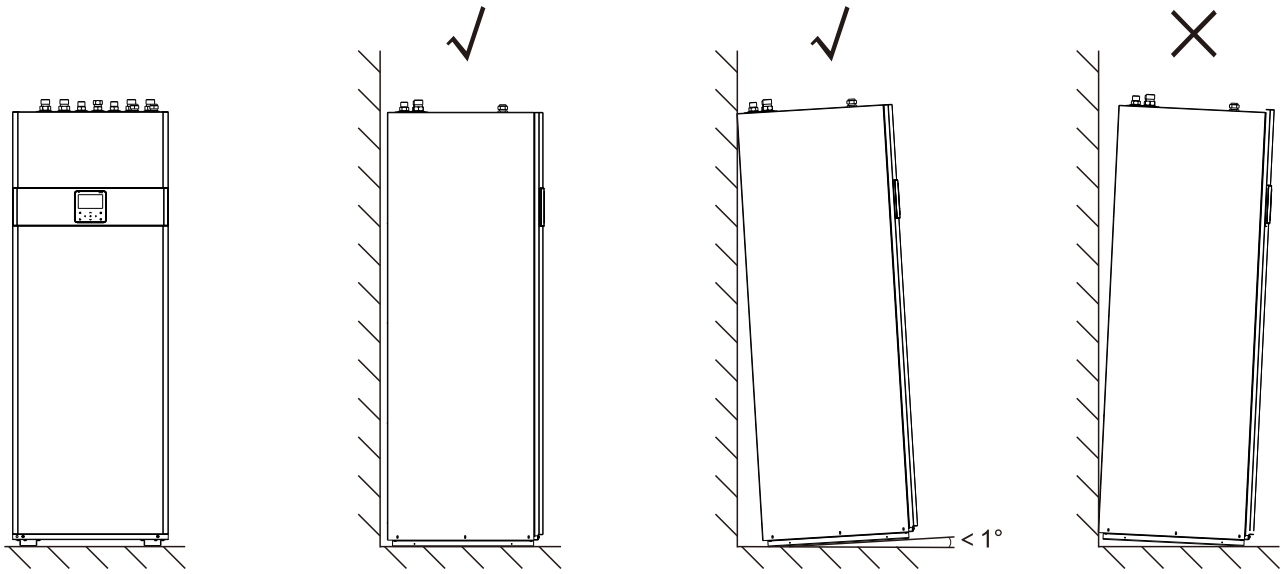
Unidad: mm





4.4 Installation of Indoor Units

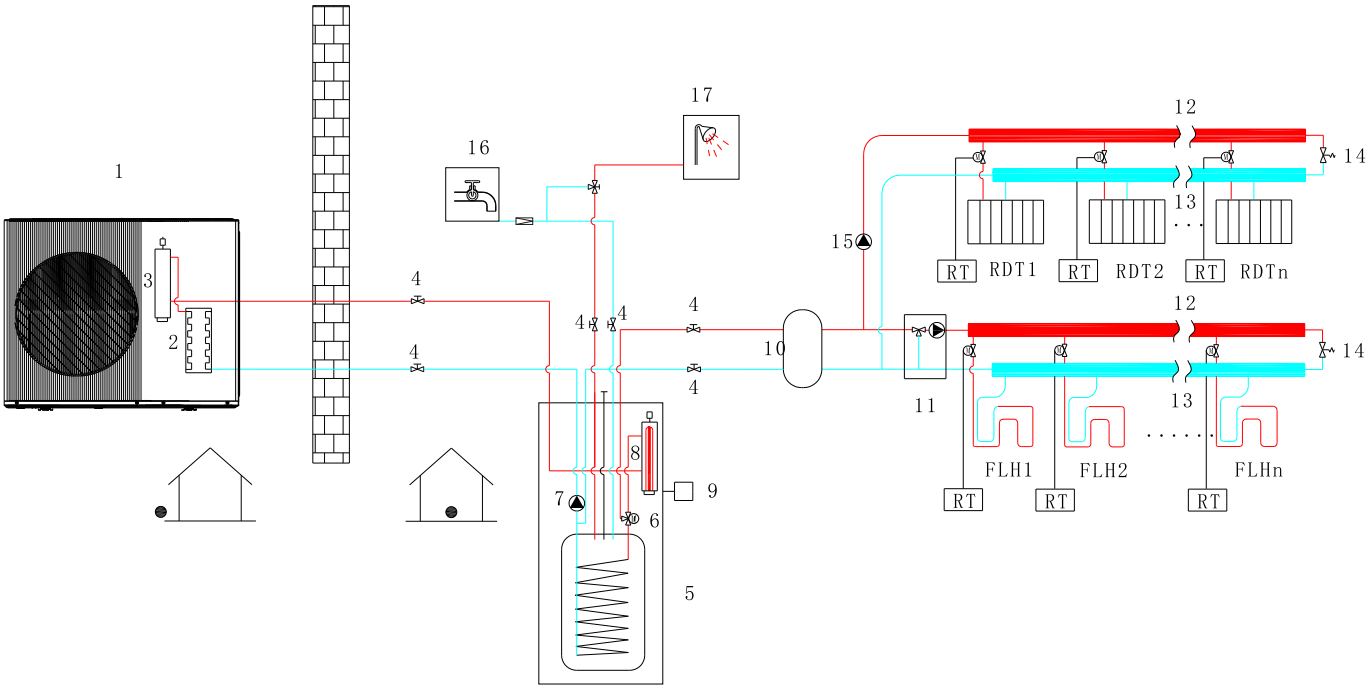
- Lift the indoor unit from the tray and place it on the floor.
- Slide the indoor unit to its position.
- When the ground is uneven. The maximum allowable deviation is 1°.
- Special care should be taken with the mounting once the unit is on the ground. Avoid rough handling of the unit as it may damage the foot.



5 TYPICAL APPLICATIONS

5.1 Space Heating and Domestic Hot Water

- The room thermostats also can connect to a motorized valve.
- Each rooms temperature is regulated by the motorized valve on its water circuit.
- Domestic hot water is supplied from the domestic hot water tank inside the indoor unit.
- A bypass valve is required.

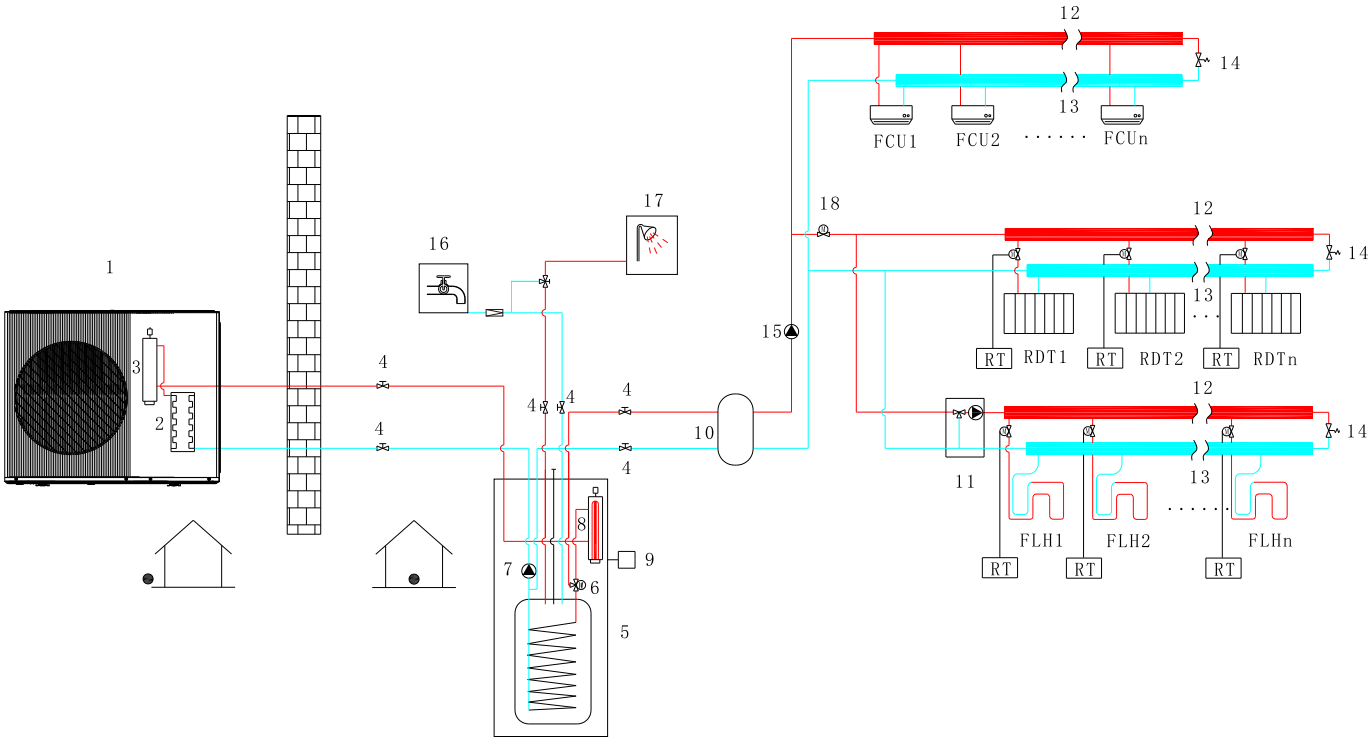


REMARK					
1	Outdoor unit	8	Backup electric heater	15	External circulation pump
2	Plate heater exchange	9	Wired controller	16	DHW-Cold water IN
3	Air-water separator	10	Balance water tank	17	DHW-Hot water OUT
4	Stop valve (local)	11	Mixing valve and mixing water pump	RDT	Heating radiator
5	Indoor unit	12	Distributor	FLH	Floor heating loops
6	Motorized 3way valve	13	Collector	RT	Room thermostats
7	Internal circulating pump	14	Bypass valve		

5 TYPICAL APPLICATIONS

5.2 Space Heating, Space Cooling and Domestic Hot Water

- Floor heating loops & Heating radiator & Fan coil units are used for space heating, fan coil units are used for space cooling.
- Domestic hot water is supplied from the domestic hot water tank inside the indoor unit.
- The unit switches to heating or cooling mode according to the temperature detected by the room thermostat.
- In space cooling mode, the 2way valve is closed to prevent cold water entering the floor heating loops & Heating radiator.

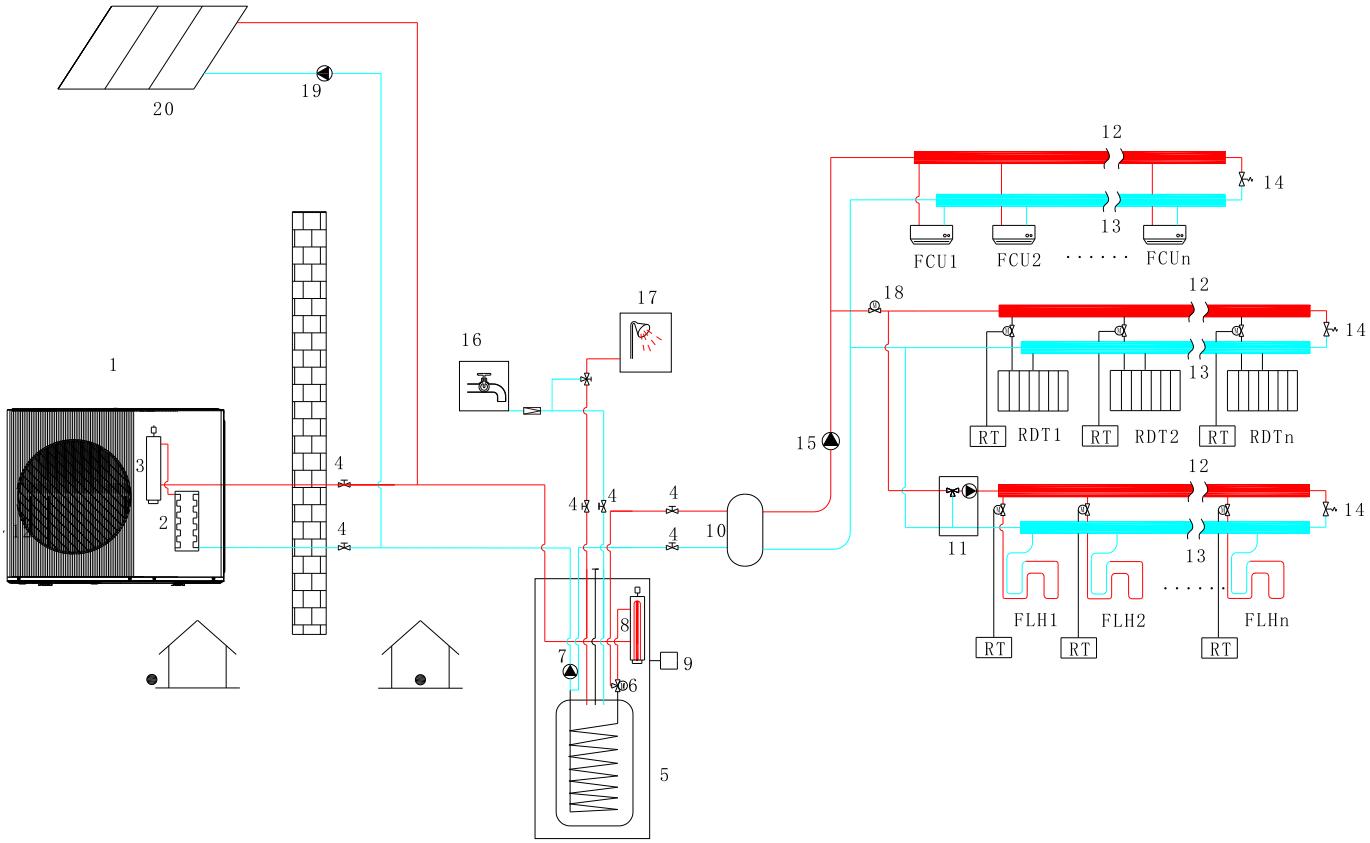


REMARK					
1	Outdoor unit	8	Backup electric heater	15	External circulation pump
2	Plate heater exchange	9	Wired controller	16	DHW-Cold water IN
3	Air-water separator	10	Balance water tank	17	DHW-Hot water OUT
4	Stop valve (local)	11	Mixing valve and mixing water pump	18	Two way valve
5	Indoor unit	12	Distributor	RDT	Heating radiator
6	Motorized 3way valve	13	Collector	FLH	Floor heating loops
7	Internal circulating pump	14	Bypass valve	RT	Room thermostats

5 TYPICAL APPLICATIONS

5.3 Space Heating, Space Cooling and Domestic Hot Water Compatible with Solar Water Heater

- Floor heating loops & Heating Radiator &fan coil units are used for space heating, and fan coil units are used for space cooling.
- The temperature in the domestic hot water tank is controlled by the hydraulic module.
- When it is detected that the temperature of the domestic hot water tank is lower than the set temperature and meets the requirements for solar hot water activation, when conditions are met, turn on the solar water pump to realize the solar hot water function.

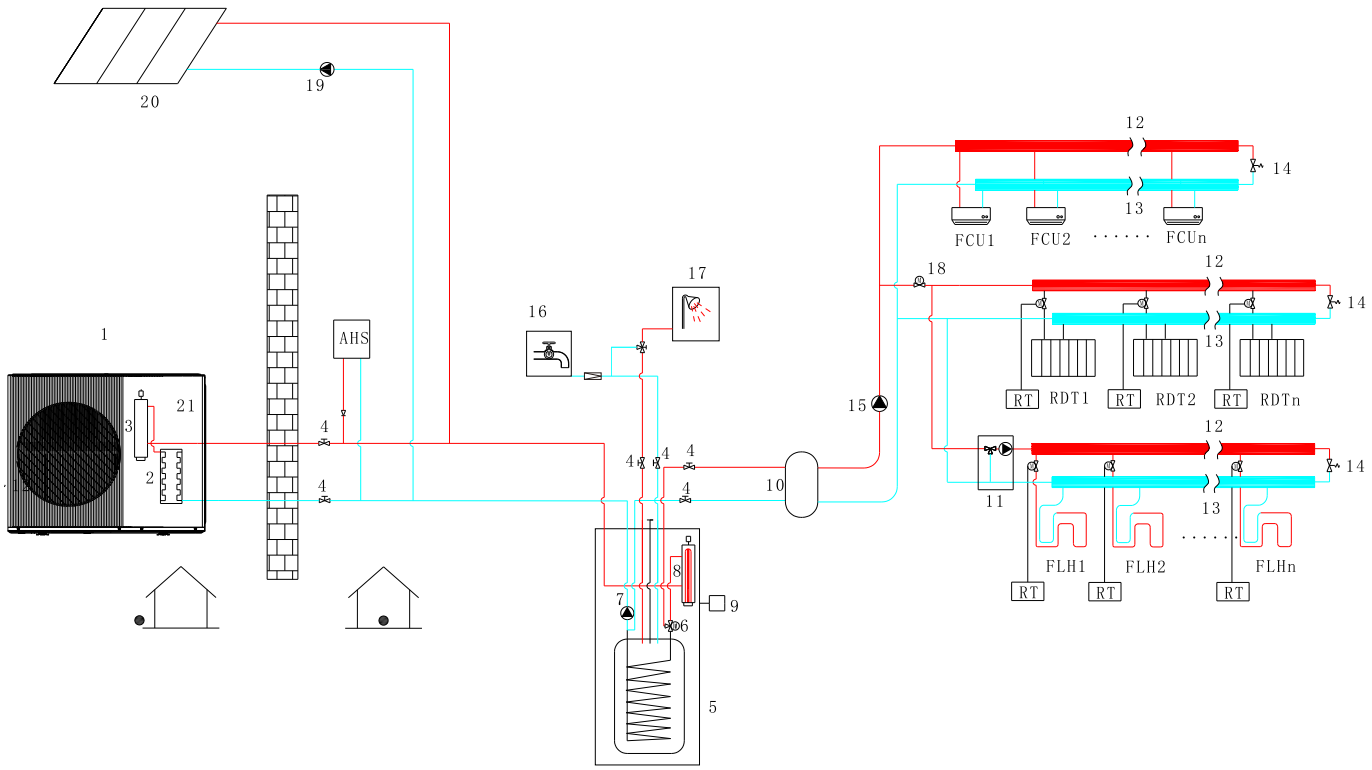


REMARK					
1	Outdoor unit	9	Wired controller	17	DHW-Hot water OUT
2	Plate heater exchange	10	Balance water tank	18	Two way valve
3	Air-water separator	11	Mixing valve and mixing water pump	19	Solar water pump
4	Stop valve (local)	12	Distributor	20	Solar panel
5	Indoor unit	13	Collector	RDT	Heating radiator
6	Motorized 3way valve	14	Bypass valve	FLH	Floor heating loops
7	Internal circulating pump	15	External circulation pump	RT	Room thermostats
8	Backup electric heater	16	DHW-Cold water IN		

5 TYPICAL APPLICATIONS

5.4 Space Heating with heat pump and AHS, space cooling with heat pump and solar for hot water

- When the heating insufficient, the gas boiler (AHS) is used as an additional heat source, and floor heating or fan coils or low temperature radiators are used for space heating (also can be used in combination with various types of terminals).
- The fan coil is used for space cooling.
- The temperature in the domestic hot water tank is controlled by the hydraulic module.
- When it is detected that the temperature of the domestic hot water tank is lower than the set temperature and meets the requirements for solar hot water activation, when conditions are met, turn on the solar water pump to realize the solar hot water function.



REMARK					
1	Outdoor unit	9	Wired controller	17	DHW-Hot water OUT
2	Plate heater exchange	10	Balance water tank	18	Two way valve
3	Air-water separator	11	Mixing valve and mixing water pump	19	Solar water pump
4	Stop valve (local)	12	Distributor	20	Solar panel
5	Indoor unit	13	Collector	21	One way valve
6	Motorized 3way valve	14	Bypass valve	RDT	Heating radiator
7	Internal circulating pump	15	External circulation pump	FLH	Floor heating loops
8	Backup electric heater	16	DHW-Cold water IN	RT	Room thermostats

CAUTION

Make sure to connect the MV1、MV2、MV3 terminals in the wired controller correctly, please refer to 7.5.2

The Balance Water Tank Volume Requirement

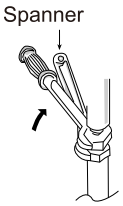
NO.	Model	Balance Water Tank (L)
1	4~6kW	≥25
2	8~16kW	≥40

6 WATER CIRCUIT CONNECTION

Water connections must be made correctly in accordance with respect to the water inlet and water outlet.

CAUTION

Be careful not to deform the unit's piping by using excessive force when connecting the piping.
Make sure to use two spanners to tighten the connection.
Deforming the piping can cause the unit to malfunction.



If air, moisture or dust gets in the water circuit, problems may occur. Therefore, always take into account the following when connecting the water circuit:

- Use clean pipes only.
- Hold the pipe end downwards when removing burrs.
- Cover the pipe end when inserting it through a wall to prevent dust and dirt entering.
- Use a good thread sealant for sealing the connections. The sealing must be able to withstand the pressures and temperatures of the system.
- When using non-copper metallic piping, be sure to insulate two kind of materials from each other to prevent galvanic corrosion.
- As copper is a soft material, use appropriate tools for connecting the water circuit. Inappropriate tools will cause damage to the pipes.

NOTE

The unit is only to be used in a closed water system. Application in an open water circuit can lead to excessive corrosion of the water piping:

- Never use Zn-coated parts in the water circuit. Excessive corrosion of these parts may occur as copper piping is used in the unit's internal water circuit.
- When using a 3-way valve in the water circuit. Preferably choose a ball type 3-way valve to guarantee full separation between the domestic hot water and floor heating water circuit.
- When using a 3-way valve or a 2-way valve in the water circuit. The recommended maximum changeover time of the valve should be less than 60 seconds.

6.1 Water Piping

All piping lengths and distances have been taken into consideration.

NOTE

- If no glycol is in the system, in case of a power supply failure or pump operating failure, drain all the water system if the water temperature is below 0℃ in the cold winter.
- When water is at standstill inside the system, freezing is very likely to happen and damage the system in the process.

6.1.1 Check the Water Circuit

- The unit is equipped with a water inlet and water outlet for connection to a water circuit.
- This circuit must be provided by a licensed technician and must comply with local laws and regulations.
- The unit is only to be used in a closed water system.
- Application in an open water circuit can lead to excessive corrosion of the water piping.
- Before continuing installation of the unit, check the following:

- The maximum water pressure ≤ 3 bar.
- The maximum water temperature ≤ 80℃ according to safety device setting.
- Always use materials that are compatible with the water used in the system and with the materials used in the unit.
- Ensure that components installed in the field piping can withstand the water pressure and temperature.
- Drain taps must be provided at all low points of the system to permit complete drainage of the circuit during maintenance.
- Air vents must be provided at all high, points of the system. The vents should be located at points that are easily accessible for service. An automatic air purge is provided inside the unit. Check that this air purge valve is not tightened so that automatic release of air in the water circuit is possible.

6.1.2 Water Volume and Sizing Expansion Vessels

The units are equipped with an expansion vessel of 8L that has a default pre-pressure of 3 bar. To assure proper operation of the unit, the pre-pressure of the expansion vessel might need to be adjusted.

1) Check that the total water volume in the installation, excluding the internal water volume of the unit, is at least 40L. See “Technical specifications” to find the total internal water volume of the unit.

NOTE

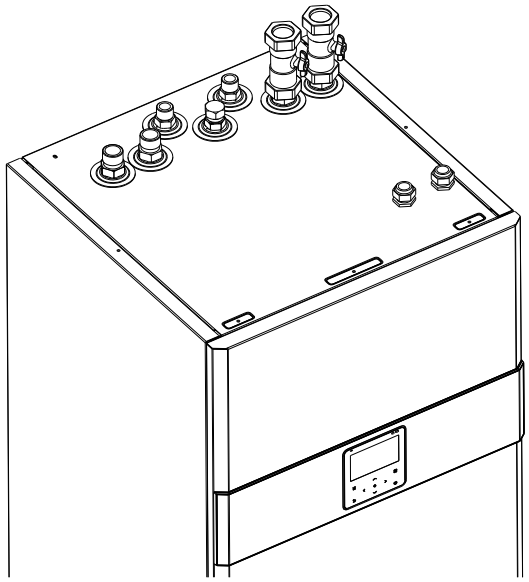
- In most applications this minimum water volume will be satisfactory.
- In critical processes or in rooms with a high heat load though, extra water might be required.
- When circulation in each space heating loop is controlled by remotely controlled valves, it is important that this minimum water volume is kept even if all the valves are closed.

2) Expansion vessel volume must fit the total water system volume.
3) To size the expansion for the heating and cooling circuit.

6 WATER CIRCUIT CONNECTION

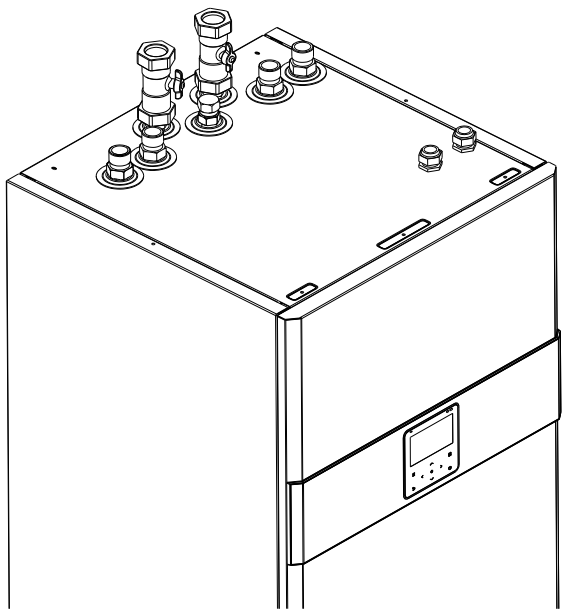
6.2 Connection of Water Pipes for Heating (Cooling) Spaces

In order to facilitate service and maintenance tasks, two stop valves (field supply) and one overpressure bypass valve should be installed. Two stop valves shall be installed on the heating (cooling) water inlet and outlet pipes of the indoor unit space.



- Connect the stop valve to the indoor unit.
- Connect the stop valve to the heating (cooling) water pipe of the space

6.3 Connection of Pipes for Domestic Cold and Hot Water



The shut-off valve must be installed at the domestic cold water inlet

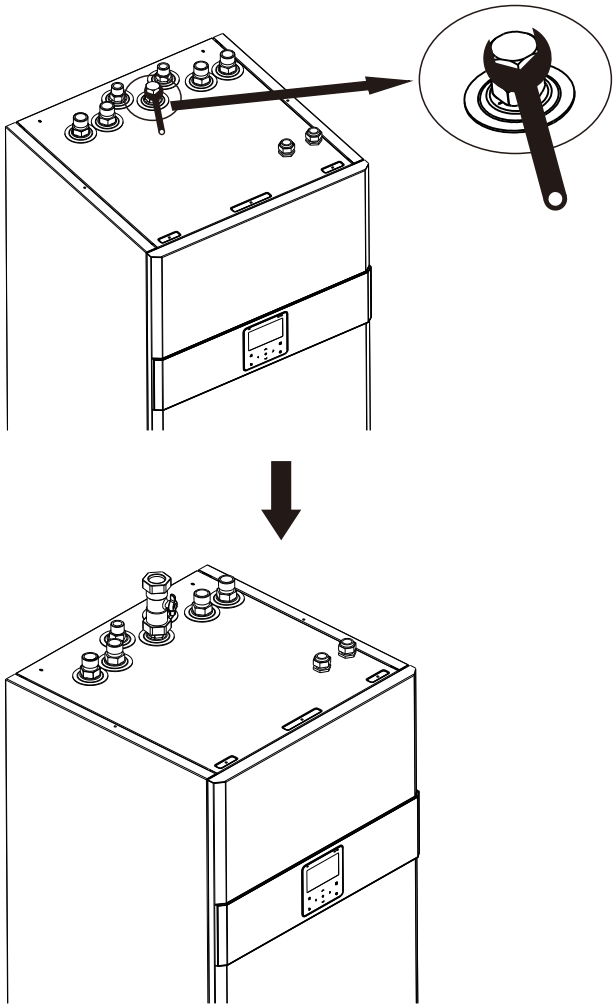
- Connect the shutoff valve to the cold water inlet of the indoor unit.
- Connect the cold water pipe to the shutoff valve.
- Connect the domestic hot water pipe to the hot water outlet of the indoor unit.

6 WATER CIRCUIT CONNECTION

6.4 Connection of Recirculating Water Pipe

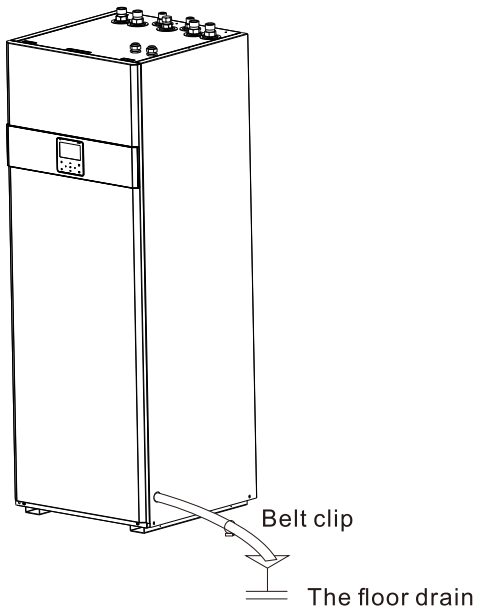
If the domestic hotIf the domestic hot water recirculation function is required, the recirculation pipe must be connected.

- Remove the indoor unit recirculation nut
- Connect the recirculation water pipe to the indoor unit.



6.5 Connection of drain hose to indoor unit

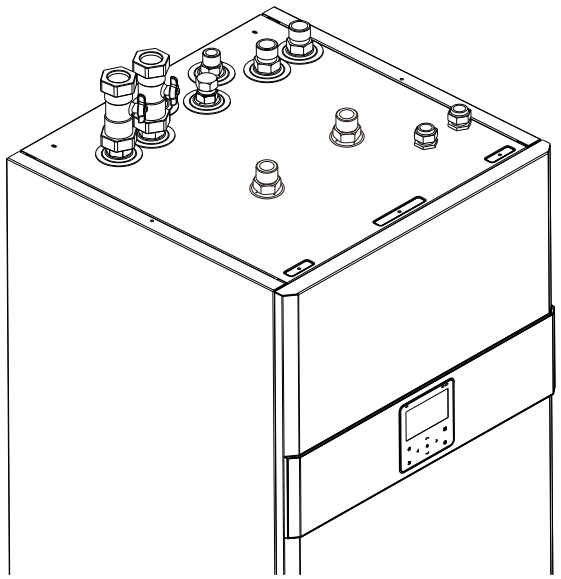
Water from the pressure relief valve and condensate water are collected in the drain tray.
The drain hose must be connected to the drain pipe.
Connect the drainage pipe with a belt clip and insert it into the floor drain.



6 WATER CIRCUIT CONNECTION

6.6 Connection of Solar Circulation Pipes (if necessary)

If the solar kit is designed in the system. Solar circulating water pipes shall be connected to the inlet and outlet connectors of indoor units



6.7 Insulation of Water Pipes

The compete water circuit including all piping, water piping must be insulated to prevent condensation during cooling operation and reduction of the heating and cooling capacity as well as prevention of freezing of the outside water piping during winter. The insulation material should at least of B1 fire resistance rating and complies with all applicable legislation. The thickness of the sealing materials must be at least 13 mm with thermal conductivity 0.039 W/mK in order to prevent freezing on the outside water piping.

If the outdoor ambient temperature is higher than 30 ˚C and the humidity is higher than RH 80%, then the thickness of the sealing materials should be at least 20 mm in order to avoid condensation on the surface of the seal.

6.8 Water Circuit Anti-freeze Protection

- All internal hydronic parts are insulated to reduce heat loss. Insulation must also be added to the field piping.
- The software contains special functions using the heat pump and backup heater (if it is aviliable) to protect the entire system against freezing. When the temperature of the water flow in the system drops to a certain value, the unit will heat the water, either using the heat pump, the electric heating tap, or the backup heater. The freeze protection function will turn off only when the temperature increases to a certain value.
- In event of a power failure, the above features would not protect the unit from freezing.

CAUTION

When the unit is not running for a long time make sure the unit is powered on all the time. if you want to cut off the power, the water in the system pipe needs to be drained clean, avoid the pump and pipeline system be damaged by freezing. Also the power of the unit needs to be cut off after water in the system is drained clean.

Water may enter into the flow switch and cannot be drained out and may freeze when the temperature is low enough. The flow switch should be removed and dried, then can be reinstalled in the unit.

NOTE

1. Counterclockwise rotation, remove the flow switch.
2. Drying the flow switch completely.

6 WATER CIRCUIT CONNECTION

6.9 Filling Water

6.9.1 Water Circuit Filling

- Connect the water supply to the filling valves and open the valve.
- Filling with water until the manometer indicates a pressure of approximately 2.0bar. Remove air in the circuit as much as possible using the manual exhaust valve.

(When the system is running open the manual exhaust valve tum counterclockwise at least 2 full tums to release air from the system.)

NOTE

During filling, it might not be possible to remove all air in the system. Remaining air will be removed through the manual exhaust valve during the first operating hours of the system, Topping up the water afterwards might be required.

- The water pressure indicated on the manometer will vary depending on the water temperature (higher pressure at higher water temperature). However, at all times water pressure should remain above 0.3bar to avoid air entering the circuit.
- The unit might drain-off too much water through the pressure relief valve.
- Water quality should be complied with EN 98/83 EC Directives.
- Detailed water quality condition can be found in EN98/83 EC Directives.
- In most applications, this minimum water volume will be satisfactory.
- However, in critical processes or in rooms with high heat loads, additional water may be required.
- When the circulation in each space heating circuit is controlled by remote control valves, it is important to maintain this minimum water volume even if all valves are closed.
- In the case of each space heating circuit (cooling circuit is controlled by a valve), overpressure bypass valves, (field supply) must be installed between the heating (cooling) circuits.

6.9.2 Water Injection of the Domestic Hot Water Tank

- Turn on each hot water tap in turn to remove the air from the system pipes
- Open cold water supply valve
- Turn off all taps after removing all air.
- Check for water leaks.
- Manually operate the pressure relief valve installed in the field to ensure the free flow of water through the discharge pipe.

CAUTION

The inlet pressure of cold water should be less than 0.8 MPa. Expansion cup and safety valve shall be installed (field supply, protection pressure 0.8 MPa).

Warning and Water and Groundwater Quality Directive: This product is designed to comply with European Water Quality Directive 98/83/EC as amended by Directive 2015/1787/EU. The service life of the product is not guaranteed when groundwater is used, such as springs and wells, tap water containing salt or other impurities, or in areas with acidic water quality. The maintenance and warranty costs associated with these cases are the responsibility of the customer.

7 FIELE WIRING

WARNING

● A main switch or other means of disconnection, having a contact separation in all poles, must be incorporated in the fixed wiring in accordance with relevant local laws and regulations. Switch off the power supply before making any connections.
● Use only copper wires. Never squeeze bundled cables and make sure they do not come in contact with the piping and sharp edges. Make sure no external pressure is applied to the terminal connections. All field wiring and components must be installed by a licensed electrician and must comply with relevant local laws and regulations.
● The field wiring must be carried out in accordance with the wiring diagram supplied with the unit and the instructions given below.
● Be sure to use a dedicated power supply. Never use a power supply shared by another appliance.
● Be sure to establish a ground. Do not ground the unit to a utility pipe, surge protector, or telephone ground. Incomplete grounding may cause electrical shock.
● Be sure to install a ground fault circuit interrupter(30 mA). Failure to do so may cause electrical shock.
● Be sure to install the required fuses or circuit breakers.

7.1 Precautions on Electrical Wiring Work

● Fix the cable so that it does not touch the pipe (especially on the high pressure side).
● Fix the electrical wiring with flanges, as shown in the figure, so that it does not contact with the pipeline, especially on the high pressure side.
● Make sure no external pressure is applied to the terminal connectors.
● When installing the grounding fault circuit breaker, check whether it is compatible with the inverter (high frequency electrical interference) to avoid unnecessary disconnection of the grounding fault circuit breaker.
● The ground fault circuit interrupter must be a high- speed type breaker of 30 mA (<0.1s).

NOTE

● The maximum length of the communication cable is 50 meters.
● Power lines and communication lines must be laid separately and cannot be laid in the same pipeline. Otherwise, it may cause electromagnetic interference. The power line and communication line shall not contact with the Water pipeline to prevent the high temperature pipe from damaging the cables
● Communication cables shall be armored, including indoor to outdoor PQE and indoor to controller ABXYE line.

● Loads requiring field wiring. Refer also to “Typical Application”.
(a) Minimum cable section AWG18 (0.75mm²).
(b) The thermistor cable are delivered with the unit: if the current of the load is large, an AC contactor is needed.
● This unit is equipped with an inverter. Installing, a phase advancing capacitor not only will reduce the power factor improvement effect, but also may cause abnormal heating of the capacitor due to high-frequency waves. Never install a phase advancing capacitor as it could lead to an accident.
● Equipment must be grounded.
● All high-voltage external load, if it is metal or a grounded port, must be grounded.
● All external load current is needed less than 0.2A, if the single load current is greater than 0.2A, the load must be controlled through AC contactor.
● Most field wiring on the unit is to be made on the terminal block inside the switch box. To gain access to the terminal block, remove the switch box service panel.

WARNING

Switch off all power including the unit power supply and backup heater and domestic hot water tank power supply (if applicable) before removing the switch box service panel.
● Fix all cables using cable ties.
● A dedicated power circuit is required for the backup heater.
● Lay out the electrical wiring so that the front cover does not rise up when doing wiring work and attach the front cover securely.
● Follow the electric wiring diagram for electrical wiring works (the electric wiring diagrams are located on the cover of the electronic control box.
● Install the wires and fix the cover firmly so that the cover may be fit in properly.

7 FIELE WIRING

7.2 Precautions on Wiring of Power Supply

● Use circular line terminals for connection to the power supply terminal board. In case it cannot be used due to unavoidable reasons, be sure to observe the following instructions.
-Do not connect different gauge wires to the same power supply terminal.(Loose connections may cause overheating.)
● Use the correct screwdriver to tighten the terminal screws. Small screwdrivers can damage the screw head and prevent appropriate tightening.
● Over-tightening the terminal screws can damage the screws.
● Attach a ground fault circuit interrupter and fuse to the power supply line.
● In wining, make certain that prescribed wires are used, carry out complete connections, and fix the wires so that outside force cannot affect the terminals.

7.3 Safety Device Requirements

1.Select the wire diameters (minimum value) individually for each unit based on the table below.
2.Select circuit breaker that having a contact separation in all poles not less than 3 mm providing full disconnection.

1-phase 4kW-16kW(Backup heater: 3kW) and 3-phase 8kW-16kW(Backup heater: 9kW) standard

System	Power Current						WPM	
	Hz	Voltage(V)	Min(V)	Max(V)	MCA(A)	MHA(A)	Kw	FLA(A)
4kW-16kW	50	220-240/1N	198	264	14	13	0.095	0.75

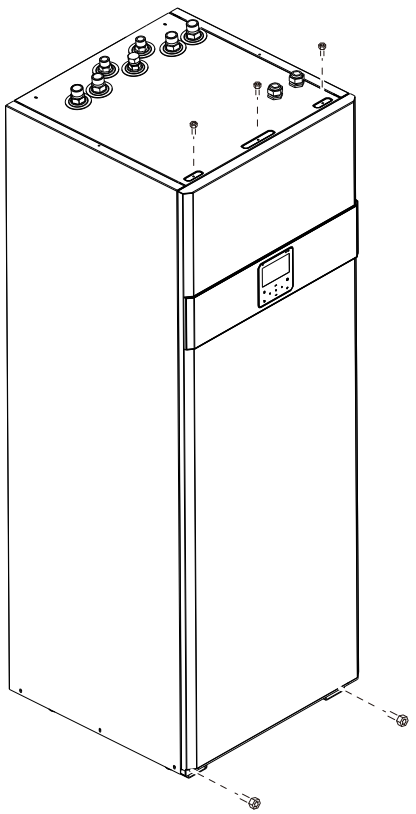
NOTE

MCA: Max. Circuit Amps.(A)
MHA: Max. Heater Amps.(A)
WPM: Water Pump Motor
FLA: Full Load Amps.(A)

A creepage circuit breaker above the maximum current must be installed to avoid possible electric shocks.

7.4 Before Wiring

1. Remove the bolts at the lower edge of the front panel of the indoor unit
2. Open the front panel.
3. Remove the control box cover.

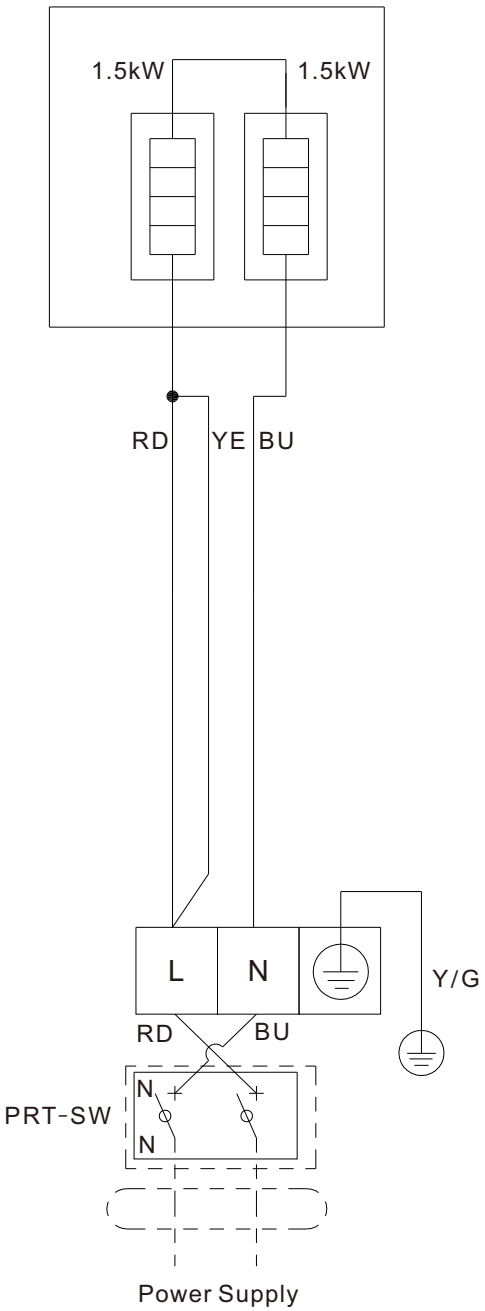


7 FIELE WIRING

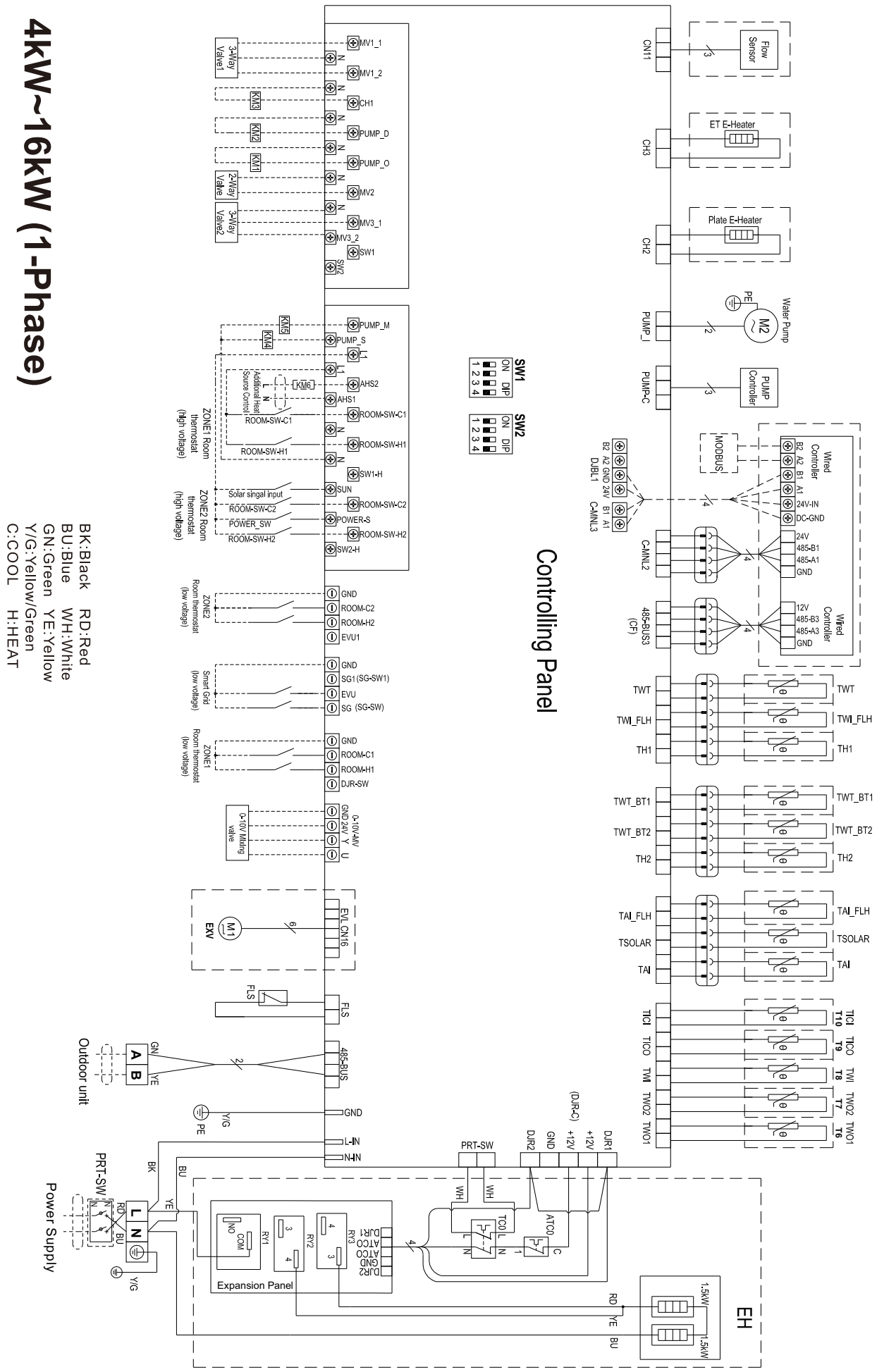
7.5 Electronic Control Box

The figure is only for reference, please refer to the actual product.

4kW~16kW(1-phase)



7 FIELE WIRING



7 FIELE WIRING

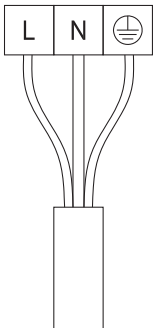
Components description:

ROOM-SW-C1	Cool Zone 1 Room thermostat (high voltage)
ROOM-SW-H1	Heat Zone 1 Room thermostat (high voltage)
ROOM-SW-C2	Cool Zone 2 Room thermostat (high voltage)
ROOM-SW-H2	Heat Zone 2 Room thermostat (high voltage)
ROOM-C1	Cool Zone 1 Room thermostat (low voltage)
ROOM-H1	Heat Zone 1 Room thermostat (low voltage)
ROOM-C2	Cool Zone 2 Room thermostat (low voltage)
ROOM-H2	Heat Zone 2 Room thermostat (low voltage)
TWO1	Outlet water temp. sensor of plate heat exchanger
TWO2	Outlet water temp. sensor of Electric heating
TWI	Inlet water temp. sensor of plate heat exchanger
TICO	Indoor coil outlet
TICI	Indoor coil inlet
TWT_BT1	Buffer tank temp. sensor 1
TWT_BT2	Buffer tank temp. sensor 2
TWI_FLH	Floor heating water inlet temp. sensor
TWT	Tank water temp. sensor
TAI	ZONE1 Room temp. sensor
TSOLAR	Solar panel temp. sensor
TAI_FLH	ZONE2 Room temp. sensor
AHS	Additional Heat Source
ATCO	Automatic Thermostat
EH	Electric Heater
KM1	Zone1 PUMP AC Contactor2
KM2	DHW PIPE PUMP AC Contactor1
KM3	Electric heating for water tank AC contactor3
KM4	Solar PUMP AC contactor4
KM5	Zone 2 PUMP AC contactor5
KM6	Additional heat source AC contactor6
TCO	Manual Thermostat
SG	Smart Grid
EVU	Commercial power

7 FIELE WIRING

7.5.1 Specifications of Standard Wiring Components

Equipment main Power Supply Wiring



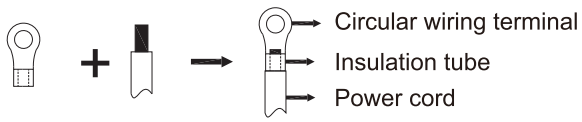
Single phase power

- Stated values are maximum values (see electrical data for exact values)

Unit	12kW-16kW (3kW-1PH heater)
1PH-wiring size(mm²)	2.5

CAUTION

When connecting to the power supply terminal, use the circular wiring terminal with the insulation casing.
Use power cord that conforms to the specifications and connect the power cord firmly. To prevent the cord from being pulled out by external force, make sure it is fixed securely.



NOTE

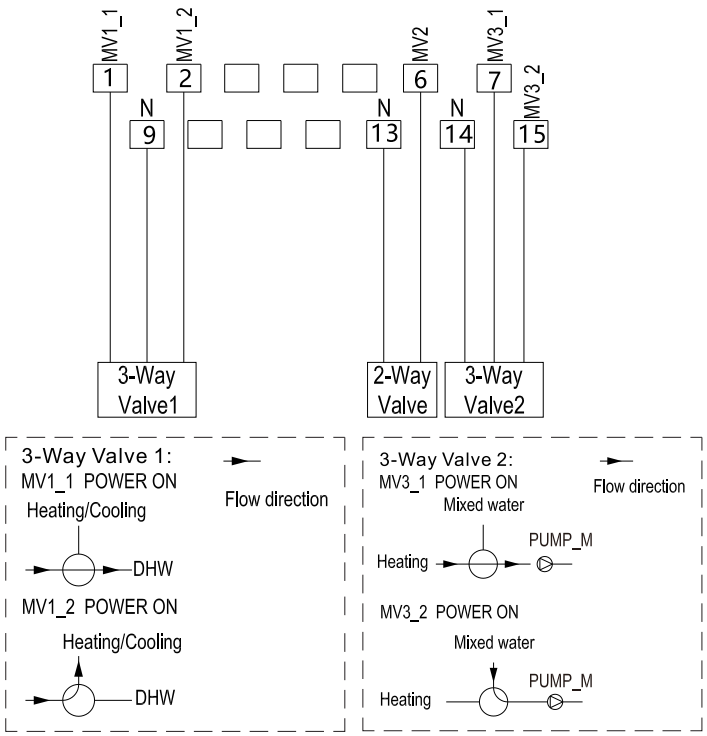
The ground fault circuit interrupter must be a high-speed type breaker of 30 mA(<0.1 s). Flexible cord must meet 60245IEC(HO5VV-F) standards.

7.5.2 Connection for Other Components

Port provide the signal with 220V voltage. If the current of load is <0.2A load can connect to the port directly. If the current of load is 0.2A, the AC contactor is required to connected for the load.

7 FIELE WIRING

1) For 3-way value MV1、MV2 and MV3



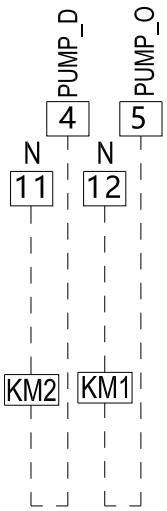
Voltage	220-240VAC
Maximum running current(A)	0.2
Wiring size(mm^2)	0.75

a) Procedure

Connect the cable to the appropriate terminals as shown in the picture. Fix the cable reliably.

MV1: Motorized 3way value
MV2: Two way valve
MV3: Mixing valve

2) For Zone1 pump and DHW pipe pump:



Voltage	220-240VAC
Maximum running current(A)	0.2
Wiring size(mm^2)	0.75

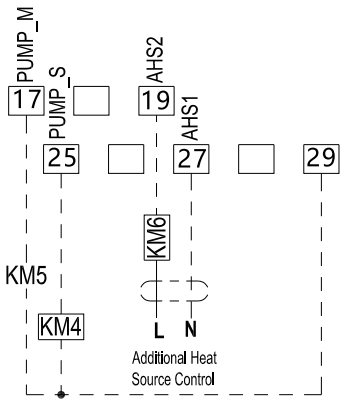
Zone1 pump: External circulation pump:
KM1: DHW PIPE PUMP AC Contactor1
KM2: Zone1 PUMP AC Contactor2

3) For tank booster heater:

Voltage	220-240VAC
Maximum running current(A)	0.2
Wiring size(mm^2)	0.75

KM3: Electric heating for water tank AC contactor3

4)For zone2 pump and additional heat source control:



Voltage	220-240VAC
Maximum running current(A)	0.2
Wiring size(mm^2)	0.75

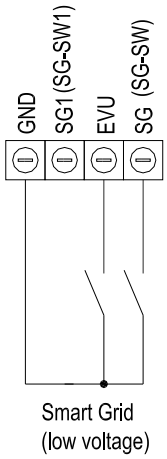
KM4: Solar PUMP AC contactor4
Zone2 pump: Mixing valve
KM5: Zone2 PUMP AC contactor5
Additional heat source control: AHS
KM6: Additional heat source AC contactor6

WARNING

This part only applies to Basic. For Customized, cause there is an interval backup heater in the unit, the indoor unit should not be connected to any additional heat source.

7 FIELE WIRING

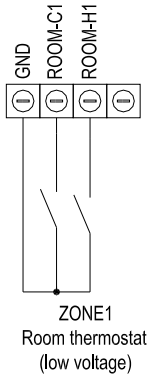
5) For smart grid:



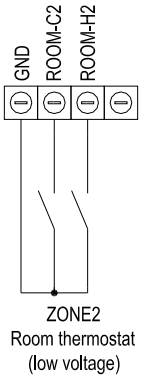
The unit has smart grid function, there are two ports on PCB to connect SG signal and EVU signal as following:
1.When EVU signal is on, the unit operate as below:
DHW mode turn on, the setting temperature will be changed to 70˚C automatically, and the TBH operate as below. Twt<69, the TBH is on, Twt>70, the TBH is off.
The unit operate in cooling/heating mode as the normal logic.
2.When EVU signal is off, and SG signal is on, the unit operate normally.
3.When EVU signal is off, SG signal is off, the DHW mode is off, and the TBH is invalid, disinfect function is invalid.
The max running time for cooling/heating is “SG RUNNIN TIME”, then unit will be off.

6) Room Thermostat (Low Voltage)

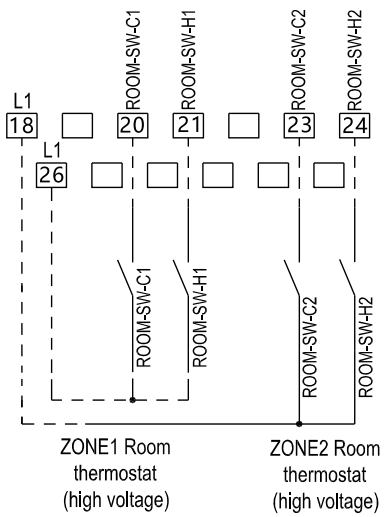
a) ZONE1



b) ZONE2

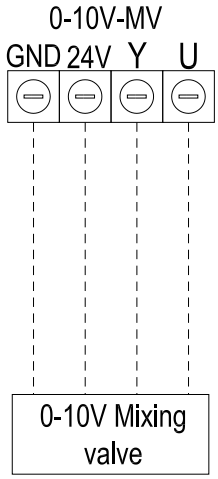


7) Room Thermostat (High Voltage)

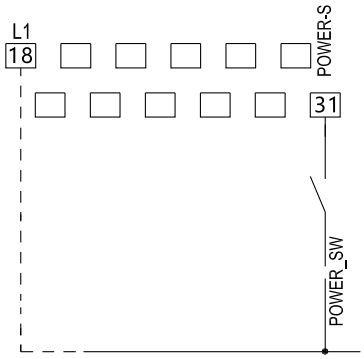


8) 0-10V Mixing valve

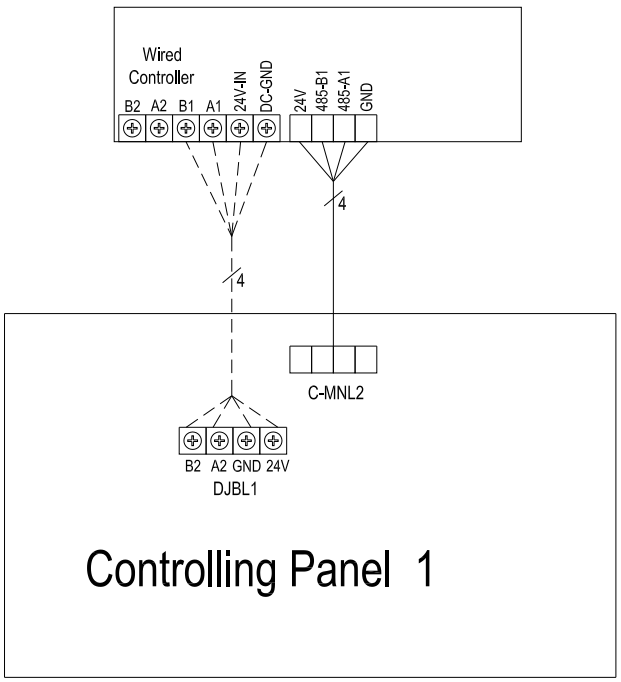
(Only one can be used of mixing valve and MV3)



9) Backup power



10) Connection mode of the wired controller when cascade are operated



8 START-UP AND CONFIGURATION

The unit should be configured by the installer to match the installation environment (outdoor clirmate, installed options, etc.) and user expertise.

CAUTION

It is important that all information in this chapter is read sequentially by the installer and that the system is configured as applicable.

8.1 Initial Start-up At Low Outdoor Ambient Temperature

During initial start-up and when water temperature is low, it is important that the water is heated gradually. Failure to do so may result in concrete floors cracking due to rapid temperature change. Please contact the responsible cast concrete building contractor for further details.
To do so, the lowest water flow set temperature can be decreased to a value between 25°℃ and 35°C by adjusting the FOSERVICEMAN.

8.2 Pre-operation Checks

Checks before initial start-up.

DANGER

The power switch must be closed before making any connection.
After the installation of the unit, check the following before switching on the circuit breaker;
- Field wiring: Make sure that the field wiring between the local supply panel and unit and valves (when applicable), unit and room thermostat (when applicable), unit and domestic hot water tank, and unit and backup heater kit have been connected according to the instructions described in the chapter 6 "Field wiring", according to the wiring diagrams and to local laws and regulations.
- Fuses, circuit breakers, or protection devices Check that the fuses or the locally installed protection devices are of the size and type specified in the chapter 7.3 “Technical specifications”. Make sure that no fuses or protection devices have been bypassed.
- Backup heater circuit breaker: Do not forget to turn on the backup heater circuit breaker in the switchbox (it depends on the backup heater type). Refer to the wiring diagram.
- Booster heater circuit breaker: Do not forget to turn on the booster heater circuit breaker (applies only to units with optional domestic hot water tank installed).
- Ground wiring: Make sure that the ground wires have been connected properly and that the ground terminals are tightened.
- Internal wiring: Visually check the switch box for loose connections or damaged electrical components.
- Mounting: Check that the unit is properly mounted, to avoid abnormal noises and vibrations when starting up the unit.
- Damaged equipment: Check the inside of the unit for damaged components or squeezed pipes.
- Power supply voltage: Check the power supply voltage on the local supply panel. The voltage must correspond to the voltage on the identification label of the unit.
- Fust valve: Ensure vent valve is open (at least 2 laps).
- Blocking Valves: Make sure the locking valves are fully open.

9 TEST RUN AND FINAL CHECKS

The installer is obliged to verify correct operation of unit after installation.

9.1 Final Checks

Before switching on the unit, read following recommendations:
- When the complete installation and all necessary setting have been carried out, close all front panels of the unit and refit the unit cover.
- The service panel of the switch box may only be opened by a licensed electrician for maintenance purpose.

9.2 Test Run Operation (manually)

If required, the installer can perform a manual test run operation at any time to check correct operation of air purge, healing, cooling and domestic water heating.

10 MAINTENANCE AND SERVICE

In order to ensure optimal availability of the unit, a number of checks and inspections on the unit and the filed wiring have to be carried out at regular intervals.
This maintenance needs to be carried out by your local technician.

DANGER

Electric Shock
- Before carrying out any maintenance or repairing activity, must switch off the power supply on the supply panel.
- Do not touch any live part for 10 minutes after the power supply is turned off.
- The crank heater of compressor may operate even in standby.
- Please note that some sections of the electric component box are hot.
- Forbid touch any conductive parts.
- Forbid rinse the unit. It may cause electric shock or fire.
- Forbid leave the unit unattended when service panel is removed.

The following checks must be performed at least once a year by qualified person:

- Water pressure

Check the water pressure, if it is below 1 bar, fill water to the system.

- Water filter

Clean the water filter.

- Water pressure relief valve

Check for correct operation of the pressure relief valve by turning the black knob on the valve counter-clockwise:
-If you do not hear a clacking sound, contact your dealer.
-In case the water keeps running out of the unit, close both the water inlet and outlet shut-off valves first and then contact your local dealer.

- Pressure relief valve hose

Check that the pressure relief valve hose is positioned appropriately to drain the water.

- Backup heater vessel insulation cover

Check that the backup heater insulation cover is fastened tightly around the backup heater vessel.

- Domestic hot water tank pressure relief valve (filed supply) Applies only to installation with a domestic hot water tank.

Check for correct operation of the pressure relief valve on the domestic hot water tank.

- Domestic hot water tank booster heater

Applies only to installations with a domestic hot water tank. It is advisable to remove lime buildup on the booster heater to extend its life span, especially in regions with hard water. To do so, drain the domestic hot water tank, remove the booster heater from the domestic hot water tank and immerse in a bucket (or similar) with lime-removing product for 24 hours.

- Unit switch box

-Carry out a thorough visual inspection of the switch box and look for obvious defects such as loose connections or detective wiring.
-Check for correct operation of contactors with an ohm meter, All contacts of these contactors must be in open position.
Use of glycol (Refer to 5.7 “Water circuit anti-freeze protection”) Document the glycol concentration and the pH-valve in the system at least once a year.
-A PH-value below 8.0 indicates that a significant portion of the inhibitor has been depleted and that more inhibitor needs to be added.
-When the PH-value is below 7.0 then oxidation of the glycol occurred, the system should be drained and flushed thoroughly before severe damage occurs.
Make sure that the disposal of the glycol solution is done in accordance with relevant local laws and regulations.

11 TROUBLE SHOOTING

This section provides useful information for diagnosing and correcting certain troubles which may occur in the unit This troubleshooting and related corrective actions may only be carried out by your local technician

11.1 General Guidelines

Before starting the troubleshooting procedure, carry out a thorough visual inspection of the unit and look for obvious defects such as loose connections or defective wiring.

WARNING

- When carrying out an inspection on the switch box of the unit, always make sure that the main switch of the unit is switched off.
- When a safety device was activated, stop the unit and find out why the safety device was activated before resetting it. Under on circumstance can safety devices be bridged or changed to a valve other than the factory setting. If the cause of the problem cannot be found, call your local dealer
- If the pressure relief valve is not working correctly and is to be replaced, always reconnect the flexible hose attached to the pressure relief valve to avoid dripping out of the unit!

Note: For problems related to the optional solar kit for domestic water heating, refer to the troubleshooting in the Installation and owner's manual for that kit.

11.2 General Symptoms

Symptom 1: The unit is turned on but the unit is not heating or cooling as expected

Possible Causes	Corrective Action
The temperature setting is not correct.	Check the parameters.Tao_HMAX,Tao_HMIN in heat mode. Tao_CMAX,Tao_CMIN in cool mode.Tao_DHWMAX Tao_DHWMIN in DHW mode.
The water flow is too low.	● Check that all shut off valves of the water circuit are in the right osition. ● Check the water filter is plugged. ● Make sure there is no air in the water system. ● Check on the manometer that there is sufficient water pressure. The water pressure, must be > 1 bar(water is cold). ● Make sure that the expansion vessel is not too high for the pump.
The water volume in the installation is too low.	Make sure the water volume in the installation is above the minimum required value (refer to "6.1.2 Water volume and sizing expansion vessels")

Symptom 2: The unit is turned on but the compressor is not starting(space heating or domestic water heating)

Possible Causes	Corrective Action
The unit maybe operate out of its operation range (the water temperature is too low).	In case of low water temperature, the system utilizes the backup heater to reach the minimum water temperature first(18℃). ● Check that the backup heater power supply is correct. ● Check that the backup heater thermal fuse is closed. ● Check that the backup heater thermal protector is not activated. ● Check that the backup heater thermal contactors are not broken.

Symptom 3: Pump is making noise(cavitation)

Possible Causes	Corrective Action
There is air in the system.	Purge air.
Water pressure at pump inlet is too low.	● Check on the manometer that there is sufficient water pressure. ● The water pressure must be >1bar(water is cold). ● Check that the manometer is not broken. ● Check that the expansion vessel is not broken. ● Check that the setting of the pre-pressure of the expansion vessel is correct (refer to "6.1.2 Watervolume and seizing expansion vessels).

Symptom 4: The water pressure relief valve opens

Possible Causes	Corrective Action
The expansion vessel is broken.	Replace the expansion vessel.
The filling water pressure in the installation is higher than 0.3MPa.	Make sure that the filling water pressure in the installation is about 0.1 ~ 0.2MPa (refer to "6.1.2 Water volume and sizing expansion vessels").

11 TROUBLE SHOOTING

Symptom 5: The water pressure relief valve leaks

Possible Causes	Corrective Action
Dirt is blocking the water pressure relief valve outlet.	Check for correct operation of the pressure relief valve by turning the black knob on the valve counter clockwise; ● If you do not hear a clacking sound, contact your local dealer. ● In case the water keeps running out of the unit, close both the water inlet and outlet shut-off valves first and then contact your local dealer.

Symptom 6: Space heating capacity shortage at low outdoor temperatures

Possible Causes	Corrective Action
Backup heater operation is not activated.	Check that the “OTHER HEATING SOURCE/BACKUP HEATER” is enable, see **“Wired Controller Instruction”** Check whether or not the thermal protector of the backup heater has been activated (refer to “Controls parts for backup heater(IBH)”). Check if booster heater is running, the backup heater and booster heater can’t operate simultaneously.
Too much heat pump capacity is used for heating domestic hot water (applies only to installations with a domestic hot water tank).	Check that the “t DHWHP_MAX” and “tDHWHP_RESTRICT” are configured appropriately: ● Make sure that the “DHW PRIORITY” in the user interface is disabled. ● Enable the “Tao TBH ON” in the user interface/FOR SERVICEMAN to active the booster heater for domestic water heating.

Symptom 7: Heat mode can’t change to DHW mode immediately

Possible Causes	Corrective Action
There is air in the system.	Purge air.

Symptom 8: DHW mode can’t change to Heat mode immediately.

Possible Causes	Corrective Action
Heat exchange for space heating not big enough	● Set “LDHWHPMAX” to minimum value, the suggested value is 60min. ● If circulating pump out of unit is not controlled by unit, try to connect it to the unit. ● Add3-way valve at the inlet of fan coil to ensure enough water flow.
Space heating load is small	Normal, no need for heating
Disinfect function is enabled but without TBH	● Disable disinfect function ● Add TBH or AHS for DHW mode
Manual turn on the FAST WATER function, after the hot water meets the reguirements. the heat pump fails to switch to the air-conditioning mode in time when the air conditioner is in demand	Manual turn off the FAST WATER Add TBH or AHS for DHW mode
When the ambient temperature is low, the hot water is not enough and the AHS is not operated or operated late	● Set “Tao_DHWMIN”, the suggested value is ≥-5℃ ● Set “Tao_TBH_ON”, the suggested value is≥5℃
DHW mode priority	If there is AHS or IBH connect to the unit ,when the outdoor unit failed the indoor unit must run DHW mode till the water temperature reach the setting temperature before change to heating mode.

Symptom 9: DHW mode heat pump stop work but set point not reached, space heating require heat but unit stay in mode

Possible Causes	Corrective Action
TBH or AHS not available	Heat pump will stay in DHW mode until “t DHWHP MAX” reached or setpoint. Add TBH or AHS for DHW mode, TBH and AHS should be controlled by the unit

11 TROUBLE SHOOTING

11.3 Error codes

When a safety device is activated, an error code will be displayed on the user interface. A list of all errors and corrective actions can be found in the table below.
Reset the safety by turning the unit OFF and back ON.
In case this procedure for resetting the safety is not successful, contact your local dealer.

ERROR CODE	MALFUNCTION OR PROTECTION	FAILURE CAUSE AND CORRECTIVE ACTION
A7	Water flow fault	● The wire circuit is short connected or open. Reconnect the Wire correctly. ● Water flow rate is too low ● Water flow switch is failed, switch is open or close continuously, change the water flow switch.
AA	Communication fault between controller and indoor unit	● Wire doesn't connect between wired controller and unit, connect the wire. ● Communication wire sequence is not right. Reconnect the Communication fault wire in the right sequence, between controller. ● Whether there is a high magnetic field or high power and indoor unit interfere, such as lifts, large power transformers, etc. To add a barrier to protect the unit or to move the unit to the other place.
93	Final outlet water temp. sensor(TWO2) fault	● Check the resistance of the sensor ● The TWO2 sensor connector is loosen. Reconnect it. ● The TWO2 sensor connector is wet or there is water in, remove the water, make the connector dry, Add waterproof adhesive, ● The TWO2 sensor failure, change a new sensor.
96	Water tank temp. sensor(TWT)fault	● Check the resistance of the sensor. ● The TWT sensor connector is loosen, Reconnect it. ● The TWT sensor connector is wet or there is water in. remove the water, make the connector dry. Add waterproof adhesive ● The TWT sensor failure, change a new sensor.
A9	Communication fault between indoor unit and outdoor unit	● Wire doesn't connect between outdoor unit and main controll board of indoor unit. connect the wire, ● Communication wire sequence is not right. Reconnect the wire in the right sequence ● Whether there is a high magnetic field or high power interfere, such as lifts, large power transformers, etc.. To add a barrier to protect the unit or to move the unit to the other place.
7F	Solar temp. sensor(Tsolar) fault	● Check the resistance of the sensor. ● The Tsolar sensor connector is loosen ,reconnect it. ● The Tsolar sensor connector is wet or there is water in, remove the water , make the connector dry. Add waterproof adhesive. ● The Tsolar sensor failure, change a new sensor.
7E	Floor heating water inlet temp, sensor (TWI_FLH)	● Check the resistance of the sensor. ● The TWI FLH sensor connector is loosen, reconnect it. ● The TWI_FLH sensor connector is wet or there is water in, remove the water, make the conneclor dry, Add waterproof adhesive. ● The TWI FLH sensor failure, change a new sensor.
A5	IDU water pump fault	● Check whether the water valve is open ● Check whether the water pump controlline is loose ● Check whether the filter is dirty and blocked ● Check whether the pump voltage is lower than 170V or higher than 270V ● The water pump failure, change a new water pump
98	Early closing fault of water flow switch	● Check whether the wiring of water flow switch is correct ● Check whether other equipment is connected in series with the host ● Water flow switch failure, change a new water flow switch
AF	Electric heating overheat protection	● Check whether the filter is dirty and blocked ● Check whether the thermal protection switch falls off
7D	Expansion Board Comm fault.	Check whether the connection line is normal
A8	EE fault	● Check whether the internal and external connecting lines are connected normally ● The control panel failure, change a new control panel

CAUTION

In winter, if the unit has failure and the unit is not repaired in time, the water pump and pipeline system may be damaged by freezing, so failure must be repaired in time.

12 TECHNICAL SPECIFICATIONS

Indoor unit model		3kW Heater	9kW Heater
		190L	190L
Power supply		220-240V~50Hz	380-415V~50Hz
Nominal capacity		3100W	9100W
Nominal		Refer to the Technical Data	
Dimensions (H×W×D) [mm]		600×600×1795	600×600×1795
Packing Dimensions (H×W×D) [mm]		700×682×1945	700×682×1945
Weight			
Net weight (kg)		129	130
Gross weight (kg)		143	144
Connections			
Circulating water inlet and outlet	Pipe Diameter	G1”	G1”
	Standard Lenght	5.0m	5.0m
	Maximum Pipe Lenght	30.0m	30.0m
	I/D & O/D Maximum Height Difference	7m	7m
Domestic water inlet and outlet		G3/4”	G3/4”
Space heating (cooling) water inlet and outlet		G1”	G1”
Expansion vessel			
volume		8L	
Maximum working pressure(MWP)		3bar	
Pump			
Type		Water cooled	Water cooled
No.of speed		Variable speed	Variable speed
Pressure relief valve water circuit		3bar	
Operation range			
heating (℃)		+25~+80	
cooling (℃)		+5~+25	
Domestic hot water (℃)		+30~+75	

13 MAINTENANCE NOTICE

Attention:

- For maintenance or scrap, please contact authorized service centers.
- Maintenance by unqualified person may cause dangers.
- Feed air conditioner with R290 refrigerant, and maintain the air conditioner in strictly accordance with manufacturer's requirements.
- The refrigerant may mix with air to form a flammable atmosphere. There is a risk of fire and explosion.
- The chapter is mainly focused on special maintenance requirements for appliance with R290 refrigerant.
- Ask repairer to read after-sales technical service handbook for detailed information.

Qualification requirements of maintenance personnel

1.Special training additional to usual refrigerating equipment repair procedures is required when equipment with flammable refrigerants is affected. In many countries, this training is carried out by national training organisations that are accredited to teach the relevant national competency standards that may be set in legislation. The achieved competence should be documented by a certificate.
2.The maintenance and repair of the air conditioner must be conducted according to the method recommended by the manufacturer. If other professionals are needed to help maintain and repair the equipment, it should be conducted under the supervision of individuals who have the qualification to repair AC equipped with flammable refrigerant.
3.Wear suitable personal protective equipment and bring a fire extinguisher with you.

Inspection of the Site

- Safety inspection must be taken before maintaining equipment with R290 refrigerant to make sure the risk of fire is minimized. Check whether the place is well ventilated, whether anti-static and fire prevention equipment is perfect.
- While maintaining the refrigeration system, observe the following precautions before operating the system.
- Note that the refrigerant R290 must never be introduced into the sewage system.

Operating Procedures

1.General work area:
All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.
2.Checking for presence of refrigerant:
The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. no-sparking, adequately sealed or intrinsically safe.
3.Presence of fire extinguisher:
If any hot work is to be conducted on the refrigeration equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO_2 fire extinguisher adjacent to the charging area.
4.No ignition sources:
No person carrying out work in relation to a refrigeration system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. No Smoking signs shall be displayed.
5.Ventilated Area(open the door and window):
Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
6 Checks to the refrigeration equipment:
Where electrical components are being changed, they shall be fit for the purpose and to the correct specification.
At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance. The following checks shall be applied to installations using flammable refrigerants:
- The charge size is in accordance with the room size within which the refrigerant containing parts are installed.
- The ventilation machinery and outlets are operating adequately and are not obstructed.
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
- Refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

7.Checks to electrical devices:
Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.
Initial safety checks shall include:
- That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking.
- That no live electrical components and wiring are exposed while charging, recovering or purging the system.
- Keep continuity of earthing.

13 MAINTENANCE NOTICE

Inspection of Cable

Check the cable for wear, corrosion, overvoltage, vibration and check if there are sharp edges and other adverse effects in the surrounding environment. During the inspection, the impact of aging or the continuous vibration of the compressor and the fan on it should be taken into consideration.

Leakage check of R290 refrigerant

● Note: Check the leakage of the refrigerant in an environment where there is no potential ignition source. No halogen probe (or any other detector that uses an open flame) should be used.

● Leak detection method:

- For systems with refrigerant R290, electronic leak detection instrument is available to detect and leak detection should not be conducted in environment with refrigerant. Make sure the leak detector will not become a potential source of ignition, and is applicable to the measured refrigerant.
- Leak detector shall be set for the minimum ignitable fuel concentration (percentage) of the refrigerant. Calibrate and adjust to proper gas concentration(no more than 25%) with the used refrigerant.
- The fluid used in leak detection is applicable to most refrigerants. But do not use chloride solvents to prevent the reaction between chlorine and refrigerants and the corrosion of copper pipeline.

-If you suspect a leak, then remove all the fire from the scene or put out the fire.

-If the location of the leak needs to be welded, then all refrigerants need to be recovered, or isolate all refrigerants away from the leak site (using cut-off valve). Before and during the welding, use OFN to purify the entire system.

Removal and Vacuum Pumping

1.Make sure there is no ignited fire source near the outlet of the vacuum pump and the ventilation is well.

2.Allow the maintenance and other operations of the refrigeration circuit should be carried out according to the general procedure, but the following best operations that the flammability is already taken into consideration are the key. You should follow the following procedures:

- Remove the refrigerant.
- Decontaminate the pipeline by inert gases.
- Evacuation.
- Decontaminate the pipeline by inert gases again.
- Cut or weld the pipeline.

3.The refrigerant should be returned to the appropriate storage tank. The system should be blown with oxygen free nitrogen to ensure safety. This process may need to be repeated for several times. This operation shall not be carried out using compressed air or oxygen.

4.Through blowing process, the system is charged into the anaerobic nitrogen to reach the working pressure under the vacuum state, then the oxygen free nitrogen is emitted to the atmosphere, and in the end, vacuum the system. Repeat this process until all refrigerants in the system is cleared. After the final charging of the anaerobic nitrogen, discharge the gas into the atmosphere pressure, and then the system can be welded. This operation is necessary for welding the pipeline.

Procedures of Charging Refrigerants

As a supplement to the general procedure, the following requirements need to be added:

- Make sure that there is no contamination among different refrigerants when using a refrigerant charging device. The pipeline for charging refrigerants should be as short as possible to reduce the residual of refrigerants in it.
- Storage tanks should remain vertically up.
- Make sure the grounding solutions are already taken before the refrigeration system is charged with refrigerants.
- After finishing the charging (or when it is not yet finished), label the mark on the system.
- Be careful not to overcharge refrigerants.

13 MAINTENANCE NOTICE

Scrap and Recovery

Scrap:

Before this procedure, the technical personnel shall be thoroughly familiar with the equipment and all its features, and make a recommended practice for refrigerant safe recovery. For recycling the refrigerant, shall analyze the refrigerant and oil samples before operation. Ensure the required power before the test.

1.Be familiar with the equipment and operation.
2.Disconnect power supply.
3.Before carrying out this process. you have to make sure:
- If necessary, mechanical equipment operation should facilitate the operation of the refrigerant tank.
- All personal protective equipment is effective and can be used correctly.
- The whole recovery process should be carried out under the guidance of qualified personnel.
- The recovering of equipment and storage tank should comply with the relevant national standards.

4.If possible, the refrigerating system should be vacuumized.
5.If the vacuum state can't be reached, you should extract the refrigerant in each part of the system from many places.
6.Before the start of the recovery, you should ensure that the capacity of the storage tank is sufficient.
7.Start and operate the recovery equipment according to the manufacturer's instructions.
8.Don't fill the tank to its full capacity (the liquid injection volume does not exceed 80% of the tank volume).
9.Even the duration is short, it must not exceed the maximum working pressure of the tank.
10.After the completion of the tank filling and the end of the operation process, you should make sure that the tanks and equipment should be removed quickly and all closing valves in the equipment are closed.
11.The recovered refrigerants are not allowed to be injected into another system before being purified and tested.

Note: The identification should be made after the appliance is scrapped and refrigerants are evacuated. The identification should contain the date and endorsement. Make sure the identification on the appliance can reflect the flammable refrigerants contained in this appliance.

Recovery:

1.The clearance of refrigerants in the system is required when repairing or scrapping the appliance.
It is recommended to completely remove the refrigerant.
2.Only a special refrigerant tank can be used when loading the refrigerant into the storage tank.
Make sure the capacity of the tank is appropriate to the refrigerant injection quantity in the entire system. All tanks intended to be used for the recovery of refrigerants should have a refrigerant identification (i.e refrigerant recovery tank).
Storage tanks should be equipped with pressure relief valves and globe valves and they should be in a good condition.
If possible, empty tanks should be evacuated and maintained at room temperature before use.
3.The recovery equipment should be kept in a good working condition and equipped with equipment operating instructions for easy access. The equipment should be suitable for the recovery of R290 refrigerants. Besides, there should be a qualified weighting apparatus which can be normally used. The hose should be linked with detachable connection joint of zero leakage rate and be kept in a good condition.
Before using the recovery equipment, check if it is in a good condition and if it gets perfect maintenance. Check if ll electrical components are sealed to prevent the leakage of the refrigerant and the fire caused by it.
If you have any question, please consult the manufacturer.
4.The recovered refrigerant shall be loaded in the appropriate storage tanks, attached with a transporting instruction, and returned to the refrigerant manufacturer. Don't mix refrigerant in recovery equipment, especially a storage tank.
5.The space loading R290 refrigeration can't be enclosed in the process of transportation.
Take anti electrostatic measures if necessary in transportation. In the process of transport, loading and unloading, necessary protective measures must be taken to protect the air conditioner to ensure that the air conditioner is not damaged.
6.When removing the compressor or clearing the compressor oil, make sure the compressor is pumped to an appropriate level to ensure that there is no residual R290 refrigerants in the lubricating oil. The vacuum pumping should be carried out before the compressor is returned to the supplier. Only the electrical heating method for heating the compressor housing is allowed to speed up the process.
Ensure the safety when discharging oil from the system.

DE-COMMISSIONING,DISMANTLING&DISPOSAL

This product contains refrigerant under pressure, rotating parts, and electrical connections which may be a danger & cause injury. All work must only be carried out by competent persons using suitable protective clothing and safety precautions.

Read the Manual

Risk of Electric Shock

RoHS

Unit is Remotely controlled
& may start without warning

1. Isolate all sources of electrical supply to the unit including any control system supplies switched by the unit.
   Ensure that all points of electrical and gas isolation are secured in the OFF position.
   The supply cables and gas pipe work may then be disconnected and removed.
   For points of connection refer to unit installation instructions.
2. Remove all refrigerant from each system of the unit into a suitable container using a refrigerant reclaim or recovery unit.
   This refrigerant may then be reused, if appropriate, or returned to the manufacturer for disposal.
   Under no circumstances should refrigerant be vented to atmosphere Where appropriate, drain the refrigerant oil from each system into a suitable container and dispose of according to local laws and regulations governing disposal of oily wastes.
3. Packaged units can generally be removed in one piece after disconnection as above.
   Any fixing down bolts should be removed and then unit lifted from position using the points provided and equipment of adequate lifting capacity.
   Reference MUST be made to the unit installation instructions for unit weight and correct methods of lifting.
   Note that any residual or spilt refrigerant oil should be mopped up and disposed of as described above.
4. After removal from position the unit parts may be disposed of according to local laws and regulations.
5. Meaning of crossed Out wheeled dustbin: Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities.
   Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well being. When replacing old appliances with new ones, the retailer is legally obligated to take back your old appliance for disposals at least free of charge.