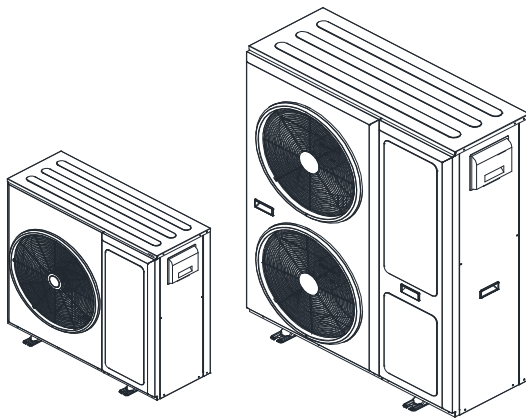


AIR TO WATER HEAT PUMP

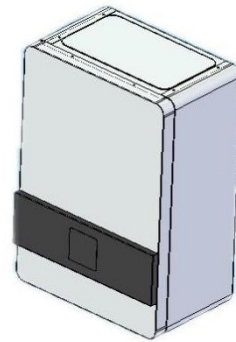
Operation, installation & maintenance manual

V.2501



Heat Pump Models:

CHS06V-QPANW
CHS08V-QPANW
CHS10V-QPANW
CHS12V-DPANW
CHS15V-DPANW
CHS22V-DPANW



Indoor unit Model:

DSK03-QG
DSK09-QG

The indoor unit DSK03-QG/DSKB03-QG is an optional accessory. Your heat pump could come with or without the indoor unit as per your purchasing.

If your heat pump does not come with indoor unit, the descriptions with the indoor unit in the manual could be ignored.

Before operating the system, please read these operating instructions thoroughly and keep them for future reference.



INDEX

1 Safety Precautions	1
1.1 Intended use	1
1.2 Symbols and Markings	1
1.3 safety instructions	2
1.4 Security measures	3
1.5 Work on the refrigerant circuit	4
1.6 Emergency measures	5
1.7 Safety zone	6
1.8 Safety devices	8
1.8.1 Freezing protection function	8
1.8.2 Insufficient water flow protection	8
1.8.3 Pump blocking protection	8
1.8.4 Safety cut-out in the backup heater	8
1.9 Working principle	8
1.10 Care and maintenance	8
1.11 Safety qualification confirmation	10
2 Product Information Description	12
2.1 Refrigerant circuit diagram	12
2.2 Components	13
2.2.1 Outdoor unit components	13
2.2.2 Indoor unit components	15
2.3 Dimensions	16
2.4 Water Pressure Plots	17
2.5 Pump Curve	18
2.6 Operating range	19
2.7 technical data sheet	20
3 Pre-Installation	21
3.1 Movement and Storage	21
3.2 Installation Location	22
3.3 Outdoor unit setup	25
3.4 Connect drainage pipe	25
3.5 Steps to open the cabinet	28
3.6 Indoor unit installation	31
3.7 Hydraulics installation	33
3.7.1 with indoor unit DSK03-QG installation	33
3.7.2 with indoor unit DSKB03-QG installation	错误！未定义书签。
3.8 Hydraulic installation notice	34
4 Systems Overview	34
4.1 without indoor unit installation	35
4.1.1 System Overview 1: Floor heating	35

4.1.2 System Overview 2: Heating, Cooling with DHW Production	36
4.1.3 System Overview 3: Multiple Units in Series Cascade Connection	39
4.1.4 System Overview 4: with gas boiler and buffer tank	41
4.2 with indoor unit	42
4.2.1 System Overview1: with DKS03-QG installation	42
4.2.1 System Overview1: with DKSB03-QG installation	43
4.3 Room thermostat control set up	44
5 Electrical Connections	45
5.1 Terminal diagram	45
5.1.1 Electric connection overview (without indoor unit)	45
5.1.2 Electric connection overview (with indoor unit):	46
5.2 Power Connection	48
5.2.1 Temperature sensor for hot water :	错误！未定义书签。
5.2.2 DHW circulation Pump Connection	错误！未定义书签。
5.2.3 Boiler control connection	错误！未定义书签。
5.2.4 DHW heater	错误！未定义书签。
5.2.5 Touch screen installation	错误！未定义书签。
5.2.6 Modbus communication connection (10-11) potential free	错误！未定义书签。
5.2.7 Auxiliary electric heater or boiler (3-4) and 3 way valve (7-8-9)	错误！未定义书签。
5.2.8 Secondary (transport) pump (field supply) connection (12-13)	错误！未定义书签。
5.2.9 SG READY -Smart Grid	错误！未定义书签。
6 System program information	错误！未定义书签。
6.1 Unit operation logic	错误！未定义书签。
6.1.1 Cooling demand	错误！未定义书签。
6.1.2 Heating demand	错误！未定义书签。
6.1.3 Domestic hot water demand	错误！未定义书签。
6.2 Control process	错误！未定义书签。
6.2.1 Turn on process on heating mode	错误！未定义书签。
6.2.2 Turn off process on heating mode	错误！未定义书签。
6.2.3 Turn on process on cooling mode	错误！未定义书签。
6.2.4 Turn off process on cooling mode	错误！未定义书签。
6.2.5 Turn on process on hot water mode	错误！未定义书签。
6.2.6 Turn off process on hot water mode	错误！未定义书签。
6.2.7 Hot water priority:	错误！未定义书签。
6.2.8 Water pump control	错误！未定义书签。
6.2.9 Compressor running control	错误！未定义书签。
6.2.10 4 way valve control	错误！未定义书签。
6.2.11 Auxiliary Electric backup heater control	错误！未定义书签。
6.2.12 Crankcase heater running control	错误！未定义书签。
6.2.13 3 way valve control	错误！未定义书签。
6.2.14 DHW circulation pump control	错误！未定义书签。

6.2.15 DHW electric heater control	错误！未定义书签。
6.2.16 De-icing heater running control	错误！未定义书签。
6.2.17 Defrosting control	错误！未定义书签。
6.2.18 Automatic optimizing defrosting parameter data ...	错误！未定义书签。
6.3 System parameter list	错误！未定义书签。
7 Information on servicing	错误！未定义书签。
7.1 Security check	错误！未定义书签。
7.2 Device maintenance	错误！未定义书签。
7.2.1 Repairs to sealed components	错误！未定义书签。
7.2.2 Repair to intrinsically safe components	错误！未定义书签。
7.2.3 Cabling	错误！未定义书签。
7.2.4 Detection of flammable refrigerants	错误！未定义书签。
7.2.5 Leak detection methods	错误！未定义书签。
7.2.6 Removal and evacuation	错误！未定义书签。
7.2.7 Charging procedures	错误！未定义书签。
7.2.8 Decommissioning	错误！未定义书签。
7.2.9 Labelling	错误！未定义书签。
7.2.10 Recovery	错误！未定义书签。
8 Commissioning and Adjusting	59
9 Inspection and maintenance work	68
10 Commissioning Form	69
11 Maintenance	70
12 Temperature and sensor resistance table	72
13 Disposal and Recycling	79
14 Nameplate information	错误！未定义书签。
15 Electrical schematic diagram	80

1 Safety Precautions

1.1 Intended use

There is a risk of injury or death to the user or others, or of damage to the product and other property in the event of improper use or use for which it is not intended.

The product is the outdoor unit of an air to water heat pump with monoblock design.

The product uses the outdoor air as a heat source and can be used to heat a residential building and for domestic hot water generation. The air that escapes from the product must

be able to flow out freely, and must not be used for any other purposes.

The outdoor unit is only intended for outdoor installation and the indoor unit is only intended for indoor installation.

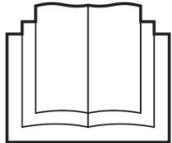
The product is intended exclusively for domestic use.

Intended use includes the following:

- observance of the operating instructions included for the product and any other installation components
- compliance with all inspection and maintenance conditions listed in the instructions.

Any other use that is not specified in these instructions, or use beyond that specified in this document, shall be considered improper use. Any direct commercial or industrial use is also deemed to be improper.

1.2 Symbols and Markings

Symbol	Importance
	Warning against flammable substances associated with refrigerant R290
	This symbol indicates that the operating instructions must be read carefully.
	This symbol indicates that a service staff must handle this equipment with reference to the installation manual.
	This symbol indicates that information is available, such as the operating manual or installation instructions;.

- The outdoor unit contains easily flammable refrigerant in safety group A3 according to

ISO 817 and ANSI/ASHRAE Standard 34. If there is a leak, the escaping refrigerant may form a flammable or explosive atmosphere in the ambient air. A safety zone is defined in the immediate vicinity of the outdoor unit, in which special rules apply when working on the appliance.

1.3 safety instructions

Please follow these safety instructions closely to prevent accidents and material losses.

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.

The plate heat exchanger, the piping and the hydraulic pump can be damaged by frost, despite the built-in anti-freeze protection of the unit.

In frost prone areas refer to installation location instructions.

To avoid freezing-up of the water contained in the system, one of the precautions must be taken during winter:

- 1.) Drain the water from the system, using the drains in the lower part of the unit.
- 2.) System separation. With a system separation, an intermediate heat exchanger is installed in the indoor unit. This separates the heating circuit into a primary heating circuit (to the outdoor unit) and a secondary heating circuit (in the building). If the primary heating circuit is filled with a water/frost protection mixture (brine fluid), the outdoor unit is then protected against freezing, even if this is electrically switched off or in the case of a power cut.
- 3.) The power to the unit must be on all the time so unit can start circulation pump and auxiliary heater for anti-freeze protection.

Installation and service works of the heat pump should only be done by authorized installer and after sales people.

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 let children to play the heat pump.

Under some conditions, the heat pump will need defrosting. Ice on the evaporator will be melt and a short cloud of condensation from the heat pump will come out. The surface below the heat pump will be wet due to the drained water from evaporator.

Do not attempt to modify, repair or service the appliance yourself.

Do not insert body parts or any other items into the air inlet or air outlet.

Do not start or stop the unit by removing the power cable; always use the controls and switches provided.

Do not operate the unit or controller with wet fingers.

Upon replacement of the fuse, ensure an adequate replacement is used (e.g. not fuse wire).

The electrical supply must be isolated during a heightened risk of lightning strikes.

Do not attempt to move the appliance once installed; this must be carried out by a

qualified engineer.

Isolate the electrical supply to the appliance if an odour presents, or scorching is detected.

Only use this appliance for the purpose intended.

Ensure the area around the appliance is clean, well-ventilated and kept free of all obstructions.

Do not keep items on top of the appliance or use it to support other appliances.

Do not under any circumstances stand on the appliance.

Drain the water from the water circuit if power to the unit is to be switched off during very cold weather.

Periodically check the condition of any supports for deterioration.

Do not wash the unit with water, alcohol, benzene, thinners, glass cleaner, polish or powders.

During cleaning, isolate the electrical supply to the appliance.

Risk of explosion!!!

1.4 Security measures

Take the following measures to prevent fire and explosion in the safety zone:

■ Keep ignition sources away, e.g. naked flames, hot surfaces, electrical devices not free of ignition sources, mobile devices with integrated batteries (e.g. mobile phones, fitness watches, etc.).

■ Permissible tools:

All tools for working in the safety zone must be designed and explosion protected in accordance with the applicable standards and regulations for refrigerant in safety groups A2L and A3, e.g. brushless machines (cordless screwdrivers), extraction equipment, disposal containers, installation aids, vacuum pumps, conductive hoses, mechanical tools of non-sparking material, etc.

Note:

The tools must also be suitable for the pressure ranges in use.

Tools must be in perfect maintenance condition.

■ The electrical equipment must meet the requirements for areas at risk of explosion, zone 2.

■ Do not use flammable materials, e.g. sprays or other flammable gases.

■ Discharge static: Before beginning work, touch earthed objects, such as heating or water pipes.

■ Do not remove, block or bridge safety equipment.

■ Do not make any changes:

Do not modify the outdoor unit, inlet/ outlet lines, electrical connections/cables or the surroundings. Do not remove any components or seals.

• Work on the refrigerant circuit with flammable refrigerant in safety group A3 may only be carried out by authorised heating contractors. These heating contractors must be trained in accordance with EN 378 Part 4 or IEC 60335-2-40, Section HH. The certificate of

competence from an industry accredited body.

- Strict compliance of the domestic laws must be observed when disposing the appliance.
- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.)
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odour.
- Spaces where refrigerant pipes shall be compliance with national gas regulations.
- Servicing shall be performed only as recommended by the manufacturer.
- The appliance shall be stored in a well-ventilated area where the room size corresponds to the room area as specified for operation.
- All working procedure that affects safety means shall only be carried by competent persons.
- The staff in servicing operations must hold the national qualification or other relevant qualifications.
- The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.
- During tests, NEVER pressurize the product with a pressure higher than the maximum allowable pressure (as indicated on the nameplate of the unit).

1.5 Work on the refrigerant circuit

R290 refrigerant (propane) is an air displacing, colourless, flammable, odourless gas which forms explosive mixtures with air.

Refrigerant drained must be properly disposed of by authorised contractors.

Perform the following measures before beginning work on the refrigerant circuit:

- Check the refrigerant circuit for leaks.
 - Ensure very good ventilation especially in the floor area and sustain this for the duration of the work.
 - Secure the area surrounding the work area.
 - Inform the following persons of the type of work to be carried out:
 - All maintenance personnel
 - All persons in the vicinity of the system.
 - Inspect the area immediately around the heat pump for flammable materials and ignition sources: Remove all flammable materials and ignition sources.
 - Before, during and after the work, check the surrounding area for escaping refrigerant using an explosion-proof refrigerant detector suitable for R290. This refrigerant detector must not generate any sparks and must be suitably sealed.
- A CO2 or powder extinguisher must be to hand in the following cases:
- Refrigerant is being drained.
 - Refrigerant is being topped up.
 - Soldering or welding work is being carried out.
- Display signs prohibiting smoking.

Escaping refrigerant can lead to fire and explosions that result in very serious injuries or death.

- Do not drill or apply heat to a refrigerant circuit filled with refrigerant.
- Do not operate Schrader valves unless a fill valve or extraction equipment is attached.
- Take measures to prevent electrostatic charge.
- No smoking! Prevent naked flames and sparks. Never switch lights or electrical appliances on or off.
- Components that contain or contained refrigerant must be labelled, and stored and transported in well ventilated areas in accordance with the applicable regulations and standards.

DANGER: RISK OF EXPLOSION

- Pump down – Refrigerant leakage. If you want to pump down the system, and there is a leakage in the refrigerant circuit:
 - Do NOT use the unit's automatic pump down function, with which you can collect all refrigerant from the system into the outdoor unit. Possible consequence: Self-combustion and explosion of the compressor because of air going into the operating compressor.
 - Use a separate recovery system so that the unit's compressor does NOT have to operate.
 - To avoid compressor breakdown, do NOT charge more than the specified amount of refrigerant.
 - When the refrigerant system is to be opened, refrigerant MUST be treated according to the applicable legislation.
 - Make sure there is no oxygen in the system. Refrigerant may only be charged after performing the leak test and the vacuum drying.
 - Only use tools exclusively for the refrigerant type used in the system, this to ensure pressure resistance and prevent foreign materials from entering into the system.
 - Do NOT touch the air inlet or aluminum fins of the unit
 - Do NOT place any objects or equipment on top of the unit.
 - Do NOT sit, climb or stand on the unit.
 - Make sure the field piping and connections are NOT subjected to stress
 - In case recharge is required, see the nameplate of the unit. It states the type of refrigerant and necessary amount.

1.6 Emergency measures

What to do if refrigerant escapes

Danger

Escaping refrigerant can lead to fire and explosions that result in very serious injuries or death. There is a risk of asphyxiation if it is breathed in.

- Ensure very good ventilation especially in the floor area of the outdoor unit.
- No smoking! Prevent naked flames and sparks. Never switch lights or electrical appliances on or off.

- Evacuate any people from the danger zone.
- From a safe position, switch off the electricity supply for all system components.
- Remove ignition sources from the danger zone.
- Let the system user know that no ignition source may be brought into the danger zone for the duration of the repair.
- Repair work must be carried out by an authorised contractor.
- Only recommission the system after it has been repaired.

Danger

Direct contact with liquid and gaseous refrigerant can cause serious damage to health, e.g. frostbite and/or burns. There is a risk of asphyxiation if it is breathed in.

- Prevent direct contact with liquid and gaseous refrigerant.
- Never breathe in refrigerant vapours.

Safety instructions for storage of the outdoor unit

The outdoor unit is charged at the factory with refrigerant R290 (propane).

Danger

Escaping refrigerant can lead to fire and explosions that result in very serious injuries or death. There is a risk of asphyxiation if it is breathed in.

Store the outdoor unit in the following conditions:

- An explosion prevention plan must be in place for storage.
- Ensure there is sufficient ventilation at the storage location.
- Temperature range for storage: $-25\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$
- Only store the outdoor unit in its ex-factory protective packaging.
- Protect the outdoor unit against damage.
- The maximum number of outdoor units that may be stored in one place is determined by local conditions.

1.7 Safety zone

The refrigerant circuit in the outdoor unit contains easily flammable refrigerant in safety group A3 according to ISO 817 and ANSI/ASHRAE Standard 34.

Note that this refrigerant has a higher density than air. In the event of a leak, escaping refrigerant may collect near the ground.

The refrigerant must not collect in any way that may lead to a dangerous, explosive, suffocating or toxic atmosphere.

The refrigerant must not get inside the building via building openings. The refrigerant must not collect in grooves.

Therefore a safety zone is defined in the immediate vicinity of the outdoor unit, in which special requirements apply.

The following conditions must not be present or occur within the safety zone:

- Building openings, e.g. windows, doors, light wells, flat roof windows, etc.

- Outdoor air and exhaust air apertures from ventilation and air conditioning systems
- Property boundaries, neighbouring properties, footpaths and driveways
- Pump shafts, inlets to waste water systems, downpipes and waste water shafts, etc.
- Other slopes, troughs, depressions, shafts
- Electrical house supply connections
- Electrical systems, sockets, lamps, light switches
- Snowfall from roofs

Do not introduce ignition sources into the safety zone:

- Naked flames or burner gauze assemblies
- Grills
- Tools that generate sparks
- Electrical devices not free of ignition sources, mobile devices with integrated batteries (e.g. mobile phones, fitness watches, etc.)
- Objects with temperatures above 360 °C

Note

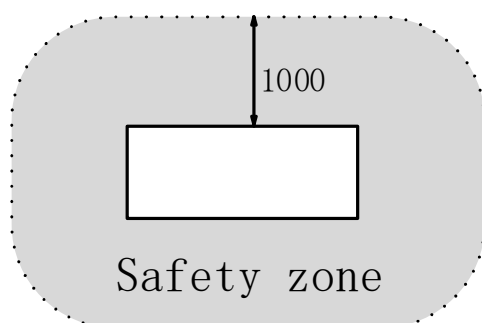
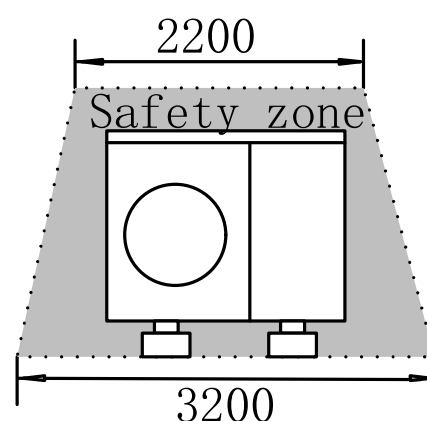
The particular safety zone is dependent on the surroundings of the outdoor unit.

■ The safety zones below are shown with floor standing installation. These safety zones also apply to other types of installation.

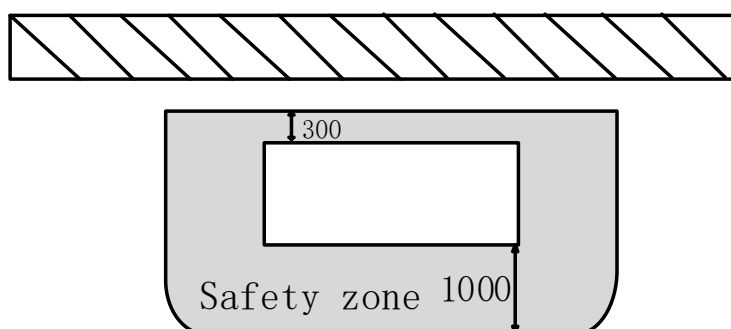
■ In the case of wall installation, the requirements listed above also apply to the area below the outdoor unit, down to the ground.

In the protective zone, you are not permitted to make any subsequent structural alterations which infringe the stated rules for the protective zone.

Freestanding positioning of the outdoor unit:



Protective zone for ground installation in front of a building wall.



1.8 Safety devices

1.8.1 Freezing protection function

The unit has freezing protection function with power ON. If the system control fails, the product guarantees limited freezing protection.

At negative outdoor temperatures, there is an increased risk of the unit freezing if a heat pump fault occurs, e.g. due to a power cut or a defective compressor.

1.8.2 Insufficient water flow protection

This function continuously monitors the flow of the heating water. It will stop the compressor and backup heater is there is insufficient flow rate and automatically returns back to work after flow rate returns to normal.

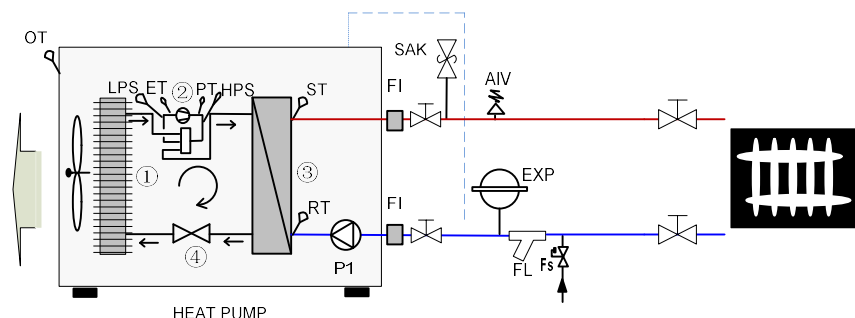
1.8.3 Pump blocking protection

This function prevents the pumps for heating water from sticking. The pumps, which were out of operation for 24 hours, are switched on for a short time, one after the other.

1.8.4 Safety cut-out in the backup heater

If the temperature in the internal electric back-up heater exceeds the maximum temperature, the safety cut out shuts down the electric back-up heater as a securing measure.

1.9 Working principle



1. The low pressure and low temperature liquid refrigerant coming out of expansion valve extracts heat energy from the air through finned coil heat exchanger ① and evaporates into gas state.
2. The gas state refrigerant is sucked into compressor ② and compressed to high pressure and high temp. gas.
3. The high pressure and high temp. gas discharged by compressor releases its heat energy to water in plate exchanger ③ and condensed to liquid state.
4. The liquid state refrigerant is expanded in thermostatic expansion valve ④ and become low pressure and low temperature liquid refrigerant.
5. The cycle repeats.

1.10 Care and maintenance

Guaranteeing frost protection

1. If no system separation for guaranteeing the frost protection is present, ensure that the product is switched on and remains switched on.
2. Ensure that no snow accumulates around the air inlet grille and air outlet grille.

Keeping the product clear

1. Regularly remove branches and leaves that have gathered around the product.
2. Regularly remove leaves and dirt from the ventilation grille below the product.
3. Regularly remove snow from the air inlet grille and from the air outlet grille.
4. Regularly remove snow that has gathered around the product.

Cleaning the product

1. Clean the casing with a damp cloth and a little solvent free soap.
2. Do not use sprays, scouring agents, detergents, solvents or cleaning agents that contain chlorine.

Danger!

Risk of injury and risk of material damage due to neglected or incorrect maintenance and repairs.

Neglected or incorrect maintenance work or repairs may lead to personal injury or damage to the product.

- ▶ Never attempt to carry out maintenance work or repairs on the product.
- ▶ Employ an authorised installation company to complete such work. We recommend making a maintenance contract.

Warning

If you need to switch off the power to the appliance, both the heat pump and boiler power must be switched off at the same time. Never leave the boiler on when the heat pump is switched off.

Troubleshooting

Eliminating faults

- ▶ If you observe a cloud of vapour on the product, you do not have to do anything. This effect may arise during the defrosting process.
- ▶ If the product will no longer start up, check whether the power supply is interrupted. If required, switch on all of the disconnectors to which the product is connected in the building.
- ▶ Contact a competent person if the measure that is described is unsuccessful.

Decommissioning

Temporarily decommissioning the product

1. Switch off all of the disconnectors to which the product is connected in the building.
2. Protect the heating installation against frost.

Permanently decommissioning the product

- ▶ Have a competent person permanently decommission the product.

Recycling and disposal

- ▶ The competent person who installed your product is responsible for the disposal of the packaging.



- ▶ do not dispose of the product with the household waste.
- ▶ hand in the product to a collection centre for waste electrical or electronic equipment.

Arranging disposal of refrigerant

The product is filled with R290 refrigerant.

- ▶ Refrigerant must only be disposed of by an authorized competent person.
- ▶ Observe the general safety information.

1.11 Safety qualification confirmation

Risk caused by inadequate qualifications

The following work must only be carried out by competent persons who are sufficiently qualified to do so:

- Set-up
- Dismantling
- Installation
- Start-up
- Inspection and maintenance
- Repair
- Decommissioning

Risk caused by inadequate qualifications for the R290 refrigerant

Any activity that requires the unit to be opened must only be carried out by competent persons who have knowledge about the particular properties and risks of R290 refrigerant.

Specific expert refrigeration knowledge in compliance with the local laws is required when carrying out work on the refrigerant circuit. This also includes specialist knowledge about handling flammable refrigerants, the corresponding tools and the required personal protective equipment.

- ▶ Comply with the corresponding local laws and regulations.

Risk of death from electric shock

There is a risk of death from electric shock if you touch live components.

Before commencing work on the product:

- ▶ Disconnect the product from the power supply by switching off all power supplies at all poles (electrical partition in overvoltage category III for full partition, e.g. fuse or circuit breaker).

- ▶ Secure against being switched back on again.
- ▶ Wait for at least 3 minutes until the capacitors have discharged.
- ▶ Check that there is no voltage.

Risk of death caused by fire or explosion if there is a leak in the refrigerant circuit

The product contains the combustible refrigerant R290. In the event of a leak, escaping refrigerant may mix with air to form a flammable atmosphere. There is a risk of fire and explosion. A safe zone is defined for the area close around the product. See section "safe zone".

- ▶ If you are working on the product when it is open, before starting work, use a gas sniffer to ensure that there is no leak.
- ▶ The gas sniffer itself must not be an ignition source. The gas sniffer must be calibrated to R290 refrigerant and set to $\leq 25\%$ of the lower explosive limit.
- ▶ Keep all ignition sources away from the safety zone. In particular, open flames, hot surfaces with temperatures above 370 °C, electrical devices or tools that are not free from electrical sources, static discharges.

Risk of death caused by fire or explosion when removing the refrigerant

The product contains the combustible refrigerant R290. The refrigerant may mix with air to form a flammable atmosphere. There is a risk of fire and explosion.

- ▶ Only carry out the work if you are competent at handling R290 refrigerant.
- ▶ Wear suitable personal protective equipment and bring a fire extinguisher with you.
- ▶ Only use tools and units that are permitted for R290 refrigerant and are in proper working condition.
- ▶ Ensure that no air gets into the refrigerant circuit, into refrigerant-carrying tools or units, or into the refrigerant cylinder.
- ▶ Note that the refrigerant R290 must never be introduced into the sewage system.

Risk of death due to lack of safety devices

The basic diagrams included in this document do not show all safety devices required for correct installation.

- ▶ Install the necessary safety devices in the installation.
- ▶ Observe the applicable national and international laws, standards and directives.

Risk of burns, scalds and frostbite due to hot and cold components

There is a risk of burns and frostbite from some components, particularly uninsulated pipelines.

- ▶ Only carry out work on the components once these have reached environmental temperature.

Regulations (directives, laws, standards)

- ▶ Observe the national regulations, standards, directives, ordinances and laws.
- ▶ Transport of equipment containing flammable refrigerants

Compliance with the transport regulations

- ▶ Marking of equipment using signs

Compliance with local regulations

- ▶ Disposal of equipment using flammable refrigerants

Compliance with national regulations

- ▶ Storage of equipment/appliances

The storage of equipment should be in accordance with the manufacturer's instructions.

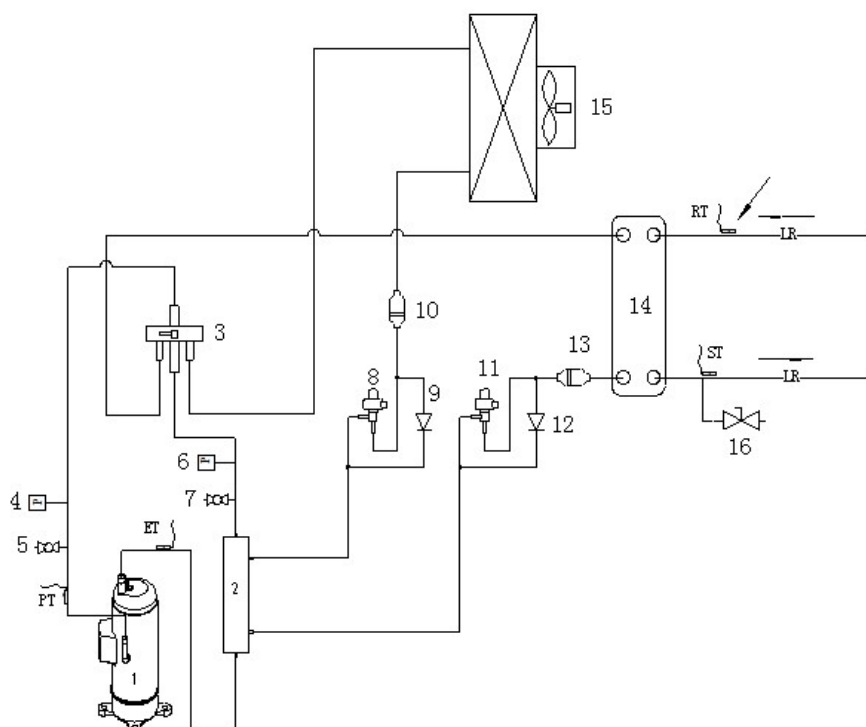
► Storage of packed (unsold) equipment

Storage package protection should be constructed such that mechanical damage to the equipment inside the package will not cause a leak of the refrigerant charge.

The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.

2 Product Information Description

2.1 Refrigerant circuit diagram



- 1.compressor
- 2.heat exchanger
- 3.4 way valve
- 4.High pressure transducer
- 5.HP service connection
- 6.Low pressure transducer
- 7.LP service connection
- 8.EEV2
- 9.single way valve
- 10.filter
- 11.EEV1
- 12.single way valve
- 13.filter
- 14.plate heat exchanger
- 15.finned coil heat exchanger
- 16.drainage valve

2.2 Components

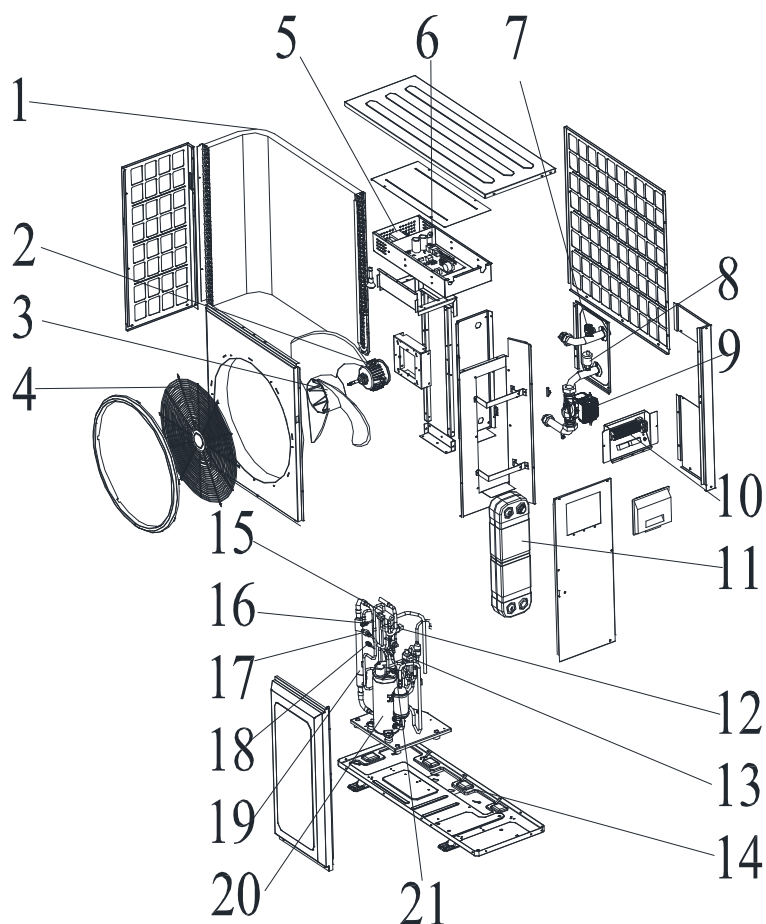
2.2.1 Outdoor unit components

CHS06V-QPANW

CHS08V-QPANW

CHS10V-QPANW

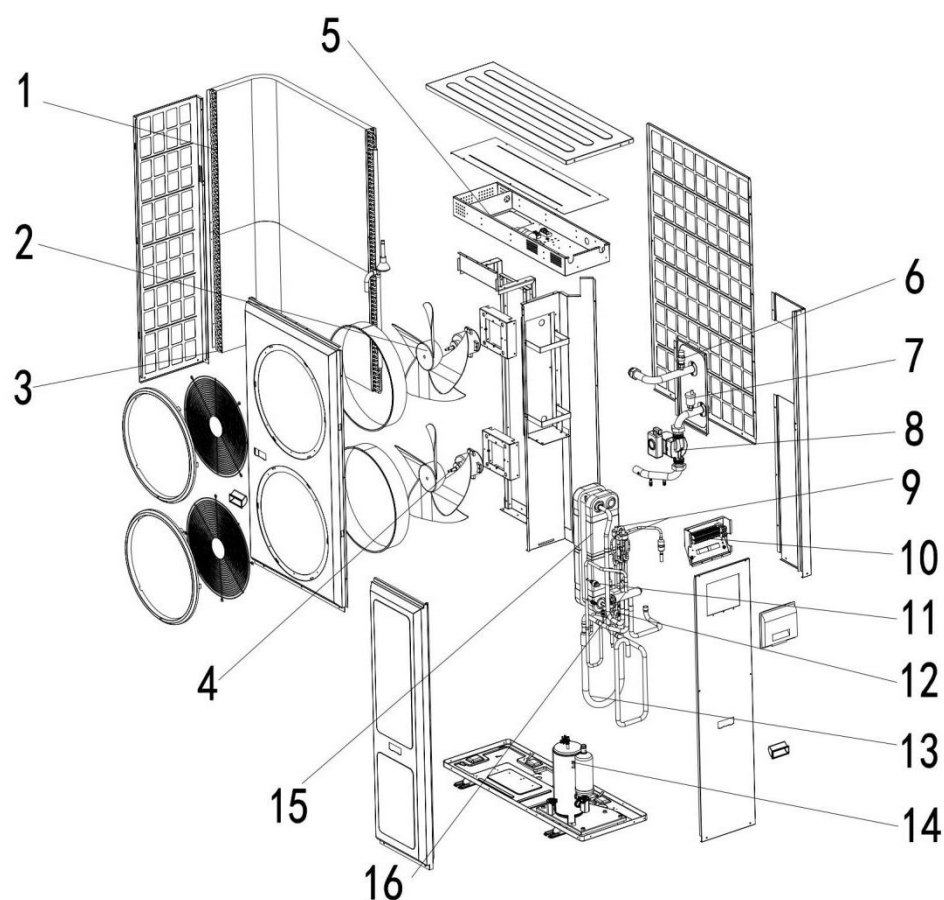
CHS12V-DPANW



1. Finned coil heat exchanger
2. EC Fan motor
3. Fan blade
4. Grill
5. Reactor
6. Inverter / control board
7. Pressure release valve
8. Air vent valve
9. Circulation pump
10. Terminal block
11. Plate heat exchanger
12. EEV2
13. EEV1
14. De-icing heater (option)
15. 4 way valve
16. LP service connection
17. HP transducer
18. HP service connection
19. heat exchanger
20. Compressor
21. LP transducer

CHS15V-DPNNW

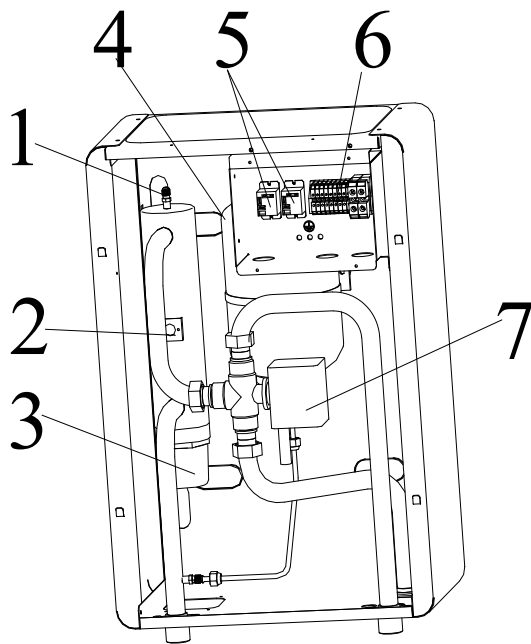
CHS22V-DPNNW



1. Finned coil heat exchanger
2. Fan blade
3. De-icing heater (option)
4. EC Fan motor
5. Electric control box
6. Pressure release valve
7. Air vent valve
8. Circulation pump
9. EEV1 & EEV2
10. Terminal block
11. HP transducer
12. LP transducer
13. Heat exchanger
14. Compressor
15. Plate heat exchanger
16. 4-way valve

2.2.2 Indoor unit components

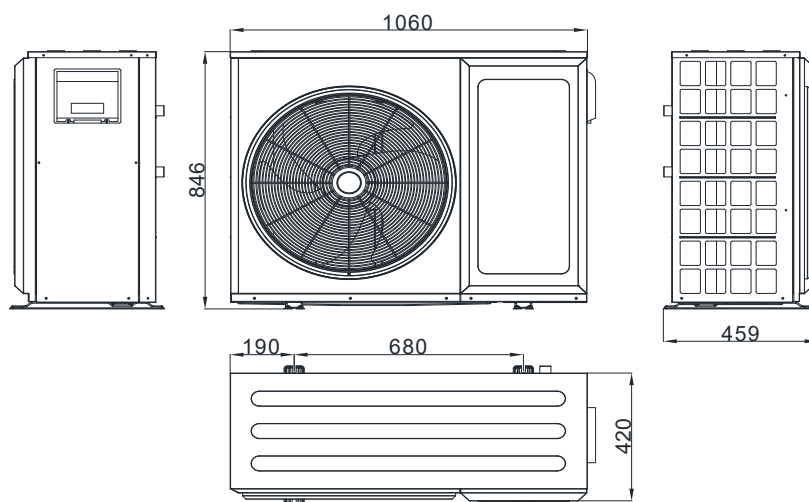
DSK03-QG/DSK09-QG



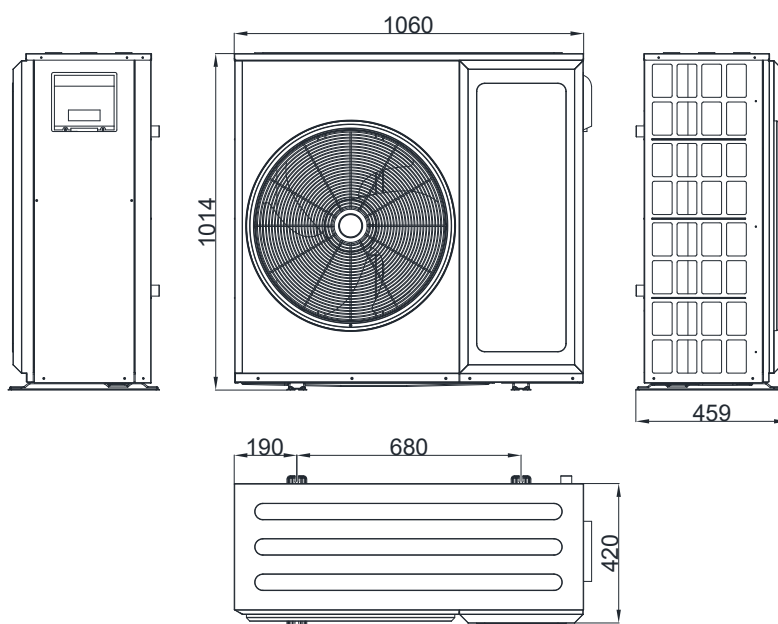
1. Air vent valve
2. Auxiliary heater safety cutout
3. Auxiliary heater
4. Expansion tank
5. Relays
6. Terminal block
7. Three way valve

2.3 Dimensions

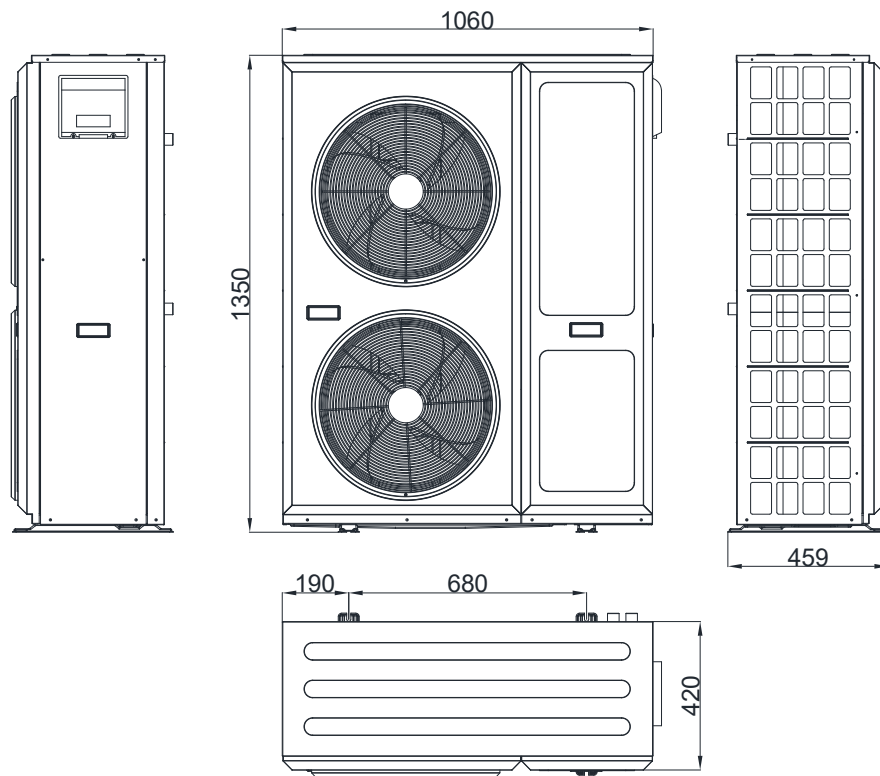
CHS06V-QPANW



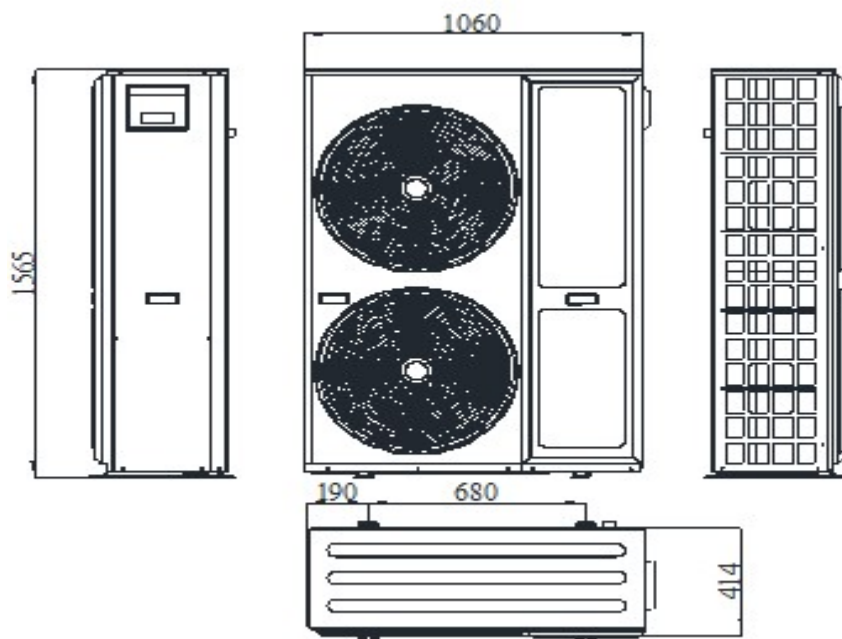
CHS06V-QPANW/ CHS08V-QPANW CHS10V-QPANW/ CHS12V-DPANW



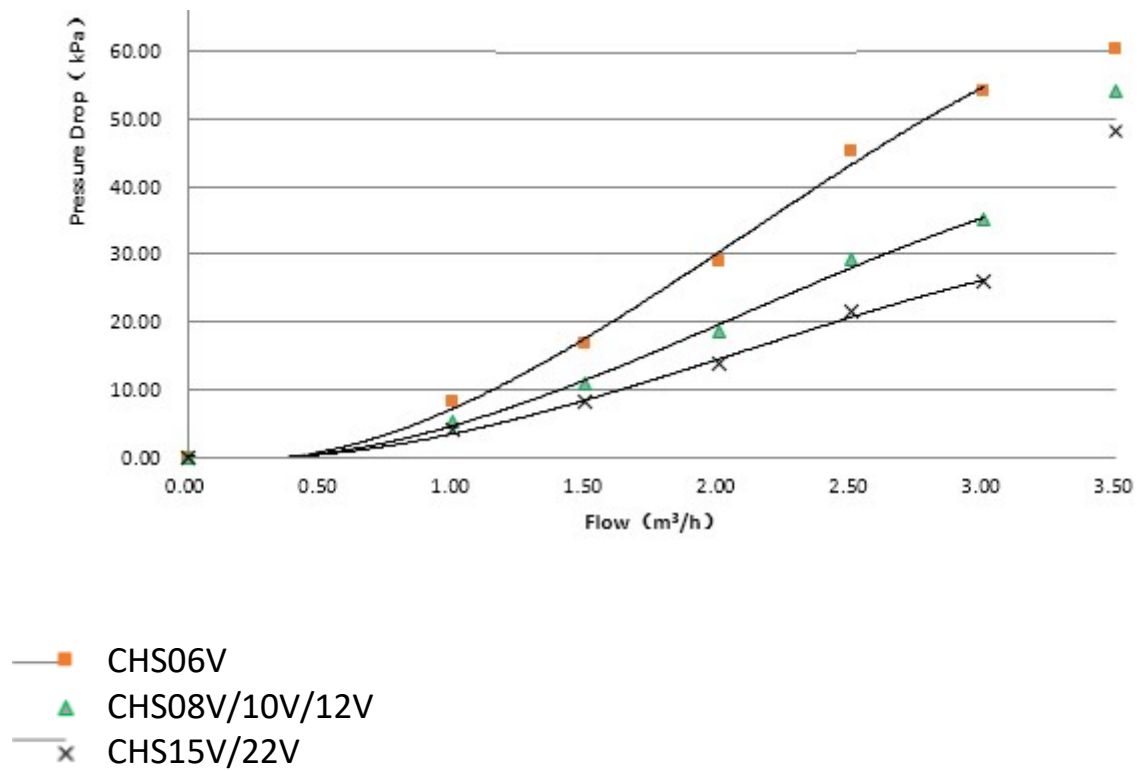
CHS15V-DPANW



CHS22V-DPANW

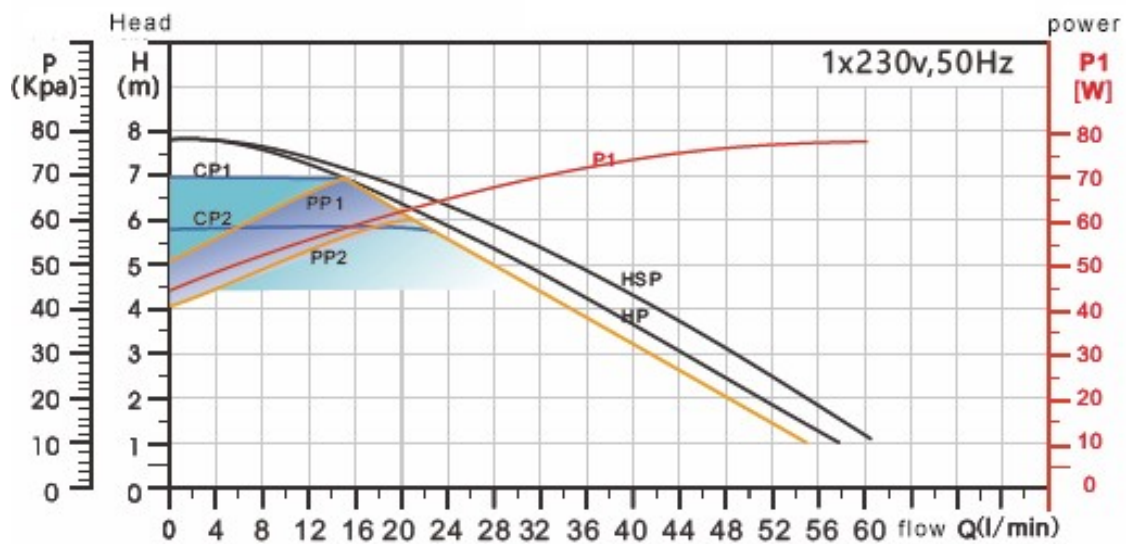


2.4 Water Pressure Plots

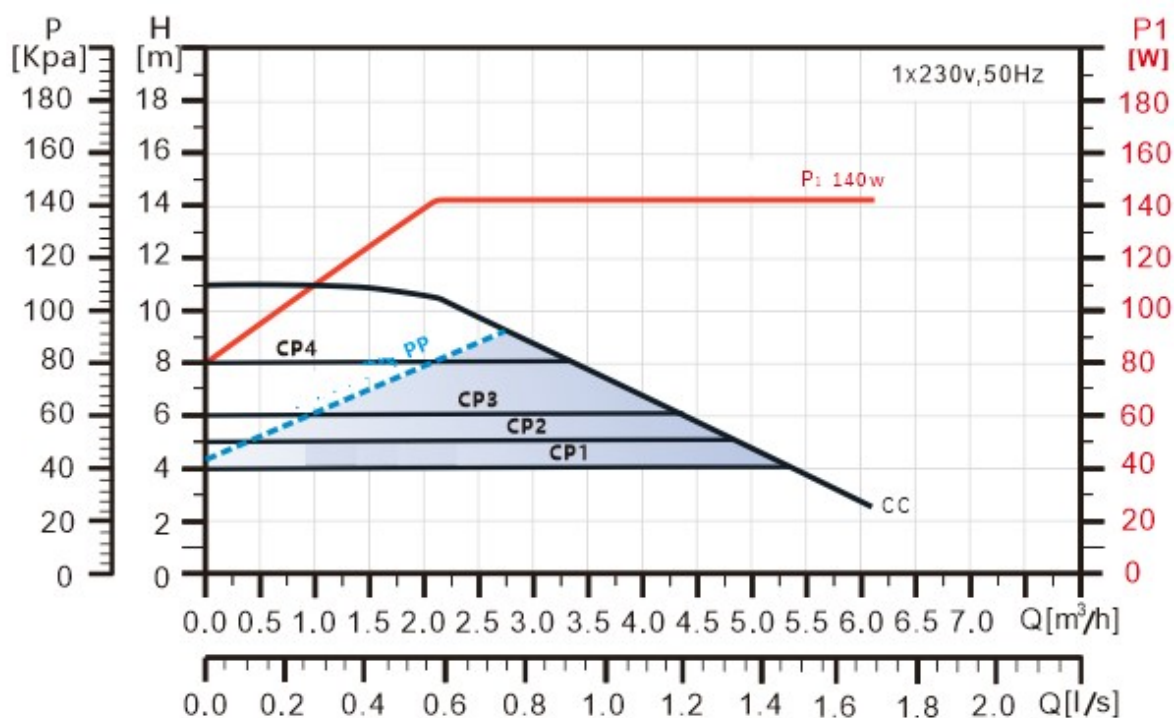


2.5 Pump Curve

CHS06V-12V circulation pump



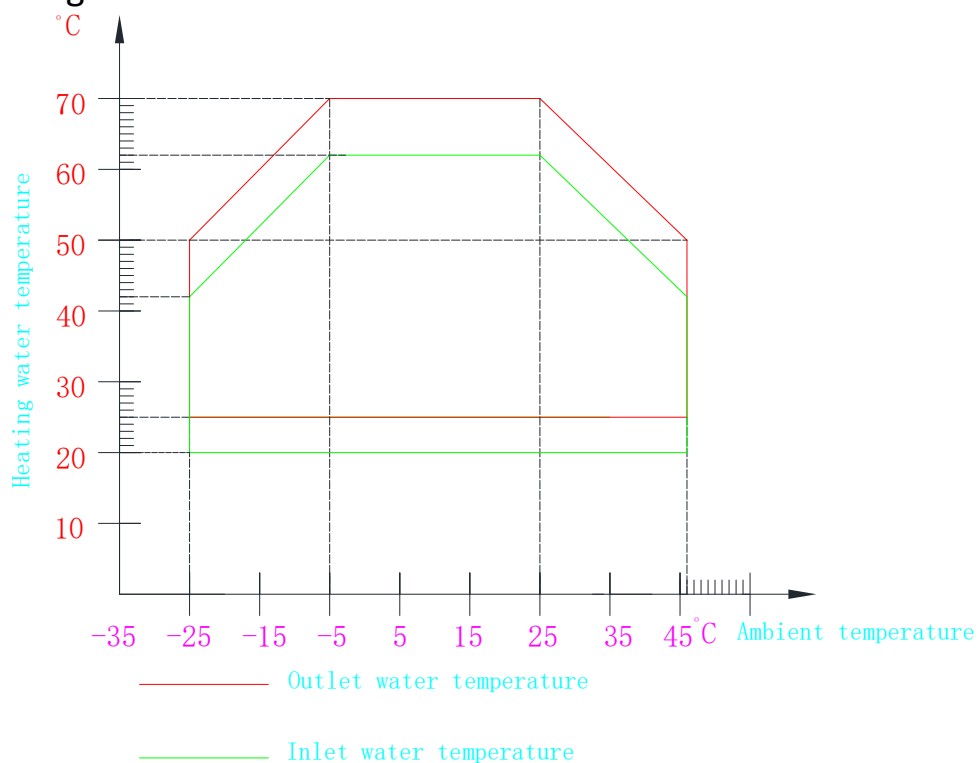
CHS15V/CHS22V circulation pump



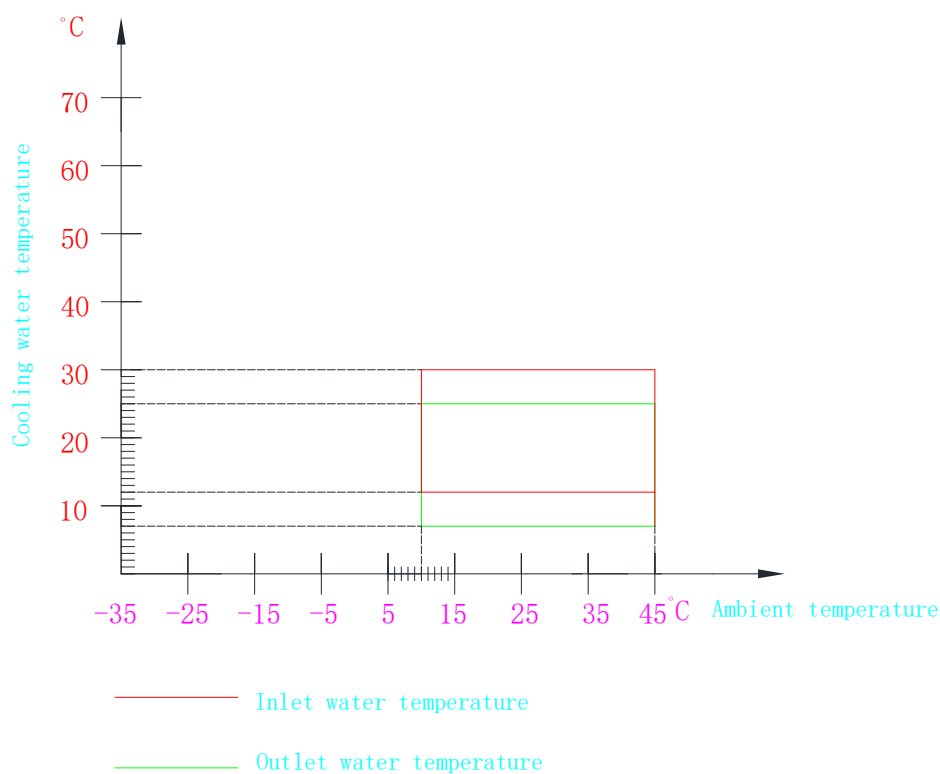
2.6 Operating range

The product works between a minimum and maximum outdoor temperature. These outdoor temperatures define the application limits for the heating mode and cooling mode. Operating outside of the application limits leads to the compressor switching off.

Heating mode



Cooling mode



2.7 technical data sheet

Unit Parameter Table							
Type		CHS06	CHS08	CHS10	CHS12	CHS15	CHS22
Refrigeration Range	kW	1.50 ~ 5.56	1.90 ~ 7.41	1.9 ~ 9.27	2.7 ~ 11.12	3.69 ~ 13.90	5.85~20.39
EER		3.06	3.08	2.85	3.02	3.01	3.02
Heating range	kW	2.30 ~ 6.46	2.90 ~ 8.20	2.90 ~ 10.10	3.80~ 12.20	4.95 ~ 15.20	6.85~22.10
COP		4.85	4.95	4.8	4.86	4.81	4.51
Nominal air flow	m ³ /h	2700	2900	3000	3350	5500	8000
Rated water flow	m ³ /h	1.09	1.1	1.2	1.7	2.12	2.55
Power supply	V/Ph/Hz	220-240V~ 50Hz			380-415V/3N~/50Hz		
Power consumption	kW	2.16	2.86	3.22	5.3	6.5	9
Rated current	A	3.9	5.2	5.8	9.6	11.7	16
Refrigerant	Typ/kg	R290/0.80	R290/1.05	R290/1.05	R290/1.25	R290/1.56	R290/1.8
CO2 equivalent	kg	2.4	3.15	3.15	3.75	4.68	5.4
Sound Pressure Level	dB (A)	44	43	44	45	47	48
Interface size	inch	G1"	G1"	G1"	G1"	G1"	G1"
Unit size	mm	1060*420*846	1060*420*1015			1060*420*1350	1060*420*1565
Unit weight	kg	92	110	110	112	136	166

3 Pre-Installation

3.1 Movement and Storage

Danger

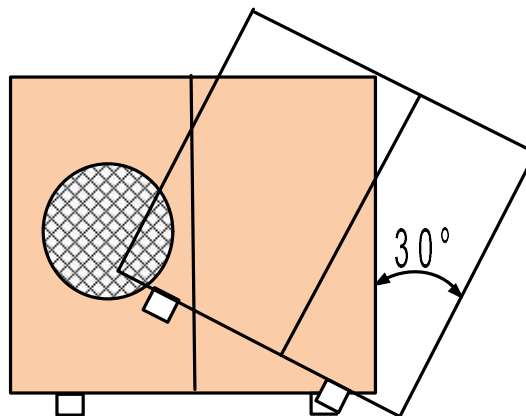
The outdoor unit is filled with refrigerant R290 (propane): Mechanical loading can lead to leaks in the refrigerant circuit. Where leaks of refrigerant occur, there is the risk of explosion or asphyxiation.

- Prevent vibration during transport.
- Position the outdoor unit carefully after transport.
- When being transported, protect the evaporator on the rear side of the outdoor unit against mechanical loading, e.g. with cardboard packaging or bubble wrap.
- Equipment damaged in transit should not be used. Shock, pressure and tensile loads can damage the equipment.
- Do not load the appliance top, front and side panels as well as the evaporator on the rear side of the equipment.
- In order to avoid damage to the air outlet grill, always fit the sack truck to the rear side of the outdoor unit.

Do not damage the evaporator when doing so. Scratches on the surface coating will lead to corrosion.

- Only remove the packaging from the outdoor unit after transporting.
- Protect the outdoor unit against direct contact with tools and transporting equipment, e.g. using cardboard packaging or bubble wrap.

The unit must not be transported, moved or stored at greater than a 30° angle from the upright position. Store the unit in a dry area until required.



The unit must be installed by a suitably qualified tradesperson and all electrical wiring must be completed by a licensed electrical contractor in accordance with all local Standards.

Do not use oxygen to purge lines or to pressurize a unit for any purpose. Oxygen gas reacts violently with oil, grease and other common substances. Use only dry nitrogen for testing.

Wear adequate personal protective equipment (protective gloves, safety glasses) when installing, maintaining or servicing the system.

Tear apart and throw away plastic packaging bags so that nobody, especially children, can play with them. Possible risk: suffocation.

Do not un-weld or flame cut the refrigerant lines including any refrigerant circuit components until the entire refrigerant (liquid and vapour) has been removed from unit. Traces of vapour should be displaced with dry nitrogen.

Refrigerant in contact with an open flame will produce toxic gases and fire.

Ensure that the necessary safety protection equipment is available when servicing. Have the appropriate fire extinguishers for that system.

Do not siphon refrigerant.

Avoid spilling liquid refrigerant onto the skin or splashing it into the eyes. Use safety goggles. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult medical advice.

Note: Never apply an open flame or live stream to a refrigerant container. This can dangerously overpressure and cause an explosion.

Compressor oil filling quantity:

CHS06V-QPANW HAF68 630ml

CHS08V-QPANW CHS10V-QPANW CHS12V-DPANW HAF68 840ml

CHS15V-DPANW HAF68 1150ml

CHS22V-DPANW HAF68 1350ml

The heating system must be pressure tested and air vented completely.

Filling water and supplemented water must be drinking water quality (colourless, clear, free from sediments)

Filling water and supplemented water must be pre-filtered. (pore size max. 5µm)

The maximum water pressure is 3 bar. Provide adequate safeguards in the water circuit to ensure that the maximum pressure is NOT exceeded

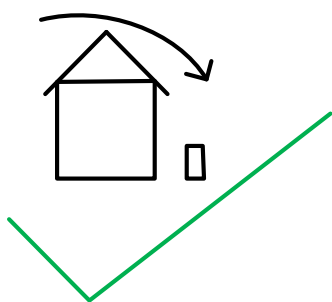
3.2 Installation Location

- The unit must be installed on a solid level surface on a concrete pad foundation not connected to the house foundation. Rubber cushions can be added to reduce vibration and noise if required.
- The unit should be placed so that it is well away from bedrooms or noise sensitive areas including neighbour's section boundaries. (The unit will produce noise that is

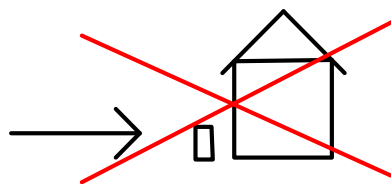
above the minimum 45 decibel rating).

- The unit should be well ventilated with no obstructions and kept level at all times.
- Ensure there is good drainage around installation area and make sure this water cannot run out onto paths as it may cause ice or slime build up which is undesirable. (The unit can produce large volumes of condensation water when running in high humidity zones. There is also a large run off when the unit melts ice during a defrost cycle).
- Avoid locations exposed to machine oil vapour, salty air, thermal springs sulphur gases or other harsh substances
- If operation in temperatures below 0°C for prolonged periods or locations where the snow may fall the unit must be raised at least 300mm off the ground. This is necessary to avoid ice build-up on the unit's chassis.
- The unit must be installed level in both axes (less than 2mm tolerance per meter)
- Locations exposed to strong winds should be avoided otherwise baffles may be necessary to deflect strong winds and to prevent snow from blowing directly into the unit. They must not restrict air flow into the unit.

Indirect offshore wind

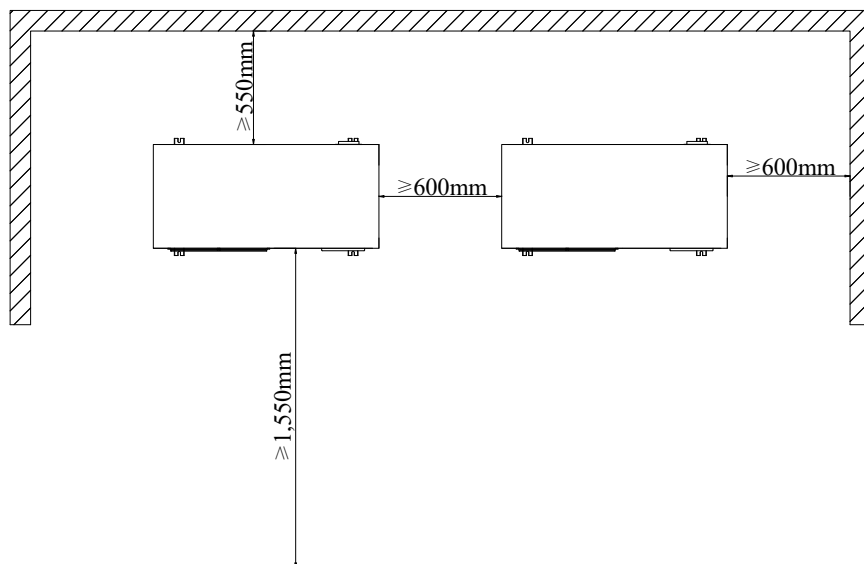


Direct offshore wind



- Keep suitable distance between the unit and the building to ensure the normal running of the unit and enough room is available for maintenance.

Minimum clearance of the unit:



3.3 Outdoor unit setup

Floor standing installation

Place the unit on a solid level base that can take the weight, preferably a concrete foundation. If concrete

slabs are used they must rest on asphalt or shingle.

Do not place unit directly on the lawn or other non solid surface.

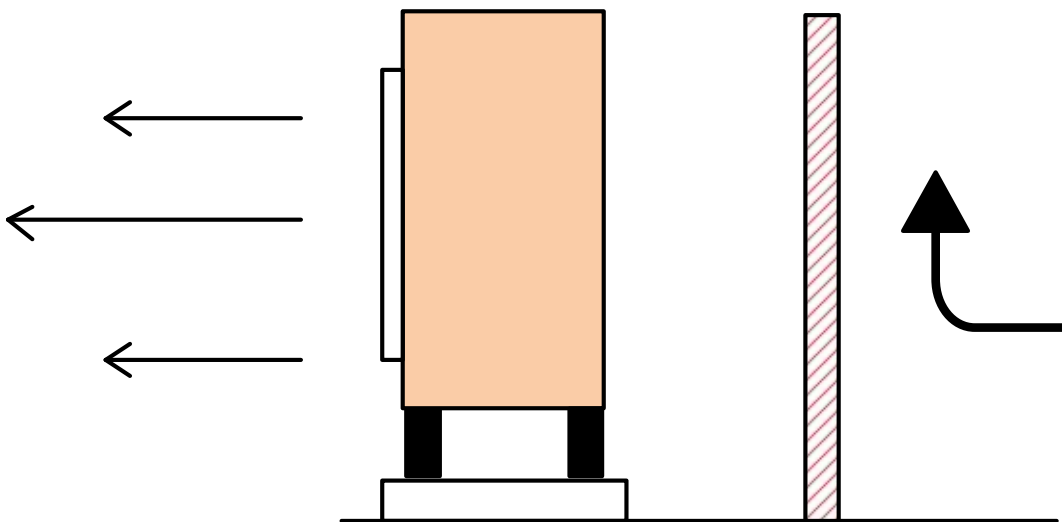
Make sure that the inclination of the heat pump in the horizontal and vertical direction is no more than 1%.

Installation problems/faults if installed on sloping surface! The condensate drainage and functionality will be impaired.

Particularly in adverse climatic environments (minus temperatures, snow and humidity) a distance to the substrate of at least 300 mm is required.

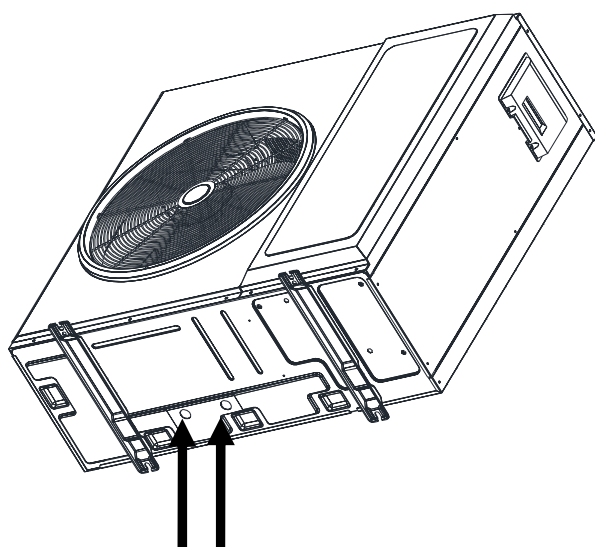
Screw the heat pump to the subsurface using suitable screws. Rubber cushion /pads should be applied to reduce vibration and noise. Align the heat pump horizontally.

Protect the intake side with a wall or similar to prevent strong winds from blowing directly on the heat pump.



3.4 Connect drainage pipe

Find the plastic adapters inside the heat pump and plug it into the holes of the unit drain pan. connect a water hose (field supply, 16mm inner diameter) to this plastic adapter



condensate discharges



Plastic adapter

The condensate collected in the collector shall be drained via a pipe to an appropriate drains where the shortest possible outdoor stretch is recommended.

- The part of the pipe that is not frost-free must be heated by a heating cable to prevent freezing.

- Lay the pipe with a drop from the heat pump

- The outlet of the condensate pipe must be in frost-free depth or alternatively indoors (subject to local regulations and regulations).

- Use a water trap in installations where air circulation may occur in the condensate pipe.

- The insulation must be connected close to the condensate collector.

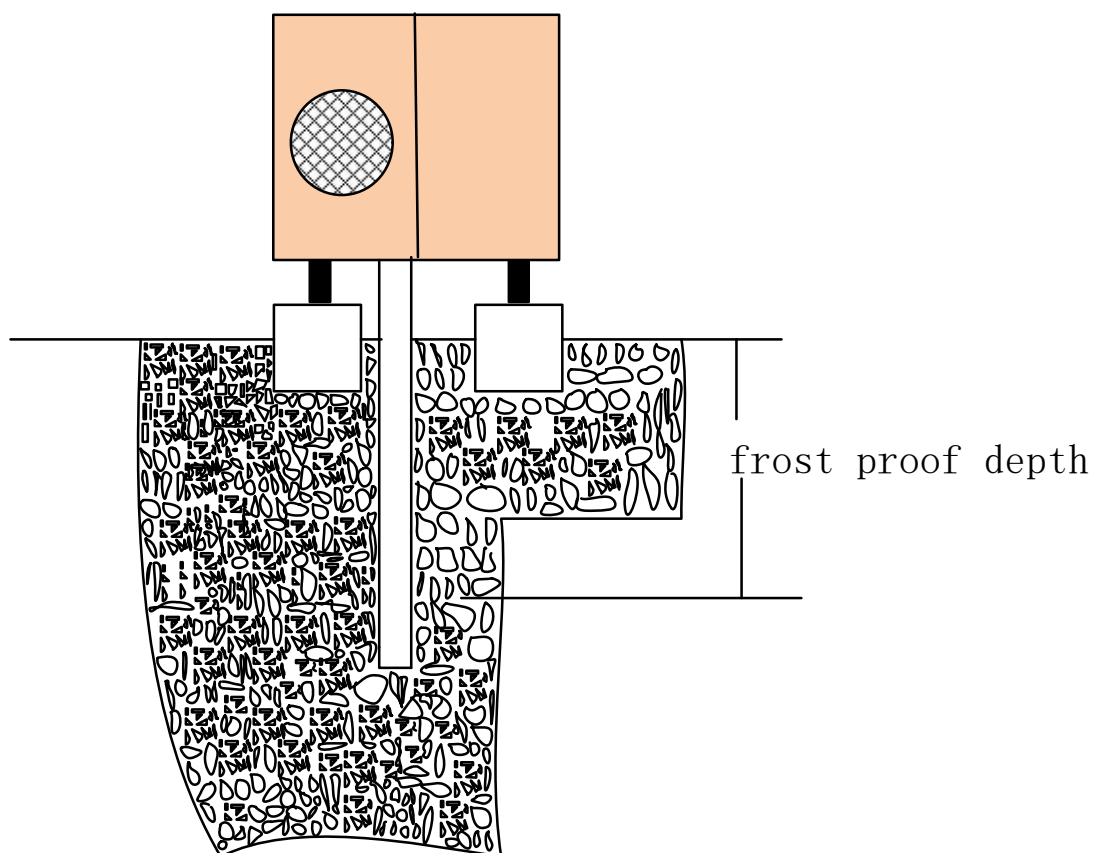
Danger of injury due to frozen condensate!

Frozen condensate on the pavement can result in falls.

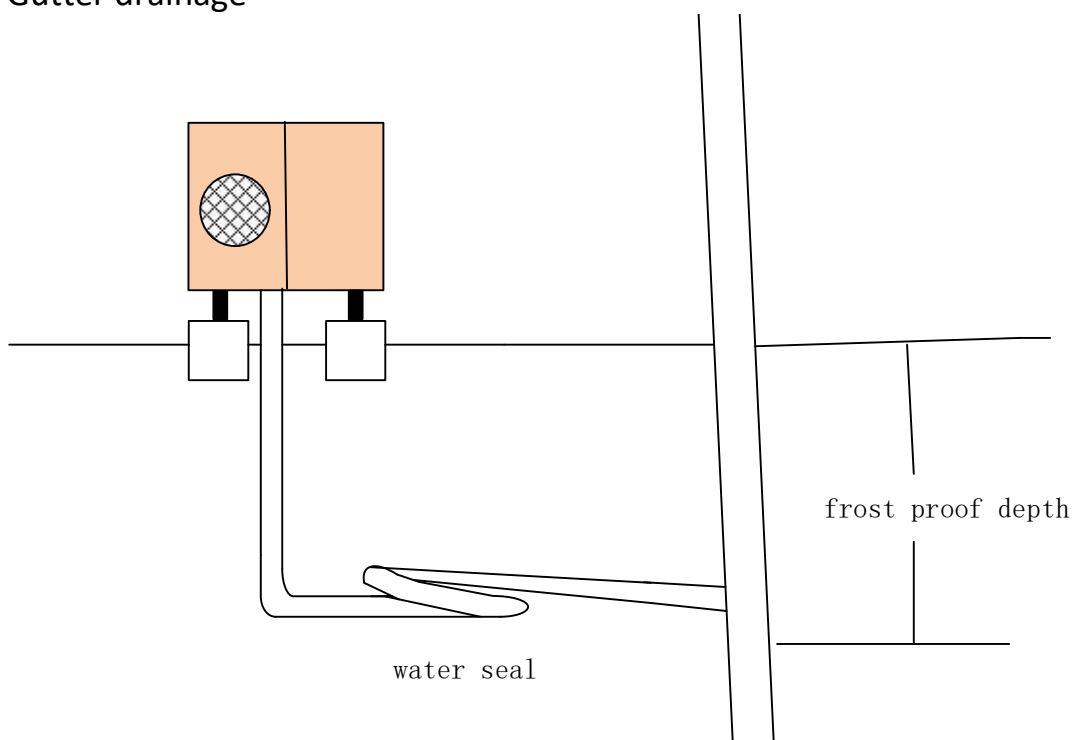
Make sure that running condensate does not end up on the pavement where it can freeze to ice.

Condensate drainage recommendations:

Stone Caisson



Gutter drainage

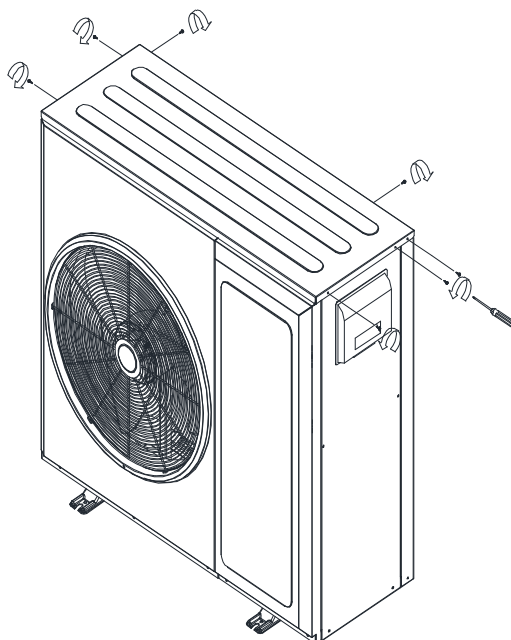


3.5 Steps to open the cabinet

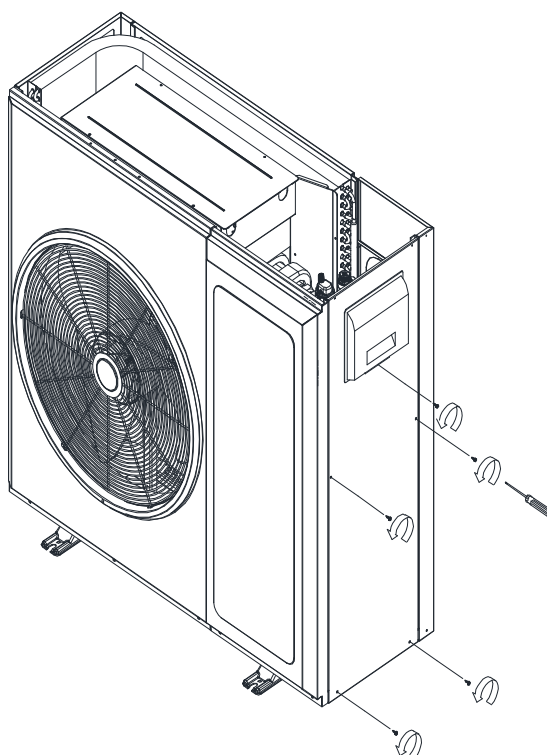
If needed, the panels could be opened by a serviceman

The panels could be removed as the order: top panel- plastic cover- right panel – front panel - fan panel.

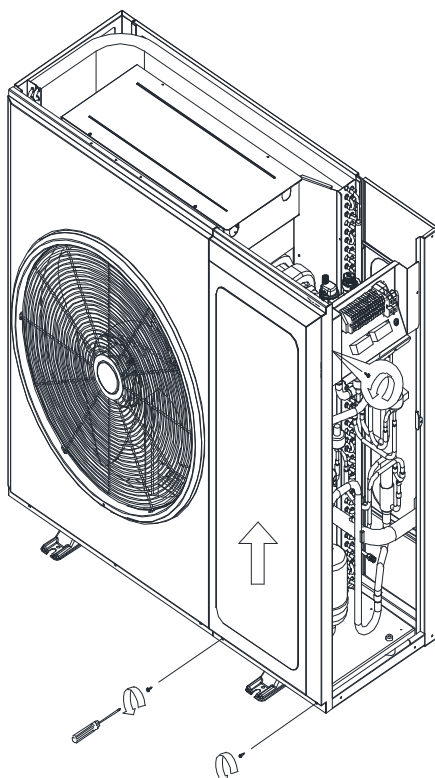
1. Unscrew the screws as below indication and top panel could be removed.



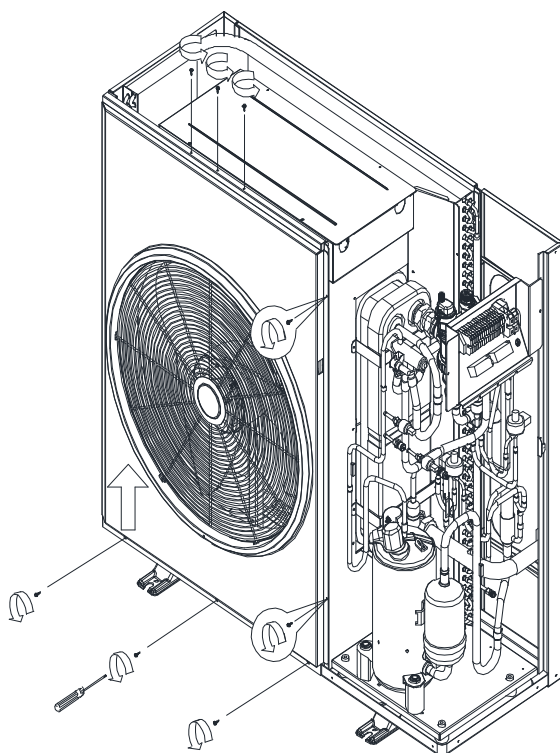
2. Unscrew the screws as below indication, remove plastic cover first, and then right panel could be removed.



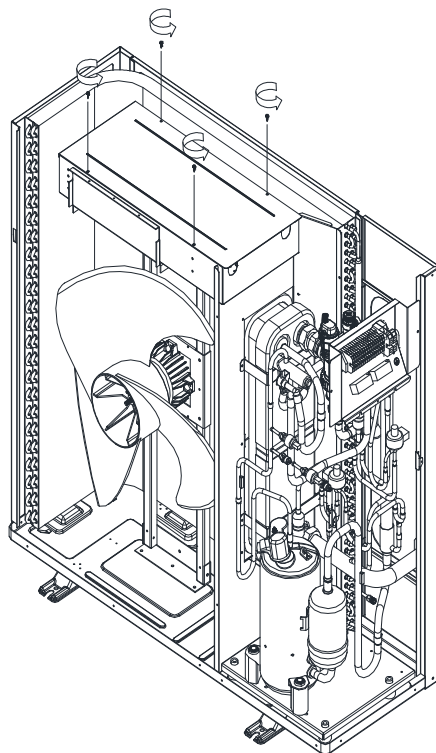
3. Unscrews the screws as below indication. Front panel could be removed by pushing the panel upward.



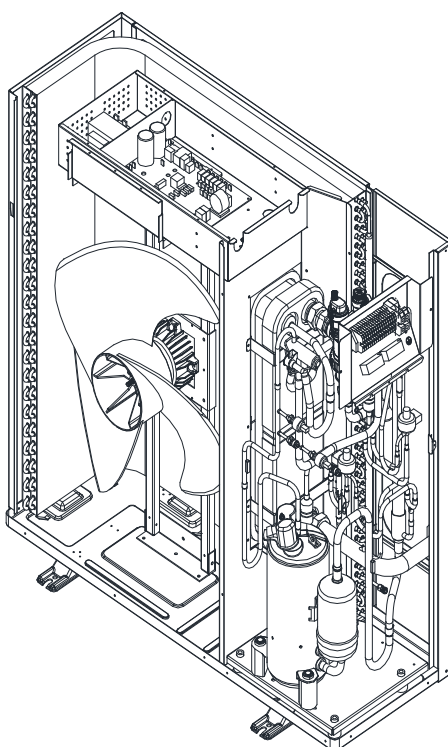
4. Unscrews the screws as below indication. Fan panel could be removed by pushing it upward.



5. Unscrews the screws as below indication. The cover of control box could be removed



6. All panels removed.



3.6 Indoor unit installation

Indoor unit dimension unit:mm

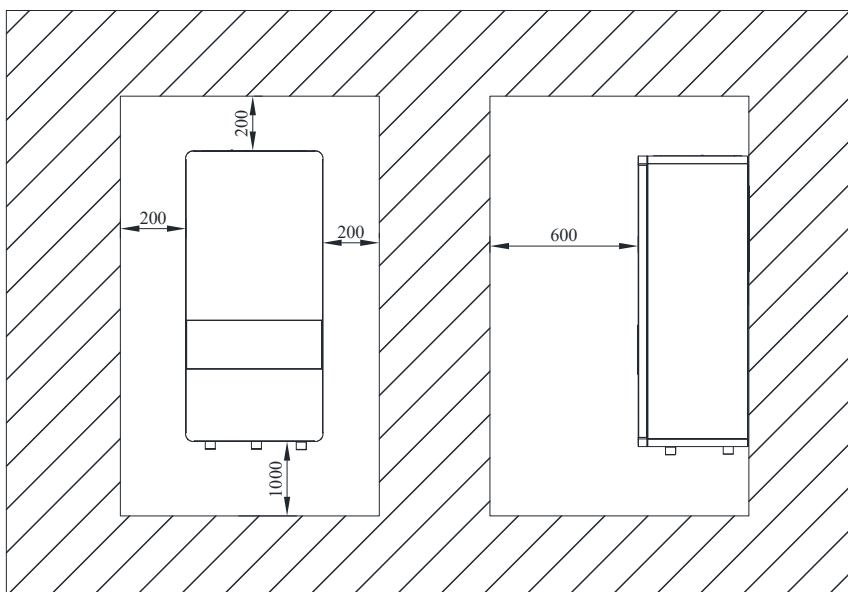
Open the front panel of the indoor unit to access terminal block.

1. Unscrew the two screws at the top of the indoor unit
2. Push the front panel upward
3. Front panel could be removed

Selecting the installation site

- ▶ The installation site must be below 2000 metres above sea level.
- ▶ Select a dry room that is frost-proof throughout and in which the maximum installation height is not exceeded and the environmental temperature 7 ... 35 °C
– Permissible relative air humidity: 40 ... 75 %
- ▶ Ensure that the required minimum clearances can be maintained.
- ▶ The permissible height difference between the indoor unit and outdoor unit must not be greater than 15 m.
- ▶ When selecting the installation site, you must take into consideration that when the heat pump is in operation, it will transfer vibrations to the walls.
- ▶ Ensure that the wall is even and offers sufficient loadbearing capacity to bear the weight of the product.
- ▶ Ensure that the pipes are routed appropriately.
- ▶ Do not install the product above another unit that may damage it (e.g. above a cooker that produces water vapour and grease) or in a room with a high level of exposure to dust or in a corrosive environment.
- ▶ Do not install the product below a unit from which liquids may flow.

Minimum clearances and installation clearances unit:mm



- Provide sufficient clearance on both sides of the product in order to facilitate access for maintenance and repair work.
- When using the accessories, observe the minimum clearances/ installation clearances.
- Ensure that no highly flammable parts come into contact with the components as these may reach temperatures of over 70°C.
- Ensure that there is a minimum clearance between the highly flammable parts and the hot components.

Check the load-bearing capacity of the wall.

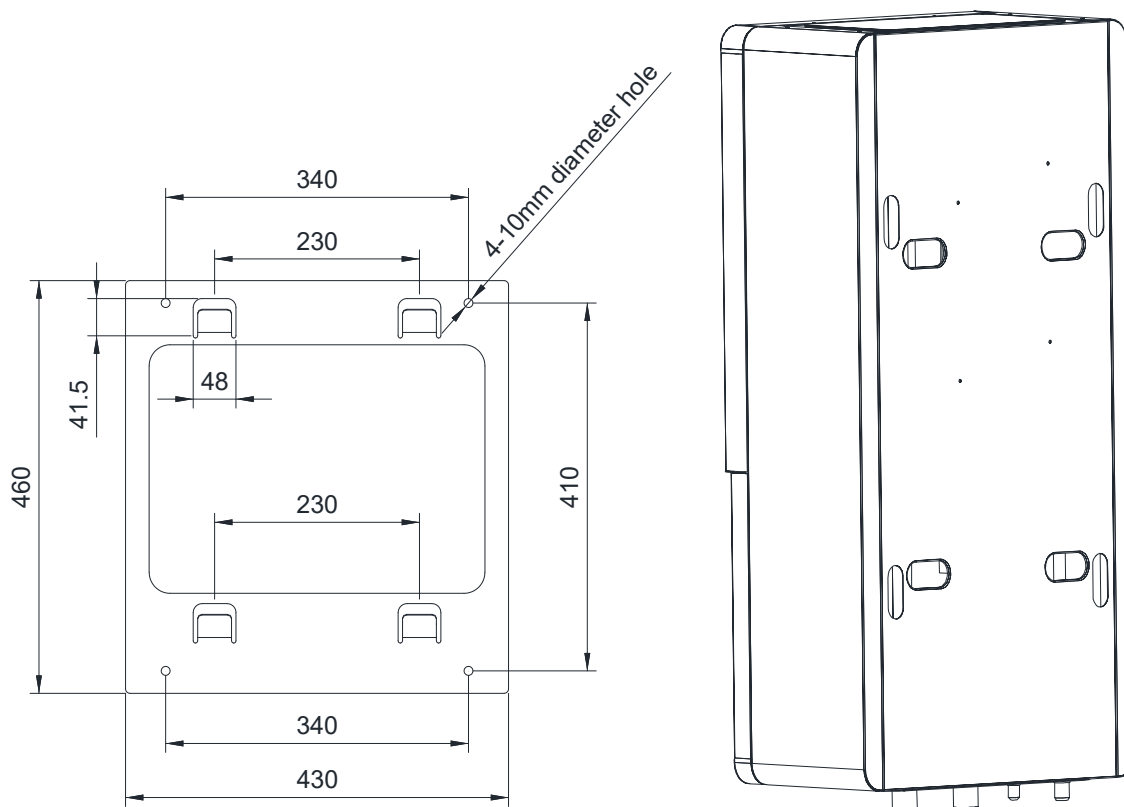
Note the total weight of the product.

Only use fixing material that is permitted for the wall.

If required, ensure that mounting apparatus on-site has sufficient load-bearing capacity. Fix the wall bracket (accessory) to the wall (level) with 4 Ø8 mm bolts (field supply)

wall bracket dimension

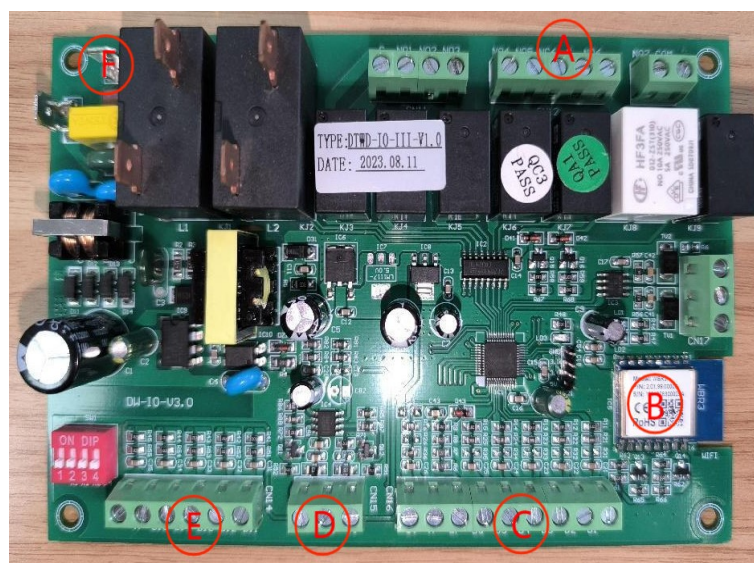
indoor unit holes on the back side



- Lift up the indoor unit
- Attach the indoor unit to the wall bracket:
- Tilt the top of the unit against the wall at the position of the wall bracket.
- Slide the bracket on the back of the unit over the wall bracket. Make sure the unit is fixed properly.

3.7 Hydraulics installation

3.6.2 IO board function description



A: Switch signal output point;

B: WIFI chip;

C: Analog signal input point;

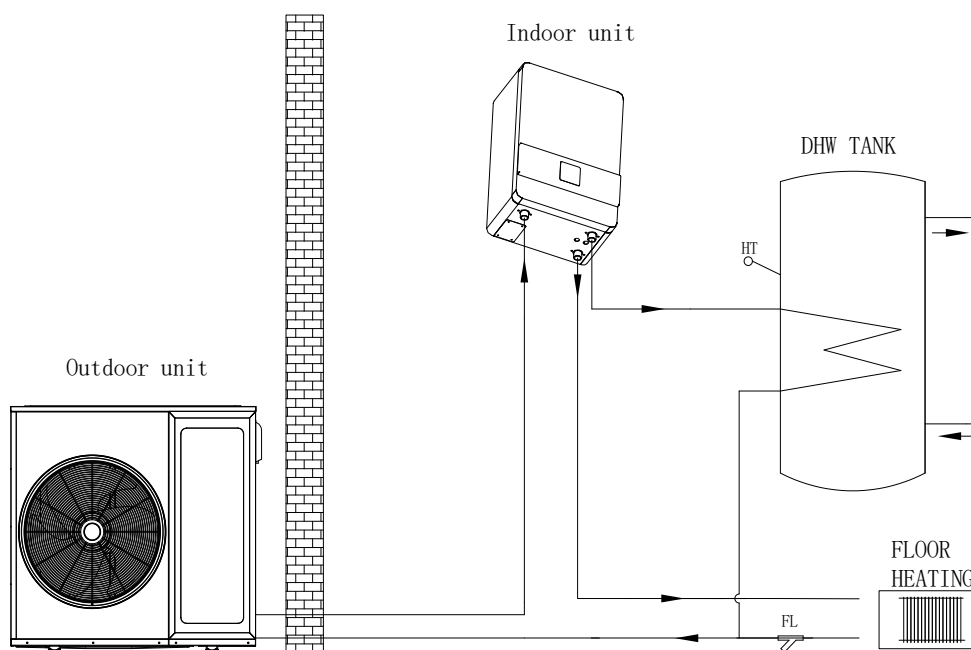
D: Analog signal output point;

E: Switch signal input point;

F: power supply input point;

3.7.1 with indoor unit DSK03-QG/DSK09-QG installation

Make sure to connect the pipes correctly and in correct flow direction as below diagram:



3.8 Hydraulic installation notice

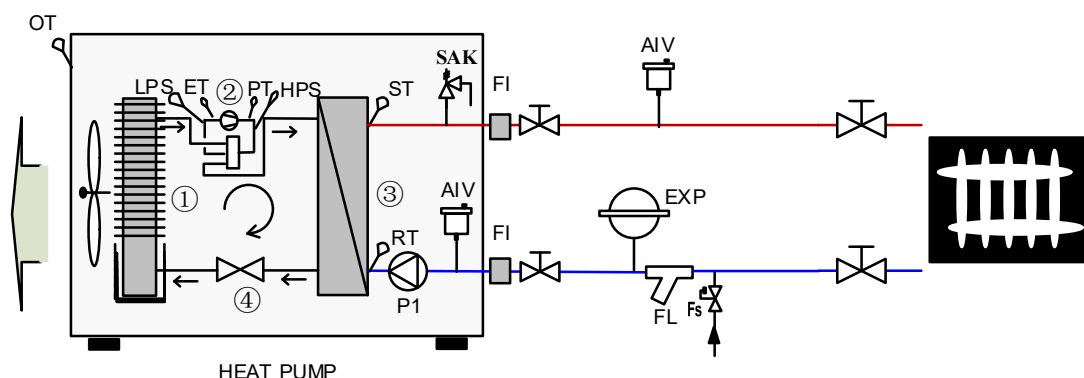
Important:

1. The pipe installation must adhere to the local Building Code, standards and any local council requirements.
2. The water supplied to the system must be clean and not contain heavy metals that could cause harm to the unit. The water must be treated with an approved inhibitor and tested annually to prevent corrosion, fouling and deterioration of the pump fittings.
3. Protection devices are to be installed to protect the unit from operating outside of its running parameter such as control devices; shutoff valve, bleed valves, Pressure release valves and expansion tanks.
4. The pipe installation should be designed to have the least number of elbows and joiners as they reduce flow. Install drain connections at low points to allow the system to be drain if required.
5. Flexible connections should be used where possible to reduce vibration transmission.
6. Insulate all pipe work and exposed areas to protect against both thermal heat loss and to prevent condensation on chilled pipes.
7. When filling the water system, use air vents and flushing procedure to evacuate any residual air pockets.
8. The heat pump is not fitted with shutoff valves and therefore these must be fitted outside of the heat pump to facilitate future service requirement.
9. – Min. heating circuit pressure: $\geq 0.05 \text{ MPa}$ ($\geq 0.50 \text{ bar}$)
– Min. heating circuit operating pressure: $\geq 0.07 \text{ MPa}$ ($\geq 0.70 \text{ bar}$)
– Max. heating circuit pressure: $< 0.3 \text{ MPa}$ ($< 3 \text{ bar}$)
– Max. heating circuit operating pressure: $< 0.3 \text{ MPa}$ ($< 3 \text{ bar}$)

4 Systems Overview

4.1 without indoor unit installation

4.1.1 System Overview 1: Floor heating



Name	Description	Included	Name	Description	Included
P1	Circulation pump	Internal	RT	Inlet water temperature sensor	Internal
AIV	Air vent valve		ST	Outlet water temperature sensor	Internal
FI	Soft joint	External	OT	Ambient temperature sensor	Internal
FS	Automatic water supplement valve	External	PT	Discharge gas temperature sensor	Internal
FL	Filter	External	ET	Suction gas temperature sensor	Internal
EXP	Diaphragm expansion vessel	External	HPS	High pressure transducer	Internal
SAK	pressure release valve	internal	LPS	Low pressure transducer	Internal

Heating Mode Working Principle:

On heating mode

Unit On : when $RT < T(\text{heating}) - ST04$ ($T(\text{heating})$ is the control inlet water temperature on heating mode)

Unit Off: $RT > T(\text{heating}) + 2^{\circ}\text{C}$ and running frequency of the compressor has reduced to Minimum and lasts for 30s.

T(heating) calculation:

Default $ST02=35$, $ST06=0.6$

The heat pump units' maximum outlet water temperature is limited by ambient temperature. It could make maximum 70°C when ambient temperature is from -5°C to $+25^{\circ}\text{C}$. Out of this ambient temperature range, the maximum outlet water temperature will drop linearly to 55°C . the details refer to operating range envelope in OPERATING RANGE chapter.

1.) When $SF04=\text{No}$, there is no heating curve. $T(\text{heating})=ST02$. $ST02$ is heating setpoint set on the user interface.

If the set $ST02$ value is out of the operating range envelope, the heat pump on/off control

inlet water temperature will be "Maximum outlet limit - EV04 (set Inlet/outlet temp. diff. heating)", EV04 default setting is 5°C.

2.) When SF04=Yes, heating curve is activated,

$T(\text{heating}) = ST02 + (20 - OT) \times ST06$, Refer to chapter "Heating compensation curve setting".

The calculated $T(\text{heating})$ is subject to the limitation of both ST14 (Max. heating set point) and Maximum outlet limit as per operating range envelope.

A. If calculated $T(\text{heating})$ is higher than ST14 (Max. heating set point) and ST14 is within the operating range envelope, ST14 would be $T(\text{heating})$.

B. If the calculated $T(\text{heating})$ is higher than ST14 and ST14 is out of the operating range envelope, the heat pump on/off control inlet water temperature will be "Maximum outlet limit - EV04 (set Inlet/outlet temp. diff. heating)", EV04 default setting is 5°C.

Auxiliary Electric backup heater or boiler control

Auxiliary backup heater or boiler only could be switched on when all of conditions below are met.

1.) Heating mode running and compressor has been running on the maximum operating frequency.;

2.) Compressor has run over 300s

3.) $OT \leq \text{AUXILIARY ELECTRIC HEATER START TEMP.}$;

4.) $RT \leq T(\text{heating}) - ST04 - 2$;

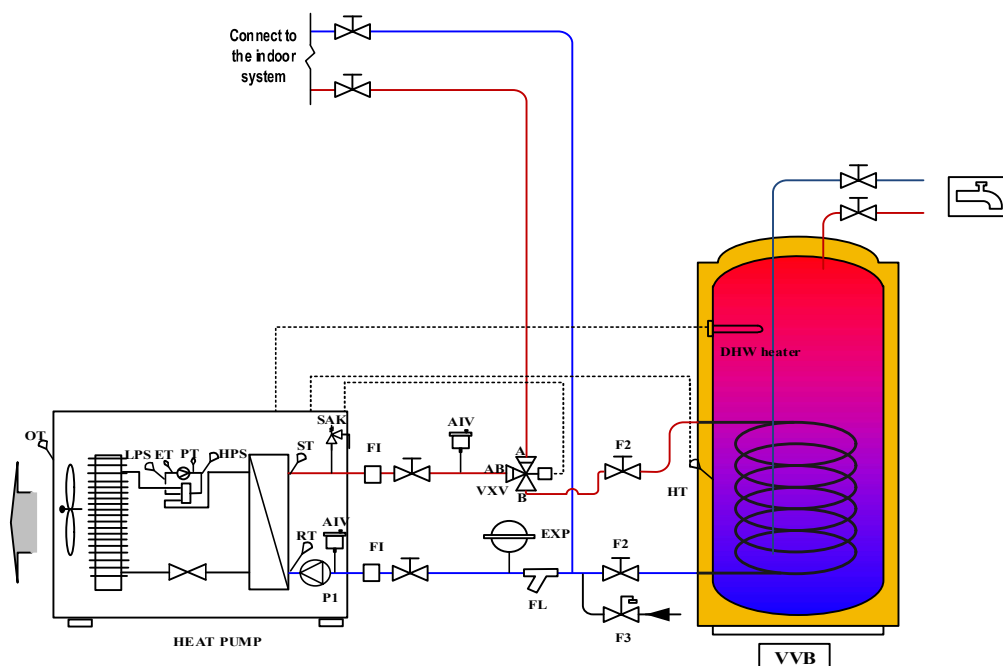
5.) Compressor has run over 5 minutes.

Auxiliary backup heater or boiler is switched off when any of conditions below is met.

1.) A/C flow alarm.

2.) $RT \geq T(\text{heating}) - 2$;

4.1.2 System Overview 2: Heating, Cooling with DHW Production



Name	Description	Included	Name	Description	Included
P1	Circulation pump	Internal	RT	Inlet water temperature sensor	Internal
VXV	3 way valve	External	ST	Outlet water temperature sensor	Internal
VVB	Hot water tank	External	OT	Ambient temperature sensor	Internal
FI	Soft joint	External	HT	Domestic hot water	Internal
F2	Shut-off valve	External	PT	Discharge gas temperature sensor	Internal
SAK	pressure release valve	internal	ET	Suction gas temperature sensor	Internal
FL	Filter	External	HP	High pressure transducer	Internal
AIV	Air vent valve		LP	Low pressure transducer	Internal
FS	Automatic water supplement	External	EXP	Diaphragm expansion vessel	External

Heating Mode Working Principle:

On heating mode, 3 way valve (VXV) will open AB-A.

Unit On : when $RT < T(\text{heating}) - ST04$ ($T(\text{heating})$ is the control water temperature on heating mode)

Unit Off: $RT > T(\text{heating}) + 2^{\circ}\text{C}$ and running frequency of the compressor has reduced to Minimum and lasts for 30s.

T(heating) calculation:

Default $ST02=35$, $ST06=0.6$

The heat pump units' maximum outlet water temperature is limited by ambient temperature. It could make maximum 70°C when ambient temperature is from -5°C to $+25^{\circ}\text{C}$. Out of this ambient temperature range, the maximum outlet water temperature will drop linearly to 55°C . the details refer to operating range envelope in OPERATING RANGE chapter.

1.) When $SF04=\text{No}$, there is no heating curve. $T(\text{heating})=ST02$. $ST02$ is heating setpoint set on the user interface.

If the set $ST02$ value is out of the operating range envelope, the heat pump on/off control inlet water temperature will be "Maximum outlet limit - $EV04$ (set Inlet/outlet temp. diff. heating)", $EV04$ default setting is 5°C .

2.) When $SF04=\text{Yes}$, heating curve is activated,

$T(\text{heating}) = ST02 + (20 - OT) \times ST06$, Refer to chapter "Heating compensation curve setting".

The calculated $T(\text{heating})$ is subject to the limitation of both $ST14$ (Max. heating set point) and Maximum outlet limit as per operating range envelope.

A. If calculated $T(\text{heating})$ is higher than $ST14$ (Max. heating set point) and $ST14$ is within the operating range envelope, $ST14$ would be $T(\text{heating})$.

C. If the calculated $T(\text{heating})$ is higher than $ST14$ and $ST14$ is out of the operating range envelope, the heat pump on/off control inlet water temperature will be "Maximum outlet limit - $EV04$ (set Inlet/outlet temp. diff. heating)", $EV04$ default setting is 5°C .

Auxiliary Electric backup heater control

Auxiliary backup heater only could be switched on when all of conditions below are met.

1.) Heating mode running and compressor has been running on the maximum operating frequency.;

- 2.) Compressor has run over 300s
- 3.) $OT \leq \text{AUXILIARY ELECTRIC HEATER START TEMP.}$;
- 4.) $RT \leq T(\text{heating}) - ST04 - 2$;

5.) Compressor has run over 5 minutes.

Auxiliary backup heater is switched off when any of conditions below is met.

- 1.) A/C flow alarm.
- 2.) $RT \geq T(\text{heating}) - 2$;

Cooling Mode Working Principle:

On cooling mode, 3 way valve (VXV) will open AB-A.

Unit On: $RT > ST01 + ST03$

Unit Off: $RT < ST01 - 1.5^\circ\text{C}$ and running frequency of the compressor has reduced to Minimum and lasts for 30s.

Hot water production working principle:

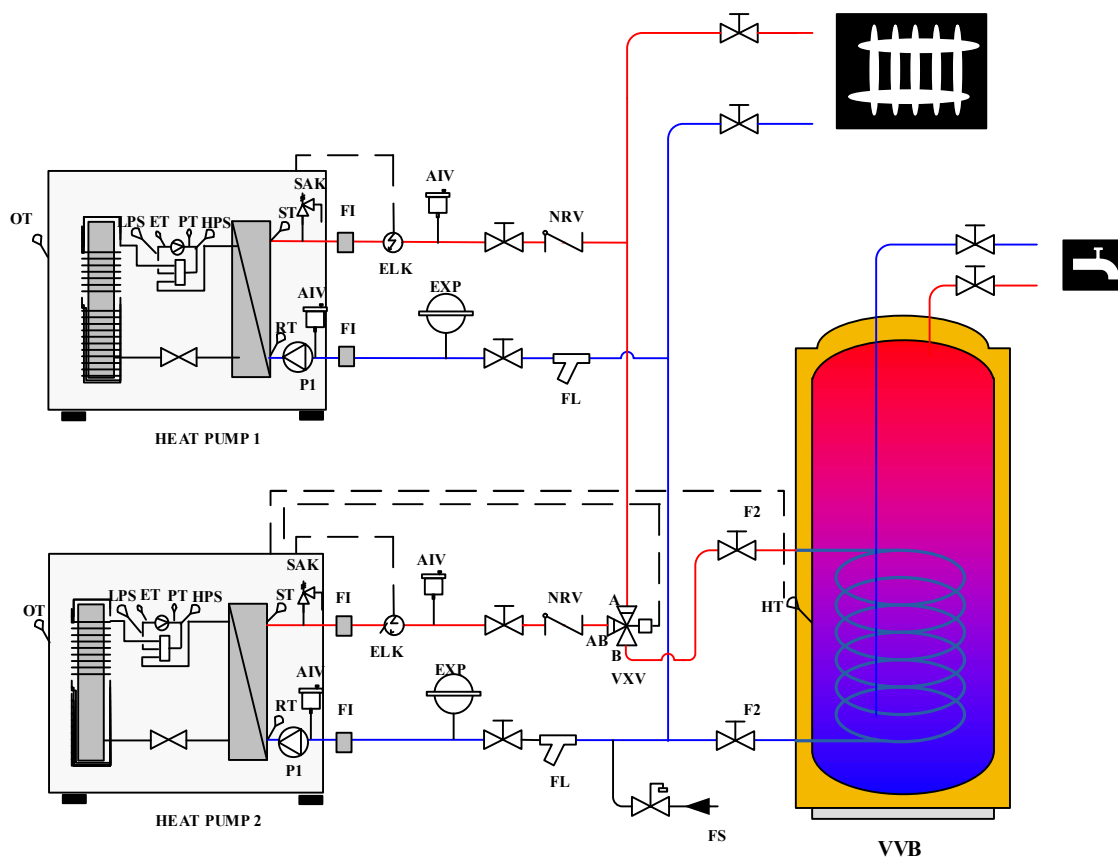
On hot water mode, 3 way valve (VXV) will open AB-B.

1.) ON: $HT \leq ST09 - ST10$

Off: $HT > ST09$

To avoid the outlet water temperature out of the operating range, on DHW mode, compressor frequency is regulated to keep the outlet water temperature within the operating range. After DHW temperatures goes up, the unit could not keep the outlet water temperature within the limit. when outlet water temperature is 2°C higher than the maximum outlet water temperature limit, the compressor is switched off and DHW electric heater (installed in the DHW tank) is switched on to take over to heat the DHW up to ST09.

4.1.3 System Overview 3: Multiple Units in Series Cascade Connection



Name	Description	Included ?	Name	Description	Included ?
P1	Circulation pump	Internal	RT	Inlet water temperature sensor	Internal
VXV	3 way Valve	External	ST	Outlet water temperature sensor	Internal
VVB	Hot water tank	External	OT	ambient temperature sensor	Internal
FI	Soft joint	External	HT	Domestic hot water temperature sensor	Internal
F2	Shut-off valve	External	PT	Discharge gas temperature sensor	Internal
SAK	pressure release valve	internal	ET	Suction gas temperature sensor	Internal
FL	Filter	External	HP	High pressure transducer	Internal
NRV	Non-return valve	External	LP	Low pressure transducer	Internal
ELK	Electric heater	External	EXP	Diaphragm expansion vessel	External
AIV	Air vent valve		FS	Automatic water supplement valve	External

Heating working principle

To set two or more units in parallel operation, set the primary unit to the required parameters, other units could have 2~5°C difference of ST01 and ST02 to allow for energy stage control.

On heating mode, 3 way valve (VXV) will open AB-A.

Unit On : when $RT < T(\text{heating}) - ST04$ ($T(\text{heating})$ is the control water temperature on heating mode)

Unit Off: $RT > T(\text{heating}) + 2^{\circ}\text{C}$ and running frequency of the compressor has reduced to Minimum and lasts for 30s.

T(heating) calculation:

Default ST02=35, ST06=0.6

The heat pump units' maximum outlet water temperature is limited by ambient temperature. It could make maximum 70°C when ambient temperature is from -5°C to +25°C. Out of this ambient temperature range, the maximum outlet water temperature will drop linearly to 55°C. the details refer to operating range envelope in OPERATING RANGE chapter.

1.) When SF04=No, there is no heating curve. $T(\text{heating}) = ST02$. ST02 is heating setpoint set on the user interface.

If the set ST02 value is out of the operating range envelope, the heat pump on/off control inlet water temperature will be "Maximum outlet limit - EV04 (set Inlet/outlet temp. diff. heating)", EV04 default setting is 5°C.

2.) When SF04=Yes, heating curve is activated,

$T(\text{heating}) = ST02 + (20 - OT) \times ST06$, Refer to chapter “Heating compensation curve setting”.

The calculated $T(\text{heating})$ is subject to the limitation of both ST14 (Max. heating set point) and Maximum outlet limit as per operating range envelope.

A. If calculated $T(\text{heating})$ is higher than ST14 (Max. heating set point) and ST14 is within the operating range envelope, ST14 would be $T(\text{heating})$.

B. If the calculated $T(\text{heating})$ is higher than ST14 and ST14 is out of the operating range envelope, the heat pump on/off control inlet water temperature will be "Maximum outlet limit - EV04 (set Inlet/outlet temp. diff. heating)", EV04 default setting is 5°C.

Auxiliary Electric backup heater or boiler control

Auxiliary backup heater or boiler only could be switched on when all of conditions below are met.

1.) Heating mode running and compressor has been running on the maximum operating

frequency.;

2.) Compressor has run over 300s

3.) $OT \leq \text{AUXILIARY ELECTRIC HEATER START TEMP.};$

4.) $RT \leq T(\text{heating}) - ST04 - 2;$

5.) Compressor has run over 5 minutes.

Auxiliary backup heater or boiler is switched off when any of conditions below is met.

1.) A/C flow alarm.

2.) $RT \geq T(\text{heating}) - 2;$

DHW (domestic hot water) production working principle:

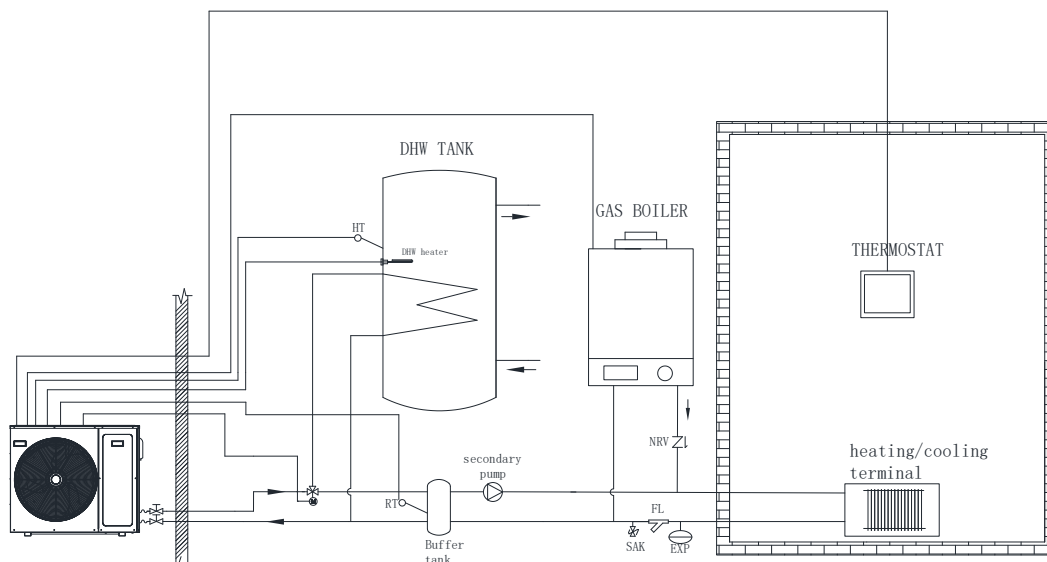
On domestic hot water mode, 3 way valve (VXV) will open AB-B.

1.) ON: $HT \leq ST09 - ST10$

Off: $HT > ST09$

To avoid the outlet water temperature out of the operating range, on DHW mode, compressor frequency is regulated to keep the outlet water temperature within the operating range. After DHW temperatures goes up, the unit could not keep the outlet water temperature within the limit, when outlet water temperature is 2°C higher than the maximum outlet water temperature limit. the compressor is switched off and DHW electric heater (installed in the DHW tank) is switched on to take over to heat the DHW up to ST09.

4.1.4 System Overview 4: with gas boiler and buffer tank



Name	Description	Included	Name	Description	Included
SAK	Pressure release valve	external	FL	Filter	external
EXP	expansion tank	External	NRV	non-return valve	external

The desired room temperature is set via the thermostat.

The space heating/cooling demand from the thermostat is sent to the heat pump A/C switch via B1-B2 terminal connection

when the room thermostat sends ON signal to heat pump, the unit is switched on.

when the room thermostat sends OFF signal to the heat pump, the unit is switched off.

when the heat pump is switched on, the running regulation is same as other systems.

The thermostat and heat pump connection refer to following page.

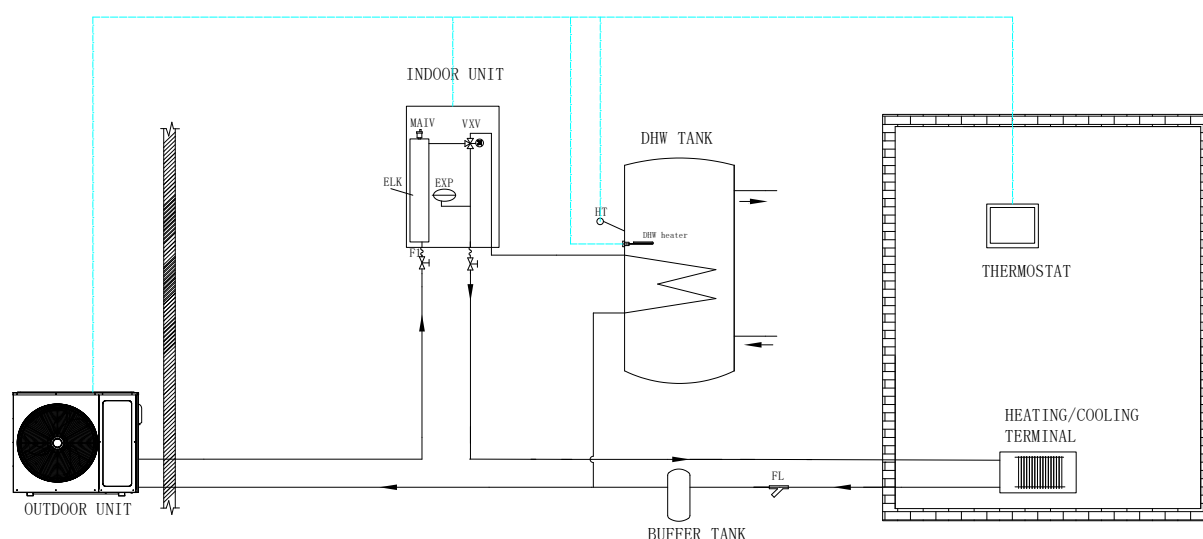
The inlet water temperature (RT) should be moved to the sensor pocket of buffer tank.

service parameter EV01 could be set to work by regulation. Circulation pump will stop when compressor stops to save energy consumption.

Important: the thermostat must be well set to let heat pump run at least 20 minutes on each cycle. If heat pump runs less than 20 minutes for all cycles, it can not go into defrost.

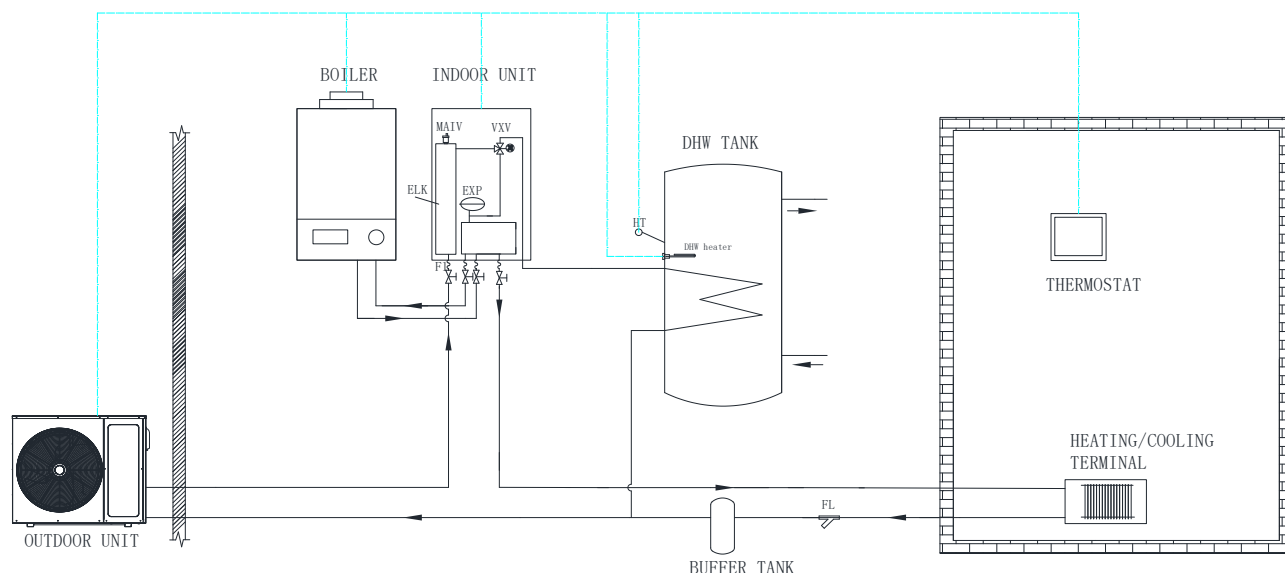
4.2 with indoor unit

4.2.1 System Overview1: with DKS03-QG installation



Name	Description	Included	Name	Description	Included
FI	Soft joint	NO	HT	Domestic hot water temperature sensor	included
VXV	3 way valve	included	EXP	Diaphragm expansion vessel	included
MAIV	Manual air vent valve	included	FL	Filter	NO
SAK	Pressure release valve	included	ELK	Aux heater	included

4.2.1 System Overview1: with DKSB03-QG installation



Name	Description	Included	Name	Description	Included
FI	Soft joint	NO	HT	Domestic hot water temperature sensor	included
VXV	3 way valve	included	EXP	Diaphragm expansion vessel	included
MAIV	Manual air vent valve	included	FL	Filter	NO
SAK	Pressure release valve	included	ELK	Aux heater	included

Heating Mode Working Principle:

On heating mode, 3 way valve (VXV) will turn to heating circuit.

Unit On : when $RT(\text{inlet water temperature}) < T(\text{heating}) - ST04(\text{temp. diff. heating})$.

($T(\text{heating})$ is the user set control water temperature on heating mode)

Unit Off: $RT > T(\text{heating}) + 2^{\circ}\text{C}$.

T(heating) calculation:

1.) When SF04 weather compensation=OFF. $T(\text{heating})$ = user set heating water temperature but subject to operating range envelope.

2.) When SF04 weather compensation=ON, heating curve is activated,
 $T(\text{heating})$ = calculated control water temperature as per the user menu weather compensation calculation result but subject to ST14 and operating range envelope.

Auxiliary Electric backup heater and boiler control

Auxiliary backup heater and boiler only could be switched on when all of conditions below are met.

1.) Heating mode running and compressor has been running on the maximum operating frequency.;

2.) Compressor has run over 300s

3.) $OT \text{ (Ambient temp.)} \leq \text{AUXILIARY ELECTRIC HEATER START TEMP.};$

4.) $RT \leq T(\text{heating}) - ST04(\text{temp. diff. heating}) - 2;$

5.) Compressor has run over 5 minutes.

Auxiliary backup heater and boiler is switched off when any of conditions below is met.

1.) A/C flow alarm.

2.) $RT \geq T(\text{heating}) - 2;$

Cooling Mode Working Principle:

On cooling mode, 3 way valve (VXV) will open AB-A.

Unit On: $RT > T(\text{cooling}) + ST03(\text{temp. diff. cooling})$

($T(\text{cooling})$ is the user set control water temperature on cooling mode)

Unit Off: $RT < T(\text{cooling}) - 1.5^\circ\text{C}.$

T(cooling) calculation:

1.) When SF04 weather compensation=OFF. $T(\text{cooling}) = \text{user set cooling water temperature}.$

2.) When SF04 weather compensation=ON, cooling curve is activated,

$T(\text{cooling}) = \text{calculated control water temperature as per the user menu weather compensation calculation result}.$

Hot water production working principle:

On hot water mode, 3 way valve (VXV) will open AB-B.

1.) On: $HT \leq ST09 - ST10$

Off: $HT > ST09$

To avoid the outlet water temperature out of the operating range, on DHW mode, compressor frequency is regulated to keep the outlet water temperature within the operating range. After DHW temperatures goes up, the unit could not keep the outlet water temperature within the limit, when outlet water temperature is 2°C higher than the maximum outlet water temperature limit. the compressor is switched off and DHW electric heater (installed in the DHW tank) is switched on to take over to heat the DHW up to ST09.

4.3 Room thermostat control set up

By default, the unit on/off is regulated by its inlet water temperature.

It is also possible to regulate the unit via the room temperature with a room temp. thermostat.

Need to connect a potential free thermostat on/off switch signal to the B1-B2 terminal block and change SF14 in service menu to remote.

If SF14 set = "remote". the unit on/off control is taken over by the thermostat and the touch screen can not turn On/Off the heating and no heating schedule On/Off function. when B1-B2 connector is bridged by room temp. thermostat, the unit is switched on and

will go to standby after the buffer tank water temperature reaches set point.
when B1-B2 connector is disconnected by room temp. thermostat, the unit is switched off.

Important: need to set a good thermostat hysteresis to avoid too short running cycle.
The unit needs to run continually at least 20 minutes to permit a defrosting cycle. If the running cycles are always shorter than 20 minutes, the defrosting can not be activated and cause heavily frosted evaporator.

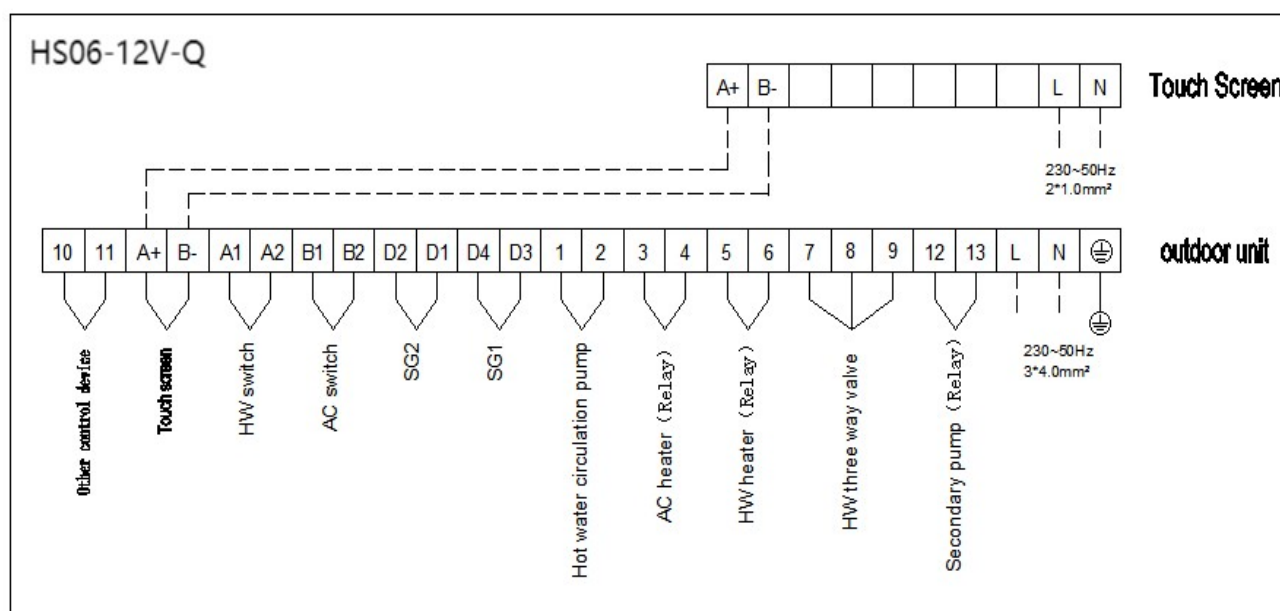
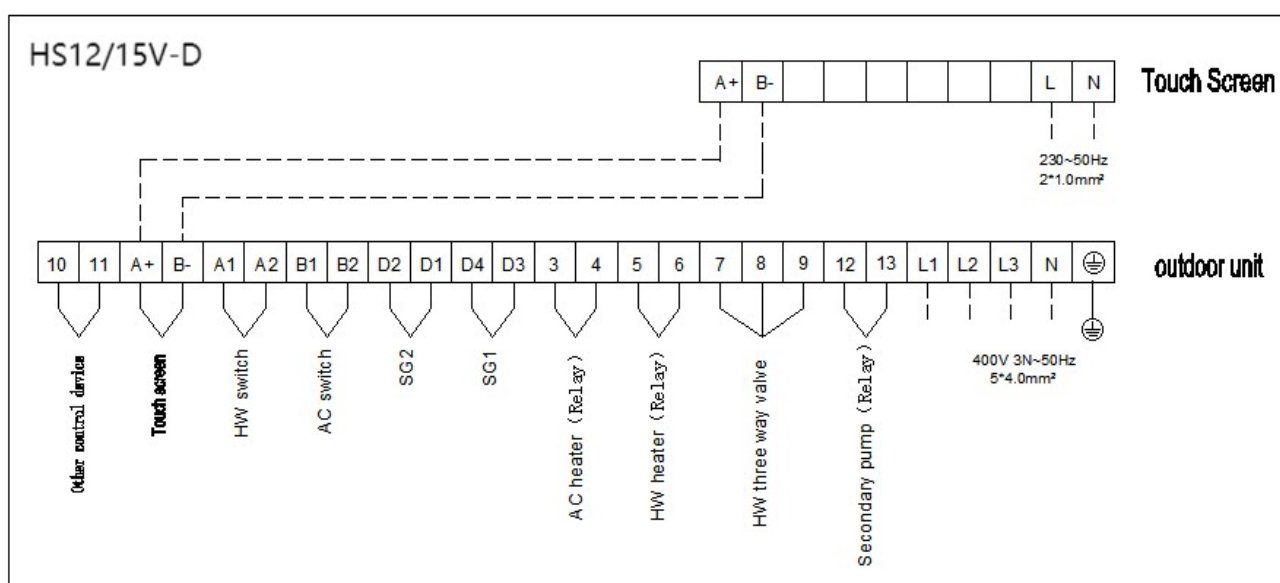
Note

This is a potential free input contact only. DO NOT PUT 230VAC INTO THIS CONTACT

5 Electrical Connections

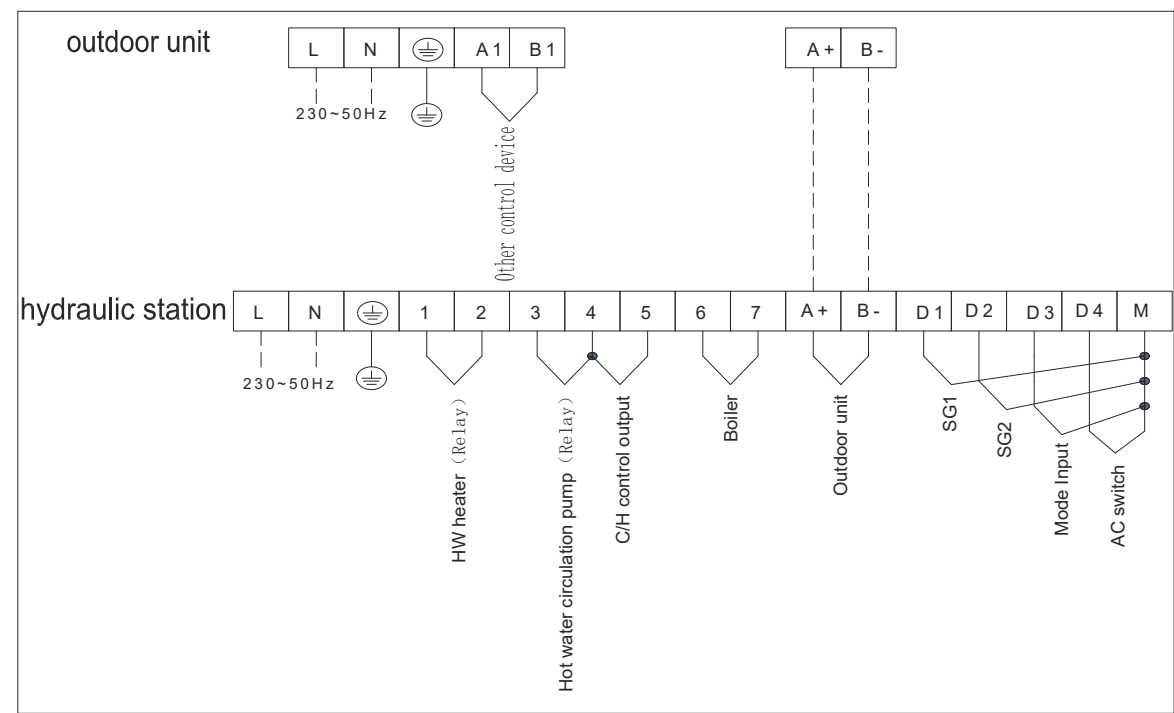
5.1 Terminal diagram

5.1.1 Electric connection overview (without indoor unit)

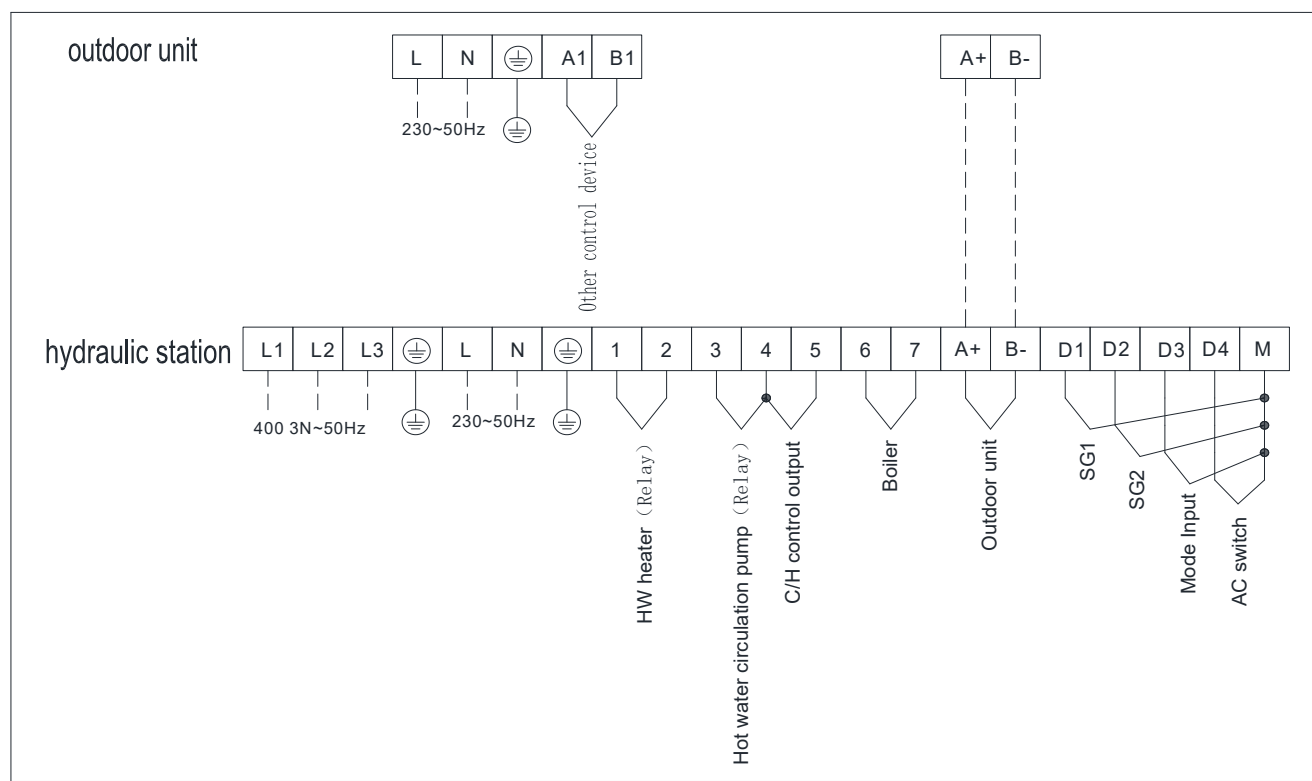


5.1.2 Electric connection overview (with indoor unit):

Single phase outdoor unit and hydraulic station DSK03-QG/DSKB03-QG wiring connection overview:



Single phase outdoor unit and hydraulic station DSK09-DPVTSG wiring connection overview:



Important: Relays must be applied to run the load if the load running current is over 1A.

5.2 Recommended power cables and fuse

5.2.1 For heat pump outdoor units:

Model		CHS06V	CHS08V	CHS10V	CHS12V-Q	CHS15V-Q
Rated voltage	V	220-240V/50Hz 1~/N/PE				
Rated power,Max	KW	2.16	2.86	3.22	4.15	7.10
Rated current ,Max.	A	9.4	12.5	14	18	32
Fuse	A	10	16	16	20	32
power cable with temperature resistance of 90 °C	mm ²	3X4				3X6
indoor/outdoor unit communication cable (A+ B-)	mm ²	2X0.5				
Other control device Modbus communication A1-B1	mm ²	2X0.5				
fuse type		C characteristics, slow blow				

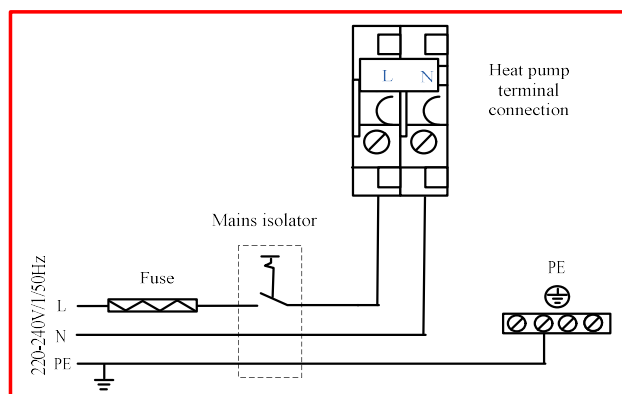
Model		CHS15V-D	CHS22V-D
Rated voltage	V	380-415V/50Hz 3~/N/PE	
Rated power, Max	KW	6.50	6.50
Rated current , Max.	A	11.5	11.5
Fuse	A	13	13
power cable with temperature resistance of 90 °C	mm ²	5X4	
indoor/outdoor unit communication cable (A+ B-)	mm ²	2X0.5	
Other control device Modbus communication A1-B1	mm ²	2X0.5	
fuse type		C characteristics (slow blow), 3-pole switching	

5.2.2 For hydraulic station:

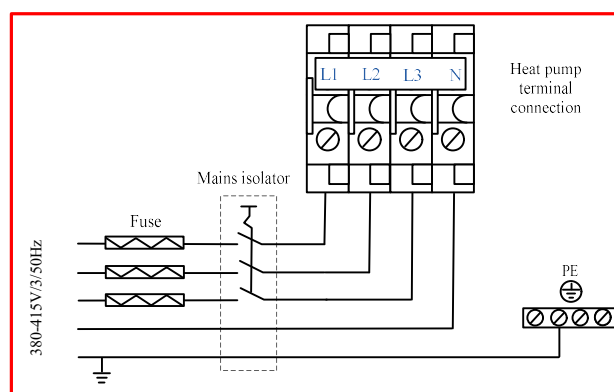
Model		DSK03-QPVTSG	DSK09-DPVTSG
Rated voltage	V	220-240V/50Hz 1~/N/PE	power supply X1: 220-240V/50Hz 1~/N/PE
			power supply X2:380-415V/50Hz 3~/N/PE
Rated power, Max.	KW	3.4	power supply X1:0.3
			power supply X2:9
Rated current, Max.	A	14.8	power supply X1:1.3
			power supply X2:13
Fuse	A	16	power supply X1: 5
			power supply X2:16
power cable with temperature resistance of 90 °C	mm2	3X2.5	power supply X1:3X2.5
			power supply X2:3X2.5
Max. cable length	m	30	
fuse type		B characteristics	
Connector 1-2,3-4,4-5,6-7	mm2	2X1	
connector D1-M,D2-M,D3-M,D4-M	mm2	2X0.5	

5.2 Power Connection

Single phase:



Triple phase:



Before connecting the power supply, please confirm the unit suits the power supply.

- The appliance shall be installed in accordance with national wiring regulations.
- An all pole disconnection device which has at least 3mm clearances in all poles, and have a leakage current that may exceed 10mA, the residual current device (RCD) having a rated residual operating current not exceeding 30mA, and disconnection must be incorporated in the fixed wiring in accordance with the wiring rules.
- The appliance includes an inverter for the variable speed compressor. In case of a fault, inverters can cause DC residual currents. RCDs have to be type B AC/DC-sensitive. A DC residual current can block type A RCDs.
- Breaker protection must be installed according to the max value stated in the nameplate attached to the unit inside of the front panel.
- Make sure to install earth wiring. Do NOT earth the unit to a utility pipe, surge absorber, or telephone earth. Incomplete earth may cause electrical shock.
- The power supply must conform to the specification on the unit's nameplate. The supply voltage must be within the range specified in the electrical data table. For wiring connection, refer to the electric wiring diagram on the inside panel of the unit.
- When the building is equipped with a RCD the heat pump should be equipped with a separate one.
- When installing the earth leakage protector, make sure it is compatible with the inverter (resistant to high frequency electric noise) to avoid unnecessary opening of the earth leakage protector.

IMPORTANT:

During the installation of the unit, first make the water connections and then electrical connections. If the unit is to be removed first disconnect the electrical connections, then the water connections to reduce the chance of an electrical shock.

WARNING:

Disconnect the main power supply switch before servicing the system or handling any internal parts of the unit.

In case of any major malfunction turn the unit off, disconnect the mains power supply and contact a qualified service engineer.

5.3.1 Temperature sensor for hot water only for hydraulic station

The domestic hot water sensor probe should be put into hot water cylinder temperature sensor probe inlet pocket if required.

If the domestic hot water sensor cable runs close to power cables, then a shielded cable should be used. If a conduit is used then it should be sealed to avoid condensation forming in the temperature sensor probe.

Important:

All temperature sensor must be separated (min 200 mm) from high voltage power cables to avoid interference which will cause measured temperature fluctuating and the heat pump may operate incorrectly.

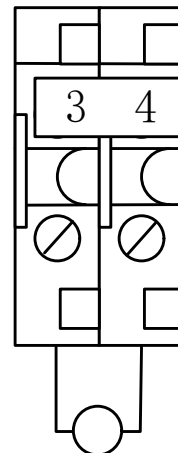
5.3.2 DHW circulation Pump Connection

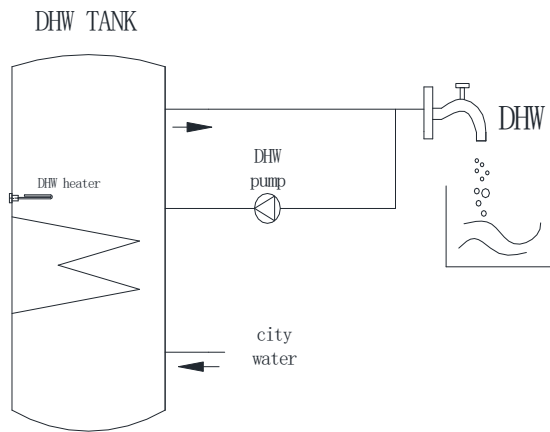
By connecting a DHW pump, instant hot water can be available at the tap.

The DHW pump and the installation are field supply
.The DHW circulation pump power supply should be connected to port (3-4) 230VAC terminal block. If the current could be over 1A, a relay must be adopted.

DHW circulation pump control:

- 1.) when DHW mode is switched on, DHW circulation pump will be switched on and run DHW cir. pump on time in every DHW cir. pump off time interval.
- 2.) when DHW mode is switched off, DHW circulation pump is switched off after 3 minutes' delay.





5.3.3 Boiler

Connector (6-7) potential free contact can be used to activate and de-activate a backup heating device like a boiler (field supply).

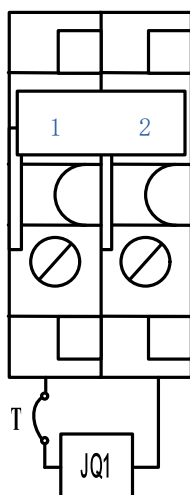
(important: this is potential free contact. do not apply any voltage source to it)

Backup boiler control refer to “System overview” chapter

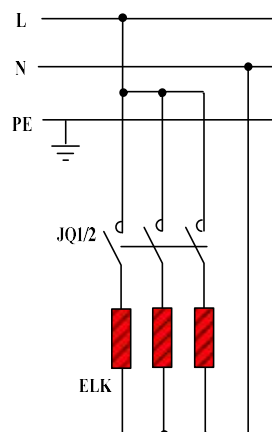
5.3.4 DHW heater

only for hydraulic station

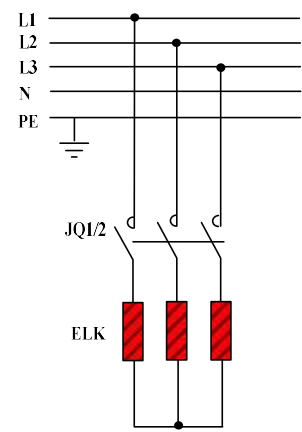
Connector (1-2) 230VAC can be used to activate and de-activate a DHW electric heater (installed in the water tank) for heating domestic hot water heater via a relay JQ (field supply).



(Single phase)



(Triple phase)



(important: do not connect electric heaters directly to the terminal block that could burn the controller)

DHW electric heater (Field supply) control refer to "System overview" chapter

5.3.5 Modbus communication connection (A1-B1) potential free

The A1-B1 potential free contact on the outdoor unit terminal block could be connected to a control device and they could communicate via the Modbus protocol.

5.3.6 Indoor and outdoor unit communication connection (A+ B-)

The A+-B- potential free contact on the outdoor unit terminal block and hydraulic station terminal block should be connected.

5.3.7 Mode input (D3-M) potential free (optional)

The D3-M potential free contact on the hydraulic station / tower terminal block could be connected to a thermostat with mode change signal so the outdoor unit could change running mode as per the thermostat setting.

This function needs to be activated on service menu parameter SF113 Enable mode change input.

5.3.8 Mode output (4-5) 230VAC

The 4-5 contact on the hydraulic station/tower terminal block could be connected to a thermostat with mode change function so the thermostat could change its running mode as per heat pump setting.

4-5 contact output 230V on cooling mode and 0V on heating mode.

If the thermostat mode input needs potential free signal, a relay should be applied.

4-5 terminal signal also could be connected to a 2 way valve to close floor heating circuit on cooling mode if fan coil units are adopted for cooling.

5.3.9 SG READY -Smart Grid

The units are with SG - smart grid label certification from German heat pump association. If there is SG signal or PV system signal, they could be connected to the unit.

This function can only be used in mains networks that support the "SG Ready" standard.

"SG Ready" requires two AUX inputs.

In cases where this function is required, it must be connected to terminal block D1-M and D2-M.

"SG Ready" is a smart form of tariff control, through which your electricity supplier can affect the heating, cooling and hot water temperatures (if applicable) or simply block the the heat pump at certain times of the day.

1.) Connectors D1-M is connected to SG1 and D2-M is connected to SG2 of the electric meter SG signal.

2.) SF217 parameter in Service menu are used to turn on / off unit SG function.

When SG function is set OFF, SG function is invalid.

When SG function is set ON, SG function is valid. "SG mode" display on touch screen. SG1 SG2 signal status display on I/O menu.

1.) SG1=closed, SG2=open: switch off command

Unit has to stop. but anti-freezing function is still valid so water pump could be switched on if anti-freezing circulation is needed.

2.) SG1=open, SG2=open: normal operation.

unit runs in normal program regulation.

3.) SG1=open, SG2=closed: switch-on recommendation: cheap electricity mode;

A) On heating mode, heating control water temperature automatically increase ST17 (SG cool/heat diff. default 2) to store heating energy. but the maximum heating control water temp. is limited by ST14 (max. heating setpoint, default 60).

B.) On DHW mode, DHW control temperature automatically increase ST18 (SG DHW diff. default 5) to store DHW energy. but the maximum DHW control temperature is limited by ST16 (Max. DHW setpoint, default 70).

C) On cooling mode, cooling control water temperature automatically decrease ST17 to store cooling energy. but the minimum cooling control water temp. is limited by ST11 (min. cooling setpoint, default 12).

4.) SG1=closed, SG2=closed: switch-on command; very cheap electricity mode

A) On heating mode, heating control water temperature automatically increase ST17+2 to store more heating energy. but the maximum heating control water temp. is limited by ST14.

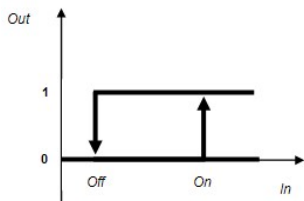
B.) On DHW mode, DHW control temperature automatically increase to ST16 to store maximum DHW energy. DHW electric heater (installed in the water tank) is switched on after compressor stops when DHW temperature reaches ST20 until DHW temperature reaches ST16.

C) On cooling mode, cooling control water temperature automatically decrease ST17-2 to store more cooling energy. but the minimum cooling control water temp. is limited by ST11.

6 System program information

6.1 Unit operation logic

6.1.1 Cooling demand

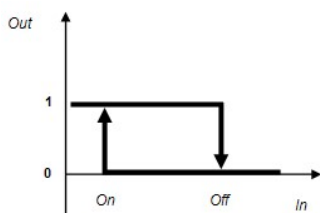


In: RT (buffer tank water temperature)

On: $RT > ST01$ (cooling setpoint)+ $ST03$ (cooling diff.)

Off: $RT < ST01 - 1.5^{\circ}\text{C}$

6.1.2 Heating demand



In: RT

On: $RT < T(\text{heating}) - ST04$ ($T(\text{heating})$ is the control water temperature on heating mode)

Off: $RT > T(\text{heating}) + 2^{\circ}\text{C}$.

T(heating) calculation:

Default $ST02=35$, $ST06=0.6$

1.) When $SF04=\text{No}$, there is no heating curve. $T(\text{heating})=ST02$.

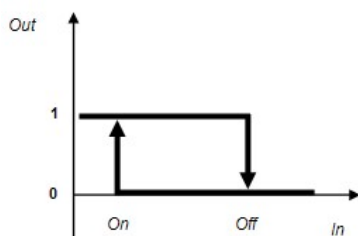
2.) When $SF04=\text{Yes}$, heating curve is activated

$$T(\text{heating}) = ST02 + (20 - OT) \times ST06$$

If calculated $T(\text{heating})$ is higher than $ST14$ (max. heating setpoint), $ST14$ would be $T(\text{heating})$.

Refer to chapter "Heating compensation curve setting".

6.1.3 Domestic hot water demand



In: HT

1.) When $ST09$ (hot water temp. setpoint) $\leq ST20$ (max. DHW temp. made by compressor)

Compressor ON: $HT \leq ST09 - ST10$ (DHW set temp. diff.)

Compressor Off: $HT > ST09$

2.) When $ST09 > ST20$

Compressor On: $HT \leq ST20 - ST10$

Compressor Off: $HT > ST20$

Remarks: when DHW set point ST09 is lower than ST20, only compressor is switched on to produce DHW.

When DHW set point ST09 is higher than ST20, DHW will be heated to ST20 by compressor and then electric heater instead of compressor will be switched on to heat DHW to set point.

6.2 Control process

6.2.1 Turn on process on heating mode

- 1.) Start water pump, check water flow
- 2.) if water flow meet requirement and there is heating demand, start fan and compressor

6.2.2 Turn off process on heating mode

- 1.) Switch off compressor
- 2.) After 5 second's delay, switch off fan motor
- 3.) After 30 seconds' delay, switch off water pump.

6.2.3 Turn on process on cooling mode

- 1.) Start water pump and 4 way valve, check water flow
- 2.) if water flow meet requirement and there is cooling demand, start fan and compressor

6.2.4 Turn off process on cooling mode

- 1.) Switch off compressor
- 2.) After 5 seconds' delay, switch off fan motor
- 3.) After 30 seconds' delay, switch off water pump.
- 4.) After 120 seconds' delay, switch off 4 way valve.

6.2.5 Turn on process on hot water mode

- 1.) start 3 way valve and water pump, check water flow.
- 2.) if water flow meets requirement, start fan and compressor

6.2.6 Turn off process on hot water mode

- 4.) Switch off compressor
- 5.) After 5 seconds' delay, switch off fan motor
- 6.) After 30 seconds' delay, switch off water pump and 3 way valve.

6.2.7 Hot water priority:

- When unit is heating, if there is a call for hot water, it starts 3 way valve at once and turn to hot water mode directly. It will revert back to heating mode after hot water reach set temperature.

- When unit is cooling, if there is a call for hot water, it stops compressor first and then start at hot water mode, it stops compressor again when hot water reach set temperature before it reverts back to cooling mode.

6.2.8 Water pump control

- Circulation pump is switched on when cooling, heating or DHW mode is turned on. Circulation pump continues to run on cooling, heating or DHW mode running.
- When compressor is just turned ON on heating or cooling mode, circulation pump PWM signal output is 100% for the first 3 minutes, and then run PID control
- During defrosting period and 3 minutes after the end of defrosting, circulation pump PWM signal output is 100%.

After circulation pump stops running over 24 hours, circulation pump is switched on and runs 3 minutes. The PWM signal output is 60%. This is to prevent the pump from seizing.

6.2.9 Compressor running control

1.) On cooling mode, when $RT \leq T(\text{cooling}) - 0.5^{\circ}\text{C}$, compressor runs with minimum frequency.

when $RT \leq T(\text{cooling}) - 1.5^{\circ}\text{C}$, after running 10 seconds with minimum frequency, compressor is switched off.

when $ST \leq 7^{\circ}\text{C}$, compressor runs with minimum frequency.

when $ST \geq 8^{\circ}\text{C}$, compressor runs with normal PID control.

2.) On heating mode, when $RT \geq T(\text{heating}) + 0.5^{\circ}\text{C}$, compressor runs with minimum frequency.

when $RT \geq T(\text{heating}) + 2^{\circ}\text{C}$, after running 10 seconds with minimum frequency, compressor is switched off.

3.) DHW running

Compressor runs with outlet water PID control with ST21 (Outlet water temperature DHW PID setup, default 70) as control target.

On DHW running ,when $ST \geq ST21 + 1^{\circ}\text{C}$, compressor runs with min. frequency

6.2.10 4 way valve control

4 way valve is OFF under any of below conditions. It is ON under any other conditions.

1.) Heating mode, hot water mode, or heating + hot water mode

2.) Producing hot water on cooling + hot water mode.

6.2.11 Auxiliary Electric backup heater control

Auxiliary backup heater or boiler only could be switched on when all of conditions below are met.

1.) Heating mode running and compressor has been running with the maximum workable frequency.;

2.) Compressor has run over 300s

3.) $OT \leq ST07$;

4.) $RT \leq T(\text{heating}) - ST04 - 2$;

Auxiliary backup heater or boiler is switched off when any of conditions below is met.

- 1.) A/C flow alarm.
- 2.) $RT \geq T(\text{heating}) - 2$;
- 3.) unit is switched off

6.2.12 Crankcase heater running control

When all of conditions below are met, compressor crankcase heater is switched on

- 1.) Compressor is OFF;
- 2.) $OT \leq 10^{\circ}\text{C}$

When any of conditions below is met, compressor crankcase heater is switched off

- 1.) Compressor is ON;
- 2.) $OT \geq 11^{\circ}\text{C}$

6.2.13 3 way valve control

3 way valve is ON when there is DHW demand. Otherwise, it is OFF.

6.2.14 DHW circulation pump control

- 1.) when DHW mode is switched on, DHW circulation pump will be switched on and run ST34 in every ST33 interval.
- 2.) when DHW mode is switched off, DHW circulation pump is switched off after 3 minutes' delay.

6.2.15 DHW electric heater control

- 1.) If $ST09 < ST20$, DHW is only heated by compressor.
- 2.) If $ST09 > ST20$, compressor stops heating DHW after $HT \geq ST20$, DHW electric heater is switched on until $HT \geq ST09$.
- 3.) If the unit with fault and there is DHW demand, DHW heater is switched on until $HT \geq ST09$
- 4.) DHW heater is switched on to kill bacteria until $HT \geq ST27$ (DHW bacteria killing temp.), if HT is not over ST27 in ST26 time interval. If $ST26=0$, bacteria killing function is not valid. by default $ST26=0$ hours.

6.2.16 De-icing heater running control

When all of conditions below are met, de-icing heater is switched on

- 1.) Compressor is ON;
- 2.) Heating or DHW mode running
- 3.) Ambient temperature $OT \leq DF15$

When any of conditions below is met, de-icing heater is switched off

- 1.) Compressor is OFF;
- 2.) Ambient temperature $OT > DF15 + 2$;

6.2.17 Defrosting control

The unit is equipped with hot gas defrosting. When the conditions of defrosting are met,

- 1.) compressor speed begins to go down.

- 2.) After compressor speed reduces to 30Hz and last 60 seconds, 4 way valve is switched on, fan motor is switched off and it begins to count defrosting time . the hot gas flows out to the finned coil heat exchanger .

- 3.) 10 seconds after 4 way valve is switched on , compressor speed increases to rated cooling speed.

- 4.) When $HPS \geq DF13$,fan motor is switched on and runs in CN02 speed for 10 seconds to blow down the condensed water.

- 5.) After the conditions of ending defrosting is met, compressor speed reduces and it stop counting defrost time.

- 6.) After compressor reduces to 30Hz and last 10 seconds, 4 way valve is switched off and fan motor is switched on. The hot gas flows into brazed plate heat exchanger and the unit returns to heating mode operation.

- 7.) 60 seconds after 4 way valve is switched off, compressor recovers to run with the speed as PID control.

Defrosting mode activation conditions one (all must be met)

- a.) The unit running time after previous defrosting $\geq DF06$

- b.) Temperature differential $OT \text{ minus } LPS \geq \Delta T$ and last DF05 time .

$\Delta T = DF04 - 4 * (CM15 - CMF) / (CM15 - CM16)$, CMF is current compressor running frequency

- c.) $LPS \leq DF02$ and last DF11 time.

- d.) Compressor has run more than 5 minutes.

- e.) Ambient temperature $OT < DF03$

Defrosting mode activation conditions two (all must be met)

- f.) The accumulated compressor running time is over DF16 after $LPS \leq DF02$ and compressor has run more than 5 minutes.

When any of above condition one or two are met, unit will start to defrost.

Defrosting ends condition (any of the following conditions is met)

- A.) High pressure $HPS \geq AR33$ and last 5 seconds.

- B.) $HPS \geq DF09$ and last 10 seconds

- C.) AL17 alarm

- D.) $ST \leq 7^{\circ}\text{C}$ and last 5 seconds.

- E.) Defrost time $\geq DF10$

6.2.18 Automatic optimizing defrosting parameter data

Optimization solution one (if the last defrosting is activated by condition one as above)

1.) if previous defrosting time is less than 3 minutes and defrosting is terminated by above condition A or B. It means that there is little frost on the evaporator when unit start defrosting. Then on the next time defrosting, DF04 will add 1°C. After this optimization, next time defrosting will be activated a little later.

2.) if previous defrosting time is between 3 to 5 minutes, on next time defrosting, DF04 does not change.

3.) if previous defrosting time is over 5 minutes and defrosting is terminated by above condition A or B. If on previous defrosting activation, DF06 is the last condition to meet, then DF04 does not change in next defrosting. Otherwise, DF04 value will reduce 1°C in next defrosting.

4.) DF04 optimized valued is limited by its max setting and min setting value.

Optimization solution two (if the last defrosting is activated by condition two mentioned above)

1.) if previous defrosting time is less than 3 minutes and defrosting is terminated by above condition A or B. It means that there is little frost on the evaporator when unit starts defrosting. Then on the next time defrosting, DF16 will add 10 minutes. After this optimization, next time defrosting will be activated a little later.

2.) if previous defrosting time is between 3 to 5 minutes, on next time defrosting, DF16 does not change.

3.) if previous defrosting time is over 5 minutes and defrosting is terminated by above condition A or B. It means that there is too much frost on the evaporator when the previous defrosting is activated. DF16 value will reduce 10 minutes in next defrosting. After this optimization, next time defrosting will be activated a little earlier.

1.) DF16 optimized valued is limited by its max setting and min setting value.

6.3 System parameter list

Input password to access service parameter list.

Para.	Descriptions	De- fault	Min.	Max.	Unit	Res
EV03	set Inlet/outlet temp. diff .cooling :ΔT of heat pump inlet and outlet to control primary pump speed on cooling mode	5	1	10	°C	0.1
EV04	set Inlet/outlet temp. diff. heating :ΔT of heat pump inlet and outlet to control primary pump speed on heating mode	5	1	10	°C	0.1
EV05	pump Max. speed	100%	0%	100%	0.1%	0.1

EV06	pump Min. speed : Could be adjusted as per the circuit pressure drop. But need to meet minimum flow rate of the heat pump unit as per type plate.	70%	0%	100%	0.1%	0.1
SF05	Enable domestic hot water function : Could be set to OFF if no DHW function.	ON	ON or OFF			
SF223	Air purge : use to purge system air bubble during test run	OFF	ON or OFF			
SF14	Heating/cooling On/Off way	Keyboard	Keyboard or remote			
DF04	Defrost temperature diff.	8	8	20	°C	0.1
DF06	Defrost minimum interval	30	15	90	Min	1
DF09	Defrost end condensation temp.	35	5	60	°C	0.1
DF16	Force defrost time	180	60	180	Min.	1
AR04	Primary pump alarm delay	120	1	120	s	1
ST03	Temp diff. Cooling : ΔT on cooling mode	2	1	10	°C	0.1
ST04	Temp. diff. Heating : ΔT on heating mode	2	1	10	°C	0.1
ST08	Cooling curve factor	0.6	0.1	3	-	0.1
ST06	Heating curve factor	0.6	0.1	3	-	0.1
ST17	SG cool/heat diff.	2	1	10	°C	0.1
ST18	SG DHW diff.	5	1	10	°C	0.1
ST26	Disinfect time : the interval to heat DHW up to 65°C to kill bacterial. If no DHW tank fitted or no need disinfection, set to 0.	360	0	1000	h	0.1
ST10	Temp. diff. DHW : ΔT on DHW mode	3	1	10	°C	0.1
SF217	SG function : set ON if Smart grid function is needed.	OFF	ON or OFF			
SF219	Display heat meter	YES	YES or NO			
SF220	Pump mode : continuous – primary pump will run when heating/cooling switch is turned on. regulated - primary pump ON when compressor ON, OFF when compressor OFF	continuous	continuous or regulated			
SF221	Current limit enable	OFF	ON or OFF			
SF222	disable force defrost	OFF	ON or OFF			
ST07	Back up heater external setup	0	-20	20	°C	0.1
CM200	Comp. max. freq. night mode					
CN200	Fan max. speed night mode					

SF225	Back up heater capacity : set in the factory for calculating power consumption for energy management system		
SF226	DHW heater capacity :Hydraulic tower is set in the factory for calculating power consumption for energy management system . :Hydraulic station, as the DHW heater is fitted on site, installer need to set this parameter as per the real DHW tank heater capacity.		
SF200	With an I/O board :set by factory to yes for the units with hydraulic station /tower :set by factory to No for the units without hydraulic station /tower	YES	YES or NO
SF224	Enable gas boiler :set to YES if a boiler is fitted; otherwise, set to NO		
SF200	Boiler external setup : set by installer as per the requirement		
SF201	Boiler takeover external setup : set by installer as per the requirement		

7 Information on servicing

7.1 Security check

1) Checks to the area

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. For repair to the refrigerating system, the following precautions shall be complied with prior to conducting work on the system.

2) Work procedure

Work shall be undertaken under a controlled procedure so as to minimise the risk of a flammable gas or vapour being present while the work is being performed.

3) 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.

4) 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 flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

5) 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 CO2 fire extinguisher adjacent to the charging area.

6) No ignition sources

No person carrying out work in relation to a refrigeration system which involves exposing any pipe work that contains or has contained flammable refrigerant 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 flammable 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.

7) Ventilated area

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.

8) 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;
- Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
- 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.

9) 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 there no live electrical components and wiring are exposed while charging, recovering or purging the system;
- That there is continuity of earth bonding.

7.2 Device maintenance

7.2.1 Repairs to sealed components

1) During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently

operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

2) Particular attention shall be paid to the following to ensure that by working on electrical

components, the casing is not altered in such a way that the level of protection is affected.

This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

Ensure that apparatus is mounted securely.

Ensure that seals or sealing materials have not degraded such that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.

NOTE: The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

7.2.2 Repair to intrinsically safe components

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring

that this will not exceed the permissible voltage and current permitted for the equipment in use.

Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.

Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

7.2.3 Cabling

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

7.2.4 Detection of flammable refrigerants

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

7.2.5 Leak detection methods

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants.

Electronic leak detectors shall be used to detect flammable refrigerants, but the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed and the appropriate percentage of gas (25 % maximum) is confirmed.

Leak detection fluids are suitable for use with most refrigerants but the use of

detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

If a leak is suspected, all naked flames shall be removed/ extinguished.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.

7.2.6 Removal and evacuation

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, it is important that best practice is followed since flammability is a consideration. The following procedure shall be adhered to:

- Remove refrigerant;
- Purge the circuit with inert gas;
- Evacuate;
- Purge again with inert gas;
- Open the circuit by cutting or brazing.

The refrigerant charge shall be recovered into the correct recovery cylinders. The system shall be “flushed” with OFN to render the unit safe. This process may need to be repeated several times. Compressed air or oxygen shall not be used for this task.

Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and

finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place.

Ensure that the outlet for the vacuum pump is not close to any ignition sources and there is ventilation available.

7.2.7 Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept upright.
- Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigeration system.

Prior to recharging the system it shall be pressure tested with OFN. The system shall be leak tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

7.2.8 Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar

with the equipment and all its detail. It is recommended good practice that all refrigerants

are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant. It is essential that electrical power is available before the task is commenced.

- a) Become familiar with the equipment and its operation.
- b) Isolate system electrically.
- c) Before attempting the procedure ensure that:
 - Mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - All personal protective equipment is available and being used correctly;
 - The recovery process is supervised at all times by a competent person;
 - Recovery equipment and cylinders conform to the appropriate standards.
- d) Pump down refrigerant system, if possible.
- e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- f) Make sure that cylinder is situated on the scales before recovery takes place.
- g) Start the recovery machine and operate in accordance with manufacturer's instructions.

- h) Do not overfill cylinders. (No more than 80 % volume liquid charge).
- i) Do not exceed the maximum working pressure of the cylinder, even temporarily.
- j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- k) Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

7.2.9 Labelling

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

7.2.10 Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding

the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.

The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant Waste Transfer Note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be

employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

8 Commissioning and Adjusting

Preparations- Filling and Flushing

1. Before commissioning, ensure the whole system has been properly flushed and filled with water.
2. Check the pipe work system for leaks.
3. The heating system is filled with water and inhibitor to the required pressure between 100-200 kPa or 15-30PSI.
4. Vent air out the system using the air venting valves.

Compressor crankcase heater

- The unit is equipped with a compressor crankcase heater which heats the compressor oil and evaporates the dissolved refrigerant before start-up when outdoor temperature is low.
- The unit must be in the standby state for 6-8 hours before the unit is switched on for the first time. This is so the compressor crankcase heater has the compressor oil at the correct temp before the FIRST start, this will ensure no damage is done to the compressor on start up.

Start-up and Inspection

1. Turn the isolator switch on.

Note:

Ensure that the heating control system is in the off position first.

2. The compressor oil heater must have been operational for at least 6–8 hours before a compressor start can be initiated.
3. Start the unit by turning on the heating control system and therefore switching on the unit.
4. The water pump will start, then fan motor, and finally the compressor.

Air in the System after Start-up

- Air will initially be released from the water as its heated and further venting may be required.

- If a bubbling sound can be heard from the heat pump, the circulation pump, under-floor and or radiators then the entire system will require further venting.
- When the system is stable (correct pressure and all air eliminated) the automatic heating control system can be set as required.

9 Inspection and maintenance work

Outdoor unit

#	Maintenance work	Interval
1	Checking the protective zone	Annually
2	Cleaning the product	Annually
3	Checking the evaporator, fan and condensate discharge	Annually
4	Checking the refrigerant circuit	Annually
5	Checking the electrical connections and electrical wires	Annually
6	Check the shock absorbers for wear	Annually after the first 3 years

Hydraulic Module when in possession

1	Checking the pre-charge pressure of the expansion vessel	Annually
2	Check that the 3 way valve can move easily (visually/audibly)	Annually
3	Checking the electronics boxes, removing dust	Annually
4	Cleaning the buffer tank	Annually

Hydraulic tower when in possession

1	Checking the pre-charge pressure of the expansion vessel	Annually
2	Check that the 3 way valve can move easily (visually/audibly)	Annually
3	Checking the electronics boxes, removing dust	Annually
4	Cleaning the buffer tank and domestic hot water cylinder	Annually

10 Commissioning Form

Commissioning Form			
Client / Installation address:		Telephone Number	
Installer:		Commissioned by	
Heat pump Model:		Heat pump serial number:	
Commissioning date:			
The heating system has been filled and pressure tested			YES ()
Expansion vessel for heating is sized, fitted & charged in accordance with manufacturer's instructions			YES ()
The heat pump is fitted on a solid/stable surface capable of taking its weight			YES ()
The system has been flushed and cleaned in accordance with BS7593 and heat pump manufacturer's instructions			YES ()
What system cleaner was used?			
What inhibitor was used?			Qty:() litres
Are all exposed external pipeworks insulated?			YES ()
Central heating mode (10 minutes after compressor start to run)			
Is buffer tank installed			Capacity:() litres
Inlet	() °C	discharge	() °C
outlet	() °C	suction	() °C
ambient	() °C	HP	() bar
Power voltage	() V	Current	() A
LP	() bar	Power voltage	() V
Domestic hot water mode (10 minutes after compressor start to run)			
Is a hot water cylinder installed	Capacity:() litres Heating coil diameter () mm, length () m		
Inlet	() °C	discharge	() °C
outlet	() °C	suction	() °C
ambient	() °C	HP	() bar
hot water	() °C	Current	() A
LP	() bar	Power voltage	() V
Additional heat sources connected: Gas Boiler () Oil Boiler () Electric Heater () Solar Thermal ()			YES ()
The heating, hot water and ventilation systems complies with the appropriate Building Regulations			YES ()
All electrical work complies with the appropriate Regulations			YES ()
The heat pump and associated products have been installed and commissioned as the manufacturer's instructions			YES ()
The operation of the heat pump and system controls have been demonstrated to the customer			YES ()
The operation, installation and maintenance manual has been explained and left with the customer			YES ()
Commissioning Engineer's Signature			
Customer's Signature (To confirm demonstration of equipment and receipt of appliance instructions)			

11 Maintenance

To ensure the optimal performance of the unit regular maintenance is essential. Failure to undertake regular maintenance can reduce the unit performance and of the system shorten the life of the unit.

Exterior Maintenance

1. Make regular checks throughout the year that the inlet grill is not blocked or clogged by leaves, snow or anything else.
2. Ensure during the colder times of the year that there isn't too much frost or ice building up on or around the unit.
3. Periodically inspected for loose, damaged or broken parts. If these faults are found and not eliminated, the unit could cause physical injury and damage to people, goods and property.
4. Regularly carry out leak checks and immediately repair any leak found. If there is a leak in the plate heat exchanger, this part must be replaced.

Unit Refrigerant Checks

1. Verify the air grills are clear and clean it at least once a year, or more often if the equipment environment is especially demanding, this ensures that the unit's performance can be maintained.
2. Check the operation of the high-pressure and low pressure transducers. Replace them if there is a fault.
3. Check the fouling of the filter (by checking the temperature difference in the copper piping). Replace it if necessary.

Full-load operating test verify the following values:

- A. Compressor high-pressure side discharge pressure
- B. Compressor low-pressure side suction pressure
- C. Verify the charge status by checking the super heat and sub-cooling.
- D. Temperature difference between the heat exchanger water inlet and outlet temperature
- E. Actual liquid sub-cooling, overheating at the expansion device on heat pumps verify correct defrost of the air heat exchanger

If there is not enough refrigerant in the system, the unit will have poor performance.

If the low refrigerant charge is significant, the suction pressure drops, then the compressor suction superheat will also be high.

Find the leak and completely drain the system with a refrigerant recovery unit. Carry out the repair, leak test and then recharge the system.

Note:

After the leak has been repaired, the circuit must be tested, without exceeding the maximum low-side operating pressure shown on the unit name plate.

The refrigerant must always be recharged in the liquid state into the liquid line.

The refrigerant cylinder must always contain at least 10% of its initial charge.

For the refrigerant quantity per unit, refer to the data on the unit name plate.

Verify the Alarm Status

1. Check the alarm menu when the unit is in the standby mode to see if any alarms or warning have occurred.

Electrical Maintenance

1. Check for correct termination tension of the electrical connections, contactors, isolation switch and transformer.
2. Check the condition of the contactors, fuses and capacitors,
3. Check the condition of the electrical cables and their insulation.
4. Carry out an operating test of tray de-icing heater, compressor oil heater, refrigerant valve and expansion device.
5. Check the phase/earth insulation of the compressors, fans and pumps.
6. Check the compressor, fan and pump winding status.

Mechanical Maintenance

1. Check the tension of the fan motor, fan wheel, compressor and control box fixing bolts.
2. Check that no water has penetrated into the control box.

Evaporator Coil

It is recommended that the finned coils are inspected regularly to check the degree of fouling. This depends on the environment where the unit is installed, areas by the sea can cause increase corrosion and an approved sprayed film coating is recommended.

For coil cleaning proceed as follows:

1. Remove fibre and dust collected on the evaporator face with a soft brush (or vacuum cleaner).
2. Clean the coil with the appropriate cleaning agents

Water Circuit Checks

2. Clean the water filter if fitted.

- 3.Purge the system to remove any air.
- 4.Check the status of the thermal piping insulation.
- 5.Check the water flow by checking the water inlet and outlet temperature difference.
- 6.Check the concentration of the anti-freeze protection solution (ethylene glycol or polyethylene glycol).
- 7.Check the status of the heat transfer fluid or the water quality.
- 8.Check the expansion tank for signs of excessive corrosion or gas pressure loss and replace it, if necessary.
- 9.Check that the pressure release valve is not leaking
- 10.Check that the air vent valves are not leaking system water

12 Temperature and sensor resistance table

Except B5 PT sensor, the other sensors are NTC10K.

R25 : 10.0 kΩ±1% B25/50: 3470K±1%

T (°C)	Rmin [KΩ]	Rnom [KΩ]	Rmax [KΩ]
-29	117.0	121.1	125.3
-28	110.8	114.6	118.6
-27	105.0	108.6	112.2
-26	99.48	102.8	106.3
-25	94.33	97.47	100.7
-24	89.49	92.42	95.44
-23	84.92	87.66	90.47
-22	80.62	83.17	85.80
-21	76.56	78.95	81.39
-20	72.74	74.96	77.25
-19	69.12	71.20	73.33
-18	65.71	67.66	69.65
-17	62.50	64.31	66.17
-16	59.54	61.15	62.88
-15	56.58	58.16	59.78
-14	53.86	55.34	56.85
-13	51.29	52.67	54.09
-12	48.86	50.15	51.47
-11	46.56	47.77	49.00
-10	44.38	45.51	46.66
-9	42.32	43.37	44.45
-8	40.36	41.35	42.36
-7	38.51	39.43	40.37
-6	36.75	37.62	38.49
-5	35.09	35.89	36.72
-4	33.51	34.26	35.03
-3	32.01	32.71	33.43
-2	30.59	31.24	31.91
-1	29.23	29.85	30.48
0	27.95	28.53	29.11

1	26.73	27.27	27.81
2	25.57	26.07	26.58
3	24.47	24.94	25.41
4	23.42	23.86	24.30
5	22.42	22.83	23.25
6	21.47	21.86	22.24
7	20.57	20.93	21.29
8	19.71	20.04	20.38
9	18.89	19.20	19.52
10	18.11	18.40	18.69
11	17.37	17.64	17.91
12	16.66	16.91	17.16
13	15.98	16.22	16.45
14	15.34	15.56	15.78
15	14.72	14.93	15.13
16	14.13	14.32	14.51

17	13.57	13.75	13.93
18	13.04	13.20	13.37
19	12.53	12.68	12.83
20	12.04	12.18	12.32
21	11.57	11.70	11.84
22	11.13	11.25	11.37
23	10.70	10.81	10.93
24	10.29	10.40	10.50
25	9.900	10.00	10.10
26	9.522	9.621	9.721
27	9.160	9.259	9.359
28	8.814	8.931	9.012
29	8.483	8.581	8.680
30	8.166	8.264	8.362
31	7.863	7.960	8.058
32	7.573	7.669	7.766
33	7.295	7.391	7.487
34	7.029	7.123	7.219
35	6.774	6.868	6.962
36	6.529	6.622	6.716
37	6.295	6.387	6.479
38	6.071	6.161	6.253
39	5.855	5.945	6.035
40	5.649	5.737	5.826
41	5.451	5.538	5.626
42	5.260	5.347	5.433
43	5.078	5.163	5.249
44	4.903	4.987	5.071
45	4.735	4.817	4.900
46	4.573	4.654	4.736
47	4.418	4.498	4.579
48	4.269	4.348	4.427
49	4.126	4.203	4.282
50	3.988	4.064	4.141
51	3.855	3.930	4.007
52	3.728	3.802	3.877
53	3.606	3.678	3.752
54	3.488	3.559	3.632
55	3.374	3.445	3.516
56	3.265	3.334	3.404
57	3.160	3.228	3.297
58	3.059	3.126	3.194
59	2.962	3.027	3.094
60	2.868	2.933	2.998
61	2.778	2.841	2.905
62	2.691	2.753	2.816
63	2.607	2.668	2.730
64	2.526	2.586	2.647
65	2.448	2.507	2.567
66	2.373	2.431	2.490
67	2.301	2.357	2.415
68	2.231	2.287	2.343

69	2.164	2.218	2.274
70	2.098	2.152	2.207
71	2.036	2.088	2.142
72	1.975	2.027	2.080
73	1.917	1.976	2.019
74	1.860	1.910	1.961
75	1.806	1.855	1.904
76	1.753	1.801	1.851
77	1.702	1.749	1.797
78	1.653	1.699	1.746
79	1.606	1.651	1.697
80	1.560	1.604	1.650
81	1.515	1.599	1.603
82	1.472	1.515	1.559
83	1.431	1.473	1.516
84	1.391	1.432	1.474
85	1.352	1.392	1.434
86	1.315	1.354	1.395
87	1.278	1.317	1.357
88	1.243	1.282	1.321
89	1.209	1.247	1.285
90	1.177	1.213	1.251
91	1.145	1.181	1.218
92	1.114	1.150	1.186
93	1.084	1.119	1.155
94	1.055	1.089	1.125
95	1.027	1.061	1.095
96	1.000	1.033	1.067
97	0.974	1.006	1.039
98	0.948	0.9801	1.013
99	0.9234	0.9548	0.9873
100	0.8994	0.9303	0.9621
101	0.8762	0.9065	0.9378
102	0.8537	0.8834	0.9141
103	0.8318	0.8611	0.8912
104	0.8106	0.8393	0.8689
105	0.7901	0.8182	0.8473
106	0.7270	0.7806	0.8378
107	0.7085	0.7611	0.8173
108	0.6906	0.7422	0.7974
109	0.6732	0.7239	0.7781
110	0.6563	0.7061	0.7594
111	0.6399	0.6888	0.7411
112	0.6240	0.6720	0.7235
113	0.6086	0.6557	0.7063
114	0.5936	0.6399	0.6896
115	0.5791	0.6246	0.6733
116	0.5650	0.6096	0.6576
117	0.5513	0.5951	0.6422
118	0.5380	0.5810	0.6273
119	0.5250	0.5674	0.6128
120	0.5125	0.5541	0.5988

Only for PT sensor

R25=50K Ω ±2% B25/50=3950K ±2%

T (°C)	Rmin [K Ω]	Rnom [K Ω]	Rmax [K Ω]
-20	441.8	471.5	503.0
-19	417.9	445.5	474.7
-18	395.5	421.1	448.2
-17	374.4	398.2	423.4
-16	354.5	376.7	400.0
-15	335.8	356.4	378.1
-14	318.2	337.4	357.5
-13	301.6	319.4	338.1
-12	286.0	302.6	319.9
-11	271.3	286.7	302.8
-10	257.4	271.7	286.7
-9	244.3	257.6	271.5
-8	232.0	244.3	257.3
-7	220.3	231.8	243.8
-6	209.3	220.0	231.1
-5	198.9	208.8	219.2
-4	189.1	198.3	207.9
-3	179.8	188.4	197.3
-2	171.0	179.0	187.3
-1	162.7	170.1	177.8
0	154.8	161.7	168.9
1	147.4	153.8	160.5
2	140.4	146.3	152.5
3	133.7	139.2	145.0
4	127.4	132.5	137.8
5	121.4	126.2	131.1
6	115.7	120.2	124.8
7	110.4	114.5	118.7
8	105.3	109.1	113.0
9	100.4	104.0	107.6
10	95.84	99.14	102.5
11	91.49	94.55	97.68
12	87.35	90.20	93.09
13	83.43	86.06	88.74
14	79.70	82.14	84.62
15	76.16	78.42	80.71
16	72.80	74.88	77.00
17	69.60	71.53	73.48
18	66.55	68.34	70.14
19	63.66	65.31	66.97
20	60.91	62.42	63.96
21	58.28	59.69	61.09
22	55.79	57.08	58.38
23	53.42	54.60	55.79
24	51.15	52.24	53.34

T (°C)	Rmin [KΩ]	Rnom [KΩ]	Rmax [KΩ]
25	49.00	50.00	51.00
26	46.87	47.86	48.86
27	44.83	45.83	46.83
28	42.90	43.89	44.89
29	41.06	42.05	43.04
30	39.31	40.29	41.27
31	37.64	38.61	39.59
32	36.05	37.01	37.98
33	34.54	35.49	36.45
34	33.10	34.03	34.98
35	31.72	32.65	33.58
36	30.41	31.32	32.25
37	29.16	30.06	30.97
38	27.97	28.85	29.75
39	26.83	27.70	28.59
40	25.74	26.60	27.48
41	24.70	25.55	26.41
42	23.71	24.54	25.39
43	22.77	23.58	24.42
44	21.86	22.67	23.49
45	21.00	21.79	22.60
46	20.18	20.95	21.74
47	19.39	20.15	20.93
48	18.64	19.38	20.15
49	17.91	18.64	19.40
50	17.23	17.94	18.68
51	16.57	17.27	17.99
52	15.94	16.62	17.33
53	15.33	16.00	16.70
54	14.75	15.41	16.10
55	14.20	14.85	15.51
56	13.67	14.30	14.96
57	13.16	13.78	14.42
58	12.68	13.28	13.91
59	12.21	12.80	13.42
60	11.76	12.34	12.95
61	11.34	11.90	12.49
62	10.92	11.48	12.06
63	10.53	11.07	11.64
64	10.15	10.69	11.24
65	9.791	10.31	10.86
66	9.444	9.953	10.48
67	9.110	9.608	10.13
68	8.790	9.277	9.786
69	8.483	8.959	9.457
70	8.187	8.653	9.141
71	7.904	8.359	8.837
72	7.632	8.077	8.544
73	7.370	7.805	8.262

T (°C)	Rmin [KΩ]	Rnom [KΩ]	Rmax [KΩ]
74	7.119	7.544	7.991
75	6.877	7.293	7.731
76	6.645	7.051	7.480
77	6.421	6.819	7.238
78	6.207	6.595	7.005
79	6.000	6.380	6.781
80	5.801	6.173	6.565
81	5.610	5.973	6.357
82	5.426	5.781	6.157
83	5.249	5.596	5.963
84	5.078	5.418	5.777
85	4.914	5.246	5.598
86	4.756	5.080	5.424
87	4.604	4.921	5.258
88	4.457	4.767	5.096
89	4.316	4.619	4.941
90	4.180	4.476	4.791
91	4.048	4.338	4.647
92	3.922	4.205	4.507
93	3.800	4.077	4.372
94	3.682	3.953	4.242
95	3.569	3.833	4.116
96	3.459	3.718	3.995
97	3.354	3.607	3.877
98	3.252	3.499	3.764
99	3.153	3.395	3.655
100	3.058	3.295	3.549
101	2.967	3.198	3.447
102	2.878	3.105	3.348
103	2.792	3.014	3.252
104	2.710	2.927	3.160
105	2.630	2.842	3.070
106	2.553	2.760	2.984
107	2.478	2.681	2.900
108	2.406	2.605	2.819
109	2.337	2.531	2.740
110	2.269	2.460	2.665
111	2.204	2.390	2.591
112	2.141	2.323	2.520
113	2.080	2.259	2.451
114	2.022	2.196	2.384
115	1.964	2.135	2.320
116	1.909	2.076	2.257
117	1.856	2.019	2.196
118	1.804	1.964	2.137
119	1.754	1.911	2.080
120	1.705	1.859	2.025

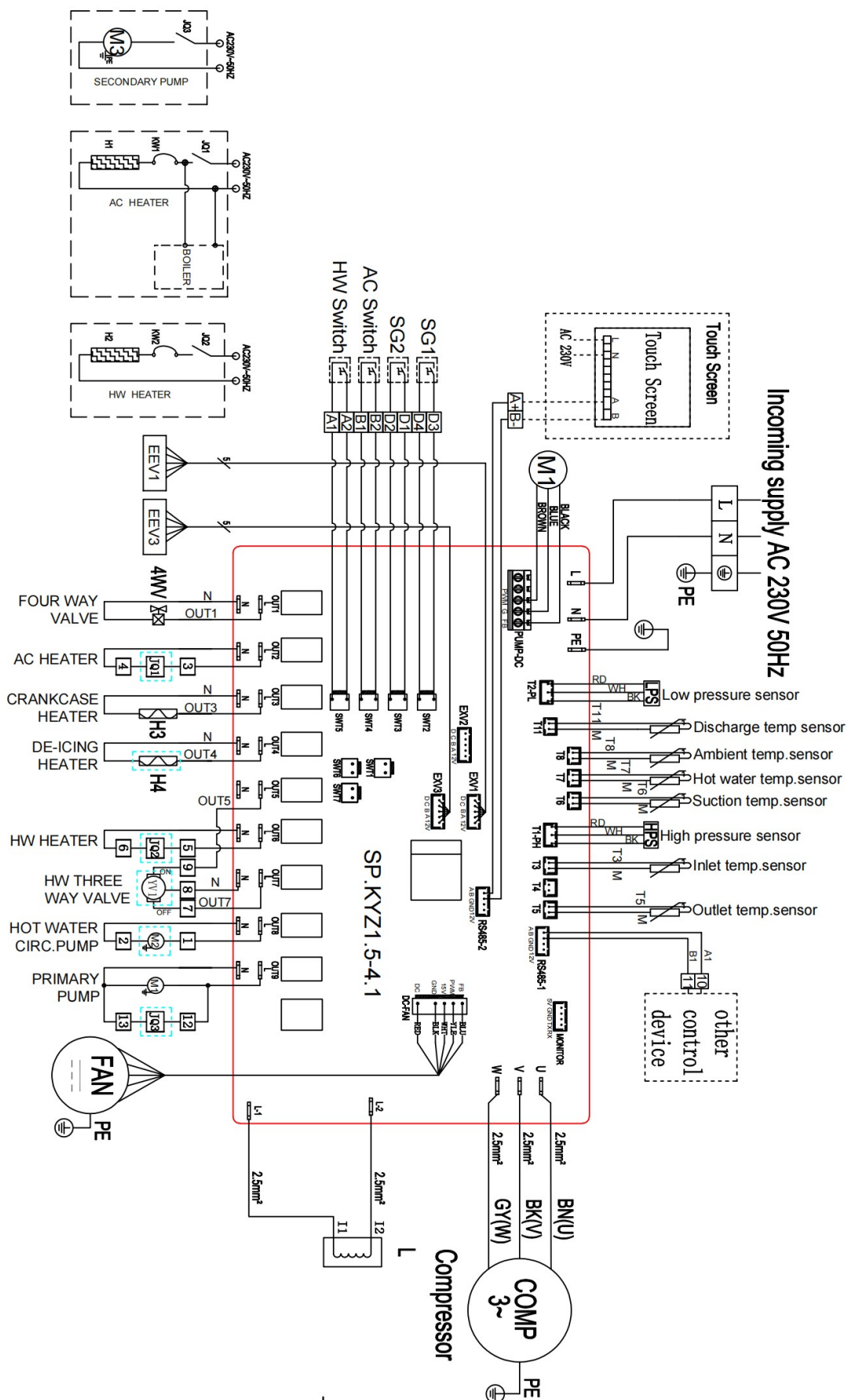
13 Disposal and Recycling

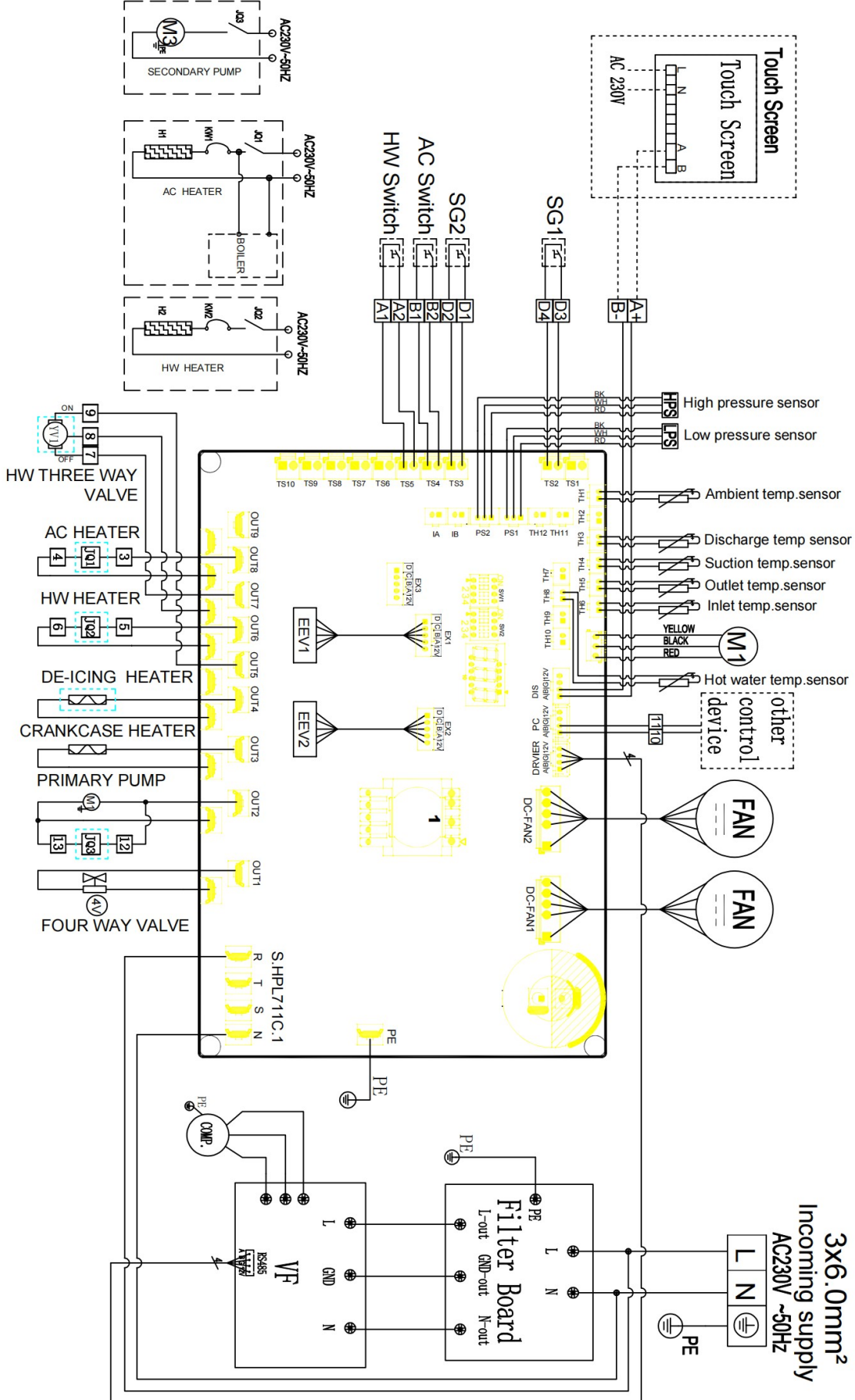
The removal and disposal of the heat pump must be carried out by a qualified professional in accordance with local and national regulations.

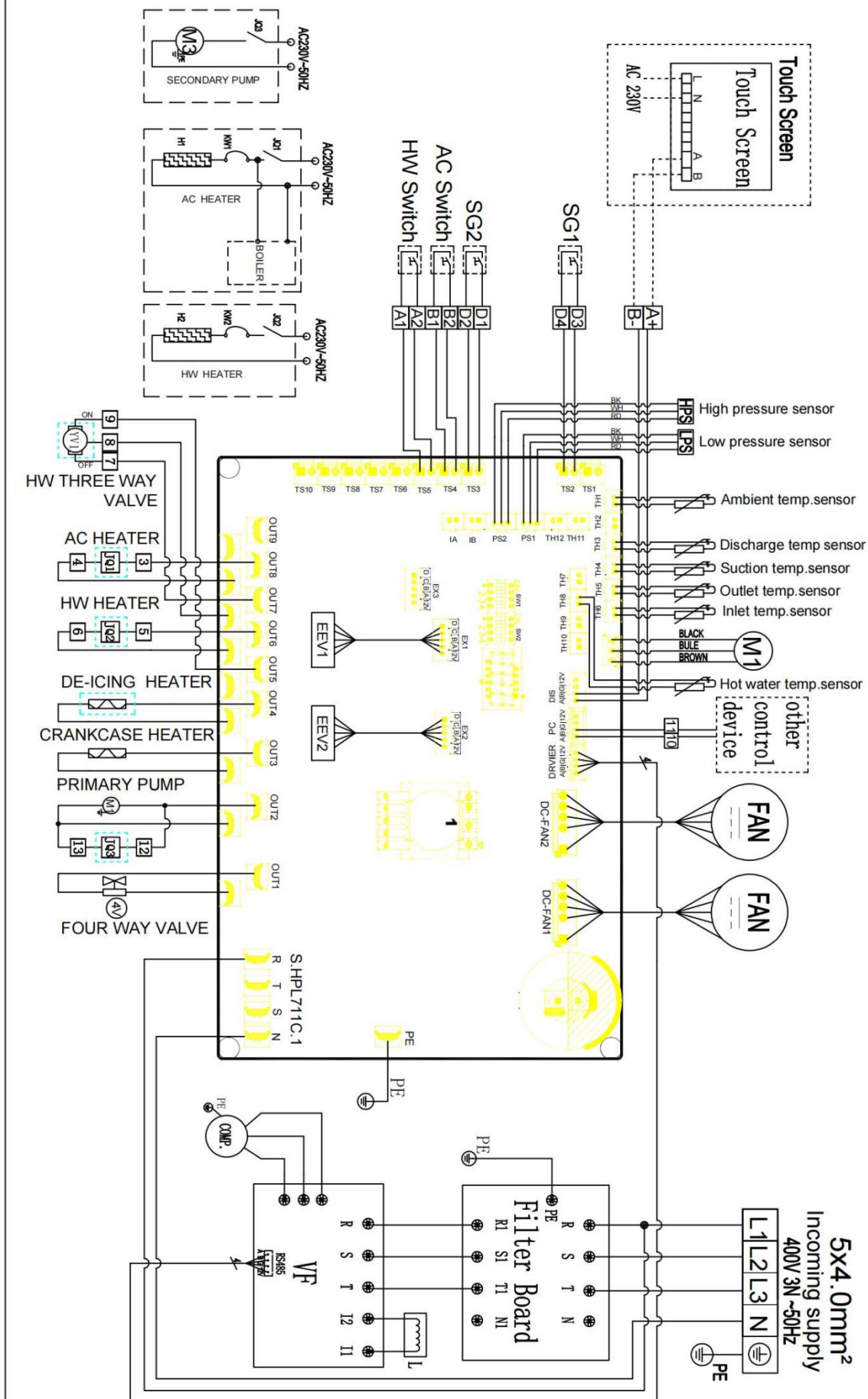


- Switch off the heat pump.
- Cut the mains supply to the heat pump
- Collect the refrigerant according to the applicable regulations
- Make sure that the refrigerant cannot escape into the open air.
- Disconnect the refrigerant lines
- Close the main water tap
- Drain the water from the installation.
- Disconnect all hydraulic connections.
- Dismantle the heat pump.
- Scrap or recycle the heat pump in accordance with the applicable local and national regulations.

15 Electrical schematic diagram

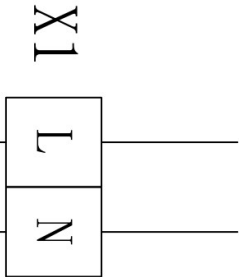






Incoming supply
AC230V 50Hz

BOILER



BRN BLU

BRN BLU BLK BLU BRN BLU BRN WHT BLK

