

5.3 Installation of outdoor unit

Models FDC200VSA-W, 250VSA-W, 280VSA-W

PSC012D154B

Inverter driven split PAC
FDC200VSA-W, FDC250VSA-W, FDC280VSA-W
Designed for R32 refrigerant

- ⊙ This installation manual deals with outdoor units and general installation specifications only. For indoor units, refer to page 131.
- ⊙ When install the unit, be sure to check whether the selection of installation place, power supply specifications, usage limitation (piping length, height differences between indoor and outdoor units, power supply voltage and etc.) and installation spaces

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 the **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
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- For 3 phase power supply outdoor unit, EN61000-3-2 is not applicable if consent by the utility company or notification to the utility company is given before usage.
- 3phase power supply unit, both indoor and outdoor, is suitable for installation in a commercial and light industrial environment. If installed as a house-hold appliance it could cause electromagnetic interference.
- 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.

Check before installation work

[Accessory]

Edging 1 piece knock-out hole protection	Accessory pipe 1 piece Accessory pipe A	1 piece Accessory pipe B
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- Model name and power supply
- Refrigerant piping length
- Piping, wiring and miscellaneous small parts
- Indoor unit installation manual

WARNING

<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. ● 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. In case of R32, the refrigerant could be ignited because of its flammability. ● 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 supply 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 block. 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 R32. Using existing parts for R22 or R407C can cause the unit failure and serious accidents due to burst of the refrigerant circuit. 	<ul style="list-style-type: none"> ● 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 optional 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 supply in the event of installation, inspection or servicing. If the power supply 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. ● Be sure to wear protective goggles and gloves while at work. ● This unit is designed specifically for R32. Using any other refrigerant can cause unit failure and personal injury. ● 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 process or splice the power cord, or share the socket with other power plugs. This may cause fire or electric shock due to defecting contact, defecting insulation and over-current etc. ● Do not bundle or wind or process the power cord. Do not deform the power cord by treading it. This may cause fire or heating.
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CAUTION

<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 supply wiring in accordance with the local codes and regulations. The isolator should be locked in accordance with EN62024-1. ● 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 carrying the unit by hand. Use gloves to minimize the risk of cuts by the aluminium 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 to dispose after use 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 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 an old and damage base frame can cause the unit falling down and cause personal injury. 	<ul style="list-style-type: none"> ● 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 sulfidic gas, chlorine 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 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. ● Do not touch the suction or aluminum fin on the outdoor unit. This may cause injury.
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Notabilia as a unit designed for R32

- Do not use any refrigerant other than R32. R32 will rise to pressure about 1.6 times higher than that of a conventional refrigerant. A cylinder containing R32 has a light blue indication mark on the top.
- A unit designed for R32 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 flare 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 R32 tools listed in the table on the right before installing or servicing this unit.
- All indoor units must be models designed exclusively for R32. Check connectable indoor unit models in a catalog, etc. (A wrong indoor unit, if connected into the system, will impair proper system operation)

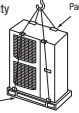
	Dedicated R32 tools
a)	Gauge manifold
b)	Charge hose
c)	Electronic scale for refrigerant charging
d)	Torque wrench
e)	Flare tool
f)	Protrusion control copper pipe gauge
g)	Vacuum pump adapter
h)	Gas leak detector

MITSUBISHI HEAVY INDUSTRIES THERMAL SYSTEMS, LTD.

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

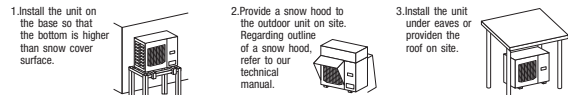
- Deliver the unit as close as possible to the installation site before removing it from the packaging.
- When some compelling reason necessitates the unpacking of the unit before it is carried in, use nylon slings or protective wood pieces so as not to damage the unit by ropes lifting it.

3) Selection of installation location for the outdoor unit

- Be sure to select a suitable installation place in consideration of the 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.
 - 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, chlorine 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).

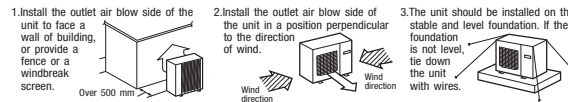
4) Caution about selection of installation location

(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.



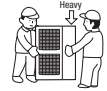
- Don't execute drain piping work by using a drain elbow and drain grommets (optional parts). [REFER TO DRAIN PIPING WORK.]
 - Recommend setting Defrost Control (SW3-1) and Snow Guard Fan Control (SW3-2). [Refer to Setting SW3-1, SW3-2.]
 - Attach heater on a base plate on site, if there is possibility to freeze drain water.
- In case that the product has a condensate drainage system, the drainage paths should have suitable measure against freezing but be sure not to melt the material of drainage paths with heat.

(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.



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.



5) Installation space

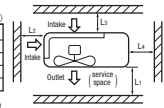
- Walls surrounding the unit in the four sides are not acceptable.
- There must be a 1-meter or larger space in the above.
- Where a danger of short-circuiting exists, install guide louvers.
- When more than one unit are installed, provide sufficient intake space consciously so that short-circuiting 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.

*In case that outdoor temperature is 44°C or lower

Size	Example installation	I	II	III
L1	Open	Open	Open	Open
L2	300	5	Open	Open
L3	150	300	150	Open
L4	250 (25)	250 (25)	250 (25)	Open

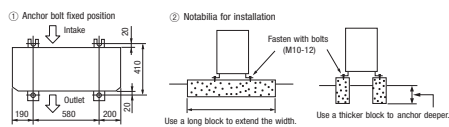
*In case that outdoor temperature is higher than 44°C

Size	Example installation	Open	Open	2400
L1	Open	Open	Open	Open
L2	300	750	Open	Open
L3	300	300	300	Open
L4	750	300	1500	Open



* If unit is installed in L4 space with () condition, secure space of 250mm in lateral (L4) by unit movement at the time of exchange work of compressor.

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.

7) To run the unit for a cooling operation, when the outdoor temperature is -5°C or lower.

- When the outdoor air temperature is -5°C or lower, provide a snow hood to the outdoor unit on site. So that strong wind will not blow against the outdoor heat exchanger directly. Regarding outline of a snow hood, refer to our technical manual.

2. REFRIGERANT PIPING WORK

1) Restrictions on unit installation and use

- Check the following points against the specification of the indoor unit and the installation site.
- Observe the following restrictions regarding unit installation and use. Improper installation can cause compressor failure or degradation of performance.
- The total liquid pipe length of the system is restricted by the equivalent length (Le). The equivalent length (Le) is a virtual length corresponding to an equivalent length of liquid piping using a diameter of 12.7mm.

Restriction	Dimensional restrictions	Marks appearing in the drawing				
		Single	Twin	Tripe	W-twin	W-train
Total equivalent length (Liquid piping)	≤ 70m	Le	Le	Le	Le	Le
One-way pipe length of refrigerant piping	Liquid piping	≤ 40m (φ 12.7)	L	L4, L1, L4, L1, L4, L1	L4, L1, L4, L1, L4, L1	L4, L1, L4, L1, L4, L1
	Gas piping	≤ 70m	L	L4, L1, L4, L1, L4, L1	L4, L1, L4, L1, L4, L1	L4, L1, L4, L1, L4, L1
Main pipe length	Liquid piping	≤ 70m	L	L	L	L
	Gas piping	≤ 70m (φ 25.4 or φ 28.8)	L	L	L	L
One-way pipe length from the first branching point to the second branching point	≤ 30m	-	-	-	-	-
	≤ 30m	L1, L2	L1, L2, L3	L3	L4, L1, L4, L1, L4, L1	L4, L1, L4, L1, L4, L1
One-way pipe length from the first branching point to indoor units through the second branching point	≤ 27m	-	-	-	-	-
	≤ 27m	-	-	-	-	-
Twin Type, W-Twin	≤ 10m	-	R1, L20	-	-	-
	≤ 10m	-	-	-	-	-
One-way pipe length difference from the first branching point to the indoor units	≤ 3m	-	-	-	-	-
	≤ 3m	-	-	-	-	-
One-way pipe length difference from the second branching point to the indoor units	≤ 10m	-	-	-	-	-
	≤ 10m	-	-	-	-	-
Total pipe length after the second branching point to the indoor units	≤ 10m	-	-	-	-	-
	≤ 10m	-	-	-	-	-
Elevation difference between indoor and outdoor units	When the outdoor unit is positioned higher	≤ 50m (H)	H	H	H	H
	When the outdoor unit is positioned lower	≤ 15m	H	H	H	H
Elevation difference between indoor units	≤ 0.5m	-	-	-	-	-
	≤ 0.5m	-	-	-	-	-

- For model 200V, always use φ12.7mm liquid main pipe when one-way piping length exceeds 40m and φ8.52mm if it is 40m or less.
- If φ9.52mm liquid pipe is used in an installation having one-way pipe longer than 40m, it may cause degradation of performance and/or water drops in the indoor unit.
- Always use φ25.4mm or φ28.8mm gas main pipe "L" when the length of "L" exceeds 35m.
- If φ22.2mm gas pipe is used in an installation having one-way pipe longer than 35m, it may cause degradation of performance and/or water drops in the indoor unit.

● FDC250/280V

Restriction	Dimensional restrictions	Marks appearing in the drawing			
		Single	Twin	Tripe	W-train
Total equivalent length (Liquid piping)	250W ≤ 70m 280V ≤ 60m	Le	Le	Le	Le
One-way pipe length of refrigerant piping	250W ≤ 70m 280V ≤ 60m	L	L4, L1, L4, L1, L4, L1	L4, L1, L4, L1, L4, L1	L4, L1, L4, L1, L4, L1
	250W ≤ 70m 280V ≤ 60m	L	L	L	L
Main pipe length	250W ≤ 70m 280V ≤ 60m	L	L	L	L
	250W ≤ 70m 280V ≤ 60m	L	L	L	L
One-way pipe length after the first branching point to the indoor units	≤ 30m	-	-	-	-
	≤ 30m	-	-	-	-
One-way pipe length difference from the first branching point to the indoor units	≤ 10m	-	-	-	-
	≤ 10m	-	-	-	-
One-way pipe length difference from the second branching point to the indoor units	≤ 10m	-	-	-	-
	≤ 10m	-	-	-	-
Elevation difference between indoor and outdoor units	When the outdoor unit is positioned higher	≤ 50m (H)	H	H	H
	When the outdoor unit is positioned lower	≤ 15m	H	H	H
Elevation difference between indoor units	≤ 0.5m	-	-	-	-
	≤ 0.5m	-	-	-	-

[Formula to calculate equivalent length (Le)]
In case of new piping Le = (length of φ 12.7) × 0.52 × (length of φ 9.52)
In case of existing piping Le = (length of φ 12.7) × 0.52 × (length of φ 9.52) + 1.56 × (length of φ 15.88)

- Notes: (1) Install the indoor units so that L + L1 becomes the longest one-way pipe.
- (2) Connect the indoor unit with the maximum capacity to L1.
- (3) If the outdoor temperature is above 45°C, the dimensional restriction is ≤ 30m.

2) Determination of pipe size

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

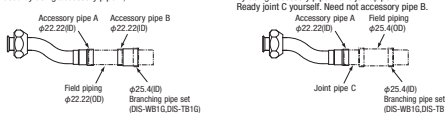
Outdoor unit connected	Model 200V		Model 250V/280V			
	Gas pipe	Liquid pipe	Gas pipe	Liquid pipe	Gas pipe	Liquid pipe
Refrigerant piping (main pipe L)	φ22.22 or φ25.4 or φ28.8	φ9.52 or φ12.7	φ22.22 or φ25.4 or φ28.8	φ9.52 or φ12.7	φ22.22 or φ25.4 or φ28.8	φ9.52 or φ12.7
In the case of a single type	Capacity of indoor unit	φ25.4	φ12.7	φ25.4	φ12.7	-
	Branching pipe set	DS-WB16	DS-WB16	DS-WB16	DS-WB16	DS-WB16
In the case of a twin type	Refrigerant piping (branch pipe L1, L2)	φ15.88	φ9.52	φ15.88	φ9.52	φ15.88
	Capacity of indoor unit	φ15.88	φ9.52	φ15.88	φ9.52	φ15.88
In the case of a tripe type A	Refrigerant piping (branch pipe L1, L2, L3)	φ15.88	φ9.52	φ15.88	φ9.52	φ15.88
	Capacity of indoor unit	φ15.88	φ9.52	φ15.88	φ9.52	φ15.88
In the case of a tripe type B	Refrigerant piping (branch pipe L1, L1')	φ15.88	φ9.52	φ15.88	φ9.52	φ15.88
	Capacity of indoor unit	φ15.88	φ9.52	φ15.88	φ9.52	φ15.88
In the case of a W-twin type	Refrigerant piping (branch pipe L1, L2)	φ15.88	φ9.52	φ15.88	φ9.52	φ15.88
	Capacity of indoor unit	φ15.88	φ9.52	φ15.88	φ9.52	φ15.88

CAUTION

- When the model 50V or model 60V model is connected as an indoor unit, always use a φ9.52 liquid pipe for the branch (branching pipe - indoor unit) and a different diameter joint supplied with the branching pipe set for connection with the indoor unit (φ6.35 on the liquid pipe side).
- If a φ6.35 pipe is used for connection with a branching pipe, a refrigerant distribution disorder may occur, causing one of the indoor units to fall short of the rated capacity.
- A rear pipe must be a part of the main. A branching pipe set should be installed horizontally at a point as close to an indoor unit as possible.
- A branching part must be treated with a heat-insulation material supplied as an accessory.
- For the details of installation work required at and near a branching area, see the installation manual supplied with your branching pipe set.

3) How to use pipe reducer.

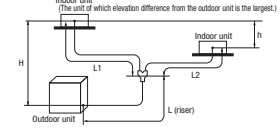
- φ22.22(OD) size of the refrigerant gas pipe can be used by using accessory pipe A.B.
- φ25.4(OD) size of the refrigerant gas pipe can be used by using accessory pipe A and joint pipe C.
- φ28.58(OD) size of the refrigerant gas pipe can be used by using accessory pipe A and joint pipe C, D.



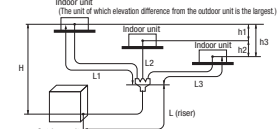
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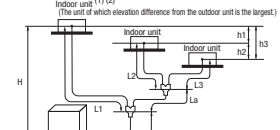
< Twin type >



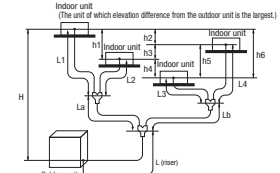
< Tripe type A >



< Tripe type B >

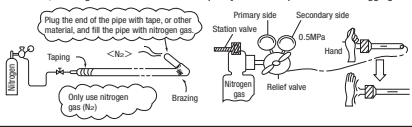


< W-twin type >



About brazing

Brazing must be performed under a nitrogen gas flow. Without nitrogen gas, a large quantity of foreign matters (oxidized film) are created, causing a critical failure from capillary tube or expansion valve clogging.



4) 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.
- This unit uses R32. Always use 1/2H pipes having a 1.0mm or thicker wall for φ19.05 or larger pipes, because O-type pipes do not meet the pressure resistance requirement.

Pipe diameter [mm]	6.35	9.52	12.7	15.88	22.22	25.4	28.58
Minimum pipe wall thickness [mm]	0.8	0.8	0.8	1.0	1.0	1.0	1.0
Pipe material*	O-type pipe	O-type pipe	O-type pipe	O-type pipe	1/2H-type pipe	1/2H-type pipe	1/2H-type pipe

*Phosphorus deoxidized seamless copper pipe C1220T, JIS H3300

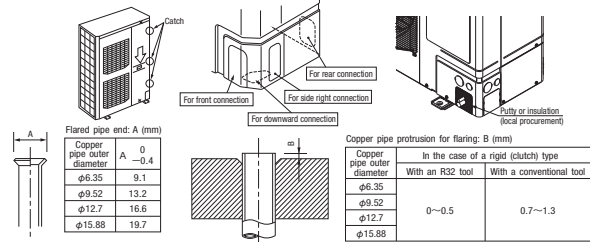
NOTE

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

5) On-site piping work

- 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.
- **IMPORTANT** First remove screws (X mark) of the service panel 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.
- 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.
- Please close the gap of piping connecting part with putty or insulation material (locally procured) after piping connection. Small animals or insects may intrude into the outdoor unit and it will cause electrical short.
- Carry out the on site piping work with the operation 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 R32 are different from those for conventional R22 and R407C. Although we recommend the use of flaring tools designed specifically for R32, conventional flaring tools can also be used by adjusting the measurement of protrusion B with a protrusion control gauge.
- Do not reuse existing flare, make new flare.
- The pipe should be anchored every 1.5m or less to isolate the vibration.
- Tighten a flare joint securely with a double spanner.



Operation valve size (mm)	Tightening torque (N·m)
φ6.35 (1/4")	14-18
φ9.52 (3/8")	34-42
φ12.7 (1/2")	49-61
φ15.88 (5/8")	68-82
φ19.05 (3/4")	100-130

Do not hold the valve cap area with a spanner.

Use a torque wrench

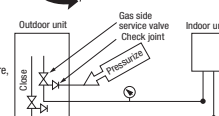


CAUTION

- Do not apply force beyond proper fastening torque in tightening the flare nut.
- For both liquid and gas service valves at the valve main bodies as illustrated on the right, and then fasten them, applying appropriate fastening torque.
- Do not apply refrigerating machine oil to the flared surface. It can cause refrigerant leakage.

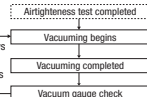
6) Air tightness test

- ① 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 through the service valve's check joint equipped on the outdoor unit side. While conducting a test, keep the service valve shut all the time.
 - a) Raise the pressure to 0.5 MPa, and then stop. Leave it for five minutes to see if the pressure drops.
 - b) Then raise the pressure to 1.5 MPa, and stop. Leave it for five more minutes to see if the pressure drops.
 - c) Then raise the pressure to the specified level (4.15 MPa), and record the ambient temperature and the pressure.
 - d) 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.
 - e) If a pressure drop is observed in checking a) 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.
- ② 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.



7) 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.
- Run the vacuum pump for at least one hour after the vacuum gauge shows -101kPa or lower. (-755mmHg or lower)
- Confirm that the vacuum gauge indicator does not rise even if the system is left for one hour or more.



Pay attention to the following points in addition to the above for the R32 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, R410A etc.)
- Use a counterflow prevention adapter to prevent vacuum pump oil from entering the refrigerant system.

8) Additional refrigerant charge

- (1) Determine if the factory refrigerant charge of the outdoor unit is sufficient to cover the total liquid piping length.

Item	Capacity	Factory refrigerant charge (kg)	Liquid piping length covered with factory refrigerant charge (m)
200V	4.3		30
250V	5.1		
280V	5.6		

- (2) If the factory charge does not cover the total liquid piping length, an addition of refrigerant is necessary.

Step1 - Calculate the total equivalent length, Le:

Formula to calculate equivalent length (Le)

In case of new piping	Le = (length of φ12.7) + 0.52 × (length of φ9.52)
In case of existing piping	Le = (length of φ12.7) + 0.52 × (length of φ9.52) + 1.56 × (length of φ15.88)

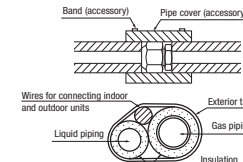
- (3) Charging refrigerant

- 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. Do not use a vacuum gauge to check the amount of refrigerant. If you do 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 a required amount can be charged 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 Put down the refrigerant volume calculated from the pipe length onto the label attached on the back side of the service panel.

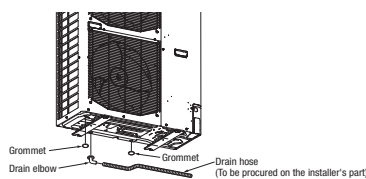
9) Heating and condensation prevention

- (1) Dress refrigerant pipes (both gas and liquid pipes) for heat insulation and prevention of dew condensation.
- (2) 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/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 cable 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%.

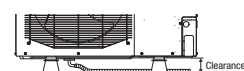


3. DRAIN PIPING WORK

- Executes 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.
- Water may drip where there is a larger amount of drain water. Seal around the drain elbow and drain grommets with putty or adequate caulking material.
- Condensed water may flow out from vicinity of service valve or connected pipes.
- Where you are likely to have several days of sub-zero temperatures in a row, do not use a drain elbow and drain grommets. (There is a risk of drain water freezing inside and blocking the drain.)
- 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.



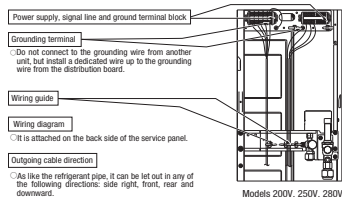
- When condensed water needs to be led to a drain, etc., install the unit on a flat base (supplied separately as an optional part) or concrete blocks. Then, please secure space for the drain elbow and the drain hose.



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

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.

- Do not use any supply cord lighter than one specified in parentheses for each type below.
 - braided cord (code designation 60245 IEC 51),
 - ordinary tough rubber sheathed cord (code designation 60245 IEC 53)
 - flat twin tinsel cord (code designation 60227 IEC 41);
- Do not use anything lighter than polychloroprene sheathed flexible cord (code designation 60245 IEC57) for supply cords of parts of appliances for outdoor use.
- 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.
- The installation of an impulse withstanding type earth leakage breaker is necessary. A failure to install an earth leakage breaker can result in an accident such as an electric shock or a fire.
- Do not turn on the power until the electrical work is completed.



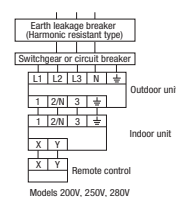
- Do not use a condensive capacitor for power factor improvement under any circumstances. (It does not improve power factor, while it can cause an abnormal overheating accident)
- For power supply cables, use conduits.
- Do not lay electronic control cables (remote control and signaling wires) and other 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 they 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.)
- Always use a three-core cable for an indoor-outdoor connecting cable. Never use a shield cable. Separate grounding wire from indoor / outdoor connecting wire.
- Connect a pair bearing a common terminal number with an indoor-outdoor connecting wire.
- In connecting, fasten cables securely with cable clamps 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.

CAUTION

Always use an earth leakage circuit breaker designed for inverter circuits to prevent a faulty operation.



5.4 Method for connecting the accessory pipe

Models FDC200VSA-W, 250VSA-W, 280VSA-W

PSC012D028H 

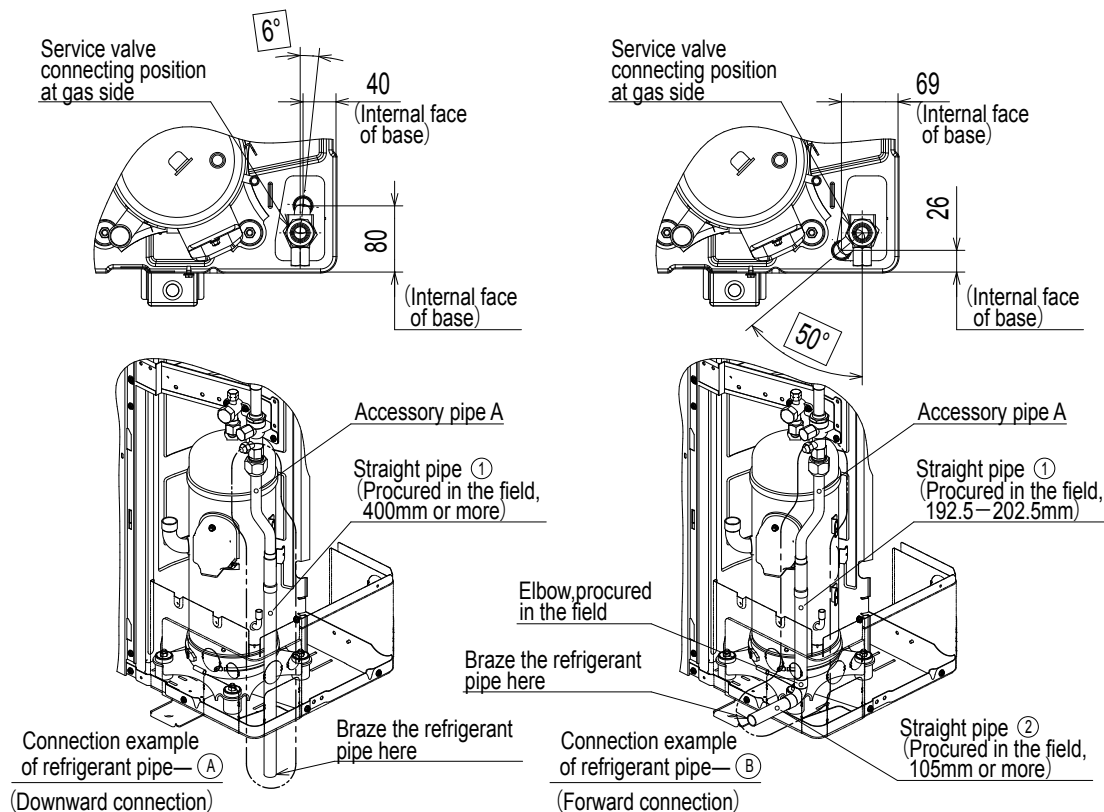
- Be sure to use the accessory pipe to connect the service valve on the gas side with the field pipe.
- Be sure to use the straight pipe (Procured at the field) shown in the table 1 applicable to the model of outdoor unit.
- When tightening the flare, connect the pipe securely by pressing the flared face of pipe against the service valve.
- When brazing between the pipe in place and the attached pipe, confirm that no excessive force is applied to the flare joint. Otherwise gas could leak from the flare joint.
- Connect the attached pipe according to the following steps ① – ⑤.
 - ① Referring to Table 2 and Table 3, prepare the straight pipe and the elbow in the field, which are used in the construction examples (A) – (D) applicable to the connecting direction.
 - ② Firstly, use the accessory pipe to assemble the connecting pipe assembly outside the outdoor unit. (As shown in the figure of connecting examples (A) – (D).)
 - ③ After assembling the connecting pipe, connect it to the service valve on the gas side inside the outdoor unit. Tighten the flare nut with appropriate torque.

Proper torque	
φ 19.05	100–130N•m

- ④ After connection of the connecting pipe assembly to the service valve on the gas side, braze the connecting pipe assembly and the field pipe.
- ⑤ When connecting pipe contacts wiring, attach heat insulating material to the pipe in order to prevent from contacting of the pipe and wiring. (If the wiring is rubbed with the pipe and the cover of wiring is teared, there is a risk of a short circuit or an electric shock.)

[Connection example (A) – (D) applicable to the connecting direction.]

- The piping angle shown below is an example in case of 15mm of heat insulating material. Adjust an angle, according to the thickness of heat insulating material. Pass the connecting pipe in a hole after angle adjustment.



About brazing

- Be sure to braze while supplying nitrogen gas.
If no nitrogen gas is supplied, a large amount of impurity (oxidized film) will be generated, which may clog the capillary tube and the expansion valve, resulting in fatal malfunction.

Table 1 Pipe specification

		Refrigerant line (one way) length(m)	
Single type	200V	≤35(m)	φ 22.22 x t1.0
	250V	≤70(m)	φ 25.4 x t1.0 or φ 28.58 x t1.0
	280V	≤35(m)	φ 22.22 x t1.0
		≤60(m)	φ 25.4 x t1.0 or φ 28.58 x t1.0

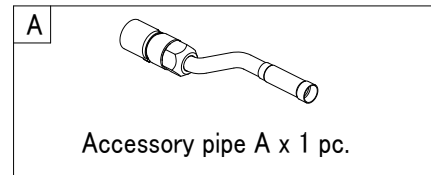
- Be sure to use pipes of 1/2H material, and wall thickness above 1mm. (Pressure resistance of O-type pipe is not enough.)

Table 2 Parts used for the connecting pipe assembly

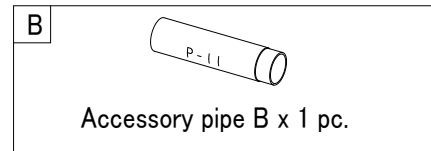
No.	Name	Quantity	Remark
1	Accessory pipe A	1	Accessory
2	Straight pipe ①	1	Procured at the field
3	Straight pipe ②	1 or 0	Procured at the field (Not required for downward direction)
4	Elbow	1 or 0	Procured at the field (Not required for downward direction)

Table 3 Length and specification of straight pipe (Procured in the field)

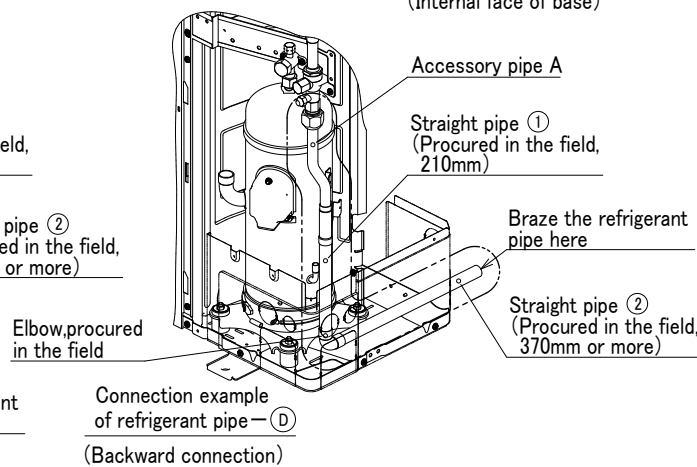
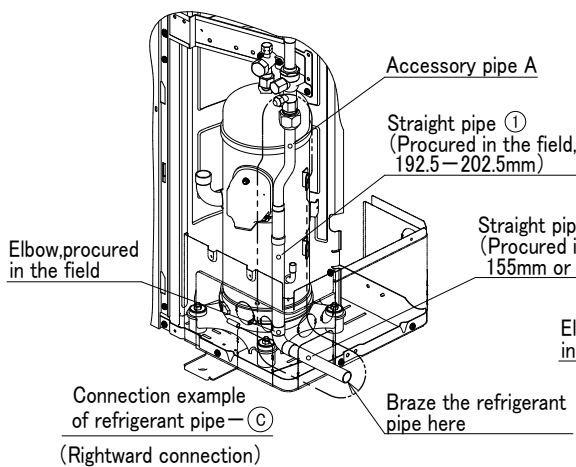
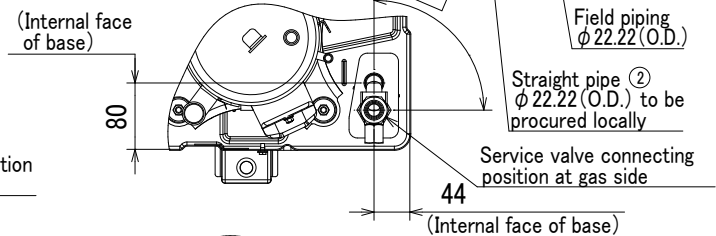
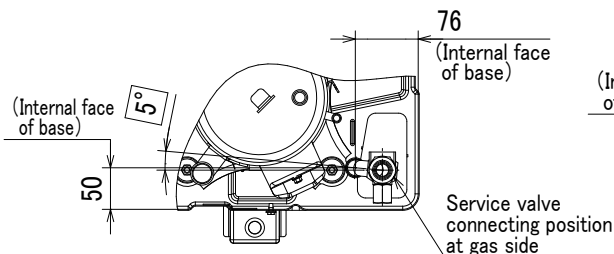
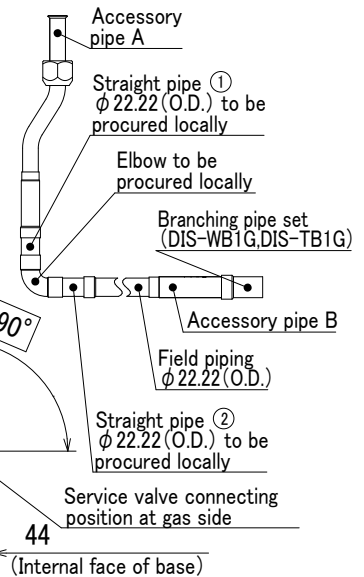
	Ⓐ Downward	Ⓑ Forward	Ⓒ Rightward	Ⓓ Backward
Straight pipe ①	400mm or more	192.5—202.5mm	192.5—202.5mm	210mm
Straight pipe ②	-	105mm or more	155mm or more	370mm or more




Heat insulating material is attached to the accessory pipe with band. When installing the heat insulating material, cut the band and retrieve it.



- Branching pipe set can be used by using the accessory pipe B. When φ 22.22 (O.D.) size of the indoor unit gas pipe is used, the accessory pipe B is unnecessary.



5.5 Instructions for branching pipe set (DIS-WA1G, WB1G, TA1G, TB1G)

PSB012D865 

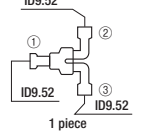
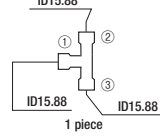

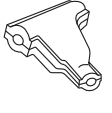
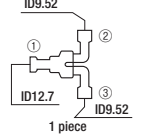
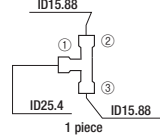


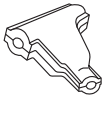
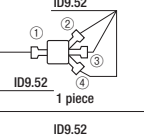
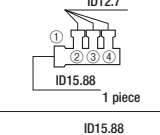


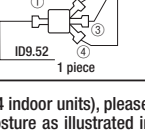
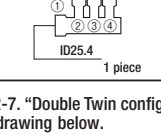





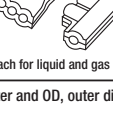
WARNING / CAUTION

- This set is for R410A and R32 refrigerant.
- Select a branching pipe set correctly rated for the combined total capacity of connected indoor units and install it according to this manual. An improperly installed branching pipe set can cause degraded performance or an abnormal unit stop.
- Provide good heat insulation to the pipes by following instructions contained in this manual.
- Improper heat insulation can result in degraded performance or a water leak accident from condensation.
- Please make sure that only parts supplied as accessories or the manufacturer's approved parts are used in installing the unit, because a leak of refrigerant can result in a lack-of-oxygen accident, if it reaches a concentration beyond the tolerable limit.

This manual explains how to use a branching pipe set that is indispensable in connecting pipes for a twin/triple/double-twin configuration installation (system). For the details of piping work, unit installation work and electrical installation work, please refer to the installation manuals and installation guides supplied with your outdoor and indoor units.

1. Branching pipe set specifications

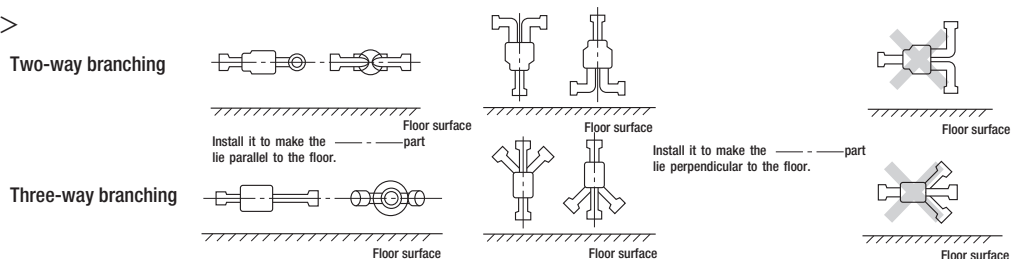
- (1) Please make sure that you have chosen the right branching pipe set and the specifications of the parts contained in it by checking with the table below.
- (2) Connect pipes as illustrated in the table below. The pipe from an outdoor unit must be brazed to the pipe connection port "①" and the pipes from indoor units to "②," "③" and "④."

Branching pipe set type	Supported outdoor/indoor unit combinations		Part lists			
	Outdoor unit model	Indoor unit model	Branching pipe set for a liquid pipe	Branching pipe set for a gas pipe	Different diameter pipe joint	Heat insulation material
DIS-WA1G (Two-way branching set)	3HP	1.5HP + 1.5HP			Joint A  2 pieces Flare joint (for indoor unit side connection)	
	4HP	2HP + 2HP				
		1.5HP + 2.5HP				
	5HP	2.5HP + 2.5HP				
6HP	2HP + 3HP					
	3HP + 3HP					
DIS-WB1G (Two-way branching set)	8HP	4HP + 4HP			Joint C  1 piece OD12.7  ID9.52	
		3HP + 5HP				
DIS-TA1G (Three-way branching set)	6HP	5HP + 5HP			Joint A  3 pieces Flare joint (for indoor unit side connection)	
		6HP + 6HP				
DIS-TB1G (Three-way branching set)	8HP	3HP + 3HP + 3HP			Joint A  2 pieces Flare joint (for indoor unit side connection) Joint B  1 piece ID12.7  Joint D  1 piece ID12.7  OD9.52	

- (3) To connect pipes for a Double Twin installation (involving 4 indoor units), please see 2-7. "Double Twin configuration."
- (4) A branching pipe set must always be installed into the posture as illustrated in the drawing below.

ID stands for inner diameter and OD, outer diameter.

< Posture to install into >

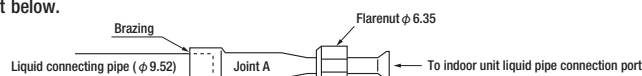


2. Pipe connecting procedure

Braze the different diameter pipe joint found in the set matching the connected outdoor and indoor unit capacities according to the instructions set out below.

CAUTION

In connecting an indoor unit of which capacity is 1.5HP, 2HP or 2.5HP, always use a $\phi 9.52$ liquid pipe to connect to the branching pipe (branching pipe - indoor unit).
 In connecting to an indoor unit (liquid pipe side: $\phi 6.35$), use the different diameter pipe joint A supplied with the set and follow the procedure set out below.



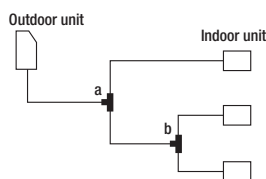
2-1 DIS-WA1G

Supported combinations		Liquid branching pipe	Gas branching pipe
Outdoor unit model	Indoor unit model		
3HP	1.5HP + 1.5HP		
4HP	2HP + 2HP		
	1.5HP + 2.5HP		
5HP	2.5HP + 2.5HP		
	2HP + 3HP		
6HP	3HP + 3HP		
	2HP + 4HP		

Note When connect the indoor unit of an old model that is shown in the model list, use the joint supplied with the branch piping set like *A

2-5. Triple type for same model/same capacity or different model/same capacity

When the difference in length of pipes after the branch is longer than 3m and shorter than 10m



Outdoor unit model	Indoor unit model	Branching pipe	Branching pipe set type	Liquid branching pipe	Gas branching pipe
6HP	2HP + 2HP + 2HP	a	DIS-WA1G		
8HP	3HP + 3HP + 3HP	a	DIS-WB1G		

2-2 DIS-WB1G

Supported combinations		Liquid branching pipe	Gas branching pipe
Outdoor unit model	Indoor unit model		
8HP	3HP + 5HP		
	4HP + 4HP		
10HP 12HP	5HP + 5HP		
	6HP + 6HP		

2-3 DIS-TA1G

Applicable to the difference in length of pipes after the branch being less than 3m
* Connection is not allowed when the difference in length of pipes is larger than 3m.

Supported combinations		Liquid branching pipe	Gas branching pipe
Outdoor unit model	Indoor unit model		
6HP	2HP + 2HP + 2HP		

2-4 DIS-TB1G

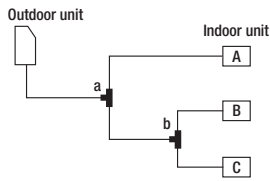
Applicable to the difference in length of pipes after the branch being less than 3m
* Connection is not allowed when the difference in length of pipes is larger than 3m.

Supported combinations		Liquid branching pipe	Gas branching pipe
Outdoor unit model	Indoor unit model		
8HP	3HP + 3HP + 3HP		

2-6. Triple type for same model/different capacity or different model/different capacity

Applicable to the difference in length of pipes after the branch being less than 3m

* Connection is not allowed when the difference in length of pipes is larger than 3m.



Connecting position

Outdoor unit model	Indoor unit model	A	B	C
10HP	2.5HP+2.5HP+5HP	5HP	2.5HP	2.5HP
	3HP+3HP+4HP	4HP	3HP	3HP
12HP	3HP+3HP+6HP	6HP	3HP	3HP

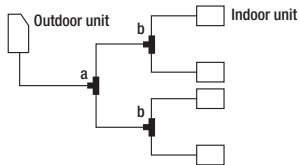
Outdoor unit model	Indoor unit model	Branching pipe	Branching pipe set type	Liquid branching pipe	Gas branching pipe
10HP 12HP	2.5HP+2.5HP+5HP 3HP+3HP+6HP	a	DIS-WB1G		
		b	DIS-WA1G		
10HP	3HP+3HP+4HP	a	DIS-WB1G		
		b	DIS-WA1G		

Note When connect the indoor unit of an old model that is shown in the model list, use the joint supplied with the branch piping set like ※ A.

2-7. Double twin type

Pipes should be connected as follows for a double twin installation (4 connected indoor units. The capacity of an outdoor unit available for this configuration is either 8HP or 10HP only):

Outdoor unit capacity	Indoor unit capacity
8HP	2HP × 4 units
10HP	2.5HP × 4 units
12HP	3HP × 4 units

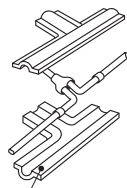


Branching pipe	Branching pipe set type	Outdoor unit model	Liquid branching pipe	Gas branching pipe
a	DIS-WB1G	8HP		
		10HP 12HP		
b	DIS-WA1G	8HP		
		10HP 12HP		

Note When connect the indoor unit of an old model that is shown in the model list, use the joint supplied with the branch piping set like ※ A.

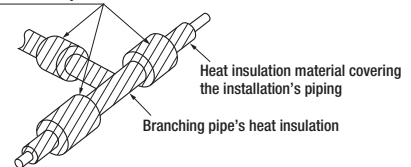
3. Heat insulation work

- (1) Condensation can also occur on liquid pipes with this model. Please provide good heat insulation to both liquid and gas pipes.
- (2) For the heat insulation of a branching pipe, always use the heat insulation material supplied with the set and provide heat insulation according to the instructions set out below.



1. It has an adhesive layer on the entire inner face. Remove a separator and wrap it around the branching pipe.

Heat insulation material (for pipe insulation, etc.) to be procured locally



2. Apply a heat insulation material (to be procured locally) to the joint between the branching pipe's heat insulation and the heat insulation material covering the installation's piping as described above and wrap a tape over the gap shown as a hatched (///) area to complete dressing of the piping.