

ORIGINAL  
MANUAL



# INSTALLATION & OWNER'S MANUAL

## Nexus Series Inverter Mini Chillers

KEM-05 DVN1  
KEM-07 DVN1  
KEM-10 DVN

KEM-12 DVN  
KEM-12 DTN  
KEM-14 DTN

KEM-16 DTN



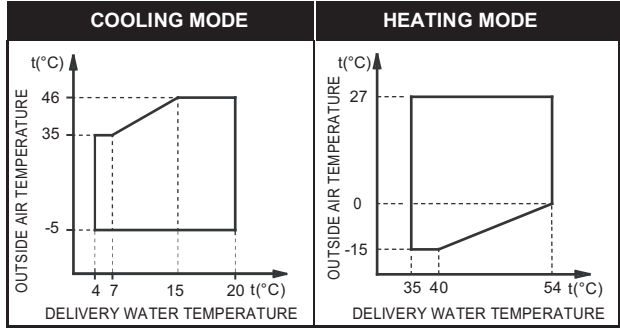
Thank you very much for purchasing our product.

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# 1. INTRODUCTION

## 1.1 General information

- These units are used for both heating and cooling applications. They can be combined with fan coil units, floor heating applications (connect the mixed station), low temperature high efficiency radiators (field supply).
- The host unit controller is standard supplied with the unit to control the system.
- A wired remote controller can also be used to control the system (Optional).
- **Operation range**



(\*) The unit can not operate in cold weather conditions below -15°C. If it is necessary to operate, an external auxiliary heat source must be added as a backup heater. the backup heater also serves as a backup in case of malfunctioning of the unit and for freeze protection of the outside water piping during winter time.

These models have an antifreeze function that allows the use of heat pumps to keep the water system free from freezing under all conditions. If there is an accident or intentional power outage, it is recommended to use ethylene glycol.

## 1.2 Scope of this manual

This installation & owner's manual does not include the selection procedure and water system design procedure. Only some precautions and tips and tricks about the design of the water circuit are given in a separate chapter of this manual. Once the selection is done and the water system is designed, this manual describes the procedures for handling, installing and connecting the unit. This manual has been prepared to ensure adequate maintenance of the unit, and it will provide help if problems occur.



READ THESE INSTRUCTIONS CAREFULLY BEFORE INSTALLATION. KEEP THIS MANUAL IN A HANDY PLACE FOR FUTURE REFERENCE.

IMPROPER INSTALLATION OR ATTACHMENT OF EQUIPMENT OR ACCESSORIES COULD RESULT IN ELECTRIC SHOCKS, SHORT-CIRCUITS, LEAKS, FIRE OR OTHER DAMAGE TO THE EQUIPMENT. BE SURE TO ONLY USE ACCESSORIES MADE BY THE SUPPLIER WHICH ARE SPECIFICALLY DESIGNED FOR USE WITH THE EQUIPMENT AND HAVE INSTALLATION DONE BY A PROFESSIONAL

ALL ACTIVITIES DESCRIBED IN THIS MANUAL SHALL BE CARRIED OUT BY A LICENSED TECHNICIAN.

BE SURE TO WEAR ADEQUATE PERSONAL PROTECTION SUCH AS GLOVES AND SAFETY GLASSES WHEN PERFORMING INSTALLATION, MAINTENANCE OR SERVICE TO THE UNIT.

IF UNSURE OF INSTALLATION PROCEDURES OR USE, CONTACT YOUR DEALER FOR GUIDANCE

# 2. ACCESSORIES

## 2.1 Accessories supplied with the unit

Unit	Qty.	Shape
Installation & Owner's Manual	1	
Rubber ring for wires (only 10~16kW)	2	
Outflow connecting tube (for the chassis)	1	
Straight screwdriver	1	
Y-shaped filter	1	

### 3. SAFETY CONSIDERATIONS

The precautions listed here are divided into the following types. They are quite important, so be sure to follow them carefully.

Meanings of **DANGER**, **WARNING**, **CAUTION** and **NOTE** symbols.



#### **DANGER**

Indicates an imminently hazardous situation which if not avoided, will result in serious injuries.



#### **WARNING**

Indicates a potentially hazardous situation which if not avoided, could result in serious injuries.



#### **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.



#### **NOTE**

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



#### **DANGER**

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



#### **WARNING**

- Tear apart and throw away plastic packaging bags so that children will not play with them.  
Children playing with plastic bags face danger of serious injuries by suffocation.
- Safely dispose of packing materials such as nails and other metal or wood parts that could cause injuries.
- Ask your dealer or qualified personnel to perform installation work in accordance with this manual. Do not install the unit yourself. Improper installation could result in water leakage, electric shocks or fire.
- Be sure to use only specified accessories and parts for installation work.  
Failure to use specified parts may result in water leakage, electric shocks, fire, or the unit falling from its mount.
- Install the unit on a foundation that can withstand its weight.
- Insufficient physical strength may cause the equipment to fall and possible injury.
- Perform specified installation work with full consideration of strong wind, hurricanes, or earthquakes.  
Improper installation work may result in accidents due to equipment falling.
- Make certain that all electrical work is carried out by qualified personnel according to the local laws and regulations and this

manual using a separate circuit.

Insufficient capacity of the power supply circuit or improper electrical construction may lead to electric shocks or fire.

- Be sure to install a ground fault circuit interrupter according to local laws and regulations.  
Failure to install a ground fault circuit interrupter may cause electric shocks and fire.
- Make sure all wiring is secure. Use the specified wires and ensure that terminal connections or wires are protected from water and other adverse external forces.  
Incomplete connection or affixing may cause a fire.
- When wiring the power supply, form the wires so that the front panel can be securely fastened.  
If the front panel is not in place there could be overheating of the terminals, electric shocks or fire.
- After completing the installation work, check to make sure that there is no 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, etc.) during and immediately after operation.  
Touching the internal parts can cause burns. To avoid injury, give the internal parts time to return to normal temperature or, if you must touch them, be sure to wear protective gloves.

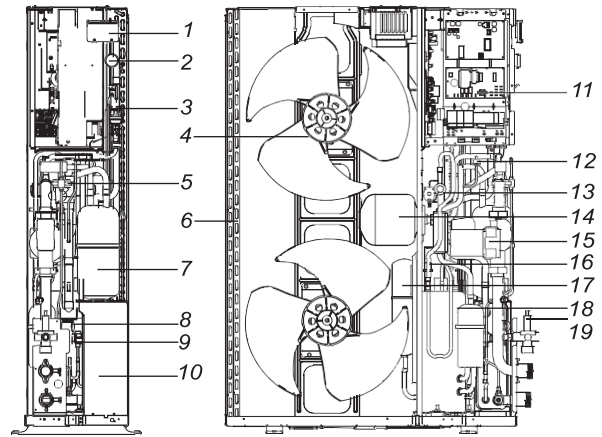


#### **CAUTION**

- Ground the unit.  
Grounding resistance should be according to local laws and regulations.  
Do not connect the ground wire to gas or water pipes, lightning conductors or telephone ground wires.  
Incomplete grounding may cause electric shocks.
- 
- a) Gas pipes.  
Fire or an explosion might occur if the gas leaks.
  - b) Water pipes.  
Hard vinyl tubes are not effective grounds.
  - c) Lightning conductors or telephone ground wires.
- Electrical threshold may rise abnormally if struck by a lightning bolt.
- Install the power wire at least 3 feet (1 meter) away from televisions or radios to prevent interference or noise. (Depending on the radio waves, a distance of 3 feet (1 meter) may not be sufficient to eliminate the noise.)
  - Do not wash the unit. This may cause electric shocks or fire. The appliance must be installed in accordance with national wiring regulations. If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
  - Do not install the unit in the following places:
    - a) Where there is mist of mineral oil, oil spray or vapors.  
Plastic parts may deteriorate, and cause them to come loose or water to leak.
    - b) Where corrosive gases (such as sulphurous acid gas) are produced.  
Where corrosion of copper pipes or soldered parts may cause refrigerant to leak.

- c) Where there is machinery which emits electromagnetic waves. Electromagnetic waves can disturb the control system and cause equipment malfunction.
- d) Where flammable gases may leak, where carbon fiber or ignitable dust is suspended in the air or where volatile flammables such as paint thinner or gasoline are handled. These types of gases might cause a fire.
- e) Where the air contains high levels of salt such as near the ocean.
- f) Where voltage fluctuates a lot, such as in factories.
- g) In vehicles or vessels.
- h) Where acidic or alkaline vapors are present.

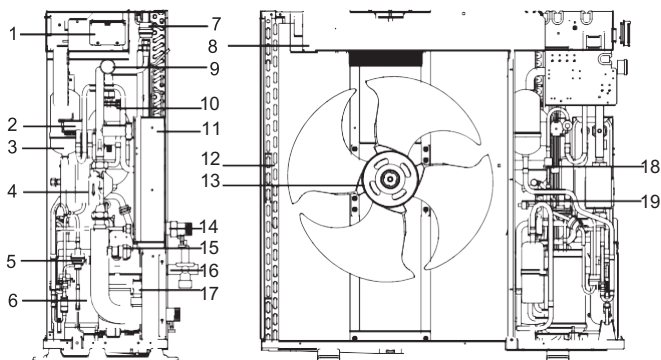
- This appliance can be used by children 8 years old and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they are supervised or given instruction on using the unit in a safe manner and understand the hazards involved. Children should not 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. If electrical appliances are disposed of in landfills or dumps, hazardous substance can leak into the groundwater and get into the food chain, damaging your health and well-being.
- The wiring must be performed by professional technicians in accordance with national wiring regulation and this circuit diagram. An all-pole disconnection device which has at least 3mm 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.



- |                                |                                  |
|--------------------------------|----------------------------------|
| 1 Operation panel              | 11 Electrical control box        |
| 2 Water manometer              | 12 High pressure switch          |
| 3 Air purge valve              | 13 4-ways valve                  |
| 4 Axial-flow fan               | 14 Expansion tank                |
| 5 Differential pressure switch | 15 Pump                          |
| 6 Condenser                    | 16 Low pressure switch           |
| 7 Accumulator                  | 17 Storage tank                  |
| 8 Security discharge           | 18 Compressor                    |
| 9 Electric expansive valve     | 19 Auto-water replenishing valve |
| 10 Plate heat exchanger        |                                  |

## 4. OVERVIEW OF THE UNIT

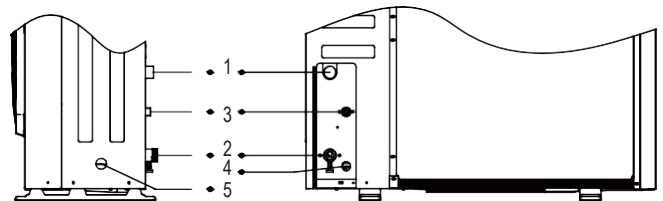
### 4.1 Main parts of the unit



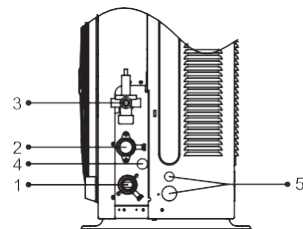
- |                            |  |
|----------------------------|--|
| 1 Operation panel          | 11 Plate heat exchanger                      |
| 2 4-ways valve             | 12 Condenser                                 |
| 3 Storage tank             | 13 Axial-flow fan                            |
| 4 Pump                     | 14 Adapter substitute (accessory)            |
| 5 Electric expansive valve | 15 Security discharge                        |
| 6 Compressor               | 16 Auto-water replenishing valve (accessory) |
| 7 Air purge valve          | 17 Water flow switch                         |
| 8 Electrical control box   | 18 High pressure switch                      |
| 9 Water manometer          | 19 Low pressure switch                       |
| 10 Expansion tank          |  |

### 4.2 Unit connections

5/7kW

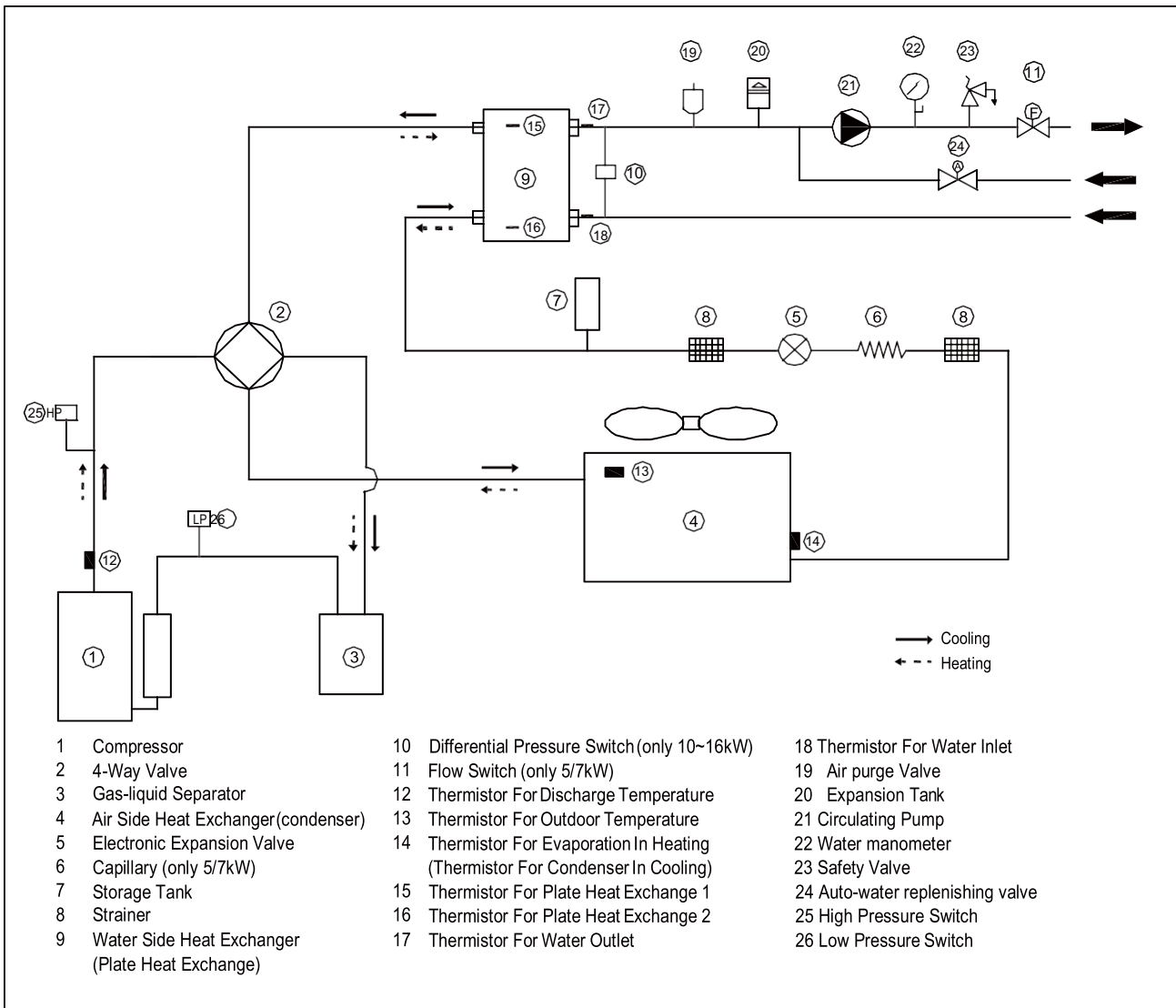


10~16kW



- |                                   |
|-----------------------------------|
| 1 Water inlet                     |
| 2 Water outlet                    |
| 3 Auto-water replenishing orifice |
| 4 Water outlet of safety Valve    |
| 5 Wire hole                       |

### 4.3 Refrigerant cycle

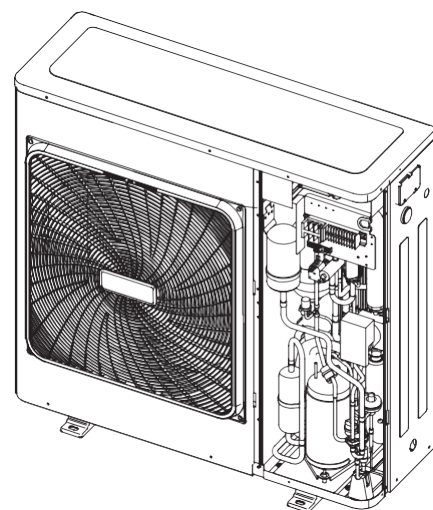


### 4.4 Electrical control box introduces

#### 4.4.1 5/7kW (1-phase)

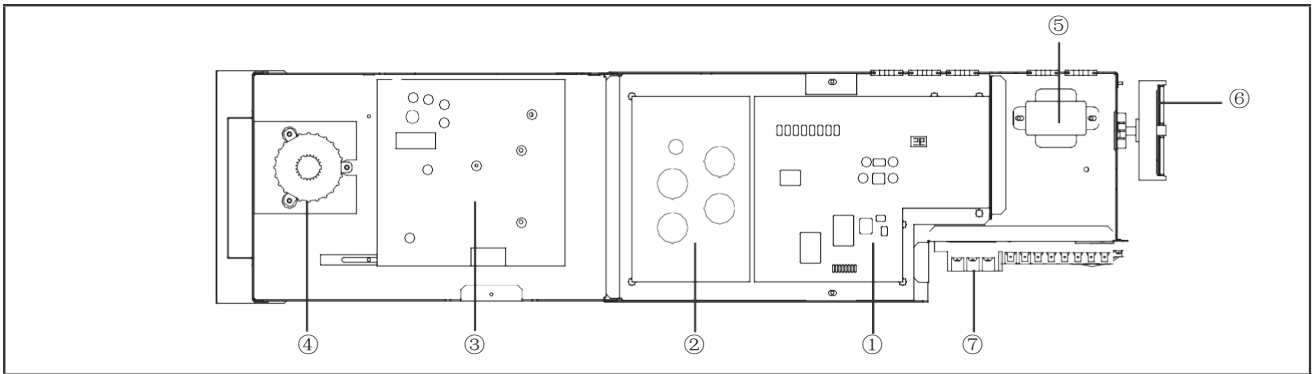
The electrical control box is located inside the unit at the top of the technical compartment where the various components of the refrigerant circuit are also to be found.

To access the electrical panel, remove the front panel of the unit by undoing the screws.



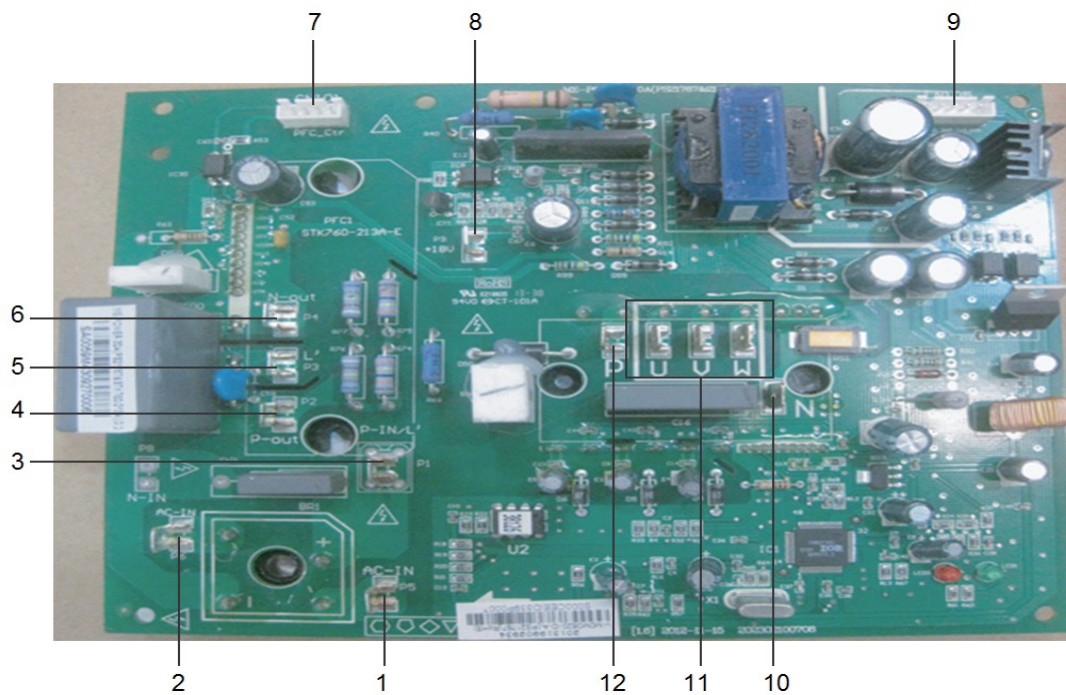
### 1. ELECTRICAL PANEL LAYOUT

(The picture below shows the position of the diagram, please participate in the concrete photos)



- |                          |                 |                                |
|--------------------------|-----------------|--------------------------------|
| ① Main control board     | ④ FC inductance | ⑦ Customer connection terminal |
| ② DC filter board        | ⑤ Transformer   |                                |
| ③ IPM & PFC module board | ⑥ Display board |                                |

### 2. PFC&IPM module board (The picture is for reference only)



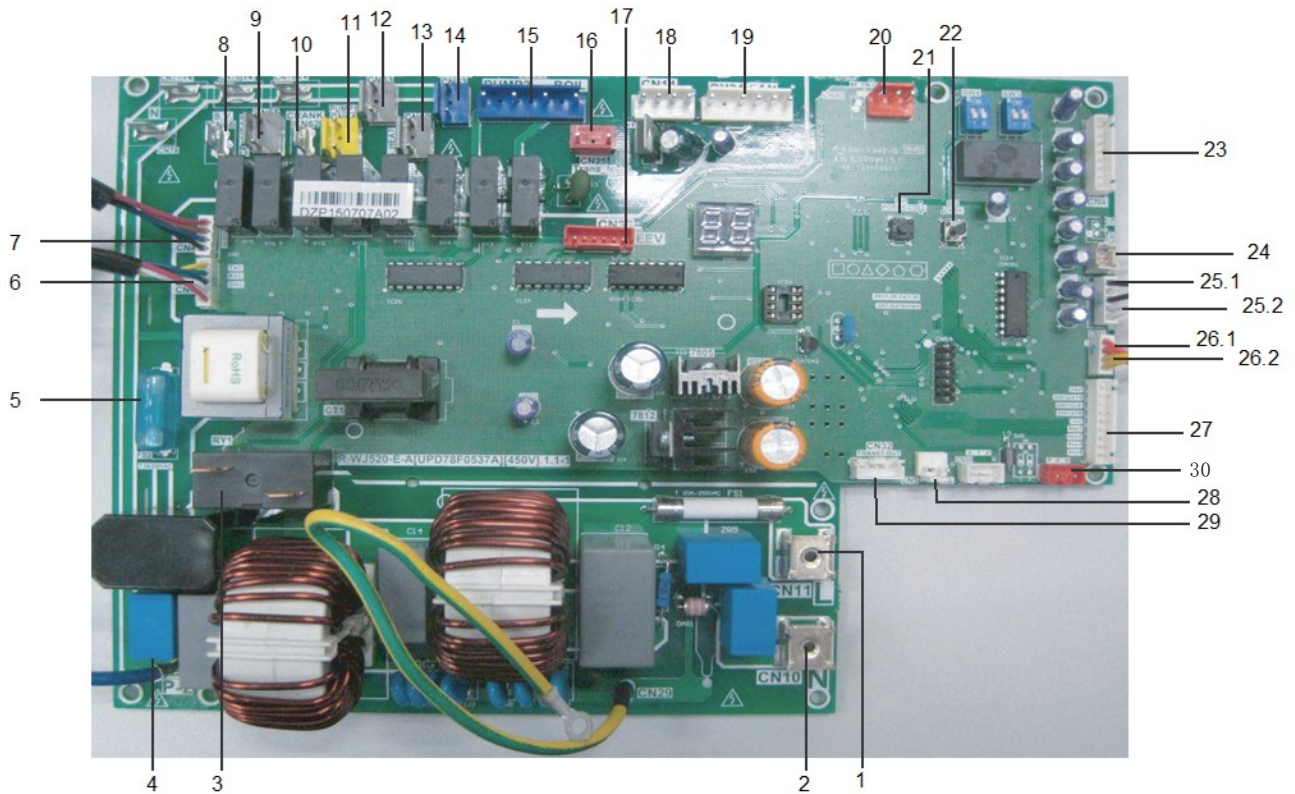
- |                                  |                                      |
|----------------------------------|--------------------------------------|
| 1. Input rectifier bridge port 1 | 7.PFC control port                   |
| 2.Input rectifier bridge port 2  | 8.+18V port                          |
| 3.PFC inductance port 1          | 9.IPDU communication port            |
| 4.P-OUT                          | 10.IPM power port N                  |
| 5.PFC inductance port 2          | 11. Compressor connection port U/V/W |
| 6.N-OUT                          | 12.IPM power port P                  |

### 3. DC filter board (The picture is for reference only)



- |                                       |
|---------------------------------------|
| 1. IPM Power supply P                 |
| 2. IPM Power supply N                 |
| 3. PFC output power N                 |
| 4. PFC output power P                 |
| 5. DC 380V (DC fan power supply port) |

#### 4. Main control board (The picture is for reference only)

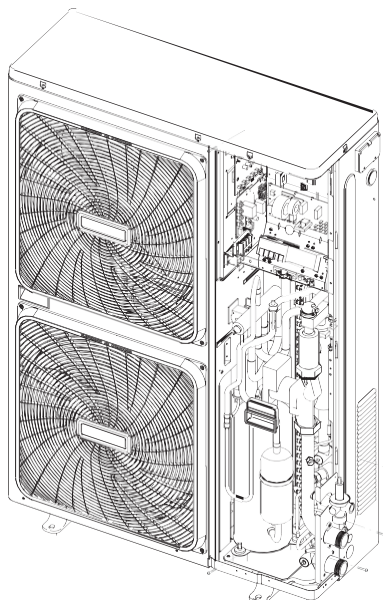


- 1.Power L
- 2.Power N
- 3.Preliminary charging relay (rectifier bridge input port 1)
- 4.Input rectifier bridge line (rectifier bridge input port 2)
- 5.5A fuse
- 6. To IPDU
- 7. To PFC
- 8. Solenoid valve (Reserve)
- 9. Electric heater of plate heatexchanger
- 10.Electric heater of compressor
- 11.Pump
- 12.Electric heater of exhaust valve
- 13.Electric heater of water flow switch
- 14.4-way valve
- 15.Additional pump/Remote alarm port
- 16.Transformer input

- 17.Electronic expansion valve
- 18.DC fan power supply port
- 19.DC fan port
- 20.Remote control port
- 21.Force cooling switch
- 22.Parameter checking switch
- 23.Tin/Tout/Tb1 temperature sensor
- 24.Discharge temperature sensor (Tp)
- 25.1 Outlet of outdoor heat exchanger temperature sensor (T3)
- 25.2 Ambient temperature sensor(T4)
- 26.1 Low pressure switch
- 26.2 High pressure switch
- 27.Operation and display panel port
- 28.Water flow switch
- 29.Transformer output
- 30.Wired controller port

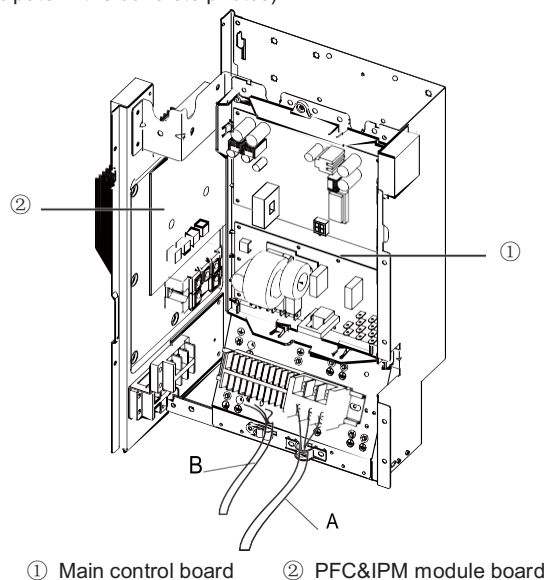
#### 4.4.2 10~12kW (1-phase)

Remove the inspection panel by unscrewing the five screws. The electric control box is located inside the unit at the top of the technical components.



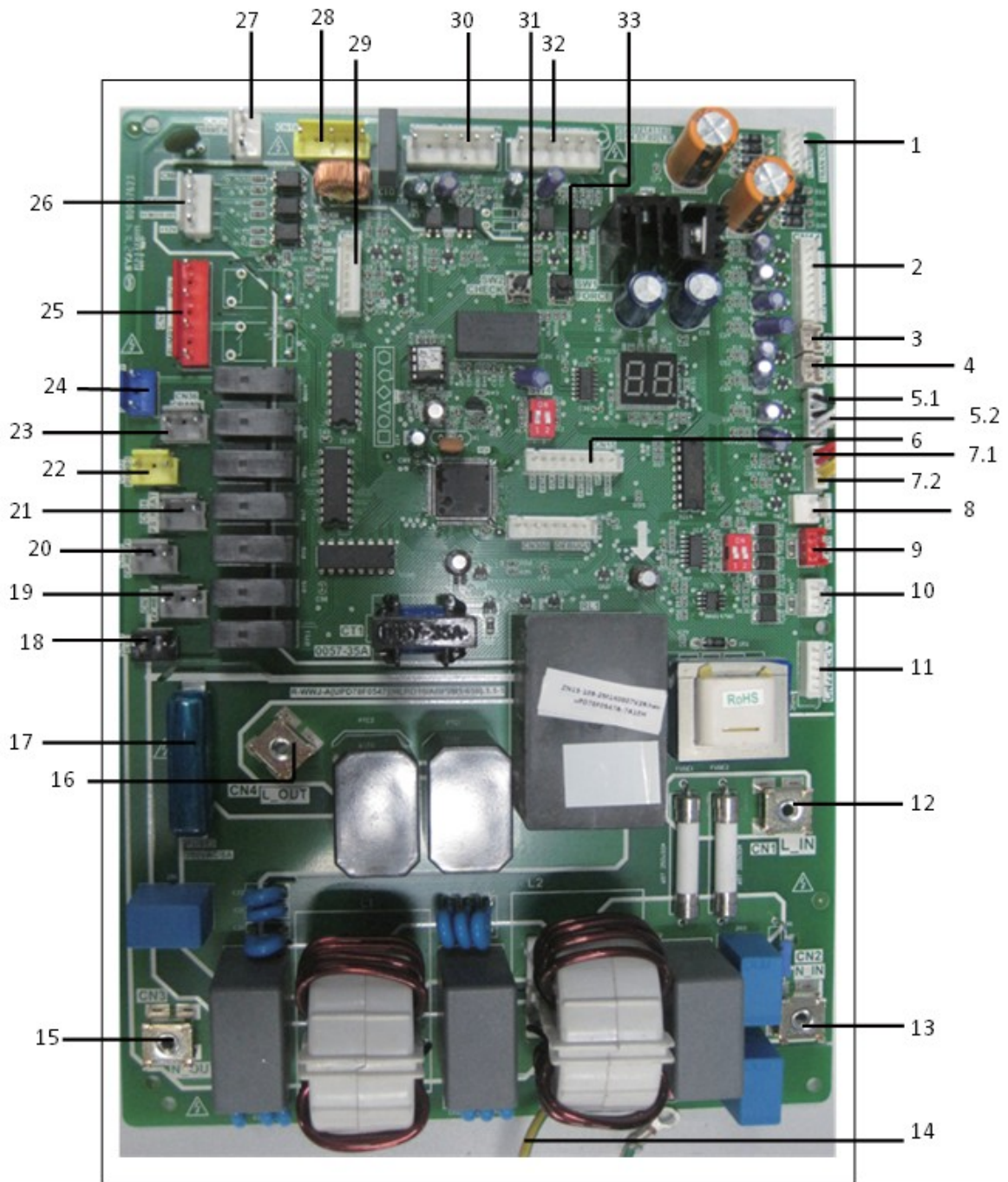
**1. Use grommet A for the electrical power cable and grommet B for the other external wires.**

(The picture below shows the position of the diagram, please participate in the concrete photos)



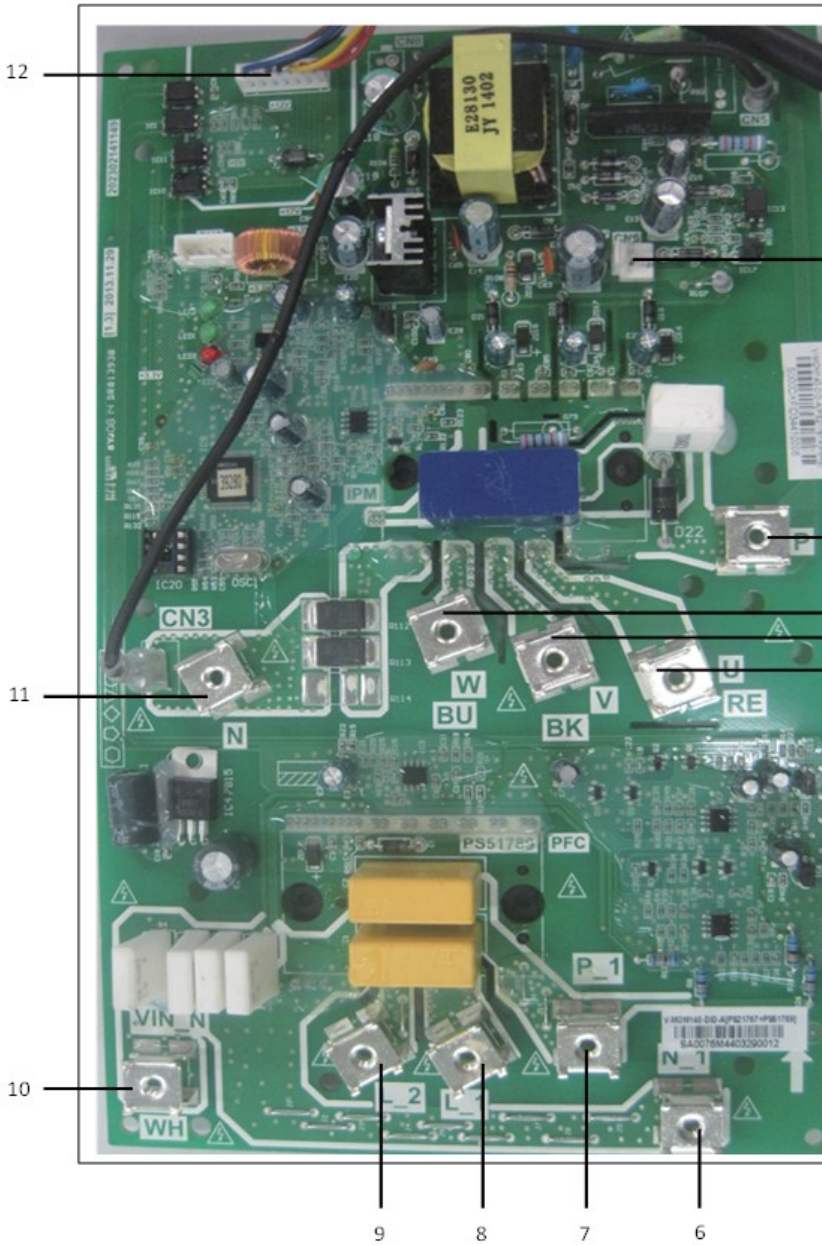
① Main control board    ② PFC&IPM module board

2. Main control board (The picture is for reference only)



- |   |   |
|---|---|
| <p>1. Transformer output port<br/>                 2. Tin/Tb1/Tout/Tb2 temperature sensor port<br/>                 Note: Tin: water inlet temp. Tout: water outlet temp.<br/>                 Tb1: Temp. 1 of plate heat exchanger<br/>                 Tb2: Temp.2 of plate heat exchanger<br/>                 3. Radiator temperature sensor port(Reserved) (T6)<br/>                 4. Discharge temperature sensor port<br/>                 5.1 Outlet of outdoor heat exchanger temp. sensorport(T3)<br/>                 5.2 Ambient temp. sensor port (T4)<br/>                 6.Operation and display panel port<br/>                 7.1 Low pressure switch<br/>                 7.2 High pressure switch<br/>                 8.Differential pressure valve port<br/>                 9.Factory debug port<br/>                 10.Wired controller port<br/>                 11.Electric expansion valve port<br/>                 12.Power supply input port L<br/>                 13.Power supply input port N<br/>                 14.Ground wire<br/>                 15. Rectifier bridge input port N</p> | <p>16. Rectifier bridge input port L<br/>                 17. 8A fuse tube<br/>                 18. Solenoid valve port (Reserved)<br/>                 19. Exhaust valve electric heater port<br/>                 20. Plate heat exchanger electric heater port<br/>                 21. Flow switch electric heater port<br/>                 22. Built-in water pump port<br/>                 23. Compressor electric heater port<br/>                 24. 4-way valve port<br/>                 25. External pump/Remote alarm port<br/>                 26. Remote control port<br/>                 27. Transformer input port<br/>                 28. P/N/+15V port<br/>                 29. Communication port between IPDU and main PCB<br/>                 30. Down DC fan port<br/>                 31. Check touch switch<br/>                 32. Up DC fan port<br/>                 33. Force-cooling touch switch</p> |
|---|---|

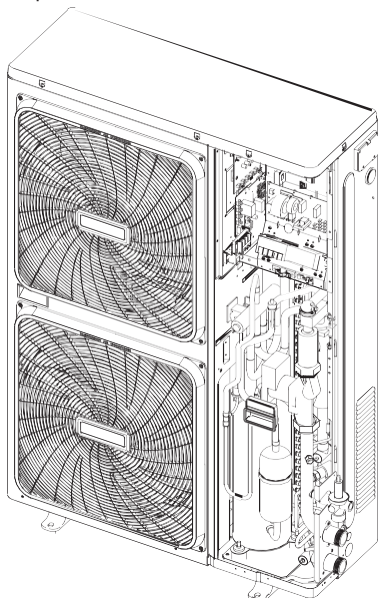
3. PFC&IPM module board (The picture is for reference only)



1. +18V output port
2. Input Port P for IPM
3. Power supply port W of the compressor
4. Power supply port V of the compressor
5. Power supply port W of the compressor
6. PFC output N
7. PFC output P
8. PFC inductance port L\_1
9. PFC inductance port L\_2
10. PFC input N
11. IPM input N
12. Communication port to main control board

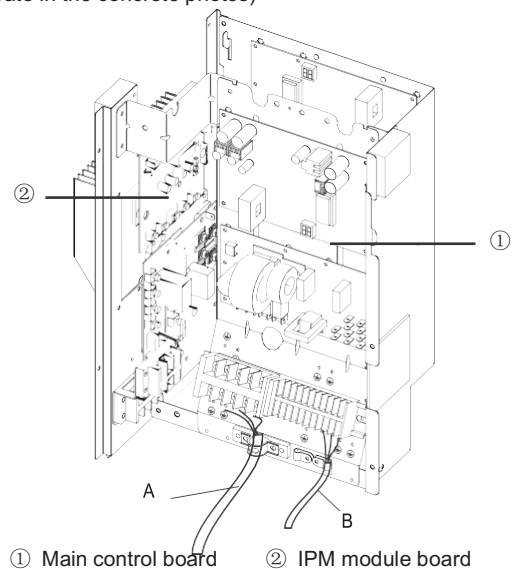
4.4.3 12~16kW (3-phase)

Remove the inspection panel by unscrewing the five screws. The electric control box is located inside the unit at the top of the technical components.

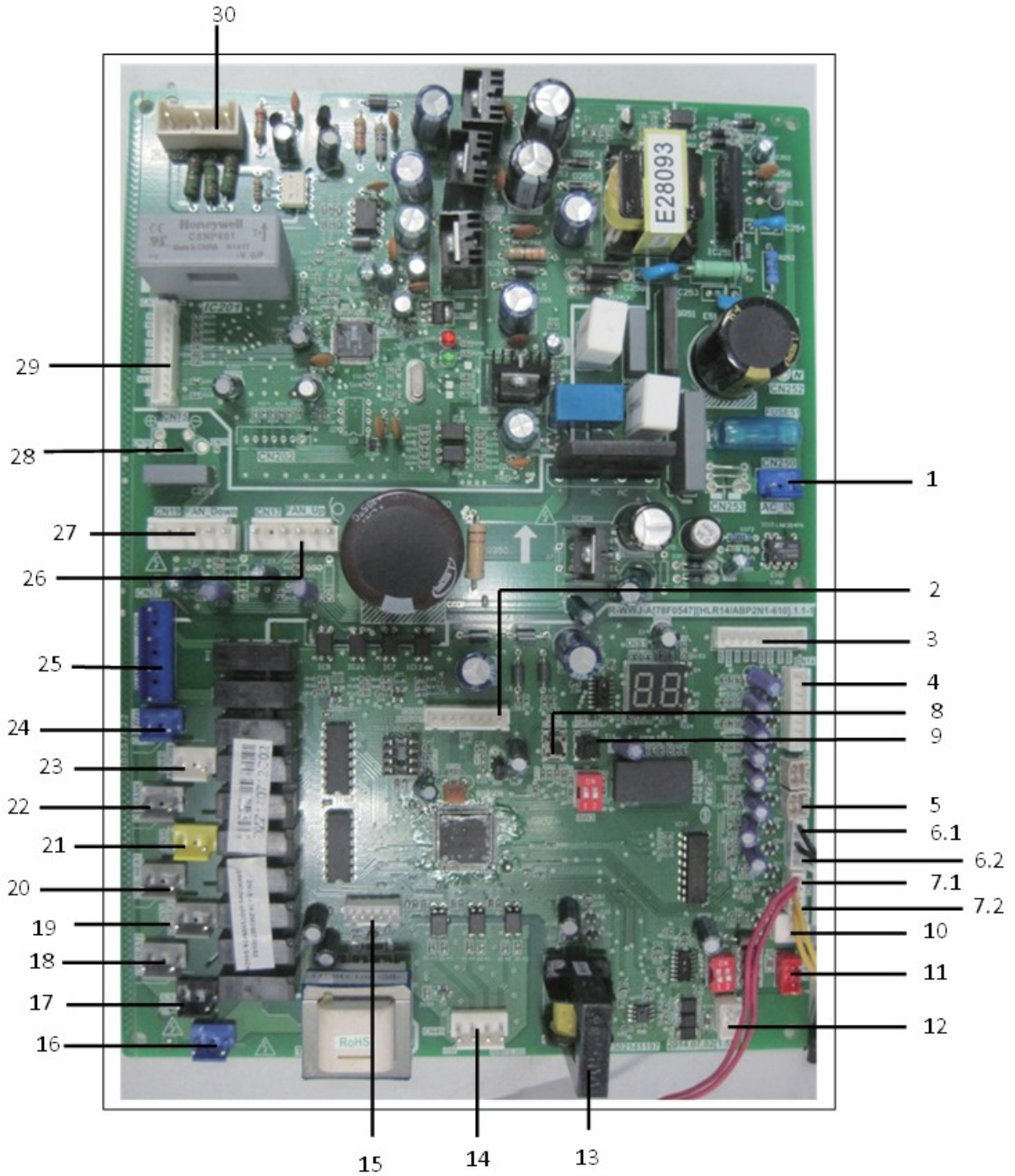


1. Use grommet A for the electrical power cable and grommet B for the other external wires.

(The picture below shows the position of the diagram, please participate in the concrete photos)

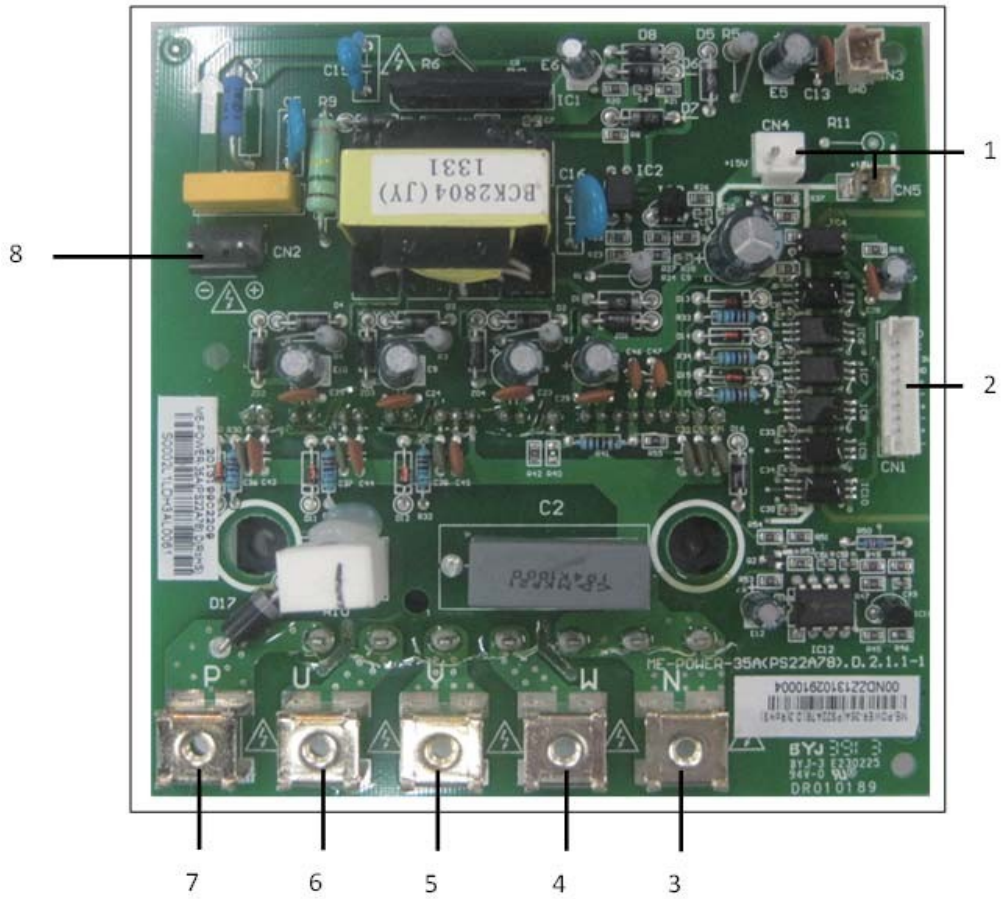


2. Main control board (The picture is for reference only)



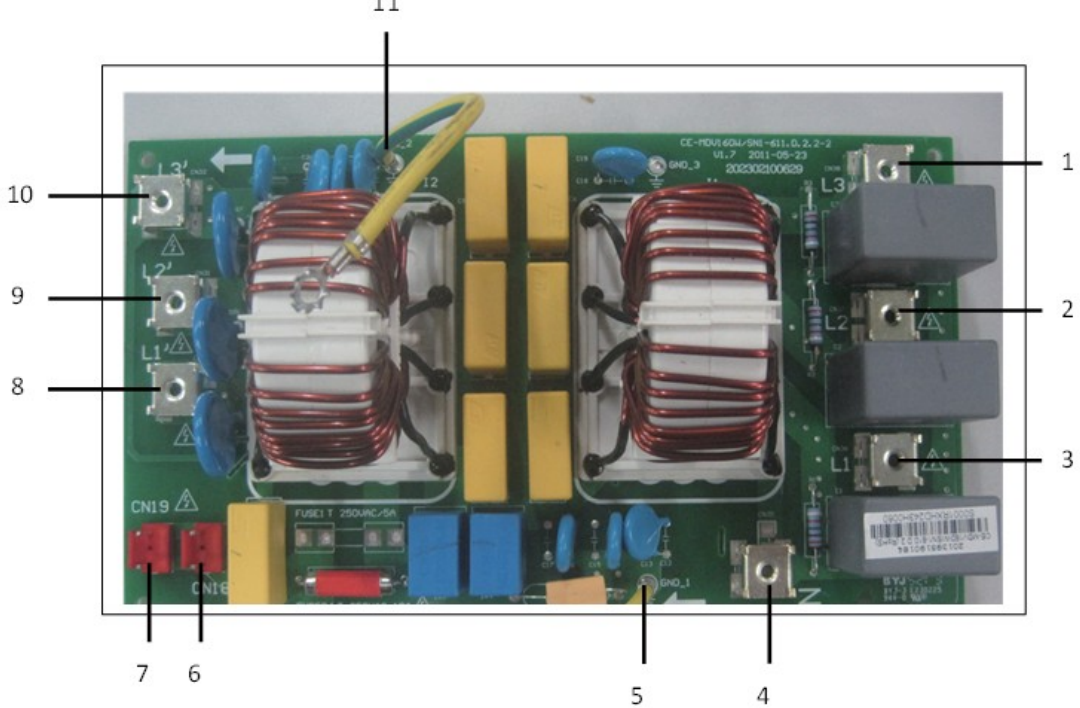
- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1. Input port for switching power supply</li> <li>2. Debugging port</li> <li>3. Connection port for operation and displaypanel</li> <li>4. Tin/Tb1/Tout/Tb2 temp. sensor port</li> <li>Note: Tin: water inlet temp. Tout: water outlet temp.</li> <li>Tb1: Temp.1 of plate heat exchanger</li> <li>Tb2: Temp. 2 of plate heat exchanger</li> <li>5. Discharged temperature sensor port (Tp)</li> <li>6.1 T3 temperature sensor port</li> <li>6.2 T4 ambient temperature sensor port</li> <li>7.1. Low pressure switch</li> <li>7.2 High pressure switch</li> <li>8. Checking touch switch</li> <li>9. Force-cooling touch switch</li> <li>10. Differential pressure valve port</li> <li>11. Factory debugging port</li> <li>12. Wired controller port</li> <li>13. AC Current transformer</li> </ul> | <ul style="list-style-type: none"> <li>14. Remote control port</li> <li>15. Electronic expansion valve port</li> <li>16. AC 220V power supply port</li> <li>17. Solenoid valve port (Reserved)</li> <li>18. Exhaust valve electric heater port</li> <li>19. Electric heater port of Plate heat exchanger</li> <li>20. Electric heater port of differential pressure valve</li> <li>21. Built-in water pump port</li> <li>22. Electric heater of the compressor</li> <li>23. Precharge AC contactor port</li> <li>24. 4-way valve port</li> <li>25. External water pump/Remote alarm port</li> <li>26. Up DC fan port</li> <li>27. Down DC fan port</li> <li>28. Power supply port for switching power supply of PFC board</li> <li>29. Drive module port</li> <li>30. P/N/+15V port</li> </ul> |
|---|--|

3. IPM module board (The picture is for reference only)



- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. +15V output port</li> <li>2. communication port to main control board</li> <li>3. IPM input port N</li> <li>4. Compressor connection port W</li> </ul> | <ul style="list-style-type: none"> <li>5. Compressor connection port V</li> <li>6. Compressor connection port U</li> <li>7. IPM input P</li> <li>8. Power supply port for switching power supply</li> </ul> |
|--|---|

4. Filter board (The picture is for reference only)



- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1. Power supply port L3</li> <li>2. Power supply port L2</li> <li>3. Power input port L1</li> <li>4. Power input port N</li> <li>5. Ground wire</li> </ul> | <ul style="list-style-type: none"> <li>6. Loaded power supply port for main control board</li> <li>7. Power supply port for main control board</li> <li>8. Power output port L1 after filtering</li> <li>9. Power output port L2 after filtering</li> <li>10. Power output port L3 after filtering</li> <li>11. Ground wire</li> </ul> |
|---|--|

## 5. UNIT INSTALLATION

### 5.1 Before installation

#### Before installation

Be sure to confirm the model name and the serial number of the unit.

#### Handling

Due to relatively large dimensions and heavy weight, the unit should only be handled using lifting tools with slings. The slings can be fitted into foreseen sleeves at the base frame that are made specifically for this purpose.



#### CAUTION

- To avoid injury, do not touch the air inlet or aluminium fins of the unit.
- Do not use the grips in the fan grills to avoid damage.
- The unit is top heavy! Prevent the unit from falling due to improper inclination during handling.



### 5.2 Selecting the installation site



#### WARNING

- Be sure to provide for adequate measures in order to prevent that the unit be used as a shelter by small animals.
- Small animals making contact with electrical parts can cause malfunctions, smoke or fire. Please instruct the customer to keep the area around the unit clean.

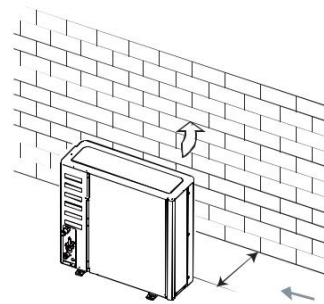
- 1 Select an installation site where the following conditions are satisfied and one that meets with your customer's approval.
  - Places that are well-ventilated.
  - Places where the unit does not disturb next-door neighbours.
  - Safe places which can bear the unit's weight and vibration and where the unit can be installed at an even level.
  - Places where there is no possibility of flammable gas or product leak.
  - The equipment is not intended for use in a potentially explosive atmosphere.
  - Places where servicing space can be well ensured.
  - Places where the units' piping and wiring lengths come within the allowable ranges.
  - Places where water leaking from the unit cannot cause damage to the location (e.g. in case of a blocked drain pipe).
  - Places where rain can be avoided as much as possible.
  - Do not install the unit in places often used as a work space. In case of construction work (e.g. grinding etc.) where a lot of dust is created, the unit must be covered.
  - Do not place any objects or equipment on top of the unit (top plate)
  - Do not climb, sit or stand on top of the unit.
  - Be sure that sufficient precautions are taken in case of refrigerant leakage according to relevant local laws and regulations.
- 2 When installing the unit in a place exposed to strong wind, pay special attention to the following.
 

Strong winds of 5 m/sec or more blowing against the unit's air outlet causes a short circuit (suction of discharge air), and this may have the following consequences:

  - Deterioration of the operational capacity.
  - Frequent frost acceleration in heating operation.
  - Disruption of operation due to rise of high pressure.
  - When a strong wind blows continuously on the front of the unit, the fan can start rotating very fast until it breaks.

Refer to the figures for installation of this unit in a place where the wind direction can be foreseen.

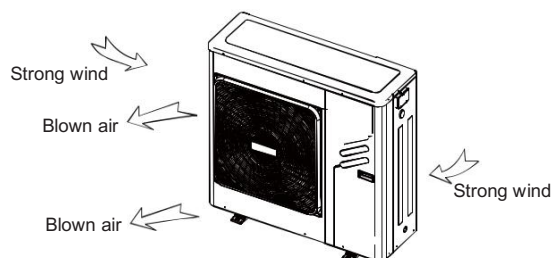
  - Turn the air outlet side toward the building's wall, fence or screen.



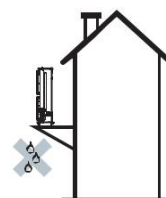
Unit	A(mm)
5-16kW	≥2000

Make sure there is enough room to do the installation

- Set the outlet side at a right angle to the direction of the wind.



- 3 Prepare a water drainage channel around the foundation, to drain waste water from around the unit.
- 4 If water does not easily drain from the unit, mount the unit on a foundation of concrete blocks, etc. (the height of the foundation should be about 100 mm (3.93 in.).)
- 5 If you install the unit on a frame, please install a waterproof plate (about 100 mm) on the underside of the unit to prevent water from coming in from the low side.
- 6 When installing the unit in a place frequently exposed to snow, pay special attention to elevate the foundation as high as possible.
- 7 If you install the unit on a building frame, please install a waterproof plate (field supply) (about 100 mm.) on the underside of the unit in order to avoid drain water dripping. (See figure).



#### NOTE

Unit is top heavy!  
Try not to install on the building frame.

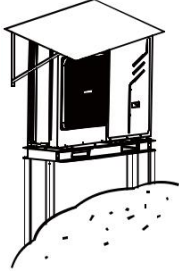
### 5.2.1 Selecting a location in cold climates



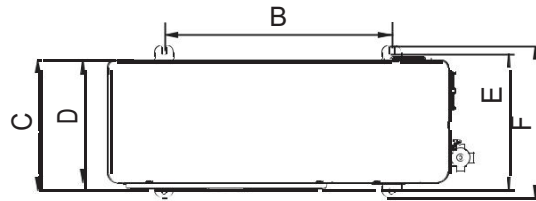
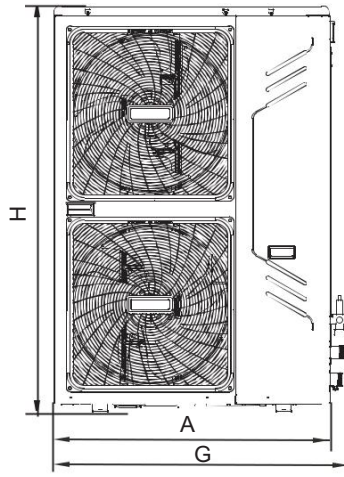
#### NOTE

When operating the unit in cold climates, be sure to follow the instructions described below.

- To prevent exposure to wind, install the unit with its suction side facing the wall.
- Never install the unit at a site where the suction side may be exposed directly to wind.
- To prevent exposure to wind, install a baffle plate on the air discharge side of the unit.
- In heavy snowfall areas it is very important to select an installation site where the snow will not affect the unit. If lateral snowfall is possible, make sure that the heat exchanger coil is not affected by the snow (if necessary construct a lateral canopy).



- 1 Construct a large canopy.
- 2 Construct a pedestal.  
Install the unit high enough off the ground to prevent it from being buried in snow.

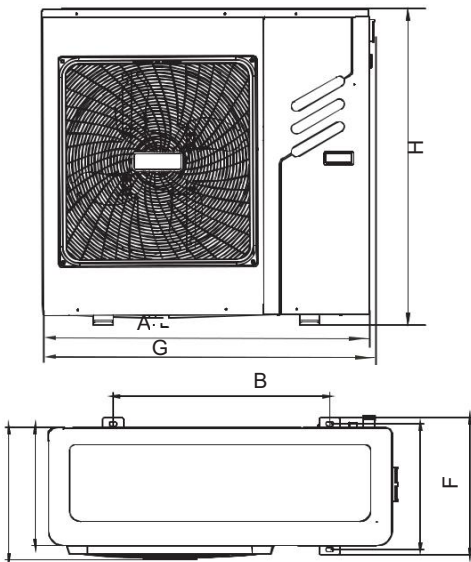


### 5.2.2 Selecting a location in hot climates

As the outdoor temperature is measured via the outdoor unit air thermistor, make sure to install the outdoor unit in the shade, or a canopy should be constructed to avoid direct sunlight. so that it is not influenced by the sun's heat, otherwise protection may be possible to the unit.

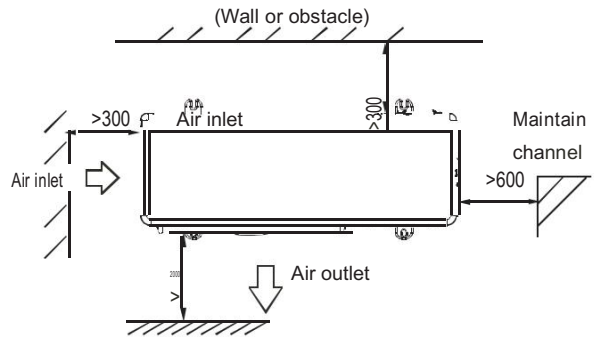
MODEL (kW)	A	B	C	D	E	F	G	H
10/12 /14/16	900	600	348	320	360	400	970	1327

### 5.3 Installation space (Unit:mm)

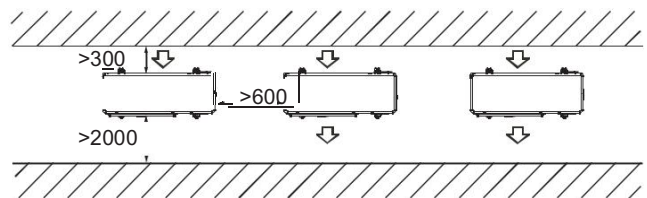


MODEL (kW)	A	B	C	D	E	F	G	H
5/7	994	626	382	342	363	396	1008	963

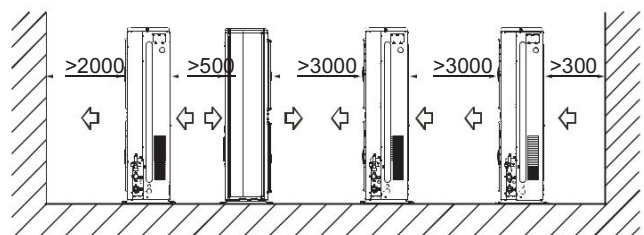
- Single unit installation



- Parallel connect the two units or above

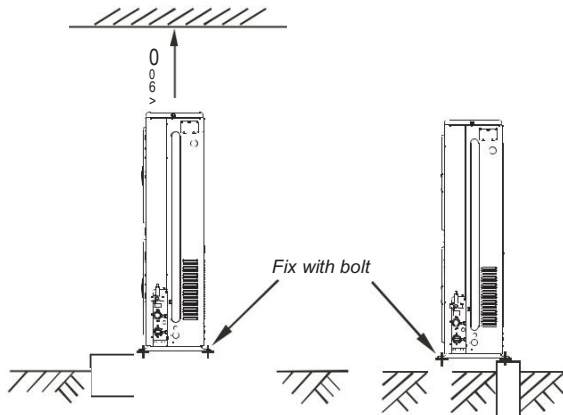


- Parallel connect the front with rear sides



### 5.3.1 Moving and installation

- Since the gravity center of the unit is not at its physical center, so please be careful when lifting it with a sling.
- Never hold the inlet of the outdoor unit to prevent it from deforming.
- Do not touch the fan with hands or other objects.
- Do not lean it more than 45°, and do not lay it sidelong.
- Make concrete foundation according to the specifications of the outdoor units.
- Fasten the feet of this unit with bolts firmly to prevent it from collapsing in case of earthquake or strong wind.



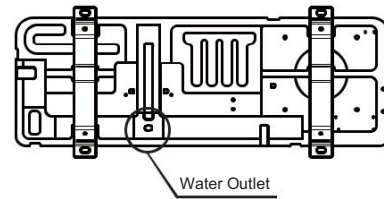
#### NOTE

All the pictures in this manual are for explanation purpose only. They may be slightly different from the air conditioner you purchased (depend on model). The actual shape shall prevail.

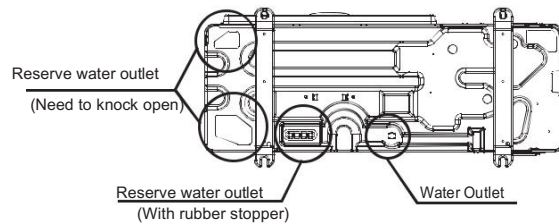
### 5.3.2 Water Outlet

The condensed water outlets on the chassis for selection display as the follow figure:

5/7kW



10~16kW



#### CAUTION

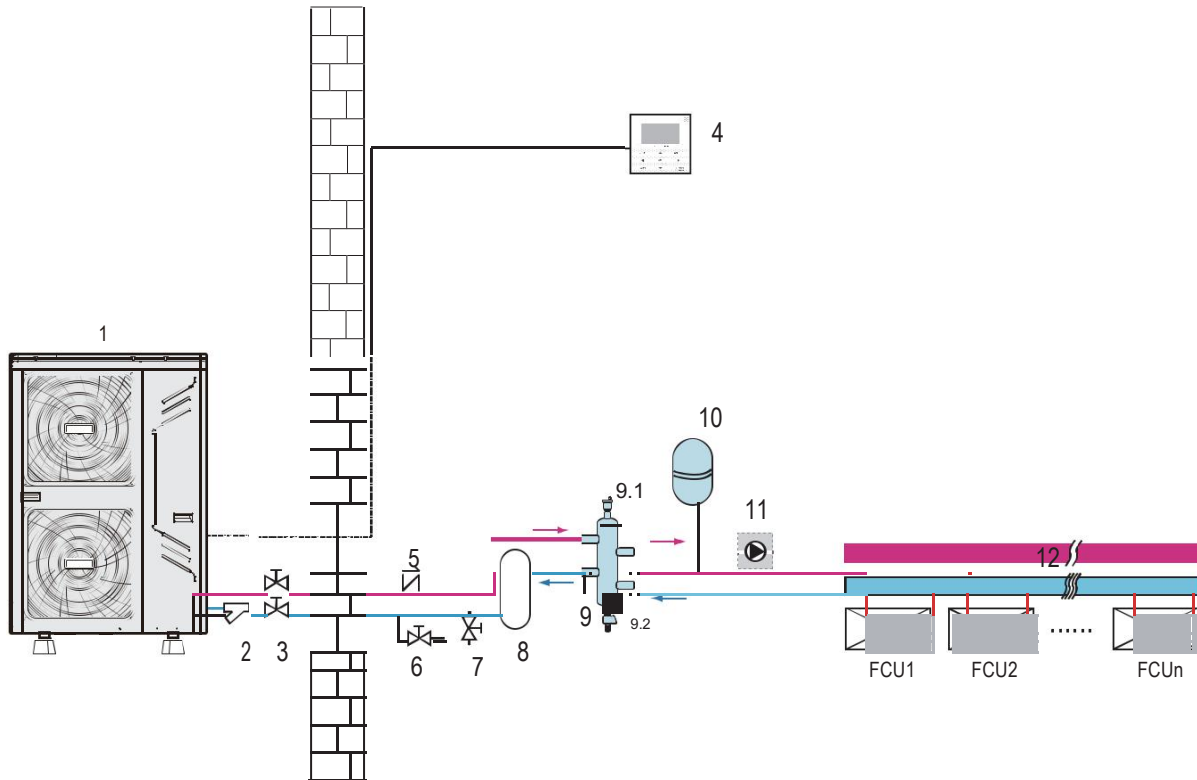
While installing the outdoor unit, pay attention to the installation place and the drainage pattern;  
 If it's installed at the alpine zone, the frozen condensed water will block up the water outlet, please pull out the rubber stopper of the reserve water outlet (10~16kW). If that still fails to satisfy for the water draining, please knock open the other water outlets (10~16kW), and keep the water can drain in time.  
 Pay attention to the knock the reserve water outlet from outside to inside, and it will be beyond repair after knocking open, please pay attention to the installation place, lest cause the inconvenience.  
 Please do the moth proofing for the knocked-out hole, to avoid the pest processing into and destroy the components.

## 5.4 TYPICAL APPLICATION EXAMPLES

The application examples given below are for illustration purposes only.

### 5.4.1 Application 1

Space cooling and heating application with a standard controller (or optional wired controller) connected to the unit.



- |                                   |  |
|-----------------------------------|--|
| 1 outdoor unit                    | 9 balance tank (field supply)                      |
| 2 Y-shape filter                  | 9.1 air purge valve                                |
| 3 shut-off valve (field supply)   | 9.2 drain valve                                    |
| 4 wired controller (optional)     | 10 expansion vessel (field supply)                 |
| 5 non-return valve (field supply) | 11 Pump 2: outside circulation pump (field supply) |
| 6 drain valve (field supply)      | 12 collector (field supply)                        |
| 7 fill valve (field supply)       | FCU 1...n fan coil units                           |
| 8 buffer tank (field supply)      |  |



### NOTE

If the volume of balance tank(9) larger than 30L, the buffer tank(8) is unnecessary, otherwise the buffer tank(8) should be installed and the total volume of buffer tank and balance tank should larger than 30L. The drain valve (6) should be installed at the lowest position of the system.

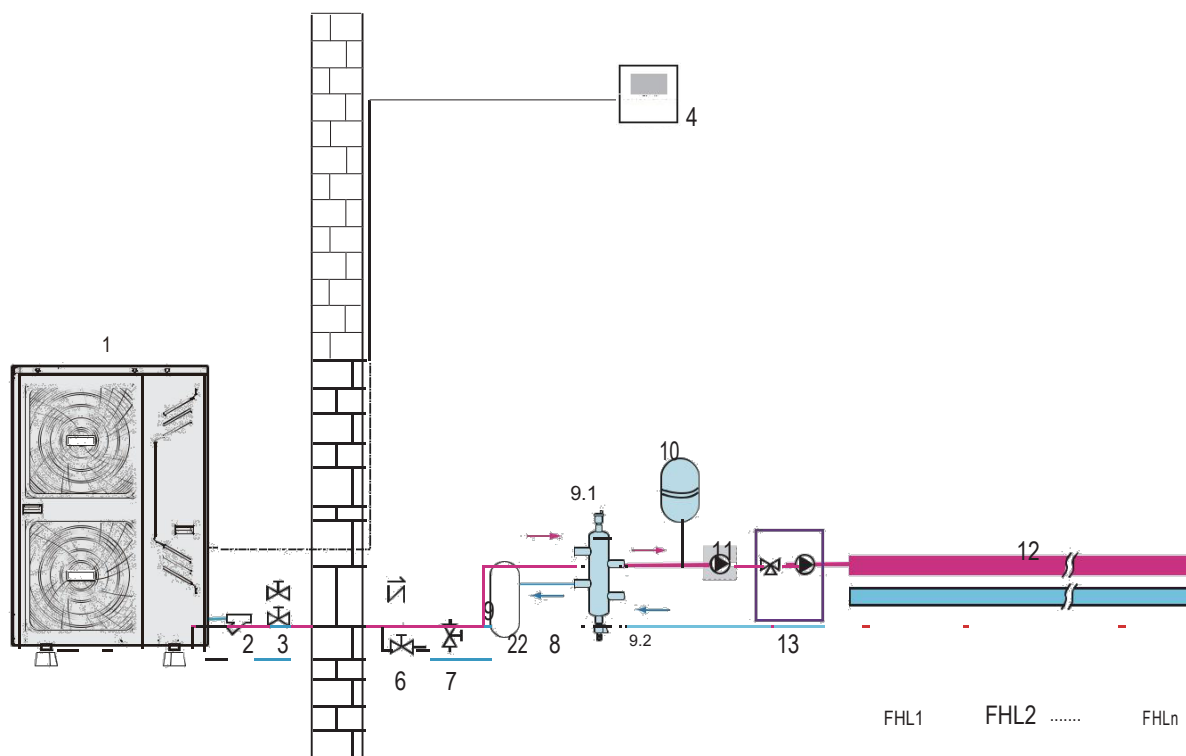
An independent backup heater can be selected and installed in the door, which can provide additional heating source and ensure better performance of the system when the ambient temperature is low.

### Unit operation

when there is a cooling or heating request from the standard controller (or optional wired controller), the unit will start operating to achieve the target water flow temperature as set on standard controller (or optional wired controller). When the room temperature reaches the set point, the unit will stop operating. The circulation pump (built-in pump 1 and outside pump 2) will also running.

## 5.4.2 Application 2

Space heating only application with a standard controller (or optional wired controller) connected to the unit. Heating is provided through floor heating loops.



- |                                   |  |
|-----------------------------------|--|
| 1 outdoor unit                    | 9 balance tank (field supply)                      |
| 2 Y-shape filter                  | 9.1 air purge valve                                |
| 3 shut-off valve (field supply)   | 9.2 drain valve                                    |
| 4 wired controller (optional)     | 10 expansion vessel (field supply)                 |
| 5 non-return valve (field supply) | 11 Pump 2: outside circulation pump (field supply) |
| 6 drain valve (field supply)      | 12 collector (field supply)                        |
| 7 fill valve (field supply)       | 13 mixing station (field supply, field control)    |
| 8 buffer tank (field supply)      | FHL 1...n floor heating loop                       |



### NOTE

If the volume of balance tank(9) larger than 30L, the buffer tank(8) is unnecessary, otherwise the buffer tank(8) should be installed and the total volume of buffer tank and balance tank should larger than 30L.The drain valve (6) should be installed at the lowest position of the system.

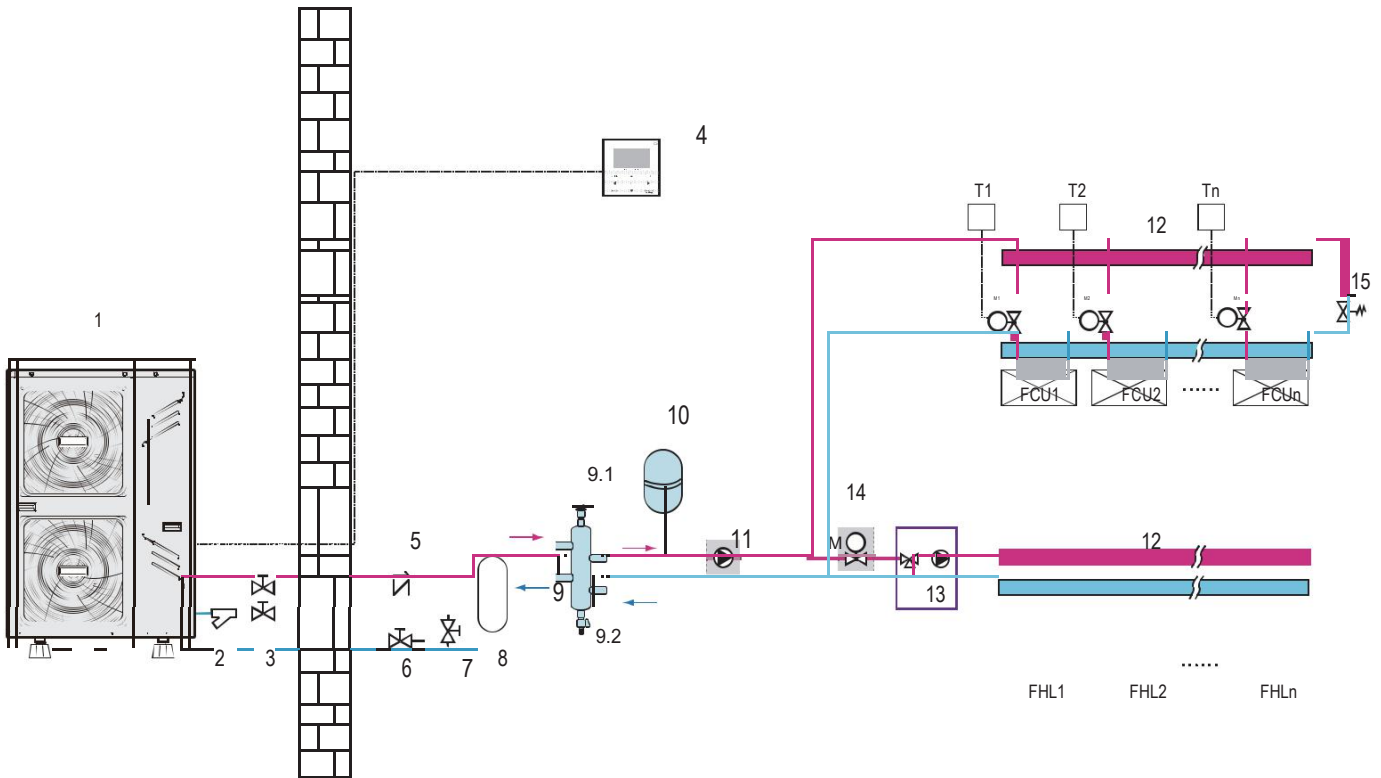
An independent backup heater can be selected and installed in the door, which can provide additional heating source and ensure better performance of the system when the ambient temperature is low.

#### ■ Mixing station

As the unit is mainly to provide middle-temperature and high-temperature water, when connecting floor heating, the need to increase the mixing station (13) before the floor heating.

### 5.4.3 Application 3

Space cooling and heating application with a standard controller (or optional wired controller) connected to the unit. Heating is provided through floor heating loops and fan coil units. Cooling is provided through the fan coil units only.



- |                                   |   |
|-----------------------------------|---|
| 1 outdoor unit                    | 10 expansion vessel (field supply)  |
| 2 Y-shape filter                  | 11 Pump 2: outside circulation pump (field supply)  |
| 3 shut-off valve (field supply)   | 12 collector (field supply)   |
| 4 wired controller (optional)     | 13 mixing station (field supply, field control)   |
| 5 non-return valve (field supply) | 14 Motorised 2-way valve to shut off the floor heating loops during cooling operation (field supply, field control) |
| 6 drain valve (field supply)      | 15 by-pass valve (field supply)   |
| 7 fill valve (field supply)       | FHL 1... n floor heating loop   |
| 8 buffer tank (field supply)      | FCU 1... n fan coil units   |
| 9 balance tank (field supply)     | M1...n motorised valve to control loop FHL1...3 (field supply)  |
| 9.1 air purge valve               | T1...n room thermostat (field supply)   |
| 9.2 drain valve                   |   |



#### NOTE

If the volume of balance tank (9) larger than 30L, the buffer tank(8) is unnecessary, otherwise the buffer tank(8) should be installed and the total volume of buffer tank and balance tank should larger than 30L. The drain valve (6) should be installed at the lowest position of the system.

An independent backup heater can be selected and installed in the door, which can provide additional heating source and ensure better performance of the system when the ambient temperature is low.

#### ■ Mixing station

As the unit is mainly to provide middle-temperature and high-temperature water, when connecting floor heating, the need to increase the mixing station (13) before the floor heating.

#### ■ Pump operation and space heating and cooling

According to the season, the unit (1) will switch to either heating or cooling mode according to the temperature detected by the standard controller (or optional wired controller (4)). When space heating/cooling is requested standard controller (or optional wired controller (4)), the pump will start operating and the unit (1) will switch to heating mode/cooling mode. The unit (1) will operating to achieve the target cold/hot water leaving temperature.

In the cooling mode. the motorized 2-way valve (14) will be set to closed to prevent cold water running through the floor heating loops (FHL).

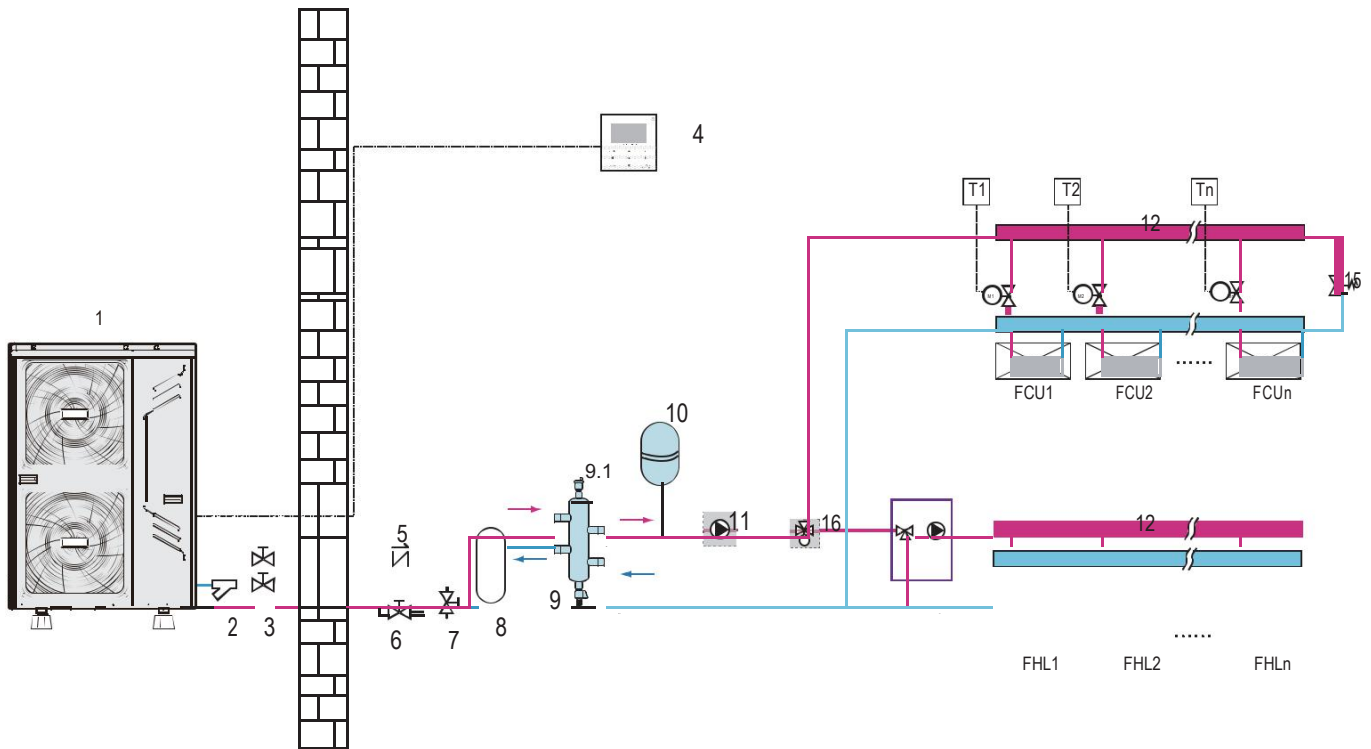


#### CAUTION

When circulation in each fan coil units (FCU 1...3) is controlled by remotely controlled valves (M1...3), it is important to provide a by-pass valve (15) to avoid the flow switch safety device from being activated. The pass-by valve should be selected as such that at all time the minimum water flow. It is recommended to select a pressure difference controlled by-pass valve.

### 5.4.4 Application 4

Space cooling and heating application with a standard controller (or optional wired controller) connected to the unit. Heating is provided through floor heating loops. Cooling is provided through the fan coil units only. The 3-way valve is used to change the direction of water flow when the operation mode changed.



- |                                   |  |
|-----------------------------------|--|
| 1 outdoor unit                    | 10 expansion vessel (field supply)                     |
| 2 Y-shape filter                  | 11 Pump 2: outside circulation pump (field supply)     |
| 3 shut-off valve (field supply)   | 12 collector (field supply)                            |
| 4 wired controller (optional)     | 13 mixing station (field supply)                       |
| 5 non-return valve (field supply) | 15 by-pass valve (field supply)                        |
| 6 drain valve (field supply)      | 16 Motorised 3-way valve (field supply, field control) |
| 7 fill valve (field supply)       | FHL 1...n floor heating loop                           |
| 8 buffer tank (field supply)      | FCU 1...n fan coil units                               |
| 9 balance tank (field supply)     |  |
| 9.1 air purge valve               |  |
| 9.2 drain valve                   |  |

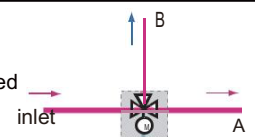


### NOTE

If the volume of balance tank (9) larger than 30L, the buffer tank(8) is unnecessary, otherwise the buffer tank(8) should be installed and the total volume of buffer tank and balance tank should larger than 30L. The drain valve (6) should be installed at the lowest position of the system. An independent backup heater can be selected and installed in the door, which can provide additional heating source and ensure better performance of the system when the ambient temperature is low.

The 3-way valve control requires field control, the unit does not provide control function.

In normal condition, port A should be opened, while signal sent to the 3-way valve (16), port A will be closed and port B will be opened. When in cool mode, ON signal will sent to the 3-way valve (16), the cold water will flow through port inlet to port B, and port B should connect to the fan coil units. While in heating mode, the hot water will flow through port inlet to port A, and port A should connect to the floor heating loops. In this way, all the water from the unit will flow through the floor heating loops and thus ensure better performance of the floor heating.



### 5.4.5 Application 5

Space heating with an auxiliary boiler (alternating operation).

Space heating application by either the unit or by an auxiliary boiler connected in the system.

■ The unit controlled contact (also called "permission signal for the auxiliary boiler") is required on-site, and it is recommended that the signal be determined by the outdoor temperature (thermistor located at the outdoor unit).

■ **Application A** can be used if the auxiliary boiler replace the unit provides heating for space heating.

■ **Application B** can be used if the temperature of water from the outdoor unit is not high enough. An additional 3-way valve should be installed, if the temperature of water from outdoor unit is high enough. The boiler will then be bypassed. When the temperature is not high enough, the 3-way valve will open and the water from outdoor unit will flow through the boiler and be heated again.



#### NOTE

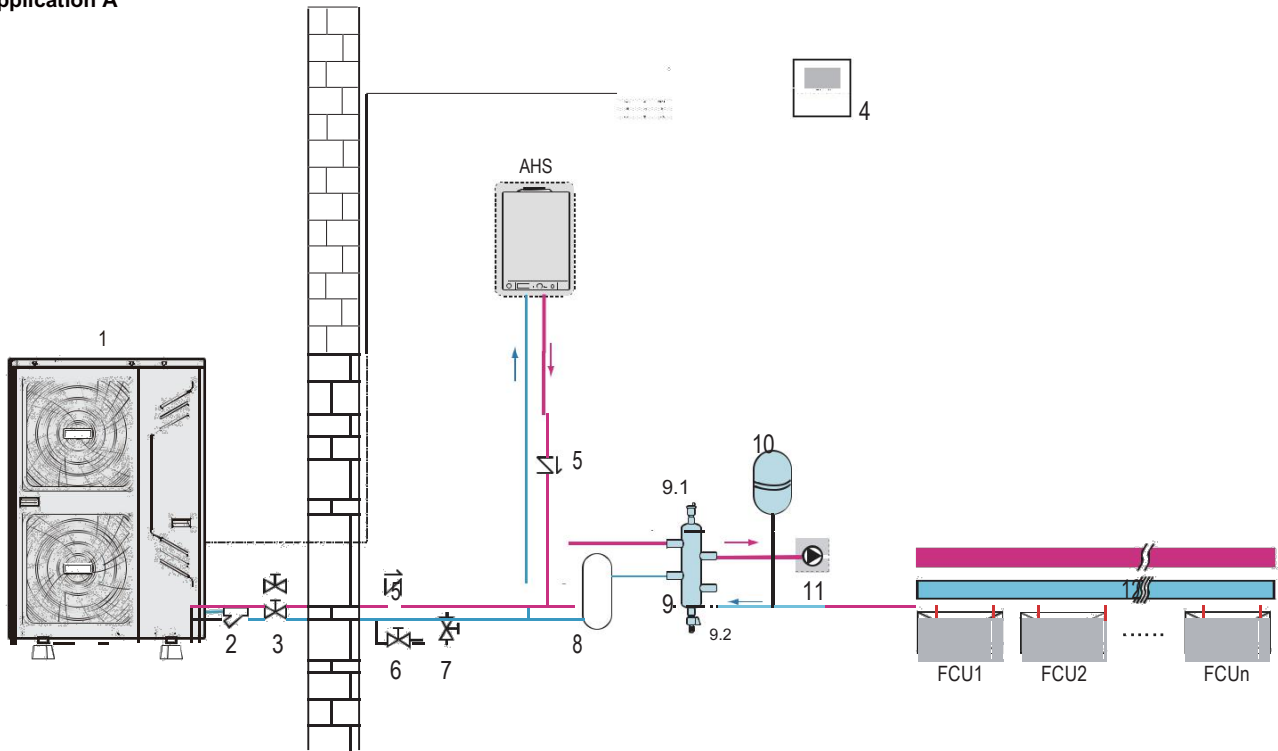
If you need to connect an auxiliary boiler (or other additional heating source) and can control auxiliary boiler, you need to customize.



#### CAUTION

Be sure that the boiler and the integration of the boiler in the system is in accordance with relevant local laws and regulations.

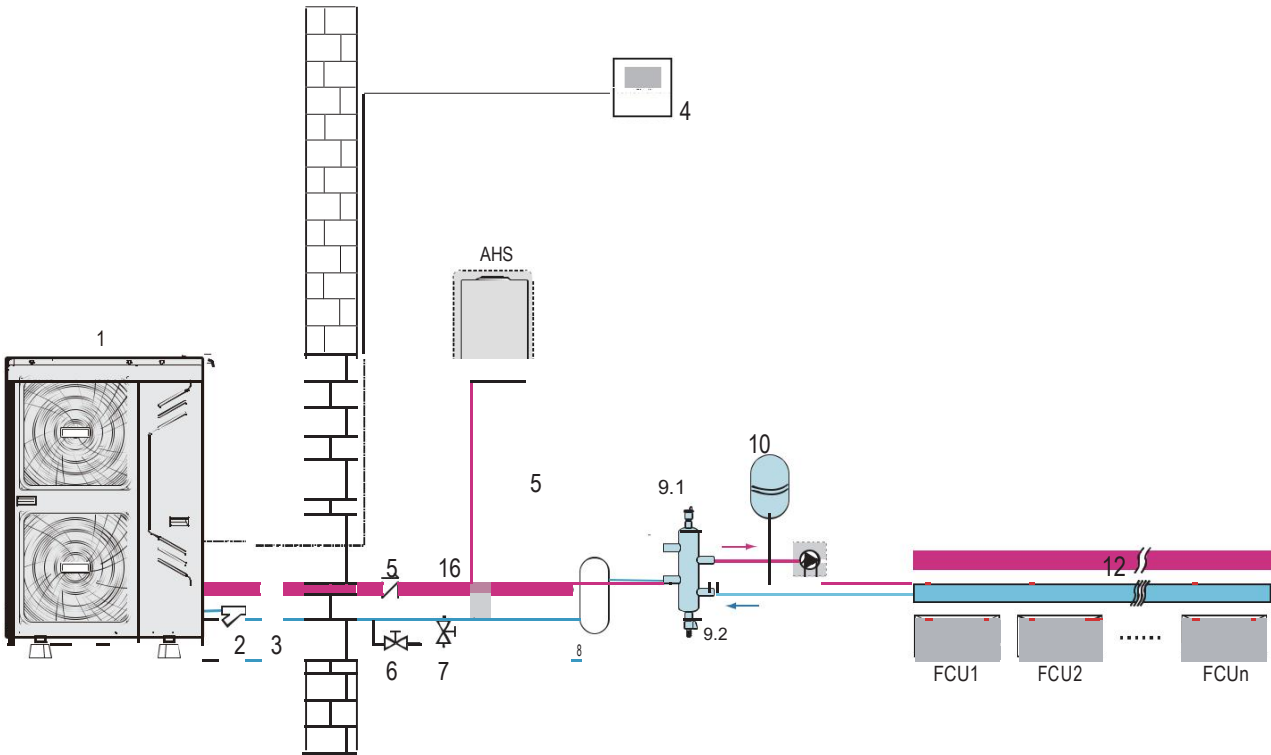
#### Application A



- |                                   |  |
|-----------------------------------|--|
| 1 outdoor unit                    | 9 balance tank (field supply)                      |
| 2 Y-shape filter                  | 9.1 air purge valve                                |
| 3 shut-off valve (field supply)   | 9.2 drain valve                                    |
| 4 wired controller (optional)     | 10 expansion vessel (field supply)                 |
| 5 non-return valve (field supply) | 11 Pump 2: outside circulation pump (field supply) |
| 6 drain valve (field supply)      | 12 collector (field supply)                        |
| 7 fill valve (field supply)       | FCU 1...n fan coil units                           |
| 8 buffer tank (field supply)      | AHS additional heating source                      |

## Application B

If application B is selected, the control cable connect to the boiler should also connect to the 3-way valve (16)



- |                                   |  |
|-----------------------------------|--|
| 1 outdoor unit                    | 9 balance tank (field supply)                          |
| 2 Y-shape filter                  | 9.1 air purge valve                                    |
| 3 shut-off valve (field supply)   | 9.2 drain valve  |
| 4 wired controller (optional)     | 10 expansion vessel (field supply)                     |
| 5 non-return valve (field supply) | 11 Pump 2: outside circulation pump (field supply)     |
| 6 drain valve (field supply)      | 12 collector (field supply)                            |
| 7 fill valve (field supply)       | 16 Motorised 3-way valve (field supply, field control) |
| 8 buffer tank (field supply)      | FCU 1...n fan coil units                               |
|                                   | AHS additional heating source                          |



## NOTE

If the volume of balance tank (9) larger than 30L, the buffer tank(8) is unnecessary, otherwise the buffer tank(8) should be installed and the total volume of buffer tank and balance tank should larger than 30L. The drain valve (6) should be installed at the lowest position of the system. An independent backup heater can be selected and installed in the door, which can provide additional heating source and ensure better performance of the system when the ambient temperature is low.

## Operation

When heating is required, either the unit or the boiler starts operating, depending on the outdoor temperature.

- As the outdoor temperature is measured via the outdoor unit air thermistor, make sure to install the outdoor unit in the shade, so that it is not influenced by the sun's heat.
- Frequent switching can cause corrosion of the boiler at an early stage. Contact the boiler manufacturer.
- During heating operation of the unit, the unit will operate to achieve the target water flow temperature set on the controller.
- During heating operation of the boiler, the boiler will operate to achieve the target water flow temperature set on the controller.

## 5.5 Water pipe installation

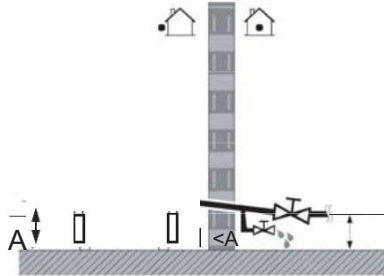


### NOTE

- If there is no glycol (anti-freeze) in the system there is a power supply or pump failure, drain the system (as shown in the figure below).



### WARNING



When water is not moving inside the system in cold weather, freezing is very likely and will damage the system.

### 5.5.1 Water quality control

#### 1 Water quality control

When industrial water is used as chilled water, little furring may occur; however, well water or river water, used as chilled water, may cause much sediment, such as furring, sand, and so on. Therefore, well water or river water must be filtered and softened in softening water equipment before flowing into chilled water system. If sand and clay settle in the evaporator, circulation of chilled water may be blocked, and thus leading to freezing accidents; if hardness of chilled water is too high, furring may occur easily, and the devices may be corroded. Therefore, the quality of chilled water should be analysed before being used, such as PH value, conductivity, concentration of chloride ion, concentration of sulphide ion, and so on.

#### 2 Applicable standard of water quality for the unit

PH value	6~8
Total hardness	<50ppm
Conductivity	<200 $\mu$ V/cm (25°C)
Sulfide ion	No
Chloride ion	<50ppm
Ammonia ion	No
Sulfate ion	<50ppm
Silicon	<30ppm
Iron content	<0.3ppm
Sodium ion	No requirement
Calcium ion	<50ppm

### 5.5.2 Checking the water circuit

The units are equipped with a water inlet and outlet for connection to a water circuit. This circuit must be provided by a licensed technician and must comply with local laws and regulations.



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

Before continuing installation of the unit, check the following:

- The maximum water pressure can not exceed 3 bar.
- The maximum water temperature is 60°C according to safety device setting.
- Always use materials that are compatible with the water used in the system and with the materials used in the unit.
- Ensure that components installed in the field piping can withstand the water pressure and temperature.
- Drain taps must be provided at all low points of the system to permit complete drainage of the circuit during maintenance.
- Air vents must be provided at all high points of the system. The vents should be located at points that are easily accessible for servicing. An automatic air purge is provided inside the unit. Check that this air purge valve is not tightened too much so that automatic release of air in the water circuit remains possible.

### 5.5.3 Checking the water volume and expansion vessel pre-pressure

The unit is equipped with expansion vessel that has a default pre-pressure of 1.5 bar.

To assure proper operation of the unit, the pre-pressure of the expansion vessel might need to be adjusted and the minimum and maximum water volume must be checked.

1. Check that the total water volume in the installation, excluding the internal water volume of the unit, is at least 20L. Refer to 14 Technical specifications to find the total internal water volume of the unit.



### NOTE

- In most applications this minimum water volume will be satisfactory.
  - In critical processes or in rooms with a high heat load though, extra water might be required.
  - When circulation in each space heating loop is controlled by remotely controlled valves, it is important that this minimum water volume is kept even if all the valves are closed.
2. Using the table below, determine if the expansion vessel pre- pressure requires adjustment.
  3. Using the table and instructions below, determine if the total water volume in the installation is below the maximum allowed water volume.

Installation height difference (a)	Water volume	
	5/7kW ≤ 58 L 10~16kW ≤ 88 L	5/7kW > 58 L 10~16kW > 88 L
≤ 7 m	No pre-pressure adjustment required.	Actions required: • pre-pressure must be decreased, calculate according to "Calculating the pre-pressure of the expansion vessel" • check if the water volume is lower than maximum allowed water volume (use graph below)
> 7 m	Actions required: • Pre-pressure must be increased, calculate according to "Calculating the pre-pressure of the expansion vessel" below. • Check if the water volume is lower than maximum allowed water volume (use graph below)	Expansion vessel of the unit too small for the installation.

(a) Installation height difference: height difference (m) between the highest point of the water circuit and the unit. If the unit is located at the highest point of the installation, the installation height should be 0 m.

#### Calculating pre-pressure of the expansion vessel

The pre-pressure (Pg) to be set depends on the maximum installation height difference (H) and is calculated as follows:

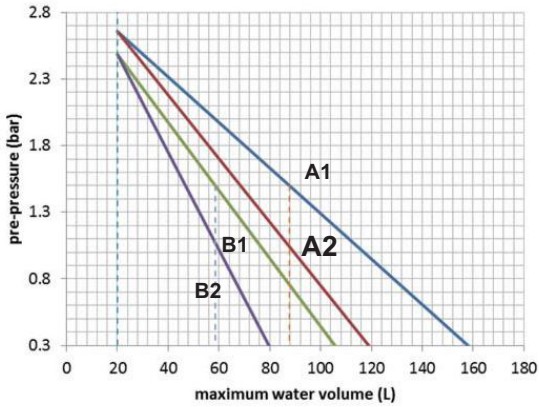
$$Pg(\text{bar}) = (H(\text{m}) / 10 + 0.3) \text{ bar}$$

#### Checking the maximum allowed water volume

To determine the maximum allowed water volume in the entire circuit, proceed as follows:

1. Determine the calculated pre-pressure (Pg) for the corresponding maximum water volume using the graph below.

2. Check that the total water volume in the entire water circuit is lower than this value.  
If this is not the case, the expansion vessel inside the unit is too small for the installation.



pre-pressure = pre-pressure of the expansion vessel  
water volume = maximum water volume in the system

- A1 System without glycol for the 10~16 kW unit
- A2 System without glycol for the 5/7 kW unit
- B1 System with 25% propylene glycol for the 10~16 kW unit
- B2 System with 25% propylene glycol for the 5/7kW unit  
(Refer to "Caution: Use of glycol" on Page 21.)

**Example 1**

The 10kW unit is installed 5 m below the highest point in the water circuit.  
The total water volume in the water circuit is 60 L.  
In this example, no action or adjustment is required.

**Example 2**

The 10kW unit is installed at the highest point in the water circuit. The total water volume in the water circuit is 100 L. Result:

- Since 100 L is more than 88 L, the pre-pressure must be decreased (see table above).
- The required pre-pressure is:  
 $P_g(\text{bar}) = (H(\text{m})/10 + 0.3) \text{ bar} = (0/10 + 0.3) \text{ bar} = 0.3 \text{ bar}$
- The corresponding maximum water volume can be read from the graph: approximately 158 L.
- Since the total water volume (100 L) is below the maximum water volume (158 L), the expansion vessel suffices for the installation.

**5.5.4 Setting the pre-pressure of the expansion vessel**

When it is required to change the default pre-pressure of the expansion vessel (1.5 bar), keep in mind the following guidelines:

- Use only dry nitrogen to set the expansion vessel pre-pressure.
- Inappropriate setting of the expansion vessel pre-pressure will lead to malfunctioning of the system. Pre-pressure should only be adjusted by a licensed installer.

**5.5.5 Connecting the water circuit**

Water connections must be made in accordance with the outlook diagram delivered with the unit, with respect to the water intake and water outlet.



Be careful not to deform the unit's piping by using excessive force when connecting the piping. Deforming the piping can cause the unit to malfunction.

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

- Use clean pipes only.
- Hold the pipe end downwards when removing burrs
- Cover the pipe end when inserting it through a wall so that no dust and dirt enter.
- Use a good thread sealant for sealing the connections. The sealing must be able to withstand the pressures and temperatures of the system.
- When using non-brass metallic piping, make sure to insulate both materials from each other to prevent galvanic corrosion.

- Because brass is a soft material, use appropriate tools for connecting the water circuit.  
Inappropriate tools will cause damage to the pipes.



**NOTE**

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

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

**5.5.6 Protecting the water circuit against freezing**

Frost can cause damage to the hydraulic system. As this unit is installed outdoors and thus the hydraulic system is exposed to freezing temperatures, care must be taken to prevent freezing of the system.

All hydraulic parts are insulated to reduce heat loss. Insulation must be present on the field piping.

The unit is already equipped with several features to prevent freezing. For example: the software contains special functions using pump and heat pump to protect the entire system against freezing. When the temperature of the water flow in the system drops to a certain value, the software will heat the water, either using the heat pump, the electric heating tap. The freeze protection function will turn off only when the temperature increases to a certain value. Refer to "7.3 Operating characteristics".

In case of a power failure, the features mentioned above cannot protect the unit from freezing.

Since a power failure could happen when the unit is unattended, the supplier recommends adding glycol to the water system. Refer to "Caution: Use of glycol".

Depending on the expected lowest outdoor temperature, make sure the water system is filled with a concentration of glycol as mentioned in the table below.

When glycol is added to the system, the performance of the unit will be affected. The correction factor of the unit capacity, flow rate and pressure drop of the system is listed in the table below:

**Ethylene Glycol**

Quality of glycol/%	Modification coefficient				Freezing point/°C
	Cooling capacity modification	Power modification	Water resistance	Water flow modification	
0	1.000	1.000	1.000	1.000	0.000
10	0.984	0.998	1.118	1.019	-4.000
20	0.973	0.995	1.268	1.051	-9.000
30	0.965	0.992	1.482	1.092	-16.000
40	0.960	0.989	1.791	1.145	-23.000
50	0.950	0.983	2.100	1.200	-37.000

**Propylene Glycol**

Quality of glycol/%	Modification coefficient				Freezing point/°C
	Cooling capacity modification	Power modification	Water resistance	Water flow modification	
0	1.000	1.000	1.000	1.000	0.000
10	0.976	0.996	1.071	1.000	-3.000
20	0.961	0.992	1.189	1.016	-7.000
30	0.948	0.988	1.380	1.034	-13.000
40	0.938	0.984	1.728	1.078	-22.000
50	0.925	0.975	2.150	1.125	-35.000

If no glycol is added, the water must be drained out when there is a power failure.



## WARNING

### ETHYLENE GLYCOL AND PROPYLENE GLYCOL ARE TOXIC

- a. The concentrations mentioned in the table above will not prevent the medium freezing, but will prevent the hydraulics from bursting.
- b. The maximum allowed water volume is then reduced according to the figure "Maximum allowed water volume" on Page 21 C.



## CAUTION

### Use of glycol

- For installations with a domestic hot water tank, the use of propylene glycol, including necessary inhibitors, is only EN1717 or equivalent based on the applicable legislation.
- in case of over-pressure when using glycol, be sure to connect the safety valve to a drain pan in order to recover the glycol.  
Connecting a drain pipe is not required if no glycol is used, the discharged water is then drained via the bottom of the unit.



## NOTE

### Corrosion in the system due to glycol

Uninhibited glycol will turn acidic under the influence of oxygen. This process is accelerated by presence of copper and at higher temperatures. The acidic uninhibited glycol attacks metal surfaces and forms galvanic corrosion cells that cause severe damage to the system.

It is of extreme importance:

- That the water treatment is correctly executed by a qualified water specialist.
- That a glycol with corrosion inhibitors is selected to counteract acids formed by the oxidation of glycols.
- That in case of an installation with a domestic hot water tank, only the use of propylene glycol is allowed. In other installations the use of ethylene glycol is fine.
- That no automotive glycol is used because their corrosion inhibitors have a limited lifetime and contain silicates that can foul or plug the system;
- That galvanized piping is not used in glycol systems since it may lead to the precipitation of certain elements in the glycol's corrosion inhibitor;
- To ensure that the glycol is compatible with the materials used in the system.



## NOTE

- Be aware of the hygroscopic property of glycol. It absorbs moisture from the environment.
- Leaving the cap off the glycol container causes the concentration of water to increase. The glycol concentration is then lower and the water could freeze.
- Preventive actions must be taken to ensure minimal exposure of the glycol to air.

### 5.5.7 Fouling factors

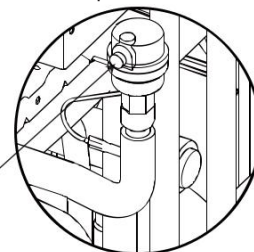
The performance data given refer to conditions with clean evaporator plates (fouling factor=1). For different fouling factors, multiply the figures in the performance tables by the coefficient given in the following table.

Fouling factors (m <sup>2</sup> °C/W)	Evaporator		
	capacity correction factor	compressor power input correction factor	total power input correction factor
4.4 x 10 <sup>-5</sup>	-	-	-
0.86 x 10 <sup>-4</sup>	0.96	0.99	0.99
1.72 x 10 <sup>-4</sup>	0.93	0.98	0.98

### 5.5.8 Filling with water

- Connect the water supply to the fill valve and open the valve.
- Make sure the automatic air purge valve is open (at least 2 turns).
- Fill with water until the manometer indicates a pressure of approximately 2.0 bar. Remove air in the circuit as much as possible using the air purge valves. Air present in the water circuit might cause malfunctioning of the backup heater.

Do not fasten plastic cover on the air purge valve at the top side of the unit when the system is running. Open air purge valve, turn anticlockwise at least 2 full turns to release air from the system.



## NOTE

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

- The water pressure indicated on the manometer will vary depending on the water temperature (higher pressure at higher water temperature).  
However, at all times water pressure should remain above 0.3 bar to avoid air entering the circuit.
- The unit might drain-off too much water through the pressure relief valve.
- Water quality must be according to "Safe Drinking water Act "

### 5.5.9 Piping insulation

The complete water circuit including all piping, must be insulated to prevent condensation during cooling operation and reduction of the heating and cooling capacity as well as prevention of freezing of the outside water piping during winter. The thickness of the sealing materials must be at least 13 mm with  $\lambda = 0.039$  W/mK in order to prevent freezing on the outside water piping.

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

## 5.6 Field wiring



## WARNING

- A main switch or other means of disconnection, having a contact separation in all poles, must be incorporated in the fixed wiring in accordance with relevant local laws and regulations.
- Switch off the power supply before making any connections.
- Use only copper wires.

- Never squeeze bundled cables and make sure they do not come in contact with the piping and sharp edges. Make sure no external pressure is applied to the terminal connections.
- All field wiring and components must be installed by a licensed electrician and must comply with relevant local laws and regulations.
- The field wiring must be carried out in accordance with the wiring diagram supplied with the unit and the instructions given below.
- Be sure to use a dedicated power supply. Never use a power supply shared by another appliance.
- Be sure to establish a ground. Do not ground the unit to a utility pipe, surge protector, or telephone ground. Incomplete grounding may cause electrical shock.
- Be sure to install a ground fault circuit interrupter (30mA). Failure to do so may cause electrical shock.
- Be sure to install the required fuses or circuit breakers.

### 5.6.1 Precautions on electrical wiring work

- Fix cables so that cables do not contact the pipes (especially on the high-pressure side).
- Secure the electrical wiring with cable ties as shown in figure so that it does not contact the piping, particularly on the high-pressure side.
- Make sure no external pressure is applied to the terminal connectors.
- When installing the ground fault circuit interrupter make sure that it is compatible with the inverter (resistant to high frequency electrical noise) to avoid unnecessary opening of the ground fault circuit interrupter.



#### NOTE

The ground fault circuit interrupter must be a high-speed type breaker of 30 mA (<0.1 s).

- This unit is equipped with an inverter. Installing a phase advancing capacitor not only will reduce the power factor improvement effect, but also may cause abnormal heating of the capacitor due to high-frequency waves. Never install a phase advancing capacitor as it could lead to an accident.

### 5.6.2 Precautions on wiring of power supply

- Use a round crimp-style terminal for connection to the power supply terminal board. In case it cannot be used due to unavoidable reasons, be sure to observe the following instructions.
  - Do not connect different gauge wires to the same power supply terminal. (Loose connections may cause overheating.)
  - When connecting wires of the same gauge, connect them according to the figure below.



- Use the correct screwdriver to tighten the terminal screws. Small screwdrivers can damage the screw head and prevent appropriate tightening.
- Over-tightening the terminal screws can damage the screws.
- Attach a ground fault circuit interrupter and fuse to the power

supply line.

In wiring, make certain that prescribed wires are used, carry out

complete connections and fix the wires so that outside force can not affect the terminals.

### 5.6.3 Electrical connection

The unitary mini chillers leave the factory already wired, and require the installation of an omni polar thermal overload switch, a lockable main disconnecting switch for the connection to the mains power supply, and the connection of the flow switch to the corresponding terminals. All the above operations must be carried out by qualified personnel in compliance with the legislation in force. For all electrical work, refer to the electrical wiring diagrams in this manual. You are also recommended to check that the characteristics of the mains electricity supply are adequate for the absorptions indicated in the electrical characteristics table below, also bearing in mind the possible use of other equipment at the same time.

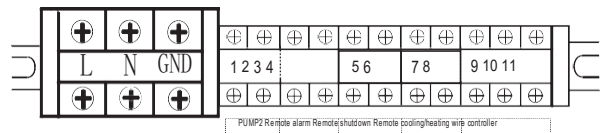


#### IMPORTANT

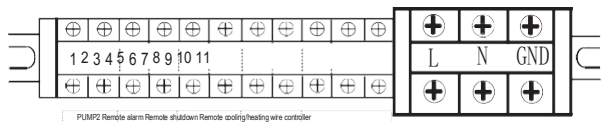
- Power to the unit must be turned on only after installation work (hydraulic and electrical) has been completed.
- All electrical connections must be carried out by qualified personnel in accordance with legislation in force in the country concerned.
- Respect instructions for connecting phase, neutral and earth conductors.
- The power line should be fitted upstream with a suitable device to protect against short-circuits and leakage to earth, isolating the installation from other equipment.
- Voltage must be within a tolerance of  $\pm 10\%$  of the rated power supply voltage for the unit (for three phase units, the unbalance between the phases must not exceed 3%). If these parameters are not respected, contact the electricity supply company.
- For electrical connections, use double insulation cable in conformity with current legislation in the country concerned.
- An omnipolar thermal overload switch and a lockable main disconnecting switch, in compliance with the CEI-EN standards (contact opening of at least 3mm), with adequate switching and residual current protection capacity based on the electrical data table shown below, must be installed as near as possible to the appliance.
- The devices on the unit must be lockable. An efficient earth connection is obligatory. Failure to earth the appliance absolves the manufacturer of all liability for damage.
- Do not use water pipes to earth the unit.

#### 1. Customer connection terminal

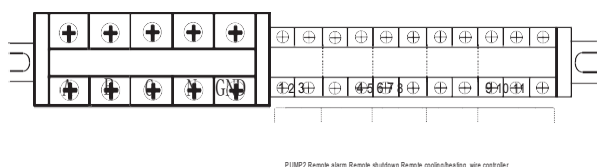
##### 5kW/7kW (1-phase)



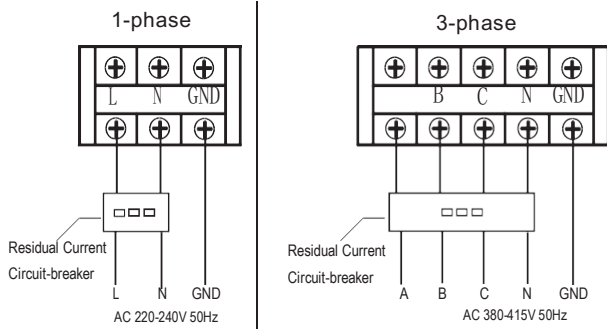
##### 10kW/12kW (1-phase)



##### 12kW/14kW/16kW (3-phase)



## 2. Electrical Power Connection

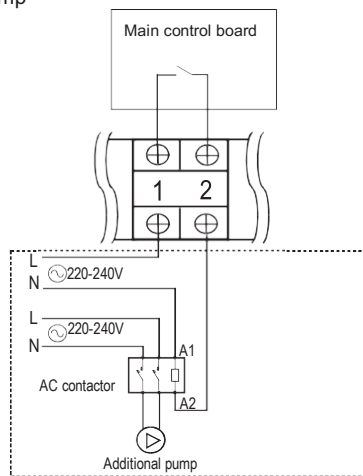


### NOTE:

The outdoor units must be installed with an Residual Current Circuit-breaker near the power supply and must be effectively earthed.

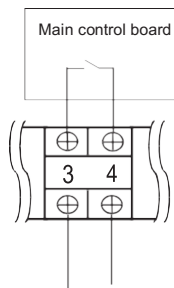
## 3. Auxiliary function connections

### ■ Additional pump



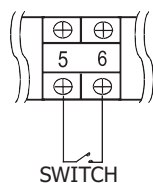
“PUMP2” terminal only provides passive switching signal. Additional water pump must be controlled by the AC contactor.

### ■ Remote alarm



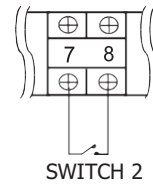
“Remote alarm” terminal only provides passive switching signal. Current passing through the terminal interface should less than 1.5A, otherwise please use AC contactor to control load indirectly.

### ■ Remote shutdown



If switch is closed, the unit will be stopped forcibly. Under this circumstance, anti-frozen protection and other protection functions are still effective. If switch breaks, unit can run normally according settings.

### ■ Remote cooling/heating



If switch2 is closed, the unit will shift to heating mode forcibly; If switch2 breaks the unit will shift to cooling mode forcibly.



### NOTE

- Remote shutdown and Remote cooling/heating is optional function.
- Choose this function by DIP switch SW4\_1 (for 1-phase) or SW3\_1 (for 3-phase) on PCB board. Factory default has no remote cooling/heating.

Without Remote central function (Factory default)

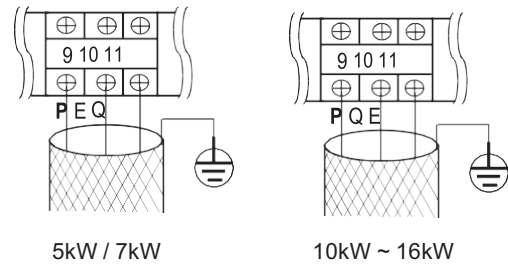


With Remote central function



- When the remote control and wire controller used at the same time, the unit will carry out the last command of arbitrary terminal.
- Remote shutdown has the highest priority. In the status of remote shutdown, other controllers can't start the unit.

### ■ Wire controller



- The wire controller is optional.
- Please use 3-core shielded wire to connect the wire controller and the shielding layer must be grounded.
- When connecting wire controller, host unit control panel is mainly used for display which can carry out parameter inquiry such as inquiry and checking and can't be used to set mode and temperature.

#### 4. The Specification of Power

TYPE		5kW	7kW	10kW/12kW	12kW/14kW/16kW
Power	Phase	1-Phase	1-Phase	1-Phase	3-Phase
	Frequency and Volt	220-240V~, 50Hz	220-240V~, 50Hz	220-240V~, 50Hz	380-415V~, 50Hz
Circuit Breaker // Fuse (A)		30/25	30/25	40/35	25/20
Power Wiring (mm <sup>2</sup> )		3x4.0	3x4.0	3x6.0	5x4.0
Ground Wiring (mm <sup>2</sup> )		4.0	4.0	6.0	4.0



### IMPORTANT

The power cord type designation is H07RN-F.

Connecting cable between indoor unit and outdoor unit shall be approved poly-chloroprene sheathed flexible cord, type designation H07RN-F or heavier cord.

The means for disconnection from a power supply shall be incorporated in the fixed wiring and have an air gap.

## 6. START-UP AND CONFIGURATION

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



### CAUTION

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

### 6.1 Pre-operation checks

#### Checks before initial start-up



### DANGER

Switch off the power supply before making any connections.

After the installation of the unit, check the following before switching on the circuit breaker:

- Field wiring
  - Make sure that the field wiring between the local supply panel and unit and valves (when applicable), unit and room thermostat (when applicable) have been connected according to the instructions described in the chapter **5.6 Field wiring**, according to the wiring diagrams and to local laws and regulations.
- Fuses, circuit breakers, or protection devices
  - Check that the fuses or the locally installed protection devices are of the size and type specified in the chapter **Page 25: The Specification of Power**. Make sure that no fuses or protection devices have been bypassed.
- Booster heater circuit breaker
  - Do not forget to turn on the booster heater circuit breaker (applies only to units with optional domestic hot water tank installed).
- Ground wiring
  - Make sure that the ground wires have been connected properly and that the ground terminals are tightened.
- Internal wiring
  - Visually check the switch box for loose connections or damaged electrical components.

- Mounting
  - Check that the unit is properly mounted, to avoid abnormal noises and vibrations when starting up the unit.
- Damaged equipment
  - Check the inside of the unit for damaged components or squeezed pipes.
- Refrigerant leak
  - Check the inside of the unit for refrigerant leakage. If there is a refrigerant leak, call your local dealer.
- Power supply voltage
  - Check the power supply voltage on the local supply panel. The voltage must correspond to the voltage on the identification label of the unit.
- Air purge valve
  - Make sure the air purge valve is open (at least 2 turns).
- Water leak
  - check the inside of the unit on water leakage, in case there is a water leakage close the water inlet water outlet shut-off valves and call your local dealer.
- Shut-off valves
  - Make sure that the shut-off valves are fully open



### DANGER

Operating the system with closed valves will damage the circulation pump!

### 6.2 Setting the pump speed

The pump speed can be selected by adjusting the red knob on the pump. The notch point indicates pump speed.

The default setting is the highest speed (III). If the water flow in the system is too high, the speed can be set to low (I).

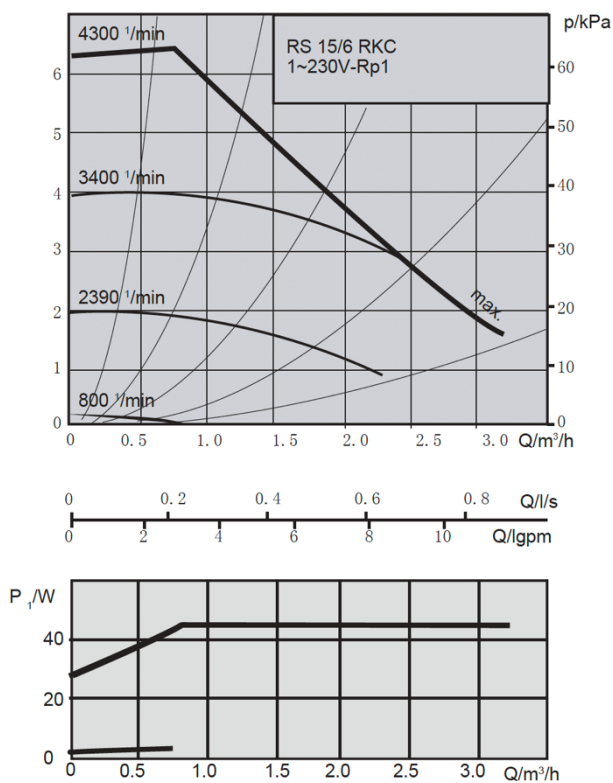


The pump hydraulic operational area and the available external static pressure function for water flow are shown in the graph below.

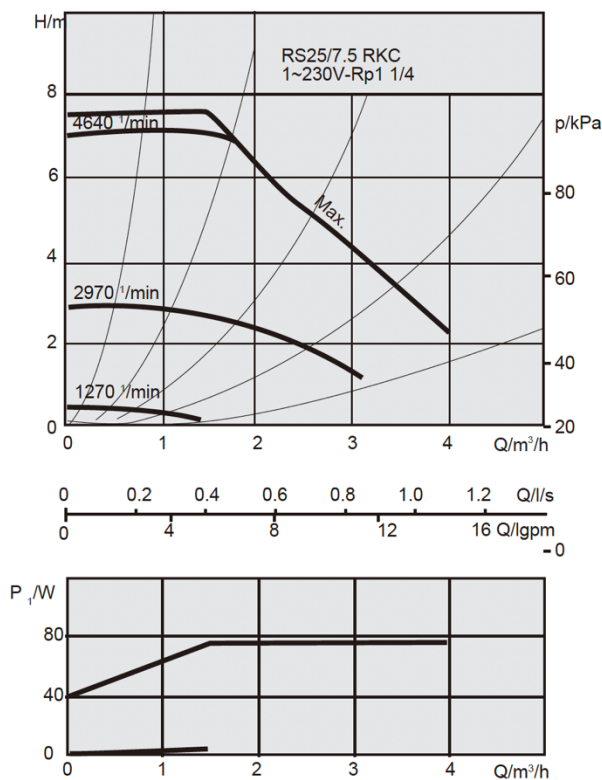
## 6.2.1 Hydraulic operational area constant speed I, II, III

Constant speed I II III

Constant speed I II III



5/7 kW



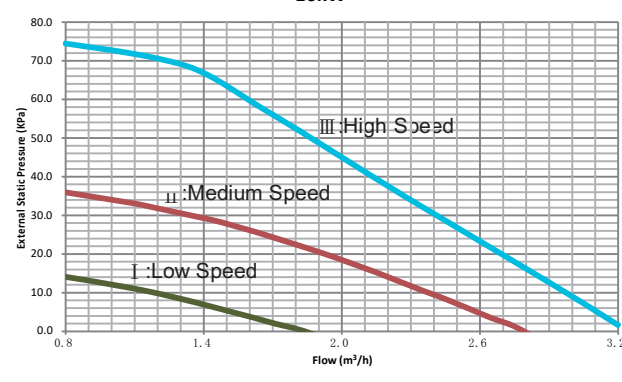
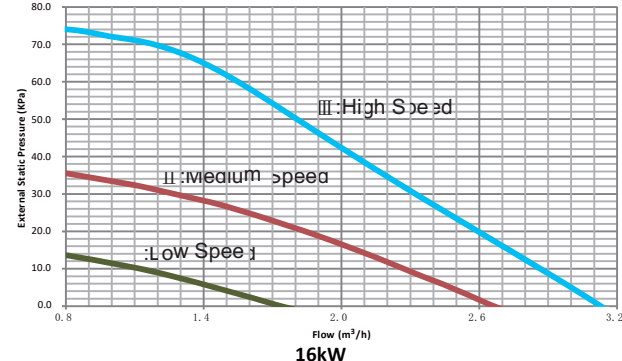
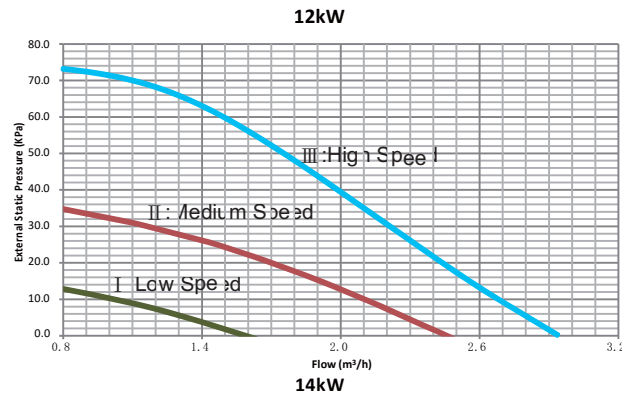
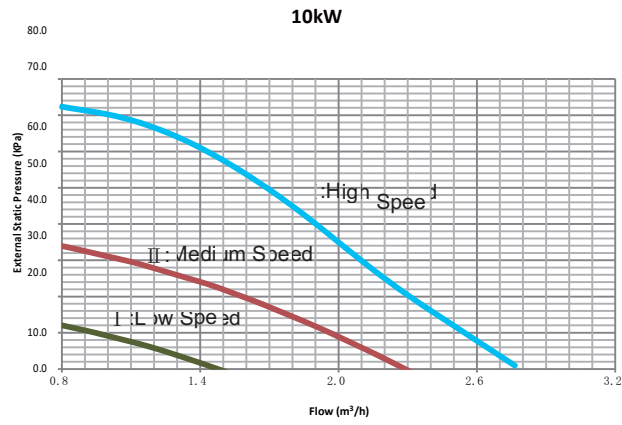
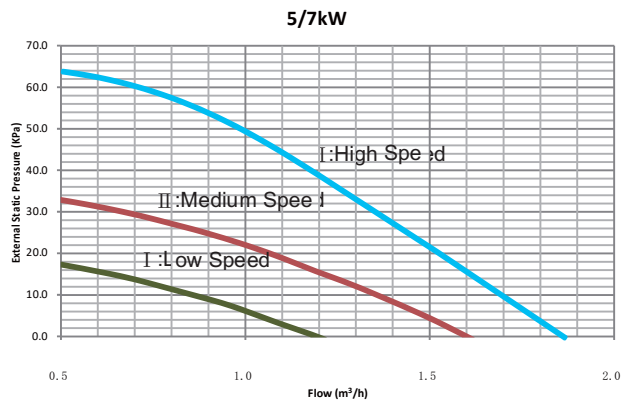
10~16kW

## 6.2.2 Pump LED diagnosis and solutions

The pump has an LED operating status display. This makes it easy for the technician to search for the cause of a fault in the heating system.

Led color	Meaning	Diagnostic	Cause	Remedy
<b>Continuous green</b>	Normal running	Pump runs as expected	<u>Normal operation</u>	
<b>Quick green blinks</b>	Venting routine running	Pump runs during 10min in venting function Afterwards the installer has to adjust the targeted performance		
<b>Red /green blinking</b>	Abnormal situation (pump functional but stopped)	Pump will restart by itself after the abnormal situation disappeared	1. <u>Under voltage or Overvoltage</u> : U < 160V or U > 280V 2. <u>Module overheating</u> : T° inside motor too high	1. Check voltage supply 160V < U < 280V 2. Check water & ambient T°
<b>Red blinking</b>	Stopped (e.g. pump blocked)	Reset the pump Check LED signal	Pump cannot restart itself due to a permanent failure	Change pump
<b>No LED</b>	No power supply	No voltage on electronics	1) Pump is not connected to power supply 2) LED is damaged 3) Electronics are damaged	1) Check cable connection 2) Check if pump is running 3) Change pump

### 6.2.3 Static Pressure Drop Unit



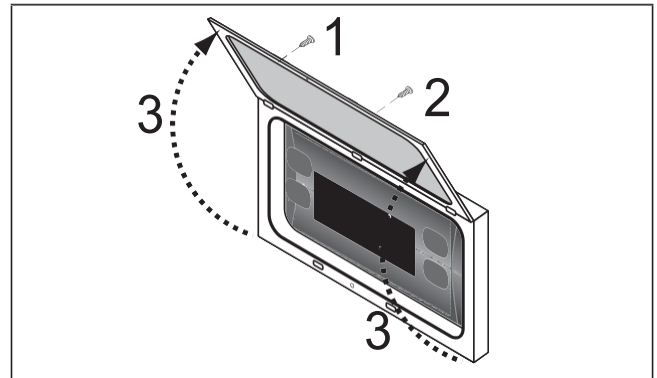
### 6.2.4 Failure diagnosis when first installation

- If nothing is displayed on the user interface, it is necessary to check for any of the following abnormalities before diagnosing possible error codes.
    - Disconnection or wiring error (between power supply and unit and between unit and user interface).
    - The fuse on the PCB may have blown.
  - If the user interface shows "E8" as an error code, there is a possibility that there is air in the system, or the water level in the system is less than the required minimum.
  - If the error code "E2" is displayed on the user interface, check the wiring between the user interface and unit.
- More error code and failure causes can be found in **8.2 Error codes**.

## 7. THE HOST UNIT CONTROLLER ELUCIDATION

### 7.1 To access the control panel, open the door

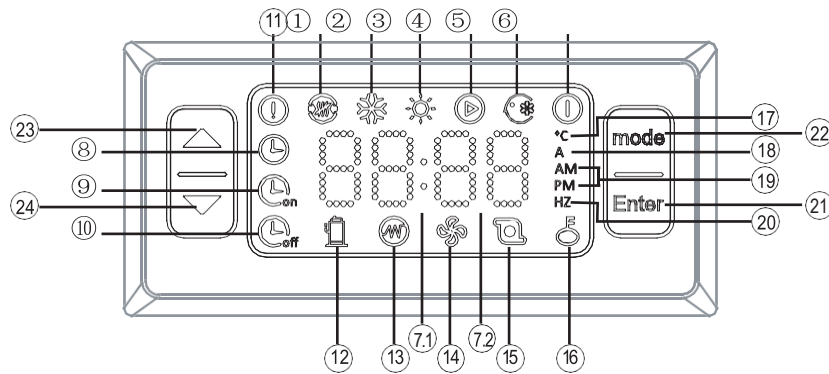
- remove the screw 1 and screw 2;
- lift the door 3.



## 7.2 Activating and deactivating the unit

### 7.2.1 Icon Description

The front panel of the device functions as the user interface and is used to perform all operations relating to the device.



NO.	Icon	Description
①		Outside heat source running icon(Reserved)
②		Cooling mode icon This icon will be constantly light when customers choose cooling mode.
③		Heating mode icon This icon will be constantly light when customers choose heating mode.
④		Water pump mode icon This icon will be constantly light when customers choose water pump mode.
⑤		Force cooling icon This icon will be constantly light when customers choose force cooling mode.
⑥		Power off icon This icon will be constantly light when customers choose Power off mode.
⑦①		Clock icon, the middle ":" flicker once every 1s. It will display time when customers set the timer.
⑦②		The last 2 digits of the nixie tube "88" icon. If "88" is constantly light, it will display the current inlet water temperature. Its unit is °C . When customers do water temperature set, icon will display the set water temperature. When checking, "88" will display the result of checking. When water heating is broken down or in protection, "88" display the error code and protection code.
⑧		Clock icon It will display when finish setting the clock and be extinguished when the clock setting work is done.
⑨		Timing on function icon will flicker when setting timing on. The icon will be constantly light when finish setting.
⑩		Timing off function icon will flicker when setting timing off. The icon will be constantly light when finish setting.
⑪		Breakdown light icon When the unit is broken down or under protection, this icon will flicker and will be extinguished when malfunction and protection are eliminated.
⑫		Compressor booting indicator icon When booting the compressor, this icon will be constantly light. It will be extinguished when the compressor is shut down
⑬		E-heater booting indicator icon (Reserved) When booting the external E-heater, this icon will be constantly light. It will be extinguished when the external E-heater is shut down.
⑭		Fan booting indicator icon When booting the fan, this icon will be constantly light. It will be extinguished when the fan is shut down.
⑮		Water pump booting indicator icon When booting the water pump, this icon will be constantly light. It will be extinguished when the water pump is shut down.
⑯		Key freezing icon When freezing the keys, this icon will be constantly light. It will be extinguished when unfreezing keys.
⑰		Temperature unit icon When the control panel displays temperature, this icon will be constantly light.
⑱		Current unit icon When the control panel displays current, this icon will be constantly light.
⑲		Time format icon The unit is 12-hour format. "AM" will be constantly light when it is forenoon. "PM" will be constantly light when it is afternoon

NO.	Icon	Description
20		Frequency unit icon It will be constantly light when the control panel displays frequency of the compressor.
21		ON/OFF and OK button 1.Press “” to confirm the former operation when finishing the setting work. 2.Long press “” for 3S will recovers to factory default mode.
22		Mode choice function/Function choice/Back function button 1.Mode choice function. Choose operation mode. 2. Function choice. Long press it for 3s to enter function setting in the main interface.(Clock setting, Timing on and timing off setting) 3. Back to the previous menu. Long press it for 3s to back to previous menu in the function setting interface. Top menu is the main interface.
23		Up 1.(Value increase) 2.Forward to the previous interface.
24		Down 1.(Value decrease) 2.Backward to the next interface.

## 7.2.2 Control panel operation description

### 1. ON/OFF

The first time to powered on the unit,

Operation panel displays “OFF”. Long press “” for 3s, to unlock “OFF” status and enter into standby status.

Power on: In the standby status, press “” to enter mode choice function. Press “” circularly to choose one kind of “power on” mode, the mode icon will flicker at the moment.

Press “” to confirm the power on mode. The unit will run as the chosen mode when the mode icon will be constantly light.

Power off: Press “” in the main interface to enter mode choice function and the icon which indicate the current mode will flicker. Press “” circularly to choose power off mode, “” will flicker at this moment. Press “” button to

confirm the power off mode. By this time, “” will be constantly light and the unit stops.

### 2. Mode choice and temperature settings

Press “” in the main interface to enter mode choice function. The “Mode” icon will flicker. Click “” circularly to choose a mode. The circulating order is “Cooling mode”→ “Heating mode”→“Water pump mode” →“Power off mode”→

“Cooling mode”. The chosen mode will flicker.

Press “” or “” to increase/decrease the temperature in the chosen mode.

Press “” to confirm power off mode and the set temperature. Mode icon will be constantly light and the unit will run as the chosen mode.

Press “” or “” in the main interface to increase/decrease the temperature in the chosen mode.

### 3. Clock setting

Long press “” for 3s to enter function interface. “” clock icon will flicker. Press “” to enter clock setting function. “” icon will be constantly light and the first 2 digits on nixie tube will flicker. Press “” or “” to set minute. Press “” when finish setting and “” will be extinguished.

### 4. Timing setting 1)

Timing on setting

① Long press “” for 3s to enter function interface. “” clock icon will flicker. Press “” again to enter timing on function. “” will flicker and press “” to enter timing on setting.

② At this moment, last 2 digits of the nixie tube display “01” which means the first group setting begins. Press “” to the next step.

③ By this time, mode icon will flicker and press “” to

and go to the next step.

④ By this time, the last 2 digits of the nixie tube will flicker and press “” or “” to adjust temperature and set the temperature of the inlet water. Press “” to confirm and move to the next step.

⑤ By this time, the first 2 digits of the nixie tube will flicker and press “” or “” to adjust time of timing on. Press “” to confirm and switch to minute setting automatically. The last 2 digits of the nixie tube will flicker and press “” or “” to adjust minute setting of timing on.(minimal unit of minute adjustment: 15 minutes) .

⑥ Press “” to confirm. The first group setting is finished and “” will be constantly light. When processing the second timing setting, repeat the 1-2 operation above. When the nixie











tube displays “01” and flicker, press “” or “” to choose the timing on group. When the nixie tube displays “02” which means setting timing on function of the second group.

Refers the timing on setting operation of group 1 to set that of group 2.








choose timing on mode. Press “” to confirm your choice

- Long press “mode” for 3s to return to the previous interface to reset the parameter during setting clock timing.

## 2) Timing off setting



- ① Long press “mode” for 3s in the main interface to enter function interface. Press “mode” circularly to enter timing off function. “Enter” will flicker and press “” to enter timing off setting.
- ② At this moment, the last 2 digits of the nixie tube display “01” which means the first group setting begins. Press “Enter” “mode” to the next step.
- ③ By this time, the first 2 digits of the nixie tube will flicker and press “” or “” to adjust time of timing off. Press “” to confirm and switch to minute setting automatically. The last 2 digits of the nixie tube will flicker and press “” or “” to adjust minute setting of timing off. Press “” to confirm. The first group setting is finished and “” will be constantly light.
- ④ When processing timing setting of group 2, repeat the 1-2 operation above. When the nixie tube displays “01” and flicker, press “” or “” to choose the timing off group. When the nixie tube displays “02” which means setting timing off function of the second group. Refers the timing off setting operation of group 1 to set that of group 2.



## 3) Cancel all timing on/off settings

- Long press “mode” for 3s to enter function interface. “mode” clock icon will flicker and press “” “mode” to choose the timing function. “” and “” flicker simultaneously means “” choosing to cancel all timing functions. Press “” to cancel timing settings. “Enter” and “” both will be extinguished.
- 

### 7.2.3 Functions of combination key




#### 1. Force cooling



Press “” and “” simultaneously for 3s in the main interface to enter into force cooling mode. The force cooling mode icon will be constantly light.

Press “” button and “” button simultaneously for 3s to quit force cooling mode. The unit will enter power off mode automatically when quitting force cooling mode.

#### 2. Parameter query function

##### ① To enter parameter query function.



Press “” and “” simultaneously for 3s to enter the interface of parameter query function. At this moment, first 2 digits of the nixie tube  will display sequence number and the last 2 digits is specific parameters.

Press “” or “” to query the relative parameters.



See query orders in Table 11-1.

##### ② Quit parameter query function

If there's no operation in 20s when enter the parameter query, it will quit automatically and return to the main interface.

Press “” and “” simultaneously to quit parameter query manually.

#### 3. Auto-lock(unlock) function

If don't operate the controller in 60s, the keyboard will lock automatically. Press “” and “” simultaneously for 3s to unlock.


#### 4. Factory Reset:

In main interface, long press “ENTER” for 3s, the unit will close and recovers to factory default mode.

Display panel will display “OFF”.

### 7.2.4 Shutting down for long periods

If it is previewed not to use the machine for long periods After deactivating the chiller:

-Make sure the model is in the Power off model “”, or alternatively disconnect the unit from the power supply.

-Make sure the remote control switch is closed (if present) .

-Close the water valves.

Table.11-1 Query orders

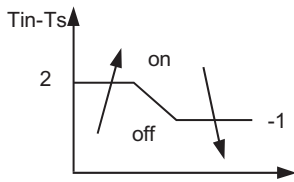
No.	Content	Remark
1	Frequency	Display operating frequency when the unit is in cooling mode and heating mode.
2	Mode	0-Power off, 1-water pump, 2-cooling, 3-heating, 4-force cooling, 5-force heating
3	Wind speed level	0-Power off (1-7)
4	Total capacity requirements	Capacity before revised (Force cooling displays 5)
5	Capacity requirements after revised	Capacity after revised (Force cooling displays 5)
6	Temp. set	Cooling/heating temp. set
7	T3	Condenser temperature sensor
8	T4	Outdoor ambient temperature sensor
9	Tp	Comp. Discharge temperature sensor
10	Tin	Inlet water temperature sensor of plate heat exchanger
11	Tout	Outlet water temperature sensor of plate heat exchanger
12	Tb1	Plate heat exchanger anti-freezing temperature sensor 1
13	Tb2	Plate heat exchanger anti-freezing temperature sensor 2
14	T6	Radiator surface temperature(reserved)
15	Unit operation current	Unit operation current
16	Power supply voltage AD value	Power supply voltage AD value
17	Opening of EXV	Step number *8
18	Model	(Operation panel has no such function)
19	Version number	(Operation panel has no such function)
20	Err1	
21	Err2	(PCB has no such function)
22	Err3	(PCB has no such function)

## 7.3 Operating characteristics

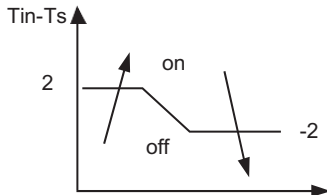
### 1. Set temperature in cooling

Range: 10~20°C (default : 12°C)

If the set temperature is between 10~13°C, the compressor start and shut down according to the difference between the inlet temperature and the set temperature as follows:



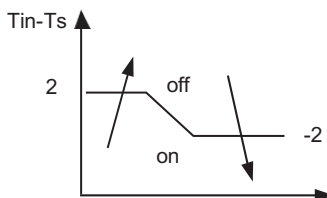
If the set temperature is between 14~20°C, the compressor start and shut down according to the difference between the inlet temperature and the set temperature as follows:



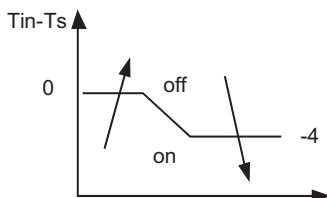
### 2. Set temperature in heating

Range: 35~50°C (default : 40°C)

If the set temperature is between 35~44°C, the compressor start and shut down according to the difference between the inlet temperature and the set temperature as follows:



If the set temperature is between 45~50°C, the compressor start and shut down according to the difference between the inlet temperature and the set temperature as follows:



### NOTE

The set temperature refers to the set return water temperature or inlet temperature;

In the event of a temporary power failure, when power returns, the mode set previously will be retained in the memory.

### 3. Compressor start up delay

To prevent the compressor frequent start and stop, the compressor must ensure that each start since the last stop since the minimum time of 300 seconds.

### 4. The pump control and the flow switch control

The electronic board includes two pumps control output. The pump 1 running 3 seconds, the pump 2 starts running. The pump 1 starts when the assembly is powered up and at least 285 seconds before the compressor starts up and stops 120 seconds after the assembly shuts down.

After the first 120 seconds of pump1 operation when the water flow meets the operating requirements, the water flow alarm functions are activated (differential pressure switch or flow switch). If the differential pressure switch (or flow switch) detects a continuous closure for 15 seconds, the unit can run normally, otherwise, it will shut down and display C8 fault.

In the unit operation process, if the continuous 10 seconds to detect the differential pressure switch (or flow switch) is opened, the unit will stop running and display C8 fault.

### 5. Fan speed control

For correct operation of the unit with different ambient temperatures, the microprocessor controls the fan speed based on the ambient temperature and the condensing or evaporation temperature as well as compressor frequency, thus enabling heat exchange to be increased and/or decreased, maintaining the condensing or evaporation temperature practically constant.

### 6. Frost prevention protection

To prevent the water freezing and damaging the plate heat exchanger, the microprocessor will perform antifreeze protection program if the heat exchanger temperature or the water temperature below a certain temperature.

a. In the cooling mode or water pump mode: if the heat exchanger temperature or the outlet temperature sensor is less than 3°C, the compressor will shut down and the controller display Pb code, the water pump will continue to run until the heat exchanger temperature or the outlet temperature sensor is above 8°C and the unit will resume normal operation.

b. In the heating mode or standby mode: if the heat exchanger temperature or the inlet temperature sensor is less than 8°C, the controller display Pb code, the water pump will continue to run until the heat exchanger temperature or the inlet temperature sensor is above 15°C. If the heat exchanger temperature or the inlet temperature sensor continues to fall below 5°C, the unit will be forced heating operation, the compressor and the water pump will be running until the heat exchanger temperature or the inlet temperature sensor is above 15°C.

c. If the ambient temperature is less than 8°C and the heat exchanger temperature or the inlet temperature sensor is less than 2°C, the electric exchanger temperature heating will turn on until the heat exchanger temperature or the inlet temperature sensor is above 7°C.

If the unit is likely to operate below 0°C, it is advisable to add antifreeze to the water system to prevent the unit from freezing the system in the event of a power cut off or failure.

### 7. Fin heat exchanger high temperature protection

When the fin heat exchanger temperature over than 62°C, system will shut down, but not returns to normal operation until the temperature decreased less than 52°C.

### 8. Comp. discharge temperature protection

If the compressor discharge temperature is more than 115°C, the compressor will be stop running until the temperature is lower than 83°C. The compressor starts with a 5-minute delay protection.



### CAUTION

If there is a possibility that the outside temperature may drop below zero, there is the risk of freezing.

The water circuit MUST BE EMPTIED AND SHUT OFF POWER (when draining after heat pump operation take care as the water may be hot) or antifreeze must be added in the proportion recommended by the manufacturer.

## 8. TROUBLE SHOOTING

This section provides useful information for diagnosing and correcting certain troubles which may occur in the unit.

This troubleshooting and related corrective actions may only be carried out by your local technician.

## 8.1 General guidelines

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



### WARNING

When carrying out an inspection on the switch box of the unit, always make sure that the main switch of the unit is switched off.

When a safety device was activated, stop the unit and find out why the safety device was activated before resetting it. Under no circumstances can safety devices be bridged or changed to a value other than the factory setting. If the cause of the problem cannot be found, call your local dealer.

If the pressure relief valve is not working correctly and is to be replaced, always reconnect the flexible hose attached to the ~~pressure relief valve to avoid water dripping out of the unit!~~



### NOTE

For problems related to the optional solar kit for domestic water heating, refer to the troubleshooting in the Installation & Owner's manual for that kit.

## 8.2 Error code and protection code shooting table:

E9	EEPROM malfunction
CP	Anti-idling protection of water pump
CL	Low temperature protection in heating mode
HD	Communication malfunction between the main controlling chip and IPDU
E4	T3 & T4 temperature sensor malfunction
E5	Voltage protection
E6	DC fan motor malfunction
	Evaporator high temperature protection in heating mode
	Two times of E6 protection in 10 minutes (Recover when powering off)
CD	Tin temperature sensor malfunction
CI	Tout temperature sensor malfunction
F7	Tb1 temperature sensor malfunction
F8	Tb2 temperature sensor malfunction
PL	Radiator high temperature protection
P1	High pressure protection
P2	Low pressure protection
P3	Outdoor units current protection
P4	Compressor discharge temperature protection
P5	Condenser high temperature protection
P6	IPM mode protection
P8	Typhoon protection
	System anti-freezing protection
CB	Flow switch malfunction
CH	High temperature protection in heating mode
	Defrosting
	Oil return of compressor
dB	Remote control
PH	High temperature difference between water side heat exchanger water inlet and water outlet temperatures protection

## 9. IMPORTANT INFORMATION FOR THE USED REFRIGERANT

This product has the fluorinated gas, it is forbidden to release to air. Refrigerant type: R410A; Volume of GWP: 2088; GWP=Global Warming Potential

Model	Factory charge	
	Refrigerant/kg	tones CO <sub>2</sub> equivalent
5kW	2.50	5.22
7kW	2.50	5.22
10kW	2.80	5.85
12kW	2.80	5.85
14kW	2.90	6.06
16kW	3.20	6.68

### Attention:

Frequency of Refrigerant Leak Checks

- 1) For equipment that contains fluorinated greenhouse gases in quantities of 5 tones of CO<sub>2</sub> equivalent or more, but of less than 50 tones of CO<sub>2</sub> equipment, at least every 12 months, or where a leakage detection system is installed, at least every 24 months.
- 2) For equipment that contains fluorinated greenhouse gases in quantities of 50 tones of CO<sub>2</sub> equivalent or more, but of less than 500 tones of CO<sub>2</sub> equipment, at least every six months, or where a leakage detection system is installed, at least every 12 months.
- 3) For equipment that contains fluorinated greenhouse gases in quantities of 500 tones of CO<sub>2</sub> equivalent or more, at least every three months, or where a leakage detection system is installed, at least every six months.
- 4) This air-conditioning unit is a hermetically sealed equipment that contains fluorinated greenhouse gases.
- 5) Only certificated person is allowed to do installation, operation and maintenance.

## 10. MAIN PARAMETERS

Model		5	7	10	12	12	14	16	
Power supply		V-Ph-Hz	220-240, 1,50	220-240, 1,50	220-240, 1,50	220-240, 1,50	380-415, 3,50	380-415, 3,50	380-415, 3,50
Cooling	Capacity	kW	5.0(1.9~5.8)	7.0(2.1~7.8)	10.0(2.9~10.5)	11.2(3.1~12.0)	11.2(3.1~12.0)	12.5(3.3~14.0)	14.5(3.5~15.5)
	rated Input	W	1550	2250	2950	3500	3380	3900	4700
	rated current	A	6.8	9.9	13.0	15.4	5.5	6.4	7.7
	EER	W/W	3.23	3.11	3.39	3.20	3.31	3.20	3.10
Heating	Capacity	kW	6.2(2.1~7.0)	8.0(2.3~9.0)	11.0(3.2~12.0)	12.3(3.3~13.2)	12.3(3.3~13.2)	13.8(3.5~15.4)	16.0(3.7~17.0)
	rated Input	W	1900	2500	3140	3780	3720	4250	4850
	rated current	A	8.3	11.0	13.8	16.6	6.1	7.0	8.0
	COP	W/W	3.26	3.20	3.50	3.25	3.31	3.25	3.30
Max. input consumption		W	2800	3000	4800	5200	5200	5600	5900
Max. input current		A	14.6	15.6	25.0	26.0	8.9	9.6	10.1
Refrigerant type /Quantity	Type		R410A	R410A	R410A	R410A	R410A	R410A	R410A
	Charged volume	g	2500	2500	2800	2800	2800	2900	3200
Dimension (W×H×D)		mm	1008×963×396			970×1327×400			
Packing (W×H×D)		mm	1120×1100×435			1082×1456×435			
Net/ Gross weight		kg	81/91		110/121		111/122		
Ambient temp.		°C	Cooling: -5°C~46°C; Heating: -15-27°C						
Water inlet setting temp. range (default)		°C	Cooling: 10~20°C(12°C); Heating mode: 35~50°C(40°C)						

# Product fiche 1

Heat pump space heater		Outdoor	KEM-05 DVN1	KEM-07 DVN1	KEM-10 DVN	KEM-12 DVN
		Indoor	-	-	-	-
Indoor unit sound power (*)		[dB(A)]	-	-	-	-
Outdoor unit sound power (*)		[dB(A)]	63.0	66.0	68.0	68.0
Space heating	Energy efficiency class 35°C (Low temp. app.)	-	A+	A+	A+	A+
Average climate (Design temperature = -10°C)						
Space heating 35°C	Prated (declared heating capacity) @ -10°C	[kW]	6.2	8.0	11.0	12.3
	Seasonal space heating efficiency (ηs)	[%]	139	135	131	135
	Annual energy consumption ion	[kWh]	3,600	4,750	6,900	7,400
Warmer climate (Design temperature = 2°C)						
Space heating 35°C	Prated (declared heating capacity) @ 2°C	[kW]	5.1	6.8	9.0	9.3
	Seasonal space heating efficiency (ηs)	[%]	169	165	161	164
	Annual energy consumption	[kWh]	1,125	1,484	2,155	2,312
Ecodesign technical data						
Product description	Air-to-water heat pump	Y/N	Yes	Yes	Yes	Yes
	Water-to-water heat pump	Y/N	No	No	No	No
	Brine-to-water heat pump	Y/N	No	No	No	No
	Low-temperature heat pump	Y/N	Yes	Yes	Yes	Yes
	Equipped with a supplementary heater	Y/N	Yes	Yes	Yes	Yes
	Heat pump combination heater	Y/N	No	No	No	No
Air to water unit	Rated airflow (outdoor)	[m3/h]	3200	3750	4800	4800
Brine/water to water unit	Rated water/brine flow (outdoor H/E)					
Other	Capacity control	-				
	Poff (Power consumption Off mode)	[kW]	0.011	0.011	0.018	0.018
	Pto (Power consumption Thermostat off mode)	[kW]	0.005	0.005	0.023	0.023
	Psb (Power consumption Standby mode)	[kW]	0.011	0.011	0.019	0.019
	PCK (Power crankcase heater model)	[kW]	0.032	0.032	0.060	0.060
	Qelec (Daily electricity consumption)	[kWh]				
	Qfuel (Daily fuel consumption)	[kWh]				
Part load conditions space heating average climate						
(A) condition (-7°C)	Pdh (declared heating capacity)	[kW]	5.51	5.70	10.20	10.50
	COPd (declared COP)	-	2.50	2.30	2.30	2.25
	Cdh (degradation coefficient)	-	0.90	0.90	0.90	0.90
(B) condition (2°C)	Pdh (declared heating capacity)	[kW]	3.59	4.40	6.10	3.80
	COPd (declared COP)	-	3.88	3.48	3.20	3.35
	Cdh (degradation coefficient)	-	0.90	0.90	0.90	0.90
(C) condition (7°C)	Pdh (declared heating capacity)	[kW]	2.20	2.90	3.80	4.40
	COPd (declared COP)	-	4.56	5.60	4.75	5.00
	Cdh (degradation coefficient)	-	0.90	0.90	0.90	0.90
(D) condition (12°C)	Pdh (declared heating capacity)	[kW]	1.06	1.29	2.10	2.10
	COPd (declared COP)	-	4.15	4.30	4.70	5.15
	Cdh (degradation coefficient)	-	0.90	0.90	0.90	0.90
(E) Tol (temperature operating limit)	Tol (temperature operating limit)	[°C]	-10.00	-10.00	-10.00	-10.00
	Pdh (declared heating capacity)	[kW]	5.10	5.45	9.50	10.00
	COPd (declared COP)	-	2.45	2.30	2.25	2.15
	WTOL (Heating water Operation Limit)	[°C]	52.00	52.00	52.00	52.00
(F) Tbivalent temperature	Tblv	[°C]	-7.00	-4.00	-7.00	-6.00
	Pdh (declared heating capacity)	[kW]	5.51	6.26	10.20	10.90
	COPd (declared COP)	-	2.50	2.54	2.30	2.35
Capacity of the back-up heater integrated in the unit	Psup back-up heater (@Tdesignh: -10°C)	[kW]	3.00	3.00	4.50	4.50
Supplementary capacity at P_design	Psup (@Tdesignh: -10°C)	[kW]	1.10	2.55	1.50	2.30

## Product fiche 2

Heat pump space heater		Outdoor	KEM-12 DTN	KEM-14 DTN	KEM-16 DTN
		Indoor	-	-	-
Indoor unit sound power (*)		[dB(A)]	-	-	-
Outdoor unit sound power (*)		[dB(A)]	68.0	70.0	72.0
Space heating	Energy efficiency class 35°C (Low temp. app.)	-	A+	A+	A+
Average climate (Design temperature = -10°C)					
Space heating 35°C	Prated (declared heating capacity) @ -10°C	[kW]	12.3	13.8	16.0
	Seasonal space heating efficiency (ηs)	[%]	143	148	133
	Annual energy consumption	[kWh]	7,050	7,600	9,878
Warmer climate (Design temperature = 2°C)					
Space heating 35°C	Prated (declared heating capacity) @ 2°C	[kW]	9.3	9.5	9.8
	Seasonal space heating efficiency (ηs)	[%]	172	176	163
	Annual energy consumption	[kWh]	2,202	2,374	3,086
Ecodesign technical data					
Product description	Air-to-water heat pump	Y/N	Yes	Yes	Yes
	Water-to-water heat pump	Y/N	No	No	No
	Brine-to-water heat pump	Y/N	No	No	No
	Low-temperature heat pump	Y/N	Yes	Yes	Yes
	Equipped with a supplementary heater	Y/N	Yes	Yes	Yes
	Heat pump combination heater	Y/N	No	No	No
Air to water unit	Rated airflow (outdoor)	[m <sup>3</sup> /h]	4800	4800	6200
Brine/water to water unit	Rated water/brine flow (outdoor H/E)				
Other	Capacity control	-			
	Poff (Power consumption Off mode)	[kW]	0.018	0.020	0.020
	Pto (Power consumption Thermostat off mode)	[kW]	0.023	0.026	0.026
	Psb (Power consumption Standby mode)	[kW]	0.019	0.020	0.020
	PCK (Power crankcase heater model)	[kW]	0.060	0.062	0.062
	Qelec (Daily electricity consumption)	[kWh]			
	Qfuel (Daily fuel consumption)	[kWh]			
Part load conditions space heating average climate					
(A) condition (-7°C)	Pdh (declared heating capacity)	[kW]	11.10	12.30	11.40
	COPd (declared COP)	-	2.50	2.45	2.10
	Cdh (degradation coefficient)	-	0.90	0.90	0.90
(B) condition (2°C)	Pdh (declared heating capacity)	[kW]	7.00	7.60	8.50
	COPd (declared COP)	-	3.60	3.80	3.40
	Cdh (degradation coefficient)	-	0.90	0.90	0.90
(C) condition (7°C)	Pdh (declared heating capacity)	[kW]	4.30	4.90	5.83
	COPd (declared COP)	-	5.20	5.30	5.24
	Cdh (degradation coefficient)	-	0.90	0.90	0.90
(D) condition (12°C)	Pdh (declared heating capacity)	[kW]	2.00	2.40	2.82
	COPd (declared COP)	-	4.90	5.55	5.75
	Cdh (degradation coefficient)	-	0.90	0.90	0.90
(E) Tol (temperature operating limit)	Tol (temperature operating limit)	[°C]	-10.00	-10.00	-10.00
	Pdh (declared heating capacity)	[kW]	10.40	10.90	11.50
	COPd (declared COP)	-	2.35	2.20	2.10
	WTOL (Heating water Operation Limit)	[°C]	52.00	52.00	52.00
(F) Tivalent temperature	Tblv	[°C]	-7.00	-5.00	-4.00
	Pdh (declared heating capacity)	[kW]	11.10	11.20	12.61
	COPd (declared COP)	-	2.50	2.80	2.35
Capacity of the back-up heater integrated in the unit	Psup back-up heater (@Tdesignh: -10°C)	[kW]	4.50	4.50	4.50
Supplementary capacity at P_design	Psup (@Tdesignh: -10°C)	[kW]	1.90	2.90	4.50

# Technical parameters

Model(s):	KEM-05 DVN1
Air-to-water heat pump:	YES
Water-to-water heat pump:	NO
Brine-to-water heat pump:	NO
Low-temperature heat pump:	YES
Equipped with a supplementary heater:	NO
Heat pump combination heater:	NO
Parameters shall be declared for medium-temperature application, except for low-temperature heat pumps. For low-temperature heat pumps, parameters shall be declared for low-temperature application.	
Parameters shall be declared for average, colder and warmer climate conditions.	

Item	Symbol	Value	Unit
Rated heat output (*)	Prated	6	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	Pdh	5.5	kW
Tj = 2°C	Pdh	3.6	kW
Tj = 7°C	Pdh	2.2	kW
Tj = 12°C	Pdh	1.1	kW
Tj = bivalent temperature	Pdh	5.5	kW
Tj = operating limit	Pdh	5.1	kW
For air-to-water heat pumps: Tj = -15°C	Pdh	-	kW
Bivalent temperature	T <sub>biv</sub>	-7	°C
Cycling interval capacity for heating	P <sub>cych</sub>	-	kW
Degradation co-efficient (**)	C <sub>dh</sub>	0.9	--
Power consumption in modes other than active mode			
off mode	P <sub>off</sub>	0.011	kW
standby mode	P <sub>sb</sub>	0.011	kW
thermostat-off mode	P <sub>to</sub>	0.005	kW
crankcase heater mode	P <sub>ck</sub>	0.032	kW
Other items			
Capacity control	variable		
Sound power level, indoors/outdoors	L <sub>WA</sub>	-/63	dB
Annual energy consumption	Q <sub>HE</sub>	3600	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η <sub>s</sub>	139	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	COP <sub>d</sub>	2.50	-
Tj = 2°C	COP <sub>d</sub>	3.88	-
Tj = 7°C	COP <sub>d</sub>	4.56	-
Tj = 12°C	COP <sub>d</sub>	4.15	-
Tj = bivalent temperature	COP <sub>d</sub>	2.50	-
Tj = operating limit	COP <sub>d</sub>	2.45	-
For air-to-water heat pumps: Tj = -15°C	COP <sub>d</sub>	-	-
For air-to-water heat pumps: Operation limit temperature	T <sub>OL</sub>	-10	°C
Cycling interval efficiency	COP <sub>cyc</sub> or PER <sub>cyc</sub>	-	%
Heating water operating limit temperature	W <sub>TOL</sub>	-	°C
Supplementary heater			
Rated heat output (**)	P <sub>sup</sub>	-	kW
Type of energy input	-		
For air-to-water heat pumps: Rated air flow rate, outdoors			
	-	3200	m³/h
For water-/or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger			
	-	-	m³/h

For heat pump combination heater:							
Declared load profile	-			Water heating energy efficiency	η <sub>wh</sub>	-	%
Daily electricity consumption	Q <sub>elec</sub>	-	kWh	Daily fuel consumption	Q <sub>fuel</sub>	-	kWh
Annual electricity consumption	AEC	-	kWh	Annual fuel consumption	AFC	-	GJ

(\*) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating P<sub>designh</sub>, and the rated heat output of a supplementary heater P<sub>sup</sub> is equal to the supplementary capacity for heating sup(Tj).  
(\*\*) If C<sub>dh</sub> is not determined by measurement then the default degradation coefficient is C<sub>dh</sub> = 0,9.

# Technical parameters

Model(s):	KEM-07 DVN1
Air-to-water heat pump:	YES
Water-to-water heat pump:	NO
Brine-to-water heat pump:	NO
Low-temperature heat pump:	YES
Equipped with a supplementary heater:	NO
Heat pump combination heater:	NO
Parameters shall be declared for medium-temperature application, except for low-temperature heat pumps. For low-temperature heat pumps, parameters shall be declared for low-temperature application.	
Parameters shall be declared for average, colder and warmer climate conditions.	

Item	Symbol	Value	Unit
Rated heat output (*)	Prated	8	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	Pdh	5.7	kW
Tj = 2°C	Pdh	4.4	kW
Tj = 7°C	Pdh	2.9	kW
Tj = 12°C	Pdh	1.3	kW
Tj = bivalent temperature	Pdh	6.3	kW
Tj = operating limit	Pdh	5.5	kW
For air-to-water heat pumps: Tj = -15°C	Pdh	-	kW
Bivalent temperature	T <sub>biv</sub>	-4	°C
Cycling interval capacity for heating	P <sub>cych</sub>	-	kW
Degradation co-efficient (**)	C <sub>dh</sub>	0.9	--
Power consumption in modes other than active mode			
off mode	P <sub>off</sub>	0.011	kW
standby mode	P <sub>sb</sub>	0.011	kW
thermostat-off mode	P <sub>to</sub>	0.005	kW
crankcase heater mode	P <sub>ck</sub>	0.032	kW
Other items			
Capacity control	variable		
Sound power level, indoors/outdoors	L <sub>WA</sub>	-/66	dB
Annual energy consumption	Q <sub>HE</sub>	4750	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η <sub>s</sub>	135	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	COP <sub>d</sub>	2.30	-
Tj = 2°C	COP <sub>d</sub>	3.48	-
Tj = 7°C	COP <sub>d</sub>	5.60	-
Tj = 12°C	COP <sub>d</sub>	4.30	-
Tj = bivalent temperature	COP <sub>d</sub>	2.54	-
Tj = operating limit	COP <sub>d</sub>	2.30	-
For air-to-water heat pumps: Tj = -15°C	COP <sub>d</sub>	-	-
For air-to-water heat pumps: Operation limit temperature	TOL	-10	°C
Cycling interval efficiency	COP <sub>cyc</sub> or PER <sub>cyc</sub>	-	%
Heating water operating limit temperature	W <sub>TOL</sub>	-	°C
Supplementary heater			
Rated heat output (**)	P <sub>sup</sub>	-	kW
Type of energy input	-		
For air-to-water heat pumps: Rated air flow rate, outdoors	-	3750	m³/h
For water-/or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	-	-	m³/h

For heat pump combination heater:							
Declared load profile	-						
Daily electricity consumption	Q <sub>elec</sub>	-	kWh	Water heating energy efficiency	η <sub>wh</sub>	-	%
Annual electricity consumption	AEC	-	kWh	Daily fuel consumption	Q <sub>fuel</sub>	-	kWh
				Annual fuel consumption	AFC	-	GJ

(\*) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj).  
(\*\*) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.

# Technical parameters

Model(s):	KEM-10 DVN
Air-to-water heat pump:	YES
Water-to-water heat pump:	NO
Brine-to-water heat pump:	NO
Low-temperature heat pump:	YES
Equipped with a supplementary heater:	NO
Heat pump combination heater:	NO
Parameters shall be declared for medium-temperature application, except for low-temperature heat pumps. For low-temperature heat pumps, parameters shall be declared for low-temperature application.	
Parameters shall be declared for average, colder and warmer climate conditions.	

Item	Symbol	Value	Unit
Rated heat output (*)	Prated	11	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	Pdh	10.2	kW
Tj = 2°C	Pdh	6.1	kW
Tj = 7°C	Pdh	3.8	kW
Tj = 12°C	Pdh	2.1	kW
Tj = bivalent temperature	Pdh	10.2	kW
Tj = operating limit	Pdh	9.5	kW
For air-to-water heatpumps: Tj = -15°C	Pdh	-	kW
Bivalent temperature	T <sub>biv</sub>	-7	°C
Cycling interval capacity for heating	P <sub>cych</sub>	-	kW
Degradation co-efficient (**)	C <sub>dh</sub>	0.9	--
Power consumption in modes other than active mode			
off mode	P <sub>off</sub>	0.018	kW
standby mode	P <sub>sb</sub>	0.019	kW
thermostat-off mode	P <sub>to</sub>	0.023	kW
crankcase heater mode	P <sub>ck</sub>	0.060	kW
Other items			
Capacity control	variable		
Sound powerlevel, indoors/outdoors	L <sub>WA</sub>	-/68	dB
Annual energy consumption	Q <sub>HE</sub>	6900	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η <sub>s</sub>	131	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	COP <sub>d</sub>	2.30	-
Tj = 2°C	COP <sub>d</sub>	3.20	-
Tj = 7°C	COP <sub>d</sub>	4.75	-
Tj = 12°C	COP <sub>d</sub>	4.70	-
Tj = bivalent temperature	COP <sub>d</sub>	2.30	-
Tj = operating limit	COP <sub>d</sub>	2.25	-
For air-to-water heatpumps: Tj = -15°C	COP <sub>d</sub>	-	-
For air-to-water heatpumps: Operation limit temperature	TOL	-10	°C
Cycling interval efficiency	COP <sub>cyc</sub> or PER <sub>cyc</sub>	-	%
Heating water operating limit temperature	W <sub>TOL</sub>	-	°C
Supplementary heater			
Rated heat output (**)	P <sub>sup</sub>	-	kW
Type of energy input	-		
For air-to-water heat pumps: Rated air flow rate, outdoors			
	-	4800	m <sup>3</sup> /h
For water-/or brine-to-water heat pumps: Rated brine or water flowrate, outdoor heat exchanger			
	-	-	m <sup>3</sup> /h

For heat pump combination heater:			
Declared load profile	-		
Daily electricity consumption	Q <sub>elec</sub>	-	kWh
Annual electricity consumption	AEC	-	kWh
Water heating energy efficiency	η <sub>wh</sub>	-	%
Daily fuel consumption	Q <sub>fuel</sub>	-	kWh
Annual fuel consumption	AFC	-	GJ

(\*) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj).  
(\*\*) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.

# Technical parameters

Model(s):	KEM-12 DVN
Air-to-water heat pump:	YES
Water-to-water heat pump:	NO
Brine-to-water heat pump:	NO
Low-temperature heat pump:	YES
Equipped with a supplementary heater:	NO
Heat pump combination heater:	NO
Parameters shall be declared for medium-temperature application, except for low-temperature heat pumps. For low-temperature heat pumps, parameters shall be declared for low-temperature application.	
Parameters shall be declared for average, colder and warmer climate conditions.	

Item	Symbol	Value	Unit
Rated heat output (*)	Prated	12	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	Pdh	10.5	kW
Tj = 2°C	Pdh	6.8	kW
Tj = 7°C	Pdh	4.4	kW
Tj = 12°C	Pdh	2.1	kW
Tj = bivalent temperature	Pdh	10.9	kW
Tj = operating limit	Pdh	10.0	kW
For air-to-water heat pumps: Tj = -15°C	Pdh	-	kW
Bivalent temperature	T <sub>biv</sub>	-6	°C
Cycling interval capacity for heating	P <sub>cych</sub>	-	kW
Degradation co-efficient (**)	C <sub>dh</sub>	0.9	--
Power consumption in modes other than active mode			
off mode	P <sub>off</sub>	0.018	kW
standby mode	P <sub>sb</sub>	0.019	kW
thermostat-off mode	P <sub>to</sub>	0.023	kW
crankcase heater mode	P <sub>ck</sub>	0.060	kW
Other items			
Capacity control	variable		
Sound power level, indoors/outdoors	L <sub>WA</sub>	-/68	dB
Annual energy consumption	Q <sub>HE</sub>	7400	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η <sub>s</sub>	135	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	COP <sub>d</sub>	2.25	-
Tj = 2°C	COP <sub>d</sub>	3.35	-
Tj = 7°C	COP <sub>d</sub>	5.00	-
Tj = 12°C	COP <sub>d</sub>	5.15	-
Tj = bivalent temperature	COP <sub>d</sub>	2.35	-
Tj = operating limit	COP <sub>d</sub>	2.15	-
For air-to-water heat pumps: Tj = -15°C	COP <sub>d</sub>	-	-
For air-to-water heat pumps: Operation limit temperature	TOL	-10	°C
Cycling interval efficiency	COP <sub>cyc</sub> or PER <sub>cyc</sub>	-	%
Heating water operating limit temperature	W <sub>TOL</sub>	-	°C
Supplementary heater			
Rated heat output (**)	P <sub>sup</sub>	-	kW
Type of energy input	-		
For air-to-water heat pumps: Rated air flow rate, outdoors			
	-	4800	m <sup>3</sup> /h
For water-/or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger			
	-	-	m <sup>3</sup> /h

For heat pump combination heater:							
Declared load profile	-						
Daily electricity consumption	Q <sub>elec</sub>	-	kWh	Water heating energy efficiency	η <sub>wh</sub>	-	%
Annual electricity consumption	AEC	-	kWh	Daily fuel consumption	Q <sub>fuel</sub>	-	kWh
				Annual fuel consumption	AFC	-	GJ

(\*) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj).  
(\*\*) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.

# Technical parameters

Model(s):	KEM-12 DTN
Air-to-water heat pump:	YES
Water-to-water heat pump:	NO
Brine-to-water heat pump:	NO
Low-temperature heat pump:	YES
Equipped with a supplementary heater:	NO
Heat pump combination heater:	NO
Parameters shall be declared for medium-temperature application, except for low-temperature heat pumps. For low-temperature heat pumps, parameters shall be declared for low-temperature application.	
Parameters shall be declared for average, colder and warmer climate conditions.	

Item	Symbol	Value	Unit
Rated heat output (*)	Prated	12	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	Pdh	11.1	kW
Tj = 2°C	Pdh	7.0	kW
Tj = 7°C	Pdh	4.3	kW
Tj = 12°C	Pdh	2.0	kW
Tj = bivalent temperature	Pdh	11.1	kW
Tj = operating limit	Pdh	10.4	kW
For air-to-water heat pumps: Tj = -15°C	Pdh	-	kW
Bivalent temperature	T <sub>biv</sub>	-7	°C
Cycling interval capacity for heating	P <sub>cych</sub>	-	kW
Degradation co-efficient (**)	C <sub>dh</sub>	0.9	--
Power consumption in modes other than active mode			
off mode	P <sub>off</sub>	0.018	kW
standby mode	P <sub>sb</sub>	0.019	kW
thermostat-off mode	P <sub>to</sub>	0.023	kW
crankcase heater mode	P <sub>ck</sub>	0.060	kW
Other items			
Capacity control	variable		
Sound powerlevel, indoors/outdoors	L <sub>WA</sub>	-/68	dB
Annual energy consumption	Q <sub>HE</sub>	7050	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η <sub>s</sub>	143	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	COP <sub>d</sub>	2.50	-
Tj = 2°C	COP <sub>d</sub>	3.60	-
Tj = 7°C	COP <sub>d</sub>	5.20	-
Tj = 12°C	COP <sub>d</sub>	4.90	-
Tj = bivalent temperature	COP <sub>d</sub>	2.50	-
Tj = operating limit	COP <sub>d</sub>	2.35	-
For air-to-water heat pumps: Tj = -15°C	COP <sub>d</sub>	-	-
For air-to-water heat pumps: Operation limit temperature	TOL	-10	°C
Cycling interval efficiency	COP <sub>cyc</sub> or PER <sub>cyc</sub>	-	%
Heating water operating limit temperature	W <sub>TOL</sub>	-	°C
Supplementary heater			
Rated heat output (**)	P <sub>sup</sub>	-	kW
Type of energy input	-		
For air-to-water heat pumps: Rated air flow rate, outdoors			
	-	4800	m <sup>3</sup> /h
For water-/or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger			
	-	-	m <sup>3</sup> /h

For heat pump combination heater:							
Declared load profile	-			Water heating energy efficiency	η <sub>wh</sub>	-	%
Daily electricity consumption	Q <sub>elec</sub>	-	kWh	Daily fuel consumption	Q <sub>fuel</sub>	-	kWh
Annual electricity consumption	AEC	-	kWh	Annual fuel consumption	AFC	-	GJ

(\*) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj).  
(\*\*) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.

# Technical parameters

Model(s):	KEM-14 DTN
Air-to-water heat pump:	YES
Water-to-water heat pump:	NO
Brine-to-water heat pump:	NO
Low-temperature heat pump:	YES
Equipped with a supplementary heater:	NO
Heat pump combination heater:	NO
Parameters shall be declared for medium-temperature application, except for low-temperature heat pumps. For low-temperature heat pumps, parameters shall be declared for low-temperature application.	
Parameters shall be declared for average, colder and warmer climate conditions.	

Item	Symbol	Value	Unit
Rated heat output (*)	Prated	14	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	Pdh	12.3	kW
Tj = 2°C	Pdh	7.6	kW
Tj = 7°C	Pdh	4.9	kW
Tj = 12°C	Pdh	2.4	kW
Tj = bivalent temperature	Pdh	11.2	kW
Tj = operating limit	Pdh	10.9	kW
For air-to-water heat pumps: Tj = -15°C	Pdh	-	kW
Bivalent temperature	T <sub>biv</sub>	-5	°C
Cycling interval capacity for heating	P <sub>cych</sub>	-	kW
Degradation co-efficient (**)	C <sub>dh</sub>	0.9	--
Power consumption in modes other than active mode			
off mode	P <sub>off</sub>	0.020	kW
standby mode	P <sub>sb</sub>	0.020	kW
thermostat-off mode	P <sub>to</sub>	0.026	kW
crankcase heater mode	P <sub>ck</sub>	0.062	kW
Other items			
Capacity control	variable		
Sound power level, indoors/outdoors	L <sub>WA</sub>	-/70	dB
Annual energy consumption	Q <sub>HE</sub>	7600	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η <sub>s</sub>	148	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	COP <sub>d</sub>	2.45	-
Tj = 2°C	COP <sub>d</sub>	3.80	-
Tj = 7°C	COP <sub>d</sub>	5.30	-
Tj = 12°C	COP <sub>d</sub>	5.55	-
Tj = bivalent temperature	COP <sub>d</sub>	2.80	-
Tj = operating limit	COP <sub>d</sub>	2.20	-
For air-to-water heat pumps: Tj = -15°C	COP <sub>d</sub>	-	-
For air-to-water heat pumps: Operation limit temperature	TOL	-10	°C
Cycling interval efficiency	COP <sub>cyc</sub> or PER <sub>cyc</sub>	-	%
Heating water operating limit temperature	W <sub>TOL</sub>	-	°C
Supplementary heater			
Rated heat output (**)	P <sub>sup</sub>	-	kW
Type of energy input	-		
For air-to-water heat pumps: Rated air flow rate, outdoors	-	4800	m <sup>3</sup> /h
For water-/or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	-	-	m <sup>3</sup> /h

For heat pump combination heater:							
Declared load profile	-			Water heating energy efficiency	η <sub>wh</sub>	-	%
Daily electricity consumption	Q <sub>elec</sub>	-	kWh	Daily fuel consumption	Q <sub>fuel</sub>	-	kWh
Annual electricity consumption	AEC	-	kWh	Annual fuel consumption	AFC	-	GJ

(\*) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj).  
 (\*\*) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.

# Technical parameters

Model(s):	KEM-16 DTN
Air-to-water heat pump:	YES
Water-to-water heat pump:	NO
Brine-to-water heat pump:	NO
Low-temperature heat pump:	YES
Equipped with a supplementary heater:	NO
Heat pump combination heater:	NO
Parameters shall be declared for medium-temperature application, except for low-temperature heat pumps. For low-temperature heat pumps, parameters shall be declared for low-temperature application.	
Parameters shall be declared for average, colder and warmer climate conditions.	

Item	Symbol	Value	Unit
Rated heat output (*)	Prated	16	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	Pdh	11.4	kW
Tj = 2°C	Pdh	8.5	kW
Tj = 7°C	Pdh	5.8	kW
Tj = 12°C	Pdh	2.8	kW
Tj = bivalent temperature	Pdh	12.6	kW
Tj = operating limit	Pdh	11.5	kW
For air-to-water heat pumps: Tj = -15°C	Pdh	-	kW
Bivalent temperature	T <sub>biv</sub>	-4	°C
Cycling interval capacity for heating	P <sub>cyc</sub>	-	kW
Degradation co-efficient (**)	C <sub>dh</sub>	0.9	--
Power consumption in modes other than active mode			
off mode	P <sub>off</sub>	0.020	kW
standby mode	P <sub>sb</sub>	0.020	kW
thermostat-off mode	P <sub>to</sub>	0.026	kW
crankcase heater mode	P <sub>ck</sub>	0.062	kW
Other items			
Capacity control	variable		
Sound powerlevel, indoors/outdoors	L <sub>WA</sub>	-/72	dB
Annual energy consumption	Q <sub>HE</sub>	9878	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η <sub>s</sub>	133	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7°C	COP <sub>d</sub>	2.10	-
Tj = 2°C	COP <sub>d</sub>	3.40	-
Tj = 7°C	COP <sub>d</sub>	5.24	-
Tj = 12°C	COP <sub>d</sub>	5.75	-
Tj = bivalent temperature	COP <sub>d</sub>	2.35	-
Tj = operating limit	COP <sub>d</sub>	2.10	-
For air-to-water heat pumps: Tj = -15°C	COP <sub>d</sub>	-	-
For air-to-water heat pumps: Operation limit temperature	TOL	-10	°C
Cycling interval efficiency	COP <sub>cyc</sub> or PER <sub>cyc</sub>	-	%
Heating water operating limit temperature	W <sub>TOL</sub>	-	°C
Supplementary heater			
Rated heat output (**)	P <sub>sup</sub>	-	kW
Type of energy input	-		
For air-to-water heat pumps: Rated air flow rate, outdoors			
	-	6200	m <sup>3</sup> /h
For water-/or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger			
	-	-	m <sup>3</sup> /h

For heat pump combination heater:							
Declared load profile	-			Water heating energy efficiency	η <sub>wh</sub>	-	%
Daily electricity consumption	Q <sub>elec</sub>	-	kWh	Daily fuel consumption	Q <sub>fuel</sub>	-	kWh
Annual electricity consumption	AEC	-	kWh	Annual fuel consumption	AFC	-	GJ

(\*) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj).  
(\*\*) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.

MD14IU-023LW







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