

TOSHIBA

ENGLISH

INSTALLATION MANUAL AIR TO WATER HEAT PUMP



Outdoor unit
HWS-455H-E

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PRECAUTIONS FOR SAFETY

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The manufacturer shall not assume any liability for the damage caused by not observing the description of this manual.

Be sure to read this installation manual carefully before installing.

Recommend to the owner to perform maintenance periodically when using over long periods of time.

Be sure to follow the precautions provided here to avoid safety risks. The symbols and their meanings are shown below.

DANGER : It indicates that incorrect use of this unit can result in a high possibility of severe injury (*1) or death.

WARNING : It indicates that incorrect use of this unit may cause severe injury or death.

CAUTION : It indicates that incorrect use of this unit may cause personal injury (*2), or property damage (*3).

*1 : A severe injury refers to blindness, injury, burns (hot or cold), electrical shock, bone fracture, or poisoning that leaves aftereffects and requires hospitalization or extended out-patient treatment.

*2 : Personal injury means a slight accident, burn, or electrical shock which does not require admission or repeated hospital treatment.

*3 : Property damage means greater damage which affects assets or resources.

For general public use

Power supply cord of parts of appliance shall be at least polychloroprene sheathed flexible cord (design H07RN-F) or cord designation 60245 IEC66 (1.5 mm² or more). (Shall be installed in accordance with national wiring regulations.)

CAUTION

New refrigerant air to water heat pump installation

- **THIS AIR TO WATER HEAT PUMP USES THE NEW HFC REFRIGERANT (R410A), WHICH DOES NOT DESTROY THE OZONE LAYER.**

R410A refrigerant is apt to be affected by impurities such as water, oxidizing membranes, and oils because the pressure of R410A refrigerant is approx. 1.6 times of refrigerant R22. As well as the adoption of this new refrigerant, refrigerating machine oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigerating machine oil does not enter the refrigeration cycle of a new-refrigerant air to water heat pump. To avoid mixing refrigerant and refrigerating machine oil, the sizes of charging port connecting sections on the main unit are different from those for the conventional refrigerant, and different size tools are also required. For connecting pipes, use new and clean piping materials with high pressure withstand capabilities, designed for R410A only, and ensure that water or dust does not enter. Moreover, do not use any existing piping as its pressure withstand may be insufficient and may contain impurities.

DANGER

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- FOR USE BY QUALIFIED PERSONS ONLY.
- MEANS FOR DISCONNECTION FROM THE SUPPLY HAVING A CONTACT SEPERATION OF AT LEAST 3 mm IN ALL POLES MUST BE INCORPORATED IN THE FIXED WIRING.
- TURN OFF MAIN POWER SUPPLY BEFORE ATTEMPTING ANY ELECTRICAL WORK. MAKE SURE ALL POWER SWITCHES ARE OFF. FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK.
- CONNECT THE CONNECTING CABLE CORRECTLY. IF THE CONNECTING CABLE IS CONNECTED WRONGLY, ELECTRIC PARTS MAY BE DAMAGED.
- CHECK THE EARTH WIRE THAT IT IS NOT BROKEN OR DISCONNECTED BEFORE INSTALLATION.
- DO NOT INSTALL NEAR CONCENTRATIONS OF COMBUSTIBLE GAS OR GAS VAPORS. FAILURE TO FOLLOW THIS INSTRUCTION CAN RESULT IN FIRE OR EXPLOSION.
- TO PREVENT OVERHEATING THE HYDRO UNIT AND CAUSING A FIRE HAZARD, PLACE THE UNIT WELL AWAY (MORE THAN 2 M) FROM HEAT SOURCES SUCH AS RADIATORS, HEATERS, FURNACE, STOVES, ETC.
- WHEN MOVING THE AIR TO WATER HEAT PUMP FOR INSTALLING IT IN ANOTHER PLACE AGAIN, BE VERY CAREFUL NOT TO GET THE SPECIFIED REFRIGERANT (R410A) WITH ANY OTHER GASEOUS BODY INTO THE REFRIGERATION CYCLE. IF AIR OR ANY OTHER GAS IS MIXED IN THE REFRIGERANT, THE GAS PRESSURE IN THE REFRIGERATION CYCLE BECOMES ABNORMALLY HIGH AND IT RESULTINGLY CAUSES BURST OF THE PIPE AND INJURIES ON PERSONS.
- IN THE EVENT THAT THE REFRIGERANT GAS LEAKS OUT OF THE PIPE DURING THE INSTALLATION WORK, IMMEDIATELY LET FRESH AIR INTO THE ROOM. IF THE REFRIGERANT GAS IS HEATED BY FIRE OR SOMETHING ELSE, IT CAUSES GENERATION OF POISONOUS GAS.
- WHEN INSTALLING OR RE-INSTALLING THE AIR TO WATER HEAT PUMP, DO NOT INJECT AIR OR OTHER SUBSTANCES BESIDES THE DESIGNATED REFRIGERANT "R410A" INTO THE REFRIGERATING CYCLE. IF AIR OR OTHER SUBSTANCES ARE MIXED, AN ABNORMAL PRESSURE CAN OCCUR IN THE REFRIGERATING CYCLE, AND THIS CAN CAUSE AN INJURY DUE TO A PIPE RUPTURE.

WARNING

- Installation work must be requested from the supplying retail dealership. Self-installation may cause water leakage, electrical shock, or fire as a result of improper installation.
- Specified tools and pipe parts for model R410A are required, and installation work must be done in accordance with the manual. HFC type refrigerant R410A has 1.6 times more pressure than that of conventional refrigerant (R22). Use the specified pipe parts, and ensure correct installation, otherwise damage and/or injury may be caused. At the same time, water leakage, electrical shock, and fire may occur.
- Be sure to install the unit in a place which can sufficiently bear its weight. If the load bearing of the unit is not enough, or installation of the unit is improper, the unit may fall and result in injury.
- Electrical work must be performed by a qualified supplying retail dealership in accordance with the code governing such installation work, internal wiring regulations, and the manual. A dedicated circuit and the rated voltage must be used. Insufficient power supply or improper installation may cause electrical shock or fire.
- Use a cabtyre cable to connect wires in the hydro/outdoor units. Midway connection, stranded wire, and single-wire connections are not allowed. Improper connection or fixing may cause a fire.
- Wiring between the hydro unit and outdoor units must be well shaped so that the cover can be firmly placed. Improper cover installation may cause increased heat, fire, or electrical shock at the terminal area.
- Be sure to use only approved accessories or the specified parts. Failure to do so may cause the unit to fall, water leakage, fire or electrical shock.
- After the installation work, ensure that there is no leakage of refrigerant gas. If the refrigerant gas leaks out of the pipe into the room and is heated by fire or something else from a fan heater, stove or gas range, it causes generation of poisonous gas.
- Make sure the equipment is properly earthed. Do not connect the earth wire to a gas pipe, water pipe, lightning conductor, or telephone earth wire. Improper earth work may be the cause of electrical shock.
- Do not install the unit where flammable gas may leak. If there is any gas leakage or accumulation around the unit, it can cause a fire.
- Do not select a location for installation where there may be excessive water or humidity, such as a bathroom. Deterioration of insulation may cause electrical shock or fire.

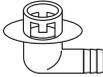
- Installation work must be performed following the instructions in this installation manual. Improper installation may cause water leakage, electrical shock or fire. Check the following items before operating the unit.
 - Be sure that the pipe connection is well placed and there are no leaks.
 - Check that the service valve is open. If the service valve is closed, it may cause overpressure and result in compressor damage. At the same time, if there is a leak in the connection part, it may cause air suction and overpressure, resulting burst or injury.
- In pump down operations, ensure to perform the following procedures.
 - Do not inject air into the refrigeration cycle.
 - Be sure to close both service valves and stop the compressor before removing the refrigerant pipe. If removing the refrigerant pipe while the compressor is operating with the service valves opened, it may cause to air absorbed and abnormal high pressure inside the refrigeration cycle and resulting burst or injury.
- Do not modify the power cable, connect the cable midway, or use a multiple outlet extension cable. Doing so may cause contact failure, insulation failure, or excess current, resulting in fire or electrical shock.
- Do not use any refrigerant different from the one specified for complement or replacement. Otherwise, abnormally high pressure may be generated in the refrigeration cycle, which may result in a failure or explosion of the product or an injury to your body.
- Be sure to comply with local regulations/codes when running the wire from the outdoor unit to the hydro unit. (Size of wire and wiring method etc.)
- Places where iron or other metal dust is present. If iron or other metal dust adheres to or collects on the interior of the air to water heat pump, it may spontaneously combust and start a fire.
- If you detect any damage, do not install the unit. Contact your supplying dealer immediately.
- Never modify this unit by removing any of the safety guards.

CAUTION

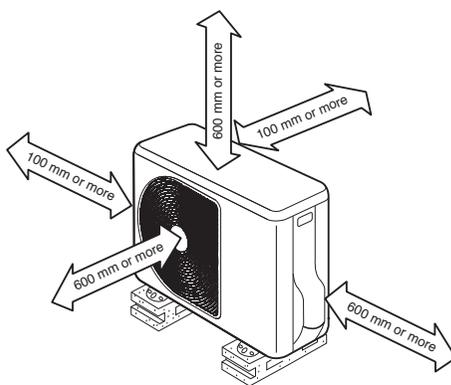
- Please read this installation manual carefully before installing the unit. It contains further important instructions for proper installation.
- Exposure of unit to water or other moisture before installation could result in electric shock. Do not store it in a wet basement or expose to rain or water.
- After unpacking the unit, examine it carefully for possible damage.
- Do not install in a place that can increase the vibration of the unit. Do not install in a place that can amplify the noise level of the unit or where noise and discharged air might disturb neighbors.
- This appliance must be connected to the main power supply by means of a circuit breaker depending on the place where the unit is installed. Failure to do so may cause electrical shock.
- Follow the instructions in this installation manual to arrange the drain pipe for proper drainage from the unit. Ensure that drained water is discharged. Improper drainage can result in water leakage, causing water damage to furniture.
- Tighten the flare nut with a torque wrench using the prescribed method. Do not apply excess torque. Otherwise, the nut may crack after a long period of usage and it may cause the leakage of refrigerant.
- Wear gloves (heavy gloves such as cotton gloves) for installation work. Failure to do so may cause personal injury when handling parts with sharp edges.
- Do not touch the air intake section or the aluminum fins of the outdoor unit. It may cause injury.
- Do not install the outdoor unit in a place which can be a nest for small animals. Small animals could enter and contact internal electrical parts, causing a failure or fire.
- Request the user to keep the place around the unit tidy and clean.
- Make sure to conduct a trial operation after the installation work, and explain how to use and maintain the unit to the customer in accordance with the manual. Ask the customer to keep the operation manual along with the installation manual.

ACCESSORY PARTS

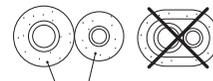
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Part name	Q'ty	Shape
Outdoor unit installation manual	1	
Drain nipple	1	
Waterproof rubber cap	2	
Energy label	2	
Product fiche	1	

INSTALLATION DIAGRAM OF OUTDOOR UNITS



Insulate the refrigerant pipes separately with insulation, not together.



6 mm thick heat resisting polyethylene foam

Remark :

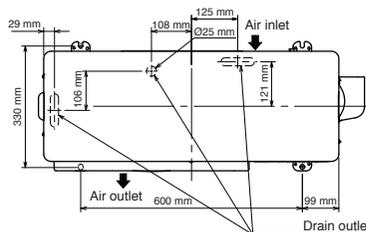
- Some pictures might be different from the actual parts.

Optional Installation Parts

Part code	Parts name	Q'ty
Ⓐ	Refrigerant piping Liquid side : Ø6.35 mm Gas side : Ø12.7 mm	One each
Ⓑ	Pipe insulating material (polyethylene foam, 6 mm thick)	1
Ⓒ	Putty, PVC tapes	One each

Fixing bolt arrangement of outdoor unit

- Secure the outdoor unit with fixing bolts and nuts if the unit is likely to be exposed to a strong wind.
- Use Ø8 mm or Ø10 mm anchor bolts and nuts.
- If it is necessary to drain the defrost water, attach drain nipple and cap water proof to the bottom plate of the outdoor unit before installing it.



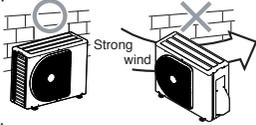
* Drain nipple and cap water proof are packed in outdoor unit.

Installation Place

- A place which provides the spaces around the outdoor unit as shown in the diagram
- A place which can bear the weight of the outdoor unit and does not allow an increase in noise level and vibration
- A place where the operation noise and discharged air do not disturb your neighbors
- A place which is not exposed to a strong wind
- A place free of a leakage of combustible gases
- A place which does not block a passage
- When the outdoor unit is to be installed in an elevated position, be sure to secure its feet.
- A place where the drain water does not raise any problems

CAUTION

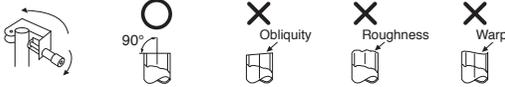
1. Install the outdoor unit without anything blocking the air discharging.
2. When the outdoor unit is installed in a place always exposed to strong wind like a coast or on a high storey of a building, secure the normal fan operation using a duct or a windshield.
3. In particularly windy areas, install the unit such as to avoid admission of wind.
4. Installation in the following places may result in trouble.
Do not install the unit in such places.
 - A place full of machine oil
 - A saline-place such as the coast
 - A place full of sulfide gas
 - A place where high-frequency waves are likely to be generated as from audio equipment, welders, and medical equipment



Refrigerant Piping Connection

Flaring

1. Cut the pipe with a pipe cutter.

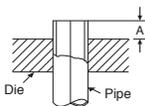


2. Insert a flare nut into the pipe and flare the pipe.

- Projection margin in flaring : A (Unit : mm)

Rigid (clutch type)

Outer dia. of copper pipe	R410A tool used	Conventional tool used
Ø6.35	0 to 0.5	1.0 to 1.5
Ø12.70	0 to 0.5	1.0 to 1.5

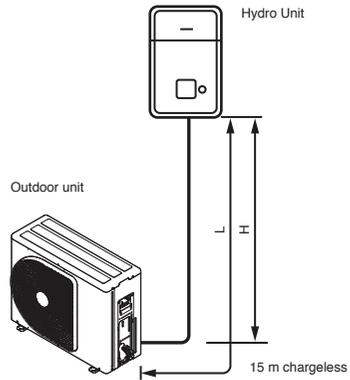


Imperial (wing nut type)

Outer dia. of copper pipe	R410A
Ø6.35	1.5 to 2.0
Ø12.70	2.0 to 2.5

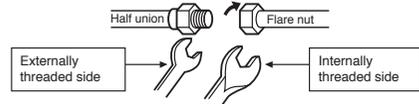
Refrigerant pipe length

Refrigerant pipe
H: max. ±10 m (above / below)
L: max. 15 m, min 5 m
15 m chargeless



Tightening connection

Align the centers of the connecting pipes and tighten the flare nut as far as possible with your fingers. Then tighten the nut with a spanner and torque wrench as shown in the figure.



Use a wrench to secure.

Use a torque wrench to tighten.

CAUTION

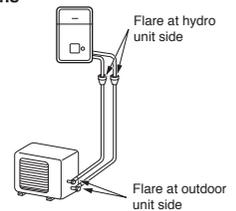
Do not apply excess torque. Otherwise, the nut may crack depending on the conditions.

(Unit : N·m)

Outer dia. of copper pipe	Tightening torque
Ø6.35 mm	14 to 18 (1.4 to 1.8 kgf·m)
Ø12.70 mm	50 to 62 (5.0 to 6.2 kgf·m)

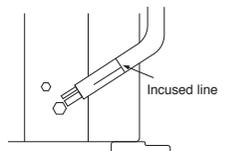
Tightening torque of flare pipe connections

The operating pressure of R410A is higher than that of R22 (approx. 1.6 times). It is therefore necessary to firmly tighten the flare pipe connecting sections (which connect the hydro and outdoor units) up to the specified tightening torque. Incorrect connections may cause not only a gas leakage, but also damage to the refrigeration cycle.



Shaping pipes

1. How to shape the pipes
Shape the pipes along the incused line on the outdoor unit.
2. How to fit position of the pipes
Put the edges of the pipes to the place with a distance of 85 mm from the incused line.



Evacuating

After the piping has been connected to the hydro unit, you can perform the air purge together at once.

AIR PURGE

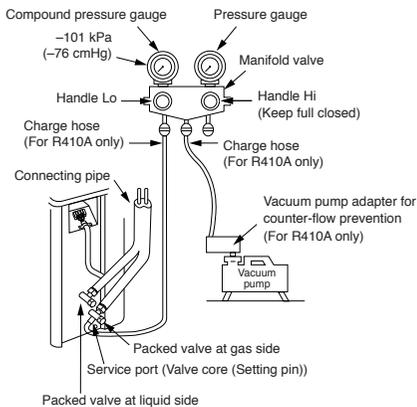
Evacuate the air in the connecting pipes and in the hydro unit using a vacuum pump. Do not use the refrigerant in the outdoor unit. For details, see the manual of the vacuum pump.

Using a vacuum pump

Be sure to use a vacuum pump with counter-flow prevention function so that inside oil of the pump does not flow backward into pipes of the air to water heat pump when the pump stops.

(If oil inside of the vacuum pump enters the air to water heat pump, which use R410A, refrigeration cycle trouble may result.)

1. Connect the charge hose from the manifold valve to the service port of the packed valve at gas side.
2. Connect the charge hose to the port of the vacuum pump.
3. Open fully the low pressure side handle of the gauge manifold valve.
4. Operate the vacuum pump to start evacuating. Then confirm that the compound pressure gauge reading is -101 kPa (-76 cmHg).
5. Close the low pressure side valve handle of the gauge manifold valve.
6. Open fully the valve stem of the packed valves (both gas and liquid sides).
7. Remove the charging hose from the service port.
8. Securely tighten the caps on the packed valves.



CAUTION

KEEP IMPORTANT 5 POINTS FOR PIPING WORK.

- (1) Take away dust and moisture (inside of the connecting pipes).
- (2) Tighten the connections (between pipes and unit).
- (3) Evacuate the air in the connecting pipes using a VACUUM PUMP.
- (4) Check gas leak (connected points).
- (5) Be sure to fully open the packed valves before operation.

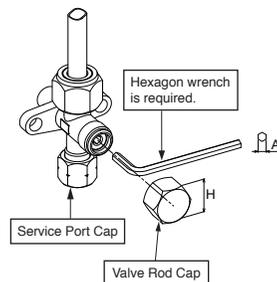
Packed valve handling precautions

- Open the valve stem all the way out, but do not try to open it beyond the stopper.

Pipe size of Packed Valve	Size of Hexagon wrench
12.70 mm and smaller	A = 4 mm

- Securely tighten the valve cap with torque in the following table.

Cap	Cap Size (H)	Torque
Valve Rod Cap	H17 - H19	14~18 N·m (1.4 to 1.8 kgf·m)
	H22 - H30	33~42 N·m (3.3 to 4.2 kgf·m)
Service Port Cap	H17	14~18 N·m (1.4 to 1.8 kgf·m)



ELECTRICAL WORKS

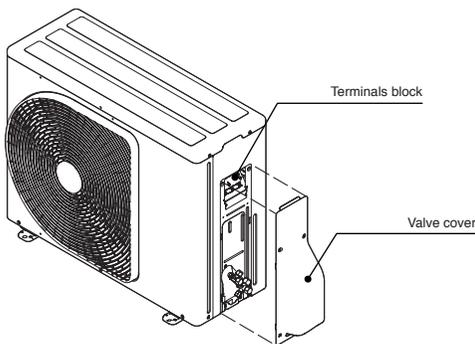
Connect the power supply and connecting cable by follow the instruction as following.

Model	HWS-455H-E
Power source	50Hz, 220-230V Single phase
Maximum running current	11.1A
Circuit breaker rating	15A
Wire type :	
Power supply cable	More than H07RN-F or 60245 IEC66 (1.5 mm ² or more)
Connecting cable	More than H07RN-F or 60245 IEC66 (1.5 mm ² or more)

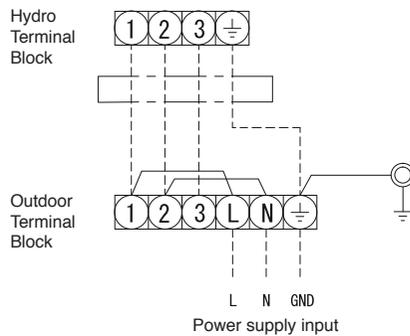
Wiring Connection

Outdoor unit

1. Remove the valve cover from the outdoor unit.
2. Connect the cable to the terminals as identified with their respective matched numbers on the terminal block of outdoor unit.
3. When connecting the cable to the outdoor unit terminals, make a loop as shown in the installation diagram of outdoor unit to prevent water coming in the outdoor unit.
4. Insulate the unused cords (conductors) from any water coming in the outdoor unit. Proceed them so that they do not touch any electrical or metal parts.

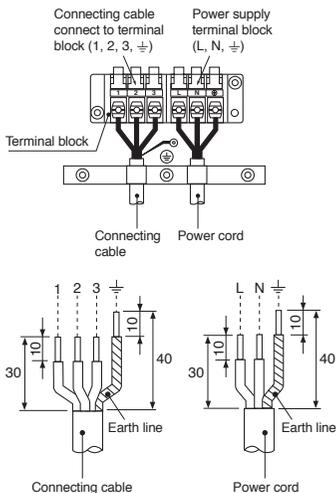


Power supply input Wiring Diagram



Power Supply and Connecting Cable Connection

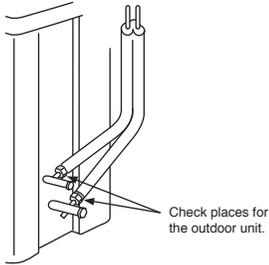
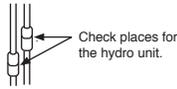
Power Supply Input at Outdoor Unit Terminal Block



CAUTION

1. The power supply must be same as the rated of air to water heat pump.
2. Prepare the power source for exclusive use with air to water heat pump.
3. Circuit breaker must be used for the power supply line of this air to water heat pump.
4. Be sure to comply power supply and connecting cable for size and wiring method.
5. Every wire must be connected firmly.
6. Perform wiring works so as to allow a general wiring capacity.
7. Wrong wiring connection may cause some electrical part burn out.
8. Incorrect or incomplete wiring is carried out, it will cause an ignition or smoke.
9. This product can be connected to main power supply. Connection to fixed wiring : A switch which disconnects all poles and has a contact separation at least 3mm must be incorporated in the fixed wiring.

Gas Leak Test



- Check the flare nut connections for the gas leak with a gas leak detector or soap water.

Earthing

Connect the earth wire properly following applicable technical standards. Connecting the earth wire is essential to preventing electric shock and to reducing noise and electrical charges on the outdoor unit surface due to the high-frequency wave generated by the frequency converter (inverter) in the outdoor unit.

If you touch the charged outdoor unit without an earth wire, you may experience an electric shock.

Finishing

After the refrigerant pipe, Hydro / Outdoor connecting wires have been connected, cover them with finishing tape and clamp them to the wall with off-the-shelf support brackets or their equivalent. Keep the power wires and Hydro / outdoor connecting wires off the valve on the gas side or pipes that have no heat insulator.

Test run

- Turn on the leakage breaker at least 12 hours before starting a test run to protect the compressor during startup.
- Check the following before starting a test run:
 - **That all pipes are connected securely without leaks.**
 - **That the valve is open.**

If the compressor is operated with the valve closed, the outdoor unit will become overpressurized, which may damage the compressor or other components.

If there is a leak at a connection, air can be sucked in and the internal pressure further increases, which may cause a burst or injury.

Please refer to the Hydro unit installation manual for the detail of the test run.

Annual maintenance

- For an air to water heat pump system that is operated on a regular basis, cleaning and maintenance of the Hydro / outdoor units are strongly recommended.
- As a general rule, if an Hydro unit is operated for about 8 hours daily, the Hydro / outdoor units will need to be cleaned at least once every 3 months.
- This cleaning and maintenance should be carried out by a qualified service person.
- Failure to clean the Hydro / outdoor units regularly will result in poor performance, icing, water leaking and even compressor failure.

Air to water heat pump operating conditions

For proper performance, operate the air to water heat pump under the following temperature conditions:

Cooling operation	10 °C to 43 °C
Heating operation	-20 °C to 25 °C
Hot water operation	-20 °C to 43 °C*

If air to water heat pump is used outside of the above conditions, safety protection may work.

* Heater operation in more than 35 °C

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