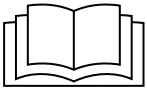
USER'S MANUAL

Air To Water Heat Pump

CH-HP5.0UIMPRK

Appliance filled with flammable gas R32.

Caution, risk of fire



Before use the appliance, read the owner's manual first.

Before install the appliance, read the installation manual first.

Before repair the appliance, read the service manual first.

The Refrigerant

- To realize the function of the air conditioner unit, a special refrigerant circulates in the system. The used refrigerant is the fluoride R32, which is specially cleaned. The refrigerant is flammable and inodorous. Furthermore, it can leads to explosion under certain conditions. But the flammability of the refrigerant is very low. It can be ignited only by fire.

- Compared to common refrigerants, R32 is a nonpolluting refrigerant with no harm to the ozonosphere. The influence upon the greenhouse effect is also lower. R32 has got very good thermodynamic features which lead to a really high energy efficiency. The units therefore need a less filling.

WARNING

- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacture. Should repair be necessary, contact your nearest authorized Service Centre. Any repairs carried out by unqualified personnel may be dangerous.
- 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.
- Appliance shall be installed, operated and stored in a room with a floor area larger than 4m ^{2}.
- The installation of pipe-work shall be kept to a minimum 4m ^{2}.
- 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 affets safety means shall only be carried by competent persons.




⚠ WARNING

Annex CC (informative)

Transportation, marking and storage for units that employ flammable refrigerants

- The following information is provided for units that employ flammable refrigerants.

CC.1 Transport of equipment containing flammable refrigerants

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.

CC.2 Marking of equipment using signs

Signs for similar appliances used in a work area generally are 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.

CC.3 Disposal of equipment using flammable refrigerants

See national regulations.

CC.4 Storage of equipment/appliances

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

CC.5 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.

Content

Operation Instructions

Installation Instructions

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
Children should be supervised to ensure that they do not play with the appliance.
If it needs to install, move or maintain the air conditioner, please contact dealer or local service center to conduct it at first. Air conditioner must be installed, moved or maintained by appointed unit. Otherwise, it may cause serious damage or personal injury or death.

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

R32: 675

Precautions

WARNING

Information for users

In order to use this product safely, please read this Instruction carefully and pay special attention to cautions before and during installation.
If the unit is not used in winter, please keep 24hr power supply for the unit. If the power is cut off, the water system may freeze and the unit may fail when it is started again.
For this product, it is not permitted to be used by persons with inattentive physical, sensory or mental abilities (including children), unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Safety Precautions

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

INFOTMATION

• Read these instructions carefully before installation. Keep this manual in a handy for future reference.
• Improper installation of equipment or accessories may result in electric shock, short-circuit, leakage, fire or other damage to the equipment. Be sure to only use accessories made by the supplier, which are specifically designed for the equipment and make sure to get installation done by a professional.
• All the activities described in this manual must be carried out by a licensed technician. Be sure to wear adequate personal protection equipment such as gloves and safety glasses while installation the unit or carrying out maintenance activities.
• Contact your dealer for any further assistance.

DANGER

Indicates an imminently hazardous situation which if not avoided, will result in death or serious injury.

Precautions

WARNING

Indicates a potentially hazardous situation which if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which if not avoided, may result in minor or moderate injury.
It is also used to alert against unsafe practices.

NOTICE

Indicates situations that could only result in accidental equipment or property damage.

DANGER

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

WARNING

• Ask your dealer or qualified personnel to perform installation work in accordance with this manual. Do not install the unit yourself. Improper installation could result in water leakage, electric shocks or fire.
• Be sure to use only specified accessories and parts for installation work. Failure to use specified parts may result in water leakage, electric shocks, fire, or the unit falling from its mount.
• Install the unit on a foundation that can withstand its weight. Insufficient physical strength may cause the equipment to fall and possible injury.
• Perform specified installation work with full consideration of strong wind, hurricanes, or earthquakes. Improper installation work may result in accidents due to equipment falling.

Precautions

• Make certain that all electrical work is carried out by qualified personnel according to the local laws and regulations and this manual using a separate circuit. Insufficient capacity of the power supply circuit or improper electrical construction may lead to electric shocks or fire.
• Make sure all wiring is secure. Use the specified wires and ensure that terminal connections or wires are protected from water and other adverse external forces.
• Be sure to install a ground fault circuit interrupter according to local laws and regulations. Failure to install a ground fault circuit interrupter may cause electric shocks and fire.
• After completing the installation work, check to make sure that there is no refrigerant leakage.
• Never directly touch any leaking refrigerant as it could cause severe frostbite.Do not touch the refrigerant pipes during and immediately after operation as the refrigerant pipes may be hot or cold, depending on the condition of the refrigerant flowing through the refrigerant piping, compressor and other refrigerant cycle parts. Burns or frostbite are possible if you touch the refrigerant pipes. To avoid injury, give the pipes time to return to normal temperature or, if you must touch them be sure to wear protective gloves.
• Do not touch the internal parts (pump, backup heater, etc.) during and immediately after operation. Touching the internal parts can cause burns. To avoid injury, give the internal parts time to return to normal temperature or, if you must touch them, be sure to wear protective gloves.
• Do not pierce or burn.
• Do not use means to accelerate the defrosting process or to clean the equipment, other than those recommended by the manufacturer.
• Be aware that R32 refrigerant does not contain an odour.

CAUTION

• Ground the unit. Grounding resistance should be according to local laws and regulations.
• Do not connect the ground wire to gas or water pipes, lightning conductors or telephone ground wires.
• Do not wash the unit. This may cause electric shocks or fire. The appliance must be installed in accordance with national wiring regulations. If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

Precautions

• Do not install the unit in the following places:
- Where there is mist of mineral oil, oil spray or vapors.
- Where corrosive gases (such as sulphurous acid gas) are produced.
- Where there is machinery which emits electromagnetic waves.
- Where flammable gases may leak, where carbon fiber or ignitable dust is suspended in the air or where volatile flammables such as paint thinner or gasoline are handled.
- Where the air contains high levels of salt such as near the ocean.
- Where voltage fluctuates a lot, such as in factories.
- In vehicles or vessels.
- Where acidic or alkaline vapors are present.
• This appliance can be used by children 8 years old and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they are supervised or given instruction on using the unit in a safe manner and understand the hazards involved. Children should not play with the unit. Cleaning and user maintenance should not be done by children without supervision.
• Children should be supervised to ensure that they do not play with the appliance.
• If the supply cord is damaged, it must be replaced by the manufacturer or its service agent or a similarly qualified person.
• DISPOSAL: Do not dispose this product as unsorted municipal waste. Collection of such waste separately for special treatment is necessary. Do not dispose of electrical appliances as municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available.
• The wiring must be performed by professional technicians in accordance with national wiring regulation and this circuit diagram. An all-pole disconnection device which has at least 3mm separation distance in all pole and a residual current device(RCD) with the rating not exceeding 30mA shall be incorporated in the fixed wiring according to the national rule.
• Before wiring/pipes, confirm the safety of the installation area (walls, floors, etc.) without hidden dangers such as water, electricity, and gas.
• Do not push or place redundant cable length in the unit.
• Before installation , check whether the user's power supply meets the electrical installation requirements of unit (including reliable grounding , leakage , and wire diameter electrical load, etc.). If the electrical installation requirements of the product are not met, the installation of the product is prohibited until the product is rectified.

Precautions

• Product installation should be fixed firmly. Take reinforcement measures, when necessary.

NOTICE

• About Fluoridated Gases

- This air-conditioning unit contains fluoridated gases. For specific information on the type of gas and the amount, please refer to the relevant label on the unit itself. Compliance with national gas regulations shall be observed.
- Installation, service, maintenance and repair of this unit must be performed by a certified technician.
- Product demolition and recycling must be performed by a certified technician.

Precautions for operating in winter

1.When low temperature in winter or the unit is not used for a long time, the unit shall be energized and preheated for at least 8 hours.

2.At low outdoor temperature in winter, power supplies can not be cut off after stop of unit to ensure auto anti-freezing protection for unit.The software is equipped with special frost protection functions such as water pipe freeze prevention and drain prevention that include the activation of pump in case of low temperatures.

However, in case of a power failure, these functions cannot guarantee protection. Do one of the following to protect the water circuit against freezing:

▪ Add glycol to the water. Glycol lowers the freezing point of the water.

▪ Install freeze protection valves. Freeze protection valves drain the water from the system before it can freeze.

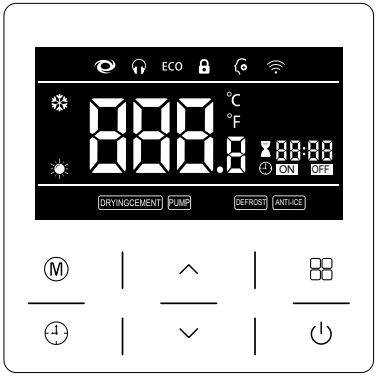
3.If the unit is not in use for a long time, drain the water in unit, water tank and pipeline through drainage valve after power off the unit.

CAUTION

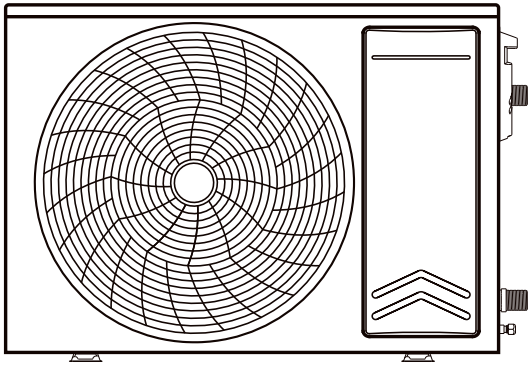
If user can not easily operate the unit or there is danger. Please contact with service center.

Parts Name

Wired controller



Outdoor unit



Note:
Actual product may be different from above graphics, please refer to actual products.

Function And Wired Controller

• Do not install or remove the wired controller by yourself. If necessary, please contact the after- sales serviceman.
• Do not install the wired controller in the humid area or under direct sunlight.
• Do not beat, toss, or frequently assemble/disassemble the wired controller.
• Do not operate the wired controller with wet hands.

Installation and Disassembly

1.Installation Place and Installation Requirements

• Do not install the wired controller in the humid area or under direct sunlight
• Do not install the wired controller close to the high-temperature object or place where is easy to splash on the wired controller.
• Do not install the wired controller directly opposite to the window so as to avoid improper operation caused by the interference of the neighbor's same model wired controller.
• Please cut off the power supply of wires embedded in the wall. No operation is allowed with electricity.
• To avoid abnormal operation caused by electromagnetic interference or other causes, please take notice of the following statements during wiring.
1. Be sure the communication line is wired into the correct port, otherwise it would lead to communication fault.
2. The communication line (wired controller) and power line must be separated with the minimal distance of 20cm, otherwise it would lead to communication fault.
3. If the air conditioner is installed where is easy to suffer electromagnetic interference, the communication line of the wired controller must be shielded twisted pair.

2. Installation of the Signal Wire

1. Open the right valve cover of outdoor unit .
2. Insert the signal line port on the port corresponding to the outdoor unit.
3. Fix the control wires with wire clamp.

Notice:
The communication distance between main board and wired controller can reach 20m. (The recommended length is 8m)

Function And Wired Controller

3. Installation of Wired Controller

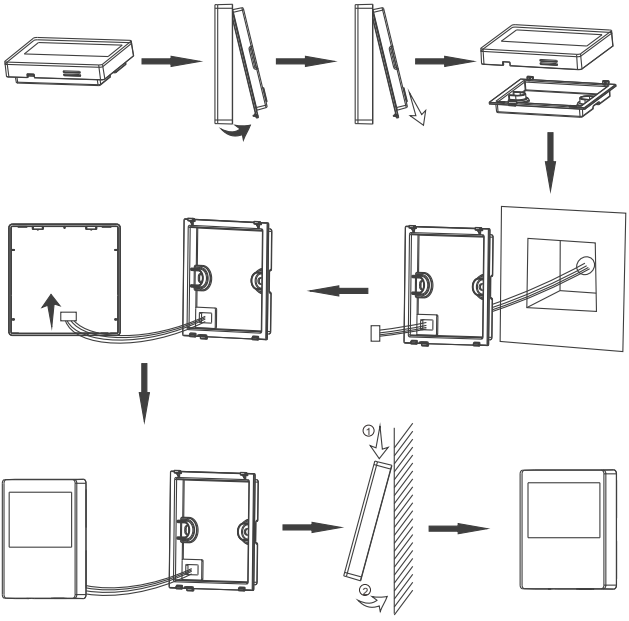
The simple installation step of wired controller is as shown on the figure, please notice below issues:

• Pull out the 4 core twisted pair wire from the mounting hole and pass this line through the oblong hole located at the bottom of the wired controller.

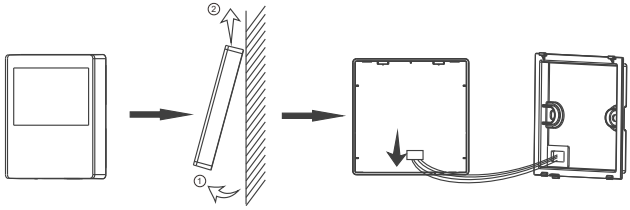
• Use M4×25 screws to fix the base plate together with installation hole of the wall.

• Insert the through signal wire in the slot on the wired controller , also lock the wired controller panel and base plate together.

Wired controller installation steps:



4. Disassembly the Wired Controller

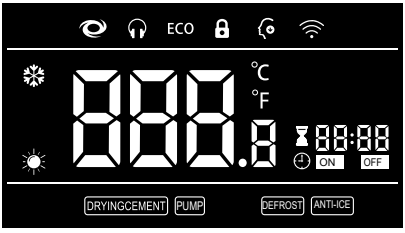


Function And Wired Controller

Liquid crystal display

Overview

Display Explanation

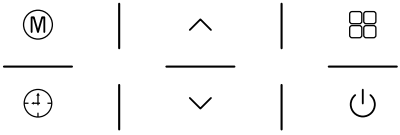


Icon	Description
	Powerful Mode
	Quiet Mode
ECO	Eco Mode
	Child Lock
	Memory
	Cooling
	Heating

Function And Wired Controller

	Temperature Setting
	Timer Setting
DRYINGCEMENT	Dry Concrete function
PUMP	Air purge function
DEFROST	Defrost running
ANTI ICE	Anti-icing running

Buttons Explanation



Button Icon	Description
Ⓜ	Mode Setting
^	Up/Increase
⊞	Function Setting
⏻	On/Off Button
v	Down/Decrease
⏲	Timer

Notice:

After 20s for no operation, the LCD will go into low brightness state. Any operation will awake the LCD to high brightness state and then can be allowed to set functions or parameters.

Operation Instructions

On/Off

Press the ⏻ button to turn on or off the unit.

Notice:

In on-state, after 5s that has no operation, the actual temperature will display on.

Mode Setting

After press ⏻ , unit is on-state, press Ⓜ to select Cooling ❄ or Heating ☀ mode.

Temperature Setting

Press ∧ or ∨ button to increase or decrease setting temperature in on-state of the unit. If press either of them continuously, temperature will be changed rapidly.
Below is temperature setting range.

Mode	Range	Default
Cooling	5~25℃	7℃
Heating	20~60℃	35℃

Timer Setting

1.Countdown timer

To set the unit start or stop after a specific period time.

Setting range is 30 min~24 hours, display shown as 00:30~24:00.Minimum step is 30 minutes.

Operation and display:

In on-state, press 🕒 to set unit stop time. OFF is flashing and 88:88 is lighted, then adjust the stop time through ∧ and ∨. Within 5 minutes that has no operation or press 🕒 to confirm setting. Then ⏳, 88:88, OFF icons are lighted.

In off-state, press 🕒 to set unit start time. ON is flashing and 88:88 is lighted, then adjust the start time through ∧ and ∨. Within 5 minutes that has no operation or press 🕒 to confirm setting. Then ⏳, 88:88, ON icons are lighted.

Operation Instructions

Notice:

Setting 00:00 and confirm that is regarded as quit countdown timer.

After setting countdown timer successfully, press ⏲ again is regarded as exit countdown timer and all relevant icons are extinguished.

In countdown timer setting page ,press ⏻ will also quit setting.

Countdown timer will NOT memory when power off.

When countdown start, the 88:88 and ON are lighted.

When countdown stop, the 88:88 and OFF are lighted.

When clock is counting, ⏳ is lighted.

2.Clock timer

To set clock time for unit start and/or stop. Both on-state and off- state can set clock timer.

Operation and display:

Continually press ⏲ button for 3s to enter clock timer. Then the ⏲ icon is lighted, countdown timer is invalid. And ON is flashing, --:-- is lighted.

And then Continually press ⏲ button for 3s to quit clock timer, all the ⏲ 88:88 ON OFF icons are extinguished.

In clock timer interface, firstly ON and --:-- are flashing, setting start time through ∧ and ∨. Within 5 minutes that has no operation or press ⏲ to confirm setting.

Secondly then OFF and --:-- are flashing, setting stop time through ∧ and ∨.

Within 5 minutes that has no operation or press ⏲ to confirm setting.

After both start and stop clock time are set, the ⏲, 88:88, ON, OFF icons are lighted.

Press ⏲ button again, it will cancel the clock timer setting.

Notice:

After clock timer is set ,in on-state the ⏲, 88:88, OFF icons are lighted; in off-state the ⏲, 88:88, ON icons are lighted.

User Function Setting

In on-state, press ⊞ button, it will switch between the 👁, 🎧, ECO and standard mode(no icon). After 8s that has no operation, it will send the setting to the unit.

The default mode is standard, and after on/off that is also standard mode.

Operation Instructions

Dry Concrete

The dry concrete function is used for drying out the screed of an underfloor heating system during the construction of the building.

Operation and display:

In Off-state, continually press button for 3s that will show up DRYINGCEMENT . It will display on the bottom of the LCD. Press the button directly can exit the function.

Notice:

The installer is responsible for:

- contacting the screed manufacturer for the maximum allowed water temperature, to avoid cracking the screed,
- programming the underfloor heating screed dry out schedule according to the initial heating instructions of the screed manufacturer,
- checking the proper functioning of the setup on a regular basis,
- performing the correct program complying with the type of the used screed.

Pump

When commissioning and installing the unit, it is very important to remove all air in the water circuit. When the air purge function is running, the pump operates without actual operation of the unit and the removal of air in the water circuit will start.

Operation and display:

In Off-state, continually press button for 3s that will show up DRYINGCEMENT and then again press button for 3s that will switch to PUMP. It will display on the bottom of the LCD. After that ,press button for 3s or press the button directly can also exit the function.

Notice:

Before starting the air purge, open the safety valve and check if the circuit is sufficiently filled with water. Only if water escapes the valve after opening it, you can start the air purge procedure.

Other Function Setting

1.Child lock

To block all buttons(except the unlock operation that combination ∧ and ∨.)

Operation and display:

In on-state or off-state, continually press ∧ and ∨ button for 5s,that will enter or quite child lock function. When enter child lock function, the icon will flash 2s and lighted.

Operation Instructions

Notice:

To avoid misunderstanding of operation, when child lock is active, any operation will NOT respond and the icon will flash to remind this function is under running.

Notice:

When sterilizing function is actived, the electrical heater will turn on dependently. After sterilizing is finish, the electrical heater will turn back to previous setting.

3.Manual defrost

In on-state, continually press Ⓜ and ^ button for 3s, unit will force to enter defrost cycle. And DEFROST status will show on.

Status Display

1.Anti-ice

When the condition reaches anti-ice judgement, the ANTI ICE status is lighted. And it will extinguish when quite this function.

2.Defrost

When unit is under defrost cycle, the DEFROST status is show up. And it will extinguish when unit quite defrosting.

Maintenance

WARNING

- **Turn off the unit and disconnect the power before cleaning the unit to avoid electric shock.**
- **Do not wash the unit with water to avoid electric shock.**
- **Do not use volatile liquid to clean the unit.**

Cleaning before use-season

1. Check whether air inlets and air outlets are blocked.
2. Check whether air switch, plug and socket are in good condition.
3. Check whether drainage pipe is damaged.

Cleaning after use-season

Disconnect power supply.

Notice for recovery

1. Most of packing materials are recyclable materials.Please dispose them inappropriate.
2. If you want to dispose the unit, please contact local dealer orconsultant service center for the correct disposal method.

Malfunction Analysis

Error Code

When error happens to the unit, the error code will be shown on the wired controller. When multiple errors simultaneously happen, the error codes will circularly show up.

When error occurs, please immediately shut down the unit and contact service center

Error Code	Description
H0	High discharge temp. protection
H1	Overcapacity protection
H2	Compressor overload protection
H3	Anti-frost protection
H4	System high pressure protection
H5	System low pressure protection
H6	Lack refrigerant/ valve stop protection
H7	4-way valve reversed malfunction protection
H8	ODU ambient temperature out of range protection
F8	Water flow switch error
C9	The communication error between main board and wired controller
L0	Compressor non-synchronism protection
L1	Compressor start failure protection
L2	Compressor peak current protection
L3	Compressor RMS current protection
L4	Compressor IPM protection
L5	Compressor IPM overheat protection
L6	Compressor current sensing circuit malfunction protection
L7	Compressor phase loss protection
L8	ODU DC fan motor protection
Lc	Compressor code error
U0	ODU EEPROM malfunction
U1	ODU Charging malfunction
U2	ODU AC voltage abnormal protection
U3	ODU DC voltage overhigh protection
U4	ODU DC voltage over low protection
U5	ODU DC voltage drop protection
U6	ODU AC current abnormal protection
U7	ODU AC RMS current overhigh protection
U8	ODU PFC current sensing circuit malfunction protection

Malfunction Analysis

Error Code	Description
U9	PFC protection
Ud	ODU jumper cap error
UE	Communication error between ODU main control board and driver board
UF	Communication error between ODU main control board and fan motor driver board
E2	Outdoor ambient temperature sensor error
E3	Outdoor evaporator temperature sensor error
E4	Discharge temperature sensor error
E5	Compressor IPM temperature senseor error
E6	Liquid pipe temperature sensor error
E7	Gas pipe temperature sensor error
EF	High pressure sensor error
EP	Suction temperature sensor error
Ed	Inlet water temperature sensor error
EE	Outlet water temperature sensor error

Contact us

When below phenomenon occurs, please turn off air conditioner and disconnect power immediately, and then contact the dealer or qualified professionals for service.

- **Power cord is overheating or damaged.**
- **The unit gives off burning smell.**
- **There's abnormal sound during operation.**
- **Circuit break trips off frequently.**

Do not repair or refit the unit by yourself.If the unit operates under abnormal conditions, it may cause malfunction, electric shock or fire hazard.

Specifications

Model		**VWV-S18A3B(O)**
Heating capacity	W	5100
Cooling capacity	W	5000
Power supply	—	220-240V～ 50Hz
Heating power input	W	1400
Cooling power input	W	1250
Rated input	W	2000
Rated current	A	9
Climate Type	—	T1
Isolation	—	I
Moisture Protection	—	IPX4
Refrigerant and charge volume	—	R32/0.65kg
Maximum permissible pressure	MPa	4.5
Water outlet temp	℃	Defaulted 35℃，adjustable 20～6 0℃
Tonnes CO_2 equivalent	—	0.44t
Water side connection	—	G 1"
Dimension of unit(W×D×H)	mm	863×372×598
Net weight	kg	40
Sound power Level	dB	61
Fuse	—	250V～/15A

(1) Test conditions:
Heating Outdoor ambient temp.: 7 ℃ DB/6 ℃ WB, water initial/outlet temp.: 30℃ / 35℃.
Cooling Outdoor ambient temp.: 35 ℃ DB/—, water initial/outlet temp.: 23℃ /18℃.

(2) If there is any change of specification for improvement of product, please refer to the nameplate.

Installation Notice

Safety operation of flammable refrigerant

Qualification requirement for installation and maintenance man

- All the work men who are engaging in the refrigeration system should bear the valid certification awarded by the authoritative organization and the qualification for dealing with the refrigeration system recognized by this industry. If it needs other technician to maintain and repair the appliance, they should be supervised by the person who bears the qualification for using the flammable refrigerant. It can only be repaired by the method suggested by the equipment's manufacturer.

Installation notes

- The unit is not allowed to use in a room that has running fire (such as fire source, working coal gas ware, operating heater).
- It is not allowed to drill hole or burn the connection pipe.
- The unit must be installed in a room that is larger than the minimum room area. The minimum room area is shown on the nameplate .
- Leak test is a must after installation.

Maintenance notes

- Check whether the maintenance area or the room area meet the requirement of the nameplate.
  - It's only allowed to be operated in the rooms that meet the requirement of the nameplate.
- Check whether the maintenance area is well-ventilated.
  - The continuous ventilation status should be kept during the operation process.
- Check whether there is fire source or potential fire source in the maintenance area.
  - The naked flame is prohibited in the maintenance area; and the "no smoking" warning board should be hanged.
- Check whether the appliance mark is in good condition.
  - Replace the vague or damaged warning mark.

Fuse Size

- 18K:T20AH; 250VAC Fuse

Installation Notice

Power supply cord and Inter connection cord

18K:H07RN-F 3G1.5 mm²;
Inter connection cord:4G 0.75 mm²

Welding

- If you should cut or weld the refrigerant system pipes in the process of maintaining, please follow the steps as below:
  a. Shut down the unit and cut power supply
  b. Eliminate the refrigerant
  c. Vacuuming
  d. Clean it with N^2 gas
  e. Cutting or welding
  f. Carry back to the service spot for welding
- The refrigerant should be recycled into the specialized storage tank.
- Make sure that there isn't any naked flame near the outlet of the vacuum pump and it's well-ventilated.

Filling the refrigerant

- Use the refrigerant filling appliances specialized for R32. Make sure that different kinds of refrigerant won't contaminate with each other.
- The refrigerant tank should be kept upright at the time of filling refrigerant.
- Stick the label on the system after filling is finished (or haven't finished).
- Don't overfilling.
- After filling is finished, please do the leakage detection before test running; another time of leak detection should be done when it's removed.

Safety instructions for transportation and storage

- Please use the flammable gas detector to check before unload and open the unit.
- No fire source and smoking.
- According to the local rules and laws.

Refrigerant Charge

The product specific value is subject to the rating plate.

Installation Notice

Safety precautions for installing and relocating the unit

To ensure safety, please be mindful of the following precautions.

⚠ WARNING

- **When installing or relocating the unit, be sure to keep the refrigerant circuit free from air or substances other than the specified refrigerant.**
  Any presence of air or other foreign substance in the refrigerant circuit will cause system pressure rise or compressor rupture, resulting in injury.
- **When installing or moving this unit, do not charge the refrigerant which is not comply with that on the nameplate or unqualified refrigerant.**
  Otherwise, it may cause abnormal operation, wrong action, mechanical malfunction or even series safety accident.
- **Prohibit installing the unit at the place where there may be leaked corrosive gas or flammable gas.**
  If there leaked gas around the unit, it may cause explosion and other accidents.
- **Do not use extension cords for electrical connections. If the electric wire is not long enough, please contact a local service center authorized and ask for a proper electric wire.**
  Poor connections may lead to electric shock or fire.
- **Use the specified types of wires for electrical connections between the indoor and outdoor units. Firmly clamp the wires so that their terminals receive no external stresses.**
  Electric wires with insufficient capacity, wrong wire connections and insecure wire terminals may cause electric shock or fire.

Installation Prepare

Selection of location

Basic requirement

1.The location should be able to withstand the weight of outdoor unit.

2.The outdoor unit should add the fence in front the air outlet of unit for safety purpose.

Note:

Installing the unit in the following places may cause malfunction.If it is unavoidable, please consult the local dealer.

Installation Notice

1. The place with strong heat sources, vapors, flammable or explosive gas, or volatile objects spread in the air.
2. The place with high-frequency devices (such as welding machine, medical equipment).
3. The place near coast area.
4. The place with oil or fumes in the air.
5. The place with sulfureted gas.
6. Other places with special circumstances.
7. The appliance shall not be installed in the laundry.

Safety precaution

● Must follow the electric safety regulations when installing the unit.
● According to the local safety regulation,use qualified power supply circuit and air switch.
● Make sure the power supply matches with the requirement of air conditioner. Unstable power supply or incorrect wiring or malfunction. Press install proper power supply cables before using the air conditioner.
● Properly connect the live wire, neutral wire and grounding wire of power socket.
● Be sure to cut off the power supply before proceeding any work related to electricity and safety.
● Do not connect the power before finishing installation.
● If the supply cord is damaged, it must be replaced by the manufacture, its service agent or similarly qualified persons in order to avoid a hazard.
● The temperature of refrigerant circuit will be high, please keep the interconnection cable away from the copper tube.
● The appliance shall be installed in accordance with national wiring regulations.
● Installation must be performed in accordance with the requirement of NEC and CEC by authorized personnel only.Appliance shall be installed, operated and stored in a room with a floor area larger than 4m².

Please notice that the unit is filled with flammable gas R32. Inappropriate treatment of the unit involves the risk of severe damages of people and material. Details to this refrigerant are found in chapter “refrigerant”.

Installation Notice

Please notice that the unit is filled with flammable gas R32. Inappropriate treatment of the unit involves the risk of severe damages of people and material. Details to this refrigerant are found in chapter “refrigerant”.

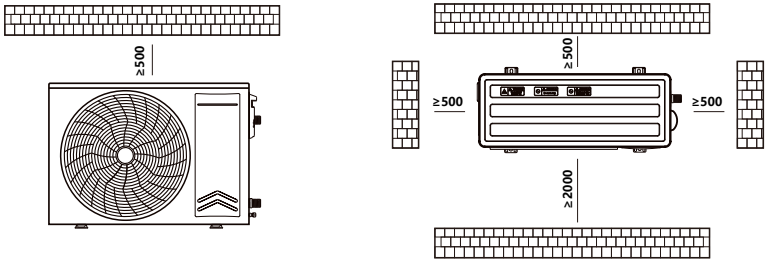
Grounding requirement

● The air conditioner is the first class electric appliance. It must be properly grounding with specialized grounding device by a professional. Please make sure it is always grounded effectively, otherwise it may cause electric shock.
● The yellow-green wire in air conditioner is grounding wire,which can’t be used for other purposes.
● The grounding resistance should comply with national electric safety regulations.
● The appliance must be positioned so that the plug is accessible.
● An all-pole disconnection switch having a contact separation of at least 3min in all poles should be connected in fixed wiring. For models with a power plug, make sure the plug is within reach after installation.
● Including an circuit break with suitable capacity, please note the following table. Circuit break should be included magnet buckle and heating buckle function, it can protect the circuit-short and overload. (Caution:please do not use the fuse only for protect the circuit)

Installation Drawing

Installation space requirements

Mind the spacing guidelines:

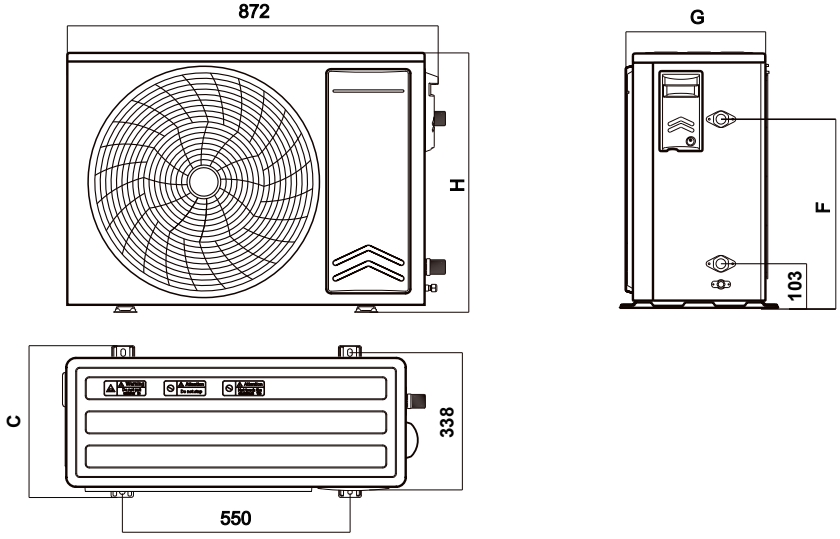


The outdoor unit is following ambient temperatures:

Cooling Mode	15~52℃
Heating Mode	-27~30℃

Mind the measurement guidelines:

Maximum distance between outdoor unit and external backup heater kit	10m



Unit: mm

Code	A	B	C	D	E	F	G	H
Dimensions	863	338	372	550	393	463	323.5	598

Installation of The Unit

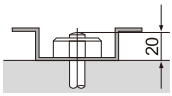
- **Check the strength and level of the installation ground so that the unit may not cause any vibrations or noise during its operation.**

1.Mounting the outdoor unit

To provide the installation structure

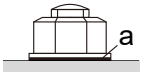
INFOTMATION

The recommended height of the upper protruding part of the bolts is 20 mm.



NOTICE

Fix the outdoor unit to the foundation bolts using nuts with resin washers (a). If the coating on the fastening area is stripped off, the metal can rust



To install the outdoor unit

1. Move the unit and put it onto the installation structure.
2. Fix the unit to the installation structure. Use 4 sets of M10 anchor bolts, nuts and washers to fix the unit.

To provide drainage

INFOTMATION

If necessary, you can use a drain pan (field supply) to prevent drain water from dripping.

NOTICE

If the unit can not be installed fully level, always make sure that the inclination is towards the backside of the unit. This is required to guarantee proper drainage.

If drain holes of the outdoor unit are covered by a mounting base or by floor surface, raise the unit to provide a free space of more than 150 mm under the outdoor unit. Additionally, make sure the unit is positioned at least 100 mm above the maximum expected level of snow.

Make sure not to cover the drain holes.

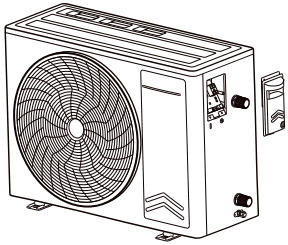
Installation of The Unit

Opening and closing the unit

DANGER: RISK OF ELECTROCUTION

DANGER: RISK OF BURNING/SCALDING

Open the electrical box cover and to connect the power supply cords and field supply components.



2.Piping installation

WARNING

1. A new G1" and 0.7Mpa (7bar) safety unit protected from freezing and in accordance with local standards must be installed on the inlet of the water heater.
2. Connect the safety unit to a discharge pipe, kept in the open air, in a frost-free environment,continuously sloping downwards to drain off the heat-expanded water or to allow for drainage of the water heater.
3. If the appliance is set up on a false ceiling, the attic or above living space, a drain pan is to be installed underneath the water heater.
4. A drainage connected to the sewer system is required.

Preparing water piping

NOTICE

• In case of plastic pipes, make sure they are fully oxygen diffusion tight according to DIN 4726. The diffusion of oxygen into the piping can lead to excessive corrosion.

• **Water circuit requirements.** Make sure to comply with the water pressure and water temperature requirements. For additional water circuit requirements, see the installer reference guide.

Installation of The Unit

▪ **Pipe specifications**

Water pipe	Specification
Outlet Water pipe	G1"
Inlet Water pipe	G1"

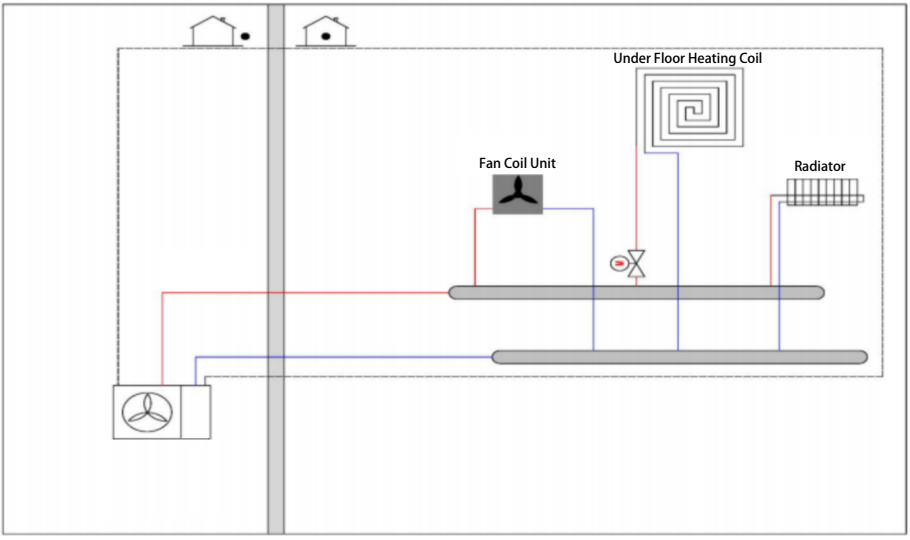
▪ **Water pressure**

The maximum water pressure is 0.7Mpa (7bar) . Provide adequate safe guards in the water circuit to ensure that the maximum pressure is not exceeded.

Installation Diagram

NOTICE

- The following illustration is an example and might not match your system layout.
- To prevent the pressure of the water system from rising or falling, an expansion tank can be installed at a lower temperature in the water circuit, and attention should be paid to the corresponding pipeline insulation.



Installation of The Unit

To check the water volume and flow rate Minimum water volume

Check that the total water volume in the installation is higher than the minimum water volume, the internal water volume of the outdoor unit NOT included:

If…	Then the minimum water volume is…
Cooling operation	8
Heating/defrost operation and the external backup heater kit is…	
Connected	8
NOT Connected	17

NOTICE

When circulation in each space heating/cooling loop is controlled by remotely controlled valves, it is important that the minimum water volume is guaranteed, even if all of the valves are closed..

Minimum flow rate

Check that the minimum flow rate (required during defrost/backup heater operation (if applicable)) in the installation is guaranteed in all conditions.

If operation is…	Then the minimum required flow rate is…
Cooling	8/min
Heating/defrost when outdoor temperature is above –5°C	8/min
Heating/defrost when outdoor temperature is below –5°C	10/min

NOTICE

When circulation in each or certain space heating loops is controlled by remotely controlled valves, it is important that the minimum flow rate is guaranteed, even if all valves are closed. In case the minimum flow rate cannot be reached, a flow error F8 will be generated (no heating or operation).

Installation of The Unit

Connecting water piping

To connect the water piping

NOTICE
Do NOT use excessive force when connecting the field piping and make sure the piping is aligned properly.
Deformation of the piping can cause malfunctioning of the unit.

NOTICE
When connecting the field piping, hold the nut on the inside of the unit in place using a spanner to provide extra leverage.

1. Connect the shut-off valve (with integrated filter) to the outdoor unit water inlet, using thread sealant.
2. Connect the field piping to the shut-off valve.
3. Connect the field piping to the outdoor unit water outlet.

NOTICE
Do NOT use excessive force when connecting the field piping and make sure the piping is aligned properly.
Deformation of the piping can cause malfunctioning of the unit.

NOTICE
About the shut-off valve with integrated OR independent filter :
- The installation of the valve at the water inlet is mandatory.
- Mind the flow direction of the valve.

NOTICE
For service purposes, it is recommended to also install a shut-off valve and drain point to the water OUT connection.
This shut-off valve and drain point are field supplied.

NOTICE
Install air purge valves at all local high points.

Installation of The Unit

To fill the water circuit

To fill the water circuit, use a field supply filling kit. Make sure you comply with the applicable legislation.

NOTICE

The unit contains a manual air purge valve. Make sure it is closed. Only open it when performing an air purge.

If the field piping contains any automatic air purge valves, make sure they are open, also after commissioning.

To protect the water circuit against freezing

About freeze protection

Frost can damage the system. To prevent the hydraulic components from freezing, the software is equipped with special frost protection functions such as water pipe freeze prevention and drain prevention that include the activation of pump in case of low temperatures.

However, in case of a power failure, these functions cannot guarantee protection.

Do one of the following to protect the water circuit against freezing:

- Add glycol to the water. Glycol lowers the freezing point of the water.
- Install freeze protection valves. Freeze protection valves drain the water from the system before it can freeze.

NOTICE

If you add glycol to the water, do NOT install freeze protection valves.

Possible consequence: Glycol leaking out of the freeze protection valves.

Freeze protection by glycol

About freeze protection by glycol

Adding glycol to the water lowers the freezing point of water.

WARNING

Ethylene glycol is toxic.

WARNING

Due to the presence of glycol, corrosion of the system is possible. Uninhibited glycol will turn acidic under the influence of oxygen.

This process is accelerated by the presence of copper and high temperatures. The acidic uninhibited glycol attacks metal surfaces and forms galvanic corrosion cells that cause severe damage to the system. Therefore it is important that:

- the water treatment is correctly executed by a qualified water specialist,
- a glycol with corrosion inhibitors is selected to counteract acids formed by the oxidation of glycols,
- no automotive glycol is used because their corrosion inhibitors have a limited lifetime and contain silicates which can foul or plug the system,
- galvanized pipes are NOT used in glycol systems since the presence may lead to the precipitation of certain components in the glycol's corrosion inhibitor.

NOTICE

Glycol absorbs water from its environment. Therefore do NOT add glycol that has been exposed to air. Leaving the cap off the glycol container causes the concentration of water to increase. The glycol concentration is then lower than assumed. As a result, the hydraulic components might freeze up after all. Take preventive actions to ensure a minimal exposure of the glycol to air.

Types of glycol

The following types of glycol are allowed:

- **Ethylene glycol**;
- **Propylene glycol**,including the necessary inhibitors, classified as Category III according to EN1717.

Required concentration of glycol

The required concentration of glycol depends on the lowest expected outdoor temperature, and on whether you want to protect the system from bursting or from freezing. To prevent the system from freezing, more glycol is required.

Add glycol according to the table below

Lowest outdoor temperature	Prevent from bursting	Prevent from freezing
-5°C	10%	15%
-10°C	15%	25%
-15°C	20%	35%
-20°C	25%	—
-25°C	30%	—
-30°C	35%	—

INFOTMATION

- Protection against bursting: the glycol will prevent the piping from bursting, but NOT the liquid inside the piping from freezing.
- Protection against freezing: the glycol will prevent the liquid inside the piping from freezing.

NOTICE

- The required concentration might differ depending on the type of glycol. ALWAYS compare the requirements from the table above with the specifications provided by the glycol manufacturer. If necessary, meet the requirements set by the glycol manufacturer.
- The added concentration of glycol should NEVER exceed 35%.
- If the liquid in the system is frozen, the pump will NOT be able to start. Mind that if you only prevent the system from bursting, the liquid inside might still freeze.
- When water is at standstill inside the system, the system is very likely to freeze and get damaged.

Glycol and the maximum allowed water volume

Adding glycol to the water circuit reduces the maximum allowed water volume of the system.

Freeze protection by freeze protection valves

About freeze protection valves

When no glycol is added to the water, you can use freeze protection valves to drain the water from the system before it can freeze.

- Install freeze protection valves (field supply) at all lowest points of the field piping.
- Normally closed valves (located indoors near the piping entry/exit points) can prevent that all water from indoor piping is drained when the freeze protection valves open.

NOTICE

When freeze protection valves are installed, set the minimum cooling setpoint (default=5°C) at least 2°C higher than the maximum opening temperature of the freeze protection valve. If lower, freeze protection valves can open during cooling operation.

To insulate the water piping

The piping in the complete water circuit must be insulated to prevent reduction of the water heating capacity.

Outdoor water piping insulation

NOTICE

Make sure the outside piping is insulated as instructed to protect against hazards.

For piping in free air, it is recommended to use the insulation thickness as shown in below table as a minimum (with λ=0.039 W/m·K).

Piping length (m)	Minimum insulation thickness (mm)
＜20	19
20~30	32
30~45	40
40~50	50

This recommendation ensures good operation of the unit, however, local regulations may differ and shall be followed.

3.Finishing the outdoor unit installation

To check the insulation resistance of the compressor

NOTICE

If after installation, refrigerant accumulates in the compressor, the insulation resistance over the poles can drop, but if it is at least 1MΩ, then the unit will not break down.

- Use a 500 V mega-tester when measuring insulation.
- Do not use a mega-tester for low-voltage circuits.

Measure the insulation resistance over the poles.

If	Then
≥1MΩ	Insulation resistance is OK. This procedure is finished.
<1MΩ	Insulation resistance is not OK. Go to the next step.

Installation of The Unit

4.Electrical installation

DANGER: RISK OF ELECTROCUTION

WARNING

- ALWAYS use cable for power supply cables.
- Make sure to turn off the power before removing the cover to prevent any injury or electric shock risk.
- Upstream of the appliance, the electrical installation must have an all-pole cut-out device (circuit-breaker, fuse) in accordance with the applicable local installation rules (30mA earth-leakage circuit-breaker).
- Please observe the wiring diagram on the back of the cover.
- Always connect the earth conductor of the cable to the earth ground wire or connect the earth conductor to the appropriate terminal identified by the symbol.

NOTICE

The distance between the high voltage and low voltage cables should be at least 50 mm.

About electrical compliance

Equipment complying with EN/IEC 61000-3-12 (European/International Technical Standard setting the limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and ≤75 A per phase.).

Guidelines when connecting the electrical wiring

Tightening torques

Item	Tightening torque (N•m)
XT1	2.45±10%
XT2	0.88±10%

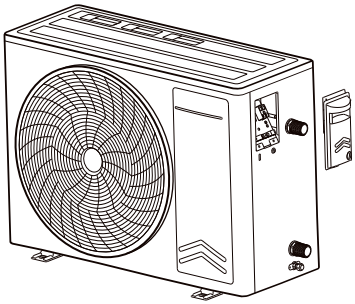
Connections to the outdoor unit

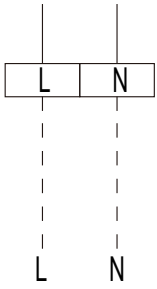
Item	Then
Power supply(main)	See " To connect the main power supply".
Wired controller	See " To connect the wired controller".

Installation of The Unit

To connect the main power supply

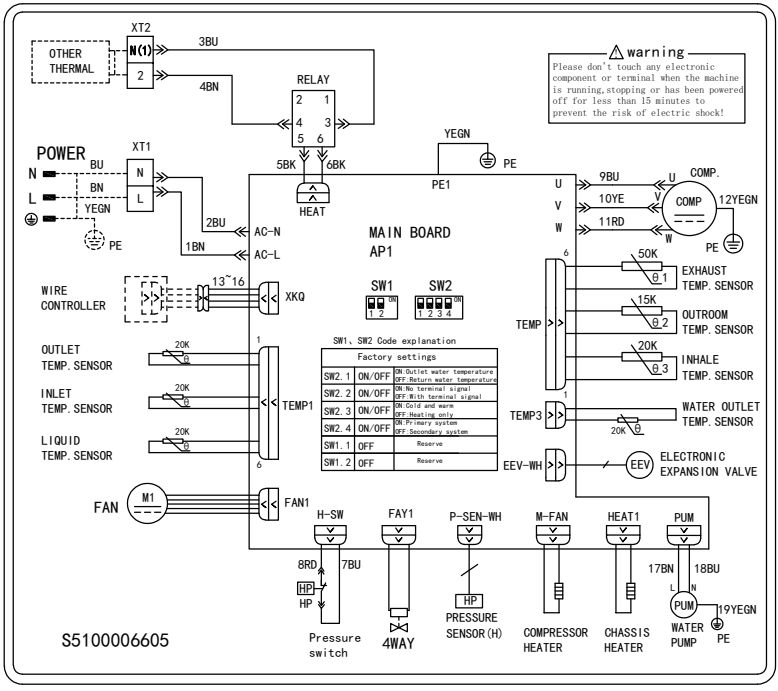
1. Open the electrical box cover.
2. Connect the wires to the appropriate terminals, and fix the cables with cable ties.





Power Supply

3. Fix the cables with cable ties to the cable tie mountings.



Commissioning

INFOTMATION

• General commissioning checklist. The general commissioning checklist is complementary to the instructions in this chapter and can be used as a guideline and reporting template during the commissioning and hand-over to the user.

• The software is equipped with protective functions, such as room anti-frost. The unit automatically runs these functions when necessary.

Checklist before commissioning

After the installation of the unit, first check the items listed below. Once all checks are fulfilled, the unit must be closed. Power-up the unit after it is closed.

□	You read the complete installation instructions.
□	The outdoor unit is properly mounted.
□	Field wiring Be sure that the field wiring has been carried out according to the instructions described in the chapter "Electrical installation", according to the wiring diagrams and according to the applicable legislation.
□	The system is properly earthed and the earth terminals are tightened.
□	The fuses or locally installed protection devices are installed according to this document, and have not been bypassed.
□	The power supply voltage matches the voltage on the identification label of the unit.
□	There are no loose connections or damaged electrical components in the switch box.
□	There are no damaged components or squeezed pipes on the inside of the outdoor unit.
□	The correct pipe size is installed and the pipes are properly insulated.
□	There are no water leaks inside the outdoor unit.
□	The manual discharge valve is closed.
□	The pressure relief valve purges water when opened. Clean water must come out.

Test operation

Conditions: Make sure all operation is disabled. Go to: Mode setting.

1	Press ⏻ to turn on the unit.
2	Press ∧ and ∨ to set target temperature
3	**Result**: The unit starts.
	To stop the test run manually: Press ⏻ to turn off the unit.

Commissioning

NOTICE

If the outdoor temperature is outside the range of operation, the unit may NOT operate or may not deliver the required capacity.

Hand-over to the user

Once the test run is finished and the unit operates properly, please make sure the following is clear for the user:

▪ Make sure that the user has the printed documentation and ask him/her to keep it for future reference.

▪ Explain the user how to properly operate the system and what to do in case of problems.

▪ Show the user what to do for the maintenance of the unit.

Servicing

WARNING

• Turn off the power and the cold water supply, open the hot water faucets and then open the drain valve of the safety unit.

• The drainage system of the pressure reducing device should be operated periodically (at least once a month) to eliminate dirt and ensure that it is not blocked.

• If the power cable is damaged, it must be replaced by the manufacturer, its customer service or a professional with similar qualification to prevent any hazards.

• The operating instructions for this appliance can be obtained from the customer service.

• Don’t repair the water heater yourself to avoid electric shock or fire. If there is any question, please contact with service center.

Servicing

Maintenance of Unit

▪Periodically check air inlet/outlet of unit for blockage. If blockage, clean it immediately.

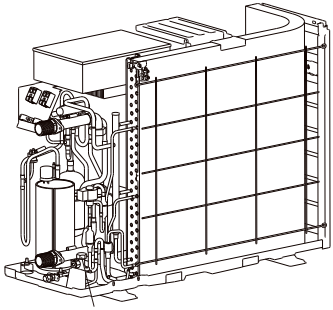
▪Periodically check pipeline between main unit and water tank, waterway at user side, pipe joint and valve body for damage, blockage or water leakage of each joint. If there is, handle them immediately.

Refrigerant addition and discharge

Addition Method of Refrigerant

▪ Under hot water running mode, add refrigerant directly.

▪ Connect the flexible tube in the middle of refrigerant meters with refrigerant bottle and one end of blue flexible tube of low pressure meters with charge nozzle of suction pipe of the unit. Open the valve of refrigerant bottle and then open the valve next to low pressure meters to discharge air for 5s.Screw the joint of flexible tube of refrigerant meters on charge nozzle. If indicator of low pressure meters slowly increases, unscrew the valve next to the low pressure gauge and add the refrigerant.



Refrigerants infusion valve

Discharge of Refrigerant

▪ Open charge nozzle to discharge refrigerant and vacuum.

Maintenance Safety Precautions

Information on servicing

● 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.

● 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.

● 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.

● 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.

● Presence of fire extinguisher

If any hot work is to be conducted on the refrigeration equipment or any associated parts,appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO fire extinguisher adjacent to the charging area.

● 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.

Maintenance Safety Precautions

● 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.

● 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.

● 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.

Maintenance Safety Precautions

Repairs to sealed components

● 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.

● 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.

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.

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.

Maintenance Safety Precautions

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.

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.

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.

Maintenance Safety Precautions

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.

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.

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.

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.

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.

Maintenance Safety Precautions

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.