

Outdoor unit installation

PSC012D066T

FDCW60VNX-A

60VNX
Designed for R410A refrigerant

- This installation manual deals with outdoor units and general installation specifications only. For indoor units, refer to the respective installation manuals supplied with the units.
- Read this manual carefully before you set to installation work and carry it out according to the instructions contained in this manual.

SAFETY PRECAUTIONS

- We recommend you to read this "SAFETY PRECAUTIONS" carefully before the installation work in order to gain full advantage of the functions of the unit and to avoid malfunction due to mishandling.
 - The precautions described below are divided into [WARNING] and [CAUTION]. The matters with possibilities leading to serious consequences such as death or serious personal injury due to erroneous handling are listed in the [WARNING] and the matters with possibilities leading to personal injury or damage of the unit due to erroneous handling including probability leading to serious consequences in some cases are listed in [CAUTION]. These are very important precautions for safety. Be sure to observe all of them without fail.
 - The meaning of "Marks" used here are as shown below.
-  Never do it under any circumstance.
  Always do it according to the instruction
- Be sure to confirm no anomaly on the equipment by commissioning after completed installation and explain the operating methods as well as the maintenance methods of this equipment to the user according to the owner's manual. If unusual noise can be heard during the test, consult the dealer.
 - Keep the installation manual together with owner's manual at a place where any user can read at any time. Moreover if necessary, ask to hand them to a new user.
 - Our company does not assume any responsibility for the damage caused by use of our products without following the instructions mentioned in our manuals.



WARNING

- | | |
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| <ul style="list-style-type: none"> ● Installation must be carried out by the qualified installer.
If you install the system by yourself, it may cause serious trouble such as water leaks, electric shocks, fire and personal injury, as a result of a system malfunction. ● Install the system in full accordance with the instruction manual.
Incorrect installation may cause bursts, personal injury, water leaks, electric shocks and fire. ● Be sure to wear protective goggles and gloves while performing installation work.
Improper safety measures can result in personal injury. ● Use the original accessories and the specified components for installation.
If parts other than those prescribed by us are used, it may cause fall of the unit, water leaks, electric shocks, fire, refrigerant leak, substandard performance, control failure and personal injury. ● When installing in small rooms, take prevention measures not to exceed the density limit of refrigerant in the event of leakage accordance with ISO5149.
Consult the expert about prevention measures. If the density of refrigerant exceeds the limit in the event of leakage, lack of oxygen can occur, which can cause serious accidents. ● Ventilate the working area well in the event of refrigerant leakage during installation.
If the refrigerant comes into contact with naked flames, poisonous gas is produced. ● After completed installation, check that no refrigerant leaks from the system.
If refrigerant leaks into the room and comes into contact with an oven or other hot surface, poisonous gas is produced. ● Hang up the unit at the specified points with ropes which can support the weight in lifting for portage. And to avoid jolting out of alignment, be sure to hang up the unit at 4-point support.
An improper manner of portage such as 3-point support can cause death or serious personal injury due to falling of the unit. ● Install the unit in a location with good support.
Unsuitable installation locations can cause the unit to fall and cause material damage and personal injury. ● Ensure the unit is stable when installed, so that it can withstand earthquakes and strong winds.
Unsuitable installation locations can cause the unit to fall and cause material damage and personal injury. ● The electrical installation must be carried out by the qualified electrician in accordance with "the norm for electrical work" and "national wiring regulation", and the system must be connected to the dedicated circuit.
Power source with insufficient capacity and incorrect function done by improper work can cause electric shocks and fire. ● Be sure to shut off the power before starting electrical work.
Failure to shut off the power can cause electric shocks, unit failure or incorrect function of equipment. ● Be sure to use the cables conformed to safety standard and cable ampacity for power distribution work.
Unconformable cables can cause electric leak, anomalous heat production or fire. ● Use the prescribed cables for electrical connection, tighten the cables securely in terminal block and relieve the cables correctly to prevent overloading the terminal blocks.
Loose connections can cause anomalous heat production or fire. ● Arrange the wiring in the control box so that it cannot be pushed up further into the box. Install the service panel correctly.
Incorrect installation may result in overheating and fire. ● Do not process, splice or modify the power cable, or share the socket with other power plugs.
Improper power cable or power plug can cause fire or electric shock due to poor connection, insufficient insulation or over-current. ● This appliance must be connected to main power source by means of a circuit breaker or switch with a contact separation of at least 3mm.
Improper electrical work can cause unit failure or personal injury. | <ul style="list-style-type: none"> ● When plugging this unit, a plug conforming to the norm IEC60884-1 must be used.
Using improper plug can cause electric shock or fire. ● Do not perform brazing work in the airtight room
It can cause lack of oxygen. ● Use the prescribed pipes, flare nuts and tools for R410A.
Using existing parts for R22 or R407C can cause the unit failure and serious accidents due to burst of the refrigerant circuit. ● Tighten the flare nut by using double spanners and torque wrench according to prescribed method. Be sure not to tighten the flare nut too much.
Loose flare connection or damage on the flare part by tightening with excess torque can cause burst or refrigerant leaks which may result in lack of oxygen. ● Do not open the service valves for liquid line and gas line until completed refrigerant piping work, air tightness test and evacuation.
If the compressor is operated in state of opening service valves before completed connection of refrigerant piping work, you may incur frost bite or injury from an abrupt refrigerant outflow and air can be sucked into refrigerant circuit, which can cause burst or personal injury due to anomalously high pressure in the refrigerant. ● Only use prescribed option parts. The installation must be carried out by the qualified installer.
If you install the system by yourself, it can cause serious trouble such as water leaks, electric shocks, fire. ● Do not perform any change of protective device itself or its setup condition
The forced operation by short-circuiting protective device of pressure switch and temperature controller or the use of non specified component can cause fire or burst. ● Be sure to switch off the power source in the event of installation, inspection or servicing.
If the power source is not shut off, there is a risk of electric shocks, unit failure or personal injury due to the unexpected start of fan. ● Consult the dealer or an expert regarding removal of the unit.
Incorrect installation can cause water leaks, electric shocks or fire. ● Stop the compressor before closing valve and disconnecting refrigerant pipes in case of pump down operation.
If disconnecting refrigerant pipes in state of opening service valves before compressor stopping, you may incur frost bite or injury from an abrupt refrigerant outflow and air can be sucked, which can cause burst or personal injury due to anomalously high pressure in the refrigerant circuit. ● Ensure that no air enters in the refrigerant circuit when the unit is installed and removed.
If air enters in the refrigerant circuit, the pressure in the refrigerant circuit becomes too high, which can cause burst and personal injury. ● Do not run the unit with removed panels or protections
Touching rotating equipments, hot surfaces or high voltage parts can cause personal injury due to entrapment, burn or electric shocks. ● Be sure to fix up the service panels.
Incorrect fixing can cause electric shocks or fire due to intrusion of dust or water. ● Do not perform any repairs or modifications by yourself. Consult the dealer if the unit requires repair.
If you repair or modify the unit, it can cause water leaks, electric shocks or fire. ● Do not use any other refrigerant except the HFC-refrigerant (R410A).
It may cause the serious trouble like malfunction or explosion. ● Do not vent R410A into atmosphere.
R410A is a fluorinated greenhouse gas with a Global Warming Potential(GWP)=2088. |
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CAUTION

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| <ul style="list-style-type: none"> ● Carry out the electrical work for ground lead with care
Do not connect the ground lead to the gas line, water line, lightning conductor or telephone line's ground lead. Incorrect grounding can cause unit faults such as electric shocks due to short-circuiting. Never connect the grounding wire to a gas pipe because if gas leaks, it could cause explosion or ignition. ● Use the circuit breaker for all pole with correct capacity.
Using the incorrect circuit breaker, it can cause the unit malfunction and fire. ● Install isolator or disconnect switch on the power source wiring in accordance with the local codes and regulations.
The isolator should be locked in accordance with EN60204-1. ● Take care when carrying the unit by hand.
If the unit weighs more than 20kg, it must be carried by two or more persons. Do not carry by the plastic straps, always use the carry handle when carrying the unit by hand. Use gloves to minimize the risk of cuts by the aluminum fins. ● Dispose of any packing materials correctly.
Any remaining packing materials can cause personal injury as it contains nails and wood. And to avoid danger of suffocation, be sure to keep the plastic wrapper away from children and dispose of it after tear it up. ● Pay attention not to damage the drain pan by weld spatter when welding work is done near the indoor unit.
If weld spatter entered into the indoor unit during welding work, it can cause pin-hole in drain pan and result in water leakage. To prevent such damage, keep the indoor unit in its packing or cover it. ● Be sure to insulate the refrigerant pipes so as not to condense the ambient air moisture on them.
Insufficient insulation can cause condensation, which can lead to moisture damage on the ceiling, floor, furniture and any other valuables. ● Be sure to perform air tightness test by pressurizing with nitrogen gas after completed refrigerant piping work.
If the density of refrigerant exceeds the limit in the event of refrigerant leakage in the small room, lack of oxygen can occur, which can cause serious accidents. ● Perform installation work properly according to this installation manual.
Improper installation can cause abnormal vibrations or increased noise generation. ● Earth leakage breaker of appropriate capacity must be installed
If the earth leakage breaker of appropriate capacity is not installed, it can cause fire or electric shocks. ● Do not use any materials other than a fuse with the correct rating in the location where fuses are to be used.
Connecting the circuit with copper wire or other metal thread can cause unit failure and fire. ● Do not install the unit near the location where leakage of combustible gases can occur.
If leaked gases accumulate around the unit, it can cause fire. ● Do not install the unit where corrosive gas (such as sulfuric acid gas etc.) or combustible gas (such as thinner and petroleum gases) can accumulate or collect, or where volatile combustible substances are handled.
Corrosive gas can cause corrosion of heat exchanger, breakage of plastic parts and etc. And combustible gas can cause fire. ● Secure a space for installation, inspection and maintenance specified in the manual.
Insufficient space can result in accident such as personal injury due to falling from the installation place. ● When the outdoor unit is installed on a roof or a high place, provide permanent ladders and handrails along the access route and fences and handrails around the outdoor unit.
If safety facilities are not provided, it can cause personal injury due to falling from the installation place. ● Do not install nor use the system close to the equipment that generates electromagnetic fields or high frequency harmonics
Equipment such as inverters, standby generators, medical high frequency equipments and telecommunication equipments can affect the system, and cause malfunctions and breakdowns. The system can also affect medical equipment and telecommunication equipment, and obstruct its function or cause jamming. ● Do not install the outdoor unit in a location where insects and small animals can inhabit.
Insects and small animals can enter the electric parts and cause damage or fire. Instruct the user to keep the surroundings clean. | <ul style="list-style-type: none"> ● Do not use the base flame for outdoor unit which is corroded or damaged due to long periods of operation.
Using an old and damaged base flame can cause the unit falling down and cause personal injury. ● Do not install the unit in the locations listed below <ul style="list-style-type: none"> -Locations where carbon fiber, metal powder or any powder is floating. -Locations where any substances that can affect the unit such as sulphide gas, chloride gas, acid and alkaline can occur. -Vehicles and ships -Locations where cosmetic or special sprays are often used. -Locations with direct exposure of oil mist and steam such as kitchen and machine plant. -Locations where any machines which generate high frequency harmonics are used. -Locations with salty atmospheres such as coastlines -Locations with heavy snow (if installed, be sure to provide base flame and snow hood mentioned in the manual) -Locations where the unit is exposed to chimney smoke -Locations at high altitude (more than 1000m high) -Locations with ammoniac atmospheres (e.g. organic fertilizer) -Locations with calcium chloride (e.g. snow melting agent) -Locations where heat radiation from other heat source can affect the unit -Locations without good air circulation. -Locations with any obstacles which can prevent inlet and outlet air of the unit -Locations where short circuit of air can occur (in case of multiple units installation) -Locations where strong air blows against the air outlet of outdoor unit It can cause remarkable decrease in performance, corrosion and damage of components, malfunction and fire. ● Do not install the outdoor unit in the locations listed below. <ul style="list-style-type: none"> -Locations where discharged hot air or operating sound of the outdoor unit can bother neighborhood. -Locations where outlet air of the outdoor unit blows directly to an animal or plants. The outlet air can affect adversely to the plant etc. -Locations where vibration can be amplified and transmitted due to insufficient strength of structure. -Locations where vibration and operation sound generated by the outdoor unit can affect seriously (on the wall or at the place near bed room) -Locations where an equipment affected by high harmonics is placed. (TV set or radio receiver is placed within 5m) -Locations where drainage cannot run off safely. It can affect surrounding environment and cause a claim ● Do not use the unit for special purposes such as storing foods, cooling precision instruments and preservation of animals, plants or art.
It can cause the damage of the items. ● Do not touch any buttons with wet hands
It can cause electric shocks ● Do not touch any refrigerant pipes with your hands when the system is in operation.
During operation the refrigerant pipes become extremely hot or extremely cold depending the operating condition, and it can cause burn injury or frost injury. ● Do not clean up the unit with water
It can cause electric shocks ● Do not operate the outdoor unit with any article placed on it.
You may incur property damage or personal injury from a fall of the article. ● Do not step onto the outdoor unit.
You may incur injury from a drop or fall. ● Do not put anything on the outdoor unit.
Object may fall causing property damage or personal injury. ● Do not touch the aluminum fin of the outdoor unit.
Aluminum fin temperature is high during heating operation. Touching fin can cause burn. |
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1. TOOLS

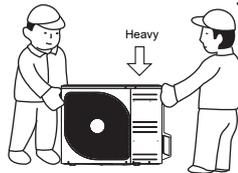
Locally procured parts		Tools for installation work		
(a) Anchor bolt(M10-M12)×4 pcs	Plus headed driver	Spanner wrench	Vacuum pump*	
(b) Putty	Knife	Torque wrench [14.0-62.0N/m(1.4-6.2kgf·m)]	Gauge manifold *	
(c) Electrical tape	Saw	Wrench key (Hexagon) [4mm]	Charge hose *	
(d) Connecting pipe	Tape measure	Flaring tool set *	Vacuum pump adapter* (Anti-reverse flow type)	
(e) Connecting cable	Pipe cutter	Flare adjustment gauge	Gas leak detector *	
(f) Power cable				
(g) Clamp and screw (for finishing work)				

*Designed specifically for R410A

2. OUTDOOR UNIT INSTALLATION

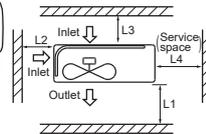
1. Haulage

- Always carry or move the unit with two or more persons.
 - The right hand side of the unit as viewed from the front (outlet side) is heavier.
- A person carrying the right hand side must take care of this fact. A person carrying the left hand side must hold the handle provided on the front panel of the unit with his right hand and the corner column section of the unit with his left hand.



3. Installation space

- There must be 1 meter or larger space between the unit and the wall in at least 1 of the 4 sides. Walls surrounding the unit from 4 sides is not acceptable. The wall height on the outlet side should be 1200 mm or less. Refer to the following figure and table for details.



Size	Example installation (mm)			
	I	II	III	IV
L1	Open	280	280	180
L2	100	75	Open	Open
L3	100	80	80	80
L4	250	Open	250	Open

CAUTION
When a unit is hauled, take care of its gravity center position which is shifted towards right hand side. If the unit is not hauled properly, it can go off balance and fall resulting in serious injury.

2. Selecting the installation location

- Select the suitable installation location where:
- Unit will be stable, horizontal and free of any vibration transmission.
 - There is no obstacle which can prevent smooth air circulation from inlet and outlet side of the unit.
 - There is enough space for service and maintenance of unit.
 - Neighbours are not bothered by noise or air generating from the unit.
 - Outlet air of the unit does not blow directly to animals or plants.
 - Drain water can be discharged properly.
 - There is no risk of flammable gas leakage.
 - There are no other heat sources nearby.
 - Unit is not directly exposed to rain or sunlight.
 - Unit is not directly exposed to oil mist and steam.
 - Chemical substances like ammonia (organic fertilizer), calcium chloride (snow melting agent) and acid (sulfurous acid etc.), which can harm the unit, will not generate or accumulate.
 - Unit is not directly exposed to corrosive gases (like sulphide gas, chloride gas), sea breeze or salty atmosphere.
 - No TV set or radio receiver is placed within 1m.
 - Unit is not affected by electromagnetic waves and/or high-harmonic waves generated by other equipments.
 - Strong wind does not blow against the unit outlet.
 - Heavy snowfalls do not occur (If installed, provide proper protection to avoid snow accumulation).

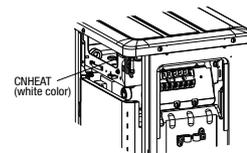
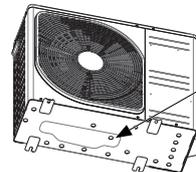
NOTE

When more than one unit are installed side by side, provide a 250mm or wider interval between them as a service space.

CAUTION
When more than one unit are installed in parallel directions, provide sufficient inlet space so that short-circuiting may not occur.

4. Drain piping work (if necessary)

- Carry out drain piping work if condensed water needs to be drained out.
- (1) Prepare another drain tray made of metallic material for collecting drain when base heater is used.
- (2) Do not use drain elbow and grommet made of plastic for drain piping when base heater for outdoor unit is used. Plastic grommet and elbow will be damaged and burnt in worst case.
- (3) In case plastic grommet and drain elbow is used in warm climate area, disconnect the connector for heater on PCB shown in the drawing.



NOTE

If the unit is installed in the area where there is a possibility of strong wind or snow accumulation, the following measures are required.

(1) Location of strong wind

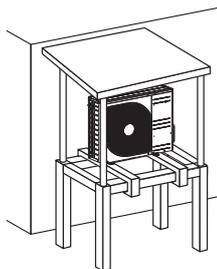
- Place the unit with its outlet side facing the wall.
- Place the unit such that the direction of air from the outlet gets perpendicular to the wind direction.



- Use wind guard in case outdoor unit is installed where ambient temperature drops below -10°C and natural wind blows into outdoor unit directly. For details, refer to technical manual.

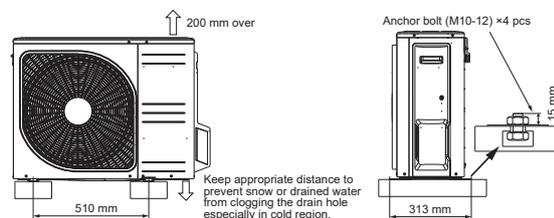
(2) Location of snow accumulation

- Install the unit on the base so that the bottom is higher than snow cover surface.
- Install the unit under eaves or provide the roof on site.



5. Installation

- Install the unit on a flat level base.
- While installing the unit, keep space and fix the unit's legs with 4 anchor bolts as shown in the figure below. The protrusion of an anchor bolt from the foundation surface must be kept within 15mm.

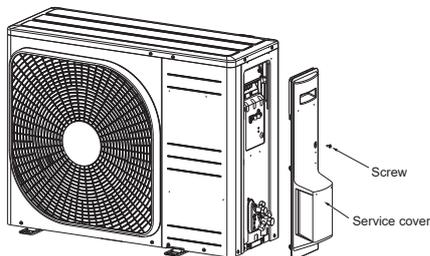


CAUTION
Install the unit properly so that it does not fall over during earthquake, strong wind, etc.
Make sure that unit is installed on a flat level base. Installing unit on uneven base may result in unit malfunction.

3. PREPARATION FOR WORK

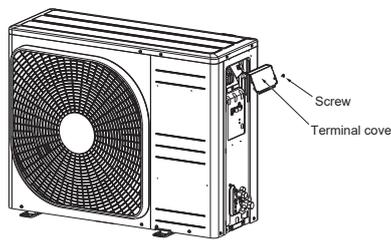
1. Removing service cover

Remove the screw. Slide service cover downwards and remove it.



2. Removing terminal cover

Remove the screw and take out terminal cover.

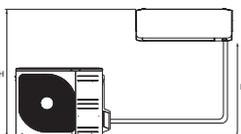


4. CONNECTING PIPING WORK

1. Restrictions on unit installation

Abide by the following restrictions on unit installation. Improper installation can cause compressor failure or performance degradation.

	Dimensional restrictions
Connecting pipe length(L)	30m or less
Elevation difference between indoor and outdoor units(H)*	7m or less



* Outdoor unit installation position can be higher as well as lower than the indoor unit installation position.

2. Preparation of connecting pipe

2.1. Selecting connecting pipe

Select connecting pipe according to the following table.

	Pipe diameter (mm)	Minimum thickness (mm)
Gas pipe	ø12.7	0.8
Liquid pipe	ø6.35	0.8

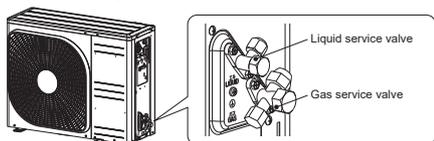
* Pipe material must be O-type (Phosphorus deoxidized seamless copper pipe ICS 23.040.15, ICS 77.150.30).

2.2. Cutting connecting pipe

- Cut the connecting pipe to the required length with pipe cutter.
- Hold the pipe downward and remove the burrs. Make sure that no foreign material enters the pipe.
- Cover the connecting pipe ends with the tape.

3. Piping work

Check that both liquid and gas service valves are fully closed. Carry out the piping work with service valves fully closed.



3.1. Flaring pipe

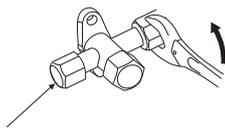
- Take out flare nuts from the service valves of outdoor unit and engage them onto connecting pipes.
 - Flare the pipes according to table and figure shown below.
- Flare dimensions for R410A are different from those for conventional refrigerant. Although it is recommended to use the flaring tools designed specifically for R410A, conventional flaring tools can also be used by adjusting the measurement of protrusion B with a flare adjustment gauge.

Copper pipe outer diameter	A	B	Rigid (clutch) type	
			R410A	Conventional
ø6.35	9.1	0	0-0.5	1.0-1.5
ø9.52	13.2	0	0-0.5	1.0-1.5
ø12.7	16.6	0	0-0.5	1.0-1.5

3.2. Connecting pipes

- Connect pipes on both liquid and gas sides.
- Tighten nuts to specified torque shown in the table below.

Service valve size (mm)	Tightening torque (N·m)
ø6.35 (1/4")	14-18
ø9.52 (3/8")	34-42
ø12.7 (1/2")	49-61



Do not hold the valve cap area with a spanner

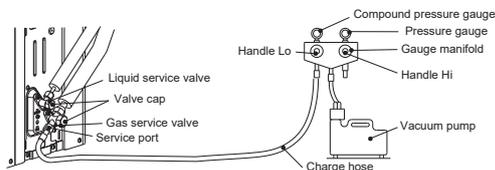
CAUTION

- Do not apply refrigerating machine oil to the flared surface. It can cause refrigerant leakage.
- Do not apply excess torque to the flared nuts. The flared nuts may crack resulting in refrigerant leakage.

4. Evacuation

- Connect vacuum pump to gauge manifold. Connect charge hose of gauge manifold to service port of outdoor unit.
- Run the vacuum pump for at least one hour after the vacuum gauge shows -0.1MPa (-76cm Hg).
- Confirm that the vacuum gauge indicator does not rise even if the system is left for 15 minutes or more. Vacuum gauge indicator will rise if the system has moisture left inside or has a leakage point. Check the system for the leakage point. If leakage point is found, repair it and return to (1) again.
- Close the Handle Lo and stop the vacuum pump. Keep this state for a few minutes to make sure that the compound pressure gauge pointer does not swing back.
- Remove valve caps from liquid service valve and gas service valve.
- Turn the liquid service valve's rod 90 degree counterclockwise with a hexagonal wrench key to open valve. Close it after 5 seconds, and check for gas leakage. Using soapy water, check for gas leakage from indoor unit's flare and outdoor unit's flare and valve rods. Wipe off all the water after completing the check.
- Disconnect charging hose from gas service valve's service port and fully open liquid and gas service valves. (Do not attempt to turn valve rod beyond its stop.)
- Tighten service valve caps and service port cap to the specified torque shown in the table below.

Service valve size (mm)	Service valve cap tightening torque (N·m)	Service port cap tightening torque (N·m)
ø6.35 (1/4")	20-30	10-12
ø9.52 (3/8")		
ø12.7 (1/2")	25-35	



CAUTION

- To prevent different oil from entering into the refrigeration system, do not use tools designed for any other refrigerant type (R22, R407C, etc.).
- To prevent vacuum pump oil from entering into the refrigeration system, use a counterflow prevention adapter.

5. Additional refrigerant charge

Additional refrigerant charge is required only when connecting pipe length exceeds 15 m.

5.1 Calculating additional refrigerant charge

Additional refrigerant charge can be calculated using the formula given below.
Additional refrigerant charge (g) = { Connecting pipe length (m) - Factory charged length 15 (m) } x 20 (g/m)

NOTE

- If additional refrigerant charge calculation result is negative, there is no need to remove the refrigerant.
- If refrigerant recharge is required for the unit with connecting pipe length 15m or shorter, charge the factory charged volume as shown in the table below.

Factory charged volume(kg)	1.50

5.2 Charging refrigerant

- Charge the R410A refrigerant in liquid phase from service port with both liquid and gas service valves shut. Since R410A refrigerant must be charged in the liquid phase, make sure that refrigerant is discharged from the cylinder in the liquid phase all the time.
- When it is difficult to charge a required refrigerant volume, fully open both liquid and gas service valves and charge refrigerant, while running the unit in the cooling mode. When refrigerant is charged with the unit being run, complete the charge operation within 30 minutes.
- Write the additional refrigerant charge calculated from the connecting pipe length on the label attached on the service cover.

CAUTION

Running the unit with an insufficient quantity of refrigerant for a long time can cause unit malfunction.

5. ELECTRICAL WIRING WORK

⚠ WARNING

- Make sure that all the electrical work is carried out in accordance with the national or regional electrical standards.
- Make sure that the earth leakage breaker and circuit breaker of appropriate capacities are installed (Refer to the table given below).
- Do not turn on the power until the electrical work is completed.
- Do not use a condensative capacitor for power factor improvement under any circumstances. (It does not improve power factor. Moreover, it can cause an abnormal overheat accident).

Breaker specifications

Phase	Earth leakage breaker	Circuit breaker
Single phase	Leakage current: 30mA, 0.1sec or less	Over current: 20A

Main fuse specification

Specification	Parts No.	Code on LABEL, WIRING
250V 20A	SSA564A136A	F4

1. Preparing cable

(1) Selecting cable

Select the power source cable and connecting cable in accordance with the specifications mentioned below.

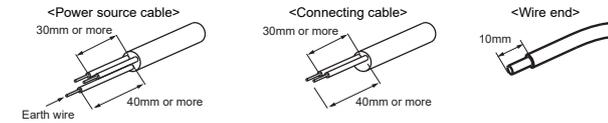
(a) Power source cable

- 3 cores * 2.0mm² or more, conformed with 60245 IEC57
- When selecting the power source cable length, make sure that voltage drop is less than 2%.
- If the wire length gets longer, increase the wire diameter.

(b) Connecting cable

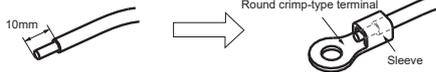
- 2 cores * 1.5mm², conformed with 60245 IEC57
- * 1 Earth wire is included (Yellow).

(2) Arrange each wire length connecting to the outside unit as shown below. Make sure that each wire is stripped 10mm from the end.



Refer to the installation manual for Indoor unit when arrange each wire connecting to the Indoor unit.

(3) Attach round crimp-type terminal to each wire connecting to the outside unit as shown in the below. Select the size of round crimp-type terminal after considering the specifications of terminal block and wire diameter.



Refer to the installation manual for Indoor unit when arrange each wire connecting to the Indoor unit.

⚠ CAUTION

Power source cable and connecting cable must conform to the specifications mentioned in the manual. Using cables with wrong specifications may result in unit malfunction.

2. Connecting cable

(1) Remove the service cover.

(2) Connect the cables according to the instructions and figures given below.

(a) Connect the earth wire of power source cable.

An earth wire must be connected before connecting the other wires of power source cable. Keep the earth wire longer than the remaining two wires of power source cable.

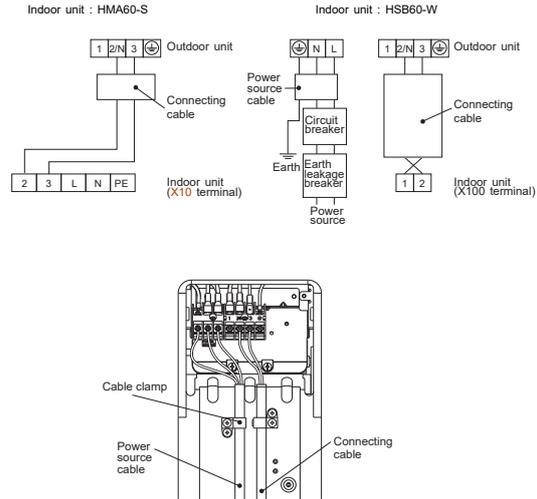
(b) Connect the remaining two wires (N and L) of power source cable.

(c) Connect the wires of connecting cable. Make sure that for each wire, outdoor and indoor side terminal numbers match.

(3) Fasten the cables properly with cable clamps so that no external force may work on terminal connections.

Moreover, make sure that cables do not touch the piping, etc. When cables are connected, make sure that all electrical components within the electrical component box are free of loose connector coupling or terminal connection.

<Circuit diagram>



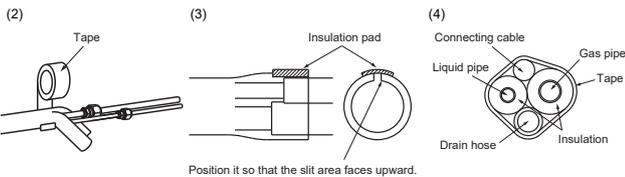
6. FINISHING WORK

1. Heating and condensation prevention

(1) Dress the connecting pipes (both liquid and gas pipes) with insulation to prevent it from heating and dew condensation.

Use the heat insulating material which can withstand 120°C or higher temperature. Make sure that insulation is wrapped tightly around the pipes and no gap is left between them.

- (2) Wrap the refrigerant pipings of indoor unit with indoor unit heat insulation using tape.
- (3) Cover the flare-connected joints (indoor side) with the indoor unit heat insulation and wrap it with an insulation pad (standard accessory provided with indoor unit).
- (4) Wrap the connecting pipes, connecting cable and drain hose with the tape.



NOTE

Locations where relative humidity exceeds 70%, both liquid and gas pipes need to be dressed with 20mm or thicker heat insulation materials.

⚠ CAUTION

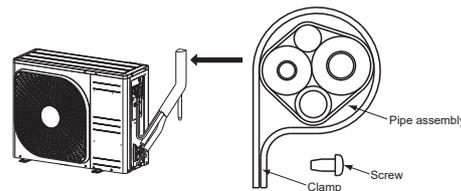
- Improper insulation can cause condensate(water) formation during cooling operation. Condensate can leak or drip causing damage to household property.
- Poor heat insulating capacity can cause pipe outer surface to reach high temperature during heating operation. It can cause cable deterioration and personal injury.

2. Finishing work

(1) Make sure that the exterior portion of connecting pipes, connecting cable and drain hose is wrapped properly with tape. Shape the connecting pipes to match with the contours of the pipe assembly route.

(2) Fix the pipe assembly with the wall using clamps and screws. Pipe assembly should be anchored every 1.5m or less to isolate the vibration.

(3) Install the service cover securely. Water may enter the unit if service cover is not installed properly, resulting in unit malfunction and failure.



⚠ CAUTION

Make sure that the connecting pipes do not touch the components within the unit. If pipes touch the internal components, it may generate abnormal sounds and/or vibrations.

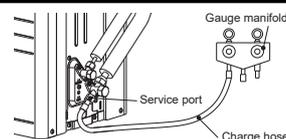
7. INSTALLATION TEST CHECK POINTS

After finishing the installation work, check the following points again before turning on the power. Conduct test run (Refer to indoor unit installation manual) and ensure that the unit operates properly.

Power source voltage complies with the rated voltage of air-conditioner.		No gas leaks from the joints of the service valves.	
Earth leakage breaker and circuit breaker are installed.		Indoor and outdoor side pipe joints have been insulated.	
Power cable and connecting cable are securely fixed to the terminal block.		Drain hose (if installed) is fixed properly.	
Both liquid and gas service valves are fully open.		Screw of the service cover is tightened properly.	

8. PUMP DOWN (IN CASE OF RELOCATION OR DISPOSAL OF UNIT)

- (1) Connect charge hose of gauge manifold to service port of outdoor unit.
- (2) Close the liquid service valve with hexagonal wrench key.
- (3) Fully open the gas service valve with hexagonal wrench key.
- (4) Carry out forced cooling operation (For forced cooling operation procedure, refer to indoor unit installation manual).
- (5) When the low pressure gauge becomes 0.01MPa, close the gas service valve and stop forced cooling operation.



FDCW71, 100, 140VNX-A

PSC012D066V

71VNX, 100VNX, 140VNX
Designed for R410A refrigerant

- This installation manual deals with outdoor units and general installation specifications only. For indoor units, refer to the respective installation manuals supplied with the units.
- Read this manual carefully before you set to installation work and carry it out according to the instructions contained in this manual.

SAFETY PRECAUTIONS

- We recommend you to read this "SAFETY PRECAUTIONS" carefully before the installation work in order to gain full advantage of the functions of the unit and to avoid malfunction due to mishandling.
 - The precautions described below are divided into [**⚠ WARNING**] and [**⚡ CAUTION**]. The matters with possibilities leading to serious consequences such as death or serious personal injury due to erroneous handling are listed in the [**⚠ WARNING**] and the matters with possibilities leading to personal injury or damage of the unit due to erroneous handling including probability leading to serious consequences in some cases are listed in [**⚡ CAUTION**]. These are very important precautions for safety. Be sure to observe all of them without fail.
 - The meaning of "Marks" used here are as shown below.
- ⊘ Never do it under any circumstance. ⚠ Always do it according to the instruction
- 5 and 6 HP units of single phase power source are equipment complying with IEC 61000-3-12.
 - Be sure to confirm no anomaly on the equipment by commissioning after completed installation and explain the operating methods as well as the maintenance methods of this equipment to the user according to the owner's manual.
 - Keep the installation manual together with owner's manual at a place where any user can read at any time. Moreover if necessary, ask to hand them to a new user.
 - Our company does not assume any responsibility for the damage caused by use of our products without following the instructions mentioned in our manuals.

Check before installation work

[Accessory]

Edging 	1 piece	knock-out hole protection (100VNX, 140VNX only)
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- Model name and power source
- Refrigerant piping length
- Piping, wiring and miscellaneous small parts
- Indoor unit installation manual

WARNING

- **Installation must be carried out by the qualified installer.**
If you install the system by yourself, it may cause serious trouble such as water leaks, electric shocks, fire and personal injury, as a result of a system malfunction.
- **Install the system in full accordance with the instruction manual.**
Incorrect installation may cause bursts, personal injury, water leaks, electric shocks and fire.
- **Use the original accessories and the specified components for installation.**
If parts other than those prescribed by us are used, it may cause fall of the unit, water leaks, electric shocks, fire, refrigerant leak, substandard performance, control failure and personal injury.
- **When installing in small rooms, take prevention measures not to exceed the density limit of refrigerant in the event of leakage accordance with ISO5149.**
Consult the expert about prevention measures. If the density of refrigerant exceeds the limit in the event of leakage, lack of oxygen can occur, which can cause serious accidents.
- **Ventilate the working area well in the event of refrigerant leakage during installation.**
If the refrigerant comes into contact with naked flames, poisonous gas is produced.
- **After completed installation, check that no refrigerant leaks from the system.**
If refrigerant leaks into the room and comes into contact with an oven or other hot surface, poisonous gas is produced.
- **Hang up the unit at the specified points with ropes which can support the weight in lifting for portage. And to avoid jolting out of alignment, be sure to hang up the unit at 4-point support.**
An improper manner of portage such as 3-point support can cause death or serious personal injury due to falling of the unit.
- **Install the unit in a location with good support.**
Unsuitable installation locations can cause the unit to fall and cause material damage and personal injury.
- **Ensure the unit is stable when installed, so that it can withstand earthquakes and strong winds.**
Unsuitable installation locations can cause the unit to fall and cause material damage and personal injury.
- **The electrical installation must be carried out by the qualified electrician in accordance with "the norm for electrical work" and "national wiring regulation", and the system must be connected to the dedicated circuit.**
Power source with insufficient capacity and incorrect function done by improper work can cause electric shocks and fire.
- **Be sure to shut off the power before starting electrical work.**
Failure to shut off the power can cause electric shocks, unit failure or incorrect function of equipment.
- **Be sure to use the cables conformed to safety standard and cable ampacity for power distribution work.**
Unconformable cables can cause electric leak, anomalous heat production or fire.
- **Use the prescribed cables for electrical connection, tighten the cables securely in terminal block and relieve the cables correctly to prevent overloading the terminal blocks.**
Loose connections or cable mountings can cause anomalous heat production or fire.
- **Arrange the wiring in the control box so that it cannot be pushed up further into the box. Install the service panel correctly.**
Incorrect installation may result in overheating and fire.
- **Do not perform brazing work in the airtight room**
It can cause lack of oxygen.
- **Use the prescribed pipes, flare nuts and tools for R410A.**
Using existing parts for R22 or R407C can cause the unit failure and serious accidents due to burst of the refrigerant circuit.
- **Tighten the flare nut by using double spanners and torque wrench according to prescribed method. Be sure not to tighten the flare nut too much.**
Loose flare connection or damage on the flare part by tightening with excess torque can cause burst or refrigerant leaks which may result in lack of oxygen.
- **Do not open the service valves for liquid line and gas line until completed refrigerant piping work, air tightness test and evacuation.**
If the compressor is operated in state of opening service valves before completed connection of refrigerant piping work, you may incur frost bite or injury from an abrupt refrigerant outflow and air can be sucked into refrigerant circuit, which can cause burst or personal injury due to anomalously high pressure in the refrigerant.
- **Only use prescribed option parts. The installation must be carried out by the qualified installer.**
If you install the system by yourself, it can cause serious trouble such as water leaks, electric shocks, fire.
- **Do not perform any change of protective device itself or its setup condition**
The forced operation by short-circuiting protective device of pressure switch and temperature controller or the use of non specified component can cause fire or burst.
- **Be sure to switch off the power source in the event of installation, inspection or servicing.**
If the power source is not shut off, there is a risk of electric shocks, unit failure or personal injury due to the unexpected start of fan.
- **Consult the dealer or an expert regarding removal of the unit.**
Incorrect installation can cause water leaks, electric shocks or fire.
- **Stop the compressor before closing valve and disconnecting refrigerant pipes in case of pump down operation.**
If disconnecting refrigerant pipes in state of opening service valves before compressor stopping, you may incur frost bite or injury from an abrupt refrigerant outflow and air can be sucked, which can cause burst or personal injury due to anomalously high pressure in the refrigerant circuit.
- **Ensure that no air enters in the refrigerant circuit when the unit is installed and removed.**
If air enters in the refrigerant circuit, the pressure in the refrigerant circuit becomes too high, which can cause burst and personal injury.
- **Do not run the unit with removed panels or protections**
Touching rotating equipments, hot surfaces or high voltage parts can cause personal injury due to entrapment, burn or electric shocks.
- **Be sure to fix up the service panels.**
Incorrect fixing can cause electric shocks or fire due to intrusion of dust or water.
- **Do not perform any repairs or modifications by yourself. Consult the dealer if the unit requires repair.**
If you repair or modify the unit, it can cause water leaks, electric shocks or fire.
- **Do not use any other refrigerant except the HFC-refrigerant (R410A).**
It may cause the serious trouble like malfunction or explosion.

CAUTION

- **Carry out the electrical work for ground lead with care**
Do not connect the ground lead to the gas line, water line, lightning conductor or telephone line's ground lead. Incorrect grounding can cause unit faults such as electric shocks due to short-circuiting. Never connect the grounding wire to a gas pipe because of gas leaks; it could cause explosion or ignition.
- **Use the circuit breaker for all pole with correct capacity.**
Using the incorrect circuit breaker, it can cause the unit malfunction and fire.
- **Install isolator or disconnect switch on the power source wiring in accordance with the local codes and regulations.**
The isolator should be locked in accordance with EN60204-1.
- **Take care when carrying the unit by hand.**
If the unit weights more than 20kg, it must be carried by two or more persons. Do not carry by the plastic straps, always use the carry handle when lifting the unit. Use gloves to minimize the risk of cuts by the aluminum fins.
- **Dispose of any packing materials correctly.**
Any remaining packing materials can cause personal injury if it contains nails and wood. And to avoid danger of suffocation, be sure to keep the plastic wrapper away from children and to dispose after tear it up.
- **Pay attention not to damage the drain pan by weld spatter when welding work is done near the indoor unit.**
If weld spatter entered into the indoor unit during welding work, it can cause pin-hole in drain pan and result in water leakage. To prevent such damage, keep the indoor unit in its packing or cover it.
- **Be sure to insulate the refrigerant pipes so as not to condense the ambient air moisture on them.**
Insufficient insulation can cause condensation, which can lead to moisture damage on the ceiling, floor, furniture and any other valuables.
- **Be sure to perform air tightness test by pressurizing with nitrogen gas after completed refrigerant piping work.**
If the density of refrigerant exceeds the limit in the event of refrigerant leakage in the small room, lack of oxygen can occur, which can cause serious accidents.
- **Perform installation work properly according to this installation manual.**
Improper installation can cause abnormal vibrations or increased noise generation.
- **Earth leakage breaker must be installed**
If the earth leakage breaker is not installed, it can cause fire or electric shocks.
- **Do not use any materials other than a fuse with the correct rating in the location where fuses are to be used.**
Connecting the circuit with copper wire or other metal thread can cause unit failure and fire.
- **Do not install the unit near the location where leakage of combustible gases can occur.**
If leaked gases accumulate around the unit, it can cause fire.
- **Do not install the unit where corrosive gas (such as sulfuric acid gas etc.) or combustible gas (such as thinner and petroleum gases) can accumulate or collect, or where volatile combustible substances are handled.**
Corrosive gas can cause corrosion of heat exchanger, breakage of plastic parts and etc. And combustible gas can cause fire.
- **Secure a space for installation, inspection and maintenance specified in the manual.**
Insufficient space can result in accident such as personal injury due to falling from the installation place.
- **When the outdoor unit is installed on a roof or a high place, provide permanent ladders and handrails along the access route and fences and handrails around the outdoor unit.**
If safety facilities are not provided, it can cause personal injury due to falling from the installation place.
- **Do not install nor use the system close to the equipment that generates electromagnetic fields or high frequency harmonics**
Equipment such as inverters, standby generators, medical high frequency equipments and telecommunication equipments can affect the system, and cause malfunctions and breakdowns. The system can also affect medical equipment and telecommunication equipment, and obstruct its function or cause jamming.
- **Do not install the outdoor unit in a location where insects and small animals can inhabit.**
Insects and small animals can enter the electric parts and cause damage or fire. Instruct the user to keep the surroundings clean.
- **Do not use the base frame for outdoor unit which is corroded or damaged due to long periods of operation.**
Using old and damaged base frame can cause the unit falling down and cause personal injury.
- **Do not install the unit in the locations listed below**
-Locations where carbon fiber, metal powder or any powder is floating.
-Locations where any substances that can affect the unit such as sulphide gas, chloride gas, acid and alkaline can occur.
-Locations and ships
-Locations where cosmetic or special sprays are often used.
-Locations with direct exposure of oil mist and steam such as kitchen and machine plant.
-Locations where any machines which generate high frequency harmonics are used.
-Locations with salty atmospheres such as coastlines.
-Locations with heavy snow (if installed, be sure to provide base frame and snow hood mentioned in the manual)
-Locations where the unit is exposed to chimney smoke
-Locations at high altitude (more than 1000m high)
-Locations with ammoniac atmospheres (e.g. organic fertilizer)
-Locations with calcium chloride (e.g. snow melting agent)
-Locations where heat radiation from other heat source can affect the unit
-Locations without good air circulation.
-Locations with any obstacles which can prevent inlet and outlet air of the unit
-Locations where short circuit of air can occur (in case of multiple units installation)
-Locations where strong air blows against the air outlet of outdoor unit
It can cause remarkable decrease in performance, corrosion and damage of components, malfunction and fire.
- **Do not install the outdoor unit in the locations listed below.**
-Locations where discharged hot air or operating sound of the outdoor unit can bother neighborhood.
-Locations where outlet air of the outdoor unit blows directly to an animal or plants. The outlet air can affect adversely to the plant etc.
-Locations where vibration can be amplified and transmitted due to insufficient strength of structure.
-Locations where vibration and operation sound generated by the outdoor unit can affect seriously on the wall or at the place near bed room)
-Locations where an equipment affected by high harmonics is placed. (TV set or radio receiver is placed within 5m)
-Locations where drainage cannot run off safely.
It can affect surrounding environment and cause a claim
- **Do not use the unit for special purposes such as storing foods, cooling precision instruments and preservation of animals, plants or art.**
It can cause the damage of the items.
- **Do not touch any buttons with wet hands**
It can cause electric shocks
- **Do not touch any refrigerant pipes with your hands when the system is in operation.**
During operation the refrigerant pipes become extremely hot or extremely cold depending the operating condition, and it can cause burn injury or frost injury.
- **Do not clean up the unit with water**
It can cause electric shocks
- **Do not operate the outdoor unit with any article placed on it.**
You may incur property damage or personal injury from a fall of the article.
- **Do not step onto the outdoor unit.**
You may incur injury from a drop or fall.

Notabilia as a unit designed for R410A

- Do not use any refrigerant other than R410A. R410A will rise to pressure about 1.6 times higher than that of a conventional refrigerant. A cylinder containing R410A has a pink indication mark on the top.
- A unit designed for R410A has adopted a different size indoor unit operation valve charge port and a different size check joint provided in the unit to prevent the charging of a wrong refrigerant by mistake. The processed dimension of the flared part of a refrigerant pipe and a flare nut's parallel side measurement have also been altered to raise strength against pressure. Accordingly, you are required to arrange dedicated R410A tools listed in the table on the right before installing or servicing this unit.
- Do not use a charge cylinder. The use of a charge cylinder will cause the refrigerant composition to change, which results in performance degradation.
- In charging refrigerant, always take it out from a cylinder in the liquid phase.
- All indoor units must be models designed exclusively for R410A. Check connectable indoor unit models in a catalog, etc. (A wrong indoor unit, if connected into the system, will impair proper system operation)

Dedicated R410A tools	
a)	Gauge manifold
b)	Charge hose
c)	Electronic scale for refrigerant charging
d)	Torque wrench
e)	Flare tool
f)	Protrusion control copper pipe gauge
g)	Vacuum pump adapter
h)	Gas leak detector

1. HAULAGE AND INSTALLATION (Take particular care in carrying in or moving the unit, and always perform such an operation with two or more persons.)

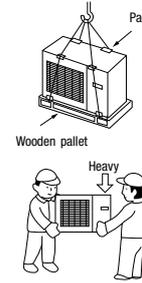
CAUTION When a unit is hoisted with slings for haulage, take into consideration the offset of its gravity center position. If not properly balanced, the unit can be thrown off-balance and fall.

1) Delivery

- Deliver the unit as close as possible to the installation site before removing it from the packaging.
- When some compelling reason necessitates the unpacking of the unit before it is carried in, use nylon slings or protective wood pieces so as not to damage the unit by ropes lifting it.

2) Portage

- The right hand side of the unit as viewed from the front (diffuser side) is heavier. A person carrying the right hand side must take heed of this fact. A person carrying the left hand side must hold with his right hand the handle provided on the front panel of the unit and with his left hand the corner column section.



3) Selection of installation location for the outdoor unit

Be sure to select a suitable installation place in consideration of following conditions.

- A place where it is horizontal, stable and can endure the unit weight and will not allow vibration transmittance of the unit.
 - A place where it can be free from possibility of bothering neighbors due to noise or exhaust air from the unit
 - A place where the unit is not exposed to oil splashes.
 - A place where it can be free from danger of flammable gas leakage.
 - A place where drain water can be disposed without any trouble.
 - A place where the unit will not be affected by heat radiation from other heat source.
 - A place where snow will not accumulate.
 - A place where the unit can be kept away 5m or more from TV set and/or radio receiver in order to avoid any radio or TV interference.
 - A place where good air circulation can be secured, and enough service space can be secured for maintenance and service of the unit safely.
 - A place where the unit will not be affected by electromagnetic waves and/or high-harmonic waves generated by other equipment.
 - A place where chemical substances like sulfuric gas, chloric gas, acid and alkali (including ammonia), which can harm the unit, will not be generated and not remain.
 - A place where strong wind will not blow against the outlet air blow of the unit.
- Do not install the unit in places which exposed to sea breeze (e.g. coastal area) or calcium chloride (e.g. snow melting agent), exposed to ammonia substance (e.g. organic fertilizer).

4) Caution about selection of installation location

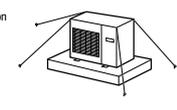
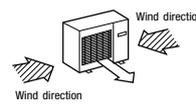
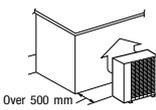
- (1) If the unit is installed in the area where the snow will accumulate, following measures are required. The bottom plate of unit and intake, outlet may be blocked by snow.

- Install the unit on the base so that the bottom is higher than snow cover surface.
- Provide a snow hood to the outdoor unit on site. Regarding outline of a snow hood, refer to our technical manual.
- Install the unit under eaves or provide the roof on site.



- (2) If the unit can be affected by strong wind, following measures are required. Strong wind can cause damage of fan (fan motor), or can cause performance degradation, or can trigger anomalous stop of the unit due to rising of high pressure or dropping of low pressure.

- Install the outlet air blow side of the unit to face a wall of building, or provide a fence or a windbreak screen.
- Install the outlet air blow side of the unit in a position perpendicular to the direction of wind.
- The unit should be installed on the stable and level foundation. If the foundation is not level, tie down the unit with wires.

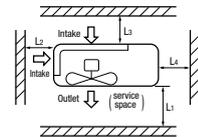


- Since drain water generated by defrost control may freeze, following measures are required.
- Don't execute drain piping work by using a drain elbow and drain grommets (optional parts). [Refer to Drain piping work.]
 - Recommend setting Defrost Control (SW3-1) and Snow Guard Fan Control (SW3-2). [Refer to Setting SW3-1, SW3-2.]

5) Installation space

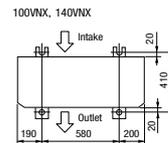
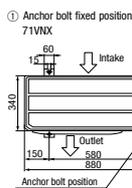
- Walls surrounding the unit in the four sides are not acceptable.
- There must be a 1-meter or larger space in the above.
- Where a danger of short-circuiting exists, install guide louvers.
- When more than one unit are installed, provide sufficient intake space consciously so that short-circuiting may not occur.
- Where piling snow can bury the outdoor unit, provide proper snow guards.
- A barrier wall placed in front of the exhaust diffuser must not be higher than the unit.
- Advisable to keep the right side service space (L4) more than 300 mm for easy maintenance.

Size	71VNX			100VNX, 140VNX		
	I	II	III	I	II	III
L1	Open	Open	500	Open	Open	500
L2	300	250	Open	300	5	Open
L3	100	150	100	150	300	150
L4	250	250	250	5	5	5

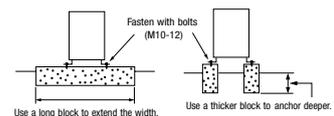


6) Installation

- In installing the unit, fix the unit's legs with bolts specified on the left.
 - The protrusion of an anchor bolt on the front side must be kept within 15 mm.
 - Securely install the unit so that it does not fall over during earthquakes or strong winds, etc.
 - Refer to the left illustrations for information regarding concrete foundations.
 - Install the unit in a level area. (With a gradient of 5 mm or less.)
- Improper installation can result in a compressor failure, broken piping within the unit and abnormal noise generation.



② Notabilia for installation



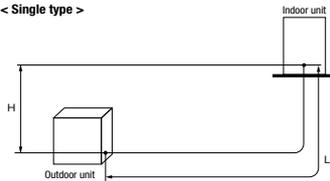
2. REFRIGERANT PIPING WORK

1) Restrictions on unit installation and use

- Check the following points in light of the indoor unit specifications and the installation site.
- Observe the following restrictions on unit installation and use. Improper installation can result in a compressor failure or performance degradation.

Restrictions	Dimensional restrictions			Marks appearing in the drawing on the right
	71VNX	100VNX	140VNX	
One-way pipe length of refrigerant piping	30m or less	30m or less	30m or less	L
Elevation difference between indoor and outdoor units	When the outdoor unit is positioned higher,	7m or less		H
	When the outdoor unit is positioned lower,	7m or less		H

< Single type >



2) Determination of pipe size

- Determine refrigerant pipe size pursuant to the following guidelines based on the indoor unit specifications.

	71VNX, 100VNX, 140VNX	
	Gas pipe	Liquid pipe
Outdoor unit connected	φ15.88 Flare	φ9.52 Flare
Refrigerant piping	φ15.88	φ9.52
Indoor unit connected	φ15.88	φ9.52
Connected indoor unit model	HSB100, HMK100 (71VNX, 100VNX), HSB140 (140VNX)	

3) Refrigerant pipe wall thickness and material

- Select refrigerant pipes of the table shown on the right wall thickness and material as specified for each pipe size.

Pipe diameter [mm]	9.52	15.88
Minimum pipe wall thickness [mm]	0.8	1.0
Pipe material*	O-type pipe	O-type pipe

*Phosphorus deoxidized seamless copper pipe C1220T, JIS H 3300

NOTE

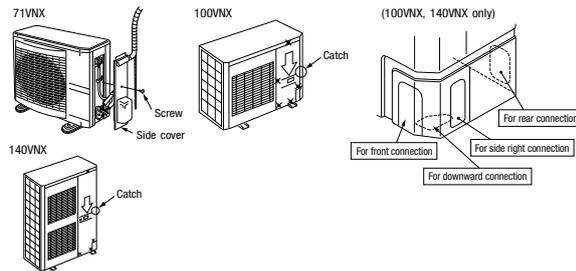
- Select pipes having a wall thickness larger than the specified minimum pipe thickness.

4) On-site piping work

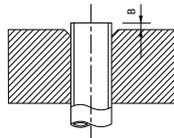
IMPORTANT Take care so that installed pipes may not touch components within a unit. If touching with an internal component, it will generate abnormal sounds and/or vibrations.

How to remove the service panel First remove the screw (s) (X mark) of the service panel or the side cover and push it down into the direction of the arrow mark and then remove it by pulling it toward you.

- The pipe can be laid in any of the following directions: side right, front, rear and downward. (100VNX, 140VNX)
- Remove a knock-out plate provided on the pipe penetration to open a minimum necessary area and attach an edging material supplied as an accessory by cutting it to an appropriate length before laying a pipe. (100VNX, 140VNX)
- Carry out the on site piping work with the service valve fully closed.
- Give sufficient protection to a pipe end (compressed and blazed, or with an adhesive tape) so that water or foreign matters may not enter the piping.
- Bend a pipe to a radius as large as practical.(R100~R150) Do not bend a pipe repeatedly to correct its form.
- Flare connection is used between the unit and refrigerant pipe. Flare a pipe after engaging a flare nut onto it. Flare dimensions for R410A are different from those for conventional R407C. Although we recommend the use of flaring tools designed specifically for R410A, conventional flaring tools can also be used by adjusting the measurement of protrusion B with a protrusion control gauge.



Copper pipe outer diameter	A
φ6.35	9.1
φ9.52	13.2
φ12.7	16.6
φ15.88	19.7



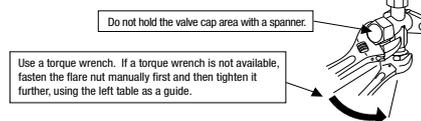
Copper pipe outer diameter	In the case of a rigid (clutch) type	
	With an R410A tool	With a conventional tool
φ6.35	0~0.5	0.7~1.3
φ9.52		
φ12.7		
φ15.88		

● Tighten a flare joint securely with a double spanner.

CAUTION Do not apply force beyond proper fastening torque in tightening the flare nut.

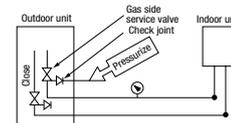
Fix both liquid and gas service valves at the valve main bodies as illustrated on the right, and then fasten them, applying appropriate fastening torque.

Service valve size (mm)	Tightening torque (N·m)	Tightening angle (°)	Recommended length of a tool handle (mm)
φ6.35 (1/4")	14~18	45~60	150
φ9.52 (3/8")	34~42	30~45	200
φ12.7 (1/2")	49~61	30~45	250
φ15.88 (5/8")	68~82	15~20	300



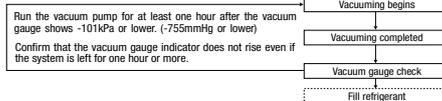
5) Air tightness test

- Although outdoor and indoor units themselves have been tested for air tightness at the factory, check the connecting pipes after the installation work for air tightness from the service valve's check joint equipped on the outdoor unit side. While conducting a test, keep the service valve shut all the time.
 - Raise the pressure to 0.5 MPa, and then stop. Leave it for five minutes to see if the pressure drops.
 - Then raise the pressure to 1.5 MPa, and stop. Leave it for five more minutes to see if the pressure drops.
 - Then raise the pressure to the specified level (4.15 MPa), and record the ambient temperature and the pressure.
 - If no pressure drop is observed with an installation pressurized to the specified level and left for about one day, it is acceptable. When the ambient Temperature fall 1°C, the pressure also fall approximately 0.01 MPa. The pressure, if changed, should be compensated for.
 - If a pressure drop is observed in checking e) and a) - d), a leak exists somewhere. Find a leak by applying bubble test liquid to welded parts and flare joints and repair it. After repair, conduct an air-tightness test again.
- In conducting an air-tightness test, use nitrogen gas and pressurize the system with nitrogen gas from the gas side. Do not use a medium other than nitrogen gas under any circumstances.



6) Evacuation

Work flow When the system has remaining moisture inside or a leaky point, the vacuum gauge indicator will rise. Check the system for a leaky point and then draw air to create a vacuum again.



Pay attention to the following points in addition to the above for the R410A and compatible machines.

- To prevent a different oil from entering, assign dedicated tools, etc. to each refrigerant type. Under no circumstances must a gauge manifold and a charge hose in particular be shared with other refrigerant types (R22, R407C, etc.).
- Use a counterflow prevention adapter to prevent vacuum pump oil from entering the refrigerant system.

7) Additional refrigerant charge

(1) Calculate a required refrigerant charge volume from the following table.

	Additional charge volume (kg) per meter of refrigerant piping (liquid pipe φ 9.52)	Refrigerant volume charged for shipment at the factory (kg)	Installation's pipe length (m) covered without additional refrigerant charge
71VNX	0.06	2.55	15
100VNX	0.06	2.9	15
140VNX	0.06	4.0	15

● This unit contains factory charged refrigerant covering 15m of refrigerant piping and additional refrigerant charge on the installation site is not required for an installation with up to 15m refrigerant piping. When refrigerant piping exceeds 15m, additionally charge an amount calculated from the pipe length and the above table for the portion in excess of 15m.

Formula to calculate the volume of additional refrigerant required

$$\text{Additional charge volume (kg)} = \{ \text{Main pipe length (m)} - \text{Length covered without additional charge 15 (m)} \} \times 0.06 \text{ (kg/m)}$$

*When an additional charge volume calculation result is negative, it is not necessary to charge refrigerant additionally.

● To charge refrigerant again to the system, recover refrigerant from the system first and then charge the same volume as initial charge.

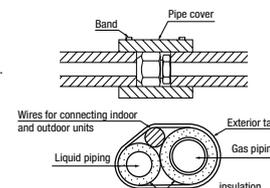
(2) Charging refrigerant

- Since R410A refrigerant must be charged in the liquid phase, you should charge it, keeping the container cylinder upside down or using a refrigerant cylinder equipped with a siphon tube.
- Charge refrigerant always from the liquid side service port with the service valve shut. When you find it difficult to charge a required amount, fully open the outdoor unit valves on both liquid and gas sides and charge refrigerant from the gas (suction) side service port, while running the unit in the cooling mode. In doing so, care must be taken so that refrigerant may be discharged from the cylinder in the liquid phase all the time. When the cylinder valve is throttled down or a dedicated conversion tool to change liquid-phase refrigerant into mist is used to protect the compressor, however, adjust charge conditions so that refrigerant will gasify upon entering the unit.
- In charging refrigerant, always charge a calculated volume by using a scale to measure the charge volume.
- When refrigerant is charged with the unit being run, complete a charge operation within 30 minutes. Running the unit with an insufficient quantity of refrigerant for a long time can cause a compressor failure.

NOTE ● Write down the additional and total refrigerant volume on the label in front.

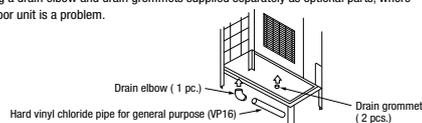
8) Insulation on piping

- Dress refrigerant pipes (both gas and liquid pipes) for heat insulation and prevention of dew condensation.
- Use a heat insulating material that can withstand 120°C or a higher temperature. Poor heat insulating capacity can cause heat insulation problems or cable deterioration.
 - Improper heat insulation/anti-dew dressing can result in a water leak or dripping causing damage to household effects, etc.
 - All gas pipes must be securely heat insulated in order to prevent damage from dripping water that comes from the condensation formed on them during a cooling operation or personal injury from burns because their surface can reach quite a high temperature due to discharged gas flowing inside during a heating operation.
 - Wrap indoor units' flare joints with heat insulating parts (pipe cover) for heat insulation (both gas and liquid pipes).
 - Give heat insulation to both gas and liquid side pipes. Bundle a heat insulating material and a pipe tightly together so that no gaps may be left between them and wrap them together with a connecting tape by a dressing tape.
 - Both gas and liquid pipes need to be dressed with 20 mm or thicker heat insulation materials above the ceiling where relative humidity exceeds 70%.



3. DRAIN PIPING WORK

● Execute drain piping by using a drain elbow and drain grommets supplied separately as optional parts, where water drained from the outdoor unit is a problem.



- There are 3 drain holes provided on the bottom plate of an outdoor unit to discharge condensed water.
- When condensed water needs to be led to a drain, etc., install the unit on a flat base (supplied separately as an option part) or concrete blocks.
- Connect a drain elbow as shown in the illustration and close the other two drain holes with grommets.

- Do not use drain elbow and grommet made of plastic for drain piping when base heater for outdoor unit is used. Plastic grommet and elbow will be damaged and burnt in worst case.
- Prepare another drain tray made of metallic material for collecting drain when base heater is used.
- In case plastic grommet and drain elbow is used in warm climate area, disconnect the connector for heater on PCB shown in the drawing.



4. ELECTRICAL WIRING WORK For details of electrical cabling, refer to the indoor unit installation manual.

PSC012D066V

Electrical installation work must be performed by an electrical installation service provider qualified by a power provider of the country.

Electrical installation work must be executed according to the technical standards and other regulations applicable to electrical installations in the country.

- Ground the unit. Do not connect the grounding wire to a gas pipe, water pipe, lightning rod or telephone grounding wire. If improperly grounded, an electric shock or malfunction may result.
- A grounding wire must be connected before connecting the power cable. Provide a grounding wire longer than the power cable.
- Do not lay electronic control cables (remote control and signaling wires) and other cables together outside the unit. Laying them together can result in the malfunctioning or a failure of the unit due to electric noises.
- Fasten cables so that may not touch the piping, etc.
- When cables are connected, make sure that all electrical components within the electrical component box are free of loose connector coupling or terminal connection and then attach the cover securely. (Improper cover attachment can result in malfunctioning or a failure of the unit, if water penetrates into the box.)

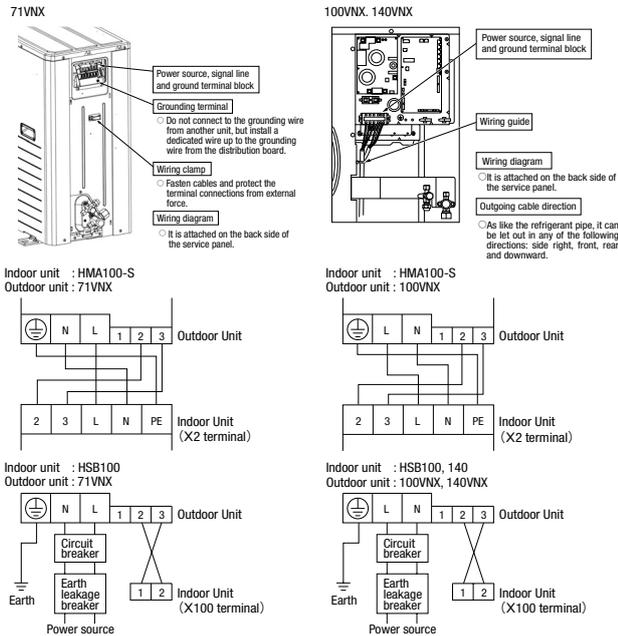
- Connect a pair bearing a common terminal number with an indoor-outdoor connecting wire.
- In cabling, fasten cables securely so that no external force may work on terminal connections.
- Grounding terminals are provided in the control box.

Power cable, indoor-outdoor connecting wires

- Always perform grounding system installation work with the power cord unplugged.

Main fuse specification

Model	Specification	Part No.
71VNX	250V 20A	SSA564A117
100VNX,140VNX	250V 30A	SSA564A161



5. COMMISSIONING For details of commissioning, refer to the Indoor unit installation manual

- WARNING**
- Before conduct a test run, make sure that the operation valves are open.
 - Turn on power 6 hours prior to a test run to energize the crank case heater.
 - Do not turn on the power when the ambient temperature is below -20°C to avoid breakdown of electronic component.
 - In case of the first operation after turning on power, even if the unit does not operate for 30 minutes, it is not a breakdown.
 - Always give a 3-minute or longer interval before you start the unit again whenever it is stopped.
 - Removing the service panel will expose high-voltage live parts and high-temperature parts, which are quite dangerous. Take utmost care not to incur an electric shock or burns. Do not leave the unit with the service panel open.

A failure to observe these instructions can result in a compressor breakdown.

Items to check before a test run

- When you leave the outdoor unit with power supplied to it, be sure to close the panel.

Item No. used in the installation manual	Item	Check item	Check
2	Refrigerant plumbing	Were air-tightness test and vacuum extraction surely performed?	
		Are heat insulation materials installed on both liquid and gas pipes?	
		Are operation valves surely opened for both liquid and gas systems?	
4	Electric wiring	Is the unit free from cabling errors such as uncompleted connection, or reversed phase?	
		Doesn't cabling cross-connect between units, where more than one unit are installed?	
		Do indoor-outdoor connecting cables connect between the same terminal numbers?	
		Is the unit grounded with a dedicated grounding wire not connected to another unit's grounding wire?	
		Are cables free from loose screws at their connection points?	
		Are cables held down with cable clamps so that no external force works onto terminal connections?	

- CAUTION**
- When you operate switches (SW3) for on-site setting, be careful not to touch a live part.
 - You cannot check discharge pressure from the liquid operation valve charge port.
 - The 4-way valve (20S) is energized during a heating operation.
 - When power supply is cut off to reset the unit, give 3 minutes or more before you turn on power again after power is cut off. If this procedure is not observed in turning on power again, "Communication error between outdoor and indoor unit" may occur.

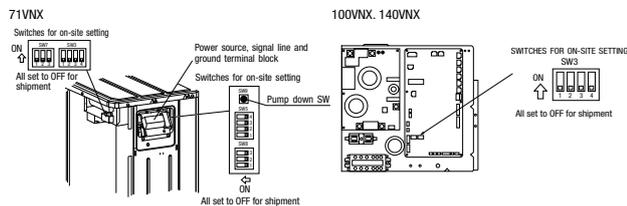
1) Test run method
Refer to the indoor unit installation manual.

2) Checking the state of the unit in operation
Use check joints provided on the piping before and after the four-way valve installed inside the outdoor unit for checking discharge pressure and suction pressure. As indicated in the table shown on the right, pressure detected at each point will vary depending on whether a cooling or heating operation has been selected.

	Check joint of the pipe	Charge port of the gas operation valve
Cooling operation (High pressure)	Discharge pressure (High pressure)	Suction pressure (Low pressure)
Heating operation (Low pressure)	Suction pressure (Low pressure)	Discharge pressure (High pressure)

3) Setting SW3-1, SW3-2, on-site

- Defrost control switching (SW3-1)
 - When this switch is turned ON, the unit will run in the defrost mode more frequently.
 - Set this switch to ON, when installed in a region where outdoor temperature falls below zero during the season the unit is run for a heating operation.
- Snow guard fan control (SW3-2)
 - When this switch is turned on, the outdoor unit fan will run for 10 seconds in every 10 minutes, when outdoor temperature falls to 3°C or lower and the compressor is not running.
 - When the unit is used in a very snowy country, set this switch to ON.



4) Failure diagnosis in a test run

Indoor Unit Display	Error Code in Error Log	Printed circuit board LED (The cycles of 5 seconds)		Failure event	Action
		Red LED	Green LED		
High pressure alarm	E40	Blinking once	Blinking continuously	63H1 actuation or operation with operation valves shut (occurs mainly during a heating operation)	1. Check whether the operation valves are open. 2. If an error has been canceled when 3 minutes have elapsed since a compressor stop, you can restart the unit by effecting Check Reset from the remote control unit.
Low pressure alarm	E49	Blinking once	Blinking continuously	Low pressure error or operation with operation valves shut (occurs mainly during a cooling operation)	

● If an error code other than those listed above is indicated, refer to the wiring diagram of the outdoor unit and the indoor unit installation manual.

5) The state of the electronic expansion valve.

The following table illustrates the steady states of the electronic expansion valve.

	When power is turned on	When the unit comes to a normal stop		When the unit comes to an abnormal stop	
		During a cooling operation	During a heating operation	During a cooling operation	During a heating operation
Valve for a cooling operation	Complete shut position	Complete shut position	Full open position	Full open position	Full open position
Valve for a heating operation	Full open position	Full open position	Complete shut position	Full open position	Full open position

6) Heed the following on the first operation after turning on the power source.

This outdoor unit may start in the standby mode (waiting for a compressor startup), which can continue up to 30 minutes, to prevent the oil level in the compressor from lowering on the first operation after turning on the circuit breaker. If that is the case, do not suspect a unit failure.