Haier

Heat Pump Water Heater

Installation and Service Manual

Model

HP80M8-9

HP110M8-9

HP150M8-9

ORIGINAL MANUAL

Please read this manual carefully prior to your use of this water heater.

The appearance of the water heater given in this manual is for reference only.

Contents

The equipment has been tested for marking according to following European Directive and following standards:

European Standards/Directives:

Directive 2014/35/UE	Title
EN 60335-1	Household and similar electrical appliances - Safety
EN 60335-2-21	Household and similar electrical appliances – Safety; Particular requirements for storage water heaters
EN 60335-2-40	Household and similar electrical appliances - Safety - Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers
EN IEC 55014-1	Electromagnetic Compatibility – Radio interference emission
EN IEC 55014-2	Electromagnetic Compatibility - Immunity
EN IEC 61000-3-2	Electromagnetic compatibility (EMC) – Harmonics emission
EN 61000-3-3	Electromagnetic Compatibility – Voltage fluctuations emission
EU 814/2013	ErP Ecodesign - Water heaters
EU 812/2013	ErP Labelling - Water heaters
EN 16147	Heat pumps with electrically driven compressors – Testing, performance rating and requirements for marking of domestic hot water units
EN12102	Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling. Measurement of airborne noise. Determination of the sound power level
2012/19/EU	WEEE: Waste Electrical and Electronic Equipment

Environmental Standards:

Directive 2011/65/EU RoHS *	Restriction of the use of certain hazardous substances in electrical and electronic equipment
Regulation (EC) 1907/2006 REACh	Registration, Evaluation, Authorization and Restriction of Chemicals

1. Product safety statement

1. Please read the instructions carefully before installation and use.

2. Do not puncture or ignite this product.

3. The environment-friendly refrigerant R290 used in this product is odorless.

4. This product must be installed outdoors

5. This product cannot be discarded or scrapped at will.

If necessary, please contact Haier's after-sales team to obtain the correct disposal method. When the product is disposed of, the refrigerant in the system needs to be recovered.

6. The product should not be stored in an area containing an open flame, including an area with an open fire, gas appliance or electric heater.

(e.g. open fire, ignited gas appliance, open electric heater).

7. Before the refrigeration system is repaired, the refrigerant must be removed by a licensed professional.

8. Do not use any method to accelerate the defrosting process or clean frosted components of the appliance.

Warning Risk of damage to the environment

This heat pump contains the refrigerant R290. The refrigerant must not be allowed to escape into the atmosphere.

Refrigerant must be disposed of by qualified professional.

Safety instructions (to be followed at any time)

1. Ask your dealer or qualified personnel to carry out installation work. Do not attempt to install the product yourself. Improper Installation may result in water leakage, electric shocks, fire or explosion.

2. Keep this manual where the user can easily take it.

3. Install the product in accordance with the instructions in this installation manual.

4. Be sure to use only the specified accessories and parts for installation work.

5. Install the product on a foundation strong enough to withstand the weight of the unit.

6. Electrical work must be performed in accordance with relevant local and national regulations and with instructions in this installation manual, Be sure to use a dedicated power supply circuit only. The wiring method should be in line with the local wiring standard. The type of connecting wire is H07RN-F.

7. Use a cable of suitable length, Do not use tapped wires or an extension lead as this may cause overheating, electric shocks, fire or explosion.

8. All the cables shall have got the authentication certificate. During installation, when the connecting cables break off, it must be assured that the grouding wire is the last one to be broken off.

9. If refrigerant gas leaks during installation, ventilate the area immediately. oxic gas may be produced if the refrigerant comes into contact with fire, and

explosion may be happen.

10. After completing installation, check for refrigerant gas leakage. When installing or relocating the product, be sure to bleed the refrigerant circuit to ensure it is free of air, and use only the specified refrigerant (R290).

11. Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

12. Do not pierce or burn.

13. Be aware that refrigerants may not contain an odour.

14. Comply with national gas regulations.

15. This appliance can be used by children aged 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given superivision or instruction concering 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 appliance can not be discarded or scrapped randomly.

16. Do not install the appliance at any place where there is danger of flammable gas leakage. In the event of a gas leakage, build-up of gas near the appliance may cause a fire to break out.

17. Take adequate steps to prevent the outdoor unit being used as a shelter by small animals. Small animals making contact with electrical parts can cause malfunctions, smoke or fire.

18. Please instruct the customer to keep the area around the unit clean.

Only qualified personnel can handle, fill, purge and dispose of the refrigerant.

19. If the unit is installed in coastal areas or other regions with sulfate gas of salty atmosphere, corrosion will occur and the unit service life will be shortened.

Loading and Unloading Requirements

1) The products shall be carefully handled during loading and unloading. Constant speed, and heavy acceleration/deceleration shall be avoided.

2) Rude and barbarous handling such as kicking, throwing, dropping, bumping, pulling and rolling is not allowed.

3) The workers engaged in loading and unloading must be subject to necessary trainings on the potential hazards caused by barbarous handling.

4) Dry powder extinguishers or other suitable fire extinguishing apparatus within the period of validity shall be equipped at the loading and unloading site.

5) The untrained personnel cannot be engaged in loading and unloading of flammable refrigerants air conditioner.

6) Before loading and unloading, anti-static measures shall be taken, and phones cannot be answered during loading and unloading.

Transporting Management Requirements

1) The maximum transporting volume of finished products shall be determined as per local regulations.

2) The vehicles used for transporting shall be operated as per local laws and regulations.

3) Dedicated after-sales vehicles shall be used for maintenance, and exposed transporting of refrigerant cylinders and the products to be maintained is not allowed.

4) The rain cover or similar shielding material of transporting vehicles shall be provided with certain flame retardancy.

5) Leakage warning device of flammable refrigerant shall be installed inside the closed-type compartment.

Storage Requirements

1) The storage package of equipment used shall be such that no leakage of refrigerant will be caused due to mechanical damage of the equipment inside.

2) The maximum quantity of the equipment allowed to be stored together shall be determined as per local regulations.

Electrical Safety Requirements

1. The surrounding conditions (ambient temperature, direct sunlight and rainwater) shall be noticed during electrical wiring, with effective protective measures being taken.

2. Copper wire cable in line with local standards shall be used as the power line and connector wire.

3. The appliance shall be reliably earthed.

4. The dedicated branch circuit must be used, and leakage protector with

sufficient capacity must be installed.

Maintenance Precautions

1. For all the faults requiring welding the refrigeration pipelines or components inside the refrigeration system of R290 refrigerant air conditioners, maintenance the user's site is never allowed.

2. For the faults requiring radical disassembly and bending operation of the heat exchanger, such as the replacement of integral disassembly of the condenser, inspection and maintenance at the user's site are never allowed.

3. For the faults requiring replacement of the compressor or parts & components of refrigeration system, maintenance at the user's site is not allowed.

4. For other faults not involved in the refrigerant container, internal refrigeration pipelines and refrigeration elements, the maintenance at the user's site is allowed, including the cleaning and dredging of the refrigeration system requiring no disassembly of refrigeration elements and no welding.

Qualification Requirements of Maintenance Personnel

1. All the operators or the maintenance personnel involved in refrigerating circuits shall be provided with the effective certificate issued by an industry-accepted assessment institute, to ensure that they are qualified for safety disposal of refrigerant as required in the assessment regulations.

2. The equipment can only be maintained and repaired as per the method recommended by the manufacturer. In case the assistance from personnel of

other disciplines is required, the assistance shall be supervised by the personnel with qualification certificate involved in flammable refrigerant.

Inspection on Maintenance Environment

1. Before operation, the refrigerant leaked in the room is not allowed.

2. Continuous ventilation shall be maintained during maintenance.

3. Open fire or high-temperature heat source higher than 548 degree which can easily give birth to open fire is not allowed inside the room within the maintenance area.

4. During maintenance, the phones and the radioactive electronics of all the operators inside the room must be powered off.

5. One dry powder or carbon dioxide extinguisher shall be equipped inside the maintenance area, and the extinguisher must be under available state.

Maintenance Site Requirements

1. The maintenance site shall be provided with favorable ventilation and must be flat. Arrangement of the maintenance site inside the basement is not allowed.

2. Welding zone and non-welding zone shall be divided at the maintenance site, and shall be clearly marked. A certain safety distance must be guaranteed between the two zones.

3. Ventilators shall be installed at the maintenance site, and exhaust fans, fans, ceiling fans, floor fans and dedicated exhaust duct can be arranged, to meet the requirements of ventilation volume and uniform exhaust, and to avoid

accumulation of refrigerant gas.

4. Leak detection equipment for flammable refrigerant shall be equipped, with relevant management system being established. Whether the leak detection equipment is under available state shall be confirmed before maintenance.

5. Sufficient dedicated vacuum pumps of flammable refrigerant and refrigerant charging equipment shall be equipped, with relevant management system for maintenance equipment being established. It shall be guaranteed that the maintenance equipment can only be used for vacuumizing and charging of one type of flammable refrigerant, and mixed usage is not allowed.

6. The master power switch shall be arranged outside the maintenance site, with protective (anti-explosive) device being equipped.

7. Nitrogen cylinders, acetylene cylinders and oxygen cylinders shall be placed separately. The distance between the gas cylinders above and the working area involved in open fire shall be at least 6m. The anti-backfire valve shall be installed for the acetylene cylinders.

The color of the acetylene cylinders and oxygen cylinders installed shall meet the international requirements.

8. The warning sign of “No Fire” shall be arranged inside the maintenance area.

9. Fire control device suitable for electric appliance such as the dry powder extinguisher or carbon dioxide extinguisher shall be equipped, and shall always be under the available state.

10. The ventilator and other electrical equipment at the maintenance site shall be relatively fixed, with standardized pipe routing. Temporary wires and sockets at the maintenance site are not allowed.

Leak Detection Methods

1. The environment in which the refrigerant leakage is checked shall be free from potential ignition source. Leak detection with halogen probes (or any other detector with open fire) shall be avoided.

2. For the system containing flammable refrigerant, leak detection may be realized with electronic leak detection equipment. During leak detection, the environment in which the leak detection equipment is calibrated shall be free from refrigerant. It shall be guaranteed that the leak detection equipment will not become potential ignition source, and is applicable to the refrigerant to be detected. 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.

3. The fluid used for leak detection shall be applicable to most of the refrigerant. The use of chlorine containing solvent shall be avoided, to avoid chemical reaction between chlorine and refrigerant and corrosion to copper pipelines.

4. In case leakage is suspected, the open fire at the site shall be evacuated or be put out.

5. In case welding is required at the leakage position, all the refrigerants shall be recovered,

or be isolated at a position far from the leak point with a stop valve. Before and during welding, the whole system shall be purified.

Safety Principles

1. During product maintenance, favorable ventilation shall be guaranteed at the maintenance site, and the close of all the doors/windows is not allowed.

2. Operation with open fire is not allowed, including welding and smoking. The use of phones is also not allowed. The user shall be informed that cooking with open fire is not allowed.

3. During maintenance in a dry season, when the relative humidity is less than 40%, anti-static measures shall be taken, including the wearing of cotton clothes and cotton gloves.

4. In case the leakage of flammable refrigerant is identified during maintenance, forced ventilation measures shall be taken immediately, and the source of leak shall be plugged.

5. In case the product damaged must be maintained by disassembling the refrigeration system, the product must be delivered to the maintenance point. Welding of refrigerant pipelines at the user’s site is not allowed.

6. The refrigeration system must be safely earthed in the whole course of maintenance.

7. For the door-to-door service with refrigerant cylinders, the refrigerant charged inside the cylinder cannot exceed the specified value. The cylinder placed in vehicles or at the installation/maintenance site shall be fixed

perpendicularly and be kept away from heat sources, ignition source, source of radiation and electric appliance.

Refrigerant Charging Procedures

The following requirements are added as the supplementation of conventional procedures:

1. During the use of refrigerant charging tools, cross contamination of different refrigerants shall be avoided. The total length (including the refrigerant pipelines) shall be shortened as much as possible, to reduce the residual of refrigerant inside;

2. The cylinders of refrigerant shall be kept upright;

3. Before refrigerant charging, the refrigeration system shall be earthed;

4. A label must be pasted on the refrigeration system after refrigerant charging;

5. Excessive charging is not allowed; the refrigerant shall be charged slowly;

6. In case system leakage is identified, refrigerant charging is not allowed unless the leak point is plugged;

7. During refrigerant charging, the charging amount shall be measured with an electronic scale or a spring scale. The connecting hose between the refrigerant cylinder and the charging equipment shall be relaxed appropriately, to avoid impact on the measuring accuracy due to stress.

Requirements on storage site of refrigerant

1. The cylinder of refrigerant shall be placed in a -10~50°C environment with favorable ventilation, and warning labels shall be pasted;

2. The maintenance tool in contact with the refrigerant shall be stored and used separately, and the maintenance tool of different refrigerants cannot be mixed.

Scrapping and Recovery

Scrapping

Before scrapping, the technician shall be completely familiar with the equipment and all its features. The safe recovery of refrigerant is recommended. In case the refrigerant recovered needs to be reused, before which the sample of refrigerant and oil shall be analyzed. The power supply required shall be guaranteed before tests.

(1) The equipment and operation shall be well known;

(2) Power supply shall be switched off;

(3) The followings shall be guaranteed before scrapping: The mechanical equipment shall be convenient for operation on the cylinder of refrigerant (if necessary); All personal protective equipment is available and being used correctly; The whole course of recovery shall be guided by qualified personnel; The recovery equipment and cylinders shall be in line with corresponding standards.

(4) The refrigeration system shall be vacuumized if possible;

(5) In case the vacuum state cannot be reached, vacuumizing shall be carried out from numerous positions, to pump the refrigerant in each part of the

system out;

(6) It shall be guaranteed that the capacity of cylinders is sufficient before recovery;

(7) The recovery equipment shall be started and operated as per the operation instructions of the manufacturer;

(8) The cylinder cannot be charged too full. (The refrigerant charged cannot exceed 80% of the capacity of cylinders)

(9) The maximum operating pressure of cylinders cannot be surpassed even only lasting for a short term;

(10) After refrigerant charging is completed, the cylinder and equipment must be evacuated rapidly, and all the stop valves on the equipment must be closed;

(11) Before purification and tests, the refrigerant recovered cannot be charged into another refrigeration system.

Recovery

During maintenance or scrapping, the refrigerant inside the refrigeration system needs to be cleared. It is recommended that the refrigerant be cleared thoroughly.

The refrigerant can only be charged into a dedicated cylinder, the capacity of which shall match with the refrigerant amount charged in the whole refrigeration system. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (Dedicated Cylinder for Refrigerant Recovery).

During transporting, the space in which the flammable refrigerant air conditioners are loaded cannot be sealed. Anti-static measures shall be taken for the transporting vehicles if necessary.

During removal of the compressor or clearing of the compressor oil, it shall be guaranteed that the compressor is vacuumized to a proper level, to ensure no residual flammable refrigerant is left inside the lubricating oil. The vacuumizing shall be completed before the compressor is delivered back to the manufacturer. Safety shall be guaranteed when the oil is discharged from the system.

Others

1. Attention is drawn to the fact that additional transportation regulations may exist with respect to equipment containing flammable gas. The maximum number of pieces of equipment or the configuration of the equipment permitted to be transported together will be determined by the applicable transport regulations.

2. Signs for similar appliances used in a work area are generally addressed by local regulations and give the minimum requirements for the provision of safety and/or health signs for a work location. All required signs are to be maintained and employers should ensure that employees receive suitable and sufficient instruction and training on the meaning of appropriate safety signs and the actions that need to be taken in connection with these signs. The effectiveness of signs should not be diminished by too many signs being placed together.

Any pictograms used should be as simple as possible and contain only essential details.

3. Disposal of equipment using flammable refrigerants. See national regulations.

4. The storage of the appliance should be in accordance with the applicable regulations or instructions, whichever is more stringent.

5. Storage package protection should be constructed in such a way 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.

6. Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

7. 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).

8. Do not pierce or burn.

9. Be aware that refrigerants may not contain an odour.

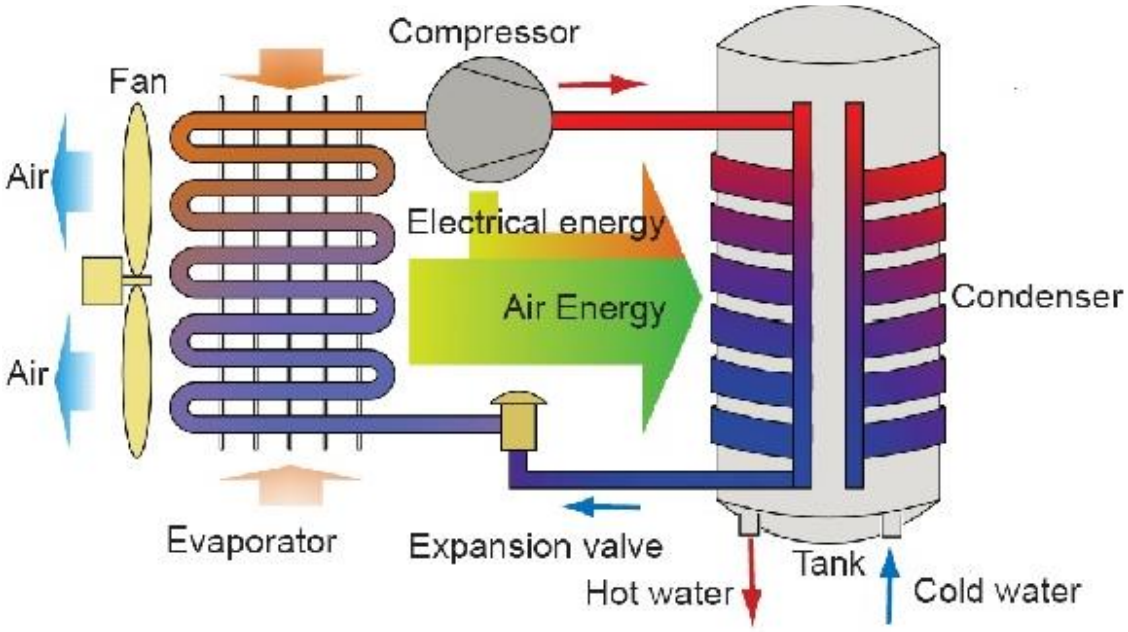
10. A warning to keep any required ventilation openings clear of obstruction.

11. A notice that servicing shall be performed only as recommended by the manufacturer.

12. A warning that ducts connected to an appliance shall not contain a potential ignition source.

2. Functionings & principles

A low-pressure liquid refrigerant is vaporized in the heat pump's evaporator and passed into the compressor. As the pressure of the refrigerant increases, so does its temperature. The heated refrigerant runs through a condenser coil within the storage tank, transferring heat to the water stored there. As the refrigerant delivers its heat to the water, it cools and condenses, and then passes through an expansion valve where the pressure is reduced and the cycle starts over.



3. Technical parameters

Model （system）	HP80M8-9	HP110M8-9	HP150M8-9
Tank volume (L)	82	102	149
Rated voltage/ frequency (V/Hz)	220~240V/50Hz	220~240V/50Hz	220~240V/50Hz
Tank rated pressure (bar)	8	8	8
Extra exchanger design / area	No	No	No
Corrosion protection	Magnesium anode	Magnesium anode	Magnesium anode
Water proof grade	IPX4	IPX4	IPX4
Assembled System			
Electric backup power (W)	1200	1200	1200
Average input - heat pump only(W)	250	250	250
Maximum input- heat pump only(W)	370	370	370
Maximum power input (W)	1570	1570	1570
Default temperature setting (°C)	56	56	56
Temperature setting range with heater (°C)	35-75	35-75	35-75
Temperature setting range heat pump only (°C)	35-65	35-65	35-65
Refrigerant type / Weight (kg)	R290/0.12	R290/0.12	R290/0.12
Ozone Depletion Potential (ODP)	0	0	0
Global Warming Potential (GWP)	3	3	3
Noise power dB(A)	50	50	50
Working temperature - heat pump only (°C)	-7-45	-7-45	-7-45
Working temperature - system (°C)	-7-45	-7-45	-7-45
Performance			
Type of extraction	Exterior	Exterior	Exterior
COP@7 °C (EN16147)	2.91	2.79	3.03
COP@14 °C (EN16147)	3.07	3.32	3.39
Heating up time (h) (@7°C)	4.44	5.64	8.62
Heating up time (h)	3.8	4.79	7.18

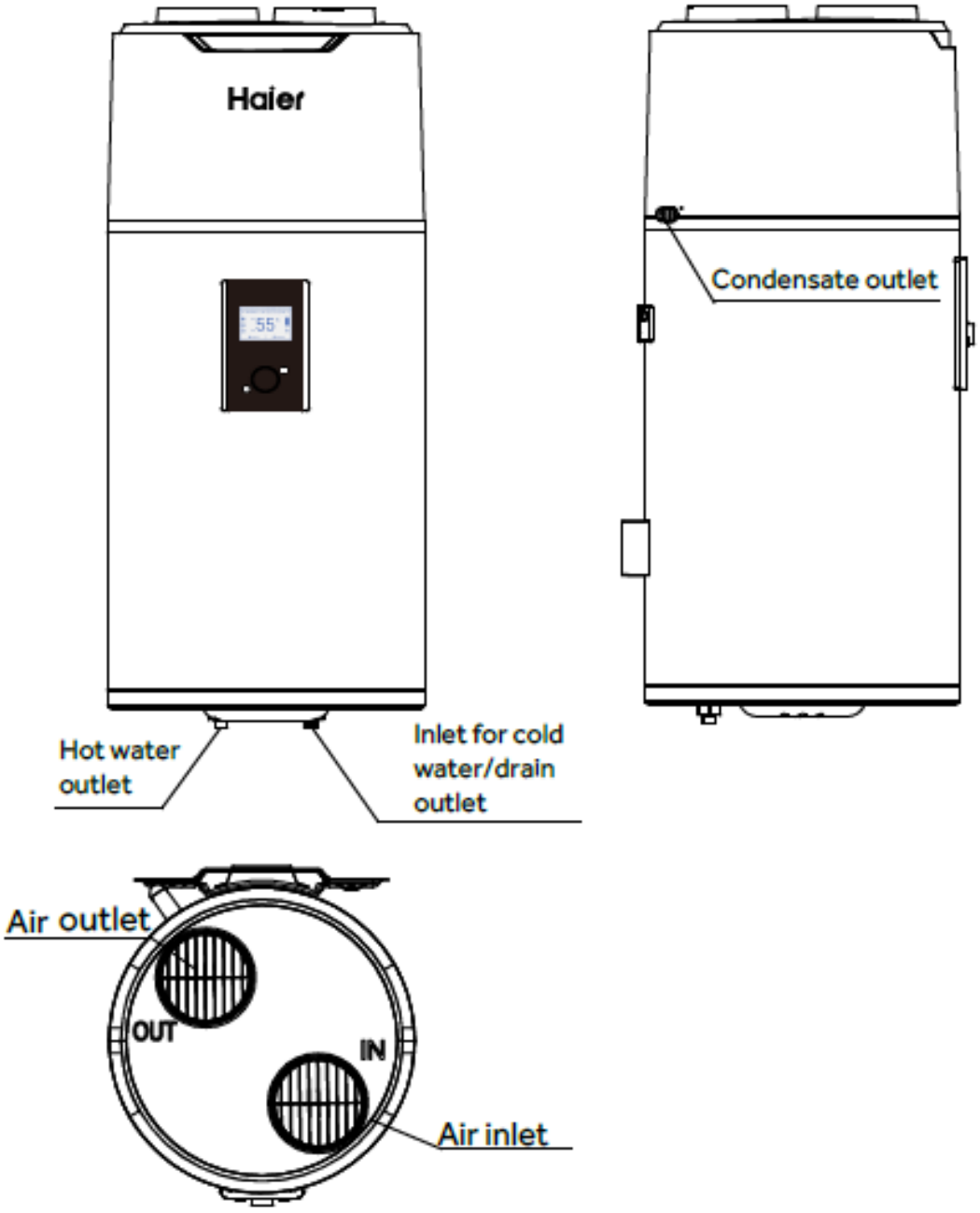
(@14°C)			
Tapping cycle (EN16147)	M	M	L
Standby power input/ Pes(W) (@7°C)	15.3	18.7	22.5
Maximum volume of usable hot water (L) V40 (EN16147)	103.8	133	190
Water heating energy efficiency class（ERP）	A+	A+	A+
Dimensions and connections			
Water outlet connection	R1/2"M	R1/2"M	R1/2"M
Water intlet & Drain connection	R1/2"M	R1/2"M	R1/2"M
Safety valve connection	R1/2"M	R1/2"M	R1/2"M
Product Dimensions (D*W*H mm)(tank unit/external unit)	492*547*1184	492*547*1334	492*537*1694
Packing dimensions(D*W*H mm)(tank unit/external unit)	587*587*1247	587*587*1397	587*587*1764
Gross weight (kg)	58	62	83
Net weight (kg)	51	54	64
Load qty. 40HQ	160	80	80

The COP and noise level data was tested in Haier lab.

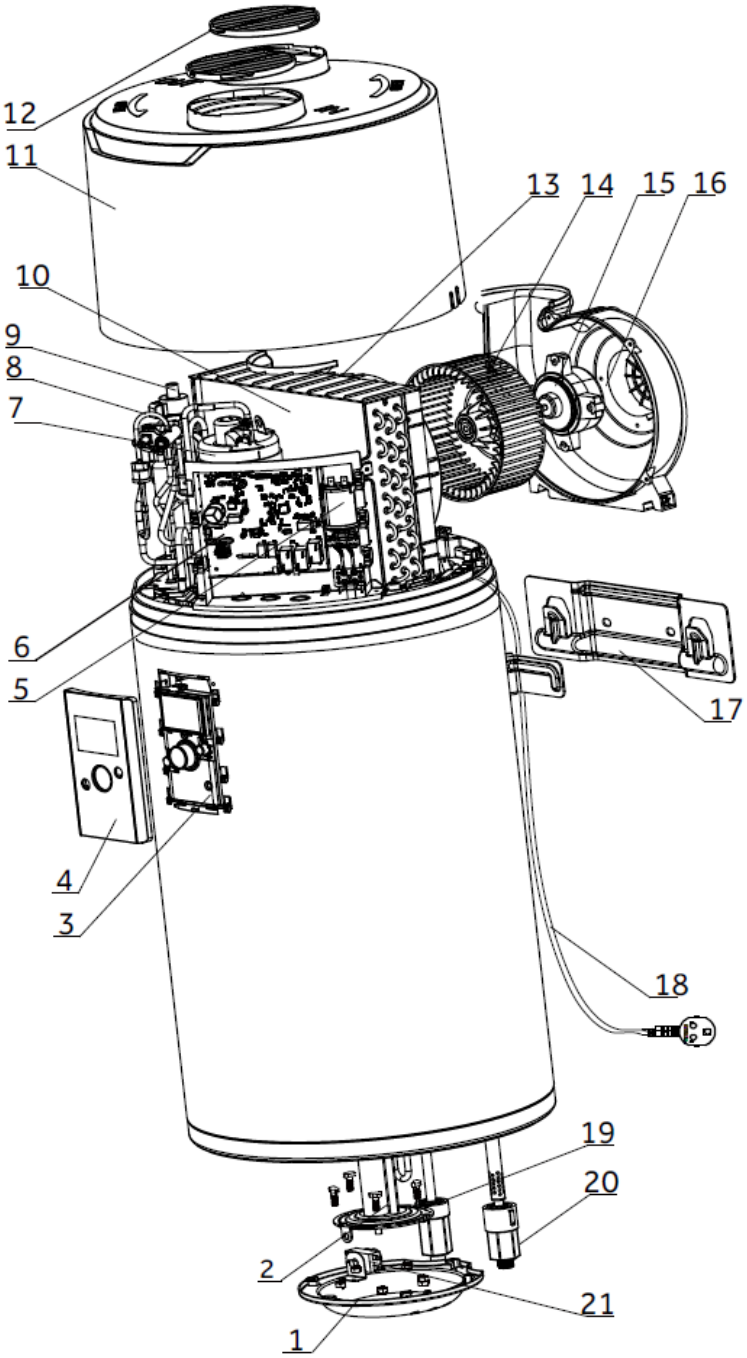
The COP values obtained with external air temperature of 7° C and 14° C, inlet water temperature of 10° C and set temperature of 55° C (HP80M8-9, HP110M8-9,according to EN 16147), inlet water temperature of 10° C and set temperature of 54° C (HP150M8-9,according to EN 16147).

4. Description of parts and components

Heat pump structure



Exploded view

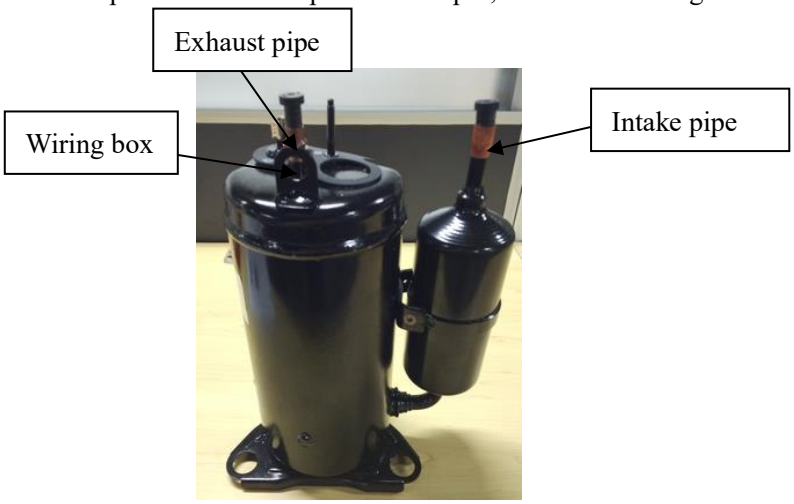


S/N	Description
1	Electric cover
2	Electric heater
3	Display panel
4	Cover for display
5	Capacitor for compressor
6	Controller panel
7	Compressor
8	Four-way valve
9	Electronic expansion valve
10	Evaporator
11	Top cover
12	Air grille
13	Air channel - front
14	Fan
15	Motor
16	Air channel - back
17	Support plate
18	Power cord
19	Pipe for water outlet
20	Pipe for water inlet
21	Thermostat

Heat pump system components

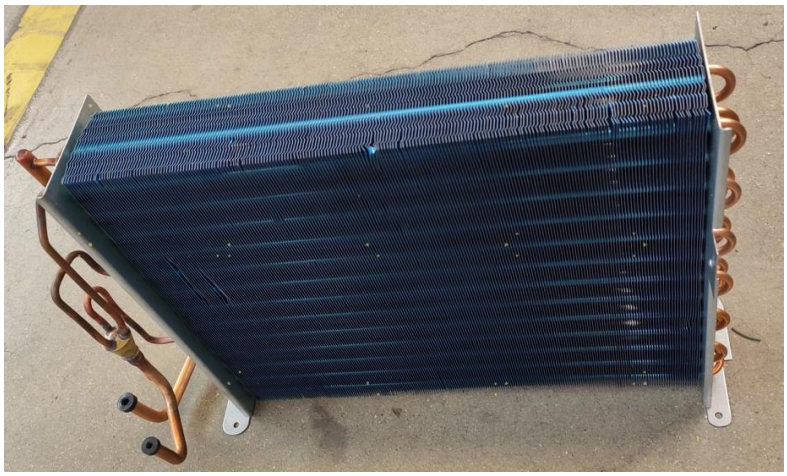
1. Compressor

The compressor is to effect a low-temperature low-pressure evaporator refrigerant vapor sucked and compressed into high temperature and pressure of the superheated vapor, and then discharged to the condenser heat exchanger.



2. Evaporator

Evaporator effects: it makes the liquid refrigerant absorbs heat and is evaporated into steam.

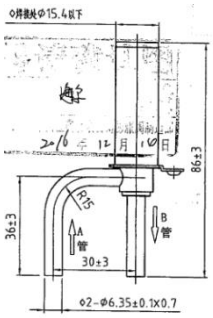


3. Condenser

A condenser: high-temperature high-pressure refrigerant vapor is condensed into liquid, during condensation, the refrigerant vapor discharge heat, the heat is absorbed by the heating medium.

4. Electronic expansion valve:

The refrigerant passes through the electric expansion valve, the pressure from the condensing pressure is reduced to the evaporation pressure, part of the refrigerant will evaporate into gas in the throttling process.



5. Filter

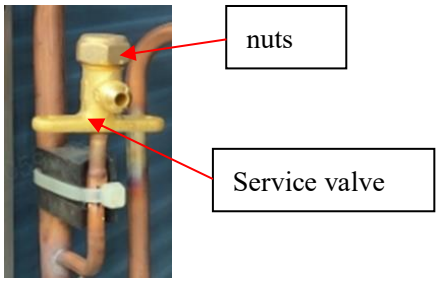
It's interior has a filter and desiccant, the desiccant absorbs moisture from the refrigerant, the filter can filter out impurities in the refrigerant.

6. High Voltage Switchgear

High-voltage switch is to prevent excessive pressure in the system, thus affecting the life of the system components, high-pressure of the high-voltage switch is 2.8MPa.

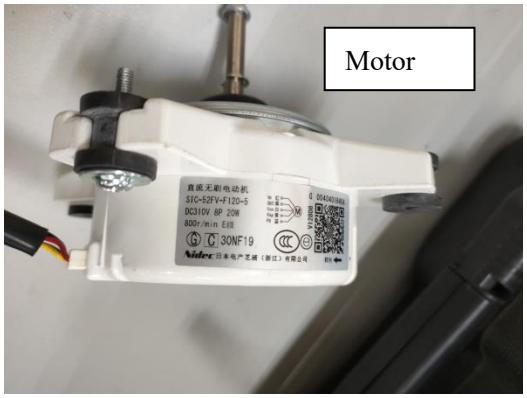
7. Service valve

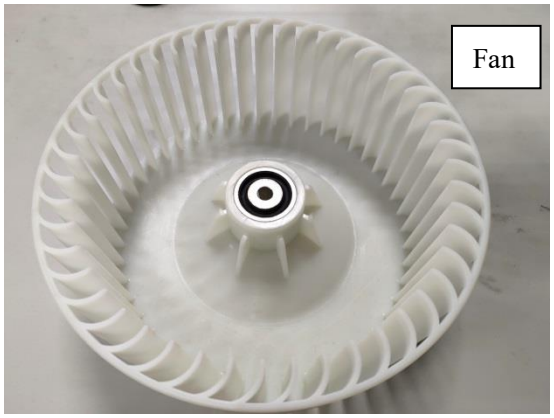
Service valve is mainly used for filling refrigerant, after removing the nuts, it contains a valve needle, sales staff can vacuum infusion refrigerant from here.



8. Fan

It forced air through the duct, and then flows through a heat exchanger to improve heat transfer efficiency of the heat exchanger.





9. Refrigerant

Heat pump refrigerant is R290, ODP value is 0, no damage to the ozone layer. R290 refrigerant cans appearance is as follows:

5. Installation introduction

a. Installation precaution

- Do not install the water heater in the position where exposed to gas, vapours or dust.

- Install the appliance on a flat, solid surface. The surface can support the machine weight and the condensate water can be drained freely.

- Noise due to operating and air flow do not bother neighbors.

- Make sure there is sufficient space left for installation and maintenance.

- There is no strong electromagnetic interference around that may affect control functions.

- There is no sulfur gas or mineral oil existing at the installation place, which may cause corrosion of the machine and the fittings.
- The water pipe for the water heater used at temperatures below 0°C shall not freeze.

- It shall not be set in rooms where a heating system is used so that heating supply to the room will not be affected.

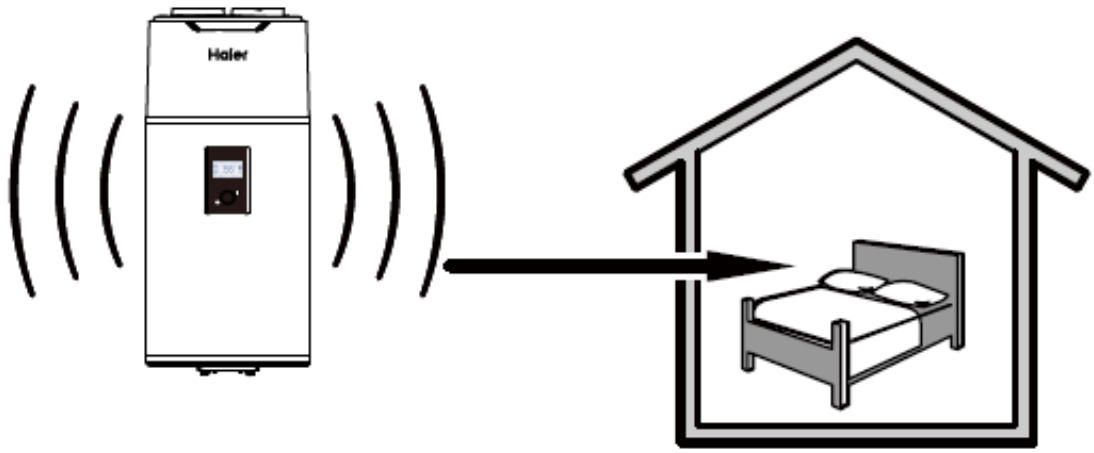
- It shall not be set inside a totally-enclosed space.

- The air taken in must in no event be dusty.

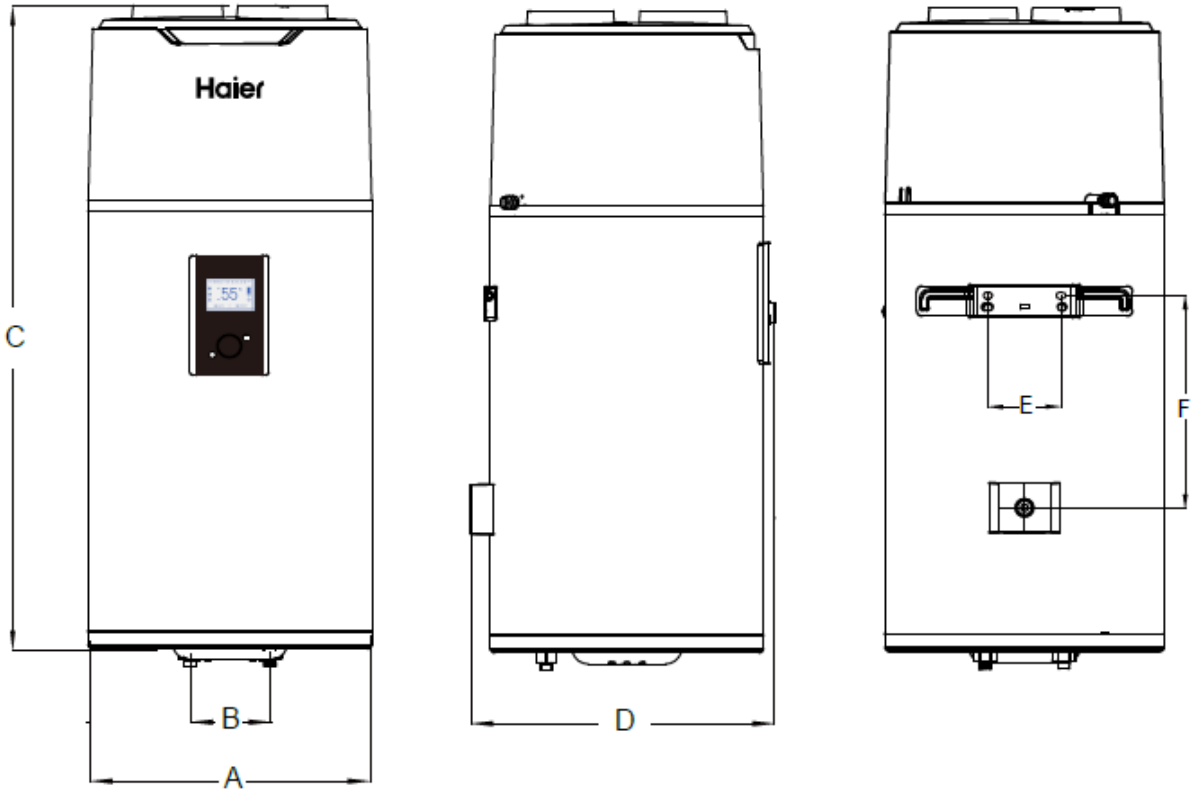
- Install the appliance in a dry, frost-free room.

- Temperature of the ambient air or of the air taken in by the heat pump for optimum running: from 10 to 35°C.

Keep an adequate distance between the working heat-pump and the resting places.



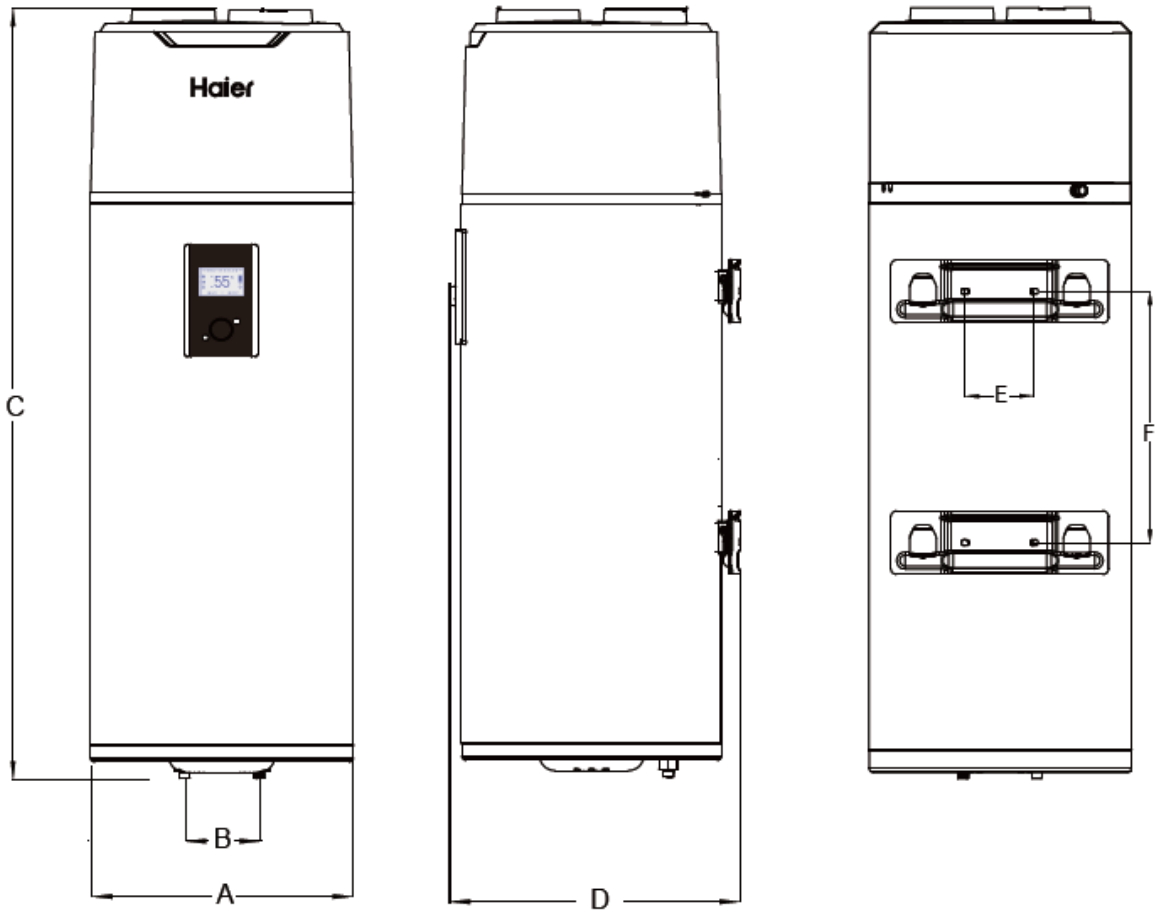
b. Installation dimensions (mm) （HP80M8-9　HP110M8-9）



Unit:mm

Model	A	B	C	D	E	F
HP80M8-9	492	140	1170	537	159	360
HP110M8-9	492	140	1320	537	159	510

Installation dimensions (mm) （HP150M8-9）

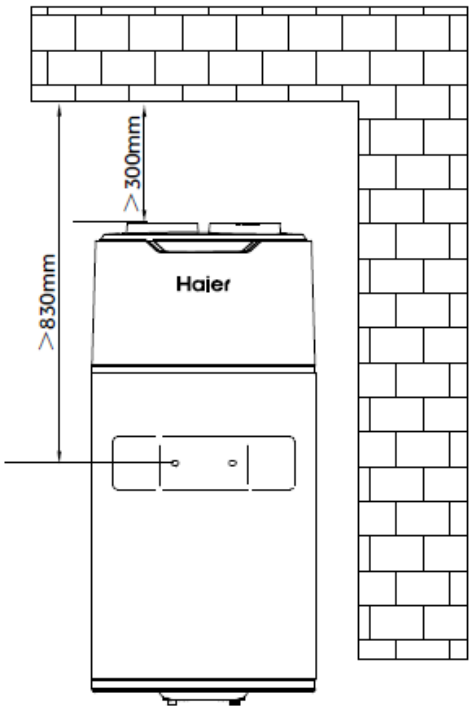


Unit:mm

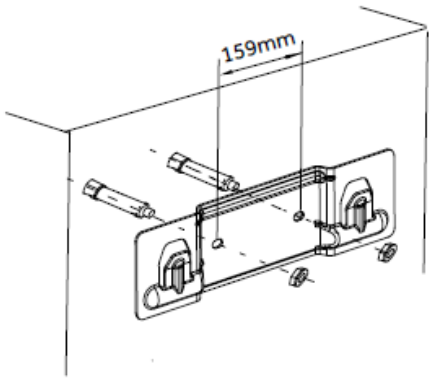
Model	A	B	C	D	E	F
HP150M8-9	492	140	1680	537	159	470

c. Installation angle refer to the following diagrams

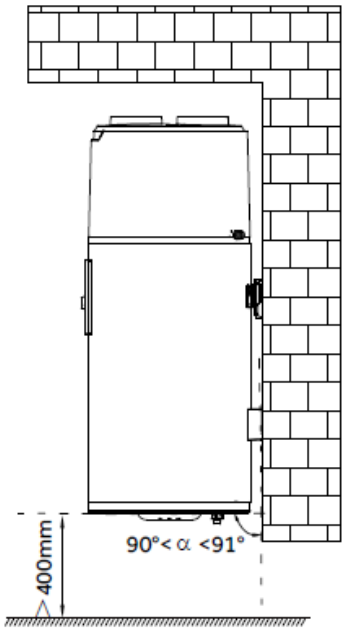
HP80M8-9　HP110M8-9：



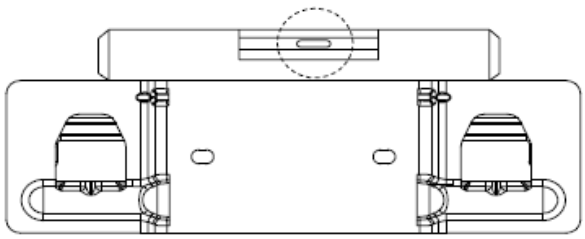
Note: These two expansion bolts can support 200kg weight at least . Please use the expansion bolts adapted to your wall material.



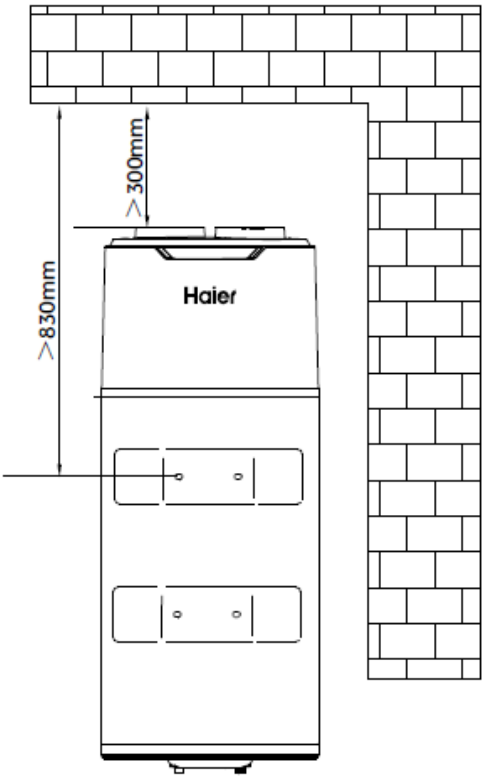
Installation angle refer to the following diagrams:



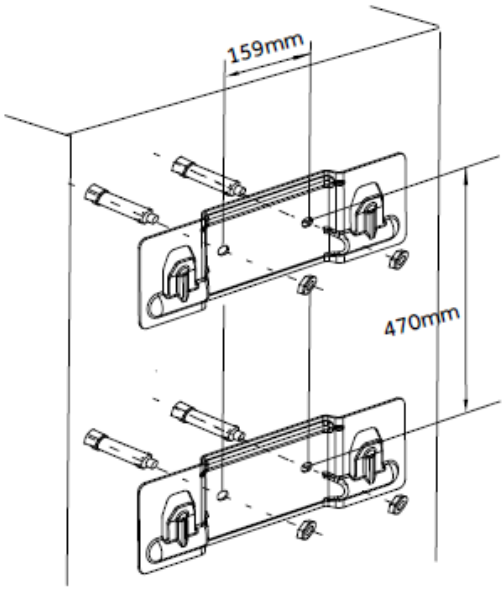
After the installation is completed, it is necessary to use a level ruler to check whether the support is maintained in a horizontal state.



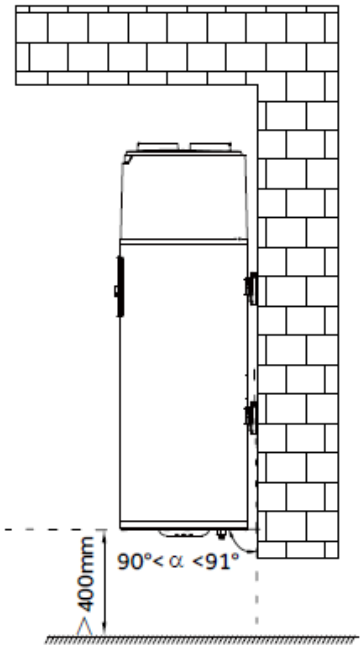
HP150M8-9：



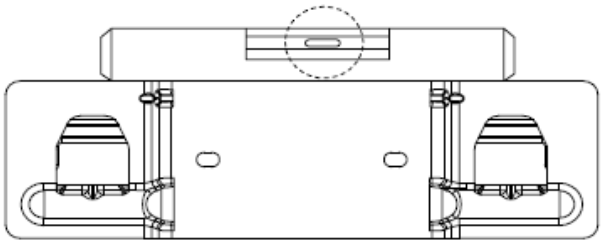
Note: These two expansion bolts can support 250kg weight at least . Please use the expansion bolts adapted to your wall material.



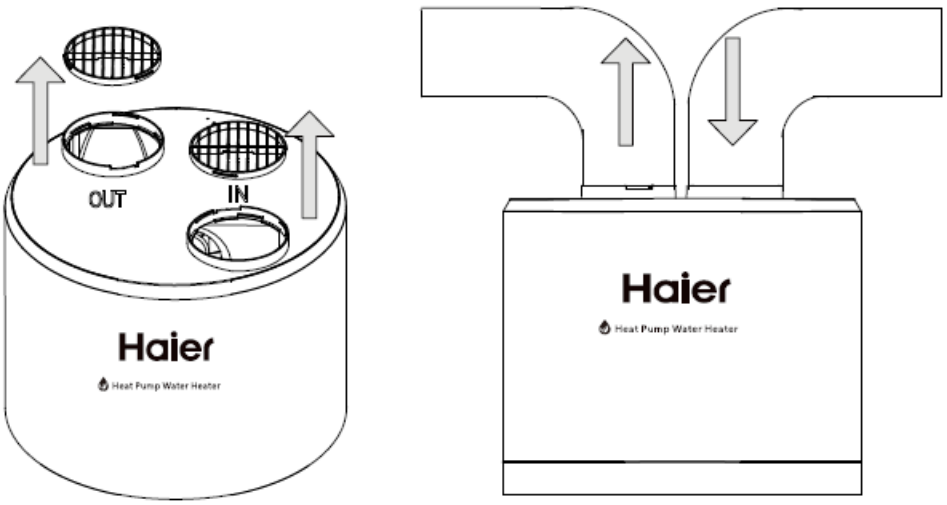
Installation angle refer to the following diagrams :



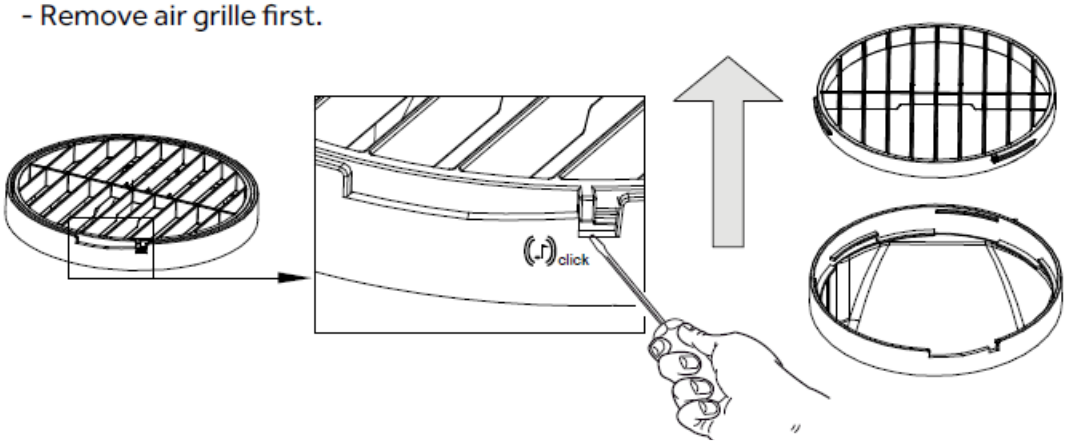
After the installation is completed, it is necessary to use a level ruler to check whether the support is maintained in a horizontal state.



Pipe connection



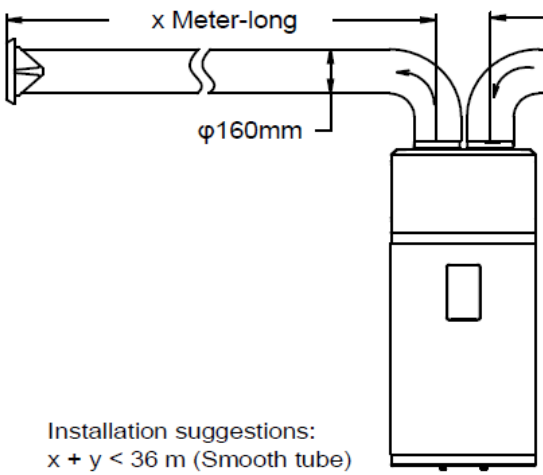
- Remove air grille first.



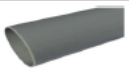
- Remove vent grid first.

- Install diameter **160mm** duct.
- Pressure drops from duct must be lower than or equal to the static pressure of the fan.
- If the pressure drops out of range, the performance of the appliance will be impaired.

Maximum length of the air connection (Diameter of air connection 160 mm)：



Installation suggestions:
x + y < 36 m (Smooth tube)
x + y < 22 m (Bellows tube)

Available pressure 30 Pa		φ160mm	
		Drop Pressure (Pa)	Equivalent 1m-long
	Smooth tube	0.6/1 meter	1
	Bellows	1 /1 meter	1.7
	Elbow	1.7/unit	2.8
	Air grid	1.3/unit	2.2

- Pressure drops from duct must be lower than or equal to the static pressure of the fan.
- If the pressure drops out of range, the performance of the appliance will be impaired. In order to ensure the performance of the product, it is recommended that the total length of the air duct should not exceed 5m. If there are other conditions, the limit length of the air duct should not exceed 15m(Bellows tube) and 24 m (Smooth tube) . In this case, the performance will not be guaranteed.

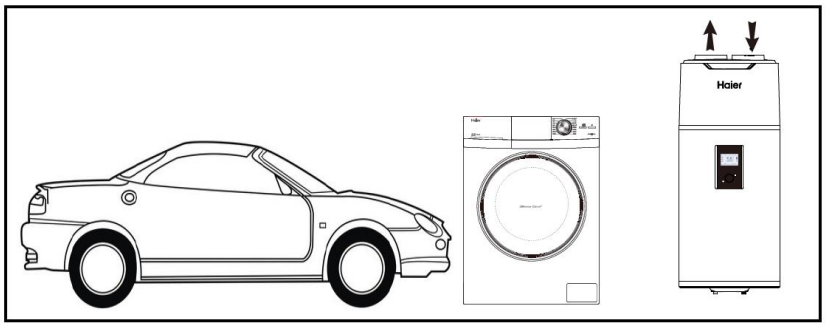
It is recommended that an air grille with a mosquito net be installed at the air inlet of the air guide duct. Ventilation area not less than 150cm2 .

d. Advised positions

Garage or laundry room (without ducts):

-Unheated room.

-Enables recovery of the free energy released by your vehicle's engine when switched off after use or by household appliances in operation.

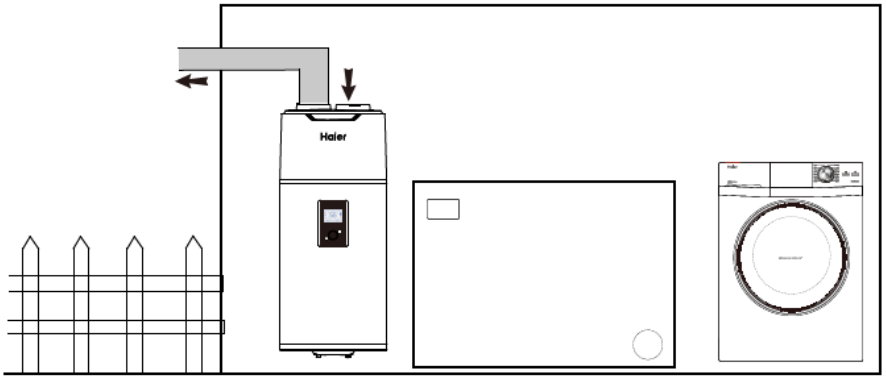


Laundry room (with one duct):

-Unheated room.

-Enables recovery of the free energy released by your vehicle's engine when switched off after use or by household appliances in operation.

-Referring installer menu, adjust the fan speed.

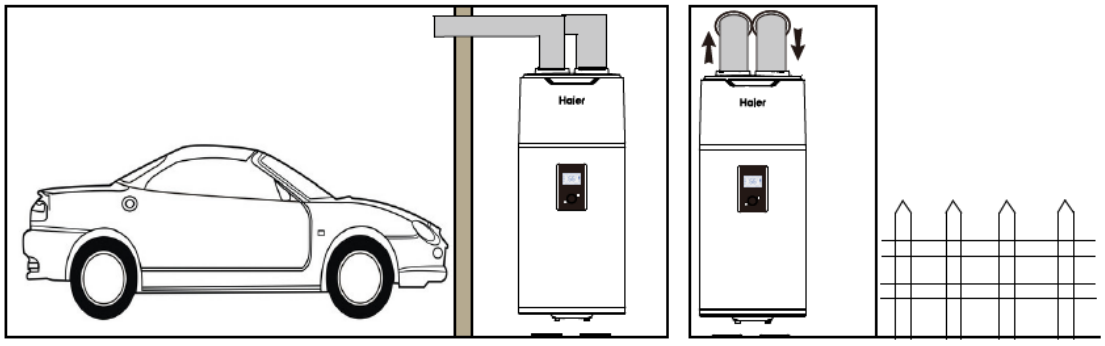


Habitable room or outside air (with two ducts):

-Can obtain free heat from the garage.

-If the outside air temperature is low, connection to the outside air may lead to overconsumption of electricity.

-Referring installer menu, adjust the fan speed



e. Installation caution

When making the connections, you should respect the standards and local directives.

- Before making the connection, rinse the drinking water inlet pipes,in order not to introduce metal or other particles into the tank.
Select copper pipes for pipeline connection.

- The inlet water pressure is between 0.1~0.5MPa. If lower than 0.1 MPa, a booster pump shall be added at the water inlet; if higher than 0.5 MPa, a pressure relief valve shall be added at the water inlet.
- The inlet water temperature is suggested between 10-30° C.
- Outdoor water pipeline and valves should be proper insulated.
- In accordance with safety rules, a safety valve(7bar, G1/2F) must be installed on the tank. For France, we recommend hydraulic safety units fitted with a membrane with the NF marking.
Integrate the safety valve in the cold water circuit. Install the safety valve close to the tank in a place which is easy to access.

No isolating devices should be located between the safety valve or unit and the tank

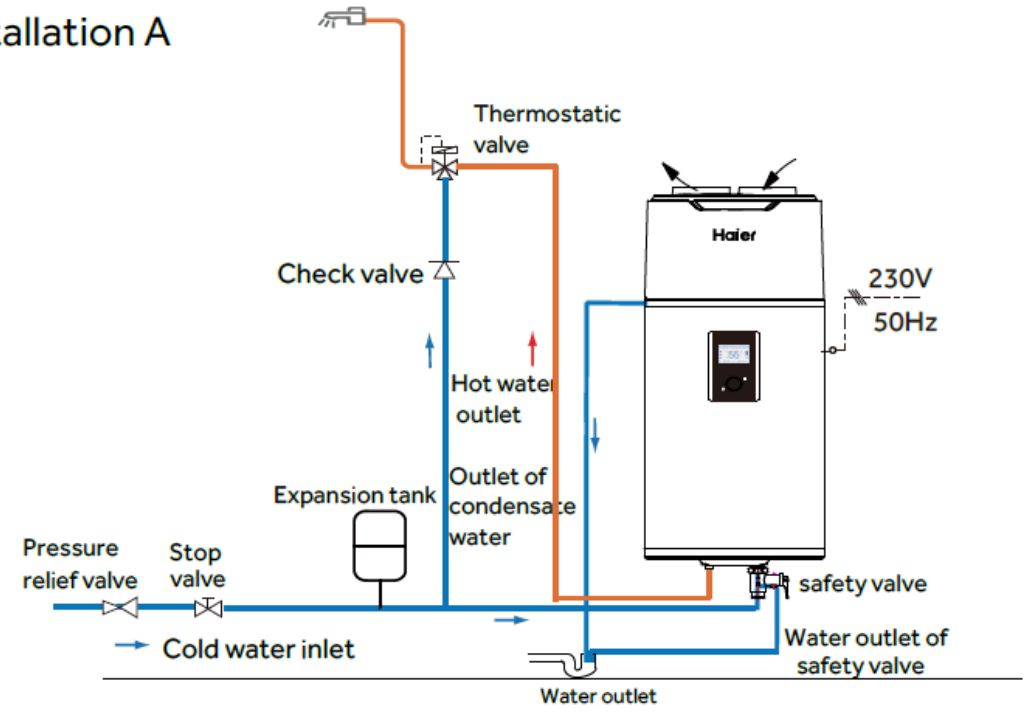
The rated pressure of the safety valve shall not exceed 0.8MPa.

- The outlet pipe in the valve or safety assembly must not be blocked.

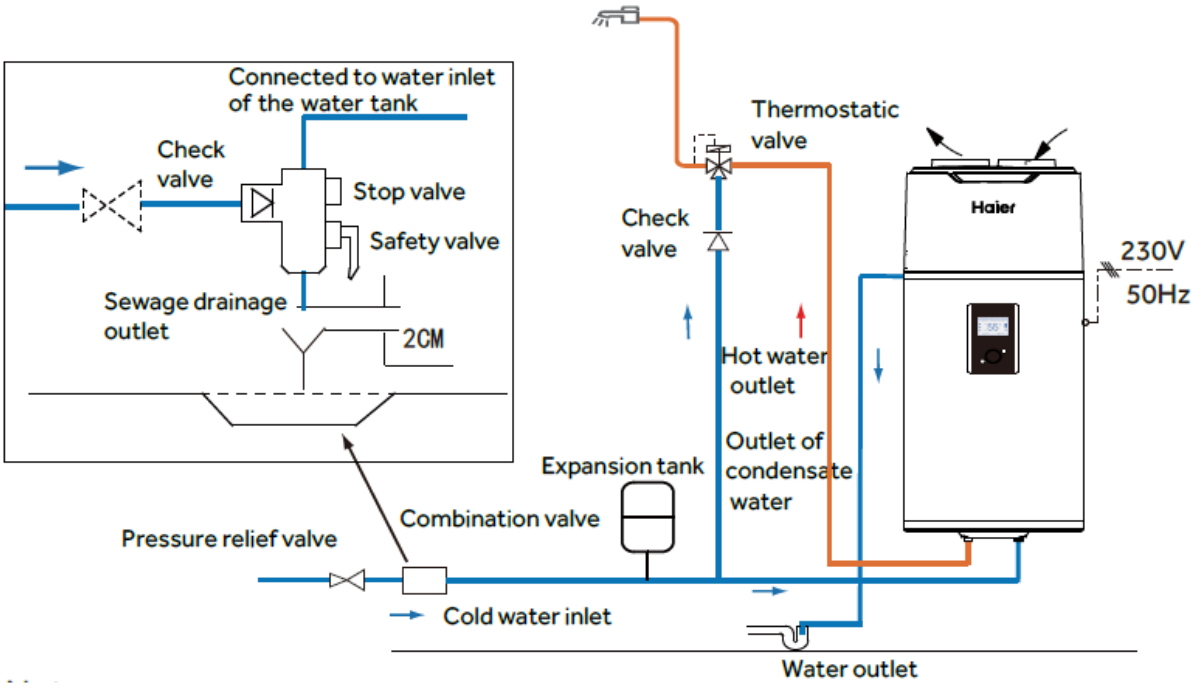
- The diameter of the safety unit and its connection to the calorifer must be at least equal to the diameter of the domestic cold water inlet on the calorifer.

- If the mains pressure exceeds 80% of safety valve, a pressure reducer must be installed upstream of the appliance.
.
Do not connect the domestic hot water connection directly to copper pipes in order to prevent galvanic couples in iron/copper (risk of corrosion). It is compulsory to fit the domestic hot water connection with a dielectric connection (not supplied).

Installation A



Installation B(for France only)



- Pressure relief valve, thermostatic valve, stop valve, check valve, T&P valve and French combination valve are not included in the accessories, please select proper fittings in local market;
- Valves with NF/CE certification are recommended

WARING: Plumber -Be Aware

Using boiler auxiliary heating, please make sure that the heat pump water tank temperature not more than 85 ℃.

f. Electrical connections precautions

WARNING

- Only qualified professionals may carry out electrical connections, always with the power off.
- The earthing shall comply with local standards.

- Water heaters shall be equipped with a dedicated power line and residual current circuit breakers. The action current shall not exceed 30 mA;

- The ground line and the zero line of the power supply shall be separated entirely. Connecting the zero line to the ground line is not allowed.

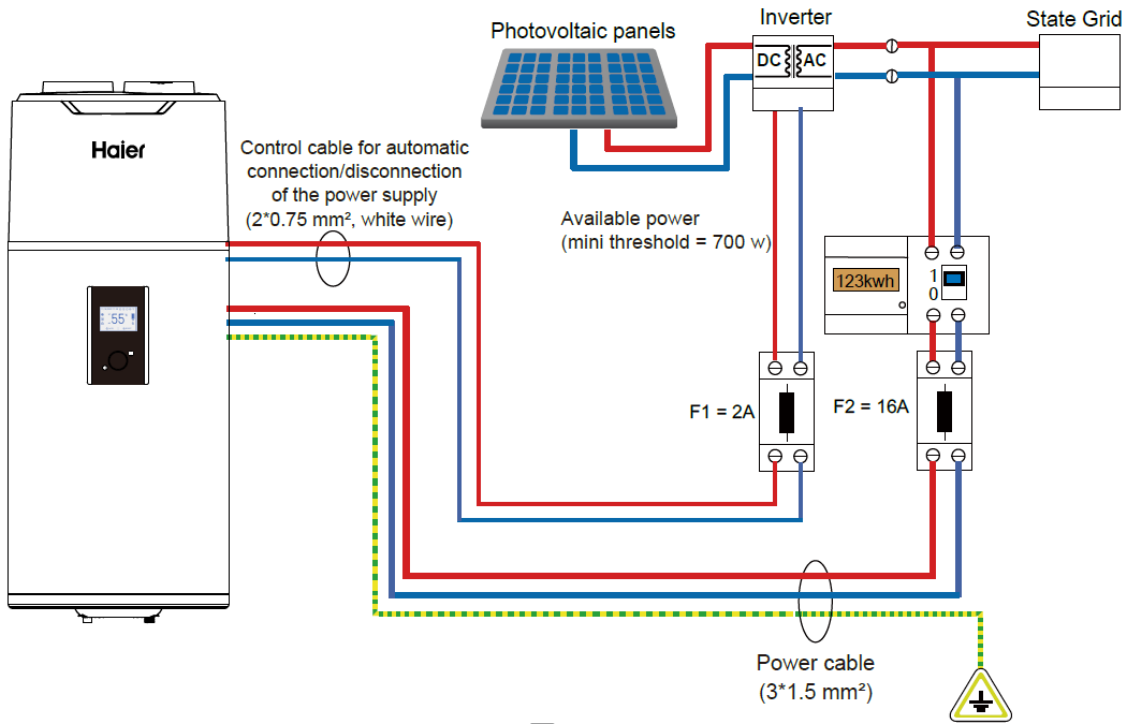
- Parameter of the power line: 3×1.5mm² or more.

- If a power cable is damaged, it shall be replaced by qualified professionals to avoid risks.

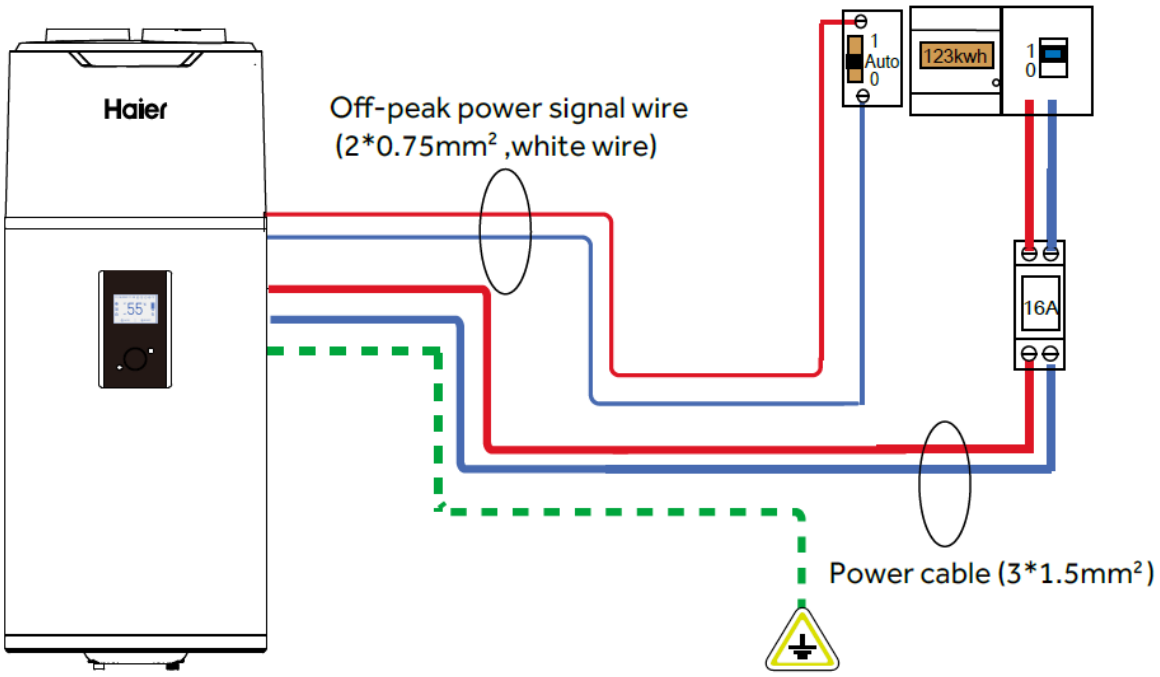
- In the case of places and walls where water may be splashed to, installation height of a power socket shall not be less than 1.8 m, and it shall be ensured that water would not be splashed on these places. The socket shall be installed out of children's reach.

- The phase line, zero line and ground line inside a power socket used in your home shall be wired correctly without any wrong positioning or false connection, and internal short circuit shall be avoided. Wrong wiring may cause fire accidents.

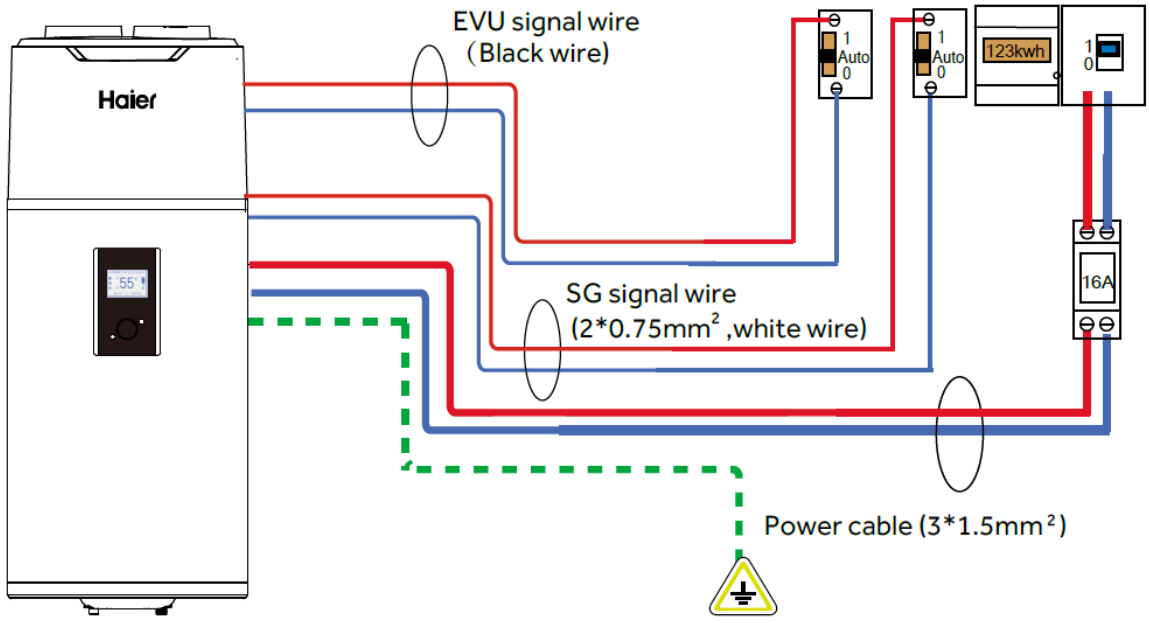
g. Connection to a PV system



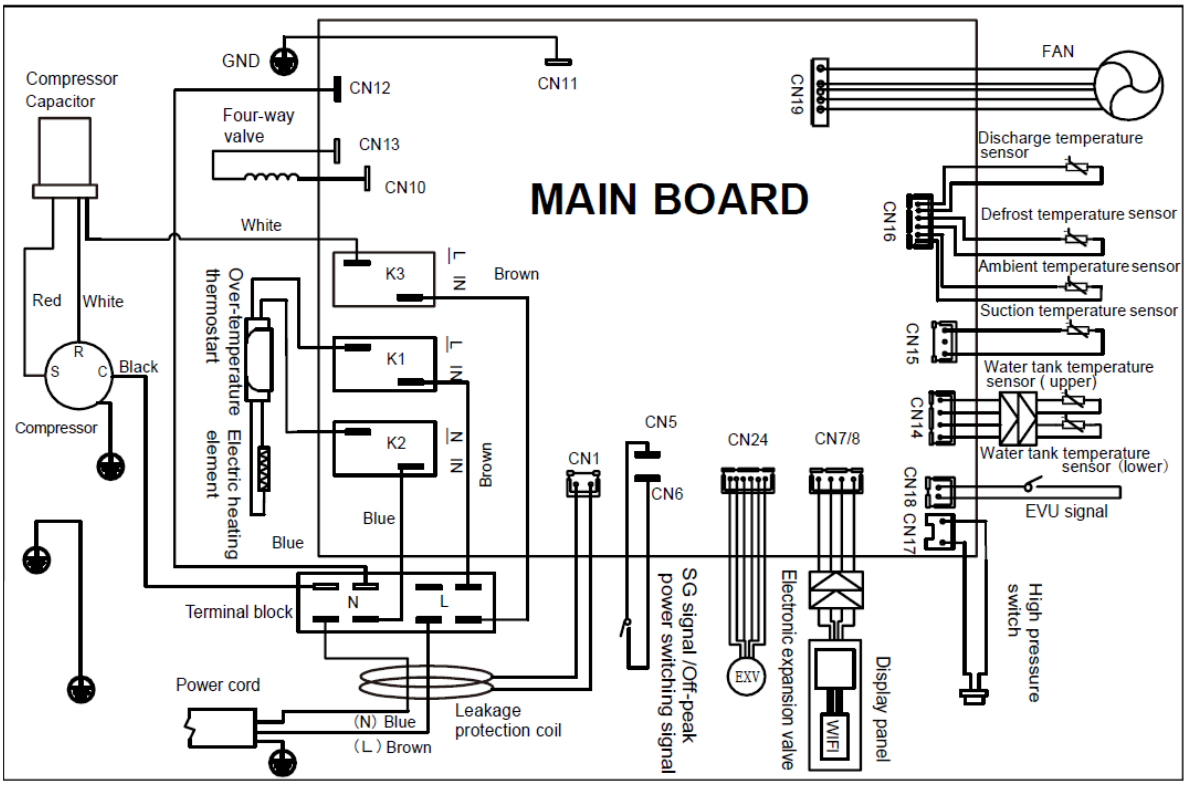
Off-peak power signal wire connection



SG signal wire connection

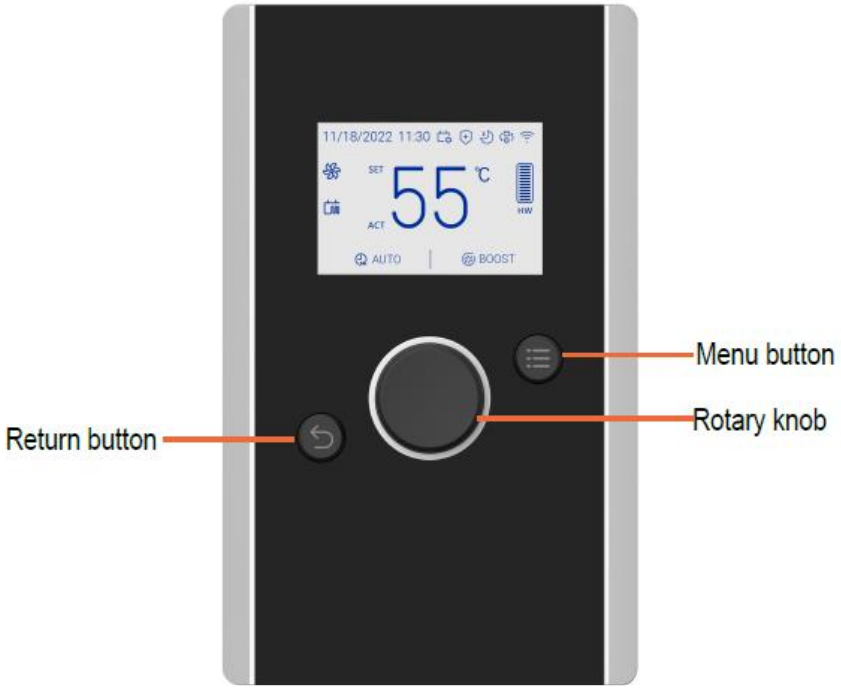


h. Wiring diagram



6. Operation and functions

Display



Functions:

Electrical leakage protection
The control system of this machine features an electricity leakage protection function.

3-minutes protection
When starting the machine immediately after electricity input, the fan and the compressor will start at the same time. When starting the machine immediately after shutdown, the system goes into the protection mode and starts after 3 minutes, which is considered to be normal.

Automatic defrosting function
The defrosting mode is automatically activated if the ambient temperature is too low and after the compressor already runs continuously for a certain period.

Overload protection
The working load of the compressor will be heavy if temperature is high in summer. In order to meet hot water requirements of users and to lengthen service life of the compressor, this product automatically adjusts the fan speed to ensure reliable operation of the compressor.

Anti-freezing function
The heat-pump starts heating to avoid freezing of the water tank if the temperature in the water tank is too low.
The default temperature setting is 55°C.

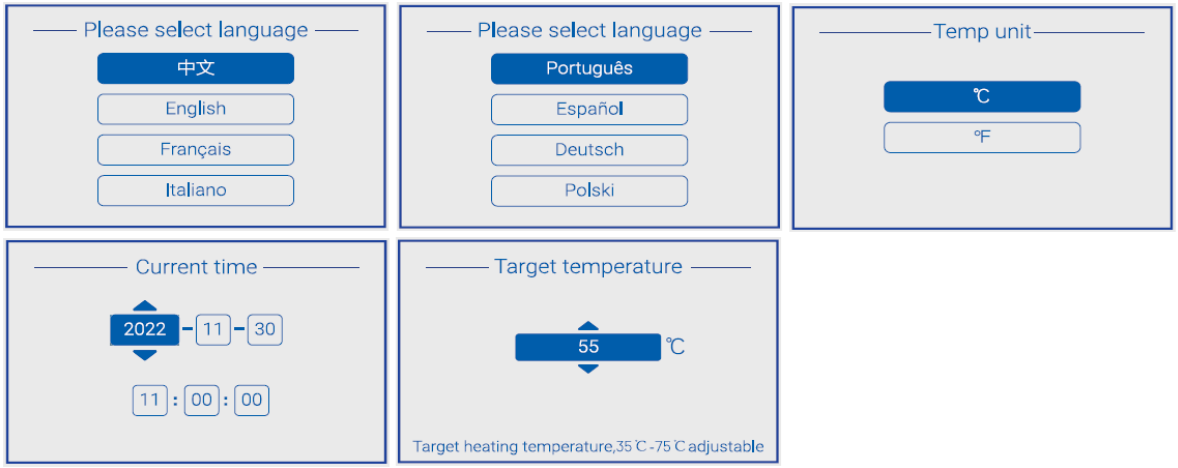
Description of the pictograms

Symbol	Description
11/18/202	Current date display
11:3C	Current time display
	PV/SG/HC signal display
	Sterilization function display
	Mute function display
	WIFI function display
	Heat pump heating indication
	Electric auxiliary heating indication
 HW	Indication of hot water availability
	Lock function display
 AUTO	-Optimised management of the heat pump and backup element for guaranteed comfort ; - The compressor maximum continuous working time （HP Duration） can be adjust in the installer settings.
 ECO	- In this mode ,priority of heat pump heating; User entered timer settings;
 ELEC	- In this mode, the backup element is used as the only heat source. - This function ensures hot water supply when the heat pump is not working properly;
 VAC	- Maintains a minimum temperature to prevent freezing. This mode is set for a number of days.
 Mute	Mute function In this mode, the heat pump heating in a state of low noise.
 Fan speed	Fan speed It can achieve a higher constant speed, but the mute function cannot be used after turning on the fan speed.
 Sterilization	Anti-legionella mode User entered Temperature setting , Start time settings, Frequency setting.

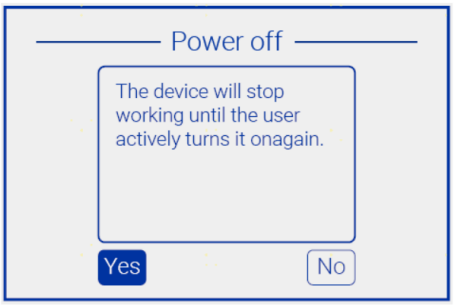
Installer settings

Power on

1. When powered on for the first time, all icons will light up for 3 seconds, and the buzzer will beep once to enter the power on state. Enter the initialization settings and select the confirmation language (Chinese/English/French/Italian/German/Spanish/Portuguese/Polish) - temperature (℃/℉) - time setting - target temperature setting by rotating the buttons.
Click on the Rotary knob to confirm. The default setting temperature is 55 ℃, and the default mode is AUTO. After the initialization setting is completed, it will no longer enter the initial setting unless the user chooses to restore the initialization setting.

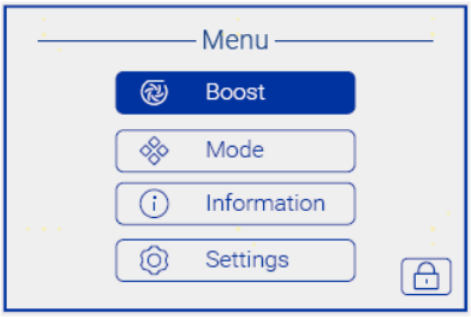


2. When turned on, operate any button to keep the screen fully lit, and after 20 seconds of no operation, the screen will turn off;
When the screen is off, operate any button and the screen will be fully lit. Long press and hold the Rotary knob for 6 seconds, and a shutdown interface will pop up. Select Yes to enter the shutdown state;



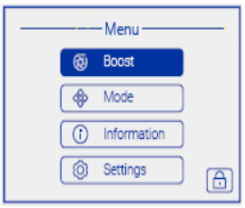
Menu functions

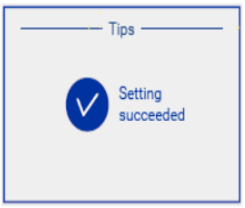
Press the menu button to enter the menu. There are 5 options to choose from, namely Boost - Mode - Information - Setting - Lock selection. You can select through the Rotary knob and click on the Rotary knob to confirm.

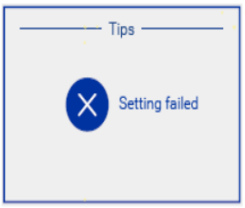


Boost function

After selecting Boost, press the Rotary knob to confirm and make an ON/OFF selection. After the selection is completed, if the setting is successful, the prompt will indicate successful setting, otherwise the prompt will indicate failed setting. BOOST mode has the highest priority and can be started in any mode. Only valid once.







Mode selection

After selecting Mode, press the rotary button to confirm. After entering the mode selection interface, there are 6 modes to select, namely AUTO-ECO-ELEC-VAC-MUTE - STERILIZE, all of which are selected through the rotary button. The first four modes are mutually exclusive. There is a situation where multiple functions are selected simultaneously.

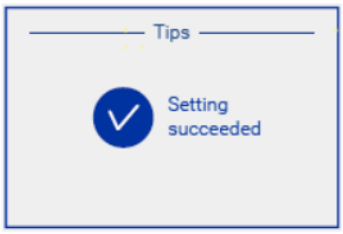
AUTO mode

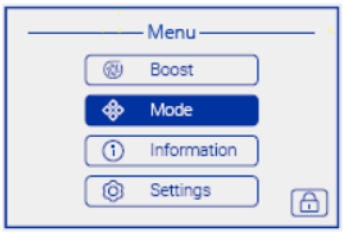
After selecting AUTO and confirming with the Rotary knob, a prompt will appear indicating whether the setting was successful or not. After the prompt is completed, the system will automatically return to the menu interface. The main interface displays AUTO mode.

In this mode, the heat pump is turned on to provide hot water. When the working time of the heat pump exceeds the maximum working time, the heat pump continues to work and the electric auxiliary heating module is started. After reaching the set temperature, the heat pump and electric auxiliary heating stop.

The maximum working time of the heat pump is set within the range of 5-14 hours, with a default

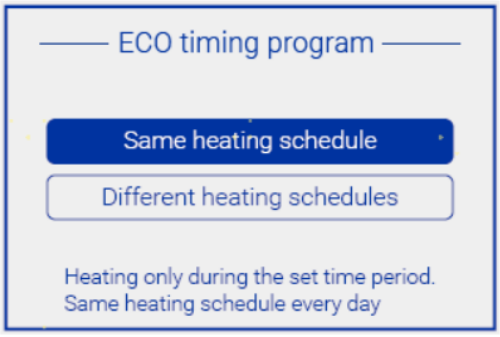
of 10 hours (which can be adjusted through the HP Duration in the setting);

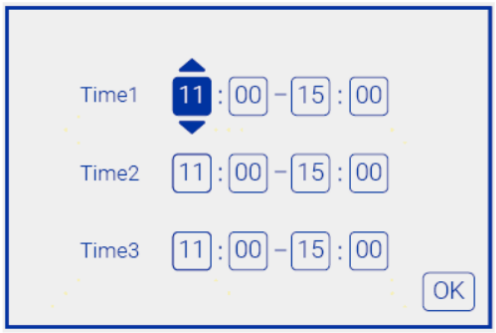


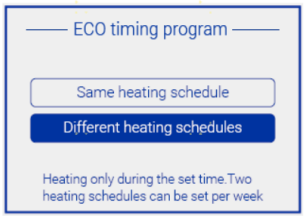


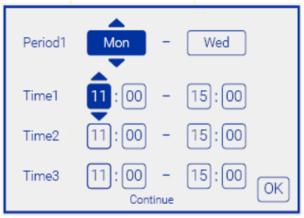
ECO mode

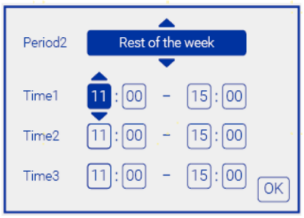
After selecting ECO by rotating the button, enter the selection interface, where you can select the ECO time period, such as Same every day - Different every day.









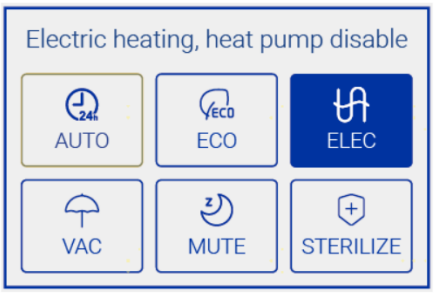


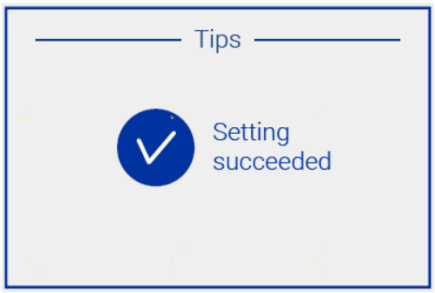
ELEC mode

After selecting ELEC, press Rotate knob to confirm, and then prompt whether the setting is successful or not. After the prompt is completed, it will automatically return to the menu interface. The main interface displays ELEC mode.

After selecting the ELEC function, the electric heating will delay powering on for 6 seconds. The electric heating work indicator icon on the main interface lights up.

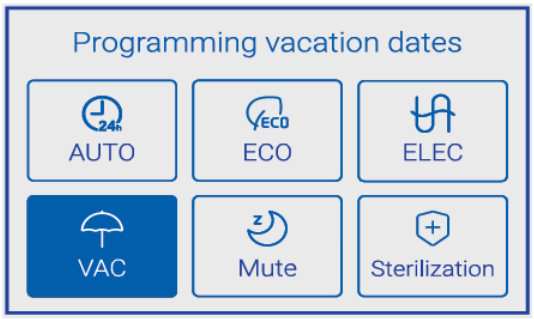
ELEC remains effective until the set temperature is reached, and the electric heater stops working and the indicator icon goes out. In ELEC mode, the heat pump does not work, only electric heating works.

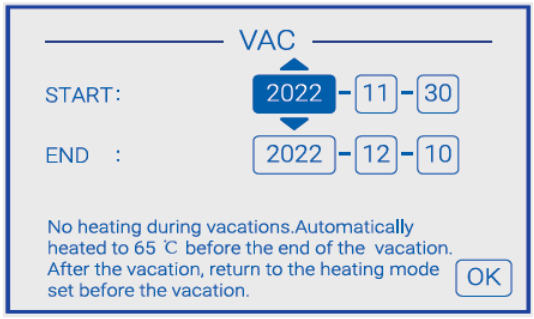




VAC mode

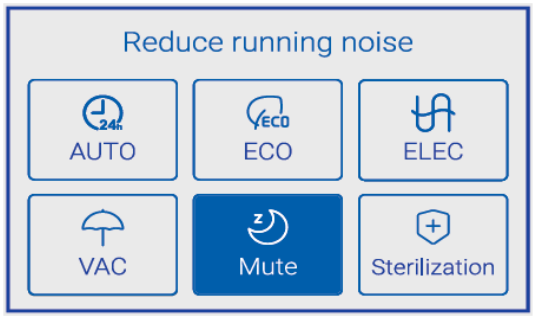
After selecting VAC, press the Rotary knob to confirm and enter the start and end time period setting. After the time setting is completed, select the OK button to automatically return to the menu interface. The main interface displays VAC mode. In this mode, the system activates the water tank protection function (anti freezing, etc.) and prepares hot water in advance based on the vacation return date entered by the user. In this mode, the displayed set temperature is the user set temperature, but it is not heated. Before the vacation is completed, the system completes a heating process and automatically switches to AUTO mode.

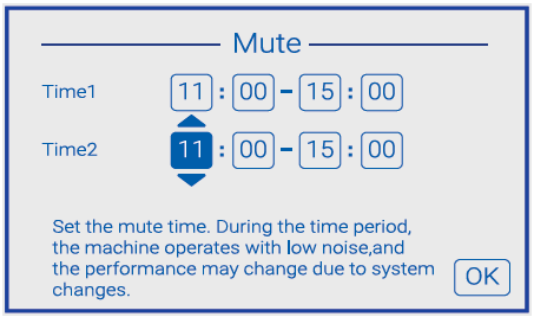




MUTE function

After selecting MUTE, press Rotary knob to confirm and enter the time period setting. After the time setting is completed, select OK to confirm and automatically return to the menu interface. The corresponding icon on the main interface lights up.

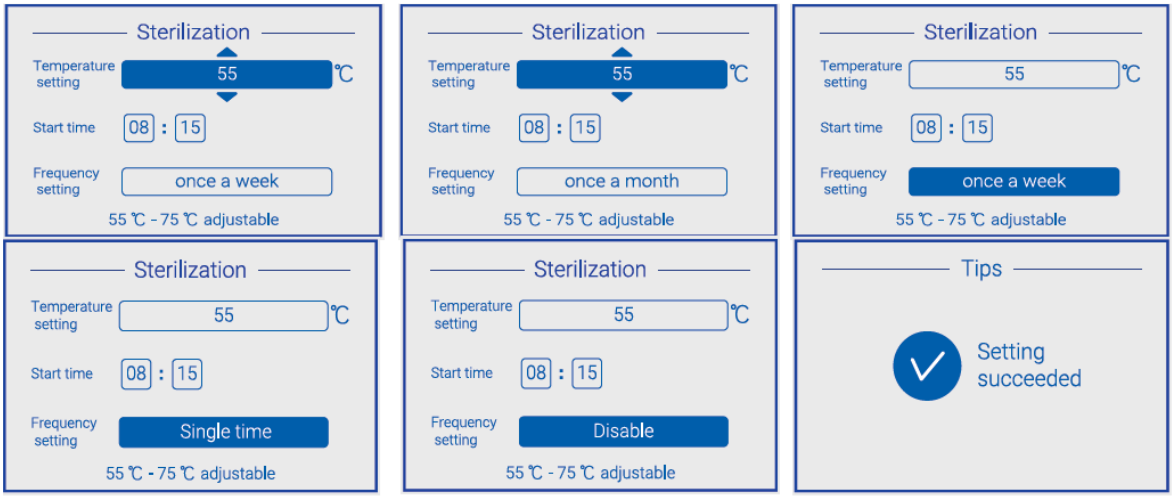




STERILIZE function

After selecting STERILIZE, press the Rotary knob to confirm and enter the temperature, frequency settings, and time point settings. Confirm the temperature and frequency settings by rotating the Rotary knob. After setting, prompt whether the setting is successful or not and return to the main interface.

1. Sterilization target temperature: Set the range to 55-75 ℃ (F), with a default of 65 ℃;
2. Frequency options: once every 30 days, once every week, only executed once, not executed, default to once every 30 days;
3. Time setting: hours and minutes, default time 00:00;



Accumulated quantity display function

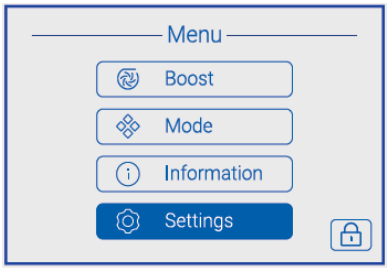
After selecting information, press Rotary knob to confirm. After entering the selection interface, there are four types of information that can be queried: Energy Accumulation - Energy consumption - Operation information - Message reset, all selected by rotating the Rotary knob.

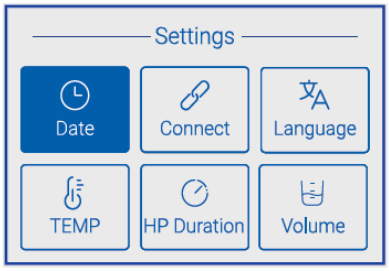
Information query function

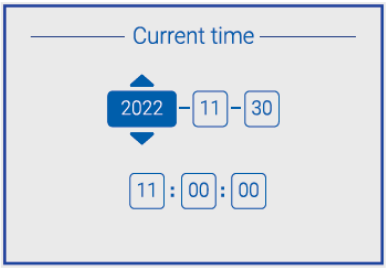
After selecting Operation information, press the rotation button to confirm and display the current operation information. Negative values can also be displayed.

Settings

After selecting Settings, press the Rotary knob to confirm and enter the selection interface. There are 7 options to choose from, including date, connection, language, temperature, HP, volume, and fan speed, all of which are selected by rotating the button.

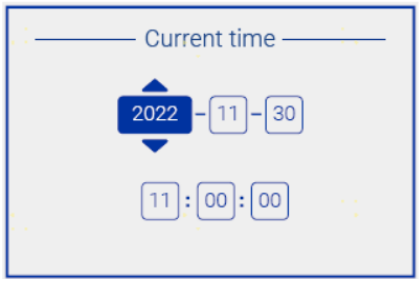






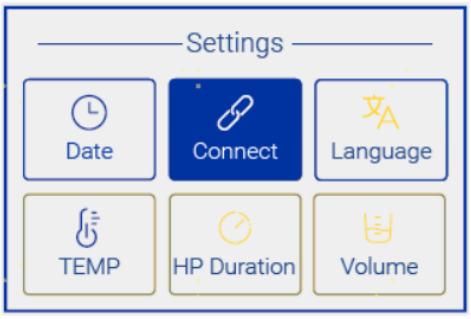
Time settings

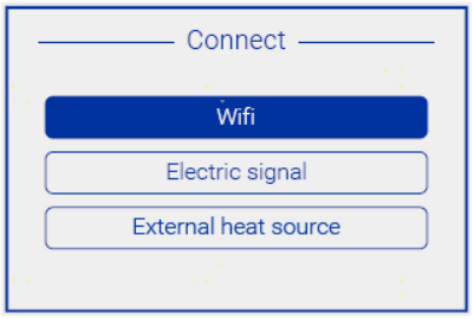
After selecting DATE by rotating the button, the color of the year deepens. Confirm by pressing the Rotary knob, and then automatically adjust to the month, in order of day, hour, minute, and second. After confirmation, press the return button to return to the menu interface.



Function settings

After selecting CONNECT, confirm and enter the next interface. There are three options to choose from: WIFI, power signal, and External heat source (M8 does not have this function).



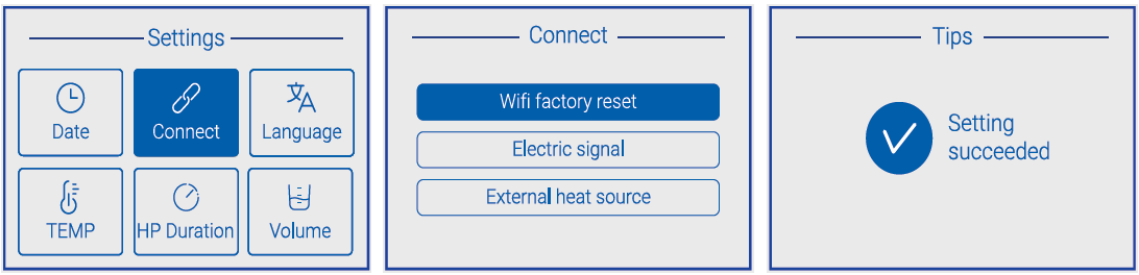


□WiFi settings

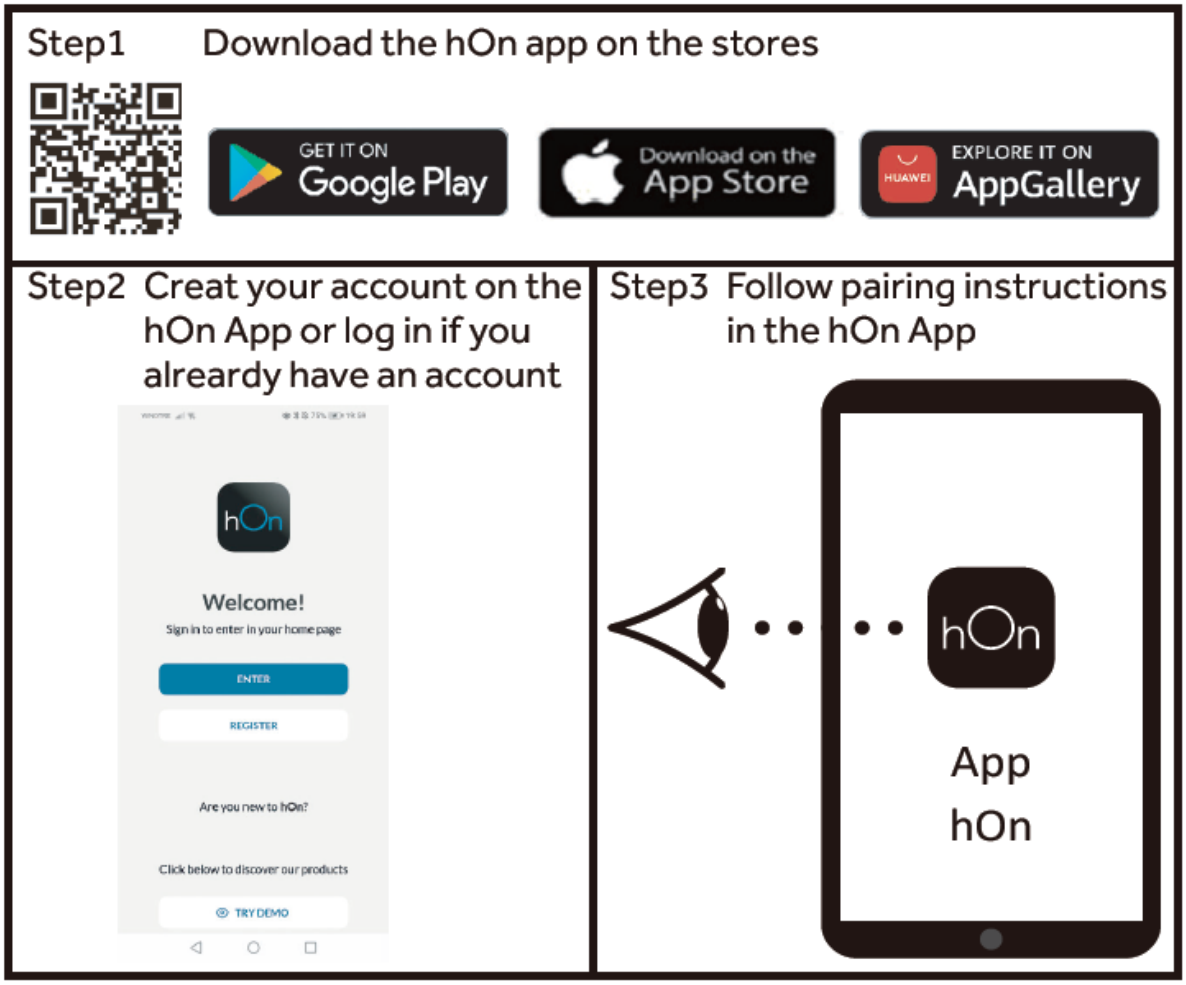
After selecting WiFi, return to the main interface and the WiFi icon flashes to connect to the network. The WiFi icon remains constantly on, indicating successful networking. After 30 minutes without WiFi, the icon stops flashing and the WIFI connection can be cancelled.

On your mobile device:

1. In App Store search “hOn” to download and install the app. (See Page39)
2. Register and create an account.
3. Add your appliance and set up the WiFi connection.

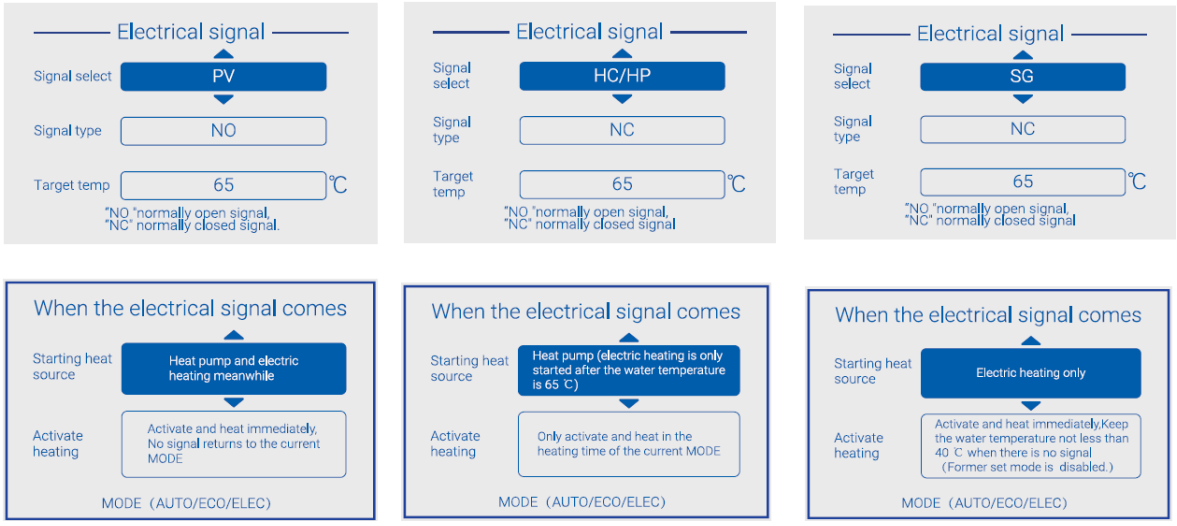


In App Store search “hOn” to download and install the app.



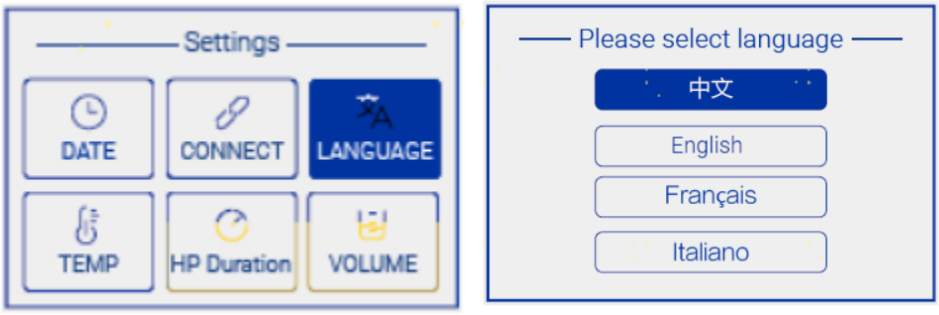
□ECO electrical signal settings

After selecting Electric signal, enter the next interface to select mode, switch signal, operation mode, target temperature, and heating method. Rotate the Rotary knob to select and confirm, and return to the menu interface. The corresponding icon will be displayed on the main interface.



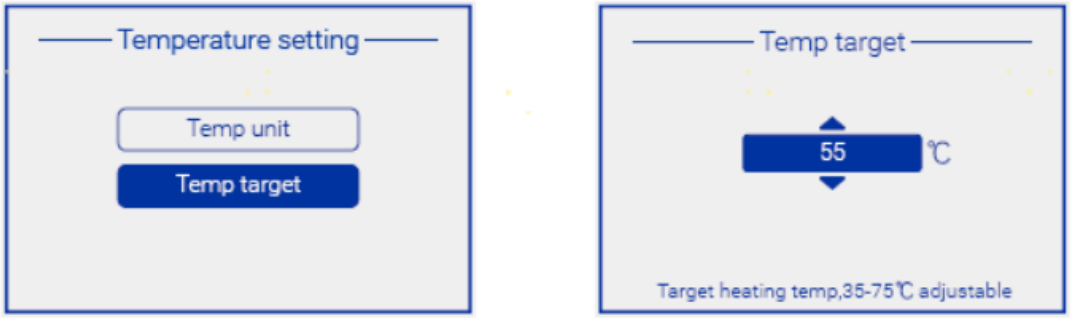
Language settings

After selecting LANGUAGE, enter the language selection for a total of 8 languages. After confirmation, it will automatically return to the menu.



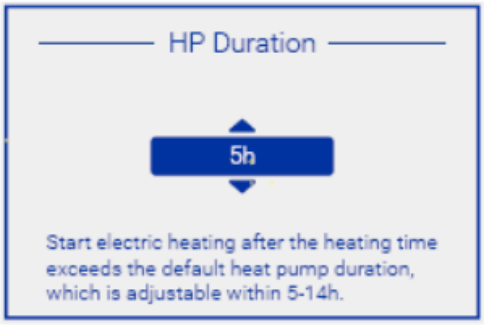
Target Temperature&Unit Settings

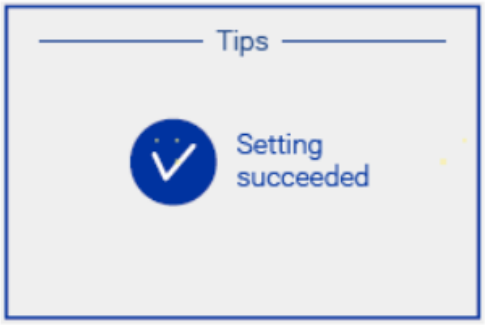
After selecting TEMP, you can set the temperature unit and temperature target value. After confirming the selection, return to the main interface.



Selection of maximum operating time for heat pump

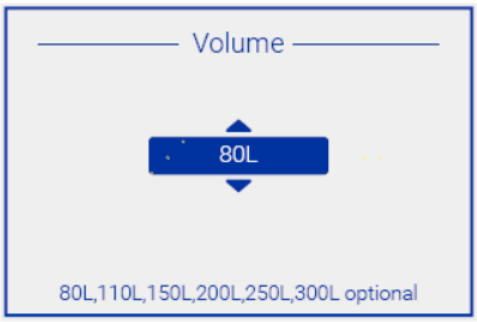
After selecting HP Duration, you can select the heating duration.

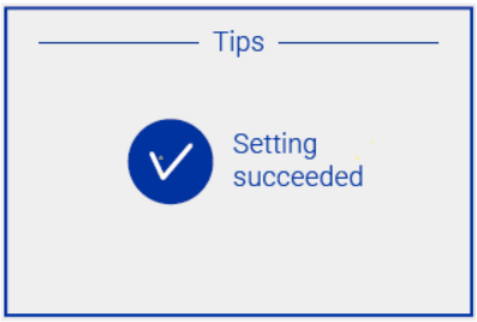




Volume selection

After selecting the volume setting, you can select the volume.





Fan speed

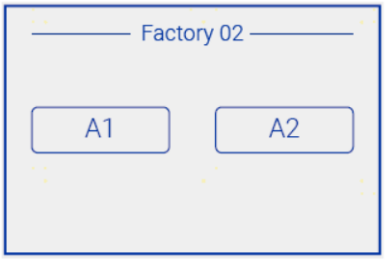
It can achieve a higher constant speed. In V1 or V2 case, the machine can connect longer air dusts, and the system performance changes accordingly.

Special functions

When turned on, press and hold the menu button for 10 seconds, and the display panel will display 01, 02, 03, and 04. Select the serial number by rotating the button.

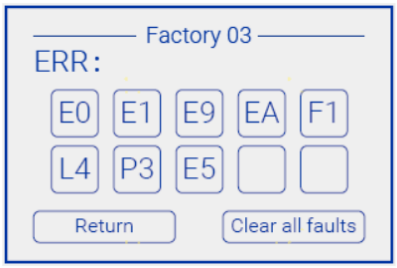
Demo prototype functionality

In the startup state, press and hold the menu button for 10 seconds, rotate the button to select 02, and press the rotate button to enter the empty shell prototype mode. The display panel temperature displays A1. A1 represents the real machine program; A2 represents the demonstration program. Use the "Rotate" button to select confirm A1 or A2, press the "Rotate" button to confirm and exit the setting interface. The default is A1.



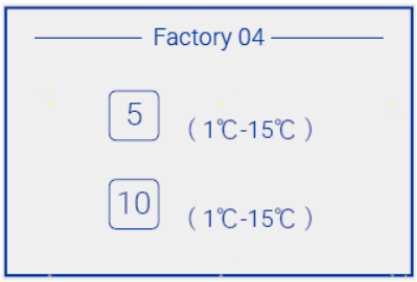
Fault query function

When turned on, press and hold the "Menu Button" button for 10 seconds, rotate the button to select 03, and press the rotate button to enter the fault query function. If there is no fault, E0 will be displayed. If there is a fault, it will be displayed from the last time. By rotating the button counterclockwise, the previous fault code can be queried in sequence. By rotating the button clockwise, the next fault code can be queried, without cycling. A total of 10 queries can be performed. After 6 seconds of querying, there will be no operation or pressing the return button to exit the query function. After entering the query function, continue to press and hold the "Rotate Button" button for 10 seconds to clear the fault code.



Differential temperature setting

In the startup state, press and hold the menu button for 10 seconds, rotate the button to select 04, and press the rotate button to enter the differential setting. The upper temperature defaults to 5 degrees, and the average temperature of the water tank defaults to 10 degrees. By rotating the button, you can make 1-15 selections, with an adjustment unit of 1. After completing the selection, press the rotation button to confirm and exit the settings interface.



7. Checking and maintenance

- Installation and maintenance of the appliance must be done by a qualified professional .
- Before working on the appliance, Shut down the machine and cut off the power supply .
- Do not touch with wet hands.
- Maintenance operations are important to guarantee optimum performance and extend the life of the equipment.

Checking the Safety valve

- Operate the safety valve at least one time per month to check if it is running correctly. Otherwise check for blocking and replace the safety valve if necessary.

Checking the hydraulic circuit

- Check the watertightness of the water connections.

Cleaning the fan

- Check the cleanliness of the fan one time per year.

Checking the evaporator

- Clean the evaporator at regular intervals using a soft-haired brush.
- If they are bent. Carefully realign the evaporator using a suitable comb.
- Because the evaporator fins is very sharp. Risk of injury on your finger.
- Do not damage the fins. Avoid affecting the performance.

Checking the condensates discharge pipe

- Check the pipe cleanliness
- An obstruction by dust may cause poor condensates flow or even a risk accumulation of water in the heat pump plastic base.

Checking the Magnesium rod

- The magnesium anode should be replaced in time, avoid tank corrosion.
- Checking magnesium anode once every 2 years .In poor water areas need to shorten the time.

Drain the water tank to empty

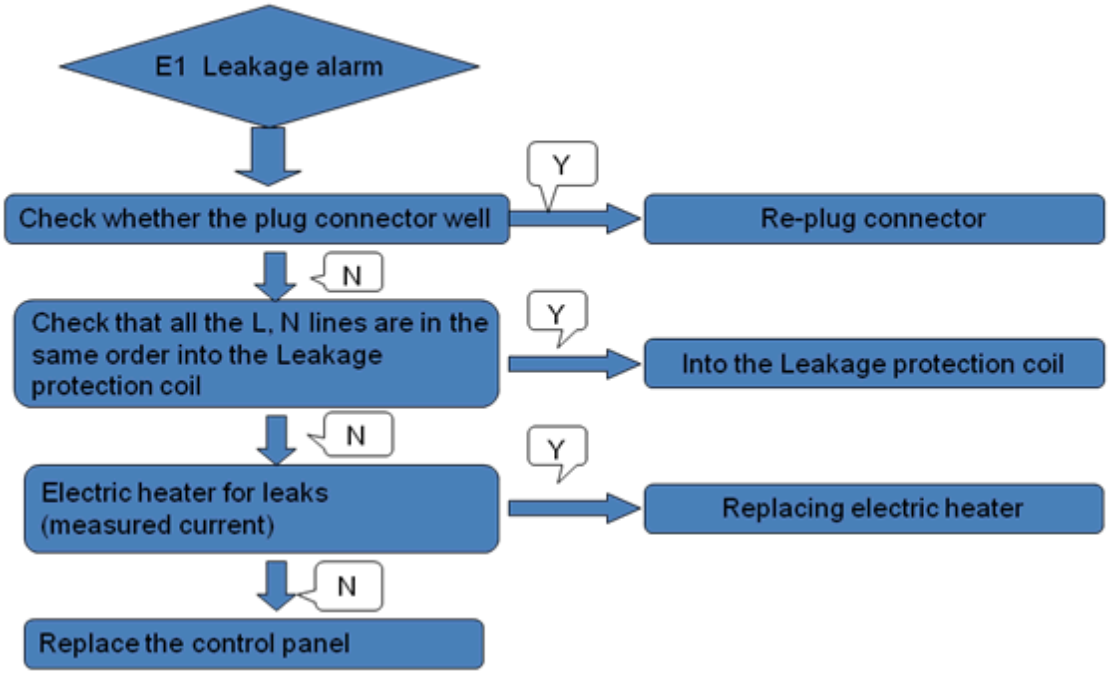
Cut off power supply and shut down water inlet valve, then drain the water tank to empty via the sewage outlet. Please stay away from the sewage outlet if there is hot water inside the water tank to avoid injury.

8. Faults and protection

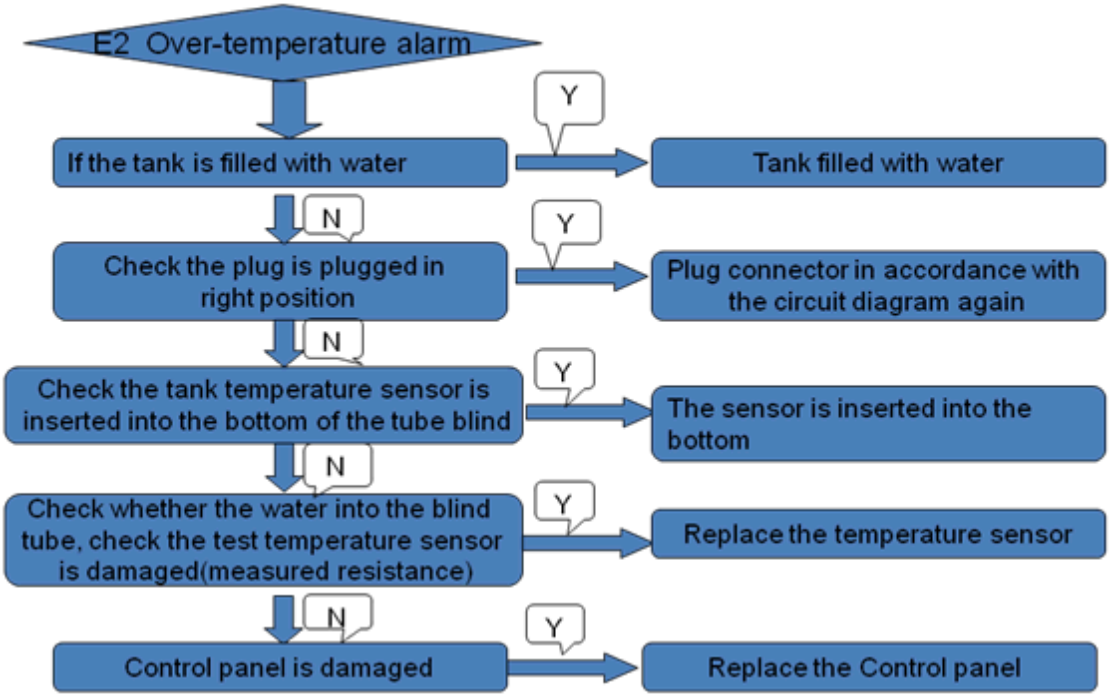
NO.	Fault category	Action conditions	Digital indication
1	Communication fault	Communication failure between Wi-Fi module and control board	F0
2	Compressor protection (ring temperature protection)	If the ambient temperature does not meet the operating conditions after the compressor is started for 5 minutes, shut down the compressor. Start auxiliary heating and heat to the set temperature	F2
3	Compressor protection (high exhaust temperature)	Exhaust temperature ≥ 115 ℃ for 30s	F3
4	Leakage alarm	When the leakage current is ≥ 15mA, cut off the power supply,	E1
5	Overtemperature alarm	Fault alarm above 88 ℃	E2
6	The temperature sensor in the tank is faulty	If short circuit or circuit break occurs to the sensor	E3
7	Ambient temperature sensor fault	If short circuit or circuit break occurs to the sensor	E4
8	Evaporation temperature sensor fault	If short circuit or circuit break occurs to the sensor	E5
9	Suction temperature sensor fault	If short circuit or circuit break occurs to the sensor	Ed
10	Exhaust temperature sensor fault	If short circuit or circuit break occurs to the sensor	E6
11	Communication failure	The communication between the main control board and the display board is abnormal, and the main control board and the remote controller	E7
12	Pressure switch protection	Pressure switch action	E8
13	Ambient temperature protection	When the ambient temperature is detected to be less than - 7 ℃ or more than 45 ℃ , the electric heating will start automatically and heat to the set temperature this time.	E9
14	Low voltage switch failure	When judging the low power by the switch signal of the power company, if the low power signal is not received within 24 hours, the switch circuit is considered to be faulty	EF
15	DC fan fault	After receiving the fan start signal, the fan feedback signal is not detected for 30 seconds, and the fan fault is reported.	L7

9. Fault code identification method

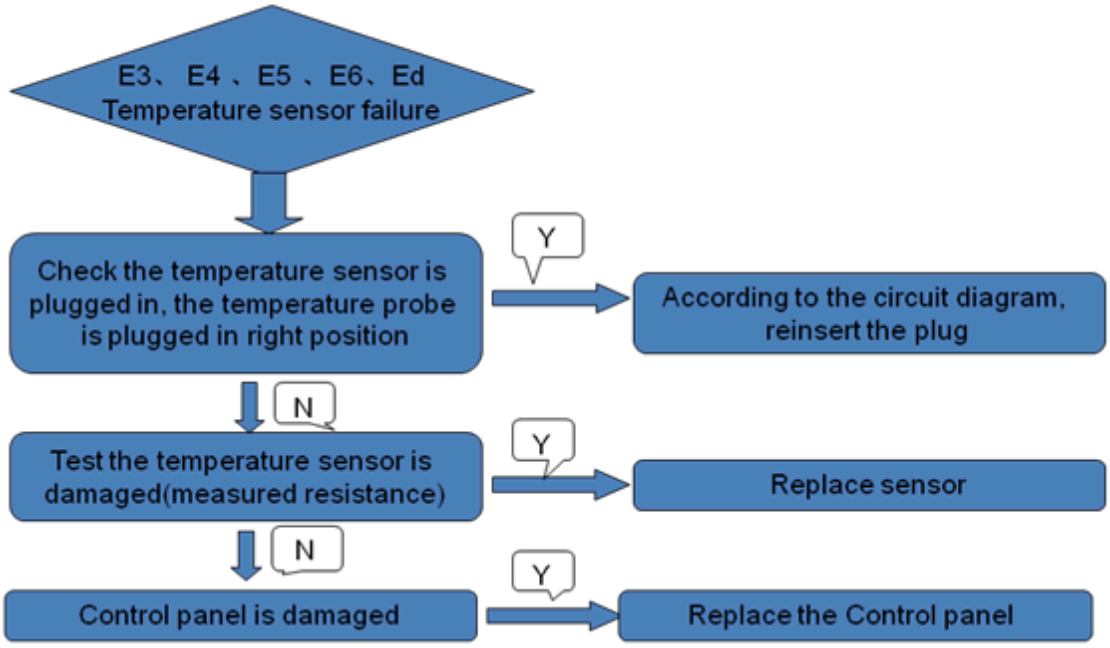
" E1 "error code and identification process



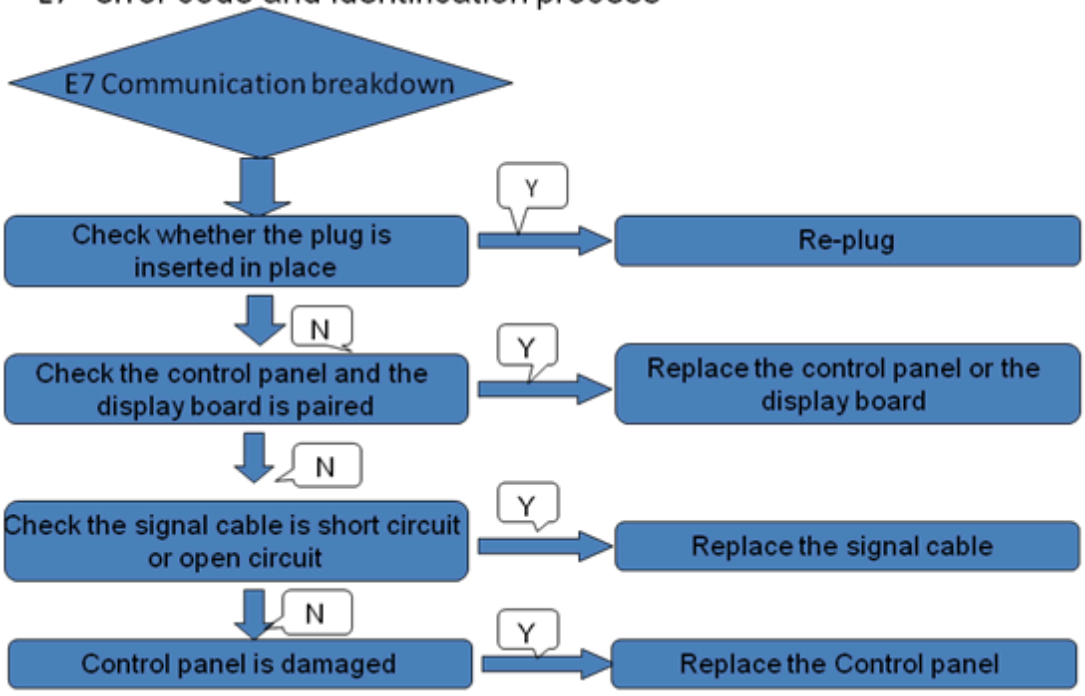
"E2" error code and identification process



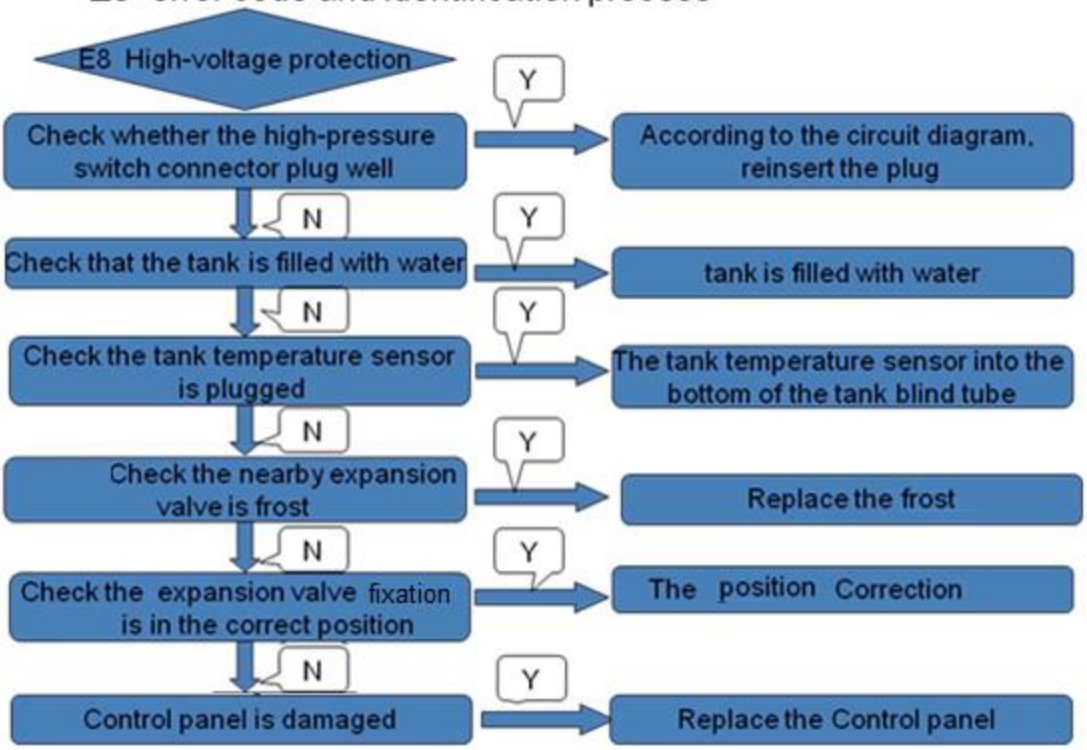
"E3、 E4 、E5 、E6、Ed" error code and identification process



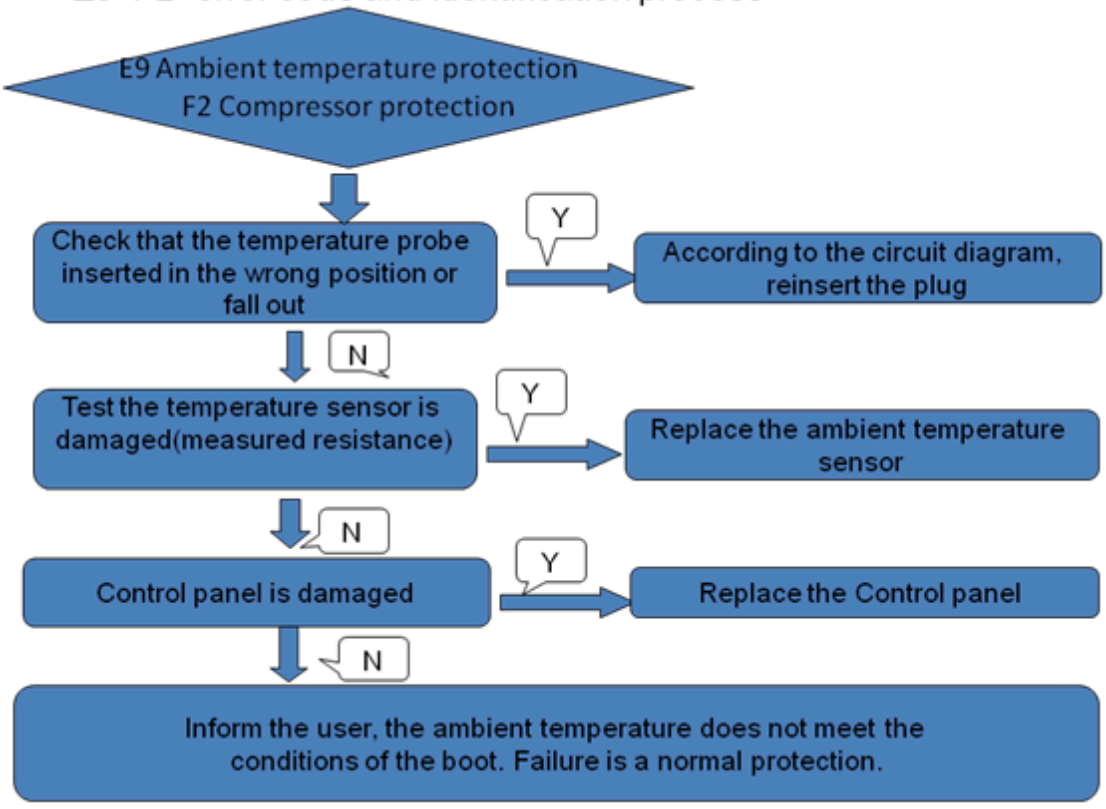
"E7" error code and identification process



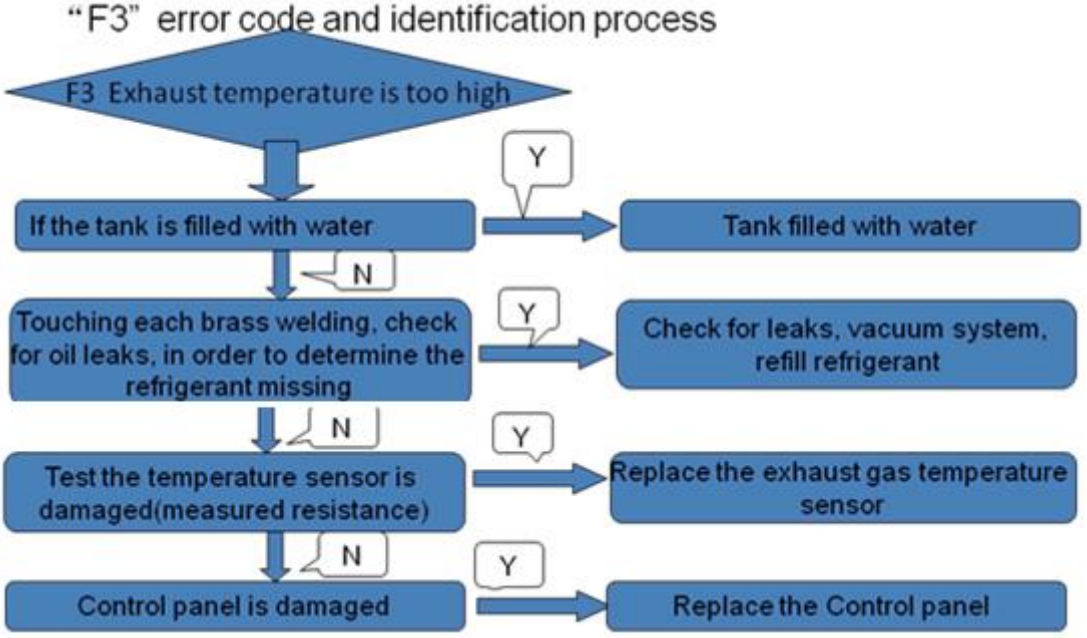
"E8" error code and identification process



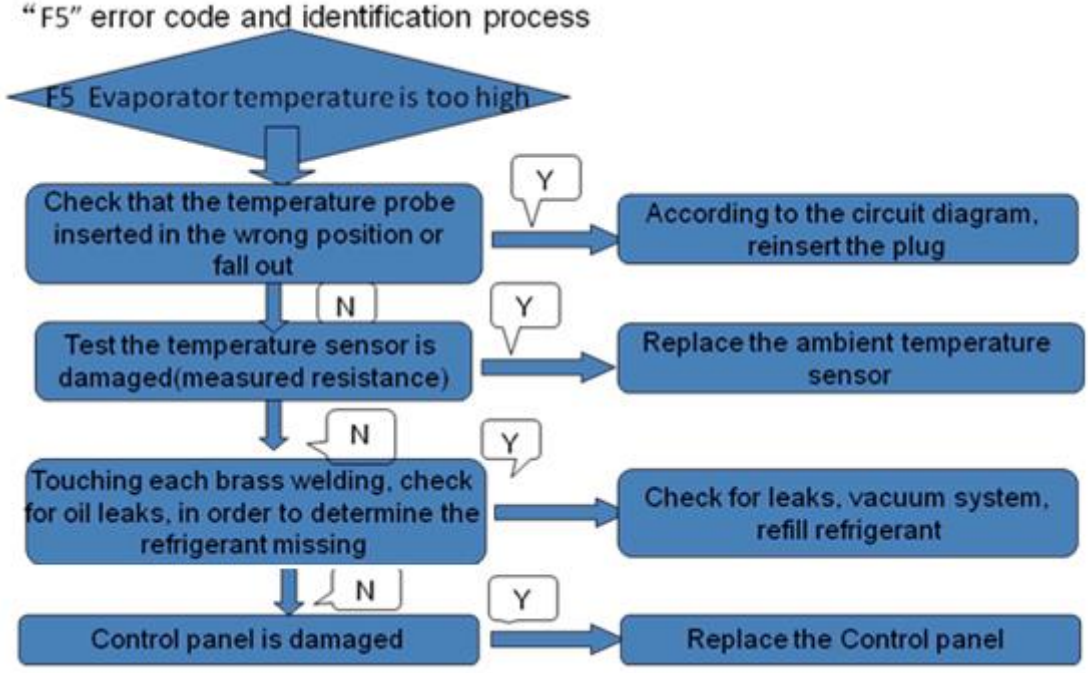
"E9 F2" error code and identification process



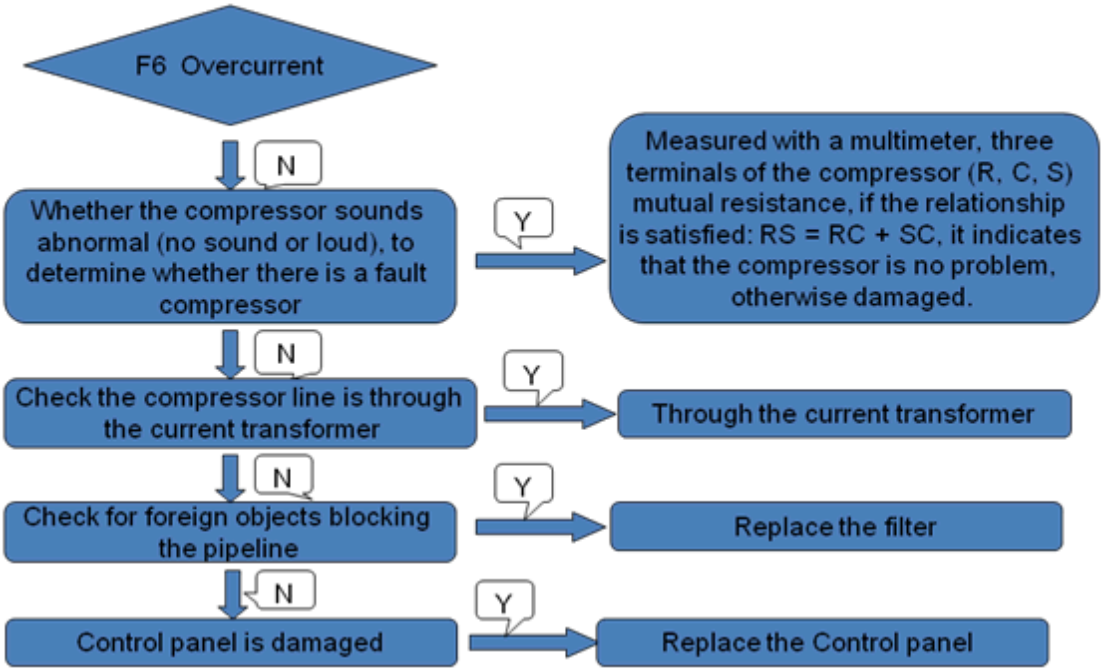
"F3" error code and identification process



"F5" error code and identification process

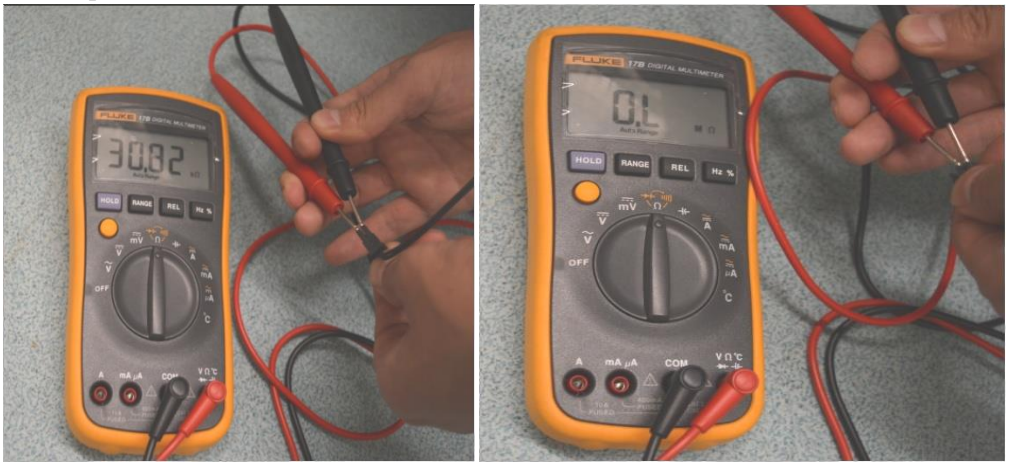


"F6" error code and identification process



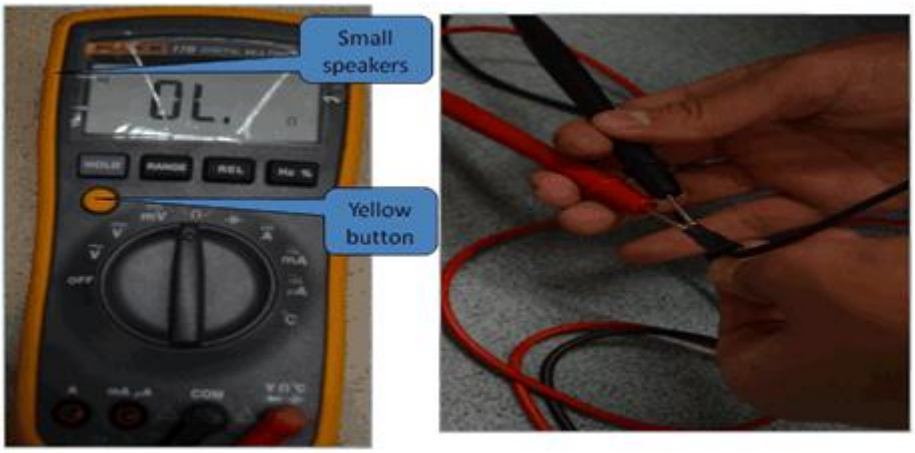
Temperature sensor resistance measurement method

Temperature sensor resistance measurement method (method of measuring the resistance value of the compressor of the same, but is switched to the small resistance of the interface unit).



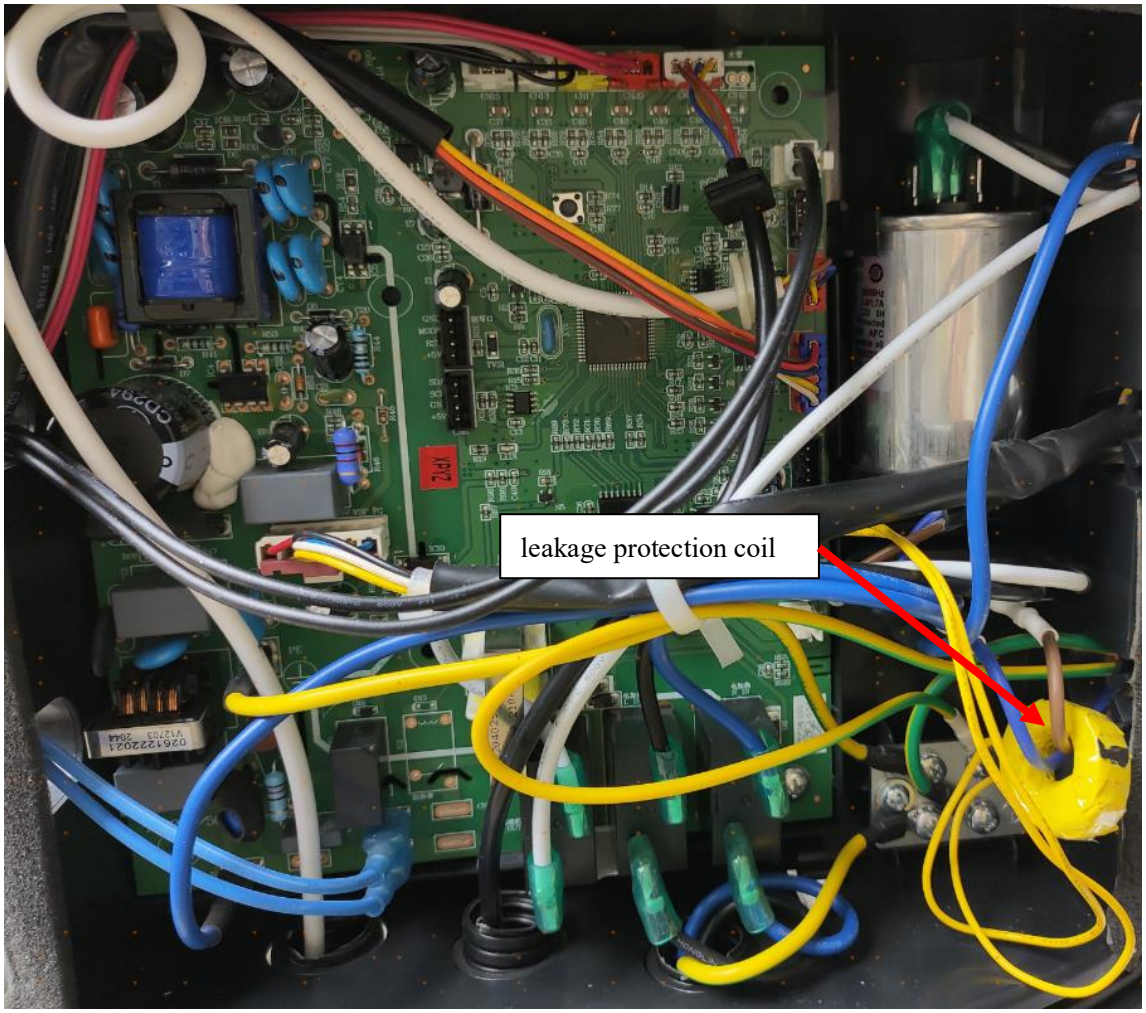
Multimeter set to Ohms, according to the picture of the method of measuring the resistance of the temperature sensor. According to the resistance table, the lower the temperature the smaller the resistance.

Check the signal cable is short-circuited



Press the yellow button to switch to the picture, when a short circuit, there is a beep, the resistance is zero.

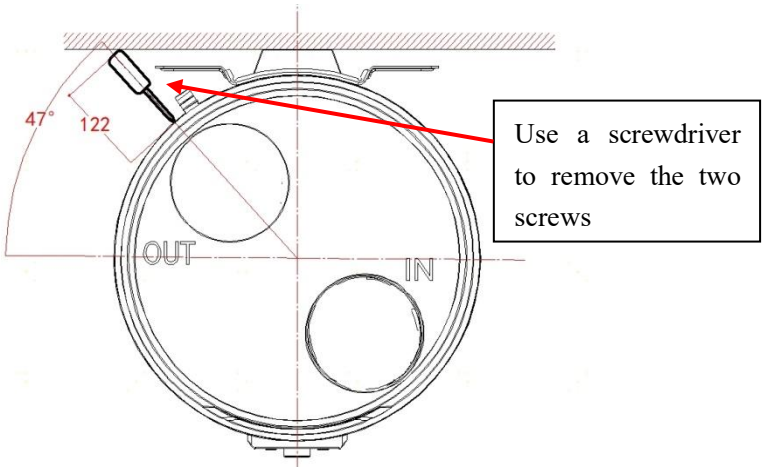
Check that the power cord L, N lines are in the same order into the leakage protection coil



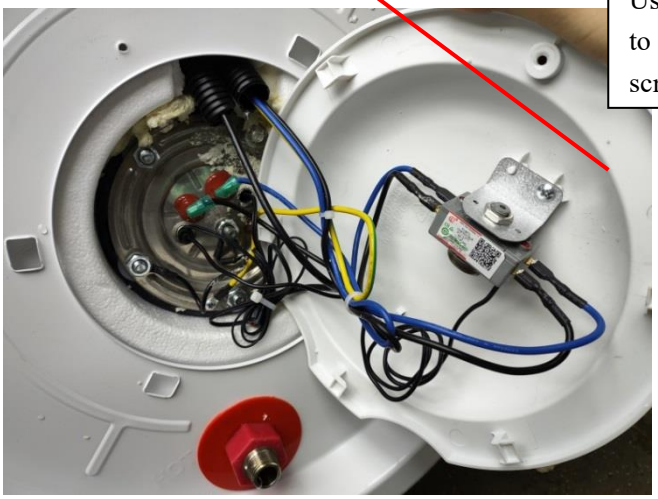
10. The method of dismantling products

Make sure the power cord is disconnected.

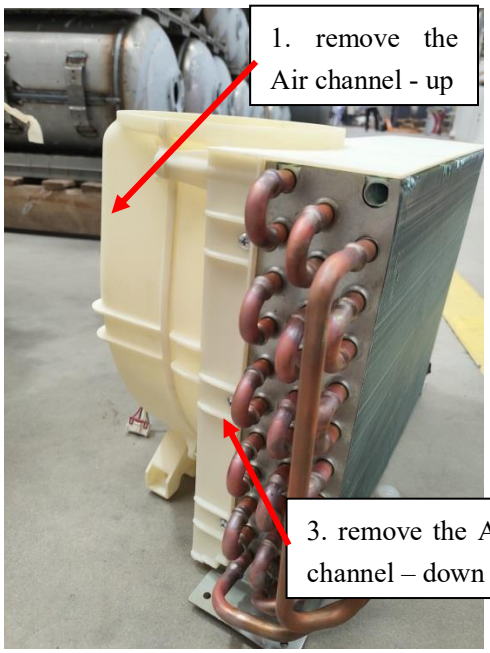
1、 Remove the Top Cover

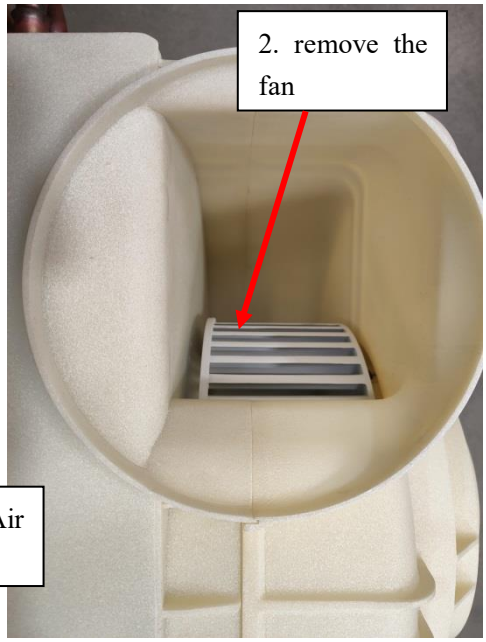


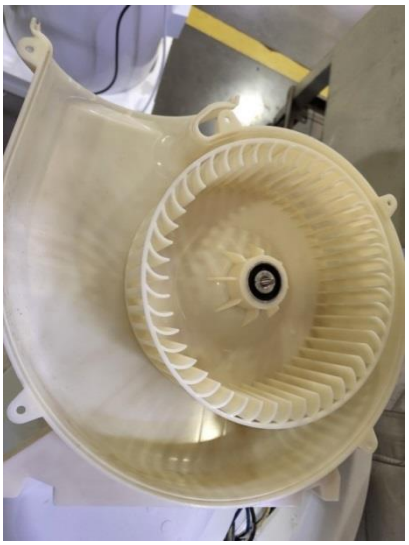
2、 Remove the Bottom Cover

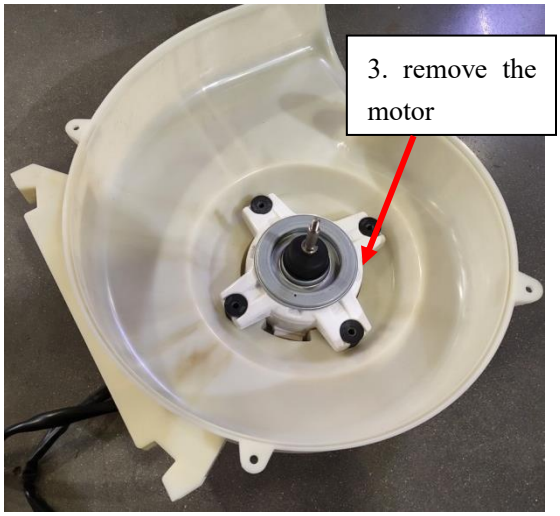


3、 Remove the Air channel and fan







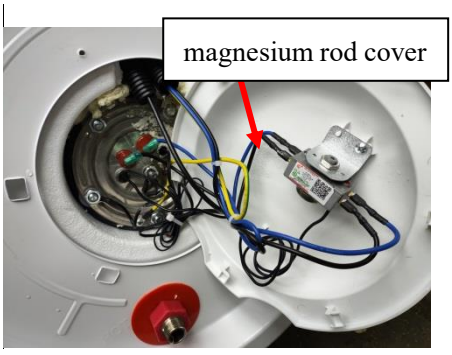


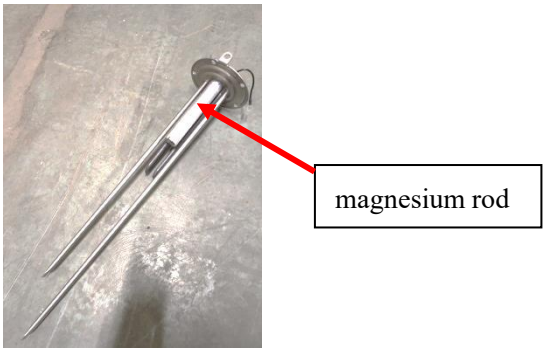
4、 Remove the Magnesium rod

Off the power and close the inlet valve, open any outlet valve, exhaust pressure, when no water flows out of time， turn off all the valves.

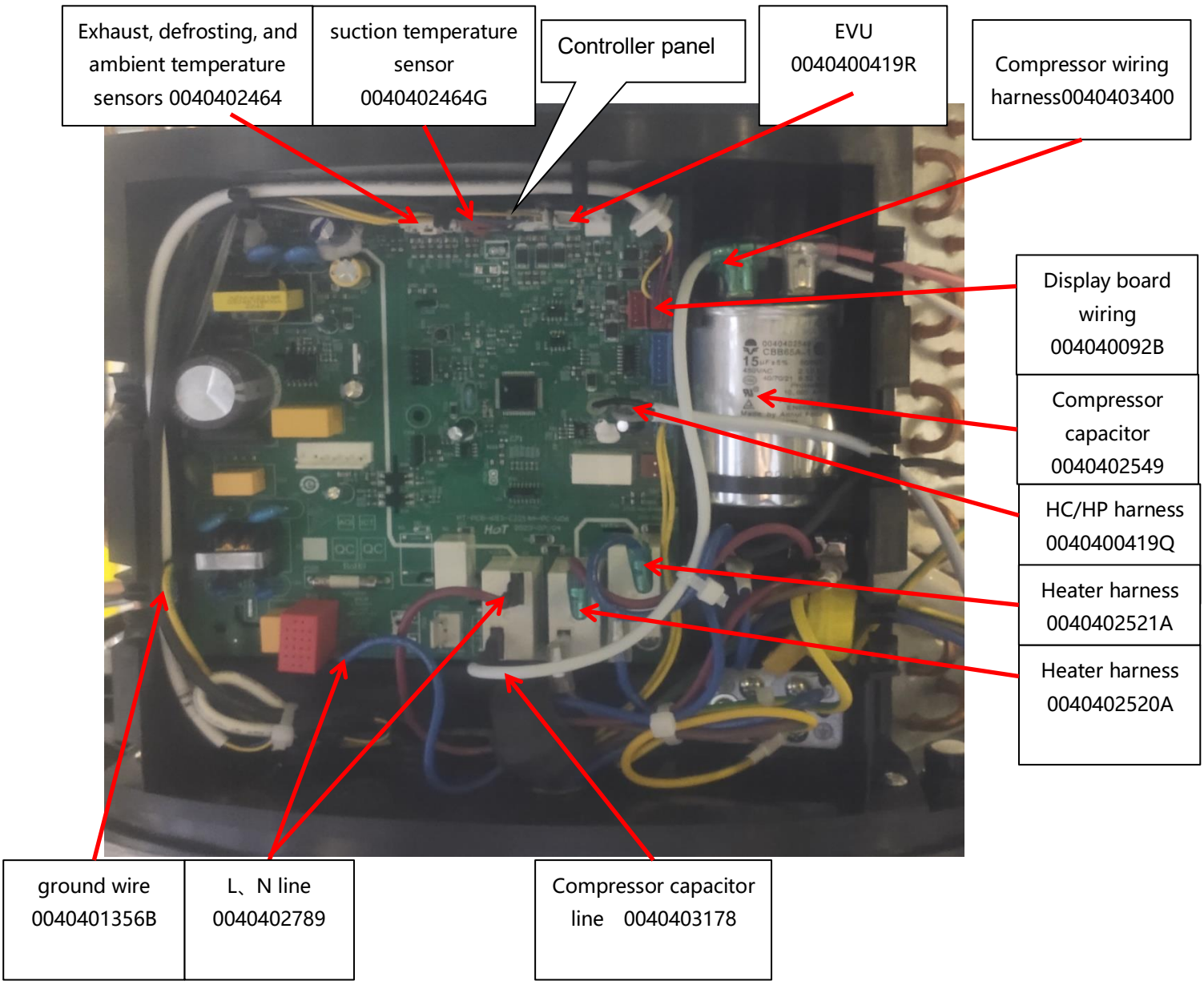
① Remove the magnesium rod cover；

② After remove the magnesium rod, according to the consumption of magnesium rod, determine whether you need to replace.





5、 Open the control box



6、 Remove the Display board box

Use a screwdriver to remove the screw

0040400092CB Display board wiring

0040400419Q WIFI line

0041800214PB
WIFI module

MAC code

11. The method of Charge of the refrigerant gas

1. Check the heat pump system refrigerant leakage method:

1. In the heating process, heat pump input power has remained unchanged;

2. During heating, the temperature of the water in the tank is constant (ensure that the electric heater is not activated).

2. Leakage check:

If you have confirmed that the system has been leaked, please check it as follows.

1． Unscrew the maintenance valve nut, access to nitrogen, to maintain pressure 1MPa.

2. Apply soap bubbles evenly over the solder joints of the copper tube. Observe the changes in the status of soap bubbles to determine the location of leakage.

3. After the professionals repair the welding leakage point, check the leakage again with the above method until it is confirmed that the system has no leakage point.

3. Making the vacuum & Gas Charging:

Bleeding from the circuit should take place with a vacuum pump and pressure gauge assembly suitable for R290.

Make sure the vacuum pump is full of oil up to the level indicated by the oil gauge.

1. Connect the manometer on the low pressure service valve of heat pump, and connect the refrigerant cylinder to the other side the manometer.
2. Connect the vacuum pump to the center tap of the manometer.

3. After opened the valves of the vacuum pump, start it and let it run. Create a vacuum for about 20 / 25 minutes;
4. Close the valves of the pump and shut off. Verify that the gauge needle does not move for about 5 minutes.
5. Disconnect the vacuum pump;
6. Open the container of the refrigerant then open the main valve cap pressure gauge and adjust the needle valve until you hear the coolant leak, and release the pin and close the valve of the pipe;
7. Keep under control the weight of the refrigerant tank through the electronic scale;
8. Open the ball valve and to flow the refrigerant gradually;
9. After reaching the mass of gas to be loaded close the tap(0.12kg);
10. Remove the manometer and charging hose from the valve;
11. turn the product in heat pump mode with the detector and check for leaks of refrigerant;
12. Remove the container from the manifold and replace all the equipment.

12. Repairs common tools

Tools Name	Quantity	Illustration
Spanner	**1pc**	
Torque Spanner	**1pc**	
Hexagon **Spanner**	**1pc**	
Flathead screwdriver	**1pc**	
Phillips screwdriver	**1pc**	
Needle-nose pliers	**1pc**	
Measuring tape	**1pc**	
Pressure gauge	**1pc**	
Vacuum pump	**1pc**	
Electronic scale	**1pc**	
Bending device	**1pc**	

Attachment: Sensor Temperature and Resistance Comparison Table

ambient-evaporator-suction T sensor：

R25=10K±3%；B25/50=3700K±3%

Temp	阻值resistance（KΩ）		
（℃）	Rmax	R（t）Normal	Rmin
-40	249.020	231.216	213.412
-39	235.632	218.928	202.224
-38	223.031	207.355	191.679
-37	211.149	196.436	181.723
-36	199.933	186.123	172.313
-35	189.335	176.372	163.409
-34	179.314	167.146	154.978
-33	169.836	158.414	146.992
-32	160.867	150.147	139.427
-31	152.381	142.319	132.257
-30	144.350	134.907	125.464
-29	136.519	127.675	118.831
-28	129.381	121.081	112.781
-27	122.638	114.849	107.060
-26	116.268	108.958	101.648
-25	110.249	103.388	96.527
-24	104.563	98.123	91.683
-23	99.190	93.144	87.098
-22	94.111	88.435	82.759
-21	89.311	83.982	78.653
-20	84.518	79.529	74.540
-19	80.484	75.785	71.086
-18	76.428	72.015	67.602
-17	72.591	68.447	64.303
-16	68.963	65.071	61.179
-15	65.530	61.874	58.218
-14	62.283	58.848	55.413
-13	59.210	55.983	52.756
-12	56.300	53.269	50.238
-11	53.547	50.699	47.851
-10	50.940	48.264	45.588
-9	48.472	45.957	43.442
-8	46.134	43.770	41.406
-7	43.918	41.697	39.476
-6	41.819	39.731	37.643
-5	39.830	37.868	35.906
-4	37.944	36.100	34.256
-3	36.157	34.423	32.689
-2	34.462	32.832	31.202
-1	32.854	31.322	29.790
0	31.362	29.920	28.478
1	29.881	28.527	27.173
2	28.507	27.234	25.961
3	27.202	26.006	24.810
4	25.965	24.840	23.715
5	24.788	23.731	22.674
6	23.672	22.678	21.684
7	22.610	21.676	20.742
8	21.601	20.723	19.845
9	20.642	19.817	18.992
10	19.730	18.955	18.180
11	18.864	18.135	17.406
12	18.039	17.354	16.669
13	17.254	16.611	15.968
14	16.507	15.903	15.299
15	15.797	15.229	14.661
16	15.120	14.587	14.054
17	14.476	13.975	13.474
18	13.862	13.392	12.922
19	13.277	12.836	12.395
20	12.720	12.306	11.892
21	12.189	11.801	11.413
22	11.683	11.319	10.955
23	11.200	10.858	10.516
24	10.739	10.419	10.099
25	10.300	10.000	9.700
26	9.894	9.600	9.306
27	9.505	9.217	8.929
28	9.134	8.852	8.570
29	8.779	8.503	8.227
30	8.441	8.170	7.899
31	8.116	7.851	7.586
32	7.805	7.546	7.287
33	7.509	7.255	7.001
34	7.225	6.976	6.727
35	6.953	6.710	6.467
36	6.692	6.454	6.216
37	6.443	6.210	5.977
38	6.204	5.976	5.748
39	5.976	5.753	5.530
40	5.756	5.538	5.320
41	5.546	5.333	5.120
42	5.345	5.136	4.927
43	5.151	4.947	4.743
44	4.967	4.767	4.567
45	4.788	4.593	4.398
46	4.618	4.427	4.236
47	4.455	4.268	4.081
48	4.298	4.115	3.932
49	4.147	3.968	3.789
50	4.004	3.829	3.654

51	3.863	3.692	3.521
52	3.729	3.562	3.395
53	3.601	3.438	3.275
54	3.478	3.318	3.158
55	3.359	3.203	3.047
56	3.246	3.093	2.940
57	3.136	2.987	2.838
58	3.031	2.885	2.739
59	2.930	2.787	2.644
60	2.833	2.693	2.553
61	2.739	2.602	2.465
62	2.649	2.515	2.381
63	2.562	2.431	2.300
64	2.478	2.350	2.222
65	2.398	2.273	2.148
66	2.320	2.198	2.076
67	2.246	2.126	2.006
68	2.174	2.057	1.940
69	2.104	1.990	1.876
70	2.038	1.926	1.814
71	1.974	1.864	1.754
72	1.912	1.805	1.698
73	1.853	1.748	1.643
74	1.795	1.692	1.589
75	1.739	1.639	1.539
76	1.686	1.588	1.490
77	1.634	1.538	1.442
78	1.585	1.491	1.397
79	1.537	1.445	1.353
80	1.490	1.400	1.310
81	1.445	1.357	1.269
82	1.402	1.316	1.230
83	1.361	1.276	1.191
84	1.321	1.238	1.155
85	1.281	1.200	1.119
86	1.244	1.165	1.086
87	1.209	1.131	1.053
88	1.173	1.097	1.021
89	1.140	1.065	0.990
90	1.107	1.034	0.961
91	1.076	1.004	0.932
92	1.045	0.975	0.905
93	1.016	0.947	0.878
94	0.987	0.920	0.853
95	0.960	0.894	0.828
96	0.934	0.869	0.804
97	0.907	0.844	0.781
98	0.883	0.821	0.759
99	0.859	0.798	0.737
100	0.836	0.776	0.716
101	0.814	0.755	0.696
102	0.791	0.734	0.677
103	0.771	0.715	0.659
104	0.750	0.695	0.640
105	0.731	0.677	0.623

exhaust T sensor：

R80=50KΩ±3%，B25/80=4450±3%

Temp	阻值resistance（KΩ）		
（℃）	Rmax	R（t）Normal	Rmin
-30	12318.968	11021.678	9724.388
-29	11551.311	10343.407	9135.504
-28	10835.229	9710.234	8585.239
-27	10167.003	9118.935	8070.867
-26	9543.200	8566.532	7589.865
-25	8960.652	8050.276	7139.901
-24	8416.430	7567.624	6718.818
-23	7907.828	7116.224	6324.620
-22	7432.345	6693.901	5955.457
-21	6987.666	6298.642	5609.618
-20	6571.650	5928.583	5285.516
-19	6187.164	5586.374	4985.585
-18	5826.712	5265.313	4703.915
-17	5488.692	4964.004	4439.315
-16	5171.616	4681.148	4190.680
-15	4874.100	4415.539	3956.978
-14	4594.858	4166.054	3737.249
-13	4332.694	3931.647	3530.600
-12	4086.494	3711.346	3336.198
-11	3855.222	3504.244	3153.266
-10	3637.915	3309.498	2981.082
-9	3433.673	3126.321	2818.969
-8	3241.661	2953.980	2666.299
-7	3061.098	2791.790	2522.482
-6	2891.257	2639.114	2386.971
-5	2731.460	2495.357	2259.253
-4	2581.076	2359.962	2138.848
-3	2439.514	2232.412	2025.310
-2	2306.222	2112.221	1918.220
-1	2180.688	1998.938	1817.187
0	2094.972	1921.993	1749.014
1	1975.099	1813.265	1651.431
2	1863.127	1711.646	1560.165
3	1758.449	1616.593	1474.737
4	1660.513	1527.611	1394.709
5	1568.817	1444.250	1319.683
6	1482.897	1366.096	1249.295
7	1402.336	1292.773	1183.210
8	1326.746	1223.935	1121.124
9	1255.774	1159.265	1062.756
54	145.099	138.255	131.411
55	139.078	132.613	126.148
56	133.336	127.229	121.122
57	127.858	122.089	116.320
58	122.630	117.181	111.732
59	117.641	112.494	107.347
60	112.879	108.018	103.157
61	108.332	103.741	99.150
62	103.989	99.654	95.319
63	99.841	95.748	91.655
64	95.879	92.014	88.149
65	92.091	88.443	84.795
66	88.472	85.028	81.584
67	85.011	81.761	78.511
68	81.703	78.636	75.569
69	78.538	75.645	72.752
70	75.510	72.781	70.052
71	72.614	70.040	67.466
72	69.842	67.415	64.988
73	67.189	64.901	62.613
74	64.649	62.493	60.337
75	62.216	60.185	58.154
76	59.886	57.973	56.060
77	57.653	55.852	54.051
78	55.515	53.820	52.125
79	53.465	51.870	50.275
80	51.500	50.000	48.500
81	49.684	48.206	46.728
82	47.940	46.484	45.028
83	46.267	44.832	43.397
84	44.659	43.246	41.833
85	43.114	41.723	40.332
86	41.629	40.260	38.891
87	40.203	38.856	37.509
88	38.831	37.506	36.181
89	37.513	36.209	34.905
90	36.244	34.962	33.680
91	35.025	33.764	32.503
92	33.851	32.612	31.373
93	32.722	31.504	30.286
94	31.636	30.439	29.242
95	30.590	29.413	28.236
96	29.583	28.427	27.271
97	28.614	27.478	26.342

98	27.680	26.564	25.448
99	26.781	25.685	24.589
100	25.914	24.838	23.762
101	25.080	24.023	22.966
102	24.275	23.237	22.199
103	23.500	22.481	21.462
104	22.753	21.752	20.751
105	22.031	21.049	20.067
106	21.336	20.372	19.408
107	20.667	19.720	18.773
108	20.020	19.091	18.162
109	19.397	18.485	17.573
110	18.795	17.900	17.005
111	18.215	17.337	16.459
112	17.655	16.793	15.931
113	17.114	16.268	15.422
114	16.593	15.763	14.933
115	16.090	15.275	14.460
116	15.603	14.804	14.005
117	15.133	14.349	13.565
118	14.681	13.911	13.141
119	14.243	13.488	12.733
120	13.821	13.080	12.339
121	13.412	12.685	11.958
122	13.019	12.305	11.591
123	12.638	11.938	11.238
124	12.271	11.584	10.897
125	11.917	11.242	10.567
126	11.573	10.911	10.249
127	11.243	10.593	9.943
128	10.923	10.285	9.647
129	10.614	9.988	9.362
130	10.315	9.701	9.087
131	10.028	9.425	8.822
132	9.750	9.158	8.566
133	9.481	8.900	8.319
134	9.222	8.651	8.080
135	8.972	8.411	7.850
136	8.731	8.180	7.629
137	8.498	7.957	7.416
138	8.273	7.741	7.209
139	8.055	7.533	7.011
140	7.846	7.333	6.820
141	7.628	7.125	6.621
142	7.417	6.923	6.429
143	7.213	6.728	6.243
144	7.014	6.538	6.062
145	6.822	6.355	5.888
146	6.636	6.178	5.719
147	6.455	6.006	5.556
148	6.280	5.839	5.398
149	6.111	5.678	5.244
150	5.946	5.521	5.096

tank temperature sensor：

B0/100=3970K±2%，R25℃=49.12KΩ±2%

Temp	阻值resistance（KΩ）			Temp	阻值resistance（KΩ）		
（℃）	Rmax	R（t）Normal	Rmin	（℃）	Rmax	R（t）Normal	Rmin
-30	895.026	861.099	827.172	17	71.407	70.434	69.462
-29	841.216	809.827	778.438	18	68.167	67.27	66.373
-28	790.949	761.905	732.861	19	65.091	64.265	63.438
-27	743.979	717.102	690.225	20	62.17	61.41	60.65
-26	700.073	675.199	650.324	21	59.396	58.697	57.999
-25	659.017	635.994	612.971	22	56.76	56.119	55.477
-24	620.611	599.3	577.989	23	54.255	53.668	53.08
-23	584.671	564.943	545.215	24	51.875	51.337	50.799
-22	551.024	532.761	514.498	25	49.611	49.12	48.629
-21	519.514	502.607	485.699	26	47.5	47.011	46.521
-20	489.992	474.339	458.686	27	45.491	45.004	44.517
-19	462.36	447.83	433.3	28	43.577	43.093	42.609
-18	436.45	422.962	409.473	29	41.754	41.274	40.793
-17	412.145	399.623	387.1	30	40.018	39.542	39.065
-16	389.336	377.71	366.084	31	38.364	37.891	37.419
-15	367.922	357.128	346.334	32	36.786	36.318	35.85
-14	347.812	337.789	327.767	33	35.282	34.819	34.356
-13	328.917	319.611	310.306	34	33.849	33.391	32.933
-12	311.156	302.516	293.876	35	32.48	32.028	31.576
-11	294.458	286.436	278.415	36	31.175	30.728	30.282
-10	278.751	271.304	263.856	37	29.929	29.489	29.048
-9	263.97	257.057	250.143	38	28.741	28.306	27.871
-8	250.058	243.64	237.223	39	27.605	27.176	26.748
-7	236.957	231.001	225.044	40	26.521	26.098	25.676
-6	224.616	219.088	213.56	41	25.484	25.068	24.652
-5	212.985	207.856	202.727	42	24.494	24.085	23.675
-4	202.022	197.264	192.506	43	23.548	23.145	22.742
-3	191.683	187.27	182.857	44	22.644	22.247	21.851
-2	181.93	177.838	173.746	45	21.779	21.389	20.999
-1	172.727	168.934	165.14	46	20.951	20.568	20.184
0	164.04	160.524	157.009	47	20.16	19.783	19.405
1	155.848	152.579	149.311	48	19.403	19.032	18.661
2	148.11	145.071	142.032	49	18.677	18.313	17.949
3	140.799	137.974	135.15	50	17.983	17.625	17.267
4	133.887	131.262	128.638	51	17.318	16.967	16.617
5	127.351	124.913	122.475	52	16.68	16.336	15.993
6	121.17	118.906	116.641	53	16.068	15.732	15.396
7	115.323	113.221	111.118	54	15.484	15.155	14.825
8	109.788	107.837	105.886	55	14.922	14.599	14.277
9	104.548	102.738	100.929	56	14.385	14.069	13.753
10	99.587	97.909	96.231	57	13.868	13.559	13.25
11	94.887	93.332	91.777	58	13.374	13.071	12.768
12	90.435	88.995	87.554	59	12.899	12.602	12.306
13	86.215	84.881	83.548	60	12.443	12.153	11.863
14	82.214	80.98	79.746	61	12.006	11.722	11.438
15	78.42	77.28	76.139	62	11.586	11.308	11.03
16	74.821	73.767	72.714	63	11.184	10.912	10.639

Temp	阻值resistance（KΩ）			Temp	阻值resistance（KΩ）		
（℃）	Rmax	R（t）Normal	Rmin	（℃）	Rmax	R（t）Normal	Rmin
64	10.797	10.53	10.264	107	2.77	2.664	2.559
65	10.425	10.164	9.903	108	2.694	2.591	2.487
66	10.067	9.812	9.557	109	2.62	2.519	2.417
67	9.724	9.474	9.224	110	2.549	2.45	2.351
68	9.394	9.149	8.905	111	2.481	2.383	2.286
69	9.076	8.837	8.597	113	2.349	2.256	2.162
70	8.771	8.537	8.303	114	2.287	2.196	2.104
71	8.478	8.248	8.019	115	2.228	2.138	2.048
72	8.196	7.971	7.747	116	2.169	2.081	1.993
73	7.924	7.704	7.484	117	2.113	2.027	1.94
74	7.663	7.448	7.233	118	2.058	1.974	1.889
75	7.411	7.201	6.991	119	2.006	1.923	1.839
76	7.169	6.963	6.757	120	1.955	1.873	1.792
77	6.936	6.734	6.533	121	1.905	1.825	1.745
78	6.712	6.514	6.317	122	1.857	1.779	1.701
79	6.495	6.302	6.109	123	1.812	1.735	1.658
80	6.287	6.098	5.909	124	1.766	1.691	1.615
81	6.086	5.901	5.716	125	1.723	1.649	1.575
82	5.893	5.712	5.53	126	1.681	1.608	1.536
83	5.706	5.529	5.352	127	1.64	1.569	1.498
84	5.527	5.353	5.179	128	1.599	1.53	1.46
85	5.354	5.184	5.014	129	1.561	1.492	1.424
86	5.187	5.021	4.855	130	1.523	1.456	1.389
87	5.027	4.864	4.701	131	1.487	1.421	1.355
88	4.871	4.712	4.553	132	1.451	1.386	1.321
89	4.722	4.566	4.411	133	1.416	1.353	1.289
90	4.577	4.425	4.273	134	1.383	1.32	1.258
91	4.438	4.289	4.14	135	1.35	1.289	1.228
92	4.303	4.158	4.012	136	1.318	1.257	1.197
93	4.174	4.032	3.889	137	1.286	1.227	1.168
94	4.049	3.91	3.77	138	1.255	1.198	1.14
95	3.929	3.792	3.656	139	1.225	1.168	1.111
96	3.813	3.679	3.545	140	1.195	1.14	1.084
97	3.7	3.569	3.438	141	1.166	1.111	1.056
98	3.592	3.464	3.336	142	1.137	1.084	1.03
99	3.487	3.362	3.236	143	1.109	1.056	1.004
100	3.386	3.264	3.141	144	1.081	1.03	0.978
101	3.288	3.168	3.048	145	1.053	1.003	0.953
102	3.194	3.077	2.959	146	1.026	0.977	0.927
103	3.103	2.988	2.873	147	0.999	0.951	0.903
104	3.016	2.903	2.79	148	0.973	0.925	0.878
105	2.932	2.821	2.711	149	0.946	0.9	0.854
106	2.85	2.742	2.634	150	0.919	0.874	0.829


Haier