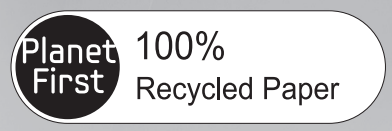
SAMSUNG

DB68-04066A-00

DVM S WATER-GEO
AM✳✳✳FXWA Series

Air Conditioner
installation manual



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Contents

Safety precautions

Before installing an air conditioner, please read this manual thoroughly to ensure that you know how to safely and efficiently install a new appliance.

- ❋ DVM S WATER-GEO air conditioner uses R-410A refrigerant.
  - When using R-410A, moisture or foreign substances may affect the capacity and reliability of the product. Safety precautions must be taken when installing the refrigerant pipe.
  - The designed maximum pressure of the system is 4.1MPa. Select appropriate material and thickness according to the regulations.
  - R-410A is a quasi-azeotrope of two refrigerants. Make sure to charge with liquid phase when filling refrigerant. (If you charge vapor refrigerant, it may affect the capacity and reliability of the product as a result of a change in the blend of the refrigerant.)
- ❋ You must connect the indoor units for R-410A refrigerant. When indoor units for R-22 refrigerant are connected, they cannot operate normally.
- ❋ DVM S WATER-GEO air conditioner uses plate type heat exchanger, and extra concern must be taken regarding on selecting the installation location since it requires water pipe installation.
- ❋ For product protection, it is recommended to adopt closed circuit cooling tower or indirect water pipe circuit structure for DVM S WATER-GEO air conditioner.

Before the installation, read the 'Severe warning signs' and the 'Caution signs' thoroughly.

Manufacturer is not responsible for accidents due to incorrect installation. (Installer will be responsible for any service charges that may occur.)

Product is irrelevant to any installation or performance problem of the cooling tower and water pipes.

Anti-freeze must be used when temperature of water inlet for heating is below 10°C or ground heat source is used.

This product has been determined to be in compliance with the Low Voltage Directive (2006/95/EC), and the Electromagnetic Compatibility Directive (2004/108/EC) of the European Union.

⚠ **WARNING**	Hazards or unsafe practices that may result in **severe personal injury or death.**
⚠ **CAUTION**	Hazards or unsafe practices that may result in **minor personal injury or property damage.**

SEVERE WARNING SIGNS

Installation must be requested to a qualified installer.

▶ If the user installs a product improperly on their own, it may cause water leakage, electric shock or fire.

Install the unit in a place where it is strong enough to hold the product weight.

▶ When installed in place where it is not strong enough to withhold the product weight, the unit could fall and cause injury.

Electric work must be done by qualified persons, complying the national wiring regulations and installed according to the instruction stated in the installation manual with leased circuit.

▶ Capacity shortage on the leased circuit and improper installation may cause electric shock or fire.

Use specified wires to connect indoor and outdoor units, and make sure the wire is firmly fixed.

▶ Improper connection may cause fire.

Safety precautions

Neatly arrange the wires in the electrical parts to make sure that electrical cover is closed securely without any gaps.

- ▶ If the cover is not properly closed, heat may be generate on the electrical terminal and cause electric shock or fire.

Make sure to use the provided or specified parts with the specified tools for installation.

- ▶ Failing to do so may cause product falling, water leakage, fire or electric shock.

In any case of refrigerant leakage, make sure to ventilate.

- ▶ If the refrigerant gas comes in contact with fire, harmful gas will be generated.
- ▶ Make sure that the refrigerant gas does not leak after completing the installation. If the refrigerant gas of the indoor unit leaks and comes into contact with the fan heater, space heater or stove, harmful gas will be generated.

Make sure to perform grounding work.

- ▶ Do not connect the ground wire to a gas pipe, water pipe, lightning rod or telephone grounding. Improper grounding could cause electric shock.

Do not install the product in a place where it is or might be exposed to inflammable gas leakage.

- ▶ When the gas leaks and gets accumulated around the product, it may cause fire.

Installation work must be done according to the instruction in this installation manual.

- ▶ Improper installation may cause water leakage, electric shock or fire.

When inserting the power plug, make sure to insert it fully and check that power plug and a consent does not have any dust, blockage or loosened part.

- ▶ If there is dust, blockage or loosened part on a power plug or consent, it can cause electric shock or fire. Also, replace the consent if it is loosened.

When installation is in progress, check the following before operating the product.

- ▶ Make sure pipes are properly connected without any leakage.
- ▶ Service valve should remain open. If the compressor operates with service valve closed, compressor or other parts may get damaged due to overpressure. Also, if there is leakage on the connection part, air inflow and other matter may make the status even more overpressured, which can cause personal injury due to explosion.

Stop the compressor before disconnecting the refrigerant pipe for pump-down operation.

- ▶ If you disconnect the refrigerant pipe while compressor is operating with service valve open, air inflow will cause excessive pressure in the refrigerant cycle that could lead to explosion and personal injury.

Do not assemble the power cord on your own, use two cables together to extend the cable length or connect the power to a multi consent connected with other products.

- ▶ Bad connection, isolation and over voltage may cause fire or electric shock.

Cut-off the main power supply before indoor unit electrical installation.

- ▶ Potential risk or electric shock.

You may need to install an ELB (earth leakage breaker) depending on the installation location.

- ▶ Not installing an ELB (earth leakage breaker) may cause electric shock.

CAUTION SIGNS

Perform the drainage/piping work securely according to the installation manual.

- ▶ If not, water could drop from the unit and household goods could get wet and damaged.

Fasten a flare nut with a torque wrench as specified in this installation manual.

- ▶ When fastened too tight, a flare nut may break after a long period of time and cause refrigerant leakage.

Wear thick gloves during the installation process.

- ▶ If not, personal injury may occur due to the air conditioner parts.

Do not install the outdoor unit in a place where animals could live.

- ▶ If an animal get contact with the electric parts, damage or fire may occur. In addition ask the customer to maintain a clean installation place around it.

After completing the installation run the trial operation. If no error occurs, explain to the customer how to use and clean the air conditioner according to the user's manual. In addition give the installation manual and the user's manual to the customer.

Before the installation, check if the product is in good shape.

- ▶ Do not install the product if there is any damage which occurred during shipment.

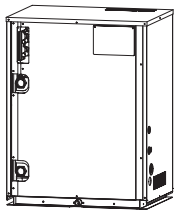
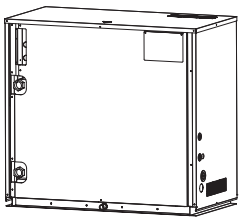
All the materials used to manufacture the product and packages are eco-friendly and they are recyclable.

Refrigerant used in this product must be added or disposed in an appropriate way by qualified personnel.

- ▶ At the end of the life cycle, take it to a proper recycling or disposal center or return it to the dealer so that it can be disposed correctly.

Preparing for installation

Outdoor unit classification

Classification	Small chassis	Large chassis
Appearance		
Models	AM080/100/120FXWA✳	AM200FXWA✳

CAUTION

Packaging material disposition

- Safely store or dispose the packaging materials.
  - Sharp metals such as nails or wooden material packaging that may break into pieces become a cause for personal injury.
  - Make sure to store or dispose the vinyl type packaging material to keep it out of reach of children. Children may put them over their face, which is very dangerous since it may lead to suffocation.

Outdoor unit combination

- Make sure to use an indoor unit that is compatible with DVM S WATER-GEO.
- Indoor units can be connected within the range indicated in following table.
- If the total capacity of the connected indoor units exceeds the indicated maximum capacity, cooling and heating capacity of the indoor unit may decrease.
- Total capacity of the connected indoor units can be allowed from 50% to 130% of the total outdoor unit capacity. 0.5 × Σ (Outdoor unit capacity) ≤ Total capacity of the connected indoor units ≤ 1.3 × Σ (Outdoor unit capacity)

Model name for combination		AM080FXWA∗∗	AM100FXWA∗∗	AM120FXWA∗∗	AM160FXWA∗∗	AM180FXWA∗∗	AM200FXWA∗∗
Number of individual outdoor units		1	1	1	2	2	1
Combined outdoor unit	AM080FXWA∗∗	1					
	AM100FXWA∗∗		1				
	AM120FXWA∗∗			1			
	AM200FXWA∗∗						1
Rated capacity	Cooling (kW)	22.4	28.0	33.6	44.8	50.4	56.0
	Heating (kW)	25.2	31.5	37.8	50.4	56.7	63.0
Total capacity of the connected indoor units (Cooling)	Minimum (kW)	11.2	14.0	16.8	22.4	25.2	28.0
	Maximum (kW)	29.1	36.4	43.7	58.2	65.5	72.8
Maximum number of connectable indoor units		14	18	22	29	32	36

Model name for combination		AM220FXWA∗∗	AM240FXWA∗∗	AM260FXWA∗∗	AM280FXWA∗∗	AM300FXWA∗∗	AM320FXWA∗∗
Number of individual outdoor units		2	2	3	2	2	2
Combined outdoor unit	AM080FXWA∗∗			2	1		
	AM100FXWA∗∗	1		1		1	
	AM120FXWA∗∗	1	2				1
	AM200FXWA∗∗				1	1	1
Rated capacity	Cooling (kW)	61.6	67.2	72.8	78.4	84.0	89.6
	Heating (kW)	69.3	75.6	81.9	88.2	94.5	100.8
Total capacity of the connected indoor units (Cooling)	Minimum (kW)	30.8	33.6	36.4	39.2	42.0	44.8
	Maximum (kW)	80.1	87.4	94.6	101.9	109.2	116.5
Maximum number of connectable indoor units		40	44	47	51	55	58

Preparing for installation

Model name for combination		AM340FXWA✳✳	AM360FXWA✳✳	AM380FXWA✳✳	AM400FXWA✳✳	AM420FXWA✳✳	AM440FXWA✳✳
Number of individual outdoor units		3	3	3	2	3	3
Combined outdoor unit	AM080FXWA✳✳		2	1			
	AM100FXWA✳✳	1		1		1	
	AM120FXWA✳✳	2				1	2
	AM200FXWA✳✳		1	1	2	1	1
Rated capacity	Cooling (kW)	95.2	100.8	106.4	112.0	117.6	123.2
	Heating (kW)	107.1	113.4	119.7	126.0	132.3	138.6
Total capacity of the connected indoor units (Cooling)	Minimum (kW)	47.6	50.4	53.2	56.0	58.8	61.6
	Maximum (kW)	123.8	131.0	138.3	145.6	152.9	160.2
Maximum number of connectable indoor units		62	64	64	64	64	64

Model name for combination		AM480FXWA✳✳	AM500FXWA✳✳	AM520FXWA✳✳	AM600FXWA✳✳
Number of individual outdoor units		3	3	3	3
Combined outdoor unit	AM080FXWA✳✳	1			
	AM100FXWA✳✳		1		
	AM120FXWA✳✳			1	
	AM200FXWA✳✳	2	2	2	3
Rated capacity	Cooling (kW)	134.4	140.0	145.6	168.0
	Heating (kW)	151.2	157.5	163.8	189.0
Total capacity of the connected indoor units (Cooling)	Minimum (kW)	67.2	70.0	72.8	84.0
	Maximum (kW)	174.7	182.0	189.3	218.4
Maximum number of connectable indoor units		64	64	64	64

✳ You can connect maximum 64 indoor units to the outdoor unit. Maximum quantity of connectable indoor unit is set to 64 since outdoor unit only support up to 64 communication address. Indoor unit address can be assigned from 0~63. If the indoor unit address was assigned from 64~79, E201 error will occur.

✳ Minimum capacity of the indoor unit is 1.7 kW.

CAUTION

• Installation combination must be complied when composing outdoor unit combination.

Moving the outdoor unit

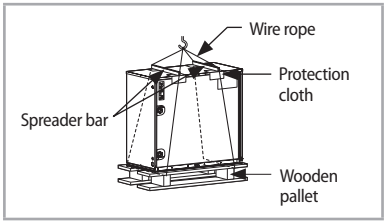
- Select the moving path in advance.
- Be sure that moving path can support weight of the outdoor unit.
- Do not slant the product more than 30˚ when carrying it. (Do not lay the product down in sideways.)
- Surface of the heat exchanger is sharp. Be careful not to get injured while moving the product.

CAUTION

- You must use certain part of the product when moving the product.

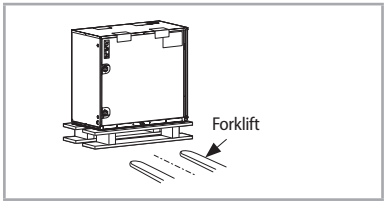
When moving with a crane

- Fasten the wire rope as shown in the figure.
- To protect damage or scratches, insert a piece of cloth between the outdoor unit and the wire rope.



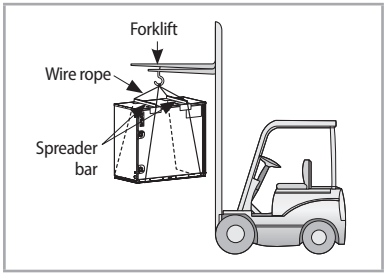
When moving with a forklift

- Carefully insert the forklift forks into the forklift holes at the bottom of the outdoor unit.
- Be careful with the forklift from damaging the product.



When moving the product without wooden pallet and the crane is not available for use

- Connect a wire rope to the outdoor unit as you would move it with a crane.
- Hang the wire rope to the forklift fork to move the outdoor unit.



Selecting installation location

Decide the installation location regarding the following condition and obtain user's approval.

Standard installation condition

- Heat source water containing foreign substances can cause condenser and pipe corrosion as well as water scale. Therefore, make sure that water source meets the standard of cooling water quality for refrigerating and air conditioning equipment. (Refer to 'Cooling water management' on page 96.)
- Closed circuit cooling tower must be used, but when open cooling tower is in use, select indirect water pipe installation method which water pipe of the building is not directly connected to the water pipe of the product.
- Strainer (which needs to be purchased separately) must be installed to the 'Water IN' pipes of the heat source water. If sand, dust or rust debris enter to water system, it may cause corrosion on metallic materials or blockage of the water heat exchanger and damage the heat exchanger.
- DVM S WATER-GEO air conditioner is not designed to be installed outdoor. There are risk of burst and frozen water pipes when the outdoor unit is installed outdoor, therefore it must be installed indoor (machine room etc.)

Installation location condition

- Choose a place with ventilation duct or opening to cool down the heat generated from the product and maintain the surrounding temperature within 0~40°C and the humidity below 80%.
- Choose a place where structure can bear the weight and vibration of the outdoor unit.
- Choose a flat place that rainwater does not settle or leak.
- Choose a well ventilated place with sufficient space for repair and other services.
- Choose a place where you can easily connect the refrigerant pipes between indoor and outdoor units within allowable distance.
- This product is not salt tolerant, therefore do not install it near the sea or hot springs where outdoor unit may corrode.

CAUTION

- R-410A refrigerant is a safe, nontoxic and nonflammable refrigerant. However, if the place holds any concerns for exceeding dangerous level of refrigerant concentration in case of refrigerant leakage, extra ventilation system is required.
- Do not install the product in a place with corrosive gas such as sulfur oxides, ammonia gas, sulfurous gases. Example: near washroom exhaust pipe, ventilation duct outlet, or surface near hot spring etc. (Copper pipes and soldered parts may corrode and cause refrigerant leakage.)
- Install the product in a place without any risk of inflammable gas leakage.
- System air conditioner can be interfered with static noise when listening to AM radio. Therefore, select a location where indoor unit can be installed while keeping optimal distance from the radio, computer, stereo equipment. Furthermore, select a location where electrical wiring work is possible and put those wires in a individual protection tubes and ground those protection tube.
  - Especially, keep the unit at least 3 m away from the electrical equipment in an area with weak electromagnetic waves and put the main power cable and communication cables in separately installed protection tubes, and ground each protection tubes.
  - Make sure that there is no equipment that generates electromagnetic waves. If not electromagnetic waves may cause problem to the control systems which may lead to air conditioner malfunction. (Example: Remote control sensor of the indoor unit may not be received well, due to ballast stabilizer of the lighting equipment.)

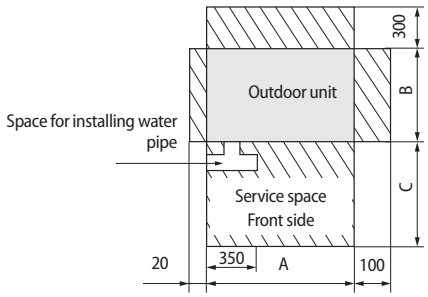
Space requirement for installation

Minimum space requirement for installation

- ▶ Secure minimum installation space as shown in the following figures, considering service area and path for people etc.
  - If the installation space is narrow, installer or other worker may get injured during work and may also cause problem to the product.
- ▶ If the conditions does not meet the space requirement in this manual, please contact qualified installation agent.

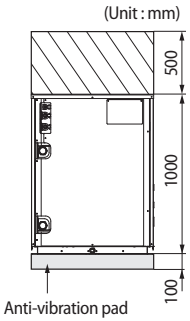
Single installation

When the water pipe passes through top of the product



<Top view>

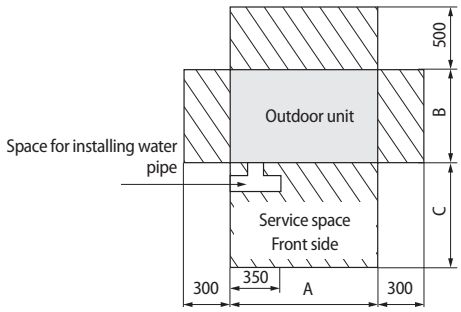
(Unit : mm)



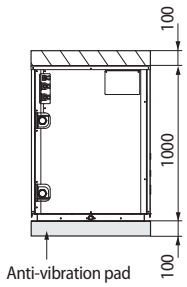
<Front view>

When the water pipe passes through back of the product

(Unit : mm)



<Top view>

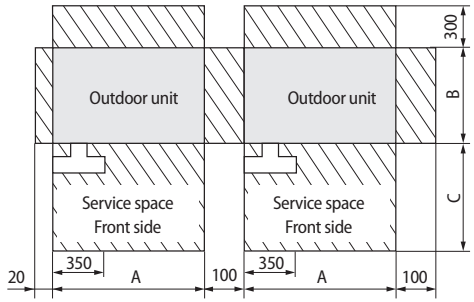


<Front view>

Space requirement for installation

Module or continuous installation

(Unit : mm)



<Top view>

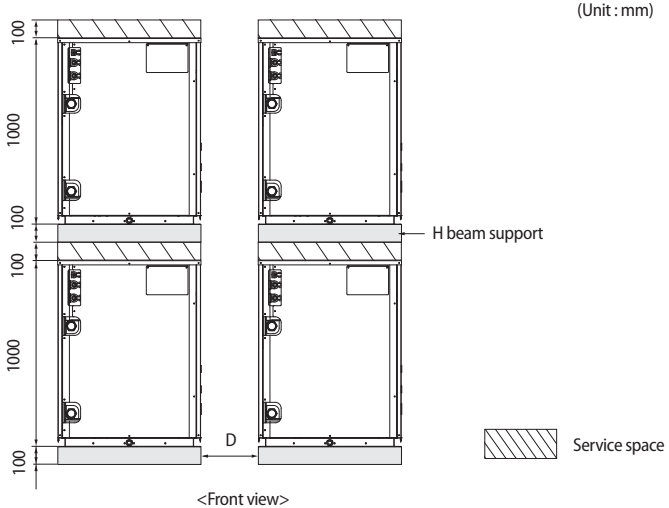
Model name of outdoor unit	A	B	C
AM080/100/120FXWA✳✳	770	545	600
AM200FXWA✳✳	1100	545	600

CAUTION

- If the outdoor unit is needed to be installed close to the walls unavoidably, prevent the vibration from being transferred to the walls with cushioning materials etc.

Double installation

(Unit : mm)



<Front view>

- For the double installation, service space is required for the front, rear, and sides of the product. For the size of the service space, refer to the service space size of single, module or continuous installation.
- Clear enough space for D (space between outdoor units), so that water pipes connected to outdoor units does not block the front side of the outdoor units next to it.

Accessories

Accessories

- ▶ You must keep following accessories until the installation is finished.
- ▶ Hand over the installation manual to the customer after finishing the installation.

Name	Installation manual	Installation check card	Packing socket
Quantity	1	1	1
Image			

✻ Models with packing socket : AM080,100,120FXWA✳✳

✻ Socket can be different depending on the model(Page 20, 23)

Optional accessories

- ▶ Following optional accessories are needed for connecting pipes between the indoor and outdoor units.

Classification	Model Name	Specification
Y-Joint	MXJ-YA1509M	15.0 kW and below
	MXJ-YA2512M	Over 15.0 kW~40.0 kW and below
	MXJ-YA2812M	Over 40.0 kW~45.0 kW and below
	MXJ-YA2815M	Over 45.0 kW~70.3 kW and below
	MXJ-YA3419M	Over 70.3 kW~98.4 kW and below
	MXJ-YA4119M	Over 98.4 kW~135.2 kW and below
	MXJ-YA4422M	Over 135.2 kW
Y-Joint (Only H/R)	MXJ-YA1500M	22.4 kW and below
	MXJ-YA2500M	Over 22.4 kW~70.3 kW and below
	MXJ-YA3100M	Over 70.3 kW~135.2 kW and below
	MXJ-YA3800M	135.2 kW and below
Distribution header	MXJ-HA2512M	45.0 kW and below (for 4 rooms)
	MXJ-HA3115M	70.3 kW and below (for 8 rooms)
	MXJ-HA3819M	Over 70.3 kW (for 8 rooms)
Y-Joint - Outdoor unit	MXJ-TA3819M	134.4 kW and below
	MXJ-TA4422M	140.0 kW and Over
Y-Joint (Only H/R) - Outdoor unit	MXJ-TA3100M	134.4 kW and below
	MXJ-TA3800M	140.0 kW and Over

✻ If you use an indoor unit with no internal EEV(Electric Expansion Valve), you will need an EEV kit.

✻ Only use the genuine accessories listed in above table and do not use imitated accessories.

✻ Recommended specification of the strainer

Work pressure	Water pipe connection	Mesh size	Material(strainer/Mesh)
1.96 MPa	32 A(Interual thread)	50 Mesh	AISI316/SUS304

Base construction and installation of the outdoor unit

WARNING

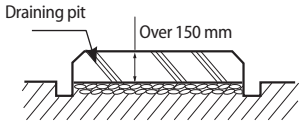
- Make sure to remove the wooden pallet before installing the outdoor unit. If you do not remove the wooden pallet, there is risk of fire during welding the pipes. If the outdoor unit is installed with wooden pallet on, and it was used for long period time, wooden palette may break and cause electrical hazard or high pressure may damage the pipes.

❋ Fix an outdoor unit firmly on the base ground with anchor bolts.

❋ Manufacturer is not responsible for the damage occurred by not following the installation standards.

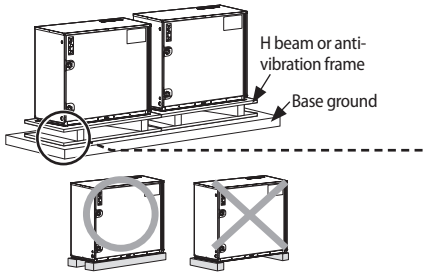
1. Make sure that the height of the base ground is 150 mm or higher to protect the outdoor unit from rain water or other external conditions. Also, install a draining pit around the base ground and connect the drain pipe to the drainage.
2. Considering the vibration and weight of the outdoor unit, strength of the base ground must be strong to prevent noise and the top surface of it should be flat.
3. Base ground should be 1.5 times larger than the bottom of the outdoor unit.
4. Outdoor unit must be fixed firmly so that it can withstand the wind speed of 30 m/s. If you cannot fix the outdoor unit on the base ground, fix it by side or use extra structure.
5. In heating operation, defrost water may form so you must really care about the drainage and waterproofing the floor. To prevent defrost water from stagnating or freezing, construct a drainage with over 1/50 slope. (Ice may form on the floor in winter time.)
6. It is necessary to add wire mesh or steel bar during concrete construction for the base ground to prevent damages or cracks.
7. When installing multiple outdoor units at the same place, construct a H beam or an anti-vibration frame on the base ground to install the outdoor unit.
8. After installing a H beam or an anti-vibration frame, apply corrosion protection and other necessary coating.
9. When concrete construction for outdoor unit installation is completed, install an anti-vibration pad (t=20 mm or more) or an anti-vibration frame to prevent vibration of the outdoor unit from transferring to the base ground.
10. Place the outdoor unit on a H beam or an anti-vibration frame and fix it with the bolt, nut and washer. (The bearing force has to be over 3.5 kN)

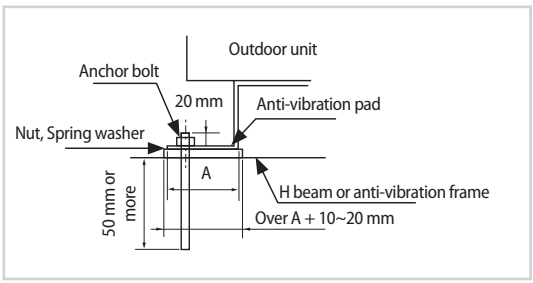
Base ground construction



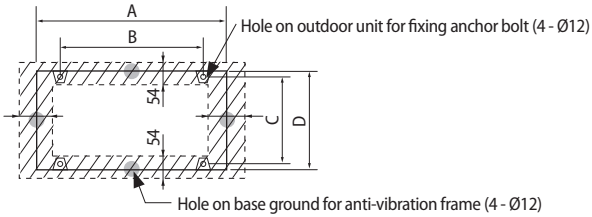
<When installing on the ground>

Outdoor unit installation





Fixing the outdoor unit



(Unit : mm)

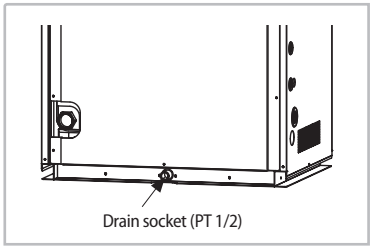
Classification	Small type	Large type
Models	AM080/100/120FXWA✳✳	AM200FXWA✳✳
A	770	1100
B	648	976
C	527	528
D	550	550

✳ Refer to the blueprints in technical data book to make holes in the base ground for fixing the anti-vibration pad.

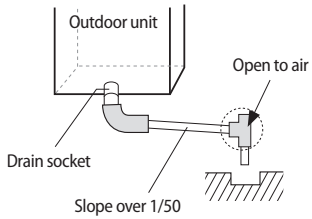
Drain pipe installation

Installing the drain pipe

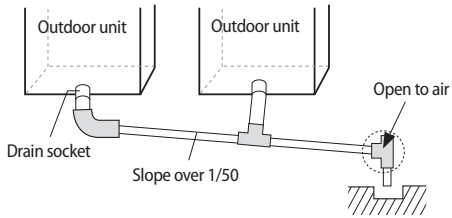
▶ Attach the drain pipe to the drain socket (PT1/2) located on the bottom of the product.



Single installation



Module installation

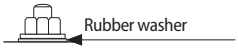


▶ Do not install trap and ensure the slope of the drain pipe is more than 1/50.
▶ Insulate the drain pipe and drain plug with insulation over 10 mm thick.
▶ Install self-regulating heating cable on the drain pipe to prevent it from freezing.
▶ If you have installed a heater to prevent drain pipe from freezing, install a safety equipment for a heating appliance.

Cautions regarding connecting the anchor bolt

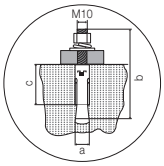
CAUTION

- Use the rubber washer to prevent the anchor bolt from corroding.



- Anchor bolt specifications

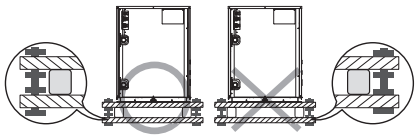
Size	Diameter of the bore (a)	Anchor length (b)	Sleeve length (b)	Insertion depth	Fastening torque
M10	14 mm	75 mm	40 mm	50 mm	30 N·m



❋ Use anchor bolts and nuts made of plated zinc or STS material. Regular anchor bolts or nuts may get damaged by corrosion.

Cautions regarding anti-vibration frame installation

- During installation, make sure there is no gap between the base ground and the supporting structures such as anti-vibration frame or H beam.
- Base ground must be constructed firmly to support the bottom part of the anti-vibration mount.
- After installing the anti-vibration frame, unscrew the fixing part on the top and bottom part of the frame.



- If the anti-vibration frame or H beam is fixed to the base ground with anchor bolts, make sure that waterproofed surface is not damaged by anchor bolts and apply additional waterproof solution if necessary.

Refrigerant pipe installation

WARNING

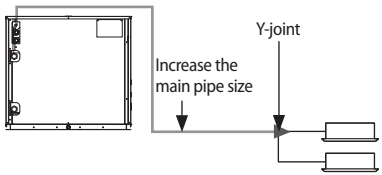
- When installing, make sure there is no leakage. When collecting the refrigerant, stop the compressor first before removing the connection pipe. If the refrigerant pipe is not properly connected and the compressor is working with the service valve open, the pipe sucks the air in which makes the pressure inside of the refrigerant cycle abnormally high which may lead to explosion and injury.

Refrigerant pipe work

- The length of refrigerant pipe should be as short as possible and the height difference between an indoor and outdoor unit should be minimized.
- Piping work must be done within allowable piping length, height difference, and the allowable length after branching.
- The pressure of the R-410A is high. Use only certified refrigerant pipe and follow the installation method.
- After installing the pipes, calculate the total length of the pipe to check if additional refrigerant is needed. When you need to charge the additional refrigerant, make sure to use R-410A refrigerant.
- The inside of the refrigerant pipe must be clean and contain no harmful ions, oxides, dust, iron particles or moisture.
- Use tools and accessories compatible with R-410A refrigerant gas.

<table>
<tr><th>Tool</th><th>Installation process/purpose</th><th colspan="2">Compatibility with conventional tool</th></tr>
<tr><td>Pipe cutter</td><td rowspan="5">Refrigerant pipe installation</td><td>Pipe cutting</td><td rowspan="2">Compatible</td></tr>
<tr><td>Flaring tool</td><td>Pipe flaring</td></tr>
<tr><td>Refrigerant machine oil</td><td>Apply refrigerant oil on flared part</td><td>Exclusive ether oil, ester oil, alkali benzene oil or synthetic oil</td></tr>
<tr><td>Torque wrench</td><td>Connect flare nut with pipe</td><td rowspan="4">Compatible</td></tr>
<tr><td>Pipe bender</td><td>Pipe bending</td></tr>
<tr><td>Nitrogen gas</td><td rowspan="2">Air tightness test</td><td>Prevent oxidation within the pipe</td></tr>
<tr><td>Welder</td><td>Pipe welding</td></tr>
<tr><td>Manifold gage</td><td rowspan="2">Air tightness test ~ additional refrigerant charging</td><td rowspan="2">Vacuuming, charging refrigerant and checking operation</td><td>Need exclusive one to prevent mixture of R-22 refrigerant oil use and also the measurement is not available due to high pressure</td></tr>
<tr><td>Refrigerant charging hose</td><td>Need exclusive one since there is risk of refrigerant leakage or contamination</td></tr>
<tr><td>Vacuum pump</td><td colspan="2">Pipe drying</td><td>Compatible (Use products which contain the check valve to prevent the oil from flowing backward into the outdoor unit.) Use the one that can be vacuumed up to -100.7kpa(5Torr).</td></tr>
<tr><td>Scale for refrigerant charging</td><td colspan="2" rowspan="2"></td><td>Compatible</td></tr>
<tr><td>Gas leak detector</td><td>Gas leak test</td><td>Need exclusive one
(Ones used for R-134a is compatible)</td></tr>
<tr><td>Flare nut</td><td colspan="3">Must use the flare nut supplied with the product. Refrigerant leakage may occur when the conventional flare nut for R-22 is used.</td></tr>
</table>

Selecting refrigerant pipe



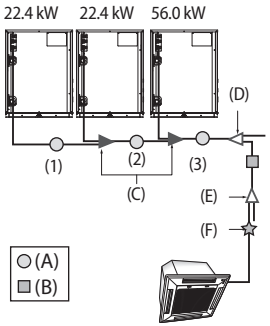
- Install the refrigerant pipe according to main pipe size of each outdoor unit capacity.
- When the pipe length (including elbow) between the outdoor unit and the farthest indoor unit exceeds 90m, the size of the pipe (main pipe) connecting the outdoor unit to the first branch joint must be increased by one grade.
- For HR System, when the pipe length (including elbow) between an outdoor unit and the farthest indoor unit exceeds 90 m, you must increase the size of the liquid pipe by one grade among the pipes(main pipe) which connects between the outdoor unit to the first branch joint

Main pipe size (Outer diameter, mm) If total pipe length is less than 90 m	Main pipe size (Outer diameter, mm) If total pipe length is 90 m or longer
9.52	12.70
12.70	15.88
15.88	19.05
19.05	22.22
22.22	25.40 note1)
28.58	31.75 note2)
34.92	38.10 note3)
41.28	53.98

Note1) If Ø 25.40 pipe is not available on site, use Ø 28.58 pipe.
Note2) If Ø 31.75 pipe is not available on site, use Ø 34.92 pipe.
Note3) If Ø 38.10 pipe is not available on site, use Ø 41.28 pipe

Refrigerant pipe installation

H/P



Ex.) 100.8 kW

Outdoor unit capacity (kW)	No.	Pipe size (mm)	
		Liquid pipe	Gas pipe
22.4	(1)	9.52	19.05
44.8	(2)	12.70	28.58
100.8	(3)	19.05	41.28

Size of the pipe connected to the outdoor unit (A)

Select the size of the pipe according to the below table.

Outdoor unit capacity (kW)	Main pipe length within 90 m		Size Up (Main pipe length over 90 m)	
	Liquid pipe (mm)	Gas pipe (mm)	Liquid pipe (mm)	Gas pipe (mm)
22.4 kW	Ø 9.52	Ø 19.05	Ø 12.70	Ø 22.22
28.0 kW		Ø 22.22		Ø 25.40 note1)
33.6 kW	Ø 12.70	Ø 28.58	Ø 15.88	Ø 28.58
44.8 kW				
50.4 kW	Ø 15.88		Ø 19.05	Ø 31.75 note2)
56.0 kW				
61.6 kW				
67.2 kW				
72.8 kW ~ 84.0 kW	Ø 19.05	Ø 34.92	Ø 22.22	Ø 38.10 note3)
89.6 kW ~ 95.2 kW				
100.8 kW		Ø 41.28		Ø 41.28
106.4 kW ~ 134.4 kW				
140.0 kW ~ 168.0 kW				Ø 53.98

Note1) If Ø 25.40 pipe is not available on site, use Ø 28.58 pipe.
Note2) If Ø 31.75 pipe is not available on site, use Ø 34.92 pipe.
Note3) If Ø 38.10 pipe is not available on site, use Ø 41.28 pipe

Size of the pipe between branch joints (B)

Select the pipe size according to the sum of indoor unit capacity which will be connected after the branch.

Indoor unit capacity (kW)	Branch pipe length within 45m		Branch pipe length between 45~90m	
	Liquid pipe (mm)	Gas pipe (mm)	Liquid pipe (mm)	Gas pipe (mm)
15.0 kW and below	Ø 9.52	Ø 15.88	Ø 12.70	Ø 19.05
Over 15.0 kW ~ 22.4 kW and below		Ø 19.05		Ø 22.22
Over 22.4 kW ~ 28.1 kW and below		Ø 22.22		Ø 25.40 note1)
Over 28.1 kW ~ 40.0 kW and below	Ø 12.70	Ø 28.58	Ø 15.88	Ø 28.58
Over 40.0 kW ~ 45.0 kW and below				Ø 31.75 note2)
Over 45.0 kW ~ 70.3 kW and below	Ø 15.88		Ø 19.05	
Over 70.3 kW ~ 98.4 kW and below	Ø 19.05	Ø 34.92	Ø 22.22	Ø 38.10 note3)
Over 98.4 kW ~ 135.2 kW and below		Ø 41.28		Ø 41.28
Over 135.2 kW ~ 169.0 kW and below				Ø 53.98
Over 169.0 kW	Ø 22.22	Ø 53.98	Ø 25.40 note1)	

Note1) If Ø 25.40 pipe is not available on site, use Ø 28.58 pipe.
Note2) If Ø 31.75 pipe is not available on site, use Ø 34.92 pipe.
Note3) If Ø 38.10 pipe is not available on site, use Ø 41.28 pipe

Size of the pipe between the branch joint and the indoor unit

Make a selection according to outdoor unit capacity.

Indoor unit capacity (kW)	Pipe size (O.D. mm)	
	Liquid pipe	Gas pipe
6.0 kW and below	Ø 6.35	Ø 12.70
7.1 kW ~ 16.0 kW and below	Ø 9.52	Ø 15.88
20.0 kW ~ 23.0 kW and below	Ø 9.52	Ø 19.05
Over 23.0 kW	Ø 9.52	Ø 22.22

Refrigerant pipe installation

Branch joint

▶ Branch joint between outdoor units (C)

Classification	Model name	Specification (kW)
Y-joint for outdoor unit (C)	MXJ-TA3819M	134.4 kW and below
	MXJ-TA4422M	140.0 kW and over

▶ First branch joint (D)

Make a selection according to outdoor unit capacity.

Classification	Outdoor unit capacity (kW)	Model name of the branch joint
Y-joint (D)	33.6 kW and below	MXJ-YA2512M
	44.8 kW	MXJ-YA2812M
	50.4 kW ~ 67.2 kW	MXJ-YA2815M
	72.8 kW ~ 95.2 kW	MXJ-YA3419M
	100.8 kW ~ 134.4 kW	MXJ-YA4119M
	140.0 kW and over	MXJ-YA4422M

▶ Branch joint (E)

Select a branch joint according to the sum of indoor unit capacity which will be connected after the branch.

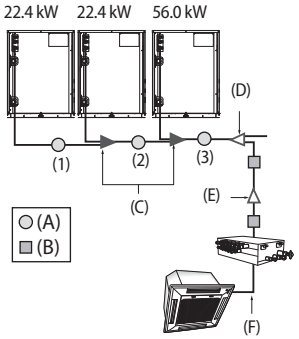
1) Y-joint

Classification	Model name	Specification (kW)
Y-joint (E)	MXJ-YA1509M	15.0 kW and below
	MXJ-YA2512M	Over 15.0 kW ~ 40.0 kW and below
	MXJ-YA2812M	Over 40.0 kW ~ 45.0 kW and below
	MXJ-YA2815M	Over 45.0 kW ~ 70.3 kW and below
	MXJ-YA3419M	Over 70.3 kW ~ 98.4 kW and below
	MXJ-YA4119M	Over 98.4 kW ~ 135.2 kW and below
	MXJ-YA4422M	Over 135.2 kW

2) Distribution header

Classification	Model name	Specification (kW)
Distribution header (E)	MXJ-HA2512M	45.0 kW and below (for 4 rooms)
	MXJ-HA3115M	70.3 kW and below (for 8 rooms)
	MXJ-HA3819M	Over 70.3 kW (for 8 rooms)

H/R



Ex.) 100.8 kW

Outdoor unit capacity (kW)	No.	Pipe size (mm)		
		Liquid pipe	Low pressure gas pipe	High pressure gas pipe
22.4	(1)	9.52	19.05	15.88
44.8	(2)	12.70	28.58	41.28
100.8	(3)	19.05	41.28	34.92

Size of the pipe connected to the outdoor unit (A)

Select the size of the pipe according to the below table.

Outdoor unit capacity (kW)	Main pipe length within 90m			Size Up (Main pipe length over 90m)		
	Liquid pipe (mm)	Low pressure gas pipe (mm)	High pressure gas pipe (mm)	Liquid pipe (mm)	Low pressure gas pipe (mm)	High pressure gas pipe (mm)
22.4 kW	Ø 9.52	Ø 19.05	Ø 15.88	Ø 12.70	Ø 19.05	Ø 15.88
28.0 kW		Ø 22.22	Ø 19.05		Ø 22.22	Ø 19.05
33.6 kW	Ø 12.70	Ø 28.58		Ø 15.88	Ø 28.58	
44.8 kW			Ø 22.22			Ø 22.22
50.4 kW	Ø 15.88			Ø 19.05		
56.0 kW			Ø 28.58			Ø 28.58
61.6 kW						
67.2 kW						
72.8 kW ~ 84.0 kW	Ø 19.05	Ø 34.92		Ø 22.22	Ø 34.92	
89.6 kW ~ 95.2 kW						
100.8 kW		Ø 41.28	Ø 34.92		Ø 41.28	Ø 34.92
106.4 kW ~ 134.4 kW						
140.0 kW ~ 168.0 kW						

✻ For HR model, only increase the size of the liquid pipe If pipe length exceeds 90m

Refrigerant pipe installation

Size of the pipe between branch joints (B)

Select the pipe size according to the sum of indoor unit capacity which will be connected after the branch.

<table>
<tr><th rowspan="2">Indoor unit capacity (kW)</th><th colspan="3">Pipe size (mm)</th></tr>
<tr><th>Liquid pipe</th><th>Low pressure gas pipe</th><th>High pressure gas pipe</th></tr>
<tr><td>15.0 kW and below</td><td rowspan="4">Ø 9.52</td><td>Ø 15.88</td><td rowspan="2">Ø 15.88</td></tr>
<tr><td>Over 15.0 kW ~ 22.4 kW and below</td><td>Ø 19.05</td></tr>
<tr><td>Over 22.4 kW ~ 28.1 kW and below</td><td>Ø 22.22</td><td rowspan="2">Ø 19.05</td></tr>
<tr><td>Over 28.1 kW ~ 33.6 kW and below</td><td rowspan="2">Ø 12.70</td><td rowspan="4">Ø 28.58</td></tr>
<tr><td>Over 33.6 kW ~ 45.0 kW and below</td><td>Ø 22.22</td></tr>
<tr><td>Over 45.0 kW ~ 50.4 kW and below</td><td rowspan="2">Ø 15.88</td><td rowspan="3">Ø 28.58</td></tr>
<tr><td>Over 50.4 kW ~ 70.3 kW and below</td></tr>
<tr><td>Over 70.3 kW ~ 98.4 kW and below</td><td rowspan="4">Ø 19.05</td><td>Ø 34.92</td></tr>
<tr><td>Over 98.4 kW ~ 105.5 kW and below</td><td rowspan="3">Ø 41.28</td></tr>
<tr><td>Over 105.5 kW ~ 135.2 kW and below</td><td rowspan="2">Ø 34.92</td></tr>
<tr><td>Over 135.2 kW ~ 169.0 kW and below</td></tr>
<tr><td>Over 169.0 kW</td><td>Ø 22.22</td><td>Ø 53.98</td><td>Ø 41.28</td></tr>
</table>

Size of the pipe between MCU and indoor unit (F)

Select a pipe size according to the sum of indoor unit capacity which will be connected to the MCU

Indoor unit capacity (kW)	Pipe size (mm)	
	Liquid pipe	Gas pipe
2.0~6.0	6.35	12.70
7.2~14.5	9.52	15.88
16.0	9.52	15.88
23.0	9.52	19.05
29.0	9.52	22.22

Branch joint

▶ Branch joint between outdoor units (C)

Classification	Model name	Specification (kW)
Liquid/Low pressure Y-joint (C)	MXJ-TA3819M	134.4 kW and below
	MXJ-TA4422M	140.0 kW and over
High pressure Y-joint (C)	MXJ-TA3100M	134.4 kW and below
	MXJ-TA3800M	140.0 kW and over

▶ First branch joint (D)

Make a selection according to outdoor unit capacity.

Classification	Outdoor unit capacity (kW)	Model name of the branch joint
Liquid/Low pressure Y-joint (D)	33.6 kW and below	MXJ-YA2512M
	44.8 kW	MXJ-YA2812M
	50.4 kW ~ 67.2 kW	MXJ-YA2815M
	72.8 kW ~ 95.2 kW	MXJ-YA3419M
	100.8 kW ~ 134.4 kW	MXJ-YA4119M
	140.0 kW and over	MXJ-YA4422M
High pressure Y-joint (D)	22.4 kW	MXJ-YA1500M
	28.0 kW ~ 67.2 kW	MXJ-YA2500M
	72.8 kW ~ 134.4 kW	MXJ-YA3100M
	140.0 kW and over	MXJ-YA3800M

▶ Branch joint (E)

Select a branch joint according to the sum of indoor unit capacity which will be connected after the branch.

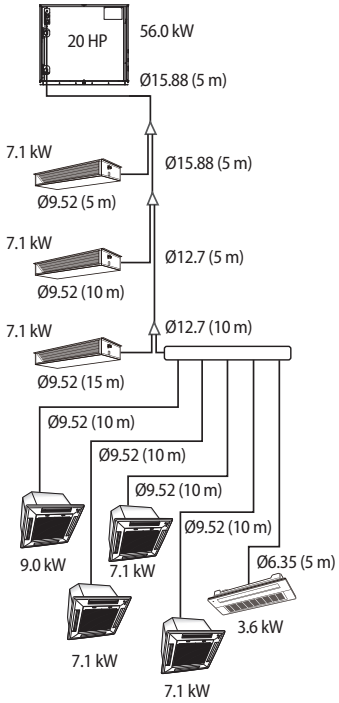
• Y-joint

Classification	Model name	Specification (kW)
Y-joint (E)	MXJ-YA1509M	15.0 kW and below
	MXJ-YA2512M	Over 15.0 kW ~ 40.0 kW and below
	MXJ-YA2812M	Over 40.0 kW ~ 45.0 kW and below
	MXJ-YA2815M	Over 45.0 kW ~ 70.3 kW and below
	MXJ-YA3419M	Over 70.3 kW ~ 98.4 kW and below
	MXJ-YA4119M	Over 98.4 kW ~ 135.2 kW and below
	MXJ-YA4422M	Over 135.2 kW
Y-joint (E) (Only H/R)	MXJ-YA1500M	22.4 kW and below
	MXJ-YA2500M	Over 22.4 kW ~ 70.3 kW and below
	MXJ-YA3100M	Over 70.3 kW ~ 135.2 kW and below
	MXJ-YA3800M	Over 135.2 kW

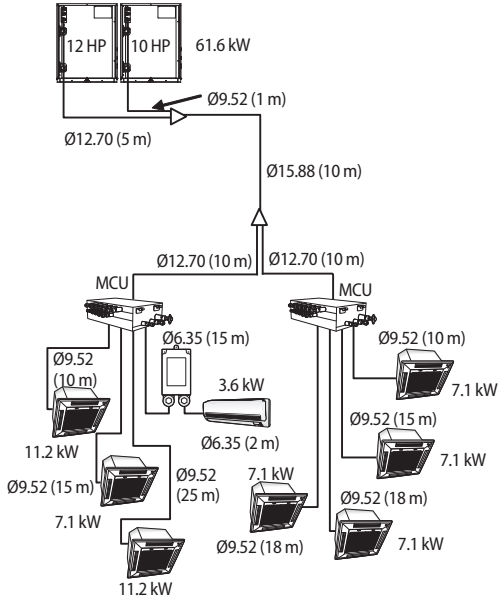
Refrigerant pipe installation

Additional refrigerant

H/P



HR



Refrigerant pipe installation

▶ Basic amount of refrigerant inside the outdoor unit (kg)

- Amount of additional refrigerant has to be calculated based on the sum of all liquid pipe lengths.

Classification	AM080FXWA✳✳	AM100FXWA✳✳	AM120FXWA✳✳	AM200FXWA✳✳
Basic amount	5.5	5.8	6.0	9.8

▶ Amount of additional refrigerant depends on the pipe size (ⓐ)

- Amount of additional refrigerant has to be calculated based on the sum of all liquid pipe length.

Size of liquid pipe (mm)	6.35	9.52	12.70	15.88	19.05	22.22	25.40	28.58
Additional amount (kg/m)	0.02	0.06	0.125	0.18	0.27	0.35	0.53	0.65

- For the indoor unit already connected to EEV kit, the additional refrigerant charging is 0.01kg per meter regardless of the pipe size.

▶ Amount of additional refrigerant for each indoor unit (ⓑ) (Unit : kg)

Capacity (kW) / Model	1.7	2.2	2.8	3.6	4.5	5.6	6	7.1	9	11.2	12.8	14	22	28	44.8	500CMH	1000CMH
Slim 1way cassette (JSF) (AM✳✳✳FN1DEH✳)		0.25	0.25	0.25													
2way cassette (AM✳✳✳FN2DEH✳)						0.31		0.47									
Global 4way cassette (AM✳✳✳FN4DEH✳)					0.45	0.45		0.45	0.45	0.57	0.69	0.69					
Floor Standing Unit (AM✳✳✳FNFDEH✳)				0.22		0.32		0.32									
ERV plus (AM✳✳✳FNKDEH✳)																0.11	0.36
4way cassette (600 X 600) (AM✳✳✳FNNDEH✳)		0.29	0.29	0.29	0.37	0.37	0.37										
Slim duct (AM✳✳✳FNLDEH✳)	0.17	0.17	0.17	0.26	0.35	0.35		0.45	0.42	0.42	0.62	0.62					
MSP duct (AM✳✳✳FNMDEH✳)		0.24	0.24	0.24	0.28	0.28		0.28	0.32	0.54	0.68	0.68					
Ceiling (AM✳✳✳FNCDEH✳)						0.39		0.39									
Console (AM✳✳✳FNJDEH✳)			0.27	0.27		0.27											
Neo forte (AM✳✳✳FNTDEH✳)		0.24	0.24	0.24		0.36		0.36									
Neo forte (with EEV) (AM✳✳✳FNQDEH✳)		0.24	0.24	0.24	0.36	0.36		0.36									
HSP duct (AM✳✳✳FNHDEH✳)										0.68	0.68	0.68	1.18	1.18			
MCU (MCU-S✳NEE✳N)	0.50																
Hydro unit / HE (AM✳✳✳FNBDEH)												0.5		0.7	1.2		
Hydro unit / HT (AM***FNBFEB, AM***FNBFGB)												0.6	0.6				

▶ If AHU kit is included among the indoor units, you must add 0.063 kg of refrigerant for every 1 kW of the AHU capacity increase.

▶ If the MCU is installed, add 0.5 kg of additional refrigerant per each MCU.

Refrigerant pipe installation

▶ Method to calculate the total amount of additional refrigerant
- Amount of additional refrigerant depends on the pipe length (ⓐ)
- Amount of additional refrigerant for each indoor unit (ⓑ) = Σ(Amount of additional refrigerant for each connected indoor unit) ※ Refer to the table
- Total amount of additional refrigerant = ⓐ+ⓑ

※ Sum of total amount of additional refrigerant and the basic amount of refrigerant should not exceed 100 kg. If the refrigerant exceeds 100kg, separate the module so that the weight of the refrigerant doesn't exceed 100 kg.
Ex.) For AM200FXWA✳✳, basic amount of refrigerant is 9.8 kg, therefore total amount of additional refrigerant (ⓐ+ⓑ) should not exceed 90.2 kg.

▶ Example of refrigerant calculation for H/P System

Classification	Size of liquid pipe	Length (m)	Unit amount of refrigerant (kg/m)	Amount of additional refrigerant (kg)	Total amount of additional refrigerant (kg)
		①	②	①×②	Σ(①×②)
Liquid pipe (ⓐ)	6.35	5	0.02	0.1	ⓐ 7.975
	9.52	70	0.06	4.2	
	12.70	15	0.125	1.875	
	15.88	10	0.18	1.8	

Classification	Model name of indoor unit	Number of units	Unit amount of refrigerant (kg/EA)	Amount of additional refrigerant (kg)	Total amount of additional refrigerant (kg)
		①	②	①×②	Σ(①×②)
Indoor unit (ⓑ)	4way cassette (AM071FN4DEH✳)	3	0.45	1.35	ⓑ 3.4
	4way cassette (AM090FN4DEH✳)	1	0.45	0.45	
	Slim duct (AM071FNLDEH✳)	3	0.45	1.35	
	1way cassette (AM036FN1DEH✳)	1	0.25	0.25	

- Total amount of refrigerant (ⓐ+ⓑ) = 7.975+3.4=11.375 (kg)

▶ Example of refrigerant calculation for HR System

Classification	Size of liquid pipe	Length (m)	Unit amount of refrigerant (kg/m)	Amount of additional refrigerant (kg)	Total amount of additional refrigerant (kg)
		①	②	①×②	Σ(①×②)
Liquid pipe (ⓐ)	6.35	15	0.02	0.3	ⓐ 11.965
	9.52	112	0.06	6.72	
	12.70	25	0.125	3.125	
	15.88	10	0.18	1.8	
	6.35 (EEV Kit ~ indoor unit)	2	0.01	0.02	

Classification	Model name of indoor unit	Number of units	Unit amount of refrigerant (kg/EA)	Amount of additional refrigerant (kg)	Total amount of additional refrigerant (kg)
		①	②	①×②	Σ(①×②)
Indoor unit (ⓑ)	4way cassette (AM071FN4DEH✳)	5	0.45	2.25	ⓑ 4.63
	4way cassette (AM112FN4DEH✳)	2	0.57	1.14	
	Neo Forte (AM036FNTDEH✳)	1	0.24	0.24	
	MCU	2	0.5	1	

- Total amount of refrigerant (ⓐ+ⓑ) = 11.965+4.63 = 16.595 (kg)

Temper grade and minimum thickness of the refrigerant pipe

Outer diameter (mm)	Minimum thickness (mm)	Temper grade
6.35	0.70	Annealed
9.52	0.70	
12.70	0.80	
15.88	1.00	
19.05	0.90	Drawn
22.22	0.90	
25.40	1.00	
28.58	1.10	
31.75	1.10	
34.92	1.21	
38.10	1.35	
41.28	1.43	
44.45	1.60	
50.80	2.00	
53.98	2.10	

CAUTION

- For pipes larger than Ø 19.05, drawn type (C1220T-1/2H or C1220T-H) type copper pipe must be used. If a annealed type (C1220T-O) copper pipe is used, pipe may break due to its low pressure resistance and cause personal injury.

Refrigerant pipe installation

Keeping refrigerant pipe

To prevent foreign materials or water from entering the pipe, storing method and sealing method (especially during installation)is very important. Apply correct sealing method depending on the environment.

Exposure place	Exposure time	Sealing type
Outdoor	Longer than one month	Pipe pinch
	Shorter than one month	Taping
Indoor	-	Taping

Refrigerant pipe welding and safety information

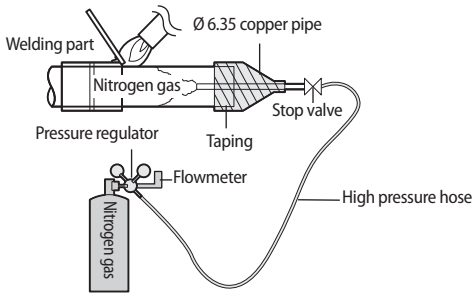
CAUTION

Important information for refrigerant pipe work

- Make sure there is no moisture inside the pipe.
- Make sure there are no foreign substances and impurities in the pipe.
- Make sure there is no leakage.
- Make sure to follow the instruction when welding or storing the pipe.

Nitrogen flushing welding

- ▶ When welding the refrigerant pipes, flush them with nitrogen gas as shown in the picture.
- ▶ If you do not perform nitrogen flushing when welding the pipes, oxide may form inside the pipe. It can cause the damage of the important parts such as compressor and valves etc.
- ▶ Adjust the flow rate of the nitrogen flushing with a pressure regulator to maintain 0.05m³/h or less.



Direction of the pipe when welding

- ▶ Direction of the pipe should be headed downward or in a sideways when welding.
- ▶ Avoid welding the pipe with pipe direction heading upward.

CAUTION

- When you test gas leakage after welding the pipes, use a designated solution for gas leakage detection. If you use the detection solution that includes sulfuric ingredient, it may cause corrosion to the pipes.

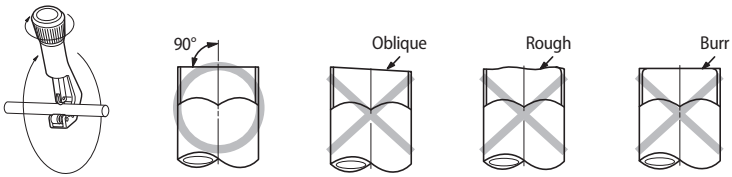
Cutting or flaring the pipes

1. Make sure that you prepared the required tools.

▶ Pipe cutter, Deburring tool, flaring tool and pipe holder, etc.

2. If you want to shorten the pipe, cut it with a pipe cutter ensuring that the cut edge remains at 90° with the side of the pipe.

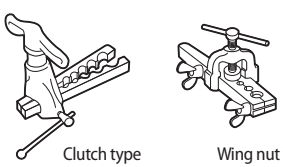
▶ Refer to below illustrations for correct and incorrect examples of cut edges.

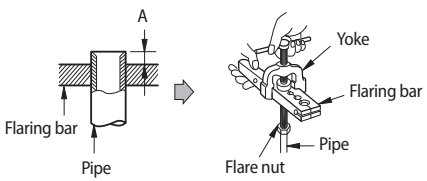


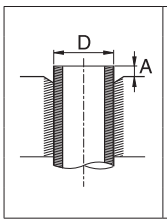
3. To prevent a gas leak, remove all burrs at the cut edge of the pipe using a Deburring tool.

4. Carry out flaring work using flaring tool as shown below.

[Flaring tools]



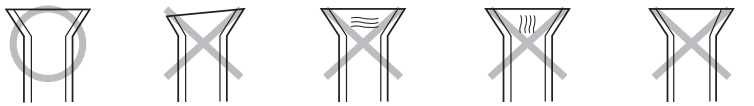




Pipe diameter [D (mm)]	Depth of flaring part [A (mm)]		
	Using flaring tool for R-410A	Using conventional flaring tool	
		Clutch type	Wing nut type
Ø 6.35	0~0.5	1.0~1.5	1.5~2.0
Ø 9.52	0~0.5	1.0~1.5	1.5~2.0
Ø 12.70	0~0.5	1.0~1.5	1.5~2.0
Ø 15.88	0~0.5	1.0~1.5	1.5~2.0

5. Check that you flared the pipe correctly.

▶ Refer to below illustrations for correct and incorrect examples of flared pipe.

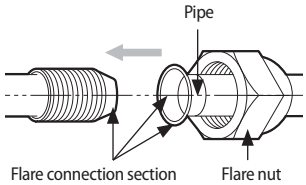


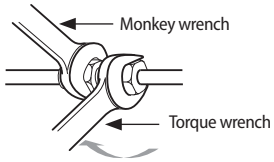
CAUTION
- If foreign matters or burrs are not removed after cutting pipe, refrigerant gas may leak.
- If foreign matters enter inside the pipe, important interior parts of the unit may get damaged or product efficiency will be reduced. So, the direction of pipe should be downward during pipe cutting or flaring.

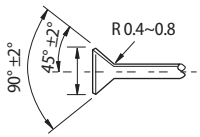
Refrigerant pipe installation

Connecting the flared pipes

- Check if the flaring is properly done according to the standard size.
- Align the center of the piping and tighten the flare nut with your hands. Then, tighten the flare nut with torque wrench in a direction of the arrow indicated in below illustration.
- Make sure to use ester oil to coat the flare connection section.





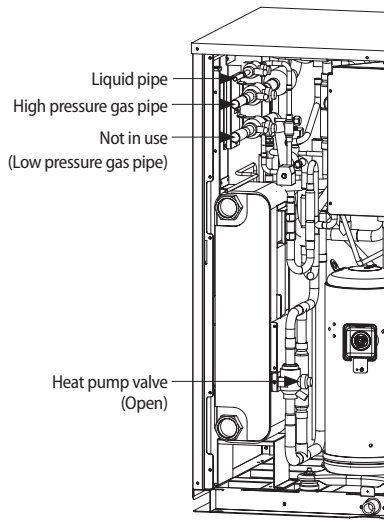
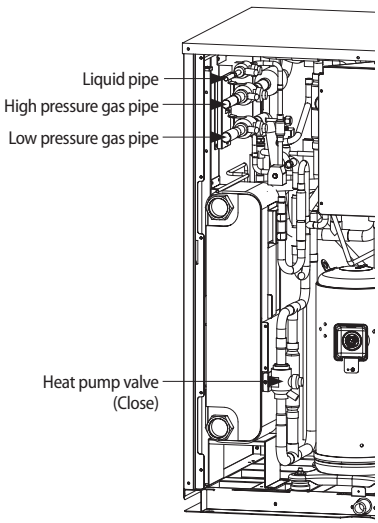
Outer diameter (mm)	Connection torque (N·m)	Flare dimension (mm)	Flare shape (mm)
Ø 6.35	14~18	8.7~9.1	
Ø 9.52	34~42	12.8~13.2	
Ø 12.70	49~61	16.2~16.6	
Ø 15.88	68~82	19.3~19.7	
Ø 19.05	100~120	23.6~24.0	

CAUTION

- Blowing Nitrogen gas should be done when welding the pipe.
- Make sure to use the provided flare nut.
- Make sure that there are no cracks or twisted part when you need to bend the pipe.
- Do not fasten the flare nut with excessive strength.
- R-410A is a high pressure refrigerant and there is a risk of refrigerant leakage if the flare connection is not coated with ester oil. Therefore, apply ester oil to coat the flare connection area.

Pipe installation for an outdoor unit

1. Please read the following instructions to connect the refrigerant pipe to an outdoor unit.
   - For H/P System, connect liquid and gas pipes to an indoor unit.
   - For HR System, connect liquid and high/low pressure gas pipes to a MCU. Close the internal heat pump valve and set the K5 switch to 'OFF'.
   - For module installation, make sure that each heat pump valve and K5 switch setting is adjusted according to each purpose. (When installing outdoor units in module, E573 error may occur when settings are different between outdoor units.)

Classification	H/P System	HR System
Service valve		
Heat pump valve	Open (Factory default)	Close (Set during installation)
Option switch (K5)	ON (Factory default)	OFF (Set during installation)

Caution for welding the pipe to an outdoor unit

CAUTION

- When welding the pipe, the unit may get damaged by the heat and flame from welding. Use a flame proofing cloth to protect the unit from a brazing fire or flame.
- The O-ring and Teflon packing inside service valve may get damaged by the heat from welding. Wrap the bottom side of the service valve with a wet cloth and weld it. Also, water dripping from the wet cloth may interrupt the welding. Make sure the water does not drip from the wet cloth.
- Make sure that connected pipes does not interrupt each other or make contact with the product. If they contact each other or contact with the outdoor unit, vibration will occur and it may cause damage to the pipes.
- When removing the sealed pipe on the bottom side of the service valve, cut it with a pipe cutter first and then start the welding. When the sealed pipe is welded without cutting, you may get injured by the refrigerant within the pipe.

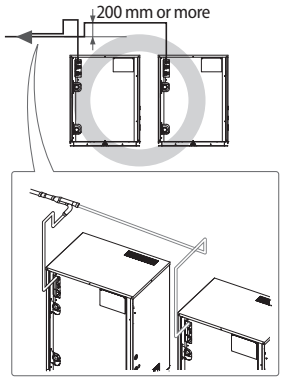
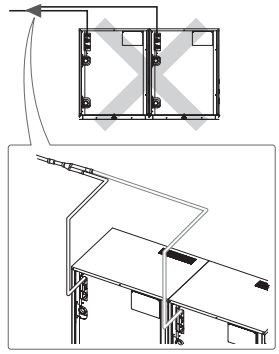
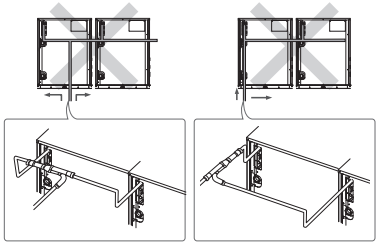
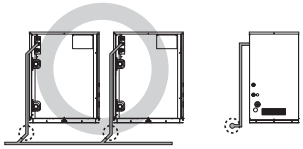
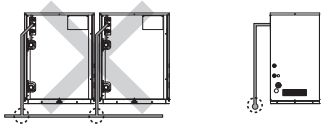
Refrigerant pipe installation

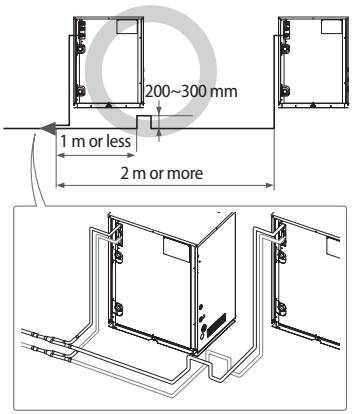
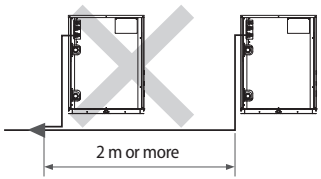
1. Connect refrigerant pipes between outdoor units.

▶ To connect pipes between outdoor units, branch joints (that needs to be purchased separate) must be installed.

❋ **For optimal distribution of the refrigerant, you must use Y-joint for connecting outdoor units. (Do not use T-joint)**

▶ When outdoor units are installed in module, there are no restrictions on the order of installation.

<table>
<tr><th>Caution</th><th>Correct installation</th><th>Incorrect installation</th></tr>
<tr><td>When refrigerant pipe is installed at higher level than the pipe connection part of the outdoor unit, you must install a trap at the gas pipe.</td><td> 
</td><td> 
 </td></tr>
<tr><td>Branch joint between outdoor units must be installed horizontally.</td><td>  </td><td>  </td></tr>
</table>

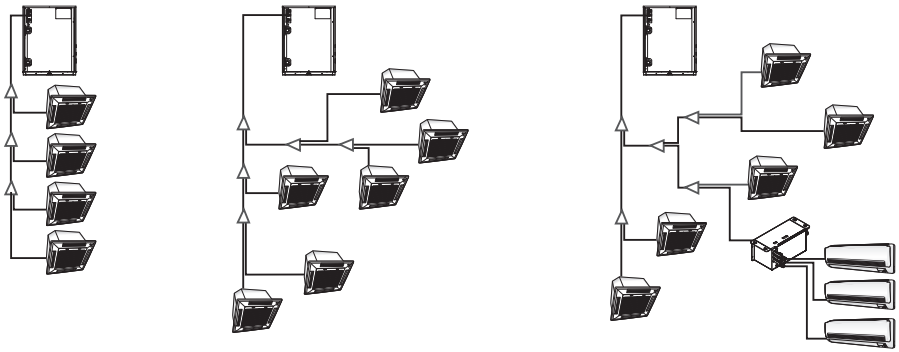
Caution	Correct installation	Incorrect installation
When the piping length between outdoor unit and the branch joint exceeds 2 m, install a vertical trap as show in the figure.		

Refrigerant pipe installation

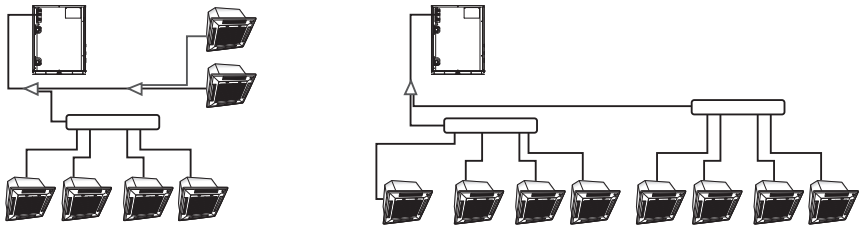
Examples of refrigerant pipe installation

H/P

1. Using Y-joint

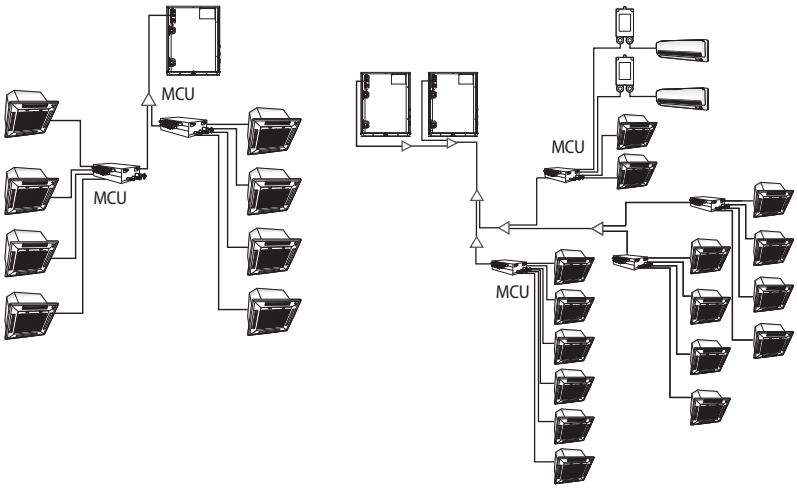


2. Using distribution header



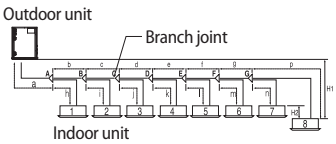
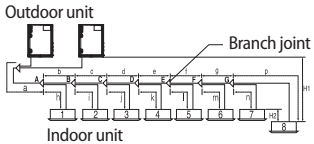
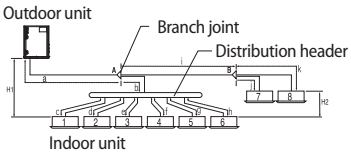
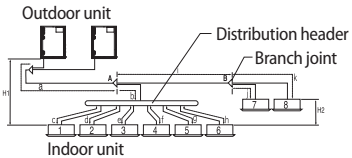
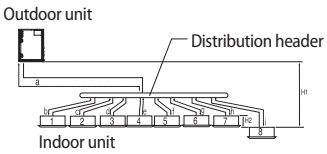
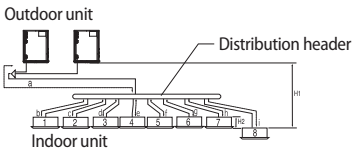
HR

1. Using Y-joint

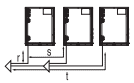


Allowable length of the refrigerant pipe and the installation examples

H/P

Classification	Single Installation	Module installation
Installing only with Y-joint		
Installing with Y-joint and distribution header		
Installing only with distribution header		

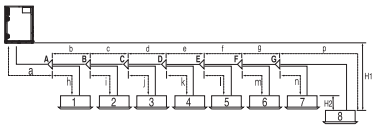
Refrigerant pipe installation

<table>
<tr><th colspan="5">Classification</th><th colspan="2">Example</th><th>Remarks</th></tr>
<tr><td rowspan="7">Maximum allowable pipe length</td><td rowspan="6">Outdoor unit ~ Indoor unit</td><td rowspan="3">Actual pipe length (Equivalent length)</td><td rowspan="3">170 m and below (190 m and below)</td><td>Installing only with Y-joint</td><td>a+b+c+d+e+f+g+p ≤ 170 (190) m</td><td rowspan="3">Equivalent length
• Y-joint: 0.5 m
• Distribution header: 1 m</td></tr>
<tr><td>Installing with Y-joint and distribution header</td><td>a+b+h ≤ 170 (190) m,
a+i+k ≤ 170 (190) m</td></tr>
<tr><td>Installing only with distribution header</td><td>a+i ≤ 170 (190) m</td></tr>
<tr><td rowspan="3">Total length of pipe (m)</td><td rowspan="3">300 m or less</td><td>Installing only with Y-joint</td><td>a+b+c+d+e+f+g+p+h+
i+j+k+l+m+n ≤ 300 m</td><td></td></tr>
<tr><td>Installing with Y-joint and distribution header</td><td>a+b+c+d+e+f+g+h+
i+j+k ≤ 300 m</td><td></td></tr>
<tr><td>Installing only with distribution header</td><td>a+b+c+d+e+f+g+h+i ≤ 300 m</td><td></td></tr>
<tr><td rowspan="2">Outdoor unit ~ Outdoor unit (Module installation)</td><td>Pipe length</td><td>10 m or less</td><td colspan="2">r ≤ 10 m, s ≤ 10 m, t ≤ 10 m</td><td rowspan="2">  </td></tr>
<tr><td>Equivalent length</td><td>13 m or less</td><td colspan="2">r ≤ 13 m, s ≤ 13 m, t ≤ 13 m</td></tr>
<tr><td>Maximum allowable height difference</td><td>Outdoor unit ~ Indoor unit</td><td colspan="2">50/40 m Note 2)</td><td colspan="2">H1 ≤ 50/40 m</td><td></td></tr>
<tr><td></td><td>Indoor unit ~ Indoor unit</td><td colspan="2">15 m or less</td><td colspan="2">H2 ≤ 15 m</td><td></td></tr>
<tr><td rowspan="2">Maximum allowable length after branch joint</td><td rowspan="2">First branch joint ~ Farthest Indoor unit</td><td rowspan="2">Pipe length</td><td>45 m or less</td><td colspan="2">b+c+d+e+f+g+p ≤ 45 m, i ≤ 45 m</td><td></td></tr>
<tr><td>45 m ~ 90 m note 1)</td><td colspan="2">Required conditions must be satisfied</td><td></td></tr>
</table>

<table>
<tr><th colspan="4">EEV kit</th><th colspan="2">Model name</th><th>Remarks</th></tr>
<tr><td rowspan="10">EEV kit ~ Indoor unit</td><td rowspan="10">Actual pipe length</td><td rowspan="2">2 m</td><td>MEV-E24SA</td><td rowspan="2">1 indooor</td><td rowspan="10">Apply to products without EEV (Wall mount & ceiling)</td></tr>
<tr><td>MEV-E32SA</td></tr>
<tr><td rowspan="8">20 m or less</td><td>MXD-E24K132A</td><td rowspan="3">2 indooor</td></tr>
<tr><td>MXD-E24K200A</td></tr>
<tr><td>MXD-E32K200A</td></tr>
<tr><td>MXD-E24K232A</td><td rowspan="4">3 indooor</td></tr>
<tr><td>MXD-E24K300A</td></tr>
<tr><td>MXD-E32K224A</td></tr>
<tr><td>MXD-E32K300A</td></tr>
</table>

❋ Please refer to the EEV Kit manual.

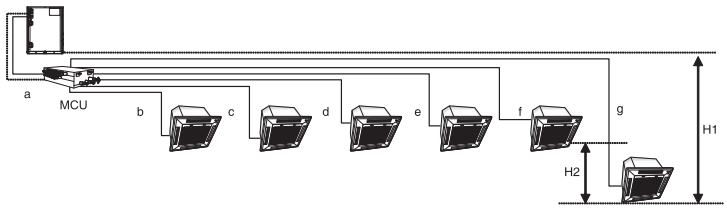
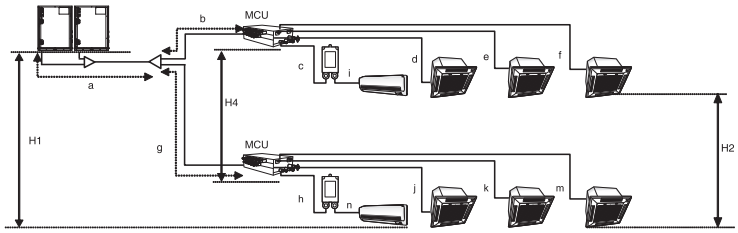
Note 1) Required condition

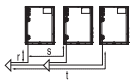
Classification	Condition	Example
First branch joint ~ Farthest Indoor unit	45 m ≤ b+c+d+e+f+g+p ≤ 90 m: Size of the branch pipe (b, c, d, e, f, g) must be increased by one grade	
Total length of extended pipe	If the size of the main pipe (pipe that connects between the outdoor unit ~ first branch joint) was not increased by one grade: a+(b+c+d+e+f+g)×2 +h+i+j+k+l+m+n+p ≤ 300 m	
	If the size of the main pipe (pipe that connects between the outdoor unit ~ first branch joint) was increased by one grade: (a+b+c+d+e+f+g)×2 +h+i+j+k+l+m+n+p ≤ 300 m	
Each Y-joint ~ Each indoor unit	h, i, j, … p ≤ 45 m	
Difference between the distance of the outdoor unit to the farthest indoor unit and nearest indoor unit ≤ 45 m (a+b+c+d+e+f+g+p)-(a+h) ≤ 45 m		

Note 2) When indoor unit is located at higher level than outdoor unit, allowable height difference is 40m, but when the indoor unit is located at lower level than outdoor unit, allowable height difference is 50 m.

Refrigerant pipe installation

HR

Classification	Installation examples
Installing with MCU only	
Installing with MCU and Y-joint	

Classification				Example		Remarks
Maximum allowable pipe length	Outdoor unit ~ Indoor unit	Actual pipe length (Equivalent length)	170 m or less (190 m or less)	Installing only with MCU	a+b+c+d+e+f+g ≤ 170 m (190 m)	Equivalent length • Y-joint: 0.5 m • Distribution header: 1 m • MCU: 1 m
				Installing with MCU and Y-joint	a+g+m ≤ 170 m (190 m)	
		Total length of pipe	300 m or less	Installing only with MCU	a+b+c+d+e+f+g ≤ 300 m	
				Installing with MCU and Y-joint	a+b+c+d+e+f+g+p+h+i+j+k+m+n ≤ 300 m	
	Outdoor unit ~ Outdoor unit (Module installation)	Pipe length	10 m or less	r ≤ 10, s ≤ 10, t ≤ 10 m		
		Equivalent length	13 m or less	r ≤ 13, s ≤ 13, t ≤ 13 m		
Maximum allowable height difference	Outdoor unit ~ Indoor unit	Pipe length	50 m/40 m Note 1)	H1 ≤ 50/40 m		
	Indoor unit ~ Indoor unit	Pipe length	15 m or less	H2 ≤ 15 m		
	MCU ~ MCU	Pipe length	15 m or less	H4 ≤ 15 m		
Maximum allowable length after branch joint	First branch joint ~ Farthest Indoor unit	Pipe length	45 m or less	Installing only with MCU	g ≤ 45 m	
				Installing with MCU and Y-joint	g+m ≤ 45 m	

Distribution kit			Model	Remarks
Allowable	From distribution kit to indoor unit	2 m	MEV-E24SA, MEV-E32SA (For 1 indoor unit)	For wall-mounted & ceiling indoor unit

Note 1) If an outdoor unit is located in a lower position than indoor unit, maximum level difference is 40 m. If outdoor unit is located in a higher position than indoor unit, level difference is 50 m or under.

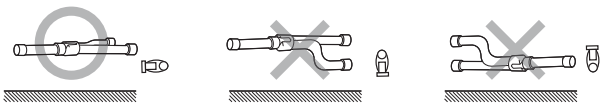
✻ Total refrigerant amount of the system must be less than 100 kg. If total refrigerant amount of system is over than 100 kg, the system has to be divided into smaller system, each less than 100 kg.

Refrigerant pipe installation

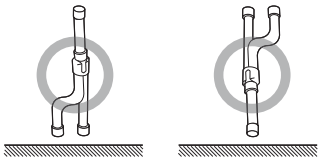
Installing the branch joints

Branch joints must be installed 'horizontally' or 'vertically'.

Horizontal installation

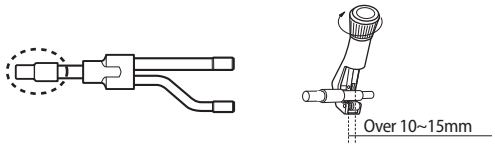


Vertical installation



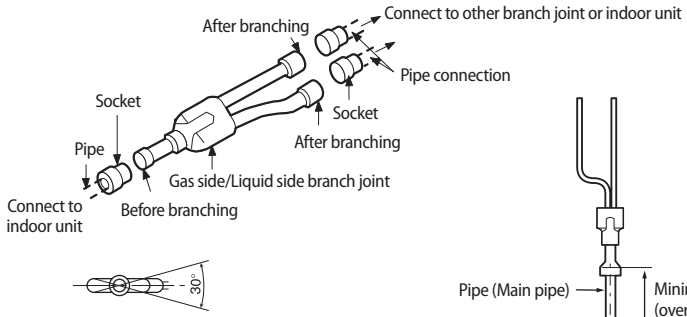
NOTE

- Cut the connection part of the branch joint or the provided socket, according to the diameter of the connection pipe, before connecting them.



CAUTION

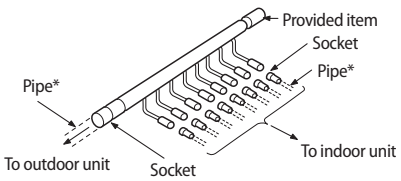
- Install the branch joint within ±15° of the horizon or vertical line.
- Make sure that the pipe is not bent at where it is connected to the branch joint.
- Keep a minimum straight line distance of 500mm or more before connecting branch joint.



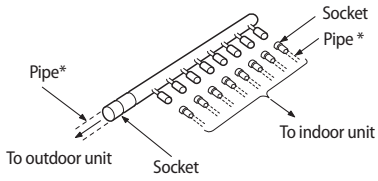
✻ Install within ±15° of the horizon or vertical line.

Installing the distribution header

1. Select the reducer that fits the diameter of the pipe.



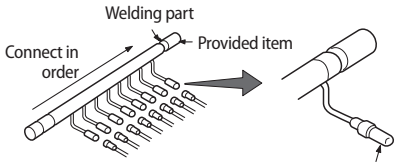
<Liquid side>



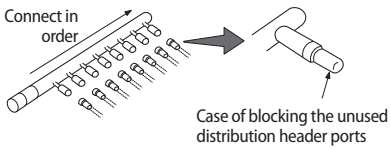
<Gas side>

❋ Pipe : Separately purchased item

2. If the number of connected indoor unit is fewer than ports on the distribution header, block the unused ports with caps.



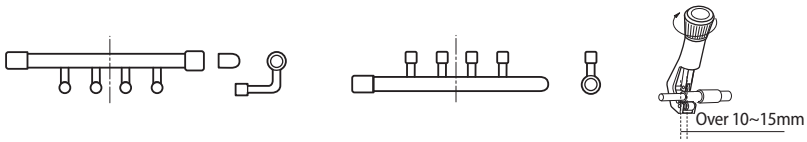
<Liquid side>



<Gas side>

NOTE

- Cut the provided socket, according to the diameter of the connection pipe, before connecting it.



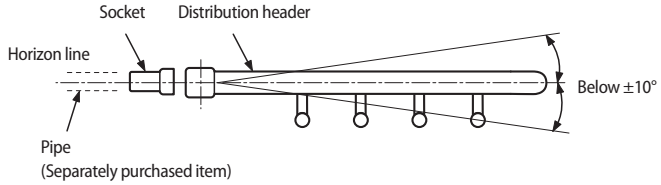
CAUTION

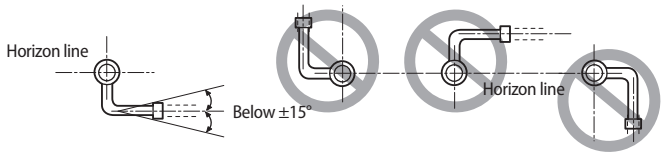
- Connect the indoor units in order, while following the direction of the arrow shown in the illustration.
- When indoor units are connected to same distribution head, indoor unit must be connected in order of their capacity, from largest to smallest.

Refrigerant pipe installation

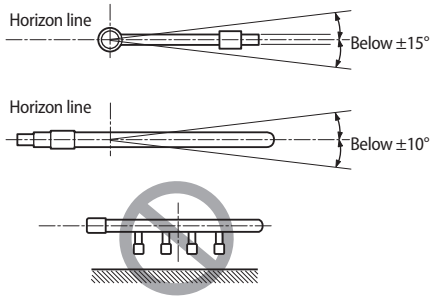
1. Install the distribution header horizontally.

► Install the distribution header horizontally so that its ports do not face down.





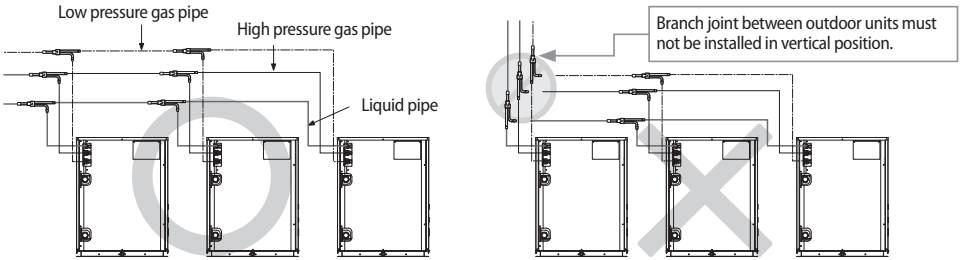
< Liquid side >



< Gas side >

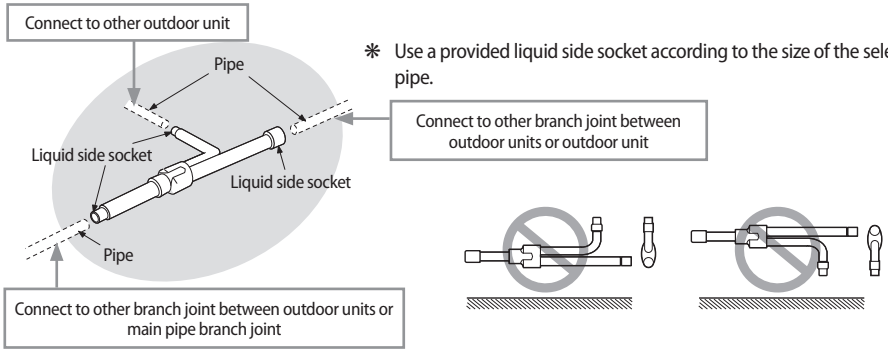
Installing the branch joint between outdoor units

Installation of outdoor joints



❋ For HR System, connect liquid pipe, high pressure gas pipe and low pressure gas pipe.

❋ For H/P System, connect liquid pipe and high pressure gas pipe.

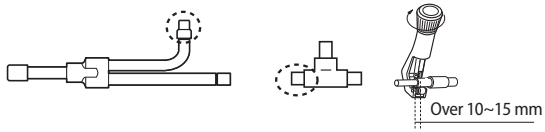


❋ Use a provided liquid side socket according to the size of the selected pipe.

<Liquid pipe, High pressure gas pipe, Low pressure gas pipe>

NOTE

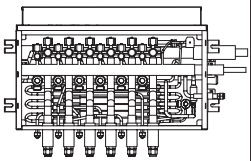
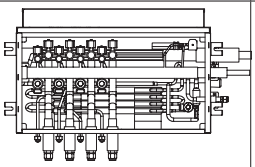
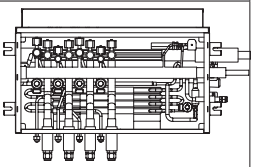
• Cut the connection part of the outdoor unit connection pipe or the provided socket, according to the diameter of the connection pipe, before connecting them.



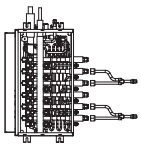
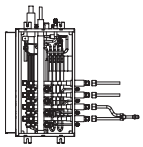
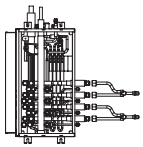
Refrigerant pipe installation

Installing the MCU

MCU specification

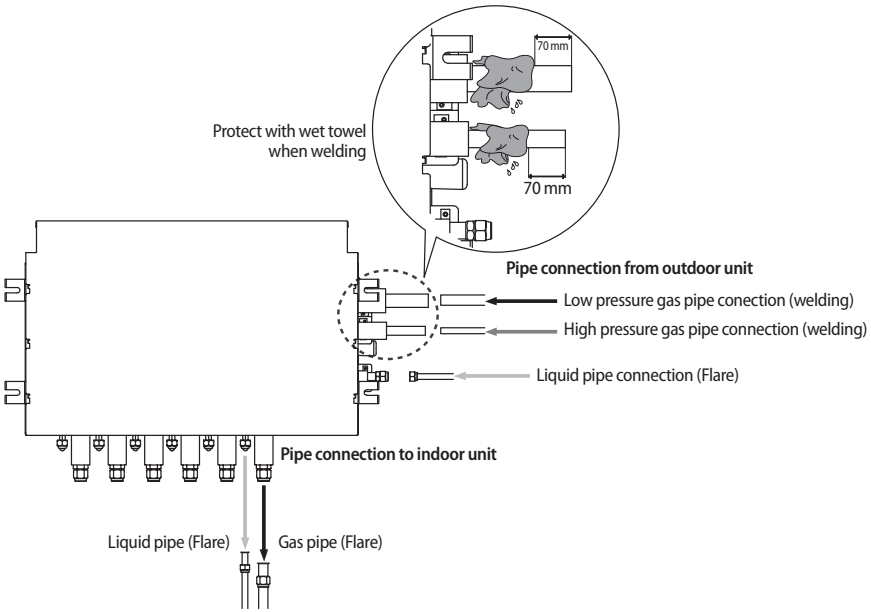
Model	MCU-S6NEE1N	MCU-S4NEE1N	MCU-S4NEE2N
Exterior of MCU			
Number of connectable indoor units	Up to 6 units	Up to 4 units	Up to 2 units ✻ Refer the detail information of installation
Maximum capacity of connectable indoor units	56 kW	56 kW	56 kW

Installing the indoor unis

Model	MCU-S6NEE1N	MCU-S4NEE1N	MCU-S4NEE2N
Example installing			
Installing indoor units	If the indoor unit's capacity is under 14kW, this can be connected in the MCU. Do not connect if the indoor unit's capacity exceeds 14kW. **Single capacity range under 10.0kW** - Connect the liquid, gas pipe of indoor unit to each single port in MCU. **Single capacity range between 11.2kW to 14.0kW** - Join two ports in the MCU with offered Y-connector(liquid, gas), then connect to indoor unit as above.		If the indoor unit's capacity is greater than or equal to 11.2kW, it can be connected in the MCU. Do not connect the indoor unit's capacity not exceeding 11.2kW. **Single capacity range between 11.2kW to 28.0kW** - Join two ports in the MCU with offered Y-connector(liquid, gas), then connect to indoor unit as above.

✻ To use HR system, MCU must be installed.

How to connect the pipes



✻ When installing MCU, use the pattern sheet for installation that is provided with the product.

✻ When welding the high/low pressure gas pipe, protect the product with the flame-proof sheet.

Electrical wiring work

Specification of the circuit breaker and power cable

Single

Capacity (HP)	Model	MCA	MFA
8	AM080FXW✳✳✳✳	16.3	20
10	AM100FXW✳✳✳✳	20.0	20
12	AM120FXW✳✳✳✳	25.0	30
20	AM200FXW✳✳✳✳	39.8	40

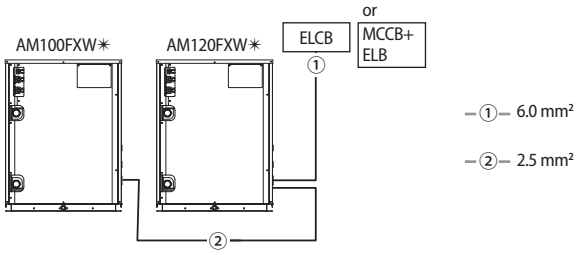
Module

Capacity (HP)	Model	Module table				MCA	MFA
		AM080FXW✳✳✳✳	AM100FXW✳✳✳✳	AM120FXW✳✳✳✳	AM200FXW✳✳✳✳		
16	AM160FXWA✳✳	2				32.5	40
18	AM180FXWA✳✳	1	1			36.3	40
22	AM220FXWA✳✳		1	1		45.0	50
24	AM240FXWA✳✳			2		50.0	50
26	AM260FXWA✳✳	2	1			52.5	60
28	AM280FXWA✳✳	1			1	56.0	60
30	AM300FXWA✳✳		1		1	59.8	60
34	AM320FXWA✳✳			1	1	57.0	60
34	AM340FXWA✳✳		1	2		61.6	75
36	AM360FXWA✳✳	2			1	63.6	75
38	AM380FXWA✳✳	1	1		1	66.9	75
40	AM400FXWA✳✳				2	70.0	75
42	AM420FXWA✳✳		1	1	1	74.6	75
44	AM440FXWA✳✳			2	1	79.0	100
48	AM480FXWA✳✳	1			2	84.3	100
50	AM500FXWA✳✳		1		2	87.6	100
52	AM520FXWA✳✳			1	2	92.0	100
60	AM600FXWA✳✳				3	104.9	125

✳ Use outdoor wires with equivalent or better grade than 60245 IEC 66 (IEC standard) or H07RN-F (CENELEC standard).

✳ When installing outdoor units in module, select the power supply cable according to the sum of outdoor unit capacity. (Refer to the table for each model)

ex) Outdoor unit installation (AM100FXW✳ + AM120FXW✳)



NOTE

- This device is intended for the connection to a power supply system with a maximum permissible system impedance shown in the table (on the left page) at the interface point (power service box) of the user's supply.
- The user must ensure that this device is connected only to a power supply system which fulfills the requirement above. If necessary, the user can ask the public power supply company for the system impedance at the interface point.
- This equipment complies with IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to Ssc(*2) at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power Ssc greater than or equal to Ssc(*2).

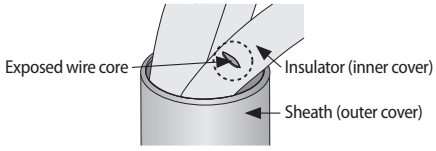
[Ssc (*2)]

Model	Ssc [MVA]
AM080FXW✳✳✳	3.9
AM100FXW✳✳✳	4.9
AM120FXW✳✳✳	4.8
AM200FXW✳✳✳	7.7

CAUTION

Caution for electrical work

- You must install ELCB or MCCB + ELB
  - ELCB: Earth leakage breaker
  - MCCB: Molded case circuit breaker
  - ELB: Earth leakage breaker
- Do not operate the outdoor unit before completing the refrigerant pipe work.
- Do not disconnect or change the cable inside the product. It may cause damage to the product.
- Specification of the power cable is selected based on following installation condition; culvert installation/ ambient temperature 30 ℃/ single multi conductor cables. If the condition is different from the ones stated, please consult an electrical installation expert and re-select the power cable.
  - If the length of power cable exceed 50m, re-select the power cable considering the voltage drop.
- Use a power cable made out of incombustible material for the insulator (inner cover) and the sheath (outer cover).
- Do not use the power cable with the core wire exposed due to insulator damage occurred during removal of the sheath. When the core wire is exposed, it may cause fire.

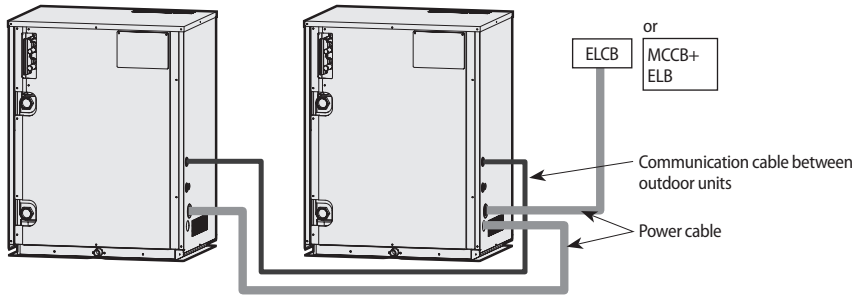


<The example of exposed core wire>

Electrical wiring work

Power and communication cable configuration

- Main power and the ground cable must be withdrawn through the knock-out hole on the bottom-right or right side of the cabinet.
- Withdraw the communication cable from the designated knock-out hole on the bottom-right side of the front part.
- Install the power and communication cable using separate cable protection tube.
- Fix a protection tube to the knock-out hole on the outdoor unit by using a CD connector or bushing. Make sure to use insulating bushing.
- Make sure that power and communication cables do not block the front panel.



Specification of the protection tube

Name	Temper grade	Applicable conditions
Flexible PVC conduit	PVC	When the protection tube is installed indoor and not exposed to outside, because it is embedded in concrete structure
Class 1 flexible conduit	Galvanized steel sheet	When the protection tube is installed indoor but exposed to outside so there are risk of damage to the protection tube
Class 2 flexible conduit	Galvanized steel sheet and Soft PVC compound	When the protection tube is installed outdoor and exposed to outside so there are risk of damage to the protection tube and extra waterproof is needed

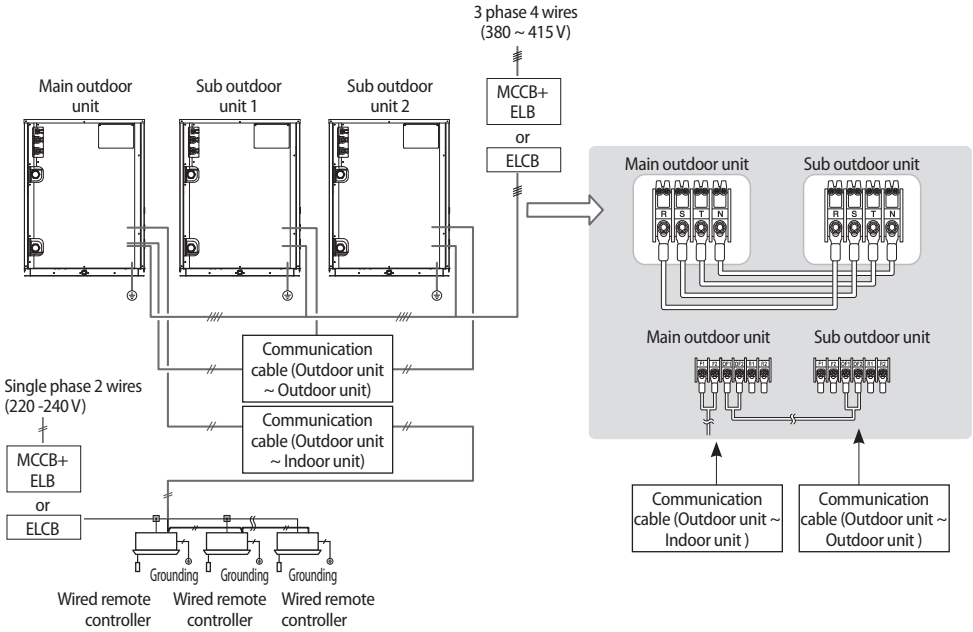
CAUTION

Caution for perforating the knock-out hole

- Perforate a knock-out hole by punching it with a hammer.
- After perforating the knock-out hole, apply rust resisting paint around the hole.
- When you need to pass the cables through the knock-out hole, remove burrs on the hole and protection the cable with a protection tape or bushing etc.

Power wiring diagram

Supplying 3 phase 4 wires (380-415 V~)



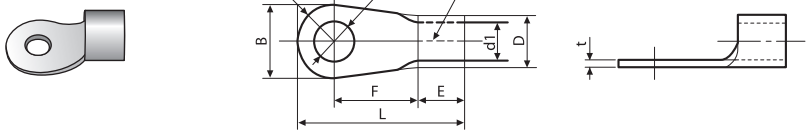
- ▶ Connect a power cable of the outdoor unit after checking that R-S-T-N (3 phase 4 wire) is properly connected. (If the 380-415 V power is supplied to the N phase, PCB and other electrical part will be damaged.)
- ▶ Communication cable between indoor and outdoor units and communication cable between outdoor units has no polarity.
- ▶ Arrange the cables with a cable tie.

✻ ELCB and ELB must be installed since there is risk of electric shock or fire when they are not installed.

Electrical wiring work

Selecting solderless ring terminal

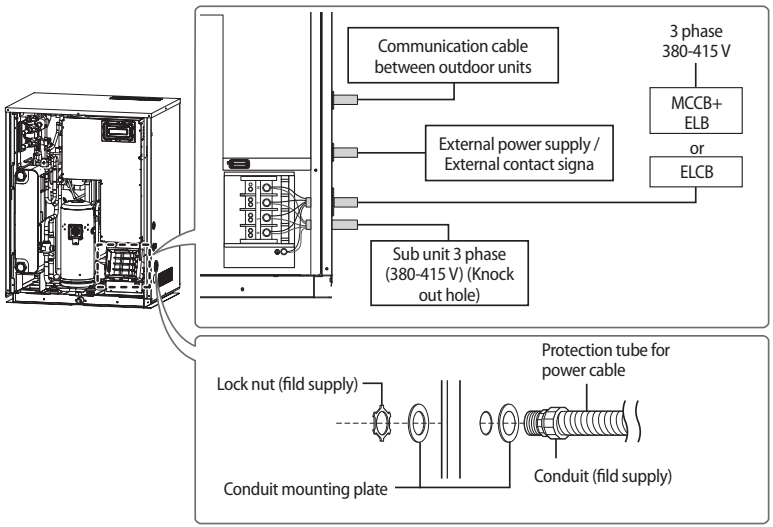
- Select a solderless ring terminal for a power cable according to the nominal dimensions for cable.
- Apply insulation coating to the connection part of the solderless ring terminal and the power cable.



Nominal dimensions for cable (mm^2)		4/6		10	16	25		35		50	70
Nominal dimensions for screw (mm)		4	8	8	8	8	8	8	8	8	8
B	Standard dimension (mm)	9.5	15	15	16	12	16.5	16	22	22	24
	Allowance (mm)	±0.2		±0.2	±0.2	±0.3		±0.3		±0.3	±0.4
D	Standard dimension (mm)	5.6		7.1	9	11.5		13.3		13.5	17.5
	Allowance (mm)	+0.3 -0.2		+0.3 -0.2	+0.3 -0.2	+0.5 -0.2		+0.5 -0.2		+0.5 -0.2	+0.5 -0.4
d1	Standard dimension (mm)	3.4		4.5	5.8	7.7		9.4		11.4	13.3
	Allowance (mm)	±0.2		±0.2	±0.2	±0.2		±0.2		±0.3	±0.4
E	Min. (mm)	6		7.9	9.5	11		12.5		17.5	18.5
F	Min. (mm)	5	9	9	13	15	13	13	13	14	20
L	Max. (mm)	20	28.5	30	33	34		38	43	50	51
d2	Standard dimension (mm)	4.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
	Allowance (mm)	+0.2 0	+0.4 0	+0.4 0	+0.4 0	+0.4 0		+0.4 0		+0.4 0	+0.4 0
t	Min. (mm)	0.9		1.15	1.45	1.7		1.8		1.8	2.0

Connecting the power terminal

- Connect the cables to the terminal board with solderless ring terminals.
- Properly connect the cables by using certified and rated cables and make sure to fix them properly so that external force is not applied to the terminal.
- Use a driver and wrench that can apply the rated torque when tightening the screws on the terminal board.
- Tighten the terminal screws by complying rated torque value. If the terminal is loose, fire can occur due to arc heat generation and if the terminal is too tight, terminal board could get damaged.



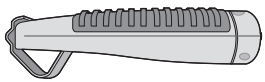
Screw	Tightening torque for terminal (N·m)	
M4	1.2~1.5	Single phase (220-240 V) power cable
M8	5.5~7.3	3 phase (380-415 V) power cable

CAUTION

- When removing the outer sheath of the power supply cable, be careful not to scratch the inner sheath of the cable.
- Make sure that more than 20mm of the outer sheath of the indoor unit power and communication cable are inside the electrical component box.
- Install the communication cable separately from power cable and other communication cables.

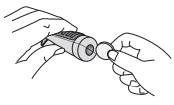
Electrical wiring work

Examples of how to use the cable striper



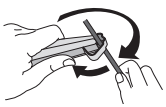
<Cable striper>

1. Adjust the blade position by coin. (Controller is at the bottom side of the tool.) Fix the blade position according to the outer sheath thickness of the power cable.

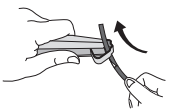


2. Fix the power cable and tool by using the hook at the top side of the tool.

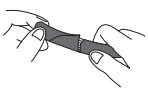
3. Cut out the outer sheath of the power cable by revolving the tool in the direction of the arrow, two or three times.



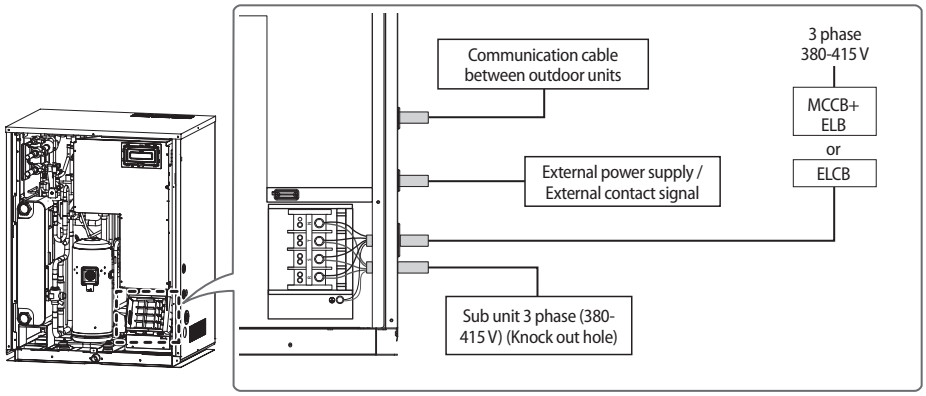
4. At this situation, cut out the outer sheath of the power cable by moving the tool toward the direction of the arrow.



5. Slightly bend the wire and pull out the cut part of the outer sheath.



Fixing the power cable

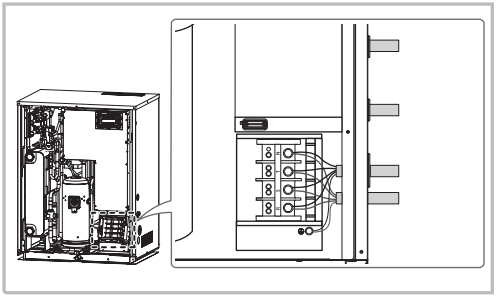


CAUTION

- Do not let the power cable come into contact with the pipes inside the outdoor unit. If the power supply cable touches the pipes, the vibration of the compressor is transferred to the pipes and can damage the power supply cables or pipes, creating the danger of fire or explosion.
- Make sure that the place where the sheath of power supply cable is removed is inside the power supply box. If it is impossible, you should connect the protection tube for power cable to the power supply box.
- After arranging the power cable into the power supply box, tighten the cover.

Connect the ring terminal of 3 phase cable

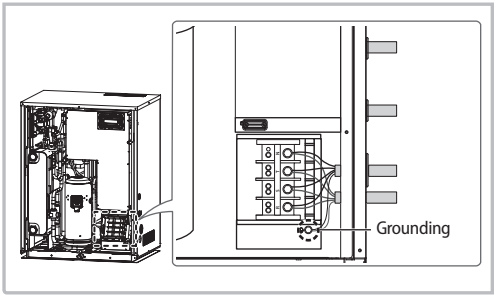
1. Cut the power cable to an appropriate length and connect it with the solderless terminal.
2. After connecting the power cable to the terminal as seen in the illustration, fix it with cable tie.
3. Fix the housing, which has an insulator, to the terminal board.



Electrical wiring work

Fixing the ground cable

▶ Connect the ground cable to the grounding hole inside the power supply box.

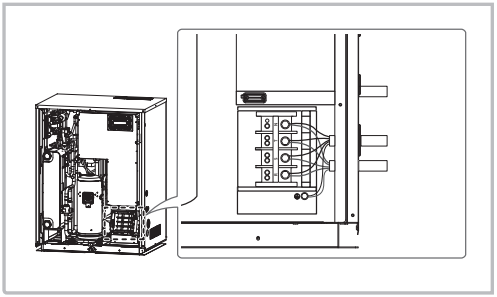


Withdrawing the power cable

▶ Through the cable withdrawing hole, penetrate the knock out hole on the side and connect the protection tube (for power cable) up to the power box.

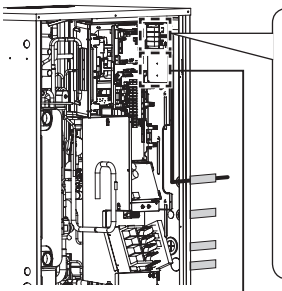
❋ When penetrating knock out hole, be careful not to damage the heat exchanger pipe or temperature sensor.

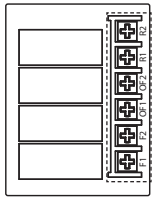
❋ Be sure that the power supply cable is not damaged by burr on the knock-out hole.



Installing the Solution device

▶ When the number of indoor units installed with the outdoor unit is 16 or less





R2	Solution device terminal
R1	
OF2	Communication cable terminal (Outdoor unit ~ Outdoor unit)
OF1	
F2	Communication cable terminal (Outdoor unit ~ Indoor unit)
F1	

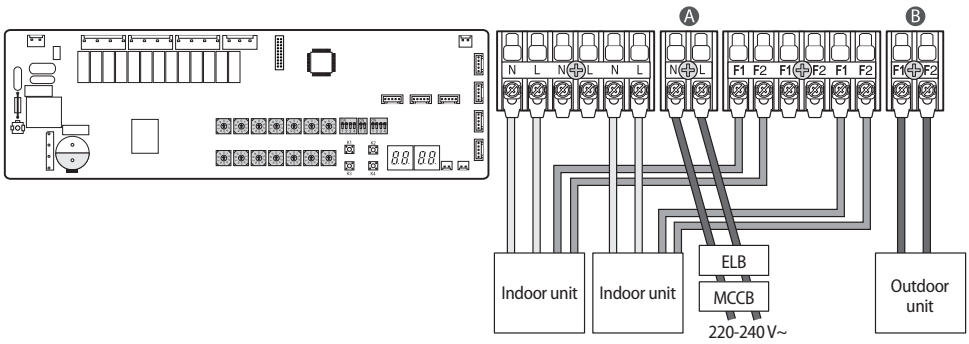
❋ When connecting the communication cable, use a wire holder to fix it.

▶ Location of the interface module

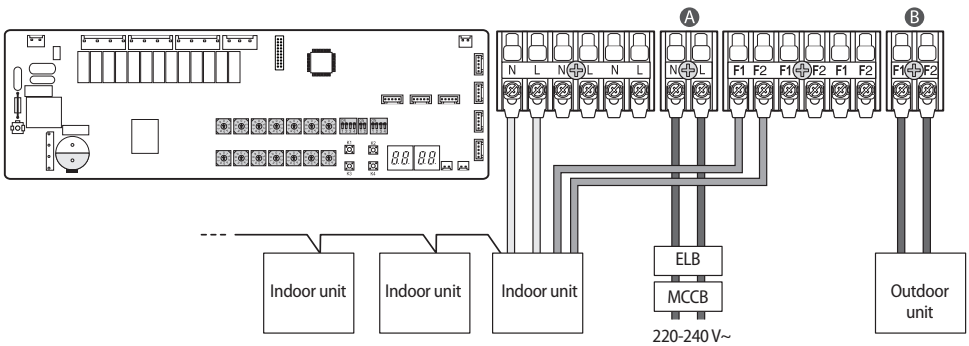
❋ To connect old communication type upper level controller, interface module must be installed. For detail instruction of installation, refer to the installation manual of corresponding interface module.

Connecting the MCU

Example 1



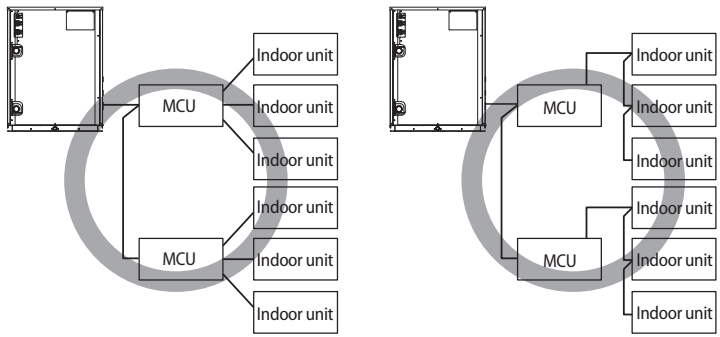
Example 2



- ▶ Ⓐ Power must be supplied to the MCU separately from the outdoor unit.
- ▶ Ⓑ Connect the communication cable of the outdoor unit (F1, F2) to the communication cable of the MCU (F1, F2)

CAUTION

- Power cable connection should be done with the solderless ring terminal.



- When installing the MCU, communication cable can be connected as shown above.

Electrical wiring work

Grounding work

Grounding must be done by a qualified installer for your safety.

Grounding the power cable

- ▶ The standard of grounding may vary according to the rated voltage and installation place of the air conditioner.
- ▶ Ground the power cable according to the following table.

Power condition / Installation place	Voltage to ground is lower than 150V	Voltage to ground is over 150V
High humidity	Must perform the grounding work 3. Note 1) (Including the case where earth leakage breaker is installed)	
Average humidity	Perform grounding work 3. Note 1)	Must perform the grounding work 3. Note 1) (Including the case where earth leakage breaker is installed)
Low humidity	Perform grounding work 3, if possible, for your safety. Note 2)	

Note 1) About grounding work 3.

- Grounding work must be done by an expert (with qualification).
- Check if the grounding resistance is lower than 100Ω. When installing a earth leakage breaker (that can cut the electric circuit within 0.5 second in case of a short circuit), allowable grounding resistance should be 30~500Ω.

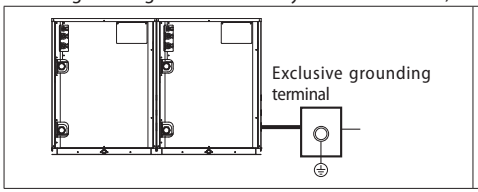
Note 2) Grounding at dry place

- The grounding resistance should be lower than 100Ω. Even in worst case, grounding resistance should be lower than 250Ω.

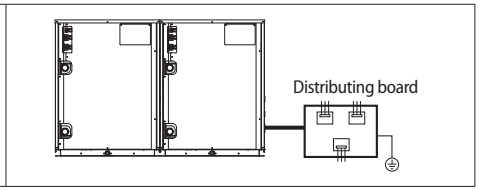
Performing the grounding work

- ▶ Use a rated grounding cable by referring to the specification of the electric cable for the outdoor unit.

✻ When using the exclusive grounding terminal (When the grounding terminal is already built on the house)



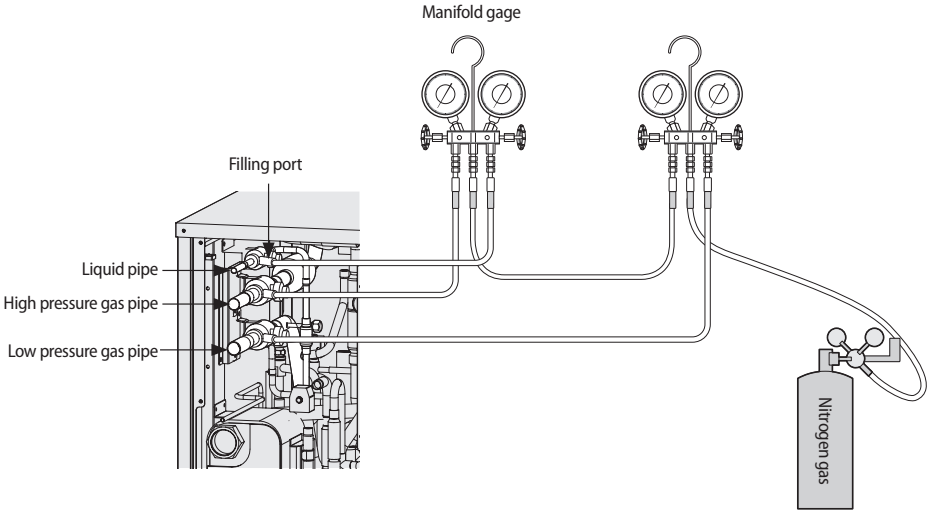
✻ When using grounding of the switch board



Air tightness test and vacuum drying

Air tightness test

- Use tools for R-410A to prevent the inflow of foreign substances and resist against the internal pressure.
- Do not remove the core of filling port.
- Use Nitrogen gas for air tightness test as shown in the illustration.



Apply pressure to the liquid side pipe and gas side pipe (when installing outdoor units in module) with Nitrogen gas at 4.1MPa.	If you apply pressure at more than 4.1MPa, pipes may get damaged. Apply pressure with pressure regulator and pay attention to the pressure of the nitrogen.
↓	
Keep it for minimum 24 hours to check if pressure drops.	After applying Nitrogen gas, check there's any change of pressure, using a pressure regulator.
↓	
If the pressure drops, check for gas leakage.	If the pressure is changed, apply soap water to check for leakage and check the pressure of the nitrogen gas again.
↓	
Maintain 1.0MPa of the pressure before performing vacuum drying and check for further gas leakage.	After checking the first gas leakage, maintain 1.0MPa to check for further gas leakage.

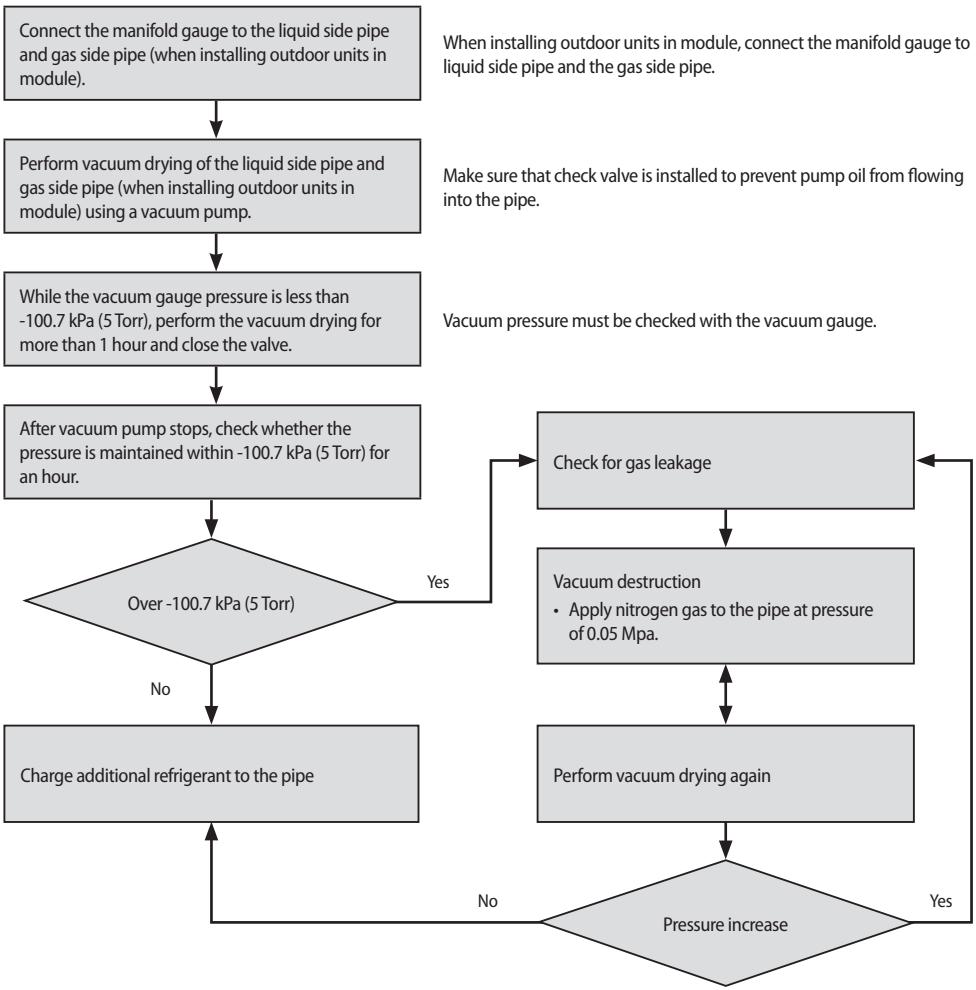
CAUTION

- Perform a Nitrogen gas leak test with the service valve of the outdoor unit closed.
- When charging the nitrogen gas, charge it from the both (high•low pressure) sides.
- If the pipe is filled in a short time with a highly excessive pressure of Nitrogen gas, the pipes may get damaged. Make sure to use a regulator to prevent the high pressure Nitrogen gas, over 4.1MPa, from entering into the pipe.

Air tightness test and vacuum drying

Vacuum drying pipes and indoor units

- Use tools for R-410A to prevent the inflow of foreign substances and resist against the internal pressure.
- Use vacuum pump that allows vacuuming under -100.7kPa (5 Torr).
- Use the vacuum pump with the check valve to prevent pump oil from flowing backward while the vacuum pump is stopped.
- Completely close the liquid·gas side service valve of the outdoor unit.



❋ If the pressure rises in an hour, either water is remaining inside the pipe or there is a leakage.

❋ When the ambient temperature of vacuuming pipe is low (less than 0 °C), moisture might remain within the pipe. Therefore, pay special attention to the pipe sealing in the winter.

Pipe insulation

Insulating the refrigerant pipes and branch joints

- Check for gas leakage before completing (the hose and pipe insulation) and if there is no sign of leakage, make sure to insulate the pipes and hoses.
- Use EPDM material insulator that meets the following conditions.

Test item	Unit	Standard
Density	g/cm³	0.048~0.096
Dimensional change rate by heat	%	Below -5
Absorption rate	g/cm³	Below 0.005
Thermal conduction rate	W/m·K	Below 0.037
Moisture transpiration factor	ng/(m²·s·Pa)	Below 15
Moisture transpiration grade	g/(m²·24h)	Below 15
Formaldehyde dispersion	mg/L	There should be none
Oxygen rate	%	Over 25

Selecting the refrigerant pipe insulator

- Insulate the gas pipe and liquid pipe by referring to the thickness of insulator for each pipe size.
- The standard condition is; temperature at 30°C, humidity less than 85%. If case if the humidity is higher, you must increase the size by one grade as stated in below table.

Pipe	Diameter of refrigerant pipe	Insulator (Cooling·Heating)		Remarks
		General [30 °C, 85 %]	High humidity [30 °C, over 85 %]	
		EPDM, NBR		
Liquid pipe	Ø 6.35~Ø 9.52	9 mm	←	Heat resisting temperature over 120°C
	Ø 12.7~Ø 50.80	13 mm	←	
Gas pipe	Ø 6.35	13 mm	19 mm	
	Ø 9.52 ~ Ø 25.40	19 mm	25 mm	
	Ø 28.58 ~ Ø 44.45		32 mm	
	Ø 50.80	25 mm	38 mm	

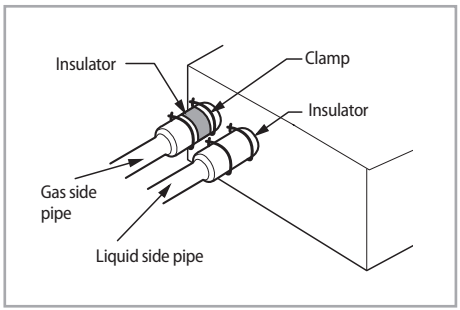
✻ When installing insulation in places and conditions below, use the same insulation that is used for high humidity conditions.

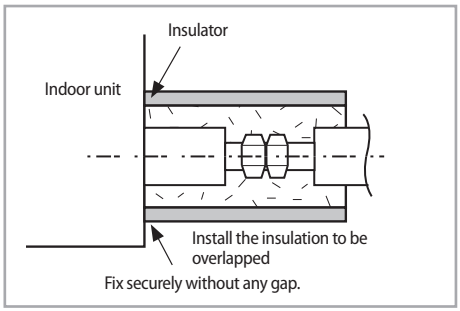
- High humidity places such as shoreline, hot spring, near lake or river, and ridge (when the part of the building is covered by earth and sand.)
- Restaurant ceiling, sauna, swimming pool etc.
- The ceiling frequently exposed to moisture and cooling is not covered. (e.g. The pipe installed at a corridor of a dormitory and studio or near an exit that opens and closes frequently.")
- The place where the pipe is installed is highly humid due to the lack of ventilation system.

Pipe insulation

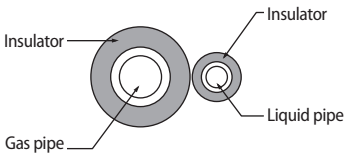
Insulate the refrigerant pipe

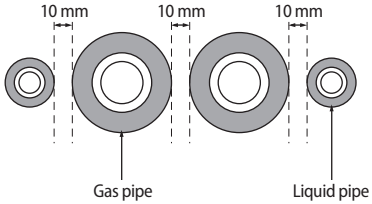
- Make sure to insulate the refrigerant pipe, branch joint, distribution header, and the connection part of the pipes.
- If you insulate the pipes, condensed water will not fall from the pipes.
- Check if there are any cracks on the insulation at the bent part of the pipe.





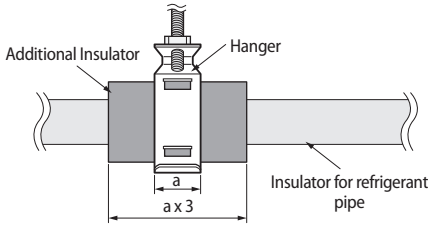
Insulating pipes	Insulating pipes connected behind the EEV kit
• The insulation of the gas and liquid pipes can be in contact with each other but they should not press excessively against each other. • When the gas side and liquid side pipes are contacting each other, increase the thickness of the insulation by one grade.	• When installing the gas side and liquid side pipes, leave at least 10mm of space. • When the gas side and liquid side pipes are contacting each other, increase the thickness of the insulation by one grade.





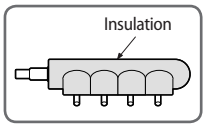
CAUTION

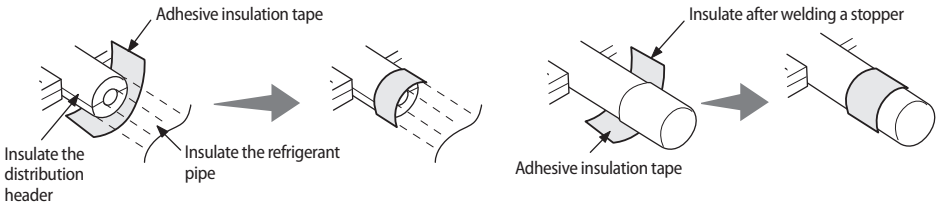
- Install the insulation without any gaps or cracks and use adhesive on the connection part of it to prevent moisture from entering.
- Bind the refrigerant pipe with insulation tape if it is exposed to outside sunlight. (When binding the pipe with finishing tape, be careful not to reduce the thickness of the insulation.)
- Install the refrigerant pipe respecting that the insulation does not get thinner on the bent part or hanger of pipe.
- When the thickness of insulation is reduced, reinforce the reduced thickness with additional insulation.



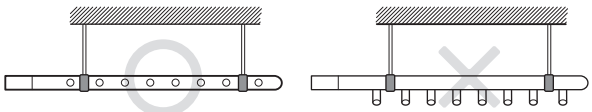
Insulate the distribution header

- Fix the distribution header with a cable tie and cover the connected part.
- Insulate the distribution header and the welded part and wrap the connected part with an adhesive insulation tape to prevent dew formation.



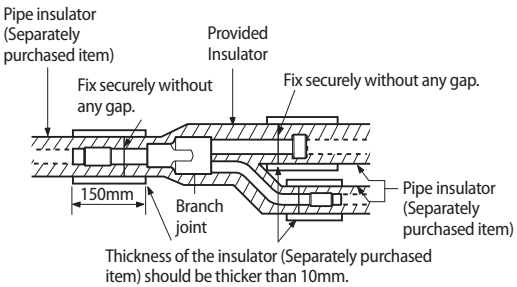


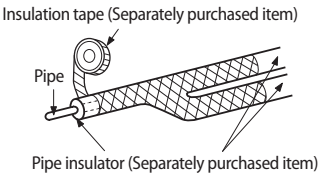
- Fix the distribution header with a hanger after insulating it.



Insulating the branch joint

- Tightly attach the insulator, provided with the branch joint, to the separately purchased insulator. Wrap the connected part with an insulator (separately purchased item) that has thickness of at least 10mm.
- Use an insulator that resist heat up to 120°C. Wrap the branch joint with an insulation that has thickness of at least 10mm.





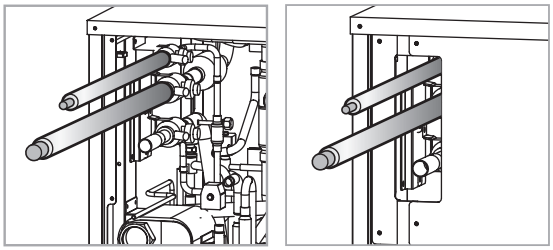
✻ Attach the adhesive insulation tape to the pipe, as shown in the picture, after insulating the pipe.

Pipe insulation

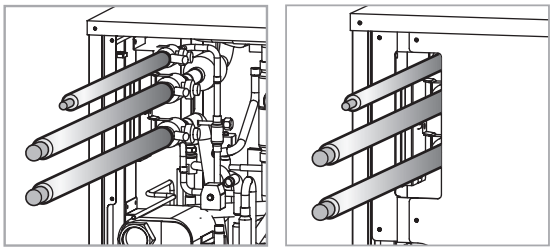
Insulating the pipe located inside of the outdoor unit

- With a pipe insulator, insulate the pipe up to whole service valve located inside of the outdoor unit.
- Seal the gap between the outdoor unit pipe and the insulator. Rainwater and dewdrops may soak through the gap between the pipe and the insulation of the outdoor unit installed on the outside.
- Separate the cover of the pipe and close it after insulation work. Only remove a knock-out hole cover where the pipe will be installed. If the knock-out hole is open unnecessarily, it must be closed. If not, small animals such as squirrels and rats may get into the unit through the hole and the unit may be damaged.

H/P



HR

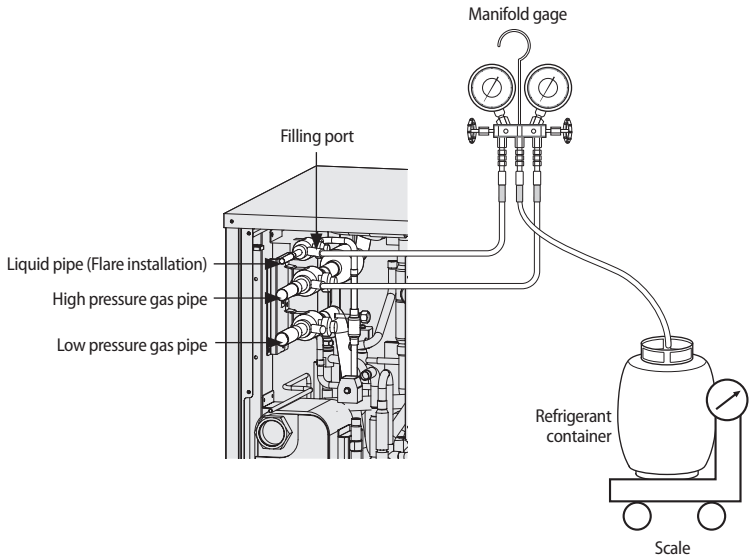


Refrigerant collection

Collecting refrigerant (to a refrigerant container)

You cannot collect the entire refrigerant in the system at once during pump down operation. Therefore you must collect additional refrigerant into the empty refrigerant container prior to pump down operation.

1. Connect a refrigerant container to an outdoor unit as shown in the illustration and operate about 50% of the indoor units in cooling mode.
2. When the pressure on the high pressure side is over 2.94 Mpa, decrease the number of operating indoor unit.
3. Open the manifold gauge (that is connected to the liquid side service valve) and the valve on the refrigerant container to collect refrigerant.



CAUTION
- Refrigerant must be collected prior to pump down operation.
- Make sure that amount of collecting refrigerant does not exceed capacity of the refrigerant container.
- Refer to service manual for detail instruction.

Charging refrigerant

- The R-410A refrigerant is blended refrigerant. Add only liquid refrigerant.
- Measure the quantity of the refrigerant according to the length of the liquid side pipe. Add quantity of the refrigerant using a scale.

Important information regulation regarding the refrigerant used

This product contains fluorinated greenhouse gases covered by the Kyoto Protocol. Do not vent gases into the atmosphere.

CAUTION

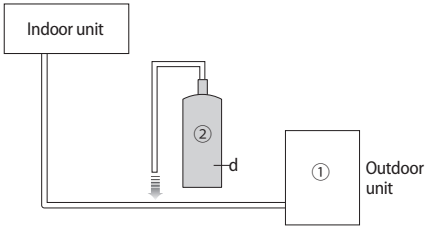
- Inform user if system contains 3 kg or more of fluorinated greenhouse gases. In this case, it has to be checked for leakage at least once every 12 months, according to regulation n°842/2006. This activity has to be covered by qualified personnel only. In case situation above (3 kg or more of R-410A), installer (or recognized person which has responsibility for final check) has to provide a maintenance book, with all the information recorded according to REGULATION (EC) N° 842/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on certain fluorinated greenhouse gases.

Please fill in with indelible ink.

- ① the factory refrigerant charge of the product.
- ② the additional refrigerant amount charged in the field.
- ①+② the total refrigerant charge.

✻ The refrigerant charge label supplied with the product.

✻ Contains fluorinated greenhouse gases covered by the Kyoto Protocol.



① = (a) kg
② = (b) kg
①+② = (c) kg

Refrigerant type	GWP value
R-410A	1975

• GWP=Global Warming Potential

NOTE

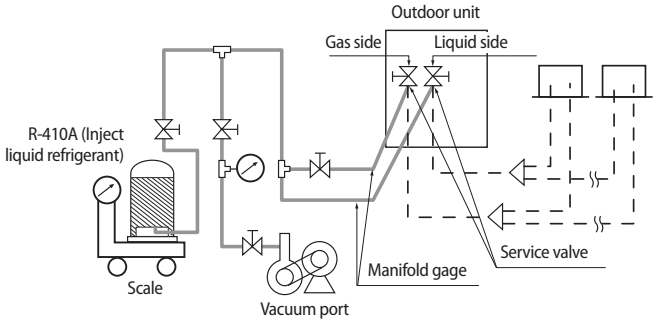
a Factory refrigerant charge of the product: see unit name plate.
b Additional refrigerant amount charged in the field. (Refer to the above information for the quantity of refrigerant replenishment.)
c Total refrigerant charge.
d Refrigerant cylinder and manifold for charging.

CAUTION

- The filled-out label must be adhered in the proximity of the product charging port. (ex. onto the inside of the stop valve cover.)

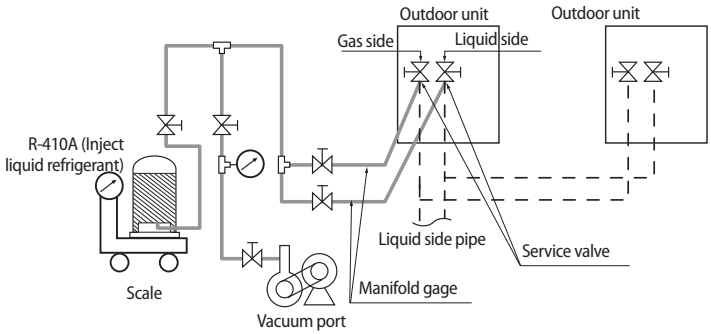
Single installation

- Open the manifold gauge valve connected to the liquid side service valve and add the liquid refrigerant.
- If you cannot add the whole quantity of the refrigerant while the outdoor unit is stopped, open the gas side and liquid side service valve. Then, add remaining refrigerant by pressing the refrigerant adding button of the outdoor PCB.



Module installation

- Open the manifold gauge valve connected to the liquid side service valve and add the liquid refrigerant.
- If you cannot add the whole quantity of the refrigerant while the outdoor unit is stopped, open the gas side and liquid side service valve. Then, add remaining refrigerant by pressing the refrigerant adding button of the outdoor PCB.
- If you use the refrigerant charging function from the PCB, outdoor unit will operate and charge the refrigerant. At this time, you must use gas side manifold gauge for cooling operation and use charging port for heating at the manifold gauge for heating operation.



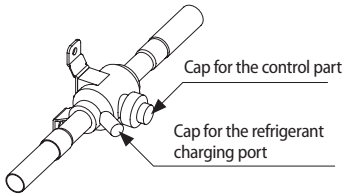
CAUTION

- Open the gas side and liquid side service valve completely after charging the refrigerant. (If you operate the air conditioner with the service valve closed, the important parts may be damaged.)
- Put on safety equipment when charging refrigerant.
- Do not charge the refrigerant when you adjust or control other product such as indoor units or EEV kits.
- If you charge the refrigerant with the front cabinet open, be very careful with the fan on the top of the product to prevent personal injury.
- When the ambient temperature is low in winter time, do not heat the refrigerant container to speed up the charging process. There is risk of explosion.
- Beware for possibility of refrigerant leakage when you connect the manifold gauge to the charging port for heating.
- Close the valve of the refrigerant container immediately after charging the refrigerant. If not, there might be a change in entire amount of refrigerant.

Charging refrigerant

Using service valve for gas

- After charging the refrigerant, close all caps as shown in the illustration.
- Tightening torque for the cap of refrigerant charging port 10~12 N·m
- Tightening torque for the cap of control part 20~25 N·m
- Opening/closing torque for the valve
  - Over Ø 19.05 : 10.0 N·m



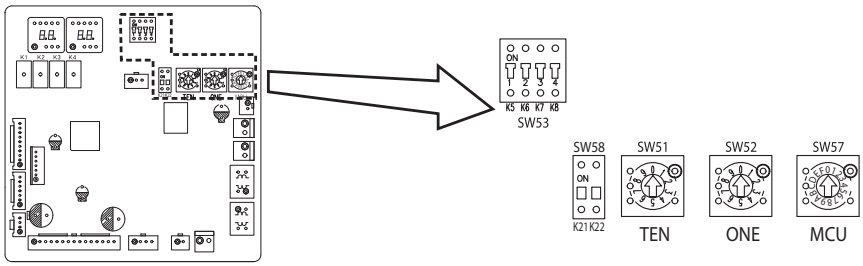
Basic segment display

Step	Display content	Display			
At initial power input	Checking segment display	SEG 1	SEG 2	SEG 3	SEG 4
		"8"	"8"	"8"	"8"
While setting communication between indoor and outdoor unit (Addressing)	Number of connected indoor units	SEG 1	SEG 2	SEG 3	SEG 4
		"A"	"d"	Number of communicated units ✻ Refer to "View Mode" for communication address	
After communication setting (usual occasion)	Transmit/Reception address	SEG 1	SEG 2	SEG 3	SEG 4
		I/U: "A" MCU: "C"	I/U: "0" MCU: "1"	Reception address (in decimal number)	

✻ I/U : Indoor unit

Setting outdoor unit option switch and key function

Setting outdoor unit option switches



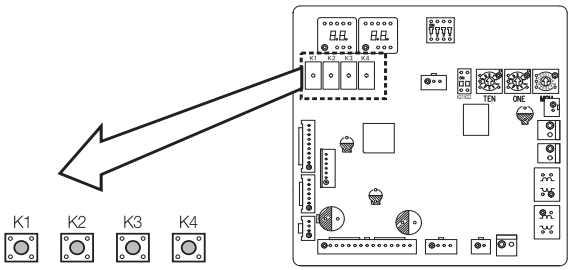
✻ If you install HR products, you must match the address between the MCU and the indoor unit.

Switch	Setting		Function	Remarks
SW51 / SW52			Setting total number of installed indoor unit SW51: Tens digit, SW52: Units digit	Setting can be done from the main outdoor unit only (sub unit: setting is unnecessary) Ex) When 12 indoor units are installed → SW51: 1, SW52: 2
SW53	K5	On	H/P(Heat Pump) System	Connect Liguid pipe and High pressure gas pipe
		Off	HR(Heat Recovery) System	Close outdoor unit's heatpump valve
	K6	On	Enable maximum capacity restriction for cooling operation	Restrict excessive capacity increase when operating indoor units with small capacity
		Off	Disable maximum capacity restriction for cooling operation	-
	K7	K8	Selecting outdoor unit address	
	On	On	Outdoor unit address: No. 1	Main unit
	On	Off	Outdoor unit address: No. 2	Sub unit 1
	Off	On	Outdoor unit address: No. 3	Sub unit 2
	Off	Off	Outdoor unit address: No. 4	Sub unit 3
SW57			Setting total number of connected MCU	Setting can be done from main unit only Ex) When 3 MCUs are installed → SW57: 3, SW52: 2
SW58	K21	K22	Selecting type of circulating water	
	ON	ON	Water circulation	-
	ON	OFF	Anti-freeze circulation (freezing point of anti-freeze must be below -8 ℃)	Minimum temperature of entering water -5 ℃
	OFF	ON	Anti-freeze circulation (freezing point of anti-freeze must be below -15 ℃)	Minimum temperature of entering water -10 ℃

✻ Maintain appropriate concentration level of anti-freeze according to SW58 switch setting. (Refer to 'Cooling water management' on page 96)

Setting outdoor unit option switch and key function

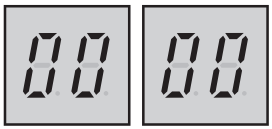
Setting outdoor unit key function



Installing and setting the option with tact switch and explanation of the functions

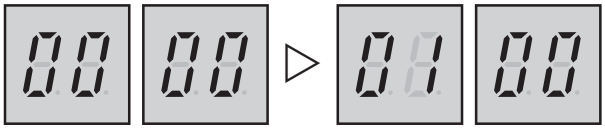
Setting the option

1. Press and hold K2 to enter the option setting. (Only available when the operation is stopped)
   - If you enter the option setting, display will show the following. (If you have set the 'Emergency operation for compressor malfunction', 1 or 2 will be displayed on Seg 4.)



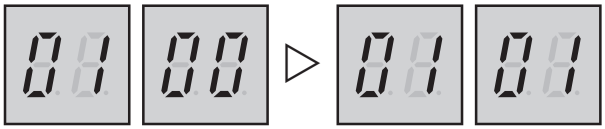
   - Seg 1 and Seg 2 will display the number for selected option.
   - Seg 3 and Seg 4 will display the number for set value of the selected option.
2. If you have entered option setting, you can shortly press the K1 switch to adjust the value of the Seg 1, Seg 2 and select the desired option. (Refer to pages 71~73 for the Seg number of the function for each option)

   Example)



3. If you have selected desired option, you can shortly press the K2 switch to adjust the value of the Seg 3, Seg 4 and change the function for the selected option. (Refer to pages 71~73 for the Seg number of the function for each option)

   Example)



4. After selecting the function for options, press and hold the K2 switch for 2 seconds. Edited value of the option will be saved when entire segments blinks and tracking mode begins.

CAUTION
- Edited option will not be saved if you do not end the option setting as explained in above instruction.

❋ While you are setting the option, you may press and hold the K1 button to reset the value to previous setting.

❋ If you want to restore the setting to factory default, press and hold the K4 button while you are in the option setting mode.
  - If you press and hold the K4 button, setting will be restored to factory default but it doesn't mean that restored setting is saved. Press and hold the K2 button. When the segments shows that tracking mode is in progress, setting will be saved.

Optional item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Emergency operation for compressor malfunction	Individual	0	0	0	0	Disabled (Factory default)	E560 will occur when all the compressors are set as malfunction state.
				0	1	Set compressor 1 as malfunction state	
				0	2	Set compressor 2 as malfunction state	
Cooling capacity correction	Main	0	1	0	0	7-9 (Factory default)	Targeted evaporation temperature [℃]. (When low temperature value is set, discharged air temperature of the indoor unit will decrease)
				0	1	5-7	
				0	2	9-11	
				0	3	10-12	
				0	4	11-13	
				0	5	12-14	
				0	6	13-15	
Capcity correction for heating	Main	0	2	0	0	2.8 (Factory default)	Targeted high pressure [MPa]. (When low pressure value is set, discharged air temperature of the indoor unit will decrease)
				0	1	2.5	
				0	2	2.6	
				0	3	2.7	
				0	4	2.9	
				0	5	3.0	
				0	6	3.1	
				0	7	3.2	
				0	8	3.3	

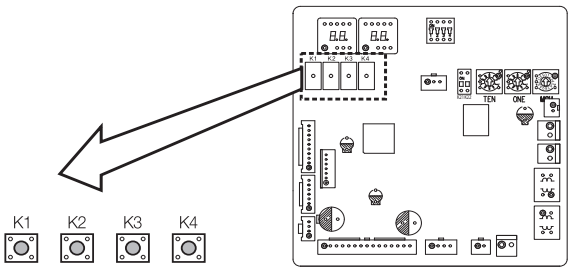
Setting outdoor unit option switch and key function

Optional item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Current restriction rate	Individual	0	3	0	0	100% (Factory default)	When restriction option is set, cooling and heating performance may decrease.
				0	1	95 %	
				0	2	90 %	
				0	3	85 %	
				0	4	80 %	
				0	5	75 %	
				0	6	70 %	
				0	7	65 %	
				0	8	60 %	
				0	9	55 %	
				1	0	50 %	
				1	1	No restriction	
Oil collection interval	Main	0	4	0	0	Factory default	
				0	1	Shorten the interval by 1/2	
Disable	Main	0	5	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
Disable	Individual	0	6	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
Disable	Main	0	7	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
				0	2	Disable	
				0	3	Disable	
Setting high-head condition	Main	0	8	0	0	Disable (Factory default)	
				0	1	Level 1 of height difference type 1 (Indoor unit is lower than outdoor unit)	When outdoor unit is over 40 ~ 80 m above the indoor unit
				0	2	Level 2 of height difference type 1 (Indoor unit is lower than outdoor unit)	When outdoor unit is over 80 m above the indoor unit
				0	3	Height difference type 2 (Outdoor unit is lower than indoor unit)	When indoor unit is over 30 m above the outdoor unit
Setting long-piping condition (Setting is unnecessary if high-head condition is set.)	Main	0	9	0	0	Disable (Factory default)	
				0	1	Long piping level 1	When equivalent length of farthest indoor unit from the outdoor unit is between 100~170 m
				0	2	Long piping level 2	When equivalent length of farthest indoor unit from the outdoor unit is over 170 m

Optional item	Input unit	SEG1	SEG2	SEG3	SEG4	Function of the option	Remarks
Energy saving setting	Main	1	0	0	0	Disable (Factory default)	
				0	1	Enable	Energy saving mode triggers when the room temperature reaches desired temperature while operating in heating mode.
Disable	Main	1	1	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
Expand operational temperature range for cooling operation	Main	1	2	0	0	Disable	
				0	1	Enable	
Channel address	Main	1	3	A	U	Automatic setting (Factory default)	Address for classifying the product from upper level controller (DMS, S-NET 3, etc)
				0 ~ 15		Manual setting for channel 0~15	
Disable	Main	1	4	0	0	Disable	This function is not applicable for this model
				0	1	Disable	
Circulation water flow control	Individual	1	5	0	0	Disable (Factory default)	
				0	1	7-10 V	When variable flow control valve is applied
				0	2	5-10 V	
				0	3	3-10 V	

Setting outdoor unit option switch and key function

Setting key operation and checking the view mode with tact switch



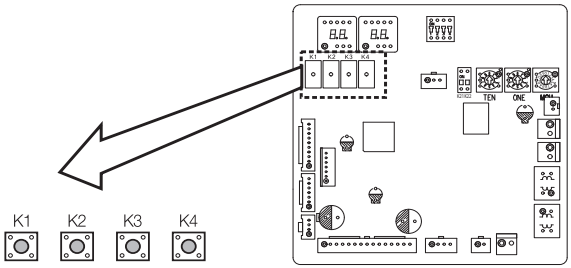
K1 (Number of press)	KEY operation	Display on segment
Press and hold 1 time	Auto trial operation	"K""K""BLANK""BLANK"
1 time	Refrigerant charging in Heating mode	"K""1""BLANK""BLANK"
2 times	Trial operation in Heating mode	"K""2""BLANK""BLANK"
3 times	Pump out in Heating mode (Outdoor unit address 1)	"K""3""BLANK""1"
4 times	Pump out in Heating mode (Outdoor unit address 2)	"K""3""BLANK""2"
5 times	Pump out in Heating mode (Outdoor unit address 3)	"K""3""BLANK""3"
6 times	Pump out in Heating mode (Outdoor unit address 4)	"K""3""BLANK""4"
7 times	Vacuumig (Outdoor unit address 1)	"K""4""BLANK""1"
8 times	Vacuumig (Outdoor unit address 2)	"K""4""BLANK""2"
9 times	Vacuumig (Outdoor unit address 3)	"K""4""BLANK""3"
10 times	Vacuumig (Outdoor unit address 4)	"K""4""BLANK""4"
11 times	Vacuuming (All outdoor units)	"K""4""BLANK""A"
12 times	End Key operation	-

K2 (Number of press)	KEY operation	Display on segment
1	Refrigerant charging in Cooling mode	K - 5 - BLANK - BLANK
2	Trial operation in Cooling mode	K - 6 - BLANK - BLANK
3	Pump down all units in Cooling mode	K - 7 - BLANK - BLANK
4	HR: Pipe connection inspection H/P: Auto trial operation	K - 8 - BLANK - BLANK
5	Checking the amount of refrigerant	K - 9 - X - X (Display of last two digits may differ depending on the status)
6	Discharge mode of DC link voltage	K - A - BLANK - BLANK
7	Forced oil collection	K - C - BLANK - BLANK
8	Inspect inverter compressor 1	K - D - BLANK - BLANK
9	Inspect inverter compressor 2	K - E - BLANK - BLANK
10	Water pipe valve/Pump check	K - F - BLANK - BLANK
11	Cooling fan/Flow control valve check	K - G - BLANK - BLANK
12	End key operation	-

- ❋ During "Discharge mode of DC link voltage", voltage of INV1 and INV2 will be displayed alternately.
- ❋ Even when the outdoor unit power is off, it is dangerous when you come in contact with inverter PCB and fan PCB since they are charged with high DC voltage.
- ❋ When there were error, 'Dicharge mode of DC link voltage' may not have been effective. Especialy if error E464 and E364 have been occured, power element might be damaged by fire and therefore, do not use the 'Discharge mode of DC link voltage'.

K3 (Number of press)	KEY operation	Display on segment
1 time	Intialize (Reset) setting	Same as initial state

Setting outdoor unit option switch and key function



K4 (Number of press)	KEY operation	Display on segment	
		SEG 1	SEG2, 3, 4
1 time	Outdoor unit model	1	AM120FXW✳ → Off, 1, 2
2 times	Target frequency (Compressor 1)	2	120 Hz → 1, 2, 0
3 times	Target frequency (Compressor 2)	3	120 Hz → 1, 2, 0
4 times	High pressure (MPa)	4	1.52 MPa → 1, 5, 2
5 times	Low pressure (MPa)	5	0.43 MPa → 0, 4, 3
6 times	Discharge temperature (Compressor 1)	6	87 ℃ → 0, 8, 7
7 times	Discharge temperature (Compressor 2)	7	87 ℃ → 0, 8, 7
8 times	IPM temperature (Compressor 1)	8	87 ℃ → 0, 8, 7
9 times	IPM temperature (Compressor 2)	9	87 ℃ → 0, 8, 7
10 times	CT sensor value (Compressor 1)	A	2 A → 0, 2, 0
11 times	CT sensor value (Compressor 2)	B	2 A → 0, 2, 0
12 times	Suction temperature	C	-42 ℃ → -, 4, 2
13 times	COND OUT temperautre	D	-42 ℃ → -, 4, 2
14 times	Temperature of liquid pipe	E	-42 ℃ → -, 4, 2
15 times	TOP temperature (Compressor 1)	F	-42 ℃ → -, 4, 2
16 times	TOP temperature (Compressor 2)	G	-42 ℃ → -, 4, 2
17 times	Water temperature	H	-42 ℃ → -, 4, 2
18 times	EVI inlet temperature	I	-42 ℃ → -, 4, 2
19 times	EVI outlet temperature	J	-42 ℃ → -, 4, 2
20 times	Main EEV 1 step	K	2000 steps → 2, 0, 0
21 times	Main EEV2 step	L	2000 steps → 2, 0, 0
22 times	EVI EEV step	M	300 steps → 3, 0, 0
23 times	HR EEV step	N	2000 steps → 2, 0, 0
24 times	-	O	-
25 times	Current frequency of the compressor 1	P	120 Hz → 1,2,0
26 times	Current frequency of the compressor 2	Q	120 Hz → 1,2,0
27 times	Suction 2 temperature	R	-42 ℃ → -, 4, 2

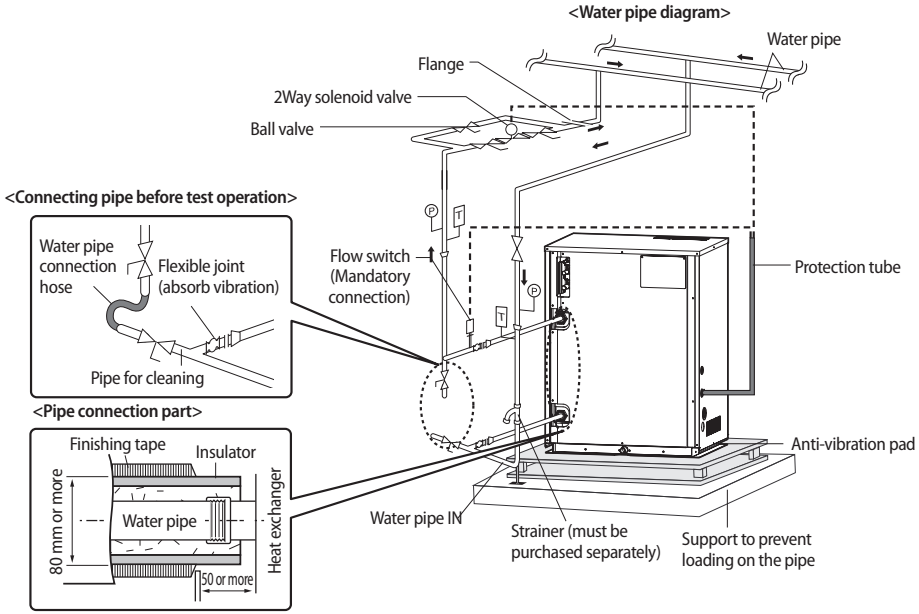
K4 (Number of press)	KEY operation	Display on segment	
		SEG 1	SEG2, 3, 4
28 times	Address of master indoor unit	S	When master indoor unit is not set → BLANK, N, D When indoor unit No.1 is set as master indoor unit →0, 0, 1
29 times	Temperature of control box	T	-42 ℃ → -, 4, 2

K4 (Number of press) Press and hold the K4 to enter the setting	Displayed content	Display on segment			
		page1	page2		
1 time	Main version	MAIN	Version (ex. 1412)		
2 times	Hub version	HUB	Version (ex. 1412)		
3 times	Water hub version	HUB2	Version (ex. 1412)		
4 times	Inverter 1 version	INV1	Version (ex. 1412)		
5 times	Inverter 2 version	INV2	Version (ex. 1412)		
6 times	EEP version	EEP	Version (ex. 1412)		
7 times	Automatically assigned address of the units	AUTO	SEG1	SEG2	SEG3, 4
			Indoor unit: "A" MCU: "C"	Indoor unit: "0" MCU: "1"	Address (ex: 07)
8 times	Manually assigned address of the units	MANU	SEG1	SEG2	SEG3, 4
			Indoor unit: "A"	Indoor unit: "0"	Address

Water pipe installation

It is recommended to use closed circuit cooling tower. If open cooling tower is applied, use intermediate heat exchanger and make sure that supplied heat source water system is closed circuit.

Water pipe installation



✻ From above illustration, flow switch (mandatory) and 2way solenoid valve (optional) must be at least equivalent to the specification recommended by our company and they should be installed horizontally.

CAUTION

When water pipe circuit freezes, it will cause damage to the plate type heat exchanger and therefore preventive measure must be taken according to the situation.

- Drain remaining water in the water pipe when it will not be used for long period of time
- Constantly operate the water pump to circulate the water within the water pipe
- Install self-regulating heat cable on the water pipes

✻ Design condition

Type	Circulating water	Operation	Inlet water temperature		Remarks
			Main usage range	Usage range limit Note 3)	
Heat source water	Water loop	Cooling	20 ~ 35 ℃	10 ~ 45 ℃	Refer to 'Cooling water management' on page 96
		Heating			
Ground heat source Note1)	Ground loop	Cooling	15 ~ 35 ℃	10 ~ 45 ℃	
		Heating	5 ~ 25 ℃	-5 ~ 45 ℃ (-10 ~ 45 ℃) Note 2)	

Note 1): Anti-freeze must be used when temperature of water inlet for heating is below 10℃ or ground heat source is used. Maintain appropriate concentration level of anti-freeze according to temperature of water inlet.

Note 2): Strict management of anti-freeze concentration level is required. Consult Samsung before application.

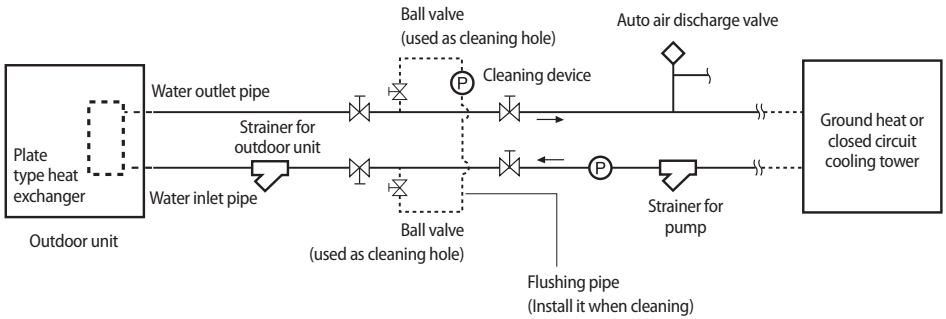
Note 3): When inlet water temperature is outside of limit, consult Samsung before application.

1. Diameter of the outdoor unit connection part where water pipe will be connected is 32A. If you install outdoor units with different capacities, install a flow control valve to secure rated flow for each outdoor unit. Socket must be connected within below tightening torque. If the tightening torque exceeds below value, it may cause product breakage.

Outer diameter of water pipe (mm)	Tightening torque (N·m)
10 ~ 20	25
21 ~ 30	50
31 ~ 50	100
51 ~ 80	220
81 ~ 115	600

2. Use certified parts for water pipe system and the water pressure of the water pipe system connected to outdoor unit must remain under 1.96 MPa.
3. Outdoor unit water pipes must be equipped with valves and other instrumentations as shown in the figure on the previous page. Strainer and flow switch must be installed within 1~2 m from the entrance pipe of the outdoor unit. (Strainer must be installed on entrance side)
   - When strainer is not installed, sand, dust or rust debris may cause product breakage.
   - Make sure to install a flow switch that works at minimum discharge. When optimal discharge level is not reached, heat exchanger within the outdoor unit may break.
4. Water inlet pipe is located at the bottom part of the heat exchanger and the water outlet pipe is at the top part of the heat exchanger.
5. Outdoor unit must be installed indoor at room temperature and the water inlet and outlet of the outdoor unit must be insulated with the heat exchanger as shown in the illustration.
6. Damp-proof, cold reserving and insulation work must be done thoroughly to prevent condensation from forming on the surface of the product and drain pipes of indoor/outdoor units. When the necessary work is not done thoroughly, you will waste energy caused by thermal loss and may get property damage during cold seasons when water pipe freezes and bursts.
7. If you stop the product for long time or in night time, water pipe circuit may freeze naturally when the temperature around the outdoor unit is under 0°C. When water pipe circuit freezes, it will cause damage to the plate type heat exchanger and therefore preventive measure must be taken according to the situation.
   - Drain remaining water in the water pipe
   - Operate continuous water circulation pump during outdoor unit operation, 1~5 minutes before the operation and 1~5 minutes after operation stops
   - Install self-regulating heat cable on the water pipes
8. When inlet water temperature is lower than 10°C, appropriate anti-freeze must be used according to the temperature. (Set the outdoor unit option switches K21 and K22 according to the usage temperature.)
   - When lowest inlet water temperature is -5°C, freezing point of anti-freeze must be lower than -8°C
   - When lowest inlet water temperature is -10°C, freezing point of anti-freeze must be lower than -15°C
9. Install number of auto air vent valve at a point where air may remain within the pipe (such as vertical water pipe). If the air within the pipe is not vented, it may cause performance decrease or corrosion on the product or pipes.
10. Keep the inlet water temperature within 'Main usage range'. If not, product may not work continuously.
11. Water scale may occur on the plate type heat exchanger depending on the water quality and the type of plate heat exchanger so regular chemical cleaning is necessary. When installing water pipes, install a heat source water shut-off valve and also install the flushing pipe with a ball valves (for chemical cleaning) on the pipe installed between the shut-off valve and the outdoor unit.

Water pipe installation



1. Before trial operation, connect the cleaning pipes installed on inlet and outlet as shown in above illustration. Then, take appropriate measures (such as blind flange etc) to stop the circulation water from entering the outdoor unit plate type heat exchanger, and use circulating pump to remove foreign substance within the water pipes and clean the strainer. When foreign substances accumulates on outdoor unit plate type heat exchanger, it may break the heat exchanger or cause problem to it.
2. For legal facilities, install digital sensor and flow meter on the water pipe for monitoring.

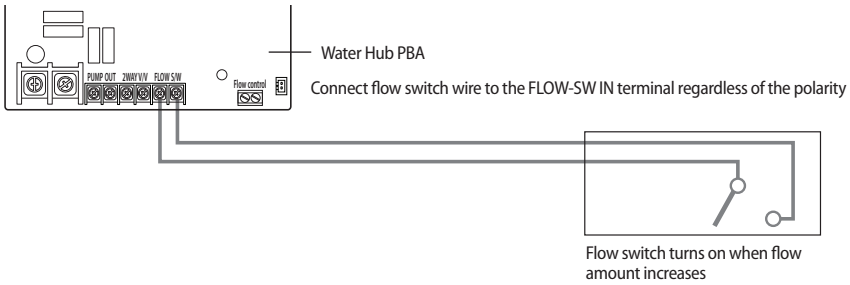
CAUTION

- Open the valve of the water pipe connected to the outdoor unit after flushing (cleaning foreign substances in water pipe) is completed.
- Check that air is vented from the water pipe and circulation amount is secured before opening the service valve on the refrigerant side of the outdoor unit.
- When circulating water stops during outdoor nit operation, it may cause breakage on plate type heat exchanger. Check the flow of circulation with flow switch or other devices.

External contact connection

Flow switch connection (Mandatory connection)

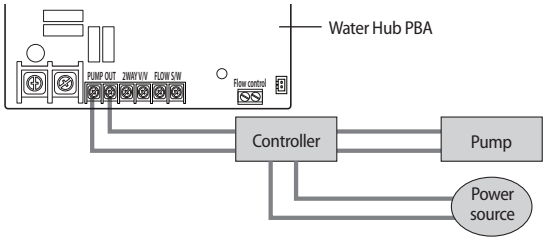
- When flow switch is used, it will receive signal of the heat source water circulation and detects if there is any problem on water circulation before operating the outdoor unit.
- When there is no contact signal input to the flow switch, it will be diagnosed as 'Problem with the heat source water circulation' and outdoor unit will stop operating to protect outdoor unit.



CAUTION
- Pump out, 2way solenoid valve, flow switch can be used individually or together.
- For installation location of the 2way solenoid valve and flow switch, Refer to 'Water pipe diagram' on page 78.

Pump out connection

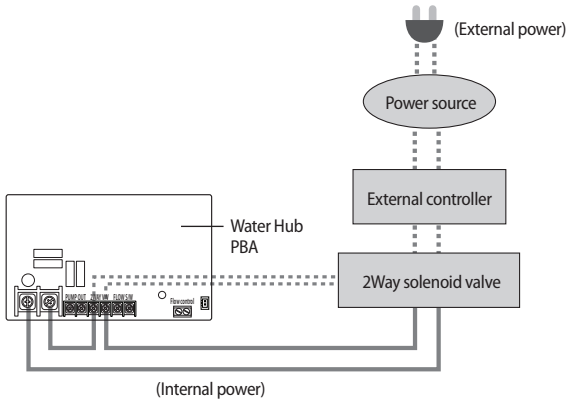
- When the main pump is installed to common water pipe, powerless contact signal will be provided. (Refer to 'Installation example of extra controller such as 2way 2way solenoid valve and pump etc' in page 83.)



Explanation of optional functions

2Way solenoid valve

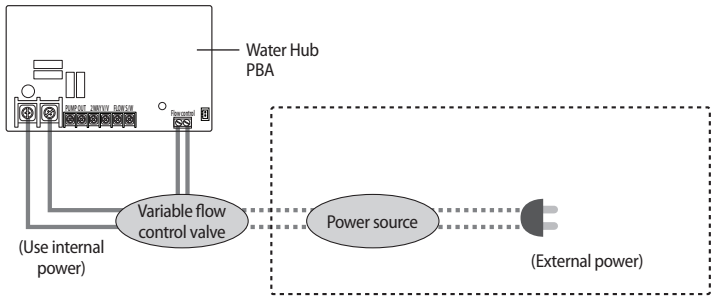
- When installing multiple number of outdoor units to a common water pipe, 2way valve will cut the cooling water supply to an outdoor unit that is not operating, so it will increase the overall efficiency of the system. 2Way solenoid valve will operate automatically depending on the operation status of the indoor and outdoor units. (Outputs contact signal)
- You may select either internal or external power cable connection for the 2way solenoid valve.



✻ Connect the 2way solenoid valve cable to the 2way valve terminal regardless of the polarity.
(However, Use external power if the load of solenoid valve is maximum 250 V and current over 0.2 A.)

Flow control

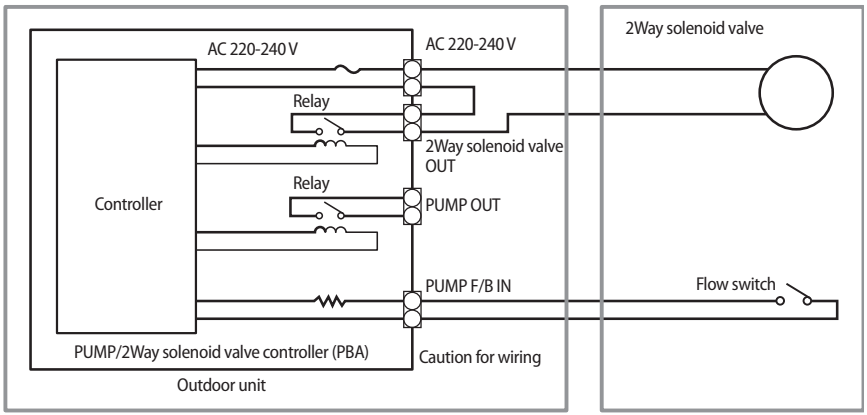
- After setting the outdoor unit option switch, you may connect variable flow control valve that is controlled at 0 ~ 10 V of input signal.
- If the power of variable flow control valve is 220-240 V, you may use the internal power of the outdoor unit.
- Use the external power if the load of variable solenoid valve is maximum 250 V and current over 0.2 A.)
- Output range of the variable flow control valve is different depending on the setting of the outdoor unit option switch (Refer to "Setting key operation and checking the view mode with tact switch on page 74)



✻ When valve load is over 0.2 A use external power.

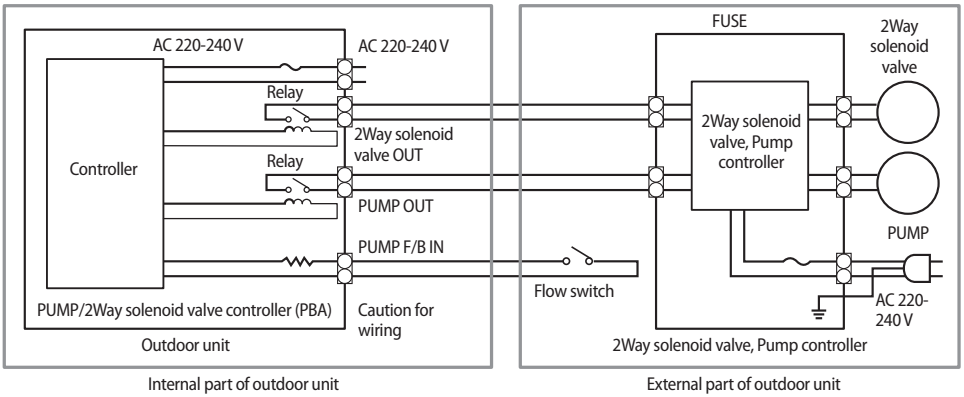
Wiring method for optional functions

Installation example of AC 220-240 V, direct operation type 2way solenoid valve



- 2way solenoid valve is a type that works at AC 220-240 V 50/60 Hz and supports product with 0.2 A or low.
  - For 2way solenoid valve with over 0.2 A, connect external power.
  - For external power cable for 2way solenoid valve must use 600 V flame-resisting double layered cable.
- Product will not operate when flow switch is not installed.

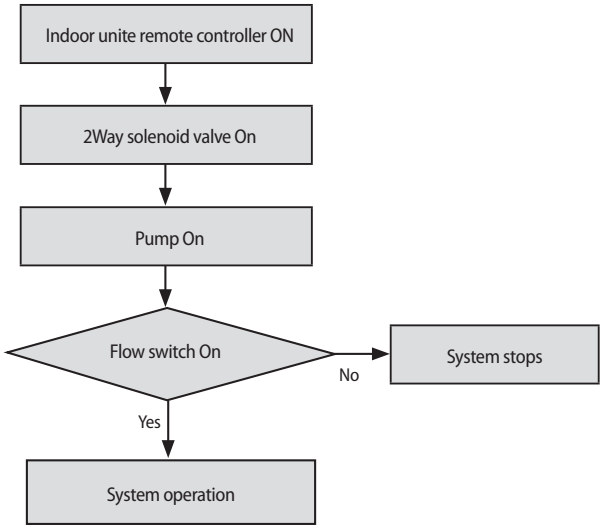
Installation example of extra controller such as 2way solenoid valve and pump etc.



- If the operation type of 2way solenoid valve is different, use extra controller.
  - Also use external controller for pump.
  - Outdoor unit only provides contact signal needed for 2way solenoid valve and pump operation. Therefore, do not use the contact signal from the air conditioner directly.
- Product will not operate when flow switch is not installed.

Explanation of optional functions

Flow chart of outdoor unit external contact controller

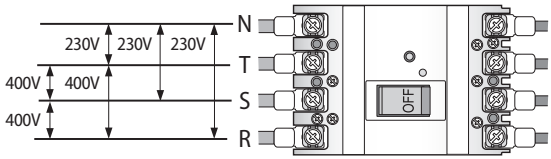


- Flow switch detector circuit must be detected for more than 30 seconds within 3 minutes after first operation signal output of the pump. (Outdoor unit will not operate when there is no detection.)
- Outdoor unit will stop if the contact of flow switch becomes 'Off' even during the operation.
- When outdoor unit stops, cooling water pump will also stop.
- Even when you are not using the external contact control from DVM outdoor unit, you may use other external control methods such as DDC, PLC or BMS and apply above flow chart. Also apply control for freezing prevention of the water circulation during winter season.
- If you control pump/2way solenoid valve with extra controller, make sure to apply in control so that pump/2way solenoid valve operates for 3 minutes after the outdoor unit stops operating.

Things to check after completing the installation

1. Before supplying the power, use DC 500 V insulation resistance tester to measure the power (3 phase: R, S, T/ 1 phase: L, N) terminal and the outdoor unit grounding.
   - Measurement should be over 30MΩ.
2. Before supplying the power, use a voltmeter and phase tester to check the voltage and the phase.
   - R, S, T, N terminal: check if the voltage is within 380-415 V between wires (R-S, S-T, T-R) and 220-240 V between phases (R-N, S-N, T-N) before turning on the switch.

CAUTION
- Never measure the communication terminal since communication circuit may get damaged.
- Check for short-circuit of the communication terminal with a general circuit tester.



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3. Check if the R-410A indoor units are connected.
4. When N phase is not correctly connected to R, S and T phase, over-voltage protection control will be in effect and it will cut-off the power of the PCB. Check the power cable connection of the N phase if the PCB is not turned on.
5. Check the following after the installation is completed.

Installation work	**Outdoor unit**	• Have you checked the external surface and the inside of the outdoor unit? • Is there any possibility of short-circuit caused by the heat of an outdoor unit? • Is the place well-ventilated and ensures space for service? • Is the outdoor unit fixed securely to withstand any external force?
	Indoor unit	• Have you checked the external surface and the inside of the indoor unit? • Is there enough space for service? • Have you checked if the center of the indoor unit is ensured and it is installed horizontally?
Refrigerant pipe work		• Have you selected correct pipes? • Are the liquid and gas valve open? • Is the total number of connected indoor units within the allowable range? • Are the length and the height difference between the refrigerant pipes within the allowable range? • Are the branch joints properly installed? • Did you check the connection of liquid and gas pipes? • Have you selected correct insulator for pipes and insulated them correctly? • DId you insulate the pipes and connection part correctly? • Is the quantity of the additional refrigerant correctly weighed in? (You must record the amount of additional refrigerant on the service record paper placed inside of the outdoor unit.)

Things to check after completing the installation

Drain pipe work	• Have you checked if the drain pipes of the indoor and outdoor unit are connected together? • Have you completed the drain test? • Is the drain pipe properly insulated?
Electrical wiring work	• Are the power cable and communication cable tightened firmly on the terminal board within the range of rated tightening torque? • Have you checked for cross-connection of the power and communication cables? • Have you performed the earthing work 3 to the outdoor unit? • Did you make sure to use 2-core cable (not multi-core cable) for the communication cable? • Is the length of the wire within allowed range? • Is the wiring route correct?
Setting address	• Did you set the address of the indoor and outdoor units properly? • Did you set the address of the indoor and outdoor units properly? (When using multiple remote controllers)
Option	• If there is a possibility of the outdoor unit from vibrating, check whether the anti-vibration frame is correctly installed.

Inspection and test operation

CAUTION

Precautions before trial operation

- Check if the circulation water condition matches the K21/K22 setting of the outdoor unit option switch. (Refer to 'Setting outdoor unit option switch and key function' on page 69)
- Make sure that water pipe facility work of the building is done appropriately.
  - Especially, check the installation location of strainer, air discharge valve (air ventilation), auto water supply valve, and expansion tank and make sure their location is appropriate.
  - Pour enough water in the expansion tank and execute individual water pipe pump operation to discharge all the air within the water pipe system.
- Measure the pressure loss at the inlet and outlet of the plate type heat exchanger to find out if there are enough amount of heat source water flowing and supplied to the product.
  - Check each models for sufficient amount of water flowing.
  - When there is air or insufficient amount of water flowing, it may cause plate type heat exchanger to freeze.
  - If the amount of water does not meet as planned, stop the operation and take appropriate counter-measure.
- When the outdoor temperature is low, turn on the main power 6 hours before beginning the operation.
  - If you start the operation immediately after turning on the main power, it may cause serious damage to the part within the product.
- Do not touch the refrigerant pipe during or right after the operation.
  - Refrigerant pipe may be hot or cold during or right after the operation depending on the status of the refrigerant which flows through the refrigerant pipe, compressor and other parts of the refrigerant cycle. If you touch the refrigerant during or right after the operation, you may get burns or frostbite.
- Do not operate the product with its panel or protection nets off.
  - There is risk of personal injury from the parts that rotates, heated or with the high voltage.
- Do not cut off the main power right after stopping the operation.
  - Wait for at least 5 minutes before turning off the main power. If not, water leakage or other problems may occur.
- Connect all the indoor units and the power supply for the outdoor unit and run auto address setting. Run auto address setting even after changing the indoor unit PCB.

Inspection and test operation

Checklist before auto trial operation

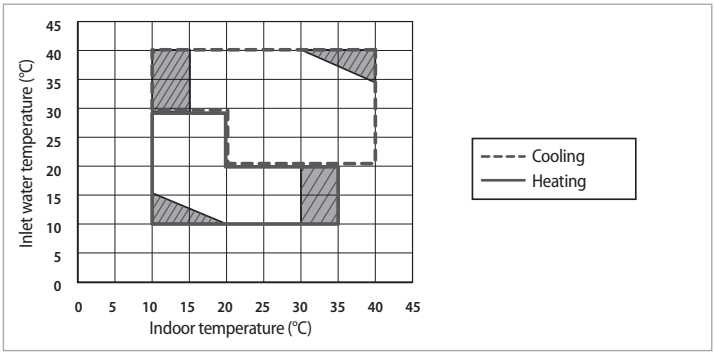
1. Check the power cable and communication cable of the indoor and outdoor unit.
2. Supply power to the outdoor unit 6 hours before trial operation to pre-heat the crank case heater.
3. Before supplying the power, use a voltmeter and phase tester to check the voltage and the phase.
   - R, S, T, N terminal: check if the voltage is within 380 -415 V between wires (R-S, S-T, T-R) and 220-240 V between phases (R-N, S-N, T-N).
4. When the power is supplied, outdoor unit will execute tracking to check the indoor unit connection and other optional functions.
5. Write down the installation report on the service history report paper attached on the front part of the control box.

CAUTION

- Supply power to the outdoor unit 6 hours before auto trial operation to pre-heat the crank case heater.

6. Guaranteed range of auto trial operation

   For precise judgment, you must perform auto trial operation in below indoor/outdoor temperature condition.



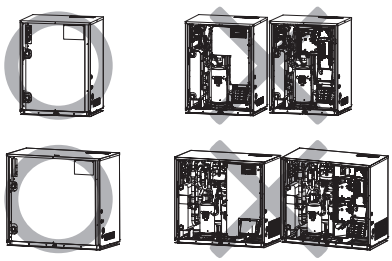
- In Auto trial operation, product will automatically select either cooling or heating mode and operate in selected mode.
- In the temperature range marked with slashed pattern, system protection control may trigger during operation.(If the system protection control is enabled, it can be hard to get the precise judgment after the auto trial operation.)
- When the temperature is outside of guaranteed range, accuracy of judgment on auto trial operation may decrease near boarder line area.

Auto trial operation

1. If the Auto Trial Operation is not completed, normal operation will be prohibited.
   - When the auto trial operation is not completed, UP (UnPrepared) will appear on the segment after the communication check and restrict compressor from operating. (UP Mode will be cleared automatically when auto trial mode is completed.)
   - Auto trial operation may take 20 minutes to maximum 2 hours depending on the operation status.
   - During auto trial operation, noise can be generated due to vavle inspection. (Check the product if abnormal noise occurs continously)
2. When error occurs during auto trial operation, check the error code and take appropriate measures.
   - Refer to next couple of pages when E503, E505 or E506 error occurs.
   - Refer to service manual if you need inspection or when other errors occur.
3. When auto trial operation ends, use S-NET pro or S-CHECKER to issue a result report.
   - Refer to service manual for further actions if you have any items with "inspection required" sign on the result report.
   - After taking appropriate measure for the items with "inpection required" sign, run the auto trial operation again.
4. Check the following items by running trial operation (cooling/heating).
   - Check if cooling/heating operation performs normally.
   - Individual indoor unit control: Check for air flow direction and fan speed.
   - Check for abnormal operation noise from the indoor and outdoor unit.
   - Check for proper draining from the indoor unit during cooling operation.
   - Use S-NET pro to check the detail operation status.
5. Explain to the user how to use the air conditioner according to the user's manual and provide this installation manual to the user.

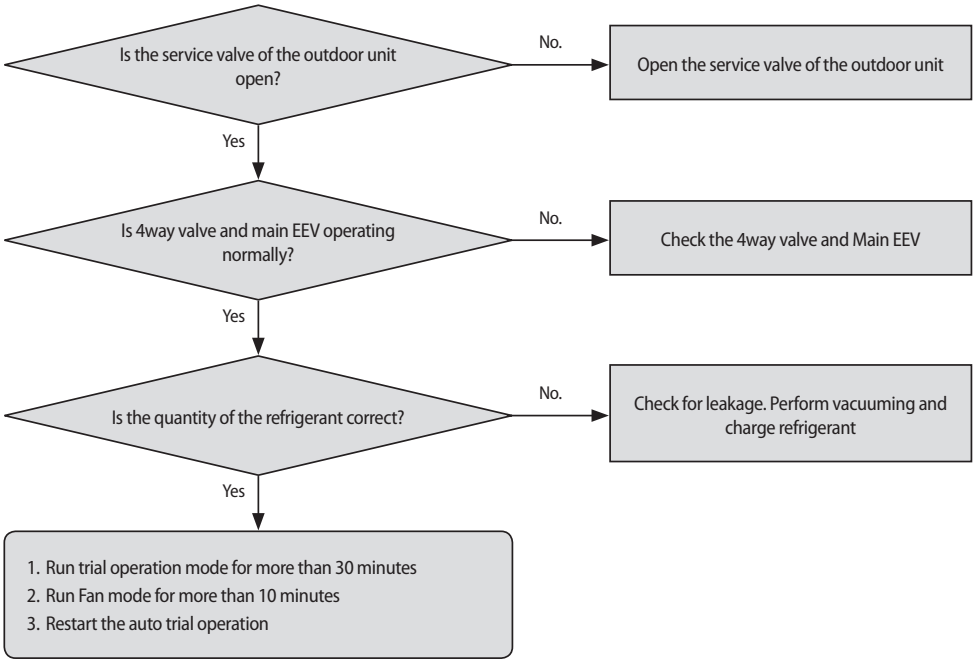
CAUTION

- Make sure to close the front part of the outdoor unit cabinet during operation. If you operate the unit with the front cabinet open, it may cause damage to the product and you may not get the precise data from S-NET pro.



Inspection and trial operation

Measures to take when an E503 error occurs (When the "inspection required" message appears on the S-NET pro report)



❋ 4-Way valve abnormal operation symptoms:

- Refrigerant noise increases when the compressor is in operation and the inlet pipe temperature (H/P: Suction, H/R: Suction 2) remains over 10 °C when compared to the low pressure saturation temperature.
- During heating operation, the temperature of the EVa. in/out maintains a calue of less than 0 °C.

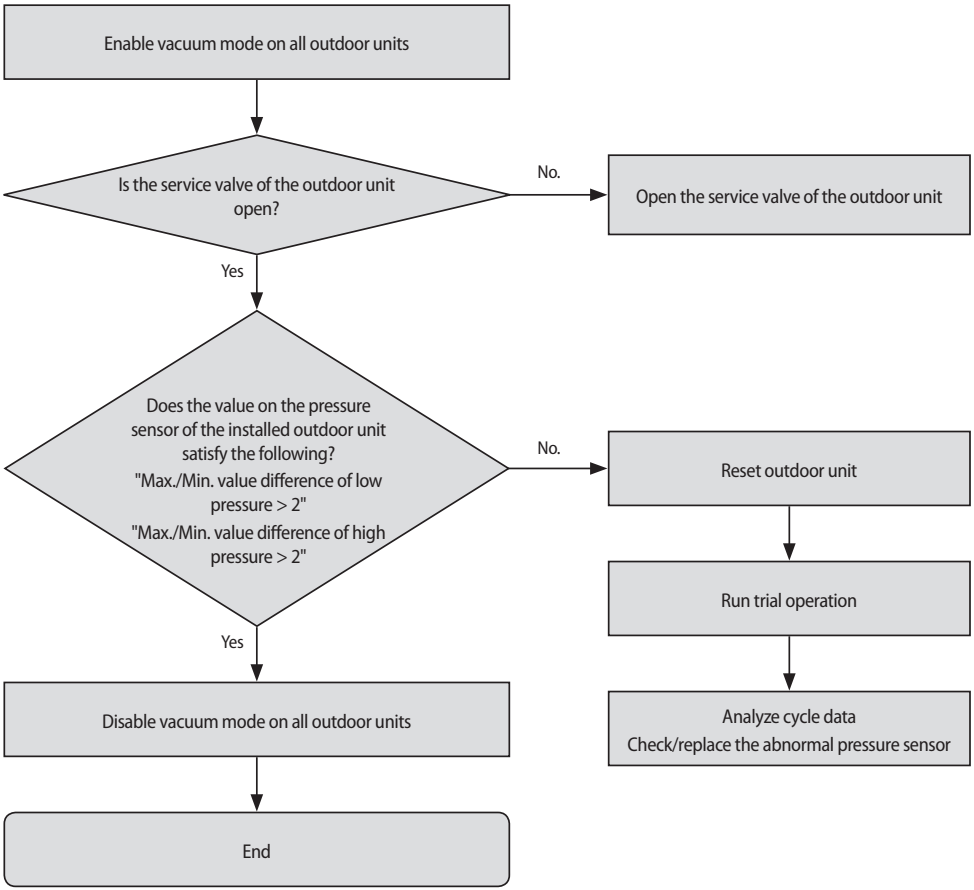
❋ Main EEV abnormal operation symptoms:

- During heating operation, an error occurs when controlling the degree of the superheat on the compressor inlet.
  : If there is an operation error whilst the EEV is fully open, the target degree of superheat (1 °C) cannot be achieved (below 0 °C) and the discharge temperature of the compressor is low.
  : If there is and operation error whilst the EEV is fully closed, the low pressure will decrease and the degree of superheat on the compressor inlet increases excessively.

CAUTION

- If the service valve needs to be detected, corresponding outdoor unit will display the error.
- If the service valve needs to be detected, auto detection mode will end. Check both gas pipe and liquid pipe service valves when detecting service valve.
- When 4way valve, Main EEV detection is needed, run heating trial operation for more than 1 hour and analyze the data to check for a problem.
- If the opreation range is not within guaranteed range, error may occur even though the product is normal.

Measure to take when E505, E506 error occurs

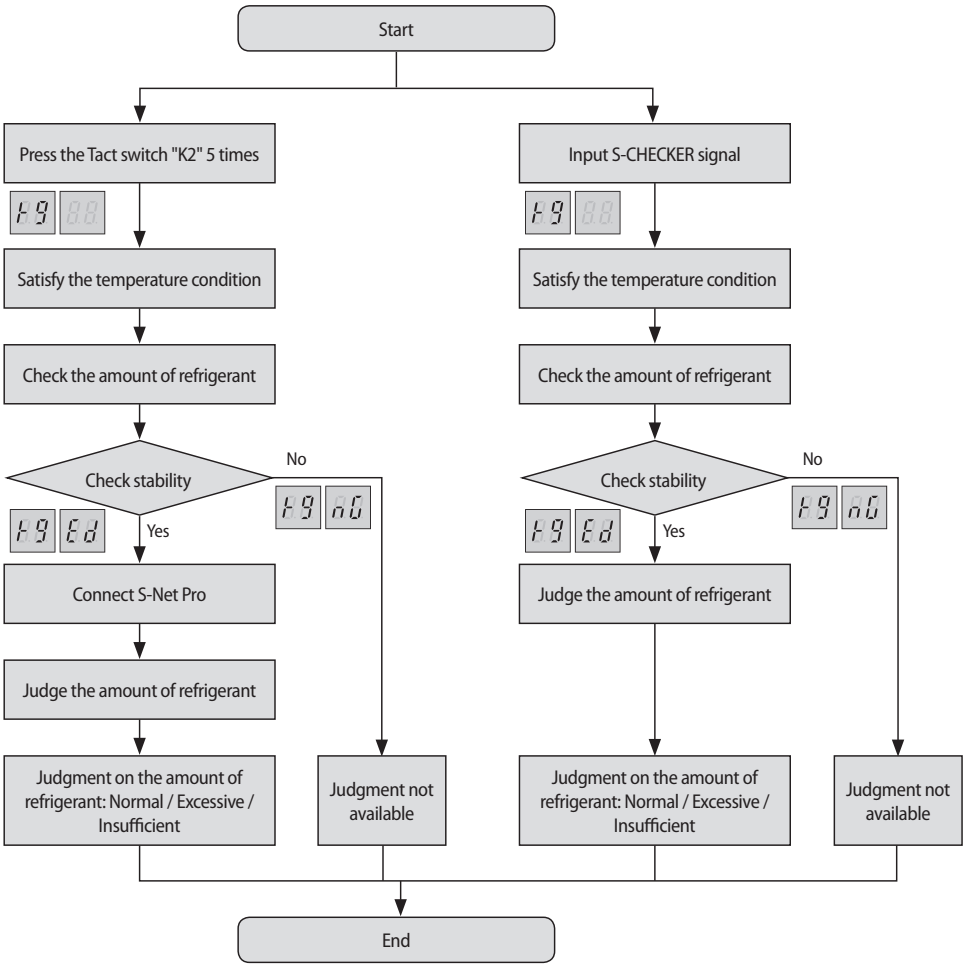


CAUTION

- When the auto trial operation for pressure sensor is executed before the pressure of the outdoor unit is equalized (when there is little difference between high and low pressure), error may occur even though the product is normal.
- If the pressure sensor needs to be detected, all outdoor units will display the error.
- If the pressure sensor needs to be detected, auto trial operation mode will end.
- To check for the pressure sensor with the problem, run trial operation for more than 1 hour and analyze the data to check for a problem.

Automatic refrigerant amount checking function

This function detects the amount of refrigerant in the system



CAUTION

- When the temperature is outside of guaranteed range, you can not obtain an accurate result.
  - Indoor : 20~32 ℃
  - Water temperature : 15~40 ℃
- If the operation cycle is not stable, refrigerant amount detection operation may end.
- Accuracy of the results may decrease if the product is not operated for a long period time before the refrigerant amount detection function operation is activated. Use the refrigerant amount detection operation function after operating the product in cooling mode for at least 30 minutes.
- Depending upon the operational environment, a system protection operation may be triggered. As a result, the refrigerant amount detection result may be inaccurate.

Actions to take after the detection result

- Excessive amount of refrigerant : Discharge 5% of the detected amount of refrigerant and restart the refrigerant amount detection operation.
- Insufficient amount of refrigerant : Charge 5% of the detected amount of refrigerant and restart the refrigerant amount detection operation.
- Insufficient degree of supercooling : Charge 10 % of the detected amount of refrigerant and restart the refrigerant amount detection operation.
- Judgment not available : Check if the refrigerant amount detection operation was executed within guaranteed temperature range. Execute trial operation to check if there's any other problems on the system.

Precaution before trial operation

1. Water quality management
   - It is not possible to disassemble the plate heat exchanger for cleaning or part replacement. therefore, to prevent corrosion or water scale on the plate type heat exchanger, you must manage the cooling water quality in compliance with standard of cooling water.(Refer to page 96.)
   - If the temperature of water is higher than room temperature, make sure to keep the concentration of chloride ion below 100 ppm to prevent corrosion and the water hardness should be below 150 mg CaCO3/L to prevent water scale. When a scale inhibitor is used, make sure to use the a type that is corrosion-free to the stainless steel and copper.
2. Water flow management
   - Insufficient water flow will lead to accidents related to frozen plate type heat exchanger. Check to make sure if there is any decrease in amount of water flow due to blocked strainer, problem on air ventilation or circulation pump after checking the temperature/pressure difference between the inlet and outlet of the plate type heat exchanger. If the temperature/pressure difference exceeds optimal range, stop the operation until remedial action is taken before the operation is restarted.
3. Counter-measures after E436 error (anti-freeze control) display
   - If E436 is displayed during operation, make sure to take care of the cause of problem before re-starting the operation. Water may freeze partially from the point when E436 is displayed. If you re-start the operation before the problem has been taken care of, plate type heat exchanger will shutdown and it will be impossible to melt the ice. If the water remains frozen, plate type heat exchanger will break and cause refrigerant leakage or water may enter into the refrigerant cycle.

Maintenance

Precautions on plate type heat exchanger maintenance

❋ Make sure to tell the user to keep this installation manual.

1. When the product was not operated for long period of time, check the followings:
   - Check the water to see if the water quality is meets the standard.
   - Clean the strainer.
   - Check to see if there is enough amount of water flow
   - Check to see if there is any problems on the water pressure, amount of water and the water temperature at inlet/outlet.
   - If you are using ground heat source, make sure to check the concentration level of the anti-freeze before the operation to maintain the freezing point at below -8 ℃ (Refer to 'Ground heat exchanger circulation water (anti-freeze) usage standard (mandatory checklist)' on page 98)
2. It is not possible to disassemble the plate heat exchanger for cleaning or part replacement. Therefore it has to be cleaned by following methods.
   - Check if there is any cleaning hole for chemical cleaning at the inlet water pipe. For water scale cleaning use diluted (down to 5%) citric acid, oxalic acid, acetic acid, phosphoric acid. However, do not use a cleaning solution containing hydrochloric acid, sulfuric acid or nitric acid since they are highly corrosive.
   - Check if there is valve on the inlet/outlet of the plate type heat exchanger.
   - Connect a exclusive pipe for cleaning to the inlet/outlet pipe of the plate type heat exchanger and fill the detergent at the temperature of 50~60˚C and circulate the detergent for about 2~5 hours. Cleaning time can be different depending on the temperature of detergent or degree of water scale. Judge the degree of water scale removal by the color of water detergent.
   - After cleaning, discharge the detergent within the plate type heat exchanger and fill the plate type heat exchanger with a water mixed with 1~2% of sodium hydroxide or sodium bicarbonate. Circulate the water mixture for 15~20 minutes to neutralize.
   - After neutralizing the pipes, rinse the plate type heat exchanger with distilled water.
   - If you are using the detergent sold at local retail stores, make sure that it doesn't cause any corrosion to the stainless steel or copper.
   - For detail information on cleaning method (and proper use of detergent), contact the detergent manufacturer.
3. After cleaning, check to see if it is possible to operate normally.

Recommended number of inspection for normal operation

Inspection list	Inspection standard	Number of inspection	Side effects when inadequate
Forced drainage	Have you set the electric conductivity value properly?	Once a week	Corrosion, water scale or slime may occur
	Is electric conductivity sensor working properly?		
	Is auto valve working properly?		
Cooling water and water quality inspection	Is cooling water corrupted or have floating particles?	Once a month	Corrosion, water scale or slime may occur
	Is there rust water?		
	Is there any red tides?		
	Is the concentration of the antifreeze being maintained?	Once a year (before winter season)	-
Internal/external part of the cooling tower	Is there any water scale or slime?	Once a month	Corrosion, water scale or slime may occur
	Is there any signs of corrosion on the metal part?		
	Is there any water plant?		
Heat source water device	Have you set the make-up water supply value properly?	Daily	Operation problem at the cooling tower or intensified water concentration
	Is there any excess or deficiency of the make-up water?		
	Is the water level within the tank normal for operation?		

Cooling water management

1. Standard of cooling water quality for air conditioning and the number of water quality inspection

❋ Make sure to comply the standard for water quality management.

▶ Cooling water with high level of foreign substances can cause pipe corrosion or creation of water scale which effects the product's performance and lifespan. (Use the appropriate heat source water according to the below table) If the system water is sourced from anything other than the local water supply, make sure to check the quality of water.

❋ For water quality management on the heat source water of closed circuit water cooling must be done according to the below table. If the water quality is not managed according to the below table, it may decrease the performance of air conditioner and cause serious problem on the product.

Classification	Item	Closed circuit system		Effects		Recommended number for water quality inspection
		Heat source water	Make-up water	Corrosion	Scale	
Standard value	pH[25 ℃]	7.0~8.0	7.0~8.0	❍	❍	Twice a month
	Electric conductivity [25 ℃] (mS/m)	30 or below	30 or below	❍	❍	
	Chloride ion (mg Cl^-/L)	50 or below	50 or below	❍		Once a month
	Sulfate ion (mg $S0_4^{2-}$/L)	50 or below	50 or below	❍		
	M alkali level [pH 4.8](mg $CaCo_3$/L)	50 or below	50 or below		❍	
	Total hardness (mg $CaCo_3$/L)	70 or below	70 or below		❍	
	Calcium hardness (mg $CaCo_3$/L)	50 or below	50 or below		❍	
	Ionized silica (mg SiO_2/L)	30 or below	30 or below		❍	
Reference	Iron (mg Fe/L)	1.0 or below	0.3 or below	❍	❍	Once a month
	Copper (mg Cu/L)	1.0 or below	1.0 or below	❍		
	Sulfate ion (mg S^{2-}/L)	Not to be detected	Not to be detected	❍		
	Ammonium ion (mg NH_4^+/L)	0.3 or below	0.1 or below	❍		
	Residual chlorine (mg Cl/L)	0.25 or below	0.3 or below	❍		
	Free carbon dioxide (mg CO_2/L)	0.4 or below	0.4 or below	❍		
	Stability index	-	-	❍	❍	

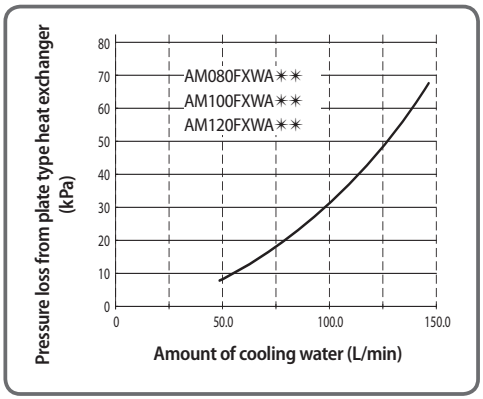
CAUTION

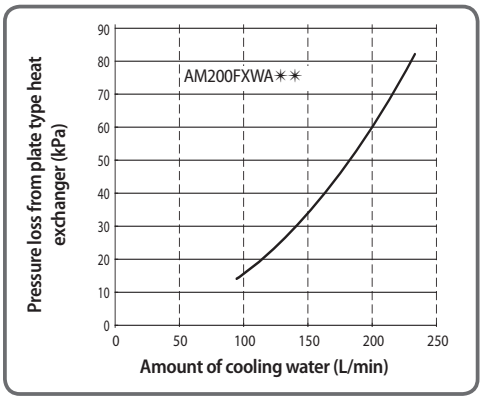
- Circle (O) denotes the factor relevant to corrosion or water scale.
- When the water temperature is over 40˚C, steel without protective coating may corrode when exposed to water. Applying corrosion prevention material or degassing can be an effective measure to prevent corrosion.
- For the cooling water and the make-up water, used under closed circuit water system with closed circuit cooling tower, should satisfy the standard shown in above table.
- Supplied water or make-up water should be tap water, industrial water or groundwater. Purified water, neutralized water and softened water should not be supplied.
- 15 items in the above table is a typical factor for corrosion and/or water scale.

2. Operation range of water

▶ When the amount of cooling water is out of the operation range, stop the outdoor unit and take care of the cause before re-start the operation (Operation range : 60~120% of the standard amount of water flow)

Section	Standard condition				Operation range			
	Amount of cooling water (L/min)				Amount of cooling water (L/min)			
	AM080FXWA✳✳	AM100FXWA✳✳	AM120FXWA✳✳	AM200FXWA✳✳	AM080FXWA✳✳	AM100FXWA✳✳	AM120FXWA✳✳	AM200FXWA✳✳
Cooling	80	96	114	190	48~96	58~115	68~137	114~228
Heating								





Cooling water management

3. Ground heat exchanger circulation water (anti-freeze) usage standard (mandatory checklist)

When using ground heat source, use anti-freeze to manage the freezing point. If you do not use anti-freeze, it will cause the pipes to freeze and burst. Note that the manufacturer does not take responsibility for any damage caused.

1) All the circulating water (anti-freeze) and additives (corrosion inhibitor, bacteria inhibitor, foam inhibitors) must be used after consulting with the business ordering party or supervisor for its impact on environment, toxicity, corrosiveness, harmfulness to human and management plan.
2) Contractor must take extra care regarding on handling, packaging and transporting regulations and procedure of the anti-freeze.
3) Do not use the anti-freeze that is harmful to humans or equipment. In addition, anti-freeze must be injected to the pipe according to specification and concentration level that is actually required by system. (Do not directly inject undiluted solution, consult business ordering party or supervisor when undiluted solution was brought to the site)
4) Before injecting the anti-freeze, evacuate any air that may remain in the system and apply pressure to check for leakage.
5) User must monitor and manage periodically to maintain initially designed concentration level of the anti-freeze. If the concentration level decrease due to leakage or over certain period of time, it may cause due to pipe to freeze and burst.
6) Usage condition of the anti-freeze when ground heat exchanger is installed (mandatory)
   - Flash point: Flash point of the anti-freeze must be over 90 °C.
   - Biochemical oxygen demand: Amount of oxygen in 1 g of anti-freeze at 10 °C must be within 0.1~0.2 g and this value must be maintained for 5 days.
   - Freezing point: Maintain concentration level of the anti-freeze so that freezing point of the anti-freeze complies to the setting of the option switch (K21/K22).
   - Toxicity: LD50 per each 1 kg of anti-freeze must be less than 5 g.
   - Storage stability: It must not be separate when heated or cooled, and also turbidity should not be increased.
   - Corrosion resistance: It must be corrosion resistant to all the metallic material used for ground heat pumps and pipes.
   - Scale: Scale that has been accumulated on the plate type heat exchanger for one year of performance should not cause performance decrease over 15%.

4. Standard data for status of Anti-freeze (Based on temperature of anti-freeze at 15 °C)

Type of anti-freeze (Based on 15 °C)	Concentration [% Wt.]	Freezing temperature	Density [kg/m^3]
Methanol	10	-5.6	983.60
	20	-11.7	975.60
Ethanol	10	-3.9	983.60
	20	-8.3	972.40
Ethylene glycol	10	-3.2	1014.87
	20	-7.8	1031.39
	30	-14.1	1047.07
	40	-22.3	1061.65
Propylene glycol	10	-3.3	1009.75
	20	-7.1	1020.91
	30	-12.7	1030.51
	40	-21.1	1038.65

Memo