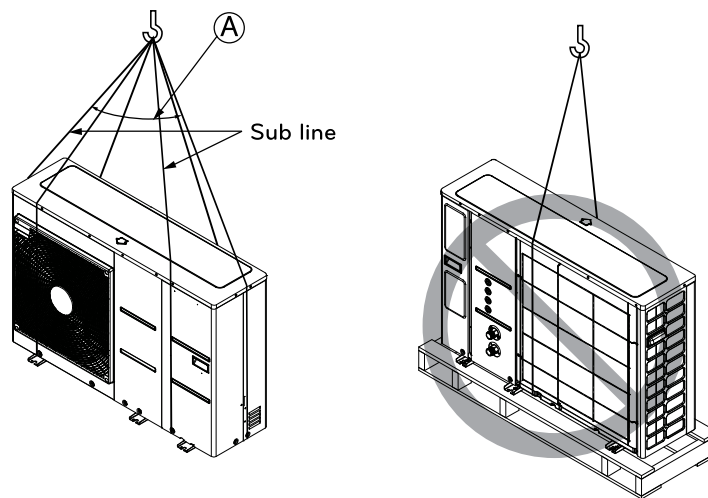


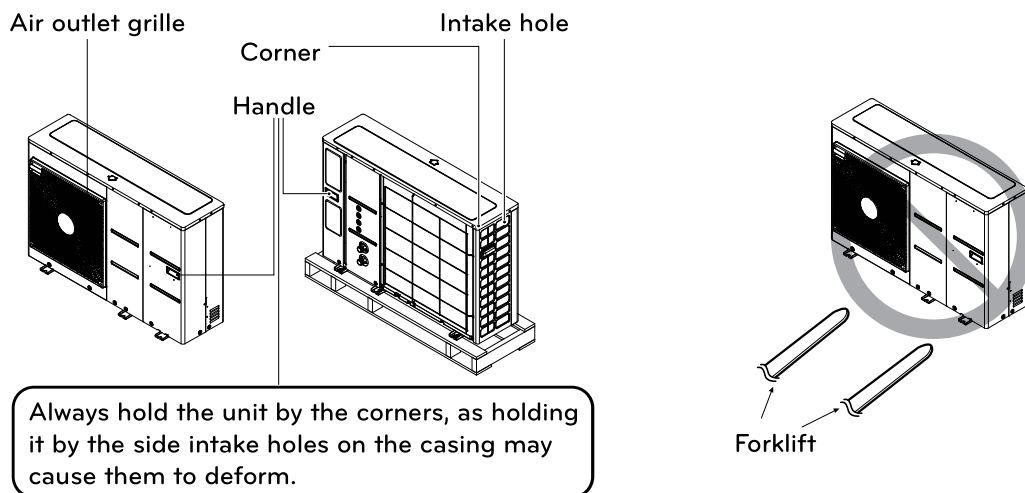
INSTALLATION

Transporting the Unit

- When carrying the suspended unit, pass the ropes between legs of base panel under the unit.
- Always lift the unit with ropes attached at four points so that impact is not applied to the unit.
- Attach the ropes to the unit at an angle (A) of 40° or less.
- Use only accessories and parts which are of the designated specification when installing.
- Forklift trucks are not available without a palette.
- Be careful not to damage the product when moving the forklift.



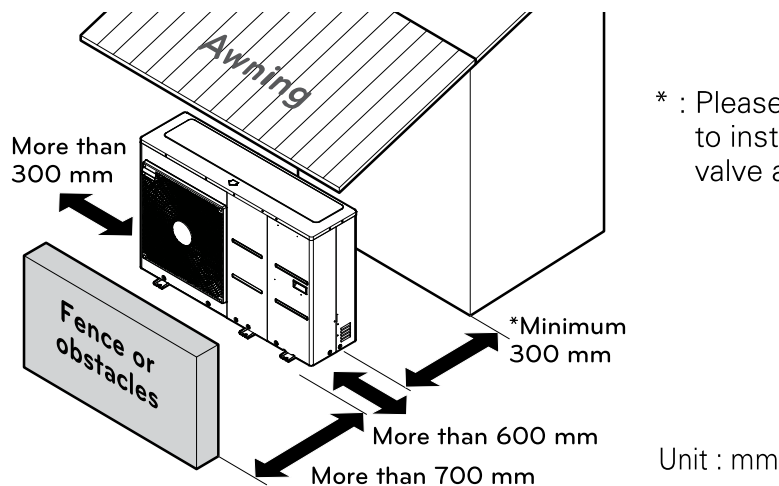
(A) 40° or less



Always hold the unit by the corners, as holding it by the side intake holes on the casing may cause them to deform.

Installation places

- If an awning is built over the unit to prevent direct sunlight or rain exposure, make sure that heat radiation from the condenser is not restricted.
- Ensure that the spaces indicated by arrows around front, back and side of the unit.
- Do not place animals and plants in the path of the warm air.
- Take the Unit weight into account and select a place where noise and vibration are minimum.
- Select a place so that the warm air and noise from the air conditioner do not disturb neighbors.
- Place that can sufficiently endure the weight and vibration of the outdoor unit and where even installation is possible
- Place that has no direct influence of snow or rain
- Place with no danger of snowfall or icicle drop
- Place without weak floor or base such as decrepit part of the building or with a lot of snow accumulation



⚠ CAUTION

Be very careful while carrying the product.

- Do not have only one person carry product if it is more than 20 kg.
- PP bands are used to pack some products. Do not use them as a mean for transportation because they are dangerous.
- Do not touch heat exchanger fins with your bare hands. Otherwise you may get a cut in your hands.
- Tear plastic packaging bag and scrap it so that children cannot play with it. Otherwise plastic packaging bag may suffocate children to death.
- When carrying in Unit, be sure to support it at four points. Carrying in and lifting with 3-point support may make Outdoor Unit unstable, resulting in a fall.
- Use 2 belts of at least 8 m long.
- Place extra cloth or boards in the locations where the casing comes in contact with the sling to prevent damage.
- Hoist the unit making sure it is being lifted at its center of gravity.

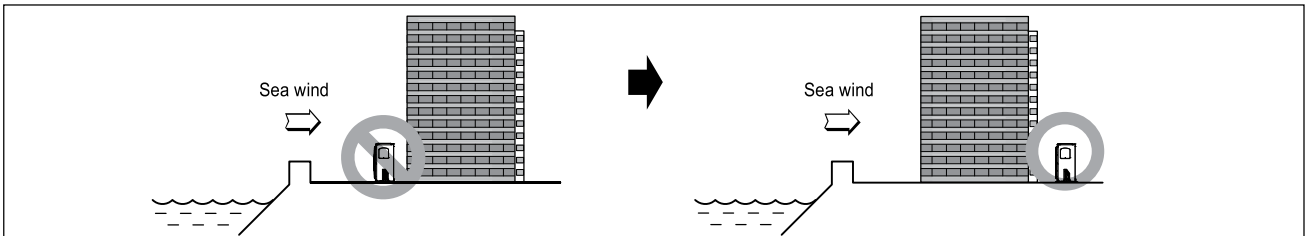
Installation at Seaside

⚠ CAUTION

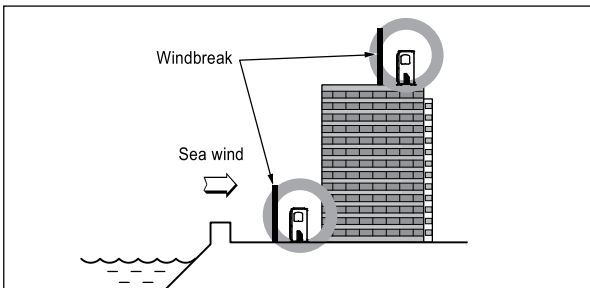
- Unit should not be installed in areas where corrosive gases, such as acid or alkaline gas, are produced.
- Do not install the unit where it could be exposed to sea wind (salty wind) directly. It can result corrosion on the unit. Corrosion, particularly on the condenser and evaporator fins, could cause unit malfunction or inefficient performance.
- If unit is installed close to the seaside, it should avoid direct exposure to the sea wind. Otherwise it needs additional anticorrosion treatment on the heat exchanger.

Selecting the location

- If the unit is to be installed close to the seaside, direct exposure to the sea wind should be avoided. Install the unit on the opposite side of the sea wind direction.



- In case, to install the unit on the seaside, set up a windbreak not to be exposed to the sea wind.



- It should be strong enough like concrete to prevent the sea wind from the sea.
- The height and width should be more than 150 % of the unit.
- It should be keep more than 700 mm of space between unit and the windbreak for easy air flow.

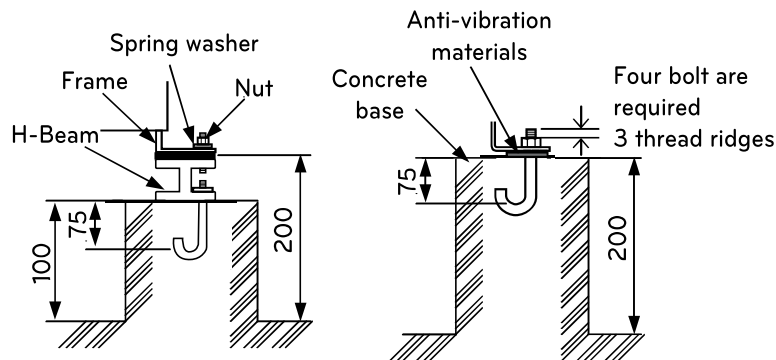
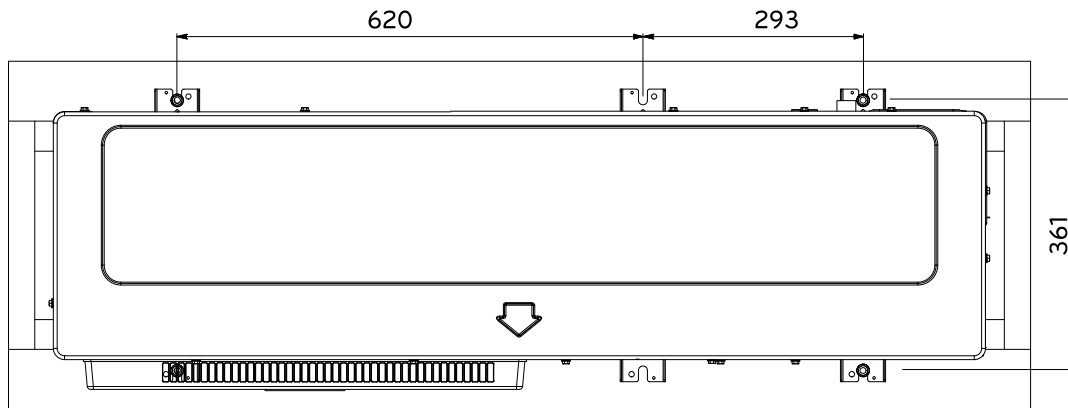
- Select a well-drained place.
 - If you can't meet above guide line in the seaside installation, please contact your supplier for the additional anticorrosion treatment.
 - Periodic (more than once/year) cleaning of the dust or salt particles stuck on the heat exchanger by using water

Seasonal Wind and Cautions in Winter

- Sufficient measures are required in a snow area or severe cold area in winter so that unit can be operated well.
- Get ready for seasonal wind or snow in winter even in other areas.
- Install a suction and discharge duct not to let in snow or rain.
- Install the unit not to come in contact with snow directly. If snow piles up and freezes on the air suction hole, the system may malfunction. If it is installed at snowy area, attach the hood to the system.
- Install the unit at the higher installation console by 500 mm than the average snowfall (annual average snowfall) if it is installed at the area with much snowfall.
- Where snow accumulated on the upper part of the unit by more than 100 mm, always remove snow for operation.
 - The height of H frame must be more than 2 times the snowfall and its width shall not exceed the width of the unit. (If width of the frame is wider than that of the unit, snow may accumulate.)
 - Don't install the suction hole and discharge hole of the unit facing the seasonal wind.

Foundation for Installation

- Check the strength and level of the installation ground so that the unit will not cause any operating vibration or noise after installation.
- Fix the unit securely by means of the foundation bolts. (Prepare 6sets of M12 foundation bolts, nuts and washers each which are available on the market.)
- It is best to screw in the foundation bolts until their length are 20 mm from the foundation surface.
- When installing the unit on the ground, install a separate pedestal with enough height to install the drain nipple.

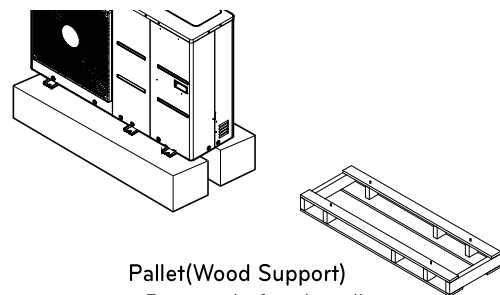


[Unit:mm]

Foundation bolt executing method

⚠ WARNING

- Be sure to remove the Pallet(Wood Support) of the bottom side of the unit Base Pan before fixing the bolt. It may cause the unstable state of the unit settlement, and may cause freezing of the heat exchanger resulting in abnormal operations.
- Be sure to remove the Pallet(Wood Support) of the bottom side of the unit before welding. Not removing Pallet(Wood Support) causes hazard of fire during welding.



Pallet(Wood Support)
- Remove before Installation

Electrical Wiring

- Follow ordinance of your governmental organization for technical standard related to electrical equipment, wiring regulations and guidance of each electric power company.

WARNING

- Be sure to have authorized electrical engineers do the electric work using special circuits in accordance with regulations and this installation manual. If power supply circuit has a lack of capacity or electric work deficiency, it may cause an electric shock or fire.

- Install the Unit transmission line away from the power source wiring so that it is not affected by electric noise from the power source. (Do not run it through the same conduit.)
- Be sure to provide designated grounding work to Unit.

CAUTION

- Be sure to correct the unit to earth. Do not connect earth line to any gas pipe, liquid pipe, lightning rod or telephone earth line. If earth is incomplete, it may cause an electric shock.

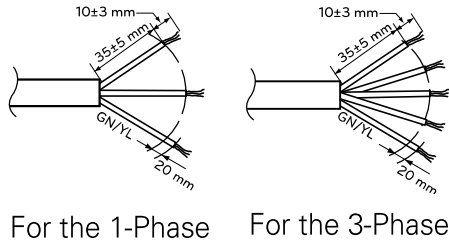
- Give some allowance to wiring for electrical part box of Units, because the box is sometimes removed at the time of service work.
- Never connect the main power source to terminal block of transmission line. If connected, electrical parts will be burnt out.
- Only the transmission line specified should be connected to the terminal block for Unit transmission.

CAUTION

- This product have reversed phase protection detector that only works when the power is turned on. If there exists black out or the power goes on and off which the product is operating, attach a reversed phase protection circuit locally. running the product in reversed phase may break the compressor and other parts.
- Use the 2-core shield cables for communication lines. Never use them together with power lines.
- The conductive shielding layer of cable should be grounded to the metal part of both units.
- Never use multi-core cable
- As this unit is equipped with an inverter, to install a phase leading capacitor not only will deteriorate power factor improvement effect, but also may cause capacitor abnormal heating. Therefore, never install a phase leading capacitor.
- Make sure that the power unbalance ratio is not greater than 2 %. If it is greater, the unit's lifespan will be reduced.
- Introducing with a missing N-phase or with a mistaken N-phase will break the equipment

CAUTION

The power cable connected to the unit should be complied with IEC 60245 or HD 22.4 S4 (This equipment shall be provided with a cable set complying with the national regulation).



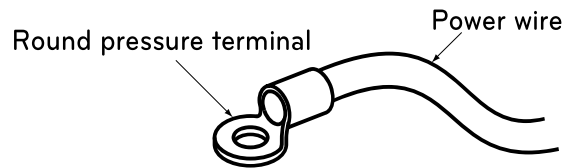
For the 1-Phase

For the 3-Phase

Model Name		Area(mm ²)	Cable Type
Phase	Capacity		
1Ø	5 kW	4	H07RN-F
	7 kW		
	9 kW		
	12 kW	6	
	14 kW		
3Ø	16 kW	4	
	12 kW		
	14 kW		
	16 kW		

Precautions when laying power wiring

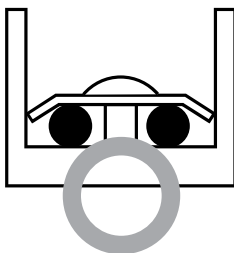
Use round pressure terminals for connections to the power terminal block.



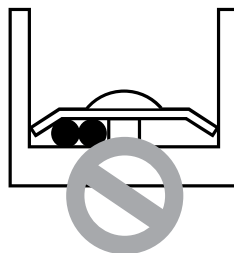
When none are available, follow the instructions below.

- Do not connect wiring of different thicknesses to the power terminal block. (Slack in the power wiring may cause abnormal heat.)
- When connecting wiring which is the same thickness, do as shown in the figure below.

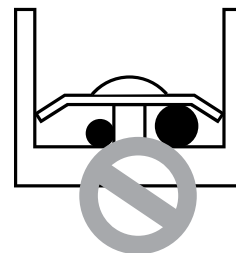
Connect same thickness wiring to both sides.



It is forbidden to connect two to one side.



It is forbidden to connect wiring of different thicknesses.



- For wiring, use the designated power wire and connect firmly, then secure to prevent outside pressure being exerted on the terminal block.
- Use an appropriate screwdriver for tightening the terminal screws. A screwdriver with a small head will strip the head and make proper tightening impossible.
- Over-tightening the terminal screws may break them.

WARNING

- Make sure that the screws of the terminal are free from looseness.

Point for attention regarding quality of the public electric power supply

This equipment complies with respectively:

- EN/IEC 61000-3-12 (1) provided that the short-circuit power S_{sc} is greater than or equal to the minimum S_{sc} value 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 respectively: S_{sc} greater than or equal to the minimum S_{sc} value.

Model Name		Minimum Ssc Value
Phase	Capacity	
1Ø	5 kW	3 142
	7 kW	
	9 kW	
	12 kW	
	14 kW	
	16 kW	

Model Name		Minimum Ssc Value
Phase	Capacity	
3Ø	12 kW	2 348
	14 kW	
	16 kW	

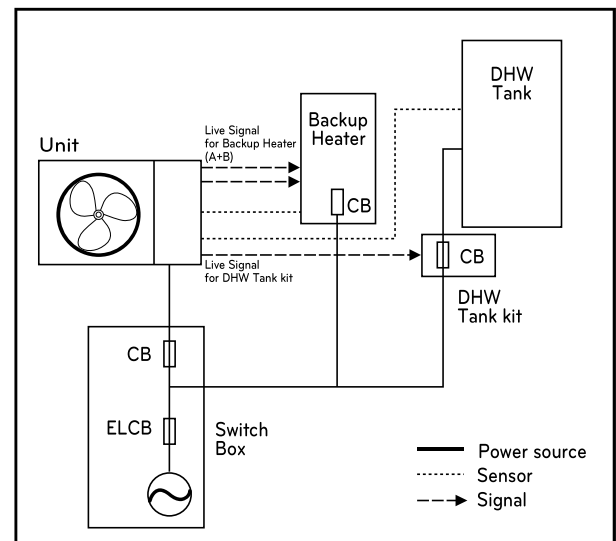
- European/International Technical Standard setting the limits for voltage changes, voltage fluctuations and flicker in public low-voltage supply systems for equipment with rated current ≤ 75 A.
- European/International Technical Standard setting the limits for harmonic currents produced by equipment connected to public low-voltage systems with input current ≤ 16 A of > 75 A per phase.

Circuit Breaker Specification

Perform the electrical wiring work according to the electrical wiring connection.

- All wiring must comply with local requirements.
- Select a power source that is capable of supplying the current required by the appliance.
- Use a recognized ELCB(Electric Leakage Circuit Breaker) between the power source and the unit. A disconnection device to adequately disconnect all supply lines must be fitted.
- Model of circuit breaker recommended by authorized personnel Only.
- Select a circuit breaker suitable for the current specification.

Model Name		Maximum Running Current
Phase	Capacity	
1Ø	5 kW	23 A
	7 kW	
	9 kW	
	12 kW	35 A
	14 kW	
	16 kW	
3Ø	12 kW	15 A
	14 kW	
	16 kW	



*CB : Circuit Breaker

*ELCB : Electric Leakage Circuit Breaker

Wiring procedure for power cable

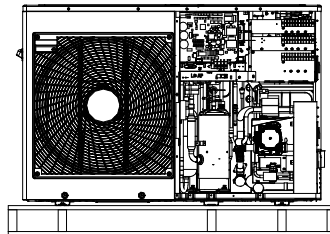
This cable is generally connected between external power source (such as main electric power distribution panel of user's house) and the unit. Before starting wiring, check if wire specification is suitable and read following directions and cautions VERY carefully.

CAUTION

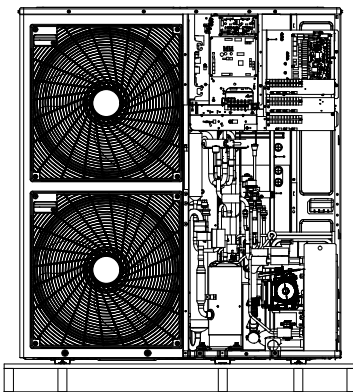
After checking and confirming following conditions, start wiring work.

- Secure dedicated power source for the Air-to-Water heat pump. The wiring diagram (attached inside the control box of the unit) is presenting related information.
- Provide a circuit breaker switch between power source and the outdoor unit.
- Although it is very rare case, sometimes the screws used to fasten internal wires can be loosen due to the vibration while product transportation. Check these screws and make it sure if they are all fastened tightly. If not tightened, burn-out of the wire can be occurred.
- Check the specification of power source such as phase, voltage, frequency, etc.
- Confirm that electrical capacity is sufficient.
- Be sure that the starting voltage is maintained at more than 90 percent of the rated voltage marked on the name plate.
- Confirm that the cable thickness is as specified in the power sources specification. (Particularly note the relation between cable length and thickness.)
- Provide an ELB(electric leakage breaker) when the installation place is wet or moist.
- The following troubles would be caused by abnormal voltage supply such as sudden voltage increasing or voltage drop-down.
 - Chattering of a magnetic switch (frequent on and off operation)
 - Physical damage of parts where magnetic switch is contacted
 - Break of fuse
 - Malfunction of overload protection parts or related control algorithms.
 - Failure of compressor start up
 - Ground wire to ground outdoor unit to prevent electrical shock.

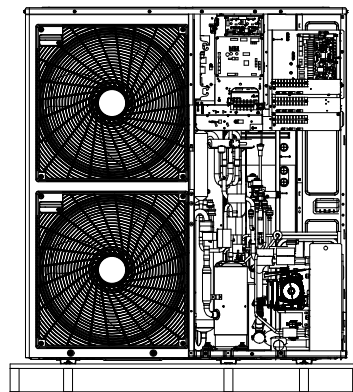
Step 1. Disassemble side panel and front panel from the unit by loosening screws.



1Ø : 5 kW, 7 kW, 9 kW



1Ø : 12 kW, 14 kW, 16 kW



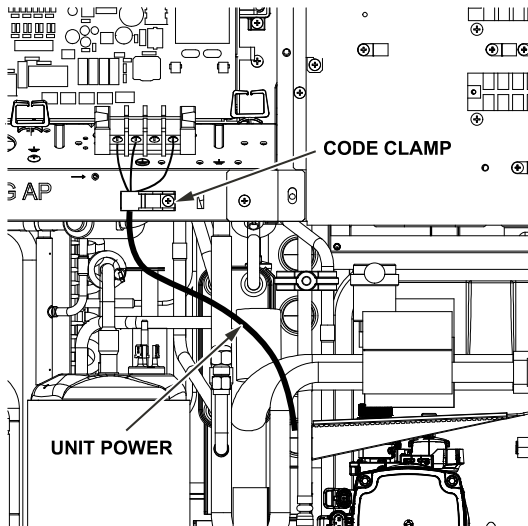
3Ø : 12 kW, 14 kW, 16 kW

Step 2. Connect power cable to main power terminal

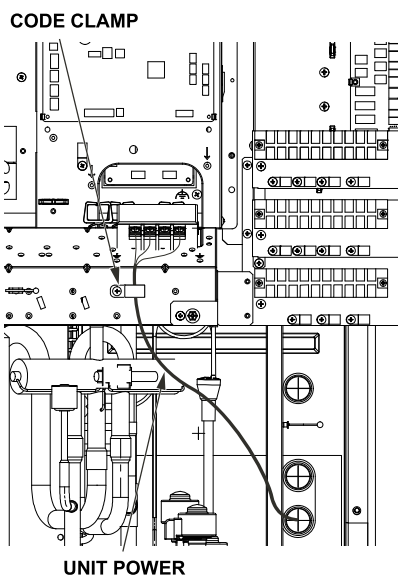
See below figure for detailed information. When connecting earth cable, the diameter of cable should refer to the below table. The earth cable is connected to the Control box case where earth symbol is ⊕ marked.

Step 3. Use cable clamps (or cord clamps) to prevent unintended move of power cable.

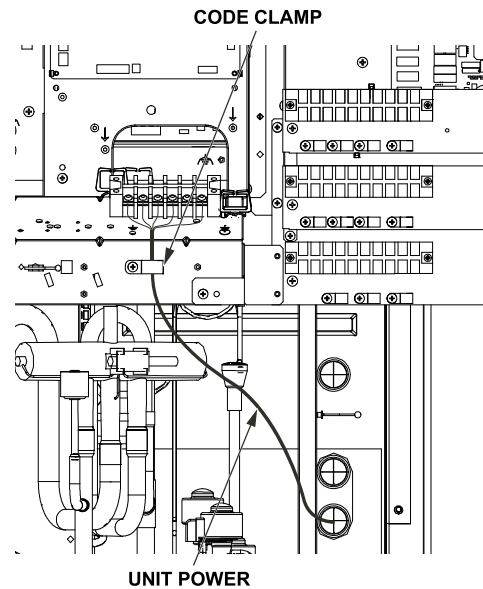
Step 4. Reassemble the side panel to the unit by fastening screws.



1Ø : 5 kW, 7 kW, 9 kW



1Ø : 12 kW, 14 kW, 16 kW



3Ø : 12 kW, 14 kW, 16 kW

Failure to do these instruction can result in fire, electric shock or death.

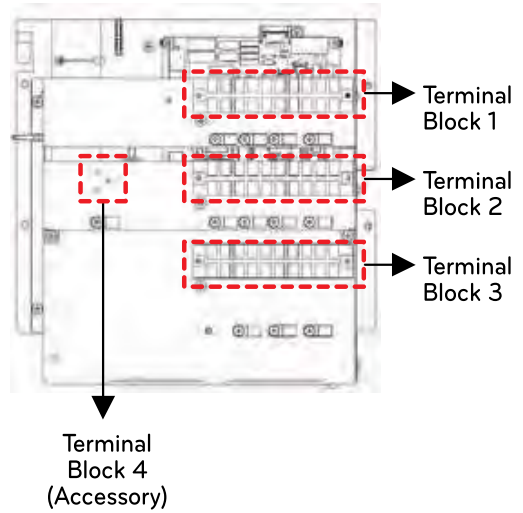
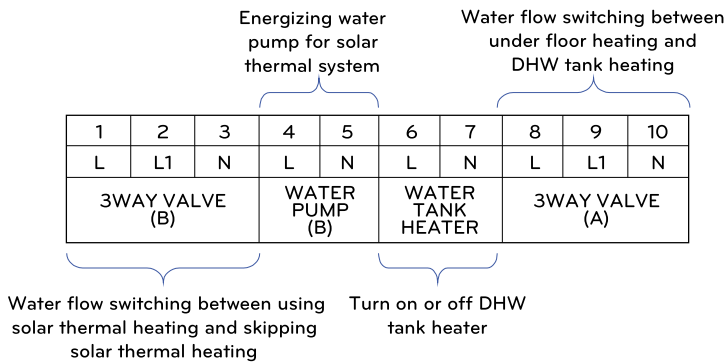
- Make sure the power cable do not touch to copper tube.
- Make sure to fix [cord clamp] firmly to sustain the connection of terminal.
- Make sure to connect unit power & heater power separately.

Terminal Block Information

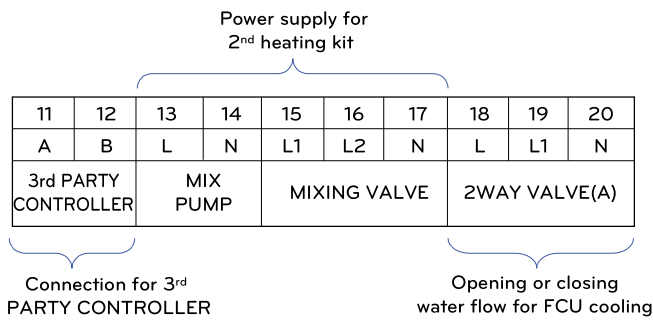
Symbols used below pictures are as follows :

- L, L1, L2 : Live (220-240 V~)
- N : Neutral (220-240 V~)
- BR : Brown , WH : White , BL : Blue , BK : Black

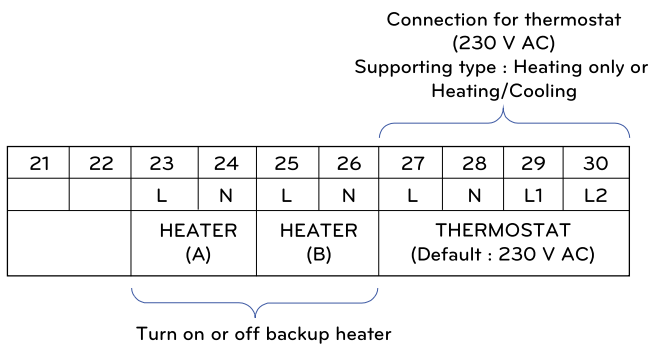
Terminal Block 1



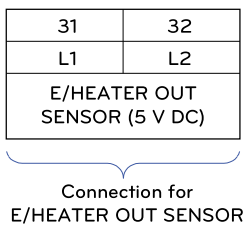
Terminal Block 2



Terminal Block 3



Terminal Block 4



Wiring of main power supply and equipment capacity

1. Use a separate unit power and heater power.
2. Bear in mind ambient conditions (ambient temperature, direct sunlight, rain water, etc.) when proceeding with the wiring and connections.
3. The wire size is the minimum value for metal conduit wiring. The power cord size should be 1 rank thicker taking into account the line voltage drops. Make sure the power-supply voltage does not drop more than 10 %.
4. Specific wiring requirements should adhere to the wiring regulations of the region.
5. Power supply cords of parts of appliances for unit use should not be lighter than polychloroprene sheathed flexible cord.
6. Don't install an individual switch or electrical outlet to disconnect each of unit separately from the power supply.

WARNING

- Follow ordinance of your governmental organization for technical standard related to electrical equipment, wiring regulations and guidance of each electric power company.
- Make sure to use specified wires for connections so that no external force is imparted to terminal connections. If connections are not fixed firmly, it may cause heating or fire.
- Make sure to use the appropriate type of overcurrent protection switch. Note that generated overcurrent may include some amount of direct current.

CAUTION

- Some installation site may require attachment of an earth leakage breaker. If no earth leakage breaker is installed, it may cause an electric shock.
- Do not use anything other than breaker and fuse with correct capacity. Using fuse and wire or copper wire with too large capacity may cause a malfunction of unit or fire.

Water Piping and Water Circuit Connection

CAUTION

Followings are should be considered before beginning water circuit connection.

- Service space should be secured.
- Water pipes and connections should be cleaned using water.
- Space for installing external water pump should be provided if internal water pump capacity is not enough for installation field.
- Never connect electric power while proceeding water charging.

Definition of terms are as follow :

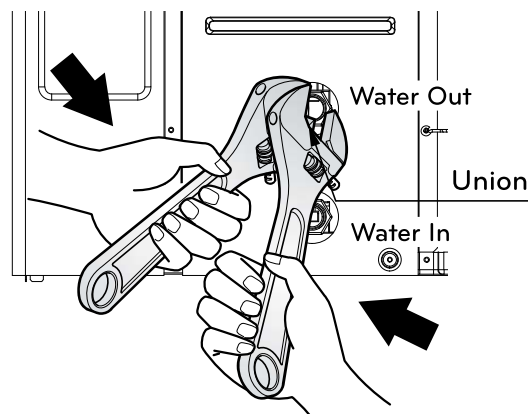
- Water piping : Installing pipes where water is flowing inside the pipe.
- Water circuit connecting : Making connection between the unit and water pipes or between pipes and pipes. Connecting valves or elbows are, for example, in this category.

Configuration of water circuit is shown in "Installation Scenes". All connections should be complied with presented diagram.

While installing water pipes, followings should be considered :

- While inserting or putting water pipes, close the end of the pipe with pipe cap to avoid dust entering.
- When cutting or welding the pipe, always be careful that inner section of the pipe should not be defective. For example, no weldments or no burrs are found inside the pipe.
- Drain piping should be provided in case of water discharge by the operation of the safety valve. This situation can be happened when the internal pressure is over 3.0 bar and water inside the unit will be discharged to drain hose.
- Pipe fittings (e.g. L-shape elbow, T-shape tee, diameter reducer, etc) should be tightened strongly to be free from water leakage.
- Connected sections should be leakage-proof treatment by applying tefron tape, rubber bushing, sealant solution, etc.
- Appropriate tools and tooling methods should be applied to prevent mechanical breakage of the connections.
- Operation time of flow valve(e.g. 3way valve or 2way valve) should be less than 90 seconds.
- While supplying water, pressure of supplying water should be 2.0 bar approximately.
- Pipe is insulated to prevent heat loss to external environment and to prevent dew generation on the surface of the pipe in cooling operation.

When the water pipes are connected.
It must be tightened the nut with two wrench.
Otherwise pipes can be deformed.



⚠ WARNING

Installing shut-off valve

- While assembling two shut-off valves, pop sound will be heard when valve is open or close by rotating handles. It is normal condition because the sound is due to leakage of charged nitrogen gas inside the valve. The nitrogen gas is applied to secure quality assurance.
- Before starting water charging, these two shut-off valves should be assembled with water inlet and outlet pipe of the unit.

Water condensation on the floor

While cooling operation, it is very important to keep leaving water temperature higher than 16 °C. Otherwise, dew condensation can be occurred on the floor.

If floor is in humid environment, do not set leaving water temperature below 18 °C.

Water condensation on the radiator

While cooling operation, cold water may not flow to the radiator. If cold water enters to the radiator, dew generation on the surface of the radiator can be occurred.

Water Pipe Insulation

Purpose of water pipe insulation is :

To prevent heat loss to external environment.

To prevent dew generation on the surface of the pipe in cooling operation.

To prevent pipe breakage by freeze at winter season,

※ Must be insulation at exterior water pipe between product and building.

Water Charging

For water charging, please follow below procedures.

Step 1. Open all valves of whole water circuit. Supplied water should be charged not only inside the unit, but also in the under floor water circuit, DHW water tank circuit, FCU water circuit, and any other water circuits controlled by the product.

Step 2. Connect supply water into drain valve and fill valve located at the side of the shut-off valve.

CAUTION

No water-leakage permitted at the drain and fill valve. Leakage-proof treatment which is described in previous section should be applied.

Step 3. Start to supply water. While supplying water, following should be kept.

- Pressure of supplying water should be 2.0 bar approximately.
- For supplying water pressure, time to be taken from 0 bar to 2.0 bar should be more than 1 minute. Sudden water supply can yield water drain through safety valve.
- Fully open the cap of air vent to assure air purging. If air is exist inside the water circuit, then performance degrade, noise at the water pipe, mechanical damage at the surface of electric heater coil.

Step 4. Stop water supplying when the pressure gage located in front of the control panel indicates 2.0 bar.

Step 5. Close drain valve and fill valve. Then wait for 20~30 seconds to observe water pressure being stabilized.

Step 6. If following conditions are satisfactory, then go to step 7(pipe insulation). Otherwise, go to step 3.

- Pressure gage indicates 2.0 bar. Note that sometimes pressure in decreased after step 5 due to water charging inside expansion vessel.
- No air purging sound is heard or no water drop are popping out from air vent.

Pipe Insulation

Purpose of water pipe insulation is :

- To prevent heat loss to external environment
- To prevent dew generation on the surface of the pipe in cooling operation

Water pump Capacity

The water pump is variable type which is capable to change flow rate, so it may be required to change default water pump capacity in case of noise by water flow. In most case, however, it is strongly recommended to set capacity as Maximum.

! NOTE

- To secure enough water flow rate, do not set water pump capacity as Minimum. It can lead unexpected flow rate error CH14.

Pressure Drop

! NOTE

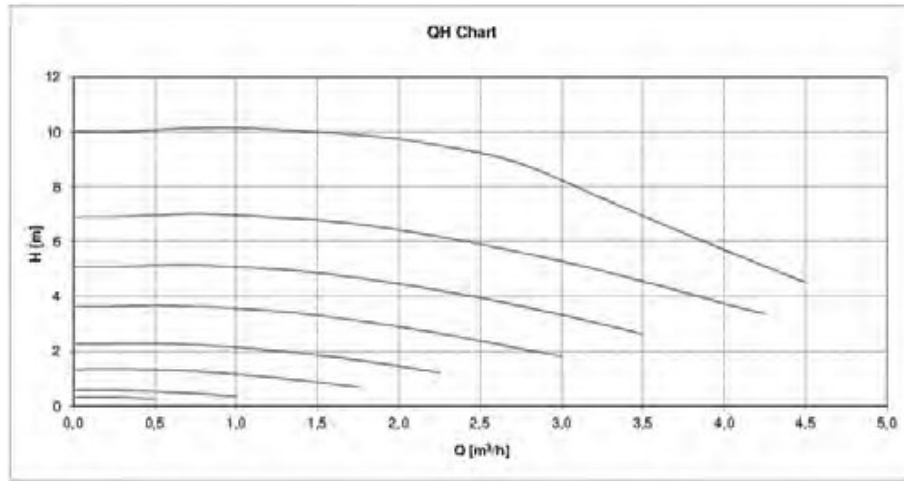
When installing the product, install additional pump in consideration of the pressure loss and pump performance.

If flow rate is low, overloading of product can occur

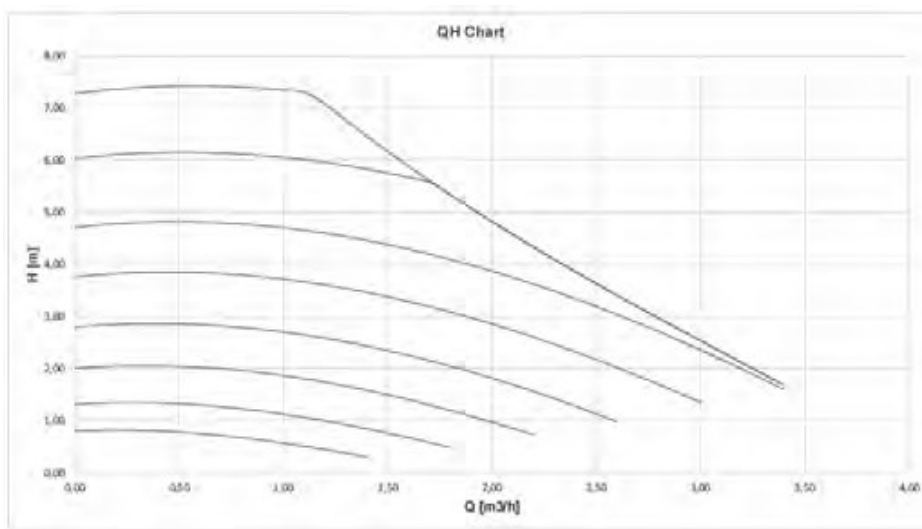
Capacity	Rated flow-rate [LPM, m ³ /h]	Pump Head [m] (at rated flow-rate)	Product pressure drop [m] (Plate heat exchanger)	Serviceable Head [m]
16 kW	46.0 (2.8)	9.0	1.4	7.6
14 kW	40.25 (2.4)	9.3	1.1	8.2
12 kW	34.5 (2.1)	9.8	0.8	9.0
9 kW	25.87 (1.5)	6.1	0.4	5.7
7 kW	20.12 (1.2)	7.3	0.3	7.0
5 kW	14.37 (0.9)	7.5	0.2	7.3

Performance curve

MGQ62321901 : UPML GEO 20 - 105 CHBL
(12 kW, 14 kW, 16 kW / UN3 Chassis)



MGQ62321902 : UPM3K GEO 20 - 75 CHBL
(5 kW, 7 kW, 9 kW / UN4 Chassis)



Performance test based on standard ISO 9906 with pre-pressure 2.0 bar and liquid temperature 20 °C.

! WARNING

- Selecting a water flowrate outside the curves can cause damage to or malfunction of the unit.

Water Quality

Water quality should be complied with EN 98/83 EC Directives.
Detailed water quality condition can be found in EN 98/83 EC Directives.

CAUTION

- If the product is installed at existing hydraulic water loop, it is important to clean hydraulic pipes to remove sludge and scale.
- Installing sludge strainer in the water loop is very important to prevent performance degrade.
- Chemical treatment to prevent rust should be performed by installer.
- It is strongly recommended to install an additional filter on the heating water circuit. Especially to remove metallic particles from the heating piping, it is advised to use a magnetic or cyclone filter, which can remove small particles. Small particles may damage the unit and will NOT be removed by the standard filter of the heat pump system.

Frost protection

In areas of the country where entering water temperatures drop below 0 °C, the water pipe must be protected by using an approved antifreeze solution. Consult your AWHP unit supplier for locally approved solutions in your area. Calculate the approximate volume of water in the system. (Except the AWHP unit.) And add six liters to this total volume to allow for the water contained in AWHP unit.

Antifreeze type	Antifreeze mixing ratio					
	0 °C	-5 °C	-10 °C	-15 °C	-20 °C	-25 °C
Ethylene glycol	0 %	12 %	20 %	30 %	-	-
Propylene glycol	0 %	17 %	25 %	33 %	-	-
Methanol	0 %	6 %	12 %	16 %	24 %	30 %

If you use frost protection function, change DIP switch setting and input the temperature condition in Installation mode of remote controller. Refer to page 87 and 137.

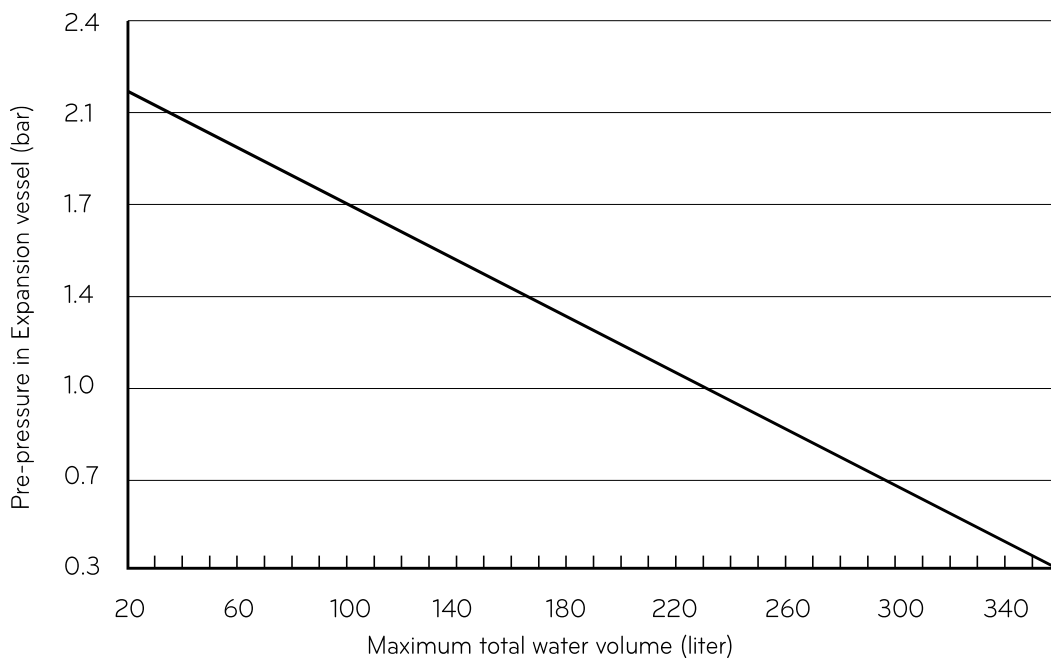
CAUTION

- Use only one of the above antifreeze.
- If a antifreeze is used, pressure drop and capability degradation of the system can be occurred.
- If one of antifreezes is used, corrosion can be occurred. So please add corrosion inhibitor.
- Please check the concentration of the antifreeze periodically to keep same concentration.
- When the antifreeze is used (for installation or operation), take care to ensure that antifreeze must not be touched.
- Ensure to respect all laws and norms of your country about Anti-freeze usage.

Water Volume and Expansion Vessel Pressure

Inside expansion vessel is included which is 8 liter capacity with 1 bar pre-pressure. That means, according to the volume-pressure graph, total water volume of 230 liter is supported as default. If total water volume is changed because of installation condition, the pre-pressure should be adjusted to secure proper operation.

- Minimum total water volume is 20 liter.
- Pre-pressure is adjusted by the total water volume. If the indoor is located at the highest position of the water circuit, adjustment is not required.
- To adjust pre-pressure, use nitrogen gas by certificated installer.



Adjusting pre-pressure of expansion vessel is as following :

Step 1. Refer "Volume-Height" table.

If installation scene is belong to Case A, go to Step 2.

Otherwise, if it is Case B, do nothing. (pre-pressure adjustment is not required.)

Otherwise, if it is Case C, go to Step 3.

Step 2. Adjust pre-pressure by following equation.

$$\text{Pre-pressure [bar]} = (0.1 \times H + 0.3) \text{ [bar]}$$

where H : difference between unit and the highest water pipe

0.3 : minimum water pressure to secure product operation

Step 3. Volume of expansion vessel is less than installation scene.

Please install additional expansion vessel at the external water circuit.

Volume-Height Table

	V < 230 liter	V ≥ 230 liter
H < 7 m	Case B	Case A
H ≥ 7 m	Case A	Case C

H : difference between unit and the highest water pipe

V : total water volume of installation scene