

# MHI

## TECHNICAL MANUAL

### **VRF INVERTER MULTI-SYSTEM AIR CONDITIONERS** Alternative refrigerant R410A use models

## **High Head Models (90m) Heat pump type** (OUTDOOR UNIT)

- **Single use (Used also for combination)**  
FDCH335KXE6-K※, 400KXE6, 450KXE6, 504KXE6, 560KXE6, 560KXE6-K※,  
615KXE6, 680KXE6  
※FDCH335KXE6-K&FDCH560KXE6-K are only used for combining with other models.
- **Combination use**  
FDCH735KXE6, 800KXE6, 850KXE6, 900KXE6, 960KXE6, 1010KXE6,  
1065KXE6, 1130KXE6, 1180KXE6, 1235KXE6, 1300KXE6, 1360KXE6

In this Technical Manual, the High Head Models of outdoor units only are shown. Regarding the standard models please see the Manual No.'09•KX-DB-127, No.'10•KX-DB-144 (Data Book) and Manual No.'09•KX-SM-128 (Service Manual)

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# 1 GENERAL INFORMATION

## 1.1 Specific features

### (1) The R410A refrigerant is used.

The refrigerant R410A with zero coefficient of ozone destruction is used in order to reduce the CO<sub>2</sub> discharge volume R410A is a pseudo-azeotropic refrigerant which has characteristics of slight temperature slide due to a little change in consistency under the mixed phase of gas and liquid, but additional charging of this refrigerant on site is possible.

### (2) Height difference up to 90m is available.

Maximum allowable height difference between the outdoor unit and the indoor unit in a position of the lowest is extend from 50m to 90m.<sup>(1)</sup> (When the outdoor unit is located in a position above the indoor units)

**Note (1) In case of less than 50m, the standard models are applied.**

### (3) Connectable indoor capacity

The limitations of connectable indoor capacity and connectable number of indoor unit can follow the tables mentioned below.

### (4) Connectable indoor capacity.

#### (a) Capacity from 50% to 150% is possible.

Model \ Item	Number of connectable	Connectable capacity <sup>(2)</sup>
FDCH400KXE6	1 to 27 units	200 ~ 600
FDCH450KXE6	1 to 30 units	225 ~ 675

Note (2) In case that the indoor unit types to be connected are FDK, FDFL, FDFU or FDFW series, the maximum connectable indoor capacity will be 130% or less.

(3) According to the total piping length, the maximum connectable indoor capacity will decrease much more as shown in Page 39.

#### (b) Capacity from 50% to 140% is possible.

Model \ Item	Number of connectable	Connectable capacity <sup>(2)</sup>
FDCH504KXE6	1 to 32 units	252 ~ 706
FDCH560KXE6	1 to 35 units	280 ~ 784
FDCH615KXE6	2 to 39 units	308 ~ 861
FDCH680KXE6	2 to 43 units	340 ~ 952
FDCH735KXE6	2 to 46 units	368 ~ 1029
FDCH800KXE6	2 to 50 units	400 ~ 1120
FDCH850KXE6	2 to 54 units	425 ~ 1190
FDCH900KXE6	2 to 57 units	450 ~ 1260
FDCH960KXE6	2 to 61 units	477 ~ 1344

Note (2) In case that the indoor unit types to be connected are FDK, FDFL, FDFU or FDFW series, the maximum connectable indoor capacity will be 130% or less.

(3) According to the total piping length, the maximum connectable indoor capacity will decrease much more as shown in Page 39.

#### (c) Capacity from 50% to 130% is possible.

Model \ Item	Number of connectable	Connectable capacity
FDCH1010KXE6	2 to 59 units	504 ~ 1311
FDCH1065KXE6	2 to 62 units	532 ~ 1384
FDCH1130KXE6	2 to 66 units	560 ~ 1456
FDCH1180KXE6	3 to 69 units	588 ~ 1528
FDCH1235KXE6	3 to 72 units	615 ~ 1599
FDCH1300KXE6	3 to 76 units	650 ~ 1690
FDCH1360KXE6	3 to 80 units	680 ~ 1768

Note (2) In case that the indoor unit types to be connected are FDK, FDFL, FDFU or FDFW series, the maximum connectable indoor capacity will be 130% or less.

(3) According to the total piping length, the maximum connectable indoor capacity will decrease much more as shown in Page 39.

## 1.5 Outdoor units combination table

The limitations of connectable indoor capacity and connectable number of indoor unit can follow the tables mentioned below.

(a) Models FDCH735, 800, 850, 900KXE6

Item Models	Combination outdoor unit models				Indoor unit	
	FDCH335 KXE6-K	FDCH400 KXE6	FDCH450 KXE6	FDCH504 KXE6	Connectable <sup>(1)</sup> capacity	Number of connectable units
FDCH735KXE6	1	1	—	—	368 ~ 1029	2 to 46 unit
FDCH800KXE6	—	2	—	—	400 ~ 1120	2 to 50 unit
FDCH850KXE6	—	1	1	—	425 ~ 1190	2 to 54 unit
FDCH900KXE6	—	—	2	—	450 ~ 1260	2 to 57 unit
FDCH960KXE6	—	—	1	1	477 ~ 1344	2 to 61 unit

Note (1) When connecting the indoor unit type FDK, FDFL, FDFU or FDFW Series, limit the connectable capacity not higher than 130%.

(b) Models FDCH960, 1010, 1065, 1130, 1180, 1235, 1300, 1360KXE6

Item Models	Combination outdoor unit models					Indoor unit	
	FDCH504 KXE6	FDCH560 KXE6	FDCH560 KXE6-K	FDCH615 KXE6	FDCH680 KXE6	Connectable capacity	Number of connectable units
FDCH1010KXE6	2	—	—	—	—	504 ~ 1311	2 to 59 unit
FDCH1065KXE6	1	1	—	—	—	532 ~ 1384	2 to 62 unit
FDCH1130KXE6	—	2	—	—	—	560 ~ 1456	2 to 66 unit
FDCH1180KXE6	—	—	1	1	—	588 ~ 1528	3 to 69 unit
FDCH1235KXE6	—	—	—	2	—	615 ~ 1599	3 to 72 unit
FDCH1300KXE6	—	—	—	1	1	650 ~ 1690	3 to 76 unit
FDCH1360KXE6	—	—	—	—	2	680 ~ 1768	3 to 80 unit

(c) Outdoor unit side branch pipe set (Option)

Outdoor unit	Branch pipe set
For two units (for FDCH 735KXE6 ~ 1360KXE6)	DOS-2A-1

Note (1) Be sure to use this when combining units.

(d) Branch pipe set (Option)

Total capacity downstream	Branching pipe set
Less than 180	DIS-22-1
180 or more but less than 371	DIS-180-1
371 or more but less than 540	DIS-371-1
540 or more	DIS-540-2

(e) Header pipe set (Option)

Total capacity downstream	Header set model type	Number of branches
Less than 180	HEAD4-22-1	4 branches at the most
180 or more but less than 371	HEAD6-180-1	6 branches at the most
371 or more but less than 540	HEAD8-371-1	8 branches at the most
540 or more	HEAD8-540-2	8 branches at the most

Note (1) Indoor units 224 and 280 can not be connected to the header.



## 4 RANGE OF USAGE & LIMITATIONS

### • Single use (also for combined use)

System		FDCH400KXE6	FDCH450KXE6	FDCH504KXE6
Item				
Indoor air temperature (Upper, lower limits)		Refer to page 17		
Outdoor air temperature (Upper, lower limits)				
Indoor units that can be used in combination	Number of connected units	1 to 27 unit	1 to 30 unit	1 to 32 unit
	Connectable capacity <sup>(1)</sup>	200 ~ 600	225 ~ 675	252 ~ 706
Total piping length <sup>(2)</sup>		1000m or less <sup>(5)</sup>		
Main pipe length		130m or less		
Single direction piping length		Actual length : 160m or less, Equivalent length : 185m or less		
Allowable pipe length from the first branching		90m or less <sup>(6)</sup> (However, difference between the longest and shortest piping : 40m or less)		
Elevation difference between the first branching point and the indoor unit		15m or less		
Difference in height between indoor and outdoor units	Outdoor unit is higher	50 ~ 90m <sup>(3)</sup>		
	Outdoor unit is lower	Prohibited activity		
Difference in the elevation of indoor units in a system		15m or less		
Indoor unit atmosphere (behind ceiling) temperature and humidity (Only models FDT, FDTC, FDTW, FDTS, FDTQ, FDU, FDUM, FDUH)		Dew point temperature 28 °C or less, relative humidity 80% or less (FDE, FDK, FDFL, FDFU : Dew point temperature 23 °C or less, relative humidity 80% or less)		
Compressor stop/start frequency	1 cycle time	6 min or more (3 minutes or more from start to stop or 3 minutes or more from stop to start)		
	Stop time	3 min or more		
Power source voltage	Voltage fluctuation	Within ±10% of rated voltage		
	Voltage drop during start	Within ±15% of rated voltage		
	Phase unbalance	Within ±3% of rated voltage		

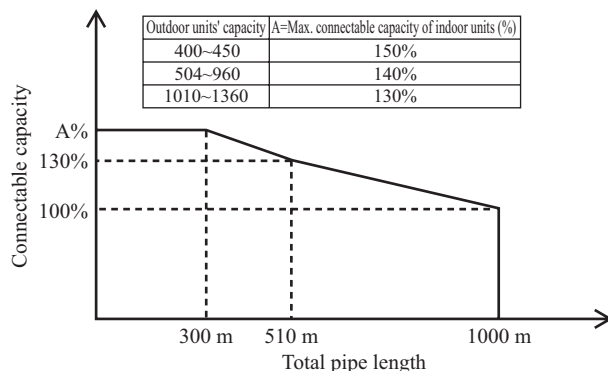
Note (1) When connecting the indoor unit type FDK, FDFL, FDFU or FDFW Series, limit the connectable capacity not higher than 130%.

(2) When the pipe extension length exceeds 510 m, additional refrigerant oil must be charged (1,000 cc).

(3) In case of less 50m, the standard models are applied.

(4) If superlink I (previous superlink) is selected all of new functions for KX6 such as automatic address setting function for multiple refrigerant systems and etc. will be cancelled.

(5) Total pipe length ... Select the total pipe length depending on the connectable capacity of indoor units so that it will fall within the following range.



(6) On indoor units with the capacity of 112 or higher, however, enlarge the size of gas pipe for 40 m or higher to 1. For details refer to Page 40, 4-1 (3) (d) indoor unit side branching pipe - indoor unit.

112, 140, 160 :  $\phi 15.88 \rightarrow \phi 19.05$

224 :  $\phi 19.05 \rightarrow \phi 22.22$

280 :  $\phi 22.22 \rightarrow \phi 25.4$

System		FDCH560KXE6	FDCH615KXE6	FDCH680KXE6
Indoor air temperature (Upper, lower limits)		Refer to page 17		
Outdoor air temperature (Upper, lower limits)				
Indoor units that can be used in combination	Number of connected units	1 to 35 unit	2 to 39 unit	2 to 43 unit
	Connectable capacity <sup>(1)</sup>	280 ~ 784	308 ~ 861	340 ~ 952
Total piping length <sup>(2)</sup>		1000m or less <sup>(5)</sup>		
Main pipe length		130m or less		
Single direction piping length		Actual length : 160m or less, Eguivalent length : 185m or less		
Allowable pipe length from the first branching		90m or less <sup>(6)</sup> (However, difference between the longest and shortest piping : 40m or less)		
Elevation difference between the first branching point and the indoor unit		15m or less		
Difference in height between indoor and outdoor units	Outdoor unit is higher	50~90m <sup>(3)</sup>		
	Outdoor unit is lower	Prohibited activity		
Difference in the elevation of indoor units in a system		15m or less		
Indoor unit atmosphere (behind ceiling) temperature and humidity (Only models FDT, FDTC, FDTW, FDTs, FDTQ, ) (FDU, FDUM, FDUH		Dew point temperature 28 ℃ or less, relative humidity 80% or less (FDE, FDK, FDFL, FDFU : Dew point temperature 23℃ or less, relative humidity 80% or less)		
Compressor stop/start frequency	1 cycle time	6 min or more (3 minutes or more from start to stop or 3 minutes or more from stop to start)		
	Stop time	3 min or more		
Power source voltage	Voltage fluctuation	Within ±10% of rated voltage		
	Voltage drop during start	Within ±15% of rated voltage		
	Phase unbalance	Within ±3% of rated voltage		

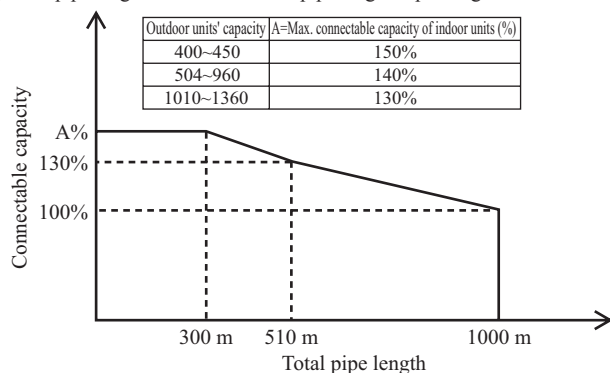
Note (1) When connecting the indoor unit type FDK, FDFL, FDFU or FDFW Series, limit the connectable capacity not higher than 130%.

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(3) In case of less 50m, the standard models are applied.

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(5) Total pipe length ... Select the total pipe length depending on the connectable capacity of indoor units so that it will fall within the following range.



(6) On indoor units with the capacity of 112 or higher, however, enlarge the size of gas pipe for 40 m or higher to 1. For details refer to Page 40, 4-1 (3) (d) indoor unit side branching pipe - indoor unit.

112, 140, 160 :  $\phi 15.88 \rightarrow \phi 19.05$

224 :  $\phi 19.05 \rightarrow \phi 22.22$

280 :  $\phi 22.22 \rightarrow \phi 25.4$

## • Combination use

System		FDCH735KXE6	FDCH800KXE6	FDCH850KXE6	FDCH900KXE6	FDCH960KXE6
Item	Indoor air temperature (Upper, lower limits)	Refer to page 17				
	Outdoor air temperature (Upper, lower limits)					
Indoor units that can be used in combination	Number of connected units	2 to 46 units	2 to 50 units	2 to 54 units	2 to 57 units	2 to 61 units
	Connectable capacity <sup>(1)</sup>	368 ~ 1029	400 ~ 1120	425 ~ 1190	450 ~ 1260	477 ~ 1344
Total piping length <sup>(2)</sup>		1000m or less <sup>(5)</sup>				
Single direction piping length		Actual length : 160m or less, Equival length : 185m or less				
Main pipe length		130m or less				
Allowable pipe length from the first branching		90m or less <sup>(6)</sup> (However, difference between the longest and shortest piping : 40m or less)				
Elevation difference between the first branching point and the indoor unit		15m or less				
Difference in height between indoor and outdoor units	Outdoor unit is higher	50~90m <sup>(3)</sup>				
	Outdoor unit is lower	Prohibited activity				
Difference in the elevation of indoor units in a system		15m or less				
Difference in height between outdoor units (Same system)		MAX. 0.4m				
Difference between an outdoor unit and on outdoor unit side branch pipe		MAX. 5m				
Length of oil equalization piping		MAX. 10m				
Indoor unit atmosphere (behind ceiling) temperature and humidity Only models FDT, FDTC, FDTW, FDTS, FDTQ, FDU, FDUM, FDUH		Dew point temperature 28 °C or less, relative humidity 80% or less (FDE, FDK, FDFL, FDFU : Dew point temperature 23°C or less, relative humidity 80% or less)				
Compressor stop/start frequency	1 cycle time	6 min or more (3 minutes or more from start to stop or 3 minutes or more from stop to start)				
	Stop time	3 min or more				
Power source voltage	Voltage fluctuation	Within ±10% of rated voltage				
	Voltage drop during start	Within ±15% of rated voltage				
	Phase unbalance	Within ±3% of rated voltage				

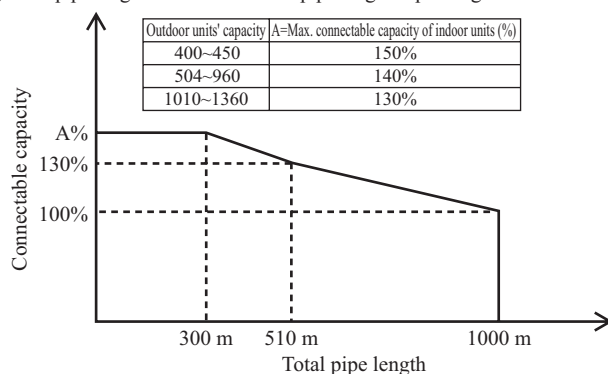
Note (1) When connecting the indoor unit type FDK, FDFL, FDFU or FDFW Series, limit the connectable capacity not higher than 130%.

(2) When the pipe extension length exceeds 510 m, additional refrigerant oil must be charged (1,000 cc).

(3) In case of less 50m, the standard models are applied.

(4) If superlink I (previous superlink) is selected all of new functions for KX6 such as automatic address setting function for multiple refrigerant systems and etc. will be cancelled.

(5) Total pipe length ... Select the total pipe length depending on the connectable capacity of indoor units so that it will fall within the following range.



(6) On indoor units with the capacity of 112 or higher, however, enlarge the size of gas pipe for 40 m or higher to 1. For details refer to Page 40, 4-1 (3) (d) indoor unit side branching pipe - indoor unit.

112, 140, 160 :  $\phi 15.88 \rightarrow \phi 19.05$

224 :  $\phi 19.05 \rightarrow \phi 22.22$

280 :  $\phi 22.22 \rightarrow \phi 25.4$

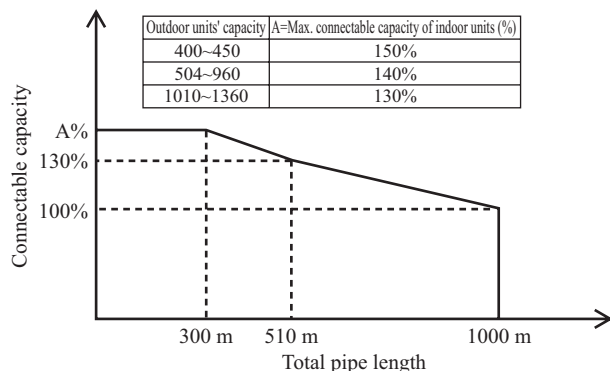
System		FDCH1010 KXE6	FDCH1065 KXE6	FDCH1130 KXE6	FDCH1180 KXE6	FDCH1235 KXE6	FDCH1300 KXE6	FDCH1360 KXE6
Indoor air temperature (Upper, lower limits)		Refer to page 17						
Outdoor air temperature (Upper, lower limits)								
Indoor units that can be used in combination	Number of connected units	2 to 59 units	2 to 62 units	2 to 66 units	3 to 69 units	3 to 72 units	3 to 76 units	3 to 80 units
	Connectable capacity	504 ~ 1311	532 ~ 1384	560 ~ 1456	588 ~ 1528	615 ~ 1599	650 ~ 1690	680 ~ 1768
Total piping length <sup>(1)</sup>		1000m or less <sup>(4)</sup>						
Single direction piping length		Actual length : 160m or less, Equival length : 185m or less						
Main pipe length		130m or less						
Allowable pipe length from the first branching		90m or less <sup>(5)</sup> (However, difference between the longest and shortest piping : 40m or less)						
Elevation difference between the first branching point and the indoor unit		15m or less						
Difference in height between indoor and outdoor units	Outdoor unit is higher	50~90m <sup>(2)</sup>						
	Outdoor unit is lower	Prohibited activity						
Difference in the elevation of indoor units in a system		15m or less						
Difference in height between outdoor units (Same system)		MAX. 0.4m						
Difference between an outdoor unit and on outdoor unit side branch pipe		MAX. 5m						
Length of oil equalization piping		MAX. 10m						
Indoor unit atmosphere (behind ceiling) temperature and humidity Only models FDT, FDTG, FDTW, FDTs, FDTQ, FDU, FDUM, FDUH		Dew point temperature 28 ℃ or less, relative humidity 80% or less (FDE, FDK, FDFL, FDFU : Dew point temperature 23 ℃ or less, relative humidity 80% or less)						
Compressor stop/start frequency	1 cycle time	6 min or more (3 minutes or more from start to stop or 3 minutes or more from stop to start)						
	Stop time	3 min or more						
Power source voltage	Voltage fluctuation	Within ±10% of rated voltage						
	Voltage drop during start	Within ±15% of rated voltage						
	Phase unbalance	Within ±3% of rated voltage						

Note (1) When the pipe extension length exceeds 510 m, additional refrigerant oil must be charged (1,000 cc).

(3) In case of less 50m, the standard models are applied.

(3) If superlink I (previous superlink) is selected all of new functions for KX6 such as automatic address setting function for multiple refrigerant systems and etc. will be cancelled.

(4) Total pipe length ... Select the total pipe length depending on the connectable capacity of indoor units so that it will fall within the following range.



(5) On indoor units with the capacity of 112 or higher, however, enlarge the size of gas pipe for 40 m or higher to 1. For details refer to Page 40, 4-1 (3) (d) indoor unit side branching pipe - indoor unit.

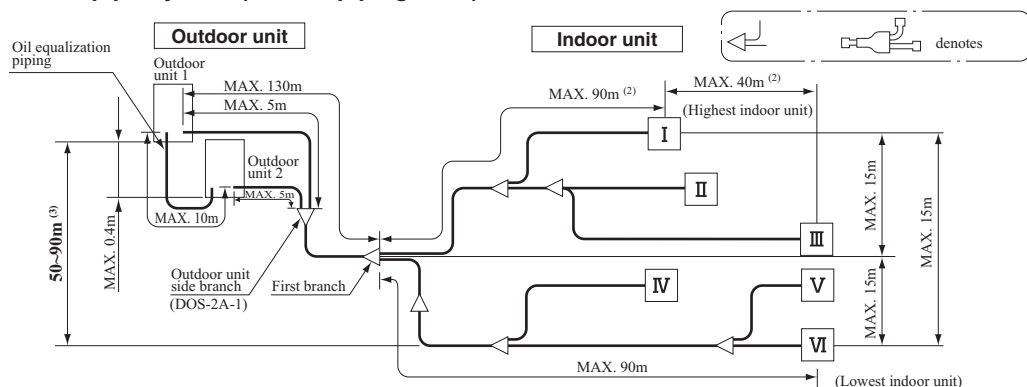
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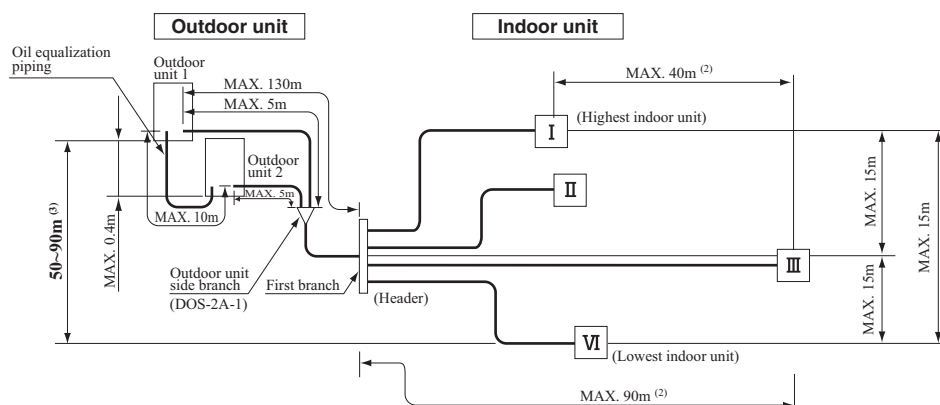
280 :  $\phi 22.22 \rightarrow \phi 25.4$

Allowable length of refrigerant piping, height difference between indoor and outdoor unit

### (1) Branch pipe System (Branch piping used)

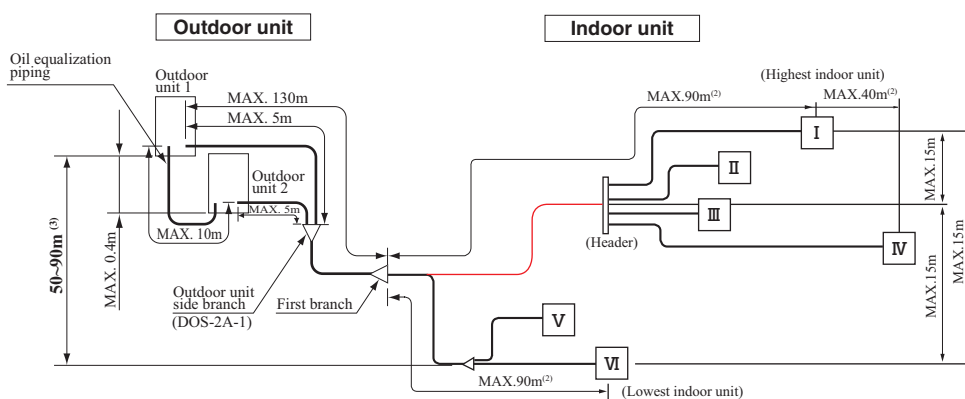


### (2) Header System (Header used)



Note (1) Indoor units 224 and 280 can not be connected to the header.

### (3) Mixed System (Branch piping and Header used)



Note (1) A branch piping system cannot be connected after a header system.

(2) 90m or less (However, difference between the longest and shortest piping : 40m or less)

(3) In case of less than 50m, the standard models are applied.

### Important

When the Additional refrigerant quantity for piping (P) is over the following table, please separate the refrigerant line.

Outdoor unit	P (kg)
735-1360	100

# MITSUBISHI HEAVY INDUSTRIES, LTD. MULTI AIR CONDITIONER OUTDOOR UNIT FOR BUILDINGS

## 6 KX SERIES INSTALLATION MANUAL

Designed for R410A refrigerant

PSB012D942L



Outdoor unit capacity  
FDCH400~1360

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

## Precautions for safety

- Read these "Precautions for safety" carefully before starting installation work and do it in the proper way.
- Safety instructions listed here are grouped into **Warnings** and **Cautions**. If a non-compliant installation method is likely to result in a serious consequence such as death or major injury, the instruction is grouped into **Warnings** to emphasize its importance. However, a failure to observe a safety instruction listed under **Cautions** can also result in a serious consequence depending on the circumstances. Please observe all these instructions, because they include important points concerning safety.
- The meanings of "Marks" used here are as shown on the right:
 

	<b>Never do it under any circumstances.</b>		<b>Always do it according to the instruction.</b>
--	---	--	---
- When you have completed installation work, perform a test run and make sure that the installation is working properly. Then, explain the customer how to operate and how to take care of the air-conditioner according to the user's manual. Please ask the customer to keep this installation manual together with the user's manual.
- This unit complies with EN61000-3-11.
- For outdoor unit, EN61000-3-2 and EN61000-3-12 are not applicable as consent by the utility company or notification to the utility company is given before usage.

### 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 according 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 open 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 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.
- In connecting the power cable, make sure that no anomalies such as dust deposits, socket clogging or wobble are found and insert the plug securely.  
Accumulation of dust, clogging on the socket, or looseness of plugging can cause electric shocks and fire.
- Be sure not to reuse existing refrigerant pipes.  
Conventional refrigerant oil or chlorine contained in the conventional refrigerant which is remaining in the existing refrigerant pipes can cause deterioration of refrigerant oil of new unit. And 1.6 times higher pressure of R410A refrigerant than conventional one can cause burst of existing pipe, personal injury or serious accident.
- 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.
- Do not put the drainage pipe directly into drainage channels where poisonous gases such as sulphide gas can occur.  
Poisonous gases will flow into the room through drainage pipe and seriously affect the user's health and safety. It can also cause the corrosion of the indoor unit and resultant unit failure or refrigerant leak.
- 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.
- 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.

### CAUTION

- Use the circuit breaker for all pole with correct capacity.  
Using the incorrect circuit breaker, it can cause the unit malfunction and fire.
- 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 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 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.
- 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 and fire due to short-circuiting. Never connect the grounding wire to a gas pipe because if gas leaks, it could cause explosion or ignition.
- 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 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
  - 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
  - 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 shut off the power supply immediately after stopping the operation.  
Wait at least 5 minutes, otherwise there is a risk of water leakage or breakdown.
- Do not control the system with main power switch.  
It can cause fire or water leakage. In addition, the fan can start unexpectedly, which can cause personal injury.
- 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 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. Please 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. BEFORE BEGINNING INSTALLATION (Check that the models, power supply specifications, piping, wiring are correct.)

**CAUTION**

- Please read this manual without fail before you set to installation work and carry it out according to this manual.
- For the installation of an indoor unit, please refer to the installation manual of an indoor unit.
- For piping work, optional distribution parts (branching pipe set, header set) are necessary. Please refer to our catalog, etc.
- Never fail to install an earth leakage breaker. (Please use one tolerable to harmonic components)
- Operating the unit with the outlet pipe thermistor, the inlet pipe thermistor, the pressure sensor, etc. removed can result in a compressor burnout. Avoid operation under such conditions in any circumstances.

**ACCESSORY**

Name	Quantity	Usage location	
Wiring 	2	In operating the unit in the silent mode or the forced cooling/heating mode, insert it to the outdoor unit board's CNG.	It is supplied with the unit. You can find it taped inside the control box.
Instruction manual	1	When the installation work is completed, give instructions to the customer and ask him/her to keep it.	Attached on the side panel below the operation valve.

**COMBINATION PATTERNS**

- The possible outdoor unit combinations and the number and the total capacity of indoor units that can be connected in a system are shown in the table below.
- Please always use indoor units designed exclusively for R410A. For connectable indoor unit model names, please check with our catalog, etc.
- It can be used in combination with the following indoor unit.

Indoor unit	Remote controller	Connection OK/NO
FD○△△KXE6	RC-E3(2 cores), RC-E4(2 cores)	OK
FD○A△△KXE4R, KXE4BR, KXE5R	RC-E1R(3 cores)	OK
FD○A△△KXE4, KXE4(A), KXE4A	RC-E1(3 cores)	NO

**Notabilia**

The same outdoor unit is used whether it is used alone or in combination with another unit.

- Model type differs on the unit with 560 capacity depending on whether the unit is used independently and with the combined capacity of 1065 or 1130, or with the combined capacity of 1180.  
(When the unit is used independently and with the combined capacity of 1065 or 1130, the model type is FDC560KXE6. When the unit is used with the combined capacity of 1180, the model type is FDC560KXE6-K.)
- Please note that an installation involving a combination other than those listed below is not operable. (For example, you cannot operate 560 and 680 in combination)
- There is restriction on the connectable capacity of indoor units depending on the total pipe length. For details, refer to 4-1, • Total pipe length.

Outdoor unit		Indoor unit	
Capacity	Combination patterns	Number of connectable units (units)	Range of the total capacity of indoor units connected in a system*
400	Single	1~27	200~600
450	Single	1~30	225~675
504	Single	1~32	252~706
560	Single	1~35	280~784
615	Single	2~39	308~861
680	Single	2~43	340~952
735	Combination (400+335-K)	2~46	368~1029
800	Combination (400+400)	2~50	400~1120
850	Combination (400+450)	2~54	425~1190
900	Combination (450+450)	2~57	450~1260
960	Combination (450+504)	2~61	477~1344
1010	Combination (504+504)	2~59	504~1311
1065	Combination (504+560)	2~62	532~1384
1130	Combination (560+560)	2~66	560~1456
1180	Combination (615+560-K)	3~69	588~1528
1235	Combination (615+615)	3~72	615~1599
1300	Combination (615+680)	3~76	650~1690
1360	Combination (680+680)	3~80	680~1768

**[Optional parts]**

Refrigerant distribution piping components supplied as optional parts will become necessary in installing the unit.

As refrigerant distribution piping components, branching pipe sets (model type: DOS) for the outdoor unit side piping, branching pipe sets (model type: DIS) and header sets (model type: HEAD) for the indoor unit side piping are available. Select according to the application. Please refer to "4. Refrigerant piping work" in selecting.

If you are uncertain, please do not hesitate to consult with your distributor or the manufacturer. Please use refrigerant branching sets and header sets designed exclusively for R410A without fail.

※ When connecting the indoor unit type FDK, FDFL or FDFU series, limit the connectable capacity not higher than 130%.

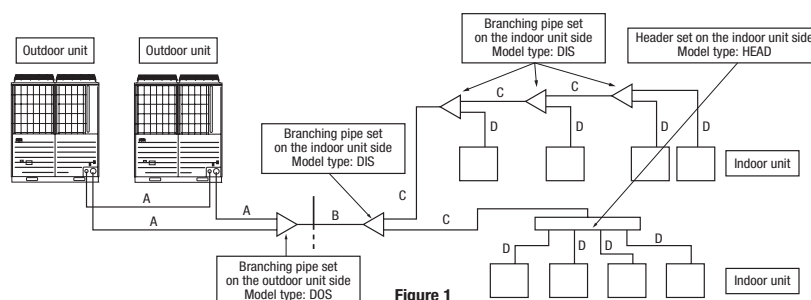
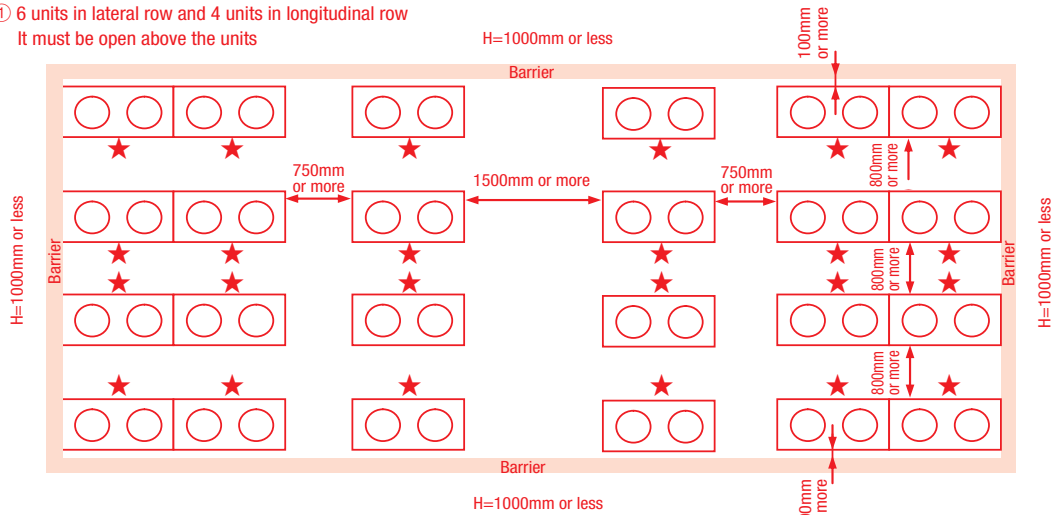


Figure 1

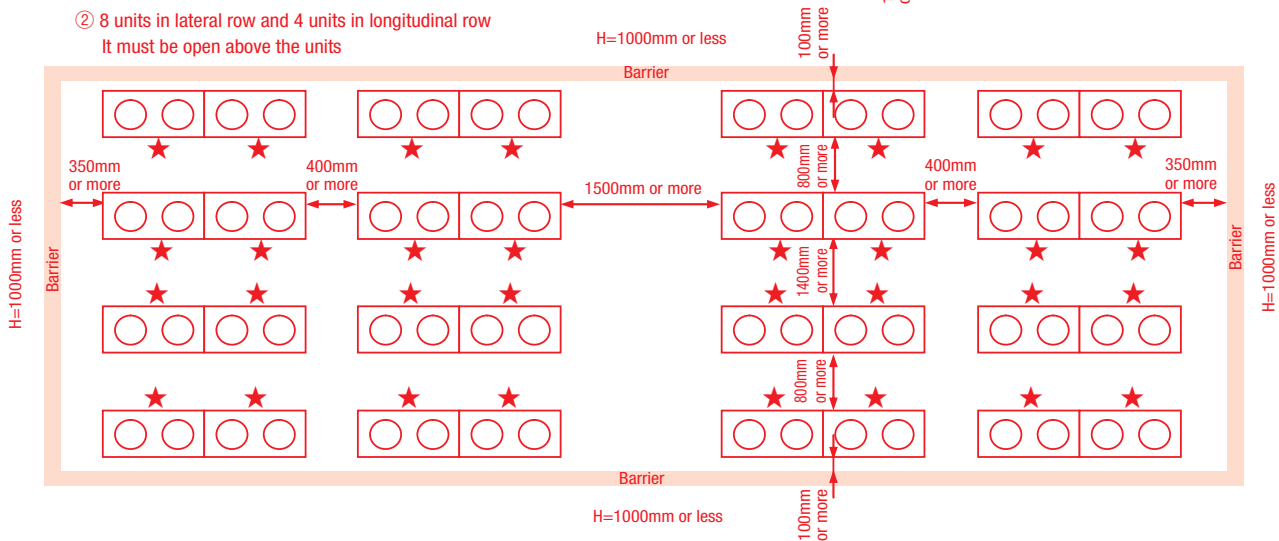


● Installation in lateral and longitudinal rows

- ① 6 units in lateral row and 4 units in longitudinal row  
It must be open above the units



- ② 8 units in lateral row and 4 units in longitudinal row  
It must be open above the units



### 3. Unit delivery and installation

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

#### 3-1. Delivery

- By defining a cartage path, carry in the entire package containing a unit to its installation point.
- In slinging a unit, use two canvas belts with plates, cloth pads or other protections applied to the unit to prevent damage.

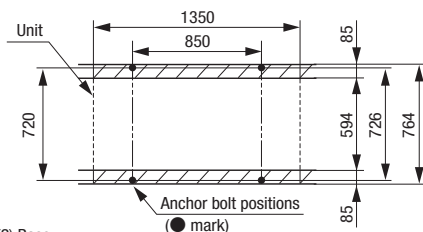
**Please note**

- Please do not fail to put belts through the rectangular holes of a unit's anchoring legs.
- Apply cloth pads between a canvas belt and a unit to prevent damage.

#### 3-2. Notabilia for installation

(1) Anchor bolt positions

- Use four anchor bolts (M10) to fix an outdoor unit's anchoring legs at all times. Ideally, an anchor bolt should protrude 20mm.

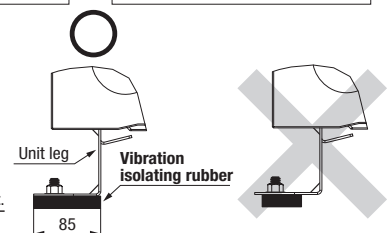
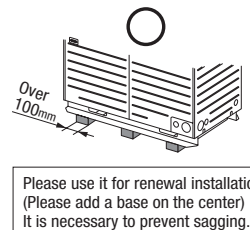
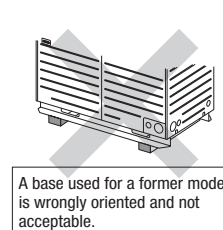
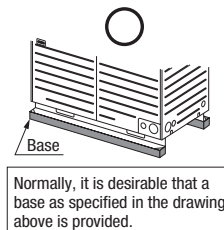
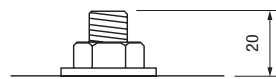


(2) Base

- Please install a unit after ascertaining that the bases have been made to sufficient strength and level to ensure the unit against vibration or noise generation.
- Please construct a base to the size of a shadowed area (the entire bottom area of an outdoor unit's anchoring leg) shown on the above drawing or larger.
- Please orient a base in the traversal direction (direction of W1350mm) of an outdoor unit as illustrated in the drawing above.
- A vibration isolating rubber must support an outdoor unit's anchoring leg by its entire bottom area.

**Please note**

- 1) Install a vibration isolating rubber in such a manner that the entire bottom area of an outdoor unit's anchoring leg will rest on it.
- 2) Do not install an outdoor unit in such a manner that a part of the bottom area of its anchoring leg is off a vibration isolating rubber.





## 2. INSTALLATION LOCATION (Obtain approval from the customer when selecting the installation area.)

### 2-1. Selecting the installation location

- Where the circulation air is not trapped.
- Where the foundation or mounting base to install the unit is enough firm.
- Where any object does not prevent inlet and outlet air flow.
- Where heat radiation from other heat source does not affect.
- Where strong winds will not blow against the air outlet port directly.
- Where electric noise is not subjected to rigid control.
- Where the drain water can be discharged safely.
- Where discharged hot air or the operation noise will not bother neighborhood.
- Where vibration or operation sound will not be transmitted to living space.  
(Avoid to install it on the building wall or near the bed room etc.)
- Where any equipments affected by high harmonics are not placed  
(Where no TV set or radio receiver is placed within the range of 5m)
- Where snow will not accumulate.

#### Please note

- (a) When installing multiple units, provide sufficient air intake space in order to avoid short-circuit of air. (Please refer to installation space example)
- (b) If there is a possibility to be short-circuit of air, please install an air flow deflector (optional part\*) at the air outlet port of outdoor unit.  
※ 1: Please prepare it locally. The dimension of optional part is mentioned in page 74.
- (c) In snowfall area, install the outdoor unit on a mounting base and fit a snow-hood (locally prepared) on the outdoor unit to prevent it from being buried in snow. (In snowfall area, collective drainage is prohibited)
- (d) Do not install the outdoor unit in area where combustible gases might leak.
- (e) Securely install the outdoor unit on a place where it is strong enough to support its weight.
- (f) Do not install the outdoor unit in special places listed below.

If you install it in such places, it may cause corrosion, damage or malfunction.

- Where corrosive gases (such as sulfurous acid gas etc.) will be emitted and accumulated.
- Where sulfurous gas, chloride gas, acid and alkaline will be emitted and accumulated.
- In ammonic atmosphere
- In salty atmosphere such as coastline
- Where oil mist is floating
- Where carbon fiber, metal powder or any powder is floating
- Where the outdoor unit will be exposed to chimney smoke
- Where any equipments will generate electromagnetic field or high frequency harmonic.  
(Such as inverter, standby generator, medical high frequency equipment, telecommunication equipment and etc.)
- On vehicle or vessel

#### CAUTION

Please leave sufficient clearance around the unit without fail. Otherwise, a risk of compressor and/or electric component failure may arise.

### 2-2. Installation space (service space) example

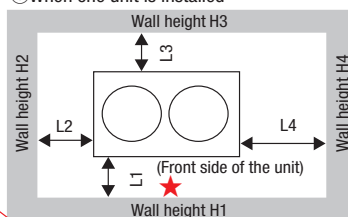
When selecting installation place, make sure to keep adequate service space for maintenance work, passageway, airflow and piping work.

★ denotes the service panel side

#### 1) Installing one unit

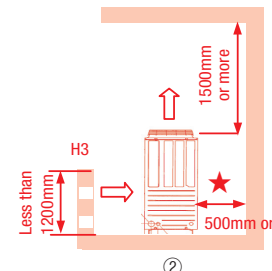
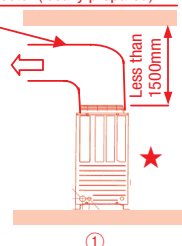
- a) Make sure to keep the air inlet and service space as shown in the right table and to keep open above the unit.
- b) In case that there is a barrier above the unit, keep 1.5m or more space above the unit and keep open surrounding the unit.
- ① If 1.5m or more space cannot be kept above the unit, be sure to install an air flow deflector (locally prepared) in order to avoid short-circuit of air.
- ② If there is some barrier surrounding the unit and H3 is higher than 1000mm (Ex. Installation at terrace), H3 wall should be less than 1200mm in height and have ventilation slots in order to get enough air intake. (If the condition ① is fulfilled, the air flow deflector is required as well)

#### ① When one unit is installed



Example installation	I	II	III
Dimensions			
L1	500	500	Open
L2	10	50	10
L3	100	50	100
L4	10	50	Open
H1	1500	1500	Open
H2	No limit	No limit	No limit
H3	1000	1000	No limit
H4	No limit	No limit	Open

Air flow deflector (locally prepared)

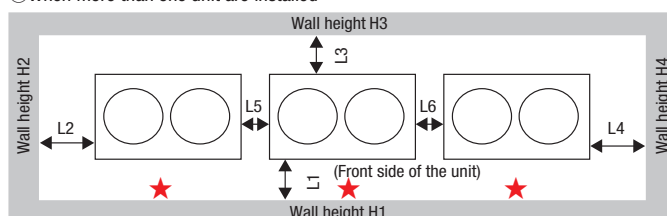


#### 2) Installing several units

- Installation in one row side-by-side (no limitation on the number)

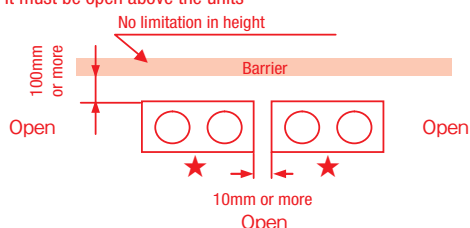
- ① 3 units in one row  
It must be open above the units

#### ② When more than one unit are installed

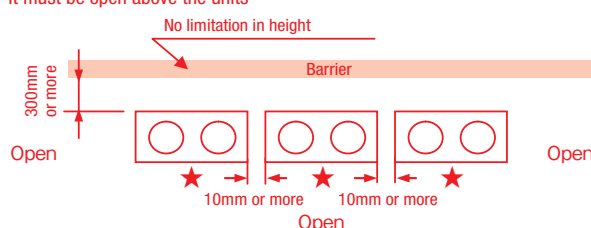


Example installation	I	II
Dimensions		
L1	500	Open
L2	10	200
L3	100	300
L4	10	Open
L5	10 (0)	400
L6	10 (0)	400
H1	1500	Open
H2	No limit	No limit
H3	1000	No limit
H4	No limit	Open

- ② 2 units in one row (with a high barrier behind the units)  
It must be open above the units



- ③ 3 units in one row (with a high barrier behind the units)  
It must be open above the units





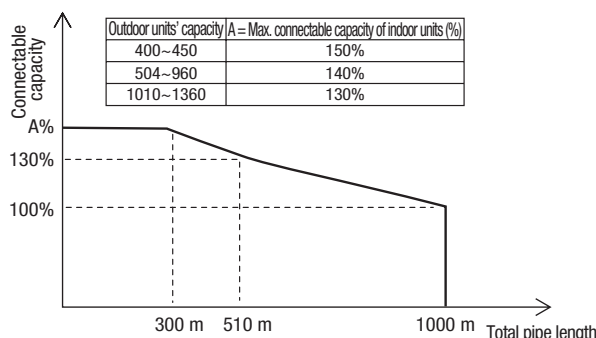
## 4. REFRIGERANT PIPING

### 4-1. Restrictions on the use of pipes

#### (1) Limitation on use of pipes

• In installing pipes, always observe the restrictions on the use of pipes specified in this Section (1) including Maximum length, Total pipe length, Allowable pipe length from the first branching, and Allowable elevation difference (head difference).

- Please avoid forming any trap (  ) or bump (  ) in piping as they can cause fluid stagnation.
- Maximum length (from an outdoor unit to the farthest indoor unit) ..... 160 m or less as actual pipe length (185 m or less as equivalent pipe length)  
(When an actual pipe length exceeds 90m, however, it is necessary to change the pipe size. Please determine the main pipe size by consulting with the Main Selection Reference Table set out in Section (3) (b).
- Total pipe length ..... **Select the total pipe length depending on the connectable capacity of indoor units so that it will fall within the following range.**



#### CAUTION

An installation not conforming to these restrictions can induce a compressor failure, which shall be excluded from the scope of warranty. Always observe the restrictions on the use of pipes in developing a system.

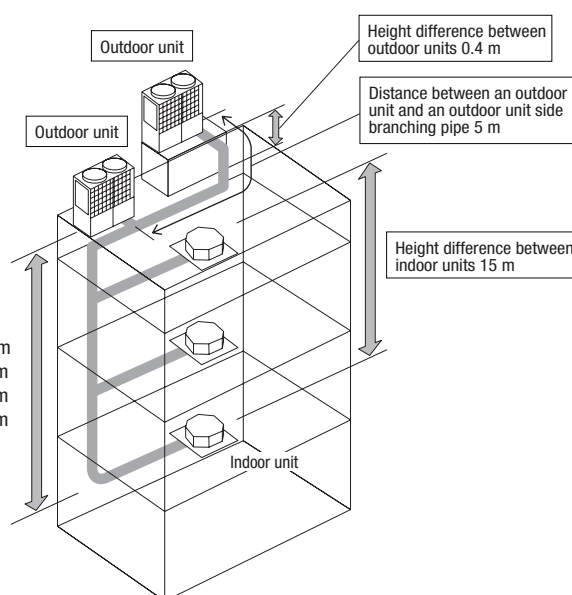
- Main pipe length ..... 130 m or less
- Allowable pipe length from the first branching ..... 90 m or less  
On indoor units with the capacity of 112 or higher, however, enlarge the size of gas pipe for 40 m or higher to 1. For details, refer to 4-1 (3) (d) Indoor unit side branching pipe – Indoor unit (However, difference between the longest and shortest piping ..... 40 m or less)
- Allowable elevation difference (head difference)
  - (a) When an outdoor unit is installed above ..... 50~90 m
  - (b) Difference in the elevation of indoor units in a system ..... 15 m or less
  - (c) Elevation difference between the first branching point and the indoor unit ..... 15 m or less
- Restrictions on piping applicable to the section between an outdoor unit and an outdoor unit side branching pipe (combination unit)
  - (a) Difference in the elevation ..... 0.4 m or less
  - (b) Distance between an outdoor unit and an outdoor unit side branching pipe ..... 5 m or less
  - (c) Length of oil equalization piping ..... 10 m or less

#### Important

When the Additional refrigerant quantity for piping (P) is over the following table, please separate the refrigerant line.

Outdoor unit	P (kg)
400~680	50
735~1360	100

Difference in the elevation	50~90 m
Actual length	160 m
Equivalent length	185 m
Total length	1000 m



#### (2) Piping material selection

- Please use pipes clean on both the inside and outside and free from contaminants harmful to operation such as sulfur, oxides, dust, chips, oil, fat and water.
- Use the following material for refrigerant piping.  
Material: phosphorus deoxidized seamless copper pipe (C1120T-0, 1/2H, JIS H3300)  
Use C1220T-1/2H for  $\phi$  19.05 or larger, or C1220T-0 for  $\phi$  15.88 or smaller
- Do not use  $\phi$  28.58 x t1.0,  $\phi$  31.8 x t1.1,  $\phi$  34.92 x t1.2 and  $\phi$  38.1 x t1.35 as a bent pipe.
- Thickness and size: Please select proper pipes according to the pipe size selection guideline.  
(Since this unit uses R410A, always use 1/2H pipes of a specified minimum thickness or thicker for all pipes of  $\phi$  19.05 or larger, because the pressure resistance requirement is not satisfied with O-type pipes).
- For branching pipes, use a genuine branching pipe set or header set at all times. (optional parts)
- For the handling of operation valves, please refer to P.8 4-3(3) Method of operating operation valves.
- In installing pipes, observe the restrictions on the use of pipes set out in Section 1 (Maximum length, total pipe length, allowable pipe length from the first branching, allowable elevation difference (head difference)) without fail.
- Install a branching pipe set, paying attention to the direction of attachment, after you have perused through the installation manual supplied with it.

### (3) Pipe size selection

#### (a) Outdoor unit – Outdoor unit side branching pipe: Section A in Figure 1

Please use a pipe conforming to the pipe size specified for outdoor unit connection.  
Indoor unit connecting pipe size table

Outdoor unit	Outdoor unit outlet pipe specifications					
	Gas pipe	Connection method	Liquid pipe	Connection method	Oil equalizing tube	Connection method
335-K,400	$\phi 25.4 (\phi 28.58) \times t 1.0$	Blazed	$\phi 12.7 \times t 0.8$	Flare	$\phi 9.52 \times t 0.8$ ※1	Flare
450	$\phi 28.58 \times t 1.0$					
504						
560						
615						
680						

Pipe sizes applicable to European installations are shown in parentheses.

Please use C1220T-1/2H for  $\phi 19.05$  or larger pipes.

※1: Please connect the master and slave units with an oil equalization pipe, when they are used in a combined installation.  
(It is not required, when a unit is used as a standalone installation)

#### (b) Main (Outdoor unit side branching pipe – Indoor unit side first branching pipe): Section B in Figure 1

If the longest distance (measured between the outdoor unit and the farthest indoor unit) is 90m or longer (actual length), please change the main pipe size according to the table below.

**Following main pipe sizes are special to the High Head Heat Pump Series models (FDCH400 – 1360). It should be noted that the sizes of liquid pipe are different from those for other models.**

Outdoor unit	Main pipe size (normal)		Pipe size for an actual length of 90m or longer	
	Gas pipe	Liquid pipe	Gas pipe	Liquid pipe
400	$\phi 28.58 \times t 1.0$	$\phi 15.88 \times t 1.0$	$\phi 28.58 \times t 1.0$	$\phi 15.88 \times t 1.0$
450				
504				
560				
615				
680				
735	$\phi 31.8 \times t 1.1$ ( $\phi 34.92 \times t 1.2$ )	$\phi 19.05 \times t 1.0$	$\phi 38.1 \times t 1.35$ ( $\phi 34.92 \times t 1.2$ )	$\phi 19.05 \times t 1.0$
800				
850				
900				
960				
1010	$\phi 38.1 \times t 1.35$ ( $\phi 34.92 \times t 1.2$ )	$\phi 22.22 \times t 1.0$		$\phi 22.22 \times t 1.0$
1065				
1130				
1180				
1235				
1300				
1360				

Please use C1220T-1/2H for  $\phi 19.05$  or larger pipes. Pipe sizes applicable to European installations are shown in parentheses.

#### (c) Indoor unit side first branching pipe – Indoor unit side branching pipe: Section C in Figure 1

Please choose from the table below an appropriate pipe size as determined by the total capacity of indoor units connected downstream, provided, **however, that the pipe size for this section should not exceed the main size (Section B in Figure 1).**

Total capacity of indoor units	Gas pipe	Liquid pipe
Less than 70	$\phi 12.7 \times t 1.0$	$\phi 9.52 \times t 0.8$
70 or more but less than 180	$\phi 15.88 \times t 1.0$ *1	
180 or more but less than 371	$\phi 19.05 \times t 1.0$ *1	
371 or more but less than 540	$\phi 25.4 \times t 1.0$ ( $\phi 28.58$ )	$\phi 15.88 \times t 1.0$
540 or more but less than 700	$\phi 28.58 \times t 1.0$	$\phi 19.05 \times t 1.0$
700 or more but less than 1100	$\phi 31.8 \times t 1.1$ ( $\phi 34.92 \times t 1.2$ )	
1100 or more	$\phi 38.1 \times t 1.35$ ( $\phi 34.92 \times t 1.2$ )	

Please use C1220T-1/2H for  $\phi 19.05$  or larger pipes. Pipe sizes applicable to European installations are shown in parentheses.

\*1: If the gas pipe size at downstream is bigger than that mentioned in the table, be sure to use the pipe size as same as that of downstream pipe.

#### (d) Indoor unit side branching pipe – Indoor unit: Section D in Figure 1

**Following indoor unit connecting pipe sizes are special to the High Head Heat Pump Series models (FDCH400 – 1360). It should be noted that the sizes of gas pipe with the capacity of 112 or higher are different from those for other models.**

Indoor unit connection pipe size table

Capacity		Pipe length from the first branching			
		40m or less		40m ~ 90m	
		Gas pipe	Liquid pipe	Gas pipe	Liquid pipe
Indoor unit	22, 28	$\phi 9.52 \times t 0.8$	$\phi 6.35 \times t 0.8$	$\phi 9.52 \times t 0.8$	$\phi 6.35 \times t 0.8$
	36, 45, 56	$\phi 12.7 \times t 0.8$		$\phi 12.7 \times t 0.8$	
	71, 80, 90,	$\phi 15.88 \times t 1.0$	$\phi 9.52 \times t 0.8$	$\phi 15.88 \times t 1.0$	$\phi 9.52 \times t 0.8$
	112, 140, 160			$\phi 19.05 \times t 1.0$	
	224			$\phi 19.05 \times t 1.0$	
	280	$\phi 22.22 \times t 1.0$	$\phi 25.4 \times t 1.0$ $(\phi 22.22 \times t 1.0)$		

Please use C1220T-1/2H for  $\phi 19.05$  or larger pipes.

#### (4) Selection of an outdoor unit side branching pipe set

This branching pipe set will always become necessary when units are used in combination.

(When a unit is used as a standalone installation, it is not required)

##### Please note

- a) In connecting an outdoor unit, please use a pipe conforming to the pipe size specified for outdoor unit connection.
- b) Choose a different-diameter pipe joint matching a main pipe size specified in the following section in installing pipes (= main pipes) on the outdoor unit side.
- c) Always install branching joints (for both gas and liquid) in such a manner that they form either correct horizontal or vertical branch.

Outdoor unit	Branching pipe set
For two units (for 735 – 1360)	DOS-2A-1

#### (5) Selection of an indoor unit side branching pipe set

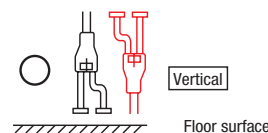
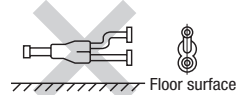
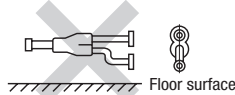
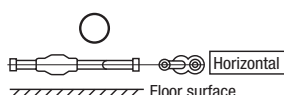
##### (a) Method of selecting a branching pipe set

- As an appropriate branching pipe size varies with the connected capacity (total capacity connected downstream), determine a size from the following table.

##### Please note

- In connecting an indoor unit with the indoor unit side branching pipe set, please use a pipe conforming to the pipe size specified for indoor unit connection.
- Always install branching pipes (both gas and liquid pipe) either horizontally or vertically.

Total capacity downstream	Branching pipe set
Less than 180	DIS-22-1
180 or more but less than 371	DIS-180-1
371 or more but less than 540	DIS-371-1
540 or more	DIS-540-2



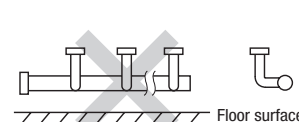
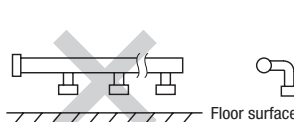
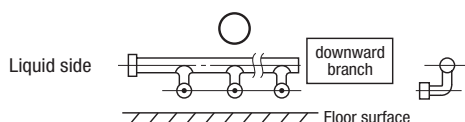
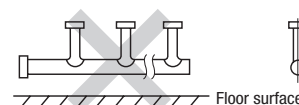
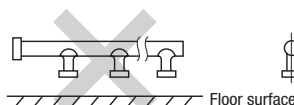
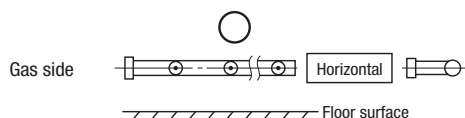
##### (b) Header Method

- Depending on the number of units connected, connect plugged pipes (to be procured on the installer's part) at a branching point (on the indoor unit connection side).
- For the size of a plugged pipe, please refer to the documentation for a header set (optional part).

Total capacity downstream	Header set model type	Number of branches
Less than 180	HEAD4-22-1	4 branches at the most
180 or more but less than 371	HEAD6-180-1	6 branches at the most
371 or more but less than 540	HEAD8-371-1	8 branches at the most
540 or more	HEAD8-540-2	8 branches at the most

##### Please note

- a) In connecting a header with an indoor unit, please use a pipe conforming to the pipe size specified for indoor unit connection.
- b) In installing a header, always arrange a gas-side header to branch horizontally and a liquid-side header to branch downward.
- c) Indoor units 224 and 280 can not be connected to the header.

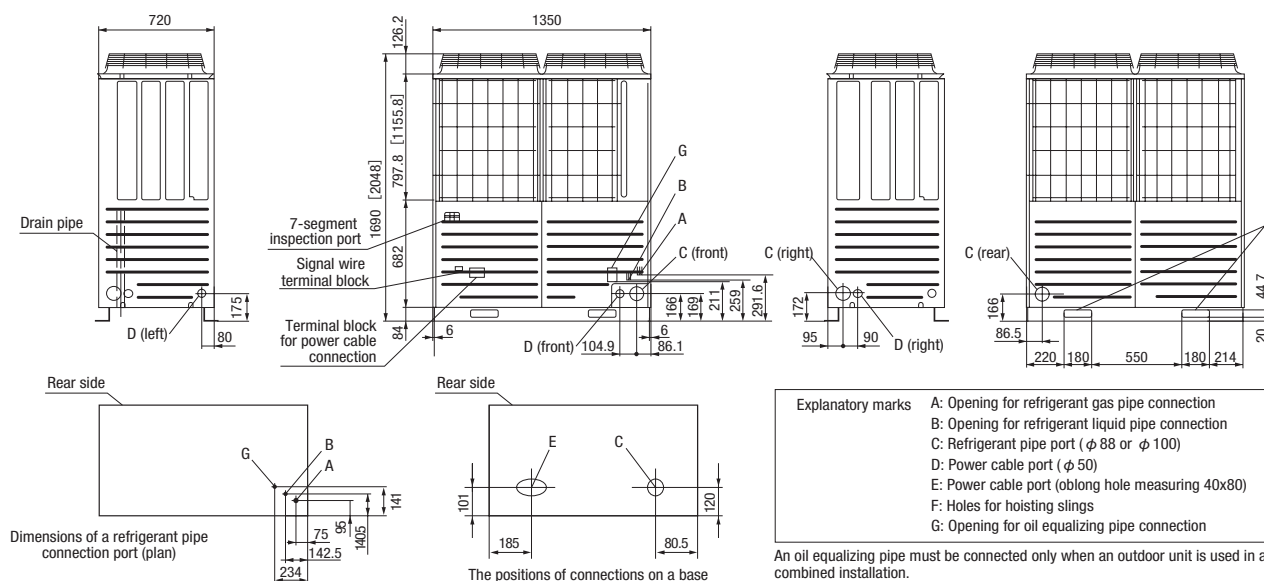


### 4-2. Pipe connection position and pipe direction

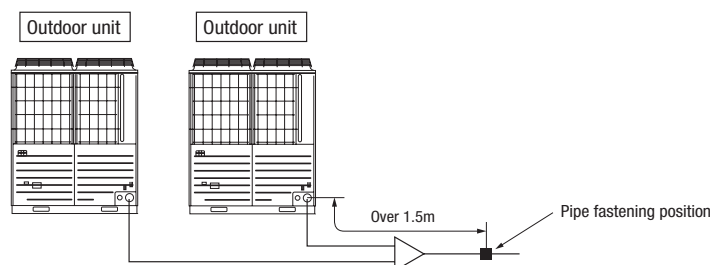
#### (1) Pipe connecting position and pipe outgoing direction

Although this drawing illustrates an installation involving a 450 or smaller capacity unit, an installation involving a 504 or a larger capacity unit should be arranged in the same manner as long as pipe connection points and directions are concerned, except that the height of a unit is different.

Measurements in [ ] indicate those of a 504 or larger capacity unit.



- A pipe can be laid through the front, right, bottom or rear of a unit as illustrated on the above drawings.
- In laying pipes on the installation site, cut off the casing's half blank ( $\phi 88$  or  $\phi 100$ ) that covers a hole for pipe penetration with nippers.
- When there is a danger that a small animal enters from the pipe port, cover the port with appropriate blocking materials (to be arranged on the user's part).
- Use an elbow (to be arranged on the user's part) to connect control valves to the piping.
- In anchoring piping on the installation site, give 1.5m or a longer distance between an outdoor unit and an anchoring point where the piping is secured as illustrated below. (A failure to observe this instruction may result in a pipe fracture depending on a method of isolating vibrations employed.)
- **The pipe should be anchored every 1.5m or less to isolate the vibration.**



## (2) Piping work

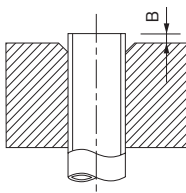
### Important

- Please take care so that installed pipes may not touch components within a unit.
- **In laying pipes on the installation site, keep the operation valves shut all the time.**
- Give **sufficient protections** (compressed and brazed or by an adhesive tape) **to pipe ends so that any water or foreign matters may not enter the pipes.**
- In bending a pipe, bend it **to the largest possible radius (at least four times the pipe diameter)**. Do not bend a pipe repeatedly to correct its form.
- An outdoor unit's liquid pipe and liquid refrigerant piping are to be flare connected. Flare a pipe after engaging a flare nut onto it. A flare size for R410A is different from that for conventional R407C. Although we recommend the use of flaring tools developed specifically for R410A, conventional flaring tools can also be used by adjusting the measurement of protrusion B with a protrusion control gauge.
- Tighten a flare joint securely **with two spanners**. Observe flare nut tightening torque specified in the table below.

### CAUTION

If you tighten it without using double spanners, you may deform the operation valve, which can cause an inflow of nitrogen gas into the outdoor unit.

Flared pipe end: A (mm)	
Copper pipe outer diameter	A
$\phi 6.35$	9.1
$\phi 9.52$	13.2
$\phi 12.7$	16.6
$\phi 15.88$	19.7



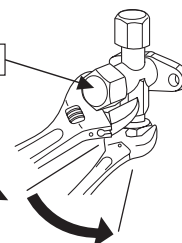
Copper pipe protrusion for flaring: B (mm)		
Copper pipe outer diameter	In the case of a rigid (clutch) type	
	With an R410A tool	With a conventional tool
$\phi 6.35$	0~0.5	0.7~1.3
$\phi 9.52$		
$\phi 12.7$		
$\phi 15.88$		

### Tightening torque (N·m)

Operation valve size (mm)	Tightening torque (N·m)	Tightening angle (°)	Recommended length of tool handle (mm)
$\phi 6.35$ (1/4")	14~18	45~60	150
$\phi 9.52$ (3/8")	34~42	30~45	200
$\phi 12.7$ (1/2")	49~61	30~45	250
$\phi 15.88$ (5/8")	68~82	15~20	300
$\phi 19.05$ (3/4")	100~120	15~20	450

Do not hold the valve cap area with a spanner.

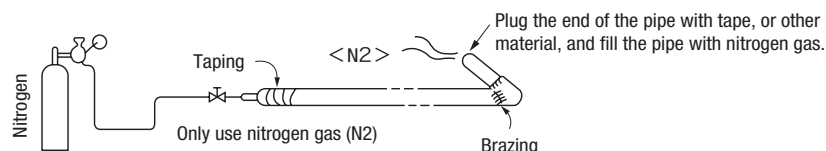
Use a torque wrench. If a torque wrench is not available, fasten the flare nut manually first and then tighten it further, using the left table as a guide.



- Do not apply any oil on a flare joint.
- Pipes are to be brazed to connect an outdoor unit's gas pipe with refrigerant piping or refrigerant piping with a branching pipe set.
- **Blazing 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.
- Brazing of the operation valve and the pipes should be performed while cooling the valve body with a wet towel.
- Perform flushing. To flush the piping, charge nitrogen gas at about 0.02MPa with a pipe end closed with a hand. When pressure inside builds up to a sufficient level, remove the hand to flush. (in flushing a pipe, close the other end of the pipe with a plug).

### Operation procedure

- ① **In laying pipes on the installation site, keep the operation valves shut all the time.**
- ② **Blazing 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.



- ③ Give **sufficient protections** (compressed and brazed or with an adhesive tape) **so that water or foreign matters may not enter the piping.**



#### (4) Method of operating operation valves

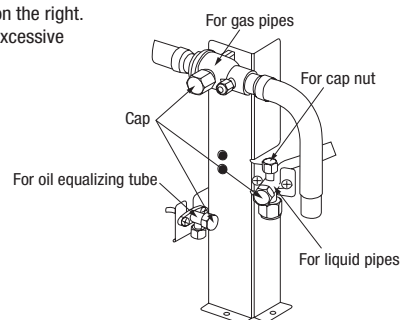
Method of opening/closing a valve

- Remove the cap, turn the gas pipe side until it comes to the "Closed" position as indicated in the drawing on the right.
- For the liquid side pipe and oil equalizing pipe side, turn with a hexagonal wrench until the shaft stops. If excessive force is applied, the valve main body can be damaged. Always use a dedicated special tool.
- Tighten the cap securely.

For tightening torque, refer to the table below.

Tightening torque N · m			
	Shaft (valve main body)	Cap (lid)	Cap nut (check joint section)
For gas pipes	7 or less	30 or less	13
For liquid pipes	14~16	25~35	10~12
For oil equalizing tube	6~8	20~30	10~12

For fastening torque of a flare nut, please refer to Section 4-2 (2) Piping work on site.



#### 4-4. Additional refrigerant charge

Charge additional refrigerant **in the liquid state**.

Be sure to measure the quantity **with a scale in adding refrigerant**.

If you cannot charge all refrigerant with the outdoor unit lying idle, charge it with the unit running in the test run mode. (For the test run method, please refer to Section 8)  
If operated for a long time with insufficient refrigerant the compressor will be damaged. (In particular, when adding refrigerant during operation, complete the job within 30min.)

This unit contains **<400~680: 11.5 kg, 735~1360: 23.0 kg> of refrigerant**.

Determine the amount of refrigerant to be charged additionally using the following formula and put down the amount of refrigerant added on the refrigerant charge volume recording plate provided on the back the front panel.

##### ● Adding additional refrigerant

**Charge additional refrigerant according to the size and length of the liquid piping and unit capacity.**

Determine additional charge volume by rounding to the nearest 0.1 kg.

Additional fill quantity (kg) = S + P + I

S: standard additional refrigerant quantity (kg)

Following standard added refrigerant volume is special to the High Head Heat Pump Series models (FDCH400 ~ 1,360). It should be noted that the volume is different from those for other models.

Outdoor unit	S (kg)	Outdoor unit	S (kg)	Outdoor unit	S (kg)
400	2.0	735	3.0	1065	12.7
450	3.9	800	4.0	1130	14.0
504	5.7	850	5.9	1180	15.2
560	7.0	900	7.8	1235	16.4
615	8.2	960	9.6	1300	17.8
680	9.6	1010	11.4	1360	19.2

P: Additional refrigerant quantity for piping (kg)

$P = (L1 \times 0.37) + (L2 \times 0.26) + (L3 \times 0.18) + (L4 \times 0.12) + (L5 \times 0.059) + (L6 \times 0.022)$

L1 :  $\phi$  22.22 total length (m) L2 :  $\phi$  19.05 total length (m) L3 :  $\phi$  15.88 total length (m)

L4 :  $\phi$  12.7 total length (m) L5 :  $\phi$  9.52 total length (m) L6 :  $\phi$  6.35 total length (m)

Refrigerant liquid pipe size	$\phi$ 22.22	$\phi$ 19.05	$\phi$ 15.88	$\phi$ 12.7	$\phi$ 9.52	$\phi$ 6.35	Remarks
Additional fill quantity (kg/m)	0.37	0.26	0.18	0.12	0.059	0.022	

I: Additional refrigerant quantity for indoor units (kg)

If the total indoor units capacity is larger than 1.3 times of outdoor unit capacity, then calculate the additional refrigerant quantity for indoor units.

$D = \{(\text{Total indoor units capacity}) - (\text{outdoor unit capacity}) \times 1.3\}$

$I = D \times 0.01$

When  $D > 0$ , calculate I using the above equation;

When  $D \leq 0$ , take it as  $I = 0$ .

##### Important

**When the Additional refrigerant quantity for piping (P) is over the following table, please separate the refrigerant line.**

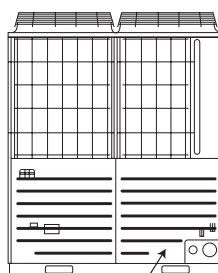
Outdoor unit	P (kg)
400-680	50
735-1360	100

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

- To prevent a different oil from entering, please 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.).
- Refrigerant types are indicated by color at the top of the cylinder 5. (Pink for R410A). Always confirm this.
- Do not use a charge cylinder under any circumstances. There is a danger that the composition of the refrigerant will change when R410A is transferred to a cylinder.
- When charging refrigerant, use liquid refrigerant from a cylinder. If refrigerant is charged in a gas form, the composition may change considerably.

##### Please note

**Put down on the refrigerant charge volume recording plate provided on the back of the front panel the amount of refrigerant calculated from the pipe length.**



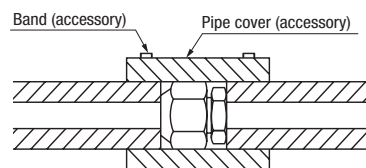
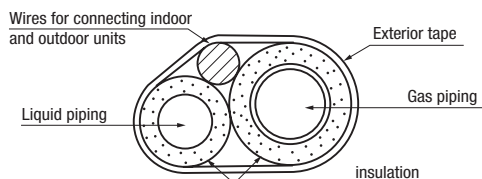
##### CAUTION

Be sure to record the refrigerant volume, because the information is necessary to perform the installation's maintenance service.



## 4-5. Heating and condensation prevention

- ① Dress refrigerant pipes (both gas and liquid pipes) for heat insulation and prevention of dew condensation. Improper heat insulation/anti-dew dressing can result in a water leak or dripping causing damage to household effects, etc.
  - 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.
    - a) The gas pipe can cause during a cooling operation dew condensation, which will become drain water causing a possible water-leak accident, or reach during a heating operation as high a temperature as 60°C to 110°C, posing a risk of burns, when touched accidentally. So, do not fail to dress it with a heat insulation material.
    - b) Wrap indoor units' flare joints with heat insulating parts (pipe cover) for heat insulation (both gas and liquid pipes).
    - c) 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.
    - d) Although this air conditioning unit has been tested under the JIS condensation test conditions, the dripping of water may occur when it is operated in a high-humidity atmosphere (23°C or a higher dew point temperature). In such a case, apply an additional heat insulation material of 10 to 20 mm thick to dress an indoor unit body, piping and drain pipes.
- When the ambient dew point temperature becomes 28°C or higher, or the relative humidity becomes 80% or higher, add further 10 to 20 mm thick heat insulation material.



## 5. Drainage

- Where water drained from the outdoor unit may freeze, connect the drain pipe using optional drain elbow and drain grommet.

## 6. ELECTRICAL WIRING WORK

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.

**⚠ Please install an earth leakage breaker without fail.** The installation of an earth leakage breaker is compulsory in order to prevent electric shocks or fire accidents. (Since this unit employs inverter control, please use an impulse withstanding type to prevent an earth leakage breaker's false actuation.)

### Please note

- a) Use only copper wires.
 

Do not use any supply cord lighter than one specified in parentheses for each type below.

  - braided cord (code designation 60245 IEC 51), if allowed in the relevant part 2;
  - ordinary tough rubber sheathed cord (code designation 60245 IEC 53);
  - flat twin tinsel cord (code designation 60227 IEC 41)
  - ordinary polyvinyl chloride sheathed cord (code designation 60227 IEC 53).

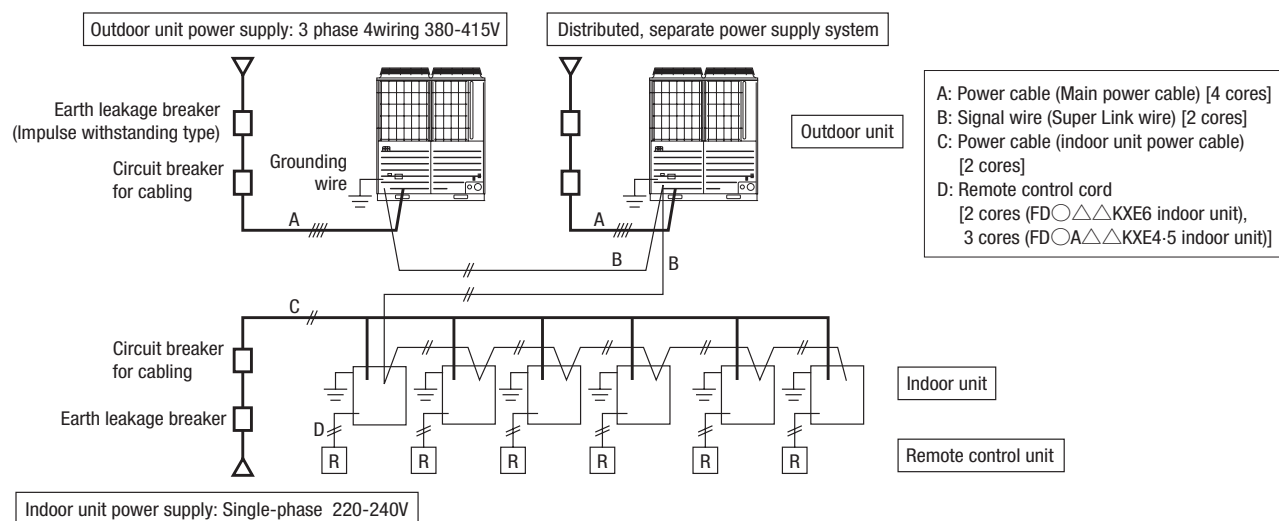
Please do not use anything lighter than polychloroprene sheathed flexible cord (cord designation 60245 IEC57) for supply cords of parts of appliances for outdoor use.
- b) Use separate power supplies for the indoor and outdoor units.
- c) A grounding wire must be connected before connecting the power cable. Provide a grounding wire longer than the power cable.
- d) The power supplies for indoor units in the same system should turn on and off simultaneously.
- e) 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.

Never connect the grounding wire to a gas pipe because if gas leaks, it could cause explosion or ignition.
- f) 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. Be sure to turn off the power when servicing.
- g) Please 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 overheat accident)
- h) For power supply cables, use conduits.
- i) Please do not lay electronic control cables (remote control and signaling wires) and other high current cables together outside the unit. Laying them together can result in malfunctioning or a failure of the unit due to electric noises.
- j) Power cables and signaling wires must always be connected to the power cable terminal block and secured by cable fastening clamps provided in the unit.
- k) Fasten cables so that they may not touch the piping, etc.
- l) When cables are connected, please 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.)
- m) Make sure to use circuit breakers (earth leakage breaker and circuit breaker) of proper capacity. Use of breakers of larger capacity could result in trouble on components or fire accident.
- n) Install isolator or disconnect switch on the power supply wiring in accordance with the local codes and regulations. The isolator should be locked in OFF state in accordance with EN60204-1.
- o) After maintenance, all wiring, wiring ties and the like, should be returned to their original state and wiring route, and the necessary clearance from all metal parts should be secured.

## 6-1. Wiring system diagrams

(Example of combination)



### CAUTION

If the earth leakage breaker is exclusively for ground fault protection, then you will need to install a circuit breaker for wiring work.

## 6-2. Method of connecting power cables

### (1) Method of leading out cables

- As shown on the drawing in Section 4-2 (1), cables can be laid through the front, right, left or bottom casing.
- In wiring on the installation site, cut off a half-blank ( $\phi 50$  or oblong hole measuring 40x80) covering a penetration of the casing with nippers.

### (2) Notabilia in connecting power cables

Power cables must always be connected to the power cable terminal block and clamped outside the electrical component box.

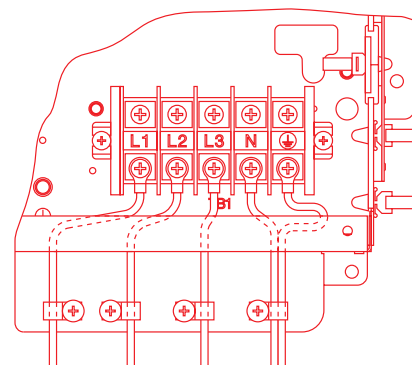
In connecting to the power cable terminal block, use round solderless terminals.

- Connect the ground wire before you connect the power cable. When you connect a grounding wire to a terminal block, use a grounding wire longer than the power cable so that it may not be subject to tension.
- Do not turn on power until installation work is completed. Turn off power to the unit before you service the unit.
- Ensure that the unit is properly grounded.
- Always connect power cables to the power terminal block.
- To connect a cable to the power terminal block, use a round crimp contact terminal.
- Use specified wires in wiring, and fasten them securely in such a manner that the terminal blocks are not subject to external force.
- In fastening a screw of a terminal block, use a correct-size driver. Fastening a screw of a terminal block with excessive force can break the screw.
- For the tightening torque of terminals, refer to the list shown at right.
- When electrical installation work is completed, make sure that all electrical components within the electrical component box are free of loose connector coupling or terminal connection.

Tightening torque (N · m)		
M4	Outdoor signal line terminal block	0.9~1.2
M5	Power cable terminal block, Earth wire	2.00~2.35
M6	Power cable terminal block	2.5~2.8

Round crimp contact terminal

Wire



### (3) Outdoor unit power supply specifications : 3 phase 380-415V

Model	Power source	Cable size for power source (mm <sup>2</sup> )	Wire length (m)	Moulded-case circuit breaker (A)		Earth leakage breaker	Earth wire	
				Rated current	Switch capacity		Size (mm <sup>2</sup> )	Screw type
335-K,400	3 phase 4 wire 380-415V 50Hz/380V60Hz	22	92	75	100	75A100mA less than 0.1 sec	5.5	M5
450		22	92	75	100	75A100mA less than 0.1 sec	5.5	M5
504		22	92	75	100	75A100mA less than 0.1 sec	5.5	M5
560		22	92	75	100	75A100mA less than 0.1 sec	5.5	M5
615		22	92	75	100	75A100mA less than 0.1 sec	5.5	M5
680		22	92	75	100	75A100mA less than 0.1 sec	5.5	M5

### Please note

- The method of laying cables has been determined pursuant to the Japanese indoor wiring regulations (JEAC8001). (Please adapt it to the regulations in effect in each country)
- In the case of distributed, separate power supply system, the listed data represent those of an outdoor unit.
- For details, please refer to the installation manual supplied with the indoor unit.
- Wire length in the table above is the value for when the indoor unit is connect to the power cable in series also the wire size and minimum length when the power drop is less than 2% are shown. If the current exceeds the value in the table above, change the wire size according to the indoor wiring regulations. (Please adapt it to the regulations in effect in each country)



## Address setting failure indication

Code	Contents of a display	Please check
A00	Unable to find any indoor unit that can be actually communicated with.	Are signal lines connected properly without any loose connections? Is power for indoor units all turned on?
A01	The number of the indoor units that can be actually communicated with is less than the number specified in P33 on the 7 segment display panel.	Are signal lines connected properly without any loose connections? Input the number of connected indoor units again.
A02	The number of the indoor units that can be actually communicated with is more than the number specified in P33 on the 7 segment display panel.	Are signal lines connected properly without any loose connections? Are the network connectors coupled properly? Input the number of connected indoor units again.
A03	Starting address (P32) + Number of connected indoor units (P33) > 128	Input the starting address again. Input the number of connected indoor units again.
A04	While some units are operating in the previous SL mode on the network, the automatic address setting on multiple refrigerant systems is attempted.	Perform manual address setting. Separate previous SL setting unit from the network Arrange all units to operate in the new SL.

## Error indication

Code	Contents of a display	Cause
E2	Duplicating indoor unit address.	• Incorrect manual address setting
E3	Incorrect pairing of indoor-outdoor units.	• An outdoor unit number that does not exist in the network is specified • No master unit exists in combination outdoor unit.
E11	Address setting for plural remote controllers.	• Indoor unit address is set from plural remote controllers.
E12	Incorrect address setting of indoor units.	• Automatic address setting and manual address setting are mixed.
E31	Duplicating outdoor unit address.	• Plural outdoor units are exist as same address in same network.
E46	Incorrect setting.	• Automatic address setting and manual address setting are mixed.

## 7-2. Control mode switching

Controls of outdoor unit may be selected as follows using the dip switches on the PCB and C○○, P○○ on the 7-segment.

To change C○○, P○○ on the 7-segment, hold down SW8 (increasing a number shown on the 7 segment display panel: one's place), SW9 (increasing a number shown on the 7 segment display panel: tens place) and SW7 (Data write/Enter).

Unit set※1	Control selecting method	Content of control
	SW setting on PCB	C○○, P○○ on 7-segment
Master	SW3-2 to ON	— Automatic back up operation
Master	SW3-7 to ON *2	Set external input function allocation to "2" *2 Forced cooling mode (It can be fixed at cooling with external input terminals open, or at heating with them closed.)
Master	SW5-1 to ON + SW5-2 to ON	— Cooling test run
Master	SW5-1 to ON + SW5-2 to OFF	— Heating test run
Master	Close the fluid operation valve on outdoor unit and set as follows: (1) SW5-2 on PCB to ON (2) SW5-3 on PCB to ON (3) SW5-1 on PCB to ON	— Pump down operation
Master	SW4-5:OFF, SW4-6:OFF*2 80% (Factory default) SW4-5:ON, SW4-6:OFF*2 60% SW4-5:OFF, SW4-6:ON*2 40% SW4-5:ON, SW4-6:ON*2 00%	Set allocation of external input function to "1" *2 Inputting signals to external input terminals selects the demand mode. (J13 closed: Level input, J13 open: Pulse input)
Master	SW5-5	— Communication method selection ON: Previous SL communication, OFF: New SL communication
Master/slave	SW6-3 to ON	— High static pressure mode
Master	J13: Closed (Factory default), J13: Open	— External input switing (CnS1, CnS2 only) Closed: Level input, Open: Pulse input
Master/slave	J14: Closed (Factory default), J14: Open	Defrost recover temperature Closed: normal, Open: cold weather district
Master/slave	J15: Closed (Factory default), J15: Open	Defrost start temperature Closed: normal, Open: cold weather district
Master	—	C70 Operation priority selection 0: First push priority (at shipping) 1: Last push priority
Master/slave	—	C75 Outdoor unit fan snow protection control 0: Control disabled (at shipping) 1: Control enabled
	—	P10 2 stage demand mode *3 OFF: Disabled (at shipping) 000, 040, 060, 080 [%] To change the 2 stage demand mode on the 7 segment, hold down SW8.
	—	P11 Allocation of external input (CnS1)
	—	P12 Allocation of external input (CnS2)
	—	P13 Allocation of external input (CnG1)
	—	P14 Allocation of external input (CnG2)
	—	P15 Allocation of external input (CnQ5)
Master/slave	—	P16 Outdoor unit fan snow protection control ON time setting - 30 sec (at shipping) 10, 30-600 sec

※1 "Unit set" shown in the above table refers to the master/slave setting of units comprising a combined installation.

Master: control mode setting required for the master unit only (setting not required with the slave unit).

Master/slave: control mode setting required for both master and slave units.

※2 Control is switched when both the allocation of external input function (P11~15) and SW are changed.

(Example: To use CnS1 for the input of forced cooling mode, set P11 at 2 and SW3-7 at ON. To use CnS2 for the input of forced cooling mode, set P12 at 2 and SW3-7 at ON.)

※3 To enable the 2 stage demand mode, set J13 closed and allocation of external input function to "1".

By changing the allocation of external input functions (P11~15) on the 7-segment, functions of external input terminals may be selected. Inputting signals to external input terminals enable the following functions.

Setting value for allocation of external input function	With external input terminals closed	With external input terminals open
"0" : External operation input	Invalid	Valid
"1" : Demand input	Invalid	Valid
"2" : Cooling/heating forced input	Valid	Invalid
"3" : Silent mode 1 *1	Valid	Invalid
"4" : 2 stage demand input	Invalid	Valid
"5" : Outdoor fan snow guard control input	Valid	Invalid
"6" : Test run external input 1 (equivalent to SW5-1)	Test run start	Normal
"7" : Test run external input 2 (equivalent to SW5-2)	Cooling	Heating
"8" : Silent mode 2 *2	Valid	Invalid
"9" : Spare		

※1 Valid/invalid is changed depending on outdoor temperature. ※2 It is always Valid, regardless of outdoor temperature.

### 7-3. External input and output terminals specifications

Name	Purpose (Factory default)	Specification	Operating side connector
External input CnS1	External operation input (Short-circuited at shipping)	Non-voltage contactor (DC12V)	NICHIATSU B02B-XAMK-1 (LF) (SN)
External input CnS2	Demand input (Short-circuited at shipping)	Non-voltage contactor (DC12V)	NICHIATSU B02B-XARK-1 (LF) (SN)
External input CnG1	Forced refrigerant input (Open at shipping)	Non-voltage contactor (DC12V)	NICHIATSU B02B-XAEK-1 (LF) (SN)
External input CnG2	Silencing mode input (Open at shipping)	Non-voltage contactor (DC12V)	NICHIATSU B02B-XASK-1 (LF) (SN)
External output CnH	Operation output	DC12V output	MOLEX 5286-02A-BU
External output CnY	Error output	DC12V output	MOLEX 5266-02A

### 7-4. Address setting for units adapted to the high head specification

This unit is adapted to the high head specification. When the conditions ① and ② are met, set the address for applicable indoor units as follows.

For the address setting method, refer to 7.1.

① When more than one indoor units of minimum capacity are used in a system

② When there are differences in the levels of indoor units of ① above

- Set a lower address No. for the unit on lower level at a value smaller than that of the unit at higher level.
- It is not necessary to set the address No. when only one unit of minimum capacity is used or all indoor units are installed at the same level.
- Take care not to duplicate the address No. on indoor units in the same network.

#### Example of the selection of address model

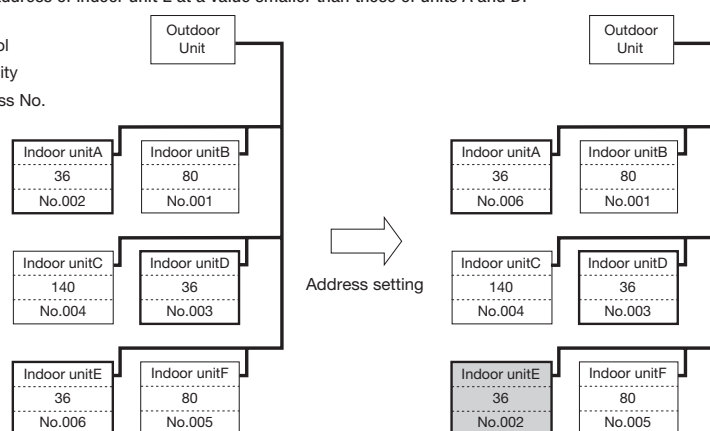
① Indoor units with the minimum capacity are units A, D and E.

② The indoor units of ① above are installed at different levels, of which the unit E is placed at the lowest level.

Consequently, it is necessary to set the address of indoor unit E at a value smaller than those of units A and D.

Indoor unit indication

Indoor unitA	→ Indoor unit symbol
36	→ Indoor unit capacity
No.002	→ Indoor unit address No.



## 8. TEST OPERATION AND TRANSFER

### 8-1. Before starting operation

- (1) **Make sure that a measurement between the power supply terminal block and ground, when measured with a 500V megger, is greater than 1 MΩ.**

When the unit is left for a long time with power OFF or just after the installation, there is possibility that the refrigerant is accumulated in the compressor and the insulation resistance between the contact terminals for power supply and grounding decreases to 1MΩ or around.

When the insulation resistance is 1MΩ or more, the insulation resistance will rise with crank case heater power ON for 6 hours or more because the refrigerant in the compressor is evaporated.

- (2) Please check the resistance of the signaling wire terminal block before power is turned on. If a resistance measurement is 100Ω or less, it suggests a possibility that power cables are connected to the signaling wire terminal block. (Please refer to 6-3. Standard resistance valve.)
- (3) **Be sure to turn on the crank case heater 6 hours before operation.**
- (4) **Make sure that the bottom of the compressor casing is warm.** (higher than outdoor temperature +5°C)
- (5) Be sure to fully open the operation valves (liquid,gas and Equalizen oil piping (for a combined installation only)) for the outdoor unit.  
Operating the outdoor unit with the valves closed may damage the compressor.
- (6) **Check that the power to all indoor units has been turned on. If not, water leakage may occur.**

#### CAUTION

Please make sure that the operation valves (gas, liquid, oil equalizing pipe (for a combined installation only)) are full open before a test run. Conducting a test run with any of them in a closed position can result in a compressor failure.

Branching pipe set type	Gas side	liquid side	Different diameter pipe joint
HEAD8-371-1			None
HEAD8-540-2			

## INSTALLATION PROCEDURE

1. Please select an appropriate branching pipe set model and a pipe size by consulting with the installation manual of the indoor unit or other relevant technical documents.

### Attention

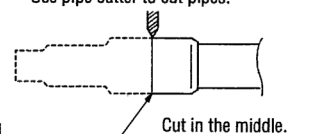
- ① Use a pipe conforming to a pipe size specified for indoor unit connection for the section between an indoor unit and a branching pipe.
- ② Use a pipe conforming to a pipe size specified for outdoor unit connection for the section between an outdoor branching pipe and an outdoor unit.

2. Cut a branching pipe set or a different diameter joint with a pipe cutter to make it fit for a selected pipe size before application.

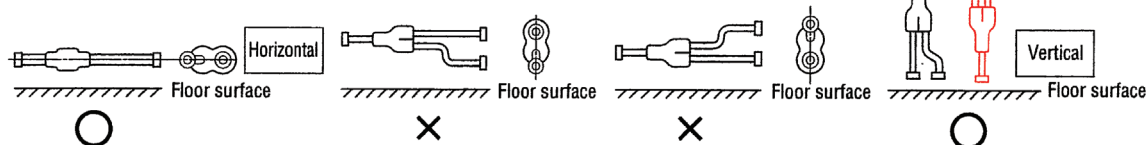
### Attention

- ① In cutting pipes, always use a pipe cutter. Remove burrs from a cut end when you cut a pipe. In doing so, keep a cut end downward so that no chips or burrs may enter the pipe.
- ② Take utmost care so that no foreign matter such as dust or water may enter piping during installation work.
  - Please cover all the open ends of piping until installation work is completed. Particularly, any openings in the section of piping laid outdoors should be sealed stringently.
  - As long as possible, avoid open ends left facing upward. Make them face either horizontally or downward.
- ③ A branching joint (for both gas and liquid) must always be positioned in such a way that it branches either horizontally or vertically.

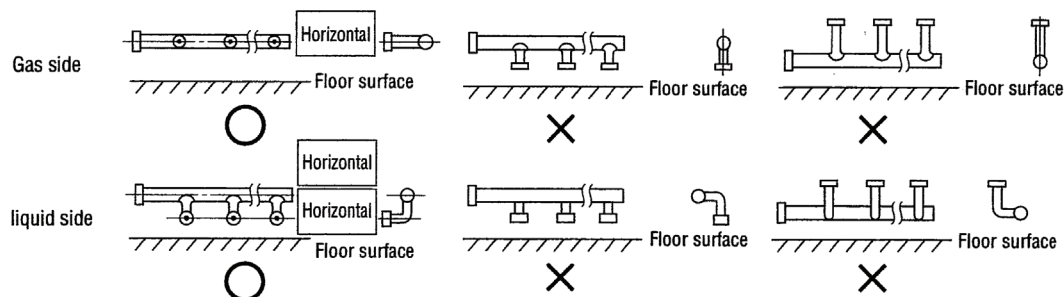
Use pipe cutter to cut pipes.



### • In the case of a branching pipe set (model type DIS)



### • In the case of a header set (model type HEAD)



- ④ Always apply nitrogen gas when soldering joints. If nitrogen gas is not applied, a large amount of film oxide will be formed which could lead to a critical failure in the unit. Use caution to prevent moisture or any foreign matters from entering the pipe when connecting pipe ends. For the method of air tightness testing and pulling air, please refer to the installation manual of the outdoor unit.
- ⑤ Do not leave piping with any open ends uncovered to prevent water or foreign matters from entering inside.

## 9 OPTIONAL PARTS

### 9.1 Installation manual of the blowout duct flange plate kit (for FDUT)

PJM012D034

Use this kit when connecting a duct which produces the static pressure of 10 Pa or more at the outside of unit.

Replace the plate at the blow outlet of unit and connect the blowout duct according to the following procedure.

The blow outlet assembled on the unit at the shipping from factory, is for a direct-blow and duct-less installation of the unit (static pressure of 10 Pa or less at the outside of unit).

When the application requires the static pressure of 10 Pa or more at the outside of unit, it is necessary to use this kit of which the dimensions of flange are enlarged at the blowout side.

#### ⚠ CAUTION

- (1) Install the kit while the unit is placed on the floor.

It should not be attempted to install it after installation of the unit in place. Otherwise, it will become very difficult to install it because related sections could be deformed by the weight of unit.

- (2) Do not supply the electric power to the unit during the installation of the kit.

There is the risk of electrical shock or injury by being caught up with revolving parts, if it is attempted to install while the unit is operating or power is supplied to the unit.

#### 1. Applicable model of unit and type of blowout duct flange plate kit

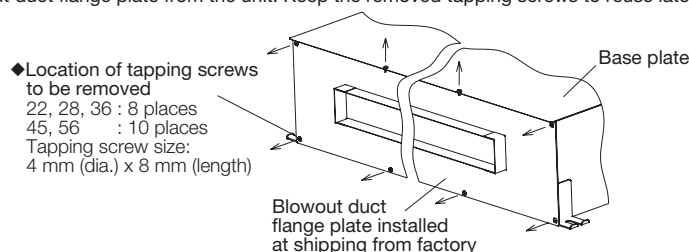
Type of blowout duct flange plate kit	UT-DAS1E	UT-DAS2E
Model	FDUT22, 28, 36	FDUT45, 46

#### 2. Installation procedure

(Figure shows the state that the unit is placed on a floor. Top and bottom are inverted after installing the unit.)

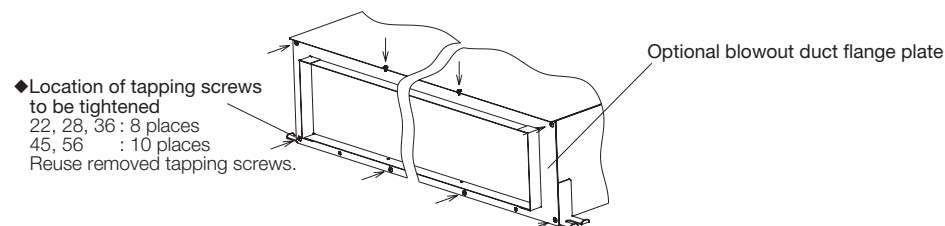
- (1) Place the unit as shown below. (Top and bottom are inverted from the state that the unit is installed in place.)

- (2) Remove the blowout duct flange plate from the unit. Keep the removed tapping screws to reuse later.



- (3) Install the optional blowout duct flange plate using the tapping screws removed at the step (2) above.

Take care not to damage the insulation when tightening the tapping screws.

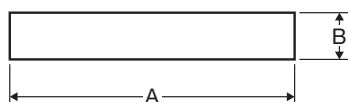


#### 3. Caution and instruction for the duct work

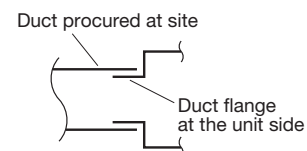
- (1) Dimensions of the blowout duct flange of the kit are as shown below. Connect the duct according to these dimensions.

Dimensions in the following table show the outside measurements of the flange.

Install the duct, which has been procured at site, at the outside of flange, with care to prevent wind leakage.



Unit: mm		
Model	A	B
22, 28, 36	162	732
45, 56	162	932



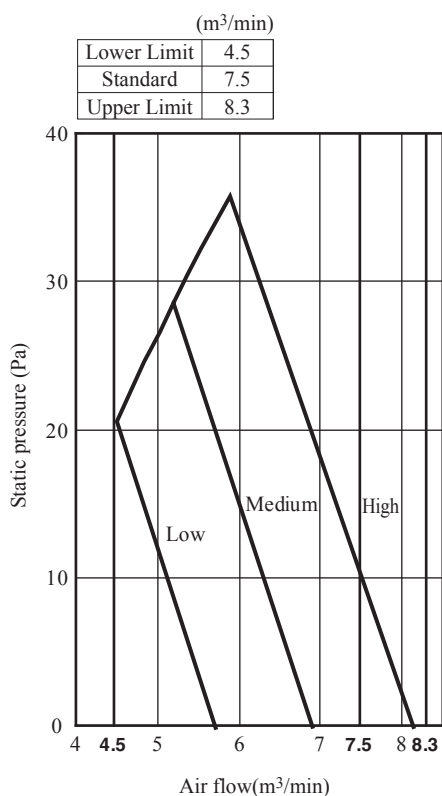
- (2) Determine the length of duct by calculating the pressure loss, taking into consideration component parts at the suction and blowout sides. Total static pressure at the outside of unit should not exceed the figures shown in the following table.

Unit: Pa	
Model	Max. static pressure at outside of unit
22, 28, 36	35
45, 56	50

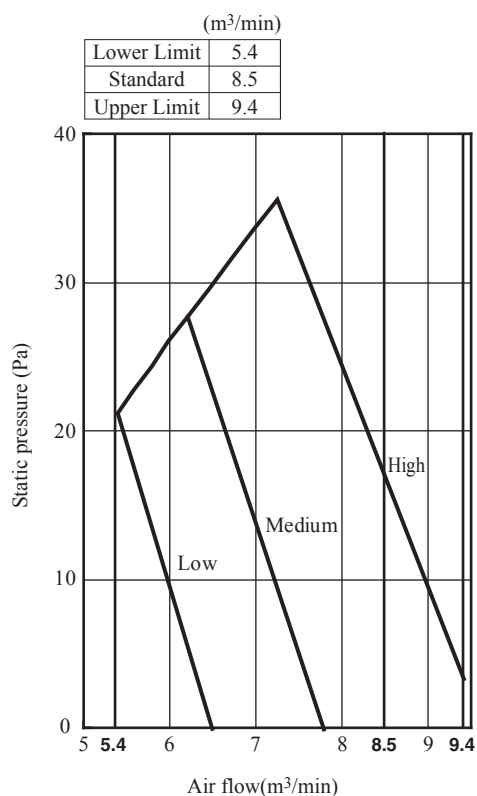
- (3) For models 22, 28 and 45, the setting for high ceiling can be made using the remote controller.

#### 4. Characteristics of fan

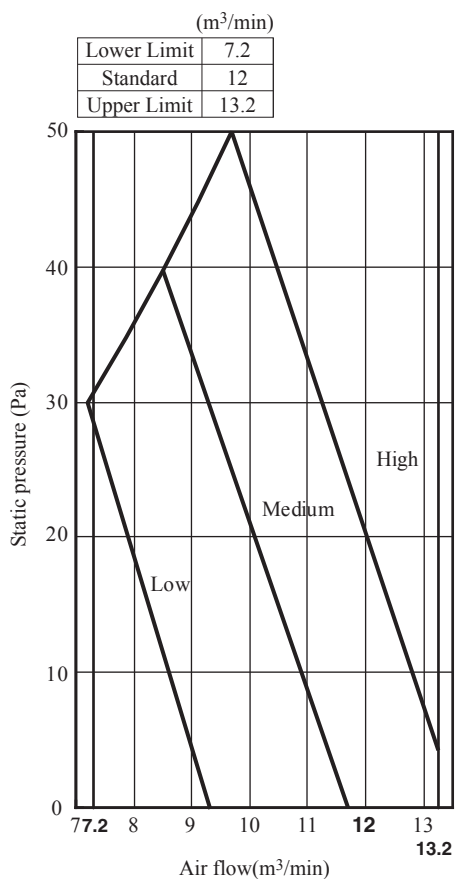
##### (1) Models FDUT22,28KXE6D (UT-DAS1E)



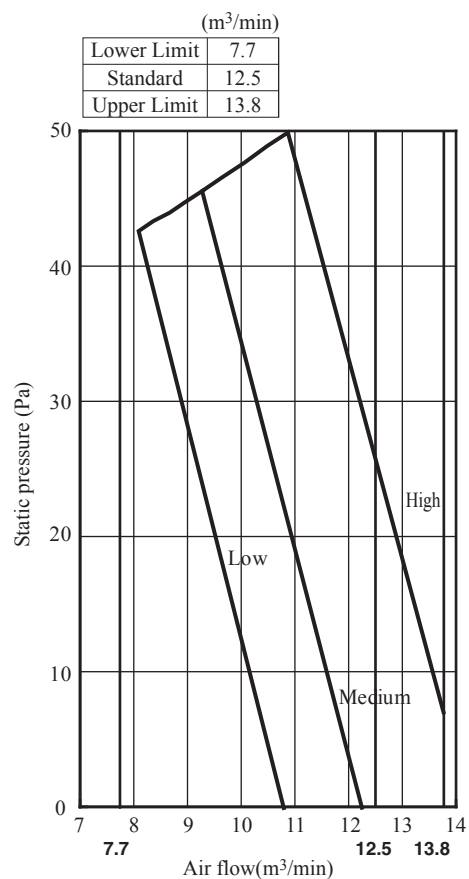
##### (2) Model FDUT36KXE6D (UT-DAS1E)



##### (3) Model FDUT45KXE6D (UT-DAS2E)

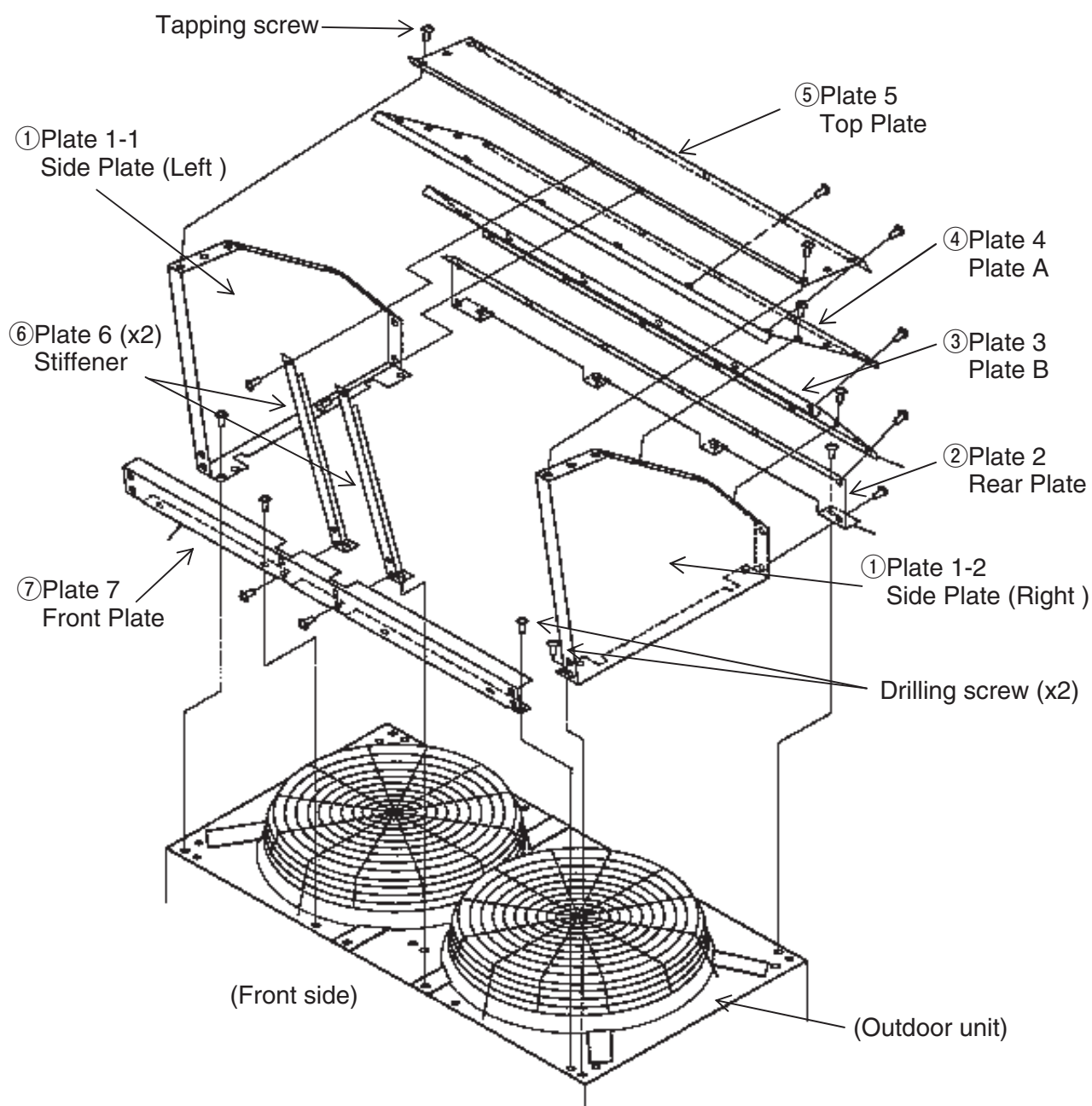


##### (4) Model FDUT56KXE6D (UT-DAS2E)



## 9.2 Air flow deflector

### 1. Assembling drawing

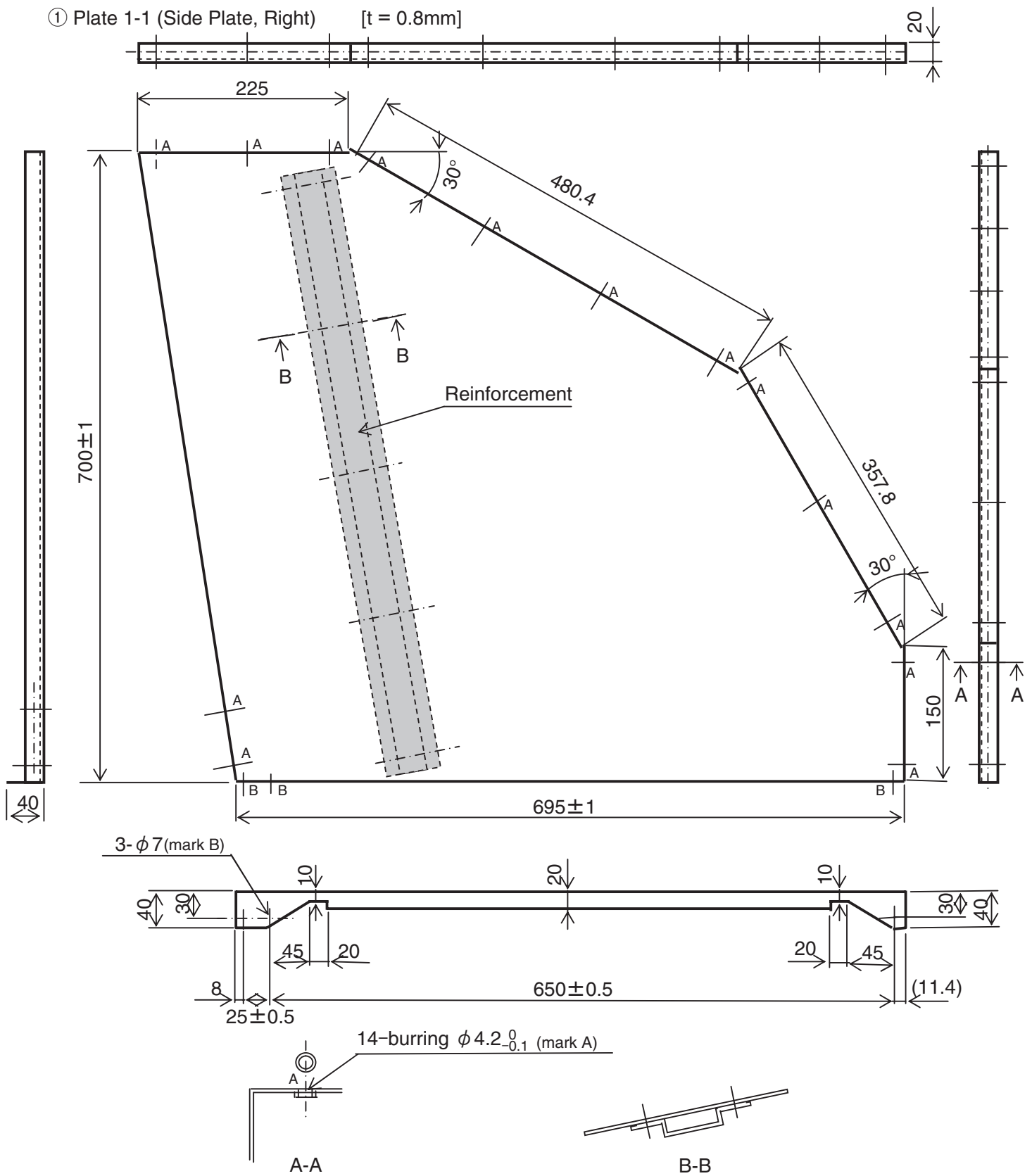


### 2. Assembling sequence

- ① Plate 1-1 and Plate 1-2 ⇒ ② Plate 2 ⇒ ③ Plate 3  
 ⇒ ④ Plate 4 ⇒ ⑤ Plate 5 ⇒ ⑥ Plate 6 (x2) ⇒ ⑦ Plate 7

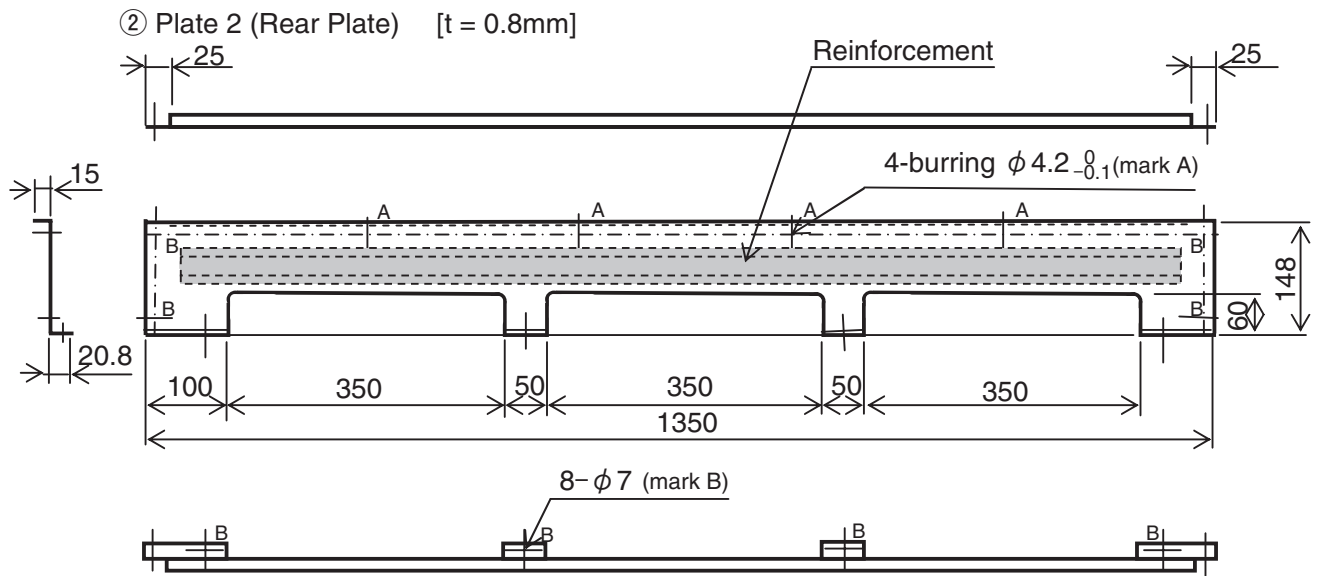
## 3. Part drawing

① Plate 1-1 (Side Plate, Right) [t = 0.8mm]

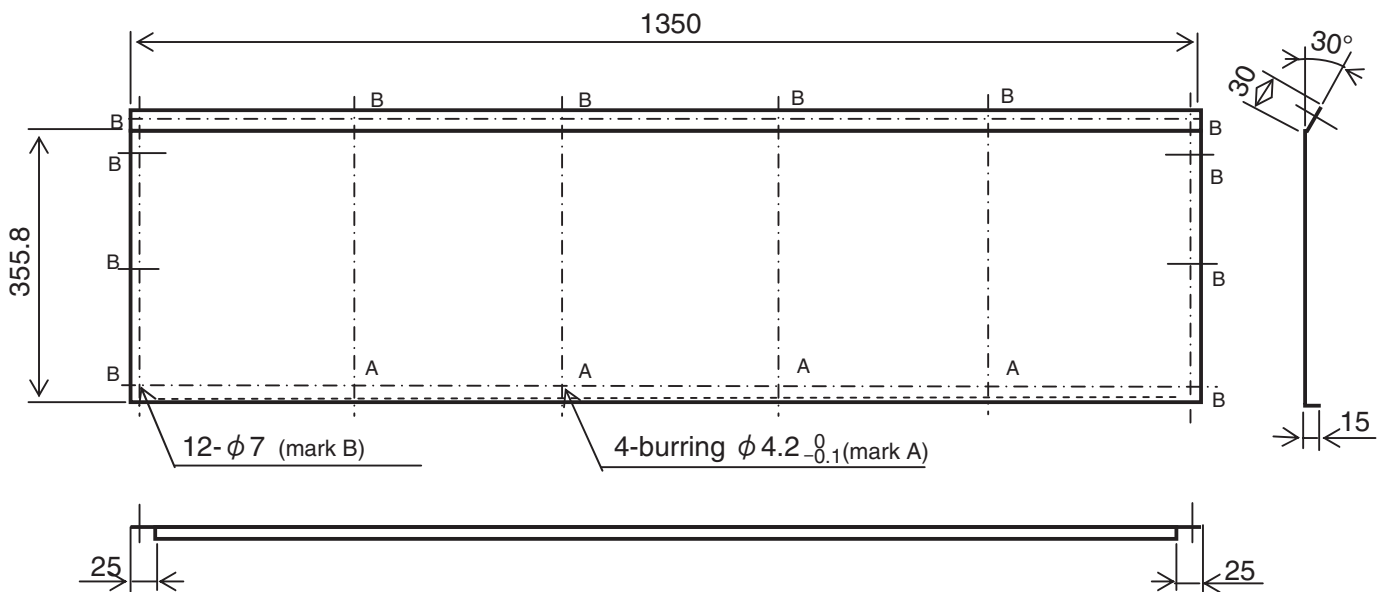


① Plate 1-2 (Side Plate, Left) [t = 0.8mm]

The drawing for Plate 1-2 is the symmetrical drawing for the Plate 1-1

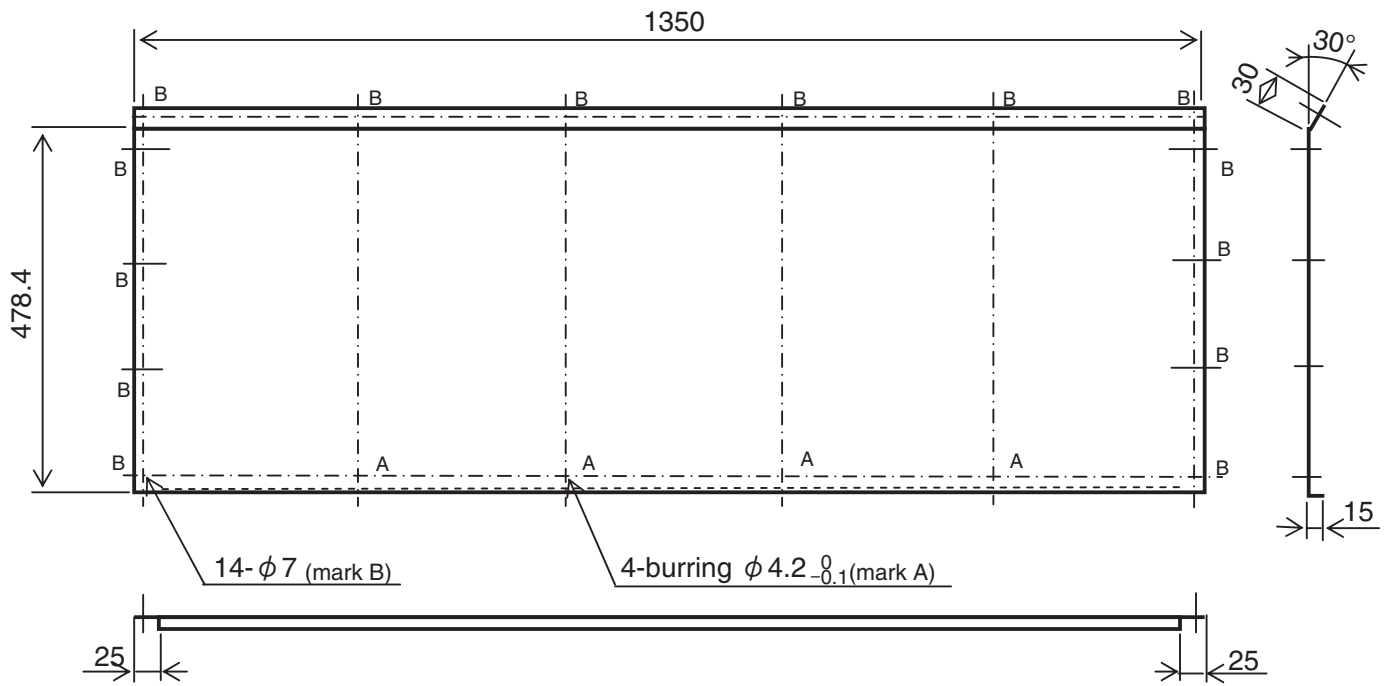


③ Plate 3 (Plate B) [t = 0.8mm]

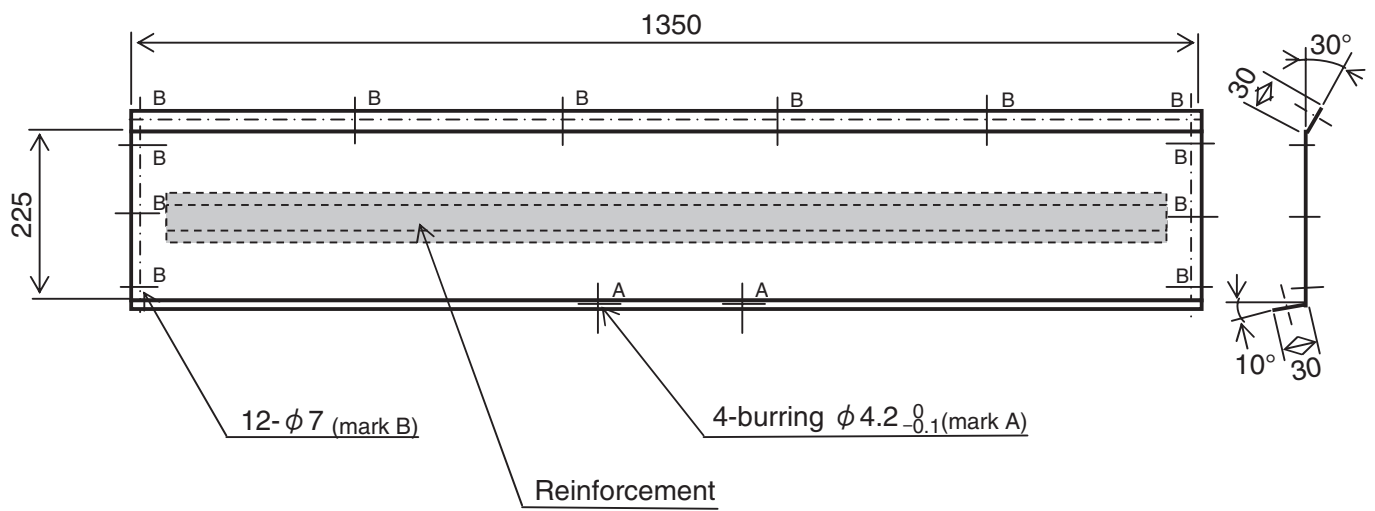




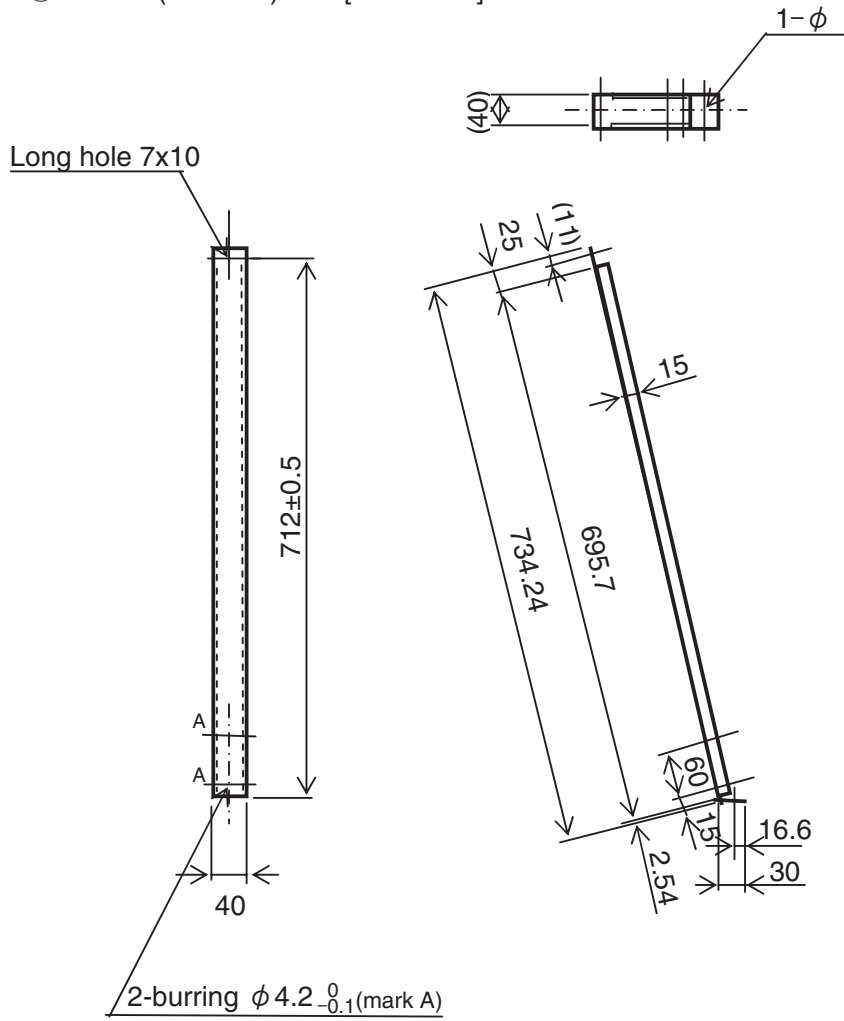
④ Plate 4 (Plate A) [t = 0.8mm]



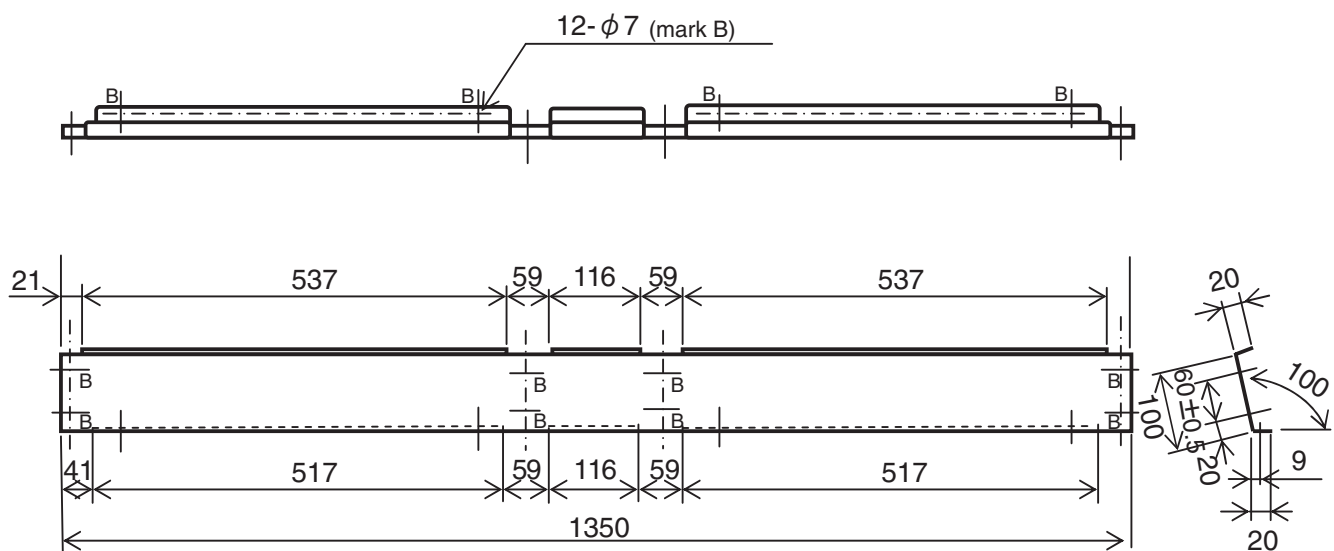
⑤ Plate 5 (Top Plate) [t = 0.8mm]



⑥ Plate 6 (Stiffener) [t = 0.8mm]



⑦ Plate 7 (Front Plate) [t = 0.8mm]



## 10 Outdoor Air (OA) intake for FDT and FDTW

### (1) FDT

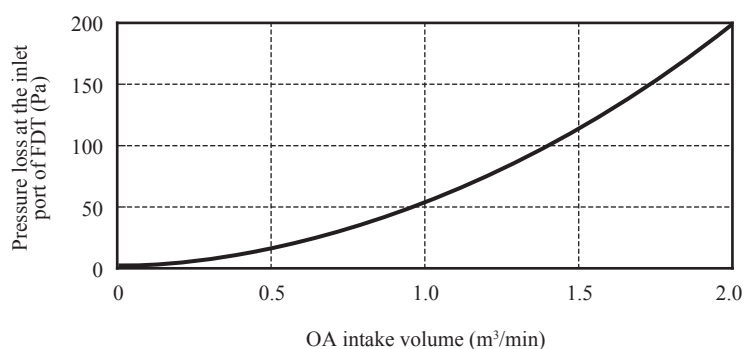
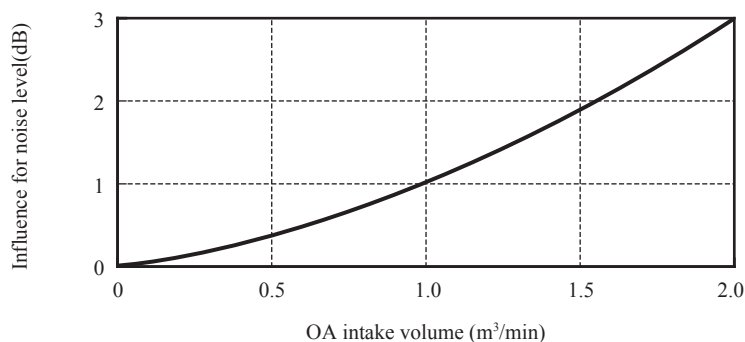
If it is required to intake OA through FDT unit, make sure to check following points carefully in order to conform to the requirement of customer.

If the OA intake volume through FDT unit is not satisfied with the required ventilation air volume, consider to install an independent ventilation system.

- 1) Be sure to calculate cooling/heating load considering the ventilation heat load and to decide the air-conditioning system.
- 2) Be sure the OA intake volume to FDT unit should not exceed 20% of the Supply Air (SA) volume of FDT unit and it should be less than 2m<sup>3</sup>/min.
- 3) Be sure to decide the OA intake volume considering the mixed air temperature will be within the usage temperature range of FDT unit.

Especially in following case, please consider to intake OA after processing OA or reducing the OA intake volume.

- 4) Be sure to equip a suitable filter for OA intaken in order to protect the dust.  
(Because OA does not pass through the filter equipped on FDT unit)
- 5) Be sure to insulate OA duct.  
(If not, it may have dew condensation.)
- 6) Be sure to interlock the booster fan for OA with the fan of FDT unit by using CNT connector.  
(If not, the dust trapped on the filter of FDT unit may be blown out to the room by the OA being intaken during the fan of FDT unit stopping)
- 7) Be sure to select a suitable booster fan for OA considering the pressure loss in the OA duct and the pressure loss at the inlet port of FDT with following diagram.  
(Please take into consideration the noise level as well)



<Selection of booster fan>

Booster fan should have a static pressure calculated with following formula

Static pressure of booster fan

= The pressure loss at the inlet port of FDT (from above diagram)

+ Pressure loss in the OA duct (In case of φ100 duct, 5Pa/m is required)

Select the booster fan from the fan characteristic diagram

**(2) FDTW**

If it is required to intake OA through FDTW unit, make sure to check following points carefully in order to conform to the requirement of customer.

If the OA intake volume through FDTW unit is not satisfied with the required ventilation air volume, consider to install an independent ventilation system.

- 1) Be sure to calculate cooling/heating load considering the ventilation heat load and to decide the air-conditioning system.
- 2) Be sure that Air flow( $\text{m}^3/\text{min}$ ) should be within the range mentioned in following diagram.
- 3) Be sure to decide the OA intake volume considering the mixed air temperature be within the usage temperature range of FDT unit.

Especially in following case, please consider to intake OA after processing OA or reducing the OA intake volume.

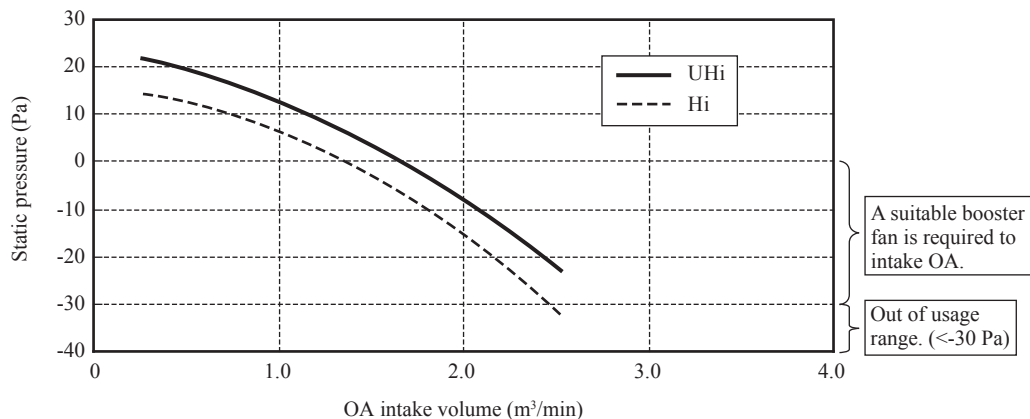
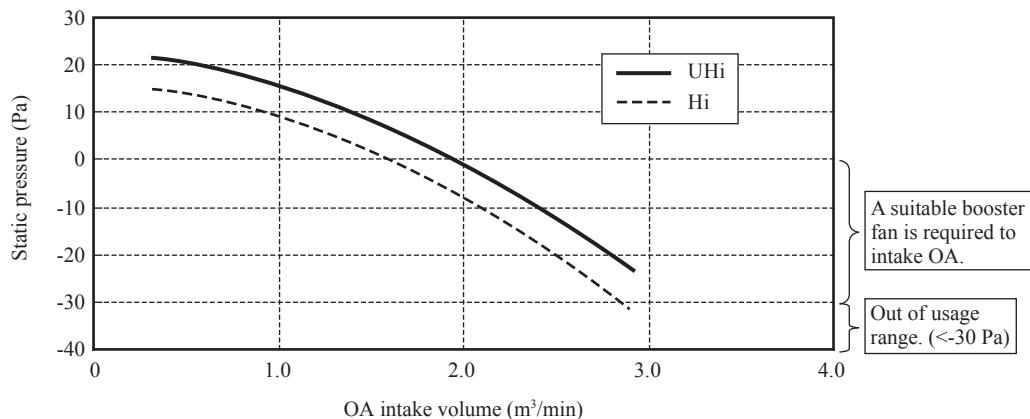
>If the dew point of OA is higher than the temperature (Dry Bulb) of Return

Air (RA) to FDTW unit. (It may have dew condensation)

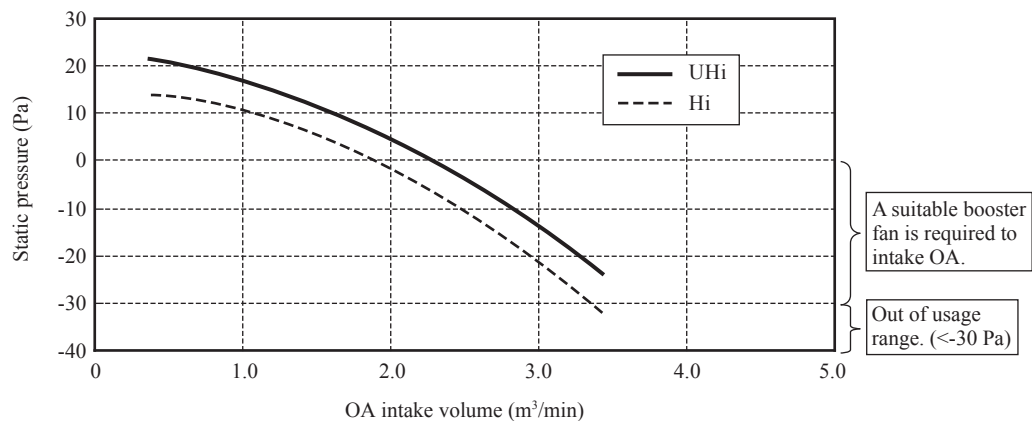
>If the temperature of OA is extremely low.

(In case of excessive OA intaken, the temperature of mixed air may become out of usage temperature range)

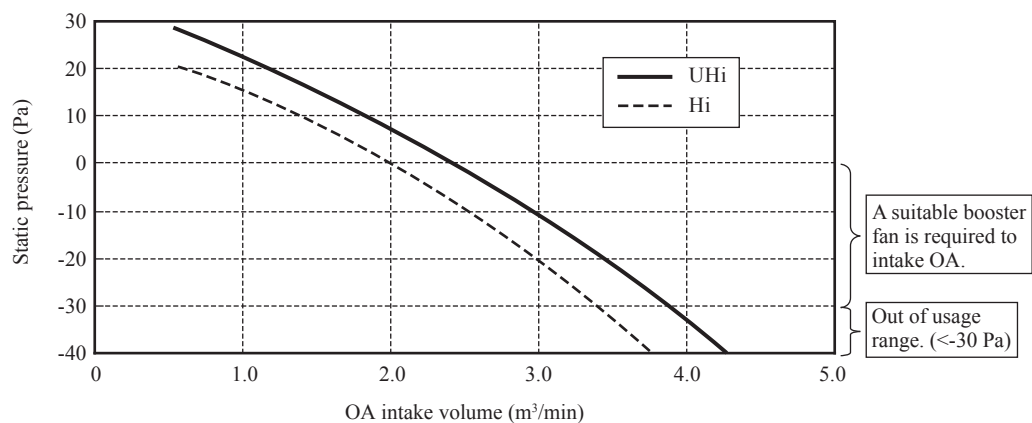
- 4) Be sure to equip a suitable filter for OA intaken in order to protect the dust.  
(Because OA does not pass through the filter equipped on FDTW unit)
- 5) Be sure to insulate OA duct.  
(If not, it may have dew condensation.)
- 6) Be sure to interlock the booster fan for OA with the fan of FDTW unit by using CNT connector.  
(If not, the dust trapped on the filter of FDTW unit may be blown out to the room by the OA being intaken during the fan of FDTW unit stopping)
- 7) Be sure to select a suitable booster fan for OA considering pressure loss in the OA duct and the pressure loss at the inlet port of FDTW with following diagram.

**FDTW28-56****FDTW71**

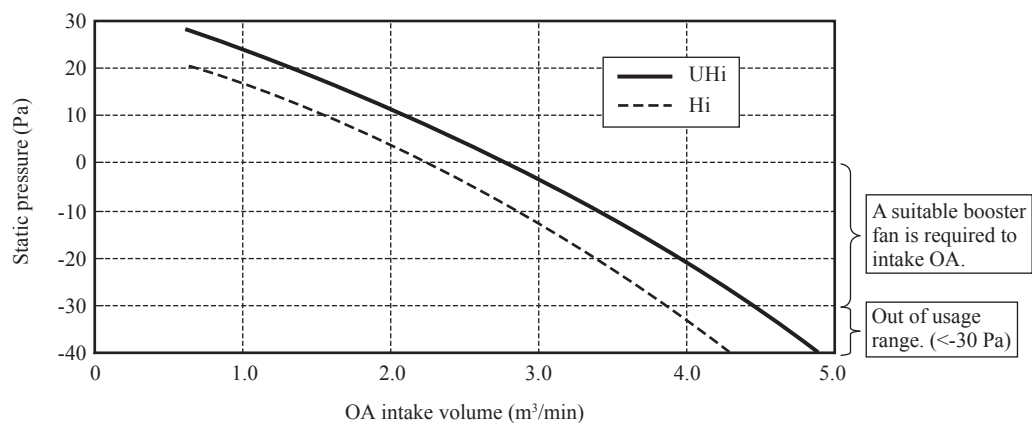
**FDTW90**



**FDTW112**



**FDTW140**



## &lt;Calculation example&gt;

Indoor unit: FDTW90

Fan speed of FDTW90: Hi

## ● Case 1

(Conditions)

OA intake volume: 1.0m<sup>3</sup>/min

⇒ Static pressure at inlet port of FDTW (OA duct = 0m): +10Pa (from following diagram)

OA duct length: 2m

OA duct size:  $\phi 100$  (Pressure loss: 5Pa/m)

(Calculation method of static pressure for booster fan)

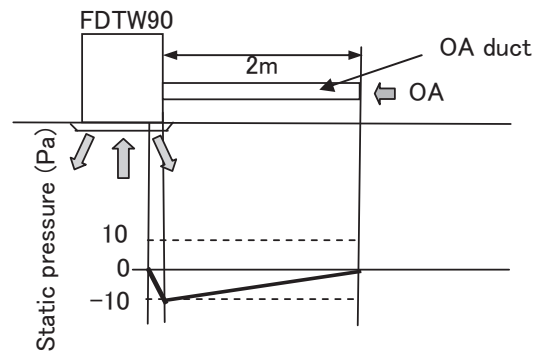
Static pressure at the inlet port of FDTW with OA duct (Ps)

= Static pressure at inlet port of FDTW + Pressure loss of the OA duct

= 10 - 5 × 2 = 0Pa

**Booster fan is no necessary.**

(If Ps &lt; 0, Booster fan is required.)



## ● Case 2

(Conditions)

OA intake volume: 3.0m<sup>3</sup>/min

⇒ Static pressure at inlet port of FDTW (OA duct = 0m): -22Pa (from following diagram)

OA duct length: 2m + 1m = 3m

OA duct size:  $\phi 100$  (Pressure loss: 5Pa/m)

(Calculation method of static pressure for booster fan)

Static pressure at the inlet port of FDTW with OA duct (Ps)

= Static pressure at inlet port of FDTW + Pressure loss of the OA duct

= -22 - 5 × 3 = -37Pa (Ps &lt; 0)

**Select the booster fan with 37Pa or more static pressure.**