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INSTALLATION AND OWNER'S MANUAL

M-thermal split Indoor unit



Original instructions.
Please read this manual carefully and keep it for future reference.
All the pictures in this manual are for illustrations purpose only.

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1 ABOUT THE DOCUMENTATION

This document is part of a documentation set. The complete set consists of:

INSTALLATION AND OWNER'S MANUAL:

- Installation and operation instructions for indoor unit

USER INTERFACE MANUAL:

- Installation and operation instructions for controller.

2 SAFETY PRECAUTIONS

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

Read these instructions carefully before installation. Keep this manual in a handy for future reference.

Meanings of DANGER, WARNING, CAUTION and NOTE symbols.

DANGER

indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

WARNING

indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

CAUTION

indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

NOTE

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

WARNING

- Improper installation of equipment or accessories may result in electric shock, short-circuit, leakage, fire or other damage to the equipment. Be sure to only use accessories made by the supplier, which are specifically designed for the equipment and make sure to get installation done by a certified person.
- All the activities described in this manual must be carried out by a licensed technician. Be sure to wear adequate personal protection equipment such as gloves and safety glasses while installing the unit or carrying out maintenance activities.

	WARNING	Flammable refrigerant is applied. A fire may occur due to unexpected leakage of refrigerant.
	CAUTION	Read the operation manual carefully before any further action.
	CAUTION	Only a specialist is allowed to take action under the instructions of the installation manual.
	CAUTION	The information is available in the relevant documentation.



WARNING: Risk of fire/
flammable materials

⚠ WARNING

- Any person who is involved with working on or breaking into a refrigerant circuit should hold a current valid certificate from an industry-accredited assessment authority, which authorises their competence to handle refrigerants safely in accordance with an industry recognised assessment specification.
- Servicing shall only be performed as recommended by the equipment manufacturer. Maintenance and repair requiring the assistance of other skilled personnel shall be carried out under the supervision of the person competent in the use of flammable refrigerants.

Special requirements for R32

⚠ WARNING

- Do NOT have refrigerant leakage and open flame.
- Be aware that the R32 refrigerant does NOT contain an odour.

⚠ WARNING

- The appliance shall be stored in a well-ventilated area where the room size corresponds to the room area as specified for operation.
- The appliance shall be stored in a room without continuously operating open flames (for example an operating gas appliance) and ignition sources (for example an operating electric heater).
- The appliance shall be stored so as to prevent mechanical damage from occurring.

⚠ CAUTION

- Do NOT re-use joints which have been used already.
- Joints made in installation between parts of refrigerant system shall be accessible for maintenance purposes.

⚠ WARNING

Make sure installation, servicing, maintenance and repair comply with instructions and with applicable legislation (for example national gas regulation) and are executed only by authorised persons.

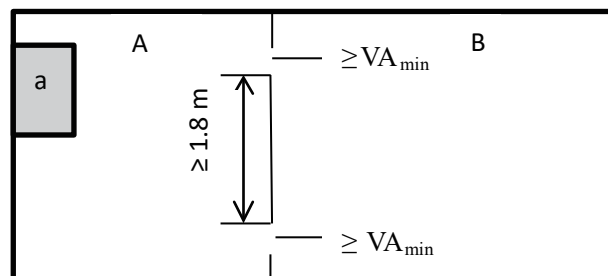
⚠ CAUTION

- Pipework should be protected from physical damage.
- Installation of pipework shall be kept to a minimum length.

If the total refrigerant charge in the system is < 1.84 kg (i.e. if the piping length is < 20 m for 8/10 kW), there are no additional minimum floor area requirement.

If the total refrigerant charge in the system is ≥ 1.84 kg (i.e. if the piping length is ≥ 20 m for 8/10 kW), you need to comply with additional minimum floor area requirements as described in the following flow chart. The flow chart uses the following tables: "Table 1-Maximum refrigerant charge allowed in a room: indoor unit" on page 3, "Table 2-Minimum floor area: indoor unit" on page 4 and "Table 3-Minimum venting opening area for natural ventilation: indoor unit" on page 4.

If the piping length is 30m, then the minimum floor area is $\geq 4.5\text{m}^2$; if the floor area is less than 4.5m^2 , it needs to be trepanned with a hole of 200cm^2 .

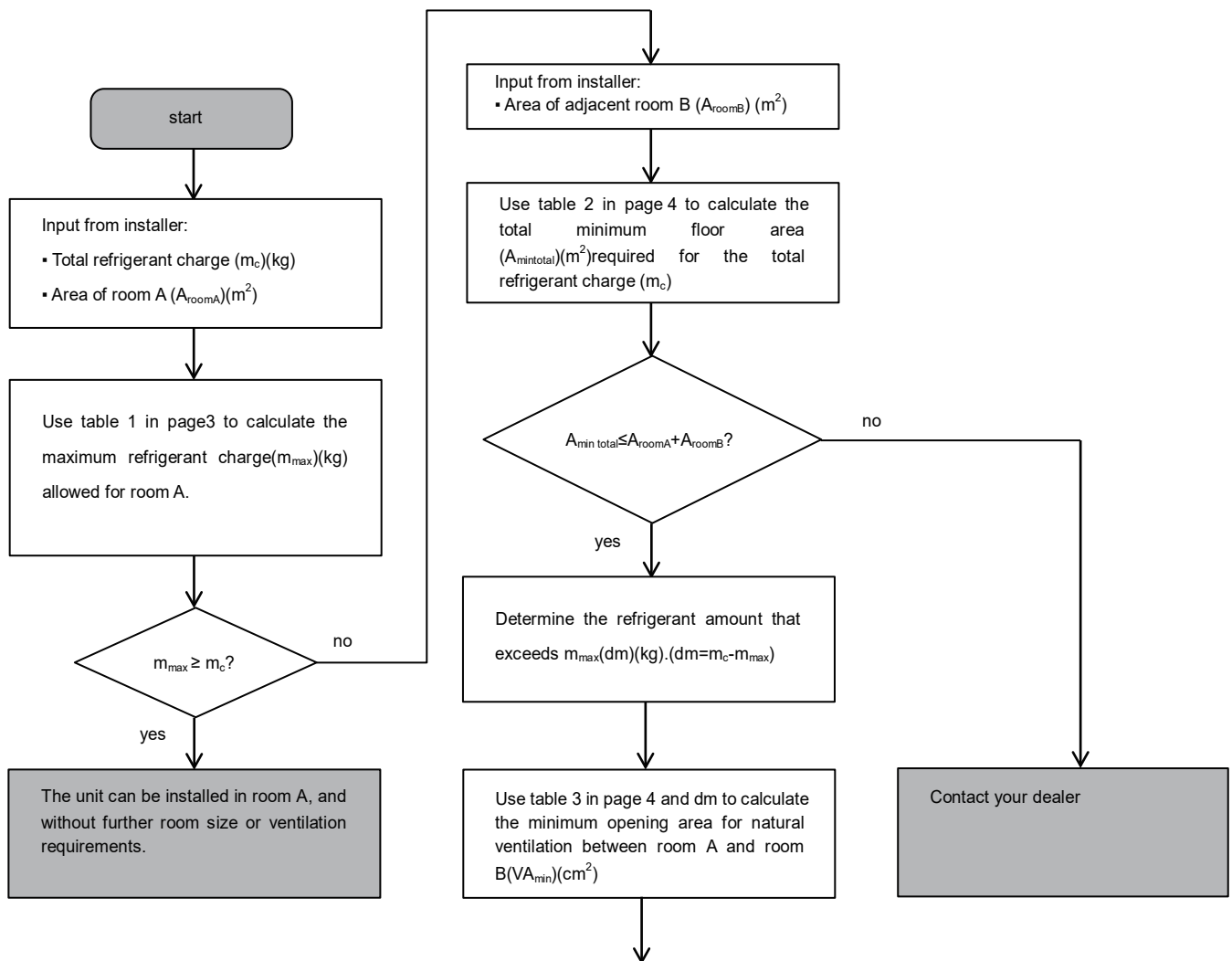


a Indoor unit

A Room where the indoor unit is installed.

B Room adjacent to room A.

The area of A plus B has to be greater than or equal to 4.5m^2 .



Unit can be installed at room A if:

- 2 ventilation openings (permanently open) are provided between room A and B, 1 at the top and 1 at the bottom.
- Bottom opening : The bottom opening must meet the minimum area requirements(VA_{min}). It must be as close as possible to the floor. If the ventilation opening starts from the floor, the height must be ≥ 20 mm. The bottom of the opening must be situated ≤ 100 mm from the floor. At least 50 % of the required opening area must be situated < 200 mm from the floor. The entire area of the opening must be situated < 300 mm from the floor.
- Top opening : The area of the top opening must be larger than or equal to the bottom opening. The bottom of the top opening must be situated at least 1.5 m above the top of the bottom opening.
- Ventilation openings to the outside are NOT considered suitable ventilation openings (the user can block them when it is cold).

Table 1-Maximum refrigerant charge allowed in a room:indoor unit

$A_{room}(m^2)$	Maximum refrigerant charge in a room(m_{max})(kg)	$A_{room}(m^2)$	Maximum refrigerant charge in a room(m_{max})(kg)
	H = 1 230 mm (60/190, 100/190)		H = 1 500 mm(100/240, 160/240)
6.9	1.85	4.7	1.85
7.0	1.87	5.0	1.93
8.0	1.98	5.5	2.01
9.0	2.13	6.0	2.10
10.0	2.23	6.5	2.19
11.0	2.34	7.0	2.27
12.0	2.44	7.5	2.34
		8.0	2.44

Table 2-Minimum floor area:indoor unit

m_c (kg)	Minimum floor area(m ²)	m_c (kg)	Minimum floor area(m ²)
	H = 1 230 mm(60/190, 100/190)		H = 1 500 mm(100/240,160/240)
1.85	6.90	1.85	4.70
1.90	7.31	1.90	4.92
1.95	7.70	1.95	5.18
2.00	8.10	2.00	5.45
2.05	8.51	2.05	5.72
2.10	8.93	2.10	6.01
2.15	9.36	2.15	6.30
2.20	9.80	2.20	6.59
2.25	10.3	2.25	6.89
2.30	10.7	2.30	7.20
2.35	11.2	2.35	7.52
2.40	11.7	2.40	7.84
2.45	12.2	2.45	8.10

Table 3-Minimum venting opening area for natural ventilation: indoor unit

m_c	m_{max}	$dm=m_c-m_{max}$ (kg)	Minimum venting opening area(cm ²)	Minimum venting opening area(cm ²)
			H = 1 230 mm(60/190, 100/190)	H = 1 500 mm(100/240,160/240)
2.41	0.3	2.11	375	290
2.41	0.5	1.91	350	280
2.41	0.7	1.71	330	268
2.41	0.9	1.51	315	258
2.41	1.1	1.31	302	247
2.41	1.3	1.11	278	228
2.41	1.5	0.91	245	200
2.41	1.7	0.71	203	167
2.41	1.9	0.51	154	126
2.41	2.1	0.31	98	80

⚠ DANGER

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

⚠ WARNING

- Tear apart and throw away plastic packaging bags so that children will not play with them.Children playing with plastic bags face danger of death by suffocation.
- Safely dispose of packing materials such as nails and other metal or wood parts that could cause injuries.
- Ask your dealer or qualified personnel to perform installation work in accordance with this manual. Do not install the unit by 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 earth fault circuit interrupter according to local laws and regulations. Failure to install a earth 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, backup heater, etc.) during and immediately after operation. Touching the internal parts can cause burns. To avoid injury, give the internal parts time to return to normal temperature or, if you must touch them, be sure to wear protective gloves.

CAUTION

- Earth the unit.
- Earthing resistance should be according to local laws and regulations.
- Do not connect the earth wire to gas or water pipes, lightning conductors or telephone earth wires.
- Incomplete earthing may cause electric shocks.
 - Gas pipes: Fire or an explosion might occur if the gas leaks.
 - Water pipes: Hard vinyl tubes are not effective earths.
 - Lightning conductors or telephone earth wires : Electrical threshold may rise abnormally if struck by a lightning bolt.

CAUTION

- Install the power cord at least 3 feet (1 meter) away from televisions or radios to prevent interference or noise. (Depending on the radio waves, a distance of 3 feet (1 meter) may not be sufficient to eliminate the noise.)
- Do not wash the unit. This may cause electric shocks or fire. The appliance must be installed in accordance with national wiring regulations. If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- Do not install the unit in the following places:
 - Where there is mist of mineral oil, oil spray or vapors. Plastic parts may deteriorate, and cause them to come loose or water to leak.
 - Where corrosive gases (such as sulphurous acid gas) are produced. Where corrosion of copper pipes or soldered parts may cause refrigerant to leak.
 - Where there is machinery which emits electromagnetic waves. Electromagnetic waves can disturb the control system and cause equipment malfunction.
 - Where flammable gases may leak, where carbon fiber or ignitable dust is suspended in the air or where volatile flammables such as paint thinner or gasoline are handled. These types of gases might cause a fire.
 - Where the air contains high levels of salt such as near the ocean.
 - Where voltage fluctuates a lot, such as in factories.
 - In vehicles or vessels.
 - Where acidic or alkaline vapors are present.
- This appliance can be used by children 8 years old and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they are supervised or given instruction on using the unit in a safe manner and understand the hazards involved. Children should not play with the unit. Cleaning and user maintenance should not be done by children without supervision.
- Children should be supervised to ensure that they do not play with the appliance.
- If the supply cord is damaged, it must be replaced by the manufacturer or its service agent or a similarly qualified person.

- The wiring must be performed by certified person technicians in accordance with national wiring regulation and this circuit diagram. An all-pole disconnection device which has at least 3 mm separation distance in all pole and a residualcurrent device(RCD) with the rating not exceeding 30 mA shall be incorporated in the fixed wiring according to the national rule.
- Confirm the safety of the installation area (walls, floors, etc.) without hidden dangers such as water, electricity, and gas before wiring/pipes.
- Before installation , check whether the user's power supply meets the electrical installation requirements of unit (including reliable earthing , leakage , and wire diameter electrical load, etc.). If the electrical installation requirements of the product are not met, the installation of the product is prohibited until the product is rectified.
- Product installation should be fixed firmly, Take reinforcement measures, when necessary.

⚠ CAUTION

- About Fluorinated Gases
 - This air-conditioning unit contains fluorinated gases. For specific information on the type of gas and the amount, please refer to the relevant label on the unit itself. Compliance with national gas regulations shall be observed.
 - Installation, service, maintenance and repair of this unit must be performed by a certified technician.
 - Product uninstallation and recycling must be performed by a certified technician.
 - If the system has a leak-detection system installed, it must be checked for leaks at least every 12 months. When the unit is checked for leaks, proper record-keeping of all checks is strongly recommended.

Disposal

This equipment uses flammable refrigerants. The disposal of the equipment must comply with national regulations.

- 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 unsorted municipal waste, and use separate collection facilities.
- Contact your local government for information regarding the collection systems available.
- If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being.



WARNING: Risk of fire

3 BEFORE INSTALLATION

• Before installation

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

⚠ CAUTION

Frequency of Refrigerant Leakage Checks

- For unit that contains fluorinated greenhouse gases in quantities of 5 tonnes of CO₂ equivalent or more, but of less than 50 tonnes of CO₂ equivalent, at least every 12 months, or where a leakage detection system is installed, at least every 24 months.
- For unit that contains fluorinated greenhouse gases in quantities of 50 tonnes of CO₂ equivalent or more, but of less than 500 tonnes of CO₂ equivalent, at least every six months, or where a leakage detection system is installed, at least every 12 months.
- For unit that contains fluorinated greenhouse gases in quantities of 500 tonnes of CO₂ equivalent or more, at least every three months, or where a leakage detection system is installed, at least every six months.
- This air-conditioning unit is a hermetically sealed equipment that contains fluorinated greenhouse gases.
- Only certificated person is allowed to do installation, operation and maintenance.

4 INSTALLATION SITE

WARNING

- There is flammable refrigerant in the unit and it should be installed in a well-ventilated site. If the unit is installed inside, an additional refrigerant detection device and ventilation equipment must be added in accordance with the standard EN378. Be sure to adopt adequate measures to prevent the unit from being used as a shelter by small animals.
 - Small animals making contact with electrical parts can cause malfunction, smoke or fire. Please instruct the customer to keep the area around the unit clean.
 - The equipment is not intended for use in a potentially explosive atmosphere.
-
- Select an installation site where the following conditions are satisfied and one that meets with your customer's approval.
 - Places that are well-ventilated.
 - 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).
 - Do not install the unit in places often used as a work space. In case of construction work (e.g. grinding etc.) where a lot of dust is created, the unit must be covered.
 - Do not place any object or equipment on top of the unit (top plate)
 - Do not climb, sit or stand on top of the unit.
 - Be sure that sufficient precautions are taken in case of refrigerant leakage according to relevant local laws and regulations.

CAUTION

The indoor unit should be installed in an indoor water proof place, or the safety of the unit and the operator cannot be ensured.

The indoor unit is to be wall mounted in an indoor location that meets the following requirements:

- The installation location is frost-free.
- The space around the unit is adequate for serving, see figure 6-2.
- The space around the unit allows for sufficient air circulation.
- There is a provision for condensate drain and pressure relief valve blow-off.

NOTE

When the unit running in the cooling mode, condensate may drop from the water inlet and water outlet pipes. Please make sure the dropping condensate will not result in damage of your furniture and other devices.

- The installation surface is a flat and vertical non-combustible wall, capable of supporting the operation weight of the unit.
- All piping lengths and distance have been taken into consideration.

Table 3-1

Requirement	Value
Maximum allowable piping length between the 3-way valve SV1 and the indoor unit (only for installations with domestic hot water tank)	3 m
Maximum allowable piping length between the domestic hot water tank and the indoor unit (only for installations with domestic hot water tank). The temperature sensor cable supplied with the indoor unit is 10 m in length.	8 m
Maximum allowable piping length between the TW2 and the indoor unit. The temperature sensor a cable of TW2 supplied with the indoor unit is 10 m in length.	8 m

5 ACCESSORIES

5.1 Unpacking

Removing the package

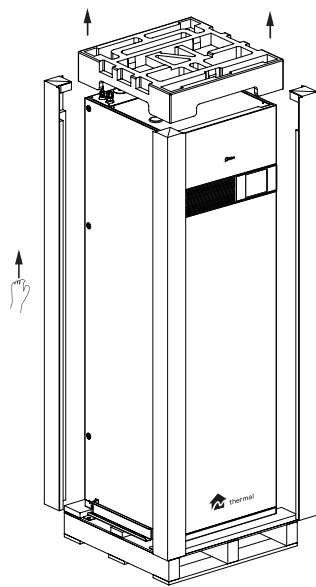


Fig.5-1

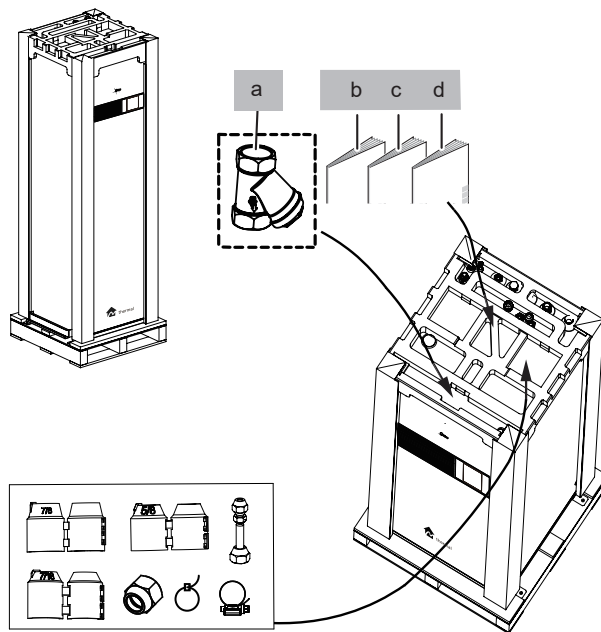


Fig.5-2

Installation Fittings						Installation Fittings					
Name	Shape	Quantity				Name	Shape	Quantity			
		60/190	100/190	100/240	160/240			60-190	100-190	100-240	160-240
Installation And Owner's Manual (This Book)		1	1	1	1	M8 Copper Flare Nut		1	0	0	0
M16 Copper Flare Nut		1	1	1	1	M9 Copper Flare Nut		0	1	1	1
Insulation Accessories		1	1	1	1	M16 Copper Flare Nut		1	1	1	1
M9 Copper Flare Nut		1	1	1	1	Y-Type Strainer		1	1	1	1
Insulation Accessories		1	1	1	1	Operation Manual (Wire Controller)		1	1	1	1
M6 Copper Flare Nut		1	1	1	1	Adapter 9.52-6.35		1	1	1	1
Insulation Accessories		1	1	1	1	Cable Tie L200		2	2	2	2
						Clamp		1	1	1	1

Accessories Available From Supplier		
Thermistor for Balance Tank(Tbt)		1
Thermistor for Zone 2 Flow Temp.(Tw2)		1

5.2 Remove the shipping pallet

- Remove the 4 screws of the wooden base(Refer to Fig.5-3).
- Four people hold the sheet metal lifting machine,one of them pull the wooden base(Refer to Fig.5-4).
- Remove the 8 screws of the sheet metal and remove the sheet metal(Refer to Fig.5-5).
- Take carefully when lifting machine and pull the wooden.
- Care should be taken when transporting the heat pump unit that the casing is not damaged by impact. Do not remove the protective packaging unit heat pump unit has reached its final location.This will help protect the structure and control panel.The heat pump unit can be transported ONLY vertically.
- Be careful with the Installation and Operation manual and with the factory-supplied accessories box located at the top of the unit.
- Four people are required when lifting because of the heavy weight of the unit.

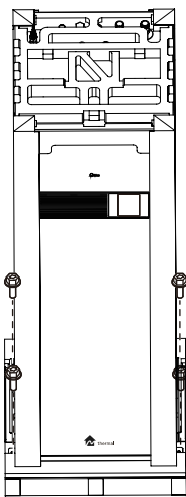


Fig.5-3

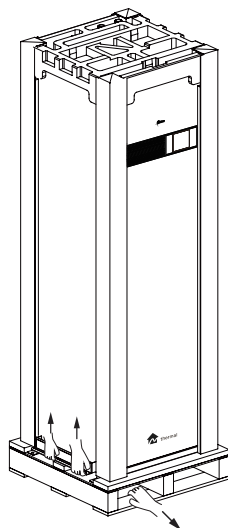


Fig.5-4

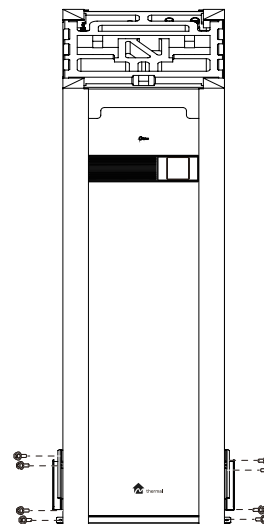


Fig.5-5

INSTALLATION SITE

⚠ WARNING

- Do not install the IDU near a bedroom;
- Suggest install it in a garage, utility room, corridor, basement, or laundry room;
- Be sure to adopt adequate measures to prevent the unit from being used as a shelter by small animals.
- Small animals making contact with electrical parts can cause malfunction, smoke or fire. Please instruct the customer to keep the area around the unit clean.
- The equipment is not intended for use in a potentially explosive atmosphere.
- Please connect the top pipe or fill the water tank immediately after removing the wooden frame, so as not to cause the machine to tip over.

- Select an installation site where the following conditions are satisfied and one that meets with your customer's approval.
 - Safe places which can bear the unit's weight and 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).
 - Do not install the unit in places often used as a work space. In case of construction work (e.g. grinding etc.) where a lot of dust is created, the unit must be covered.
 - Do not place any object or equipment on top of the unit (top plate)
 - Do not climb, sit or stand on top of the unit.
 - Be sure that sufficient precautions are taken in case of refrigerant leakage according to relevant local laws and regulations.
 - Don't install the unit near the sea or where there is corrosion gas.
- When installing the unit in a place exposed to strong wind, pay special attention to the following.
In normal condition, refer to the figures below for installation of the unit:

⚠ CAUTION

The indoor unit should be installed in an indoor water proof place.

The indoor unit is to be floor mounted in an indoor location that meets the following requirements:

- The installation location is frost-free.
- The space around the unit is adequate for servicing (Refer to Fig.6-2).
- There is a provision for condensate drain and pressure relief valve blow-off.

💡 NOTE

When the unit is running in the cooling mode, condensate may drop from the water inlet and water outlet pipes. Please make sure the dropping condensate will not result in damage of your furniture and other devices.

6 INSTALLATION

6.1 Dimensions of the unit:

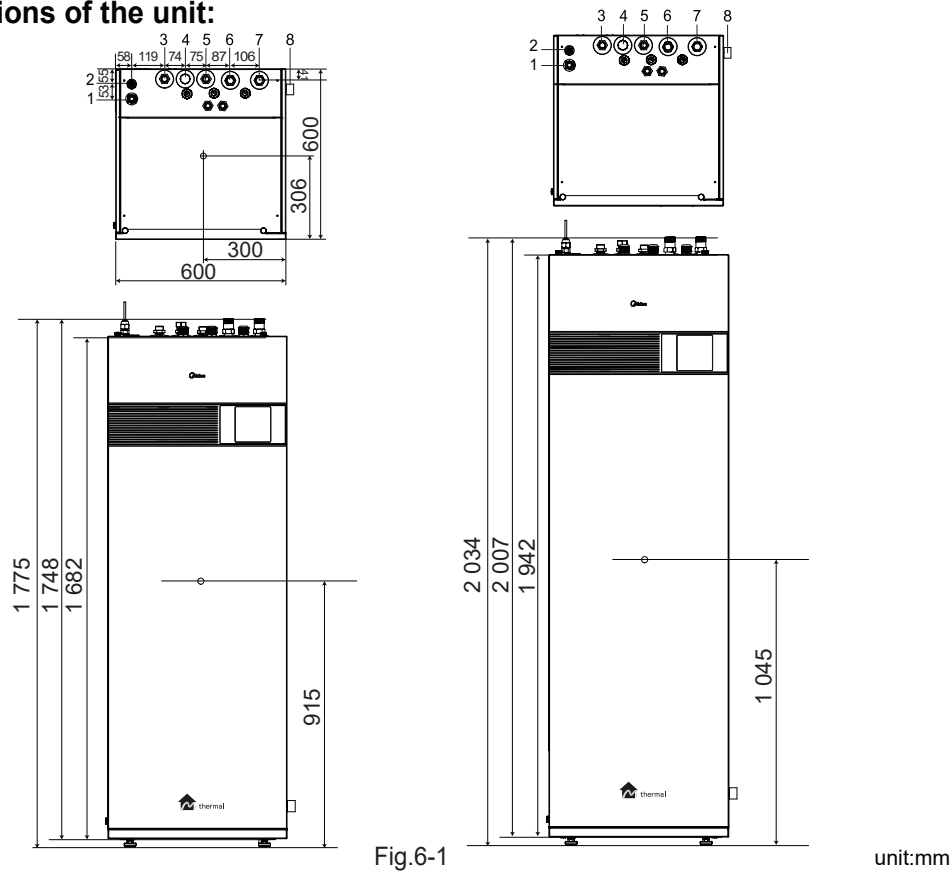


Fig.6-1

unit:mm

NO.	NAME	NO.	NAME
1	Refrigerant gas connection 5/8"-14UNF	5	Domestic cold water inlet
2	Refrigerant liquid connection 3/8" -14 UNF	6	Space heating (cooling) water inlet .R1"
3	Domestic hot water outlet R3/4"	7	Space heating (cooling) water outlet .R1"
4	Domestic hot water recirculation water inlet (Plugged by the nut).	8	Drainage Ø 25

- The content in the dotted line area is for customized.

6.2 Installation requirements

- The indoor unit is packed by the carton cap and corner.
- At delivery, the unit must be checked and any damage must be reported immediately to the carrier claims agent.
- Check if all indoor unit accessories are enclosed.
- Bring the unit as close as possible to the final installation position in its original package in order to prevent damage during transport.
- When the water tank is free of water, the maximum net weight of indoor unit with, water tank shall reach about 158 kg, which needs to be lifted by special equipment.

WARNING

Do not grasp the control box or pipe to lift the unit!

6.3 Servicing space requirements

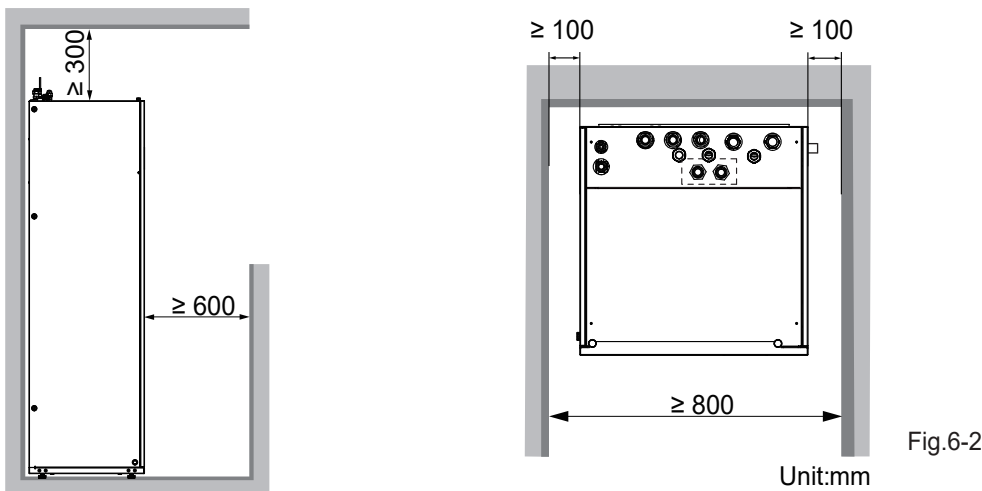


Fig.6-2

Unit:mm

6.4 Mounting the indoor unit

⚠ CAUTION

Ensure that apparatus is mounted securely.

Lift the indoor unit from the pallet and place it on the floor.

Slide the indoor unit into position.

Adjust the height of the leveling feet (Refer to Fig.6-3) to compensate for floor irregularities. The maximum allowed deviation is 1° (Refer to Fig. 6-4)

Be specially careful with the mounting foot once the unit is on the floor. Avoid harsh handling of the unit, as it could cause damages to the foot.

Each mounting feet can be adjusted up to 30 mm, but keep all them in the factory supplied position unit has been installed in its final position.

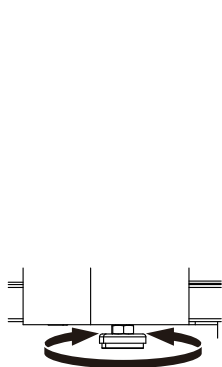


Fig.6-3

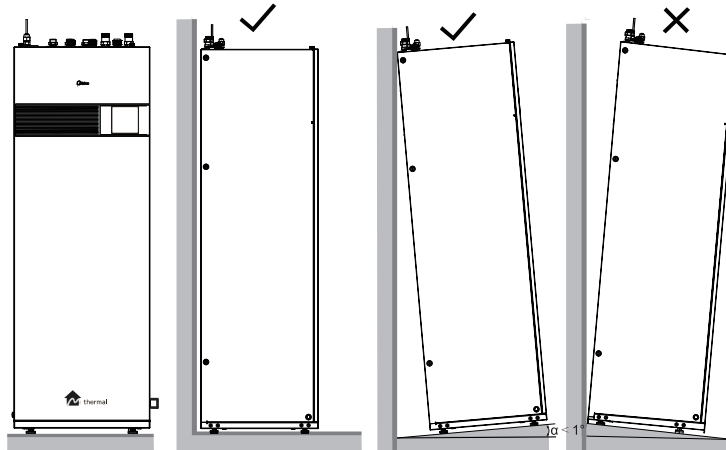


Fig.6-4

6.5 Connecting the refrigerant piping

For all guidelines, instructions and specifications regarding refrigerant pipe between the indoor unit and outdoor unit, please refer to "Installation and owner's manual" (M-thermal split outdoor unit).
Connecting the 16mm refrigerant pipe to the refrigerant gas connection.

- Sufficiently tighten the flare nut (Refer to Fig.6-7)
- Check the tightening torque (Refer to the right table)
- Tighten it with a spanner and torque wrench (Refer to Fig.6-8)
- The protective nut is a one-time part, it can not be reused. In case it is removed, it should be replaced with a new one. (Refer to Fig.6-9)

Outer diam.	Tightening torque(N·cm)	Additional tightening torque(N·cm)
φ 6.35	1 500 (153 kgf.cm)	1 600 (163 kgf.cm)
φ 9.52	2 500 (255 kgf.cm)	2 600 (265 kgf.cm)
φ 12.7	3 500 (357 kgf.cm)	3 600 (367 kgf.cm)
φ 16	4 500 (459 kgf.cm)	4 700 (479 kgf.cm)

⚠ CAUTION

- When connecting the refrigerant pipes, always use two wrenches/spanners to tighten or loosen the nuts! (Refer to Fig.6-8) Otherwise, it will cause damage of piping connections and leakage.
- If the indoor unit is matched with outdoor unit (4/6 kW), the transfer 9.52-6.35(Refer to the table in Page 8) should be mounted on the refrigerant liquid connection of indoor unit (Refer to Fig.6-6); The transfer is not used in other types of outdoor unit (8/10/12/14/16 kW).

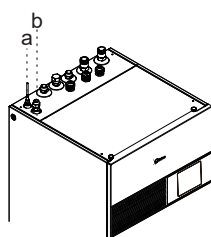


Fig.6-5

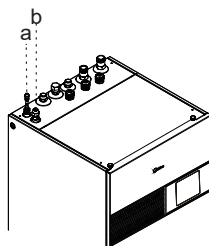


Fig.6-6

a Refrigerant liquid connection
b Refrigerant gas connection

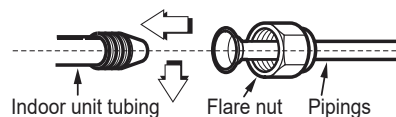


Fig.6-7

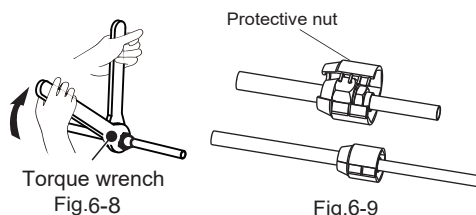


Fig.6-8

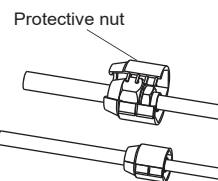


Fig.6-9

⚠ CAUTION

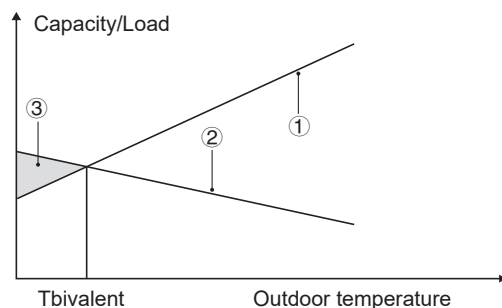
- Under installation conditions, excessive torque can damage the nut.
- When flared joints are reused, the flare part should be re-fabricated.
- Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- Leak detection fluids are suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.
- Electronic leak detectors shall be used to detect flammable refrigerants, but the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed and the appropriate percentage of gas (25 % maximum) is confirmed.
- Adapter 9.52-6.35 is single-use only.

7 GENERAL INTRODUCTION

- These units are used for both heating and cooling applications and domestic hot water. They can be combined with fan coil units, floor heating applications, low temperature high efficiency radiators.
- A wired controller is supplied with the unit.
- The backup heater can increase the heating capacity during cold outdoor temperatures. The backup heater also serves as a backup in case of malfunctioning and for frozen protection of the outside water piping during winter time.

💡 NOTE

- Maximum length of communication wirings between the indoor unit and the controller is 50 m.
- Power cords and communication wiring must be laid out separately, they can not be placed in the same conduit. Otherwise, it may lead to electromagnetic interference. Power cords and communication wirings should not come in contact with the refrigerant pipe so as to prevent the high temperature pipe from damaging wirings.
- Communication wirings must use shielded lines. Including indoor unit to outdoor unit PQE line, indoor unit to controller ABXYE line.



- ① Heat pump capacity.
- ② Required heating capacity (site dependent).
- ③ Additional heating capacity provided by backup heater.

Room thermostat(field supply)

Room thermostat can be connected to the unit(room thermostat should be kept away from heating source when selecting the installation place).

Operation range

Operation range of indoor unit		
Water pressure		0.1 MPa to 0.3 MPa
Water flow	60	0.40 m³/h to 1.25 m³/h
	100	0.40 m³/h to 2.10 m³/h
	160	0.70 m³/h to 3.00m³/h

The unit have a freeze prevention function that uses the heat pump or backup heater to keep the water system safe from freezing in all conditions. Since a power failure may happen when the unit is unattended, It's suggested to use anti-freezing flow switch in the water system. (Refer to 8.7 "Water circuit anti-freeze protection").

8 CONNECTING THE WATER PIPING

8.1 Connecting the space heating(cooling)water piping

To facilitate service and maintenance, two shut-off valves(field supply) and one overpressure bypass valve should be installed.

The two shut-off valves should be mounted on the space heating (cooling)water inlet and outlet pipe of indoor unit.

- 1.Connecting the shut-off valves to the indoor units.
- 2.Connecting the shut-off valves to the space heating(cooling) water pipes.

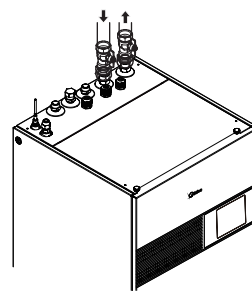


Fig. 8-1

8.2 Connecting the domestic water piping

The shut-off valve should be mounted on the domestic cold water inlet.

- 1.Connect the shut-off valve to the cold water inlet of indoor unit.
- 2 Connect the cold water pipe to the shut-off valve.
- 3 Connect the domestic hot water pipe to the hot water outlet of indoor unit.

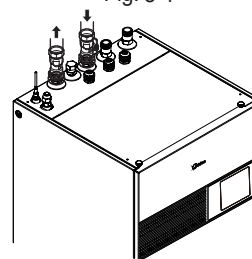


Fig. 8-2

8.3 Connecting the recirculation water piping

If domestic hot water recirculation function is requested,the recirculation pipe should be connected

- 1.Removing the nut of the recirculation on the indoor unit.
- 2.Connecting the recirculation water pipe to the indoor unit.
- 3.Check the tightening torque (Refer to the right table) .
4. Tighten it with a spanner and torque wrench.



Torque wrench

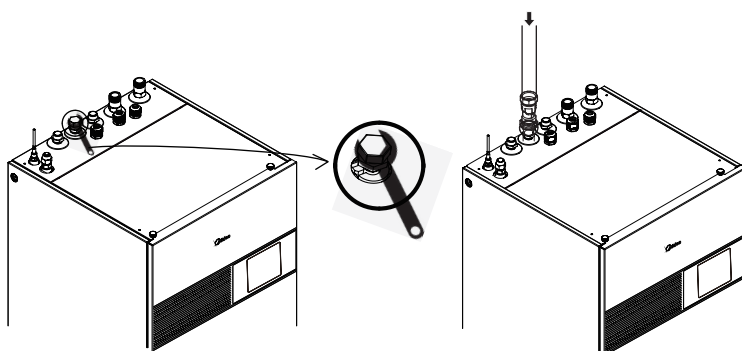


Fig.8-3

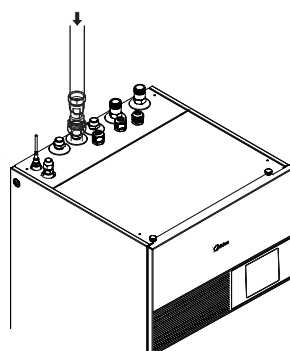


Fig.8-4

Outer diam.	Tightening torque(N·cm)	Additional tightening torque(N·cm)
φ 6.35	1 500 (153 kgf·cm)	1 600 (163 kgf·cm)
φ 9.52	2 500 (255 kgf·cm)	2 600 (265 kgf·cm)
φ 12.7	3 500 (357 kgf·cm)	3 600 (367 kgf·cm)
φ 16	4 500 (459 kgf·cm)	4 700 (479 kgf·cm)

8.4 Connecting the drainage hose to the indoor unit

The water coming from the pressure relief valve and the condensate water is collected in the drainage pan.

The drainage hose should be connected to the drainage pipe.

Connect the drainage pipe with a throat bander and insert the drainage pipe into the floor drain.

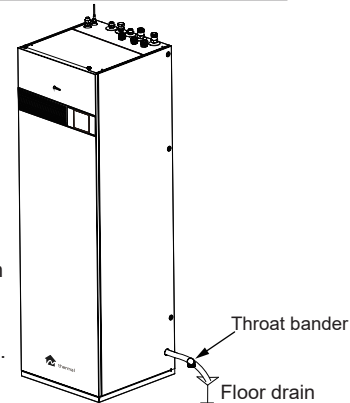


Fig.8-5

8.5 Water piping insulation

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

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

8.6 Water volume and sizing expansion vessels

The units are equipped with an expansion vessel of 8 L that has a default pre-pressure of 1.0 bar.

1) Check that the total water volume in the installation, excluding the internal water volume of the unit, is at least 40 L. See 14 "Technical specifications" to find the total internal water volume of the unit.

2) When the capacity of the integrated expansion vessel is insufficient for the system due to high water volume, an additional expansion vessel (supplied by the user) is needed.

Refer to the formula below to determine the specification of the additional expansion vessel.

System with only water	System with 35 % glycol
$V_2 = \frac{4C * 0.01979 - V_1 * (3 - Pg_1)}{3 - Pg_2}$	$V_2 = \frac{4C * 0.01373 - V_1 * (3 - Pg_1)}{3 - Pg_2}$

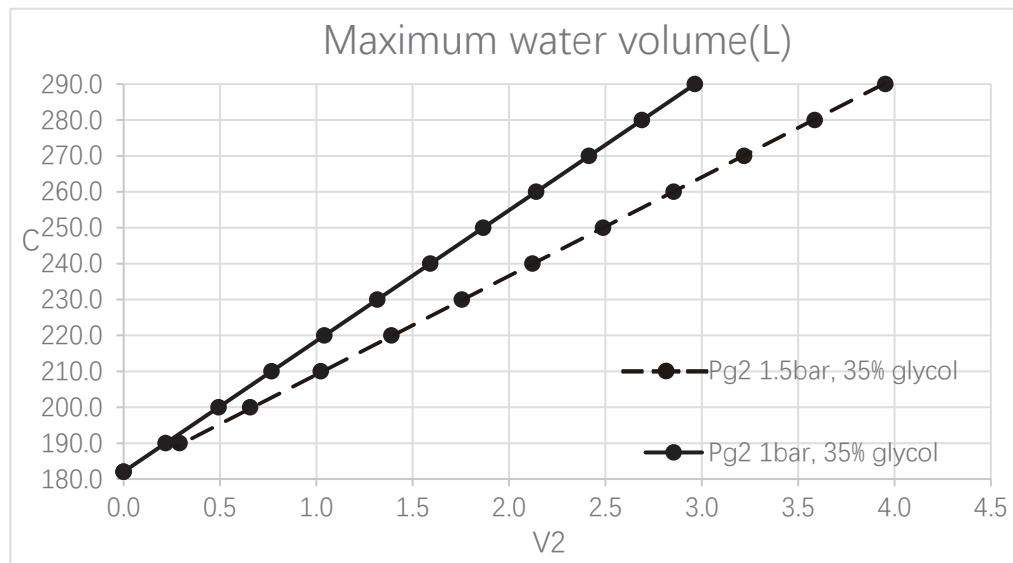
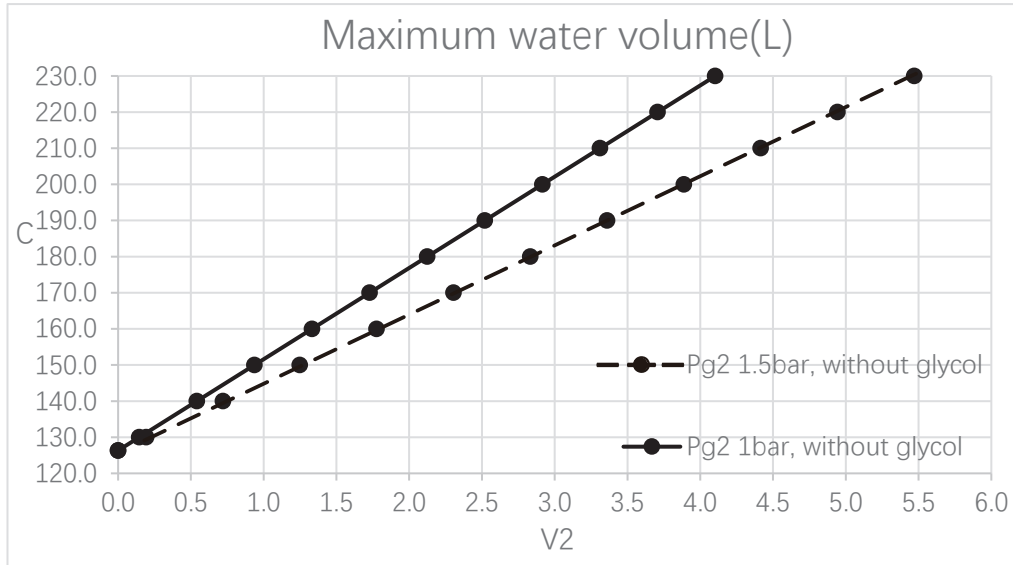
V2: Additional expansion vessel volume, in L;

V1: Integrated expansion vessel volume, in L, 5 L;

C: System water volume, in L;

Pg2: Additional expansion vessel Pre-pressure (relative pressure), in bar.

Pg1: Integrated expansion vessel Pre-pressure (relative pressure), in bar, 1 bar.



8.7 Water circuit anti-freeze protection

All hydronic parts inside of the unit are insulated to reduce the heat loss. Insulation materials must be added on the field water piping.

The unit program has special functions which use the heat pump and backup heater (if available) to protect the entire system from freezing. When the temperature of the water flow in the system drops to a certain value, the unit will heat the water by using the heat pump or the electric heating tap or the backup heater. The anti-freeze protection function will turn off only when the temperature increases to a certain value.

When unit lose the power, the above function will not active to protect the unit from freezing.

⚠ CAUTION

When the unit is not running for a long time, make sure the unit is powered on all the time. If the unit should be cut off the power, make sure the water in the piping of the system should be drained completely to avoid the water pump and piping system being damaged by freezing. The power of the unit also needs to be cut off after water in the system is drained.

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

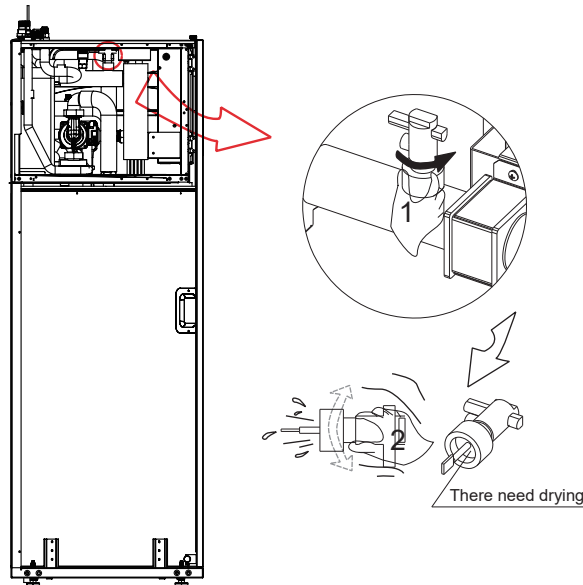


Fig.8-6

💡 NOTE

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

⚠ CAUTION

Be careful not to deform the unit's piping by using excessive force when connecting the piping. Deforming the piping may lead to malfunction of heat pump.

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

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

💡 NOTE

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

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

8.8 Water

NOTE

- Circulators function well exclusively with clean and high-quality tap water.
- Risk of material damage due to poor-quality water.
- The most frequent factors that can affect circulators and the system are oxygen, limescale, sludge, acidity level and other substances (including chlorides and minerals).
- In addition to the quality of water, installation also plays an important role. The heating system must be airtight. Choose materials that are not sensitive to oxygen diffusion (risk of corrosion...).

Characteristics of the water

- compliant with local regulations.
- Langelier Index (LI) between 0 and + 0.4.
- within the limits indicated in the chart.

Water quality must be checked by qualified personnel.

Hardness

If the water is hard, install a system suitable to preserve the unit from harmful deposits and limestone formation.

NOTE

If necessary, fit a water softener to reduce water hardness.

Cleanliness

Before connecting the water to the unit, clean the system thoroughly with specific products effective to remove residues or impurities that may affect functioning. Existing systems must be free from sludge and contaminants and protected against buildups.

New systems

In case of new installations, it is essential to wash the entire installation (with the circulator uninstalled) before commissioning the central installation. This removes residues of the installation process (welding, waste, joint products...) and preservatives (including mineral oil). The system must then be filled with clean high-quality tap water.

Existing systems

If a new boiler or heat pump is installed on an existing heating system, the system must be rinsed to avoid the presence of particles, sludge and waste. The system must be drained before installing the new unit. Dirt can be removed only with a suitable water flow. Each section must then be washed separately.

Particular attention must also be paid to "blind spots" where a lot of dirt can accumulate due to the reduced water flow. The system must then be filled with clean high-quality tap water. If, after rinsing, the quality of the water is still unsuitable, a few measures must be taken to avoid problems. An option to remove pollutants is to install a filter. Various types of filters are available. A mesh filter is designed to catch large dirt particles. This filter is usually placed in the part with the larger flow. A tissue filter is designed to catch the finer particles.

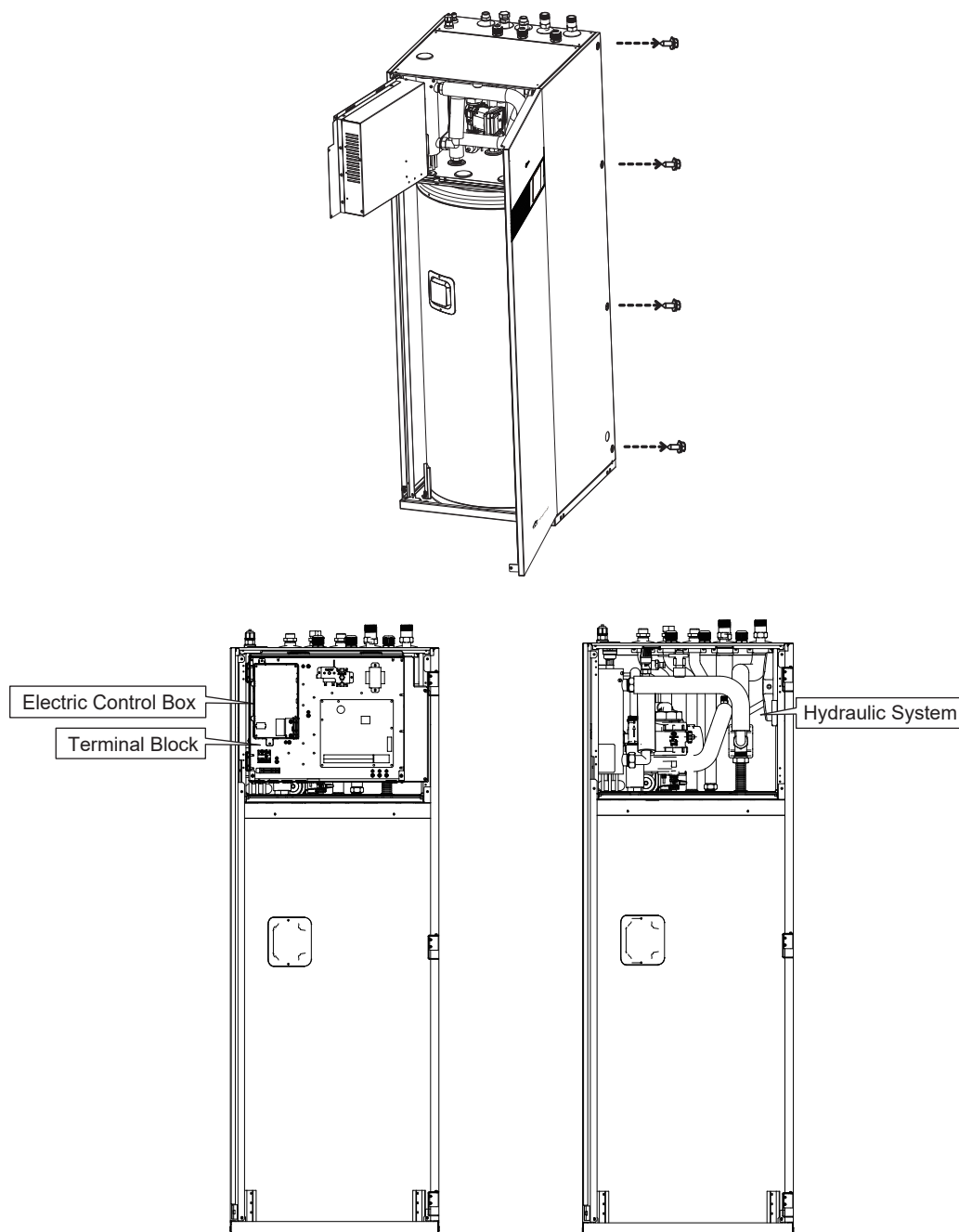
Water component for corrosion limit on Copper

PH	7.5 - 9.0	
Electric conductivity	100 - 500	μS/cm
Total Hardness	4.5 – 8.5	dH
Max. quantity glycol	40	%
Sulfate ions (SO ₄)	< 50	ppm
Alkalinity (HCO ₃)	70 - 300	ppm
Chloride ions (Cl ⁻)	< 50	ppm
Phosphates (PO ₄)	< 2.0	ppm
NH ₃	< 0.5	ppm
Iron (Fe)	< 0.3	ppm
Manganese (Mn)	< 0.05	ppm
Sulfate ions (S)	None	
Ammonium ions (NH ₄)	None	
Silica (SiO ₂)	< 30	ppm
CO ₂	< 50	ppm
Oxygen content	< 0.1	ppm
Sand	< 10 mg/L, 0.1 to 0.7 mm max diameter	
Ferrite hydroxide Fe ₃ O ₄ (black)	Dose < 7.5 mg/L, 50 % of mass, with diameter < 10 μm	
Iron oxide Fe ₂ O ₃ (red)	Dose < 7.5 mg/L, diameter < 1 μm	

9 OVERVIEW OF THE UNIT

9.1 Disassembling the unit

The indoor unit cover can be removed by removing the 2 screws and unhitching the cover.



⚠ CAUTION

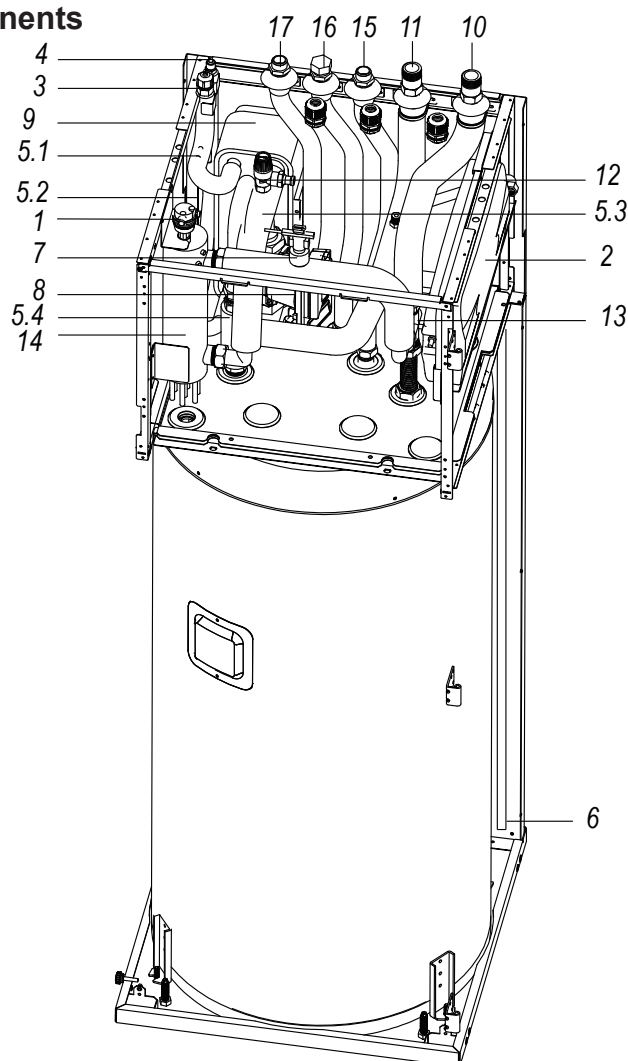
Make sure to fix the cover with the screws and nylon washers when installing the cover (screws are delivered as accessory). Parts inside the unit can be hot.

- To gain access to the control box components – e.g. to connect the field wiring – the control box service panel can be removed. There to, loosen the front screws and unhitch the control box service panel.

⚠ CAUTION

Switch off all power supply – i.e. outdoor unit power supply, indoor unit power supply, electric heater and additional heater power supply – before removing the control box service panel.

9.2 Main components

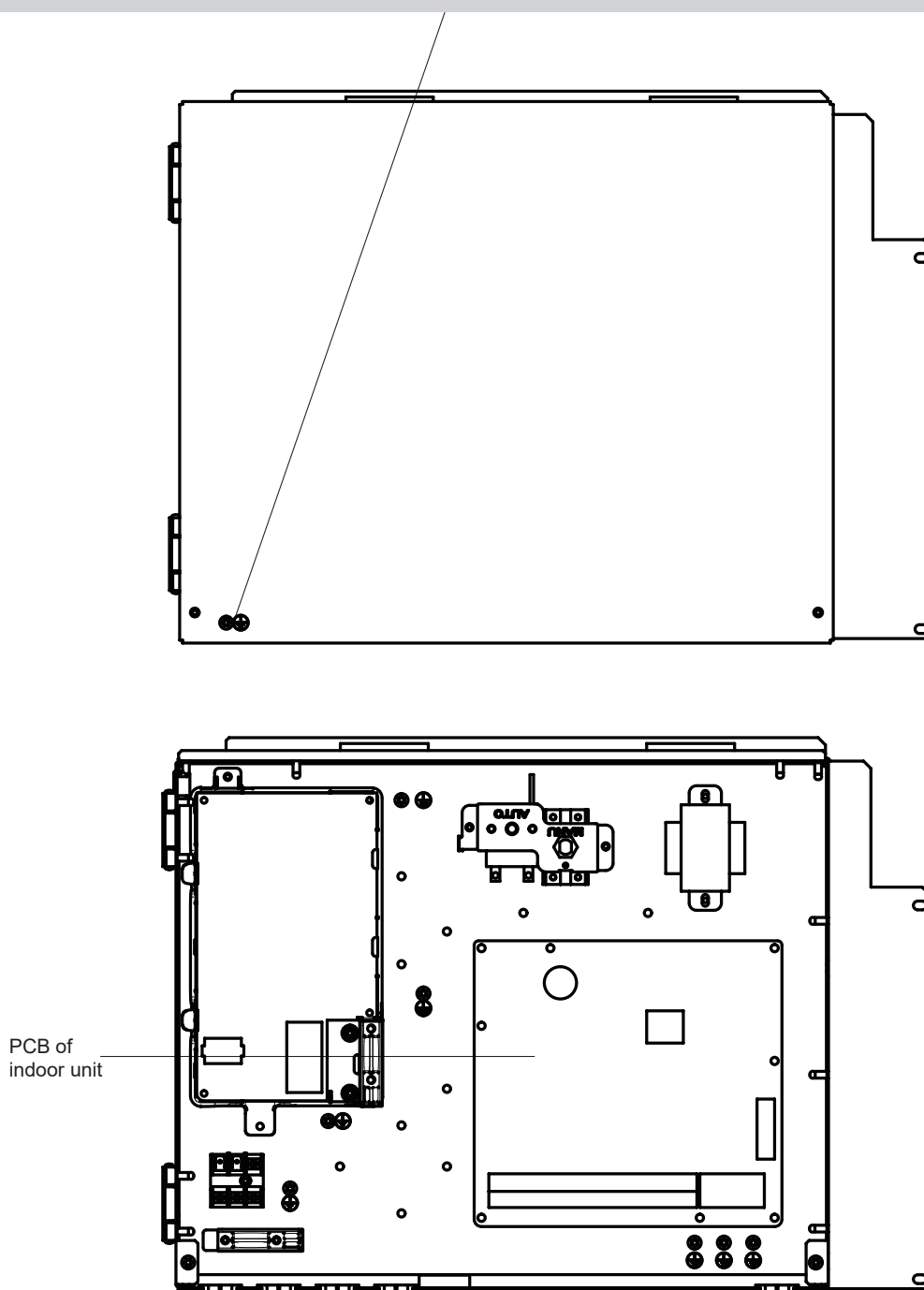


Code	Assembly unit	Description
1	Automatic air purge valve	Remaining air in the water circuit will be automatically removed via the automatic air purge valve.
2	Expansion vessel (8 L)	/
3	Refrigerant gas pipe	/
4	Refrigerant liquid pipe	/
5	Temperature sensors	Four temperature sensors determine the water and refrigerant temperature at various points. 5.1-T2B; 5.2-T2; 5.3-Tw_out; 5.4-Tw_in; 5.5-T1
6	Drainage port	/
7	Flow switch	If water flow is below 0.6 m³/h, the flow switch open, then when the water flow reach 0.66 m³/h,the flow switch close.
8	Pump_i	The pump circulates the water in the water circuit.
9	Plate heat exchanger	Heat exchanging between water and refrigerant.
10	Space heating (cooling) water outlet	/
11	Space heating (cooling) water inlet	/
12	Pressure relief valve	The pressure relief valve prevents excessive water pressure in the water circuit by opening at 43.5 psi(g)/0.3 MPa(g) and discharging some water.
13	3-Way valve	Used for switching between DHW mode and space heating/cooling mode
14	Internal backup heater	The backup heater consists of an electrical heating element that will provide additional heating capacity to the water circuit if the heating capacity of the unit is insufficient due to low outdoor temperatures, it also protects the external water piping from freezing during cold periods.
15	Domestic cold water inlet	/
16	Domestic hot water recirculation water inlet	/
17	Domestic hot water outlet	/

9.3 Electronic control box

NOTE

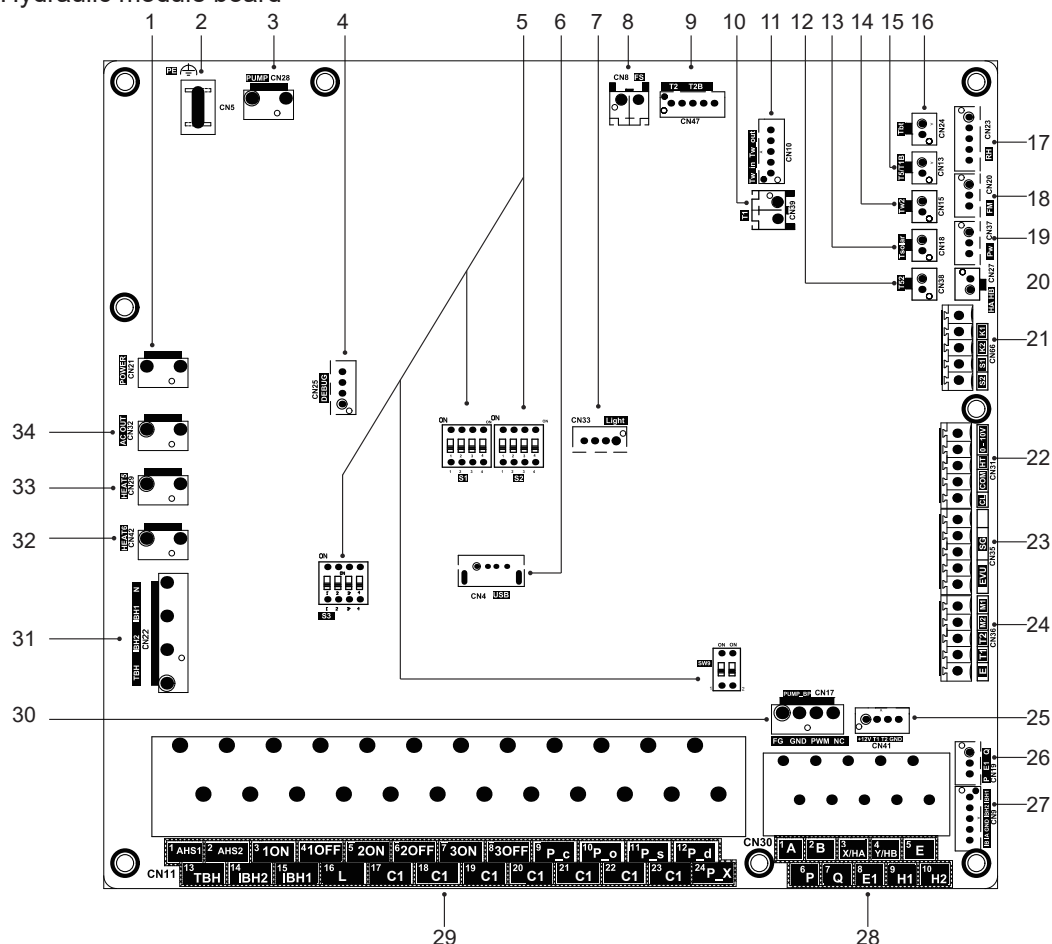
When removing the electric control box cover, loosen the screw on the left side of the electric control box without removing it, so as to prevent the cover from falling suddenly.



NOTE

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

9.3.1 Hydraulic module board



Order	Port	Code	Description	Order	Port	Code	Description
1	CN21	POWER	Port for power supply	23	CN35	SG	Port for smart grid (grid signal)
2	CN5	GND	Port for ground			EVU	Port for smart grid (photovoltaic signal)
3	CN28	PUMP	Port for variable speed pump power input	24	CN36	M1 M2	Port for remote switch
4	CN25	DEBUG	Port for IC programming			T1 T2	Port for thermostat transfer board
5	S1/S2/S3/SW9	/	Dip switch	25	CN41	/	Port for thermostat transfer board
6	CN4	USB	Port for USB programming	26	CN19	P Q	Communicate port between indoor unit and outdoor unit
7	CN33	/	Port for breathing light	27	CN9	/	Port for board
8	CN8	FS	Port for flow switch			3 4	Port for communication with the wired controller
9	CN47	T2	Port for refrigerant liquid side temperature (heating mode)	28	CN30	6 7	Communicate port between hydraulic module board and main control board
		T2B	Port for temperature sensor of refrigerant gas side temperature			9 10	Port for Internal machine Cascade
10	CN39	T1	Port for temperature sensor of final outlet water temperature			1 2	Port for additional heat source
11	CN10	TW_in	Port for temperature sensor of inlet water temperature of plate heat exchanger			3 4 17	Port for SV1(3-way valve)
		TW_out	Port for temperature sensor of outlet water temperature of plate heat exchanger			5 6 18	Port for SV2(3-way valve)
12	CN38	T52	Port for temperature sensor (Reserved)			7 8 19	Port for SV3(3-way valve)
13	CN18	Tsolar	Port for solar panel temp sensor	29	CN11	9 20	Port for zone 2 pump
14	CN15	Tw2	Port for outlet water for zone 2 temp. sensor			10 21	Port for outside circulation pump
15	CN13	T5	Port for domestic hot water tank temp. sensor			11 22	Port for solar energy pump
16	CN24	Tbt	Port for temperature sensor of balance tank			12 23	Port for DHW pipe pump
17	CN23	RH	Port for humidity sensor (Reserved)			13 18	Control port for tank booster heater
18	CN20	FM	Port for water flow sensor (Reserved)			14 18	Control port for internal backup heater 1
19	CN37	Pw	Port for water pressure sensor (Reserved)			15 17	Control port for internal backup heater 2
20	CN27	HA/HB	Port for communication with the HOME BUS wired controller (Reserved)	30	CN17	PUMP_BP	Port for variable speed pump communication
21	CN66	K1 K2	Input port (Reserved)	31	CN22	IBH1	Control port for internal backup heater 1
		S1 S2	Input port for solar energy			IBH2	Control port for internal backup heater 2
22	CN31	10V GND	Output port for 0-10V			TBH	Control port for tank booster heater
		HT	Control port for room thermostat	32	CN42	HEAT6	Port for anti-freeze electric heating tape(internal)
		COM	Power port for room thermostat	33	CN29	HEAT5	Port for anti-freeze electric heating tape(internal)
		CL	Control port for room thermostat	34	CN32	AC OUT	Port for backup heater

9.4 Refrigerant pipework

For all guidelines, instructions and specifications regarding refrigerant pipework between the indoor unit and outdoor unit, please refer to "Installation and owner's manual (M-thermal split outdoor unit)".

⚠ CAUTION

When connecting the refrigerant pipes, always use two wrenches/spanners for tightening or loosening nuts! Failure to do so can result in damaged piping connections and leaks.

💡 NOTE

- The appliance contains fluorinated greenhouse gases. Chemical name of the gas: R32
- Fluorinated greenhouse gases are contained in hermetically sealed equipment.
- An electrical switchgear has a tested leakage rate of less than 0.1 % per year as set out in the technical specification of the manufacturer.

9.5 Filling water

9.5.1 Filling the water circuit

- Connect the water supply to the filling valve and open the valve.
- Make sure all the automatic air purge valves are open (at least 2 turns).
- Filling with water until the manometer(field supply) indicates a pressure of approximately 2.0 bar. Remove air in the circuit as much as possible using the automatic air purge valves.

Open the automatic air purge valve, turn counterclockwise at least 2 full turns to release air from the system.

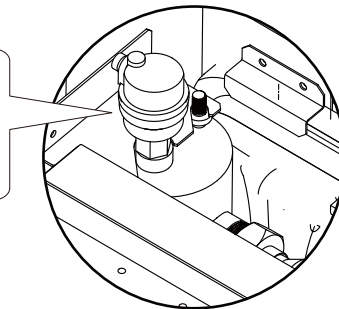


Fig.9-1

💡 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 valve during the first operating hours of the system. Topping up the water afterwards might be required.

- The water pressure indicated on the manometer will vary depending on the water temperature (higher pressure at higher water temperature). However, at all times water pressure should remain above 0.5 bar to avoid air entering the circuit.
- The unit might drain-off too much water through the pressure relief valve.
- Water quality should be complied with EN 98/83 EC Directives.
- Detailed water quality condition can be found in EN 98/83 EC Directives.

💡 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.
- if each space heating (cooling loop is controlled by the valves, the overpressure bypass valve(field supply) should be mounted between the heating(cooling) loops.

9.5.2 Filling the domestic hot water tank

1. Open every hot water tap in turn to purge air from the pipes of the system.
2. Open the cold water supply valve.
3. Close all water taps after all air is purged.
4. Check for water leakage.
5. Manually operate the field-installed pressure relief valve to ensure a free water flow through the discharge pipe.

⚠ CAUTION

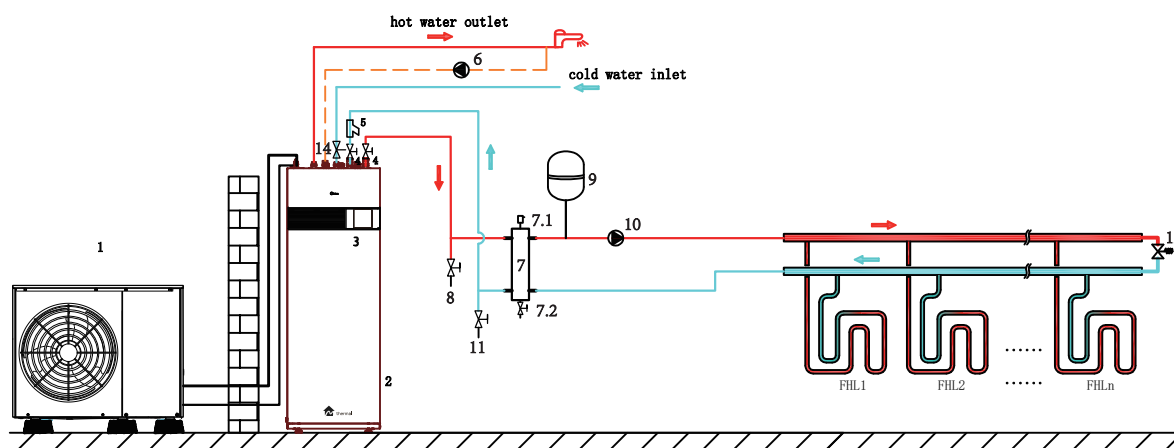
- Cold water inlet pressure should be less than 1.0 MPa. Expansion vessel and safety valve (field supply, protection pressure is 1.0 MPa) must be installed.
- Warning and Water Quality Directive and Groundwater: This product is designed to comply with the European Water Quality Directive 98/83/EC amended by 2015/1787/EU. The lifespan of the product is not guaranteed in the case of the use of groundwater, such as spring water or well water, the use of tap water when salt or other impurities are contained, nor in areas of acidic water quality. Maintenance and warranty costs related to these cases are the customer's responsibility.

9.6 Typical applications

⚠ CAUTION

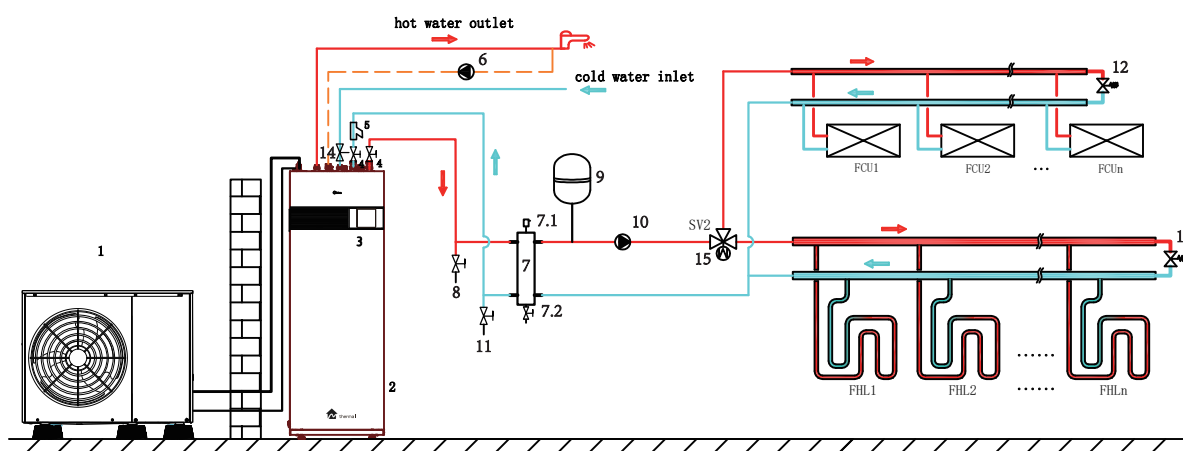
To avoid backsiphonage, it is required to install a non-return valve on the water inlet of the domestic hot water tank or water loop in accordance with the applicable legislation.

9.6.1 Application 1



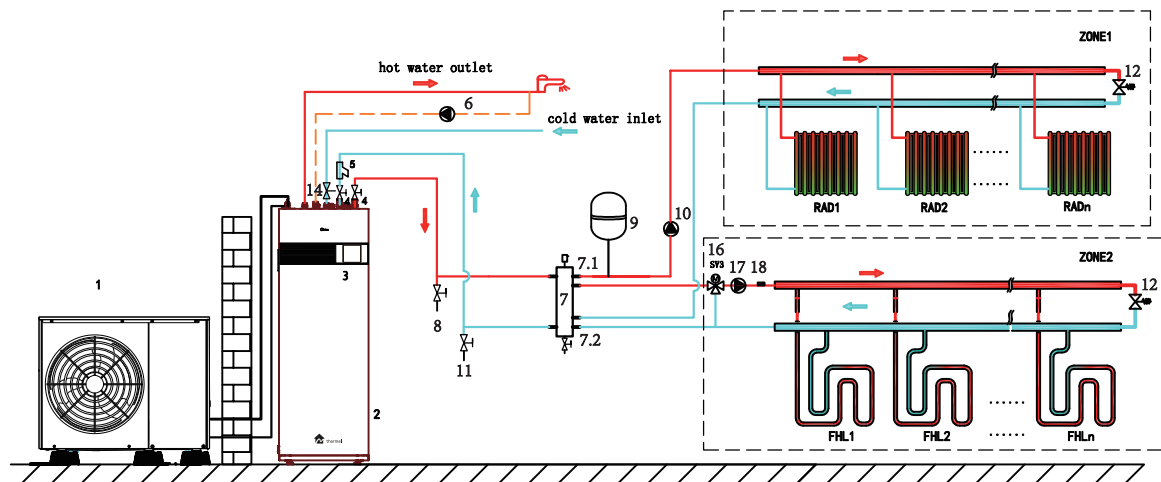
One zone for floor heating loops

9.6.2 Application 2



One zone for floor heating loops and fan coil

9.6.3 Application 3



Double zone for floor heating loops and radiators

Code	Assembly unit	Code	Assembly unit
1	Outdoor unit	9	Expansion vessel (Field supply)
2	Indoor unit with tank	10	P_o: Outside circulation pump (Field supply)
3	User interface	11	Filling valve (Field supply)
4	Shut-off valve (Field supply)	12	Bypass valve (Field supply)
5	Filter (Accessory)	13	Plate heat exchanger (Field supply)
6	P_d: DHW circulation pump (Field supply)	14	Pressure relief valve (Field supply)
7	Hydraulic separator	15	SV2: 3-way valve (Field supply)
7.1	Automatic air purge valve	16	SV3: 3-way valve (Field supply)
7.2	Drainage valve	17	P_c: zone2 circulation pump (Field supply)
8	Drainage valve (Field supply)	18	Tw2: zone 2 temperature sensor (optional)

Space heating/cooling

One zone application

1) When the unit is ON, P_o keeps running, if unit is OFF, P_o stops running

2) When the unit cooling mode is ON, SV2 keeps OFF

3) When the unit heating mode is ON, SV2 keeps ON,

Double zone application

When zone 1 is ON, P_o keeps running, if zone 1 is OFF, P_o stops running

When zone 2 is ON, P_c keeps running, SV3 switches between ON and OFF according to the Tw2 sensor, if zone 2 is OFF, SV3 keeps OFF, P_c stops running.

The floor heating loops require a lower water temperature in heating mode compared to Radiators or fan coil. To achieve these two set points, a mixing station is used to adapt the water temperature according to requirements of the floor heating loops. The radiators are directly connected to the unit water circuit and the floor heating loops are after the mixing station. The mixing station includes SV3, P_c and Tw2, can be controlled by indoor unit.

Domestic water heating

The ON/OFF signal and target tank water temperature (T5S) are set on the user interface.

P_o/P_c stops running as long as the unit is ON for domestic water heating.

NOTE

1. Install air purge valves at all local high points
2. Drainage valve must be installed at the lowest position of the piping system.
3. A pressure relief valve with an opening pressure of maximum 10 bar (= 1 MPa) must be installed on the domestic cold water inlet connection in accordance with the applicable legislation.

10 FIELD WIRING

WARNING

- 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.
- The appliance shall be installed in accordance with national wiring regulations. .
- 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 earth. Do not earth the unit to a utility pipe, surge protector, or telephone earth. Incomplete earthing may cause electrical shock.
- Be sure to install a earth fault circuit interrupter (30 mA). Failure to do so may cause electrical shock.
- Be sure to install the required fuses or circuit breakers.

10.1 Precautions on electrical wiring work

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

NOTE

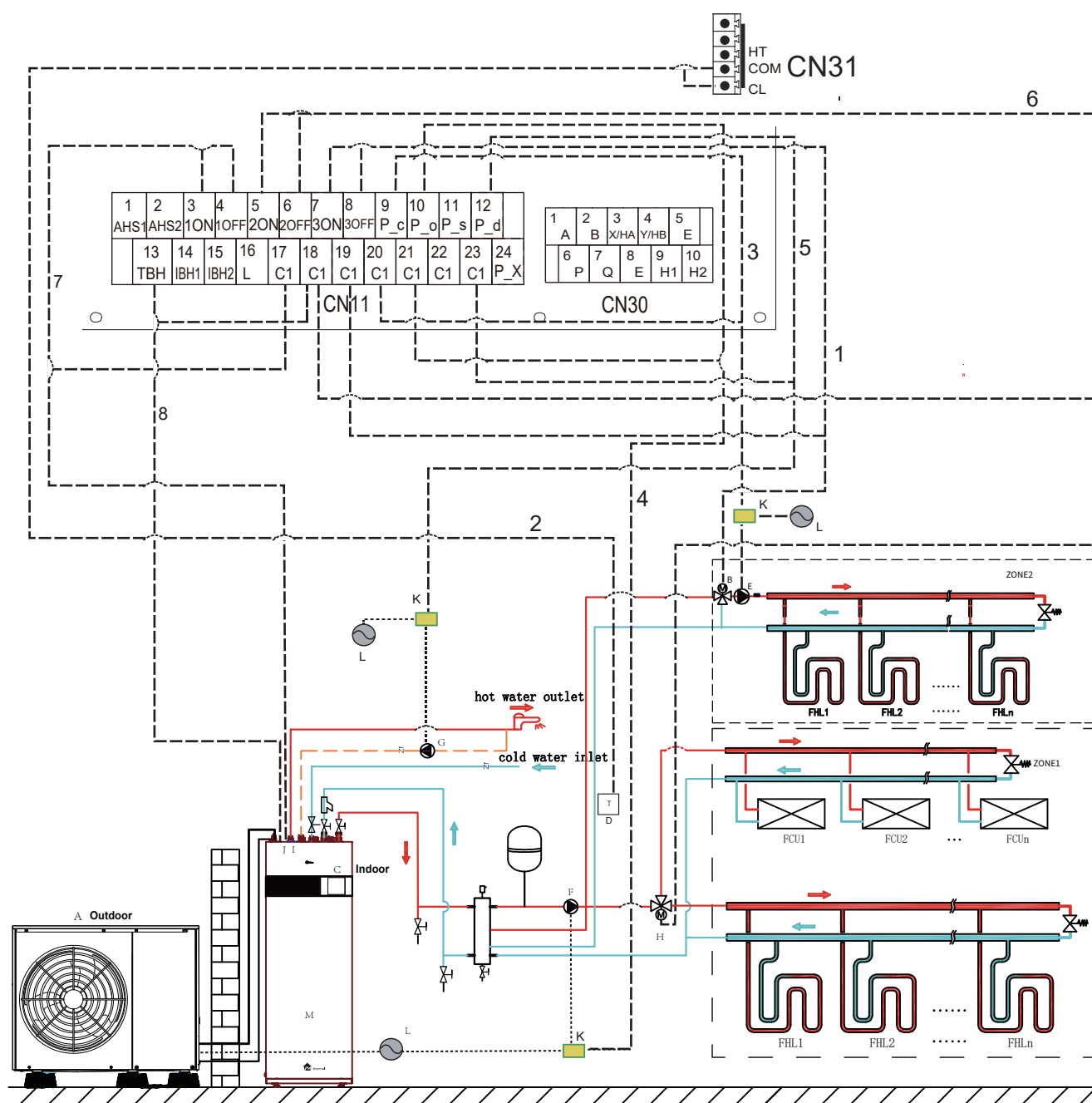
The earth fault circuit interrupter must be a high- speed type breaker of 30 mA (< 0.1 s).

NOTE

- Maximum length of communication wirings is 50 m.
 - Power cords and communication wiring must be laid out separately, they can not be placed in the same conduit.
 - Otherwise, it may lead to electromagnetic interference. Power cords and communication wirings should not come in contact with the refrigerant pipe so as to prevent the high temperature pipe from damaging the wires.
 - Communication wirings must use shielded lines. Including indoor unit to outdoor unit PQE line ,indoor unit to controller ABXYE line.
- This unit is equipped with an inverter. Installing a phase advancing capacitor not only will reduce the power factor improvement effect, but also may cause abnormal heating of the capacitor due to high-frequency waves. Never install a phase advancing capacitor as it could lead to an accident.
 - Equipment must be earthed.
 - All high-voltage external load, if it is metal or a earthed port, must be earthed.
 - All external load current is needed less than 0.2 A, if the single load current is greater than 0.2 A, the load must be controlled through AC contactor.

10.1.1 Wiring overview

The illustration below gives an overview of the required field wiring between several parts of the installation. Refer also to "9.6 Typical application".



One zone for floor heating loops and fan coil

Code	Assembly unit	Code	Assembly unit
A	Outdoor unit	H	SV2: 3-way valve (field supply)
B	SV3: 3-way valve (field supply)	I	SV1: 3-way valve for domestic hot water tank (field supply)
C	User interface	J	Booster heater
D	Low voltage room thermostat (field supply)	K	Contactator
E	P_c: Zone 2 pump (field supply)	L	Power supply
F	P_o: Outside circulation pump (field supply)	M	Indoor unit
G	P_d: DHW pump (field supply)		

Item	Description	AC/DC	Required number of conductors	Maximum running current
1	SV3: 3-way valve control cable	AC	3	200 mA(a)
2	Room thermostat cable	AC	2	200 mA(a)
3	Zone 2 pump control cable	AC	2	200 mA(a)
4	Outside circulation pump control cable	AC	2	200 mA(a)
5	DHW pump control cable	AC	2	200 mA(a)
6	SV2: 3-way valve control cable	AC	3	200 mA(a)
7	SV1: 3-way valve control cable	AC	3	200 mA(a)
8	Booster heater control cable	AC	2	200 mA(a)
9	Power supply cable for indoor unit	AC	60	0.4 A
			100	0.4 A
			160	0.4 A
			60(3 kW heater)	13.5 A
			100(3 kW heater)	13.5 A
			160(3 kW heater)	13.5 A
			4+GND	60(9 kW heater)
				100(9 kW heater)
				160(9 kW heater)

(a) Minimum cable section AWG18 (0.75 mm²).

(b) The thermistor cable are delivered with the unit: if the current of the load is large, an AC contactor is needed.

⚠ CAUTION

Please use H07RN-F for the power wire, all the cable are connect to high voltage except for thermistor cable and cable for user interface.

- Equipment must be earthed.
- All high-voltage external load, if it is metal or a earthed port, must be earthed.
- All external load current is needed less than 0.2 A, if the single load current is greater than 0.2 A, the load must be controlled through AC contactor.
- "AHS1" "AHS2" wiring terminal ports only provide the switch signal.
- Expansion valve E-Heating tape, Plate heat exchanger E-Heating tape and Flow switch E-Heating tape share a control port.

Field wiring guidelines

- Most field wiring on the unit is to be made on the terminal block inside the switch box. To gain access to the terminal block, remove the handle sheet metal.

⚠ WARNING

Switch off all power including the unit power supply and backup heater and domestic hot water tank power supply (if applicable) before removing the handle sheet metal.

- Fix all cables using cable ties.
- A dedicated power circuit is required for the backup heater.
- Installations equipped with a domestic hot water tank (field supply) require a dedicated power circuit for the booster heater. Please refer to the domestic hot water tank Installation & Owner's Manual. Secure the wiring in the order shown below.
- Lay out the electrical wiring so that the front cover does not rise up when doing wiring work and attach the front cover securely.
- Follow the electric wiring diagram for electrical wiring works (the electric wiring diagrams are located on the rear side of handle sheet metal).
- Install the wires and fix the cover firmly so that the cover may be fit in properly.

10.2 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.

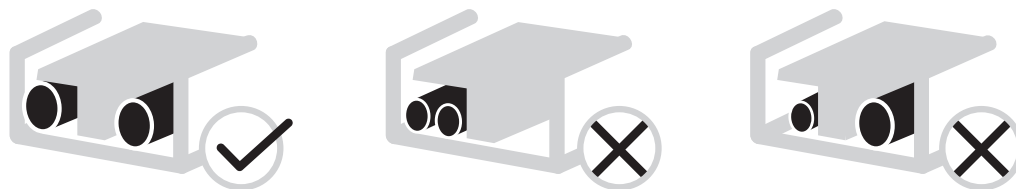


Fig. 10-1

- 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 earth 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 cannot affect the terminals.

10.3 Safety device requirements

1. Select the wire diameters(minimum value) individually for each unit based on the table below.
2. Select circuit breaker that having a contact separation in all poles not less than 3 mm providing full disconnection, where MFA is used to select the current circuit breakers and residual current operation breakers:

System	Power Current						IWPM	
	Hz	Voltage (V)	Min. (V)	Max. (V)	MCA (A)	MFA (A)	kW	FLA (A)
60	50	220-240/1N	198	264	1.20	10	0.087	0.66
100	50	220-240/1N	198	264	1.20	10	0.087	0.66
160	50	220-240/1N	198	264	1.20	10	0.087	0.66

Backup heater

System	Power Current						IWPM	
	Hz	Voltage (V)	Min. (V)	Max. (V)	MCA (A)	MFA (A)	kW	FLA (A)
60(3 kW heater)	50	220-240/1N	198	264	16.90	20	0.087	0.66
100(3 kW heater)	50	220-240/1N	198	264	16.90	20	0.087	0.66
160(3 kW heater)	50	220-240/1N	198	264	16.90	20	0.087	0.66
60(9 kW heater)	50	380-415/3N	342	456	16.90	20	0.087	0.66
100(9 kW heater)	50	380-415/3N	342	456	16.90	20	0.087	0.66
160(9 kW heater)	50	380-415/3N	342	456	16.90	20	0.087	0.66

⚠ CAUTION

MCA : Min. Circuit Amps. (A)
MFA : Max. Fuse Amps. (A)
IWPM: Indoor Water Pump Motor
FLA : Full Load Amps. (A)

10.4 Before connecting the wiring

- 1.Remove the bolt in the lower left corner of indoor unit.
- 2.Open the front panel.
- 3.Remove the cover of the control box.

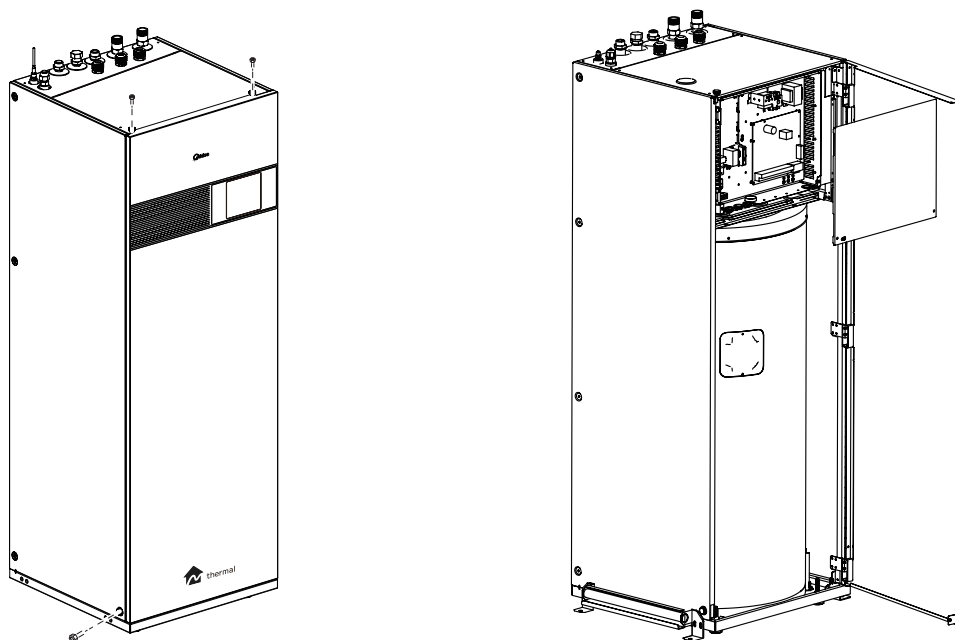


Fig. 10-2

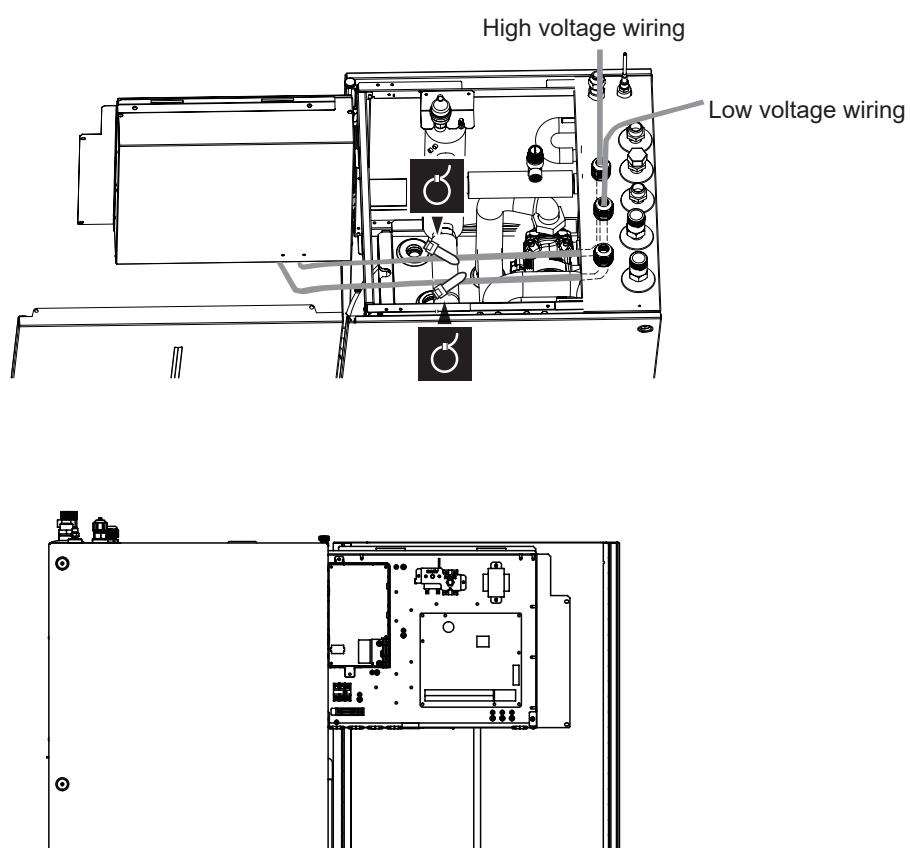
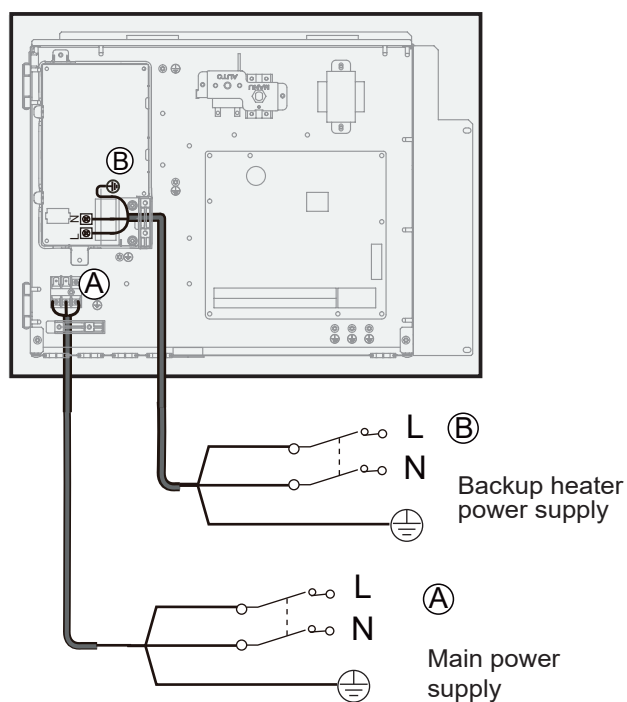


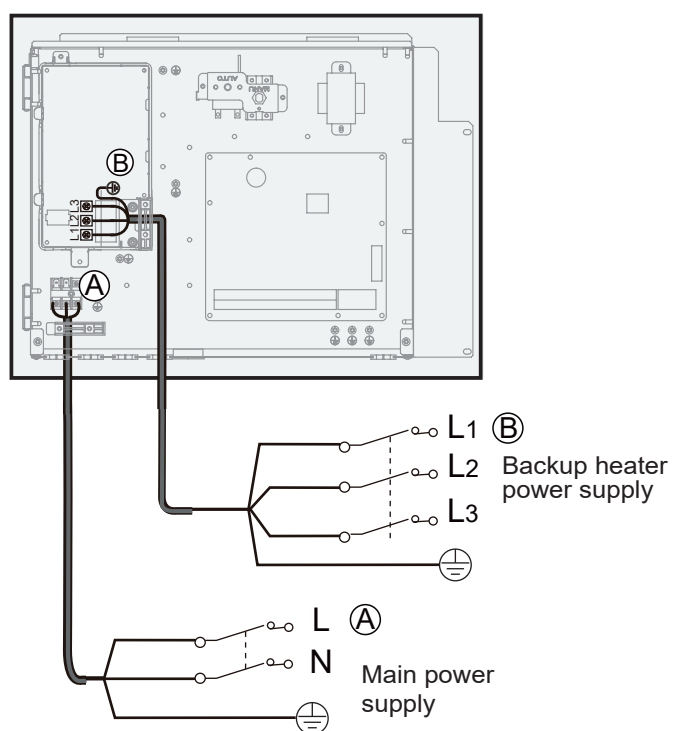
Fig. 10-3

10.4.1 Specifications of standard wiring components

1 phase with backup heater.



3 phase with backup heater.



⚠ CAUTION

Leakage protection switch must be installed.

Unit	Main power supply	Backup heater power supply	
		3 kW-1Ph	9 kW-3Ph
Wiring size(mm ²)	1.5	4.0	4.0

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

⚠ CAUTION

When connecting to the power supply terminal, use the circular wiring terminal with the insulation casing (see Figure 8.1). Use power cord that conforms to the specifications and connect the power cord firmly. To prevent the cord from being pulled out by external force, make sure it is fixed securely.

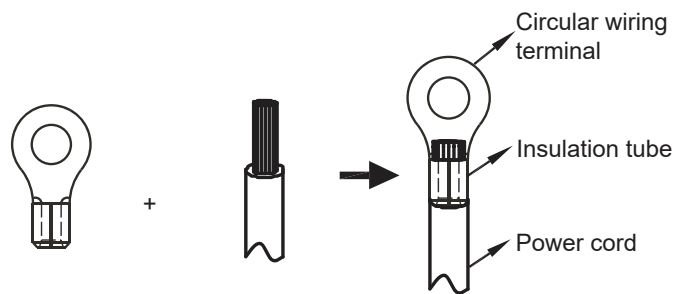


Figure 8.1

⚠ CAUTION

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

Mode selection of 3-phase 3/6/9 kW backup heater		
Option 1 /3 kW	Option 2/6 kW	Option 3 /9 kW
S1	S1	S1

⚠ CAUTION

The default of backup heater is as option 3 (for 9 kW backup heater). If 3 kW or 6 kW backup heater is needed, please ask professional installer to change the Dip switch S1 to option 1(for 3 kW backup heater) or option 2(for 6 kW backup heater), refer to FUNCTION SETTING.

10.4.2 Connection for other components unit 3-16 kW

Port provide the control signal to the load. Two kind of control signal port:

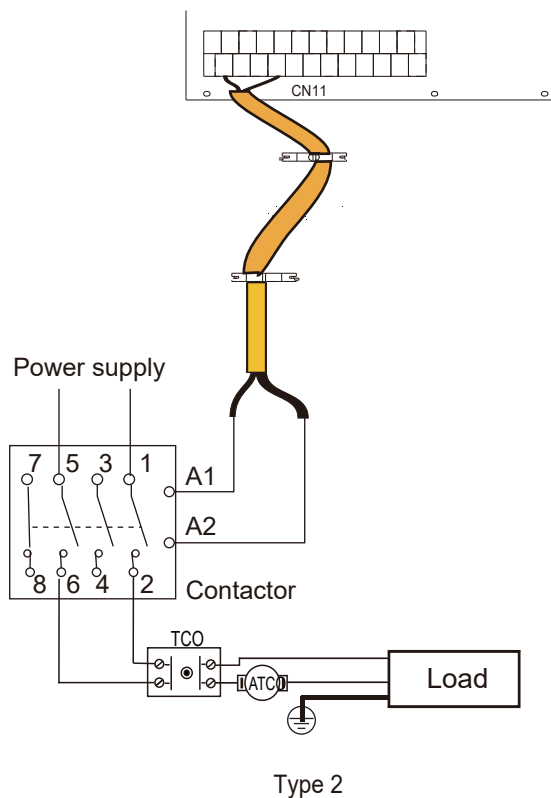
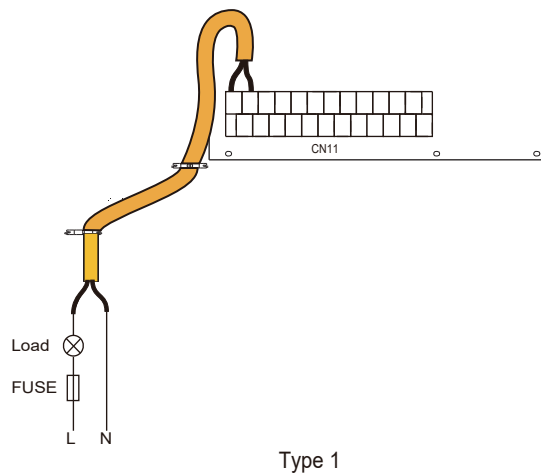
Type 1: Dry connector without voltage.

Type 2: Port provide the signal with 220 V voltage.

If the current of load is < 0.2 A, load can connect to the port directly.

If the current of load is ≥ 0.2 A, the AC contactor is required to connected for the load.

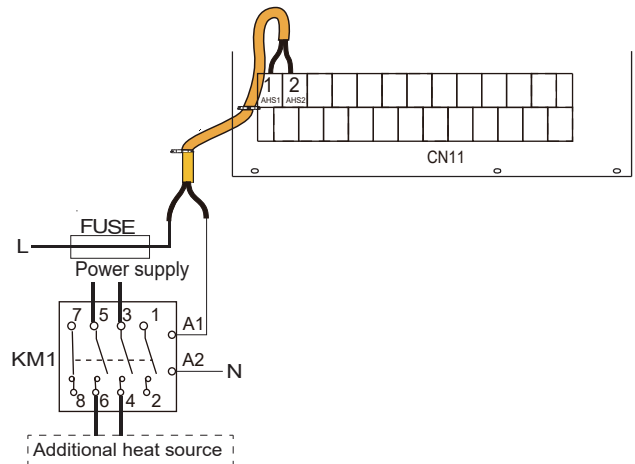
For example:



Control signal port of hydraulic module: The CN11 contains terminals for 3-way valve, pump, booster heater, etc.

The parts wiring is illustrated below:

1) For additional heat source control(AHS):



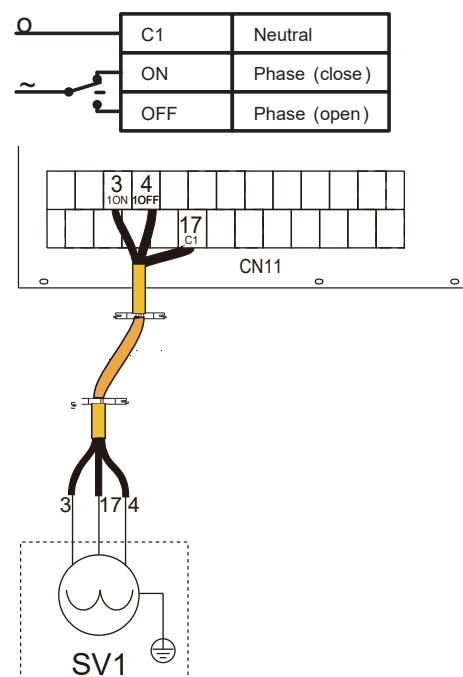
Voltage	220-240 V AC
Maximum running current(A)	0.2
Minimum wiring size(mm ²)	0.75
Control port signal type	Type 1

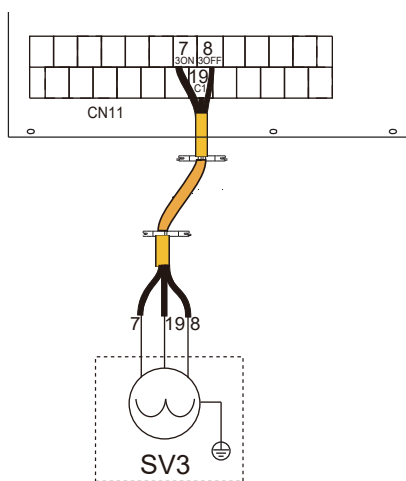
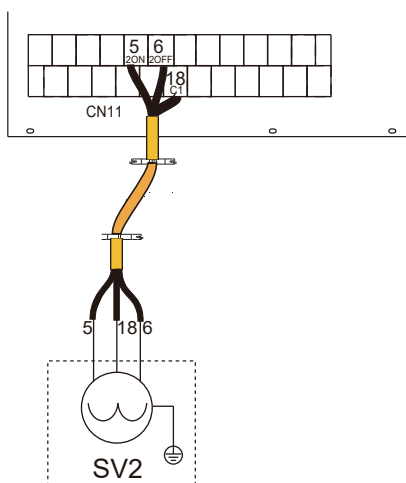
WARNING

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

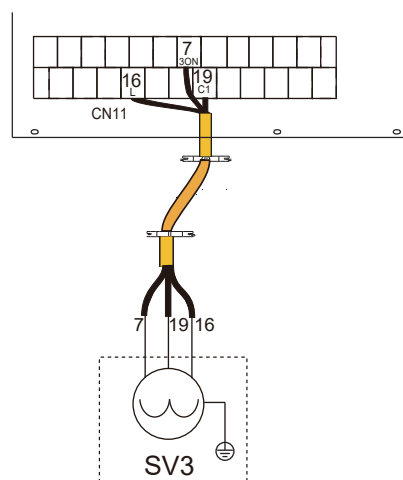
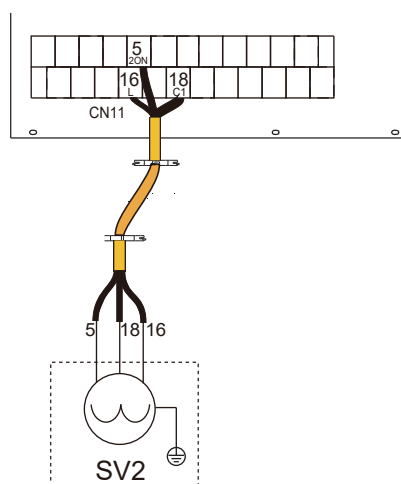
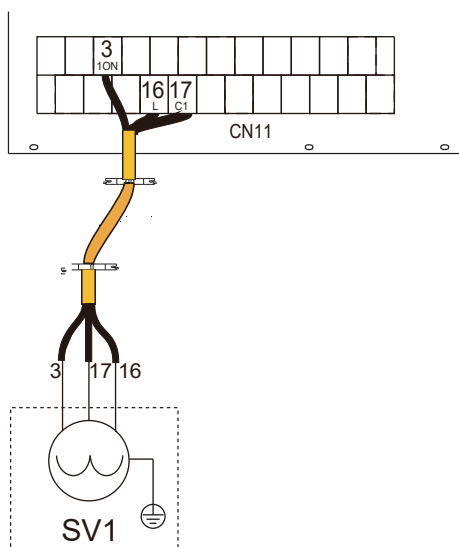
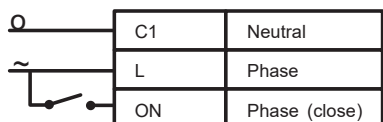
2) For 3-way valve SV1、SV2 and SV3:

The illustration below is for this type of SV:





The illustration below is for this type of SV:

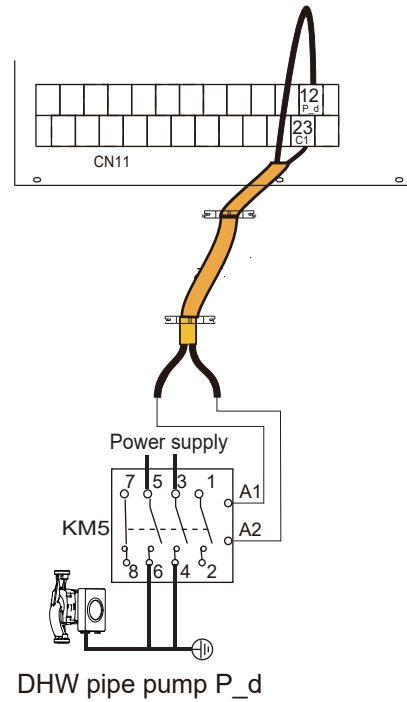
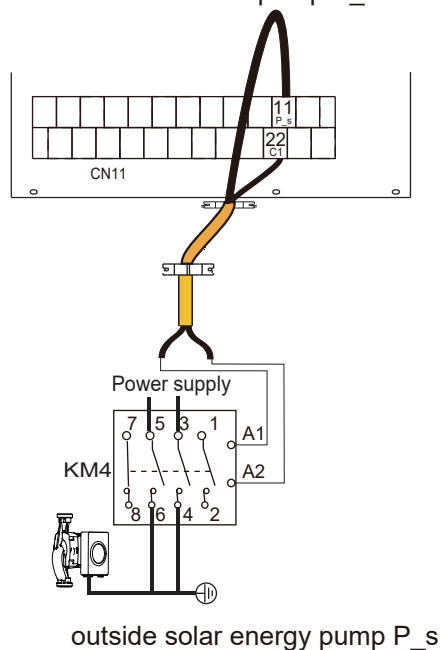
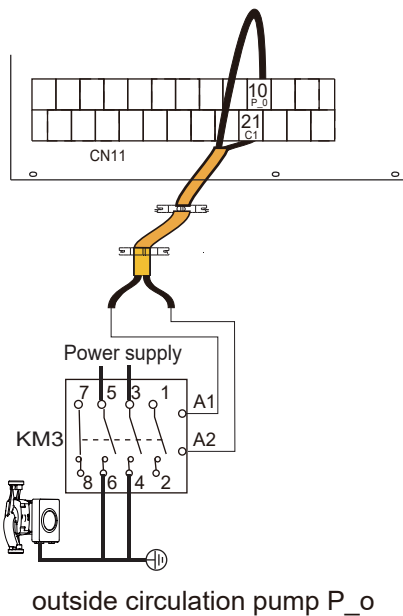
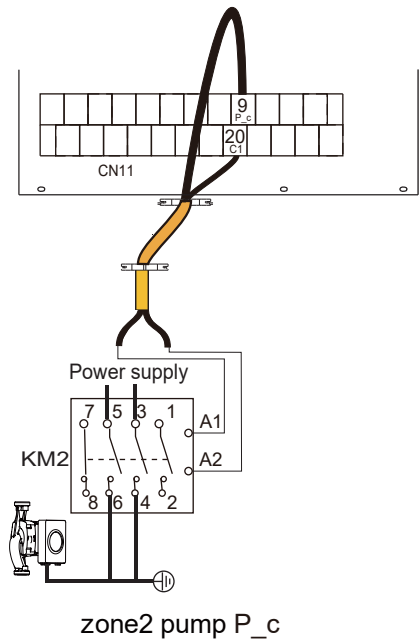


Voltage	220-240 V AC
Maximum running current(A)	0.2
Minimum wiring size(mm ²)	0.75
Control port signal type	Type 2

a) Procedure

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

3) For outside pump :

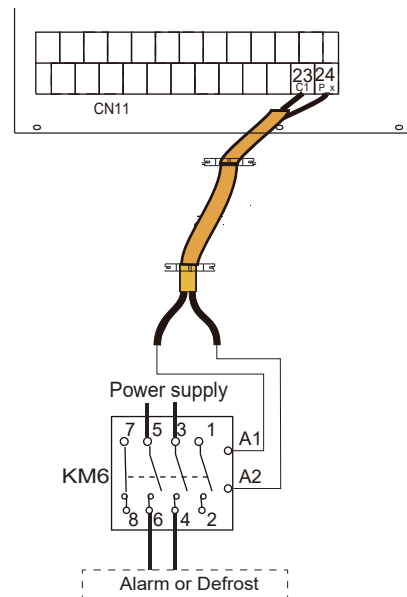


Voltage	220-240 V AC
Maximum running current(A)	0.2
Minimum wiring size(mm ²)	0.75
Control port signal type	Type 2

a) Procedure

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

4) For alarm or Defrost run(P_x):

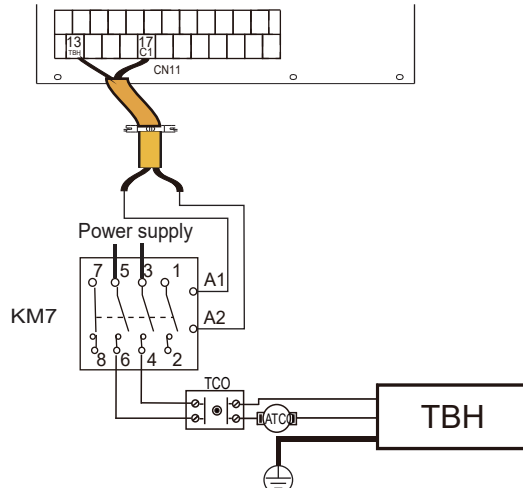


Voltage	220-240 V AC
Maximum running current(A)	0.2
Minimum wiring size(mm ²)	0.75
Control port signal type	Type 2

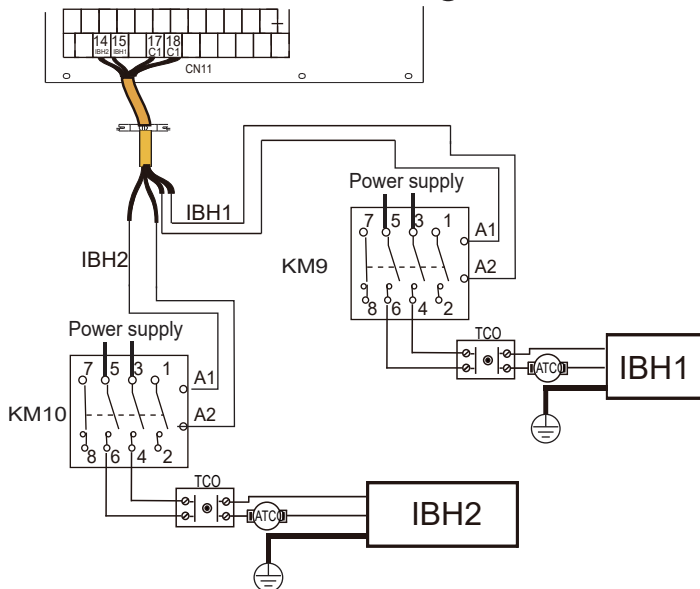
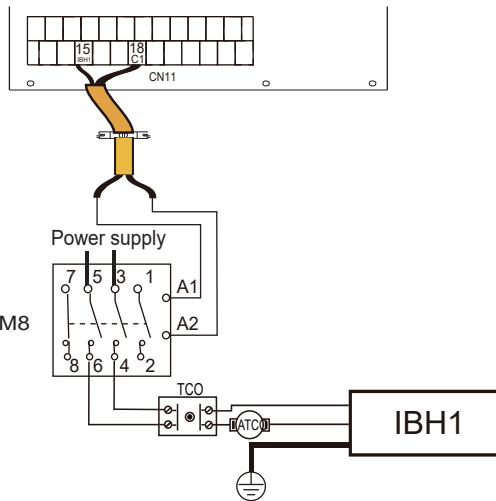
a) Procedure

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

5) For tank booster heater(TBH):



6) For internal backup heater(IBH)



Voltage	220-240 V AC
Maximum running current(A)	0.2
Minimum wiring size(mm ²)	0.75
Control port signal type	Type 2

NOTE

- The unit only sends an ON/OFF signal to the heater.
- IBH2 cannot be wired independently.

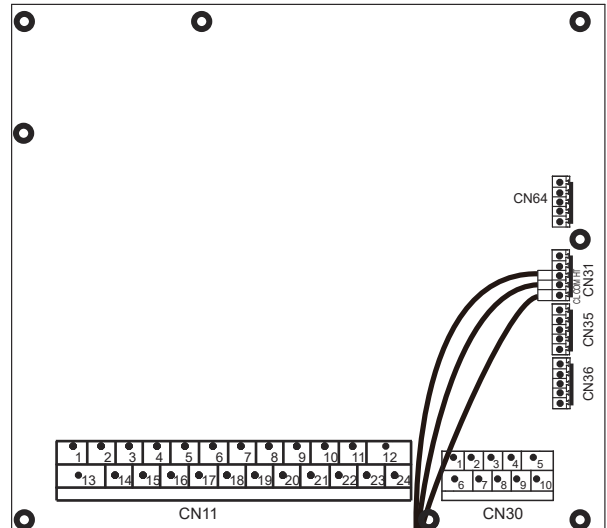
7) For room thermostat:

Room thermostat (extra-low-voltage) : "POWER IN" provide the voltage to the RT.

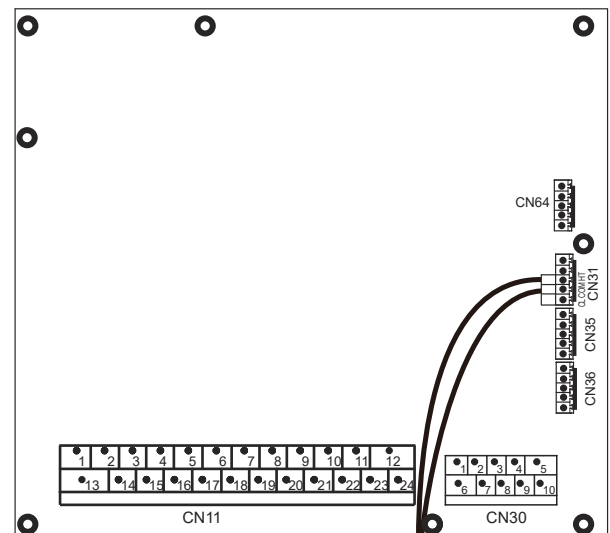
NOTE

The room thermostat must extra-low-voltage.

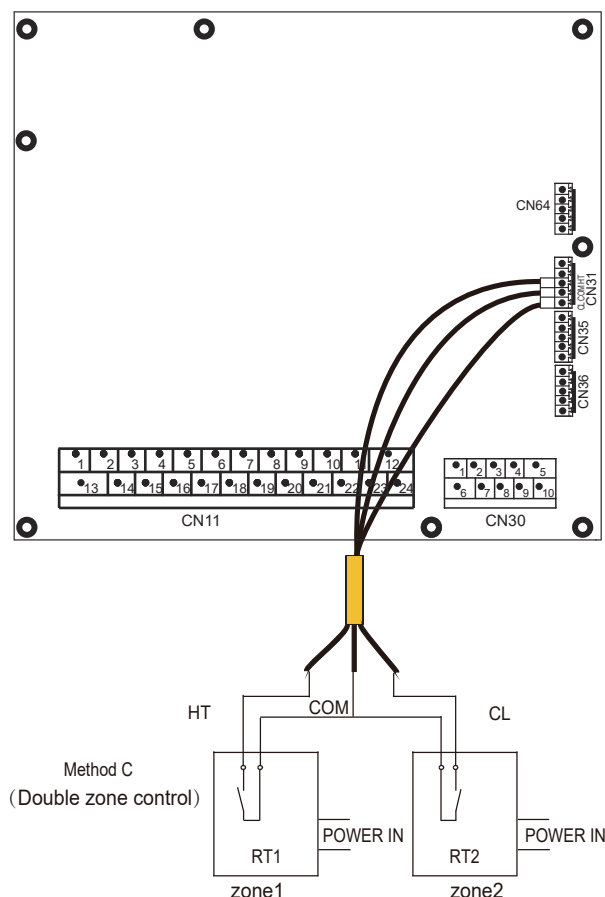
Room thermostat (extra-low-voltage):



Method A
(Mode set control)



Method B
(One zone control)



There are three methods for connecting the thermostat cable (as described in the picture above) and it depends on the application.

- **Method A (Mode set control)**

RT can control heating and cooling individually, like the controller for 4-pipe FCU. When the hydraulic module is connected with the external temperature controller, user interface FOR SERVICEMAN set ROOM THERMOSTAT to MODE SET:

A.1 When "CL" of the thermostat keep closing for 15 s, the system will run according to the priority mode set on the user interface.

A.2 When "CL" of the thermostat keep opening for 15s and "HT" close , the system will run according to the non-priority mode set on the user interface.

A.3 When "HT" of the thermostat keep opening for 15s and "CL" open , the system will turn off.

A.4 When "CL" of the thermostat keep opening for 15 s and "HT" open , the system will turn off.

The port closing voltage is 12 V DC, the port disconnection voltage is 0 V DC.

- **Method B (One zone control)**

RT provide the switch signal to unit. User interface FOR SERVICEMAN set ROOM THERMOSTAT to ONE ZONE:

B.1 When unit detect voltage is 12 V DC between HT and COM, unit turns on.

B.2 When unit detect voltage is 0 V DC between HT and COM, unit turns off.

- **Method C (Double zone control)**

Hydraulic Module is connected with two room thermostat, while user interface FOR SERVICEMAN set ROOM THERMOSTAT to DOUBLE ZONE:

C.1 When unit detect voltage is 12 V DC between HT and COM , zone1 turn on. When unit detect voltage is 0 V DC between HT and COM, zone1 turn off.

C.2 When unit detect voltage is 12 V DC between CL and COM, zone2 turn on according to climate temp curve. When unit detect voltage is 0V between CL and COM, zone2 turn off.

C.3 When HT-COM and CL-COM are detected as 0 V DC, unit turn off.

C.4 when HT-COM and CL-COM are detected as 12 V DC, both zone1 and zone2 turn on.

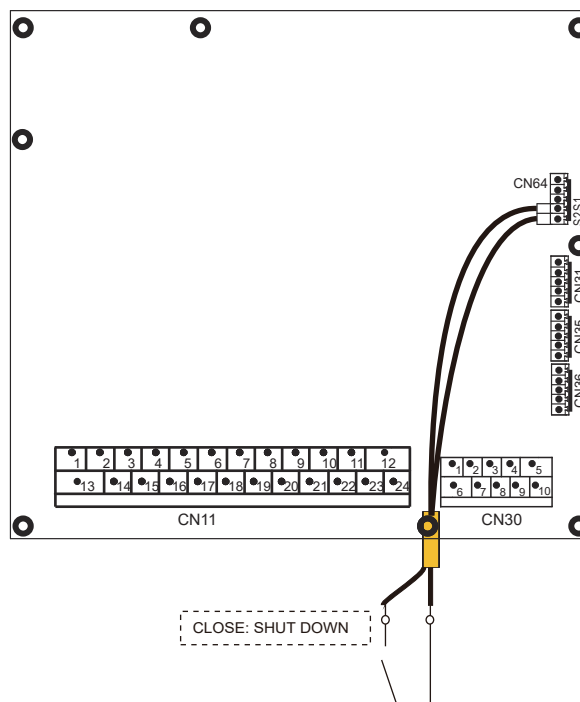
NOTE

- The wiring of the thermostat should correspond to the settings of the user interface.
- Power supply of machine and room thermostat must be connected to the same Neutral Line .
- When ROOM THERMOSTAT is not set to NON, the indoor temperature sensor Ta can't be set to valid.
- Zone 2 can only operate in heating mode, When cooling mode is set on user interface and zone1 is OFF, "CL" in zone2 closes, system still keeps 'OFF'. While installation, the wiring of thermostats for zone1 and zone2 must be correct.

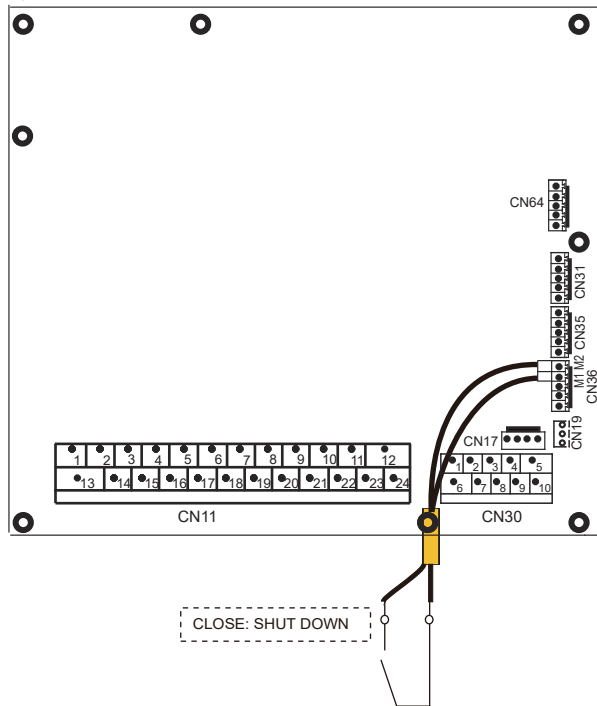
a) Procedure

- Connect the cable to the appropriate terminals as shown in the picture.
- Fix the cable with cable ties to the cable tie mountings to ensure stress relief.

8) For solar energy input signal(low voltage):

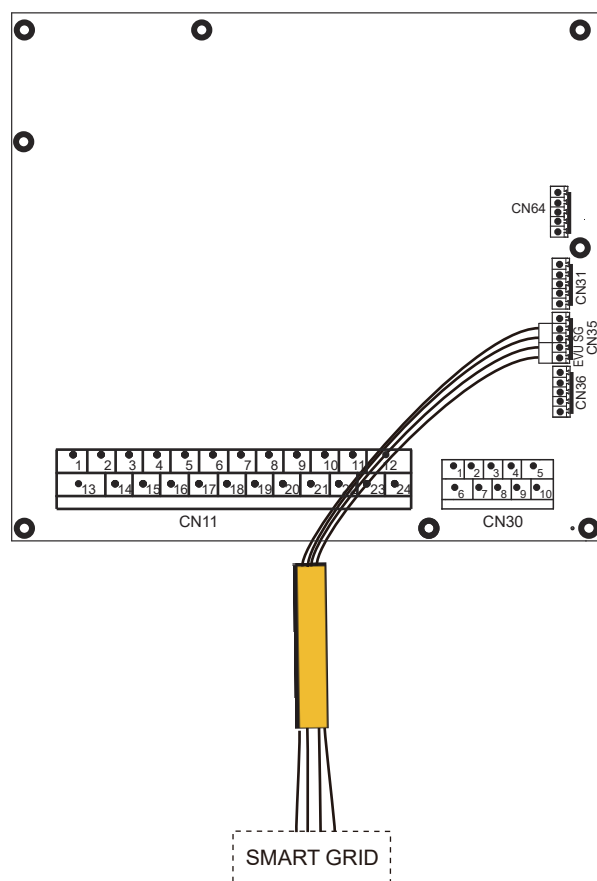


9) For remote shut down:



10) For smart grid:

The unit has smart grid function, there are two ports on PCB to connect SG signal and EVU signal as following:



NOTE

To utilize smart grid function, the DHW mode must be set available.

1) SG=ON, EVU=ON.

If DHW mode is set available:

- The heat pump will operate in DHW mode firstly.
- TBH is set available, If $T5 < 69^{\circ}\text{C}$, TBH will be turned on forcibly(The heat pump and TBH can operate at the same time.); if $T5 \geq 70^{\circ}\text{C}$, TBH will be turned off.(DHW=Domestic Hot Water, T5S is the set water tank temperature.)
- TBH is set unavailable and IBH is set available for DHW mode, as long as $T5 < 59^{\circ}\text{C}$, IBH will be turned on forcibly (The heat pump and TBH can operate at the same time.); if $T5 \geq 60^{\circ}\text{C}$, IBH will be turned off.

2) SG=OFF, EVU=ON.

If DHW mode is set available and DHW mode is set ON:

- The heat pump will operate in DHW mode firstly.
- If TBH is set available and DHW mode is set ON, If $T5 < T5S-2$, the TBH will be turned on (The heat pump and IBH can operate at the same time.); if $T5 \geq T5S+3$, the TBH will be turned off.
- If TBH is set unavailable and IBH is set available for DHW mode ,If $T5 < T5S-dT5_ON$, IBH will be turned on (The heat pump and IBH can operate at the same time.); if $T5 \geq \text{Min}(T5S+3, 60)$, the IBH will be turned off.

3) SG=OFF, EVU=OFF.

The unit will operate normally

4) SG=ON, EVU=OFF.

Heat pump, IBH, TBH will be turned off immediately.

11 CONFIGURATION

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

Follow the instructions below for the next step.

11.1 Check before configuration

Before powering on the unit, check the following items:

☐	Field wiring: make sure all wiring connections observe the instructions.
☐	Fuses, circuit breakers, or protection devices: check the size and type according to the instructions. Make sure that no fuses or protection devices have been bypassed.
☐	Backup heater's circuit breaker: ensure the backup heater's circuit breaker in the switch box is closed (It varies with the backup heater type). Refer to WIRING DIAGRAM.
☐	Booster heater's circuit breaker: ensure the booster heater's circuit breaker is closed (applicable only to units with an optional domestic hot water tank).
☐	Internal wiring: check the wiring and connections inside the switch box for loose or damaged parts, including earth wiring.
☐	Mounting: check and ensure that the unit and the water loop system are properly mounted to avoid water leakage, abnormal noises and vibrations during the unit startup.
☐	Damaged equipment: check the components and piping inside the unit for any damage or deformation.
☐	Refrigerant leak: check the inside of the unit for any refrigerant leakage. In case of refrigerant leakage, follow the relevant content in the "Safety Precautions".
☐	Power supply voltage: check the voltage of the power supply. The voltage must be consistent with the voltage on the identification label of the unit.
☐	Air vent valve: make sure the air vent valve is open (at least 1 turn).
☐	Shut-off valve: make sure that the shut-off valve is fully open.
☐	Sheet metal: make sure all the sheet metal of the unit is mounted properly.
☐	Water volume: make sure the water volume in the system is within the limitation.
☐	Strainer: make sure the strainer is mounted properly and clean.

After powering on the unit, check the following items:

☐	Upon power-on of the unit, nothing is displayed on the user interface: Check the following abnormalities before diagnosing possible error codes. - Wiring connection issue (power supply or communication signal). - Fuse failure on PCB.
☐	Error code "E8" or "E0" is displayed on the user interface: - Residual air exists in the system. - The water level in the system is insufficient. Before starting test run, make sure that the water system and the tank are filled with water, and air is removed. Otherwise, the pump or backup heater (optional) may be damaged.
☐	Error code "E2" is displayed on the user interface: - Check the wiring between the wired controller and the unit.
☐	Initial start-up at low outdoor ambient temperature: To start the initial start-up in low outdoor ambient temperature, the water has to be heated gradually. Please use the preheating for floor function. (Refer to "SPECIAL FUNCTION" in FOR SERVICEMAN mode)

 **NOTE**

For underfloor heating application, floor could be damaged if the temperature rises sharply in a short time.
Please ask the building construction contractor for further information.

11.2 Configuration

To initialize the unit, a group of advanced settings should be provided by the installer. The advanced settings are accessible in FOR SERVICEMAN mode.

The overall parameters list of the advanced settings can be found in Annex B. Operation Settings.

How to enter FOR SERVICEMAN mode

Press and hold  and  simultaneously for 3 seconds to enter the authorization page. Enter password 234 and confirm it. Then, the system jumps into the page with a list of advanced settings.

NOTE

"FOR SERVICEMAN" is only for installer or other specialist with sufficient knowledge and skills.
The end user who use "FOR SERVICEMAN" is regarded as improper use.

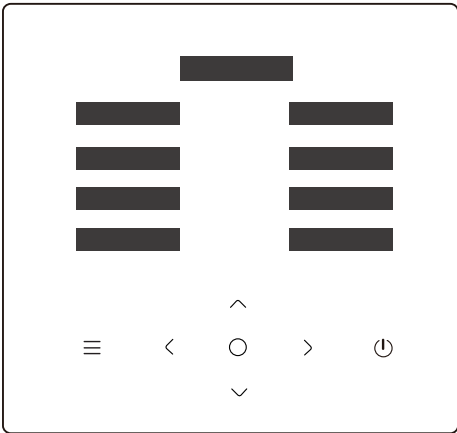
Save the settings and quit FOR SERVICEMAN mode

After all settings are adjusted, press , and the confirmation page pops out. Select Yes and confirm to quit FOR SERVICEMAN mode.

NOTE

The settings are saved automatically after you quit FOR SERVICEMAN mode.
Temperature values displayed on the wired controller (user interface) are measured in °C.

In FOR SERVICEMAN mode, select the target item and enter the setting page. Adjust the enablement settings and values as end user demand. For the list of settings, refer to Annex B. Operation Settings.



11.3 Modbus mapping table

1) MODBUS PORT COMMUNICATION SPECIFICATIONS

Port: RS-485; H1 and H2 are the Modbus communication ports.

Communication address: Only one-to-one connection is available for the host computer and wired controller, and the wired controller is a slave unit. The communication address of the host computer and wired controller is consistent with the address of HMI Address for BMS (In FOR SERVICEMAN mode).

Baud rate: 9600. Number of digits: 8 Verification: none. Stop bit: 1 bit

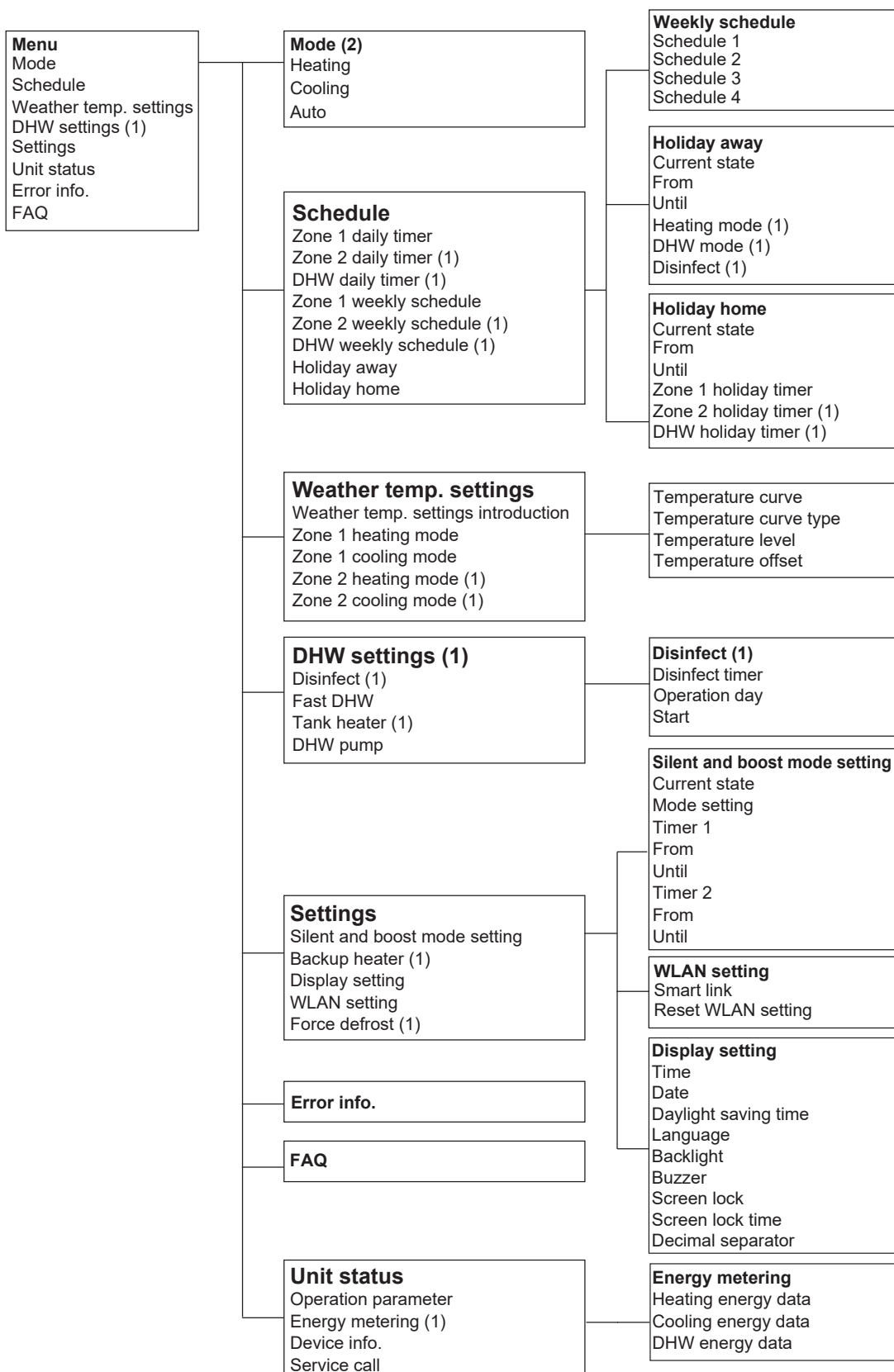
Communication protocol: Modbus RTU (Modbus ASCII not supported)

2) Mapping of registers in the wired controller

Please download the file via QR code.



12 MENU STRUCTURE : OVERVIEW



(1) Invisible if corresponding function is disabled.

(2) The layout could be different if the corresponding function is disabled or enabled.

There are also some other items that are invisible if the function is disabled or unavailable.

For serviceman

For serviceman 1 DHW setting 2 Cooling setting 3 Heating setting 4 Auto mode setting 5 Temp. type setting 6 Room thermostat setting 7 Other heating source 8 Service call 9 Restore factory setting 10 Test run 11 Special function 12 Auto restart 13 Power input limitation 14 Input define 15 Cascade setting 16 HMI address setting 17 Common setting 18 Clear energy data 19 Intelligent function settings 20 C2 fault restore	1 DHW setting 1.1 DHW mode 1.2 Disinfect 1.3 DHW priority 1.4 Pump_D 1.5 DHW priority time set 1.6 dT5_ON 1.7 dT1S5 1.8 T4DHWMAX 1.9 T4DHWMIN 1.10 T5S_Disinfect 1.11 t_DI_HIGHTEMP. 1.12 t_DI_MAX 1.13 t_DHWHP_Restrict 1.14 t_DHWHP_MAX 1.15 Pump_D timer 1.16 Pump_D running time 1.17 Pump_D disinfect 2 Cooling setting 2.1 Cooling mode 2.2 t_T4_Fresh_C 2.3 T4CMAX 2.4 T4CMIN 2.5 dT1SC 2.6 dTSC 2.7 Zone 1 C-emission 2.8 Zone 2 C-emission 3 Heating setting 3.1 Heating mode 3.2 t_T4_Fresh_H 3.3 T4HMAX 3.4 T4HMIN 3.5 dT1SH 3.6 dTSH 3.7 Zone 1 H-emission 3.8 Zone 2 H-emission 3.9 Force defrost 4 Auto mode setting 4.1 T4AUTOCMIN 4.2 T4AUTOHMAX 5 Temp. type setting 5.1 Water flow temp. 5.2 Room temp. 5.3 Double zone 6 Room thermostat setting 6.1 Room thermostat 6.2 Mode set priority 16 HMI address setting 16.1 HMI address for BMS 16.2 Stop BIT 17 Common setting 17.1 t_Delay pump 17.2 t1_Antilock pump 17.3 t2_Antilock pump run 17.4 t1_Antilock SV 17.5 t2_Antilock SV run 17.6 Ta_adj. 17.7 Pump_I silent output 17.8 Energy metering 17.9 Pump_O 17.10 Glycol 17.11 Glycol concentration	7 Other heating source 7.1 IBH function 7.2 dT1_IBH_ON 7.3 t_IBH_Delay 7.4 T4_IBH_ON 7.5 P_IBH1 7.6 P_IBH2 7.7 AHS function 7.8 AHS_Pump_I Control 7.9 dT1_AHS_ON 7.10 t_AHS_Delay 7.11 T4_AHS_ON 7.12 EnSwitchPDC 7.13 GAS_COST 7.14 ELE_COST 7.15 MAX_SETHEATER 7.16 MIN_SETHEATER 7.17 MAX_SIGHEATER 7.18 MIN_SIGHEATER 7.19 TBH function 7.20 dT5_TBH_OFF 7.21 t_TBH_Delay 7.22 T4_TBH_ON 7.23 P_TBH 7.24 Solar function 7.25 Solar control 7.26 Deltasol 8 Service call Phone number Mobile number 9 Restore factory settings 10 Test run 11 Special function 11.1 Preheating for floor 11.2 Floor drying up 12 Auto restart 12.1 Auto restart cooling/ heating mode 12.2 Auto restart DHW mode 13 Power input limitation 13.1 Power input limitation 14 Input define 14.1 M1M2 14.2 Smart grid 14.3 T1T2 14.4 Tbt 14.5 P_X PORT 15 Cascade setting 15.1 PER_START 15.2 TIME_ADJUST 18 Clear energy data 19 Intelligent function settings 19.1 Energy correction 19.2 Sensor backup setting 20 C2 fault restore
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There are some items that are invisible if the function is disabled or unavailable.

12.1 Operation settings

Title	Code	State	Default	Minimum	Maximum	Set interval	Unit
DHW heating setting	DHW mode	Enable or disable DHW mode: 0=NO, 1=YES	1	0	1	1	/
	Disinfect	Enable or disable the disinfect mode: 0=NO, 1=YES	1	0	1	1	/
	DHW priority	Enable or disable DHW priority mode: 0=NO, 1=YES	1	0	1	1	/
	Pump_D	Enable or disable DHW pump mode: 0=NO, 1=YES	0	0	1	1	/
	DHW priority time set	Enable or disable DHW priority time setting: 0=NO, 1=YES	0	0	1	1	/
	dT5_ON	The temperature difference for starting DHW mode	10	1	30	1	°C
	dT1S5	The difference value between Twout and T5 in DHW mode	10	5	40	1	°C
	T4DHWMAX	The maximum ambient temperature at which the heat pump can operate for domestic water heating	43	35	43	1	°C
	T4DHWMIN	The minimum ambient temperature at which the heat pump can operate for domestic water heating	-10	-28	30	1	°C
	T5S_Disinfect	The target temperature of water in the domestic hot water tank in DISINFECT mode	65	60	70	1	°C
	t_DI_HIGHTEMP.	The time for which the highest temperature of water in the domestic hot water tank in DISINFECT mode lasts	15	5	60	5	min
	t_DI_MAX	The maximum time for which disinfection lasts	210	90	300	5	min
	t_DHWHP_Restrict	The operating time for heating/cooling	30	10	600	5	min
	t_DHWHP_MAX	The maximum continuous operating time of the heat pump in DHW PRIORITY mode	90	10	600	5	min
	Pump_D timer	Enable or disable the DHW pump to run as scheduled and to keep running for PUMP RUNNING TIME: 0=NO, 1=YES	1	0	1	1	/
Cooling setting	Pump_D running time	The certain time for which the DHW pump keeps running	5	5	120	1	min
	Pump_D disinfect	Enable or disable the DHW pump to operate when the unit is in DISINFECT mode and T5 is larger than or equal to T5S_DI-2: 0=NO, 1=YES	1	0	1	1	/
	Cooling mode	Enable or disable the cooling mode:0=NO,1=YES	1	0	1	1	/
	t_T4_Fresh_C	The refresh time of climate-related curves in cooling mode	0.5	0.5	6	0.5	h
	T4CMAX	The highest ambient operating temperature in cooling mode	52	35	52	1	°C
	T4CMIN	The lowest ambient operating temperature in cooling mode	10	-5	25	1	°C
	dT1SC	The temperature difference for starting the heat pump (T1)	5	2	10	1	°C
	dTSC	The temperature difference for starting the heat pump (Ta)	2	1	10	1	°C
	Zone 1 C-emission	The type of Zone 1 terminal for cooling mode:0=FLH (floor heating), 1=FCU(fan coil unit), 2=RAD(radiator)	1	0	2	1	/
	Zone 2 C-emission	The type of Zone 2 terminal for cooling mode: 0=FLH (floor heating), 1=FCU(fan coil unit), 2=RAD(radiator)	1	0	2	1	/
	Heating mode	Enable or disable the heating mode: 0=NO, 1=YES	1	0	1	1	/

Heating setting	t_T4_Fresh_H	The refresh time of climate-related curves in heating mode	0.5	0.5	6	0.5	h
	T4HMAX	The maximum ambient operating temperature in heating mode	25	20	35	1	°C
	T4HMIN	The minimum ambient operating temperature in heating mode	-15	-28	30	1	°C
	dT1SH	The temperature difference for starting the unit (T1)	5	2	20	1	°C
	dTSH	The temperature difference for starting the unit (Ta)	2	1	10	1	°C
	Zone 1 H-emission	The type of Zone 1 terminal for heating mode: 0=FLH (floor heating) 1=FCU(fan coil unit), 2=RAD(radiator)	2	0	2	1	/
	Zone 2 H-emission	The type of Zone 2 terminal for heating mode: 0=FLH (floor heating) 1=FCU(fan coil unit), 2=RAD(radiator)	0	0	2	1	/
	Force defrost	Enable or disable the force defrost: 0=NO, 1=YES.	0	0	1	1	/
AUTO mode setting	T4AUTOCMIN	The minimum operating ambient temperature for cooling in auto mode	25	20	29	1	°C
	T4AUTOHMAX	The maximum operating ambient temperature for heating in auto mode	17	10	17	1	°C
Temp. type setting	Water flow temp.	Enable or disable the Water flow temp.: 0=NO, 1=YES	1	0	1	1	/
	Room temp.	Enable or disable the Room temp.: 0=NO, 1=YES	0	0	1	1	/
	Double zone	Enable or disable the Double zone: 0=NO, 1=YES	0	0	1	1	/
Room thermostat setting	Room thermostat	The style of room thermostat: 0=NO, 1=Mode set, 2=One zone, 3=Double zone	0	0	3	1	/
	Mode set priority	Select the priority mode in Room thermostat: 0=Heating, 1=Cooling	0	0	1	1	/
Other heat source	IBH function	Select the mode of IBH (Internal backup heater) : 0=Heating and DHW, 1=Heating	0 (DHW=valid) 1 (DHW=invalid)	0	1	1	/
	dT1_IBH_ON	The temperature difference between T1S and T1 for starting the backup heater	5	2	10	1	°C
	t_IBH_Delay	The time for which the compressor has run before startup of the first step backup heater	30	15	120	5	min
	T4_IBH_ON	The ambient temperature for starting the backup heater	-5	-15	30	1	°C
	P_IBH1	Power input of IBH1	0.0	0.0	20.0	0.5	kW
	P_IBH2	Power input of IBH2	0.0	0.0	20.0	0.5	kW
	AHS function	Enable or disable the AHS (Auxiliary heating source) function: 0=NO, 1=Heating, 2=Heating and DHW	0	0	2	1	/
	AHS_Pump_I Control	Select the pump operating status when only AHS runs: 0=Run, 1=Not run	0	0	1	1	/
	dT1_AHS_ON	The temperature difference between T1S and T1 for starting the auxiliary heating source	5	2	20	1	°C
	t_AHS_Delay	The time for which the compressor has run before startup of the additional heating source	30	5	120	5	min
	T4_AHS_ON	The ambient temperature for starting the additional heating source	-5	-15	30	1	°C
	EnSwitchPDC	Enable or disable automatic switch of heat pump and auxiliary heating source based on running cost: 0=NO, 1=YES	0	0	1	1	/
	GAS-COST	Price of gas	0.85	0.00	5.00	0.01	price/m ³
	ELE-COST	Price of electricity	0.20	0.00	5.00	0.01	price/kWh

Other heat source	MAX-SETHEATER	Maximum set temperature of additional heating source	80	1	80	1	°C
	MIN-SETHEATER	Minimum set temperature of additional heating source	30	0	79	1	°C
	MAX-SIGHEATER	The voltage corresponding to the maximum set temperature of additional heating source	10	1	10	1	V
	MIN-SIGHEATER	The voltage corresponding to the minimum set temperature of additional heating source	3	0	9	1	V
	TBH function	Enable or disable the TBH (Tank booster heater) function: 0=NO, 1=YES	1	0	1	1	/
	dT5_TBH_OFF	The temperature difference between T5 and T5S (the set water tank temperature) for turning the booster heater off	5	0	10	1	°C
	t_TBH_DELAY	The time for which the compressor has run before startup of the booster heater	30	0	240	5	min
	T4_TBH_ON	The ambient temperature for starting the tank booster heater	5	-5	50	1	°C
	P_TBH	Power input of TBH	2.0	0.0	20.0	0.5	kW
	Solar function	Enable or disable the Solar function: 0=NO, 1=Only solar, 2=Solar and HP (Heat Pump)	0	0	2	1	/
	Solar control	Solar pump (pump_s) control: 0=SL1SL2, 1=Tsolar	0	0	1	1	/
	Deltatsol	The temperature deviation for solar function running	10	5	20	1	°C
Special function	Preheating for floor	Enable or disable floor preheating: 0=NO, 1=YES	0	0	1	1	/
	T1S	The set outlet water temperature during first floor preheating	25	25	35	1	°C
	t_ARSTH	Running time for first floor preheating	72	48	96	12	h
	Floor drying up	Enable or disable floor drying: 0=NO, 1=YES	0	0	1	1	/
	t_Dryup	Temp-up days for floor drying	8	4	15	1	d
	t_Highpeak	Days for floor drying	5	3	7	1	d
	t_Drydown	Temp-down days for floor drying	5	4	15	1	d
	t_Drypeak	Outlet water temperature for floor drying	45	30	55	1	°C
	Start time	The start time of floor drying	00:00	0:00	23:30	1/30	h/min
Auto restart	Start date	The start date of floor drying	Current date+1	Current date+1	31/12/2099	1/1/1	dd/mm/yyyy
	Auto restart cooling/heating mode	Enable or disable the auto restart of cooling/heating mode: 0=NO, 1=YES	1	0	1	1	/
Power input limitation	Auto restart DHW mode	Enable or disable the auto restart of DHW mode: 0=NO, 1=YES	1	0	1	1	/
	Power input limitation	The type of power input limitation	1	1	8	1	/
Input definition	M1 M2	Define the function of the M1M2 switch: 0=remote ON/OFF, 1=TBH ON/OFF, 2=AHs ON/OFF	0	0	2	1	/
	Smart grid	Enable or disable the smart grid: 0=NO, 1=YES	0	0	1	1	/
	T1T2	Control options of Port T1T2: 0=NO, 1=RT/Ta_PCB	0	0	1	1	/
	Tbt	Enable or disable the TBT: 0=NO, 1=YES	0	0	1	1	/
	P_X port	Select the function of P_X port: 0=Defrost, 1=Alarm	0	0	1	1	/
Cascade setting	PER_START	Percentage of operating units among all units	10	10	100	10	%
	TIME_ADJUST	Time interval for determining the necessity of unit loading/unloading	5	1	60	1	min

HMI address setting	HMI address for BMS	Set the HMI address code for BMS	1	1	255	1	/
	Stop BIT	Upper computer stop bit: 1=STOP BIT1, 2=STOP BIT2	1	1	2	1	/
Common setting	t_Delay pump	The time for which the compressor has run before startup of the pump	2.0	0.5	20.0	0.5	min
	t1_Antilock pump	The pump anti-lock interval	24	5	48	1	h
	t2_Antilock pump run	The pump anti-lock running time	60	0	300	30	s
	t1_Antilock SV	The valve anti-lock interval	24	5	48	1	h
	t2_Antilock SV run	The valve anti-lock running time	30	0	120	10	s
	Ta-adj.	The corrected value of Ta inside the wired controller	0	-10	10	1	°C
	Pump_I silent output	The Pump_I max output limitation	100	50	100	5	%
	Energy metering	Enable or disable the energy analysis: 0=NO, 1=YES	1	0	1	1	/
	Pump_O	Additional circulation pump operation: 0=ON (keep running) 1=Auto (controlled by the unit)	0	0	1	1	/
	Glycol	Glycol application: 0=Without glycol, 1=With glycol	0	0	1	1	/
Intelligent function settings	Glycol concentration	Glycol added concentration	10	10	30	5	%
	Pump_I minimum output	Circulation pump Pump_I operating lowest limit	30	30	80	10	%
	Energy correction	Correction for Energy metering	0	-50	50	5	%
Intelligent function settings	Sensor backup mode	Sensor backup operation function, 0 =NO, 1=YES	1	0	1	1	/

NOTE

Please set P_IBH1, P_IBH2, P_TBH according to the field installation. If the values are different with the actual values, the energy metering calculation could deviate from actual situation.

13 COMMISSIONING

Test run is used to confirm the functionality of the valves, air purge, circulation pump operation, cooling, heating and domestic water heating.

Test run

Point check > |

Air purge >

Circulated pump running >

Cooling running >

Test run

Heating running > |

Cooling running >

DHW running >

Checklist during commissioning

☐	Test run for the actuator
☐	Air purge
☐	Test run for operation
☐	Check of the minimum flow rate

13.1 Test run for the actuator

NOTE

During the commissioning of the actuator, the protection function of the unit is disabled. Excessive use may damage components.

Why

Check whether each actuator is in good working conditions.

What - Actuator List

No.	Name		Note
1	SV2	Three-way valve 2	
2	SV3	Three-way valve 3	
3	PUMP_I	Integrated circulation pump	
4	PUMP_O	Additional circulation pump(for Zone 1)	
5	PUMP_C	Zone 2 pump	
6	IBH	Internal backup heater	
7	AHS	Additional heat source	
8	SV1	Three-way valve 1	Invisible if DHW is disabled
9	PUMP_D	DHW pump	Invisible if DHW is disabled
10	PUMP_S	Solar heating loop circulation pump	Invisible if DHW is disabled
11	TBH	Tank booster heater	Invisible if DHW is disabled

How

1	Go to "FOR SERVICEMAN" (Refer to 11.2 Configuration).
2	Find "Test run" and enter the process.
3	Find "Point check" and enter the process.
4	Select the actuator, and press  to activate or deactivate the actuator. The status ON means the actuator is activated, and OFF means the actuator is deactivated.

NOTE

When you return to the upper layer, all actuators turn OFF automatically.

13.2 Air purge

Why

To purge out the remaining air in the water loop.

How

1	Go to "FOR SERVICEMAN" (Refer to 11.2 Configuration).
2	Find "Test run and enter the process.
3	Find "Air purge" and enter the process.
4	Select "Air purge" and press  to activate or deactivate the air purge function.  means the air purge function is activated, and  means the air purge function is deactivated.

Besides

"Air vent pump_i output"	To set pump_i output. The higher the value is, the pump gives a higher output.
"Air vent running time"	To set the duration of air purge. When the set time is due, air purge is deactivated.
"Status check"	Additional operation parameters can be found.

13.3 Test run

Why

Check whether the unit is in good working conditions.

What

Circulated pump operation
Cooling operation
Heating operation
DHW operation

How

1	Go to "FOR SERVICEMAN" (Refer to 11.2 Configuration)
2	Find "Test run" and enter the page.
3	Find "Other" and enter the process.
4	Select "XXXX"* and press  to run the test. During test, press  , select OK and confirm to return to the upper layer. * - Four performance test options are shown in What .

NOTE

In performance test, the target temperature is preset and cannot be changed.

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

In circulated pump operation, If the flow rate is out of recommended flow rate range, please make proper change of the installation, and ensure that the flow rate in the installation is guaranteed in all conditions.

13.4 Check of the minimum flow rate

1	Check the hydraulic configuration to find out the space heating loops that can be closed by mechanical, electronic, or other valves.
2	Close all space heating loops that can be closed.
3	Start and operate the circulation pump (See "13.3 Test Run ").
4	Read out the flow rate ^(a) and modify the bypass valve settings until the set value reaches the minimum flow rate required + 2 l/min.

(a) During pump trail run, the unit can operate below the minimum required flow rate.

14 HAND-OVER TO THE USER

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

- Fill the installer setting table (in the OPERATION MANUAL) with the actual settings.
- Empty the error history in the HMI before hand-over to the user.
- It is highly recommended to do the WLAN connection of the unit. You can read more information in the APP.
- Make sure that the user has the printed documentation and ask him/her to keep it for future reference.
- Explain to the user how to properly operate the system and what to do in case of problems.

-Basic operation guidelines can be found in the OPERATION MANUAL.

-For additional information about operation, see " Additional Operation Reference".

- Show the user what to do for the maintenance of the unit.
- Explain to the user about energy saving tips as described below.

15 MAINTENANCE

Regular checks and inspections at certain intervals are required to guarantee the optimal performance of the unit.

15.1 Safety precautions for maintenance

DANGER

Risk of electrocution.

WARNING

- Please note that some parts of the electric component box are hot.
- Do not rinse the unit. Otherwise, electric shock or fire may occur.
- Do not leave the unit unattended when the service panel is removed.

NOTE

- Before performing any maintenance or service work, touch a metal part of the unit to eliminate static electricity and to protect the PCB.
- Without regular maintenance, the performance of the unit may degrade and the risk of parts damage may increase gradually.

15.2 Maintenance checklist

By user

Items	Recommended frequency
Clean the surrounding of the outdoor unit.	Once a month.

By installer

Items	Recommended frequency
General	
Check if all the parts are in the proper position.	Once a year.
Water loop	
Check if the water pressure is sufficient.	Once a year.
Clean the strainer in water system.	Once a year.
Check if the flow switch works in good condition.	Once a year.
Check if the water pressure relief valve (in water system) works in good condition.	Once a year.
Check if the water pressure relief valve (in DHW water loop) works in good condition.	Once a year.
Check if the insulation of backup heater is in good condition.	Once a year.
Check if there is water leakage in the water loop. Take care if anti-refrigerant is applied.	Once a year.
Check if the booster heater of DHW water tank is clean and in good condition.	Once a year.
Wiring and electrical parts	
Check if the temperature sensor works in good condition.	Once a year.
Check if the wiring and cables of the installation is in good condition.	Once a year.
Check if the contactors and circuit breakers works in good condition.	Once a year.
Refrigerant loop	
Check if there is refrigerant leakage in the refrigerant loop.	Once a year.

NOTE

Ask the supplier and refer to the SERVICE MANUAL for more information.

16 TECHNICAL SPECIFICATIONS

Indoor unit model	60/190 3 kW heater	100/190 3 kW heater	100/240 3 kW heater	160/240 3 kW heater
Power supply	220-240 V 1N~ 50 Hz			
Rated input	3 355 W			
Rated Current	14.6 A			
Nominal capacity	Refer to the Technical Data			
Dimensions (W×H×D)[mm]	600 * 600 * 1 683	600 * 600 * 1 683	600 * 600 * 1 943	600 * 600 * 1 943
Packing (W×H×D)[mm]	730 * 730 * 1 920	730 * 730 * 1 920	730 * 730 * 2 180	730 * 730 * 2 180
Heat exchanger	Plate heat exchanger			
Rated water pressure	0.3 MPa			
Min.water flow(flow switch)	6 L/min			10 L/min
Pump				
Type	DC inverter			
Max. head	9 m			
Power input	5 W to 90 W			
Expansion vessel				
Volume	8 L			
Max. working pressure	0.3 MPa(g)			
Pre-charge pressure	0.1 MPa(g)			
Weight				
Net weight [kg]	141	143	157	159
Gross weight [kg]	160	162	178	180
Connections				
Refrigerant gas/liquid side[mm]	Φ 12.75 / Φ 6.35	Φ 15.9 / Φ 9.52		
Water inlet/outlet	R1"			
Drain connection	DN25			
Operation range				
Outlet water(heating model)	+25 °C to +65 °C			
Outlet water(cooling model)	+5 °C to +25 °C			
Domestic hot water	+20 °C to +60 °C			
Ambient temperature	+5 °C to +35 °C			

17 TROUBLESHOOTING

This section provides useful information about diagnosing and correcting certain problems that may occur to the unit.

17.1 General Guidelines

- Before starting the troubleshooting procedure, visually inspect the unit and look for obvious defects such as loose connections or defective wiring.
- When a safety device is activated, stop the unit and find out the cause of such activation before resetting the safety device. Under no circumstances can safety devices be bridged or unit parameters be changed. If the cause of the problem cannot be found, call the local dealer.
- If the pressure relief valve does not work properly or should be replaced, always reconnect the flexible hose attached to the pressure relief valve to prevent water from dripping out of the unit.

NOTE

For problems related to the optional solar kit for domestic water heating, refer to the troubleshooting in the documents for the kit.

17.2 Typical abnormalities

Symptom 1: the unit is turned on but the unit fails to operate in cooling or heating mode as expected.

POSSIBLE CAUSE	TROUBLESHOOTING
Incorrect temperature setting	Check the parameters (T4HMAX and T4HMIN in heating mode; T4CMAX and T4CMIN in cooling mode; T4DHWMAX and T4DHWMIN in DHW mode). For the parameter range, please refer to . 12.1 Operation Settings.
Too small water flow	• Verify that all shut off valves of the water loop are in the right position. • Check if the water filter is plugged. • Make sure there is no air in the water system. • Check the water pressure. The water pressure must be larger than or equal to 1.5 bar. • Make sure that the expansion vessel is not broken.
Too small water volume in the installation	Make sure that the water volume in the installation is above the minimum required value. Please refer to "Additional expansion vessel and water volume".

Symptom 2: the unit is turned on but the compressor fails to start.

POSSIBLE CAUSE	TROUBLESHOOTING
The unit may operate out of its operating range (too low water temperature).	In case of low water temperature, the system starts the backup heater to reach the minimum water temperature first (12 °C). • Verify that the power supply for the backup heater is correct. • Verify that the thermal fuse of the backup heater is closed. • Verify that the thermal protector of the backup heater is not activated. • Verify that the contactors of the backup heater are not broken.

Symptom 3: noise is generated from the pump (cavitation).

POSSIBLE CAUSE	TROUBLESHOOTING
Air in the system.	Purge the air.
Too small water pressure at the pump inlet	• Check the water pressure. The water pressure must be larger than or equal to 1.5 bar. • Verify that the expansion vessel is not broken. • Verify that the pre- pressure of the expansion vessel is set correctly. See "Additional expansion vessel and water volume".

Symptom 4: the water pressure relief valve opens.

POSSIBLE CAUSE	TROUBLESHOOTING
Broken expansion vessel	Replace the expansion vessel.
Water pressure in the installation higher than 0.3 MPa.	Make sure that the water pressure in the installation is within 0.10 to 0.20 MPa.

Symptom 5: the water pressure relief valve leaks.

POSSIBLE CAUSE	TROUBLESHOOTING
Blockage of water pressure relief valve outlet	• Check for correct operation of the pressure relief valve by turning the black knob on the valve counterclockwise: • If you do not hear a clacking sound, contact your local dealer. • In case water keeps running out of the unit, close the shut-off Valves at both the water inlet and outlet, and then contact your local dealer.

Symptom 6: insufficient space heating capacity at low outdoor temperature.

POSSIBLE CAUSE	TROUBLESHOOTING
Backup heater not activated	• Check whether the IBH function is enabled. • Check whether the thermal protector of the backup heater has been activated. • Check whether the booster heater is running. The backup heater and booster heater can not operate simultaneously.
Excessive heat pump capacity used for heating domestic hot water (applicable only to installations with a domestic hot water tank).	Verify that the "t_DHWHP_MAX" and "t_DHWHP_RESTRICT" are configured appropriately: • Make sure that the "DHW PRIORITY" in the wired controller is disabled. • Enable the "T4_TBH_ON" in the wired controller/FOR SERVICEMEN to activate the booster heater for domestic water heating.

Symptom 7: the unit cannot switch from Heating mode to DHW mode immediately.

POSSIBLE CAUSE	TROUBLESHOOTING
Too small volume of tank and low location of water temperature probe	• Set "dT1S5" to the maximum valve, and set "t_DHWHP_RESTRICT" to the minimum valve. • Set dT1SH to 2 °C. • Enable the TBH. The TBH should be controlled by the ODU. • If AHS is available, turn on it. the heat pump will turn on once the requirements for turning it on are met. • If both the TBH and AHS are not available, try to change the position of the T5 probe (Refer to DHW Tank (Supplied by the User)).

Symptom 8: the unit cannot switch from DHW mode to Heating mode immediately

POSSIBLE CAUSE	TROUBLESHOOTING
Small heat exchanger for space heating	• Set "t_DHWHP_MAX" to the minimum valve. The suggested valve is 60 min. • If the circulation pump out of the unit is not controlled by the unit, try to connect it to the unit. • Add a 3-way valve at the inlet of the fan coil to provide enough water flow.
Small space heating load	Normal , no need for heating
Disinfection function enabled without TBH	• Disable the disinfection function • Add a TBH or AHS for DHW operation
The FAST WATER function is manually turned on after the hot water meets the requirements, and the heat pump fails to switch to the air-conditioning mode in time when air conditioning is required.	Manually turn off the FAST WATER function
In case of a low ambient temperature, the hot water is not enough and the AHS fails to operate or fails to operate in time.	• Set "T4DHWMIN". The suggested valve is larger than or equal to -5 °C • Set "T4_TBH_ON". The suggested valve is larger than or equal to 5 °C
DHW mode priority	If there is an AHS or IBH connected to the unit, when the ODU fails, the hydraulic module board must run DHW mode till the water temperature reaches the set value before change to heating mode.

Symptom 9: The heat pump stops operating in DHW mode although the set temperature is not reached, and space heating is required but the unit stays in DHW mode.

POSSIBLE CAUSE	TROUBLESHOOTING
Small surface of coil in the tank	Same as Symptom 7
TBH or AHS not available	The heat pump will stay in DHW mode until "t_DHWHP_MAX" or the set temperature is reached. Add a TBH or AHS for DHW operation. The TBH and AHS should be controlled by the unit.

17.3 Error codes

The explanation about each error code can be found on the wired controller.

Reset the unit by powering off and powering on it.

If resetting the unit is invalid, contact the local dealer.

CAUTION

In winter, if the unit suffers from E0 and Hb malfunction and the unit is not repaired in time, the water pump and pipeline system may be damaged due to freezing.
Take proper measures to eliminate the E0 and Hb malfunction.

18 SAFETY PRECAUTION ABOUT THE APPLIANCES USING FLAMMABLE REFRIGERANT

WARNING

The following precautions should be complied with when installation, service, maintenance and repair, and decommissioning of appliances using flammable refrigerant.

18.1 General

This appliance employed A2L flammable refrigerant R32.

The appliance shall be stored so as to prevent mechanical damage from occurring.

18.2 Symbols

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

WARNING

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

The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).

Do not pierce or burn.

Be aware that refrigerants might not contain an odour.

18.3 Installation

18.3.1 Qualification of workers

WARNING

Refer to Target group described in chapter 2 SAFETY PRECAUTION.

Every working procedure that affects safety means shall only be carried out by competent persons.

Examples for such working procedures are:

- breaking into the refrigerating circuit;
- opening of sealed components;
- opening of ventilated enclosures.

18.3.2 General

WARNING

Protection devices, piping and fittings shall be protected as far as possible against adverse environmental effects, for example the danger of water collecting and freezing in relief pipes or the accumulation of dirt and debris;

Provision shall be made for expansion and contraction of long runs of piping;

Piping in refrigerating systems shall be so designed and installed as to minimize the likelihood of hydraulic shock damaging the system;

Steel pipes and components shall be protected against corrosion with a rustproof coating before applying any insulation;

18.4 Information on servicing

18.4.1 General

CAUTION

Servicing shall be performed only as recommended by the manufacturer.

18.4.2 Checks to the area

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. For repair to the refrigerating system, Clause 18.4.3 to Clause 18.4.7 shall be completed prior to conducting work on the system.

18.4.3 Work procedure

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

18.4.4 General work area

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.

18.4.5 Checking for presence of refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

18.4.6 Presence of fire extinguisher

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO₂ fire extinguisher adjacent to the charging area.

18.4.7 No ignition sources

No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it can lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

18.4.8 Ventilated area

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

18.4.9 Checks to the refrigerating equipment

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.

The following checks shall be applied to installations using flammable refrigerants:

- the refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed;
- the ventilation machinery and outlets are operating adequately and are not obstructed;
- if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
- refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which can corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

18.4.10 Checks to electrical devices

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:

- that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- that no live electrical components and wiring are exposed while charging, recovering or purging the system;
- that there is continuity of earth bonding.

18.5 Sealed electrical components

WARNING

Sealed electrical components shall not be repaired.

18.6 Cabling

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

18.7 Detection of flammable refrigerants

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

The following leak detection methods are deemed acceptable for all refrigerant systems.

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

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine can react with the refrigerant and corrode the copper pipe-work.

NOTE Examples of leak detection methods are

- bubble method,
- fluorescent agent method.

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

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut-off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to Clause 17.8.

CAUTION

Oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.

18.8 Refrigerant removal and circuit evacuation

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

- safely remove refrigerant following local and national regulations;
- evacuate;
- purge the circuit with inert gas (optional for A2L);
- evacuate (optional for A2L);
- continuously flush with inert gas when using flame to open circuit;
- open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders.

CAUTION

An inert gas, specifically, is dry oxygen free nitrogen (OFN).
The system shall be “flushed” with OFN to render the unit safe. This process may need to be repeated several times.

Compressed air or oxygen shall not be used for purging refrigerant systems.

Purging of the refrigerant circuit shall be achieved by breaking the vacuum in the system with inert gas and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. The system shall be vented down to atmospheric pressure to enable work to take place.

CAUTION

This operation is absolutely vital if brazing operations on the pipework are to take place.

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

18.9 Charging procedures

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

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

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

18.10 Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken

in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

- 1) Become familiar with the equipment and its operation.
- 2) Isolate system electrically.
- 3) Before attempting the procedure, ensure that:
 - a) mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - b) all personal protective equipment is available and being used correctly;
 - c) the recovery process is supervised at all times by a competent person;
 - d) recovery equipment and cylinders conform to the appropriate standards.
- 4) Pump down refrigerant system, if possible.
- 5) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- 6) Make sure that the cylinder is situated on the scales before recovery takes place.
- 7) Start the recovery machine and operate in accordance with instructions.
- 8) Do not overfill cylinders (no more than 80 % volume liquid charge).
- 9) Do not exceed the maximum working pressure of the cylinder, even temporarily.
- 10) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- 11) Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

18.11 Labelling

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

18.12 Recovery

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

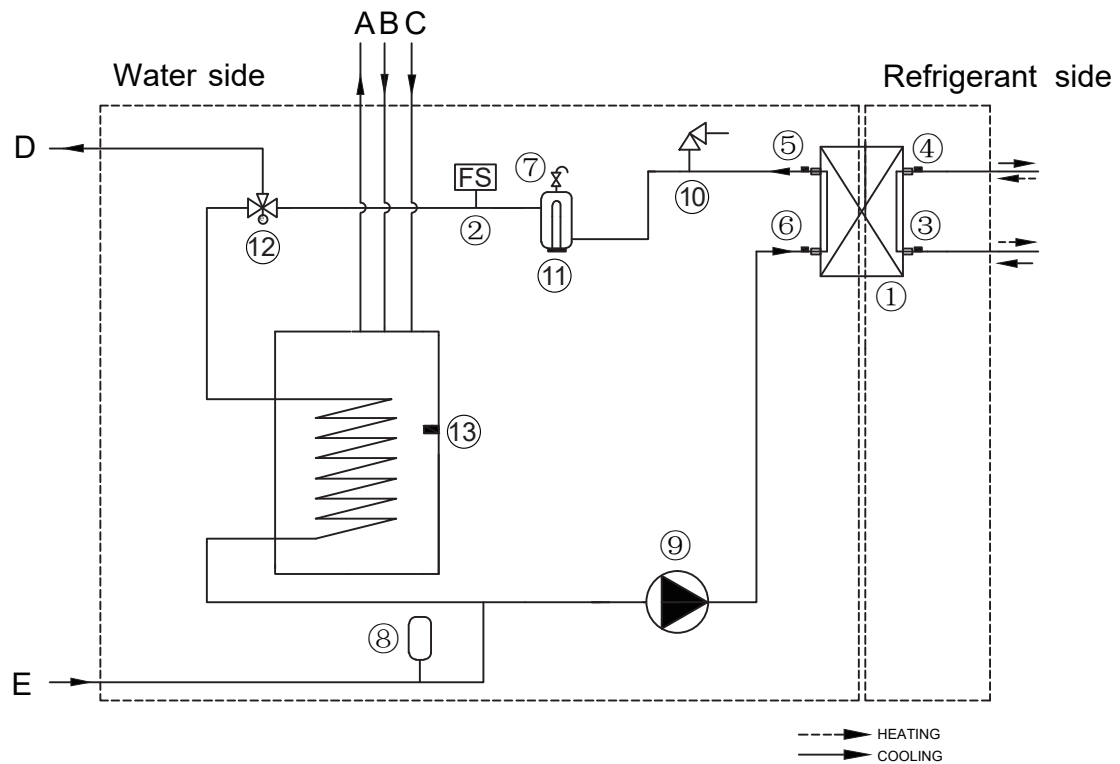
When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for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

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. Consult manufacturer if in doubt. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. Draining of oil from a system shall be carried out safely.

ANNEX A: REFRIGERANT CYCLE



Standard Unit

Item	Description	Item	Description
1	Water side heat exchanger (Plate heat exchange)	10	Pressure relief valve
2	Flow switch	11	Backup heater
3	Refrigerant liquid piping temperature sensor	12	3-Way valve
4	Refrigerant gas piping temperature sensor	13	Domestic water tank temperature sensor
5	Water outlet temperature sensor	A	Domestic hot water outlet
6	Water inlet temperature sensor	B	Domestic hot water recirculation inlet
7	Automatic air purge valve	C	Domestic cold water inlet
8	Expansion vessel	D	Space heating/cooling water outlet
9	Circulated pump	E	Space heating/cooling water inlet

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此页不做菲林，仅核对使用

印刷技术要求

材质	封面封底120g双胶纸，内页双胶纸80g
规格	210*297mm(双面)
颜色	黑白
其他	

设计更改记录表（仅做说明用，不做菲林）

版本升级	更改人	更改日期	更改主要内容	涉及更改页面 (印刷页码)