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MITSUBISHI HEAVY INDUSTRIES, LTD. Technical Manual Collection Data Combination Inverter Driven Multi-indoor Unit KX4 Serices

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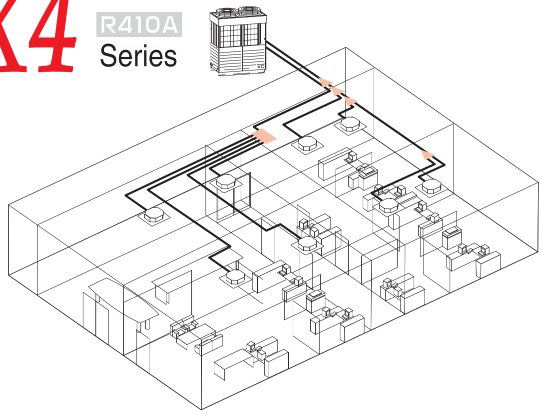
Combination Inverter Driven Multi-indoor Unit

Technical Manual Collection Data

KX4 R410A Series



MITSUBISHI HEAVY INDUSTRIES, LTD.

'05	TECHNICAL MANUAL
	KX- 4

Part 1 Basics of Air-Conditioner

1. Refrigeration Principle

Air conditioning

Comfortable indoor environment requires regulating and maintaining of indoor temperature, humidity, airflow and air cleanness.

Air conditioning can be done via compressor.

Indoor temperature and humidity condition Unit: °C DB, %

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="2">Standard condition</th><th colspan="2">Permissible condition</th></tr>
<tr><th>Temperature</th><th>Humidity</th><th>Temperature</th><th>Humidity</th></tr>
<tr><td rowspan="3">Summer</td><td>Common places</td><td rowspan="2">25 to 26</td><td rowspan="3">50 to 60</td><td>23 to 25</td><td rowspan="2">40 to 50</td></tr>
<tr><td>Theater, hotel</td><td>24 to 26</td></tr>
<tr><td>Workshop</td><td>29</td><td>25 to 27</td><td>45 to 50</td></tr>
<tr><td rowspan="3">Winter</td><td>Common places</td><td rowspan="2">20 to 22</td><td rowspan="2">40 to 50</td><td>23 to 25</td><td rowspan="3">40 to 50</td></tr>
<tr><td>Theater, hotel</td><td>22 to 23</td></tr>
<tr><td>Workshop</td><td>18</td><td>30 to 35</td><td>20 to 22</td></tr>
</table>

1.1 Refrigeration Cycle

The cars we use everyday are installed with various necessary components for the purpose of driving, including engines, car bodies, tires, steering wheels, etc., which are all indispensable. And even equipped with these necessary components, it cannot be guaranteed that vehicles can run. Because if no fuel is added and no driving force is supplied, the car still cannot run.

Same as the car, the air conditioner is also installed with 4 necessary components.

(1) Compressor

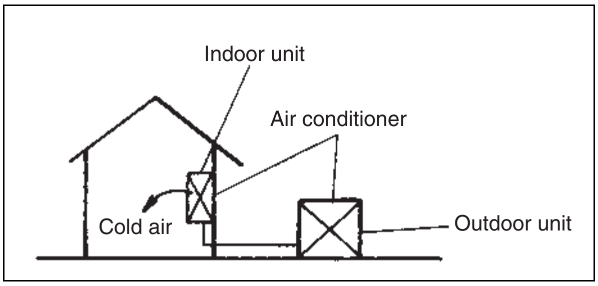
(2) Condenser

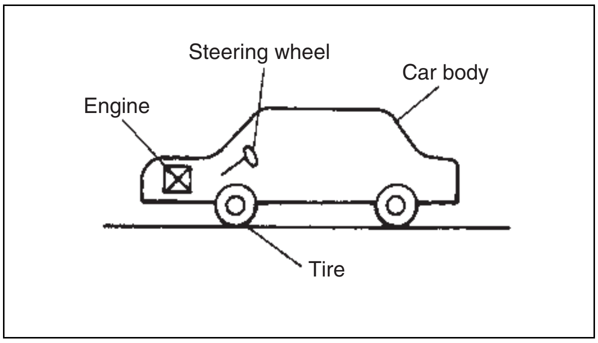
(3) Expansion valve

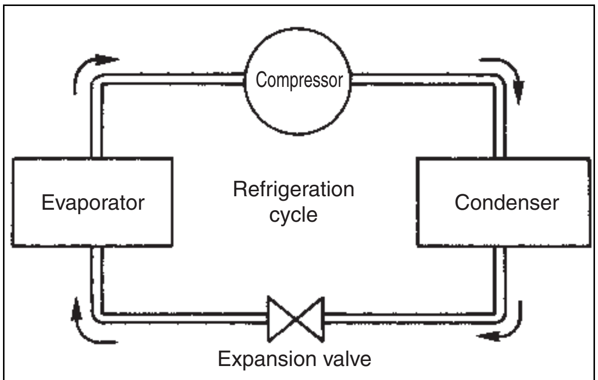
(4) Evaporator

These components are connected via piping to form a circulation loop, as shown in the right. Besides, same as adding fuel into the car, medium of cooling air (refrigerant) is encapsulated in the circulation loop. If without this refrigerant, air cooling cannot be accomplished.

Refrigerant is cycled among the above 4 components. This circulation is called refrigeration cycle. By knowing the function of these 4 components and features of refrigerant, we can understand the construction principle of air conditioners.







Refrigerant is encapsulated in the circulation loop.

1.2 Features of Refrigerant

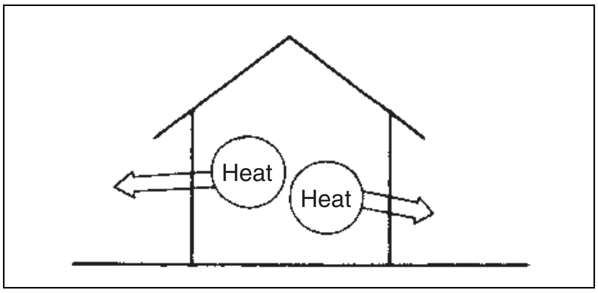
As shown in the table below, there are many kinds of refrigerant.
As for refrigerant used in the air conditioner, besides R22, there are also R407C for combination air conditioners and R410A for household air conditioners, etc.
Refrigerant must have the following features:
(1) can be vaporized under low-temperature condition
(2) can be easily vaporized into gas
(3) can be easily liquefied into liquid
(4) needs higher vaporization heat when vaporizing
(5) does not corrode metal
(6) has no toxicity

Secure
Safe
Effective

Item \ Refrigerant name		R410A	R407C	R22	R404A	R134a
Component	(wt%)	R32/R125 (50/50)	R32/R125/R134a (23/25/52)	R22 (100)	R125/R134a/R143a (44/4/52)	R134a (100)
Molecular weight		72.6	86.19	86.5	97.6	102.03
Boiling point	(°C)	-51.4	-43.6	-40.8	-46.5	-26.15
Latent heat of vaporization (0°C)	kJ/kg	225	213.7	204.7	168.3	197.6
Vapor pressure (25°C)	(MPa)	1.56	1.09	0.94	1.26	0.67
Flammability		Inflammable	Inflammable	Inflammable	Inflammable	Inflammable
Ozone Depletion Potential (ODP)		0	0	0.055	0	0
Global Warming Potential (GWP)		1730	1530	1700	3260	1300

- R134a refrigerant is used for vehicle air conditioner and refrigerated storage.
- R22 is used as refrigerant for the air conditioner, but will be gradually replaced by R407C or R410A. R407C and R410A are all non-azeotropic refrigerants, which are characterized by difference between gas phase components and liquid phase components under balanced state.

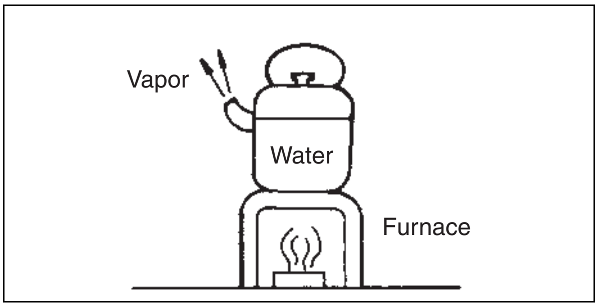
1.2.1 Vaporization of refrigerant



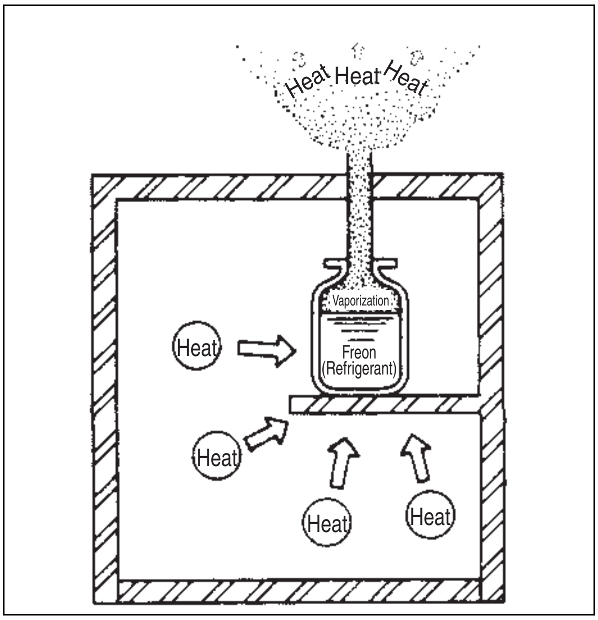
To make air temperature drop, it is necessary to absorb heat from the air.The air conditioner absorbs heat from the air by means of vaporization heat of refrigerant. Refrigerant has the feature of seizing heat from surrounding materials when vaporizing.
For vaporization, detailed explanation is as follows.

Vaporization = liquid → gas

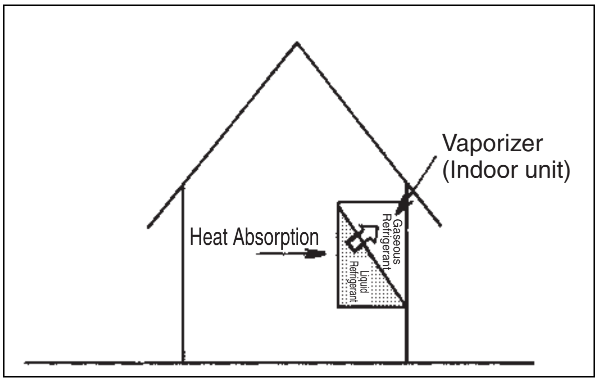
Vaporization is to change material from liquid state to gas state.



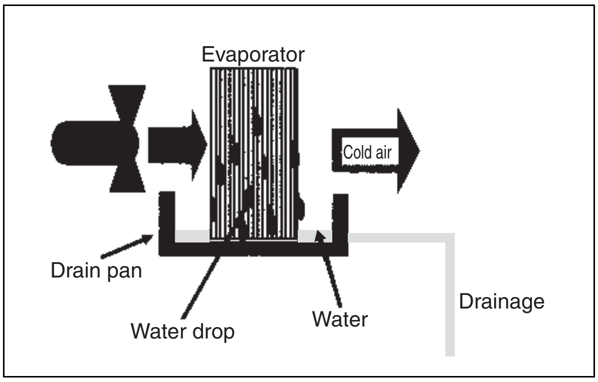
For example, as shown in the right, the phenomenon that water (liquid state) turns into vapor (gas state) after being put on fire for a while is called vaporization phenomenon.
Vice versa, water turns into vapor through absorption of heat in the fire.
As shown in the right, the high-pressure gas bottle containing liquid refrigerant (R22) is placed in the box, and the refrigerant (liquid state) is vaporized after absorbing heat in the box. Heat in the box decreases, and temperature gradually drops.
This effect is the principle of indoor refrigeration by using air conditioner.
This device that absorbs surrounding heat through vaporization of liquid refrigerant (R410A) is called **evaporator** .



But, as shown in the right, the liquid refrigerant in the high-pressure gas bottle is evaporated continuously, and will exhaust soon.In order to evaporate continuously, it is necessary to replenish liquid refrigerant. The air conditioner achieves this aim by restoring the vaporized gaseous refrigerant into liquid state.



When the indoor high-temperature gas passes the evaporator, its heat is absorbed by refrigerant, the temperature drops, and it is discharged as low-temperature gas. After the air cools down, vapor in the air will turn into liquid water and stays in the condensate pan (drain pan).



1.2.2 Liquefaction of refrigerant

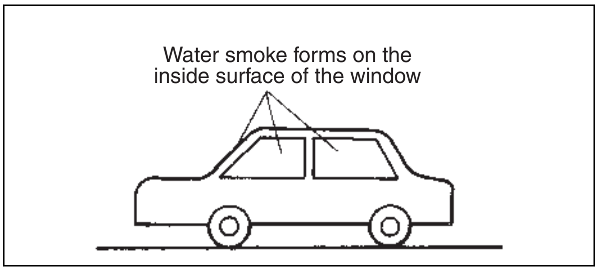
Condensation = gas → liquid

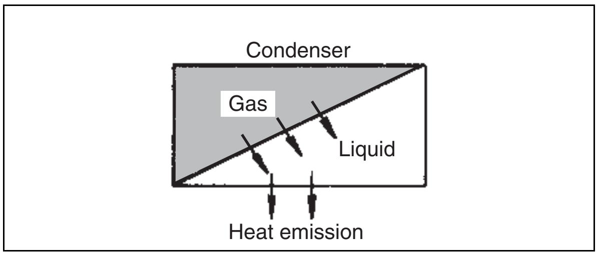
Condensation is to change materials from gas state into liquid state.

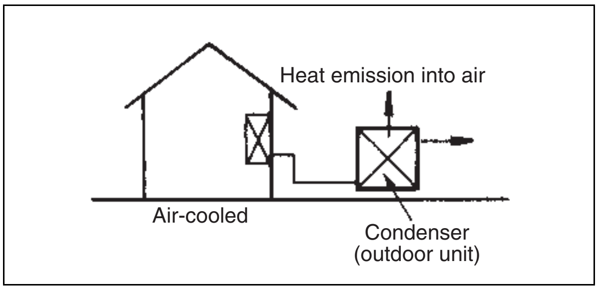
After releasing heat in gaseous refrigerant, the gaseous refrigerant will turn into liquid state. For example, when taking bus or train in winter, we will see a layer of water smoke on the window. This phenomenon is called liquefaction.

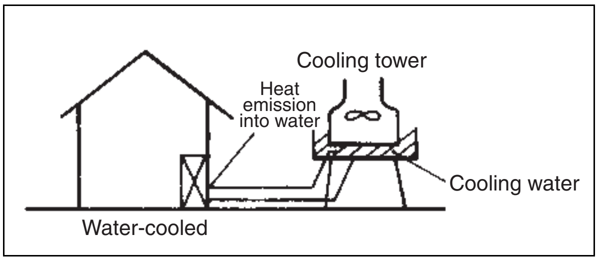
As for the question whether the water smoke is generated on window outside or window inside, the answer is inside. This is because that the high-temperature air (gas state) inside the vehicle is cooled down by the low temperature outside the vehicle, and moisture in the air is condensed into liquid water, which adheres to the vehicle window. This device that changes gas into liquid by releasing heat in the gas is called **condenser** .

The kind of condenser that utilizes air to make refrigerant release heat is called air-cooled condenser, while the kind of condenser that utilizes cold water to make refrigerant release heat is called water-cooled condenser.



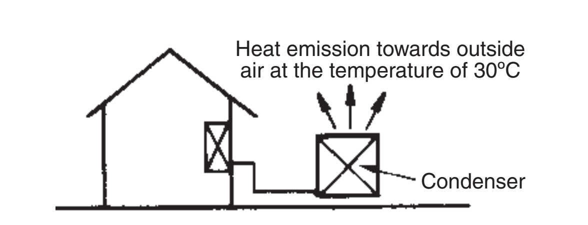


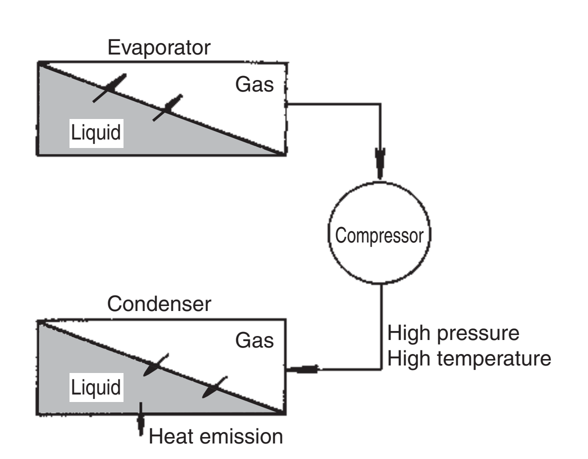




1.2.3 Compression of refrigerant

As mentioned previously, the condenser makes gaseous refrigerant release heat and become liquid state, but there exists a problem here. Now, we take the example of air cooled for explanation. In summer, outside air temperature at the place where refrigerant releases heat is about 30°C. Refrigerant needs to release heat towards outside air, therefore if temperature of gaseous refrigerant cannot exceed 30°C, heat cannot be released. Refrigerant has such a feature that temperature rises as pressure increases. The device that uses this feature to compress gaseous refrigerant to make its pressure and temperature rise is called **compressor** .





As shown in the right table, as refrigerant pressure increases, temperature of refrigerant rises gradually. Using this feature, for example, if compressor is used to raise pressure to 2.63 MPa, temperature of gaseous refrigerant can reach 45°C. Because air temperature is 30°C, gaseous refrigerant can release heat towards outside air, thus becoming liquid refrigerant.

Table of relation between saturation temperature and pressure of R407C and R22 refrigerant

Standard pressure = MPa

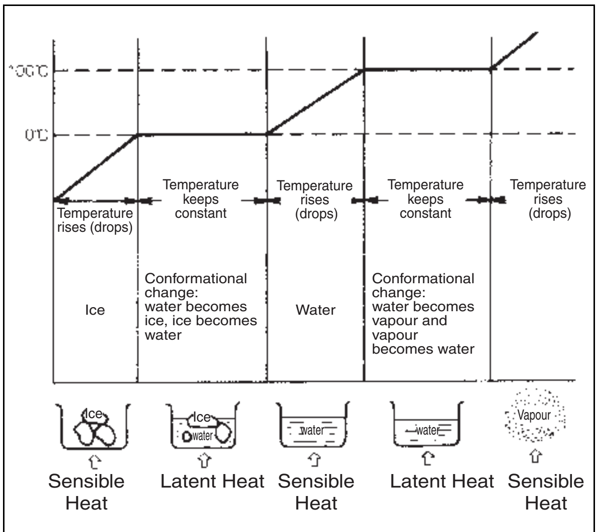
Temperature °C	R410A		R407C		R22
	Liquid	Gas	Liquid	Gas	
+60	3.74	3.73	2.65	2.40	2.35
+55	3.34	3.33	2.37	2.13	2.09
+50	2.97	2.96	2.11	1.87	1.86
+45	2.64	2.63	1.87	1.64	1.64
+40	2.33	2.32	1.64	1.43	1.45
+35	2.05	2.04	1.44	1.34	1.27
+30	1.80	1.79	1.36	1.07	1.10
+25	1.56	1.56	1.09	0.92	0.95
+20	1.35	1.35	0.94	0.78	0.82
+15	1.16	1.16	0.80	0.65	0.69
+10	0.99	0.99	0.68	0.54	0.58
+5	0.84	0.84	0.57	0.44	0.49
0	0.70	0.70	0.47	0.36	0.40
-5	0.58	0.58	0.38	0.28	0.32
-10	0.48	0.48	0.30	0.22	0.25
-15	0.38	0.38	0.24	0.16	0.20
-20	0.30	0.30	0.18	0.11	0.15
-25	0.23	0.23	0.13	0.07	0.10

1.2.4 Types of heat

The 45°C gaseous refrigerant will become 45°C liquid one when the pressure inside the condenser is 2.63 MPa.

Latent Heat = amount of heat required for conformational changes of substances.
Sensible Heat = amount of heat required for temperature changes of substances.

Let's explain with water as an example. As shown in the right diagram, the amount of heat required for the water temperature to rise from 0°C to 100°C is the sensible heat. When the 100°C water is further heated, the liquid water becomes vapour, but the temperature is still 100°C. The amount of heat required during this process is called the latent heat.

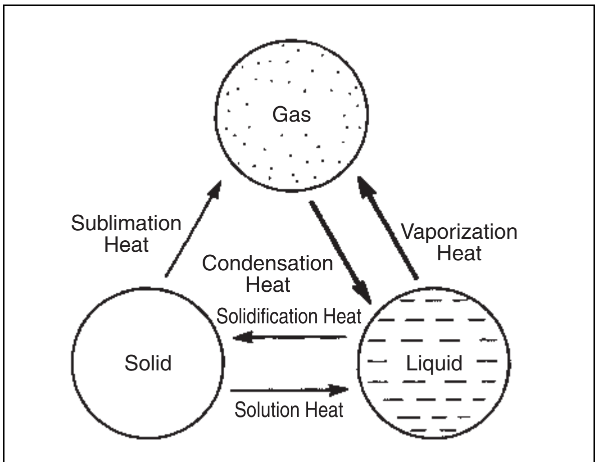


Conformational change of water
(standard atmospheric pressure)

Air-conditioners make use of two types of latent heat:

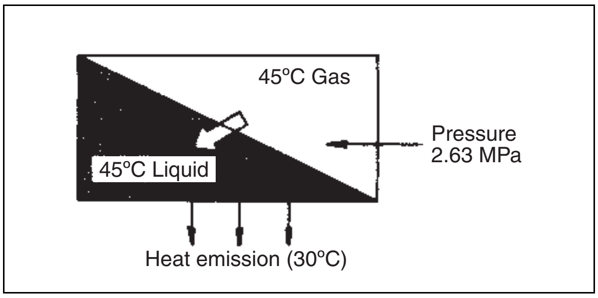
Liquid → Gas: Vaporization heat of the liquid-gas conversion.

Gas → Liquid: Condensation heat of the gas-liquid conversion.



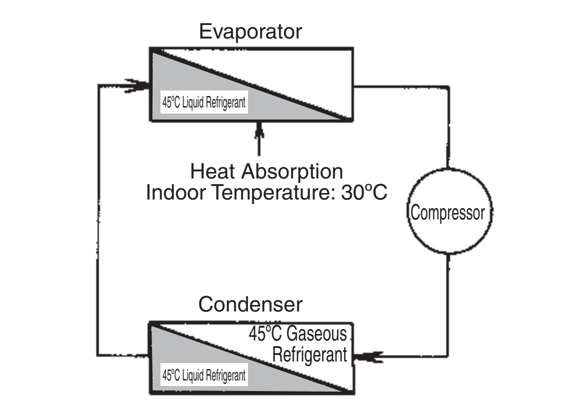
Types of Latent Heat

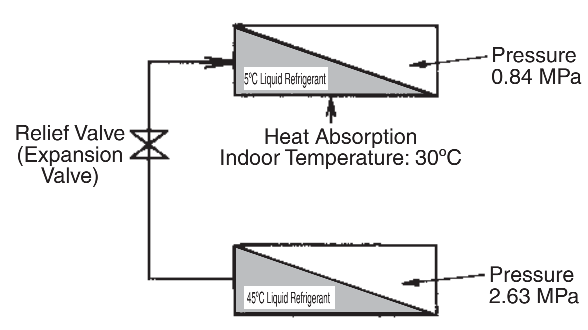
As mentioned above, the 45°C refrigerant gas emits heat and becomes 45°C liquid in the condenser.

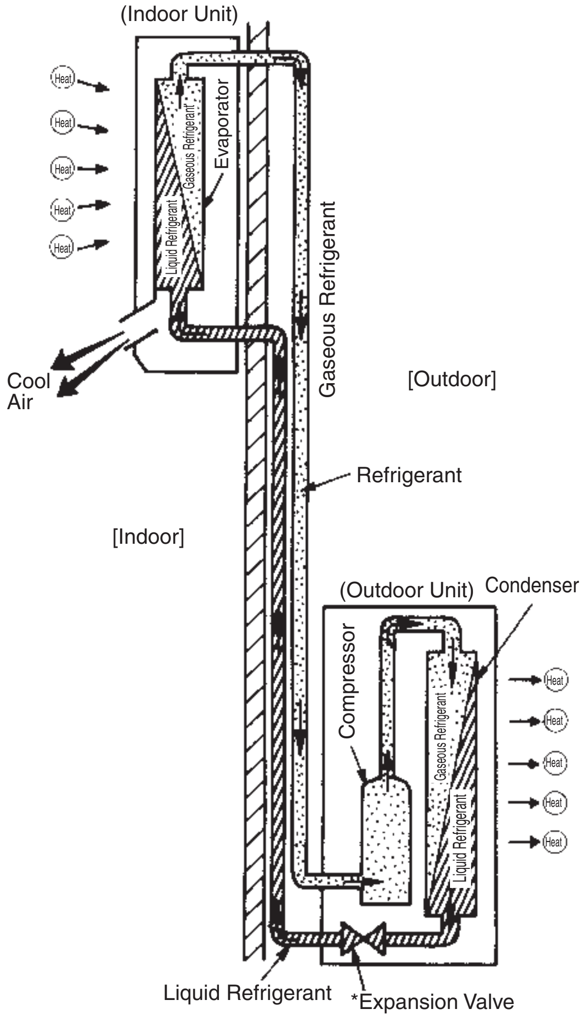


1.2.5 Expansion of refrigerant

The 45°C liquid refrigerant generated in the condenser flows to the evaporator, where it absorbs the surrounding heat and is again vaporized. As shown in the right diagram, the temperature of the heat absorption objects of the liquid refrigerant, i.e. the room air temperature, is 30°C. At this moment, the 45°C liquid refrigerant is unable to absorb heat from the indoor air for vaporization purpose.
Therefore, the temperature of the liquid refrigerant inside the condenser must drop to a lower vaporizable temperature. For this purpose, a relief valve is installed at the inlet of the evaporator to decrease the pressure inside the evaporator to 0.84 MPa.
As shown in the table on Page 13, when the pressure is decreased to 0.84 MPa, the temperature changes to 5°C. At this moment, the liquid refrigerant is able to absorb heat from the 30°C indoor air to realize vaporization.
The above mentioned relief valve is called an **expansion valve** .
Of course, some air-conditioners use capillary pipes having the same functions as the expansion valves. As described above, the refrigerant flows in the refrigeration cycle loop and the following changes happen in repetitive cycles: the high temperature and high pressure gaseous refrigerant changes into liquid state and further into a low temperature and low pressure liquid state before it turns into the gaseous state.
It is thus proved that the air-conditioners absorb heat from the indoor air through the vaporization of refrigerant and discharge the absorbed heat to the outdoor through the condensation process. The refrigerant is thus a media of heat transfer.

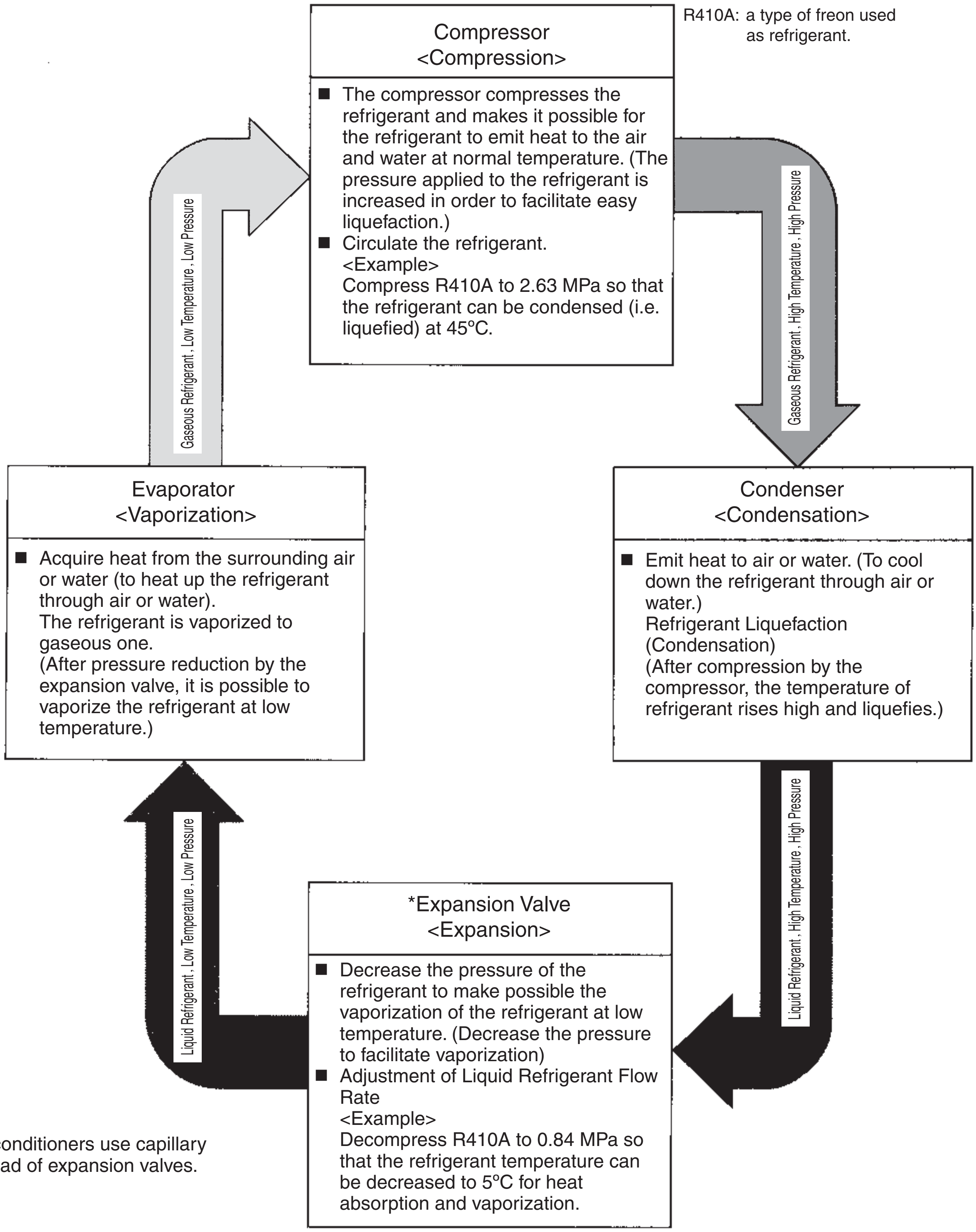






Household Air-conditioner in Cooling Operation

1.2.6 Functions of components

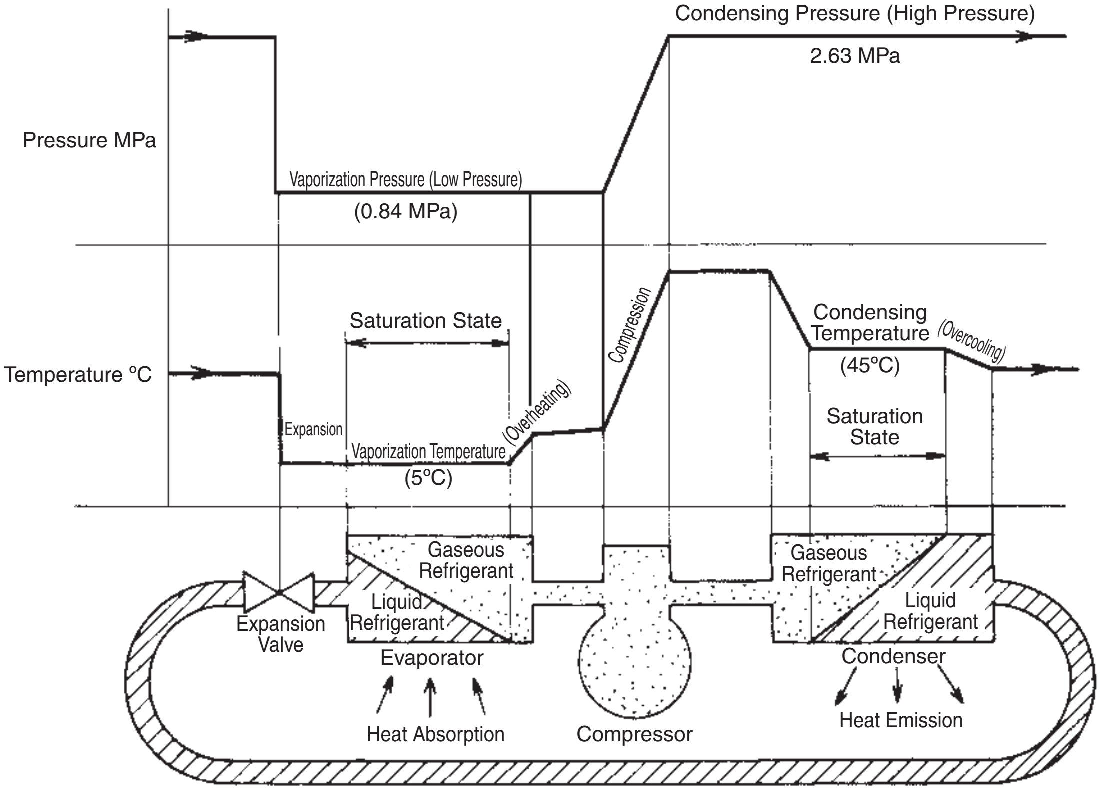


* Some air-conditioners use capillary pipes instead of expansion valves.

1.3 Temperature and Pressure in Refrigeration Cycle

The change of temperature and pressure in refrigeration cycle is shown as follows.

R410A



1.3.1 There are two types of pressures in the refrigeration cycle

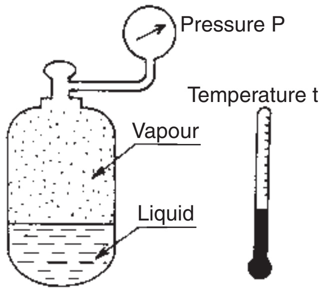
a) High Pressure
   Compressor Outlet → Expansion Valve Inlet
b) Low Pressure
   Expansion Valve Outlet → Compressor Inlet

1.3.2 Temperature in refrigeration cycle

a) Saturation Temperature
   When the aforesaid pressure reaches 2.63 MPa and the temperature reaches 45°C, it indicates that the refrigerant is in a saturation state.

Saturation State = a state where liquid and gas coexist.

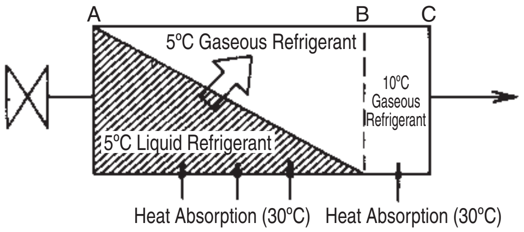
In the above diagram, when a saturation state is reached inside the evaporator and the condenser, the pressure and the temperature are in a constant relationship.



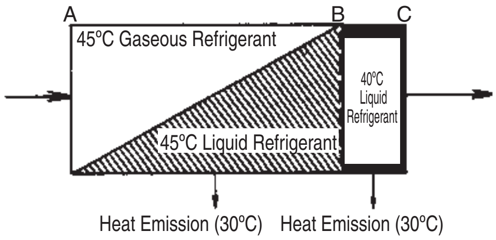
Saturation State

b) Superheat and Subcooling
Temperature changes even in the same evaporator and condenser. The pressure-temperature relationship beyond the saturation state is not fixed (liquid only or gas only).

1) Superheat
In the following diagram, when pressure inside the evaporator is 0.84 MPa, the temperature is 5°C. A saturation state is reached between A and B with a temperature of 5°C. However, it is gas only between B and C. Therefore, the 30°C surrounding air emits heat to the gaseous refrigerant, making the refrigerant temperature rise (sensible heat), e.g. to 10°C.
The outlet temperature is slightly higher than that in the evaporator. This state is called superheat and the temperature difference is called superheat degree.
For example: the temperature is 10°C at C and 5°C at B.
10°C – 5°C = 5°C
Then, the superheat degree is 5deg.
(Superheat)

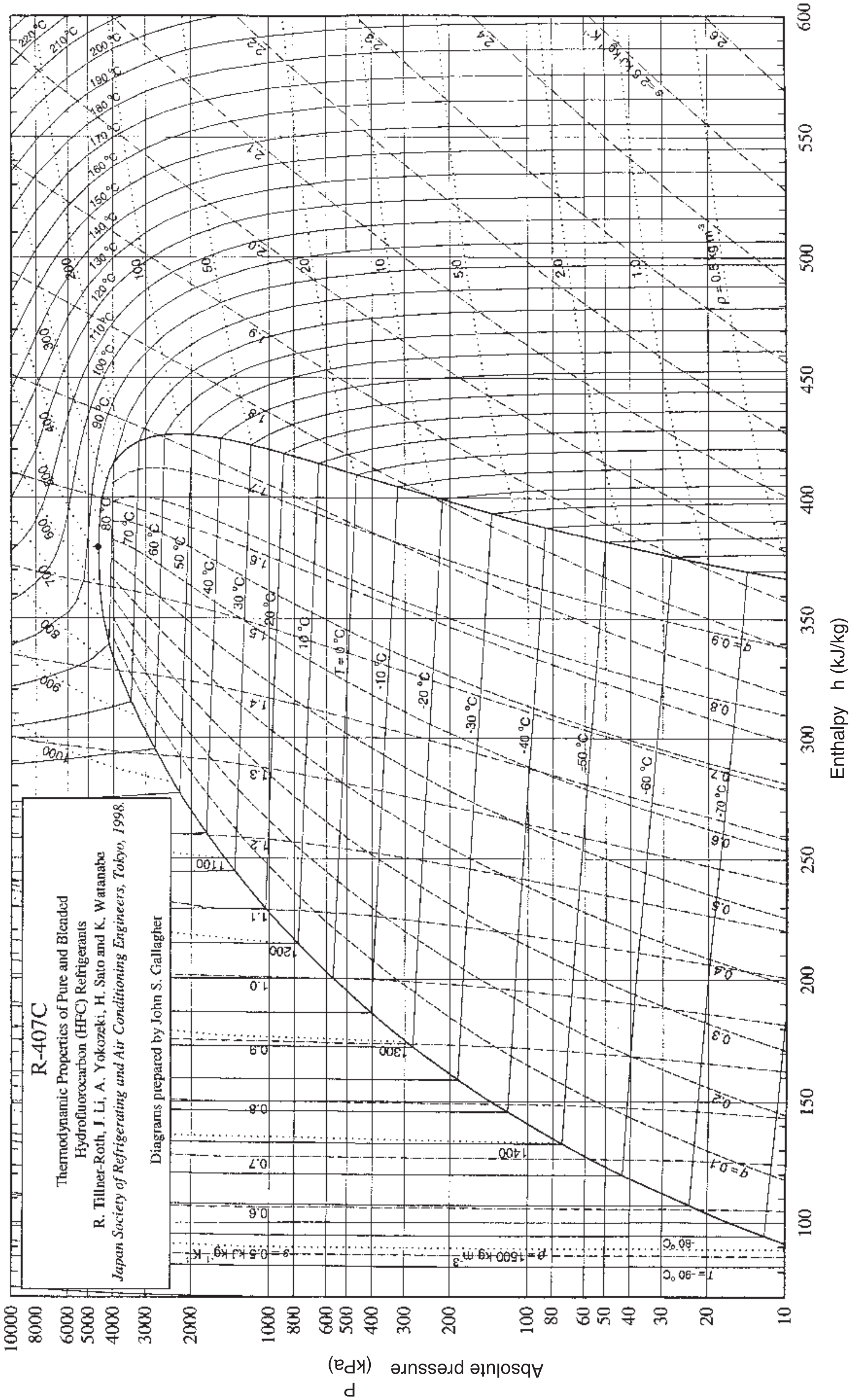


2) Subcooling
In the following diagram, when pressure inside the condenser is 2.63 MPa, the temperature is 45°C. A saturation state is reached between A and B with a temperature of 45°C. However, it is liquid only between B and C. After continuous heat emission to the surrounding environment, the temperature drops (sensible heat), e.g. to 40°C. This state when the outlet temperature is lower than that in the condenser is called overcooling.
For example: the temperature is 40°C at C and 45°C at B.
45°C – 40°C = 5°C
Then, the subcooling degree is 5deg.
(Subcooling)

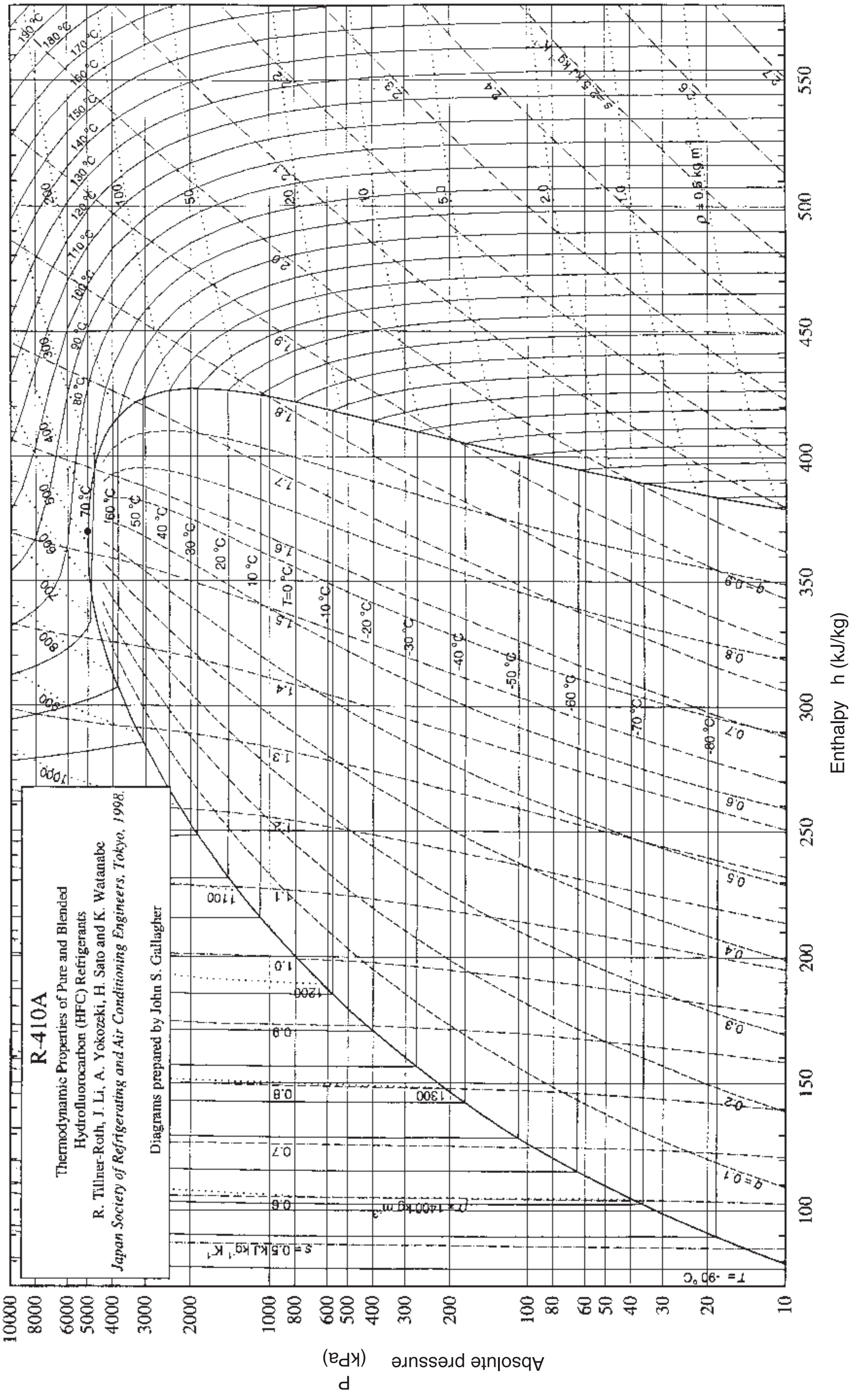


1.4 P-h Chart

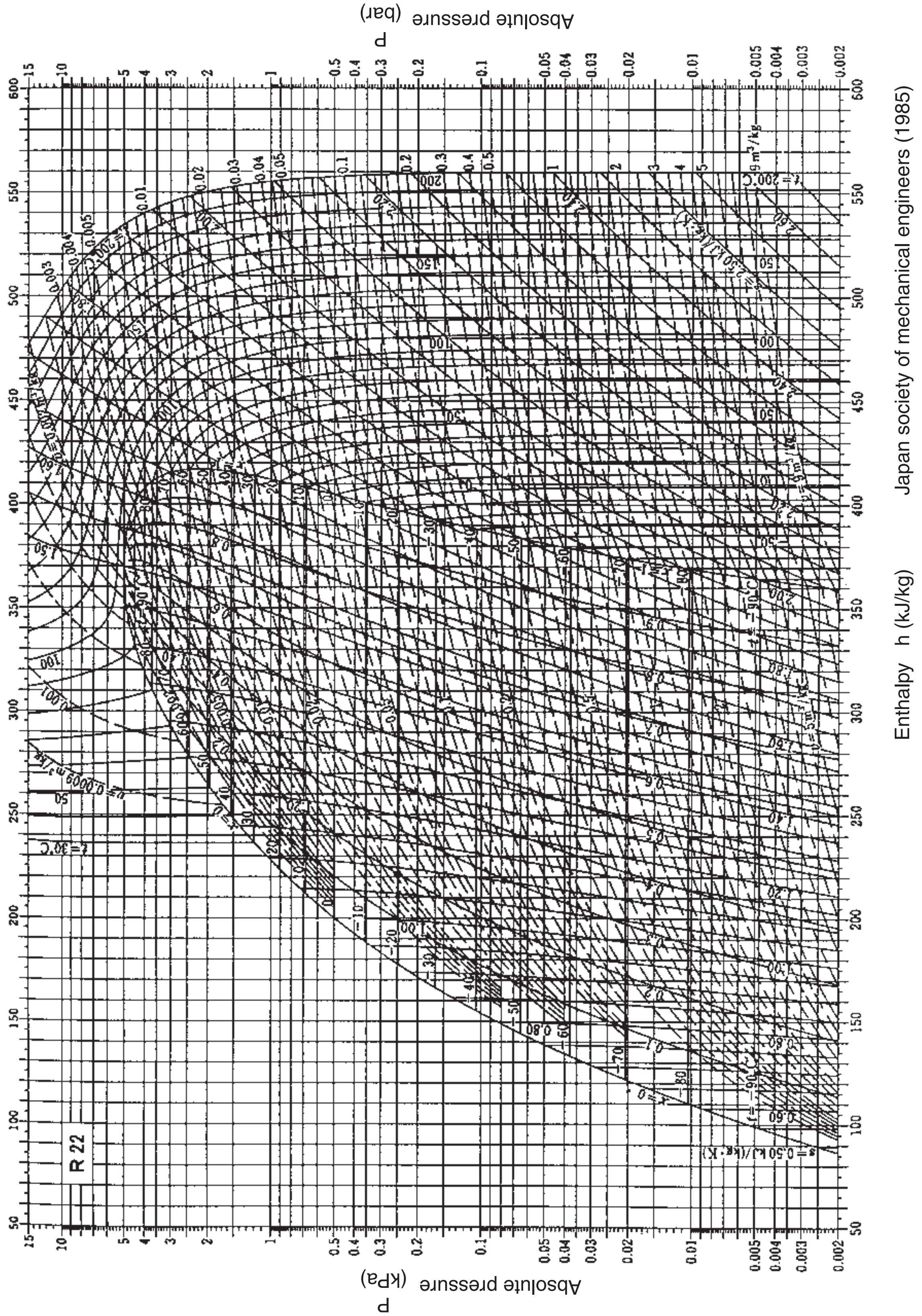
1. R407C ($CH_2F_2/C_2HF_5/CH_2FCF_3$) P-h chart



2. R410A (CH_2F_2/CHF_2CF_3) P-h chart



3. R22 ($CHClF_2$) P-h chart



1.5 Refrigerant Characteristics

1.5.1 Table of various refrigerant characteristics

Name of refrigerant		R410A	R407C	R22	R404A	R134a	Remarks
Molecular formula		CH_2F_2/ CHF_2CF_3	CH_2F_2/ C_2HF_5/ CH_2FCF_3	$CHClF_2$	CH_2CF_3/ CH_3CF_3/ CH_2FCF_3	$CH_2F\text{-}CF_3$	
Molecular weight		72.59	86.20	86.47	97.60	102.03	Note (2)
Boiling point (at standard atmospheric pressure)	°C	**-51.46**	**-43.57**	**-40.81**	**-46.13**	**-26.18**	Note (4)
Critical temperature	°C	71.99	86.54	96	71.63	101.15	Note (2)
Critical pressure	kPa Absolute	4952.5	4675.8	4936.7	3690.6	4065	Note (3)
Vaporization pressure at -14°C	kPa Absolute	499.01	349.55	307.21	380.57	171.30	Note (4)
Condensation pressure at 30°C	kPa Absolute	1879.7	1174.0	1192.4	1411.0	770.61	Note (4)
Vaporization heat at -14°C	kJ/kg	**243.17**	**232.08**	**215.21**	**176.56**	**208.41**	Note (4)
Unit volume of saturated gaseous refrigerant at -14°C	m^3/kg	0.05247	0.08425	0.074706	0.05259	0.11591	Note (4)
Unit volume of saturated liquid refrigerant at 25°C	m^3/kg	0.000942	0.000879	0.000840	0.000958	0.000829	Note (4)
Density of saturated liquid refrigerant at 25°C	kg/m^3	1061.6	1138.0	1190.7	1043.9	1205.9	Note (4)
Ozonosphere damage factor	ODP	0	0	0.055	0	0	Note (1)
Global warming coefficient (100 Years)	GWP	1730	1530	1700	3260	1300	Note (1)
Allowed toxicity concentration	(ppm)	1000	1000	1000	1000	1000	Note (1)
Combustibility		Incombustible (A1/A1)	Incombustible (A1/A1)	Incombustible (A1)	Incombustible (A1/A1)	Incombustible (A1)	Note (1)
Safety		A1/A1	A1/A1	A1	A1/A1	A1	Note (1)
Type of compressor used		Reciprocating, Rotary	Reciprocating, Rotary	Reciprocating, Rotary	Reciprocating, Rotary	Reciprocating, Rotary	
Purpose		Air conditioning	Air conditioning	Cooling, Refrigeration, Air conditioning	Cooling, Refrigeration	Cooling, Refrigeration, Air conditioning	Note (1)

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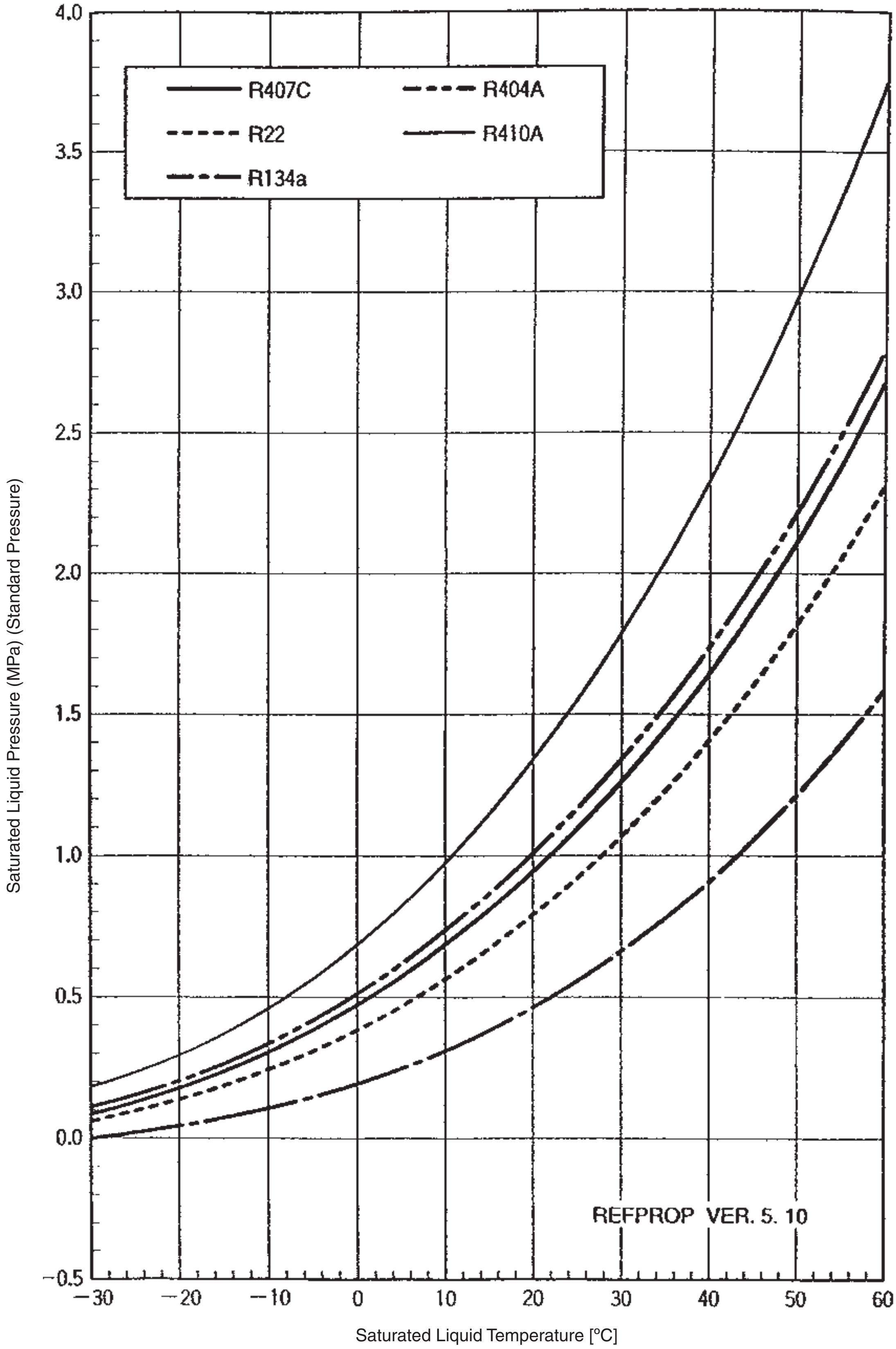
Note (1) Construction and Service Technology for Machines Used for HFC Refrigerants by Japan Refrigerating & Air-conditioning Industry Association (97.9.30)

(2) Overview of Air-conditioning and Sanitary Engineering, Edition No. 12; Thermodynamic Features of HFC Single Refrigerants and Mixed Refrigerants by Japan Refrigerating & Air-conditioning Industry Association, First Edition

(3) Thermodynamic Features of HFC Single Refrigerants and Mixed Refrigerants by Japan Refrigerating & Air-conditioning Industry Association, First Edition; Thermodynamic Features of Alternative Refrigerants as a Replacement of Freon by Japan Refrigerating Industry Association, Japan Freon Gas Association

(4) Thermodynamic Features of HFC Single Refrigerants and Mixed Refrigerants by Japan Refrigerating & Air-conditioning Industry Association, First Edition; Japan Refrigerating Industry Association, Refrigeration (No. 826, Volume 71)

1.5.2 Temperature and pressure of various refrigerants



Bibliography: Construction and Service Technology for Machines Used for HFC Refrigerants by Japan Refrigerating & Air-conditioning Industry Association (97.9.30)

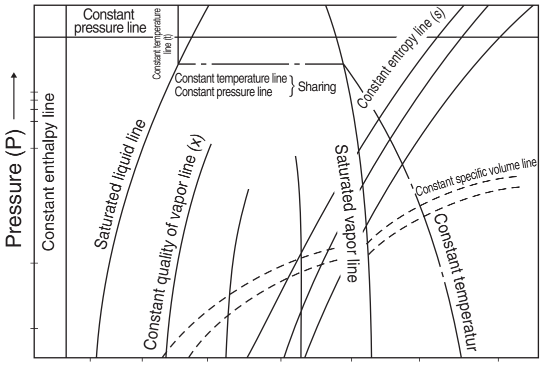
Note (1) HFC Refrigerants: R407C, R404A, R410A, R134a; HCFC Refrigerants: R22
HFC Series (Hydro Fluoro Carbon): the abbreviated official name of new alternative refrigerants without any damage to the ozonosphere.
HCFC Series (Hydro Chloro Fluoro Carbon): the abbreviated official name of refrigerants that produce minor damages to the ozonosphere but is restricted for use.

1.5.3 How to use the P-h chart

In general, the P-h chart is used to show the change process of the state of the refrigerant in the refrigeration compressor. The pressure P is shown on the vertical axis, and the enthalpy h of the refrigerant is shown on the horizontal axis.
This chart is also called a Mollier chart after the German scientist R.Mollier .
There are various tables, which are used to represent the properties of refrigerant for each kind. However, they show only the properties of the saturated state in general. For example, they are useful only when a vapor is dry saturated vapor and a liquid is saturated liquid. Arbitrary states cannot be obtained from these tables diagram directly.
Such a disadvantage can be solved and temperature, pressure, the volume, the enthalpy, and entropy, etc. under an arbitrary state are obtained at once, if the Mollier diagram is used.

a) P-h chart

The composition of the P-h chart is shown in the figure below.



The P-h chart is a chart on which absolute pressure (P) versus enthalpy (h) is plotted and that visualizes the various states of the refrigerant.
The constant enthalpy line, constant pressure line, constant temperature line, constant moisture line, constant entropy line, constant specific volume line, saturated liquid line are drawn on the figure.
Each property line is explained as follows respectively.

(1) Pressure [MPa]

The plots are logarithmic on the vertical axis denoted by absolute pressure P (MPa).
Therefore, the constant pressure line is horizontal line. For instance, if the horizontal line that passes through P = 1MPa is drawn, there is pressure of 1 MPa at any point on this line.

(2) Enthalpy [kJ / kg]

Enthalpy can be understood as the internal total heat of some substance (though it differs somewhat academically) and denoted by h kJ / kg. That is, it is considered as that there is 100kJ heat per kg in some substance whose enthalpy is100kJ / kg.
The constant enthalpy line is for the horizontal axis, so it is a perpendicular and there is the same enthalpy at any point on the line. The enthalpy of the saturated liquid of 0 degree is defined as 200.00kJ / kg (100.00kcal / kg in engineering units) regardless of the kind of the refrigerant.

(3) Saturated liquid line

A line called the saturated liquid line can show the state of the liquid refrigerant that starts just evaporating. All the compressed liquid states are located in the region to the left of the saturated liquid line and the right region is wet steam that is the mixture of the saturated liquid and the saturated vapor.

(4) Saturated vapor line

The state of refrigerant on this curve is dry saturated vapor, and all the superheated vapor states are located to the right of the saturated vapor line and the wet vapor states are located to the region between the saturated vapor line and the saturated liquid line.

(5) Isothermal (constant temperature line) [°C]

A line called the isothermal that is usually drawn in dash dotted line, and denoted by t can show the states under which temperature remains constant.

Liquid region	That is almost parallel to the constant enthalpy line.
Wet vapor region	Isothermal is horizontal line, sometimes the isothermal is same as the isobar and sometimes has inclined relative to the isobar.
Superheated vapor region	It curves somewhat in the upper right part and toward down the diagonal and the right. The scale is marked on both the saturated liquid line and the vapor line.

(6) Constant entropy line [kJ / kg·K]

It is difficult to discuss entropy academically; entropy is a property of a substance as are temperature and pressure. When a substance changed due to heat going in or out it, the change in entropy is defined as the ratio of heat transferred to the absolute temperature of the substance. Therefore, it is possible to think that there is no increase and decrease in entropy in the adiabatic process. The states under which entropy remains constant can be connected by a line called the constant entropy line and denoted by s kJ / kg·K.

The entropy of the saturated liquid of 0 degrees is defined as 1.0000kJ / kg·K (1.00kcal / kg·K in engineering units) regardless of the kind of the refrigerant.

(7) Constant specific volume line [m^3 / kg]

The state under which specific volume of the refrigerant remains constant can be showed by a curve called the constant specific volume line and denoted by νm^3 / kg. For example, $\nu = 0.1m^3$ / kg represents that its volume is $0.1m^3$ per kg of the refrigerant.

(8) Constant quality of vapor line

Quality of vapor means the proportion of the dry saturated vapor that exists in wet vapor. For example, x = 0.1 means that there is 10% of dry saturated vapor and 90% of liquid in wet vapor. Therefore, the saturated liquid line is x = 0, and the saturated vapor line is x = 1.00.

b) 3 laws necessary for drawing a figure

When the refrigeration cycle is drawn, the following three laws should also be satisfied, because P-h chart has been made according to the law of thermodynamics.

(1) When there happens the change under constant pressure, the change of entropy is equal to the transferred heat.

For example, the change in the enthalpy of the refrigerant being condensed in the condenser, and evaporating in the evaporator is equal to the heat that removed away from or absorbed into it.

(2) In the adiabatic compression process, the entropy remains constant.

For example, entropy doesn't change when the refrigerant is compressed with the compressor.

Moreover, the work done at this time is equal to the change of the enthalpy of the refrigerant that exists between the inlet and outlet of the cylinder.

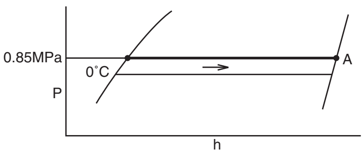
(3) The enthalpy remains constant before and after the squeezing (pressure reduction) process.

For example, as a result, the enthalpy of refrigerant that is squeezed and expanded with the expansion valve remains constant.

c) Method of determining state of refrigerant by the chart

(1) Evaporation

If the refrigerant has evaporated with the evaporator under pressure 0.85 MPa, refrigerant's state is on the line connecting the point of 0.85 MPa on the saturated liquid line and the point of 0.85 MPa on the saturated vapor line in the P-h chart.



The purpose of the refrigerant's evaporating with the evaporator is for wet vapor to absorb heat from outside. Therefore, the process shows that the isobar translates to the right on the diagram.

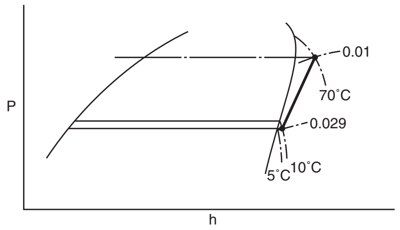
It is shown by A point that refrigerant is in the state of saturated vapor.

For example, when refrigerant is R407C, the following state values at point A can be readout:

Enthalpy...............................425kJ / kg
Entropy ....1.81kJ / kg·K
Specific volume....................0.029m^3 / kg
(Density 35kg / m^3)
Evaporating temperature .....5°C

(2) Compression

When the evaporated wet vapor with the evaporator is inhaled into the compressor, it is not usually a dry vapor but it is a superheated vapor.



This superheated vapor is inhaled and adiabatic compression process is done. It changes along the constant entropy line on the diagram. In general, the amount of the refrigerant that flows to the evaporator is adjusted so that the refrigerant gas that is inhaled into the compressor is just superheated gas.

For example, consider the case where evaporated at 5°C and the temperature of the refrigerant gas that is inhaled into the compressor is 10°C.

(In this case, it is said that degree of superheat is 5°C)

The readout is as follows:

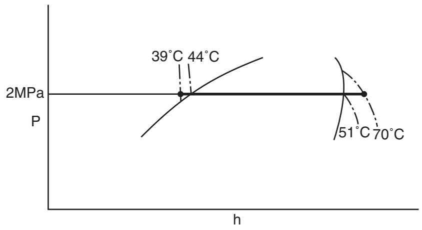
Enthalpy:	430kJ / kg
Entropy:	1.83kg / kg·K
Specific volume:	0.029m^3 / kg

When the refrigerant under the state is compressed with the compressor along the constant entropy line, pressure and the temperature rise.

If pressure rose to 2.8MPa with the compressor, states of the refrigerant at the compressor outlet are

Temperature of the discharged gas	70°C
Enthalpy:	462kJ / kg
Entropy:	1.83kJ / kg·K (It is the same as the compressor inlet)
Specific volume:	0.01m^3 / kg

(3) Condensation



In order to liquefy the refrigerant gas that became the high temperature and a high pressure due to compressing with compressor, refrigerant is deprived of heat with condenser (That is, the refrigerant emit heat outside). The refrigerant descends the temperature, becomes a saturated vapor, and a liquid part increases gradually with heat deprived of.

The state that the refrigerant is completely liquefied is a saturated liquid. In addition, it is cooled and it falls in temperature till the subcooling region.

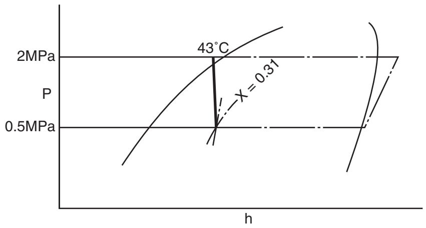
If the refrigerant liquid fell in temperature till 43°C (In this case, it is said that supercooling is 5°C), then the states of the refrigerant at this time is

Enthalpy:	272kJ / kg
Specific volume:	0.001m^3 / kg

Note (1) During the process within condenser, pressure remains constant.

(4) Adiabatic expansion

The refrigerant liquid liquefied with the condenser enters into the expansion valve and does adiabatic expansion and then it enters the evaporator.



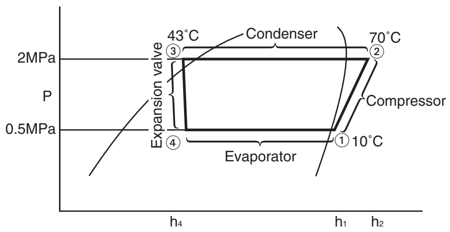
In this case, because "the enthalpy remains constant before and after the squeezing process", there is no change in heat and only pressure falls.

If pressure fell to 0.85MPa, from the diagram the states of the refrigerant of the evaporator inlet can be obtained as follows:

Enthalpy:	272kJ / kg
Entropy:	1.26kJ / kg·K
Specific volume:	0.001m^3 / kg
Quality of wet vapor:	0.30
Evaporating temperature:	5°C

Notice that after squeezing process, the refrigerant (at expansion valve outlet) has become 30% vapor and the liquid is 70% of the remainder.

d) Refrigeration cycle drawn in P-h chart



When the state mentioned in c) is drawn on P-h chart, it is like the left diagram.

Compressor inlet (= evaporator outlet) is ①
Compressor outlet (= condenser inlet) is ②
Condenser outlet (= expansion valve inlet) is ③
Evaporator inlet (= expansion valve outlet) is ④

For the same condition as the above mentioned,

(1) Heat removed with evaporator is q

Because refrigerant changes under constant pressure in the evaporator, the heat of which the refrigerant received is equal to the heat added from outside.

$q = h_1 - h_4 = 430 - 272 = 158$kJ / kg

This is called a refreezing effect. If it is multiplied by the amount of the refrigerant in circulating, it becomes a refreezing capacity.

(2) Heat corresponding to compression work

When the refrigerant is compressed in the compressor, it receives this compression work and the heat of the refrigerant increases.

Heat corresponding to compression work = $h_2 - h_1 = 462 - 430 = 32$kJ / kg

If this value is multiplied by the amount of the refrigerant circulation, needed power is theoretically obtained.

(3) Heat removed with condenser

It is necessary to remove the total heat received from outside with the evaporator and the heat corresponding to the compression work outside in the condenser.

Heat removed with condenser = $h_2 - h_4 = 462 - 272 = 190$kJ / kg

2. Calculation of Air-conditioning Load and Model Selection

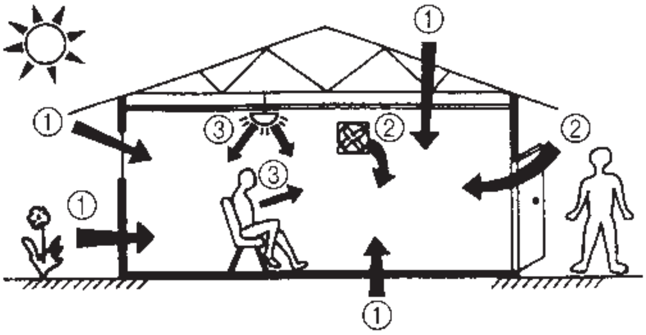
2.1 What is the Calculation of Air-conditioning Load?

1. The thermal load (cooling load and heating load) of a room to be equipped with an air-conditioner needs to be calculated so that an air-conditioner with appropriate rated power can be selected correspondingly.
2. Such calculation of thermal load is called load calculation.
3. Such load calculation may be made either through simple estimation or detailed calculation. A detailed calculation requires to figure out the heat infiltration into rooms built with different construction materials of different thickness and take account of such factors as orientation and the time of day (deferral of the heat infiltration due to sunlight changes and accumulation of heat in the walls).
4. Simple calculation refers to the calculation of the maximum load of an ordinary room within a short period of time. Such calculation method is applicable to the model selection of small and medium-sized air-conditioners.
5. In model selection, it is necessary to compare the rated power with the actual power of an air-conditioner (deviation between the actual power and the rated power stated in the catalogue due to temperature condition, piping distance and so on).
6. Generally, in case of household air-conditioner, the catalogue will indicate the power of air-conditioner under the rated JIS temperature. However, manufacturers generally do not provide the actual power values (under actual operating condition) to the market.
   Therefore, it is unlikely to compare with the actual power (for the sake of model selection) during the aforesaid load calculation (for thermal load under actual operating condition).
   For this reason, load calculation coefficients corresponding to the rated powers indicated in the catalogues of household air-conditioners are published in JIS.

(Note) This manual uses W (watt) as the unit of thermal load, which is converted into kcal / h etc in the following formula:
1 W = 0.86 kcal / h = 3.4BTU = 3600J
1 kcal / h = 1.16 W = 4.0BTU = 4200J

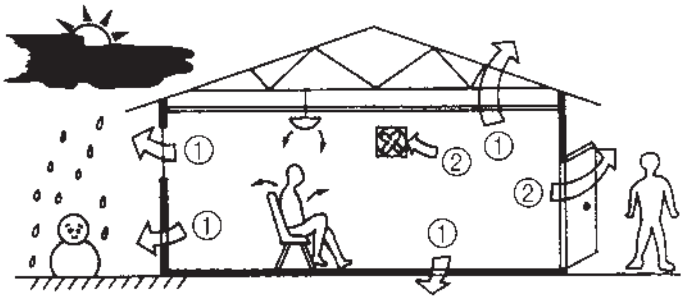
2.2 Thermal Load Analysis

Figure 1: Route of heat infiltration in cooling operation



Heat infiltration (Cooling load)

Figure 2: Route of heat emission in heating operation



Heat emission (Heating load)

1. Load of infiltration (Amount of conductive heat and radiant heat)
   (a)Walls or Glass windows (4 sides) ....
   - The unit load changes with the orientation (max. in the west side)
   - The glass windows have higher unit loads (significantly affected by the window's area)
   - The load is reduced by 30% if blinds are installed on the glass windows (when exposed to sunlight).
   - The load of the interior wall is 1/4 to 1/7 that of the exterior wall (where there is no cold air in the next room).

   (b)Roof or Ceiling ....
   - The top floor has a higher load (which accounts for approximately 20% of the total load).
   - The load of the intermediate floor is about the same as that of the interior wall.

   (c)Floors ....
   - The load of the floor contacting the ground is zero.
   - The load of other floors is about the same as that of the interior wall.
   - The load of the floors directly above a garage, etc. is equivalent to that of the exterior wall unexposed to sunlight.

2. Load of ventilation (cooling of outdoor infiltration air)
   (a)Natural ventilation ....
   - Ventilation by opening the door, etc. (The standard value is: room cubage × 1 time/hour).

   (b)Forced ventilation................................
   - Injection of fresh air or forced ventilation by a ventilator.

   (Note) The larger load in (a) and (b) is taken as the load.
3. Generated load (heat generated inside)
   (a)Human ....
   - 115W/person (100 kcal/h per person) (seated persons)
   - 140W/person (120 kcal/h per person) (persons doing light jobs)
   - 230W/person (200 kcal/h per person) (persons doing workshop jobs)

+) (b)Electric appliances, gas, etc ....
   - Total of average consumption per hour.

Total cooling load W (kcal/h)

2.3 Estimated Value of the Cooling Load (per m² of floor area)

As mentioned above, calculation is made for each item. It is also possible to conduct simple calculation according to the following estimated values.

1. Combination air-conditioners — Based on information provided by Japan Refrigeration and Air-conditioning Industry Association (PAC Operation Council).

Type of usage		W/m²(kcal/h·m²)	Type of usage		W/m²(kcal/h·m²)
1	Ordinary office	116 to 169(100 to 145)	5	Dining room	233 to 372(200 to 320)
2	Ordinary store	157 to 233(135 to 200)	6	Barber shop or Beauty parlour	233 to 291(200 to 250)
3	Hotel Hospital (Single room)	116 to 169(100 to 145)	7	Billiards room	349 to 523(300 to 450)
			8	Game centre	291 to 349(250 to 300)
4	Cafe	233 to 291(200 to 250)	9	Workshop	151 to 233(130 to 200)

(Reference) 1W = 0.86 kcal/h

2. Household air-conditioners — Based on JIS C 9612-1994

Room condition			Load & Calculation condition							
			Unit area load W/m²				Calculation condition for unit area cooling and heating loads			
			Cooling	Heat pump heating		Electric heating	Number of ventilations time/h	Window area / Floor area %	Number of persons per 10m² of the floor area person(s)/10m²	Illumination (fluorescent lamp) W/m²
				Air cooled	Water cooled					
Dwelling house (wooden house or single-story house)	Japanese style room	Southward(1)	220	275	230	230	1.5	40	3	0
		Northward(1)	160	265	215	215	1.5	20	3	10
	European style room	Southward(1)	190	265	215	215	1	30	3	0
		Westward(1)	230	265	215	215				
Residential quarter (Steel reinforced) southward european style room		Top floor	185	250	205	205	1	30	3	10
		Intermediate floor	145	220	180	180				

Note (1) "Southward" means only the southern side has windows in contact with the ambient air. Such definition also applies to the terms of Northward and Westward.

2.4 Simple Calculation Method (HASS112)

1. This specification aims to calculate the maximum thermal load in the cooling and heating operations from a practical perspective.
2. A more precise value of the maximum load for offices, residential quarters, or single houses can be figured out through simple addition and multiplication.
3. For the sake of safety, the load calculation method for other types of buildings should be able to figure out a load value with a certain allowance.
4. Although what is figured out with such method is the maximum value (of thermal load), it is estimated that the value is possibly exceeded by 2.5% to 5.0%.

<Calculation formula> $\boxed{\text{Thermal load (W)}} = \boxed{\text{Unit thermal load (W/m}^2\text{)}} \times \boxed{\text{Floor area of room (m}^2\text{)}} \times \boxed{\text{Correction coefficient}}$

- Unit thermal load: Make calculation according to the table for the next item (using unit thermal load that has gone through plus-&-minus corrections as necessary)
- Floor area of room: Effective area (instead of total area of all floors)
- Correction coefficient: Warm-up time, region correction, etc.

Table of cooling & heating load calculation

Calculation format for thermal load of offices (HASS112)

Year Month Day

Name of room ______________________ Person in charge ______________

Cooling					[W/m²] Peripheral Cooling	[W/m²] Internal Cooling
Standard Unit Thermal Load qo					140	92
Correction Unit Thermal Load Δqk	Sunlight Window Area ratio Main Window Direction	Without Sunlight	Window30%	South West North East	-14 -2 -41 -18	–
			Window45%	South West North East	0 21 -33 -2	
			Window60%	South West North East	14 44 -25 -13	
		With Sunlight	Window30%	South West North East	-47 -28 -43 -43	
			Window45%	South West North East	-39 -11 -41 -33	
			Window60%	South West North East	-31 7 -38 -23	
	Heat Generation of Illumination Machine		25 50	[W/m²]	0 29	0 29
	Number of Persons Indoor		0.1 0.2	[person/m²]	-12 0	-12 0
	Amount of Ambient Air		2 4	[m³/m²h]	-11 0	-12 0
	Room Temperature		26 28	[°C]	0 -14	0 -10
Corrected Unit Thermal Load q = qo + Δqk						
Area A [m²]						
Max. Thermal Load q·A [W]						
Total Max. Thermal Load (Peripheral + Internal) Q_b [W]						
Warm-up Time Correction Coefficient C_1	Time:				–	
Region Correction Coefficient C_2	Region:					
Final Thermal Load $Q=Q_b \cdot C_2$ [W]						

Heating			[W/m²] Peripheral Heating	[W/m²] Internal Heating
Standard Unit Thermal Load qo			134	95
Correction Unit Thermal Load Δqk	Main Window Direction	South West North East	-24 -3 0 -16	–
	Outer Heat Insulation	Large Medium Small	-15 0 15	-8 0 8
	Floor Room Depth	Intermediate Floor	0 14	0 17
		Top Floor 8 12 16 20 [m]	12 0 -7 -12	23 0 -11 -18
	Amount of Ambient Air	2 4 [m³/m²h]	-16 0	-16 0
	Room Temperature	20 22 [°C]	-16 0	-13 0
q=qo+Δqk				
A [m²]				
q·A [W]				
Q_b [W]				
C_1				
C_2(different from cooling)				
$Q=Q \cdot C_1 \cdot C_2$ [W]				

<Space Calculation>

1. Room Area
   (a) Rooms with one exterior wall
   * Peripheral Area = Length of exterior wall × 5m
     [m²] =
   * Internal Area = Room Floor Area - Peripheral Area
     [m²] =
   * Total Floor Area = Peripheral Area + Internal Area
     [m²] =

   (b) Rooms with two exterior walls or more
   * Equivalent Depth = Floor Area / Length of exterior wall
     =
   * Peripheral Area = Floor Area × 5 / Equivalent Depth
     [m²] =
   * Internal Area = Floor Area - Peripheral Area
     [m²] =
   * Total Floor Area = Peripheral Area + Internal Area
     [m²] =

∴ Outer Heat Insulation = large, medium, small
(Note) If the equivalent depth is within 5m, the total area will be taken as the peripheral area.

2. Window Area Ratio $= \frac{\text{Window Area}}{\text{Exterior Wall Area}} \times 100 =$

3. Heat Generation of Illumination Machine $= \frac{\text{Illumination (W) + Machine (W)}}{\text{Total Floor Area}} =$

4. Number of Persons Indoor $= \frac{\text{Number of Persons}}{\text{Total Floor Area}} =$

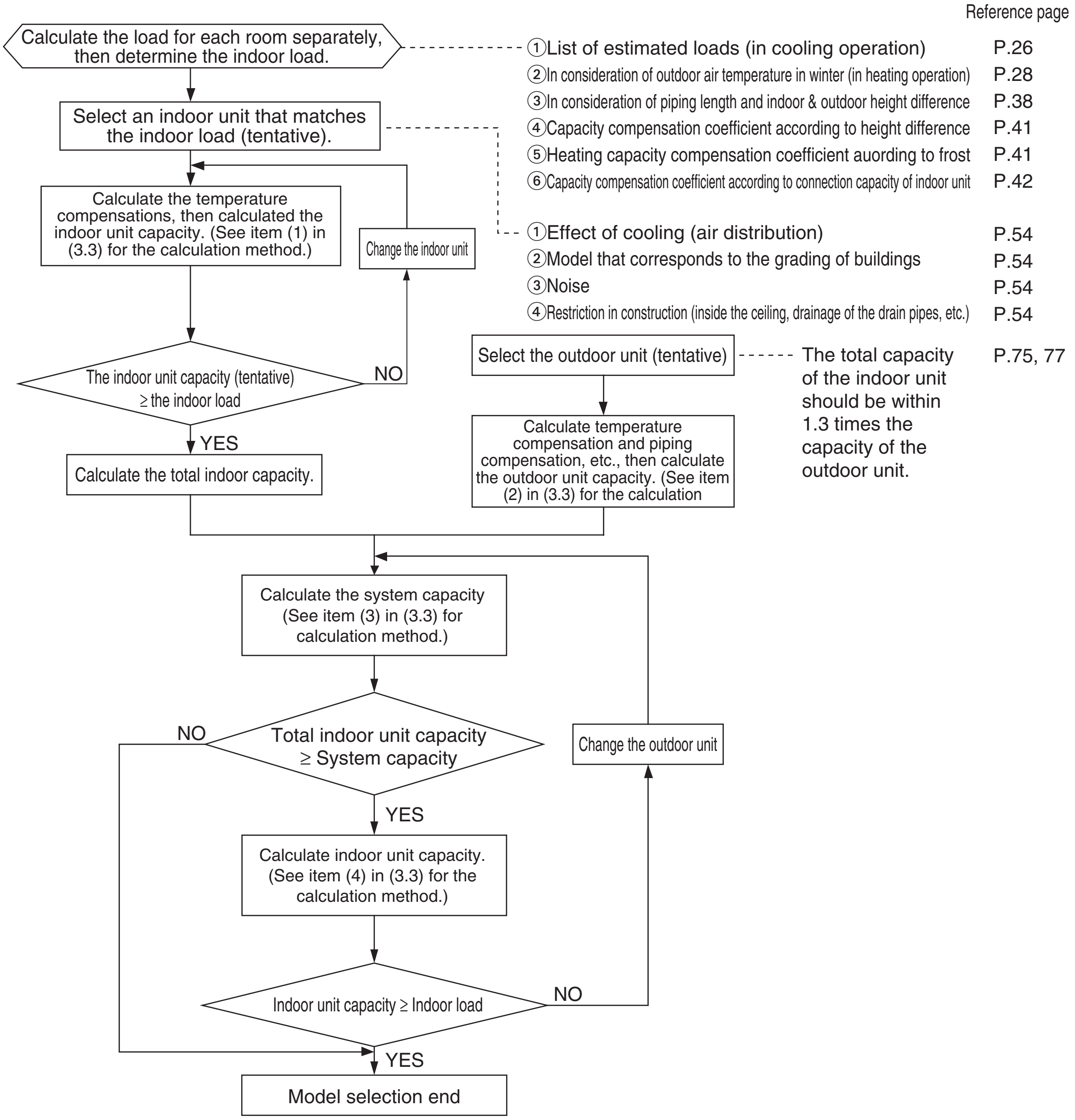
5. Amount of Ambient Air: for general conditions (with only natural ventilation): 4m³/m²h
   for conditions involving few human entries & exits and no smoking: 2m³/m²h.

3. Model Selection

3.1 Model selection procedure

Procedure	Key Points	Reference Page No.
Load calculation of each room	① List of estimated loads (in cooling operation) ② In consideration of outdoor air temperature in winter (in heating operation) ③ In consideration of piping length and indoor & outdoor height difference	P.26
Model selection of indoor units	① Air-conditioning effect (air distribution) ② Models corresponding to the grading of buildings ③ Noise ④ Construction restrictions (inside the ceiling, drainage of the drain pipes, etc.)	P.53
Model selection of outdoor units	① The total capacity of the indoor unit should be within 1.3 times of that of the outdoor unit.	P.75, 77
Confirmation of power source capacity		
Confirmation of installation site	① Confirmation of and Precautions with regard to the location and space for installation and of indoor and outdoor units	(1)
Confirmation of moving-in methods	① Moving-in Route, Elevator, Wrecking Trucks, etc	

3.2 Model selection flow



Note (1)

Model	Reference page
4-way outlet ceiling recessed type FDTA	P.253
4-way outlet ceiling recessed compact type FDTCA	P.260
2-way outlet ceiling recessed type FDTWA	P.266
1-way outlet ceiling recessed compact type FDTQA	P.272
1-way outlet ceiling recessed type FDTSA	P.280
Cassetteria type FDRA	P.286
Low static pressure duct compact type FDQMA	P.296
Middle static pressure duct type FDUMA	P.300
Ceiling mounting type FDEA	P.314
Wall mounted type FDKA	P.318
Floor standing exposed type (FDFLA)	P.324
Floor standing hidden type (FDFUA)	P.327

3.3 Capacity calculation method

1. Capacity compensation calculation of indoor unit
   Capacity of indoor unit (cooling and heating) = Rated capacity of indoor unit (indicated in the catalog) × capacity compensation coefficient according to temperature conditions
   For the capacity compensation coefficient according to temperature conditions, refer to (a) in item 3.5

2. Capacity compensation calculation of outdoor unit
   Capacity of outdoor unit(cooling and heating) = Rated capacity of outdoor unit (indicated in the catalog: rated capacity when 100% connected)
   × capacity compensation coefficient according to temperature conditions
   × capacity compensation coefficient according to piping length
   × capacity compensation coefficient according to height difference
   × heating capacity compensation coefficient according to frost
   × capacity compensation coefficient according to connection capacity of indoor unit

   ① For the capacity compensation coefficient according to temperature conditions, refer to (a) in item 3.5
   ② For the capacity compensation coefficient according to piping length, refer to (b) in item 3.5
   Please note that the compensation coefficient is different when the piping size exceeds 90m at the air-conditioning capacity compensation.
   The correction compensation is same regardless of the model when heating capacity correcting.
   ③ For the capacity compensation coefficient according to height difference, refer to (c) in item 3.5. Do this compensation only at the situations that the outdoor unit is low when air-conditioning and is high when heating.
   ④ For the capacity compensation coefficient by frost, refer to (d) in item 3.5. Do this compensation only when doing heating capacity calculation.
   ⑤ For the capacity compensation coefficient by connected capacity of indoor unit, refer to (e) in item 3.5. Do this compensation only when total capacity of indoor unit exceeds 100%.

3. Calculation of system capacity
   Comparing the calculated values in item 1 and item 2, the system capacity for cooling and heating is small value.
   ① In cases when indoor unit total capacity (cooling and heating) > outdoor unit capacity (cooling and heating)
   System capacity (cooling and heating) = outdoor unit capacity (cooling and heating)
   ② In cases where indoor unit total capacity (cooling and heating) < outdoor unit capacity (cooling and heating)
   System capacity (cooling and heating) = indoor unit capacity (cooling and heating)

4. Capacity calculation of indoor unit
   Indoor unit capacity (cooling and heating) = System capacity(cooling and heating)
   × {(indoor unit capacity) / (indoor unit total capacity)}

Example of calculating capacity

Example 1

Cooling (The indoor unit connecting total capacity is less than 100%)

Outdoor unit FDCA450HKXE4 .... 1 unit
Indoor unit FDTA71KXE4A .... 5 units
Piping length .... 60 m (equivalent length)
Difference of height between the indoor and outdoor unit .... 15 m (outdoor unit is low)
Temperature condition .... outdoor temperature:33°C DB
Temperature condition .... indoor temperature:19°C WB

< Total cooling capacity of indoor unit > Calculation of item (1):

Rated cooling capacity of indoor unit: 7.1 kW (catalog value)

Capacity correction coefficient by temperature conditions: 1.0 (obtained by the temperature conditions: indoor temperature: 19°C and outdoor temperature: 33°C)

Cooling capacity of indoor unit: 7.1 kW × 1.0 = 7.1 kW

Calculation of total cooling capacity of indoor unit

Total cooling capacity of indoor units: 7.1 kW × 5 units = 35.5 kW

< Maximum cooling capacity of outdoor unit> Calculation of item (2):

Rated cooling capacity of outdoor unit: 45.0 kW (catalog value)

Capacity correction coefficient by temperature conditions: 1.0 (obtained by the temperature conditions: indoor temperature: 19°C and outdoor temperature: 33°C)

Cooling capacity of outdoor unit: 45.0 kW × 1.0 = 45.0 kW

Capacity compensation coefficient by piping length: 0.94 obtained by the piping length: 60m

45.0 kW × 0.94 = 42.3 kW

Capacity correction coefficient by difference of height between the indoor and outdoor unit: 0.97 obtained by difference of height between the indoor and outdoor unit: 15m

42.3 kW × 0.97 ≈ 41.0 kW

Capacity correction coefficient by total capacity of air-conditioning of connected indoor units: 1.0 (71 × 5)/450 < 100%

Needs no correction

<System cooling capacity> Calculation of item (3);

Compare the total cooling capacity of indoor units with maximum cooling capacity of outdoor unit, the smaller one is actual system cooling capacity.

Total cooling capacity of indoor units: 35.5 kW
Maximum cooling capacity of outdoor unit: 41.0 kW

System cooling capacity: 35.5 kW

<Calculation of cooling capacity of indoor unit>: No correction required

7.1 kW

Example 2

Cooling (The indoor unit connecting total capacity is more than 100%)

Outdoor unit FDCA450HKXE4 .... 1 unit
Indoor unit FDTA71KXE4A .... 7 units
Piping length .... 120 m (equivalent length)
Difference of height between the indoor and outdoor unit .... 15 m (outdoor unit is high)
Temperature condition .... outdoor temperature:35°C DB
Temperature condition .... indoor temperature:18°C WB

< Total cooling capacity of indoor unit > Calculation of item (1):

Total rated cooling capacity of indoor unit: 7.1 kW (catalog value)

Capacity correction coefficient by temperature conditions: 0.97 (obtained by the temperature conditions: indoor temperature: 18°C and outdoor temperature: 35°C)

Cooling capacity of indoor unit: 7.1 kW × 0.97 = 6.89 kW

Calculation of total cooling capacity of indoor unit

Total cooling capacity of indoor units: 6.89 kW × 7 units = 48.2 kW

< Maximum cooling capacity of outdoor unit> Calculation of item (2):

Rated cooling capacity of outdoor unit: 45.0 kW (catalog value)

Capacity correction coefficient by temperature conditions: 0.97 (obtained by the temperature conditions: indoor temperature: 18°C and outdoor temperature: 35°C)

Cooling capacity of outdoor unit: 45.0 kW × 0.97 = 43.7 kW

Capacity compensation coefficient by piping length: 0.94 obtained by the piping length (in case of larger piping): 120m

43.7 kW × 0.94 = 41.0 kW

Capacity correction coefficient by difference of height between the indoor and outdoor unit: 1.0 (because the outdoor unit is high when cooling)

Need no correction

Capacity correction coefficient by total capacity of air-conditioning of connected indoor units: 1.1 (71 × 7)/ 450 = 110%

41.0 kW × 1.1 ≈ 45.1 kW

<System cooling capacity> Calculation of item (3):

Compare the total cooling capacity of indoor units with maximum cooling capacity of outdoor unit, the smaller one is actual system cooling capacity.

Total cooling capacity of indoor units: 48.2 kW
Maximum cooling capacity of outdoor unit: 45.1 kW

System cooling capacity: 45.1 kW

<Calculation of cooling capacity of indoor unit>: Calculation of item (c) in (2)

$$\frac{45.1\ \text{kW} \times 7.1\ \text{kW}}{48.2\ \text{kW}} \approx \underline{\underline{6.4\ \text{kW}}}$$

Example 3

Cooling (The indoor unit connecting total capacity is more than 100%)

- Outdoor unit FDCA450HKXE4 .... 1 unit
- Indoor unit FDTA71KXE4A .... 7 units
- Piping length .... 60 m (equivalent length)
- Difference of height between the indoor and outdoor unit .... 20 m (outdoor unit is high)
- Temperature condition .... outdoor temperature:6°C WB
- Temperature condition .... indoor temperature:19°C DB

< Total heating capacity of indoor unit > Calculation of item (1):

Total rated cooling capacity of indoor unit: 8.0 kW (catalog value)

Capacity correction coefficient by temperature conditions:1.0 (obtained by the temperature conditions: indoor temperature: 6°C WB and outdoor temperature: 19°C DB)

Cooling capacity of indoor unit: 8.0 kW × 1.0 = 8.0 kW

Calculation of total cooling capacity of indoor unit

Total cooling capacity of indoor units: 8.0 kW × 7 units = 56.0 kW

< Maximum heating capacity of outdoor unit> Calculation of item (2)

Rated heating capacity of outdoor unit: 50.0 kW (catalog value)

Capacity correction coefficient by temperature conditions:1.0 (obtained by the temperature conditions: outdoor temperature: 6°C WB and indoor temperature: 19°C DB)

Heating capacity of outdoor unit: 50.0 kW × 1.0 = 50.0 kW

Capacity compensation coefficient by piping length: 0.94 obtained by the piping length: 60m

50.0 kW × 0.94 = 47.0 kW

Capacity correction coefficient by difference of height between the indoor and outdoor unit: 0.96 obtained by the piping length: 20m

47.0 kW × 0.96 = 45.1 kW

Heating capacity correction coefficient by frosting: 0.92

45.1 kW × 0.92 = 41.5 kW

Capacity correction coefficient by total capacity of air-conditioning of connected indoor units: 1.13 (71 × 7)/ 450 = 110%

41.5 kW × 1.13 ≈ 46.9 kW

<System heating capacity> Calculation of item (3)

Compare the total heating capacity of indoor units with maximum heating capacity of outdoor unit, the smaller one is actual system heating capacity.

Total heating capacity of indoor units: 56.0 kW
Maximum heating capacity of outdoor unit: 46.9 kW

⇨ System cooling capacity: 46.9 kW

<Calculation of heating capacity of indoor unit>: Calculation of item (4)

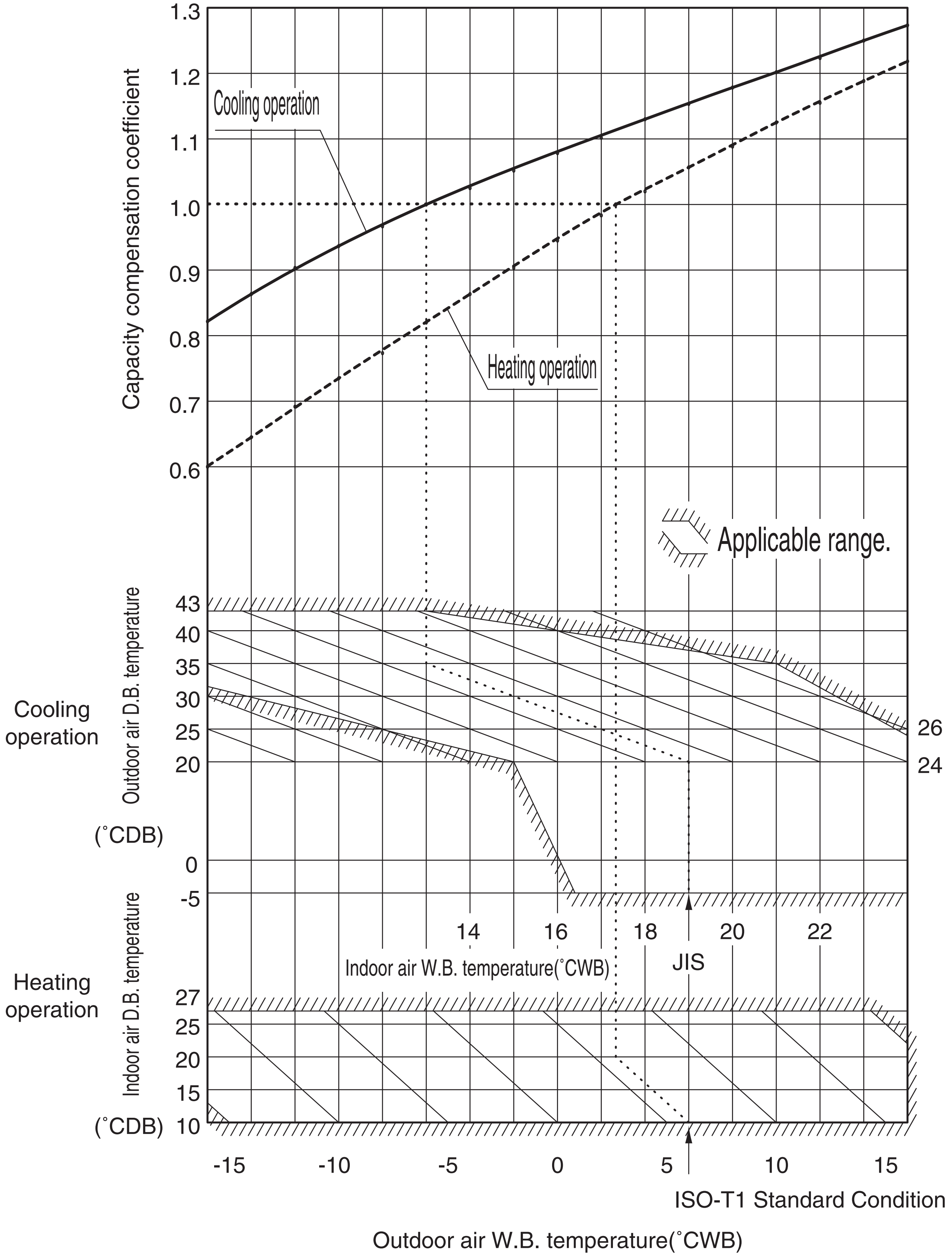
$$\frac{46.9\ \text{kW} \times 8.0\ \text{kW}}{56.0\ \text{kW}} \approx \underline{\underline{6.7\ \text{kW}}}$$

3.4 Notice on calculation of air-conditioning load and model selection

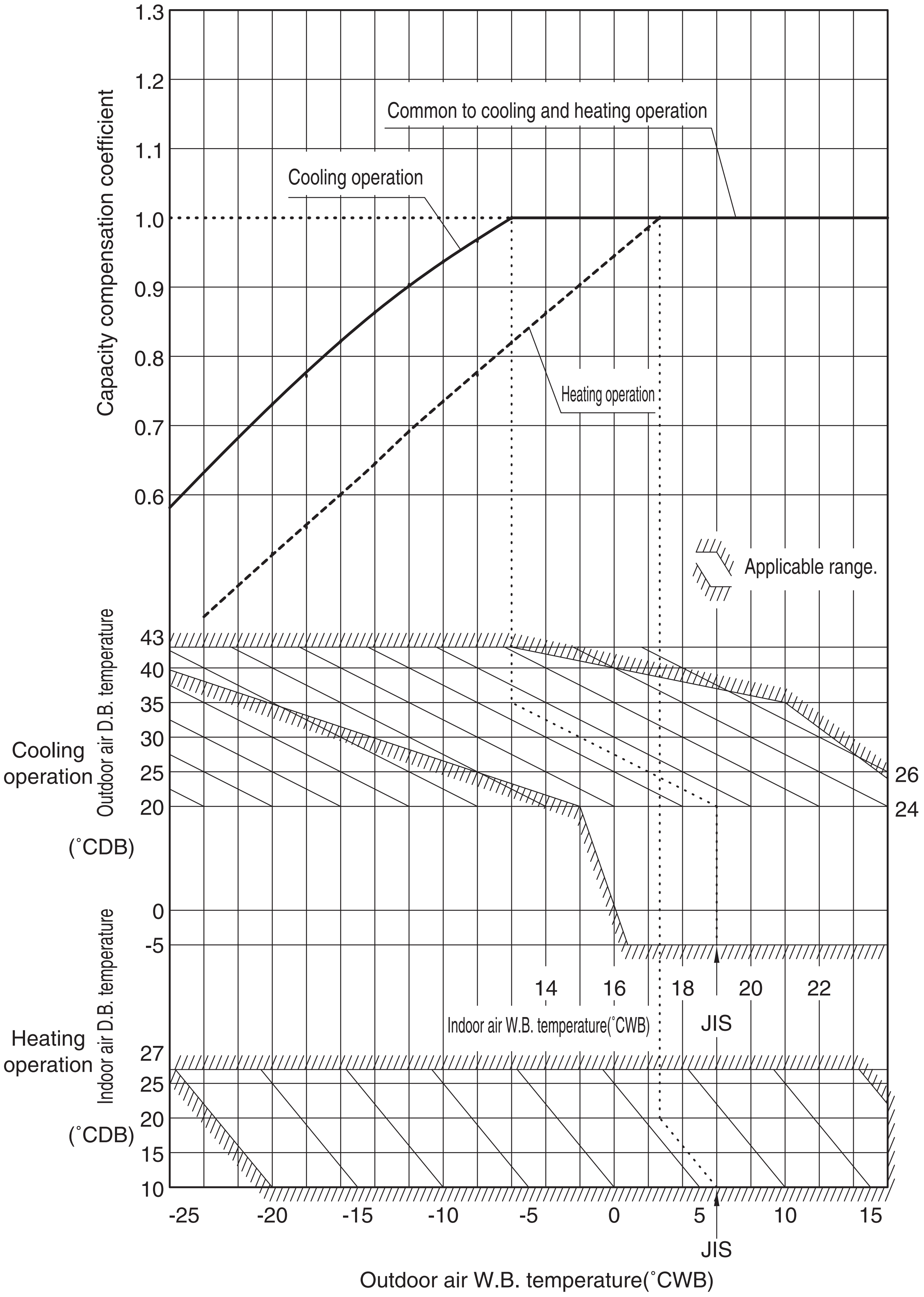
No.	Classification	Items to be checked	Standard	Reference page	Remarks (Impacts due to failure in meeting the standards)
1	System	Is the load calculation made under both cooling and heating conditions?	Models matching with higher load must be selected	P.26	• Auxiliary heat sources (such as heaters) must be considered in case of high heating load
2		Is the selection of the air-conditioner based on the various corrected capacities?	1 Corrections based on the refrigerant piping length 2 Corrections based on the height difference between the indoor unit and the outdoor unit 3 Corrections based on the design room temperature 4 Corrections based on the design ambient air temperature 5 Corrections based on the connecting capacity (100% <) of the indoor unit	P.36	• Complaints about poor cooling or heating effect will definitely arise if the capacity corrections are ignored
3		Are the following factors considered for the combination of the indoor / outdoor units: 1 Balance of the connecting capacity of the indoor units 2 Balance between cooling and heating	• The capacity of the outdoor unit is MAX • The sunlight load and the internal heat generation must be considered	P.75, 77	• Model selection must be performed after capacity corrections are made to the indoor units with over 100% connecting capacity. Failure in making capacity corrections will result in insufficient capacity • Excessive capacity will result in insufficient capability (neither cool nor warm), anomalous supply air temperature, etc.
4		Is the number and capacity of the connected indoor units within the limit?	• Problems may arise if the limits are exceeded	P.75, 77	• Excessive number of units: Excessive connected units will result in anomalies (E43)
5	Indoor	Are there a few small indoor units running 24 hours consecutively?	• If possible, separate the indoor unit from KX4	—	• It is more economic and reasonable to have the night duty room separated from the small microcomputer room
6		Is the allowable indoor noise level considered for the selected model?	• Be careful with the units installed in hotels, living rooms, bedrooms and reception rooms	—	• If no discussions are made in advance, complaints might arise later on and are very difficult to resolve

3.5 Capacity compensation coefficient

(a) Range of usage & limitations or Coefficient of cooling and heating capacity in relation to temperatures
(i) FDCA140



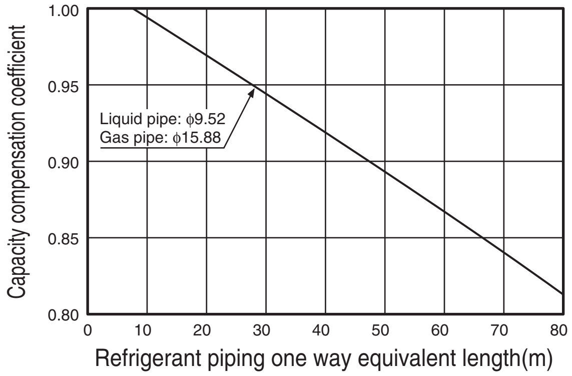
(ii) FDCA224 to 1360HKXE4



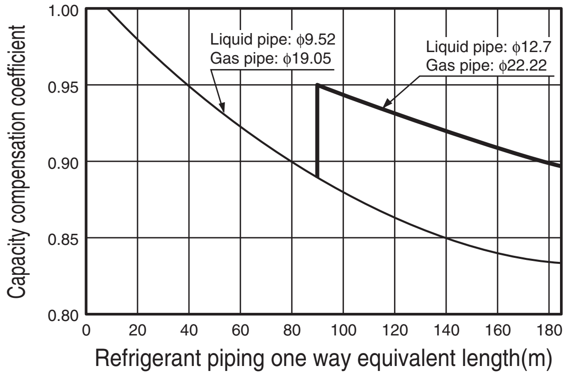
(b) Correction of cooling and heating capacity in relation to one way length of refrigerant piping

(i) Cooling operation

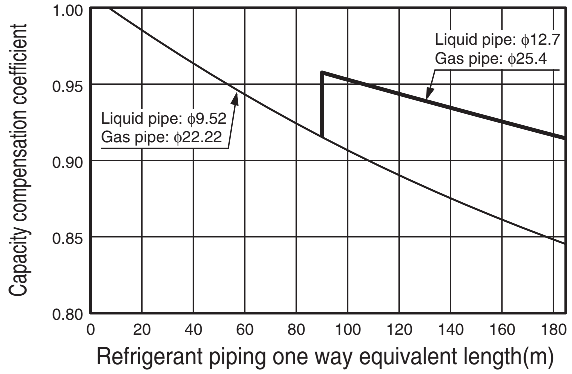
FDCA140HKXEN4(5HP)



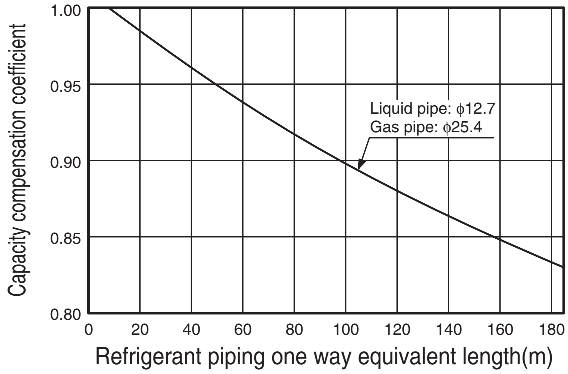
FDCA224HKXE4(8HP)



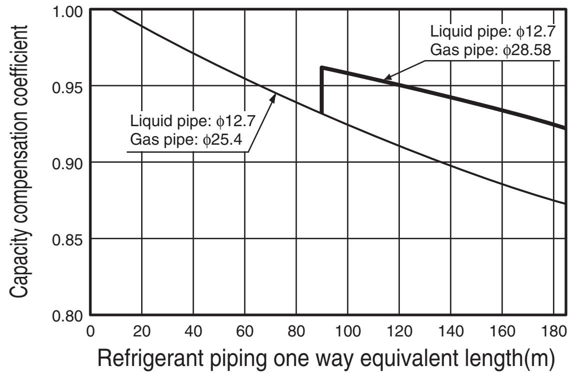
FDCA280HKXE4(10HP)



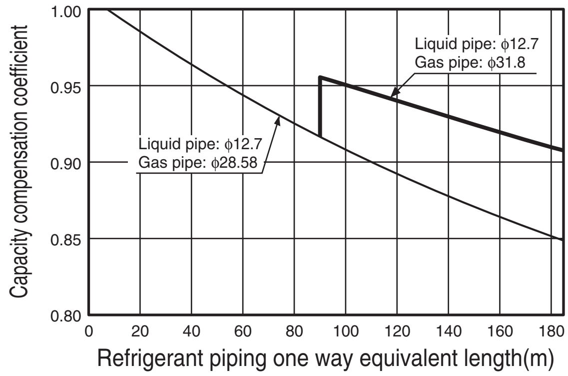
FDCA335HKXE4(12HP)



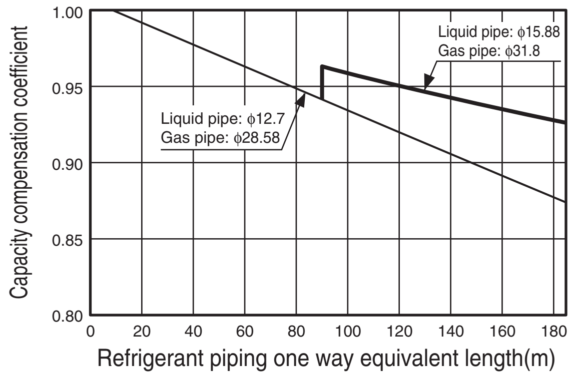
FDCA400HKXE4(14HP)



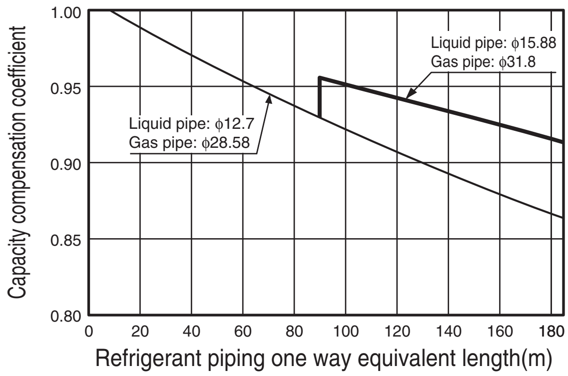
FDCA450HKXE4(16HP)



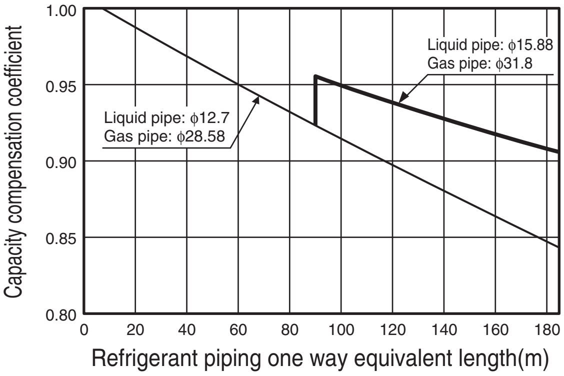
FDCA504HKXE4(18HP)



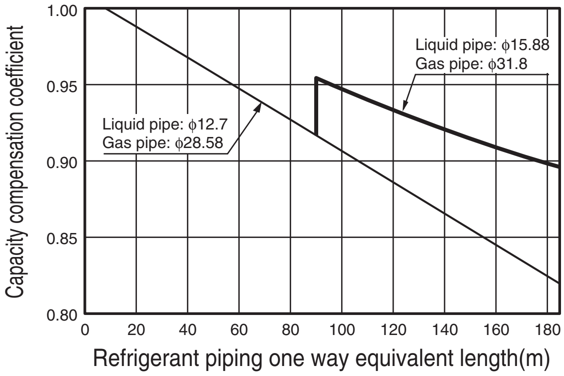
FDCA560HKXE4(20HP)



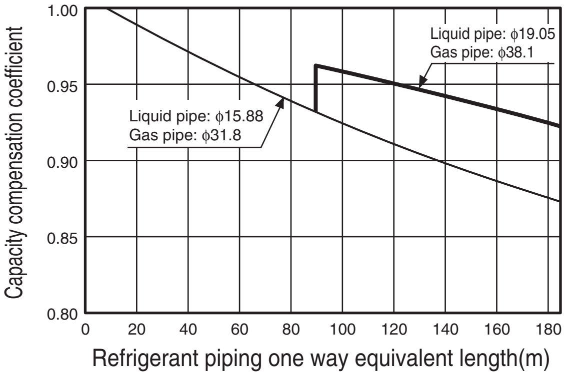
FDCA615HKXE4(22HP)



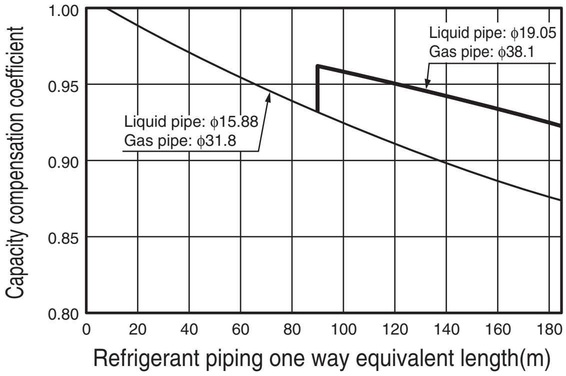
FDCA680HKXE4(24HP)



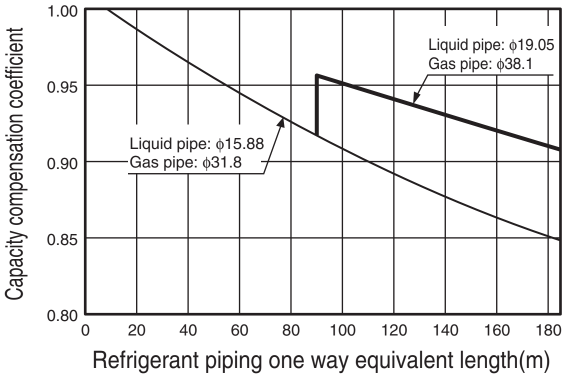
FDCA735HKXE4(26HP)
[FDCA335HKXE4-K + FDCA400HKXE4]



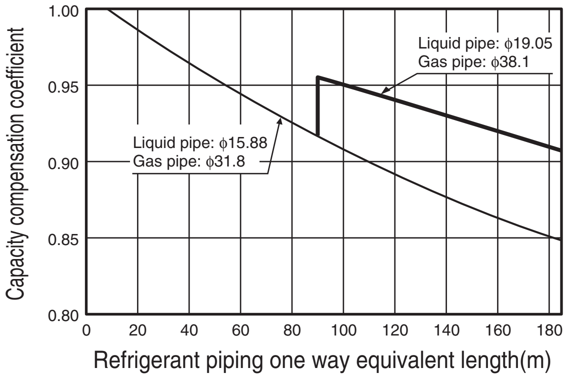
FDCA800HKXE4(28HP)
[FDCA400HKXE4 + FDCA400HKXE4]



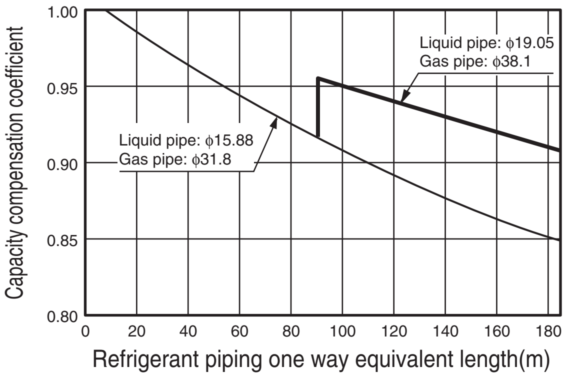
FDCA850HKXE4(30HP)
[FDCA400HKXE4 + FDCA450HKXE4]



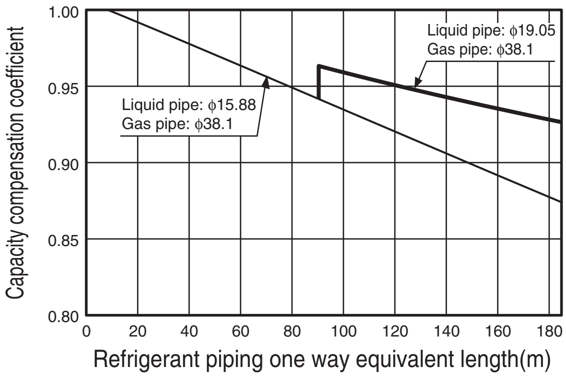
FDCA900HKXE4(32HP)
[FDCA450HKXE4 + FDCA450HKXE4]



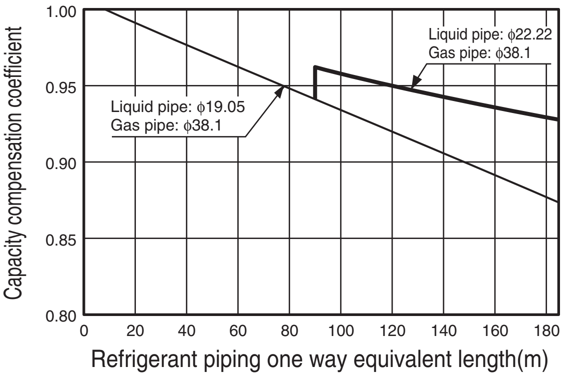
FDCA960HKXE4(34HP)
[FDCA450HKXE4 + FDCA504HKXE4]



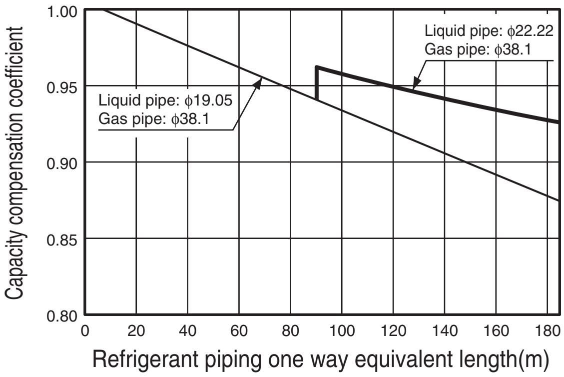
FDCA1010HKXE4(36HP)
[FDCA504HKXE4 + FDCA504HKXE4]



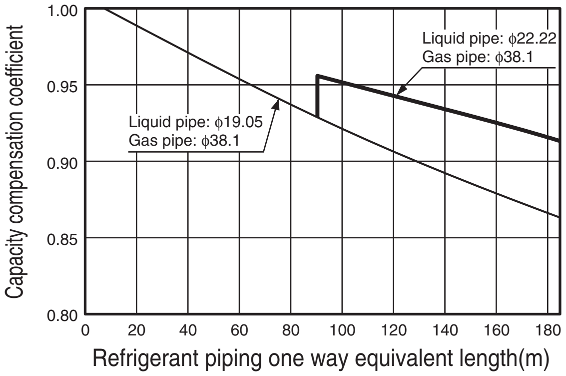
FDCA1065HKXE4(38HP)
[FDCA504HKXE4 + FDCA560HKXE4]



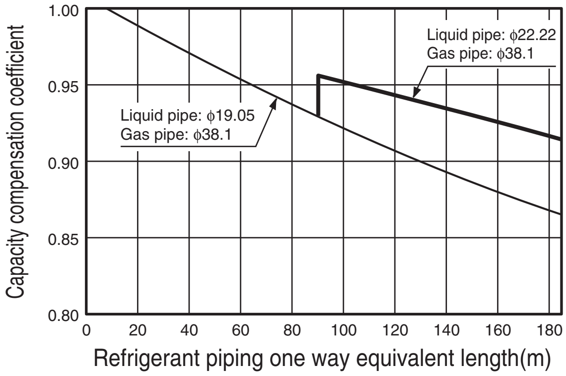
FDCA130HKXE4(40HP)
[FDCA560HKXE4 + FDCA560HKXE4]



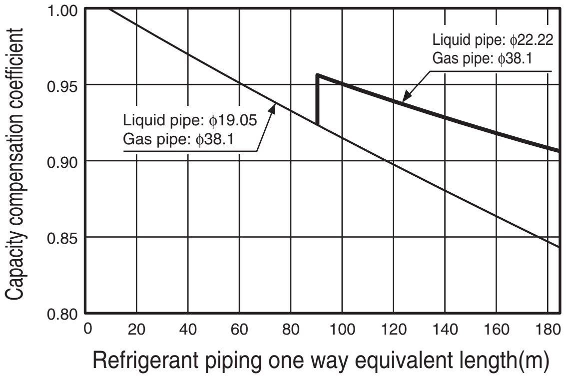
FDCA1180HKXE4(42HP)
[FDCA560HKXE4 + FDCA615HKXE4]



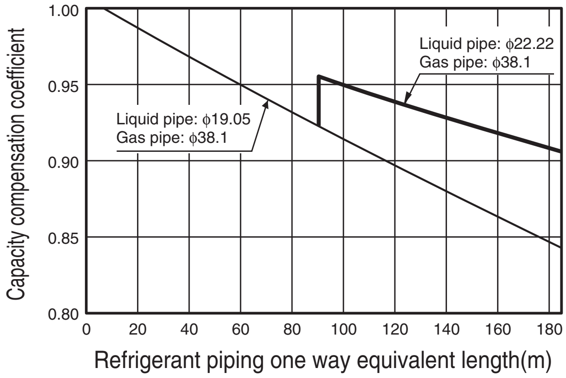
FDCA1235HKXE4(44HP)
[FDCA615HKXE4 + FDCA615HKXE4]



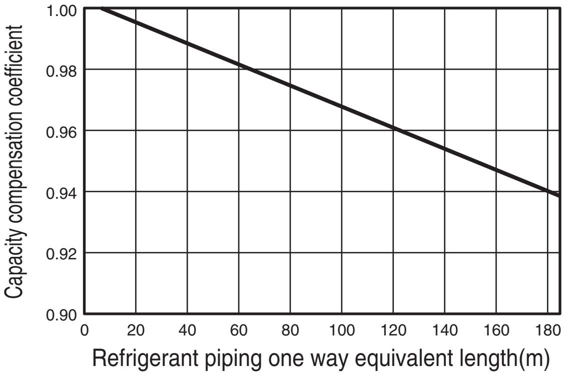
FDCA1300HKXE4(46HP)
[FDCA615HKXE4 + FDCA680HKXE4]



FDCA1360HKXE4(48HP)
[FDCA680HKXE4 + FDCA680HKXE4]



(ii) Heating operation
Common to all models



(c) Equivalent piping length can be obtained by calculating as follows.

Equivalent piping length = Real gas piping length + Number of bends in gas piping × Equivalent piping length of bends.

Equivalent length of each joint

Gas piping size(mm)	ϕ 15.88	ϕ 19.05	ϕ 22.22	ϕ 25.4	ϕ 28.58	ϕ 31.8	ϕ 34.92	ϕ 38.1
Joint (90°elbow)	0.25	0.30	0.35	0.40	0.45	0.55	0.60	0.65

(d) When the outdoor unit is located at a lower height than the indoor unit in cooling operation and when the outdoor unit is located at a higher height than the indoor unit in heating operation, the following values should be subtracted from the values in the above table.

Height difference between the indoor unit and outdoor unit in the vertical height difference(m)	5	10	15	20	25	30	35	40	45	50
Adjustment coefficient	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90

(e) Correction of heating capacity in relation to the frost on the outdoor unit heat exchanger

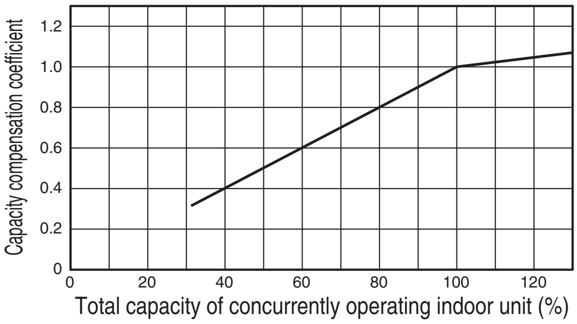
Air inlet temperature of outdoor unit in °C WB	−15	−13	−11	−9	−7	−5	−3	−1	1	3	5
Adjustment coefficient	0.96	0.96	0.95	0.94	0.93	0.91	0.88	0.86	0.87	0.92	1.00

(f) The capacity compensation coefficient and power consumption compensation coefficient vary according to the total capacity of concurrently operating indoor units, as shown below.

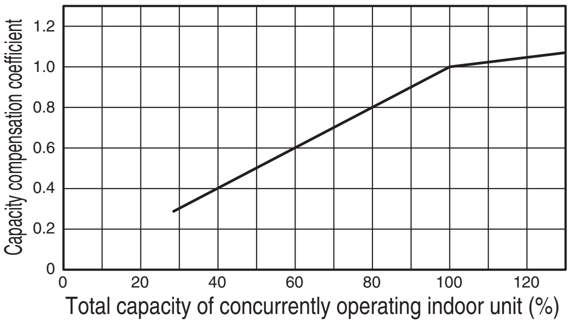
FDCA140HKXEN4(5HP)

(i) Capacity compensation coefficient

Cooling operation

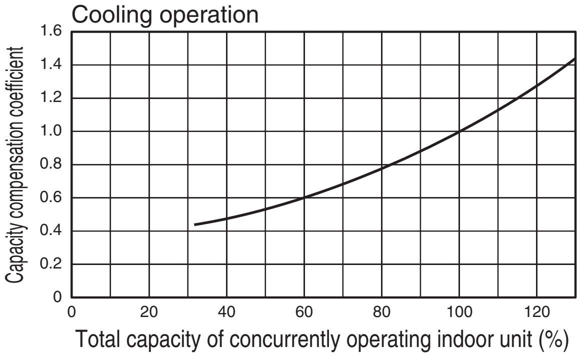


Heating operation

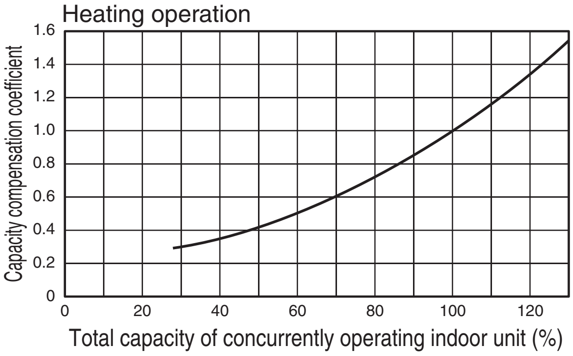


(ii) Power consumption compensation coefficient

Cooling operation



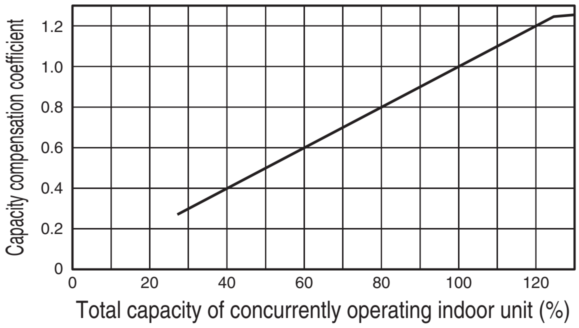
Heating operation



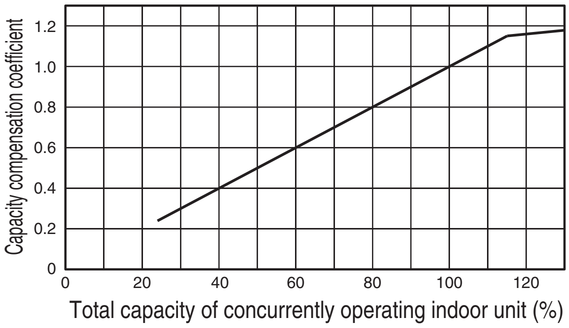
FDCA224HKXE4(8HP)

(i) Capacity compensation coefficient

Cooling operation

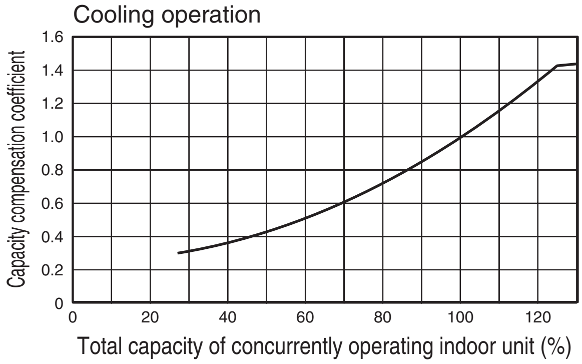


Heating operation

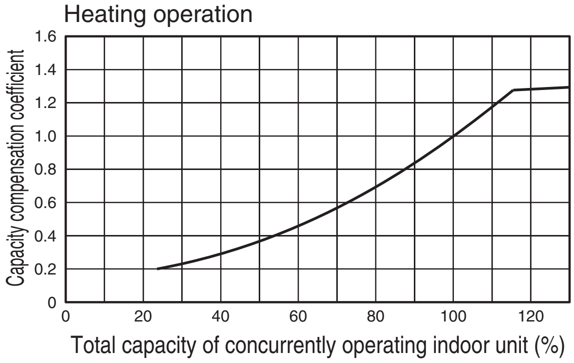


(ii) Power consumption compensation coefficient

Cooling operation



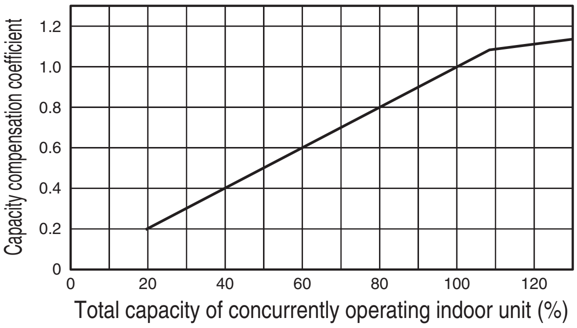
Heating operation



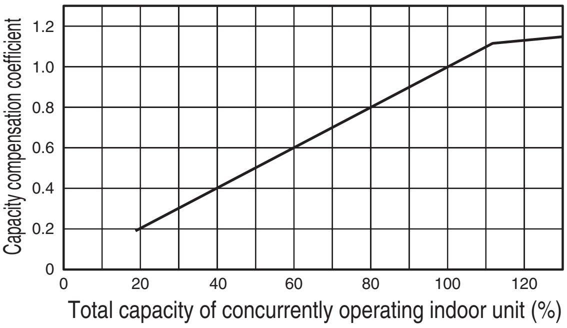
FDCA280HKXE4(10HP)

(i) Capacity compensation coefficient

Cooling operation

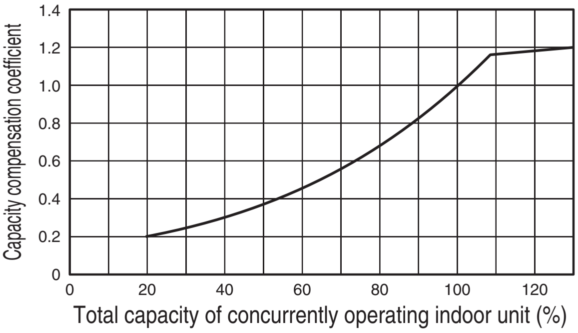


Heating operation

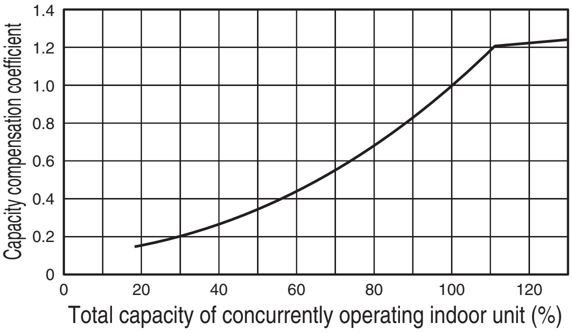


(ii) Power consumption compensation coefficient

Cooling operation



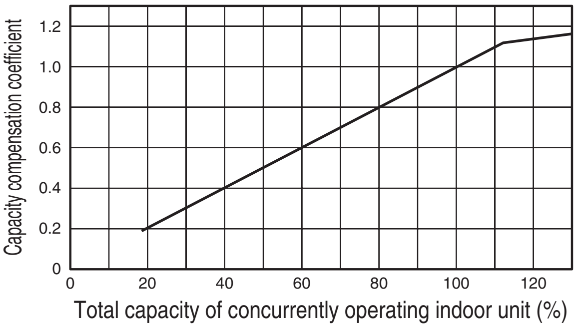
Heating operation



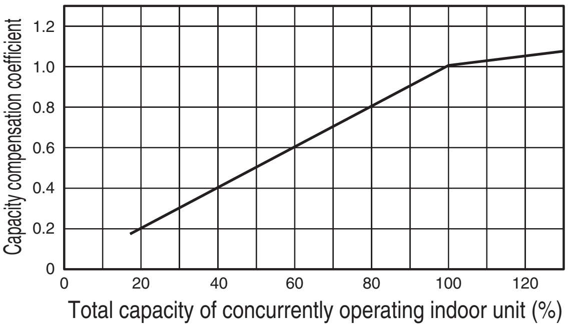
FDCA355HKXE4(12HP)

(i) Capacity compensation coefficient

Cooling operation

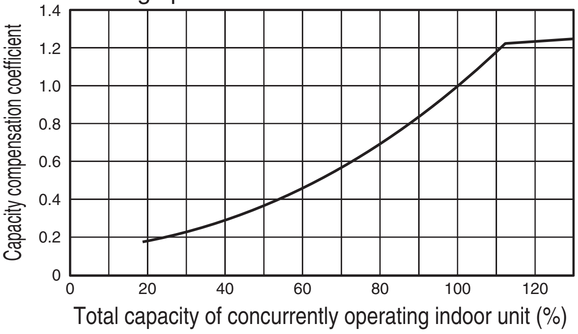


Heating operation

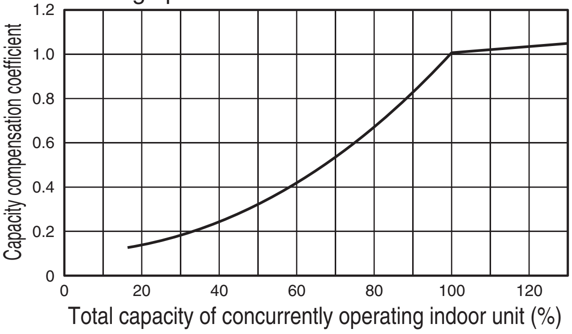


(ii) Power consumption compensation coefficient

Cooling operation



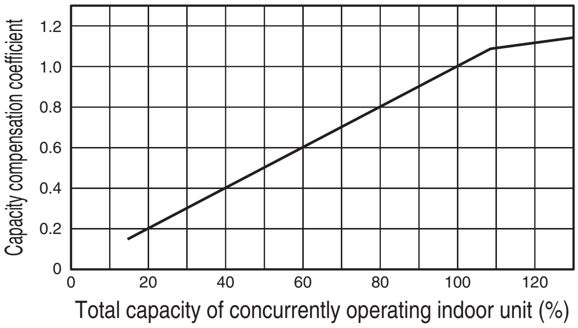
Heating operation



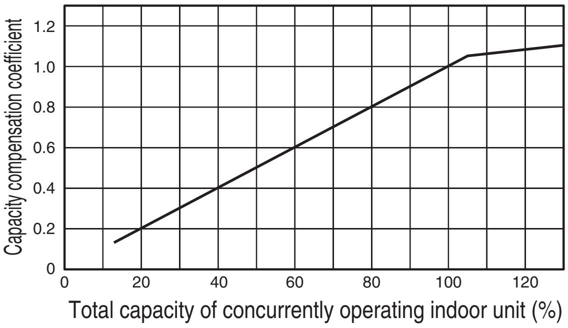
FDCA400HKXE4(14HP)

(i) Capacity compensation coefficient

Cooling operation

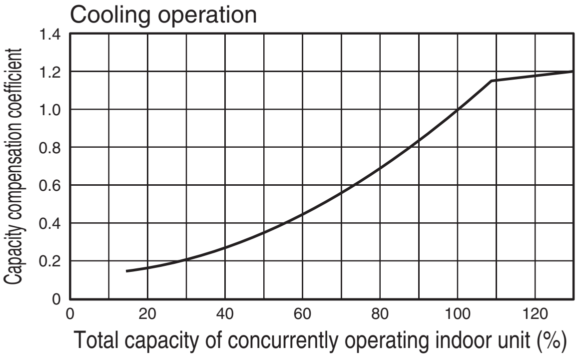


Heating operation

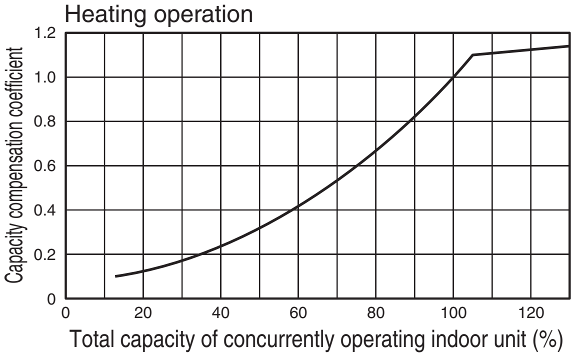


(ii) Power consumption compensation coefficient

Cooling operation



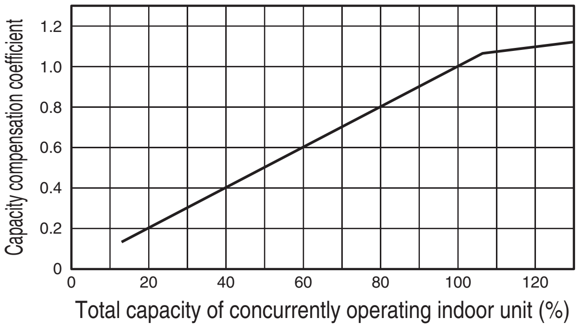
Heating operation



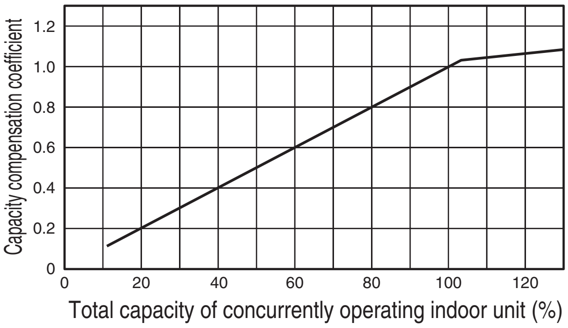
FDCA450HKXE4(16HP)

(i) Capacity compensation coefficient

Cooling operation

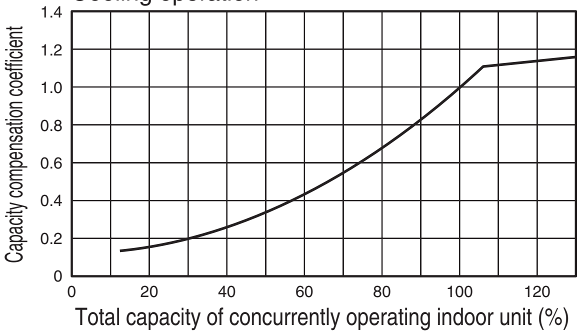


Heating operation

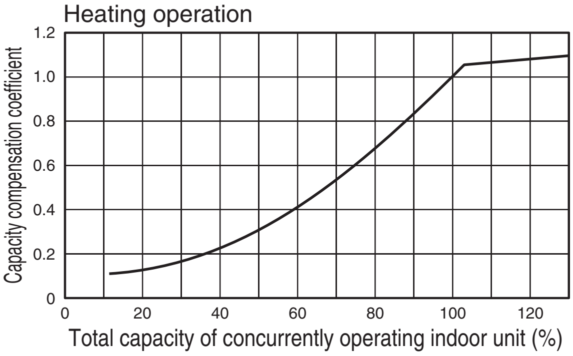


(ii) Power consumption compensation coefficient

Cooling operation



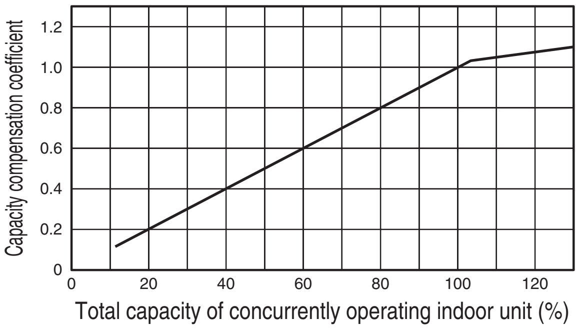
Heating operation



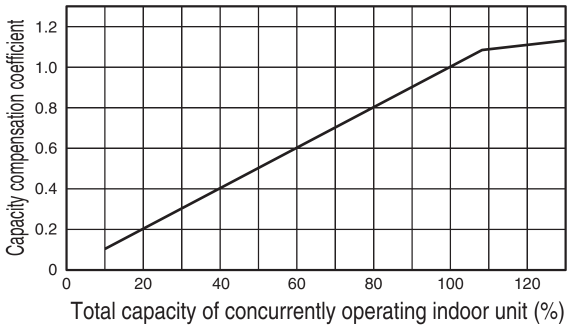
FDCA504HKXE4(18HP)

(i) Capacity compensation coefficient

Cooling operation

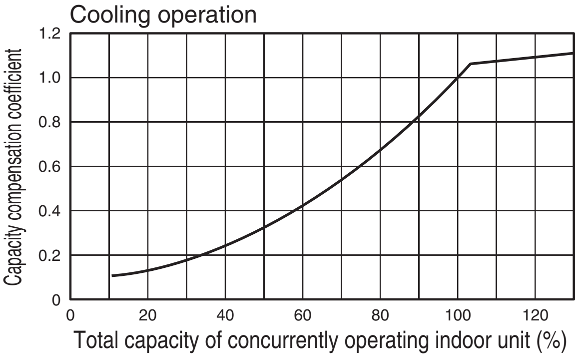


Heating operation

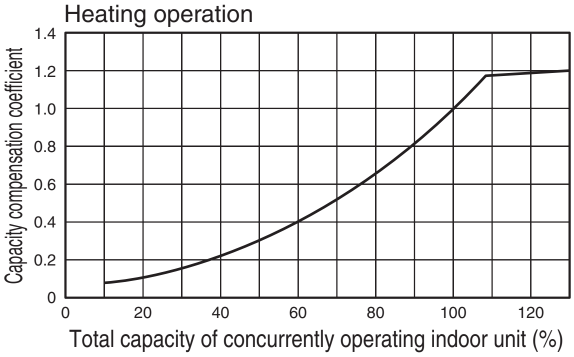


(ii) Power consumption compensation coefficient

Cooling operation



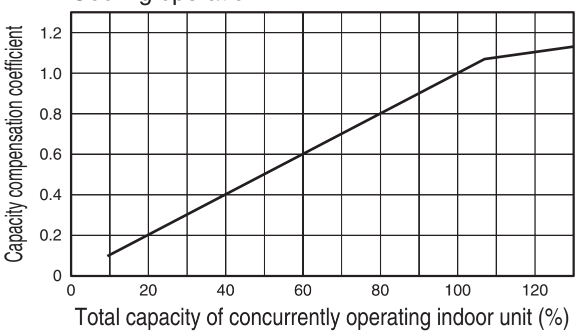
Heating operation



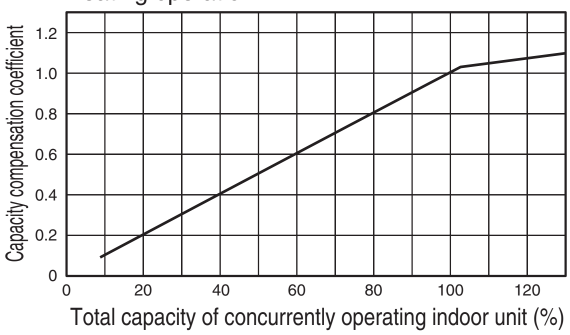
FDCA560HKXE4(20HP)

(i) Capacity compensation coefficient

Cooling operation

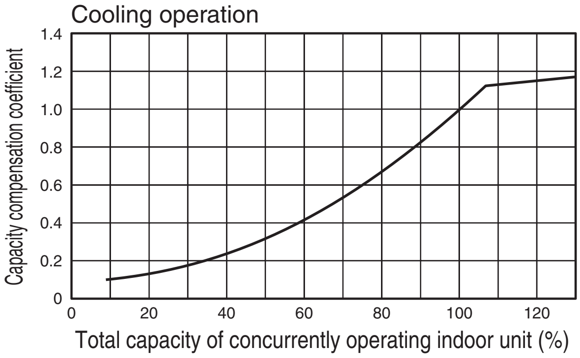


Heating operation

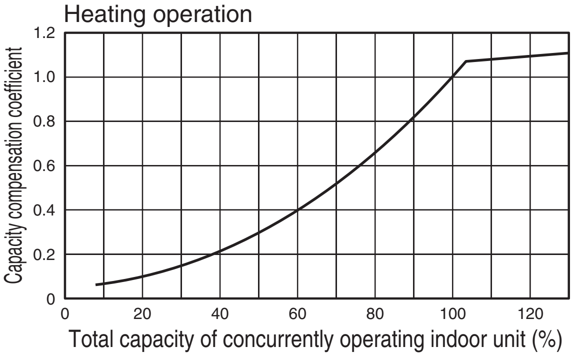


(ii) Power consumption compensation coefficient

Cooling operation



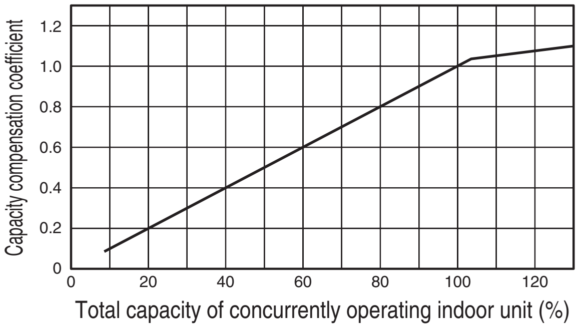
Heating operation



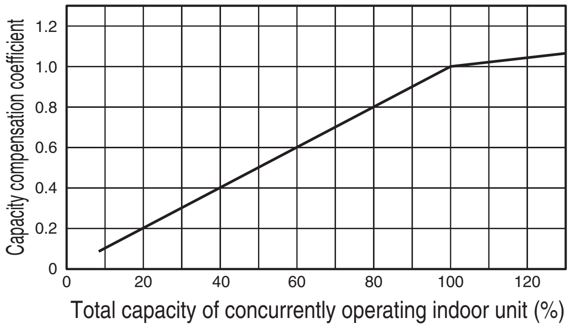
FDCA615HKXE4(22HP)

(i) Capacity compensation coefficient

Cooling operation

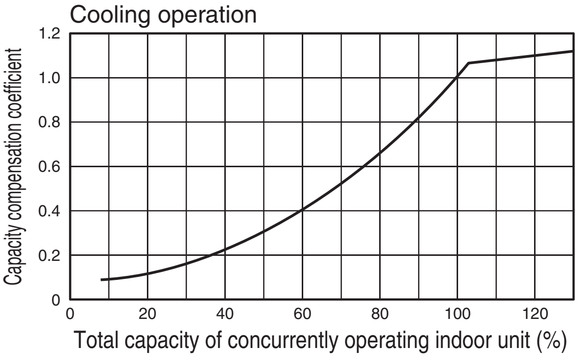


Heating operation

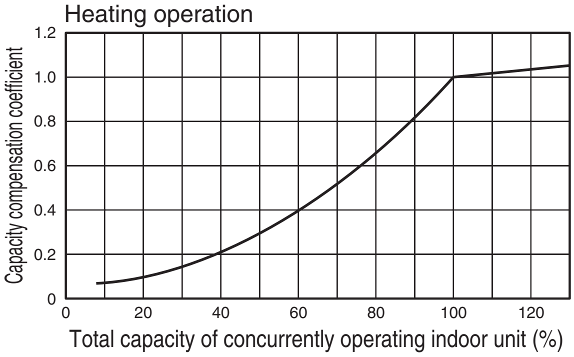


(ii) Power consumption compensation coefficient

Cooling operation



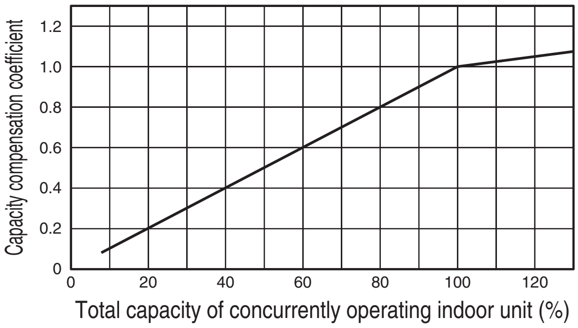
Heating operation



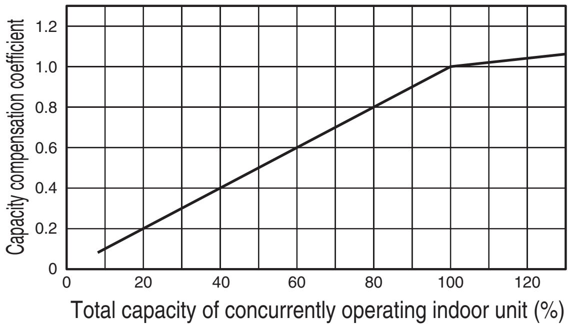
FDCA680HKXE4(24HP)

(i) Capacity compensation coefficient

Cooling operation

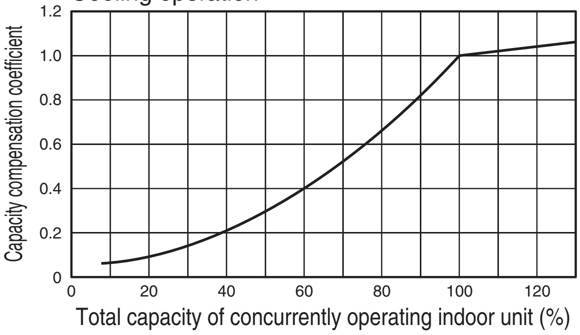


Heating operation

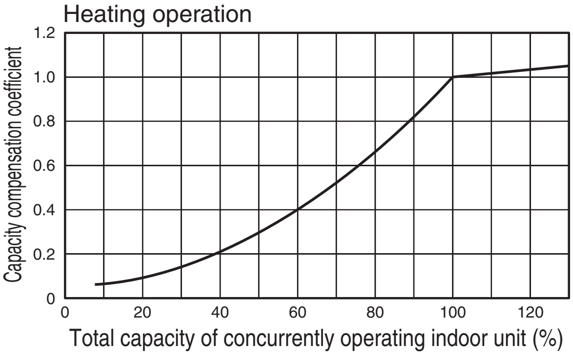


(ii) Power consumption compensation coefficient

Cooling operation

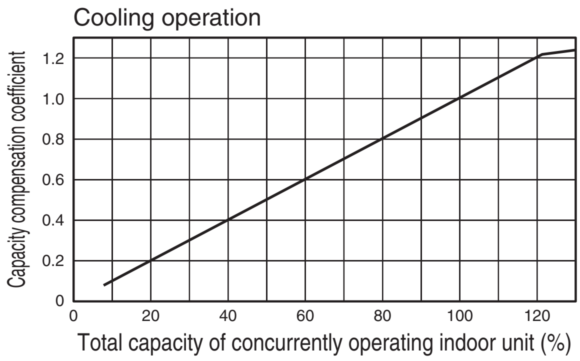


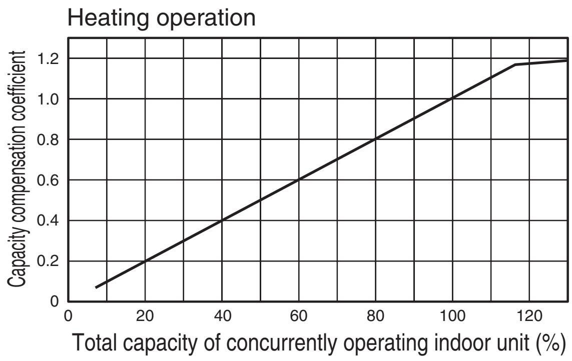
Heating operation



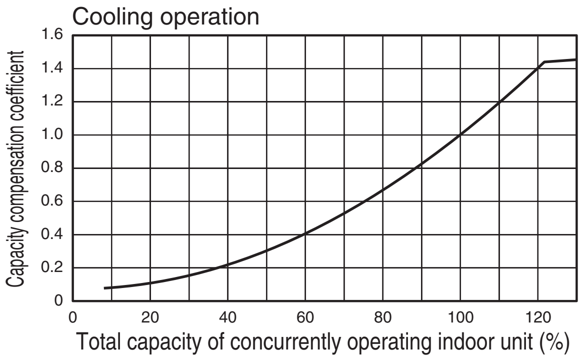
FDCA735HKXE4(26HP) [FDCA335HKXE4-K + FDCA400HKXE4]

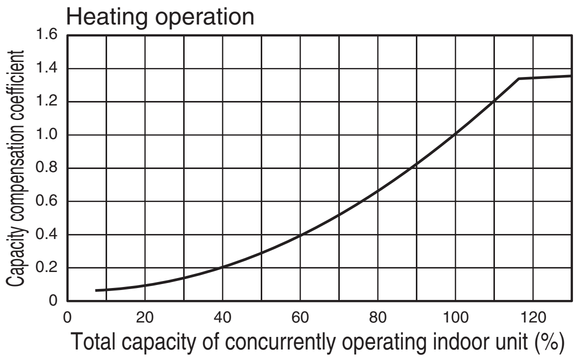
(i) Capacity compensation coefficient





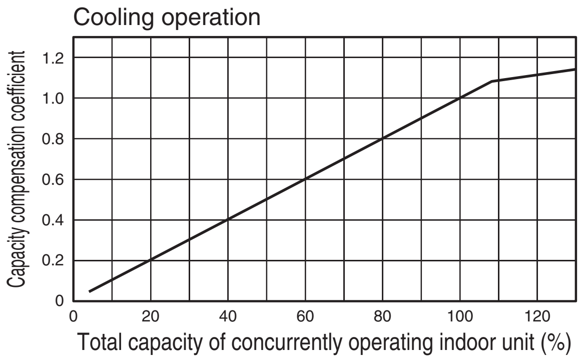
(ii) Power consumption compensation coefficient

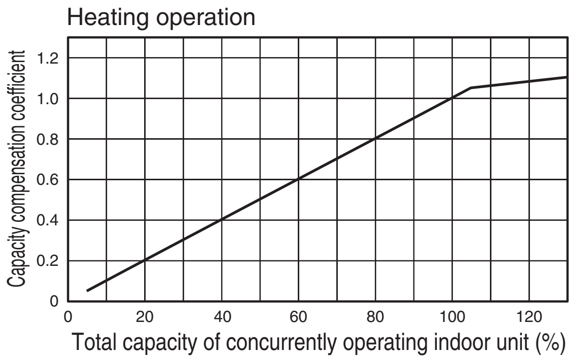




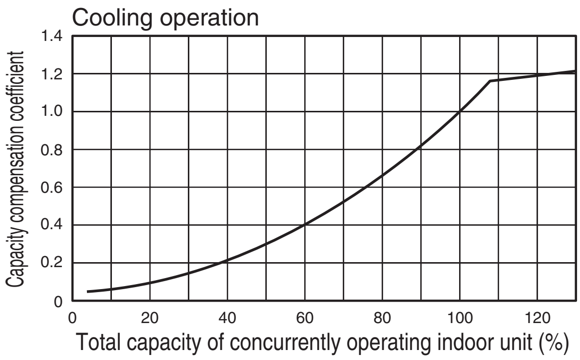
FDCA800HKXE4(28HP) [FDCA400HKXE4 + FDCA400HKXE4]

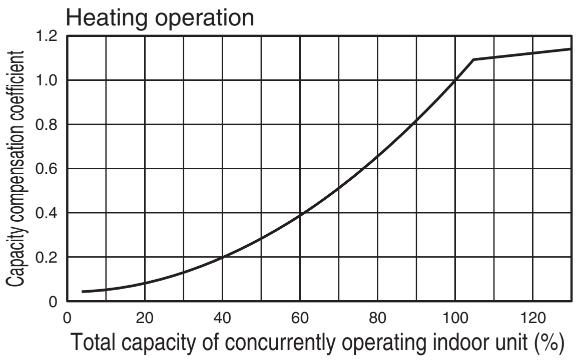
(i) Capacity compensation coefficient





(ii) Power consumption compensation coefficient

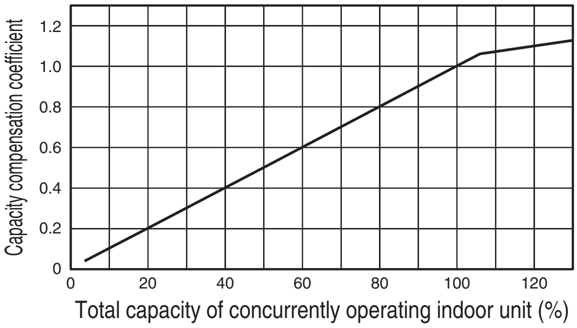




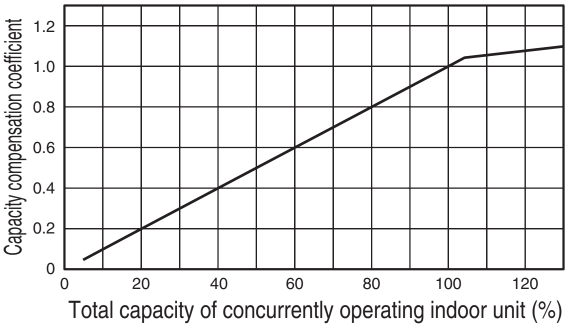
FDCA850HKXE4(30HP) [FDCA400HKXE4 + FDCA450HKXE4]

(i) Capacity compensation coefficient

Cooling operation

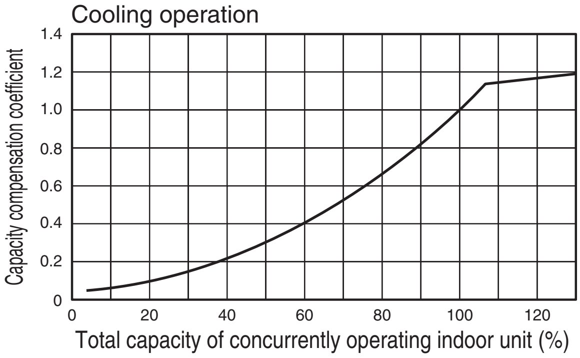


Heating operation

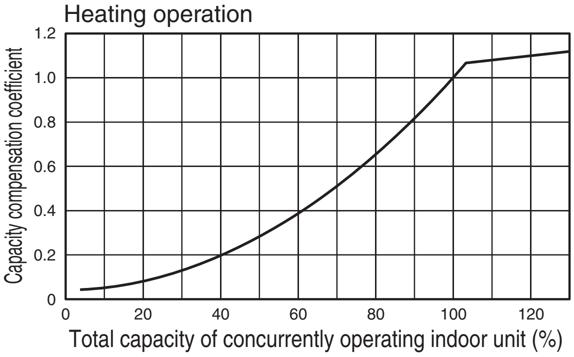


(ii) Power consumption compensation coefficient

Cooling operation



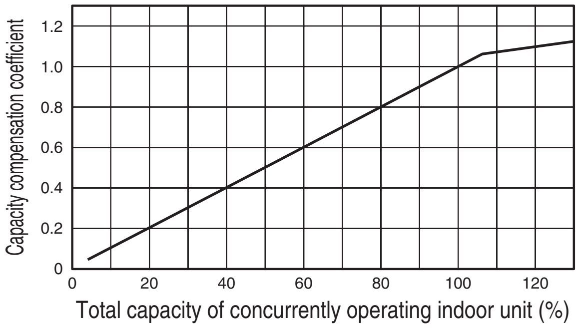
Heating operation



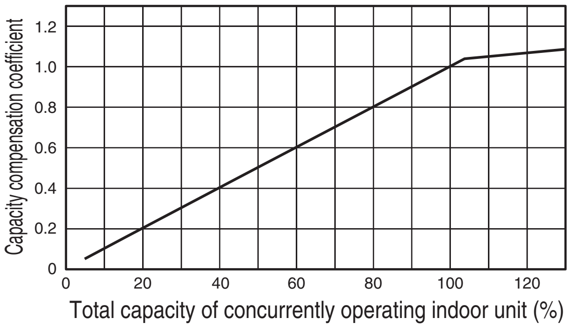
FDCA900HKXE4(32HP) [FDCA450HKXE4 + FDCA450HKXE4]

(i) Capacity compensation coefficient

Cooling operation

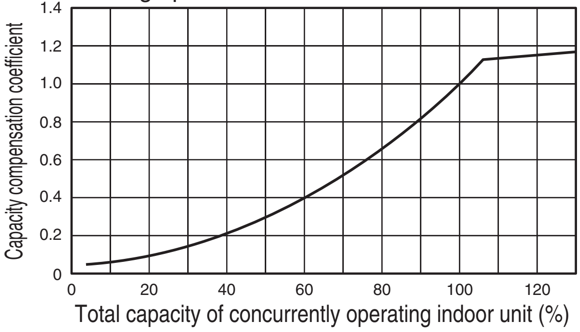


Heating operation

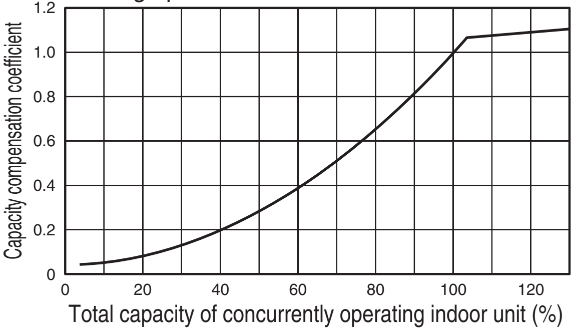


(ii) Power consumption compensation coefficient

Cooling operation



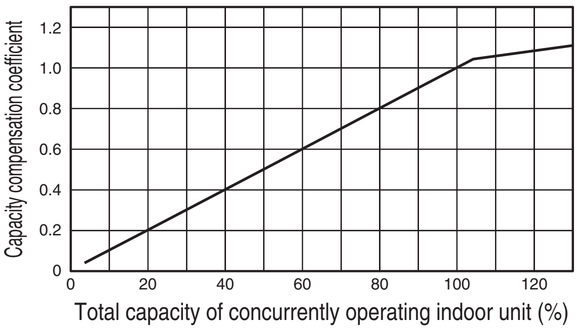
Heating operation



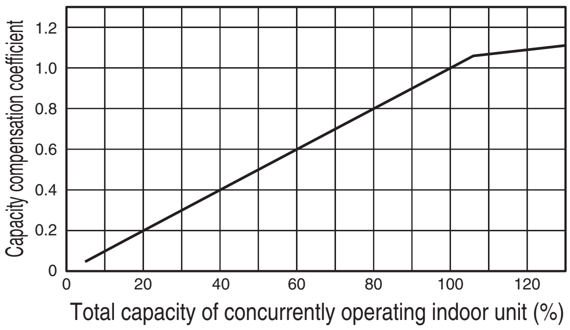
FDCA960HKXE4(34HP) [FDCA450HKXE4 + FDCA504HKXE4]

(i) Capacity compensation coefficient

Cooling operation

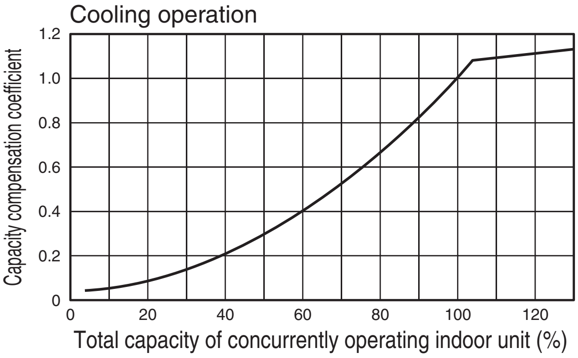


Heating operation

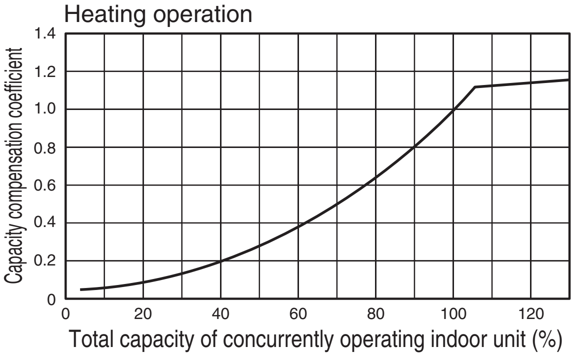


(ii) Power consumption compensation coefficient

Cooling operation



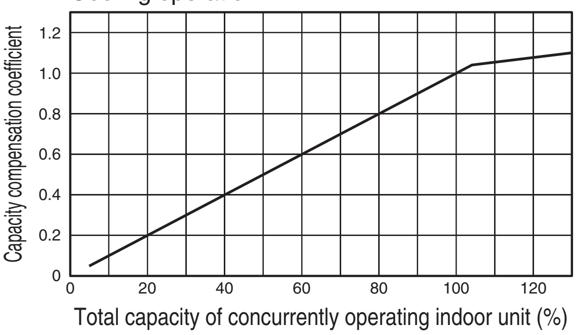
Heating operation



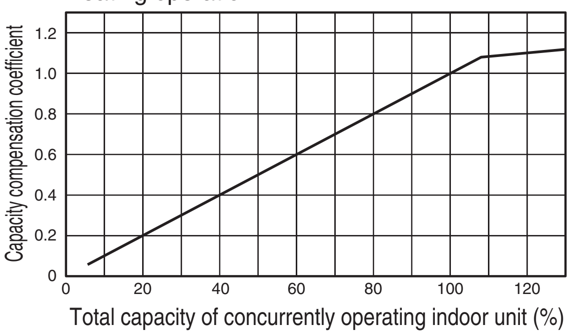
FDCA1010HKXE4(36HP) [FDCA504HKXE4 + FDCA504HKXE4]

(i) Capacity compensation coefficient

Cooling operation

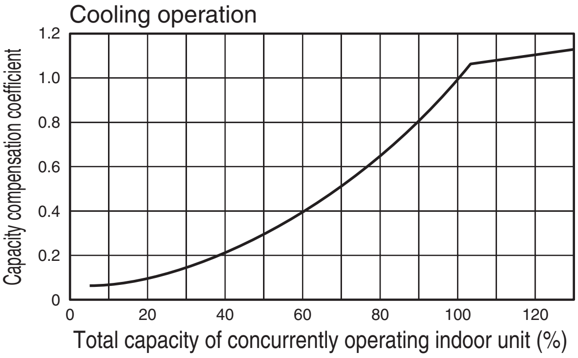


Heating operation

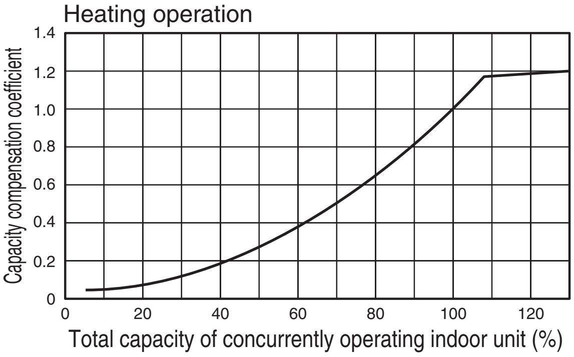


(ii) Power consumption compensation coefficient

Cooling operation

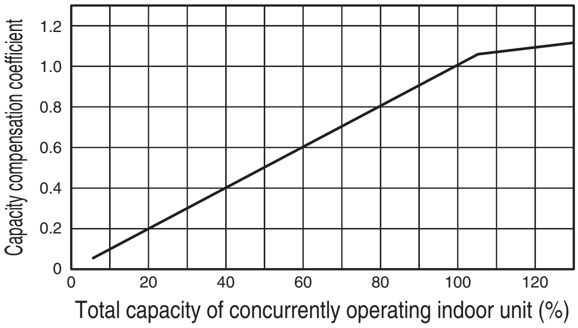


Heating operation

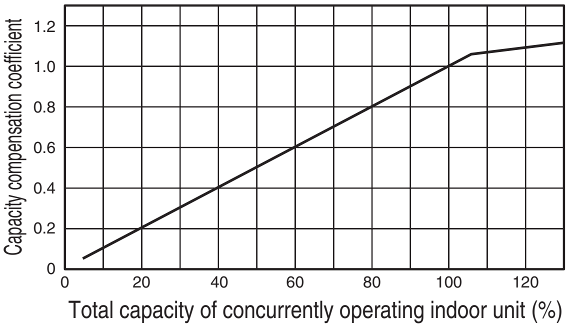


FDCA1065HKXE4(38HP) [FDCA504HKXE4 + FDCA560HKXE4]
(i) Capacity compensation coefficient

Cooling operation

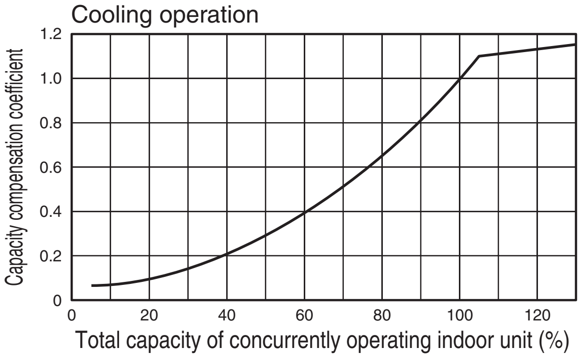


Heating operation

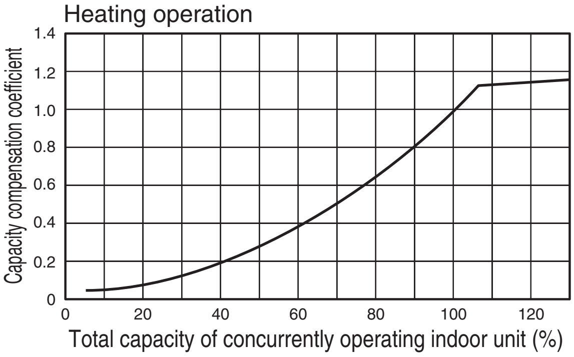


(ii) Power consumption compensation coefficient

Cooling operation

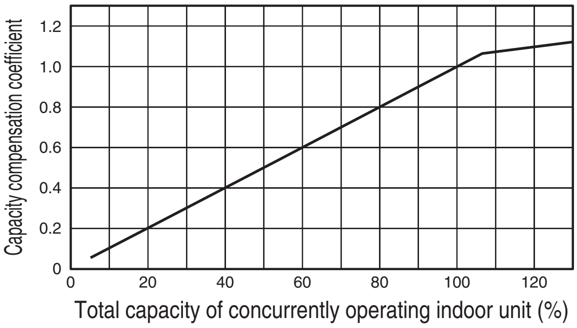


Heating operation

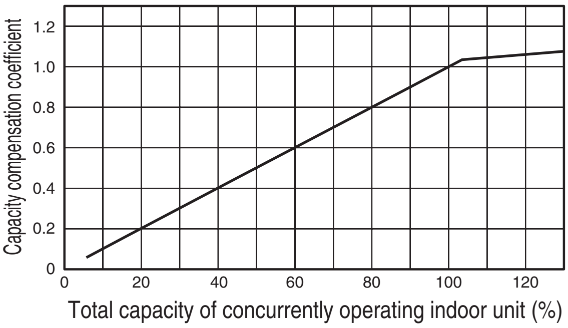


FDCA1130HKXE4(40HP) [FDCA560HKXE4 + FDCA560HKXE4]
(i) Capacity compensation coefficient

Cooling operation

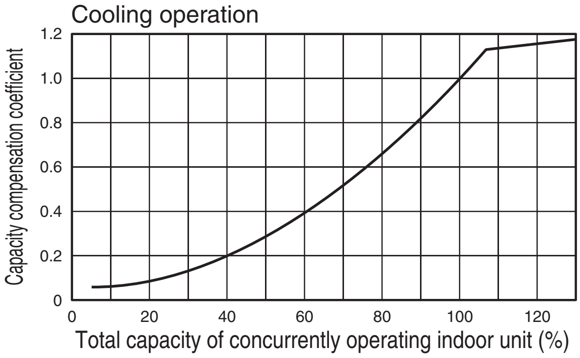


Heating operation

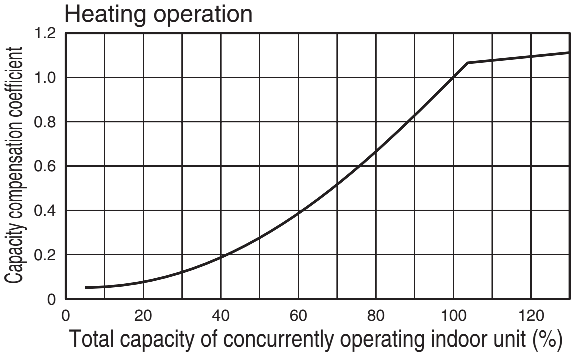


(ii) Power consumption compensation coefficient

Cooling operation



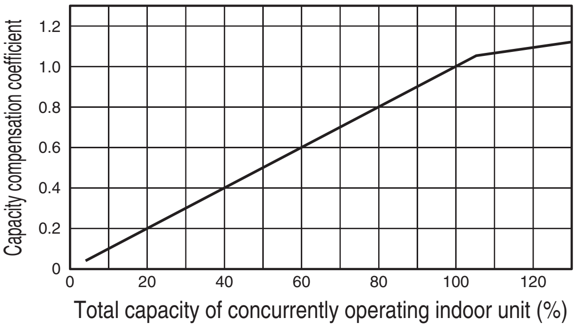
Heating operation



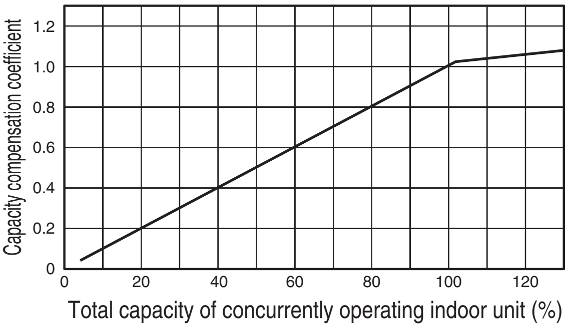
FDCA1180HKXE4(42HP) [FDCA560HKXE4 + FDCA615HKXE4]

(i) Capacity compensation coefficient

Cooling operation

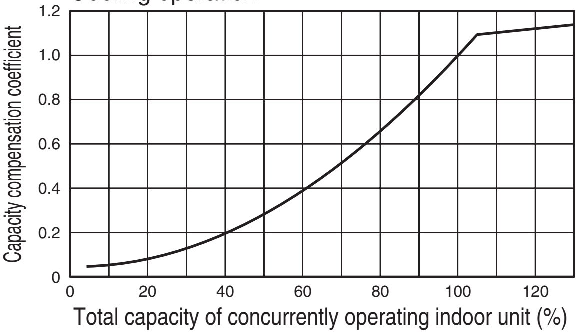


Heating operation

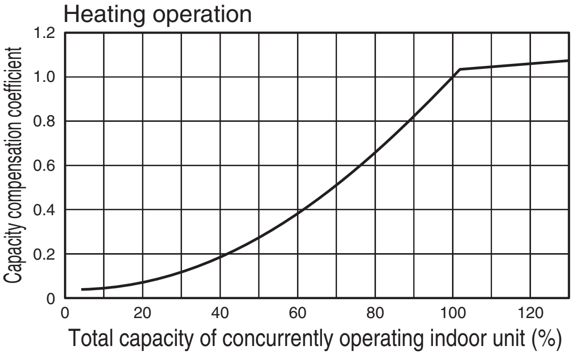


(ii) Power consumption compensation coefficient

Cooling operation



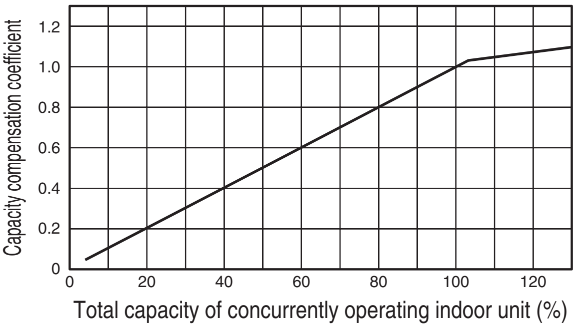
Heating operation



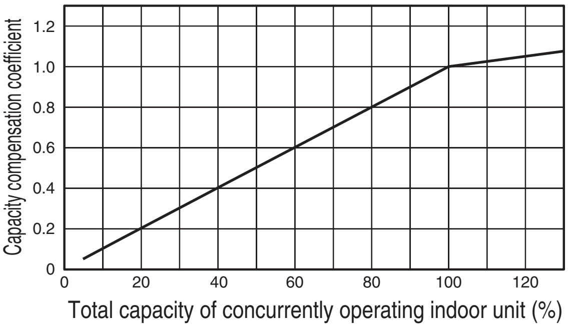
FDCA1235HKXE4(44HP) [FDCA615HKXE4 + FDCA615HKXE4]

(i) Capacity compensation coefficient

Cooling operation

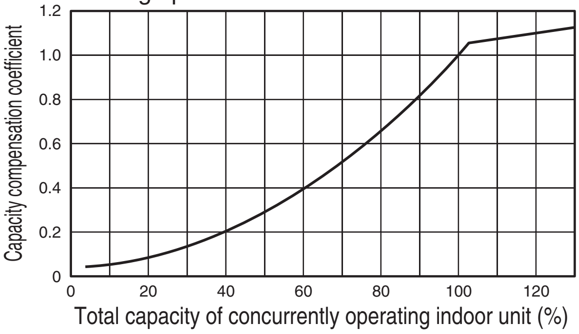


Heating operation

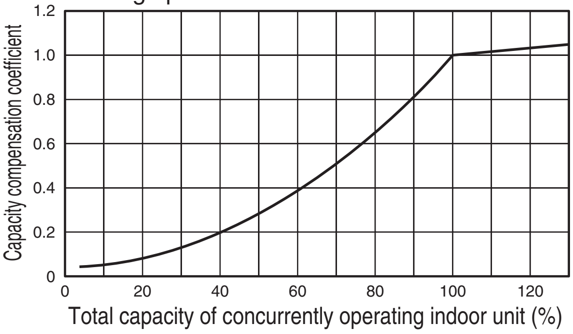


(ii) Power consumption compensation coefficient

Cooling operation



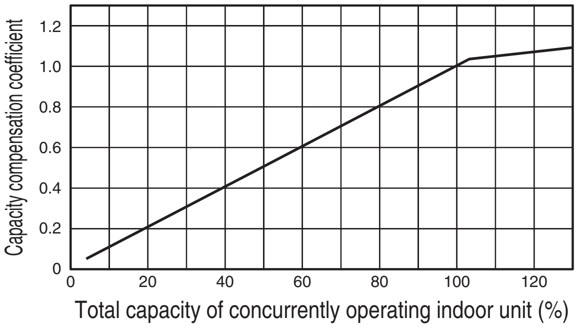
Heating operation



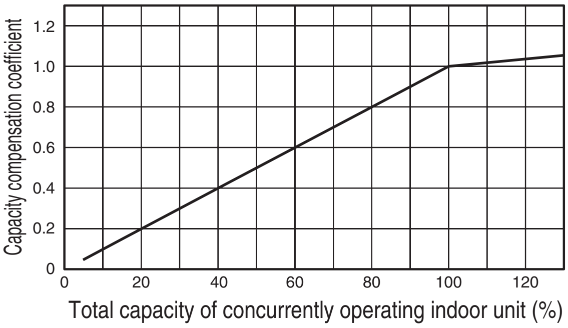
FDCA1300HKXE4(46HP) [FDCA615HKXE4 + FDCA680HKXE4]

(i) Capacity compensation coefficient

Cooling operation

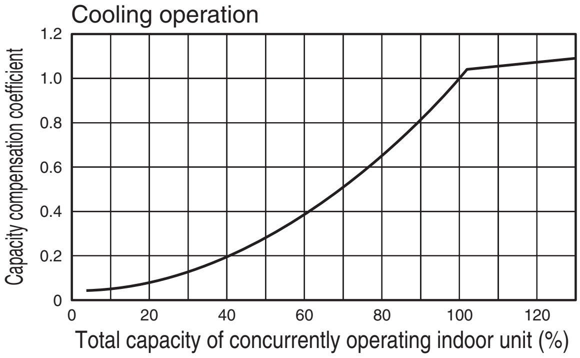


Heating operation

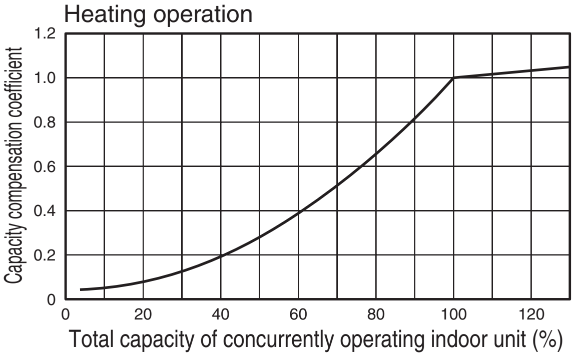


(ii) Power consumption compensation coefficient

Cooling operation



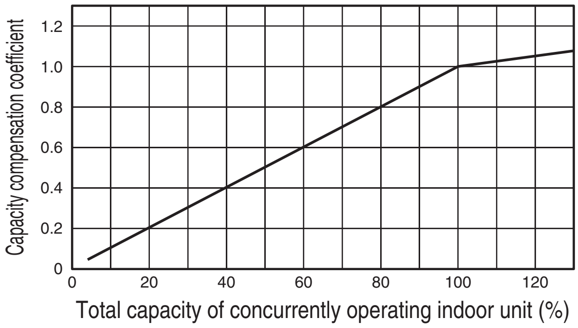
Heating operation



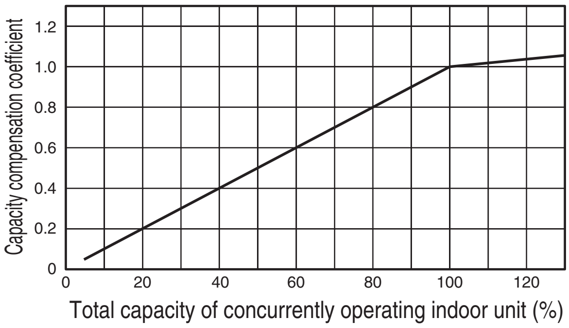
FDCA1360HKXE4(48HP) [FDCA680HKXE4 + FDCA680HKXE4]

(i) Capacity compensation coefficient

Cooling operation

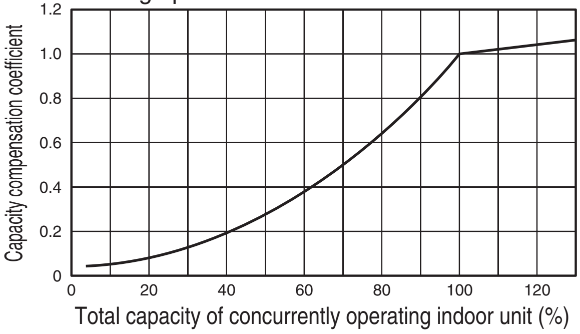


Heating operation

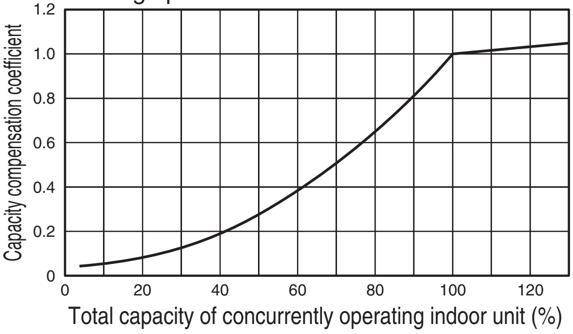


(ii) Power consumption compensation coefficient

Cooling operation



Heating operation



3.6 Key points of indoor unit selection

Series	Advantages	Disadvantages	Solutions	Reference Page
4-way outlet ceiling recessed type (FDTA)	■ It can be positioned in the centre of the room for good air-conditioning effect. ■ Four-way air blowing and good air distribution.	■ Attention should be paid to the prevention of air short circuit near the ceiling. (When the ceiling height exceeds 3m)	■ Install a circulator.	P.81
4-way outlet ceiling recessed compact type (FDTCA)	■ Compact four-way cassette meeting European ceiling mounted system requirement ■ Four-way air outlet and good air distribution ■ It can also be used in locations with a narrow space inside the ceiling	■ Inspection port of ceiling is required if installed in non European system ceiling	■ Avoid use in non European system ceiling	P.82
2-way outlet ceiling recessed type (FDTWA)	■ It can be positioned in the centre of the room for good air-conditioning effect. ■ With a faster blowing speed than the four-way type, a longer air throw distance is achieved. (The maximum ceiling height is 5m)	■ The small models have higher noise than the four-way air blowing type.	■ Avoid using it in bedroom if possible.	P.82
1-way outlet ceiling recessed type (FDTSA)	■ It can be positioned in the centre of the room for good air-conditioning effect. ■ With a faster blowing speed than the four-way type, a longer air throw distance is achieved. (The maximum ceiling height is 7m) ■ It can also be used in locations with a narrow space inside the ceiling. (above 200mm)	■ Poor air distribution when installed in the centre of the room. ■ The maximum height of the drain pump head is 200mm when the height inside the ceiling is 200mm.	■ Avoid using it in bedroom if possible. ■ Installation in a corner is recommended. ■ The piping construction of the drain pipes must be considered.	P.83
Ceiling recessed single air supply port type (FDTQA)	■ The main unit adopts a compact design and can be smoothly installed even in small rooms. ■ Quieter than FDTSJ in the weak mode. ■ Direct blow or any type of duct is available for selection depending on the change of the panels.	■ The space inside the ceiling is a little bit larger than FDTSJ. (above 250mm) ■ Large capacity series are not available.		P.83
Ceiling mounted duct type (FDURA) (13mmAq)	■ As a medium static pressure type, it has a high static pressure and long conduits can be used. ■ The air inlet can be selected from the bottom or the rear side. ■ Air filters are provided.	■ Difficult to provide low air flow rate.	■ Switch to low speed mode in case of high noise.	P.86
Satellite ducted type (FDUMA) (9mmAq)	■ It is a high-grade air-conditioner applicable to small to medium room.	■ Difficult to provide low air rate. ■ More than 360mm height is required inside the ceiling.	■ Avoid installing short conduits in bedroom if possible.	P.85
Cassetteria type (FDRA) (8mmAq)	■ The air intake panel may be directly mounted in a simple way.	■ Higher noise than FDUMJ.	■ Switch to low speed mode in case of high noise.	P.84
Medium static pressure ducted type (FDQMA) (3mmAq)	■ Applicable to small to medium room with low noise level. (Most applicable to bedrooms) ■ An installation space of more than 250mm inside the ceiling is required.	■ The only model available is the 3.6 kilowatt one. (Use in space less than 36m^2 is requested)		P.84
Ceiling suspension type (FDEA)	■ Simple construction. Rear mounting is possible. ■ As compared to the wall mounted type, more types and series with large capacity models can be selected.	■ Treatment inside the ceiling is not possible since there is no drain pump inside the unit		P.86
Wall mounted type (FDKA)	■ The construction is as simple as that of the household air-conditioners.	■ Lack of a high-class appearance. ■ Drain pump is not standard equipment.		P.87
Floor standing type (FDFLA/FDFUA)	■ No need to worry about short circuit on the ceiling surface even with higher ceilings. ■ Convenient for use in surrounding area.	■ Occupation of floor and wall areas is required.		P.87

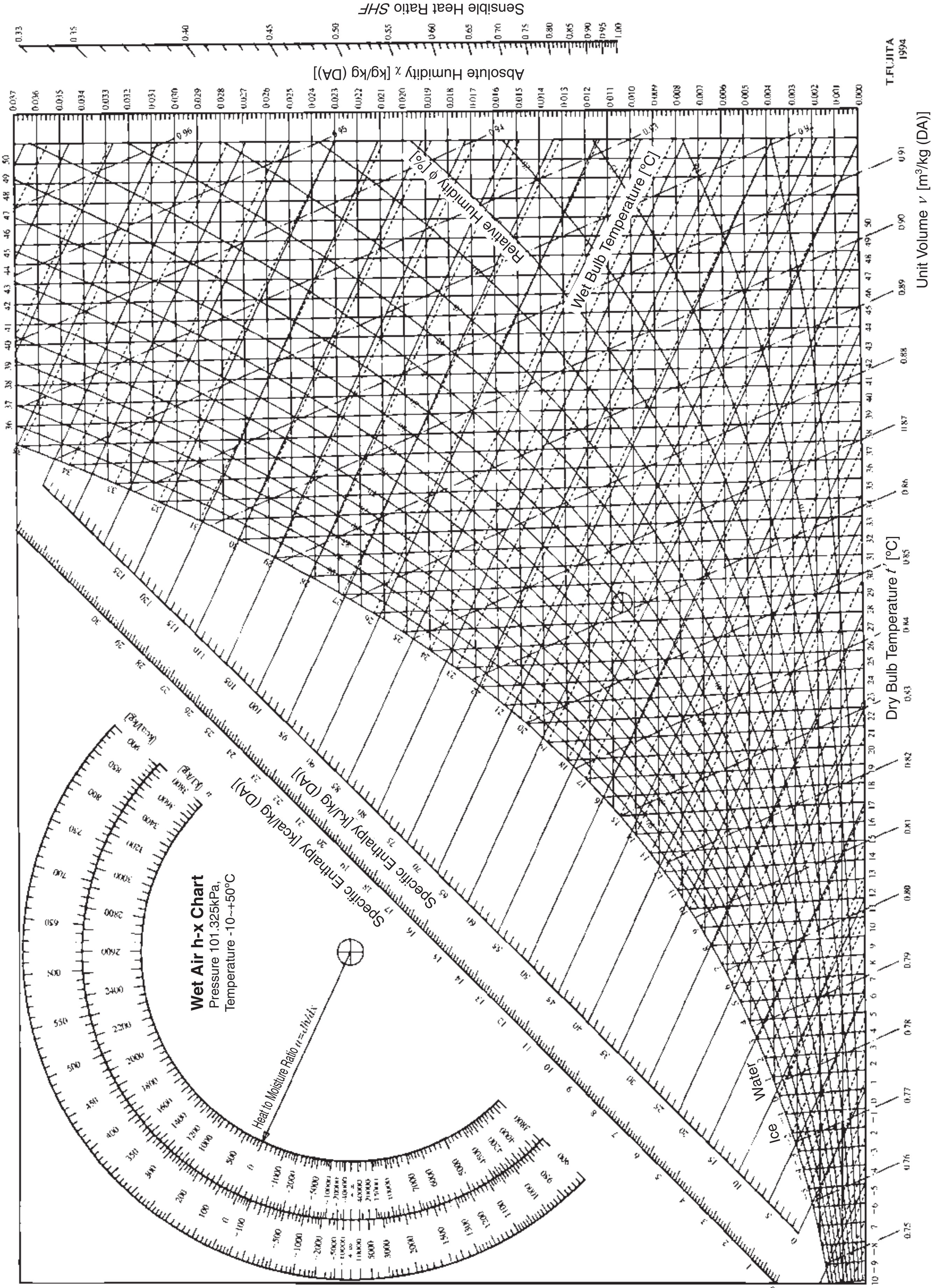
3.7 Points to be noticed in model selection

Type of building	Cooling load indicator (W/m^2)	Points to be noticed	Recommended models
Hotel: Guest room	80 to 110	High-class appearance, low noise, and bathroom load (exhaust and ventilation volume) should be considered.	Cassetteria type (FDRA), Satellite ducted type (FDUMA)
Bar and Cafe	100 to 180	Decorative	Satellite ducted type (FDUMA), Ceiling mounted duct type (FDURA)
Western restaurant	160 to 200	Decorative	Satellite ducted type (FDUMA), Ceiling mounted duct type (FDURA), 4-way outlet ceiling recessed type (FDTA)
Chinese restaurant, Banquet hall	180 to 350	High thermal load (People, diet, illumination)	4-way outlet ceiling recessed type (FDTA), Satellite ducted type (FDUMA)
Shop, Buffet	100 to 160	Frequent ventilation	4-way outlet ceiling recessed type (FDTA), 2-way outlet ceiling recessed type (FDTWA)
Small meeting room	200 to 300	High ventilation volume and low noise	4-way outlet ceiling recessed type (FDTA), Cassetteria type (FDRA), Satellite ducted type (FDUMA)
Large meeting room	180 to 280	Low noise	Satellite ducted type (FDUMA), 4-way outlet ceiling recessed type (FDTA)
Barber shop, Beauty parlour	180 to 250	Low air speed and high thermal load	4-way outlet ceiling recessed type (FDTA), Cassetteria type (FDRA), Satellite ducted type (FDUMA)
Office	90 to 120	Low noise	4-way outlet ceiling recessed type (FDTA), 4-way outlet ceiling recessed compact type(FDTCA)
Hospital: Superior ward	80 to 110	Low noise and low air speed	4-way outlet ceiling recessed type (FDTA), 4-way outlet ceiling recessed compact type(FDTCA), Cassetteria type (FDRA), Satellite ducted type (FDUMA), Ceiling recessed single air supply port type (FDTQA), Medium static pressure ducted type (FDQMA)
Marketplace, Department store	150 to 250	High thermal load and high ventitation volume	4-way outlet ceiling recessed type (FDTA)
Apartment, Dwelling house	80 to 90	Attention should be paid to temperature distribution for ventilated rooms with low noise.	Wall mounted type (FDKA), 4-way outlet ceiling recessed compact type(FDTCA), Ceiling recessed single air supply port type (FDTQA), Medium static pressure ducted type (FDQMA), Floor standing type (FDFLA)

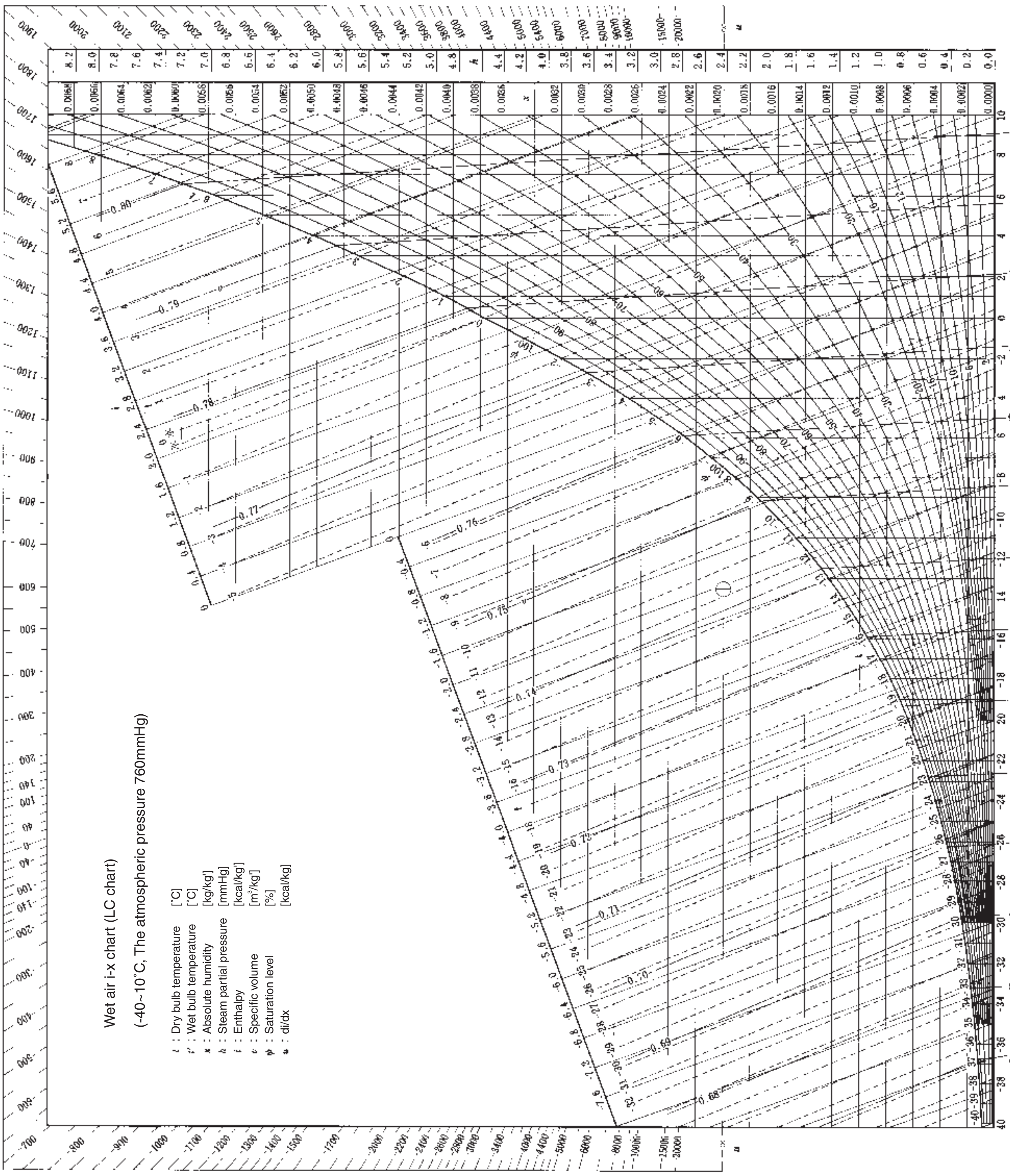
3.8 Psychrometric Chart

3.8.1 Psychrometric chart

(1) Wet air h-x chart (SI)

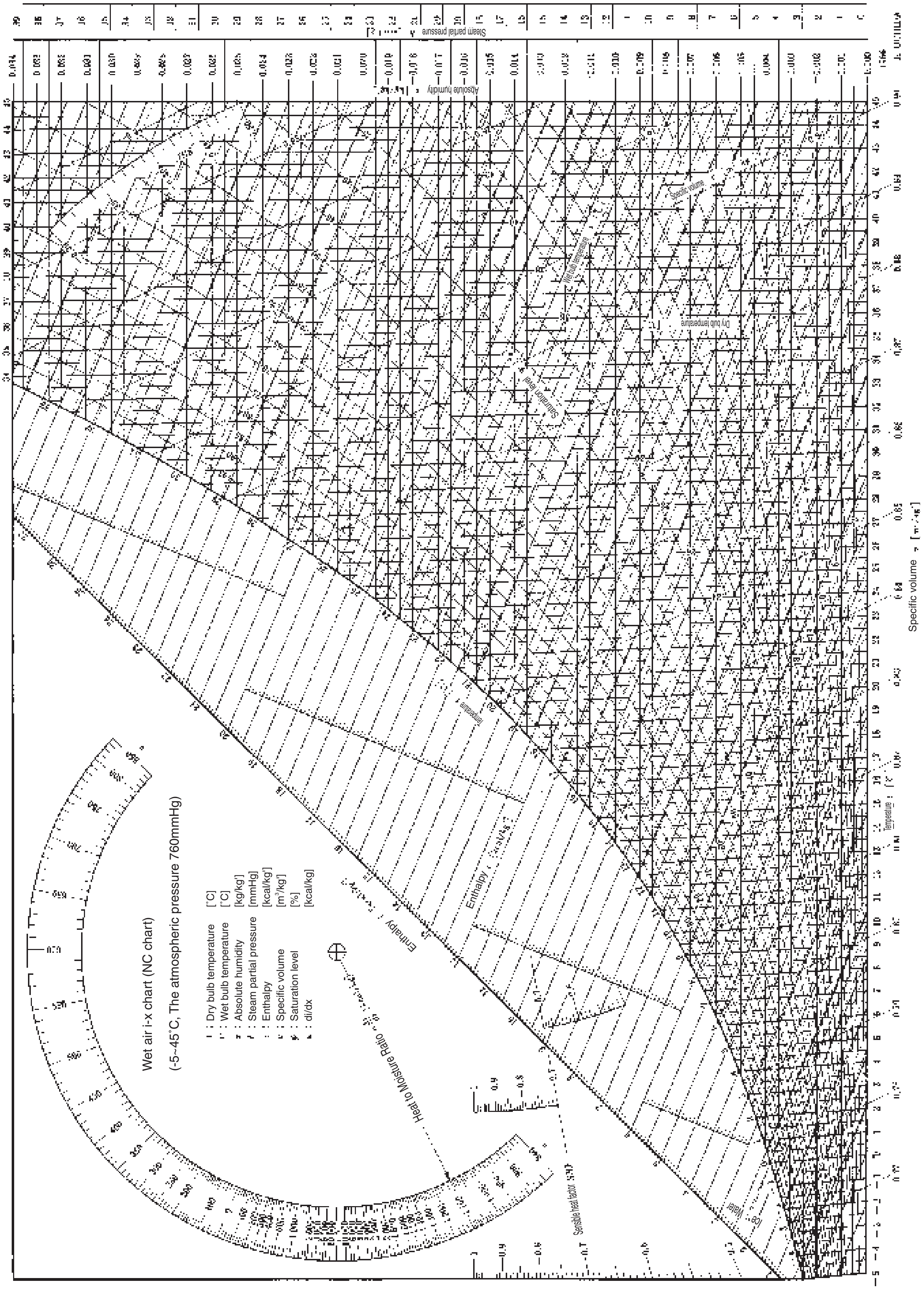


(2) Psychrometric chart



(Source:Uchida laboratory in the university of Tokyo 1951)

(3) Psychrometric Chart (NC chart)

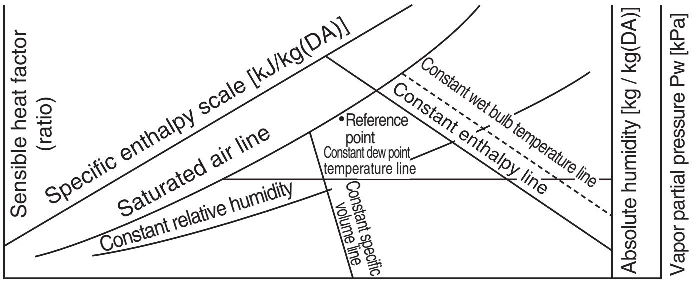


3.8.2 How to use psychrometric chart

a) Composition of air chart

As for the air chart, absolute temperature x and dry bulb temperature t is usually used as the vertical axis and the horizontal axis respectively. This t-x air chart is described as follows.

(1) The basic feature of t- x air diagram



(2) Saturated air line

The curve that connects the points representing the state of the saturated air at each temperature in is called a saturated air line.

(3) Constant relative humidity line

Relative humidity is shown by $\psi = \frac{Pw}{Pws}$, and absolute humidity is represented as

$$x = 0.622\frac{Pw}{P\text{-}Pw} = 0.622\,\frac{\psi Pws}{P\text{-}\psi Pws}.$$

P : Total pressures of air
Pw : Vapor partial pressure
Pws : Vapor partial pressure of the saturated air
Ps : Saturated steam partial pressure, $Ps \approx\ Pws$

x is solved for t from this diagram, when ψ = is constant. The line connecting the intersection of t and x is called as constant relative humidity line. [Pws (Ps) is obtained from table 2.1.2]

(4) Constant dew point temperature line

Even if the state of air undergoes change and the temperature and enthalpy change, there is no change in the dew point temperature if absolute humidity x remains constant. It can be said that absolute humidity x remaining constant is equivalent to that dew point temperature remains constant therefore.

The constant dew point temperature line can be denoted by the constant absolute humidity line representing absolute humidity x.

(5) Isenthalpic line

Temperature t usually treated in the air conditioning is represented as $\frac{1}{597.3}(h - 0.240t)$.

If h = more constant, x can be obtained from this relation. The line connecting these pints is constant enthalpy line.

(6) Constant wet bulb temperature line

As for the constant enthalpy line, Temperature t usually treated in the air conditioning is represented as

$$x = \frac{1}{597.3 - t'_1}(h'_1 - t'_1 x'_1 - 0.240t)\text{ as well.}$$

t'_1 Given wet bulb temperature
x'_1 Saturated temperature relative to t'_1
h'_1 Saturated enthalpy relative to t'_1

When t'_1 = Constant, the line connecting the intersections of x obtained and t is called as the constant wet bulb temperature line. (The constant wet bulb temperature line does not completely agree to the constant enthalpy line.)

(7) Constant specific volume line

Given the specific volume νm^3 / kg (DA), the relational expression of t and x can be represented as

$$x = \frac{219.54\nu}{273 + t} - 0.622\ .$$

When ν = constant, the line connecting the intersections of *x* obtained from above expression and t is a constant specific volume line. (It can be considered that the constant specific volume line is almost parallel each other.)

(8) Scale of sensible heat factor (ratio)

The sensible heat factor (ratio) = sensible heat / total heat = sensible heat / (sensible heat + latent heat)
Total heat $h = 1.006t + (1.846t + 2501)\ x$ $\{h = 0.240t + (0.441t + 597.3)\ x\}$

can be transformed into $\frac{1.006t}{h} = 1 - (1.846t + 2501)\ \frac{x}{h}$

From h = total heat, $1.006t$ = sensible heat, sensible heat factor (ratio) can be represented as $\frac{1.006t}{h}$.
This scale is called as the scale of the sensible heat factor (ratio). (Right coordinate)

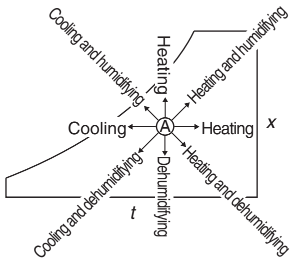
(9) Vapor partial pressure

The right coordinate is scaled by Vapor partial pressure Pw.

Total pressures of wet air : P
Partial pressure of dry air : Pa
Steam partial pressure : Pw
$P = Pa + Pw$

b) Movement on Psychrometric Chart

When air in a certain state A is heated or cooled, how is the movement of air shown on the air diagram? It moves along the direction arrowed with A point in a left diagram.
That is,



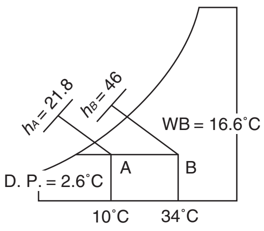
When the air in the state of A point is cooled, A point moves horizontally left.
When the air in the state of A point is heated, A point moves horizontally right.
When the air in the state of A point is cooled with dehumidification, A point moves down along left diagonal direction.
When the air in the state of A point is heated with humidification, A point moves up along right diagonal direction.

c) State change of air on Psychrometric Chart

(1) Heating with no humidification

This case is a process in which moisture remains constant and only the sensible heat is added. That is, A point moves horizontally to the right on the Psychrometric Chart.
[Example] When air at DB10°C, RH60% is heated to DB34°C, RH14%, determine

I wet bulb temperature at that time (WB)
II dew point temperature
III heat required for air of 1 kg



[Solution]

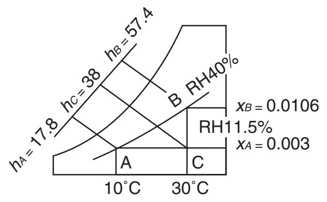
I Air at DB10°C, RH60% is A point on the air diagram as shown. The line that extends horizontally to the right from A point intersects with DB34°C at the intersections B. From the figure, WB=16.6°C
II The line that extends horizontally to the right from A point intersects with saturated air line at D.P. = 2.6°C
III Heat at A point h_A = 21.8kJ / kg (DA)
Heat at B point h_B = 46kJ / kg (DA)
$\therefore \Delta h$ = 46 - 21.8 = 24.2kJ / kg (DA)
is a heat required for heating.

(2) Heating with humidification

[Example] When air at DB10°C, RH40% is heated to DB30°C and humidified so that RH40% is remained, determine in this case

I heat required for air of 1kg

II moisture required for air of 1kg



[Solution]

If no moisture is added, RH decreases during heating process. (In the case of simple heating, RH would decrease to 11.5%). Hence humidifying is needed for keeping RH constant.

Enthalpy at A point h_A = 17.8kJ / kg (DA)

Absolute humidity at A point x_A = 0.003kg / kg (DA)

Enthalpy at B point h_B = 57.4kJ / kg (DA)

Absolute humidity at B point x_B = 0.0106kg / kg (DA)

Then

I Heat required Δq = 57.4 - 17.8 = 39.6kJ / kg (DA)

II Moisture required Δx = 0.0106 - 0.003 = 0.0076kJ / kg (DA)

(Reference) In the heat required 39.6kJ / kg (DA)

Heat required for simple heating from DB10°C to DB30°C: h_C - h_A = 38 - 17.8 = 20.2kJ / kg (DA)

Heat required for humidifying to keep RH40% constant: h_B - h_C = 57.4 - 38 = 19.4kJ / kg (DA)

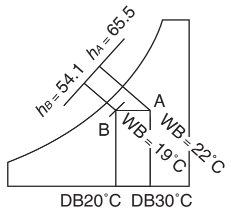
(3) Cooling with constant moisture

Cooling with constant moisture doesn't change the humidity of the moisture included in air and is the process during which absolute humidity doesn't change. That is A point moves horizontally to left.

[Example] When air at DB30°C, WB22°C is cooled to DB20°C, determine

I WB of cooled air heat required for air of 1kg

II Heat removed for air of 1kg



[Solution]

A point moves horizontally to left and intersects with DB20°C at B point.

I At B point, WB = 19°C

II Enthalpy h_A = 65.5kJ / kg (DA)

Enthalpy h_B = 54.1kJ / kg (DA)

$\Delta h = h_A - h_B$ = 65.5 - 54.1 = 11.4kJ / kg (DA)

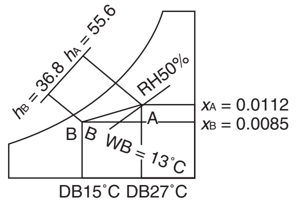
(4) Cooling with dehumidification

Usual air-conditioning is this case that is, cooling with dehumidification

[Example] When air at DB27°C, RH50% is cooled to DB15°C WB13°C, determine

I Heat that should be removed for air of 1kg

II Moisture removed for air of 1kg



[Solution]

The line AB connecting A point (DB27°C, RH50%) and B point (DB15°C, WB13°C) represents this change process.

At A point, enthalpy h_A = 55.6kJ / kg (DA)

Absolute humidity at A point x_A = 0.0112kg/kg(DA')

At B point, enthalpy h_B = 36.8kJ / kg (DA)

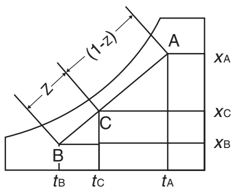
Absolute humidity at B point x_B = 0.0085kg / kg (DA)

I Heat that should be removed $\Delta h = h_A - h_B$ = 55.6 - 36.8 = 18.8kJ / kg (DA)

II Moisture removed $\Delta x = x_A - x_B$ = 0.0112 - 0.0085 = 0.0027kg / kg (DA)

(5) Mixing of airstreams

When two airstreams ((t_A, x_A) and (t_B, x_B)) at two different states (states A and B) are mixed at the ratio of Z and (1-Z), the state of the mixture (t_C, x_C) (state C) is determined as follows:



The state of the mixture will lie on the straight line connecting states A and B on the air diagram, and the ratio of the distances B-C and C-A is equal to the ratio of Z and (1-Z).

By calculation

$t_C = Zt_A + (1 - Z)\, t_B$

$x_C = Zx_A + (1 - Z)\, x_B$

$h_C = Zh_A + (1 - Z)\, h_B$ can be obtained.

[Example] When the outdoor air (DB33°C, RH68%) and indoor air (DB27°C, RH50%) are mixed at the ratio of 20% and 80%, determines the state of the mixture

I dry bulb temperature, II absolute temperature, III enthalpy

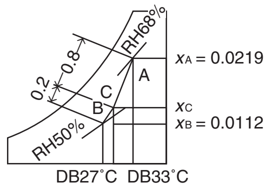
[Solution]

At the state A (DB33°C, RH68%),absolute humidity x_A = 0.0219kg / kg (DA)

Enthalpy h_A = 89.2kJ / kg (DA)

At the state B (DB27°C, RH50%),absolute humidity x_B = 0.0112kg / kg (DA)

Enthalpy h_B = 55.8kJ / ks (DA)



I $t_C = 0.2 \times 33 + 0.8 \times 27 = 28.2$°C

II $x_C = 0.2 \times 0.0219 + 0.8 \times 0.0112 = 0.01334$kg / kg (DA)

III $h_C = 0.2 \times 89.2 + 0.8 \times 55.8 = 62.5$kJ / kg (DA)

If C point would be determined in the ratio of 0.2 and 0.8 using the air diagram as shown in the left figure, t_C and x_C and h_C could be similarly obtained.

d) How to determine discharged air temperature and sensible heat factor (ratio) of air conditioner

Discharge temperature and sensible heat factor (ratio) can be obtained by using the air diagram and the relational expression among capacity of cooling, flow rate of air, enthalpy of inhaled air and enthalpy of air blowing.

Where,

Q	: cooling capacity	kW
G	: flow rate of air	kg / h
h_1	: enthalpy of inhaled air	kJ / kg
h_2	: enthalpy of air blowing	kJ / kg
h_3	: enthalpy of saturated air under surface temperature of evaporator	kJ / kg
BF	: by-pass factor	

$$Q = \frac{G \cdot (h_1 - h_2)}{3600} = \frac{G \cdot (1 - BF) \cdot (h_1 - h_2)}{3600}$$

[Example] Model: FDTA71KXE4

The piping corresponding length: 20m

Difference of height between the indoor unit and outdoor unit: 10m (outdoor unit is low)

Air condition: outdoor temperature DB 35°C and indoor temperature DB 27°C WB 20°C

Running state: 50Hz and flow rate: 15m^3 / min (sudden)

Procedures:

(1) Determine the real cooling capacity. Refer to the capacity characteristic in Cooling / Heating Handbook A / C Chapter.

$Q = [7.1\text{kW} \times \overset{*}{1.03}] \times (\overset{**}{0.982} - \overset{***}{0.02}) \approx 7.03\text{kW}$

* : Capacity correction coefficient by outdoor and indoor temperatures

** : Capacity correction coefficient by equivalent piping length

*** : Capacity correction coefficient by height difference between the indoor unit and outdoor unit

(2) Plot state point P_1 is on the psychrometric chart for inhaled air, then the readout of enthalpy is h_1 = 57.4kJ / kg.

(3) Calculate the enthalpy of the saturated air under the evaporator surface temperature, and plot point P_3 on the saturated line.

$$h_3 = h_1 - \frac{3600 \cdot Q}{G \cdot (1 - BF)} = 57.4 - \frac{3600 \times 7.03}{1039 \times (1 - 0.025)} = 57.4 - 25.0 = 32.4 kJ / kg$$

$$\text{Where, } G = \frac{V}{\nu} = \frac{15m^3 / \min \times 60\min / h}{0.866m^3 / kg} = 1039 \text{ kg} / h$$

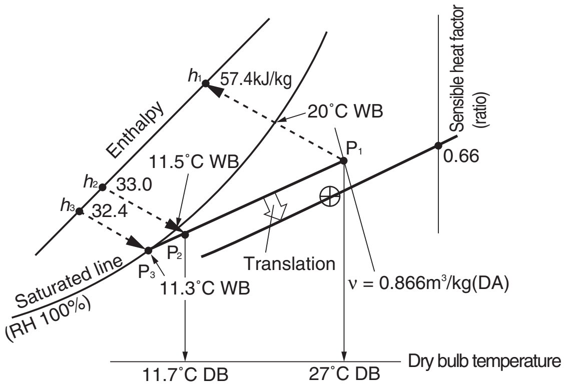
V : flow rate of inhaled air m^3 / h
ν : specific volume of inhaled air m^3 / kg
BF : 0.025 ······ Refer to capacity characteristic in Cooling / Heating Handbook A / C Chapter.

(4) Calculate the enthalpy h_2 of the discharged air.

$$h_2 = h_1 - \frac{3600 \cdot Q}{G} = 57.4 - \frac{3600 \times 7.03}{1039} = 57.4 - 24.4 = 33.0 kJ / kg$$

(5) Determine the temperature of the discharged air.
The point P_2 (h_2 = 33.0kJ / kg) on the straight line connecting states P_1 and P_3, is the state of the air blowing.
The temperatures of air blowing: DB 11.7°C WB 11.5°C.

(6) Determine the sensible heat factor (ratio).
Draw the line that passes through reference point + and is parallel to the straight line of P_1 ~ P_3, and the readout 0.66 on the SHF is the sensible heat factor (ratio).



4. Calculation of Noise Level

The basic calculation of noise level is different depending on the condition of a shape of the source of sound and its surroundings. When a source of s ound is simple source, attenuation (ΔLp) with distance is obtained as follows:
$\Delta Lp = 20\log_{10}\frac{r_2}{r_1}$ (dB) r_1, r_2: Distance from a source of sound

· Calculation of the total noise level
The total dB of the two sound pressures can be calculated using the following table. When there are more than two sound pressures, the total dB can be measured by dividing two pressures into one group.
Calculation of the sum of L_1dB and L_2dB ($L_1 > L_2$)
Sum=L1 + ΔL

Difference between the two dB values $L_1 - L_2$	0	0.2	0.4	0.6	0.8	1.0	1.5	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
dB value ΔL added to the greater one (L_1)	3.0	2.9	2.8	2.7	2.6	2.5	2.3	2.1	1.8	1.5	1.2	1.0	0.8	0.6	0.5	0.4	0.3	0.25	0.2	0.17	0.14	0.11

[Example] 1. Since the sum → difference of 60dB and 60dB is zero, 3dB is added to reach 63db, i.e. when there are two noise sources with the same dB, the noise level increases by 3dB as compared to one noise source.
2. Sum of four

54, 52 ─ 54 + 2.1 = 56.1
39, 46 ─ 46 + 0.8 = 46.8
56.1, 46.8 ─ 56.1 + 0.5 = 56.6dB

4.1 Indoor

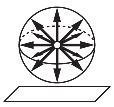
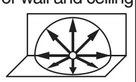
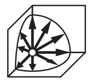
In general, the noise level data for air-conditioner given by maker is noise level dB (A) measured at the height of 1 m of the position front ahead 1 m from air-conditioner in acoustic test room (anechoic room). It is usually denoted by N number NC value.
In general, it is larger than the noise given in catalog if air-conditioner is actually installed it in a building. This is because there exist the reflection sounds from the wall, the ceiling, and the floor.
Therefore, it is necessary to estimate to what extent actual noise level is larger than the catalog value from an indoor situation in the building for installation.
This can be calculated by the following expression.

$$Lp = Lp_0 + 11 + 10\log_{10}\left(\frac{Q}{4\pi r^2} + \frac{4}{R}\right)$$

$$R = \frac{\bar{\alpha} S}{1-\bar{\alpha}}$$

Lp = Indoor sound pressure level space dB
Lp_0 = Catalog value dB (Ahead 1 m in the anechoic room.)
Q = Directional factor (It depends on the directivity and the indoor position of the sound source. Refer to the table below.)
r = Distance from air conditioner space m
$\bar{\alpha}$ = Indoor average acoustic absorptivity
S = The indoor total surface area space m^2

Position of sound source

Position of sound source		Mounted on floor, Wall mounted, ceiling hanging 	Mounted next to floor and wall, or wall and ceiling 	Mounted at a corner 
Directional factor of sound source	Q = 1	Q = 2	Q = 4	Q = 8

When power level Lw is given as a catalog value, it is needed only to calculate $Lp_0 + 11 = Lw$ in the above expression.

Because $\bar{\alpha}$ is different with different frequency, it is preferable that this calculation is done for each octave band. However, for the air-conditioner, if the above-mentioned dB(A), the NC value or the number of N is calculated by using the acoustic absorptivity at about 500Hz, approximate value can be obtained.

Approximate value of average acoustic absorptivity $\bar{\alpha}$ (at about 500Hz)

<table>
<tr><th>Situation of room</th><th>$\bar{\alpha}$</th><th colspan="2">Example</th></tr>
<tr><td>Reverberation chamber</td><td>0.05</td><td colspan="2">Gymnasium, the operating room, the garage, the church, the concrete room</td></tr>
<tr><td>Semi-reverberation chamber</td><td>0.1</td><td colspan="2">Classroom, the museum, and usual office</td></tr>
<tr><td>Usual room</td><td>0.15 ~ 0.2</td><td>House, conference room</td><td rowspan="2">Room using sound absorbing material such as carpet and texes</td></tr>
<tr><td>Semi-anechoic chamber</td><td>0.3</td><td>Department store, hotel</td></tr>
<tr><td>Anechoic chamber</td><td>0.4</td><td colspan="2">Broadcasting studios</td></tr>
</table>

Changes when air-conditioner is actually installed

1. The sound pressure level (Lp) at the center of the room is 4~5dB higher than Catalog value (Ahead 1m in the anechoic room), if the floor is carpet, the ceiling is with the board of absorbing sound, the wall is made of concrete and mortar and plywood, and average acoustic absorptivity is assumed as $\bar{\alpha}$ = 0.3, when the sound is heard at the center of the room of about 15m^2 in which the wall mounted type air conditioner has been installed. (Q = 2, r = 1.7m, S = 58m^2, R = 25m^2)
2. The sound pressure level $\bar{\alpha}$ = 0.15 at the position of 2m from the unit is 6~7dB higher than Catalog value in room whose floor space is of 15m^2, such as a usual office, and the living room and the parlor, etc. of a Japanese-style room, if assuming that (Q = 2, r = 2m, S = 70m^2, R = 12m^2).
   The sound pressure level is 3~4dB higher than Catalog value in room whose floor space is of about 60m^2. (Q = 4, r = 2m, S = 200m^2, R = 35m^2)
3. The sound pressure level is 11~12dB higher than Catalog value if $\bar{\alpha}$ = 0.05 in machine room and a room made of ferroconcrete. (Q = 4, r = 2m, S = 70m^2, R = 3.7m^2).

As above mentioned, it should be noticed that the indoor noise changes with acoustic absorptivity and the size of the room.

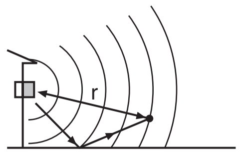
4.2 Outdoor

The outdoor side goes outside when the integrated air conditioner is installed on a wall, and the outdoor unit is put outdoor as for the separate type air conditioner etc.

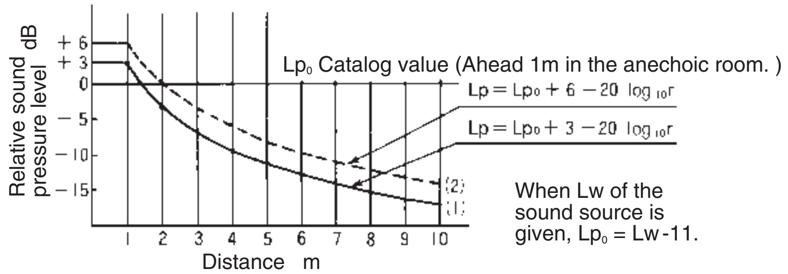
The majority of the machine is installed on ground or the roof near a wall or the wall in the building. The noise on the boundaries or at the point which is concerned is evaluated by the following methods and compared to the standard of Noise Control Law etc.

(1) When mounted on the wall like an integrated air conditioner

Assume that distance from the sound source to the boundary is r m and there is not any obstacle, then the noise level is 3dB lower than the catalog value for r = 2m and 6~9dB lower than the catalog value for r = 4m.



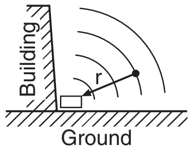
Compared with height from ground on which the unit is installed, it is nearer the curve (1) of figure below at a near point and it is the curve (2) of figure below at a far point.



Attenuation with the distance decreases by 6dB every 2 times of the distance.

(2) When mounted on the wall like a separate type

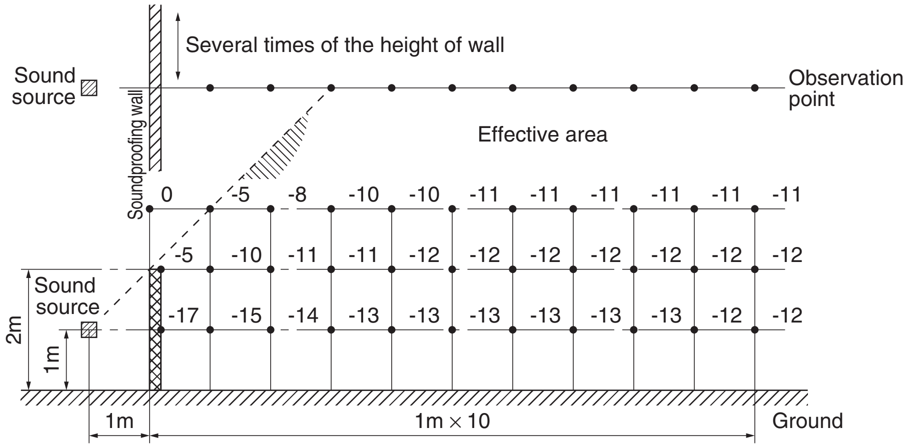
The noise level at a position of 2m is same as the catalog value and falls by 6dB at the position of 4m when installing it on ground.
It is the curve (2) of above figure.



(3) Effect when there is obstacle on the way

(a) General

The noise level cannot be almost reduced even if there are a hedge and trees between air conditioner and the neighboring house.
The illustration example of calculating effect of the noise barrier to reduce noise is shown in figure below.

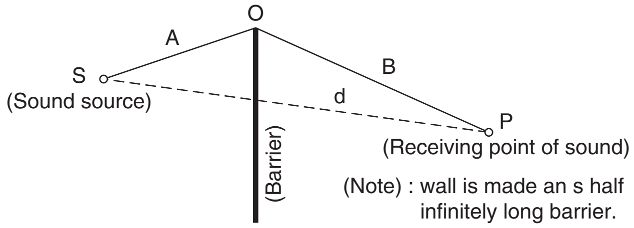


Intensity of sound source with wall (about 500Hz)

Because this value is difference between with the wall and without the wall, attenuation with the distance shown in above-mentioned (1) and (2) is added to it as the total attenuation. Then if installed noise barrier (length of both sides is several times of the height of the wall) is over 1m higher than the sound source, the noise decreases by about 10dB at about 500Hz in the opposite side of the wall. In the region where sound source cannot be seen effect of reducing noise is larger, but in the region where sound source can be seen, noise barrier has almost no effect of noise reduction. Moreover, the attenuation is closely related with the frequency of the sound and is larger for high frequency sound. Because low-frequency sound waves can get across, so there is almost no effect of reducing noise for low-frequency sound .
As shown in above figure, when the height of the wall is 2m the wall has almost no effect for the low frequency sound of 200Hz or less.

Notices when noise barrier is installed

a) Install the noise barrier as near the sound source as possible.
b) The noise barrier should be high enough. It is desirable that the lengths in direction of both sides are several times of the height of the wall.



Soundproofing effect of wall

c) The height difference between the wall and the sound source are enlarged as much as possible. In the region where sound source can be seen, noise barrier has almost no effect of noise reduction.
d) Almost no effect of noise reduction for lower frequency sound.
e) Most materials that have no aperture can be used as a material of the noise barrier. A straight board, the plate glass, and plywood, etc. have been in practical use.

(b) Details for the soundproofing effect with the wall. (Refer to the former page.)

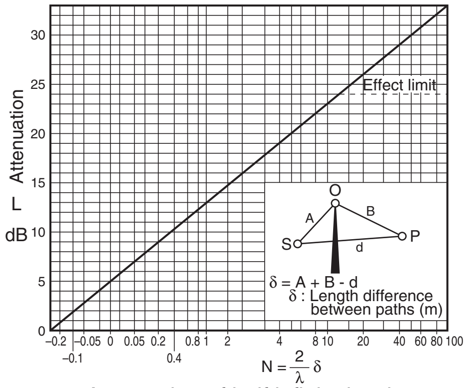
1) The reflection of ground is not taken into account

$$N = \frac{2}{\lambda}\delta = \frac{2}{\lambda}(A + B - d)$$

N : Fresnel Number

λ : Wavelength of sound

Using N in the above expression obtains the attenuation of sound from next figure.



Attenuation of half infinite barrier

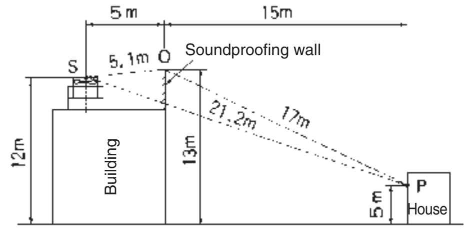
[Example] When the outdoor unit is installed at position S shown in right figure and the soundproofing wall is mounted, how is the noise at P point? Assume that the length of the soundproofing wall is several times of its height in both sides of the sound source, and the influence of the reflection sound in P point from ground is disregarded. Moreover, the noise data at the position of 1m ahead from the unit is shown by ① in the table below.

Firstly, based on sound pressure level ① at a position 1m away from the unit, the noise reduction due to the distance attenuation can be expressed as

$\Delta Lp = 20\log_{10} r_2 / r_1 = 20\log_{10} 21.2$

$\approx 20 \times 1.32 = 26.4dB$

The graph ② is plotted curve in this table below from above result.



An illustration example of noise calculation when installed on rooftop of building

Next, the effect of noise attenuation of the soundproofing wall is obtained. As an example, the sound pressure level for 500Hz is calculated as follows

Length difference between paths $\delta = 5.1 + 17 - 21.2 = 0.9m$

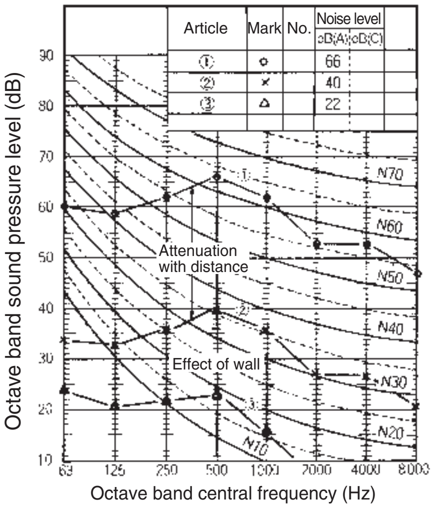
$$\lambda = \frac{C}{f} = \frac{340m/s}{500Hz} = 0.68m$$

$$\therefore N = \frac{2}{\lambda}\cdot\delta = \frac{2}{0.68} \times 0.9 = 2.65$$

Attenuation at N=2.65 is obtained as L ≈ 17dB. The attenuation for each frequency is similarly calculated, and it is subtracted from the graph of ②, then noise level ③ at receiving point P can be obtained.

2) The reflection sound of ground is taken into account

As experiential value, the reflection sound at a position of 5m above ground and on ground is the value obtained in 1) +1dB and + 3dB respectively.

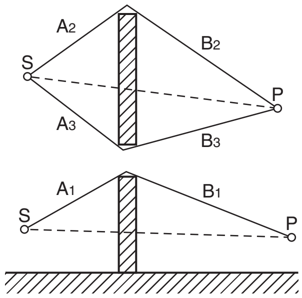


An illustration example of noise calculation

3) For a finite long barrier

Above-mentioned 1) ~ 2) are a calculation method in which the length of the barrier is assumed to be several times its height and the sounds do not get across both sides of the barrier. However, if the barrier is not long enough, the sounds can get across both sides of the barrier as shown in the figure below. So it is necessary to calculate the attenuation of each path for these paths and synthesize them.

For instance, assuming that noise reductions of A_1B_1 path, A_2B_2 path and A_3B_3 path are 10dB, 10dB and 6dB respectively, then as an application of "Synthesis of two sound pressure levels" in page 79, firstly making the synthesis of A_1B_1 and A_2B_2, next it and A_3B_3, the final synthesized result is 3.5dB. This is noise reduction obtained.



When sound getting across

MEMO

Part 2
Product Specifications

1. Description of KX4 Series

1.1 Outdoor Units / List of Indoor Units

List of outdoor units

■ Integral type

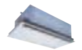
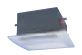
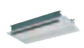
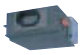
	140 Type <5 Horsepower> (12500kcal/h Equivalent value)	224 Type <8 Horsepower> (22400kcal/h Equivalent value)	280 Type <10 Horsepower> (25000kcal/h Equivalent value)	335 Type <12 Horsepower> (30000kcal/h Equivalent value)	335 Type <12 Horsepower> (30000kcal/h Equivalent value)	400 Type <14 Horsepower> (35500kcal/h Equivalent value)	450 Type <16 Horsepower> (40000kcal/h Equivalent value)	504 Type <18 Horsepower> (47000kcal/h Equivalent value)	560 Type <20 Horsepower> (50000kcal/h Equivalent value)	615 Type <22 Horsepower> (55000kcal/h Equivalent value)	680 Type <24 Horsepower> (60500kcal/h Equivalent value)
	FDCA140 HKXEN4										
		FDCA224 HKXE4	FDCA280 HKXE4	FDCA335 HKXE4	FDCA335 HKXE4-K (For combina-tional type)	FDCA400 HKXE4	FDCA450 HKXE4				
								FDCA504 HKXE4	FDCA560 HKXE4	FDCA615 HKXE4	FDCA680 HKXE4

■ Combinational type

	Capacity	26 Horsepower	28 Horsepower	30 Horsepower	32 Horsepower	34 Horsepower
	Combinational model	FDCA335 HKXE4-K	FDCA400 HKXE4	FDCA400 HKXE4	FDCA450 HKXE4	
		FDCA400 HKXE4	FDCA400 HKXE4	FDCA450 HKXE4	FDCA450 HKXE4	
	Model	FDCA735 HKXE4	FDCA800 HKXE4	FDCA850 HKXE4	FDCA900 HKXE4	
	Combinational model					FDCA450 HKXE4
						FDCA504 HKXE4
	Model					FDCA960 HKXE4

	Capacity	36 Horsepower	38 Horsepower	40 Horsepower	42 Horsepower	44 Horsepower	46 Horsepower	48 Horsepower
	Combinational model	FDCA504 HKXE4	FDCA504 HKXE4	FDCA560 HKXE4	FDCA560 HKXE4	FDCA615 HKXE4	FDCA615 HKXE4	FDCA680 HKXE4
		FDCA504 HKXE4	FDCA560 HKXE4	FDCA560 HKXE4	FDCA615 HKXE4	FDCA615 HKXE4	FDCA680 HKXE4	FDCA680 HKXE4
	Model	FDCA1010 HKXE4	FDCA1065 HKXE4	FDCA1130 HKXE4	FDCA1180 HKXE4	FDCA1235 HKXE4	FDCA1300 HKXE4	FDCA1360 HKXE4

List of indoor units

Model / Capacity		22 Type <0.8 Horsepower> (2000kcal/h Equivalent value)	28 Type <1 Horsepower> (2500kcal / h Equivalent value)	36 Type <1.25 Horsepower> (3200kcal / h Equivalent value)	45 Type <1.6 Horsepower> (4000kcal / h Equivalent value)	56 Type < 2 Horsepower> (5000kcal / h Equivalent value)	71 Type < 2.5 Horsepower > (6300kcal / h Equivalent value)	90 Type < 3.2 Horsepower> (8000kcal / h Equivalent value)	112 Type <4 Horsepower> (10000kcal / h Equivalent value)	140 Type <5 Horsepower> (12500kcal / h Equivalent value)	224 Type <8 Horsepower> (20000kcal / h Equivalent value)	280 Type <10 Horsepower> (25000kcal / h Equivalent value)
FDTA 	Four directional air blowing ceiling filling type		28KXE4A	36KXE4A	45KXE4A	56KXE4A	71KXE4A	90KXE4A	112KXE4A	140KXE4A		
FDTCA 	Ceiling recessed compact type	22KXE4A	28KXE4A	36KXE4A	45KXE4A	56KXE4A						
FDTWA 	Two directional air blowing ceiling filling type		28KXE4A		45KXE4A	56KXE4A	71KXE4A	90KXE4A	112KXE4A	140KXE4A		
FDTQA 	One directional air blowing ceiling filling type compact	22KXE4A	22KXE4A	36KXE4A								
FDTSA 	One directional air blowing ceiling filling type				45KXE4A		71KXE4A					
FDRA 	Ceiling filling Caseteria type				45KXE4A	56KXE4A	71KXE4A	90KXE4A	112KXE4A	140KXE4A		
FDQMA 	Low static pressure duct type compact	22KXE4A	28KXE4A	36KXE4A								
FDUA 	High static pressure duct type										224KXE4A	280KXE4A
FDUMA 	Middle static pressure duct type				45KXE4A	56KXE4A	71KXE4A	90KXE4A	112KXE4A	140KXE4A		
FDURA 	Amphibious type FDURA suitable for both ceiling filling Caseteria type and duct type				45KXE4Q	56KXE4Q	71KXE4Q	90KXE4Q	112KXE4Q	140KXE4Q		
FDEA 	Ceiling hanging type			36KXE4A	45KXE4A	56KXE4A	71KXE4A		112KXE4A	140KXE4A		
FDKA 	Wall mounted type	22KXE4A	28KXE4A	36KXE4A	45KXE4A	56KXE4A	71KXE4A					
FDFLA 	Floor standing exposed type		28KXE4A		45KXE4A		71KXE4A					
FDFUA 	Floor standing hidden type		28KXE4A		45KXE4A	56KXE4A	71KXE4A					
SAF 	Total heat exchanger unit	250E4, 350E4, 500E4, 800E4, 1000E4 5 types										

1.2 Model Description

1.2.1 Outdoor unit

FDC A 280 H KX E4

- E4 — Power 3φ, 380V, 50Hz
- KX — Multi-series
- H — Heat pump type
- 280 — Capacity

140 : 5HP	784 : 28HP
224 : 8HP	840 : 30HP
280 : 10HP	896 : 32HP
448 : 16HP	952 : 34HP
500 : 18HP	1008 : 36HP
560 : 20HP	1064 : 38HP
672 : 24HP	1120 : 40HP
728 : 26HP	

- A — Refrigerant
  A : R410A
- FDC — FDC : Outdoor unit

1.2.2 Indoor unit

FDT A 28 KX E4 A

- A — Series No.
- E4 — Power 1φ 220V, 50Hz
- KX — Multi-series
- 28 — Capacity

22 : 0.8HP	71 : 2.5HP
28 : 1HP	90 : 3.2HP
36 : 1.25HP	112 : 4HP
45 : 1.6HP	140 : 5HP
56 : 2.2HP	224 : 8HP
	280 : 10HP

- A — A : R410A
- FDT — Kinds of Indoor unit

FDTA	: Four directional air blowing ceiling filling type
FDTCA	: 4-way outlet ceiling recessed compact type
FDTWA	: Two directional air blowing ceiling filling type
FDTQA	: One directional air blowing ceiling filling type compact
FDTSA	: One directional air blowing ceiling filling type
FDRA	: Ceiling filling Caseteria type
FDQMA	: Low static pressure duct type compact
FDUA	: High static pressure duct type
FDUMA	: Middle static pressure duct type
FDURA	: Amphibious type for both ceiling filling Caseteria type and duct type
FDEA	: Ceiling hanging type
FDKA	: Wall mounted type
FDFLA	: Floor standing exposed type
FDFUA	: Floor standing hidden type

1.3 Feature of Outdoor Unit

1.3.1 FDCA140HKXEN4 (5HP)

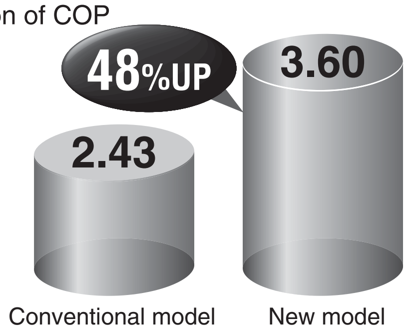
(1) Adopting new refrigerant R410A

New refrigerant R410A whose ozone destruction factor is 0 is adopted. Because R410A is pseudo-azeotropic refrigerant and the change of its compositions of the liquid and gas phases is little, the refrigerant can be added in the locale.

(2) Energy saving

Because multi-units series with sidewise blowing adopted highly efficient compressor equipped with the DC motor and the DC inverter, its COP achieved a great improvement of 48% from 2.43 to 3.60 compared with the conventional model. (Comparison of 5 horsepower)

Comparison of COP



(3) Compact

The volume of the frame is decreased by 22% through completely changing the design, and changing the dischargedirection of the fan from oblique blowing to sidewise blowing. Especially, its depth size becomes 370mm from 600mm of the conventional model and greatly thin unit is achieved. It is possible to set it up easily even in narrow space such as verandas in the apartment house.

Considerable reduction in weight

Its weight decreased from 150kg to 125kg compared with the conventional model, and made the load treatment and the transportation when installing easy together with the reduction of the size.

Volume $0.600m^3$ → $0.467m^3$

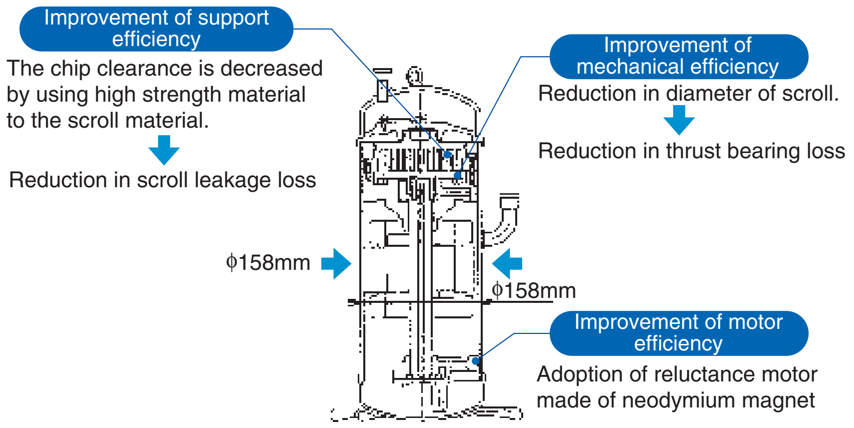
Weight 150kg → 125kg

(4) High efficiency

The leakage loss and the thrust bearing loss are decreased through the optimal design of the scroll, and the support efficiency and the mechanical efficiency have been improved.

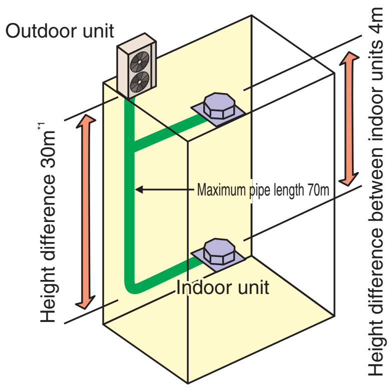
Moreover, the neodymium magnet is buried in the core of the motor rotator, and efficiency is improved up to the low-speed region with the compound effect of Fleming force + reluctance torque. In addition, the loss in an inverter was suppressed to the minimum by adopting high efficient IPM * and the high voltage drive of motor.

* IPM : Intelligent Power Module



(5) Completely Chargeless system

Sidewise blowing type Multi achieves Completely Chargeless system that needs no refrigerant charge when constructing. It can greatly reduce the refrigerant cost and construction cost when charging and can prevent from the trouble resulting from excessive shortage of the refrigerant amount, and high reliability has been achieved.



Restriction to refrigerant pipe	
Total extension length	less than 100m
Actual length	less than 70m
Total extension length	less than 50m
Height difference between units	
Between indoor unit and outdoor unit (outdoor unit is above)	less than 30m
Between indoor unit and outdoor unit (outdoor unit is below)	less than 15m
Between indoor units	less than 4m

*1 The height difference should be made less than 15m when the installation position of outdoor unit is lower than that of the indoor unit.

(6) Super-link system

- The indoor unit and the outdoor unit use 2 lines type signal wire with no polarity according to the automatic polarity selection.
- Moreover, up to 48 air-conditioners can be controlled with a pair of signal wire. The high-speed transfer method is similar to the computer network system. (48 air-conditioners can be started in a few seconds by the measurement operation mode and the operation beginning.)
- The power supplies of the indoor unit and the outdoor unit are independent, and can connect with metallic wire of the indoor unit and the outdoor unit with a pair of signal wire only. (Arbitrary units OK). Installation work is simplified, and the wiring cost and the possibility of the mis-wiring have been decreased.

(7) Improvement of service

(a) The trouble of the indoor unit and the outdoor unit is displayed on the liquid crystal display of remote controller.
The trouble of the indoor unit and the outdoor unit can be checked with remote controller.

(b) It is easy to check the lamp of the outdoor unit.
The check on the lamp need not to remove the panel, and can make locating fault easy.

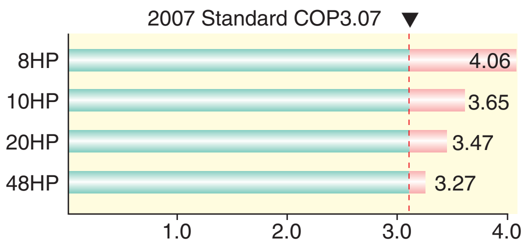
(c) The operation measurement (including selection of heating or cooling) can be done with the outdoor unit.

1.3.2 FDCA224HKXE4 ~ FDCA1360HKXE4 (8HP ~)

(1) High COP of the industry-leading class is achieved.

To save power and improve performance, the DC inverter control technique of the compressor, DC fan motor and heat exchanger with four surfaces are applied in air conditioner. As a result, COP4.06 of the industry-leading class was achieved in average of cooling and heating for 22.4kW type (corresponded 8 horsepower). Moreover COP3.65 is achieved as well for 28.0kW (corresponded 10 horsepower). Both have greatly cleared standards COP3.07 in 2007 Japanese Law Concerning Rational Use of Energy, and high COP of the top level in the industry has been achieved.

■ COP in average of cooling and heating



(2) Heating is available up to -23°C outdoor temperature

The range of use under the low outdoor temperature has been expanded. Heating can be used at ease up to -23°C.

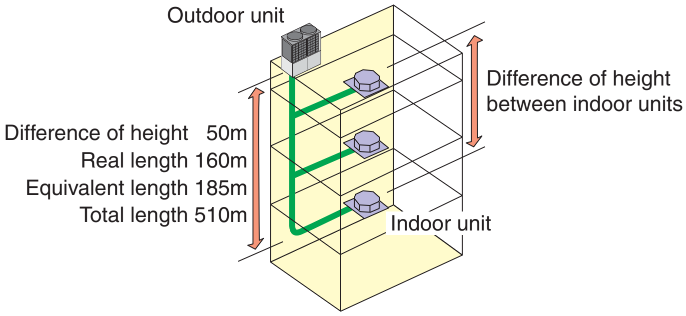
(3) Adopting new refrigerant R410A.

Because new refrigerant R410A of ozone destruction factor 0 is adopted, it contributes to the reduction of the CO_2 exhaust. Because R410A is pseudo-azeotropic refrigerant and the change of its compositions and temperature slip of the liquid and gas phases is little, so the refrigerant can be in the locale added.

(4) Long piping of industry leading

Real length of 160m and total extension *510m of industry leading were achieved by refrigerant saving resulted from miniature refrigerant pipe. In addition, it is possible to develop the system with high degree of freedom.

*For units from 22.4kW (8 horsepower) to 136.0kW (48 horsepower). 100m for 14.6kW (5 horsepower corresponding).



(5) Preeminent compact design

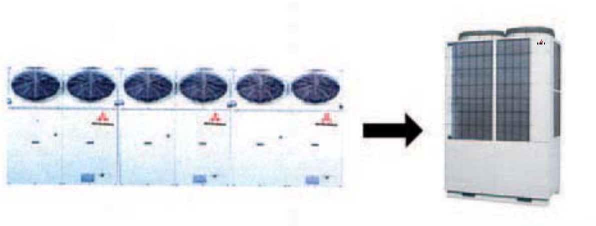
A preeminent compact was achieved by making units up to 24 horsepower be integrated. Space can be used effectively by reducing the restriction to the installation space to the utmost limit. It contributes to the improvement of additional values of the promotion of outdoor greening and the diversion to other installation space etc. Moreover, equipment change can be easily made without being influenced from the installation of other equipment even when the model of the outdoor unit is changed, because the installation space is same for unit up to 24 horsepower.

8 ~ 16 Horsepower 18 ~ 24 Horsepower

■ Installation space ■ Installation space

720 mm | 0.972m² | 1350mm → 720 mm | 0.972m² | 1350mm

Compactness of industry-leading



Conventional model of 24 horsepower KX4 series

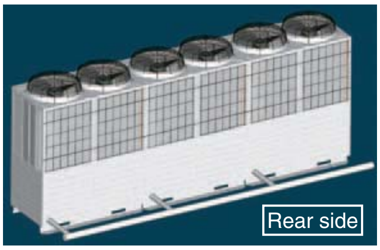
600 mm | 2.43m² | 4050mm 720 mm | 0.972m² | 1.458m² Space saving | 1350mm

The lineup includes models ranging from 5 to 48 horsepower so that it is possible to design the air-conditioning system corresponding to all the air-conditioning needs. Air-conditioning system ranging from 26 to 48 horsepower can be achieved only by combining two outdoor units of 12 to 24 horsepower. Compactness can be achieved even for air-conditioning system with large capacity, and constructing is made easy also.

Horsepower	5	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48
Combination	← Integral type →										12+14	14+14	14+16	16+16	16+18	18+18	18+20	20+20	20+22	22+22	22+24	24+24
Space required for installation of conventional model	0.414	0.81	0.81	-	-	1.62	1.62	1.62	-	2.43	2.43	2.43	2.43	3.24	3.24	3.24	3.24	3.24	-	-	-	-
Space required for installation of KX4	0.36	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	0.972	1.944	1.944	1.944	1.944	1.944	1.944	1.944	1.944	1.944	1.944	1.944	1.944
Area ratio compared with conventional model	87.0%	120.0%	120.0%	-	-	60.0%	60.0%	60.0%	-	40.0%	80.0%	80.0%	80.0%	60.0%	60.0%	60.0%	60.0%	60.0%	-	-	-	-

(6) Improvement of installation

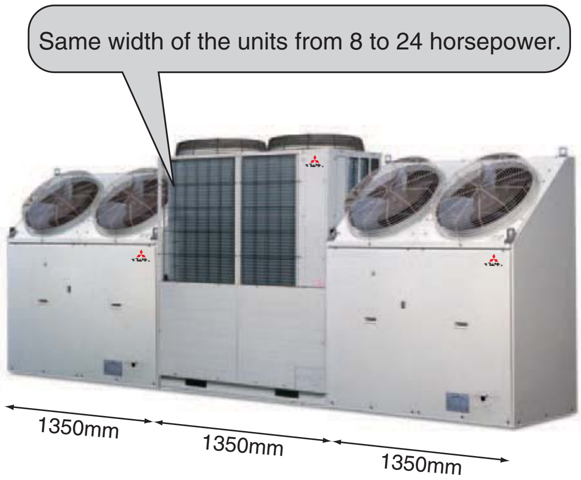
Because there was no distinction like the conventional model between master and sub units, the restriction to the order of carrying and the installation was lost, and the installation was improved. Moreover, conventional centralized power BOX became unnecessary, and wiring work was simplified. A continuous installation was improved by expanding the space of the pulling out pipe.



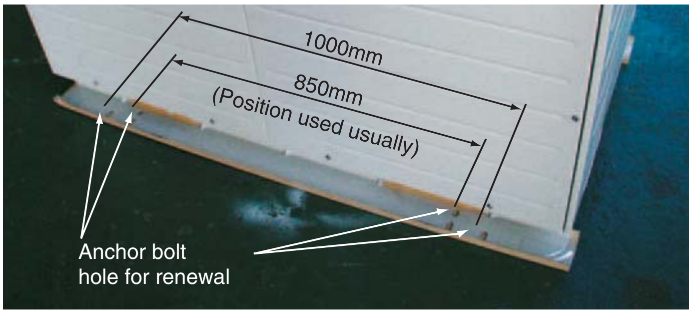
(7) Renewal improvement

The complete woodless was achieved by abolishing a conventional wooden trestle, and integrating with the unit base. The forklift can do the transit without the palette. Moreover, belt and a general elevator can transit and carry it.

It is possible to construct without worrying about installation space when the load such as increasing capacity etc. increases because unit ranging from 12 to 24 horsepower can set up in the installation space for conventional unit ranging from 8 to 10 horsepower.

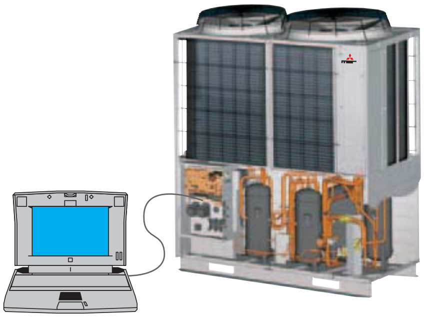


Taking account into renewal, the width of the unit has been continued for 13 years since 1st generation KX series. The main body base part was equipped with anchor bolt hole for of the conventional model. It is possible to update it to a new series easily without changing the base.

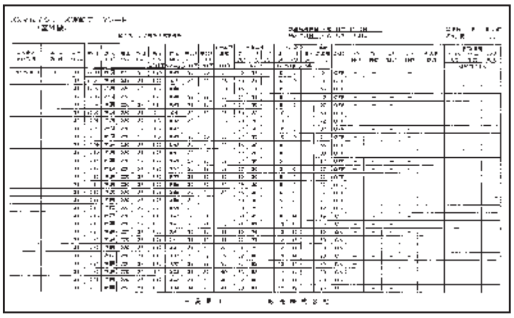


(8) Improvement of service

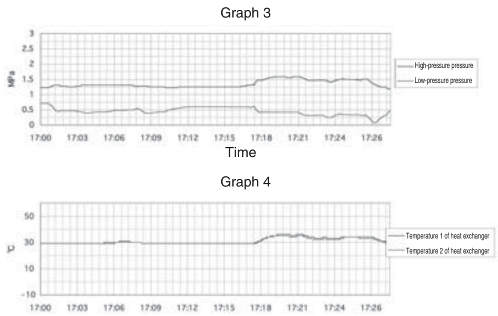
A personal computer can be connected to the printed circuit board and the operating status can be confirmed with the personal computer in the locale. The PCB is equipped with the memory function of the operating data when abnormality happening and the test run data. This function facilitates to speedup of the trouble measures and to simplify generation of the test run report by the operating data read into the personal computer.



1. Acquisition of test run data
→ Automatic generation of test run report



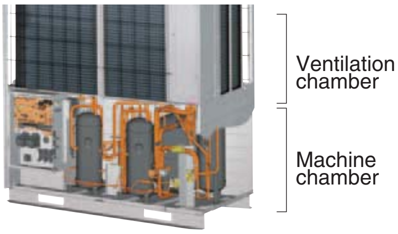
2.Operating data memory when serving
→ Operating data memory when abnormality happening



The operating data before the trouble happens is memorized automatically for about 30 minutes. As a result, it is possible to lead to a prompt cause investigation and the trouble measures even an emergency trouble happens.

Even when some compressors break down by any chance, the emergent operating with the residual compressors is automatically done.
The display items of the high and low pressure etc. were added to "7 Segment display" that displayed digitally various operating data on the board of the outdoor unit. It has become possible to do the confirmation of the operating status without using any meter etc. Moreover, the refrigerant collection can be done in short time, because it is equipped with switch for the pump down.

Because the heat-exchanging chamber is separated from the machine chamber and air sucking into heat exchanger cannot be bypassed from the machine chamber, service with the panel removed became possible.



1.4 Feature of the Indoor Unit

1.4.1 Four directional air blowing ceiling filling type FDTA

(1) New design decreasing ceiling dirt
Cause of the ceiling dirt is because the blowing air contacts with the ceiling, which causes mildew and dust in air to adhere to the ceiling. In the new panel, the panel design and the louver shape, and the swing angle etc. of the outlet are improved, and blowing method without making air contact with the ceiling is adopted.

(2) Corner cover structure to construct easily
Detachable check holes were installed at four corners of the panel. As a result, even if the panel was not removed, hanging height of the main body can be adjusted. The construction time is shortened, and the simplification of installed work has been achieved.

(3) Strong ventilation of wide and high tap
A comfortable airflow can be also carried to one's feet by a strong blowing of an ultra-high tap by switching the dip switch on the indoor unit board even ceiling is 3.5m high. Stable wide ventilation to indoor every corner was achieved. It is especially suitable for the office and the store, etc. where the ceiling is high.

The input of indoor fan is reduced by 20%
The pressure loss of the indoor unit caused by ventilation has been decreased by about 20% compared with the conventional mode by the design improvement such as the enlarging outlet flow circuit. The load of fan motor is decreased, and high efficiency has been improved. Moreover, the heat conductivity of refrigerant side is improved through reinforcing the heat exchanger of the indoor unit and adopting an efficient tube of heat exchanger, and high efficiency of about 30% has been achieved compared with the conventional model.

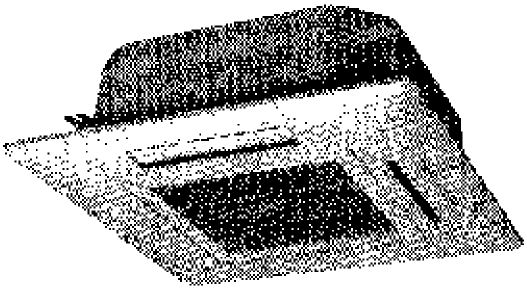
(4) Sterilization enzyme filter (option)
The microorganism such as bacilli that adhere to the filter proliferates by the nourishment source contained in dust, and there is a possibility of causing collateral contamination inside the air conditioner. Then, "Sterilization enzyme filter" has emerged as the times require.
Cell wall of bacterium and fungal mycelia are destroyed (dissolved) by the power of the enzyme, and the inside of the air conditioner is kept clean. Moreover, there is no little influence on the human body at all because it uses a natural enzyme and a safe, comfortable, clean air-conditioning has been achieved.

(5) Equipped with high head type drain pump normally
It is close to indoor unit, and the drain up of 700mm is possible from the ceiling side. A free, wide piping layout can be done according to installation features.

(6) The cutting work of eaves is reduced
The main body is of square (width 840mm × depth 840mm) size that can be installed in the pitches of eaves for all models and the cutting work on the ceiling and the eaves has been reduced.

Installation adjustment at panel rotation of 30mm
The installation of the panel and the work of the wiring connection of ceiling filling type FDTA series have been greatly improved. Because its panel can be rotated up to 30mm at the corner, fine-tuning of the panel can be done finally.

1.4.2 Four-way outlet ceiling recessed compact type FDTCA



(1) The industry's lowest 248mm height
(2) To be marketed on a substantial scale in the spring of 2005
(3) Compatible with KX4 series

1.4.3 Two directional air blowing ceiling filling type FDTWA

28 ~ 56 type

71 ~ 140 type

(1) Epoch-making thin unit of 285mm
The height of the main body has been greatly decreased from a conventional 380mm to 285mm(28 ~ 56 type). In the narrow place such bosom of ceiling, it was impossible to install air-conditioner up to now, and now it is possible to install this type. Moreover, the thin panel protrudes only 8mm from the ceiling for all models.

(2) Low noise of industry-leading class
The blowing pressure distribution of the unit was made uniform by adopting the round shape heat exchanger and the turbofan. Noise reduction of the industry-leading class and the improvement of tone quality are aimed at, and the driving noise of the indoor unit has been decreased. It is especially suitable for the conference room in the office etc.

(3) Equipped with the high head type drain pump normally
It is close to indoor unit, and the drain up of 750mm is possible from the ceiling side.
Therefore, the freedom of the piping layout has been expanded.

(4) The use of a drain natural outlet is also possible
Natural drain directly from the drain bread is possible.
Connection of branch duct possible
To make fresh air enter in indoor, it can also be connected with branch duct. A fresh indoor environment can be maintained.

(5) Easy maintenance
Doing the maintenance of the control box needs only removing the suction panel. This is easy.

1.4.4 One directional air blowing ceiling filling type compact FDTQA

■ Panel for straight blowing

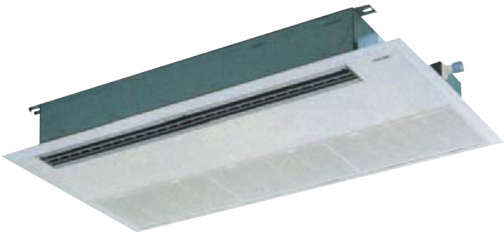
■ Panel for duct

(1) Best for a small-scale space
It is a super-compact type unit that can correspond to various situations from a small room such as the private room in the hospital, offices and hotels to the partitioned office.

(2) 34dB under operating weakly
The low noise value of only 34dB was achieved by driving. It is suitable for the use of a small-scale space by the driving sound at the air conditioner level.

(3) Equipped with the high head type drain pump normally
It is close to indoor unit, and the drain up of 600mm is possible from the ceiling side.
It is suitable for the situation when the inclination cannot be taken due to the beam in the building etc., and the freedom of the piping layout has been expanded.

1.4.5 One directional air blowing ceiling filling type FDTSA



(1) Flexibly corresponding to installation requirements
The installing method can be chosen between the ceiling filling specification and the ceiling hanging specification for FDTSA series. The comfort is expanded indoor everywhere without dead angle due to strong wind blowing downward.

(2) Super-thin unit of 194mm
The height of the indoor unit is a super-thin shape design of the industry-leading class by 194mm. If the dimension of ceiling bosom can be secured by 200mm, it can be tidily installed in the ceiling, and the installation work can be done smoothly.

(3) Refreshing by auto-swing louver
Air blowing louver can swing from the horizontal to 65 degrees downward automatically. The louver angle can be adjusted within four stages by the remote control operation. Moreover, a horizontal set mechanism that prevents unpleasant cold wind from direct blowing has been equipped normally.

(4) Equipped with the high head type drain pump normally
It is close to indoor unit, and the drain up of 600mm is possible from the ceiling side.
It is suitable for the situation when the inclination cannot be taken due to the beam in the building etc., and the freedom of the piping layout has been expanded.

1.4.6 Ceiling filling cassetteria type FDRA

(1) Two specifications corresponding to installation requirements
The canvas duct specification and the silent type specification are set to the FDRA series as installation methods adapting to the ceiling bosom dimension. If quieter air-conditioning sound is thought much of, the installation method with the ceiling return can be also selected. (The check hole is arranged locally.)

(2) Be able to correspond to irregular space even
A flexible air-conditioning layout is possible with the use of a flexible duct even in an irregular space of L and notch shape. The air-blowing outlet is separated from the indoor unit, and the best effect of air-conditioning is achieved.

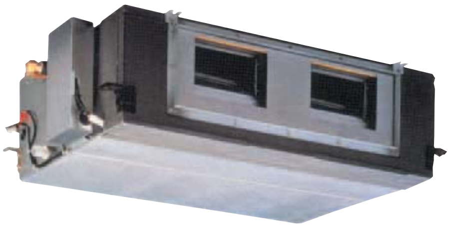
(3) High external static pressure of 85Pa or less
It corresponds to long duct of 20m or less in the one spot because it is a high external static pressure type that is 45Pa normally and secure 85Pa or less when switching at high-speed tap. The degree of freedom of the air-conditioning design has been expanded.
Equipped with the high head type drain pump normally
It is close to indoor unit, and the drain up of 650mm is possible from the ceiling side, because it has been equipped normally with the high head type drain pump of built-in type.

1.4.7 Low static pressure duct type compact FDQMA

(1) Best for a small-scale space
It is a super-compact type unit that can correspond to various situations from a small room such as the private room in the hospital, offices and hotels to the partitioned office.

(2) Equipped with the high head type drain pump normally
It is close to indoor unit, and the drain up of 600mm is possible from the ceiling side.
It is suitable for the situation when the inclination cannot be taken due to the beam in the building etc., and the freedom of the piping layout has been expanded.

1.4.8 High static pressure duct type FDUA

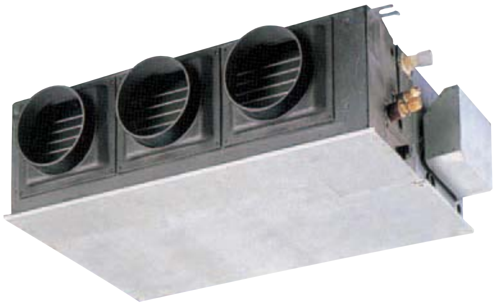


(1) External static pressure of MAX200Pa
The air-conditioning design over a wide-range space is supported with a real model of the duct type air-conditioner. The external static pressure can continuously be adjusted through fan controller governor. The air resistance in the duct was considered, and a fine fan speed adjustment can be done in the locale, and comfortable air-conditioning with the optimal air flow rate has been achieved.

(2) Space making of interior valuing
Because high static pressure duct type is veriest duct type in all models installed in ceiling, it is optimal for article whose interior is thought much of. It is the indoor unit that supports the space making of interior valuing. Moreover, because various options are prepared, a comfortable air-conditioning environment making is achieved at a high level.

(3) Super-thin type units of 360mm for all models
Even when the more than one unit with different capacity is set up, construction is easy because the height of the indoor units is unified to 360mm for all models. It is a series tidily installed in the same ceiling.

1.4.9 Middle static pressure duct type FDUMA



(1) It flexibly corresponds to installation requirements
Using flexible duct as the blowing duct makes the installation work be done considerably and smoothly. The construction time in middle and a small-scale space is shortened, and the labor saving is achieved. Moreover, the installation with the ceiling return way is also possible.

(2) Quiet of 35dB even at the rapidly driving (71 type)
A quiet driving of 35dB was achieved at rapidly driving for 71 type by the adoption of the large-scale silent storm fan. The feeling to air-conditioning is comparable with a high static pressure duct type.

(3) Thin type unit of 299mm
It is a thin type design to achieve a tidy and beautiful installation in the place where the ceiling bosom is narrow. The heights of the indoor unit are 350mm for 45 ~ 90 type, and the heights of the indoor unit are 299mm for 112 type and 140 type. Moreover, the middle static pressure duct type is a design for easy maintenance to which undersurface service with an easy maintenance and check is needed only and can be done.

(4) Comfortable space making with various options
Various options including improving cleanness are prepared such as the suction grill with the canvas ducts, blowing units and high performance filters of colorimetric method 65% and 90% that clears the "Building Management Law".

(5) Equipped with the high head type drain pump normally
It is close to indoor unit, and the drain up of 600mm is possible from the ceiling side, because it has been equipped normally with the high head type drain pump of built-in type.

(6) Light type that improves construction
The easiness of carrying and construction is one of its features because it has been light and only 40kg for 71 type. It can be said that it is a light type devoted to the labor saving construction.

1.4.10 Convertible type FDURA suitable for both ceiling filling caseteria type and duct type

(1) External static pressure of MAX130Pa
The air-conditioning design over a wide-range space is supported with a real model of the duct type air-conditioner. The external static pressure can continuously be adjusted through fan controller governor. The air resistance in the duct was considered, and a fine fan speed adjustment can be done in the locale, and comfortable air-conditioning with the optimal air flow rate has been achieved.

(2) Space making of interior valuing
Because high static pressure duct type is veriest duct type in all models installed in ceiling, it is optimal for article whose interior is thought much of. It is the indoor unit that supports the space making of interior valuing. Moreover, because various options are prepared, a comfortable air-conditioning environment making is achieved at a high level.

(3) Quiet driving sound of 43dB for 140 type (Driving rapidly)
The driving noise is greatly decreased by using more than one high performance fan and thorough soundproofing processing, and the silence of the industry-leading class is achieved. (40dB for 45 type, 41dB for 56 / 71 type, 42dB for 90 type and 42dB for 112 type.)

1.4.11 Ceiling hanging type FDEA

(1) Restyling to stylish design
Super-thin design of 210mm (36 ~ 71 type)

(2) Noise reduction of 5dB or less compared with conventional model
Noise reduction of 5dB has been achieved by adopting a large diameter and width sirocco fan compared with the conventional model. More silent and comfortable air-conditioning environment can be made.

(3) Possible with built-in the high head type drain pump (option)
The drain up of 500mm ceiling side is possible without damaging externals, because the drain pump set (option) can be built in the main body.

1.4.12 Wall mounted type FDKA

22 ~ 56 type

71 type

(1) Small and compact design (22 ~ 56 type)
In addition to the light panel design, with the reductions of the number of parts, considerable down of mass was achieved compared with conventional model. a light, compact design at the air conditioner level.

(2) Easy maintenance with a simple, clean function (22 ~ 56 type)
"Simple, clean function" in which a front panel was able to be detached easily was adopted in 22 ~ 56 type. As a result, it is possible to clean easily interior of the air conditioner, and maintenance has been improved.

(3) Aero trap louver of comfortable ventilation (71 type)

1.4.13 Floor standing exposed type FDFLA / floor standing hidden type FDFUA

Floor standing type indoor unit harmoniously integrated with the indoor space

These units adopt a compact design with a height of 630mm and the comfort is enhanced due to the wide-angle air supply.

FDFLA

FDFUA

- 630mm-high floor standing type FDFL.
- The air supply angle can be adjusted from vertically upward to 60 degrees forward, enhancing the air-conditioning comfort.
- The pipes can be connected to the bottom or back of the air-conditioner, facilitating easy installation and construction.

1.4.14 Total heat exchanger unit SAF

(1) Thin shape type to raise heat exchanger effectiveness
With a newly developed total heat exchanger and filters, high quality of air conditioning environment can be provided and energy can be saved.
It is thin and a compact airframe. Either the ceiling filling type or the ceiling hanging type can be selected according to the air-conditioning needs.

(2) air flow rate ranging from 250 to 1000m^3/h and various models
It is a super-thin design that can be installed even in narrow back side of the ceiling. The air flow rate is from 250 to 1000m^3/h and three kinds of settings are possible. The models are various, and the most ideal model can be chosen according to the customer's demand to design of the air-conditioning.
It became easier to install because it had adopted the straight exhaust way.
Driving noise is considerably reduced through the new air processing such as high static pressure and large air flow rate. Low noise was achieved, and it came to be able to satisfy silent and comfortable air-conditioning environment needs.

2. Outdoor Unit

2.1 Specifications

Item		Models	FDCA140HKXEN4	FDCA224HKXE4	FDCA280HKXE4
Horsepower		HP	5	8	10
Power source			1 Phase 220V 50Hz	3 Phase 380V/415V 50Hz	
Nominal cooling capacity*1		kW	15.2	23.3	29.1
Nominal cooling capacity*2		kW	14.6	22.4	28
Nominal heating capacity*3		kW	16.6	25.0	31.5
Noise level		dB(A)	53	57	58
Exterior dimensions (Height × Width × Depth)		mm	1300 × 970 × 370	1690 × 1350 × 720	
Net weight		kg	125	240	240
Refrigerant equipment	Compressor type & Q' ty		GT-C5139ND62 × 1	GT-C5150ND71 × 1	GT-C5150ND71 × 1
	Motor & Q'ty	kW	3.0 (4 Pole) × 1	5.6	7.0
	Starting method		Direct start		
	Capacity control	%	31 ~108	28 ~123	20 ~115
	Crankcase heater	W	33 × 1	33 × 2	
	Heat exchanger		Louver fins & inner grooved tubing		
	Refrigerant control		Electronic expansion valve		
	Refrigerant		R410A		
	Quantity*4	kg	8.5	11.5	
	Refrigerant oil	L	1.6 (M-MA32R)	1.75 (M-MA32R)	
	Defrost control		MC controlled De-Icer		
Air handling equipment	Fan type & Q'ty		Propeller fan × 2		
	Motor	W	60 × 2	120 × 2	
	Starting method		Direct start		
	Air flow (Standard)	CMM	100	220	
Shock & vibration absorber			Rubber mount (for compressor)		
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection		
Installation data	Refrigerant piping size	mm	Liquid line: φ 9.52 (3/8") Gas line: φ 15.88 (5/8")	Liquid line: φ 9.52 (3/8") Gas line: φ 19.05 (3/4")	Liquid line: φ 9 .52 (3/8") Gas line: φ 22.22 (7/8")
	Connecting method		Liquid line, Gas line: Flare	Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (φ 20 × 3)	Hole for drain (φ 20 × 5pcs, φ 45 × 3pcs)	
	Insulation for piping		Necessary (both Liquid & Gas lines)		

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include one that is unclosed in connecting pipes. Make an additional charge at local site.
FDCA140HKXEN4 is a chargeless system, and a local additional charge is not needed.

Item		Models	FDCA335HKXE4	FDCA335HKXE4-K (combination unit)
Horsepower		HP	12	
Power source			3 Phase 380V/415V 50Hz	
Nominal cooling capacity*1		kW	34.8	
Nominal cooling capacity*2		kW	33.5	
Nominal heating capacity*3		kW	37.5	
Noise level		dB(A)	Cooling: 60.5, Heating: 61	Cooling: 56, Heating: 57
Exterior dimensions (Height × Width × Depth)		mm	1690 × 1350 × 720	
Net weight		kg	290	310
Refrigerant equipment	Compressor type & Q' ty		GT-C5150ND71 × 1	GT-C5150ND78 × 2
	Motor & Q'ty	kW	8.4 × 1	2.99 × 2
	Starting method		Direct start	
	Capacity control	%	19 ~117	19 ~142
	Crankcase heater	W	33 × 1	33 × 2
	Heat exchanger		Louver fins & inner grooved tubing	Straight fin & inner grooved tubing
	Refrigerant control		Electronic expansion valve	
	Refrigerant		R410A	
	Quantity*4	kg	14.2	17.0
	Refrigerant oil	L	2.1 (M-MA32R)	3.7 (M-MA32R)
	Defrost control		MC controlled De-Icer	
Air handling equipment	Fan type & Q'ty		Propeller fan × 2	
	Motor	W	386 × 2	
	Starting method		Direct start	
	Air flow (Standard)	CMM	Cooling: 280, Heating: 260	Cooling: 220, Heating: 180
Shock & vibration absorber			Rubber mount (for compressor)	
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data	Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2") Gas line: ϕ 25.4 (1")	
	Connecting method		Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (ϕ 20 × 5pcs, ϕ 45 × 3pcs)	Hole for drain (ϕ 20 × 6pcs, ϕ 45 × 3pcs)
	Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Item \ Models			FDCA400HKXE4	FDCA450HKXE4
Horsepower		HP	14	16
Power source			3 Phase 380V/415V 50Hz	
Nominal cooling capacity*1		kW	41.6	46.6
Nominal cooling capacity*2		kW	40.0	45.0
Nominal heating capacity*3		kW	45.0	50.0
Noise level		dB(A)	Cooling: 58.5, Heating: 59	Cooling: 61, Heating: 61
Exterior dimensions (Height × Width × Depth)		mm	1690 × 1350 × 720	
Net weight		kg	290	
Refrigerant equipment	Compressor type & Q' ty		GT-C5150ND78 × 2	
	Motor & Q'ty	kW	4.8 × 2	5.6 × 2
	Starting method		Direct start	
	Capacity control	%	15 ~ 114	13 ~ 112
	Crankcase heater	W	33 × 2	
	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic expansion valve	
	Refrigerant		R410A	
	Quantity*4	kg	17.0	
	Refrigerant oil	L	3.7 (M-MA32R)	
	Defrost control		MC controlled De-Icer	
Air handling equipment	Fan type & Q'ty		Propeller fan × 2	
	Motor	W	386 × 2	
	Starting method		Direct start	
	Air flow (Standard)	CMM	Cooling: 250, Heating: 220	Cooling: 260, Heating: 240
Shock & vibration absorber			Rubber mount (for compressor)	
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data	Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2") Gas line: ϕ 25.4 (1")	Liquid line: ϕ 12.7 (1/2") Gas line: ϕ 28.58 (11/8")
	Connecting method		Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (ϕ 20 × 5pcs, ϕ 45 × 3pcs)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Product Specifications

Item		Models	FDCA504HKXE4	FDCA560HKXE4
Horsepower		HP	18	20
Power source			3 Phase 380V 50Hz	
Nominal cooling capacity*1		kW	52.4	58.2
Nominal cooling capacity*2		kW	50.4	56.0
Nominal heating capacity*3		kW	56.5	63.0
Noise level		dB(A)	60	60.5
Exterior dimensions (Height × Width × Depth)		mm	2048 × 1350 × 720	
Net weight		kg	340	
Refrigerant equipment	Compressor type & Q' ty		GT-C5150MD78 × 2	
	Motor & Q'ty	kW	4.87 × 2	5.78 × 2
	Starting method		Direct start	
	Capacity control	%	11 ~ 111	9 ~ 114
	Crankcase heater	W	33 × 2	
	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic expansion valve	
	Refrigerant		R410A	
	Quantity*4	kg	19.0	
	Refrigerant oil	L	3.7 (M-MA32R)	
	Defrost control		MC controlled De-Icer	
Air handling equipment	Fan type & Q'ty		Propeller fan × 2	
	Motor	W	386 × 2	
	Starting method		Direct start	
	Air flow (Standard)	CMM	270	
Shock & vibration absorber			Rubber mount (for compressor)	
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data	Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2"), Gas line: ϕ 28.58 (11/8")	
	Connecting method		Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (ϕ 20 × 6, ϕ 45 × 3)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Item	Unit	FDCA615HKXE4	FDCA680HKXE4
Horsepower	HP	22	24
Power source		3 Phase 380V 50Hz	
Nominal cooling capacity*1	kW	64.0	70.7
Nominal cooling capacity*2	kW	61.5	68.0
Nominal heating capacity*3	kW	69.0	73.0
Noise level	dB(A)	63	63.5
Exterior dimensions (Height × Width × Depth)	mm	2048 × 1350 × 720	
Net weight	kg	360	
Refrigerant equipment: Compressor type & Q' ty		GT-C5150MD78 × 2	
Refrigerant equipment: Motor & Q'ty	kW	6.66 × 2	7.15 × 2
Refrigerant equipment: Starting method		Direct start	
Refrigerant equipment: Capacity control	%	9 ~ 110	8 ~ 109
Refrigerant equipment: Crankcase heater	W	33 × 2	
Refrigerant equipment: Heat exchanger		Louver fins & inner grooved tubing	
Refrigerant equipment: Refrigerant control		Electronic expansion valve	
Refrigerant equipment: Refrigerant		R410A	
Refrigerant equipment: Quantity*4	kg	26.2	
Refrigerant equipment: Refrigerant oil	L	3.7 (M-MA32R)	
Refrigerant equipment: Defrost control		MC controlled De-Icer	
Air handling equipment: Fan type & Q'ty		Propeller fan × 2	
Air handling equipment: Motor	W	386 × 2	
Air handling equipment: Starting method		Direct start	
Air handling equipment: Air flow (Standard)	CMM	270	
Shock & vibration absorber		Rubber mount (for compressor)	
Safety equipment		Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data: Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2"), Gas line: ϕ 28.58 (11/8")	
Installation data: Connecting method		Liquid line: Flare, Gas line: Brazing	
Installation data: Drain		Hole for drain (ϕ 20 × 6, ϕ 45 × 3)	
Installation data: Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Item		Models	FDCA735HKXE4	FDCA800HKXE4
Horsepower		HP	26	28
Power source			3 Phase 380V 50Hz	
Nominal cooling capacity*1		kW	76.4	83.2
Nominal cooling capacity*2		kW	73.5	80.0
Nominal heating capacity*3		kW	82.5	90.0
Noise level		dB(A)	60.5	61.5
Exterior dimensions (Height × Width × Depth)		mm	(1690 × 1350 × 720) × 2	
Net weight		kg	360	
Refrigerant equipment	Compressor type & Q' ty		GT-C5150MD78 × 4	
	Motor & Q'ty	kW	2.99 × 2, 3.71 × 2	3.71 × 4
	Starting method		Direct start	
	Capacity control	%	8 ~ 120	8 ~ 115
	Crankcase heater	W	33 × 2	
	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic expansion valve	
	Refrigerant		R410A	
	Quantity*4	kg	34	
	Refrigerant oil	L	3.7 (M-MA32R)	
	Defrost control		MC controlled De-Icer	
Air handling equipment	Fan type & Q'ty		Propeller fan × 2	
	Motor	W	386 × 2	
	Starting method		Direct start	
	Air flow (Standard)	CMM	270	
Shock & vibration absorber			Rubber mount (for compressor)	
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data	Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2"), Gas line: ϕ 28.58 (11/8")	
	Connecting method		Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (ϕ 20 × 6, ϕ 45 × 3)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Item \ Models			FDCA850HKXE4	FDCA900HKXE4
Horsepower		HP	30	32
Power source			3 Phase 380V 50Hz	
Nominal cooling capacity*1		kW	88.2	93.5
Nominal cooling capacity*2		kW	85	90.0
Nominal heating capacity*3		kW	95	100.0
Noise level		dB(A)	63	64
Exterior dimensions (Height × Width × Depth)		mm	(1690 × 1350 × 720) × 2	
Net weight		kg	360	
Refrigerant equipment	Compressor type & Q' ty		GT-C5150MD78 × 4	
	Motor & Q'ty	kW	3.71 × 2, 4.29 × 2	4.29 × 4
	Starting method		Direct start	
	Capacity control	%	7 ~ 114	7 ~ 113
	Crankcase heater	W	33 × 2	
	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic expansion valve	
	Refrigerant		R410A	
	Quantity*4	kg	34	
	Refrigerant oil	L	3.7 (M-MA32R)	
	Defrost control		MC controlled De-Icer	
Air handling equipment	Fan type & Q'ty		Propeller fan × 2	
	Motor	W	386 × 2	
	Starting method		Direct start	
	Air flow (Standard)	CMM	270	
Shock & vibration absorber			Rubber mount (for compressor)	
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data	Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2"), Gas line: ϕ 28.58 (11/8")	
	Connecting method		Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (ϕ 20 × 6, ϕ 45 × 3)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB

*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB

*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB

*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Item \ Models			FDCA960HKXE4	FDCA1010HKXE4
Horsepower		HP	34	36
Power source			3 Phase 380V 50Hz	
Nominal cooling capacity*1		kW	99	104.8
Nominal cooling capacity*2		kW	96.0	101.0
Nominal heating capacity*3		kW	108.0	113.0
Noise level		dB(A)	62.5	63
Exterior dimensions (Height × Width × Depth)		mm	(1690 × 1350 × 720) × 1, (2048 × 1350 × 720) × 1	(2048 × 1350 × 720) × 2
Net weight		kg	360	
Refrigerant equipment	Compressor type & Q' ty		GT-C5150MD78 × 4	
	Motor & Q'ty	kW	4.29 × 2, 4.87 × 2	4.87 × 4
	Starting method		Direct start	
	Capacity control	%	6 ~ 112	5.5 ~ 111
	Crankcase heater	W	33 × 2	
	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic expansion valve	
	Refrigerant		R410A	
	Quantity*4	kg	36.4	38.8
	Refrigerant oil	L	3.7 (M-MA32R)	
	Defrost control		MC controlled De-Icer	
Air handling equipment	Fan type & Q'ty		Propeller fan × 2	
	Motor	W	386 × 2	
	Starting method		Direct start	
	Air flow (Standard)	CMM	270	
Shock & vibration absorber			Rubber mount (for compressor)	
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data	Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2"), Gas line: ϕ 28.58 (11/8")	
	Connecting method		Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (ϕ 20 × 6, ϕ 45 × 3)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Item \ Models			FDCA1065HKXE4	FDCA1130HKXE4
Horsepower		HP	38	40
Power source			3 Phase 380V 50Hz	
Nominal cooling capacity*1		kW	110.6	116.4
Nominal cooling capacity*2		kW	106.5	113.0
Nominal heating capacity*3		kW	119.5	127.0
Noise level		dB(A)	63.3	63.5
Exterior dimensions (Height × Width × Depth)		mm	(2048 × 1350 × 720) × 2	
Net weight		kg	360	
Refrigerant equipment	Compressor type & Q' ty		GT-C5150MD78 × 4	
	Motor & Q'ty	kW	4.87 × 2, 5.78 × 2	5.78 × 4
	Starting method		Direct start	
	Capacity control	%	5 ~ 113	4.5 ~ 114
	Crankcase heater	W	33 × 2	
	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic expansion valve	
	Refrigerant		R410A	
	Quantity*4	kg	38.8	
	Refrigerant oil	L	3.7 (M-MA32R)	
	Defrost control		MC controlled De-Icer	
Air handling equipment	Fan type & Q'ty		Propeller fan × 2	
	Motor	W	386 × 2	
	Starting method		Direct start	
	Air flow (Standard)	CMM	270	
Shock & vibration absorber			Rubber mount (for compressor)	
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data	Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2"), Gas line: ϕ 28.58 (11/8")	
	Connecting method		Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (ϕ 20 × 6, ϕ 45 × 3)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Item		Models	FDCA1180HKXE4	FDCA1235HKXE4
Horsepower		HP	42	44
Power source			3 Phase 380V 50Hz	
Nominal cooling capacity*1		kW	122.2	128
Nominal cooling capacity*2		kW	118.0	123.5
Nominal heating capacity*3		kW	132.0	138.0
Noise level		dB(A)	65	66
Exterior dimensions (Height × Width × Depth)		mm	(2048 × 1350 × 720) × 2	
Net weight		kg	360	
Refrigerant equipment	Compressor type & Q' ty		GT-C5150MD78 × 4	
	Motor & Q'ty	kW	5.78 × 2, 6.66 × 2	6.66 × 4
	Starting method		Direct start	
	Capacity control	%	4 ~ 112	4.5 ~ 110
	Crankcase heater	W	33 × 2	
	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic expansion valve	
	Refrigerant		R410A	
	Quantity*4	kg	45.6	52.4
	Refrigerant oil	L	3.7 (M-MA32R)	
	Defrost control		MC controlled De-Icer	
Air handling equipment	Fan type & Q'ty		Propeller fan × 2	
	Motor	W	386 × 2	
	Starting method		Direct start	
	Air flow (Standard)	CMM	270	
Shock & vibration absorber			Rubber mount (for compressor)	
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data	Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2"), Gas line: ϕ 28.58 (11/8")	
	Connecting method		Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (ϕ 20 × 6, ϕ 45 × 3)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Item		Models	FDCA1300HKXE4	FDCA1360HKXE4
Horsepower		HP	46	48
Power source			3 Phase 380V 50Hz	
Nominal cooling capacity*1		kW	133.9	139.8
Nominal cooling capacity*2		kW	130.0	136.0
Nominal heating capacity*3		kW	142.0	146.0
Noise level		dB(A)	66.3	66.5
Exterior dimensions (Height × Width × Depth)		mm	(2048 × 1350 × 720) × 2	
Net weight		kg	360	
Refrigerant equipment	Compressor type & Q' ty		GT-C5150MD78 × 4	
	Motor & Q'ty	kW	6.66 × 2, 7.15 × 2	7.15 × 4
	Starting method		Direct start	
	Capacity control	%	4 ~ 109	4 ~ 109
	Crankcase heater	W	33 × 2	
	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic expansion valve	
	Refrigerant		R410A	
	Quantity*4	kg	52.4	
	Refrigerant oil	L	3.7 (M-MA32R)	
	Defrost control		MC controlled De-Icer	
Air handling equipment	Fan type & Q'ty		Propeller fan × 2	
	Motor	W	386 × 2	
	Starting method		Direct start	
	Air flow (Standard)	CMM	270	
Shock & vibration absorber			Rubber mount (for compressor)	
Safety equipment			Compressor overheat protection, overcurrent protection, power transistor overheating protection, abnormal high pressure protection	
Installation data	Refrigerant piping size	mm	Liquid line: ϕ 12.7 (1/2"), Gas line: ϕ 28.58 (11/8")	
	Connecting method		Liquid line: Flare, Gas line: Brazing	
	Drain		Hole for drain (ϕ 20 × 6, ϕ 45 × 3)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
*4 It doesn't include the component that is enclosed in connecting pipes. Make an additional charge in the locale.

Product Specifications

Operation chart

Since the Multi KX series air conditioner units are free multitype to which the indoor units of different capacity and different model can be combined, the operation characteristics of all combinations are very complicated, therefore only the individual operation characteristics of indoor and outdoor units are shown. For the combined operation characteristics, calculate them with the method shown in the next page.

(1) Operating characteristic of outdoor unit

(a) Integrated type

Item		Models	5HP (220V)	8HP (380/415V)
			FDCA140HKXEN4	FDCA224HKXE4
Capacity	Nominal cooling capacity*1	kW	15.2	23.3
	Nominal cooling capacity*2	kW	14.6	22.4
	Nominal heating capacity*3	kW	16.6	25.0
Operation chart	Cooling input	kW	4.20	5.70/5.70
	Heating input	kW	4.45	5.98/5.98
	Cooling running current	A	21.2	9.6/8.8
	Heating running current	A	22.5	9.6/8.8
	Inrush current (MAX.)	A	3	5
	Cooling power factor	%	90	90/90
	Heating power factor	%	90	95/95
Noise level		dB(A)	53	57

(380/415V)

Item		Models	10HP	12HP	12HP
			FDCA280HKXE4	FDCA335HKXE4	FDCA335HKXE4-K
Capacity	Nominal cooling capacity*1	kW	29.1	34.8	34.8
	Nominal cooling capacity*2	kW	28.0	33.5	33.5
	Nominal heating capacity*3	kW	31.5	37.5	37.5
Operation chart	Cooling input	kW	8.26/8.26	9.53/9.53	8.94
	Heating input	kW	8.06/8.06	9.84/9.84	8.93
	Cooling running current	A	13.6/12.4	15.5/14.2	14.5
	Heating running current	A	13.3/12.2	16.3/14.9	14.8
	Inrush current (MAX.)	A	5	5	6
	Cooling power factor	%	92/93	93/93	94
	Heating power factor	%	92/92	92/92	92
Noise level		dB(A)	57	60.5	57

(380/415V)

Item		Models	14HP	16HP	18HP
			FDCA400HKXE4	FDCA450HKXE4	FDCA504HKXE4
Capacity	Nominal cooling capacity*1	kW	41.6	46.6	52.4
	Nominal cooling capacity*2	kW	40.0	45.0	50.4
	Nominal heating capacity*3	kW	45.0	50.0	56.5
Operation chart	Cooling input	kW	11.27/11.27	12.97/12.97	14.73
	Heating input	kW	11.73/11.73	13.10/13.10	15.15
	Cooling running current	A	18.4/16.9	21.1/19.3	24.1
	Heating running current	A	19.6/17.9	21.7/19.9	25.2
	Inrush current (MAX.)	A	8	8	6
	Cooling power factor	%	93/93	93/93	93
	Heating power factor	%	91/91	92/92	91
Noise level		dB(A)	58.5	61	60

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
Note (1) The above table is the value obtained when 4-way outlet ceiling mounted type with the rated capacity is connected under the condition of JIS- B8615.

(380/415V)

Item		Models	20HP	22HP	24HP
			FDCA560HKXE4	FDCA615HKXE4	FDCA680HKXE4
Capacity	Nominal cooling capacity*1	kW	58.2	64.0	70.7
	Nominal cooling capacity*2		56.0	61.5	68.0
	Nominal heating capacity*3		63.0	69.0	73.0
Operation chart	Cooling input	kW	17.21	20.37	24.98
	Heating input		17.07	18.48	19.08
	Cooling running current	A	28.2	33.1	40.3
	Heating running current		28.5	30.7	31.6
	Inrush current (MAX.)	A	6	6	6
	Cooling power factor	%	93	94	94
	Heating power factor		91	91	92
Noise level		dB(A)	60.5	63	63.5

(b) Combination type

(380/415V)

Item		Models / Combination unit	26HP		28HP	
			FDCA735HKXE4		FDCA800HKXE4	
			FDCA335HKXE4-K	FDCA400HKXE4	FDCA400HKXE4	FDCA400HKXE4
Capacity	Nominal cooling capacity*1	kW	76.4		83.2	
	Nominal cooling capacity*2		73.5		80.0	
	Nominal heating capacity*3		82.5		90.0	
Operation chart	Cooling input	kW	20.21		22.54	
	Heating input		20.66		23.46	
	Cooling running current	A	32.9/30.2		36.8/33.7	
	Heating running current		34.4/31.5		39.1/35.8	
	Inrush current (MAX.)	A	16		16	
	Cooling power factor	%	93/93		93/93	
	Heating power factor		91/91		91/91	
Noise level		dB(A)	61		61.5	

(380/415V)

Item		Models / Combination unit	30HP		32HP	
			FDCA850HKXE4		FDCA900HKXE4	
			FDCA400HKXE4	FDCA450HKXE4	FDCA450HKXE4	FDCA450HKXE4
Capacity	Nominal cooling capacity*1	kW	88.2		93.2	
	Nominal cooling capacity*2		85.0		90.0	
	Nominal heating capacity*3		95.0		100.0	
Operation chart	Cooling input	kW	24.22		25.94	
	Heating input		24.83		26.20	
	Cooling running current	A	39.5/36.1		42.1/38.6	
	Heating running current		41.2/37.7		43.3/39.7	
	Inrush current (MAX.)	A	16		16	
	Cooling power factor	%	93/93		94/93	
	Heating power factor		92/92		92/92	
Noise level		dB(A)	63		64	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB

Note (1) The above table is the value obtained when 4-way outlet ceiling mounted type with the rated capacity is connected under the condition of JIS- B8615.

(380/415V)

Item			34HP		36HP	
		Models	FDCA960HKXE4		FDCA1010HKXE4	
		Combination unit	FDCA450HKXE4	FDCA504HKXE4	FDCA504HKXE4	FDCA504HKXE4
Capacity	Nominal cooling capacity*1	kW	99.0		104.8	
	Nominal cooling capacity*2		96.0		101.0	
	Nominal heating capacity*3		108.0		113.0	
Operation chart	Cooling input	kW	27.7		29.46	
	Heating input		28.25		30.30	
	Cooling running current	A	45.2		48.2	
	Heating running current		46.9		50.4	
	Inrush current (MAX.)	A	9		9	
	Cooling power factor	%	93		93	
	Heating power factor		92		91	
Noise level		dB(A)	63.5		63	

(380/415V)

Item			38HP		40HP	
		Models	FDCA1065HKXE4		FDCA1130HKXE4	
		Combination unit	FDCA504HKXE4	FDCA560HKXE4	FDCA560HKXE4	FDCA560HKXE4
Capacity	Nominal cooling capacity*1	kW	110.6		116.4	
	Nominal cooling capacity*2		106.5		113.0	
	Nominal heating capacity*3		119.5		127.0	
Operation chart	Cooling input	kW	31.94		34.42	
	Heating input		32.22		34.14	
	Cooling running current	A	52.3		56.4	
	Heating running current		53.7		57.1	
	Inrush current (MAX.)	A	9		9	
	Cooling power factor	%	93		93	
	Heating power factor		91		91	
Noise level		dB(A)	63		63.5	

(380/415V)

Item			42HP		44HP	
		Models	FDCA1180HKXE4		FDCA1235HKXE4	
		Combination unit	FDCA560HKXE4	FDCA615HKXE4	FDCA615HKXE4	FDCA615HKXE4
Capacity	Nominal cooling capacity*1	kW	122.2		128.0	
	Nominal cooling capacity*2		118.0		123.5	
	Nominal heating capacity*3		132.0		138.0	
Operation chart	Cooling input	kW	37.58		40.74	
	Heating input		35.55		36.96	
	Cooling running current	A	61.3		66.2	
	Heating running current		59.2		61.4	
	Inrush current (MAX.)	A	9		9	
	Cooling power factor	%	93		94	
	Heating power factor		91		91	
Noise level		dB(A)	65		66	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB
*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB
*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB
Note (1) The above table is the value obtained when 4-way outlet ceiling mounted type with the rated capacity is connected under the condition of JIS- B8615.

(380/415V)

Item		Models / Combination unit	46HP		48HP	
			FDCA1300HKXE4		FDCA1360HKXE4	
			FDCA615HKXE4	FDCA680HKXE4	FDCA680HKXE4	FDCA680HKXE4
Capacity	Nominal cooling capacity*1	kW	133.9		139.8	
	Nominal cooling capacity*2		130.0		136.0	
	Nominal heating capacity*3		142.0		146.0	
Operation chart	Cooling input	kW	45.35		49.96	
	Heating input		37.56		38.16	
	Cooling running current	A	73.4		80.6	
	Heating running current		62.3		63.2	
	Inrush current (MAX.)	A	9		9	
	Cooling power factor	%	94		94	
	Heating power factor		92		92	
Noise level		dB(A)	66		66.5	

*1 Indoor air temperature 27°CDB, 19.5°CWB Outdoor air temperature 35.0°CDB

*2 Indoor air temperature 27°CDB, 19.0°CWB Outdoor air temperature 35.0°CDB

*3 Indoor air temperature 20°CDB Outdoor air temperature 7.0°CDB, 6.0°CWB

*4 Note (1) The above table is the value obtained when four directional air outlet ceiling filling type with the ratings capacity is connected under the condition of JIS- B8615.

(2) Operating characteristic of indoor unit refers to P236.

2.2 Exterior Dimensions

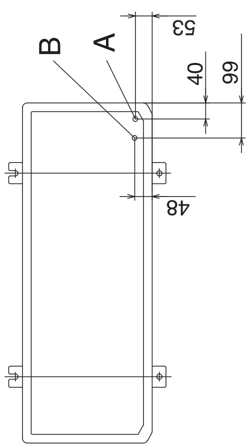
FDCA140HKXEN4

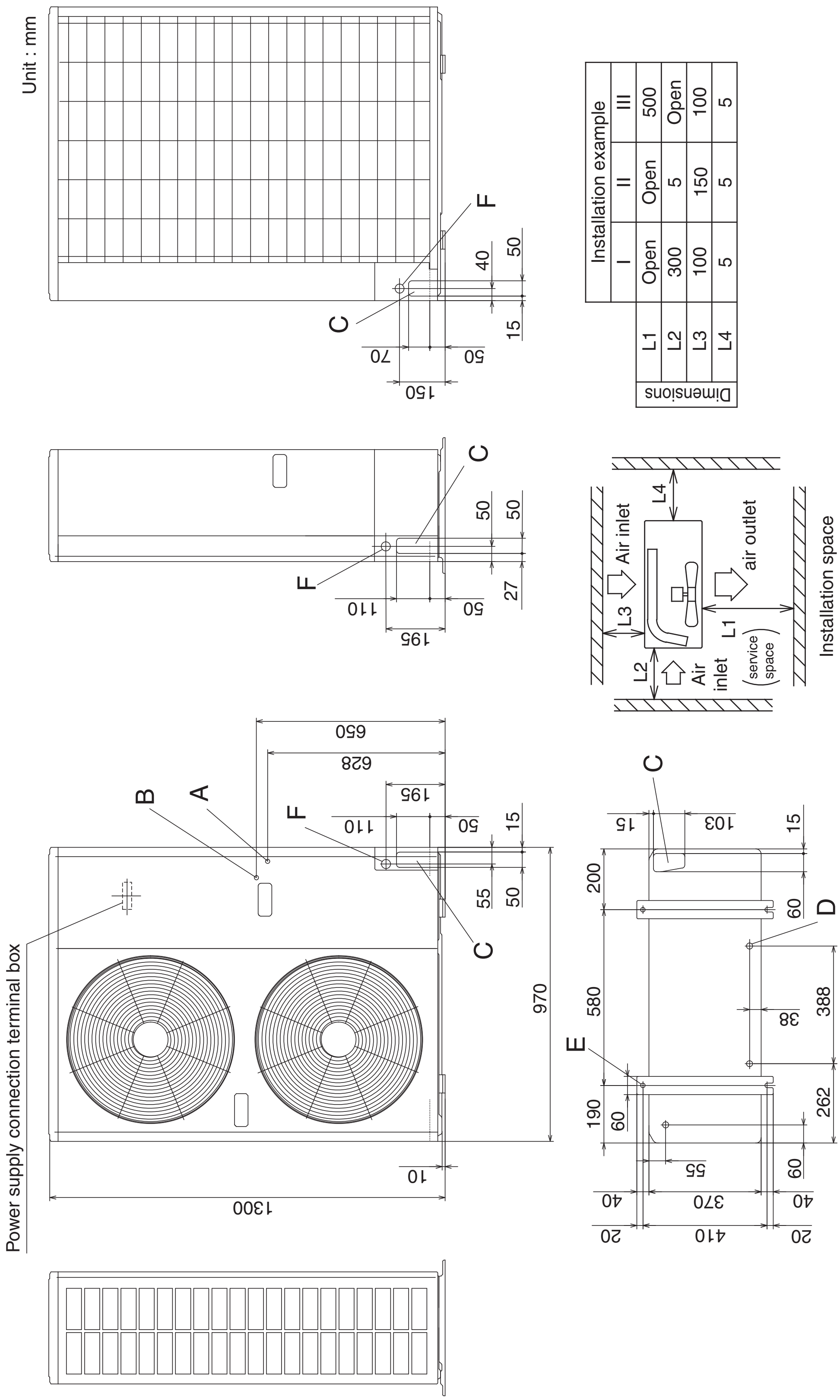
Notes
(1) It is improper that around the unit there are barriers in all directions.
(2) Make sure to secure the unit with anchor bolts.
(3) Make the air outlet perpendicular to the wind direction when the strong wind blows.
(4) Make sure to allow the space of 1m or more above the unit.
(5) Please make sure that the barrier in front of air outlet is below the height of the unit
(6) The brand of the unit has adhered under the right front.

Unit : mm

• Meaning of marks

Mark	Content	
A	Refrigerant gas piping connection pipe	ϕ15.88(Flare)
B	Refrigerant liquid piping connection pipe	ϕ9.52(Flare)
C	Piping and wiring taking out port	
D	Drain hole	ϕ20, 3pcs.
E	Anchor bolt hole	M10, 4pcs.
F	Wiring taking out port	ϕ30, 3pcs.

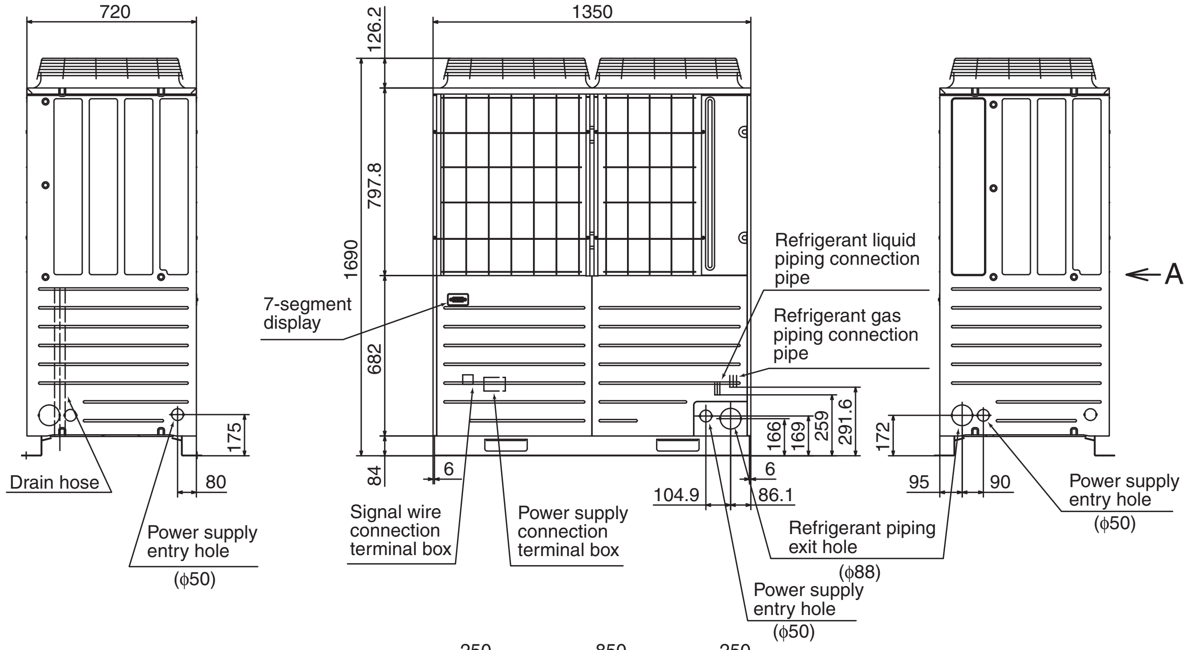


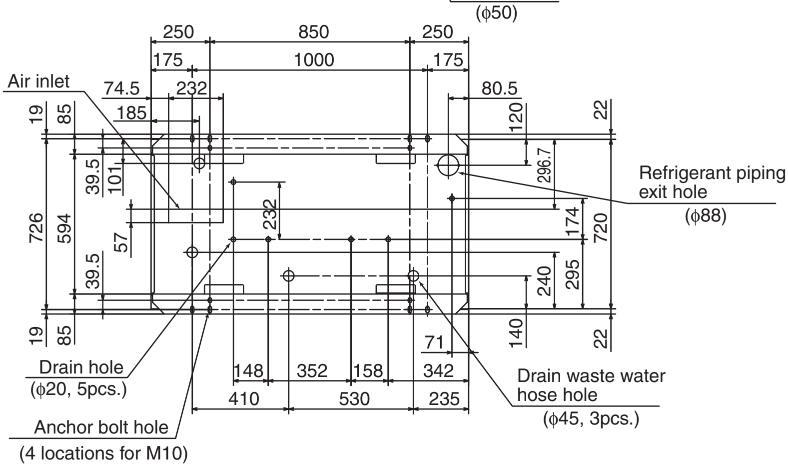


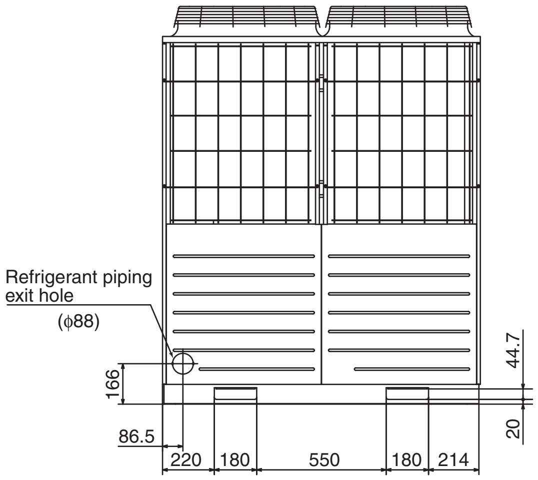
Dimensions	Installation example I	II	III
L1	Open	Open	500
L2	300	5	Open
L3	100	150	100
L4	5	5	5

FDCA224HKXE4, 280HKXE4

Unit: mm

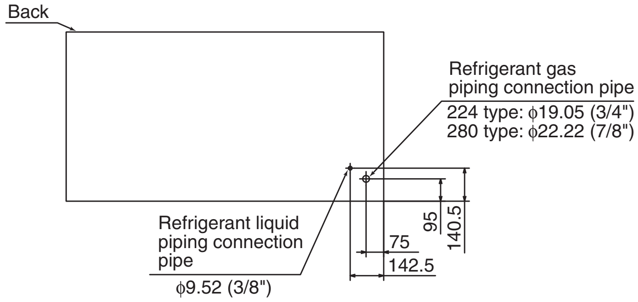






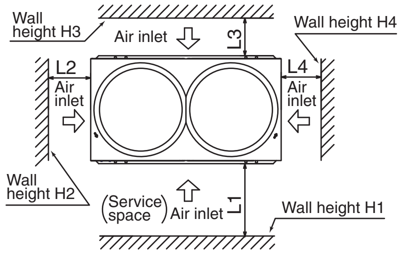
VIEW A

Dimesions after connecting included refrigerant piping (Top view)



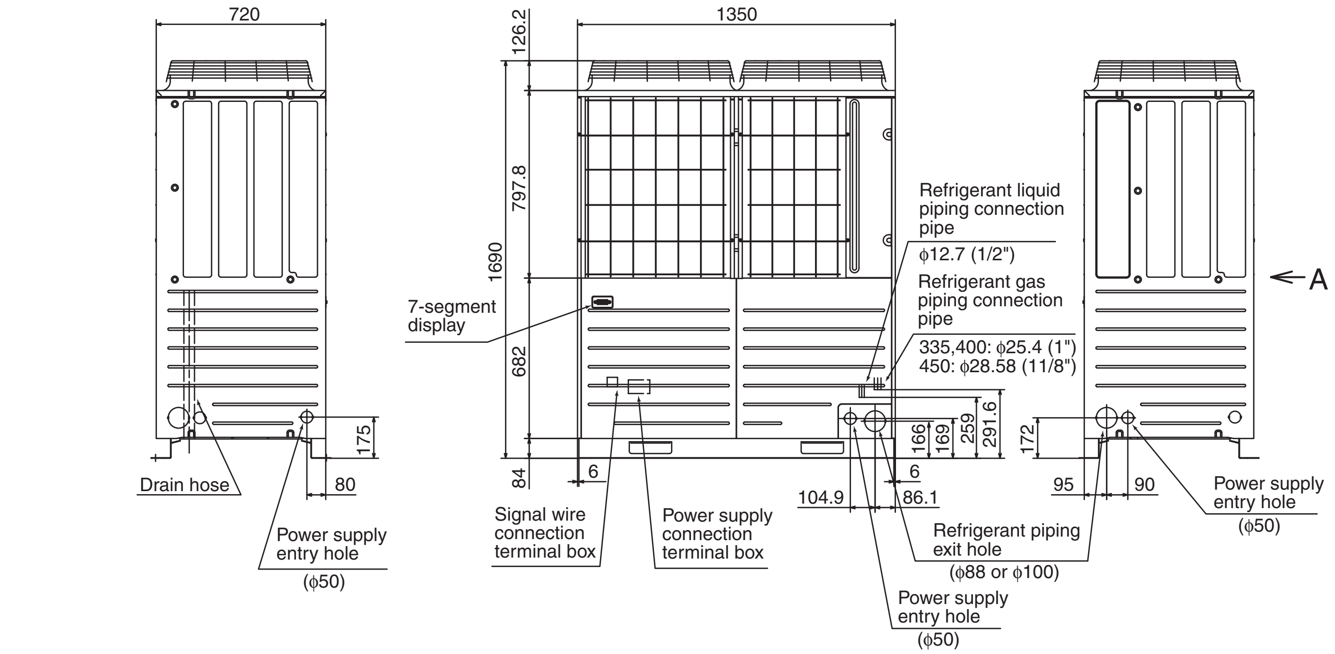
Unit: mm

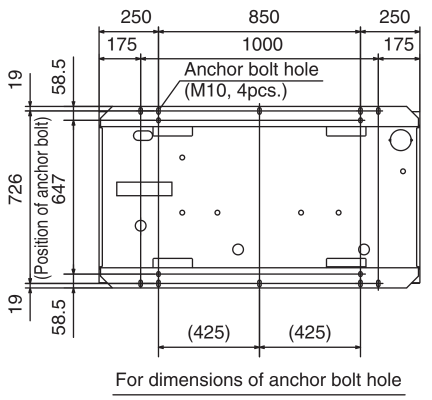
Dimensions \ Installation example	1	2
L1	500	Open
L2	10	10
L3	100	100
L4	10	Open
H1	1500	——
H2	Not limited	Not limited
H3	1000	Not limited
H4	Not limited	——

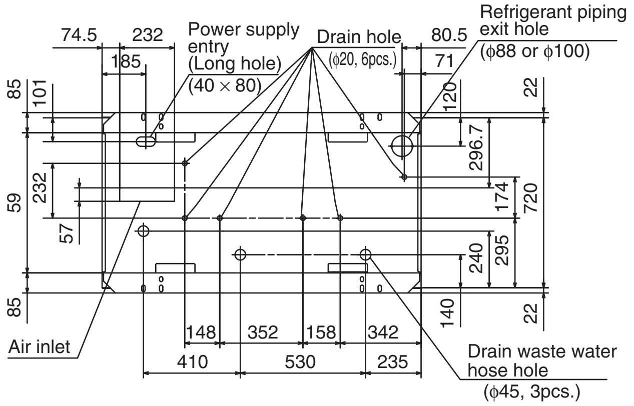


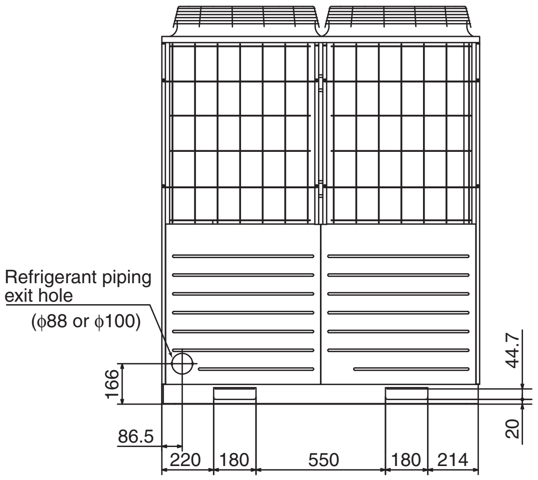
FDCA335HKXE4, 335HKXE4-K, 400HKXE4, 450HKXE4

Unit: mm

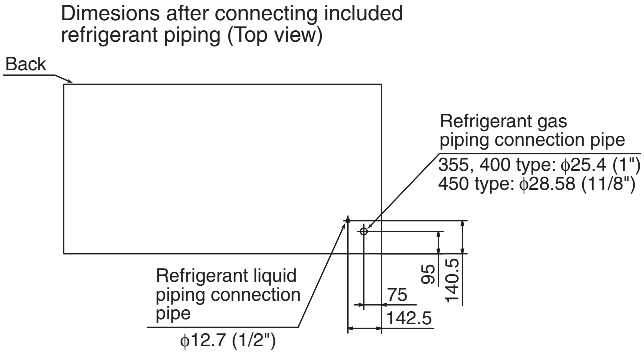






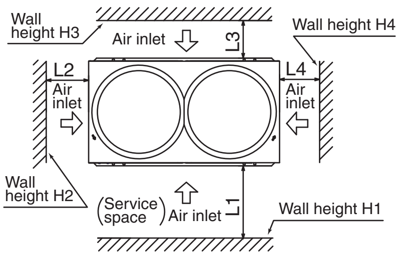


VIEW A

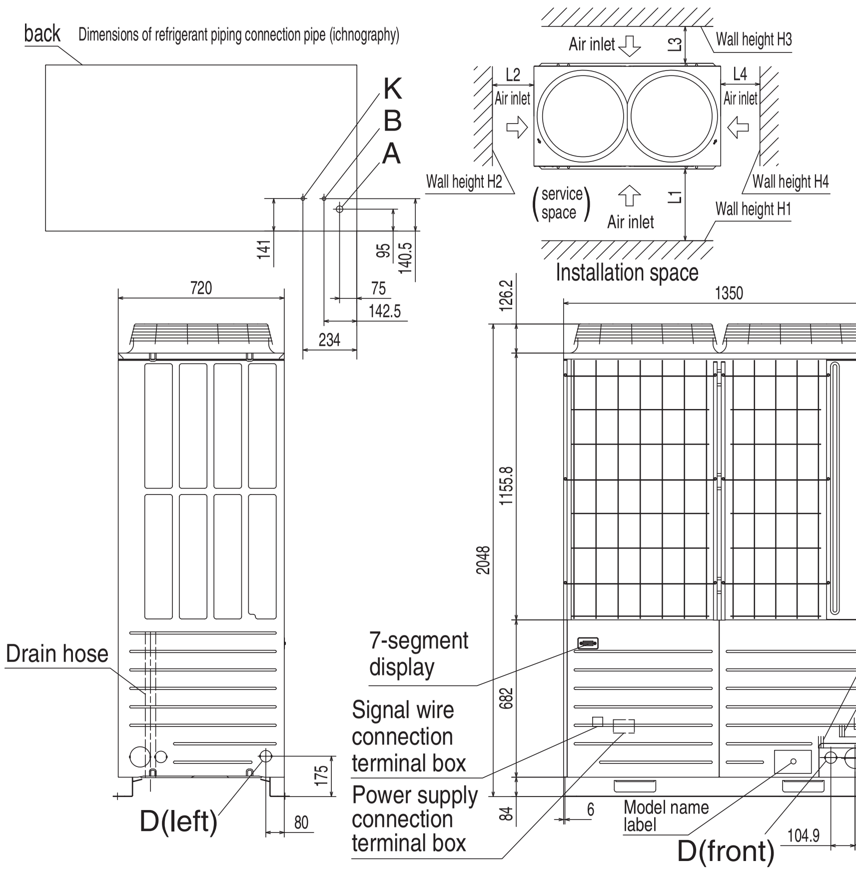


Unit: mm

Installation example / Dimensions	1	2
L1	500	Open
L2	10	10
L3	100	100
L4	10	Open
H1	1500	——
H2	Not limited	Not limited
H3	1000	Not limited
H4	Not limited	——



FDCA504HKXE4, 560HKXE4, 615HKXE4, 680HKXE4

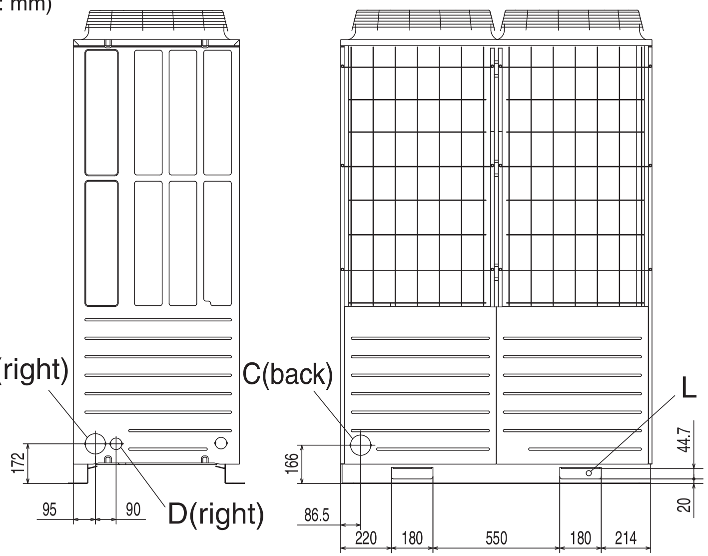


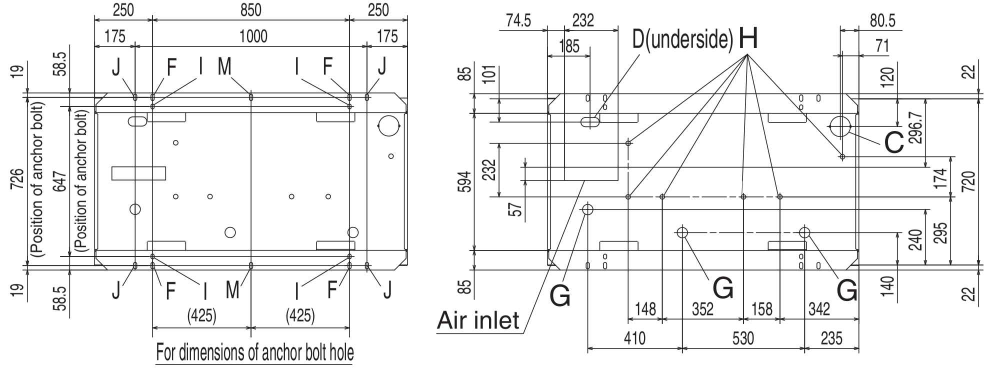
Installation example / Dimensions	1	2
L1	500	Open
L2	10	10
L3	100	100
L4	10	Open
H1	1500	——
H2	No limited	No limited
H3	1000	No limited
H4	No limited	——

(unit: mm)

Mark	Content	
A	Refrigerant gas piping connection pipe	φ28.58 (Brazing)
B	Refrigerant liquid piping connection pipe	φ12.7 (Flare)
C	Refrigerant piping exit hole	φ88 (or φ100)
D	Power supply entry hole	φ50(right, left, front), long hole 40×80(underside)
F	Anchor bolt hole	M10, 4pcs.
G	Drain waste water hose hole	φ45, 3pcs.
H	Drain hole	φ20, 6pcs.
K	Refrigerant oil equalization piping connection pipe	φ9.52 (Flare)
L	Carrying in or hole for hanging	180×44.7

(Unit: mm)



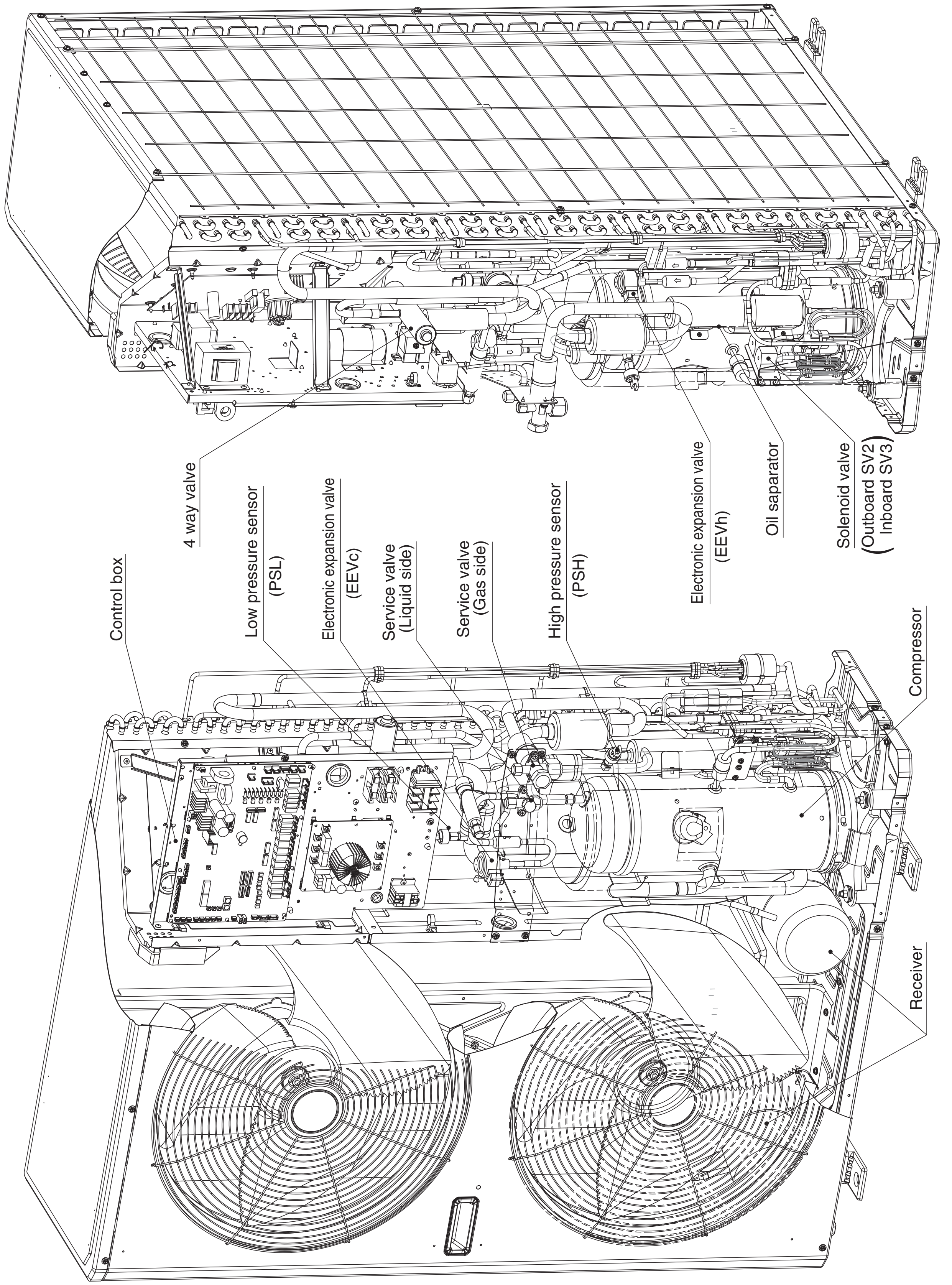


Notes (1) Make sure to secure the unit with anchor bolts.
(2) Make sure to allow the space of 2m or more above the unit.
(3) The brand of the unit has adhered under the right front.
(4) Connect the refrigerant piping (both gas side and liquid side) at local site.
(5) The refrigerant piping connection entrance and the power supply intake are of the half blank shape. Cut it with the nipper etc, when you use.
(6) Use φ88 for the refrigerant piping connection entrance. (Use φ100 when it is not used for cooling and heating.)
(7) Please use the anchor hole (M10×4) marked I and J for a renewal purpose.
(8) Please connect the oil balance pipe marked K with only the outdoor split unit.

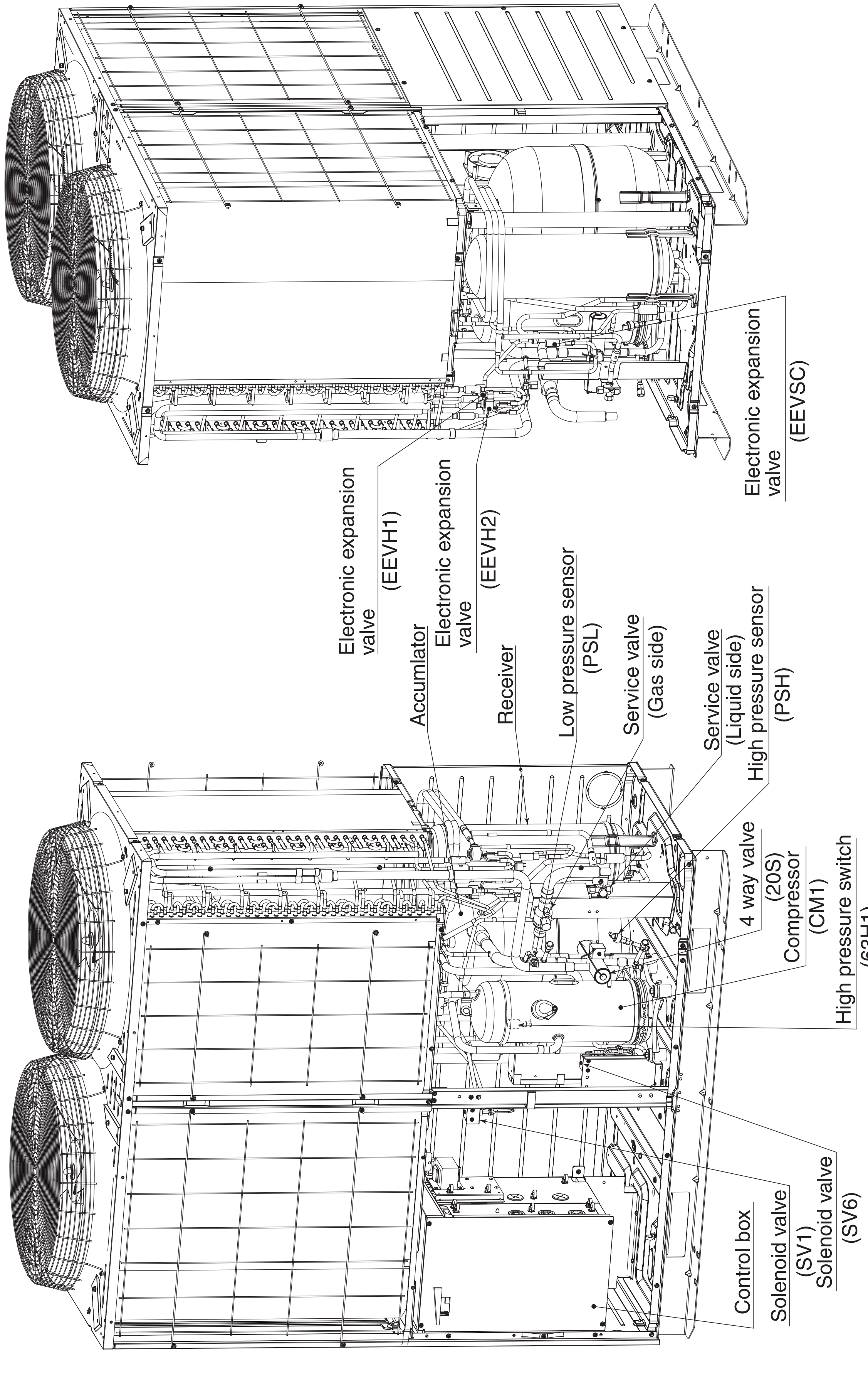
Product Specifications

2.3 Inside View

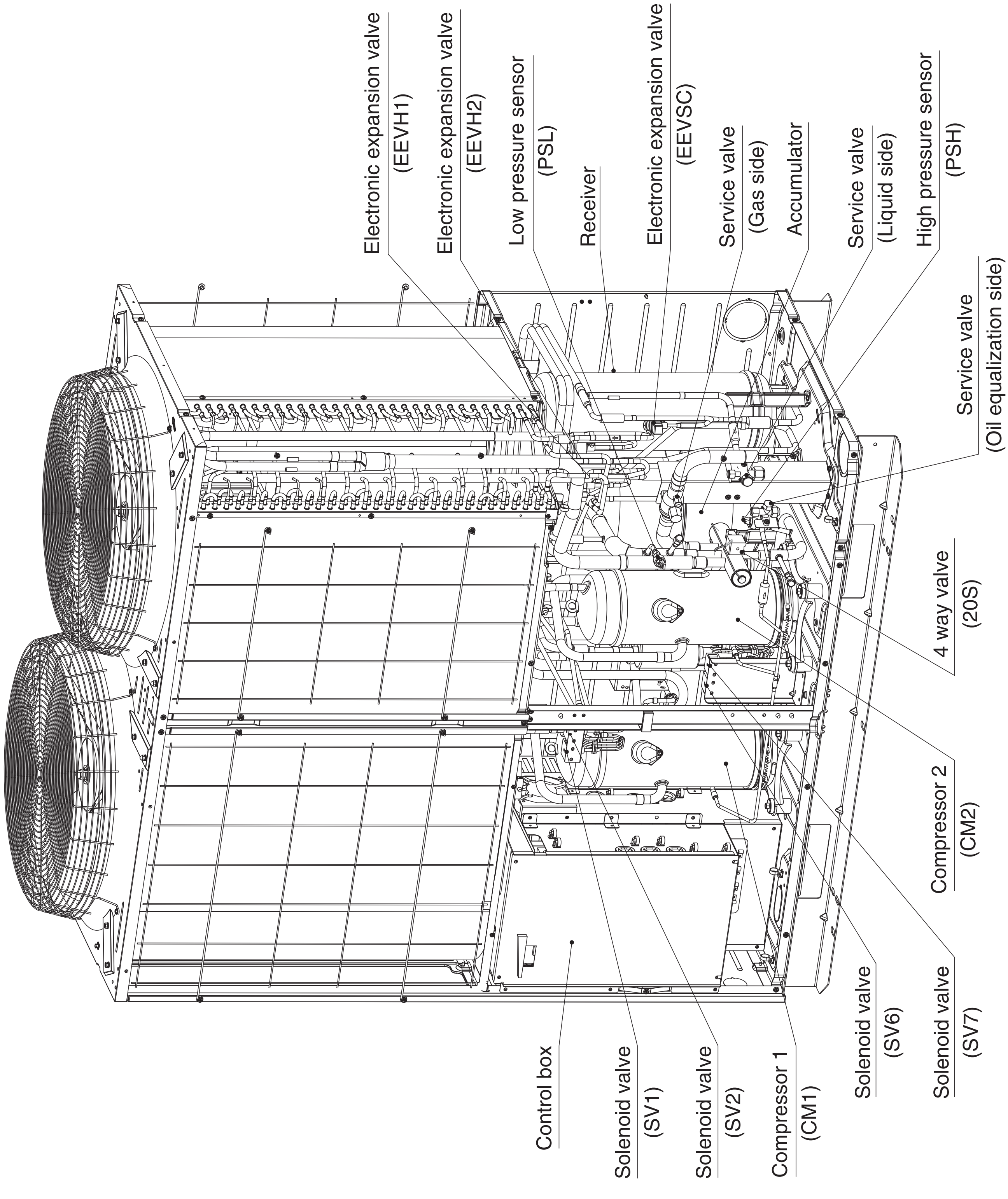
FDCA140HKXEN4



FDCA224HKXE4, 280HKXE4, 335HKXE4

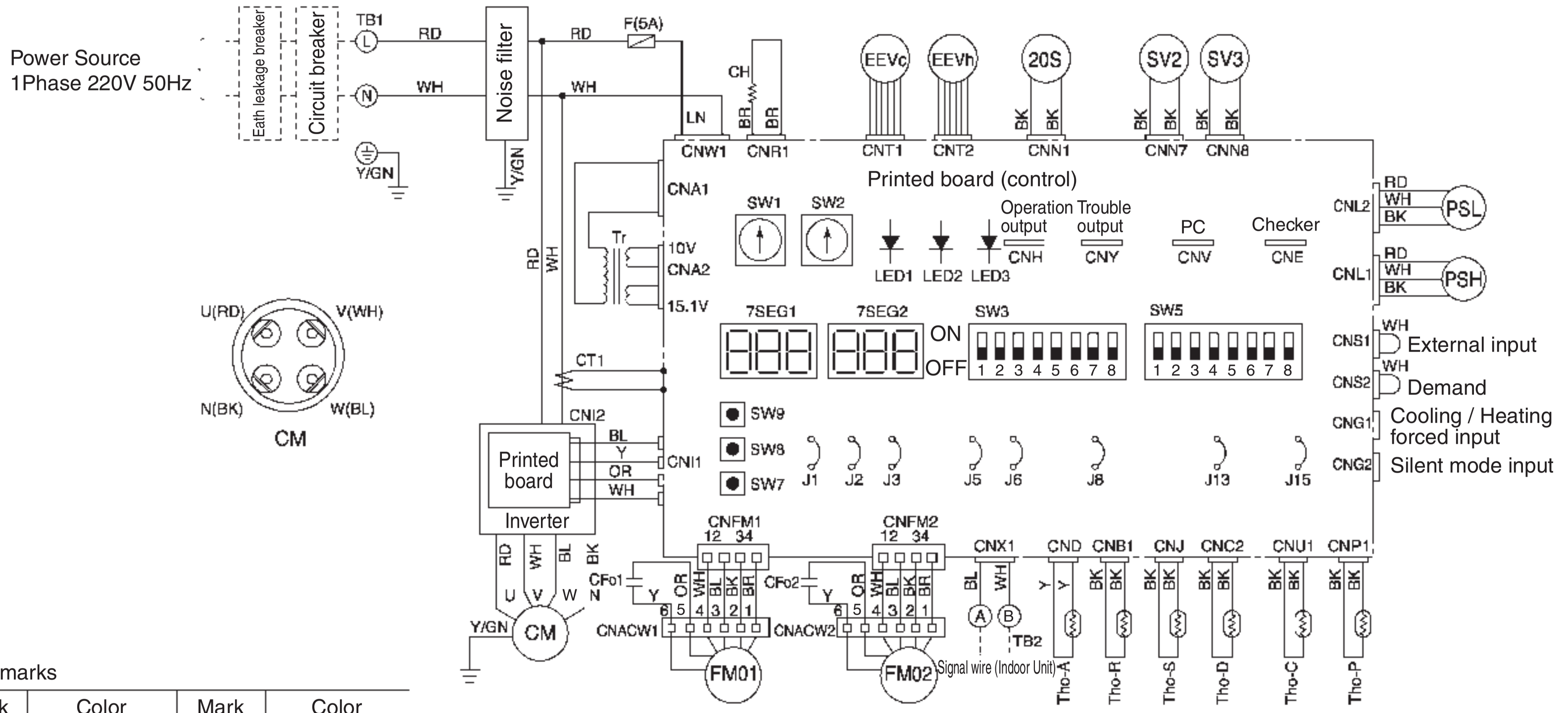


FDCA335HKXE4-K, 400HKXE4, 450HKXE4, 504HKXE4, 560HKXE4, 615HKXE4, 680HKXE4



2.4 Electrical Wiring

FDCA140HKXEN4



Color marks

Mark	Color	Mark	Color
BK	Black	RD	Red
BL	Blue	WH	White
BR	Brown	Y	Yellow
OR	Orange	Y/GN	Yellow/Green

Meaning of marks

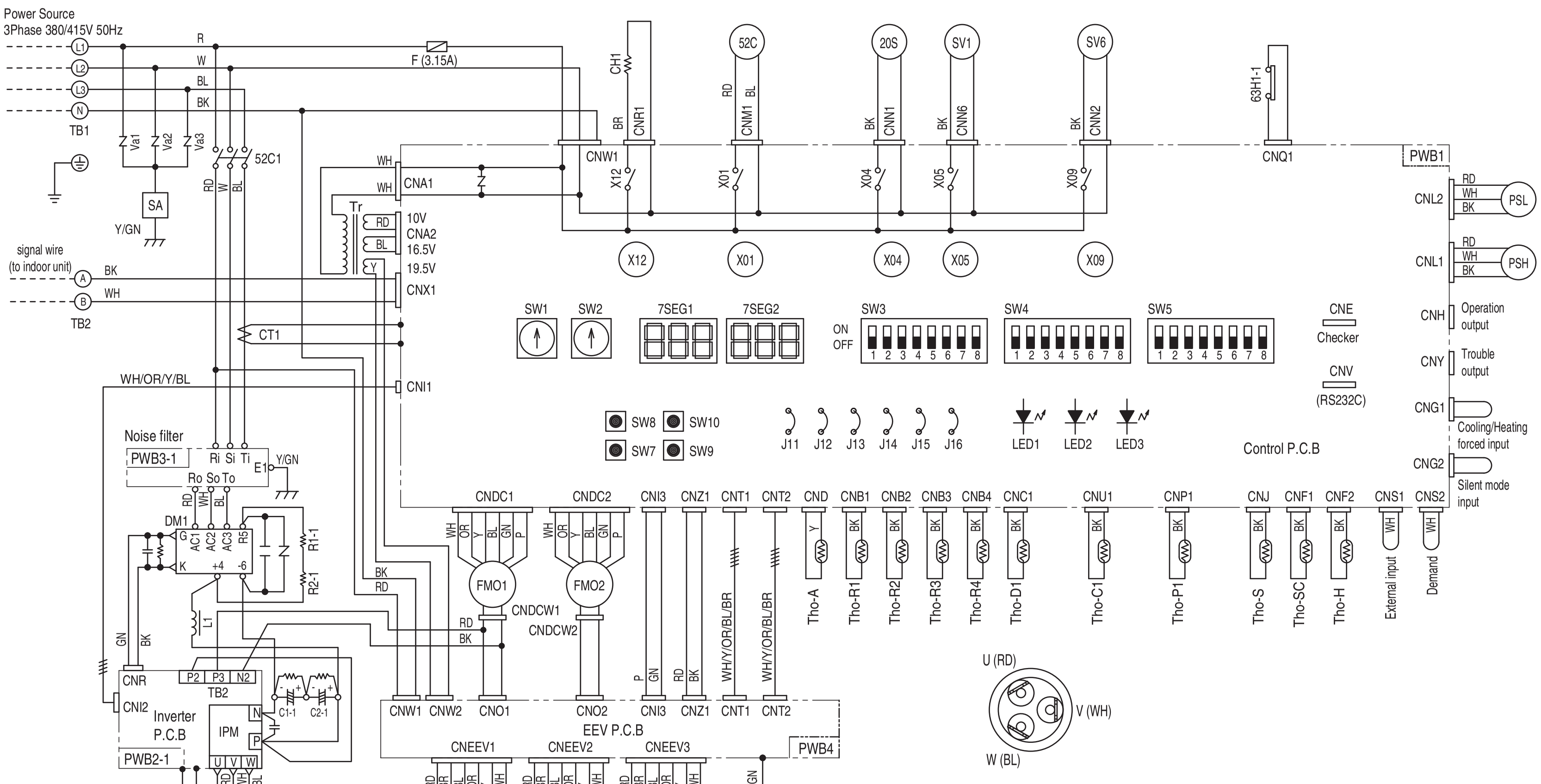
Mark	Parts name	Mark	Parts name	Mark	Parts name	Mark	Parts name
CM	Compressor motor	Tho-R	Temperature sensor for heat exchanger	SW1	Outdoor unit address (ten's place)	J8	The external fan control for snow protection switch usual/fan control
$FM_{01, 2}$	Fan motor (outdoor unit)	Tho-C	Thermistor (dome temp)	SW2	Outdoor unit address (unit's place)	J13	External input select level/pulse
CH	Crankcase heater	Tho-P	Temperature sensor for power transformer	SW3-1	L.E.D.reset	J15	Defrost start temp
$CF_{01, 2}$	Condenser for FMo	CT	Current sensor	SW5-6, 7, 8	Capacity measurement mode	7SEG1	7segments LED (function display)
20S	4 way valve	Tr	Transformer	SW7	Data clear/insert	7SEG2	7segments LED (data display)
$SV_{2, 3}$	Solenoid valve	$TB_{1, 2}$	Terminal block	SW8	7seg indicate (unit's place)	LED1	Indication lamp (red)
Tho-A	Thermistor (outdoor air temp)	F	Fuse	SW9	7seg indicate (ten's place)	LED2	Indication lamp (green)
Tho-D	Thermistor (discharge temp)	PSH	Outdoor unit address (unit's place)	J1 ~ J3	Model setting	CNA ~ X	connector
Tho-S	Thermistor (suction temp)	PSL	Outdoor unit address (ten's place)	J5, 6	Demand switch	EEVc, h	Electronic expansion valve

Function of switches

Switch		Function
SW3-4	ON	Check mode non-available
	OFF	Check mode available
SW3-5	ON	Check of trial operation
	OFF	Regular operation
SW3-7	ON	Forced cooling/heating
	OFF	Regular operation
SW3-8	ON	Test mode
	OFF	Regular operation
SW5-1	ON	Trial operation
	OFF	Regular operation
SW5-2	ON	Trial operation mode/cooling
	OFF	Trial operation mode/heating
SW5-3	ON	Pump down operation
	OFF	Regular operation

Product Specifications

FDCA224HKXE4, 280HKXE4



Compressor terminal arrangement

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
CM1	Compressor motor	Tho-SC	Thermistor (sub-cooling coil 1)	SW7	Data clear
FM01, 2	Fan motor	Tho-H	Thermistor (sub-cooling coil 2)	SW8	7-segment display up (1's digit)
52C1	CM electromagnetic contactor	PSL	Low pressure sensor	SW9	7-segment display up (10's digit)
CH1	Crankcase heater	PSH	High pressure sensor	SW10	Reset
X01~13	Auxiliary relay	CT1	Current sensor	J11, 12	Voltage select
20S	4-way valve (coil)	SA	Arrestor	J13	External input select level/pulse
SV1	Solenoid valve (CM bypass)	Tr	Transformer	J14	Defrost reset temperature select
SV6	Solenoid valve (oil separator CM1)	Va1~3	Varistor	J15	Defrost start temperature select
EEVH1, 2	Heating expansion valve	TB1, 2	Terminal block	J16	Heat recovery unit
EEVSC	Over-cooling coil expansion valve	F	Fuse	LED1	Inspection lamp (red)
63H1-1	High pressure switch (protective)	CNA-Z	Connector	LED2	Normal (green)
Tho-A	Thermistor (outdoor air temperature)	SW1	Address setting SW outdoor No. (10's digit)	LED3	Service (green)
Tho-C	Thermistor (under-dome)	SW2	Address setting SW outdoor No. (1's digit)	7SEG1	7-segment LED (function display)
Tho-D	Thermistor (discharge pipe)	SW3-1	Inspection LED reset	7SEG2	7-segment LED (data display)
Tho-P	Thermistor (power transformer)	SW3-2	Backup operation	L1	D.C. reactor
Tho-R1, 2	Thermistor (heat exchanger)	SW4-1~4	Model setting	C1-1, 2	Condensor
Tho-R3, 4	Thermistor (heat exchanger intake)	SW4-5	Demand select	PWB1~4	Printed circuit board
Tho-S	Thermistor (suction pipe)	SW4-6	Demand select	IPM	Intelligent power module

Function of switches

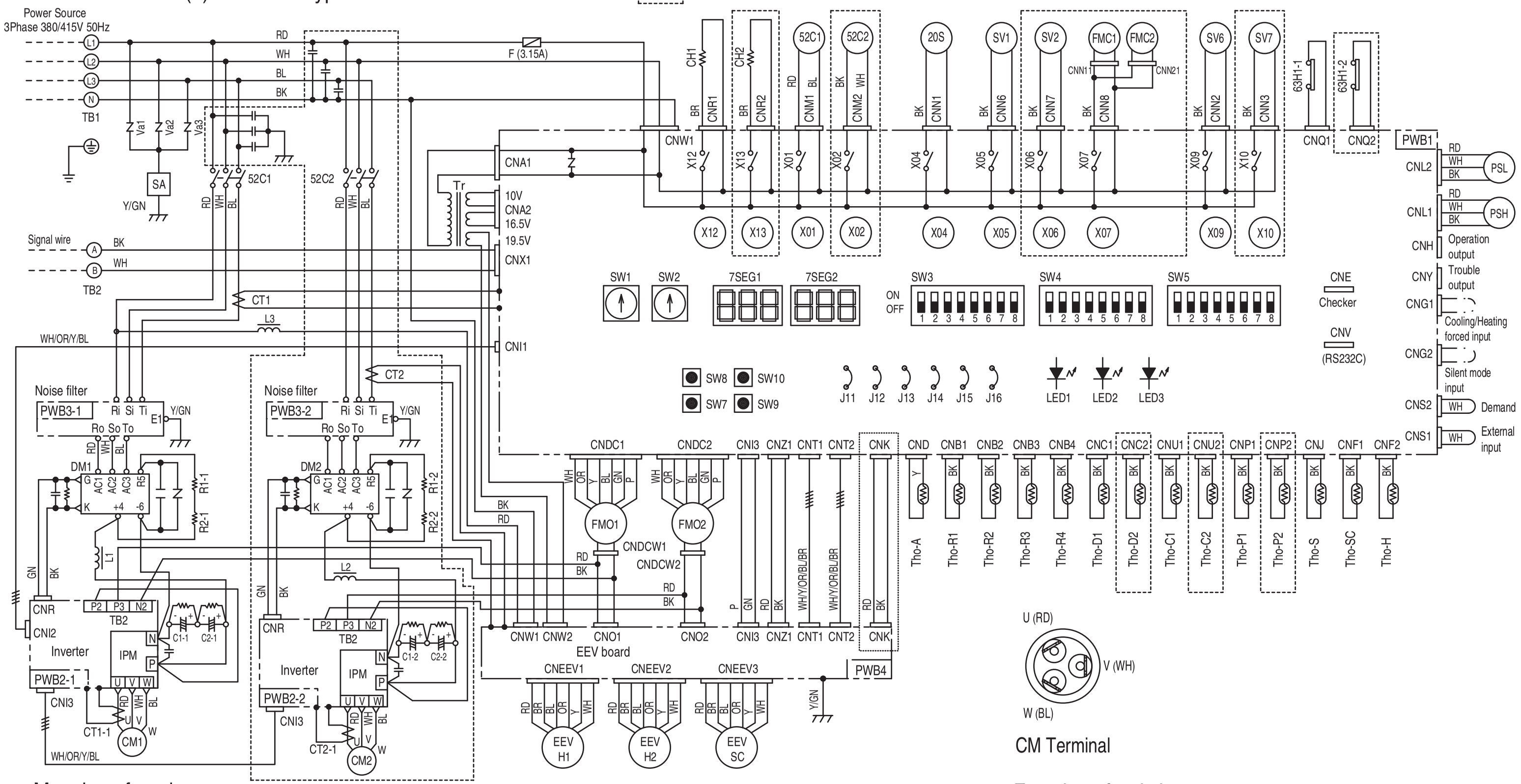
Mark		Function
SW3-3	ON	Renewal setting
	OFF	Normal operation
SW3-7	ON	Forced cooling/heating mode
	OFF	Normal operation
SW3-8	ON	Test mode
	OFF	Normal operation
SW5-1	ON	Test operation
	OFF	Normal operation
SW5-2	ON	Cooling during test operation
	OFF	Heating during test operation
SW5-3	ON	Pump down operation
	OFF	Normal operation

Color marks

Mark	Color
BK	Black
BL	Blue
GN	Green
GR	Gray
OR	Orange
RD	Red
WH	White
Y	Yellow
P	Pink
BR	Brown
Y/GN	Yellow/Green

FDCA335HKXE4

Note(1) FDCA335 type does not have circuits shown in [dashed box] area.



Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
CM1, 2	Compressor motor	Tho-R2	Thermistor (outdoor H.X. temp exhaust)	SW7	Data clear/insert
FMO1, 2	Fan motor (outdoor unit)	Tho-R3	Thermistor (outdoor H.X. temp inlet)	SW8	7seg indicate (unit's place)
52C1, 2	Magnetic contactor for CM	Tho-R4	Thermistor (outdoor H.X. temp inlet)	SW9	7seg indicate (ten's place)
CH1, 2	Crankcase heater	PSL	Low pressure sensor	SW10	Reset
X01 ~ 13	Auxiliary relay	PSH	High pressure sensor	J11, 12	Set up model (volt)
20S	4way valve	CT1, CT2	Current sensor	J13	External input select level/pulse
SV1	Solenoid valve (CM1: bypass)	SA	Arrestor	J14	Defrost recover temp
SV2	Solenoid valve (CM2: bypass)	Tr	Transformer	J15	Defrost start temp
SV6	Solenoid valve (oil separator CM1)	Va1 ~ 3	Varistor	J16	Heat recovery unit
SV7	Solenoid valve (oil separator CM2)	TB1, 2	Terminal block	LED1	Indication lamp (red)
EEVH1, 2	Expansion valve for heating	F	Fuse	LED2	Indication lamp (green)
EEVSC	Expansion valve for SC	CNA-Z	Connector	LED3	Indication lamp (green for service)
63H1-1, 2	High pressure switch (for protection)	SW1	Outdoor unit address (ten's place)	7SEG1	7seg L.E.D. (function indication)
Tho-A	Thermistor (outdoor air temp)	SW2	Outdoor unit address (unit's place)	7SEG2	7seg L.E.D. (data indication)
Tho-C1, 2	Thermistor (dome temp)	SW3-1	L.E.D.reset	L1, L2	D.C.reactor
Tho-D1, 2	Thermistor (discharge temp)	SW4-1 ~ 4	Set up model	C1-1, 2, C2-1, 2	Condensor
Tho-P1, 2	Thermistor (IPM temp)	SW4-5	Demand	PWB1 ~ 4	Printed wiring board
Tho-S	Thermistor (suction temp)	SW4-6	Demand	IPM	Intelligent power module
Tho-SC	Thermistor (SC1 temp)	SW4-7	Address setting switch (master · slave)	FMC1, 2	Fan for IPM
Tho-H	Thermistor (SC2 temp)	SW4-8	Address setting switch (master · slave)		
Tho-R1	Thermistor (outdoor H.X. temp exhaust)	SW5-4 ~ 8	Spare		

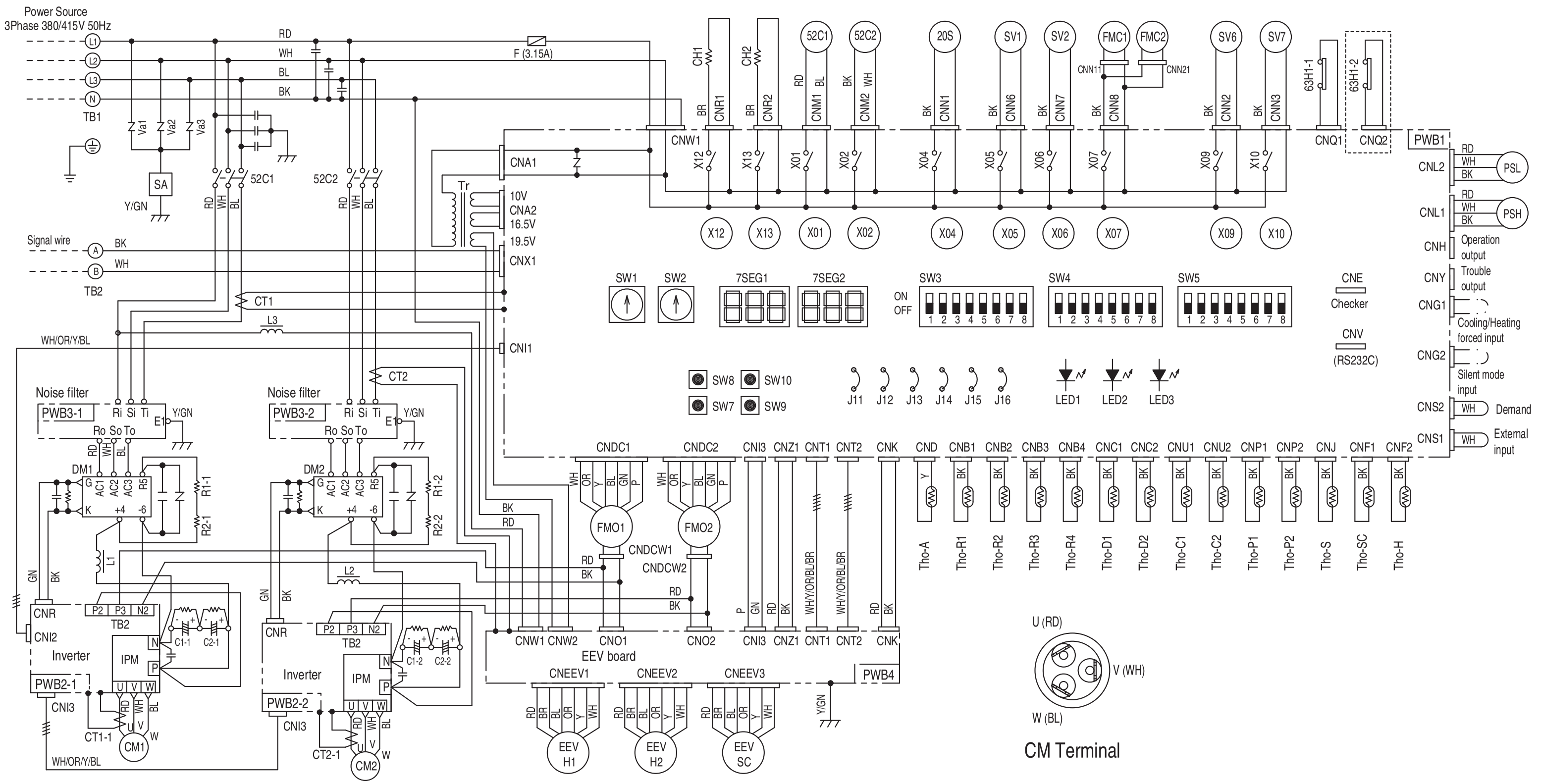
Function of switches

Mark		Function
SW3-2	ON	Auto backup operation
	OFF	Regular operation
SW3-3	ON	Set of renewal
	OFF	Regular operation
SW3-4	ON	Check mode non-available
	OFF	Check mode available
SW3-5	ON	Check of trial operation
	OFF	Regular operation
SW3-6	ON	Pipe wash mode
	OFF	Regular operation
SW3-7	ON	Forced cooling/heating
	OFF	Regular operation
SW3-8	ON	Test mode
	OFF	Regular operation
SW5-1	ON	Trial operation
	OFF	Regular operation
SW5-2	ON	Trial operation mode/cooling
	OFF	Trial operation mode/heating
SW5-3	ON	Pump down operation
	OFF	Regular operation

Color marks

Mark	Color
BK	Black
BL	Blue
BR	Brown
GN	Green
GR	Gray
OR	Orange
RD	Red
WH	White
Y	Yellow
P	Pink
Y/GN	Yellow/Green

FDCA335HKXE-K, 400HKXE4, 450HKXE4, 504HKXE4, 560HKXE4, 615HKXE4, 680HKXE4



Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
CM1,2	Compressor motor	Tho-R2	Thermistor (outdoor H.X. temp exhaust)	SW7	Data clear/insert
FMO1,2	Fan motor (outdoor unit)	Tho-R3	Thermistor (outdoor H.X. temp inlet)	SW8	7seg indicate (unit's place)
52C1,2	Magnetic contactor for CM	Tho-R4	Thermistor (outdoor H.X. temp inlet)	SW9	7seg indicate (ten's place)
CH1,2	Crankcase heater	PSL	Low pressure sensor	SW10	Reset
X01~13	Auxiliary relay	PSH	High pressure sensor	J11,12	Set up model (volt)
20S	4 way valve	CT1,CT2	Current sensor	J13	External input select level/pulse
SV1	Solenoid valve (CM1:bypass)	SA	Arrestor	J14	Defrost recover temp
SV2	Solenoid valve (CM2:bypass)	Tr	Transformer	J15	Defrost start temp
SV6	Solenoid valve (oil separator CM1)	Va1~3	Varistor	J16	Heat recovery unit
SV7	Solenoid valve (oil separator CM2)	TB1,2	Terminal block	LED1	Indication lamp (red)
EEVH1,2	Expansion valve for heating	F	Fuse	LED2	Indication lamp (green)
EEVSC	Expansion valve for SC	CNA-Z	Connector	LED3	Indication lamp (green for service)
63H1-1,2	High pressure switch (for protection)	SW1	Outdoor unit address (ten's place)	7SEG1	7seg L.E.D. (function indication)
Tho-A	Thermistor (outdoor air temp)	SW2	Outdoor unit address (unit's place)	7SEG2	7seg L.E.D. (data indication)
Tho-C1,2	Thermistor (dome temp)	SW3-1	L.E.D.reset	L1,L2,L3	D.C.reactor
Tho-D1,2	Thermistor (discharge temp)	SW4-1~4	Set up model	C1-1,2,C2-1,2	Condensor
Tho-P1,2	Thermistor (IPM temp)	SW4-5	Demand	PWB1~4	Printed wiring board
Tho-S	Thermistor (suction temp)	SW4-6	Demand	IPM	Intelligent power module
Tho-SC	Thermistor (SC1 temp)	SW4-7	Address setting switch (master·slave)	FMC1,2	Fan for IPM
Tho-H	Thermistor (SC2 temp)	SW4-8	Address setting switch (master·slave)		
Tho-R1	Thermistor (outdoor H.X. temp exhaust)	SW5-4~8	Spare		

Function of switches

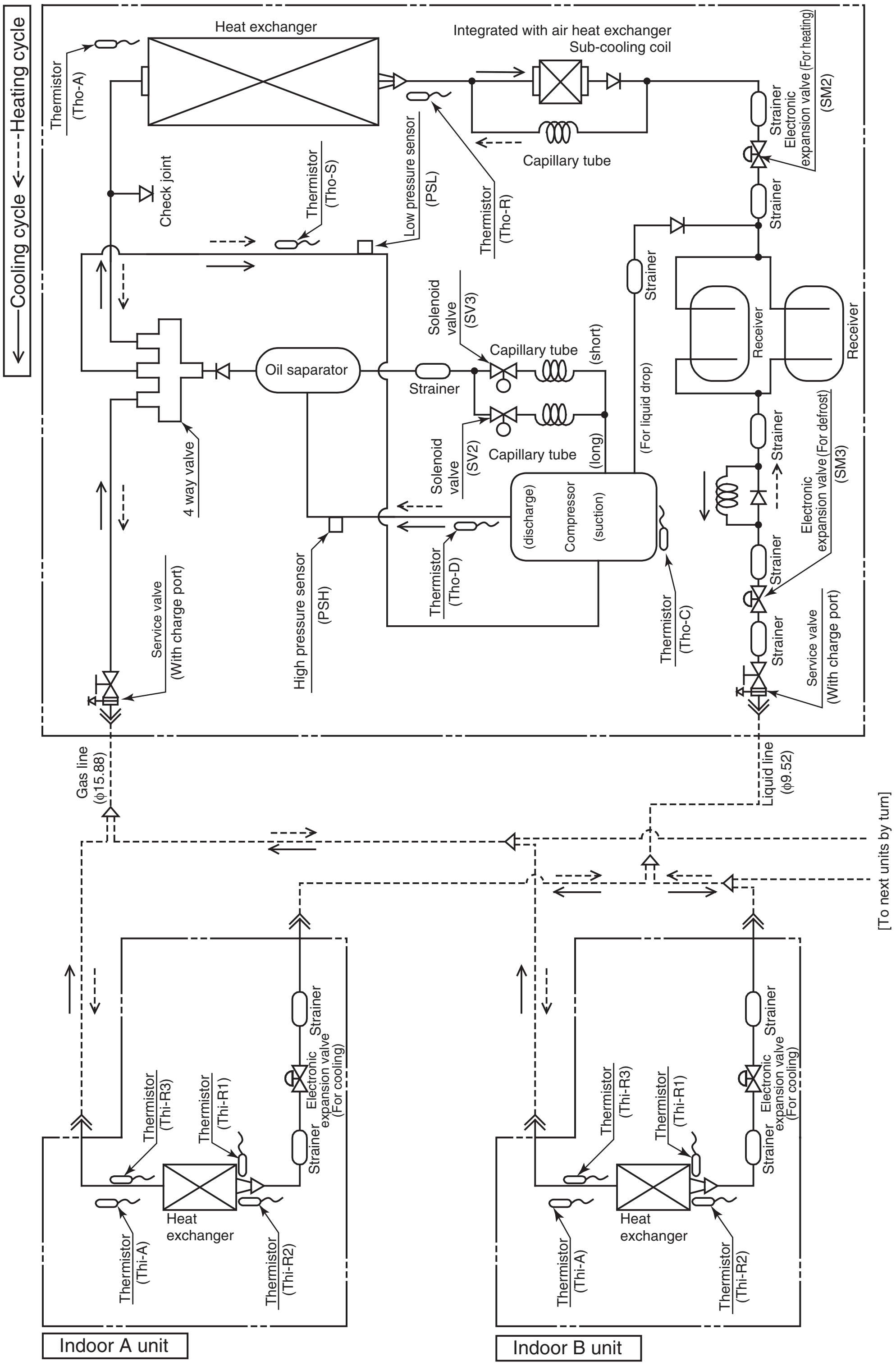
Mark		Function
SW3-2	ON	Auto backup operation
	OFF	Regular operation
SW3-3	ON	Set of renewal
	OFF	Regular operation
SW3-4	ON	Check mode non-available
	OFF	Check mode available
SW3-5	ON	Check of trial operation
	OFF	Regular operation
SW3-6	ON	Pipe wash mode
	OFF	Regular operation
SW3-7	ON	Forced cooling/heating
	OFF	Regular operation
SW3-8	ON	Test mode
	OFF	Regular operation
SW5-1	ON	Trial operation
	OFF	Regular operation
SW5-2	ON	Trial operation mode/cooling
	OFF	Trial operation mode/heating
SW5-3	ON	Pump down operation
	OFF	Regular operation

Color marks

Mark	Color
BK	Black
BL	Blue
BR	Brown
GN	Green
GR	Gray
OR	Orange
RD	Red
WH	White
Y	Yellow
P	Pink
Y/GN	Yellow/Green

2.5 Piping System

FDCA140HKXEN4



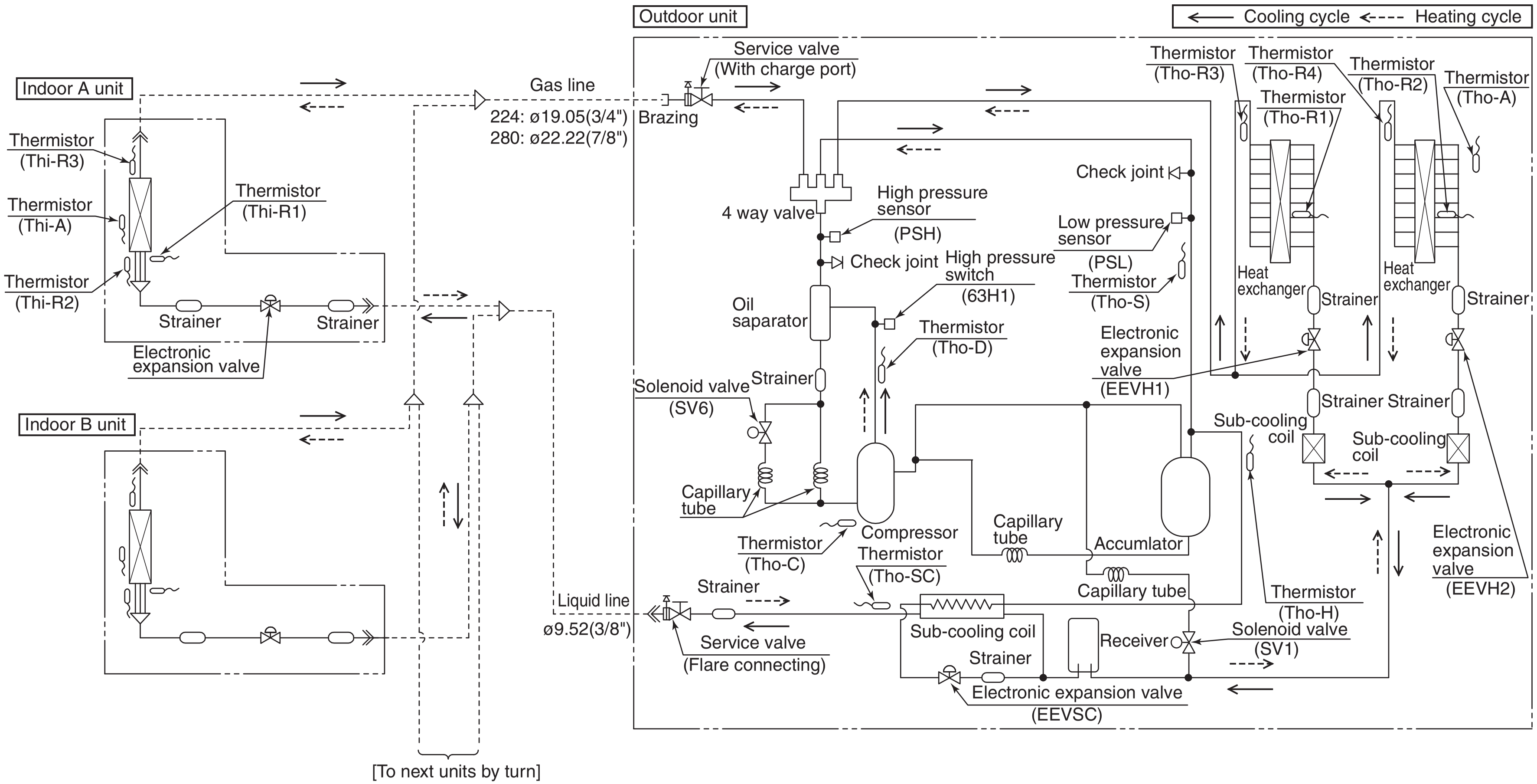
Cooling operation : Frost prevention control.
Super heat control.

Thermistor (Tho-R): For control of defrosting.
Thermistor (Tho-A): For control of defrosting.
Thermistor (Tho-D): For control of discharge pipe temperature.
Thermistor (Tho-S): For control of suction pipe temperature.
Thermistor (Tho-C): For control of temperature under the dome.

- Preset point of protective devices
  - High pressure sensor (PSH):4.055(ON)/3.658(OFF)MPa
  - Low pressure sensor (PSL):0.079(ON)/0.227(OFF)MPa
- Function of thermistor
  - Thermistor (Thi-R1,2): Indoor fan control.
  - Thermistor (Thi-R3): For super heat control of cooling operation.

Product Specifications

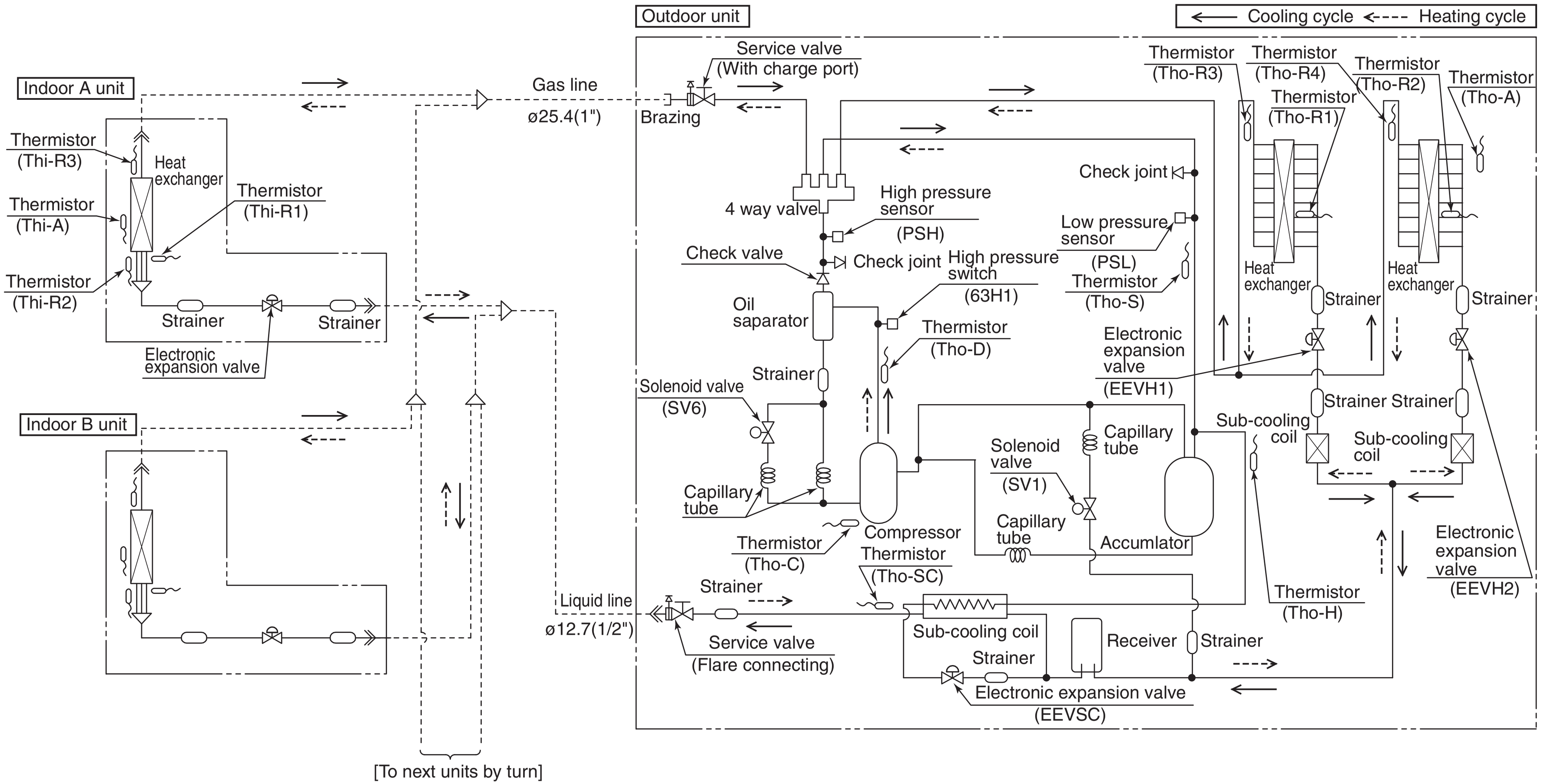
FDCA224HKXE4, 280HKXE4



Notes (1) Preset point of protective devices
63H1: Open 3.8MPa, Clase 2.9MPa
(For protection)
(2) Function of thermistor
PSH: ON 3.30MPa, OFF 3.00MPa
(For compressor control of cooling operation)
ON 3.50MPa, OFF 3.20MPa
(For compressor control of heating operation)
PSL: ON 0.15MPa, OFF 0.189MPa
(For compressor control)
Thi-R1, R2: Heating operation : Indoor fan control.
Cooling operation : Frost prevention control.
Super heat control.

Thi-R3:	For super heat control of cooling operation.
Tho-D:	For control of discharge pipe temperature.
Tho-C:	For control of temperature under the dome.
Tho-S:	For control of suction pipe temperature.
Tho-R1, R2:	For control of defrosting.
Tho-A:	For control of defrosting.
Tho-R3, R4:	Electronic expansion valve (EEVH1, 2) control of heating operation.
Tho-SC:	Electronic expansion valve (EEVSC) control of cooling operation.
Tho-H:	For super heat control of sub-cooling coil during cooling.

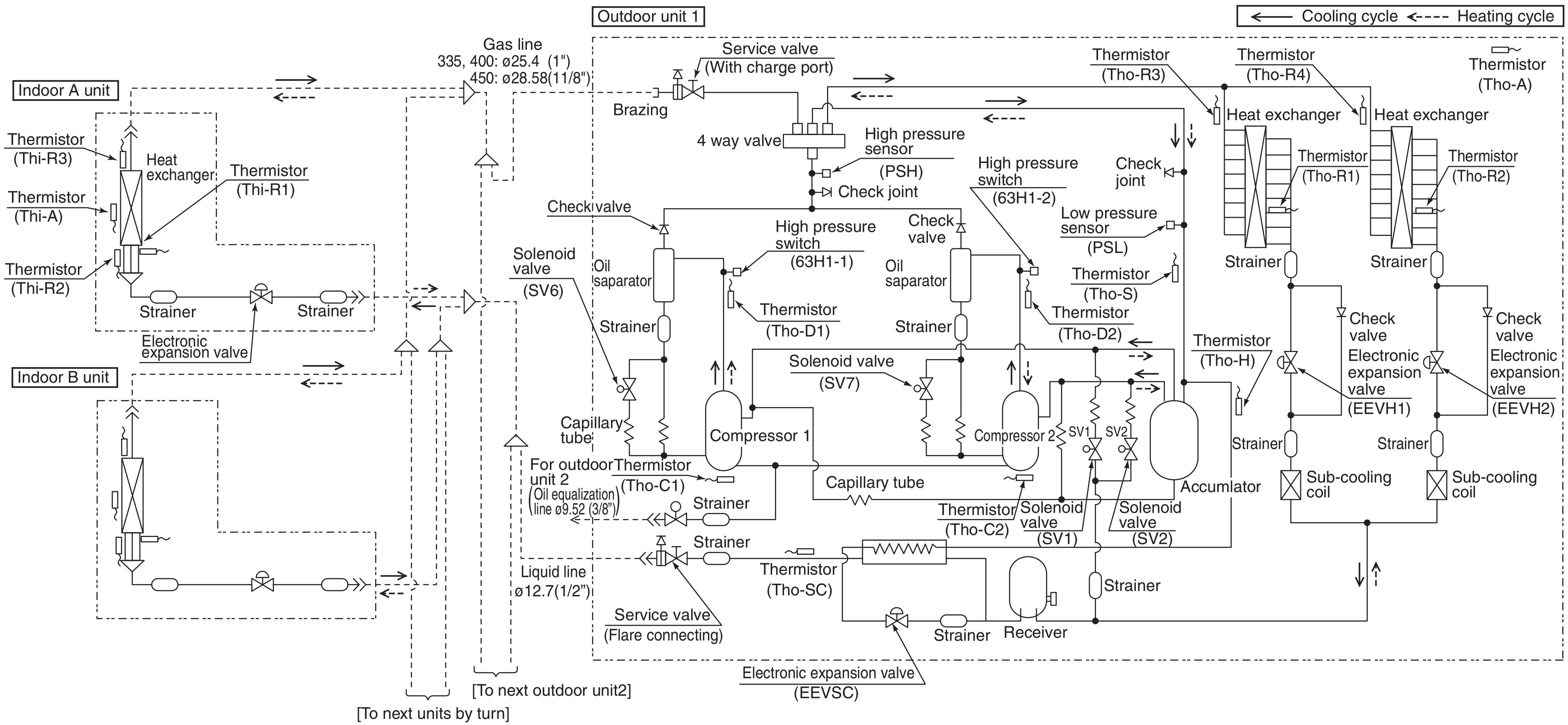
FDCA335HKXE4



Notes (1) Preset point of protective devices
63H1: Open 3.8MPa, Close 2.9MPa
(For protection)
(2) Function of thermistor
PSH: ON 3.50MPa
(For compressor control of cooling operation)
ON 3.00MPa
(For compressor control of heating operation)
PSL: ON 0.18MPa, OFF 0.20MPa
(For compressor control)
ON 0.18MPa, OFF 0.18MPa
(For protection)

Thi-R1, R2: Heating operation : Indoor fan control.
Cooling operation : Frost prevention control.
Super heat control.
Thi-R3: For super heat control of cooling operation.
Tho-D: For control of discharge pipe temperature.
Tho-C: For control of temperature under the dome.
Tho-S: For control of suction pipe temperature.
Tho-R1, R2: For control of defrosting.
Tho-A: For control of defrosting.
Tho-R3, R4: Electronic expansion valve (EEVH1, 2) control of heating operation
Tho-SC: Electronic expansion valve (EEVSC) control of cooling operation.
Tho-H: For super heat control of sub-cooling coil.

FDCA335HKXE4-K, 400 ~ 680HKXE4



Notes (1) Preset point of protective devices
63H1-1, 2: Open 4.15MPa, Close 3.15MPa
(For protection)
(2) Function of thermistor

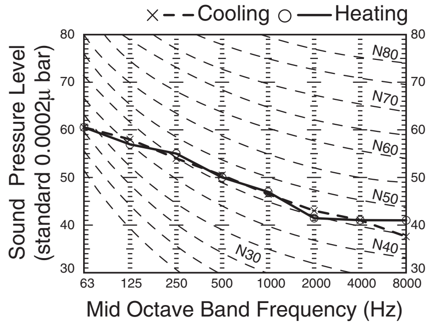
PSH:	ON 3.70MPa (For compressor control of cooling operation) ON 3.00MPa (For compressor control of heating operation)
PSL:	ON 0.18MPa, OFF 0.20MPa (For compressor control) ON 0.134MPa, OFF 0.18MPa (For protection)
Thi-R1, R2:	Heating operation : Indoor fan control. Cooling operation : Frost prevention control. Super heat control.
Thi-R3:	For super heat control of cooling operation.
Tho-D:	For control of discharge pipe temperature.
Tho-C:	For control of temperature under the dome.
Tho-S:	For control of suction pipe temperature.
Tho-R1, R2:	For control of defrosting.
Tho-A:	For control of defrosting.
Tho-R3, R4:	Electronic expansion valve (EEVH1, 2) control of heating operation
Tho-SC:	Electronic expansion valve (EEVSC) control of cooling operation.
Tho-H:	For super heat control of sub-cooling coil.

2.6 Noise Level

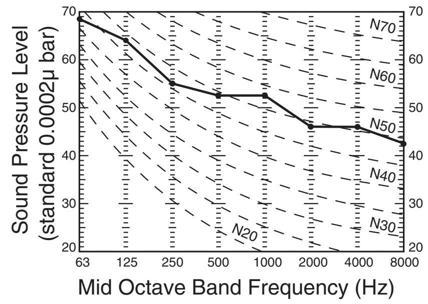
Outdoor unit

It is likely to differ from this data depending on surrounding circumstances when measuring after it is actually installed.
Measured based on JIS-B8615·cooling Mike position as highest noise level in position as below
Distance from front side 1m
Height 1m

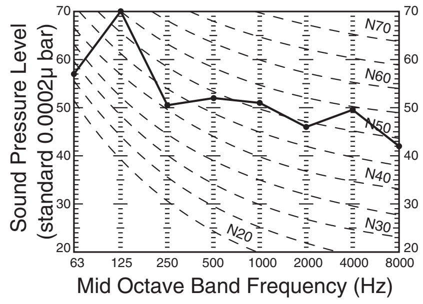
FDCA140HKXEN4



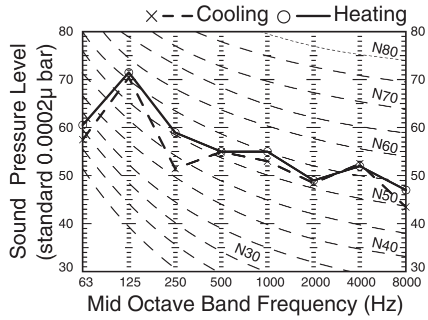
FDCA224HKXE4
Noise level 57 dB (A)



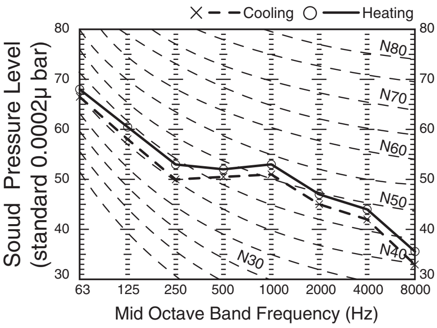
FDCA280HKXE4
Noise level 58 dB (A)



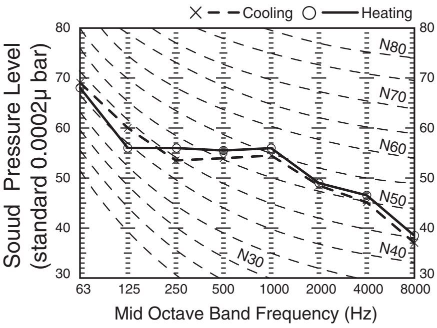
FDCA335HKXE4
Noise level 60.5 dB (A) at cooling
61 dB (A) at heating



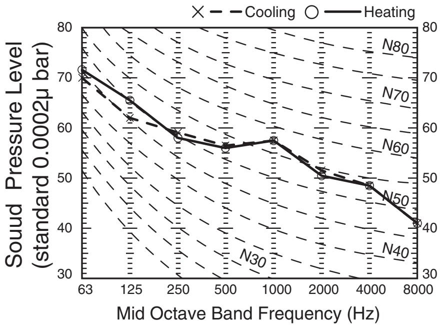
FDCA335HKXE4-K
Noise level 56 dB (A) at cooling
57 dB (A) at heating



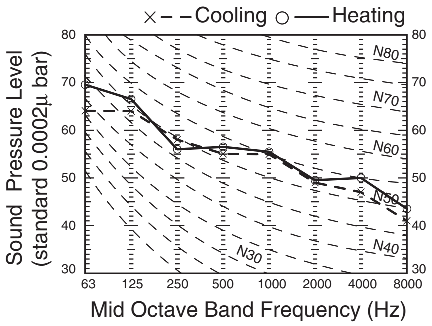
FDCA400HKXE4
Noise level 58.5 dB (A) at cooling
59 dB (A) at heating



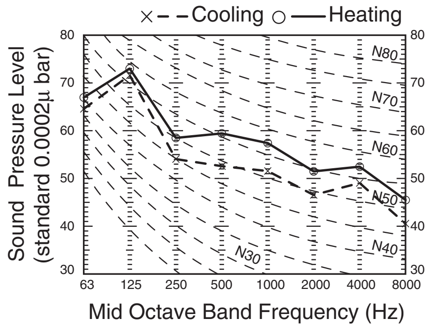
FDCA450HKXE4
Noise level 61 dB (A) at cooling
61 dB (A) at heating



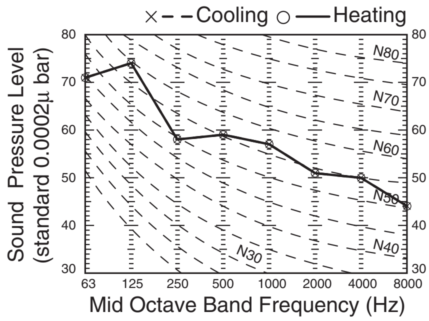
FDCA504HKXE4



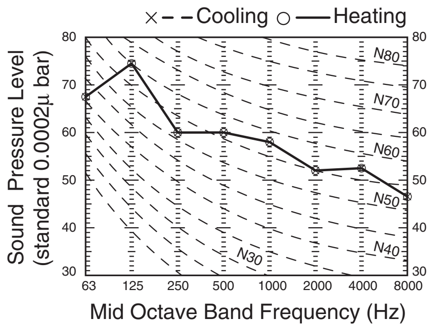
FDCA560HKXE4



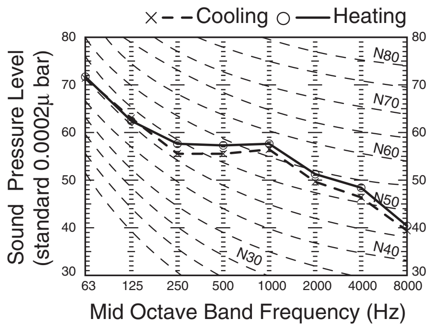
FDCA615HKXE4



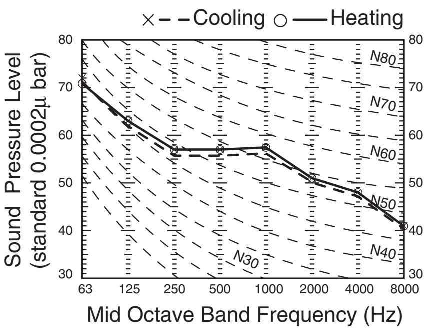
FDCA680HKXE4



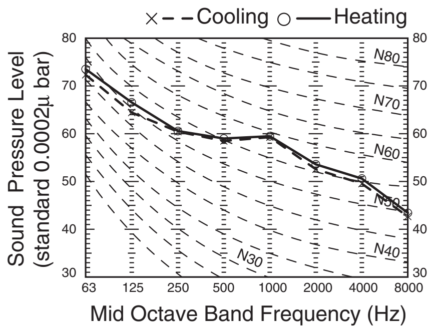
FDCA735HKXE4



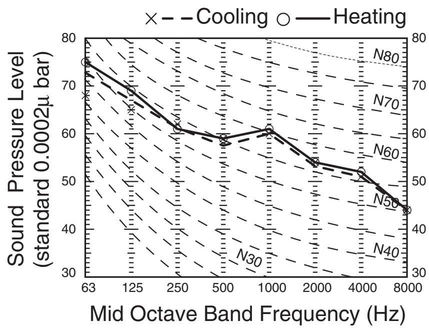
FDCA800HKXE4



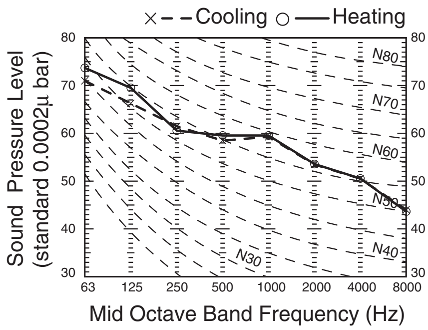
FDCA850HKXE4



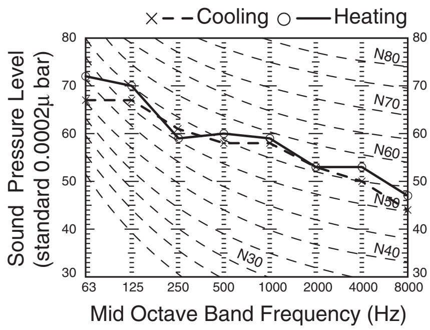
FDCA900HKXE4



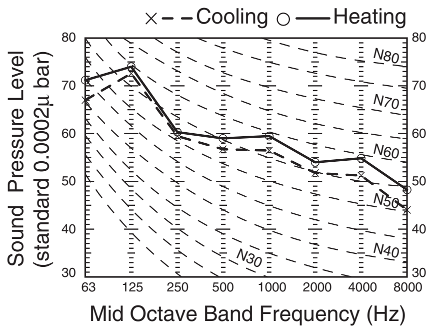
FDCA960HKXE4



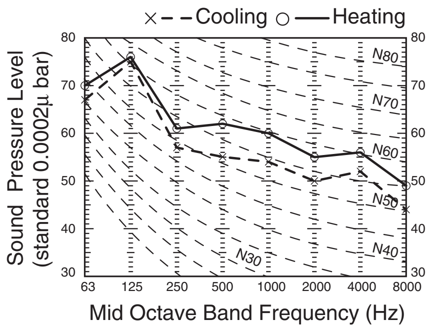
FDCA1010HKXE4



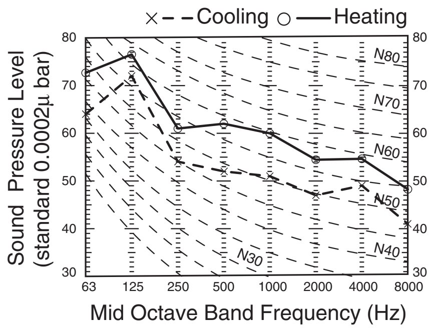
FDCA1065HKXE4



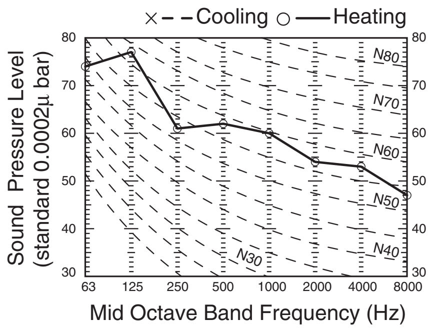
FDCA1130HKXE4



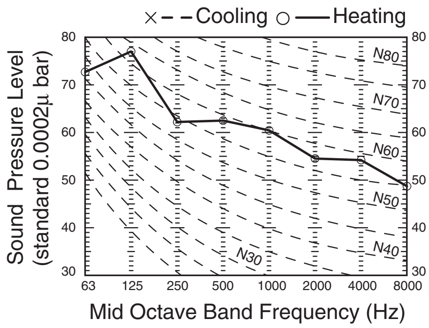
FDCA1180HKXE4



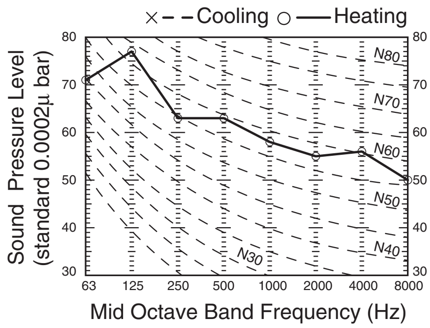
FDCA1235HKXE4



FDCA1300HKXE4



FDCA1360HKXE4



2.7 Range of Usage & Limitations

Item		System: All type					
Indoor intake air temperature (Upper, lower limits)		See capacity characteristic (page36).					
Outdoor air temperature (Upper, lower limits)		See capacity characteristic (page36).					
Indoor units that can be used in combination	Number of connected units	Outdoor 5 HP	1~8units	Outdoor 22 HP	2 ~ 36 units	Outdoor 38 HP	2 ~ 48 units
		Outdoor 8 HP	1~13units	Outdoor 24 HP	2 ~ 40 units	Outdoor 40 HP	3 ~ 48 units
		Outdoor 10 HP	1~16units	Outdoor 26 HP	2 ~ 43 units	Outdoor 42 HP	3 ~ 48 units
		Outdoor 12 HP	1~20units	Outdoor 28 HP	2 ~ 47 units	Outdoor 44 HP	3 ~ 48 units
		Outdoor 14 HP	1~23units	Outdoor 30 HP	2 ~ 48 units	Outdoor 46 HP	3 ~ 48 units
		Outdoor 16 HP	1~26units	Outdoor 32 HP	2 ~ 48 units	Outdoor 48 HP	3 ~ 48 units
		Outdoor 18 HP	1~29units	Outdoor 34 HP	2 ~ 48 units	—	—
		Outdoor 20 HP	1~33units	Outdoor 36 HP	2 ~ 48 units	—	—
	Total capacity	Outdoor 5 HP	112~182	Outdoor 22 HP	307 ~ 800	Outdoor 38 HP	532 ~ 1385
		Outdoor 8 HP	112~292	Outdoor 24 HP	340 ~ 884	Outdoor 40 HP	565 ~ 1469
		Outdoor 10 HP	140~364	Outdoor 26 HP	367 ~ 956	Outdoor 42 HP	590 ~ 1534
		Outdoor 12 HP	167~436	Outdoor 28 HP	400 ~ 1040	Outdoor 44 HP	617 ~ 1606
		Outdoor 14 HP	200~520	Outdoor 30 HP	425 ~ 1105	Outdoor 46 HP	650 ~ 1690
		Outdoor 16 HP	225~585	Outdoor 32 HP	450 ~ 1170	Outdoor 48 HP	680 ~ 1768
		Outdoor 18 HP	252~656	Outdoor 34 HP	480 ~ 1248	—	—
		Outdoor 20 HP	280~728	Outdoor 36 HP	505 ~ 1313	—	—
Total piping length		MAX. 510m (MAX. 100m)					
Single direction piping length (From the outdoor unit to the indoor unit that is the furthest)		Indoor unit MAX. 160m (MAX. 70m)					
Outdoor unit to first branching (main piping)		Max. 130m*					
Piping length after the first branching		Max. 40m*					
The piping length between outdoor units.		Within 5m after the first branch [Only for the combination use]					
Difference in height between indoor and outdoor units	When above outdoor unit	MAX. 50m (MAX. 30m)					
	When below outdoor unit	MAX. 40m (MAX. 15m)					
Difference in height between outdoor units (The same system)		MAX. 1m [Combination unit]					
Difference between an outdoor unit and on outdoor unit side branch pipe		MAX. 10m [Combination unit]					
Difference in height between indoor units		MAX. 15m					
Length of oil equalization piping		MAX. 10m [Combination unit]					
Indoor unit atmosphere (behind ceiling) temperature and humidity (FDTA, FDTWA, FDTSA, FDRA FDUMA, FDUA)		Dew point temperature 28˚C or less, relative humidity 80% or less					
Compressor stop/start frequency	1 cycle time	6 min or more (from stop to stop or from start 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					
	Interval unbalance	Within ±3% of rated voltage					

Notes (1) The figure shown inside ( ) is for 5 HP type.

(2) * is for 5 HP type. Though there are no limitations for piping length of the manifold (main pipe) and the acceptable piping length from the first branch, please ensure the total length of liquid pipe of ϕ9.52 within 50m.

3. Indoor Unit

3.1 Ceiling Recessed Type (FDTA)

3.1.1 Specifications

FDTA28KXE4A, 36KXE4A

Item \ Models			FDTA28KXE4A	FDTA36KXE4A
Nominal cooling capacity*1		kW	2.9	3.7
Nominal cooling capacity*2		kW	2.8	3.6
Nominal heating capacity*3		kW	3.2	4.0
Power source			1 Phase 220/240V 50Hz	
Noise level		dB(A)	Hi: 35 Me: 33 Lo: 31	
Exterior dimensions (Height × Width × Depth)		mm	Unit: 270 × 840 × 840 Panel: 35 × 950 × 950	
Net weight		kg	Unit: 24 Panel: 7	
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Turbo fan × 1	
	Motor & Q'ty	W	14 × 1	
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 15 Me: 14 Lo: 13	
	Fresh air intake		Possible	
	Air filter & Q'ty		Long life filter × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4") Gas line: ϕ 9.52 (3/8")	Liquid line: ϕ 6.35 (1/4") Gas line: ϕ 12.7 (1/2")
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Decorative Panel	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDTA45KXE4A, 56KXE4A

Item		Models	FDTA45KXE4A	FDTA56KXE4A
Nominal cooling capacity[*1]		kW	4.7	5.8
Nominal cooling capacity[*2]		kW	4.5	5.6
Nominal heating capacity[*3]		kW	5.0	6.3
Power source			1 Phase 220/240V 50Hz	
Noise level		dB(A)	Hi: 35 Me: 33 Lo: 31	Hi: 36 Me: 34 Lo: 32
Exterior dimensions (Height × Width × Depth)		mm	Unit: 270 × 840 × 840 Panel: 35 × 950 × 950	
Net weight		kg	Unit: 24 Panel: 7	
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Turbo fan × 1	
	Motor & Q'ty	W	14 × 1	
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 15 Me: 14 Lo: 13	
	Fresh air intake		Possible	
	Air filter & Q'ty		Long life filter × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 6.35 (1/4") Gas line: φ 12.7 (1/2")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Decorative Panel	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling[*1]	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling[*2]	27°C	19°C	35°C	24°C	
Heating[*3]	20°C	—	7°C	6°C	

FDTA71KXE4A, 90KXE4A

Item		Models	FDTA71KXE4A	FDTA90KXE4A
Nominal cooling capacity*1		kW	7.3	9.3
Nominal cooling capacity*2		kW	7.1	9.0
Nominal heating capacity*3		kW	8.0	10.0
Power source			1 Phase 220/240V 50Hz	
Noise level		dB(A)	Hi: 37 Me: 35 Lo: 33	Hi: 43 Me: 41 Lo: 38
Exterior dimensions (Height × Width × Depth)		mm	Unit: 270 × 840 × 840 Panel: 35 × 950 × 950	Unit: 295 × 840 × 840 Panel: 35 × 950 × 950
Net weight		kg	Unit: 24 Panel: 7	Unit: 26 Panel: 7
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Turbo fan × 1	
	Motor & Q'ty	W	20 × 1	40 × 1
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 15 Me: 14 Lo: 13	Hi: 21 Me: 19 Lo: 17
	Fresh air intake		Possible	
	Air filter & Q'ty		Long life filter × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 9.52 (3/8") Gas line: φ 15.88 (5/8")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Decorative Panel	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDTA112KXE4A, 140KXE4A

Item \ Models			FDTA112KXE4A	FDTA140KXE4A
Nominal cooling capacity*1		kW	11.6	14.5
Nominal cooling capacity*2		kW	11.2	14.0
Nominal heating capacity*3		kW	12.5	16.0
Power source			1 Phase 220/224V 50Hz	
Noise level		dB(A)	Hi: 43 Me: 41 Lo: 38	Hi: 45 Me: 43 Lo: 41
Exterior dimensions (Height × Width × Depth)		mm	Unit: 365 × 840 × 840 Panel: 35 × 950 × 950	
Net weight		kg	Unit: 31 Panel: 7	
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Turbo fan × 1	
	Motor & Q'ty	W	120 × 1	
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 27 Me: 23 Lo: 20	Hi: 29 Me: 26 Lo: 23
	Fresh air intake		Possible	
	Air filter & Q'ty		Long life filter × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 9.52 (3/8") Gas line: ϕ 15.88 (5/8")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Decorative Panel	

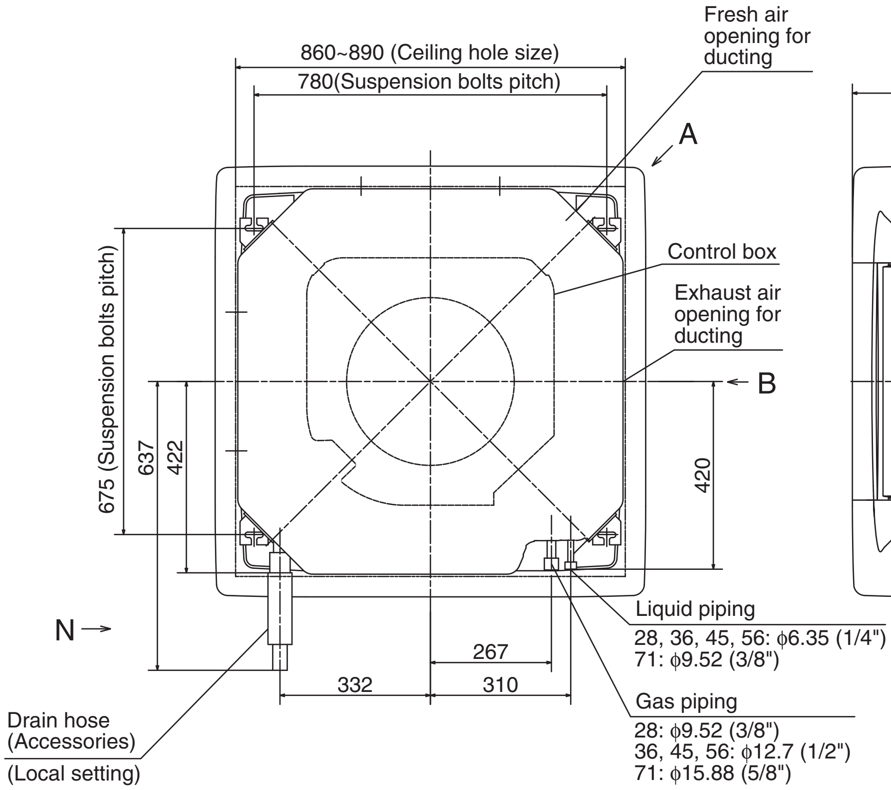
*1 ~ 3The data are measured at the following conditions.

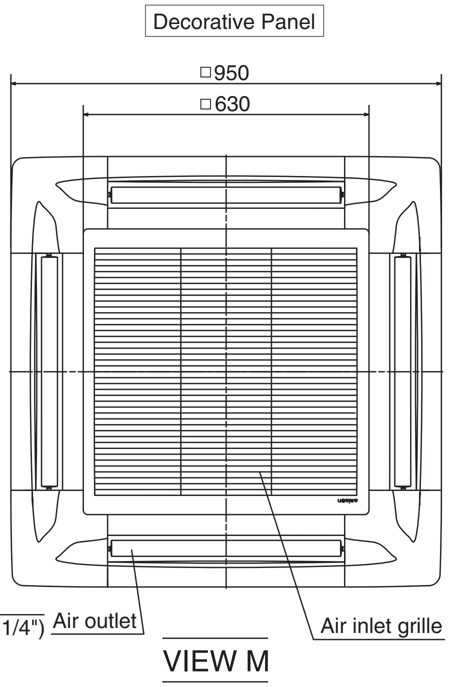
Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

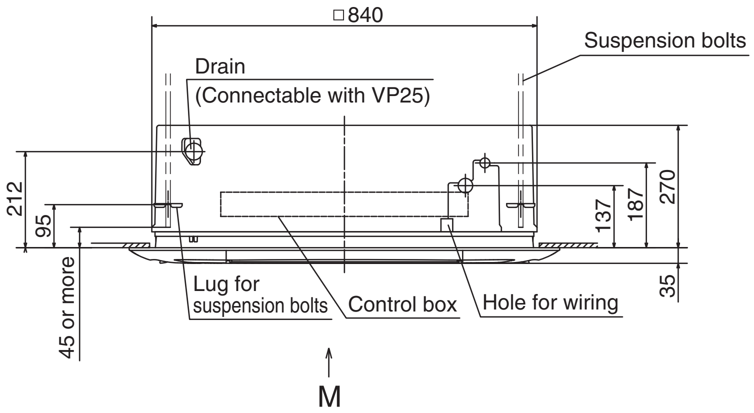
3.1.2 Exterior dimensions

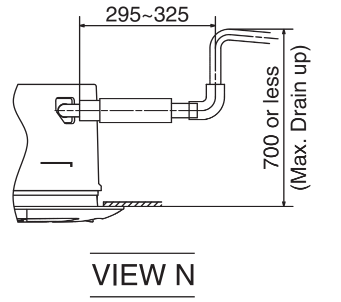
FDTA28KXE4A, 36KXE4A, 45KXE4A, 56KXE4A, 71KXE4A

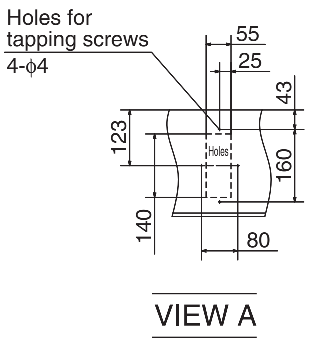
Unit: mm

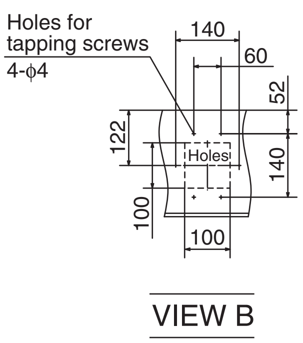


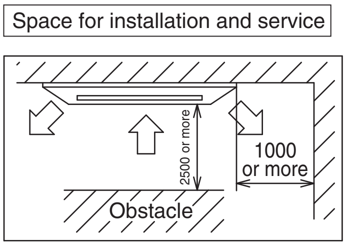






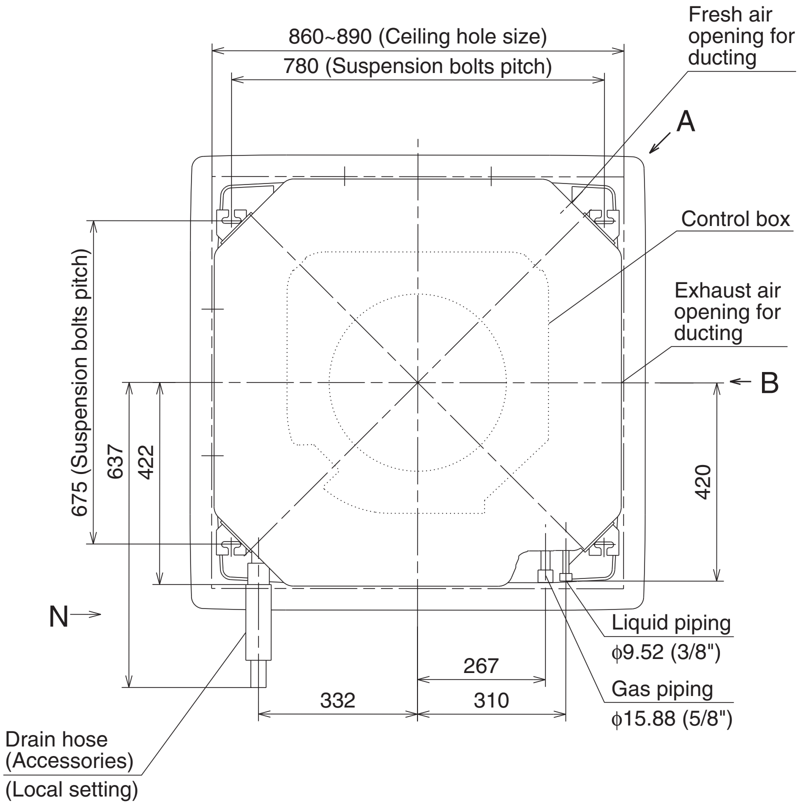


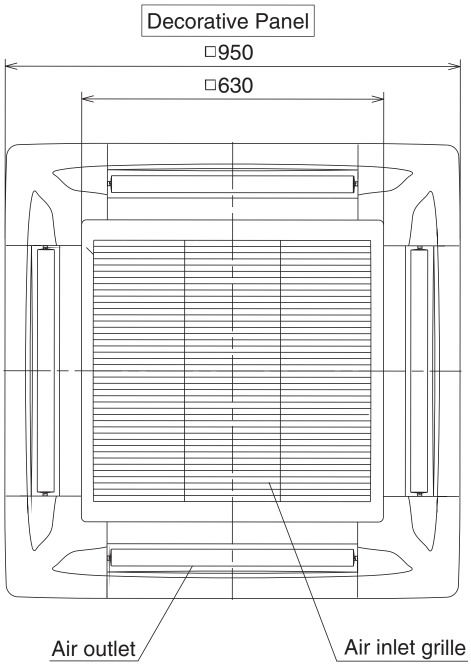




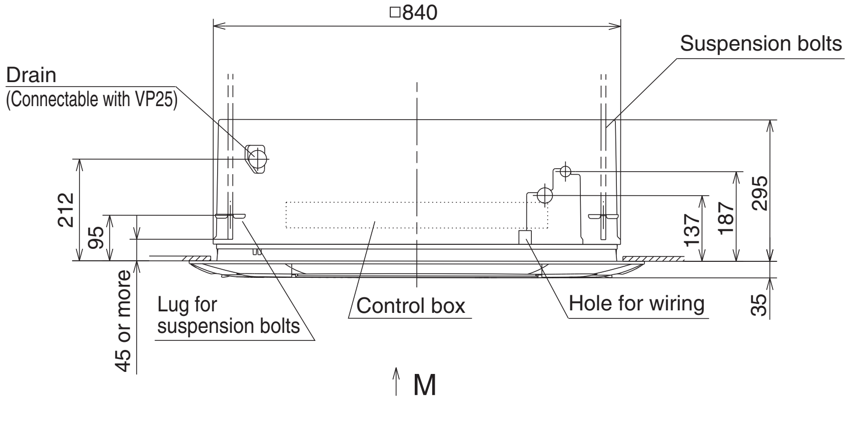
FDTA90KXE4A

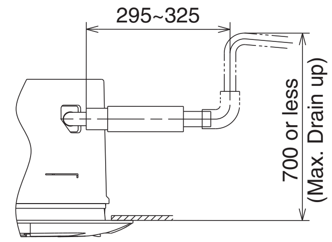
Unit: mm



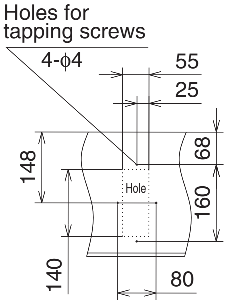


VIEW M

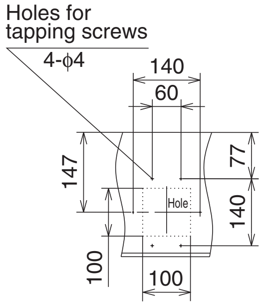




VIEW N

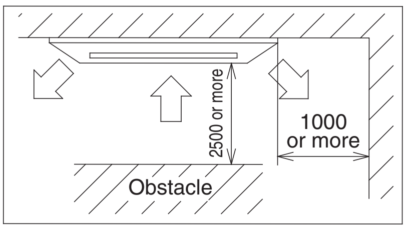


VIEW A



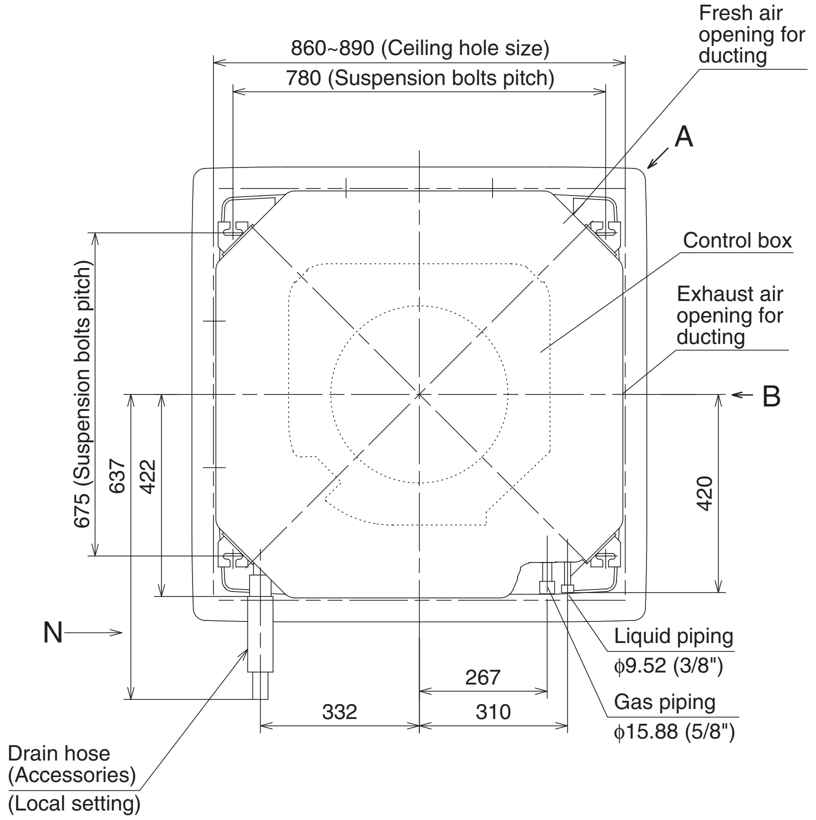
VIEW B

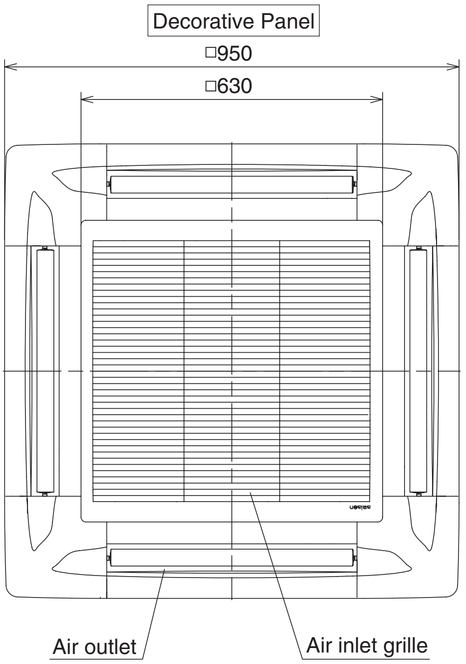
Space for installation and service



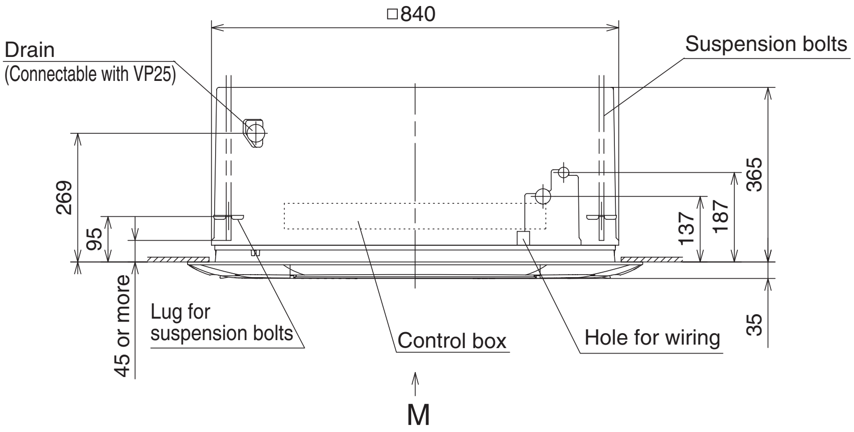
FDTA112KXE4A, 140KXE4A

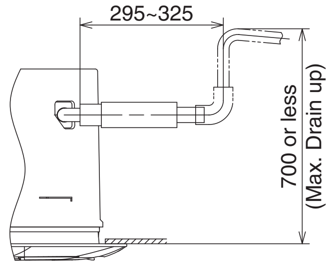
Unit: mm



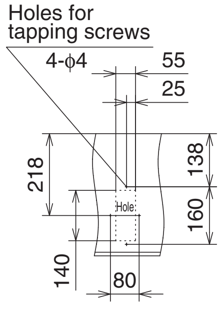


VIEW M

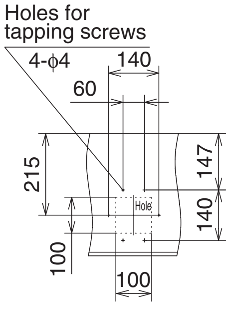




VIEW N

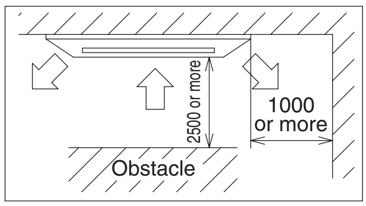


VIEW A



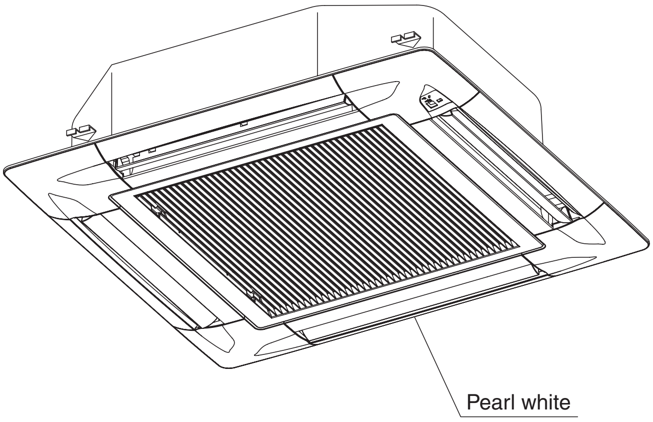
VIEW B

Space for installation and service



3.1.3 Exterior appearance

All models

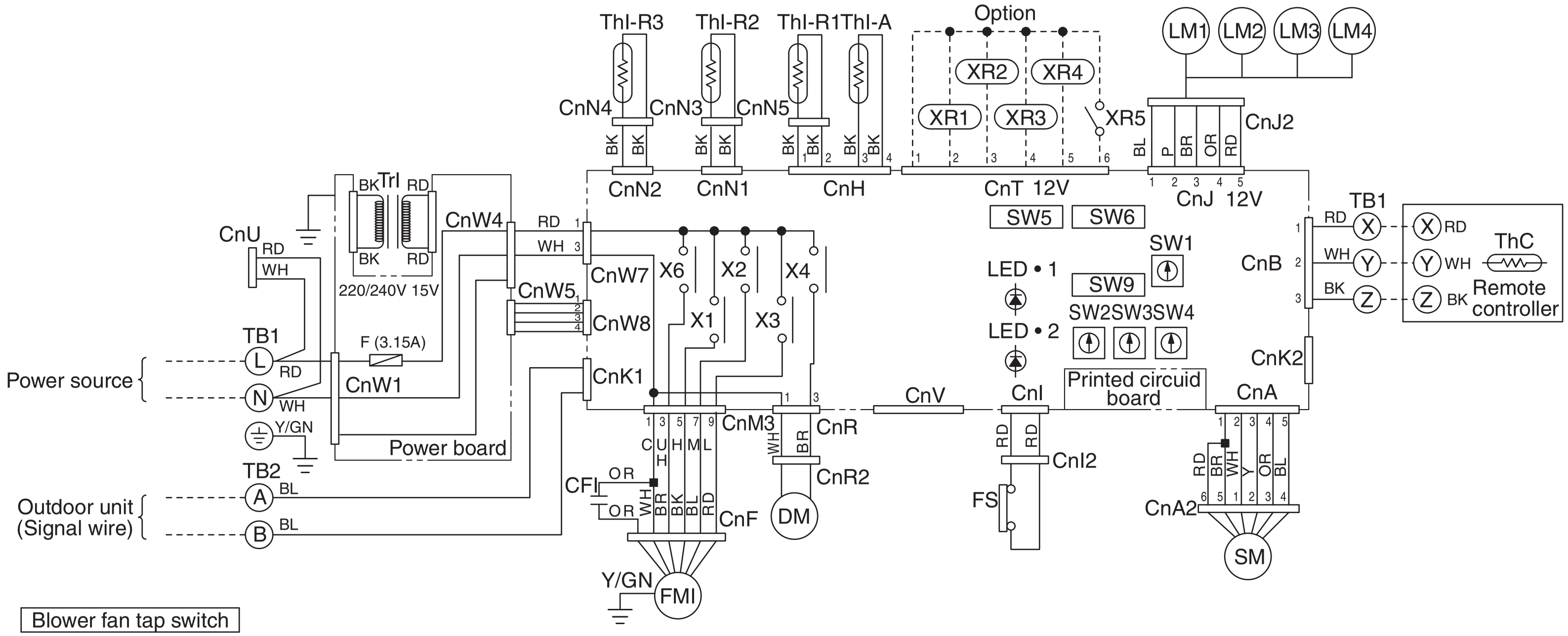


Decorative panel model (Optional)

Model	Panel Part No.
All models	T - PSA - 34W - E

3.1.4 Electrical wiring

FDTA28KXE4A, 36KXE4A, 45KXE4A, 56KXE4A, 71KXE4A, 90KXE4A



Blower fan tap switch

When increasing of static pressure is required,the following two methods are available to switch the blower fan tap. Switch to the high-speed tap with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control, high speed (High ceiling)
	OFF	Fan control, standard

② By means of function setting from the remote controller unit, set the setting Ⓒ of "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI	Fan motor	SW1	Indoor unit address ten's place	XR3	Thermo ON output (DC12V output)
CFI	Capacitor for FMI	SW2	Indoor unit address unit's place	XR4	Inspection output (DC12V output)
DM	Drain motor	SW3	Outdoor unit address ten's place	XR5	Remote operation input (volt-free contact)
FS	Float switch	SW4	Outdoor unit address unit's place	X1,2,3,6	Auxiliary relay (For FM)
LM1~4	Louver motor	SW6	Model capacity setting	X4	Auxiliary relay (For DM)
SM	Stepping motor (For Exp.v)	Trl	Transformer	TB1,2	Terminal block (○ mark)
ThI-A	Thermistor	F	Fuse	CnA~Z	Connector
ThI-R1	Thermistor	LED1	Indication lamp (Red)	■mark	Closed-end connector
ThI-R2	Thermistor	LED2	Indication lamp (Green)		
ThI-R3	Thermistor	XR1	Operation output (DC12V output)		
ThC	Thermistor	XR2	Heating output (DC12V output)		

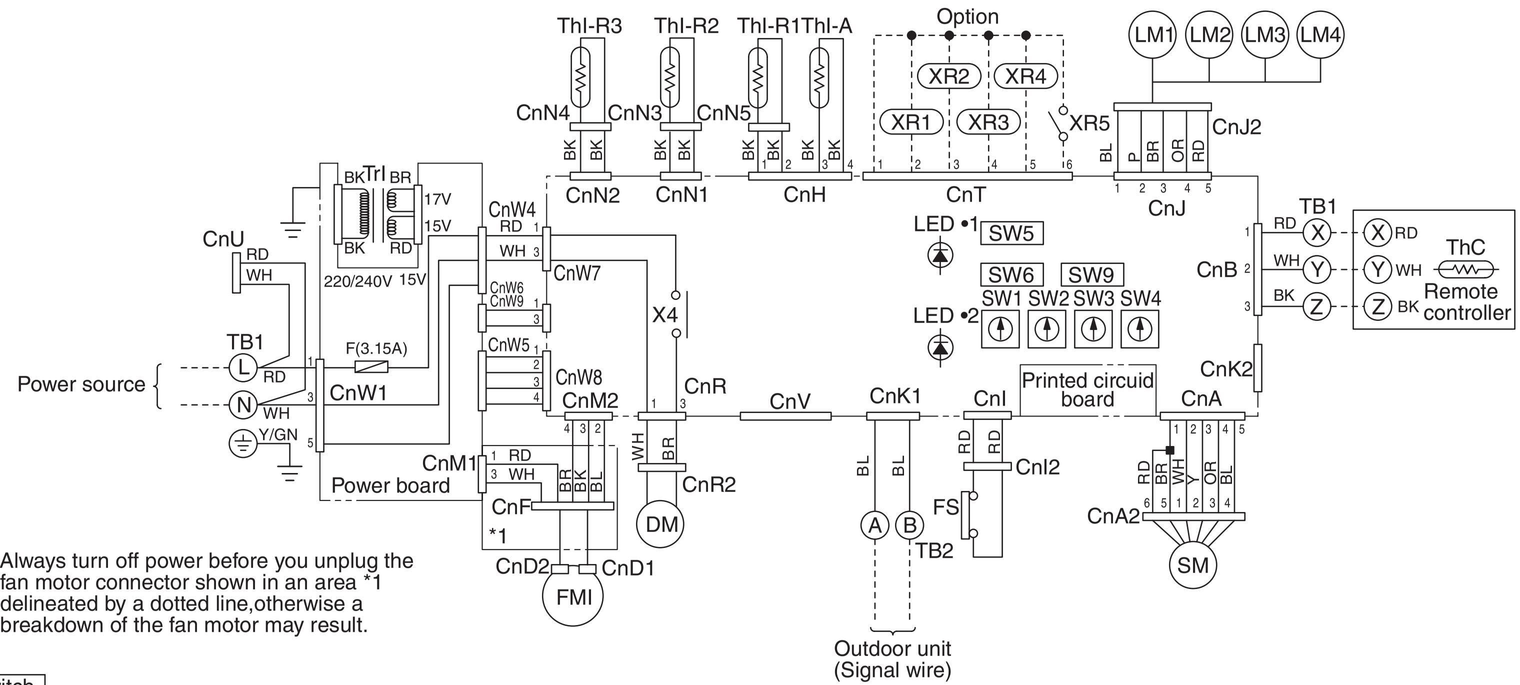
Color marks

Mark	Color	Mark	Color
BK	Black	RD	Red
BL	Blue	WH	White
BR	Brown	Y	Yellow
BR/WH	Brown/White	P	Pink
OR	Orange	Y/GN	Yellow/Green
OR/WH	Orange/White		

Function of switches

Mark		Function	
SW5-1	ON	Test run of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal: valid	
	OFF	Emergency stop signal: Invalid	

FDTA112KXE4A, 140KXE4A



Note(1) Always turn off power before you unplug the fan motor connector shown in an area *1 delineated by a dotted line,otherwise a breakdown of the fan motor may result.

Blower fan tap switch

When increasing of static pressure is required,the following two methods are available to switch the blower fan tap. Switch to the high-speed tap with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control, high speed (High ceiling)
	OFF	Fan control, standard

② By means of function setting from the remote controller unit, set the setting Ⓒ of "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI	Fan motor	SW2	Indoor unit address unit's place	XR4	Inspection output (DC12V output)
DM	Drain motor	SW3	Outdoor unit address ten's place	XR5	Remote operation input (volt-free contact)
FS	Float switch	SW4	Outdoor unit address unit's place	X4	Auxiliary relay (For DM)
LM1~4	Louver motor	SW6	Model capacity setting	TB1, 2	Terminal block (○ mark)
SM	Stepping motor (For Exp.v)	Trl	Transformer	CnA~Z	Connector
ThI-A	Thermistor	F	Fuse	■mark	Closed-end connector
ThI-R1	Thermistor	LED1	Indication lamp (Red)		
ThI-R2	Thermistor	LED2	Indication lamp (Green)		
ThI-R3	Thermistor	XR1	Operation output(DC12V output)		
ThC	Thermistor	XR2	Heating output (DC12V output)		
SW1	Indoor unit address ten's place	XR3	Thermo ON output (DC12V output)		

Color marks

Mark	Color	Mark	Color
BK	Black	RD	Red
BL	Blue	WH	White
BR	Brown	Y	Yellow
BR/WH	Brown/White	P	Pink
OR	Orange	Y/GN	Yellow/Green
OR/WH	Orange/White		

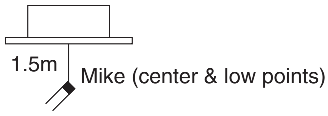
Function of switches

Mark		Function	
SW5-1	ON	Test run of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal: valid	
	OFF	Emergency stop signal: Invalid	

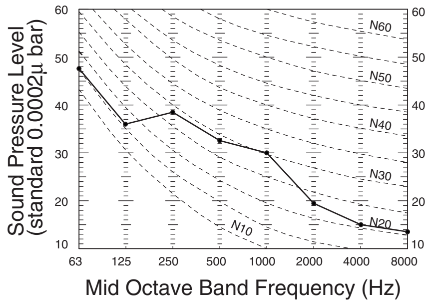
3.1.5 Noise level

Notes(1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

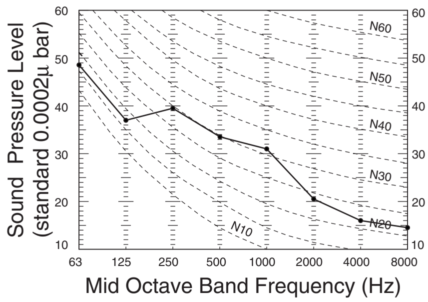
Measured based on JIS B 8616
Mike position as below



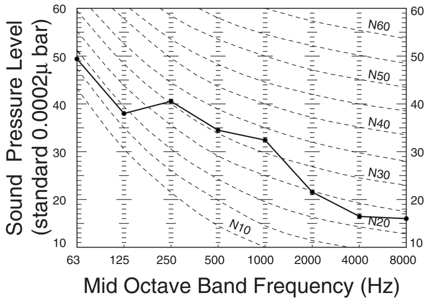
Models FDTA28KXE4A, 36KXE4A, 45KXE4A
Noise level 35 dB (A) at HIGH
33 dB (A) at MEDIUM
31 dB (A) at LOW



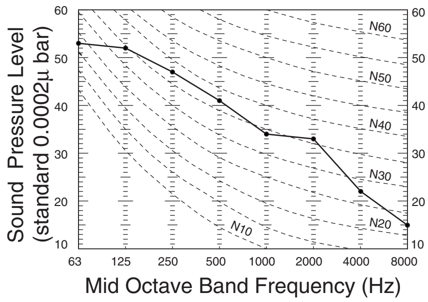
Model FDTA56KXE4A
Noise level 36 dB (A) at HIGH
34 dB (A) at MEDIUM
32 dB (A) at LOW



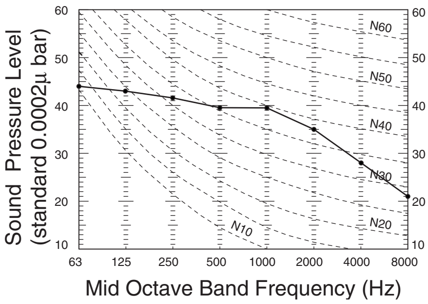
Model FDTA71KXE4A
Noise level 37 dB (A) at HIGH
35 dB (A) at MEDIUM
33 dB (A) at LOW



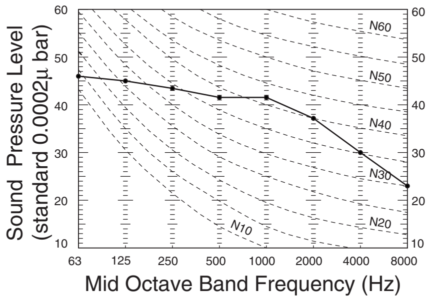
Model FDTA90KXE4A
Noise level 43 dB (A) at HIGH
41 dB (A) at MEDIUM
38 dB (A) at LOW



Model FDTA112KXE4A
Noise level 43 dB (A) at HIGH
41 dB (A) at MEDIUM
38 dB (A) at LOW



Model FDTA140KXE4A
Noise level 45 dB (A) at HIGH
43 dB (A) at MEDIUM
41 dB (A) at LOW



3.2 Ceiling Recessed Compact Type (FDTCA)

3.2.1 Specifications

FDTCA224KXE4A, 28KXE4A

Item \ Models			FDTCA22KXE4A	FDTCA28KXE4A
Nominal cooling capacity*1		W	2200	2800
Nominal heating capacity*2		W	2500	3200
Power source			1 Phase 220 / 240V 50Hz	
Noise level		dB(A)	Hi: 35 Me: 33 Lo: 32	
Exterior dimensions (Height × Width × Depth)		mm	Unit: 248 × 570 × 570 Panel: 35 × 700 × 700	
Net weight		kg	Unit: 15 Panel: 3.5	
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Turbo fan × 1	
	Motor	W	50 × 1	
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 9.5 Me: 8.5 Lo: 8	
	Fresh air intake		Possible	
	Air filter & Q'ty		Long life filter × 1 (Washable)	
Shock & vibration absorber			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 6.35 (1/4") Gas line: φ 9.52 (3/8")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Decorative Panel	

*1 ~ 2 The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19°C	35°C	24°C	ISO-T1
Heating*2	20°C	—	7°C	6°C	

Note This packaged air-conditioner is manufactured and tested in conformity with the following standard.
ISO-T1 "UNITARY AIR-CONDITIONERS"

Product Specifications

FDTCA36KXE4A, 45KXE4A, 56KXE4A

Item \ Models			FDTCA36KXE4A	FDTCA45KXE4A	FDTCA45KXE4A
Nominal cooling capacity*1		W	3600	4500	5600
Nominal heating capacity*2		W	4000	5000	6300
Power source			1 Phase 220 / 240V 50Hz		
Noise level		dB(A)	Hi: 38 Me: 36 Lo: 34	Hi: 40 Me: 38 Lo: 36	Hi: 45 Me: 42 Lo: 39
Exterior dimensions (Height × Width × Depth)		mm	Unit: 248 × 570 × 570 Panel: 35 × 700 ×700		
Net weight		kg	Unit: 16 Panel: 3.5		
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing		
	Refrigerant control		Electronic Expansion Valve		
Air handling equipment	Fan type & Q'ty		Turbo fan × 1		
	Motor	W	50 × 1		
	Starting method		Line starting		
	Air flow (Standard)	CMM	Hi: 10 Me: 9 Lo: 8	Hi: 11 Me: 10 Lo: 9	Hi: 13 Me: 11.5 Lo: 10
	Fresh air intake		Possible		
	Air filter & Q'ty		Long life filter × 1 (Washable)		
Shock & vibration absorber			Rubber sleeve (for fan motor)		
Insulation (noise & heat)			Polyurethane foam		
Operation control Operation switch			Remote control switch (Optional: RC-E1)		
Room temperature control			Thermostat by electronics		
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat		
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 6.35 (1/4") Gas line: φ 12.7 (1/2")		
	Connecting method		Flare piping		
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)		
	Insulation for piping		Necessary (both Liquid & Gas lines)		
Accessories			Mounting kit, Drain hose		
Optional parts			Decorative Panel		

*1 ~ 2 The data are measured at the following conditions.

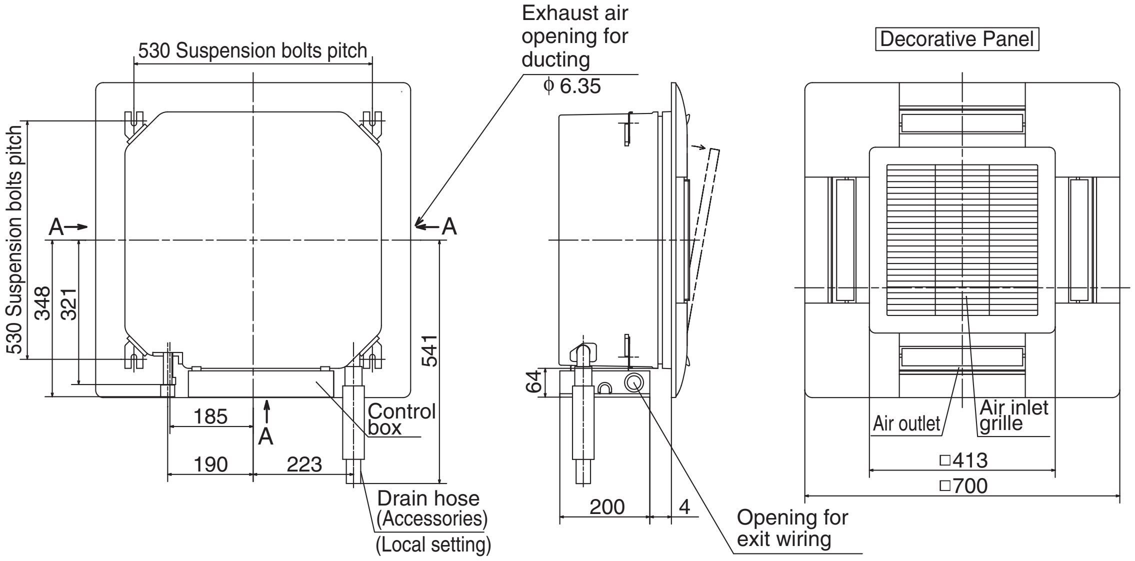
Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19°C	35°C	24°C	ISO-T1
Heating*2	20°C	—	7°C	6°C	

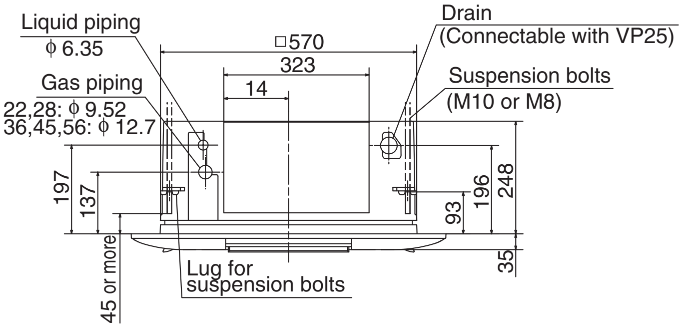
Note This packaged air-conditioner is manufactured and tested in conformity with the following standard.
ISO-T1 "UNITARY AIR-CONDITIONERS"

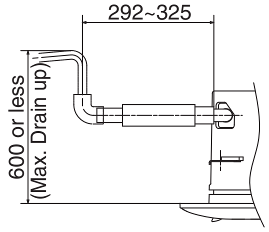
3.2.2 Exterior dimensions

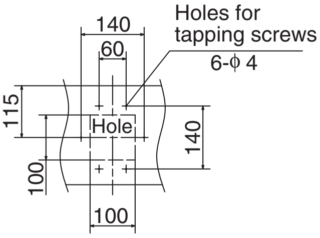
FDTCA22KXE4A, 28KXE4A, 36KXE4A, 45KXE4A, 56KXE4A

Unit:mm

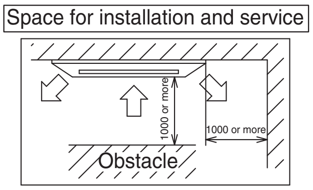






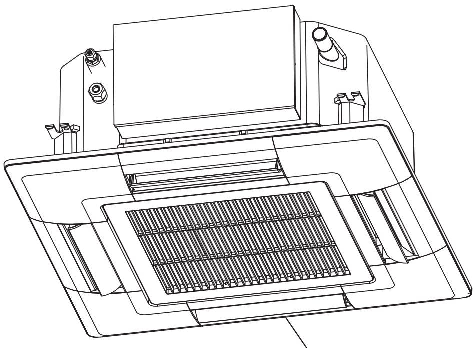


VIEW A



3.2.3 Exterior appearance

All models

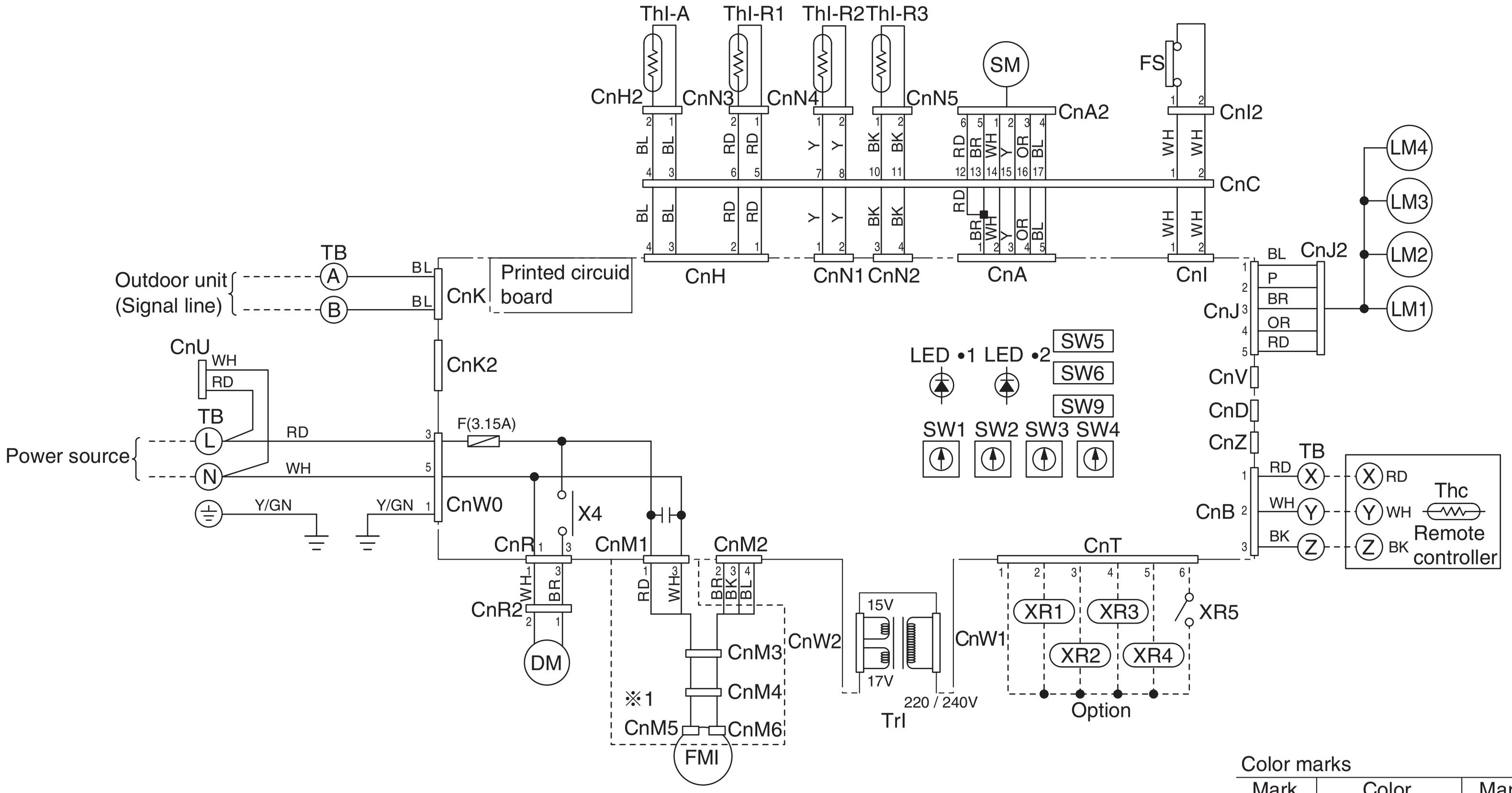


Decorative Panel model(Optional)

Item / Model	Panel Part No.
FDTCA22, 28 type	T-PSA-24W-E
FDTCA36, 45, 56 type	T-PSA-24W-E

3.2.4 Electrical wiring

FDTCA22KXE4A, 28KXE4A, 36KXE4A, 45KXE4A, 56KXE4A



Note (1) Always turn off power before you unplug the fan motor connector shown in an area ※1 delineated by a dotted line, otherwise a breakdown of the fan motor may result.

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI	Fan motor	SW2	Indoor unit address unit's place	XR4	Inspection output (DC12V output)
DM	Drain motor	SW3	Outdoor unit address ten's place	XR5	Remote operation input (volt-free contact)
FS	Float switch	SW4	Outdoor unit address unit's place	X4	Auxiliary relay (For DM)
LM1~4	Louver motor	SW6	Model capacity setting	TB	Terminal block (○mark)
SM	Stepping motor (For Exp.v)	TrI	Transformer	CnA~Z	Connector
ThI-A	Thermistor	F	Fuse	■mark	Closed-end connector
ThI-R1	Thermistor	LED1	Indication lamp (Red)		
ThI-R2	Thermistor	LED2	Indication lamp (Green)		
ThI-R3	Thermistor	XR1	Operation output (DC12V output)		
Thc	Thermistor	XR2	Heating output (DC12V output)		
SW1	Indoor unit address ten's place	XR3	Thermo ON output (DC12V output)		

Color marks

Mark	Color	Mark	Color
BK	Black	WH	White
BL	Blue	Y	Yellow
BR	Brown	P	Pink
OR	Orange	Y / GN	Yellow / Green
RD	Red		

Function of switches

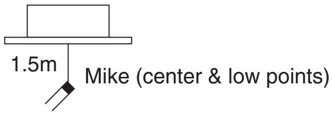
Mark		Function	
SW5-1	ON	Testrun of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Rus stop
SW5-4	ON	Emergency stop signal: Invalid	
	OFF	Emergency stop signal: valid	
SW9-4	ON	Fan control: UH, H, M	
	OFF	Fan control: H, M, L	

Product Specifications

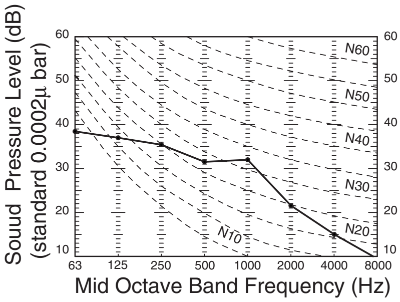
3.2.5 Noise level

Notes (1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

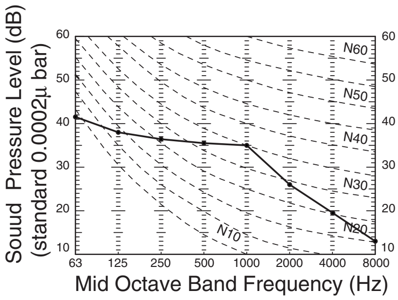
Measured based on JIS B 8616
Mike position as below



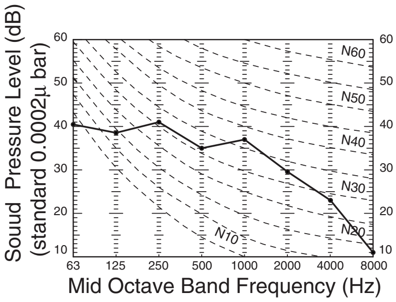
Model FDTCA22KXE4A, 28KXE4A
Noise level 35 dB (A) at HIGH
33 dB (A) at MEDIUM
32 dB (A) at LOW



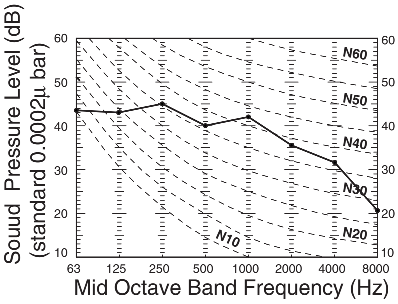
Model FDTCA36KXE4A
Noise level 38 dB (A) at HIGH
36 dB (A) at MEDIUM
34 dB (A) at LOW



Model FDTCA45KXE4A
Noise level 40 dB (A) at HIGH
38 dB (A) at MEDIUM
36 dB (A) at LOW



Model FDTCA56KXE4A
Noise level 45 dB (A) at HIGH
42 dB (A) at MEDIUM
39 dB (A) at LOW



3.3 2-way Outlet Ceiling Recessed Type (FDTWA)

3.3.1 Specifications

FDTWA28KXE4A, 45KXE4A

Item \ Models			FDTWA28KXE4A	FDTWA45KXE4A
Nominal cooling capacity*1		kW	2.9	4.7
Nominal cooling capacity*2		kW	2.8	4.5
Nominal heating capacity*3		kW	3.2	5.0
Power source			1 Phase 220/240V 50Hz	
Noise level		dB(A)	Hi: 39 Me: 36 Lo: 33	
Exterior dimensions (Height × Width × Depth)		mm	Unit: 285 × 817 × 620 Panel: 8 × 1055 × 680	
Net weight		kg	Unit: 19 Panel: 7	
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Turbo fan × 1	
	Motor & Q'ty	W	30 × 1	
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 14 Me: 12 Lo: 10	
	Fresh air intake		Possible	
	Air filter & Q'ty		Long life filter × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4") Gas line: ϕ 9.52 (3/8")	Liquid line: ϕ 6.35 (1/4") Gas line: ϕ 12.7 (1/2")
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Decorative Panel	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

Product Specifications

FDTWA56KXE4A, 71KXE4A

Item		Models	FDTWA56KXE4A	FDTWA71KXE4A
Nominal cooling capacity*1		kW	5.8	7.3
Nominal cooling capacity*2		kW	5.6	7.1
Nominal heating capacity*3		kW	6.3	8.0
Power source			1 Phase 220/224V 50Hz	
Noise level		dB(A)	Hi: 39 Me: 36 Lo: 33	Hi: 41 Me: 38 Lo: 35
Exterior dimensions (Height × Width × Depth)		mm	Unit: 285 × 817 × 620 Panel: 8 × 1055 × 680	Unit: 335 × 1054 × 620 Panel: 8 × 1300 × 680
Net weight		kg	Unit: 19 Panel: 7	Unit: 26 Panel: 9
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Turbo fan × 1	
	Motor & Q'ty	W	30 × 1	35 × 1
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 14 Me: 12 Lo: 10	Hi: 16 Me: 13 Lo: 11
	Fresh air intake		Possible	
	Air filter & Q'ty		Long life filter × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4") Gas line: ϕ 12.7 (1/2")	Liquid line: ϕ 9.52 (3/8") Gas line: ϕ 15.88 (5/8")
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Decorative Panel	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDTWA90KXE4A, 112KXE4A

Item		Models	FDTWA90KXE4A	FDTWA112KXE4A
Nominal cooling capacity*1		kW	9.3	11.6
Nominal cooling capacity*2		kW	9.0	11.2
Nominal heating capacity*3		kW	10.0	12.5
Power source			1 Phase 220/224V 50Hz	
Noise level		dB(A)	Hi: 41 Me: 39 Lo: 36	Hi: 44 Me: 41 Lo: 38
Exterior dimensions (Height × Width × Depth)		mm	Unit: 335 × 1054 × 620 Panel: 8 × 1300 × 680	Unit: 357 × 1524 × 620 Panel: 8 × 1770 × 680
Net weight		kg	Unit: 26 Panel: 9	Unit: 38 Panel: 11
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Turbo fan × 1	Turbo fan × 2
	Motor & Q'ty	W	40 × 1	40 × 2
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 45 Me: 42 Lo: 39	Hi: 28 Me: 25 Lo: 23
	Fresh air intake		Possible	
	Air filter & Q'ty		Long life filter × 1 (Washable)	Long life filter × 2 (Washable)
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 9.52 (3/8") Gas line: ϕ 15.88 (5/8")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Decorative Panel	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDTWA140KXE4A

Item \ Models			FDTWA140KXE4A
Nominal cooling capacity*1		kW	14.5
Nominal cooling capacity*2		kW	14.0
Nominal heating capacity*3		kW	16.0
Power source			1 Phase 220/224V 50Hz
Noise level		dB(A)	Hi: 45 Me: 42 Lo: 39
Exterior dimensions (Height × Width × Depth)		mm	Unit: 357 × 1524 × 620 Panel: 8 × 1770 × 680
Net weight		kg	Unit: 38 Panel: 11
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing
	Refrigerant control		Electronic Expansion Valve
Air handling equipment	Fan type & Q'ty		Turbo fan × 2
	Motor & Q'ty	W	50 × 2
	Starting method		Line starting
	Air flow (Standard)	CMM	Hi: 32 Me: 28 Lo: 24
	Fresh air intake		Possible
	Air filter & Q'ty		Long life filter × 2 (Washable)
Shock & vibration isolator			Rubber sleeve (for fan motor)
Insulation (noise & heat)			Polyurethane foam
Operation control Operation switch			Remote control switch (Optional: RC-E1)
Room temperature control			Thermostat by electronics
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 9.52 (3/8") Gas line: ϕ 15.88 (5/8")
	Connecting method		Flare piping
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)
	Insulation for piping		Necessary (both Liquid & Gas lines)
Accessories			Mounting kit, Drain hose
Optional parts			Decorative Panel

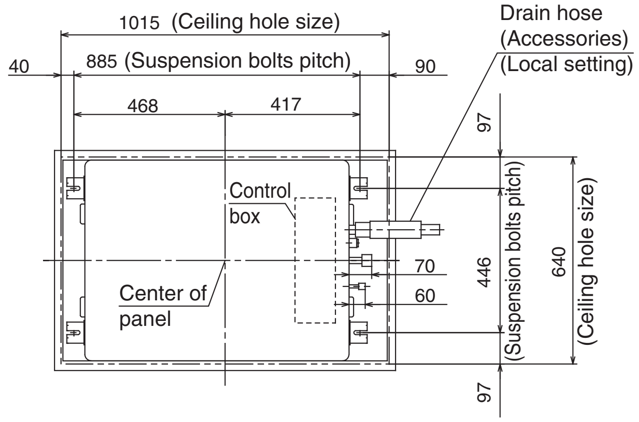
*1 ~ 3The data are measured at the following conditions.

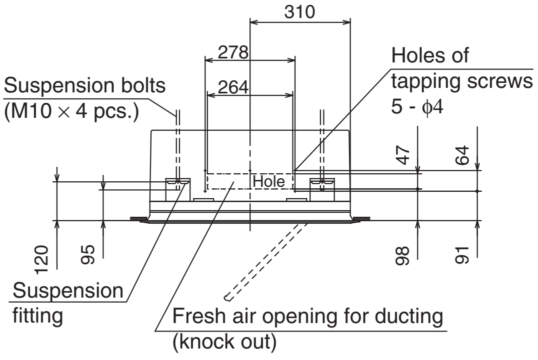
Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

3.3.2 Exterior dimensions

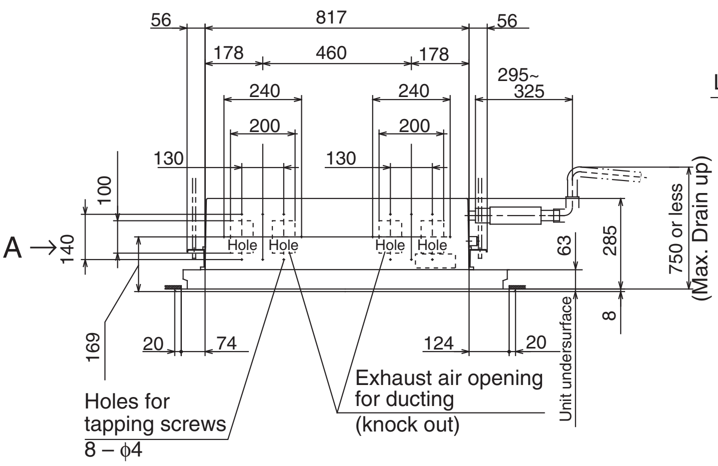
FDTWA28KXE4A, 45KXE4A, 56KXE4A

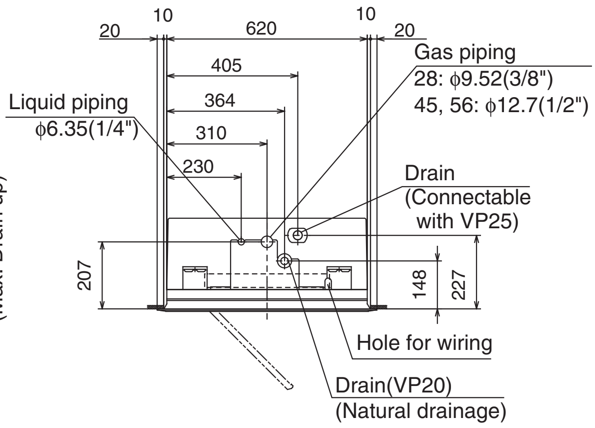
Unit : mm



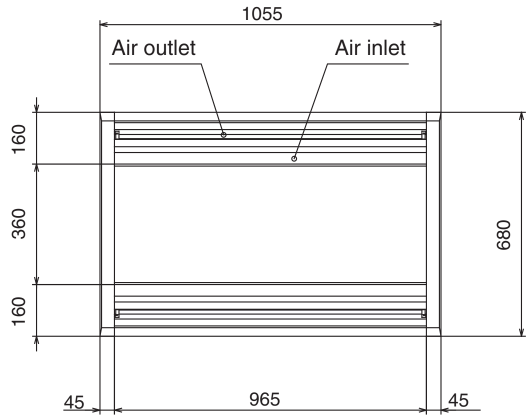


VIEW A

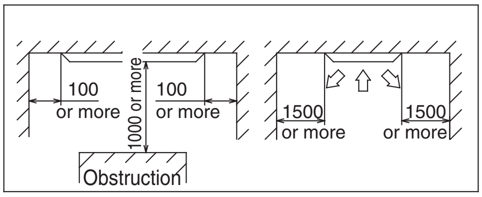




Decorative Panel

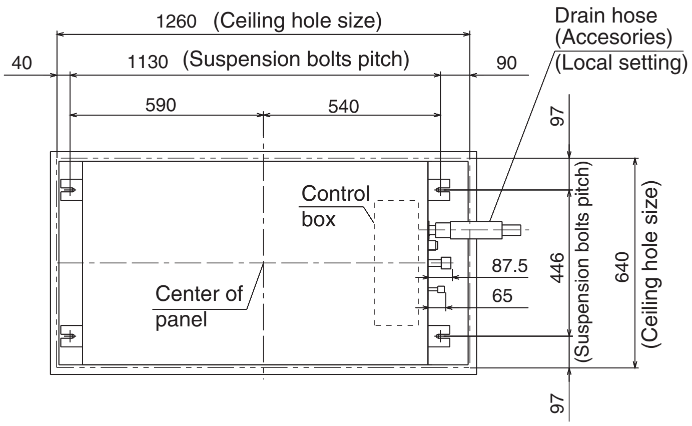


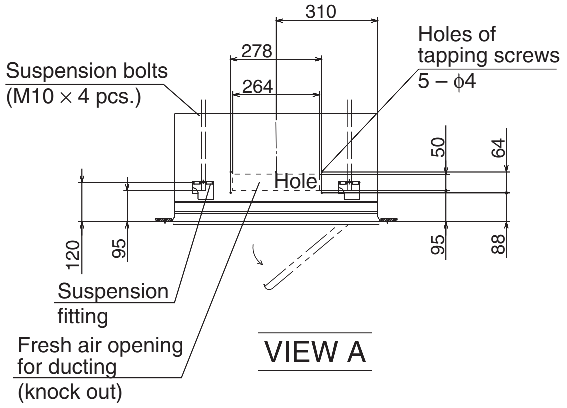
Space for installation and service

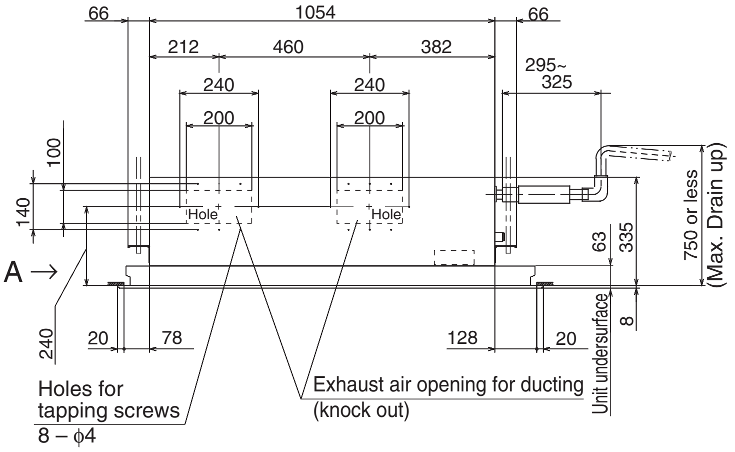


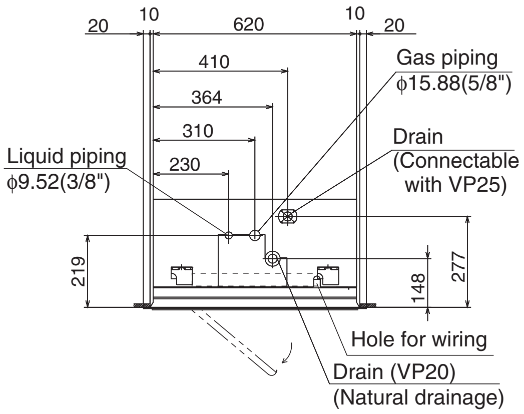
FDTWA71KXE4A, 90KXE4A

Unit : mm

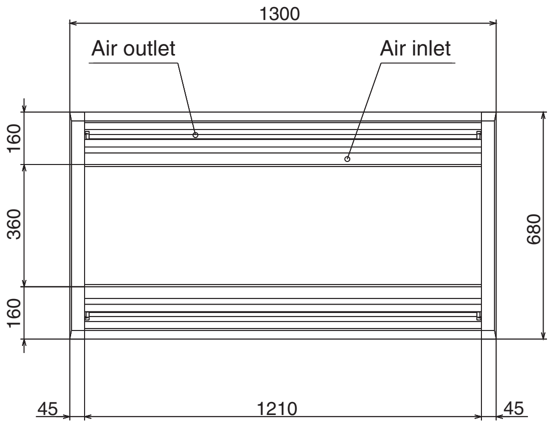




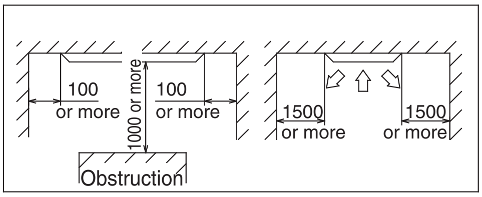




Decorative Panel

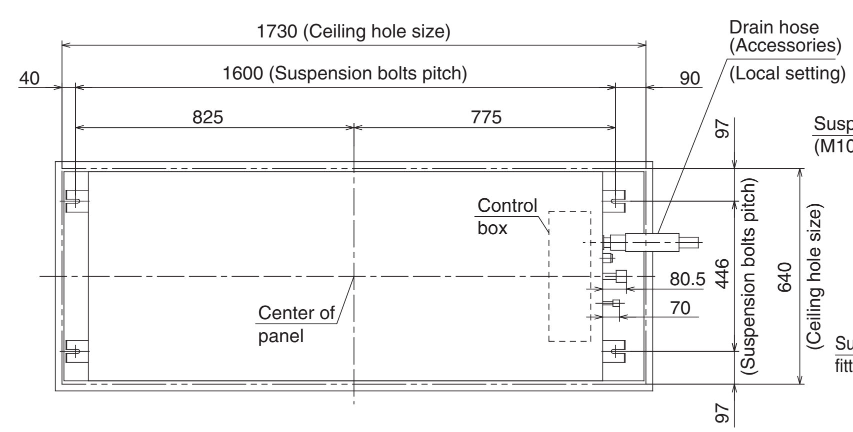


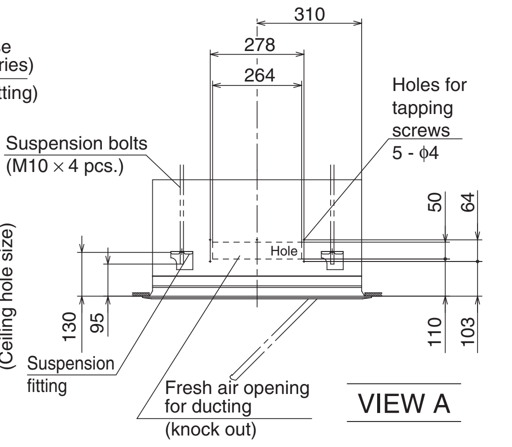
Space for installation and service

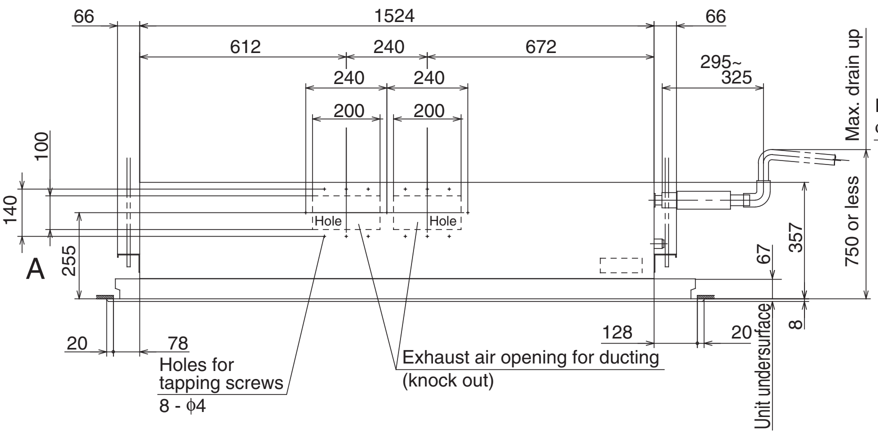


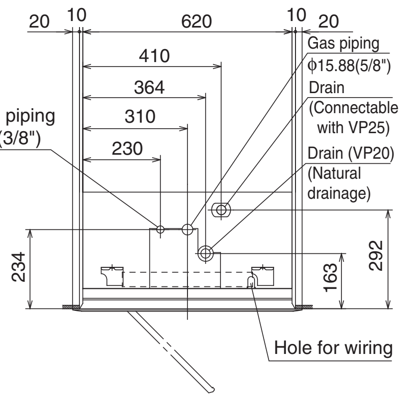
FDTWA112KXE4A, 140KXE4A

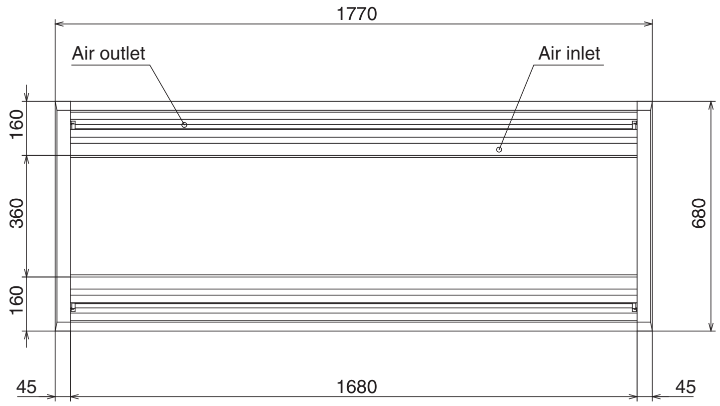
Unit : mm





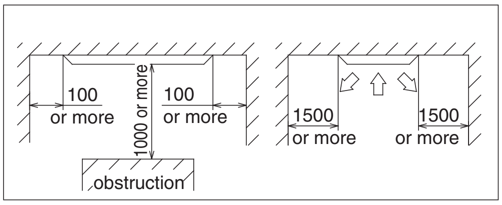






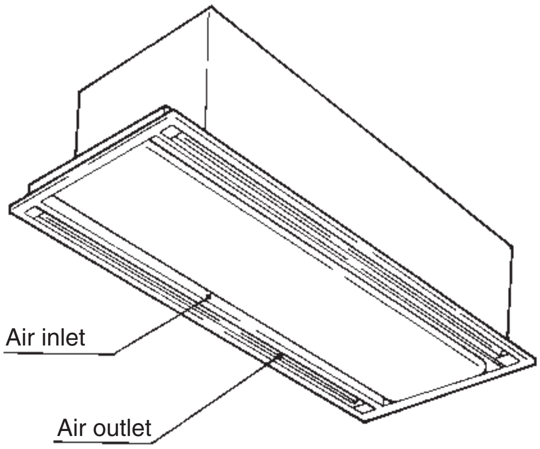
Decorative Panel

Space for installation and service



3.3.3 Exterior appearance

All models



Decorative panel

(i) Standard type

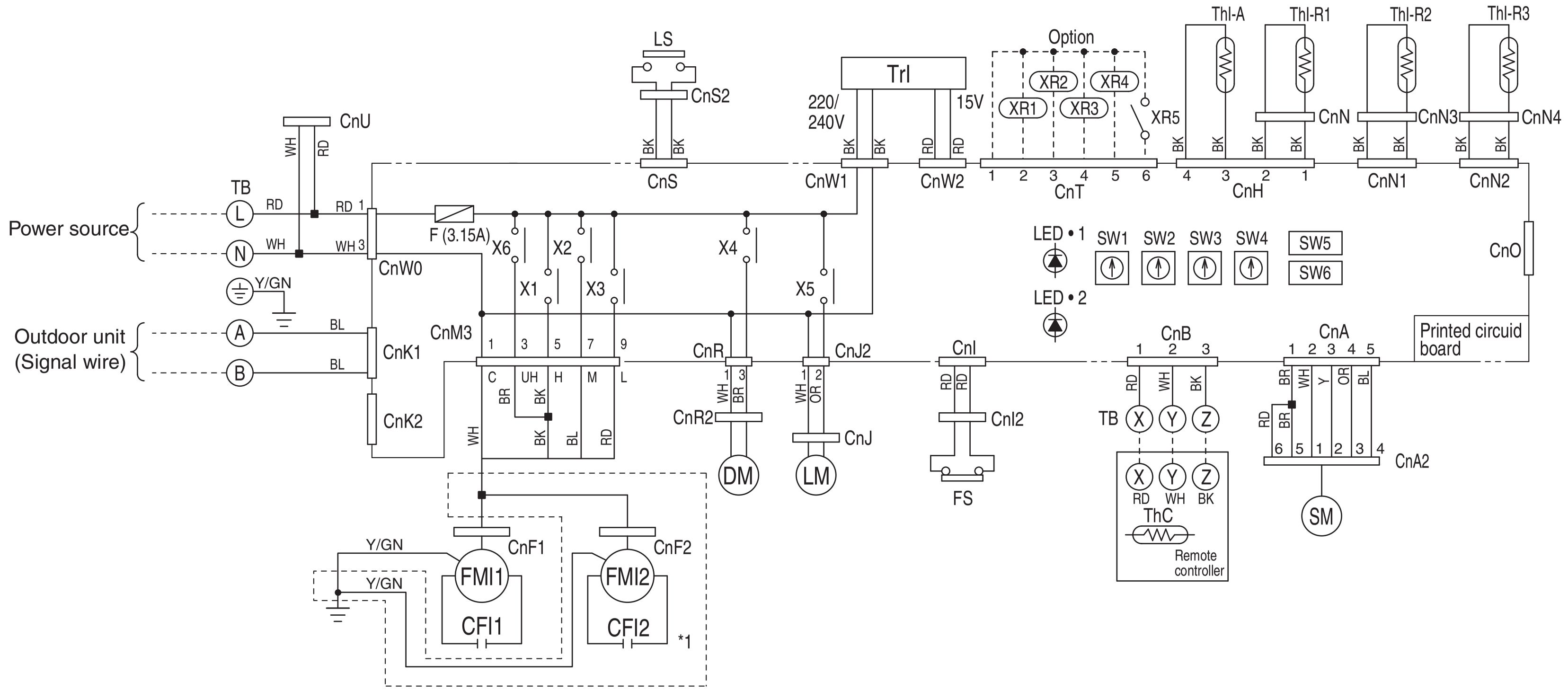
Panel part No.	Type	Panel color	Applicable model
TW-PSA-22W-E	With Auto swing	Pearl white	FDTWA28,45,56
TW-PSA-32W-E			FDTWA71,90
TW-PSA-42W-E			FDTWA112,140

(ii)Attachment of ceiling material type

Panel part No.	Type	Panel color	Applicable model
TW-PSB-28W-E	With Auto swing	Misty white	FDTWA28,45,56
TW-PSB-38W-E			FDTWA71,90
TW-PSB-48W-E			FDTWA112,140

3.3.4 Electrical wiring

All models



Note(1) *1. FMI2 is equipped only for 112,140.

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI1,2	Fan motor	SW1	Indoor unit address ten's place	XR3	Thermo ON output(DC12V output)
CFI1,2	Capacitor for FMI	SW2	Indoor unit address unit's place	XR4	Inspection output(DC12V output)
DM	Drain motor	SW3	Outdoor unit address ten's place	XR5	Remote operation input(volt-free contact)
FS	Float switch	SW4	Outdoor unit address unit's place	X1,2,3,6	Auxiliary relay(For FM)
LM	Louver motor	SW6	Model capacity setting	X4	Auxiliary relay(For DM)
SM	Stepping motor(For Exp.v)	Trl	Transformer	X5	Auxiliary relay(For LM)
Thl-A	Thermistor	F	Fuse	TB	Terminal block(○ mark)
Thl-R1	Thermistor	LED1	Indication lamp(Red)	CnA~Z	Connector
Thl-R2	Thermistor	LED2	Indication lamp(Green)	■mark	Closed-end connector
Thl-R3	Thermistor	XR1	Operation output(DC12V output)		
ThC	Thermistor	XR2	Heating output(DC12V output)		

Color marks

Mark	Color	Mark	Color
BK	Black	RD	Red
BL	Blue	WH	White
BR	Brown	Y	Yellow
OR	Orange	Y/GN	Yellow/Green

Function of switches

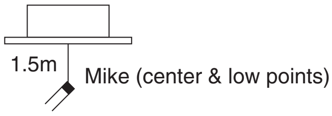
Mark		Function	
SW5-1	ON	Test run of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal:Invalid	
	OFF	Emergency stop signal:valid	

Product Specifications

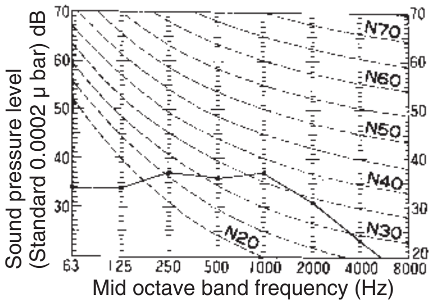
3.3.5 Noise level

Notes(1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

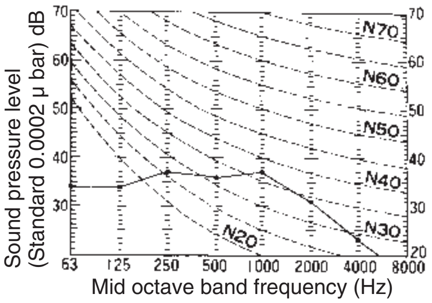
Measured based on JIS B 8616
Mike position as below



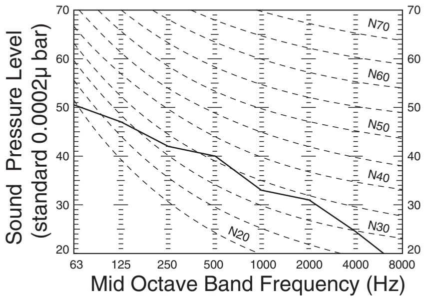
Model FDTWA28KXE4, 45KXE4, 56KXE4
Noise level 39 dB (A) at HIGH
36 dB (A) at MEDIUM
33 dB (A) at LOW



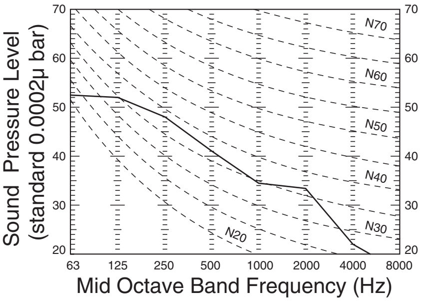
Model FDTWA71KXE4
Noise level 41 dB (A) at HIGH
38 dB (A) at MEDIUM
35 dB (A) at LOW



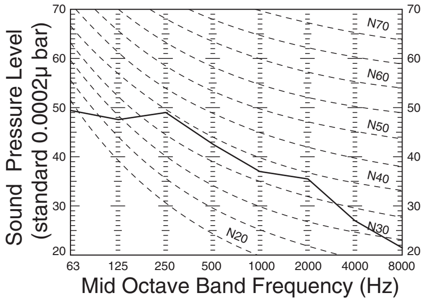
Model FDTWA90KXE4
Noise level 41 dB (A) at HIGH
39 dB (A) at MEDIUM
36 dB (A) at LOW



Model FDTWA112KXE4
Noise level 44 dB (A) at HIGH
41 dB (A) at MEDIUM
38 dB (A) at LOW



Model FDTWA140KXE4
Noise level 45 dB (A) at HIGH
42 dB (A) at MEDIUM
39 dB (A) at LOW



3.4 Ceiling Recessed Single Air Supply Port Type (FDTQA)

3.4.1 Specifications

FDTQA22KXE4A

Item		Model	FDTQA22KXE4A			
Panel name			Direct blow panel		Duct panel[*4]	
Panel model (Option)			TQ-PSA-13W-E	TQ-PSB-13W-E	QR-PNA-13W-E	QR-PNB-13W-E
Nominal cooling capacity[*1]		kW	2.3			
Nominal cooling capacity[*2]		kW	2.2			
Nominal heating capacity[*3]		kW	2.5			
Power source			1 Phase 220/240V 50Hz			
Noise level		dB(A)	Hi: 38 Lo: 34		Hi: 42 Lo: 39	
Exterior dimensions (Height × Width × Depth)		mm	Unit: 250 × 570 × 570 Panel: 35 × 625 × 650	Unit: 250 × 570 × 570 Panel: 35 × 780 × 650	Unit: 250 × 570 × 570 Panel: 35 × 625 × 650	Unit: 250 × 570 × 570 Panel: 35 × 780 × 650
Net weight		kg	Unit: 19 Panel: 2.5	Unit: 19 Panel: 3	Unit: 19 Panel: 2.5	Unit: 19 Panel: 3
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing			
	Refrigerant control		Electronic Expansion Valve			
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 1			
	Motor & Q'ty	W	20 × 1			
	Starting method		Line starting			
	Air flow (Standard)	CMM	Hi: 7 Lo: 5.4		Hi: 7 Lo: 6.5	
	Fresh air intake		Possible			
	Air filter & Q'ty		Long life filter × 1 (Washable)			
Shock & vibration isolator			Rubber sleeve (for fan motor)			
Insulation (noise & heat)			Polyurethane foam			
Operation control Operation switch			Remote control switch (Optional: RC-E1)			
Room temperature control			Thermostat by electronics			
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat			
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4"), Gas line: ϕ 9.52 (3/8")			
	Connecting method		Flare piping			
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)			
	Insulation for piping		Necessary (both Liquid & Gas lines)			
Accessories			Mounting kit, Drain hose			
Optional parts			Decorative Panel			

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling[*1]	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling[*2]	27°C	19°C	35°C	24°C	
Heating[*3]	20°C	—	7°C	6°C	

*4 This is the panel to be used when modified to the Duct panel type on site. See page 289 for the execution.

FDTQA28KXE4A

Item		Model	FDTQA28KXE4A			
Panel name			Direct blow panel		Duct panel*4	
Panel model (Option)			TQ-PSA-13W-E	TQ-PSB-13W-E	QR-PNA-13W-E	QR-PNB-13W-E
Nominal cooling capacity*1		kW	2.9			
Nominal cooling capacity*2		kW	2.8			
Nominal heating capacity*3		kW	3.2			
Power source			1 Phase 220V 50Hz			
Noise level		dB(A)	Hi: 38 Lo: 34		Hi: 42 Lo: 39	
Exterior dimensions (Height × Width × Depth)		mm	Unit: 250 × 570 × 570 Panel: 35 × 625 × 650	Unit: 250 × 570 × 570 Panel: 35 × 780 × 650	Unit: 250 × 570 × 570 Panel: 35 × 625 × 650	Unit: 250 × 570 × 570 Panel: 35 × 780 × 650
Net weight		kg	Unit: 19 Panel: 2.5	Unit: 19 Panel: 3	Unit: 19 Panel: 2.5	Unit: 19 Panel: 3
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing			
	Refrigerant control		Electronic Expansion Valve			
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 1			
	Motor & Q'ty	W	20 × 1			
	Starting method		Line starting			
	Air flow (Standard)	CMM	Hi: 7 Lo: 5.4		Hi: 7 Lo: 6.5	
	Available static pressure (at Hi)	Pa	—		30	
	Fresh air intake		Possible			
	Air filter & Q'ty		Long life filter × 1 (Washable)			
Shock & vibration isolator			Rubber sleeve (for fan motor)			
Insulation (noise & heat)			Polyurethane foam			
Operation control Operation switch			Remote control switch (Optional: RC-E1)			
Room temperature control			Thermostat by electronics			
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat			
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4"), Gas line: ϕ 9.52 (3/8")			
	Connecting method		Flare piping			
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)			
	Insulation for piping		Necessary (both Liquid & Gas lines)			
Accessories			Mounting kit, Drain hose			
Optional parts			Decorative Panel			

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

*4 This is the panel to be used when modified to the Duct panel type on site. See page 289 for the execution.

FDTQA36KXE4A

Item \ Model			FDTQA36KXE4A			
Panel name			Direct blow panel		Duct panel[*4]	
Panel model (Option)			TQ-PSA-13W-E	TQ-PSB-13W-E	QR-PNA-13W-E	QR-PNB-13W-E
Nominal cooling capacity[*1]		kW	3.7			
Nominal cooling capacity[*2]		kW	3.6			
Nominal heating capacity[*3]		kW	4.0			
Power source			1 Phase 220V 50Hz			
Noise level		dB(A)	Hi: 38 Lo: 34		Hi: 42 Lo: 39	
Exterior dimensions (Height × Width × Depth)		mm	Unit: 250 × 570 × 570 Panel: 35 × 625 × 650	Unit: 250 × 570 × 570 Panel: 35 × 780 × 650	Unit: 250 × 570 × 570 Panel: 35 × 625 × 650	Unit: 250 × 570 × 570 Panel: 35 × 780 × 650
Net weight		kg	Unit: 19 Panel: 2.5	Unit: 19 Panel: 3	Unit: 19 Panel: 2.5	Unit: 19 Panel: 3
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing			
	Refrigerant control		Electronic Expansion Valve			
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 1			
	Motor & Q'ty	W	20 × 1			
	Starting method		Line starting			
	Air flow (Standard)	CMM	Hi: 7 Lo: 5.4		Hi: 7 Lo: 6.5	
	Available static pressure (at Hi)	Pa	—		30	
	Fresh air intake		Possible			
	Air filter & Q'ty		Long life filter × 1 (Washable)			
Shock & vibration isolator			Rubber sleeve (for fan motor)			
Insulation (noise & heat)			Polyurethane foam			
Operation control Operation switch			Remote control switch (Optional: RC-E1)			
Room temperature control			Thermostat by electronics			
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat			
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4"), Gas line: ϕ 12.7 (1/2")			
	Connecting method		Flare piping			
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)			
	Insulation for piping		Necessary (both Liquid & Gas lines)			
Accessories			Mounting kit, Drain hose			
Optional parts			Decorative Panel			

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling[*1]	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling[*2]	27°C	19°C	35°C	24°C	
Heating[*3]	20°C	—	7°C	6°C	

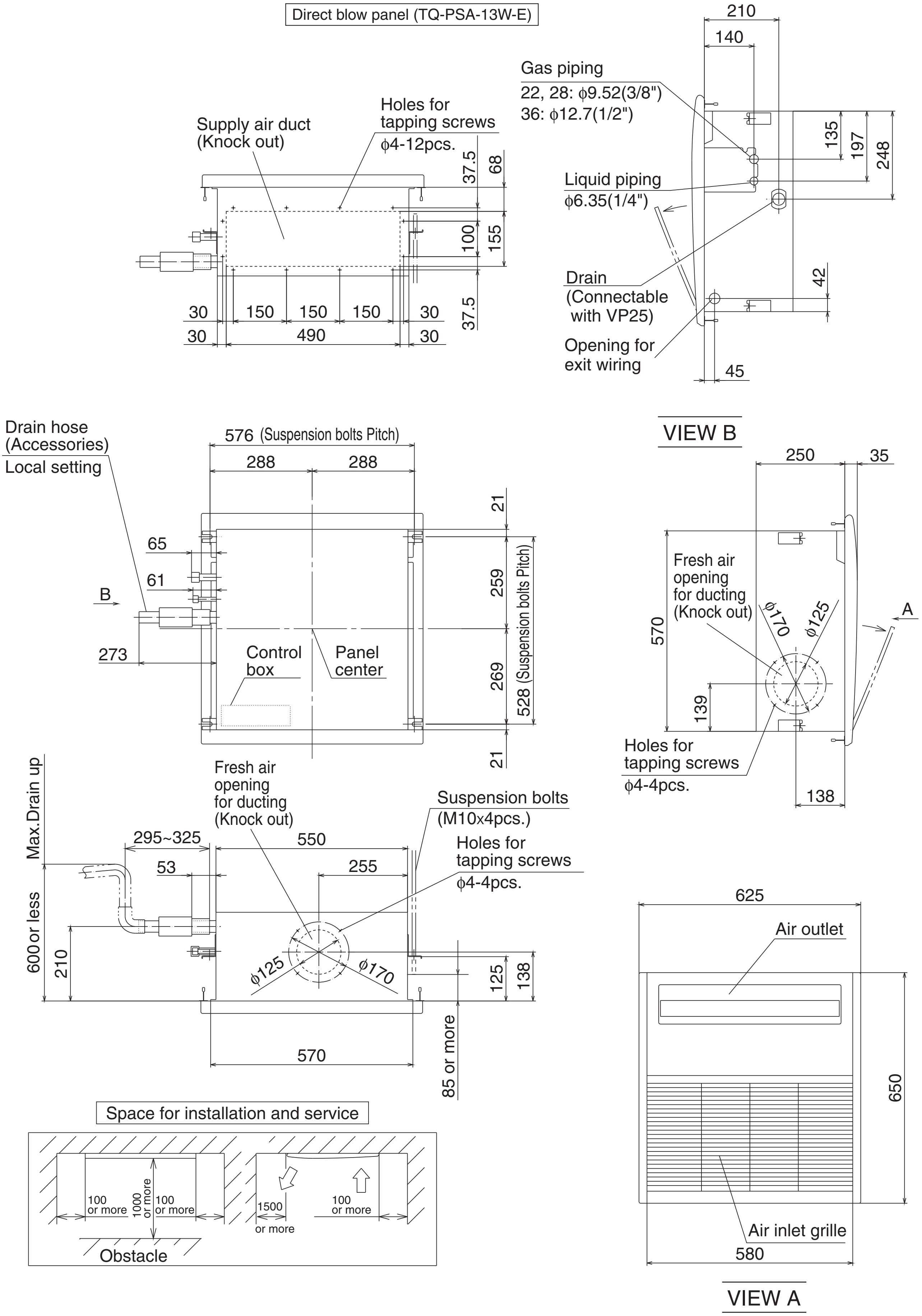
*4 This is the panel to be used when modified to the Duct panel type on site. See page 289 for the execution.

Product Specifications

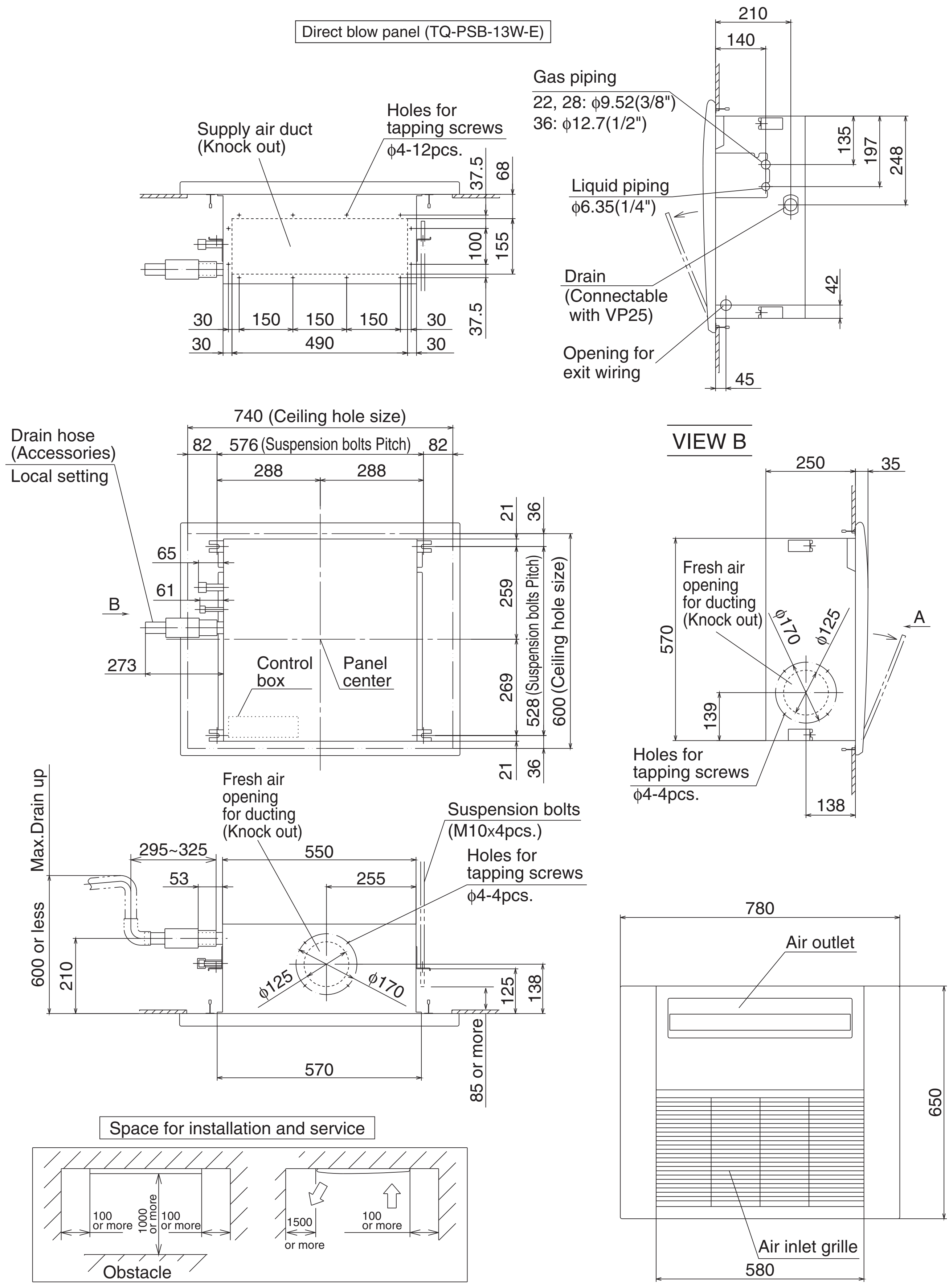
3.4.2 Exterior dimensions

FDTQA22KXE4A, 28KXE4A, 36KXE4A

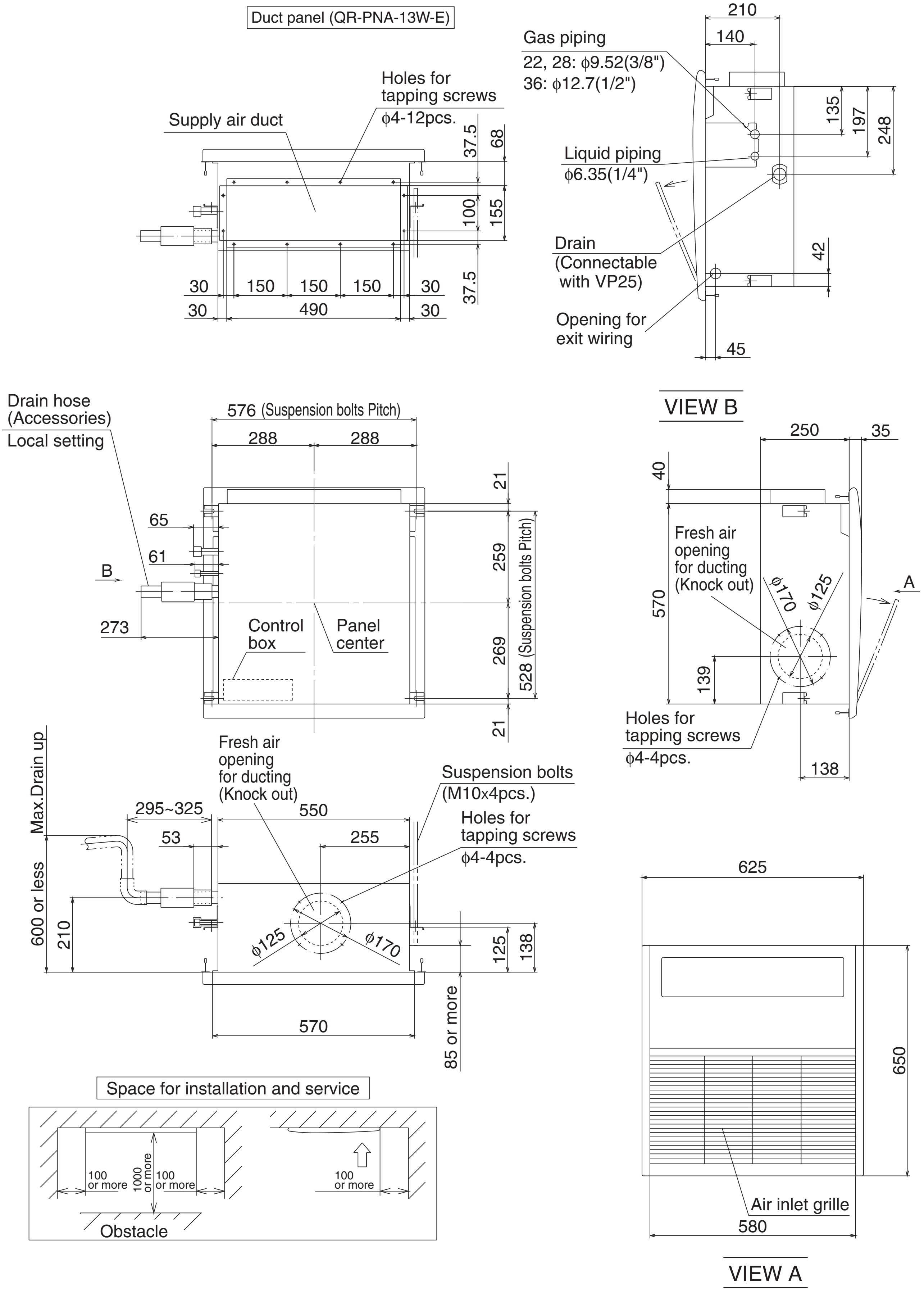
Unit : mm



Unit : mm

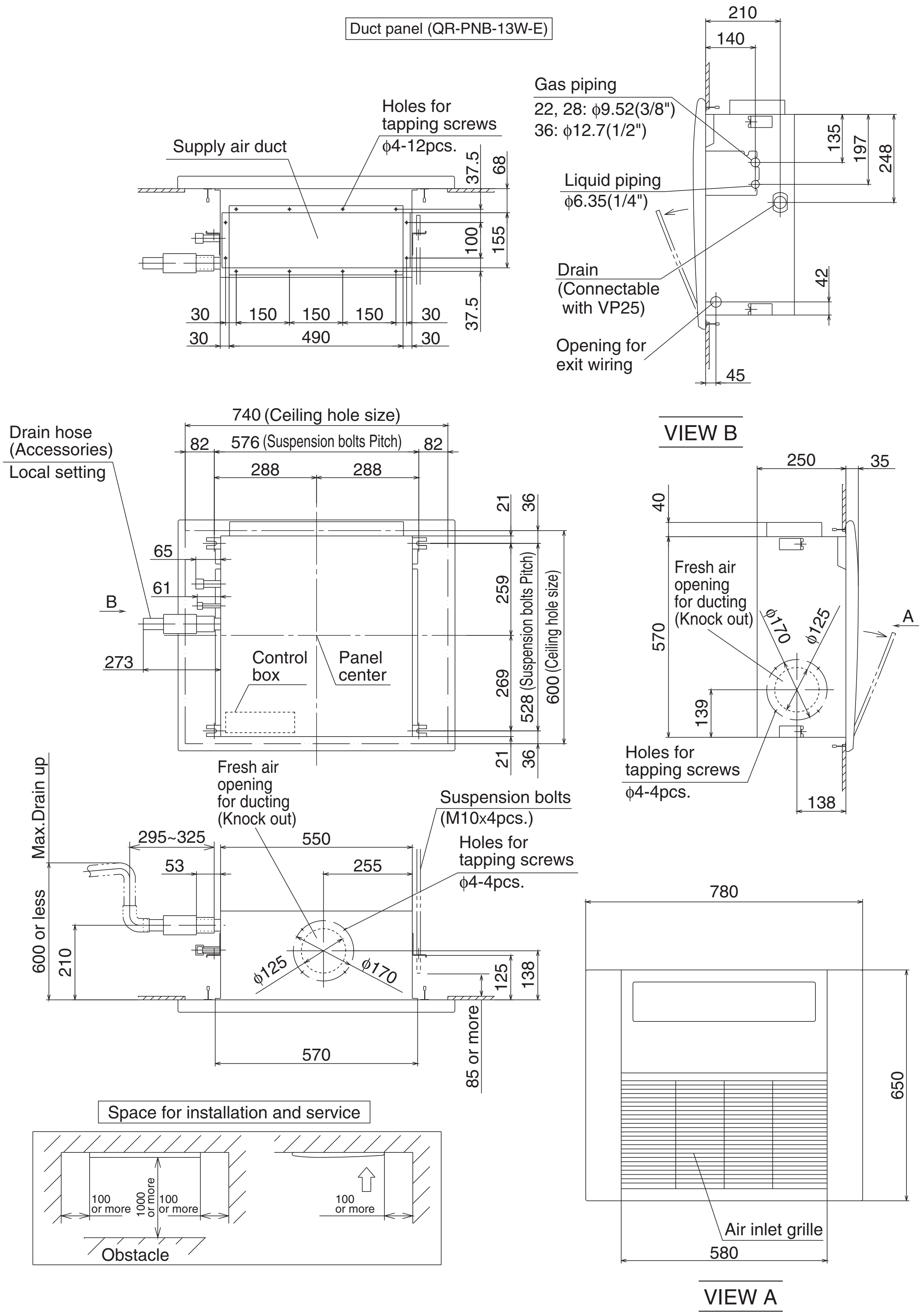

Direct blow panel (TQ-PSB-13W-E)
Supply air duct (Knock out)
Holes for tapping screws ϕ4-12pcs.
37.5
68
100
155
37.5
30 150 150 150 30
30 490 30
210
140
Gas piping
22, 28: ϕ9.52(3/8")
36: ϕ12.7(1/2")
135
197
248
Liquid piping ϕ6.35(1/4")
Drain (Connectable with VP25)
42
Opening for exit wiring
45
VIEW B
740 (Ceiling hole size)
82 576 (Suspension bolts Pitch) 82
288 288
Drain hose (Accessories)
Local setting
65
61
B
273
Control box
Panel center
21
36
259
269
528 (Suspension bolts Pitch)
600 (Ceiling hole size)
21
36
250
35
Fresh air opening for ducting (Knock out)
ϕ170
ϕ125
A
570
139
Holes for tapping screws ϕ4-4pcs.
138
Max.Drain up
600 or less
210
295~325
53
Fresh air opening for ducting (Knock out)
550
255
Suspension bolts (M10x4pcs.)
Holes for tapping screws ϕ4-4pcs.
ϕ125
ϕ170
125
138
570
85 or more
780
Air outlet
650
Air inlet grille
580
VIEW A
Space for installation and service
100 or more
1000 or more
100 or more
1500 or more
100 or more
Obstacle

Unit : mm



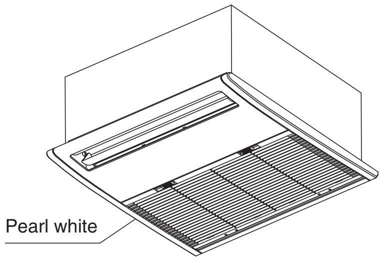
Duct panel (QR-PNA-13W-E)
Supply air duct
Holes for tapping screws
ϕ4-12pcs.
37.5
68
100
155
37.5
30 150 150 150 30
30 490 30
210
140
Gas piping
22, 28: ϕ9.52(3/8")
36: ϕ12.7(1/2")
135
197
248
Liquid piping
ϕ6.35(1/4")
Drain
(Connectable with VP25)
42
Opening for exit wiring
45
Drain hose
(Accessories)
Local setting
576 (Suspension bolts Pitch)
288 288
21
65
61
B
259
273
Control box
Panel center
269
528 (Suspension bolts Pitch)
21
VIEW B
250
35
40
Fresh air opening for ducting (Knock out)
570
ϕ170
ϕ125
A
139
Holes for tapping screws
ϕ4-4pcs.
138
Max.Drain up
600 or less
Fresh air opening for ducting (Knock out)
295~325
550
53
255
Suspension bolts
(M10x4pcs.)
Holes for tapping screws
ϕ4-4pcs.
210
ϕ125
ϕ170
125
138
570
85 or more
625
650
Air inlet grille
580
VIEW A
Space for installation and service
100 or more
1000 or more
100 or more
100 or more
Obstacle

Unit : mm


Duct panel (QR-PNB-13W-E)
Supply air duct
Holes for tapping screws φ4-12pcs.
30 150 150 150 30
30 490 30
37.5 68 100 155 37.5
210
140
Gas piping
22, 28: φ9.52(3/8")
36: φ12.7(1/2")
Liquid piping
φ6.35(1/4")
Drain (Connectable with VP25)
Opening for exit wiring
135 197 248 42 45
VIEW B
740 (Ceiling hole size)
82 576 (Suspension bolts Pitch) 82
288 288
Drain hose (Accessories)
Local setting
65
61
B
273
Control box
Panel center
21 36 259 269 21 36
528 (Suspension bolts Pitch)
600 (Ceiling hole size)
250 35
40
570
Fresh air opening for ducting (Knock out)
φ170 φ125
139
A
Holes for tapping screws φ4-4pcs.
138
Fresh air opening for ducting (Knock out)
Suspension bolts (M10x4pcs.)
Holes for tapping screws φ4-4pcs.
Max.Drain up
600 or less
295~325
53
550
255
210
φ125 φ170
125 138
570
85 or more
780
650
Air inlet grille
580
VIEW A
Space for installation and service
100 or more
1000 or more
100 or more
100 or more
Obstacle

3.4.3 Exterior appearance

All models

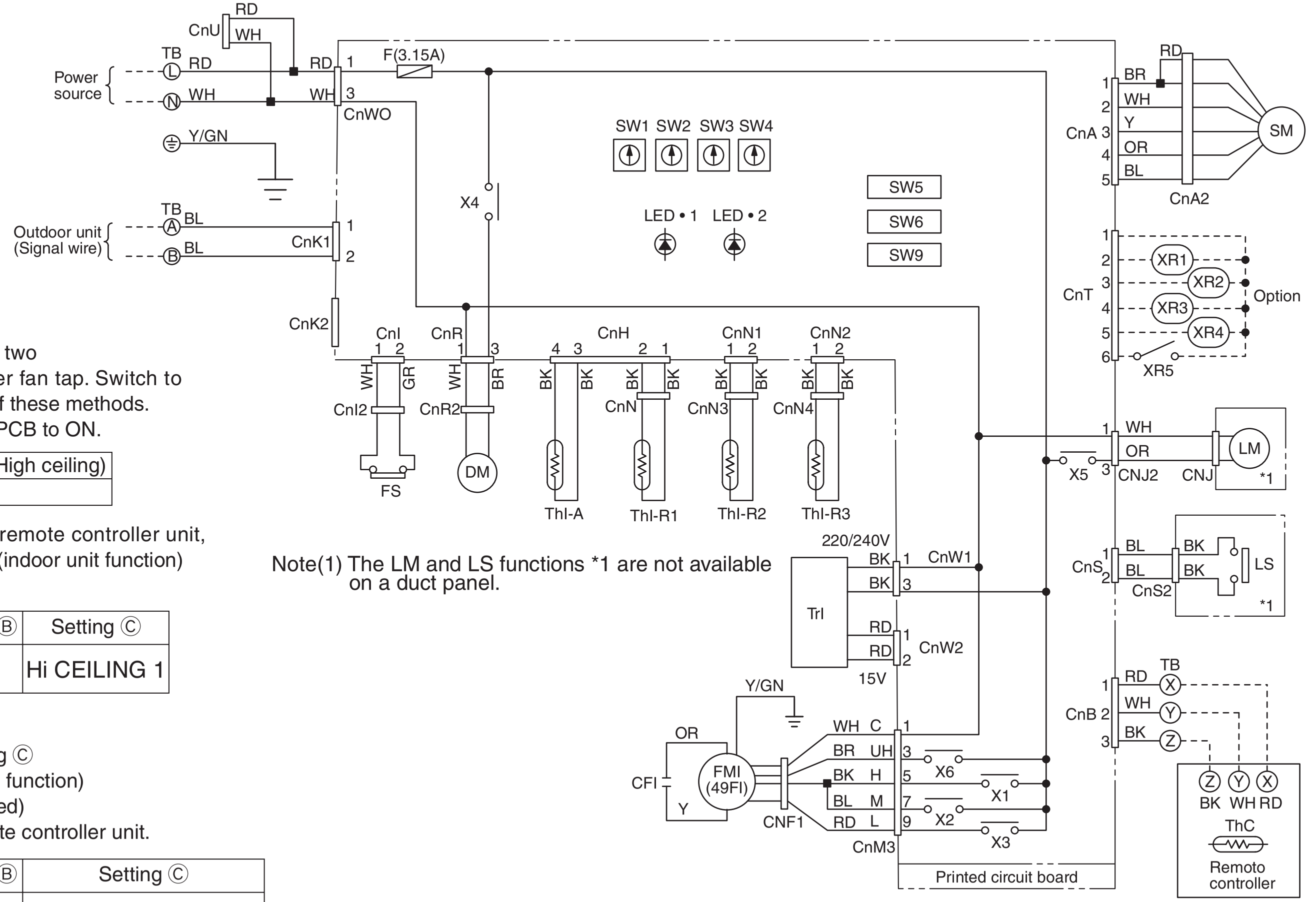


Decorative panel

Panel part No.		Type	Panel color	Applicable model
Direct blow panel	TQ-PSA-13W-E	With Auto swing	Pearl white	FDTQA22, 28, 36
	TQ-PSB-13W-E			
Duct panel	QR-PNA-13W-E	Non Auto swing	Pearl white	FDTQA22, 28, 36
	QR-PNB-13W-E			

3.4.4 Electrical wiring

All models



Note(1) The LM and LS functions *1 are not available on a duct panel.

Blower fan tap switch

In case of using duct panel, the following two methods are available to switch the blower fan tap. Switch to the high-speed tap can be done with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control,high speed (High ceiling)
	OFF	Fan control,standard

② By means of function setting from the remote controller unit, set the setting Ⓒ of "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

LOUVER switch disabled setting

In case of using duct panel, set the setting Ⓒ of "FUNCTION ▲" (remote control unit function) to "INVALID" (LOUVER switch disabled) by means of function setting from the remote controller unit.

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
07	LOUVER S/W	INVALID

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI	Fan motor	Thl-R3	Thermistor	XR1	Operation output(DC12V output)
49FI	Internal thermostat for FMI	ThC	Thermistor	XR2	Heating output(DC12V output)
CFI	Capacitor for FMI	SW1	Indoor unit address ten's place	XR3	Thermo ON output(DC12V output)
DM	Drain motor	SW2	Indoor unit address unit's place	XR4	Inspection output(DC12V output)
FS	Float switch	SW3	Outdoor unit address ten's place	XR5	Remote operation input(volt-free contact)
LM	Louver motor	SW4	Outdoor unit address unit's place	X1,2,3,6	Auxiliary relay(For FM)
LS	Limit switch	SW6	Model capacity setting	X4	Auxiliary relay(For DM)
SM	Stepping motor(For Exp.v)	Trl	Transformer	X5	Auxiliary relay(For LM)
Thl-A	Thermistor	F	Fuse	TB	Terminal block(○ mark)
Thl-R1	Thermistor	LED1	Indication lamp(Red)	CnA~Z	Connector
Thl-R2	Thermistor	LED2	Indication lamp(Green)	■mark	Closed-end connector

Color marks

Mark	Color	Mark	Color
BK	Black	RD	Red
BL	Blue	WH	White
BR	Brown	Y	Yellow
GR	Gray	Y/GN	Yellow/Green
OR	Orange		

Function of switches

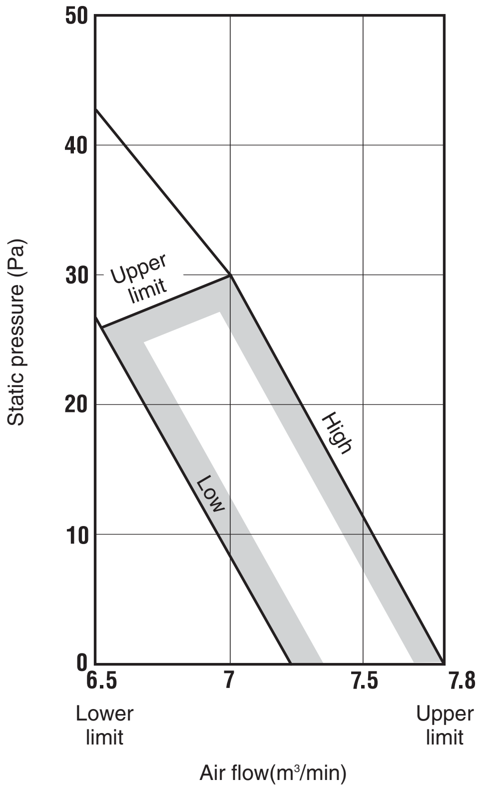
Mark		Function	
SW5-1	ON	Test run of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal:valid	
	OFF	Emergency stop signal:Invalid	

Product Specifications

3.4.5 Characteristics of fan

(Only when FDTQA22, 28 and 36 model are used for the Duct panel type.)

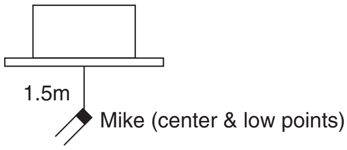
Models FDTQA22, 28, 36KXE4A



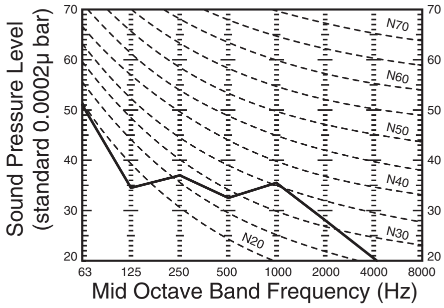
3.4.6 Noise level

Notes(1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

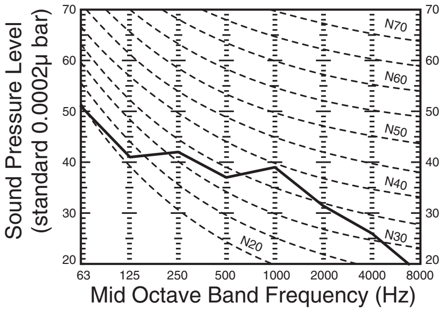
Measured based on JIS B 8616
Mike position as below



Models FDTQA22KXE4A, 28KXE4A, 36KXE4A
Noise level 38 dB (A) at HIGH
33 dB (A) at LOW



When used as the Duct panel type
Models FDTQA22KXE4A, 28KXE4A, 36KXE4A
Noise level 42 dB (A) at HIGH
39 dB (A) at LOW



3.5 1-way Outlet Ceiling Recessed Type (FDTSA)

3.5.1 Specifications

FDTSA45KXE4A, 71KXE4A

Item		Models	FDTSA45KXE4A	FDTSA71KXE4A
Nominal cooling capacity*1		kW	4.7	7.3
Nominal cooling capacity*2		kW	4.5	7.1
Nominal heating capacity*3		kW	5.0	8.0
Power source			1 Phase 220/240V 50Hz	
Noise level		dB(A)	Hi: 43 Me: 40 Lo: 38	Hi: 44 Me: 40 Lo: 38
Exterior dimensions (Height × Width × Depth)		mm	Unit: 194 × 1040 × 650 Panel: 10 × 1290 × 770	Unit: 194 × 1300 × 650 Panel: 10 × 1500 × 790
Net weight		kg	Unit: 26 Panel: 6	Unit: 30 Panel: 7
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 2	Centrifugal fan × 4
	Motor & Q'ty	W	40 × 1	25 × 2
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 14 Me: 12 Lo: 10	Hi: 18 Me: 15 Lo: 12
	Fresh air intake		Possible	
	Air filter & Q'ty		Long life filter × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4") Gas line: ϕ 12.7 (1/2")	Liquid line: ϕ 9.52 (3/8") Gas line: ϕ 15.88 (5/8")
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Decorative Panel	

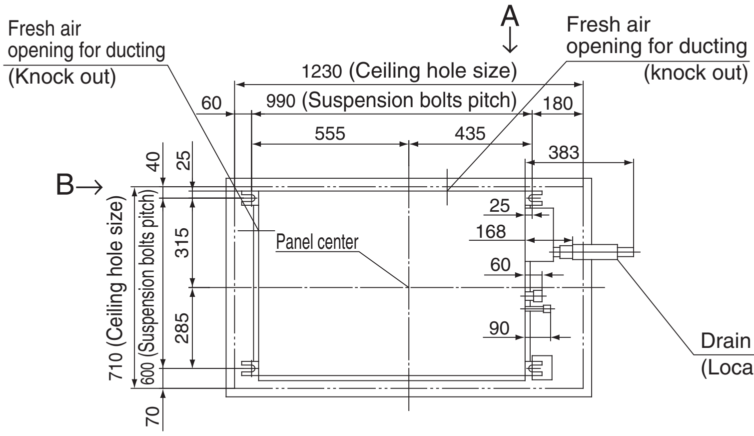
*1 ~ 3The data are measured at the following conditions.

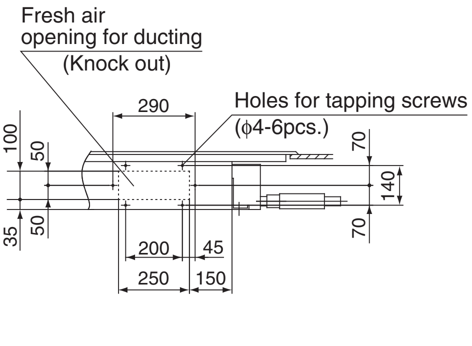
Operation / Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

3.5.2 Exterior dimensions

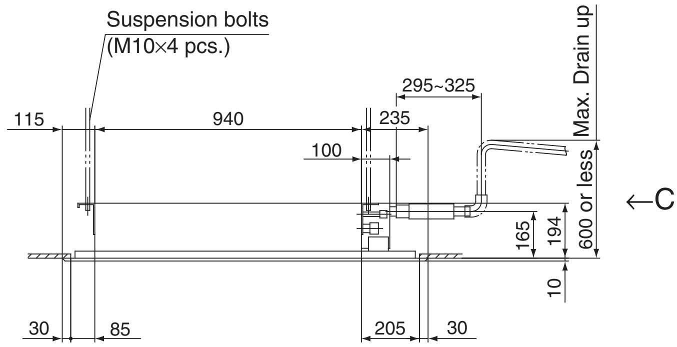
FDTSA45KXE4A

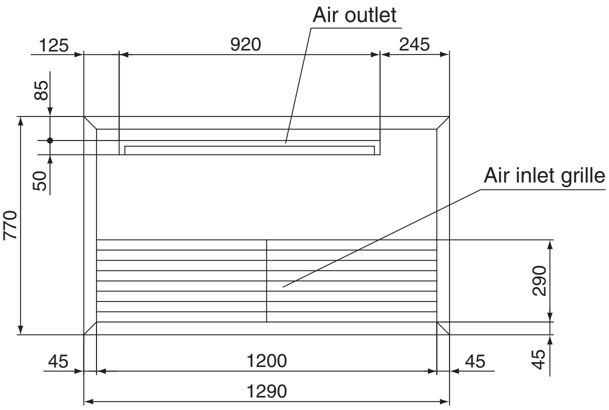
Unit : mm



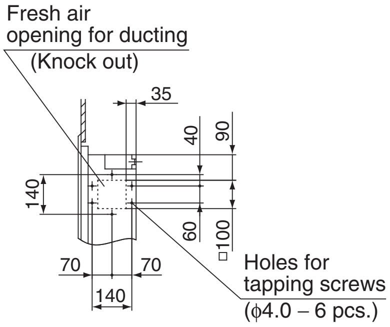


VIEW A

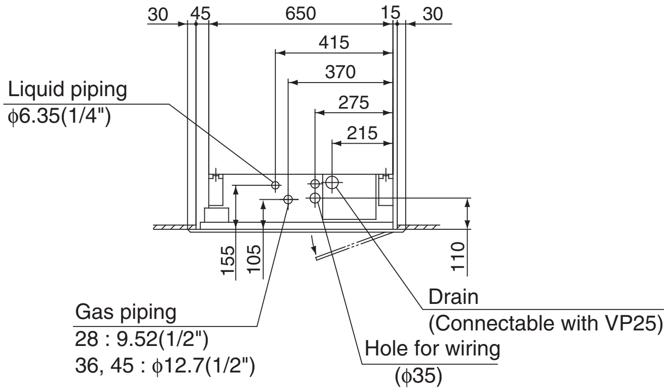




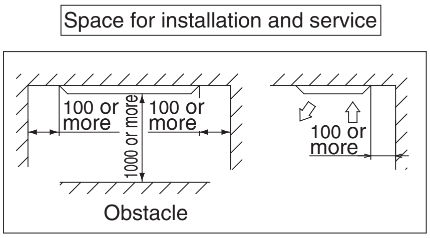
Decorative Panel



VIEW B

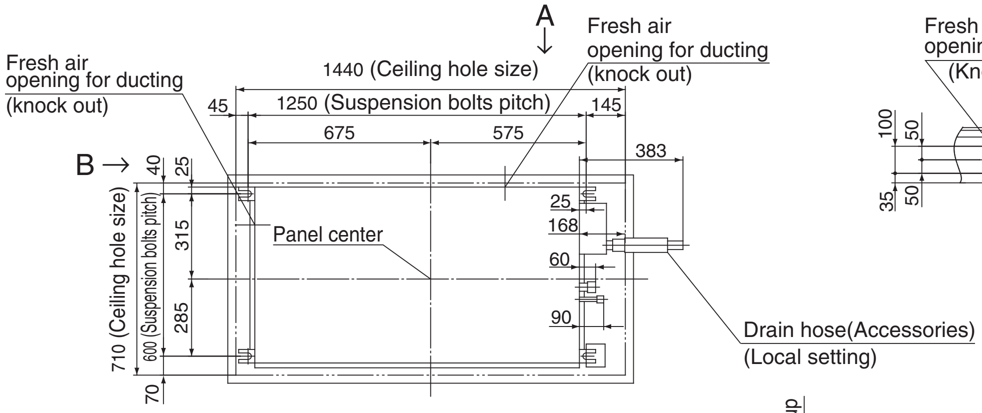


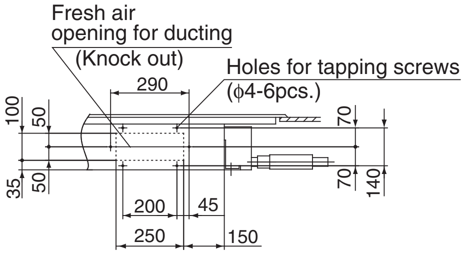
VIEW C



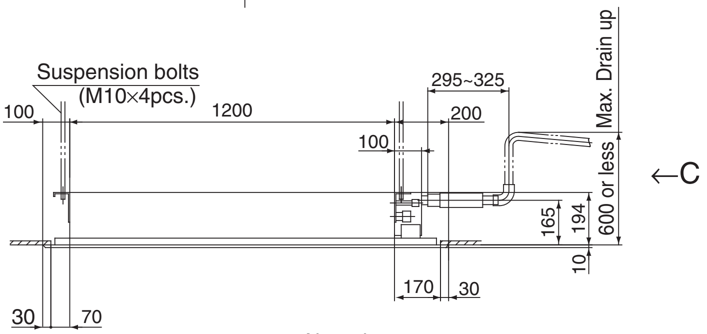
FDTSA71KXE4A

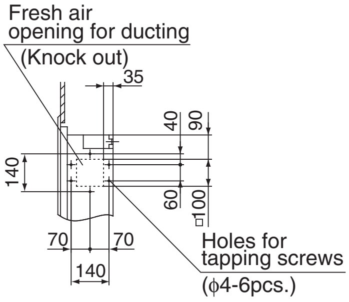
Unit : mm



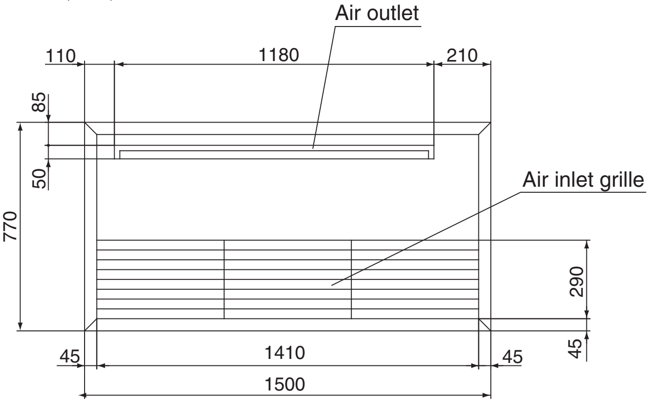


VIEW A

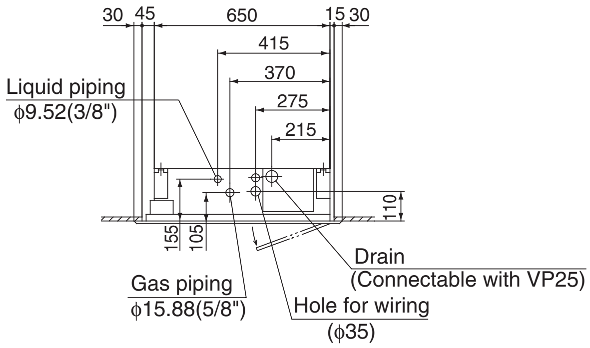




VIEW B

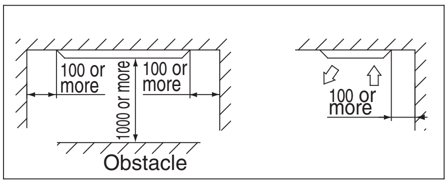


Decorative Panel



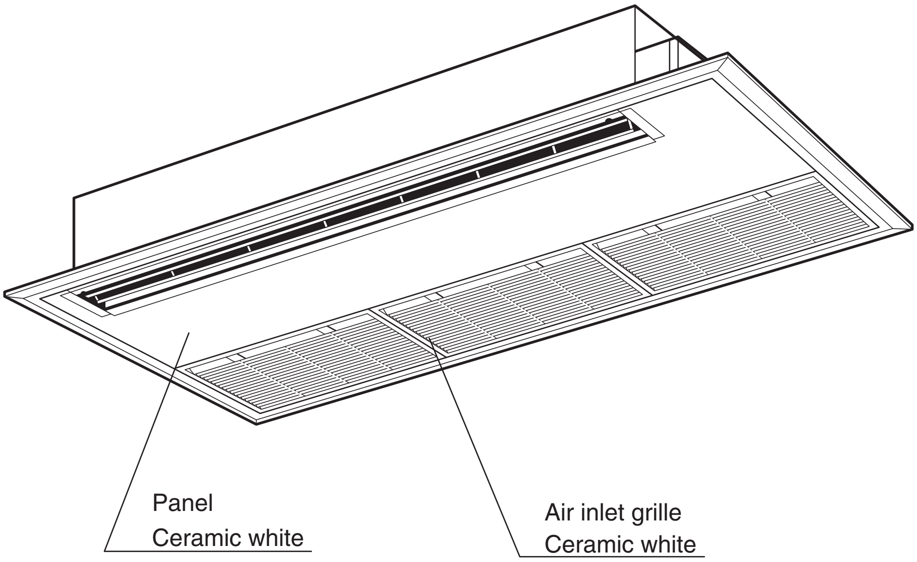
VIEW C

Space for installation and service



3.5.3 Exterior appearance

All models

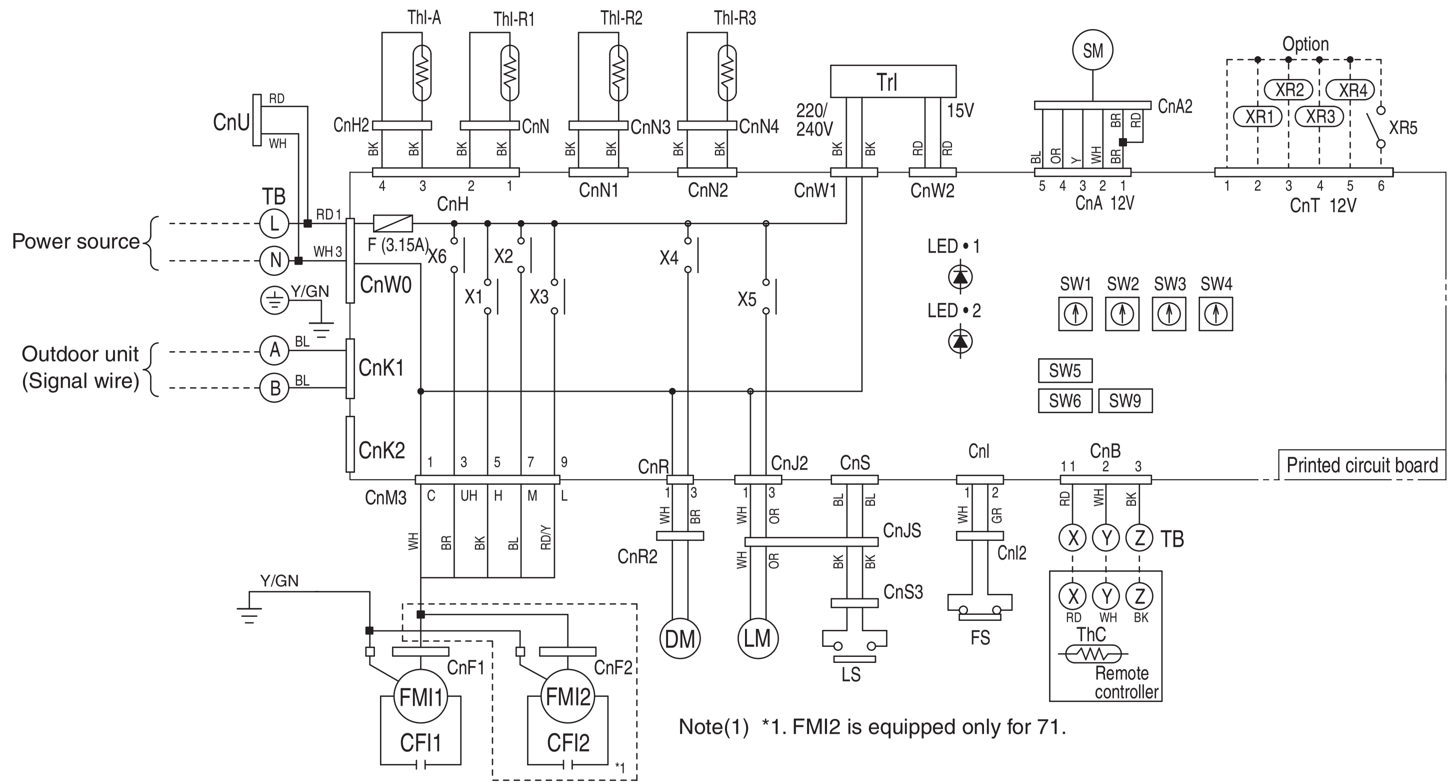


Decorative panel

Panel part No.	Type	Panel color	Applicable model
TS-PSA-27W-E	With Auto swing	Ceramic white	FDTSA45
TS-PSB-37W-E			FDTSA71

3.5.4 Electrical wiring

All models



Note(1) *1. FMI2 is equipped only for 71.

Blower fan tap switch

When increasing of static pressure is required,the following two methods are available to switch the blower fan tap. Switch to the high-speed tap can be done with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control, high speed (High ceiling)
	OFF	Fan control, standard

② By means of function setting from the remote controller unit, set the setting Ⓒ of "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI1, 2	Fan motor	ThC	Thermistor	XR2	Heating output (DC12V output)
CFI1, 2	Capacitor for FMI	SW1	Indoor unit address ten's place	XR3	Thermo ON output (DC12V output)
DM	Drain motor	SW2	Indoor unit address unit's place	XR4	Inspection output (DC12V output)
FS	Float switch	SW3	Outdoor unit address ten's place	XR5	Remote operation input (volt-free contact)
LM	Louver motor	SW4	Outdoor unit address unit's place	X1,2,3,6	Auxiliary relay (For FM)
LS	Limit switch	SW6	Model capacity setting	X4	Auxiliary relay (For DM)
SM	Stepping motor (For Exp.v)	Trl	Transformer	X5	Auxiliary relay (For LM)
Thl-A	Thermistor	F	Fuse	TB	Terminal block (○ mark)
Thl-R1	Thermistor	LED1	Indication lamp (Red)	CnA~Z	Connector
Thl-R2	Thermistor	LED2	Indication lamp (Green)	■mark	Closed-end connector
Thl-R3	Thermistor	XR1	Operation output (DC12V output)		

Color marks

Mark	Color	Mark	Color
BK	Black	RD	Red
BL	Blue	RD/Y	Red/Yellow
BR	Brown	WH	White
GR	Gray	Y	Yellow
OR	Orange	Y/GN	Yellow/Green

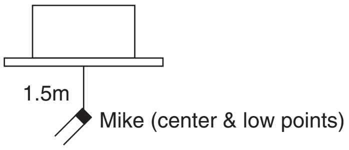
Function of switches

Mark		Function	
SW5-1	ON	Test run of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal: valid	
	OFF	Emergency stop signal: Invalid	

3.5.5 Noise level

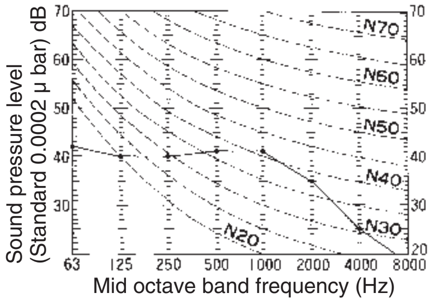
Notes(1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

Measured based on JIS B 8616
Mike position as below



Model FDTSA45KXE4A
Noise level 43 dB (A) at HIGH
40 dB (A) at MEDIUM
38 dB (A) at LOW

Model FDTSA71KXE4A
Noise level 44 dB (A) at HIGH
40 dB (A) at MEDIUM
38 dB (A) at LOW



3.6 Cassetteria Type (FDRA)

3.6.1 Specifications

FDRA45KXE4A, 56KXE4A

Item		Models	FDRA45KXE4A		FDRA56KXE4A	
Nominal cooling capacity*1		kW	4.7		5.8	
Nominal cooling capacity*2		kW	4.5		5.6	
Nominal heating capacity*3		kW	5.0		6.3	
Power source			1 Phase 220/240V 50Hz			
Noise level		dB(A)	Hi: 43 Me: 40 Lo: 37	Hi: 44 Me: 41 Lo: 38	Hi: 43 Me: 40 Lo: 37	Hi: 44 Me: 41 Lo: 38
Exterior dimensions (Height × Width × Depth)		mm	Unit: 355×750×635 Panel: 10×1040×750	Unit: (355+α)×750×635 Panel: 10×864×585	Unit: 355×750×635 Panel: 10×1040×750	Unit: (355+α)×750×635 Panel: 10×864×585
Net weight		kg	Unit: 30 Panel: 7	Unit: 30 Panel: 5	Unit: 30 Panel: 7	Unit: 30 Panel: 5
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing			
	Refrigerant control		Electronic Expansion Valve			
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 2			
	Motor & Q'ty	W	55 × 1			
	Starting method		Line starting			
	Air flow (Standard)	CMM	Hi: 14 Me: 12 Lo: 11			
	Available static pressure (at Hi)	Pa	Standard: 50, Hi speed: 85			
	Fresh air intake		Side or back			
	Air filter & Q'ty		Long life filter × 1 (Washable)			
Shock & vibration isolator			Rubber sleeve (for fan motor)			
Insulation (noise & heat)			Polyurethane foam			
Operation control Operation switch			Remote control switch (Optional: RC-E1)			
Room temperature control			Thermostat by electronics			
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat			
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 6.35 (1/4") Gas line: φ 12.7 (1/2")			
	Connecting method		Flare piping			
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)			
	Insulation for piping		Necessary (both Liquid & Gas lines)			
Accessories			Mounting kit, Drain hose			
Optional parts			Silent panel, Canvas panel, Canvas duct			

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDRA71KXE4A, 90KXE4A

Item		Models	FDRA71KXE4A		FDRA90KXE4A	
Nominal cooling capacity*1		kW	7.3		9.3	
Nominal cooling capacity*2		kW	7.1		9.0	
Nominal heating capacity*3		kW	8.0		10.0	
Power source			1 Phase 220/240V 50Hz			
Noise level		dB(A)	Hi: 43 Me: 40 Lo: 37	Hi: 44 Me: 41 Lo: 38	Hi: 43 Me: 40 Lo: 37	Hi: 44 Me: 41 Lo: 38
Exterior dimensions (Height × Width × Depth)		mm	Unit: 355×950×635 Panel: 10×1240×750	Unit: (355+α)×950×635 Panel: 10×1064×585	Unit: 355×950×635 Panel: 10×1240×750	Unit: (355+α)×950×635 Panel: 10×1064×585
Net weight		kg	Unit: 35 Panel: 8	Unit: 35 Panel: 6	Unit: 35 Panel: 8	Unit: 35 Panel: 6
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing			
	Refrigerant control		Electronic Expansion Valve			
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 2			
	Motor & Q'ty	W	90 × 1		100 × 1	
	Starting method		Line starting			
	Air flow (Standard)	CMM	Hi: 18 Me: 16 Lo: 14		Hi: 20 Me: 18 Lo: 15	
	Available static pressure (at Hi)	Pa	Standard: 45, Hi speed: 80			
	Fresh air intake		Side or back			
	Air filter & Q'ty		Long life filter × 1 (Washable)			
Shock & vibration isolator			Rubber sleeve (for fan motor)			
Insulation (noise & heat)			Polyurethane foam			
Operation control Operation switch			Remote control switch (Optional: RC-E1)			
Room temperature control			Thermostat by electronics			
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat			
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 9.52 (3/8") Gas line: ϕ 15.88 (5/8")			
	Connecting method		Flare piping			
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)			
	Insulation for piping		Necessary (both Liquid & Gas lines)			
Accessories			Mounting kit, Drain hose			
Optional parts			Silent panel, Canvas panel, Canvas duct			

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDRA112KXE4A, 140KXE4A

Item		Models	FDRA112KXE4A		FDRA140KXE4A	
Nominal cooling capacity*1		kW	11.6		14.5	
Nominal cooling capacity*2		kW	11.2		14.0	
Nominal heating capacity*3		kW	12.5		16.0	
Power source			1 Phase 220/240V 50Hz			
Noise level		dB(A)	Hi: 45 Me: 42 Lo: 38	Hi: 46 Me: 43 Lo: 39	Hi: 46 Me: 43 Lo: 39	Hi: 47 Me: 44 Lo: 40
Exterior dimensions (Height × Width × Depth)		mm	Unit: 406×1370×635 Panel: 10×1660×750	Unit: (406+α)×1370×635 Panel: 10×1484×585	Unit: 406×1370×635 Panel: 10×1660×750	Unit: (406+α)×1370×635 Panel: 10×1484×585
Net weight		kg	Unit: 52 Panel: 9	Unit: 52 Panel: 7	Unit: 52 Panel: 9	Unit: 52 Panel: 7
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing			
			Electronic Expansion Valve			
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 3			
	Motor & Q'ty	W	45 × 1, 90 × 1		50 × 1, 100 × 1	
	Starting method		Line starting			
	Air flow (Standard)	CMM	Hi: 28 Me: 25 Lo: 22		Hi: 34 Me: 31 Lo: 27	
	Available static pressure (at Hi)	Pa	Standard: 50, Hi speed: 80			
	Fresh air intake		Side or back			
	Air filter & Q'ty		Long life filter × 2 (Washable)			
Shock & vibration isolator			Rubber sleeve (for fan motor)			
Insulation (noise & heat)			Polyurethane foam			
Operation control Operation switch			Remote control switch (Optional: RC-E1)			
Room temperature control			Thermostat by electronics			
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat			
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 9.52 (3/8") Gas line: ϕ 15.88 (5/8")			
	Connecting method		Flare piping			
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)			
	Insulation for piping		Necessary (both Liquid & Gas lines)			
Accessories			Mounting kit, Drain hose			
Optional parts			Silent panel, Canvas panel, Canvas duct			

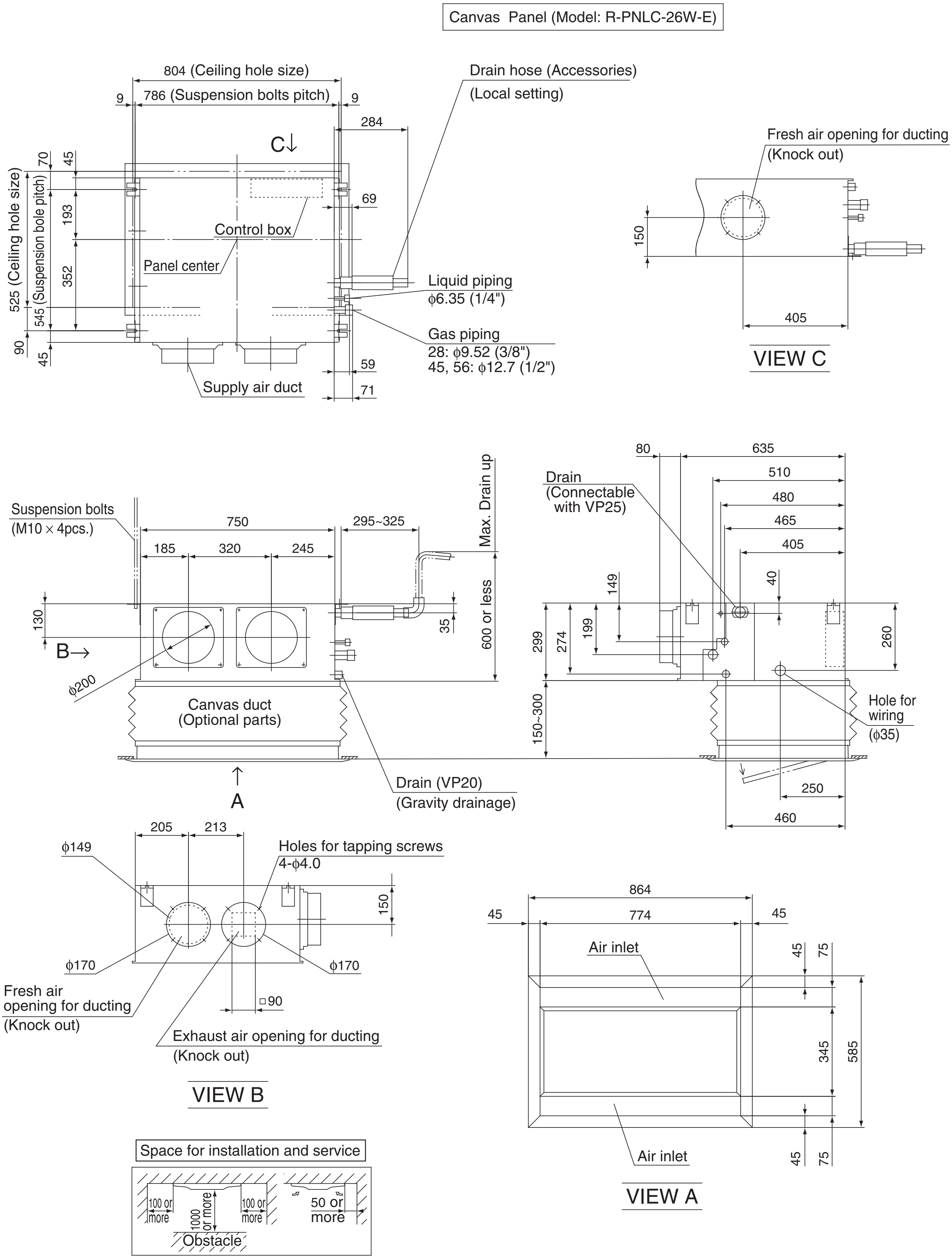
*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

3.6.2 Exterior dimensions

FDRA45KXE4A, 56KXE4A

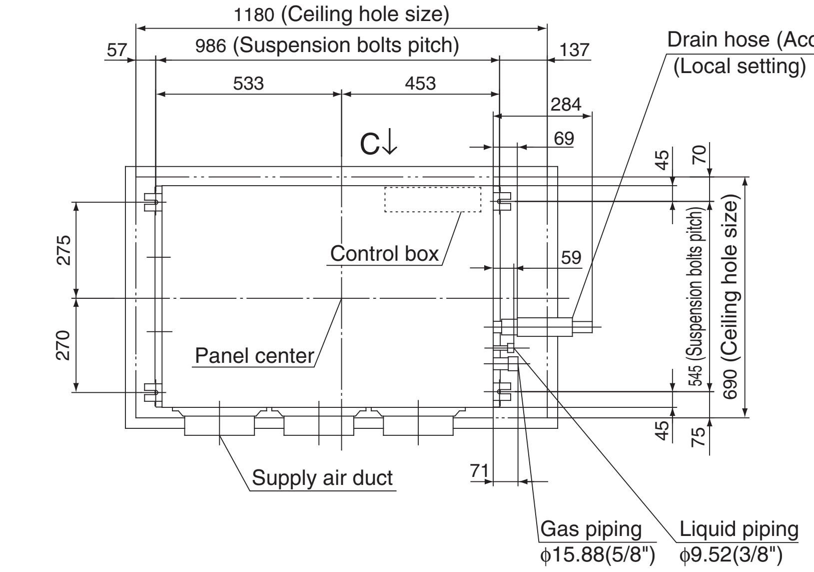
Unit : mm

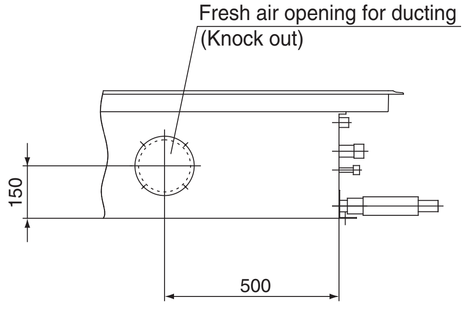


FDRA71KXE4A, 90KXE4A

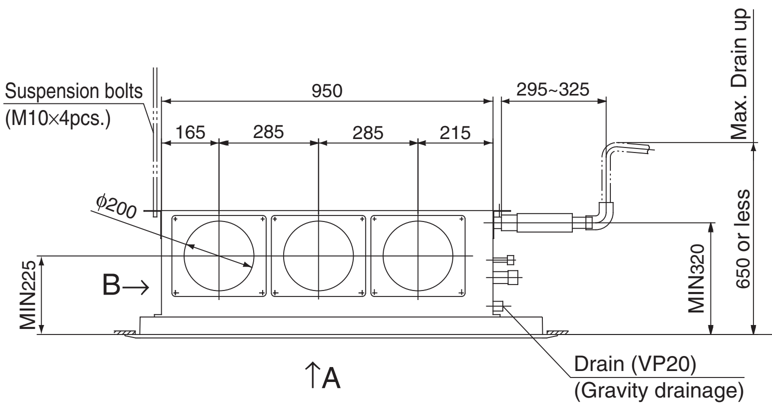
Unit : mm

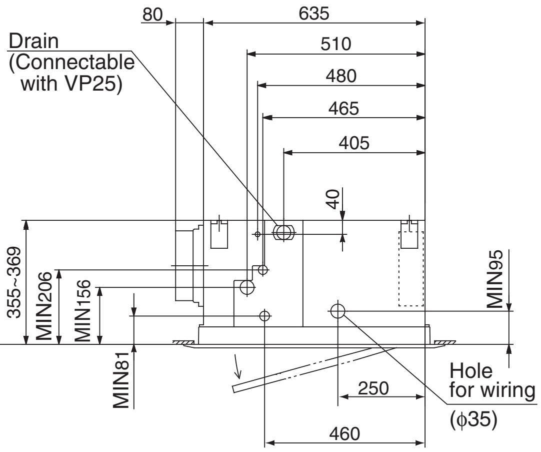
Silent Panel (Model: R-PNLS-36W-E)

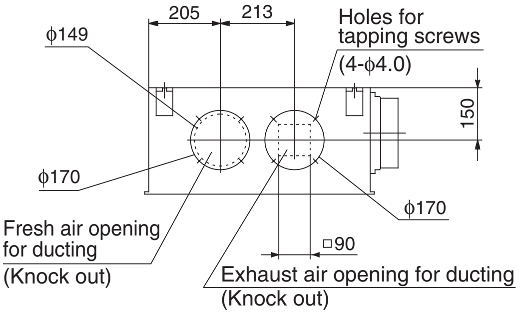




VIEW C

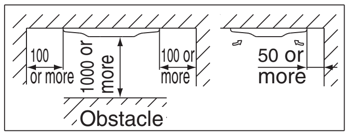


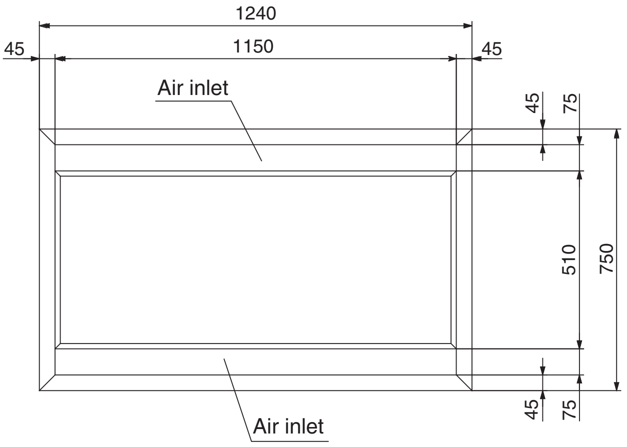




VIEW B

Space for installation and service



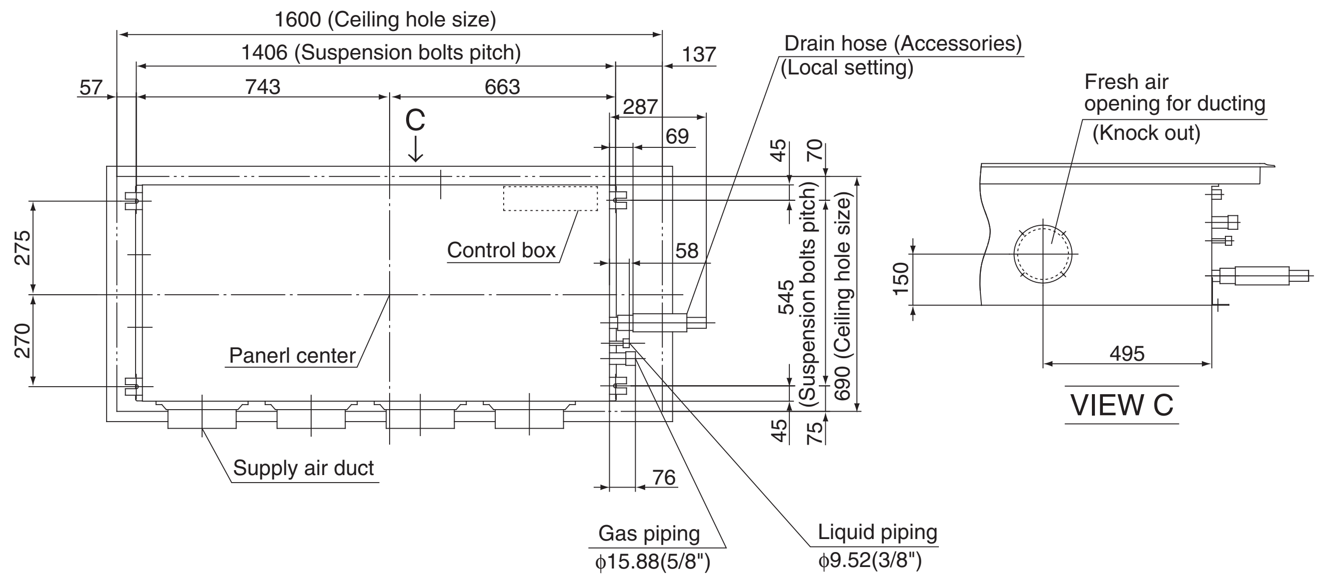


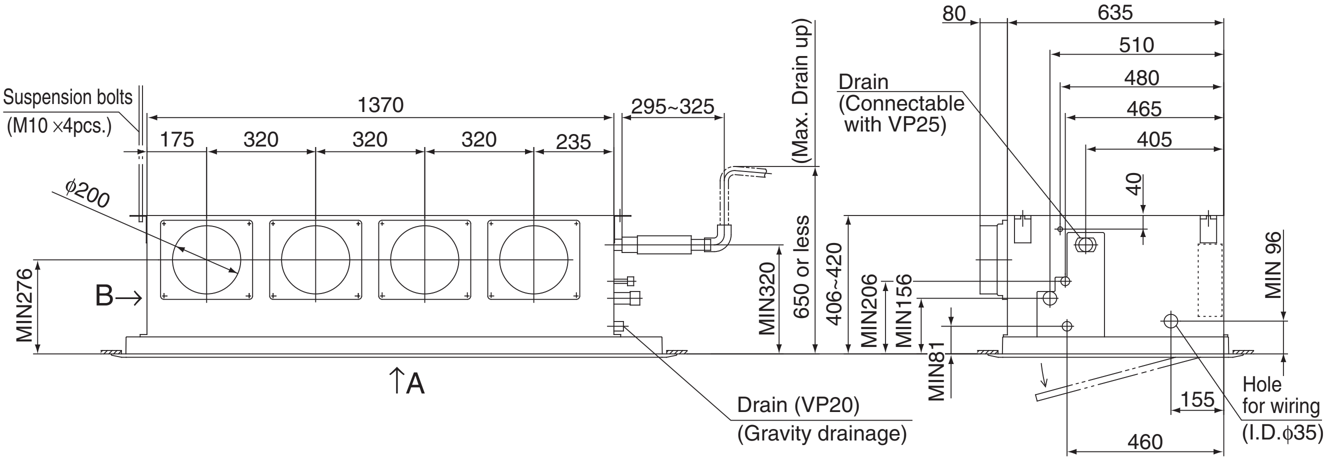
VIEW A

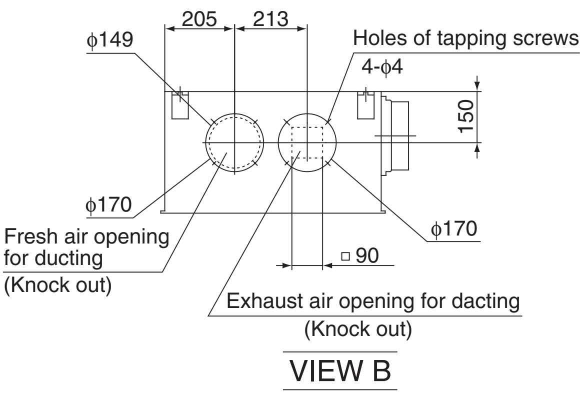
FDRA112KXE4A, 140KXE4A

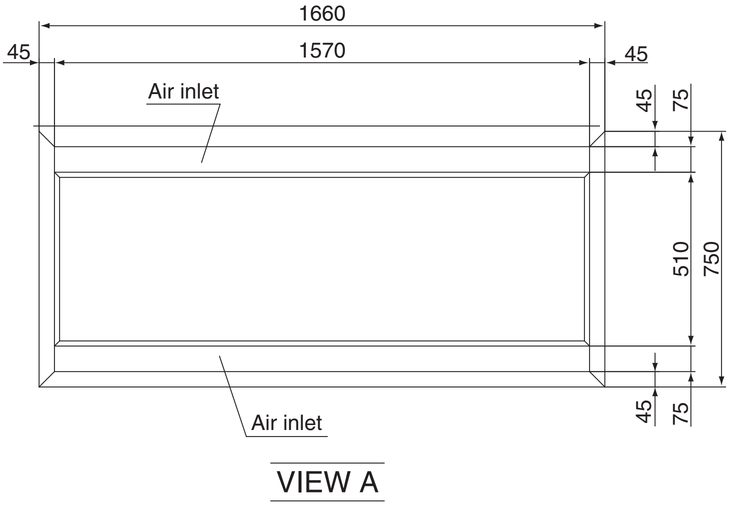
Unit : mm

Silent Panel (Model: R-PNLS-46W-E)

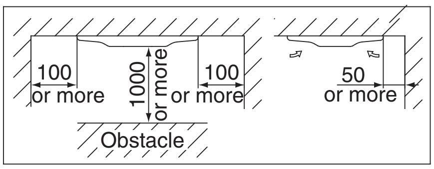








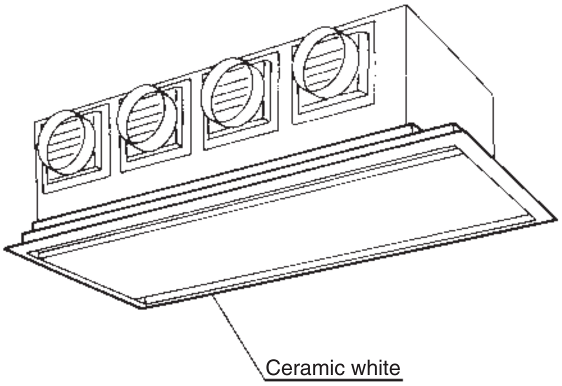
Space for installation and service



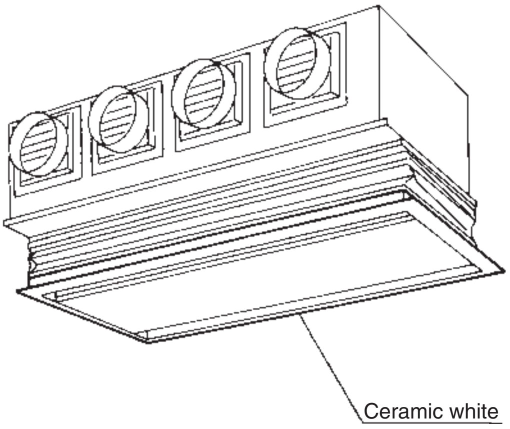
3.6.3 Exterior appearance

All models

Silent panel type

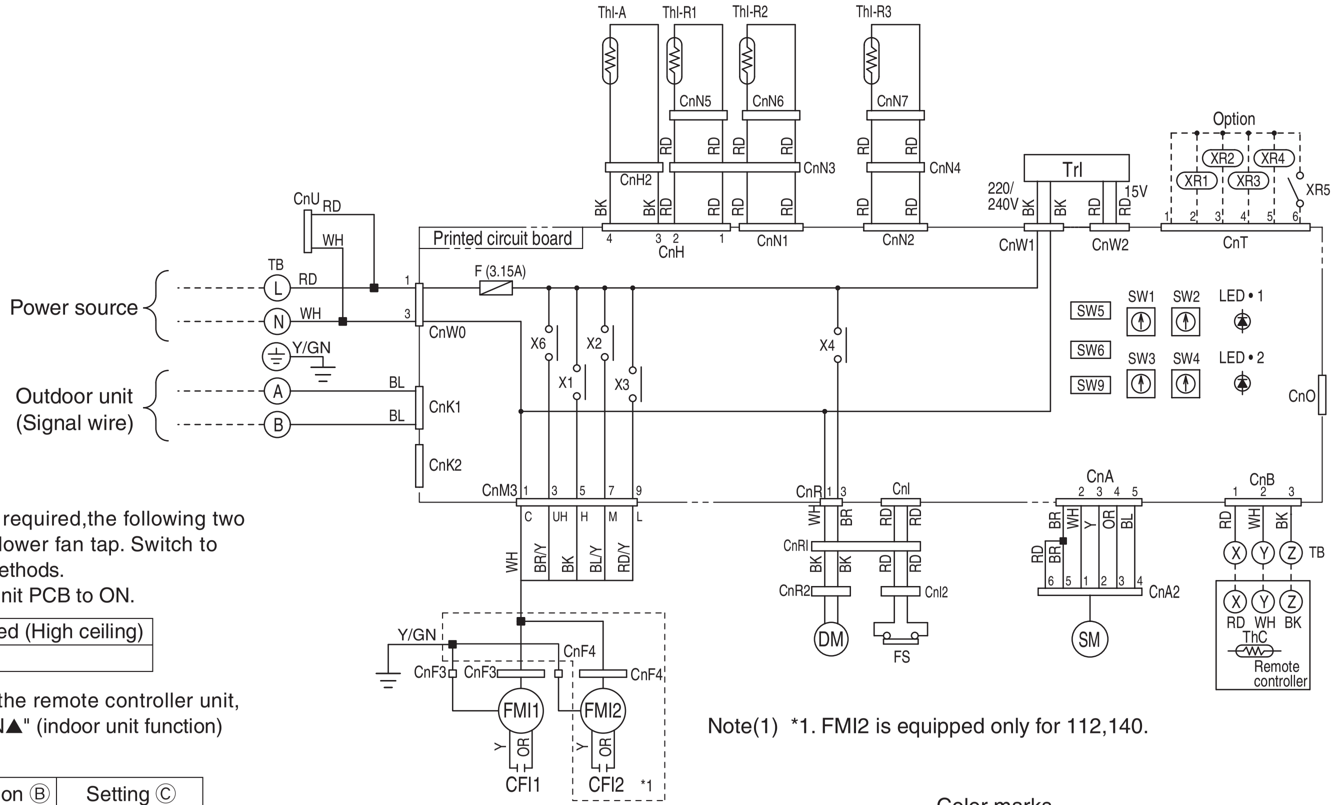


Canvas-duct panel type



3.6.4 Electrical wiring

All models



Note(1) *1. FMI2 is equipped only for 112,140.

Blower fan tap switch

When increasing of static pressure is required,the following two methods can be taken to switch the blower fan tap. Switch to the high-speed tap with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control,high speed (High ceiling)
	OFF	Fan control,standard

② By means of function setting from the remote controller unit, set the setting Ⓒ of "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI1,2	Fan motor	SW1	Indoor unit address ten's place	XR2	Heating output (DC12V output)
CFI1,2	Capacitor for FMI	SW2	Indoor unit address unit's place	XR3	Thermo ON output (DC12V output)
DM	Drain motor	SW3	Outdoor unit address ten's place	XR4	Inspection output (DC12V output)
FS	Float switch	SW4	Outdoor unit address unit's place	XR5	Remote operation input (volt-free contact)
SM	Stepping motor (For Exp.v)	SW6	Model capacity setting	X1,2,3,6	Auxiliary relay (For FM)
Thl-A	Thermistor	Trl	Transformer	X4	Auxiliary relay (For DM)
Thl-R1	Thermistor	F	Fuse	TB	Terminal block (○ maek)
Thl-R2	Thermistor	LED1	Indication lamp (Red)	CnA~Z	Connector
Thl-R3	Thermistor	LED2	Indication lamp (Green)	■mark	Closed-end connector
ThC	Thermistor	XR1	Operation output (DC12V output)		

Color marks

Mark	Color	Mark	Color
BK	Black	RD	Red
BL	Blue	RD/Y	Red/Yellow
BL/Y	Blue/Yellow	WH	White
BR	Brown	Y	Yellow
BR/Y	Brown/Yellow	Y/GN	Yellow/Green
OR	Orange		

Function of switches

Mark		Function	
SW5-1	ON	Test run of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal:Invalid	
	OFF	Emergency stop signal:valid	

3.6.5 Characteristics of fan

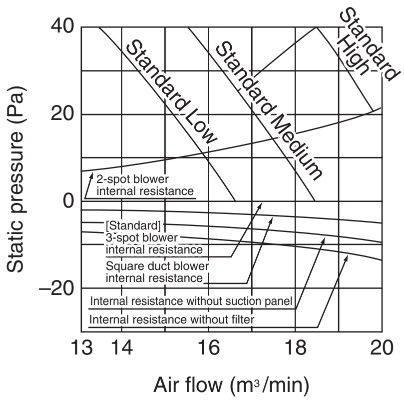
■ External static pressure table

Unit : Pa

Model	Air flow (m^3/min) / Duct specs.	1 spot closing (1)		Standard (2)		Square duct (3)	
		Standard	High(4) speed	Standard	High(4) speed	Standard	High(4) speed
FDRA22	10	-	-	45	85	50	90
FDRA28	12	-	-	45	85	45	85
FDRA45 56	14	-	-	50	85	50	90
FDRA71	18	30	65	45	80	50	85
FDRA90	20	25	60	45	80	50	85
FDRA112	28	40	70	50	80	55	85
FDRA140	34	40	70	50	80	55	85

Notes (1) 1 spot closing: Round duct flange at center is removed and shield with a special panel (option).
(2) Standard: ϕ200 duct are installed at all blowout holes.
(3) Square duct: All round ducts are removed and replaced with special square duct flanges (option).
(4) When using the high speed setting, turn the dip switch SW9-4 on the indoor unit PCB to the ON position.
(When setting from the remote controller, select "HiCEILING 1".)

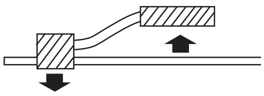
■ **How to interpret the blower characteristics table**
Example: Case of FDRA71KXE4A



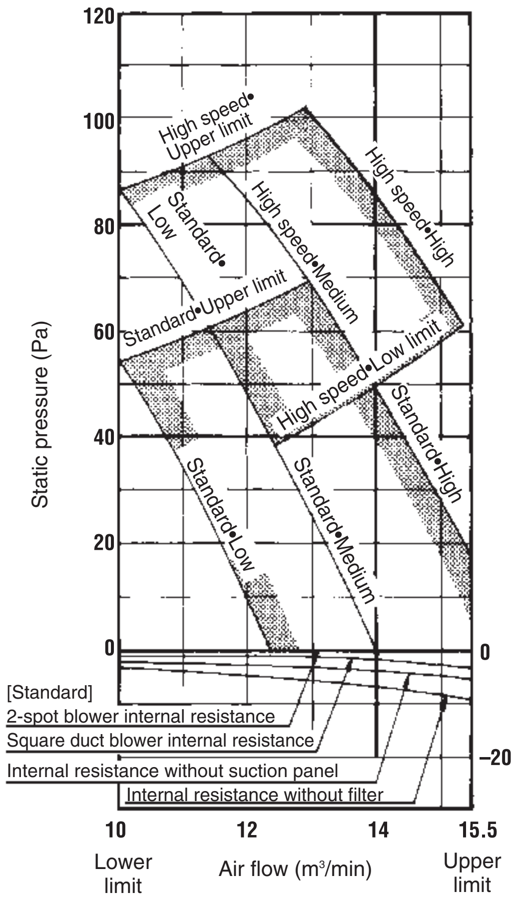
(1) 2-spot blowout
Internal resistance increases more than the standard 3-spot blowout.
Approx. 14 Pa at $17m^3$/min

(2) Square duct blowout
Internal resistance decreases more than the standard round duct (ϕ 200 3-spot). 3 Pa at $17m^3$/min.
(External static pressure increases in reverse.)

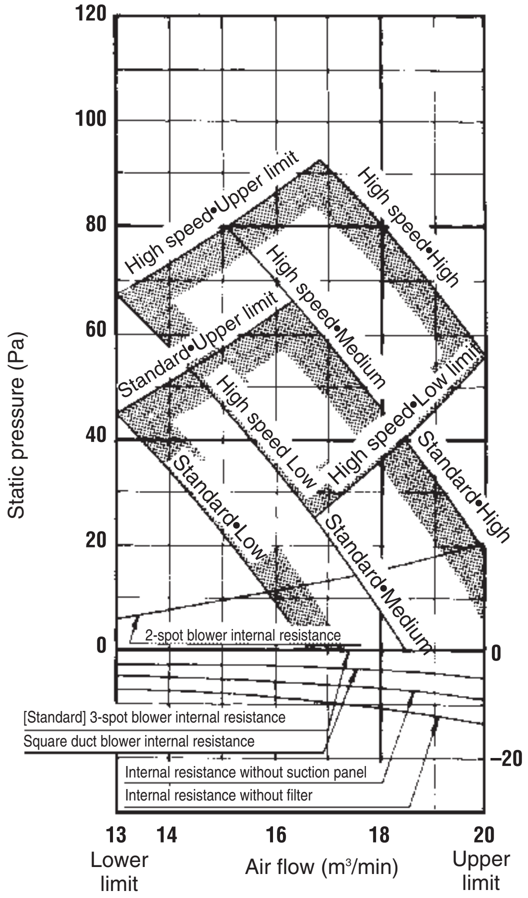
(3) Suction panel
When the suction panel is not used with the ceiling return type, the part of internal resistance related to the panel decrease. 3 Pa (= 0.6–0.3) at $17mm^3$/min.



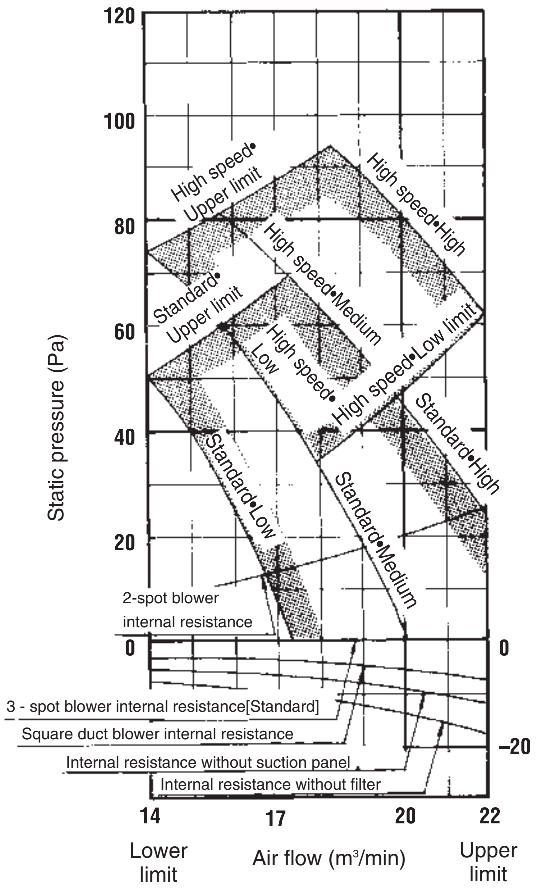
Models FDRA45KXE4A, 56KXE4A



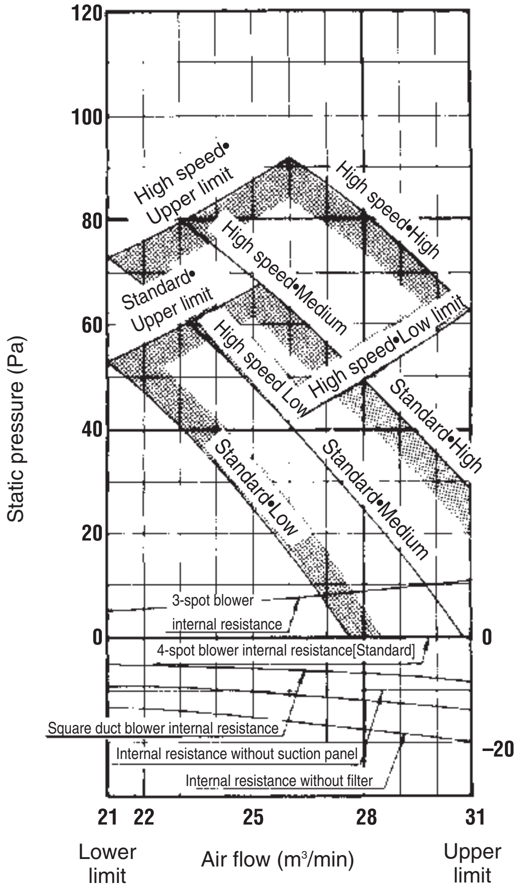
Model FDRA71KXE4A



Model FDRA90KXE4A

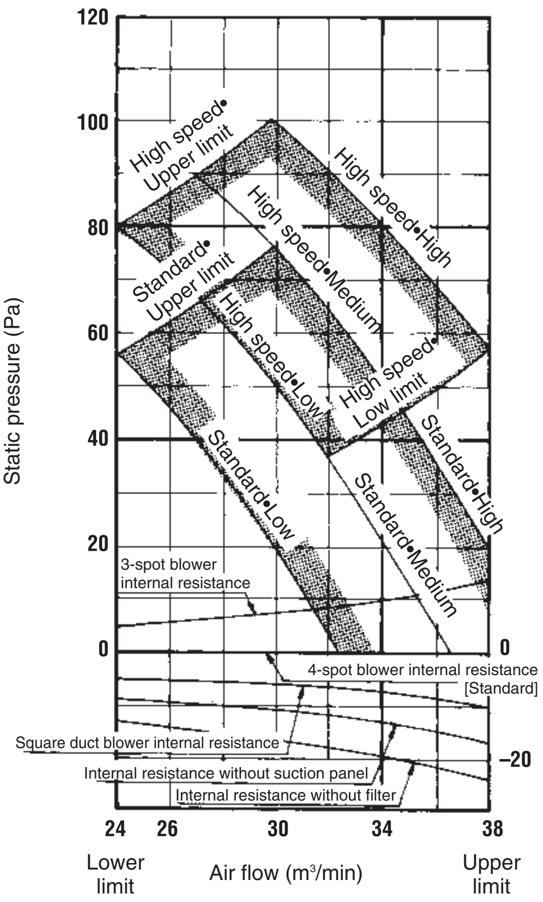


Model FDRA112KXE4A



Product Specifications

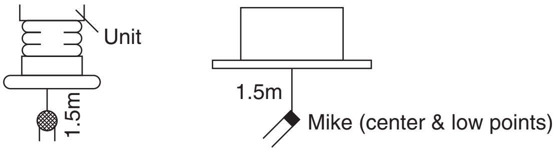
Model FDRA140KXE4A



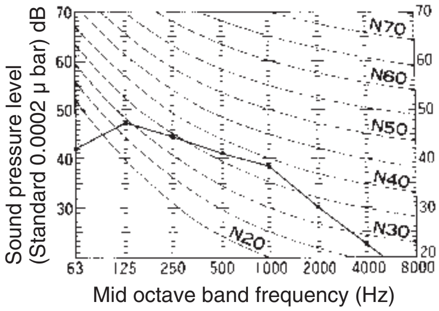
3.6.6 Noise level

Note (1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

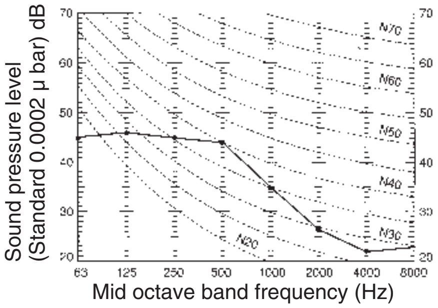
Measured based on JIS B 8616
Mike position as below



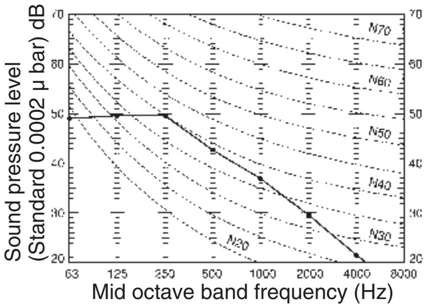
Models FDRA45KXE4A, 56KXE4A
Noise level 43 dB (A) at HIGH
40 dB (A) at MEDIUM
37 dB (A) at LOW



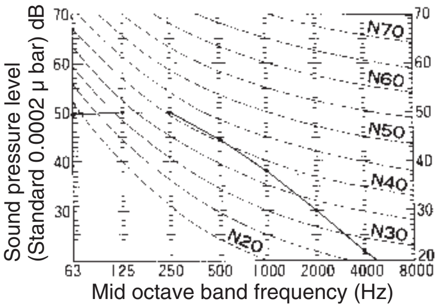
Models FDRA71KXE4A, 90KXE4A
Noise level 43 dB (A) at HIGH
40 dB (A) at MEDIUM
37 dB (A) at LOW



Model FDRA112KXE4A
Noise level 45 dB (A) at HIGH
42 dB (A) at MEDIUM
38 dB (A) at LOW



Model FDRA140KXE4A
Noise level 46 dB (A) at HIGH
43 dB (A) at MEDIUM
39 dB (A) at LOW



3.7 Medium Static Pressure Ducted Type (FDQMA)

3.7.1 Specifications

FDQMA22KXE4A, 28KXE4A, 36KXE4A

Item		Models	FDQMA22KXE4A	FDQMA28KXE4A	FDQMA36KXE4A
Nominal cooling capacity*1		kW	2.3	2.9	3.7
Nominal cooling capacity*2		kW	2.2	2.8	3.6
Nominal heating capacity*3		kW	2.5	3.2	4.0
Power source			1 Phase 220 / 240V 50Hz		
Noise level		dB(A)	Hi: 34 Lo: 31		
Exterior dimensions (Height × Width × Depth)		mm	257 × 570 × 570		
Net weight		kg	21		
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	Slit fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve		
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 1		
	Motor & Q'ty	W	20 × 1		
	Starting method		Line starting		
	Air flow (Standard)	CMM	Hi: 7 Lo: 6.5		
	Available static pressure (at Hi)	Pa	30		
	Fresh air intake		Side		
	Air filter & Q'ty		—		
Shock & vibration isolator			Rubber sleeve(for fan motor)		
Insulation (noise & heat)			Polyurethane foam		
Operation control Operation switch			Remote control switch (Optional:RC-E1)		
Room temperature control			Thermostat by electronics		
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat		
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 6.35(1/4") Gas line: φ 9.52(3/8")		Liquid line: φ 6.35(1/4") Gas line: φ 12.7(1/2")
	Connecting method		Flare piping		
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)		
	Insulation for piping		Necessary (both Liquid & Gas lines)		
Accessories			Mounting kit Drain hose		
Optional parts			—		

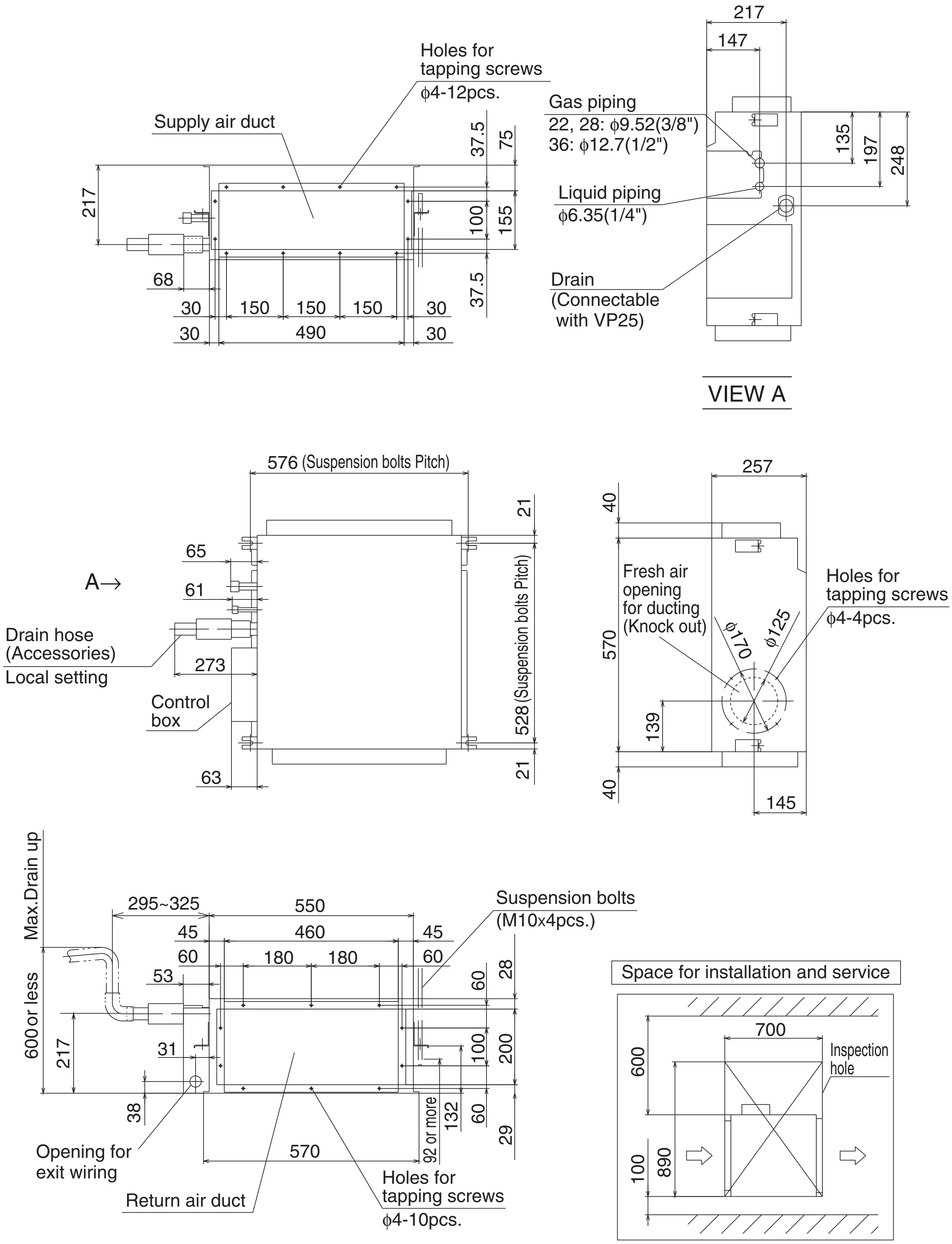
*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1 JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

3.7.2 Exterior dimensions

FDQMA22KXE4A, 28KXE4A, 36KXE4A

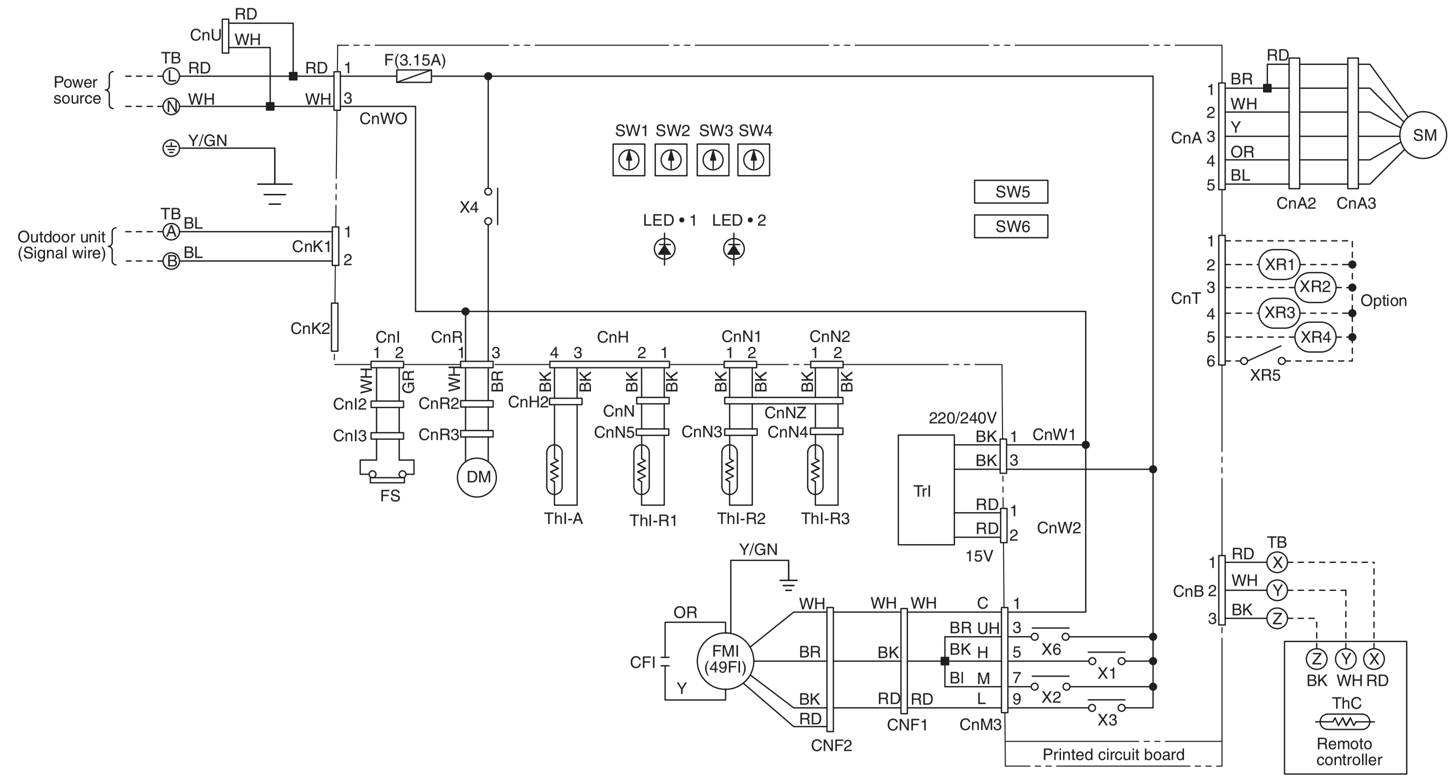
Unit : mm



Product Specifications

3.7.3 Electrical wiring

All models



Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI	Fan motor	ThC	Thermistor	XR1	Operation output (DC12V output)
49FI	Internal thermostat for FMI	SW1	Indoor unit address ten's place	XR2	Heating output (DC12V output)
CFI	Capacitor for FMI	SW2	Indoor unit address unit's place	XR3	Thermo ON output (DC12V output)
DM	Drain motor	SW3	Outdoor unit address ten's place	XR4	Inspection output (DC12V output)
FS	Float switch	SW4	Outdoor unit address unit's place	XR5	Remote operation input (volt-free contact)
SM	Stepping motor (For Exp.v)	SW6	Model capacity setting	X1,2,3,6	Auxiliary relay (For FM)
ThI-A	Thermistor	Trl	Transformer	X4	Auxiliary relay (For DM)
ThI-R1	Thermistor	F	Fuse	TB	Terminal block (○ mark)
ThI-R2	Thermistor	LED1	Indication lamp (Red)	CnA ~ Z	Connector
ThI-R3	Thermistor	LED2	Indication lamp (Green)	■mark	Closed-end connector

Color marks

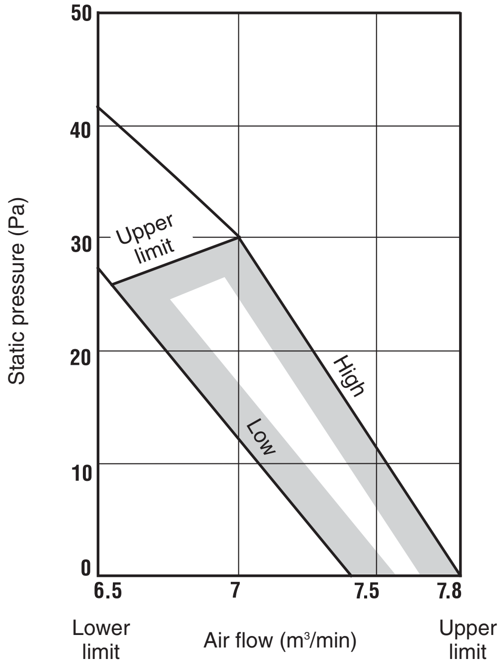
Mark	Color	Mark	Color
BK	Black	RD	Red
BL	Blue	WH	White
BR	Brown	Y	Yellow
GR	Gray	Y/GN	Yellow/Green
OR	Orange		

Function of switches

Mark		Function	
SW5-1	ON	Test run of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal : Valid	
	OFF	Emergency stop signal : Invalid	

3.7.4 Characteristics of fan

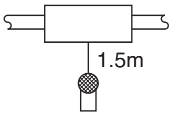
FDQMA22KXE4A, 28KXE4A, 36KXE4A



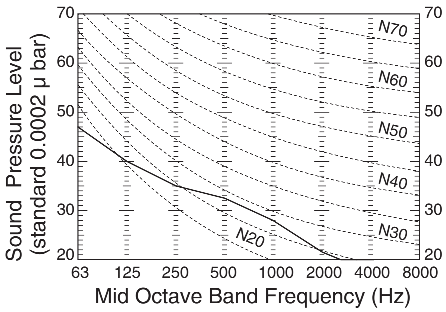
3.7.5 Noise level

Note (1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

Measured based on JIS B 8616
Mike position as below



Models FDQMA22KXE4A, 28KXE4A, 36KXE4A
Noise level 34 dB (A) at HIGH
31 dB (A) at LOW



3.8 Satellite Ducted Type (FDUMA)

3.8.1 Specifications

FDUMA45KXE4A, 56KXE4A

Item		Models	FDUMA45KXE4A	FDUMA56KXE4A
Nominal cooling capacity*1		kW	4.7	5.8
Nominal cooling capacity*2		kW	4.5	5.6
Nominal heating capacity*3		kW	5.0	6.3
Power source			1 Phase 220 / 240V 50Hz	
Noise level		dB(A)	Hi: 35 Me: 32 Lo: 29	
Exterior dimensions (Height × Width × Depth)		mm	299 × 750 × 635	
Net weight		kg	34	
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 2	
	Motor & Q'ty	W	55 × 1	
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 14 Me: 12 Lo: 11	
	Available static pressure (at Hi)	Pa	Standard: 50, Hi speed: 85	
	Fresh air intake		Side	
	Air filter & Q'ty		—	
Shock & vibration isolator			Rubber sleeve(for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional:RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35(1/4"), Gas line: ϕ 12.7(1/2")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit Drain hose	
Optional parts			—	

*1 ~ 3The data are measured at the following conditions.

Item / Operation	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1 JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDUMA71KXE4A, 90KXE4A

Item \ Models			FDUMA71KXE4A	FDUMA90KXE4A
Nominal cooling capacity*1		kW	7.3	9.3
Nominal cooling capacity*2		kW	7.1	9.0
Nominal heating capacity*3		kW	8.0	10.0
Power source			1 Phase 220 / 240V 50Hz	
Noise level		dB(A)	Hi: 35 Me: 32 Lo: 29	Hi: 36 Me: 33 Lo: 30
Exterior dimensions (Height × Width × Depth)		mm	299 × 950 × 635	
Net weight		kg	40	
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 2	
	Motor & Q'ty	W	90 × 1	100 × 1
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 18 Me: 16 Lo: 14	Hi: 20 Me: 18 Lo: 15
	Available static pressure (at Hi)	Pa	Standard: 50, Hi speed: 85	
	Fresh air intake		Side	
	Air filter & Q'ty		—	
Shock & vibration isolator			Rubber sleeve(for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional:RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 9.52(3/8"), Gas line: ϕ 15.88(5/8")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit Drain hose	
Optional parts			—	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1 JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDUMA112KXE4A, 140KXE4A

Item		Models	FDUMA112KXE4A	FDUMA140KXE4A
Nominal cooling capacity*1		kW	11.6	14.5
Nominal cooling capacity*2		kW	11.2	14.0
Nominal heating capacity*3		kW	12.5	16.0
Power source			1 Phase 220 / 240V 50Hz	
Noise level		dB(A)	Hi: 38 Me: 35 Lo: 32	Hi: 39 Me: 37 Lo: 34
Exterior dimensions (Height × Width × Depth)		mm	350 × 1370 × 635	
Net weight		kg	59	59
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 3	
	Motor & Q'ty	W	45 × 1, 90 × 1	50 × 1, 100 × 1
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 28 Me: 25 Lo: 22	Hi: 34 Me: 31 Lo: 27
	Available static pressure (at Hi)	Pa	Standard: 60, Hi speed: 90	Standard: 60, Hi speed: 85
	Fresh air intake		Side	
	Air filter & Q'ty		—	
Shock & vibration isolator			Rubber sleeve(for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional:RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 9.52(3/8"), Gas line: ϕ 15.88(5/8")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25	
	Insulation for piping		Necessary (both Liquid & Gas lines) (I.D. 25mm, O.D. 32mm)	
Accessories			Mounting kit Drain hose	
Optional parts			—	

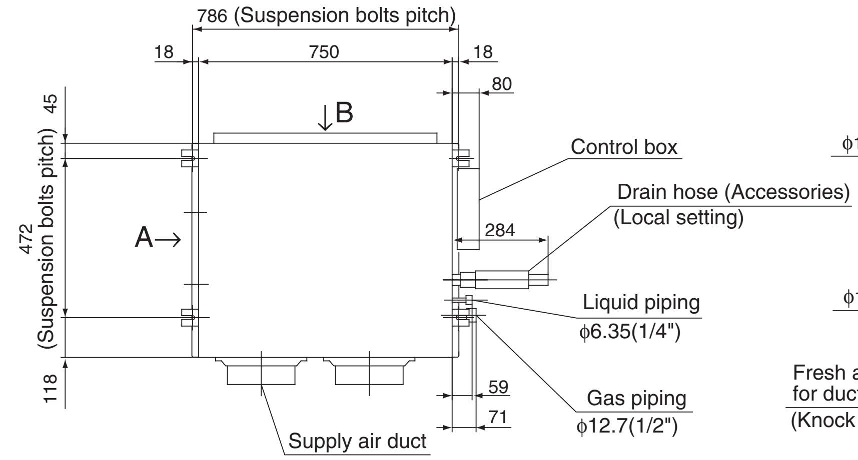
*1 ~ 3The data are measured at the following conditions.

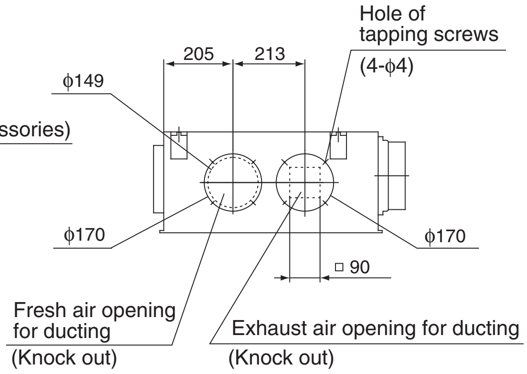
Item / Operation	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1 JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

3.8.2 Exterior dimensions

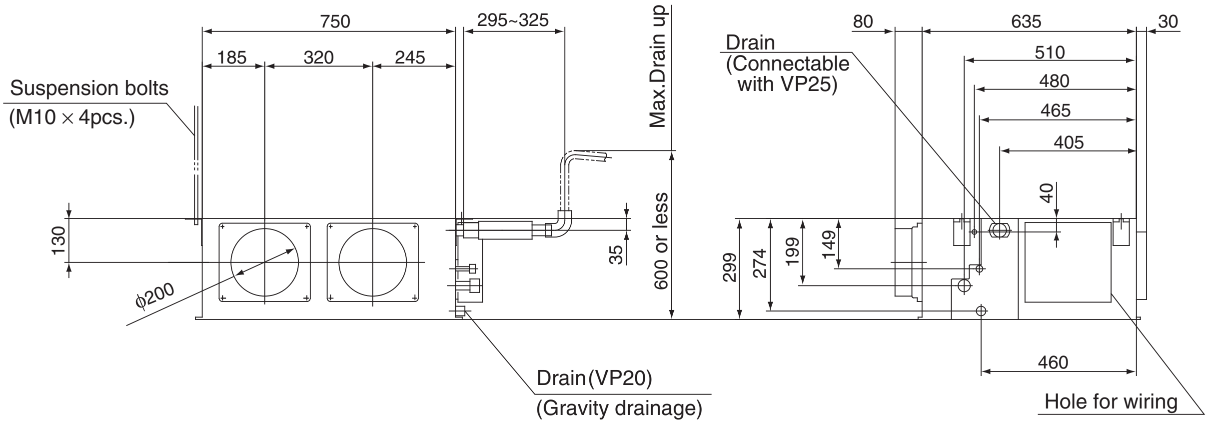
FDUMA45KXE4A, 56KXE4A

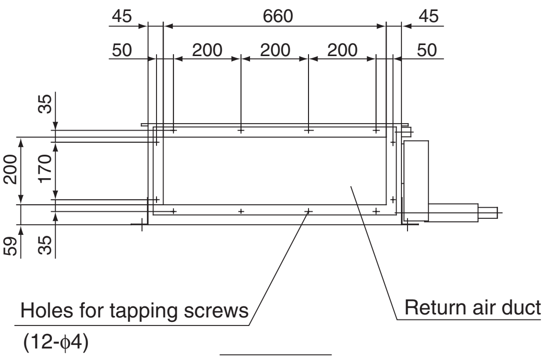
Unit : mm



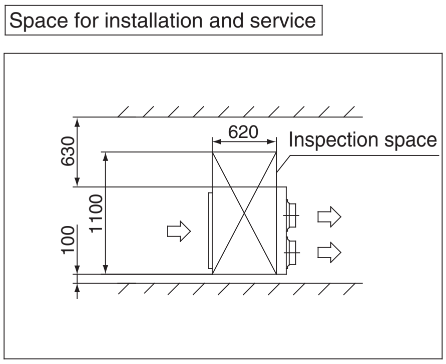


VIEW A



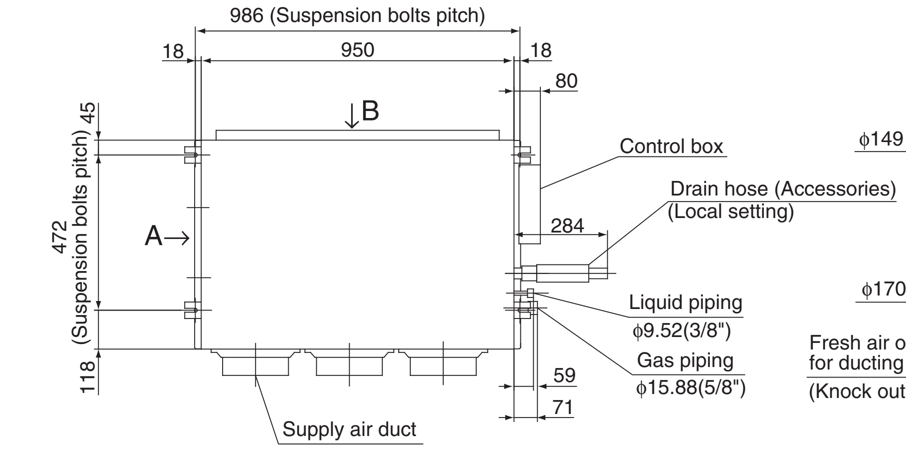


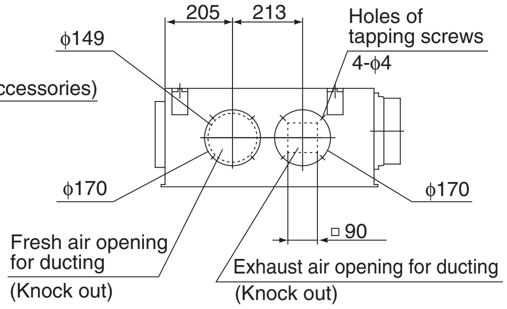
VIEW B



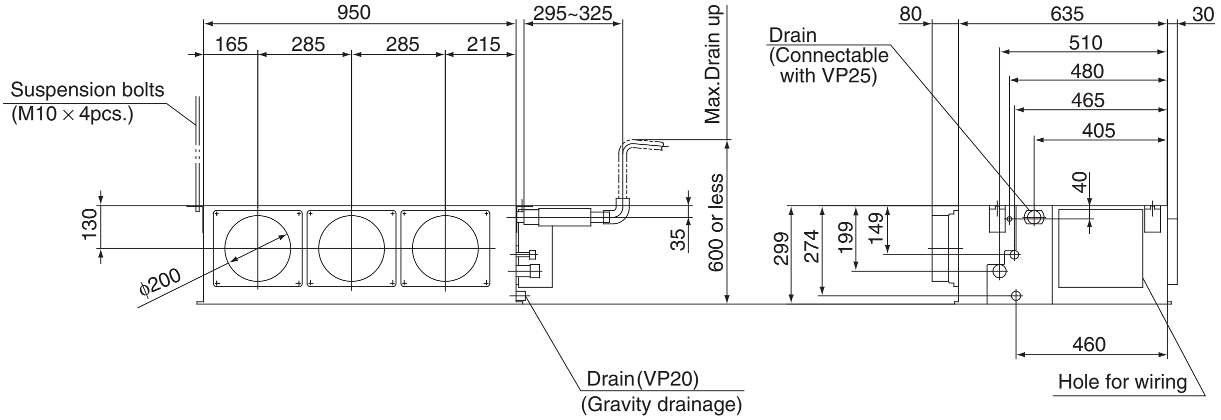
FDUMA71KXE4A, 90KXE4A

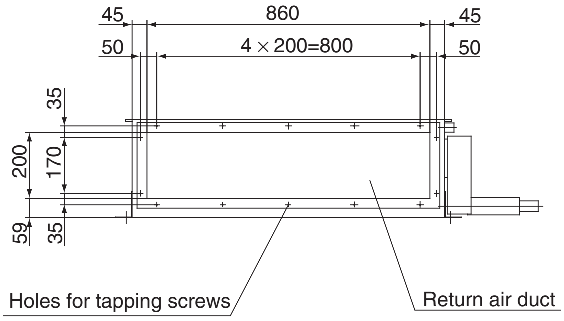
Unit : mm



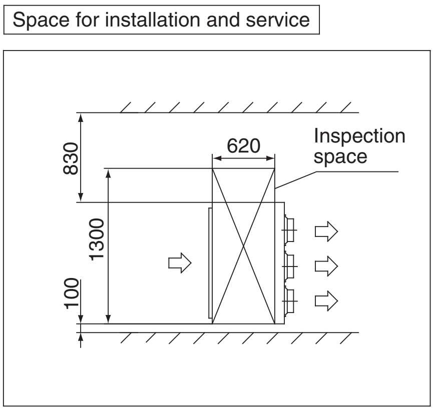


VIEW A



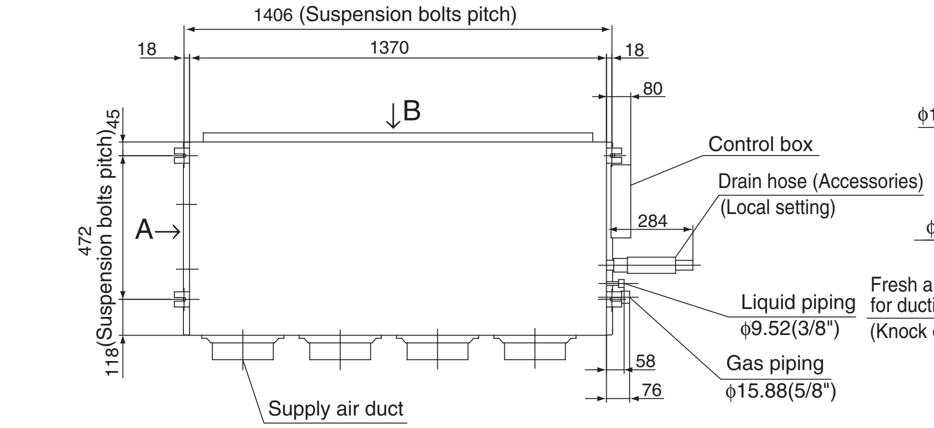


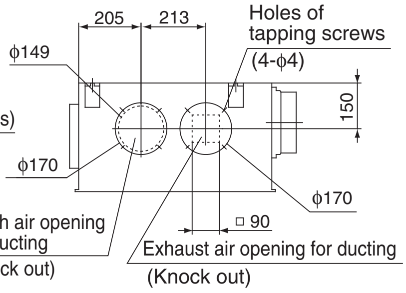
VIEW B



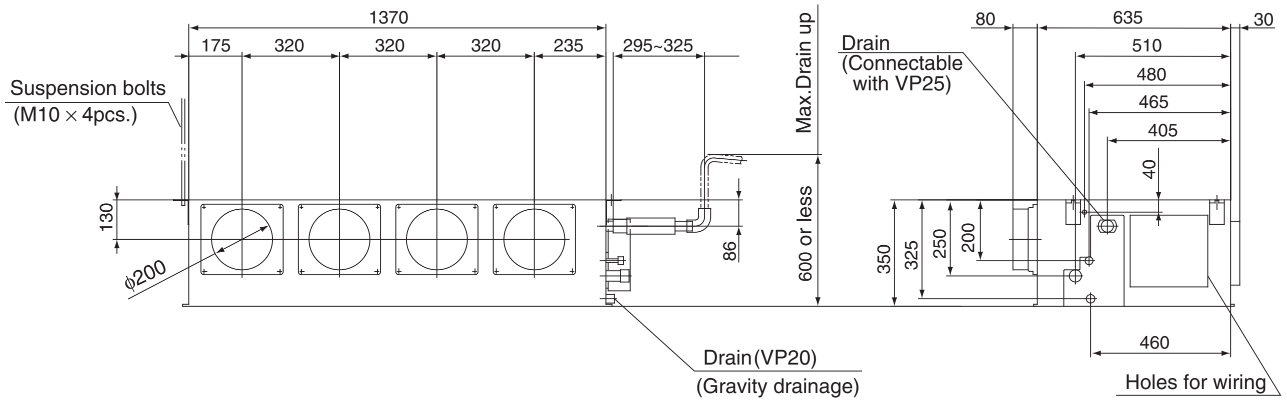
FDUMA112KXE4A, 140KXE4A

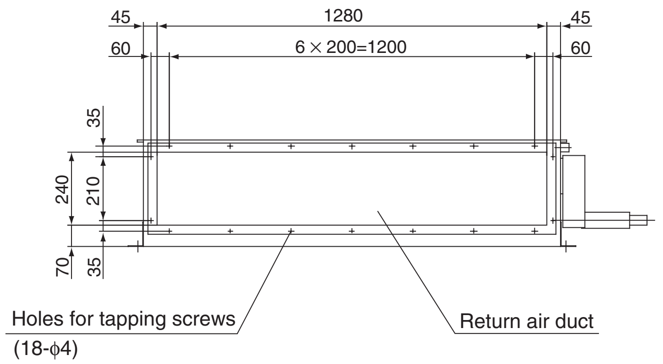
Unit : mm





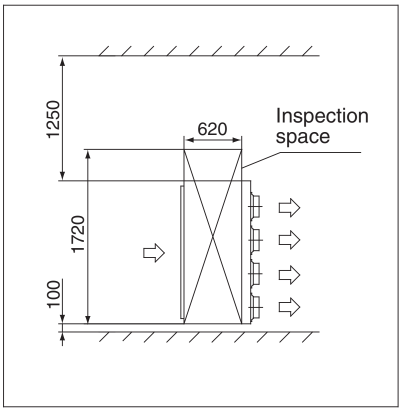
VIEW A





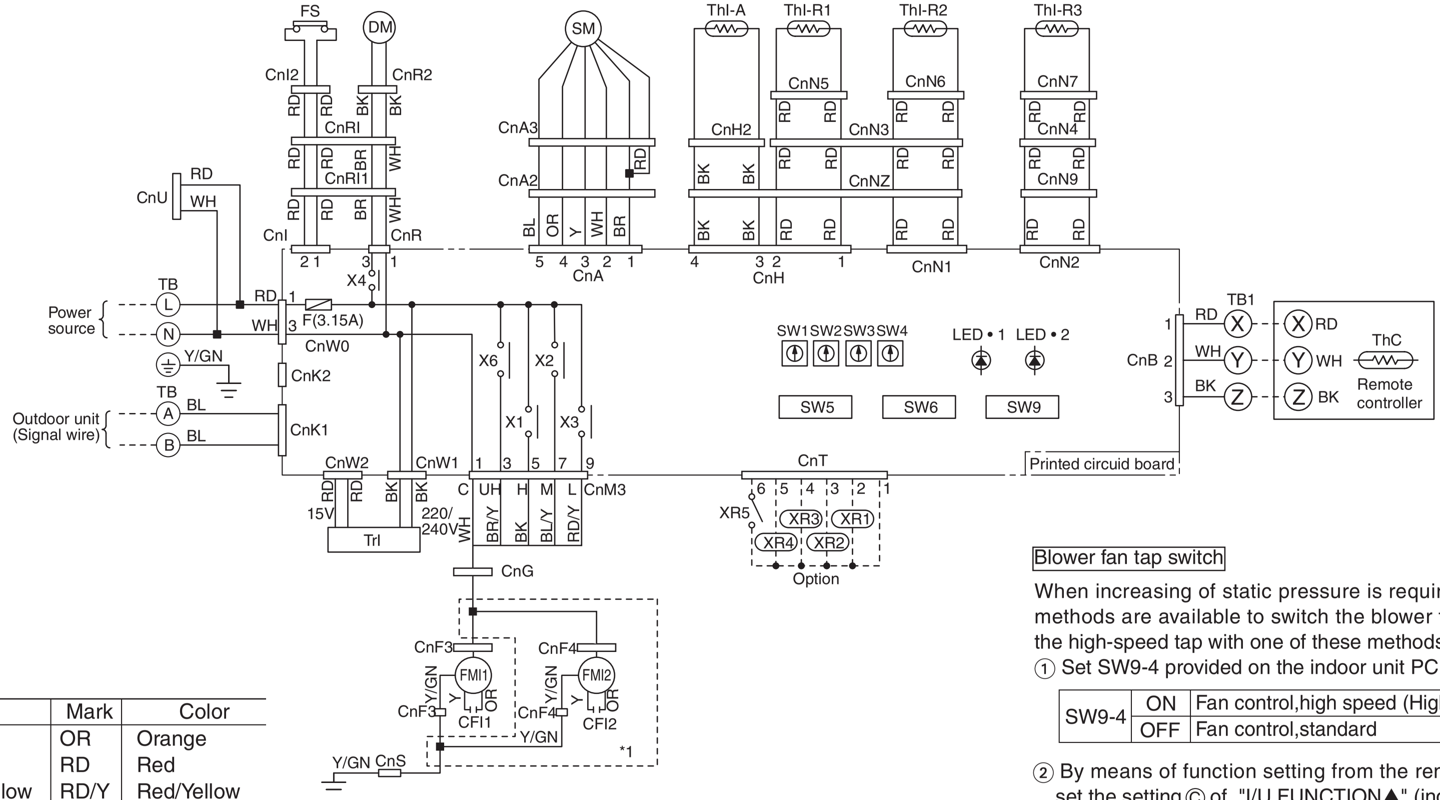
VIEW B

Space for installation and service



3.8.3 Electrical wiring

All models



Note(1) A one-motor type installation does not have the circuits shown in an area *1 delineated by a dotted line.

Color marks

Mark	Color	Mark	Color
BK	Black	OR	Orange
BL	Blue	RD	Red
BL/Y	Blue/yellow	RD/Y	Red/Yellow
BR	Brown	WH	White
BR/Y	Brown/yellow	Y	Yellow
GR	Gray	Y/GN	Yellow/Green

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI1,2	Fan motor	SW1	Indoor unit address ten's place	XR2	Heating output (DC12V output)
CFI1,2	Capacitor for FMI	SW2	Indoor unit address unit's place	XR3	Thermo ON output (DC12V output)
DM	Drain motor	SW3	Outdoor unit address ten's place	XR4	Inspection output (DC12V output)
FS	Float switch	SW4	Outdoor unit address unit's place	XR5	Remote operation input (volt-free contact)
SM	Stepping motor (For Exp.v)	SW6	Model capacity setting	X1,2,3,6	Auxiliary relay (For FM)
Thl-A	Thermistor	Trl	Transformer	X4	Auxiliary relay (For DM)
Thl-R1	Thermistor	F	Fuse	TB	Terminal block (○ mark)
Thl-R2	Thermistor	LED1	Indication lamp (Red)	CnA~Z	Connector
Thl-R3	Thermistor	LED2	Indication lamp (Green)	■mark	Closed-end connector
ThC	Thermistor	XR1	Operation output (DC12V output)		

Blower fan tap switch

When increasing of static pressure is required,the following two methods are available to switch the blower fan tap. Switch to the high-speed tap with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control,high speed (High ceiling)
	OFF	Fan control,standard

② By means of function setting from the remote controller unit, set the setting Ⓒ of "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

Function of switches

Mark		Function	
SW5-1	ON	Test run of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal:valid	
	OFF	Emergency stop signal:Invalid	

Product Specifications

3.8.4 Characteristics of fan

Satellite ducted type(FDUMA)

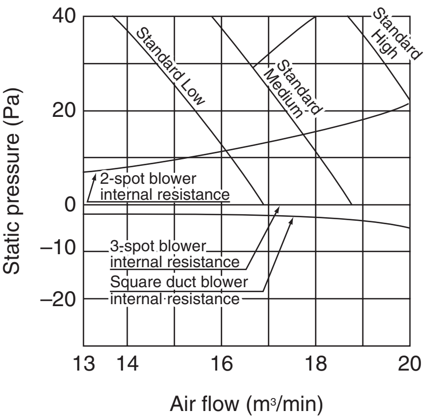
●External static pressure table Unit : Pa

Model \ Air flow (m³/min) \ Duct specs.		1 spot(1) closing		Standard(2)		Square duct(3)	
		Stan-dard	High(4) speed	Stan-dard	High(4) speed	Stan-dard	High(4) speed
FDQMA22 28 36	7	-	-	30	-	-	-
FDUMA36	12	-	-	50	85	50	90
FDUMA45 56	14	-	-	50	85	50	90
FDUMA71	18	35	70	50	85	55	90
FDUMA90	20	30	65	50	85	55	90
FDUMA112	28	50	80	60	90	65	95
FDUMA140	34	50	75	60	85	65	95

Note (1) 1 spot closing: Round duct flange at center is removed and shield with a special panel (option).
(2) Standard: ϕ200 duct are installed at blowout holes.
(3) Square duct: All round ducts are removed and replaced with special square duct flanges (option).
(4) When using the high speed setting, turn the dip switch SW9-4 on the indoor PCB to the ON position.
(When setting from the remote controller, select "HiCEILING 1".)

■ How to interpret the blower characteristics table

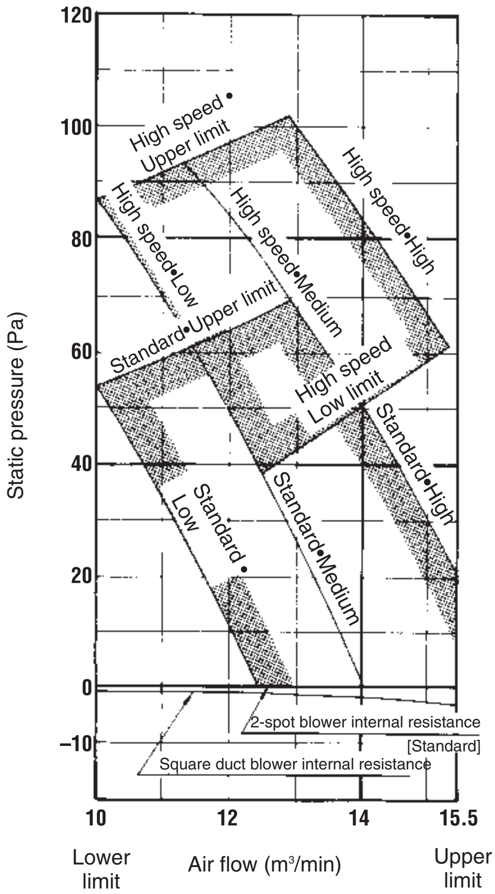
Example : Case of FDUMA71KXE4A



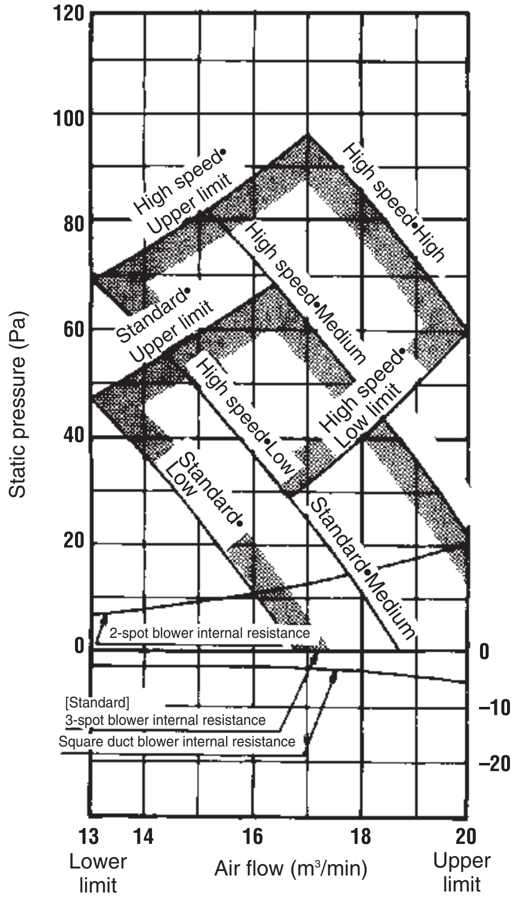
① 2-spot blowout....................
Internal resistance increases more than the standard 3-spot blowout. Approx. 14Pa at 17m³ / min.

② Square duct blowout...........
Internal resistance decreases more than the standard round duct (ϕ 200 3-spot). 3Pa at 17 m³ / min. (External static pressure increases in reverse.)

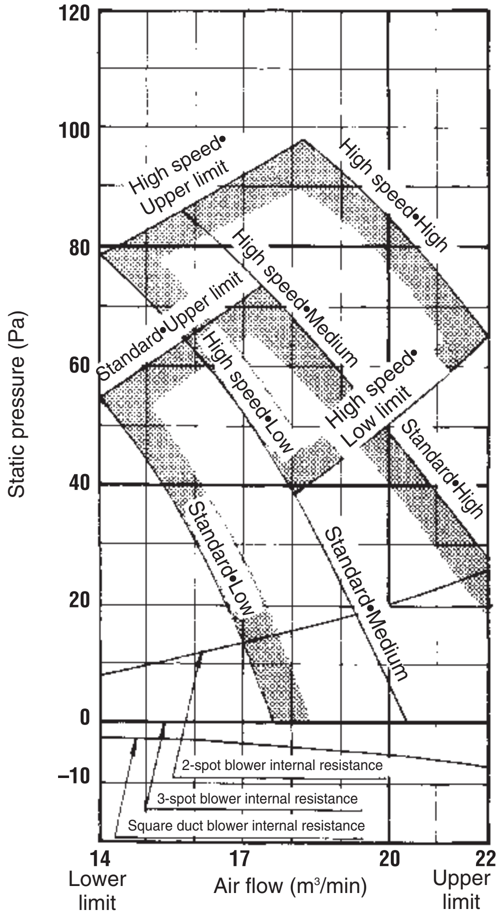
FDUMA45KXE4A, 56KXE4A



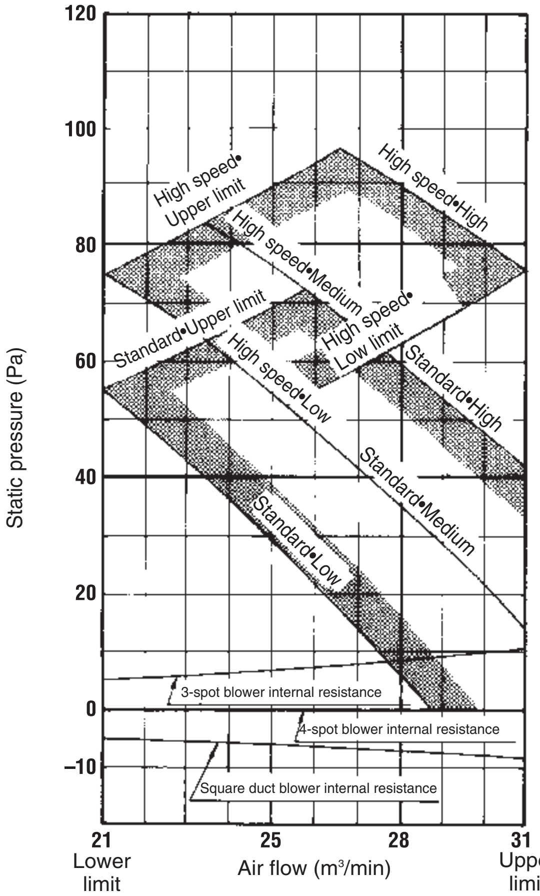
FDUMA71KXE4A



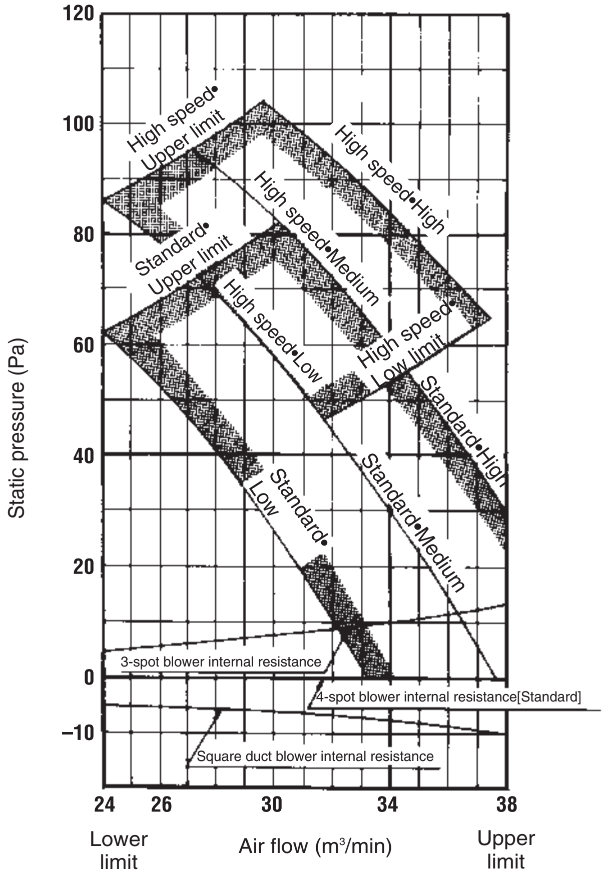
FDUMA90KXE4A



FDUMA112KXE4A



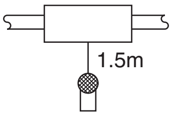
FDUMA140KXE4A



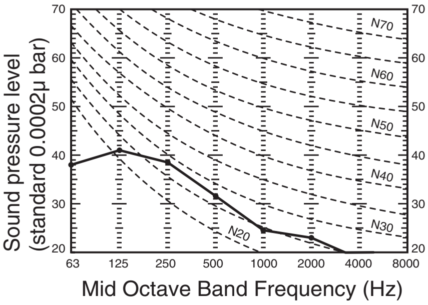
Product Specifications

3.8.5 Noise level

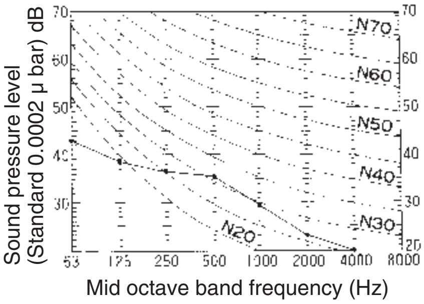
Note (1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.
Measured based on JIS B 8616
Mike position as below



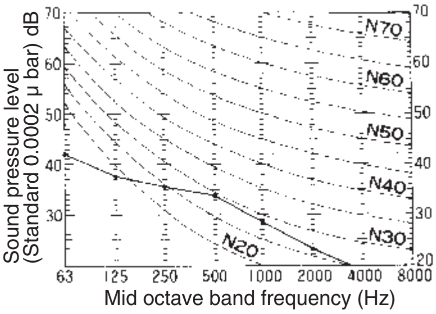
Model FDUMA36KXE4A
Noise level 34 dB (A) at HIGH
32 dB (A) at MEDIUM
29 dB (A) at LOW



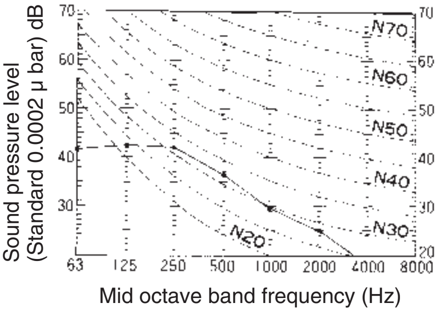
Models FDUMA45KXE4A, 56KXE4A, 71KXE4A
Noise level 35 dB (A) at HIGH
32 dB (A) at MEDIUM
29 dB (A) at LOW



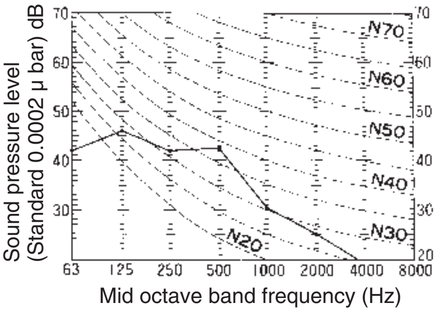
Model FDUMA90KXE4A
Noise level 36 dB (A) at HIGH
33 dB (A) at MEDIUM
30 dB (A) at LOW



Model FDUMA112KXE4A
Noise level 38 dB (A) at HIGH
35 dB (A) at MEDIUM
32 dB (A) at LOW



Model FDUMA140KXE4A
Noise level 39 dB (A) at HIGH
37 dB (A) at MEDIUM
34 dB (A) at LOW



3.9 Ceiling Mounted Duct Type (FDURA)

3.9.1 Specifications

FDURA45KXE4A, 56KXE4A

Item \ Models			FDURA45KXE4A	FDURA56KXE4A
Nominal cooling capacity *1		kW	4.7	5.8
Nominal cooling capacity *2		kW	4.5	5.6
Nominal heating capacity *3		kW	5.0	6.3
Power source			1 Phase 220/240V 50Hz	
Noise level		dB(A)	Hi: 40 Lo: 36	Hi: 41 Lo: 37
Exterior dimensions (Height × Width × Depth)		mm	295 × 850 × 650	
Net weight		kg	39	39
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion valve	
Air handling equipment	Fan type & Q'ty		Multiblade centrifugal fan × 2	
	Motor & Q'ty	W	90 × 1	130 × 1
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 17 Lo: 13.5	Hi: 21 Lo: 17
	Available static pressure (at Hi)	Pa	Standard: 50, Hi speed: 85	
	Fresh air intake		—	
	Air filter & Q'ty		Polypropylene net × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4"), Gas line: ϕ 12.7 (1/2")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Silent panel, Duct joint	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling *1	27°C	19.5°C	35°C	24°C	ISO-T1 JIS B8616
Cooling *2	27°C	19°C	35°C	24°C	
Heating *3	20°C	—	7°C	6°C	

FDURA71KXE4A, 90KXE4A

Item		Models	FDURA71KXE4A	FDURA90KXE4A
Nominal cooling capacity*1		kW	7.3	9.1
Nominal cooling capacity*2		kW	7.1	9.0
Nominal heating capacity*3		kW	8.0	10.0
Power source			1 Phase 220/240V 50Hz	
Noise level		dB(A)	Hi: 41 Lo: 37	Hi: 42 Lo: 37
Exterior dimensions (Height × Width × Depth)		mm	295 × 850 × 650	350 × 1370 × 650
Net weight		kg	40	63
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion valve	
Air handling equipment	Fan type & Q'ty		Multiblade centrifugal fan × 2	
	Motor & Q'ty	W	230 × 1	280 × 1
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 25 Lo: 18.5	Hi: 34 Lo: 27
	Available static pressure (at Hi)	Pa	Standard: 50, Hi speed: 130	
	Fresh air intake		—	
	Air filter & Q'ty		Polypropylene net × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 9.52 (3/8"), Gas line: φ 15.88 (5/8")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Silent panel, Duct joint	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1 JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDURA112KXE4A, 140KXE4A

Item / Models			FDURA112KXE4A	FDURA140KXE4A
Nominal cooling capacity*1		kW	11.6	14.5
Nominal cooling capacity*2		kW	11.2	14.0
Nominal heating capacity*3		kW	12.5	16.0
Power source			1 Phase 220/240V 50Hz	
Noise level		dB(A)	Hi: 42 Lo: 38	Hi: 43 Lo: 39
Exterior dimensions (Height × Width × Depth)		mm	350 × 1370 × 650	
Net weight		kg	63	65
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion valve	
Air handling equipment	Fan type & Q'ty		Multiblade centrifugal fan × 2	
	Motor & Q'ty	W	280 × 1	460 × 1
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 34 Lo: 27	Hi: 42 Lo: 33.5
	Available static pressure (at Hi)	Pa	Standard: 50, Hi speed: 130	
	Fresh air intake		—	
	Air filter & Q'ty		Polypropylene net × 1 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional: RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor, Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 9.52 (3/8"), Gas line: ϕ 15.88 (5/8")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP25 (I.D. 25mm, O.D. 32mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			Silent panel, Duct joint	

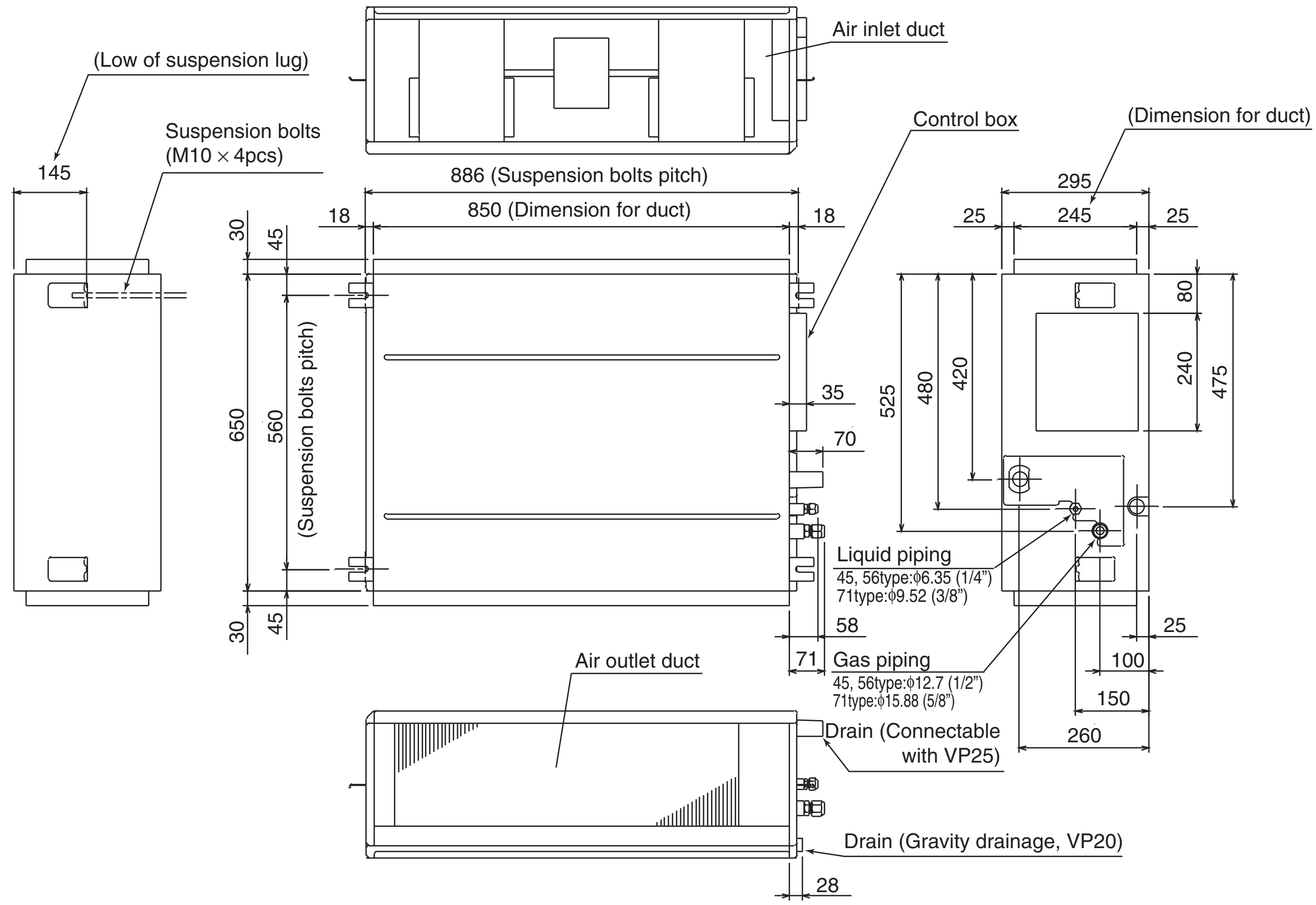
*1 ~ 3The data are measured at the following conditions.

Operation / Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1 JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

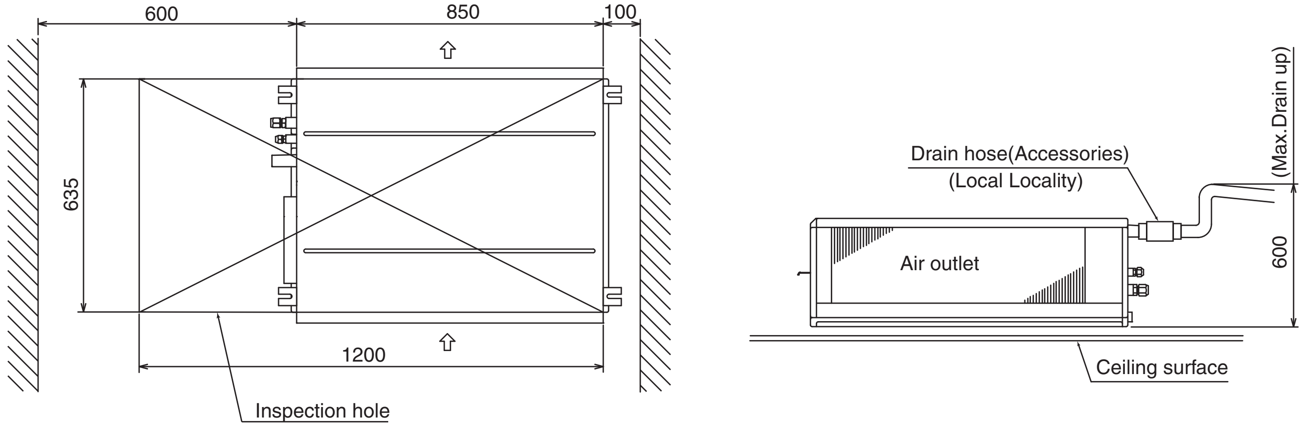
3.9.2 Exterior dimensions

FDURA45KXE4A, 56KXE4A, 71KXE4A

Unit : mm

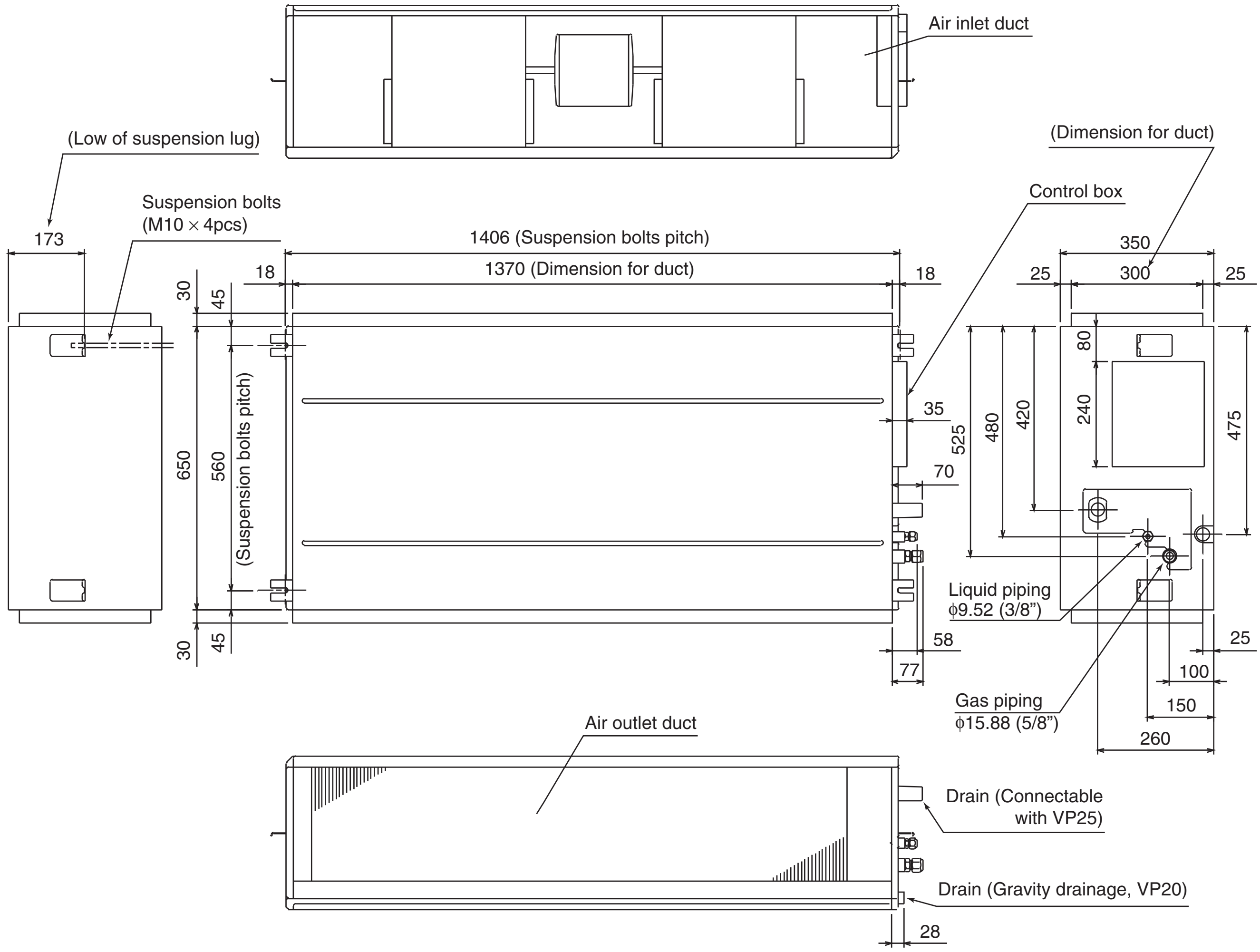


Space for installation and service

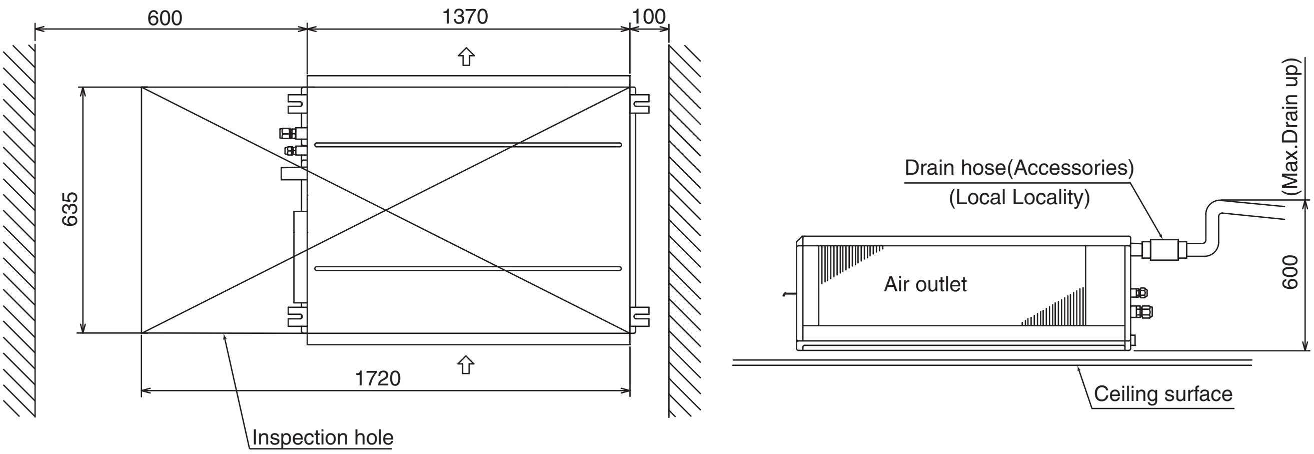


FDURA90KXE4A, 112KXE4A, 140KXE4A

Unit : mm

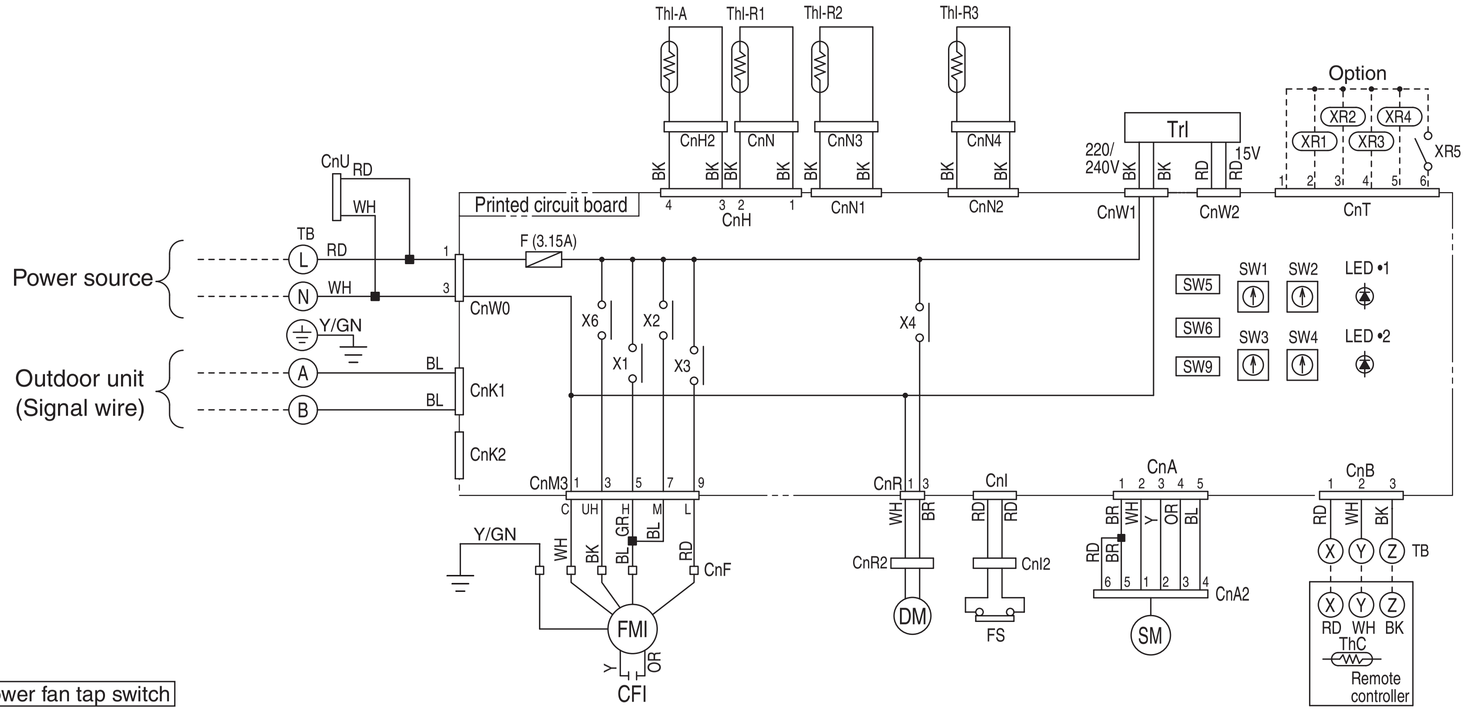


Space for installation and service



3.9.3 Electrical wiring

All models



Blower fan tap switch

When increasing of static pressure is required,the following two methods are available to switch the blower fan tap. Switch to the high-speed tap with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control, high speed (High ceiling)
	OFF	Fan control, standard

② By means of function setting from the remote controller unit, set the setting Ⓒ of "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI	Fan motor	SW1	Indoor unit address ten's place	XR2	Heating output (DC12V output)
CFI	Capacitor for FMI	SW2	Indoor unit address unit's place	XR3	Thermo ON output (DC12V output)
DM	Drain motor	SW3	Outdoor unit address ten's place	XR4	Inspection output (DC12V output)
FS	Float switch	SW4	Outdoor unit address unit's place	XR5	Remote operation input (volt-free contact)
SM	Stepping motor (For Exp.v)	SW6	Model capacity setting	X1,2,3,6	Auxiliary relay (For FM)
ThI-A	Thermistor	Trl	Transformer	X4	Auxiliary relay (For DM)
ThI-R1	Thermistor	F	Fuse	TB	Terminal block (○ mark)
ThI-R2	Thermistor	LED1	Indication lamp (Red)	CnA~Z	Connector
ThI-R3	Thermistor	LED2	Indication lamp (Green)	■mark	Closed-end connector
ThC	Thermistor	XR1	Operation output (DC12V output)		

Color marks

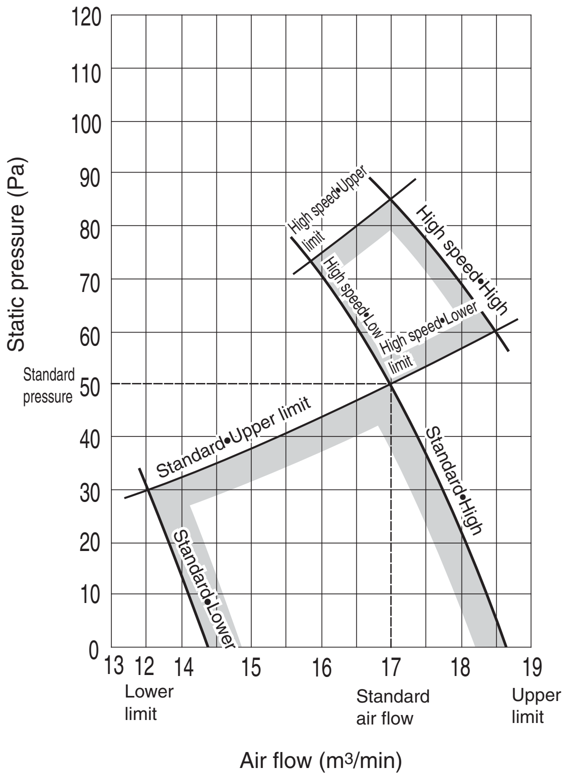
Mark	Color	Mark	Color
BK	Black	RD	Red
BL	Blue	WH	White
BR	Brown	Y	Yellow
GR	Gray	Y/GN	Yellow/Green
OR	Orange		

Function of switches

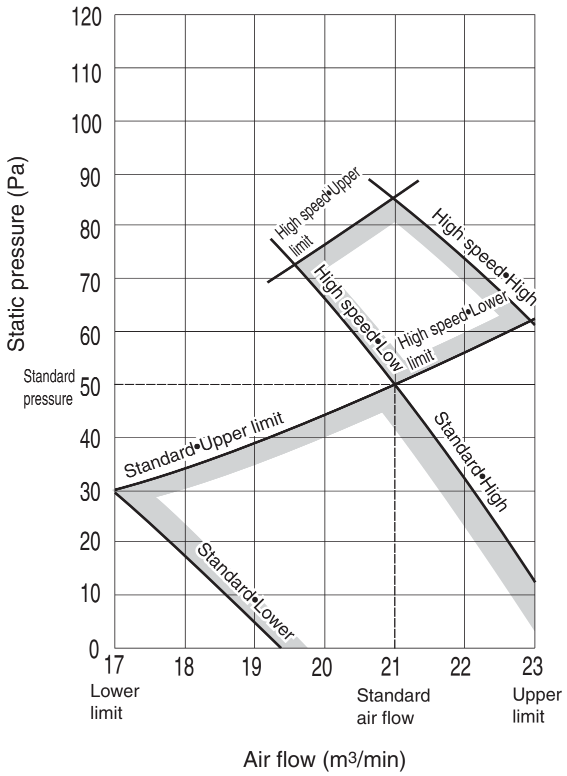
Mark		Function	
SW5-1	ON	Test run of condensate pump motor	
	OFF	Normal	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal: valid	
	OFF	Emergency stop signal: Invalid	

3.9.4 Characteristics of fan

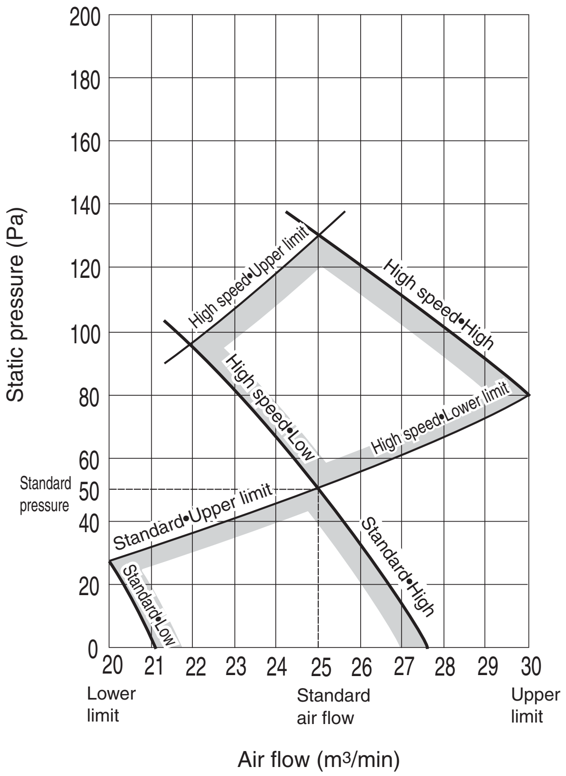
FDURA45KXE4A



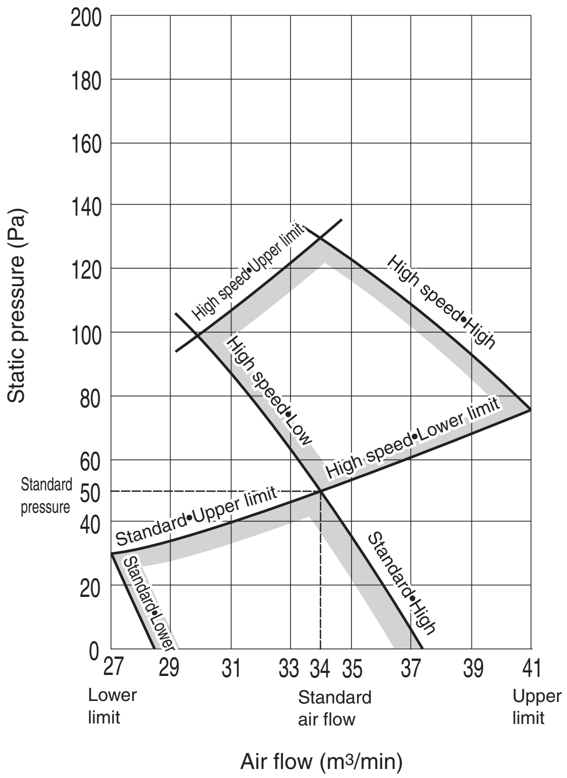
FDURA56KXE4A



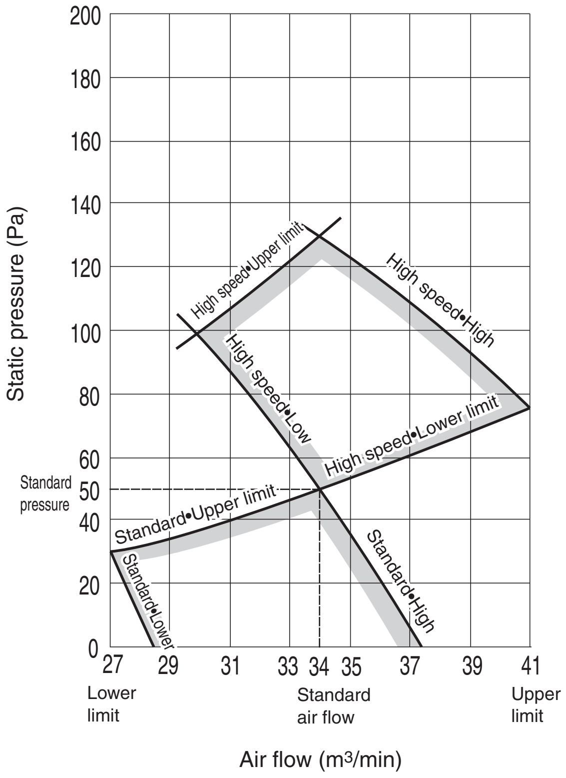
FDURA71KXE4A



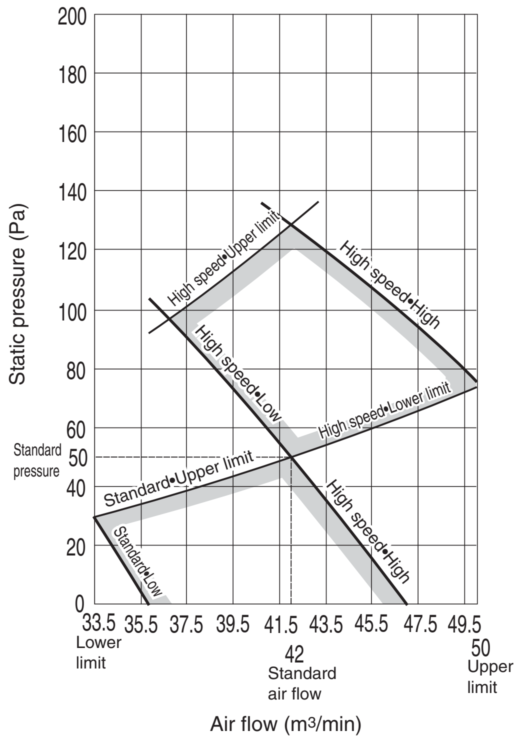
FDURA90KXE4A



FDURA112KXE4A



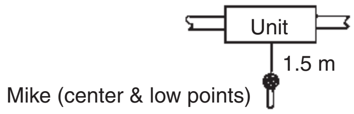
FDURA140KXE4A



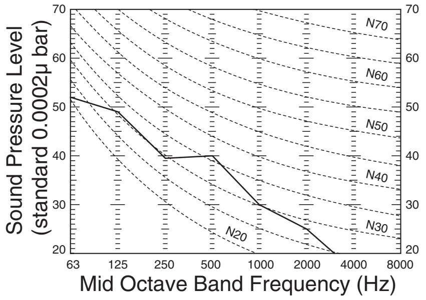
3.9.5 Noise level

Note (1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

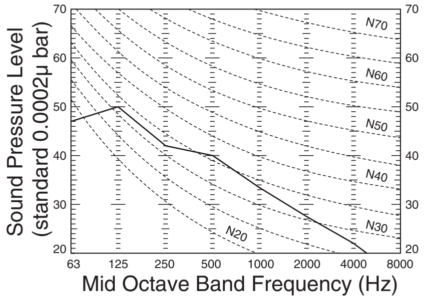
Measured based on JIS B 8616
Mike position as below



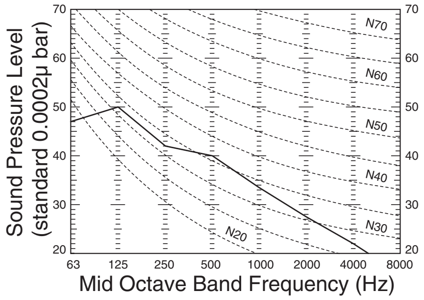
Model FDURA45KXE4A
Noise level 40 dB (A) at HIGH
36 dB (A) at LOW



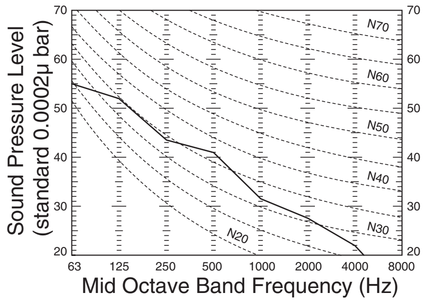
Model FDURA56KXE4A
Noise level 41 dB (A) at HIGH
37 dB (A) at LOW



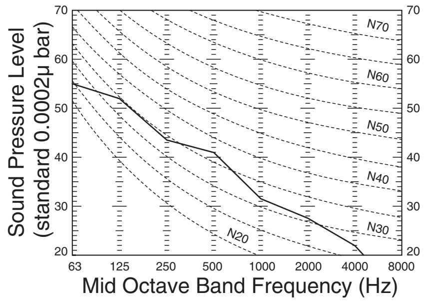
Model FDURA71KXE4A
Noise level 41 dB (A) at HIGH
37 dB (A) at LOW



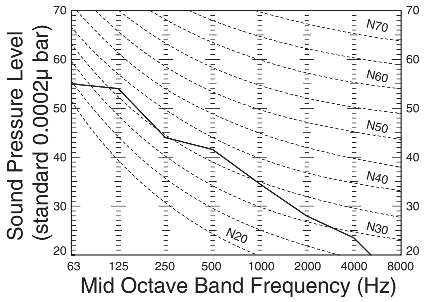
Model FDURA90KXE4A
Noise level 42 dB (A) at HIGH
37 dB (A) at LOW



Model FDURA112KXE4A
Noise level 42 dB (A) at HIGH
38 dB (A) at LOW



Model FDURA140KXE4A
Noise level 43 dB (A) at HIGH
49 dB (A) at LOW



3.10 Ceiling Suspension Type (FDEA)

3.10.1 Specifications

FDEA36KXE4A, 45KXE4A

Item \ Models			FDEA36KXE4A	FDEA45KXE4A
Nominal cooling capacity*1		kW	3.7	4.7
Nominal cooling capacity*2		kW	3.6	4.5
Nominal heating capacity*3		kW	4.0	5.0
Power source			1 Phase 220V 50Hz	
Noise level		dB(A)	Hi: 39 Me: 38 Lo: 36	
Exterior dimensions (Height × Width × Depth)		mm	210 × 1070 × 690	
Net weight		kg	30	
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 2	
	Motor & Q'ty	W	25 × 1	
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 11 Me: 9 Lo: 7	
	Fresh air intake		Not possible	
	Air filter & Q'ty		Polypropylene net × 2 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional:RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4"), Gas line: ϕ 12.7 (1/2")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP20 (I.D. 20mm, O.D. 26mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			—	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDEA56KXE4A, 71KXE4A

Item \ Models			FDEA56KXE4A	FDEA71KXE4A
Nominal cooling capacity*1		kW	5.8	7.3
Nominal cooling capacity*2		kW	5.6	7.1
Nominal heating capacity*3		kW	6.3	8.0
Power source			1 Phase 220V 50Hz	
Noise level		dB(A)	Hi: 39 Me: 38 Lo: 36	Hi: 41 Me: 39 Lo: 37
Exterior dimensions (Height × Width × Depth)		mm	210 × 1070 × 690	210 × 1320 × 690
Net weight		kg	30	36
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 2	Centrifugal fan × 4
	Motor & Q'ty	W	25 × 1	25 × 2
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 11 Me: 9 Lo: 7	Hi: 18 Me: 14 Lo: 12
	Fresh air intake		Not possible	
	Air filter & Q'ty		Polypropylene net × 2 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional:RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 6.35 (1/4"), Gas line: φ 12.7 (1/2")	Liquid line: φ 9.52 (3/8"), Gas line: φ 15.88 (5/8")
	Connecting method		Flare piping	
	Drain hose		Connectable with VP20 (I.D. 20mm, O.D. 26mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			—	

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDEA112KXE4A, 140KXE4A

Item		Models	FDEA112KXE4A	FDEA140KXE4A
Nominal cooling capacity*1		kW	11.6	14.5
Nominal cooling capacity*2		kW	11.2	14.0
Nominal heating capacity*3		kW	12.5	16.0
Power source			1 Phase 220V 50Hz	
Noise level		dB(A)	Hi: 44 Me: 41 Lo: 39	Hi: 46 Me: 44 Lo: 43
Exterior dimensions (Height × Width × Depth)		mm	250 × 1620 × 690	
Net weight		kg	46	
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 4	
	Motor & Q'ty	W	30 × 2	38 × 2
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 26 Me: 23 Lo: 21	Hi: 29 Me: 26 Lo: 23
	Fresh air intake		Not possible	
	Air filter & Q'ty		Polypropylene net × 2 (Washable)	
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional:RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 9.52 (3/8"), Gas line: ϕ .15.88 (5/8")	
	Connecting method		Flare piping	
	Drain hose		Connectable with VP20 (I.D. 20mm, O.D. 26mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			—	

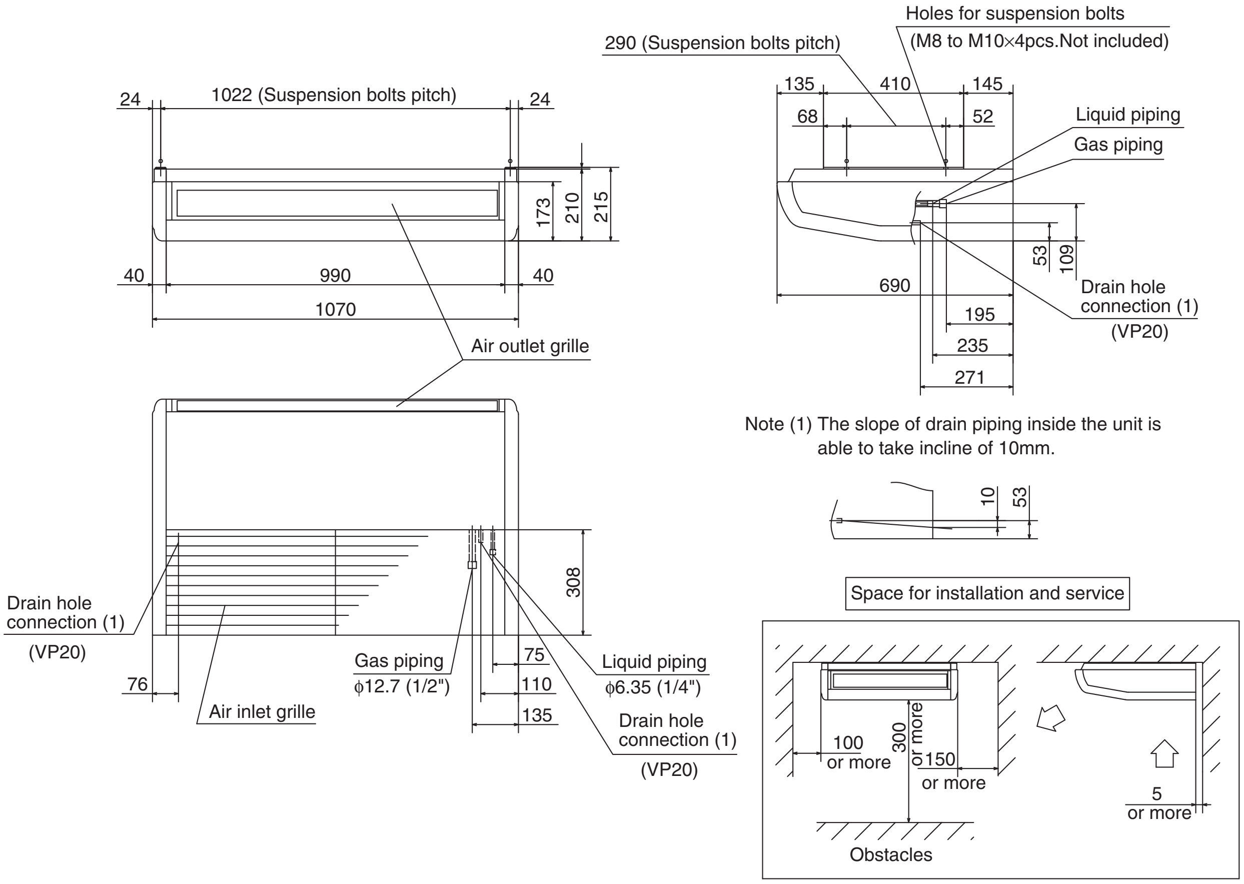
*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

3.10.2 Exterior dimensions

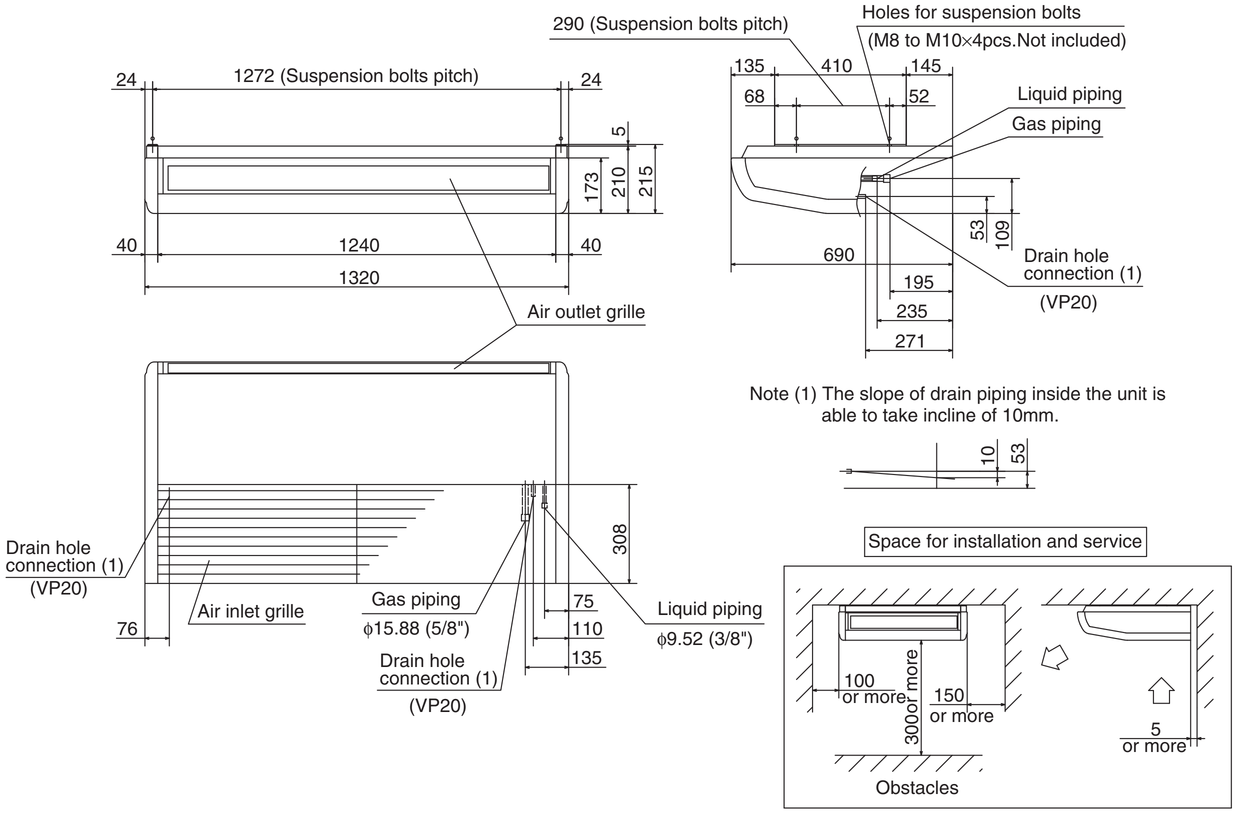
FDEA36KXE4A, 45KXE4A, 56KXE4A

Unit : mm



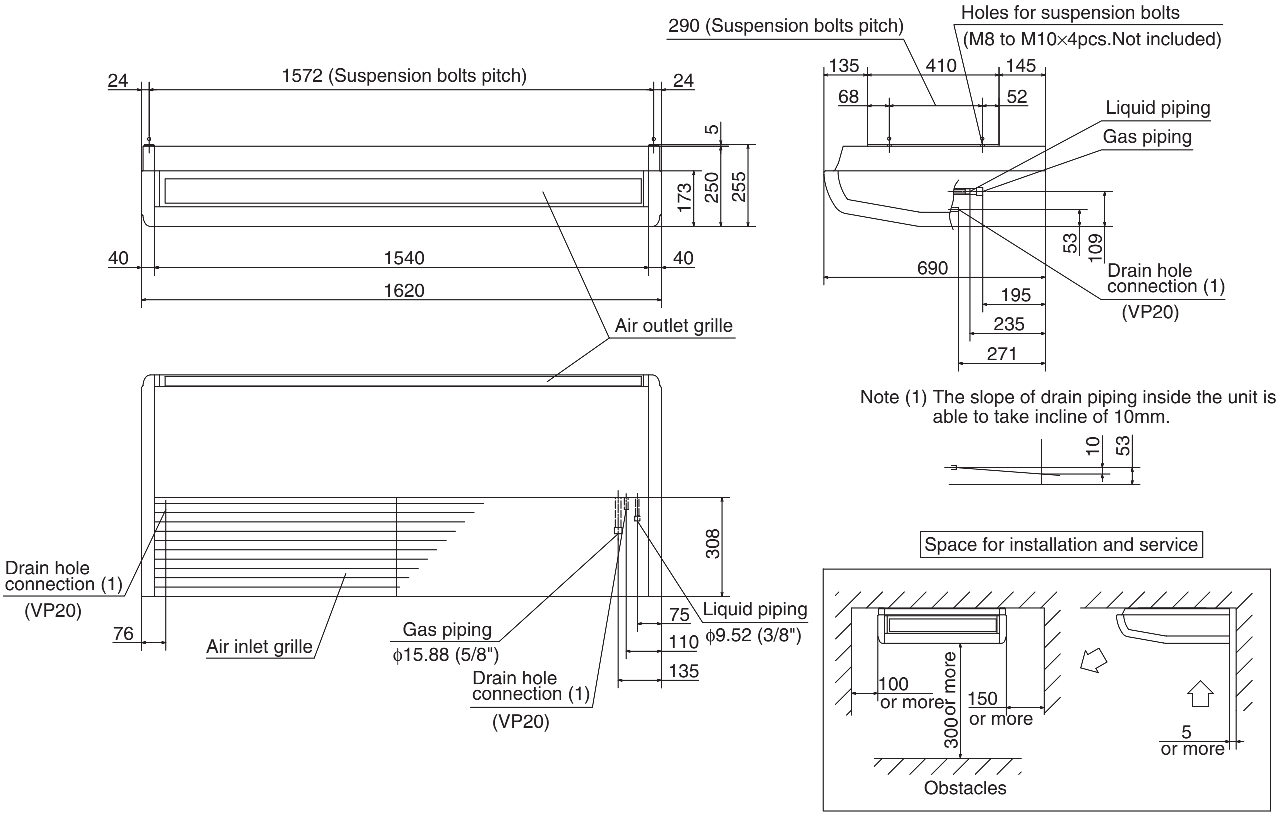
FDEA71KXE4A

Unit : mm



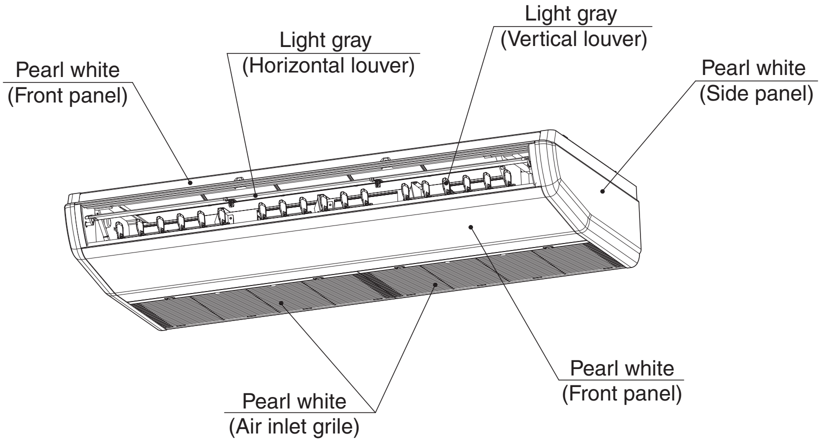
FDEA112KXE4A, 140KXE4A

Unit : mm



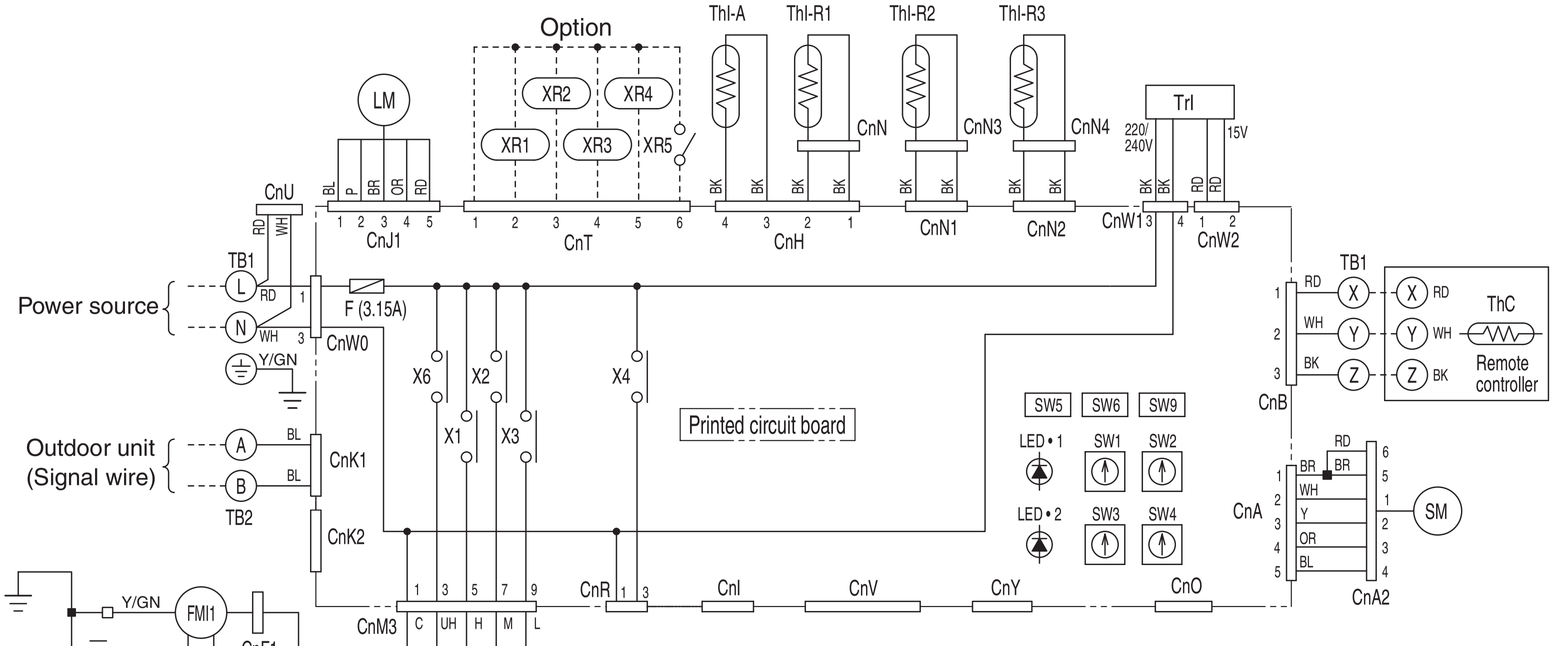
3.10.3 Exterior appearance

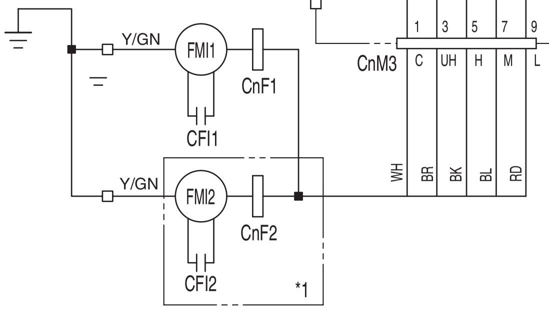
All models



3.10.4 Electrical wiring

All models





Blower fan tap switch

When increasing of static pressure is required,the following two methods are available to switch the blower fan tap. Switch to the high-speed tap with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control, high speed (High ceiling)
	OFF	Fan control, standard

② By means of function setting from the remote controller unit, set the setting Ⓒ of "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

Note (1) *1. FMI2 is equipped only for 71,112,140.

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI1,2	Fan motor	SW2	Indoor unit address unit's place	XR3	Thermo ON output (DC12V output)
CFI1,2	Capacitor for FMI	SW3	Outdoor unit address ten's place	XR4	Inspection output (DC12V output)
LM	Louver motor	SW4	Outdoor unit address unit's place	XR5	Remote operation input (volt-free contact)
SM	Stepping motor (For Exp.v)	SW6	Model capacity setting	X1,2,3,6	Auxiliary relay (For FM)
Thl-A	Thermistor	Trl	Transformer	TB1,2	Terminal block (○ mark)
Thl-R1	Thermistor	F	Fuse	CnA~Z	Connector
Thl-R2	Thermistor	LED1	Indication lamp (Red)	■mark	Closed-end connector
Thl-R3	Thermistor	LED2	Indication lamp (Green)		
ThC	Thermistor	XR1	Operation output (DC12V output)		
SW1	Indoor unit address ten's place	XR2	Heating output (DC12V output)		

Color marks

Mark	Color	Mark	Color
BK	Black	WH	White
BL	Blue	Y	Yellow
BR	Brown	P	Pink
OR	Orange	Y/GN	Yellow/Green
RD	Red		

Function of switches

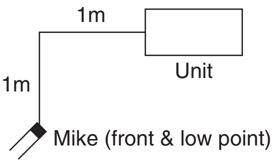
Mark		Function	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal:valid	
	OFF	Emergency stop signal:Invalid	

Product Specifications

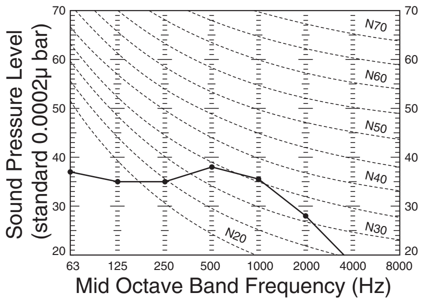
3.10.5 Noise level

Note (1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

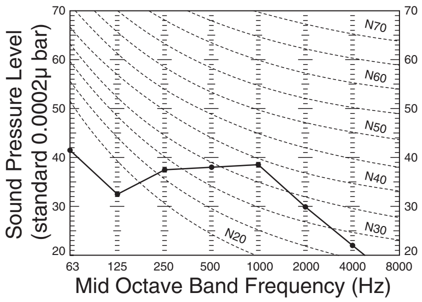
Measured based on JIS B 8616
Mike position as below



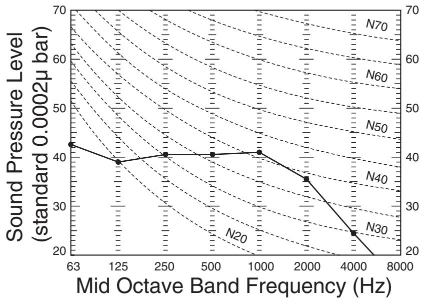
Models FDEA 36KXE4A, 45KXE4A, 56KXE4A
Noise level 39 dB (A) at HIGH
38 dB (A) at MEDIUM
36 dB (A) at LOW



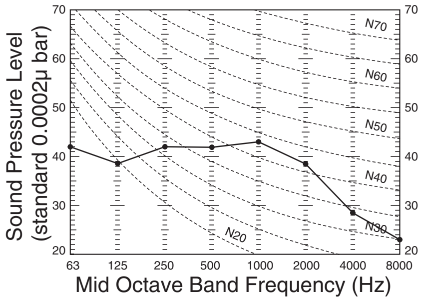
Model FDEA71KXE4A
Noise level 41 dB (A) at HIGH
39 dB (A) at MEDIUM
37 dB (A) at LOW



Model FDEA112KXE4A
Noise level 44 dB (A) at HIGH
41 dB (A) at MEDIUM
39 dB (A) at LOW



Model FDEA140KXE4A
Noise level 46 dB (A) at HIGH
44 dB (A) at MEDIUM
43 dB (A) at LOW



3.11 Wall Mounted Type (FDK)

3.11.1 Specifications

FDKA22KXE4A, 28KXE4A, 36KXE4A, 45KXE4A

Item \ Models			FDKA22KXE4A	FDKA28KXE4A	FDKA36KXE4A	FDKA45KXE4A
Nominal cooling capacity*1		kW	2.3	2.9	3.7	4.7
Nominal cooling capacity*2		kW	2.2	2.8	3.6	4.5
Nominal heating capacity*3		kW	2.5	3.2	4.0	5.0
Power source			1 Phase 220/224V 50Hz			
Noise level		dB(A)	Hi: 40 Me: 36 Lo: 32		Hi: 41 Me: 37 Lo: 33	Hi: 41 Me: 37 Lo: 32
Exterior dimensions (Height × Width × Depth)		mm	298 × 840 × 240			
Net weight		kg	12			12.5
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing			
	Refrigerant control		Electronic Expansion Valve			
Air handling equipment	Fan type & Q'ty		Tangential fan × 1			
	Motor & Q'ty	W	33 × 1			
	Starting method		Line starting			
	Air flow (Standard)	CMM	Hi: 8 Me: 7 Lo: 6		Hi: 10 Me: 9 Lo: 7	Hi: 11 Me: 9 Lo: 7
	Fresh air intake		Not possible			
	Air filter & Q'ty		Polypropylene net × 2 (Washable)			
Shock & vibration isolator			Rubber sleeve (for fan motor)			
Insulation (noise & heat)			Polyurethane foam			
Operation control Operation switch			Remote control switch (Optional:RC-E1)			
Room temperature control			Thermostat by electronics			
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat			
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ 6.35 (1/4") Gas line: ϕ 9.52 (3/8")		Liquid line: ϕ 6.35 (1/4") Gas line: ϕ 12.7 (1/2")	
	Connecting method		Flare piping			
	Drain hose		Connectable with VP16 (I.D. 16mm, O.D. 22mm)			
	Insulation for piping		Necessary (both Liquid & Gas lines)			
Accessories			Mounting kit, Drain hose			
Optional parts			—			

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

FDKA56KXE4A, 71KXE4A

Item		Models	FDKA56KXE4A	FDKA71KXE4A
Nominal cooling capacity*1		kW	5.7	7.3
Nominal cooling capacity*2		kW	5.6	7.1
Nominal heating capacity*3		kW	6.3	8.0
Power source			1 Phase 220/224V 50Hz	
Noise level		dB(A)	Hi: 46 Me: 43 Lo: 39	Hi: 47 Me: 44 Lo: 40
Exterior dimensions (Height × Width × Depth)		mm	298 × 840 × 240	375 × 1436 × 194
Net weight		kg	13	22
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing	
	Refrigerant control		Electronic Expansion Valve	
Air handling equipment	Fan type & Q'ty		Tangential fan × 1	Tangential fan × 2
	Motor & Q'ty	W	33 × 1	45 × 1
	Starting method		Line starting	
	Air flow (Standard)	CMM	Hi: 14 Me: 12 Lo: 10	Hi: 21 Me: 18 Lo: 15
	Fresh air intake		Not possible	
	Air filter & Q'ty		Polypropylene net × 2 (Washable)	Polypropylene net × 3 (Washable)
Shock & vibration isolator			Rubber sleeve (for fan motor)	
Insulation (noise & heat)			Polyurethane foam	
Operation control Operation switch			Remote control switch (Optional:RC-E1)	
Room temperature control			Thermostat by electronics	
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat	
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 6.35 (1/4") Gas line: φ 12.7 (1/2")	Liquid line: φ 9.52 (3/8") Gas line: φ 15.88 (5/8")
	Connecting method		Flare piping	
	Drain hose		Connectable with VP16 (I.D. 16mm, O.D. 22mm)	
	Insulation for piping		Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit, Drain hose	
Optional parts			—	

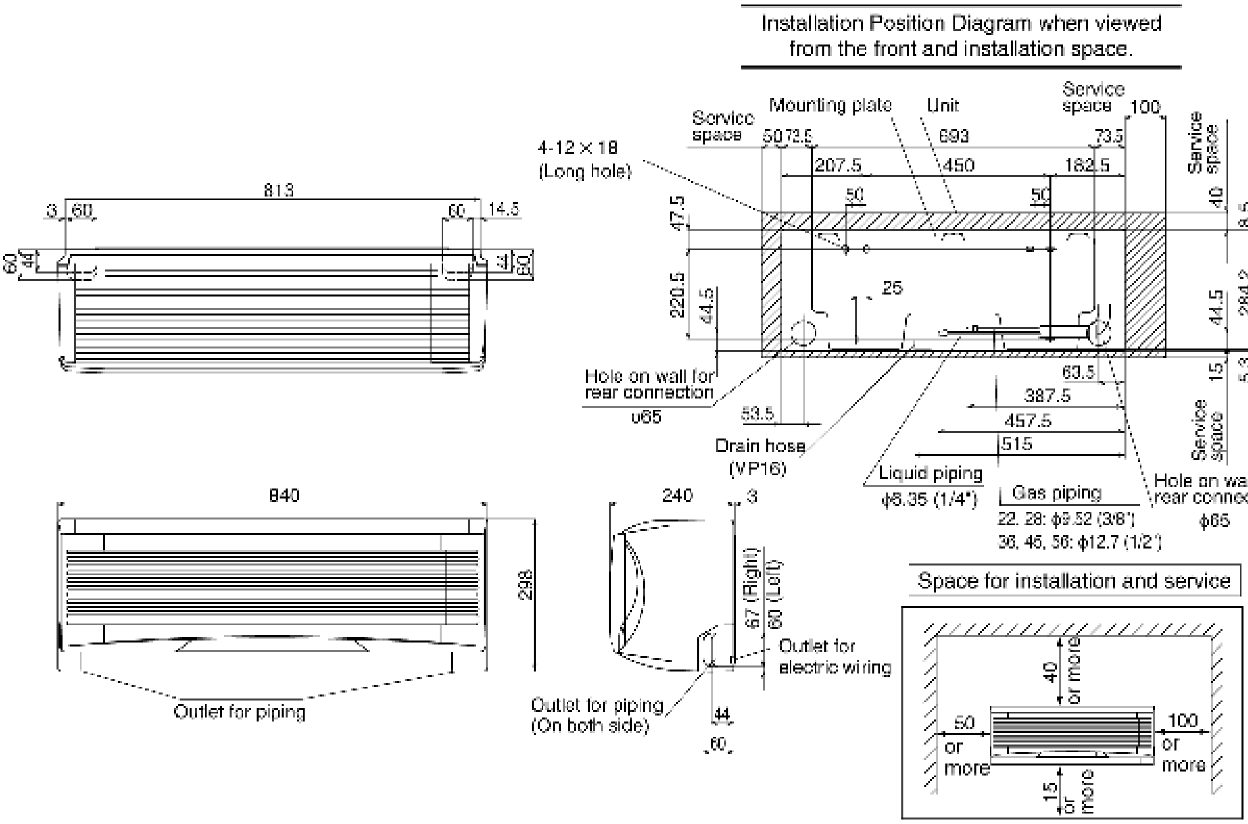
*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19.5°C	35°C	24°C	ISO-T1, JIS B8616
Cooling*2	27°C	19°C	35°C	24°C	
Heating*3	20°C	—	7°C	6°C	

3.11.2 Exterior dimensions

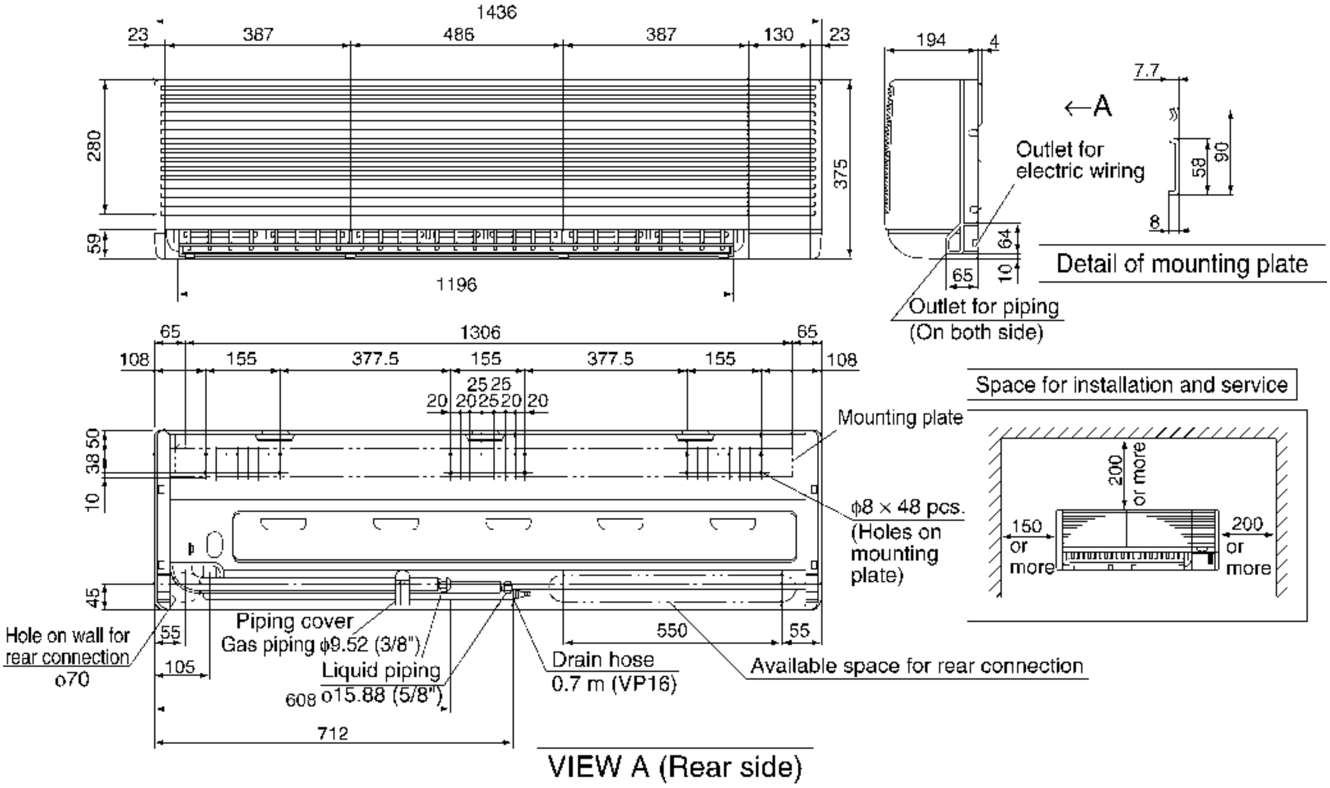
FDKA22KXE4A, 28KXE4A, 36KXE4A, 45KXE4A, 56KXE4A

Unit : mm



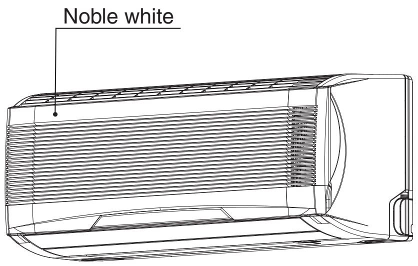
FDKA71KXE4A

Unit : mm

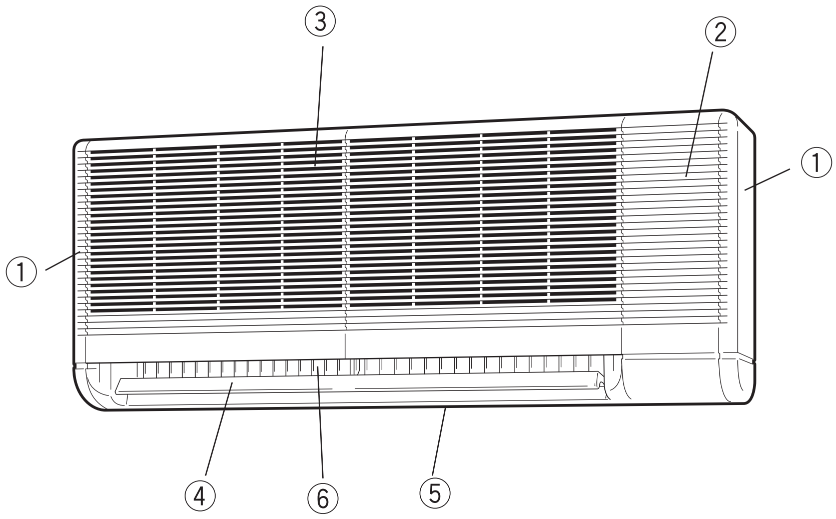


3.11.3 Exterior appearance

FDKA22 ~ 56KXE4A



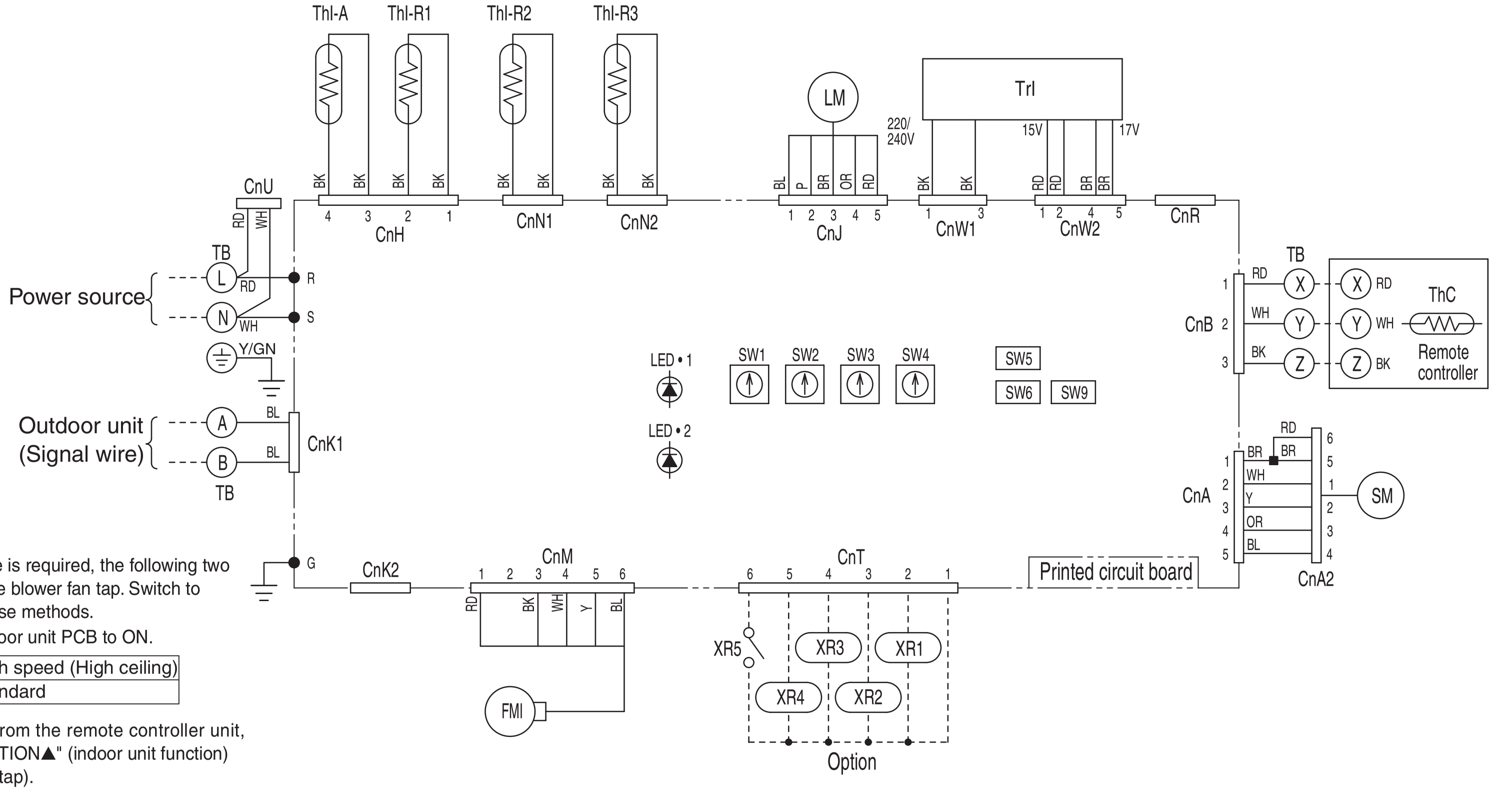
FDKA71KXE4A



No.	Parts name	Color
1	Side plate	Ceramic white
2	Front panel	
3	Inlet grill	
4	Flap	
5	Bottom plate	
6	louver	Light gray

3.11.4 Electrical wiring

FDKA22KXE4A, 28KXE4A, 36KXE4A, 45KXE4A, 56KXE4A



Blower fan tap switch

When increasing of static pressure is required, the following two methods are available to switch the blower fan tap. Switch to the high-speed tap with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control,high speed (High ceiling)
	OFF	Fan control,standard

② By means of function setting from the remote controller unit, set the setting Ⓒ of "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function numberⒶ	Function descriptionⒷ	SettingⒸ
01	Hi CEILING SET	Hi CEILING 1

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI	Fan motor	SW3	Outdoor unit address ten's place	XR4	Inspection output (DC12V output)
LM	Louver motor	SW4	Outdoor unit address unit's place	XR5	Remote operation input (volt-free contact)
SM	Stepping motor (For Exp.v)	SW6	Model capacity setting	TB	Terminal block (○ mark)
Thl-A	Thermistor	Trl	Transformer	CnA~Z	Connector
Thl-R1	Thermistor	F	Fuse	■mark	Closed-end connector
Thl-R2	Thermistor	LED1	Indication lamp (Red)		
Thl-R3	Thermistor	LED2	Indication lamp (Green)		
ThC	Thermistor	XR1	Operation output (DC12V output)		
SW1	Indoor unit address ten's place	XR2	Heating output (DC12V output)		
SW2	Indoor unit address unit's place	XR3	Thermo ON output (DC12V output)		

Color marks

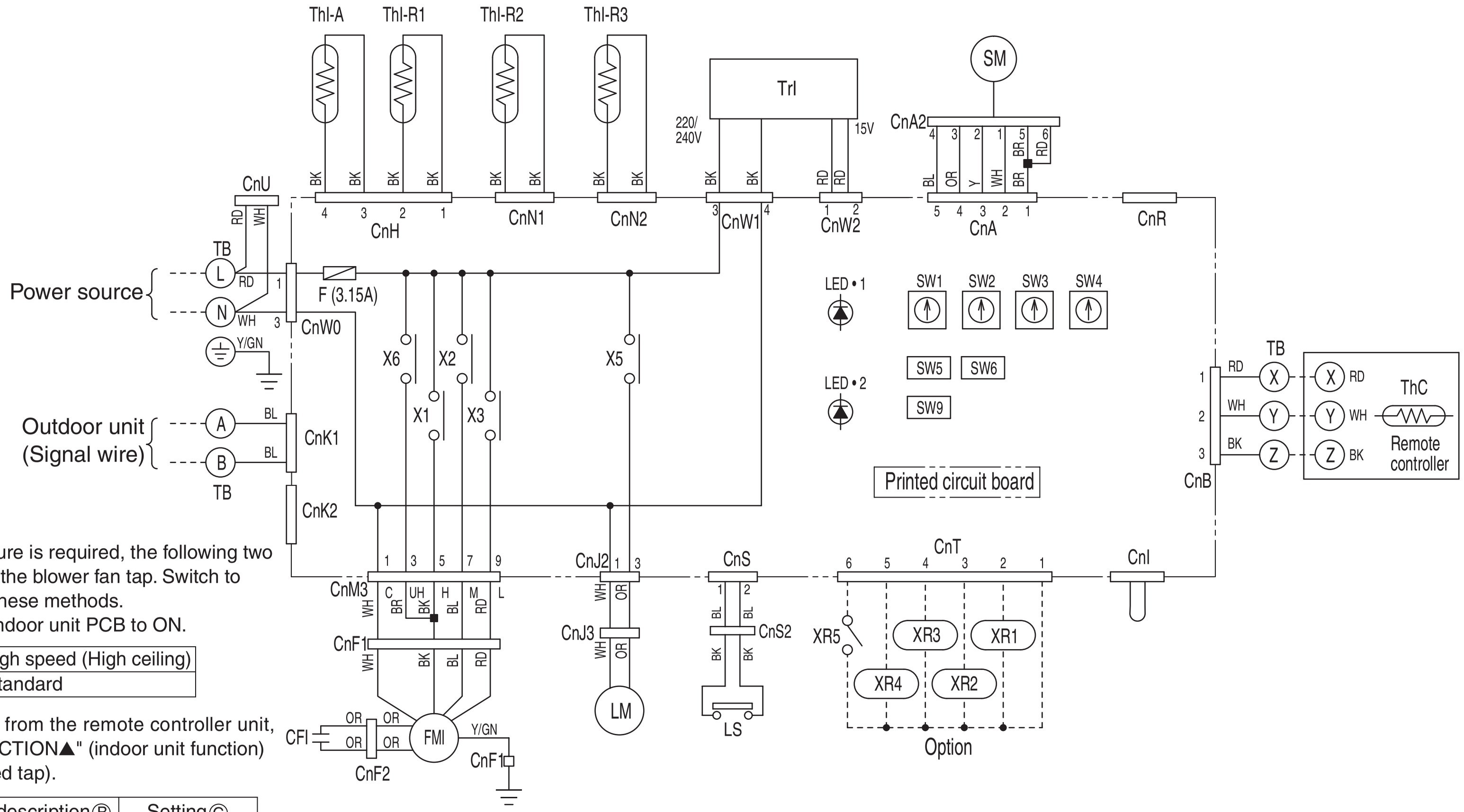
Mark	Color	Mark	Color
BK	Black	WH	White
BL	Blue	Y	Yellow
BR	Brown	P	Pink
OR	Orange	Y/GN	Yellow/Green
RD	Red		

Function of switches

Mark		Function	
SW5-3	ON	Input signal	Reverse Invalid
	OFF		Run stop
SW5-4	ON	Emergency stop signal: vali	
	OF	Emergency stop signal: Invalid	

Product Specifications

FDKA71KXE4A



Blower fan tap switch

When increasing of static pressure is required, the following two methods are available to switch the blower fan tap. Switch to the high-speed tap with one of these methods.

① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control, high speed (High ceiling)
	OFF	Fan control, standard

② By means of function setting from the remote controller unit, set the setting Ⓒof "I/U FUNCTION▲" (indoor unit function) to "Hi CEILING 1" (high-speed tap).

Function numberⒶ	Function descriptionⒷ	SettingⒸ
01	Hi CEILING SET	Hi CEILING 1

Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI	Fan motor	SW2	Indoor unit address unit's place	XR3	Thermo ON output (DC12V output)
CFI	Capacitor for FMI	SW3	Outdoor unit address ten's place	XR4	Inspection output (DC12V output)
LM	Louver motor	SW4	Outdoor unit address unit's place	XR5	Remote operation input (volt-free contact)
SM	Stepping motor(For Exp.v)	SW6	Model capacity setting	X1,2,3,6	Auxiliary relay (For FM)
ThI-A	Thermistor	Trl	Transformer	X5	Auxiliary relay (For LM)
ThI-R1	Thermistor	F	Fuse	TB	Terminal block (○ mark)
ThI-R2	Thermistor	LED1	Indication lamp (Red)	CnA~Z	Connector
ThI-R3	Thermistor	LED2	Indication lamp (Green)	■mark	Closed-end connector
ThC	Thermistor	XR1	Operation output (DC12V output)		
SW1	Indoor unit address ten's place	XR2	Heating output (DC12V output)		

Color marks

Mark	Color	Mark	Color
BK	Black	WH	White
BL	Blue	Y	Yellow
BR	Brown	P	Pink
OR	Orange	Y/GN	Yellow/Green
RD	Red		

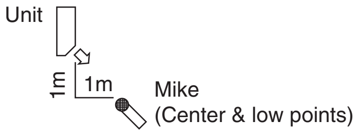
Function of switches

Mark		Function	
SW5-3	ON	Input	Reverse Invalid
	OFF	signal	Run stop
SW5-4	ON	Emergency stop signal: valid	
	OFF	Emergency stop signal: Invalid	

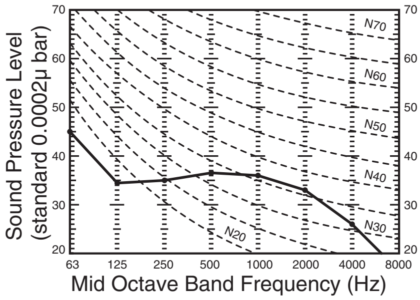
3.11.5 Noise level

Notes (1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

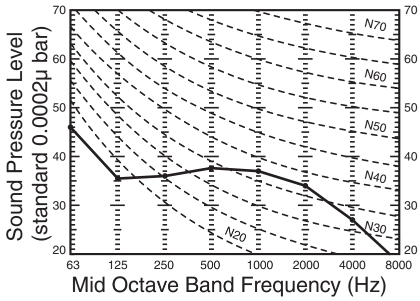
Measured based on JIS B 8616
Mike position as below



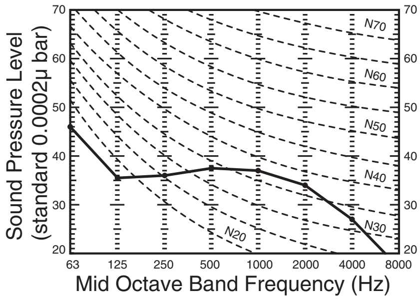
Models FDKA22KXE4A, 28KXE4A
Noise level 40 dB (A) at HIGH
36 dB (A) at MEDIUM
32 dB (A) at LOW



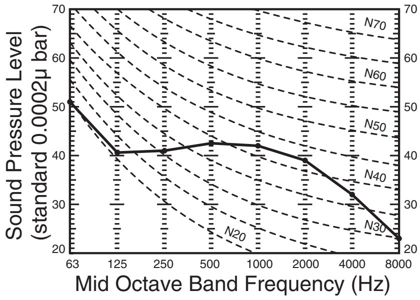
Model FDKA36KXE4A
Noise level 41 dB (A) at HIGH
37 dB (A) at MEDIUM
33 dB (A) at LOW



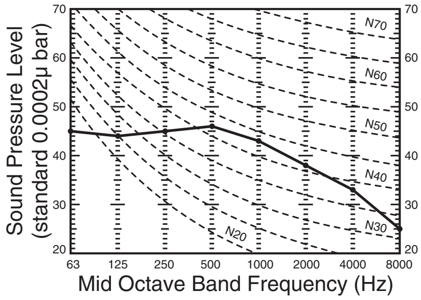
Model FDKA45KXE4A
Noise level 41 dB (A) at HIGH
37 dB (A) at MEDIUM
32 dB (A) at LOW



Model FDKA56KXE4A
Noise level 46 dB (A) at HIGH
43 dB (A) at MEDIUM
39 dB (A) at LOW



Model FDKA71KXE4A
Noise level 47 dB (A) at HIGH
44 dB (A) at MEDIUM
40 dB (A) at LOW



3.12 Floor Standing Exposed Type (FDFLA/FDFUA)

3.12.1 Specifications

3.12.1.1 Floor standing exposed type (FDFLA)

FDFLA28KXE4, 45KXE4, 71KXE4

Item		Models	FDFLA28KXE4	FDFLA45KXE4	FDFLA71KXE4
Nominal cooling capacity*1		kW	2.8	4.5	7.1
Nominal heating capacity*2		kW	3.2	5.0	8.0
Power source			1 Phase 220/240V 50Hz		
Noise level		dB(A)	Hi: 41 Me: 38 Lo: 36	Hi: 43 Me: 41 Lo: 40	
Exterior dimensions (Height × Width × Depth)		mm	630 × 1196 × 225		630 × 1481 × 225
Net weight		kg	32		40
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing		
	Refrigerant control		Electronic Expansion Valve		
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 2		
	Motor & Q'ty	W	30 × 1	40 × 1	
	Starting method		Line starting		
	Air flow (Standard)	CMM	Hi: 12 Me: 11 Lo: 10	Hi: 14 Me: 12 Lo: 10	Hi: 18 Me: 15 Lo: 12
	Fresh air intake		Not possible		
	Air filter & Q'ty		Polypropylene net *2 (Washable)		
Shock & vibration isolator			Rubber sleeve (for fan motor)		
Insulation (noise & heat)			Polyurethane foam		
Operation control Operation switch			Remote control switch (Optional: RC-E1)		
Room temperature control			Thermostat by electronics		
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat		
Installation data	Refrigerant piping size	mm (in)	Liquid line: φ 6.35 (1/4") Gas line: φ 9.52 (3/8")	Liquid line: φ 6.35 (1/4") Gas line: φ 12.7 (1/2")	Liquid line: φ 9.52 (3/8") Gas line: φ 15.88 (5/8")
	Connecting method		Flare piping		
	Drain hose		Connectable with PT20A		
	Insulation for piping		Necessary (both Liquid & Gas lines)		
Accessories			Mounting kit, Drain hose		
Optional parts			—		

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19°C	35°C	24°C	ISO-T1
Heating*2	20°C	—	7°C	6°C	

3.12.1.2 Floor standing hidden type (FDFUA)
FDFUA28KXE4, 45KXE4, 71KXE4

Item		Models	FDFUA28KXE4	FDFUA45KXE4	FDFUA56KXE4	FDFUA71KXE4
Nominal cooling capacity*1		kW	2.8	4.5	5.6	7.1
Nominal heating capacity*2		kW	3.2	5.0	6.3	8.0
Power source			1 Phase 220/240V 50Hz			
Noise level		dB(A)	Hi: 41 Me: 38 Lo: 36	Hi: 43 Me: 41 Lo: 40		
Exterior dimensions (Height × Width × Depth)		mm	630 × 1077 × 225			630 × 1362 × 225
Net weight		kg	25			32
Refrigerant equipment	Heat exchanger		Louver fins & inner grooved tubing			
	Refrigerant control		Electronic Expansion Valve			
Air handling equipment	Fan type & Q'ty		Centrifugal fan × 2			
	Motor & Q'ty	W	30 × 1	40 × 1		
	Starting method		Line starting			
	Air flow (Standard)	CMM	Hi: 12 Me: 11 Lo: 10	Hi: 14 Me: 12 Lo: 10		Hi: 18 Me: 15 Lo: 12
	Fresh air intake		Not possible			
	Air filter & Q'ty		Polypropylene net *2 (Washable)			
Shock & vibration isolator			Rubber sleeve (for fan motor)			
Insulation (noise & heat)			Polyurethane foam			
Operation control Operation switch			Remote control switch (Optional: RC-E1)			
Room temperature control			Thermostat by electronics			
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat			
Installation data	Refrigerant piping size	mm (in)	Liquid line: ϕ6.35 (1/4") Gas line: ϕ9.52 (3/8")	Liquid line: ϕ 6.35 (1/4") Gas line: ϕ 12.7 (1/2")		Liquid line: ϕ9.52 (3/8") Gas line: ϕ15.88 (5/8")
	Connecting method		Flare piping			
	Drain hose		Connectable with PT20A			
	Insulation for piping		Necessary (both Liquid & Gas lines)			
Accessories			Mounting kit, Drain hose			
Optional parts			—			

*1 ~ 3The data are measured at the following conditions.

Operation \ Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling*1	27°C	19°C	35°C	24°C	ISO-T1
Heating*2	20°C	—	7°C	6°C	

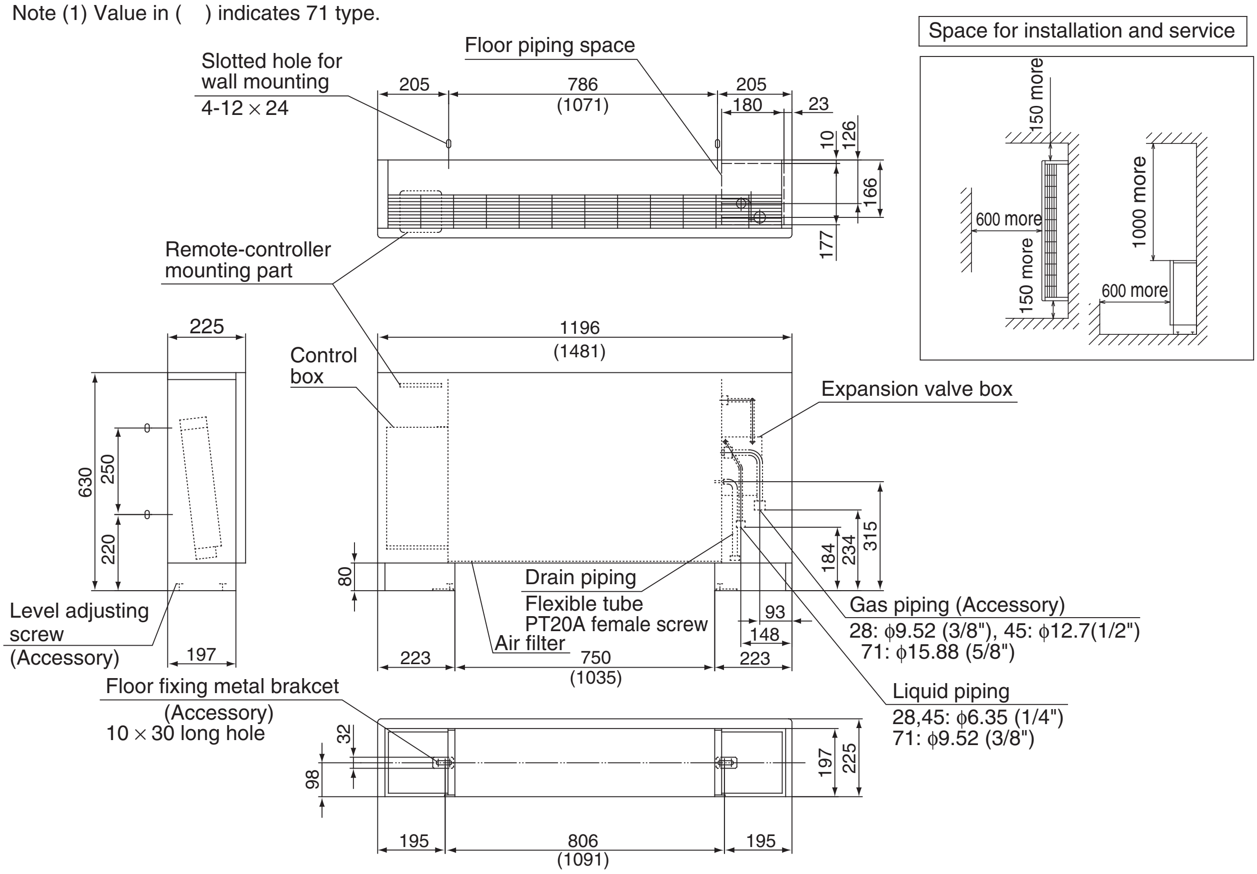
3.12.2 Exterior dimensions

3.12.2.1 Floor standing exposed type (FDFLA)

FDFLA28KXE4, 45KXE4, 71KXE4

Unit : mm

Note (1) Value in ( ) indicates 71 type.

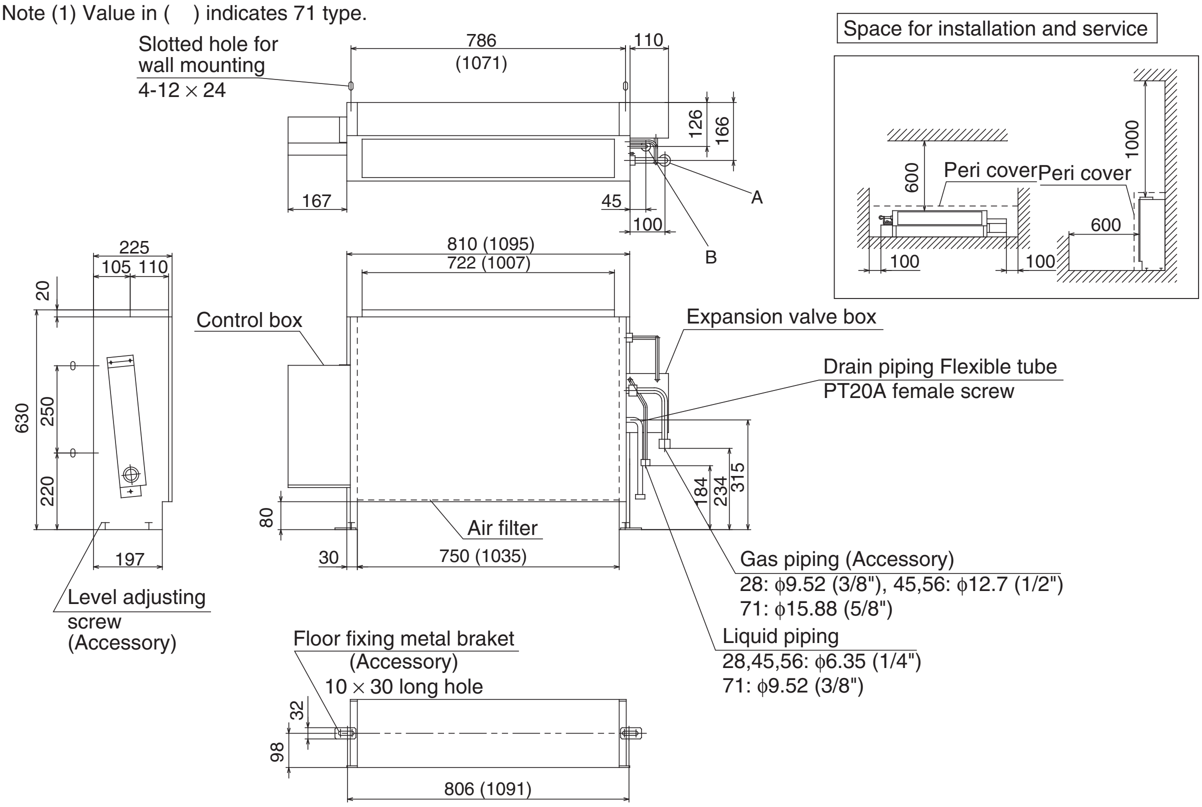


3.12.2.2 Floor standing hidden type (FDFUA)

FDFUA28KXE4, 45KXE4, 56KXE4, 71KXE4

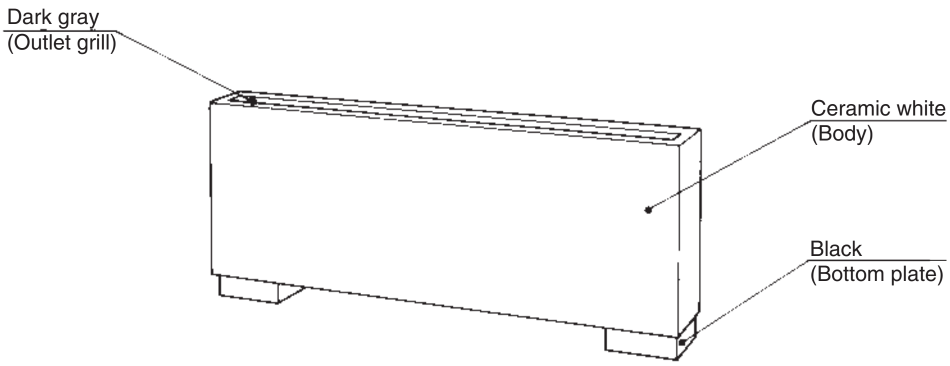
Unit : mm

Note (1) Value in ( ) indicates 71 type.



3.12.3 Exterior appearance

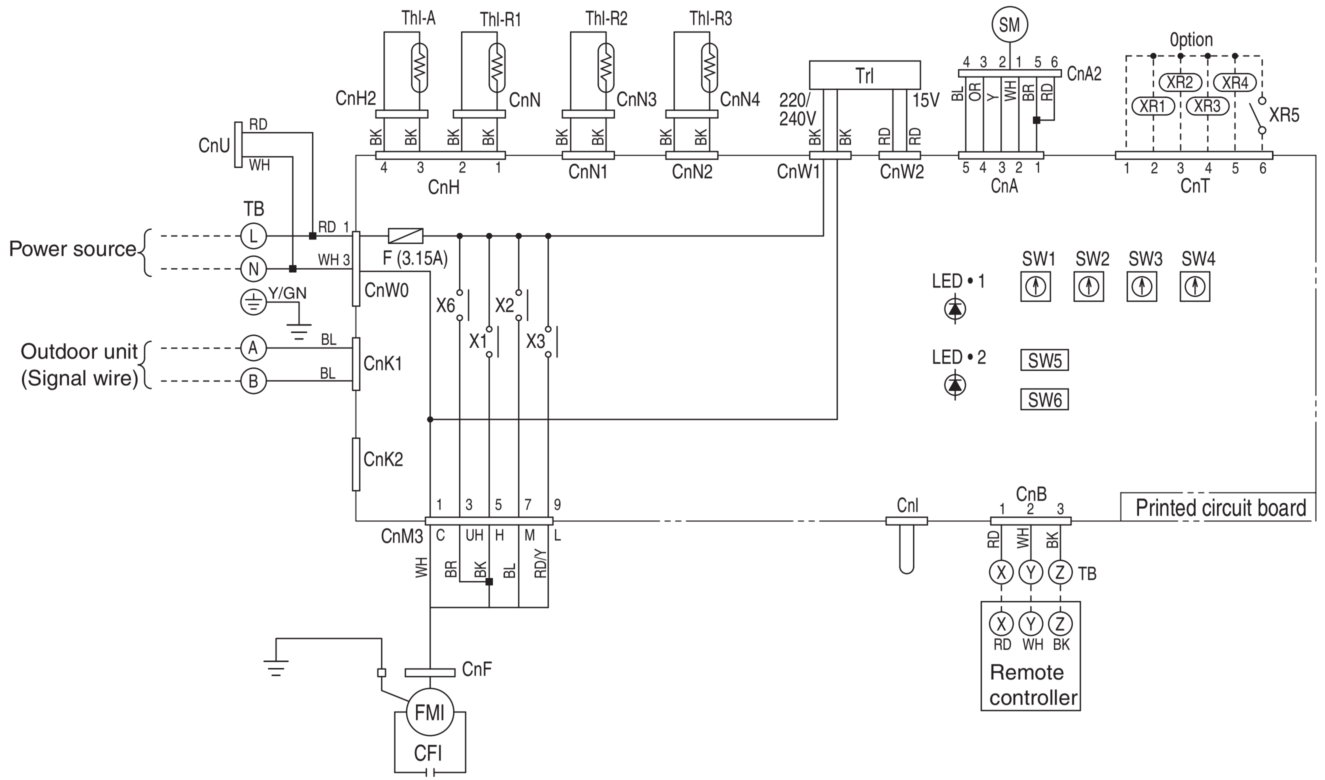
3.12.3.1 Floor standing exposed type (FDFL)



3.12.3.2 Floor standing hidden type (FDFU)................................Zinc steel plate

3.12.4 Electrical wiring

All models



Meaning of marks

Mark	Parts name	Mark	Parts name	Mark	Parts name
FMI	Fan motor	SW3	Outdoor unit address ten's place	XR3	Thermo ON output (DC12V output)
CFI	Capacitor for FMI	SW4	Outdoor unit address unit's place	XR4	Inspection output (DC12V output)
SM	Stepping motor (For Exp.v)	SW6	Model capacity setting	XR5	Remote operation input (volt-free contact)
Thl-A	Thermistor	Trl	Transformer	X1,2,3,6	Auxiliary relay (For FM)
Thl-R1	Thermistor	F	Fuse	TB	Terminal block (○ mark)
Thl-R2	Thermistor	LED1	Indication lamp (Red)	CnA~Z	Connector
Thl-R3	Thermistor	LED2	Indication lamp (Green)	■mark	Closed-end connector
SW1	Indoor unit address ten's place	XR1	Operation output (DC12V output)		
SW2	Indoor unit address unit's place	XR2	Heating output (DC12V output)		

Color marks

Mark	Color	Mark	Color
BK	Black	RD/Y	Red/Yellow
BL	Blue	WH	White
BR	Brown	Y	Yellow
OR	Orange	Y/GN	Yellow/Green
RD	Red		

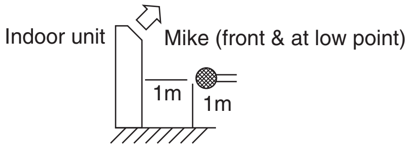
Function of switches

Mark		Function
SW5-4	ON	Emergency stop signal: Valid
	OFF	Emergency stop signal: Invalid

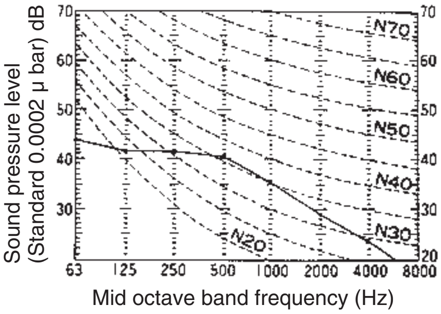
3.12.5 Noise level

Note (1) The data are based on the following conditions.
Ambient air temperature: Indoor unit 27°C DB, 19°C WB. Outdoor unit 35°C DB
(2) The data in the chart are measured in an anechoic room.
(3) The noise levels measured in the field are usually higher than the data because of reflection.

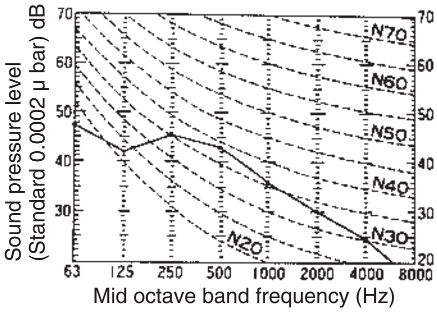
Measured based on JIS B 8616
Mike position as below



Models FDFLA28KXE4, FDFUA28KXE4
Noise level 41 dB (A) at HIGH
38 dB (A) at MEDIUM
36 dB (A) at LOW



Models FDLA45KXE4, 71KXE4,
FDFUA45KXE4, 56KXE4, 71KXE4
Noise level 43 dB (A) at HIGH
41 dB (A) at MEDIUM
40 dB (A) at LOW



3.13 Exchange Unit (SAF)

3.13.1 Specifications

SAF250E4, 350E4, 500E4

Item			Model		SAF250E4	SAF350E4	SAF500E4
Power source					1 Phase 220~240V/220V 50/60Hz		
Exterior dimensions (Height × Width × Depth)				mm	270 × 882 × 599	270 × 882 × 804	270 × 962 × 904
Exterior appearance					Galvanized steel sheet		
Operation data	Power input			W	99-114/118	124-137/149	169-188/202
	Running current			A	0.46-0.48/0.55	0.59-0.60/0.75	0.79-0.81/1.00
Capacity	UHi	Enthalpy exchange efficiency	Cooling	%	63	66	62
			Heating		70	69	67
		Temperature exchange efficiency			75	75	75
	Hi	Enthalpy exchange efficiency	Cooling		63	66	62
			Heating		70	69	67
		Temperature exchange efficiency			75	75	75
	Lo	Enthalpy exchange efficiency	Cooling		66/68	69/71	77/79
			Heating		73/75	71/73	67/69
		Temperature exchange efficiency			77/78	77/79	75/79
Motor & Q' ty				W	20 × 2	18 × 2	35 × 2
Air handling equipment Fan type & Q' ty					Sirroco fan × 2		
Air flow			UHi	m^3/h	250	350	500
			Hi		250	350	500
			Lo		170/135	280/240	370/310
Available static pressure			UHi	Pa	90/125	95/155	105/165
			Hi		80/100	65/90	70/85
			Lo		37/30	42/43	38/33
Air filter	Outside intake air				Protection for element (Washable) PS400		
	Exhaust air						
Operation time for air filter				h	3000		
Noise level			UHi	dB(A)	27-28/28	31-32/33	33-34/35
			Hi		26-27/26	29-30/30	31-32/31
			Lo		21-22/21	25-26/22	25-26/23
Net weight				kg	29	37	43
Operation control	Operation switch				Control switch (Accessories)		
	Operation				Ventilation (ON/OFF)		
	Fan speed				Hi/Lo		
	Function				Heat exchange/Normal Ventilation		
Safety equipment					Internal thermostat for fan motor		

Notes (1) The data are measured at the following conditions.

		Summer	Winter
Indoor side (Supply air)	DB	27°C	20°C
	WB	19°C	12.5°C
Outdoor side (Outside air)	DB	35°C	7°C
	WB	28.5°C	5°C
Unit around	DB	27°C	20°C

SAF800E4, 1000E4, 1000E4S

Item \ Model					SAF800E4	SAF1000E4
Power source					1 Phase 220~240V/220V 50/60Hz	
Exterior dimensions (Height × Width × Depth)				mm	388 × 1322 × 884	388 × 1322 × 1134
Exterior appearance					Galvanized steel sheet	
Operation data	Power input			W	309-329/391	360-399
	Running current			A	1.48-1.50/1.92	1.85-1.93
Capacity	UHi	Enthalpy exchange efficiency	Cooling	%	65	65
			Heating		71	71
		Temperature exchange efficiency			75	75
	Hi	Enthalpy exchange efficiency	Cooling		65	65
			Heating		71	71
		Temperature exchange efficiency			75	75
	Lo	Enthalpy exchange efficiency	Cooling		68/69	68
			Heating		74/75	73
		Temperature exchange efficiency			76/77	76
Motor & Q' ty				W	81/117 × 2	118 × 2
Air handling equipment Fan type & Q' ty					Sirroco fan × 2	
Air flow			UHi	m^3/h	800	1000
			Hi		800	1000
			Lo		650/575	810
Available static pressure			UHi	Pa	140/190	90
			Hi		110/100	55
			Lo		70/50	35
Air filter	Outside intake air				Protection for element (Washable) PS400	
	Exhaust air					
Operation time for air filter				h	3000	
Noise level			UHi	dB(A)	38-39/39	37.5-38.5
			Hi		36.5-37.5/36	36-37
			Lo		32-34/31	31-33
Net weight				kg	71	83
Operation control	Operation switch				Control switch (Accessories)	
	Operation				Ventilation (ON/OFF)	
	Fan speed				Hi/Lo	
	Function				Heat exchange/Normal Ventilation	
Safety equipment					Internal thermostat for fan motor	

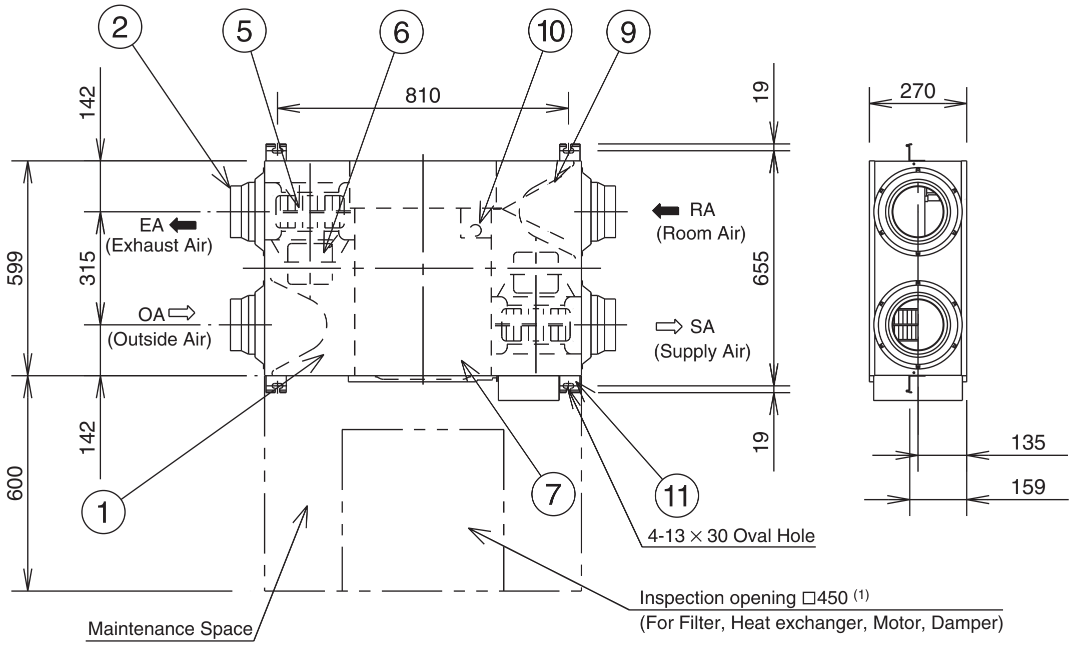
Notes (1) The data are measured at the following conditions.

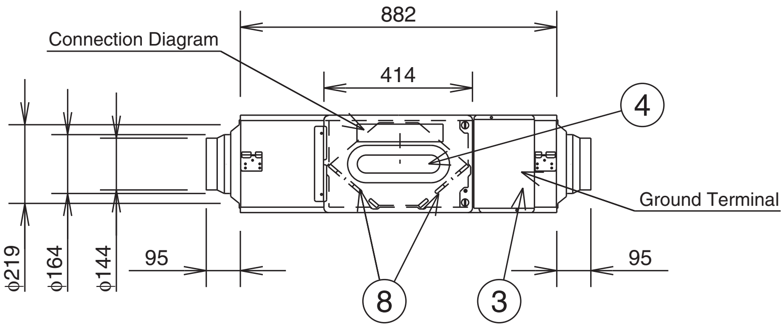
		Summer	Winter
Indoor side (Supply air)	DB	27°C	20°C
	WB	19°C	12.5°C
Outdoor side (Outside air)	DB	35°C	7°C
	WB	28.5°C	5°C
Unit around	DB	27°C	20°C

3.13.2 Exterior dimensions

SAF250E4

Unit : mm

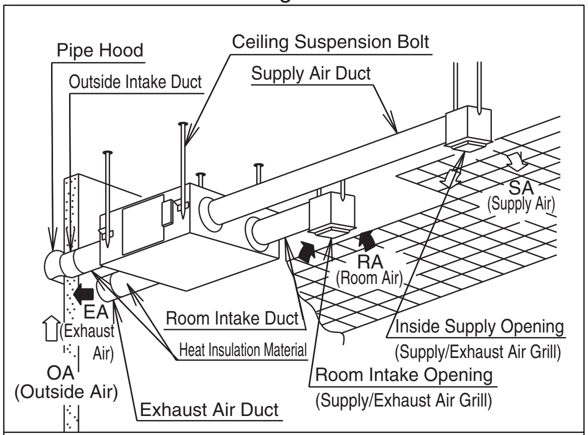




No.	Name	Quantity	Material	Remarks
1	Frame	1	Zinc-plated Steel	
2	Adapter	4	ABS Resin	
3	Electrical Equipment Box	1		
4	Inspection Cover	1	Zinc-plated Steel	
5	Fan	2	ABS Resin	
6	Motor	2		
7	Heat Exchange Element	1	Flame Retardant Paper + Plastic	Entire Heat Exchanger
8	Filter	2	Non-woven Cloth	Collection Efficiency Weighing Method 82%
9	Damper	1		
10	Damper Motor	1		
11	Ceiling Suspension Fixture	4	Zinc-plated Steel	

Note (1) An inspection port is needed for cleaning the heat exchanger and filter 1 or 2 times a year.

Installation Reference Diagram

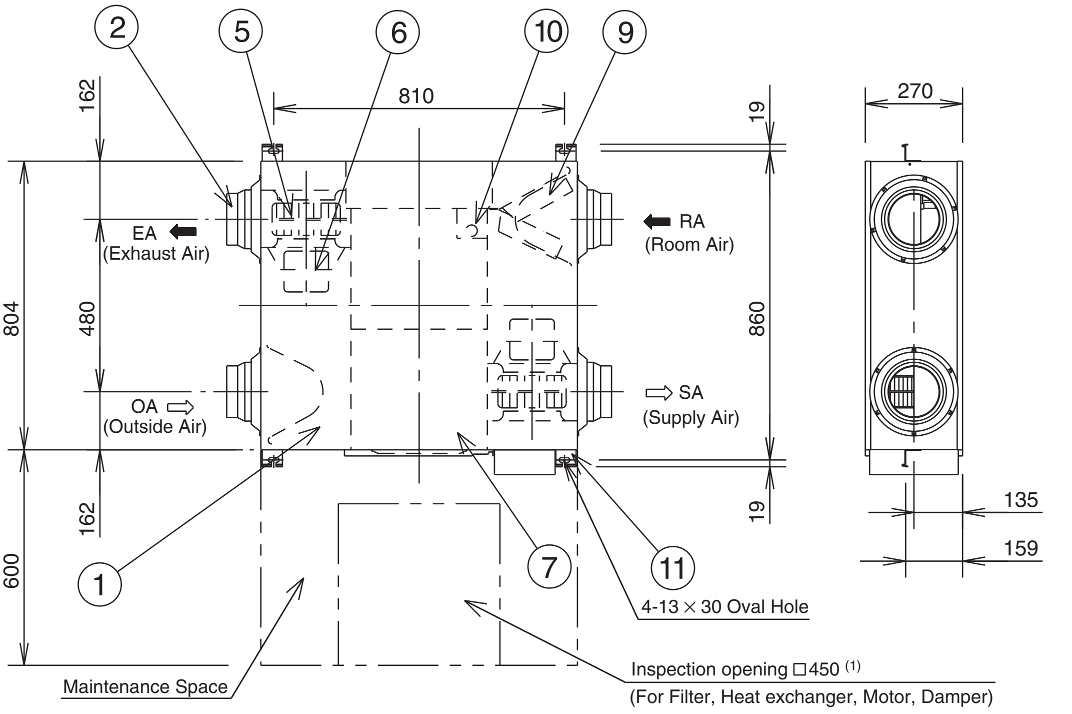


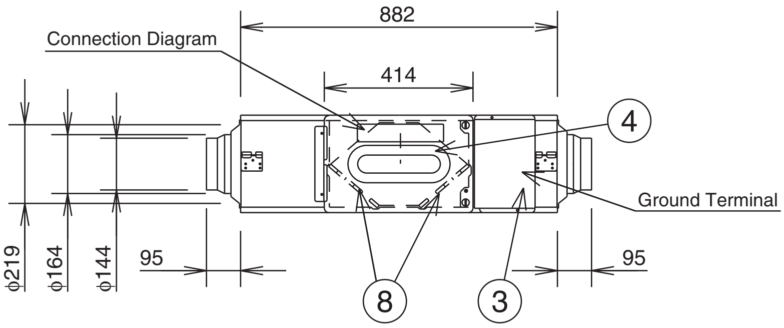
Be sure to cover the two outside air ducts (outside intake air and exhaust air ducts) with insulation to prevent condensation.
(Material: Grasswool, 25 mm thick)

Caution 1. Connection Duct: Nominal diameter ϕ150
2. The above dimensions do not include the thickness of the insulation.

SAF350E4

Unit : mm

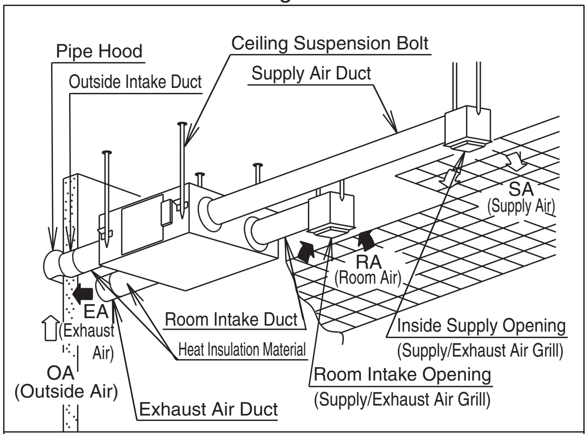




No.	Name	Quantity	Material	Remarks
1	Frame	1	Zinc-plated Steel	
2	Adapter	4	ABS Resin	
3	Electrical Equipment Box	1		
4	Inspection Cover	1	Zinc-plated Steel	
5	Fan	2	ABS Resin	
6	Motor	2		
7	Heat Exchange Element	2	Flame Retardant Paper + Plastic	Entire Heat Exchanger
8	Filter	2	Non-woven Cloth	Collection Efficiency Weighing Method 82%
9	Damper	1		
10	Damper Motor	1		
11	Ceiling Suspension Fixture	4	Zinc-plated Steel	

Note (1) An inspection port is needed for cleaning the heat exchanger and filter 1 or 2 times a year.

Installation Reference Diagram

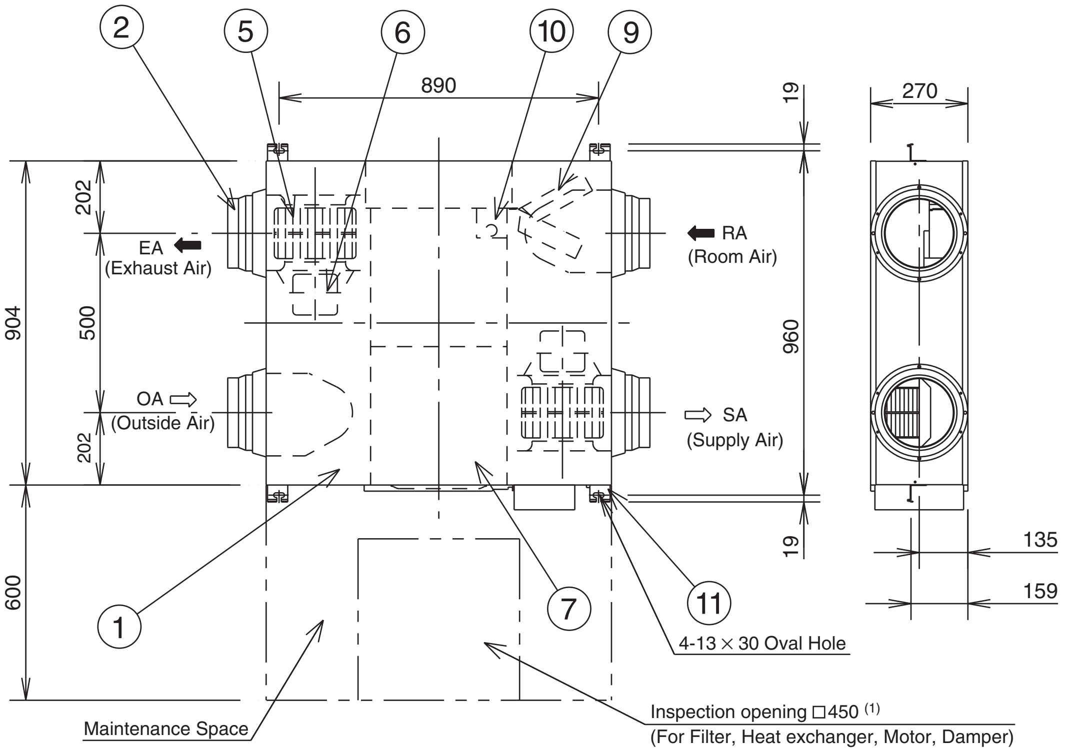


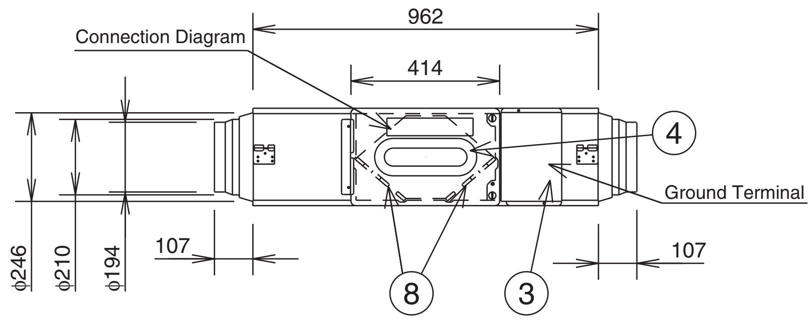
Be sure to cover the two outside air ducts (outside intake air and exhaust air ducts) with insulation to prevent condensation.
(Material: Grasswool, 25 mm thick)

Caution 1. Connection Duct: Nominal diameter φ150
2. The above dimensions do not include the thickness of the insulation.

SAF500E4

Unit : mm

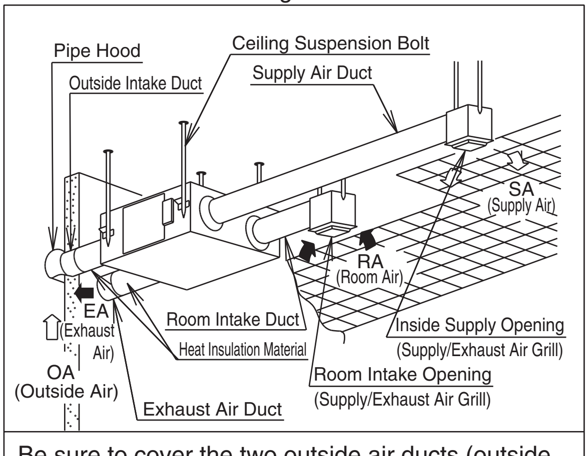




No.	Name	Quantity	Material	Remarks
1	Frame	1	Zinc-plated Steel	
2	Adapter	4	Zinc-plated Steel	
3	Electrical Equipment Box	1		
4	Inspection Cover	1	Zinc-plated Steel	
5	Fan	2	ABS Resin	
6	Motor	2		
7	Heat Exchange Element	2	Flame Retardant Paper + Plastic	Entire Heat Exchanger
8	Filter	2	Non-woven Cloth	Collection Efficiency Weighing Method 82%
9	Damper	1		
10	Damper Motor	1		
11	Ceiling Suspension Fixture	4	Zinc-plated Steel	

Note (1) An inspection port is needed for cleaning the heat exchanger and filter 1 or 2 times a year.

Installation Reference Diagram

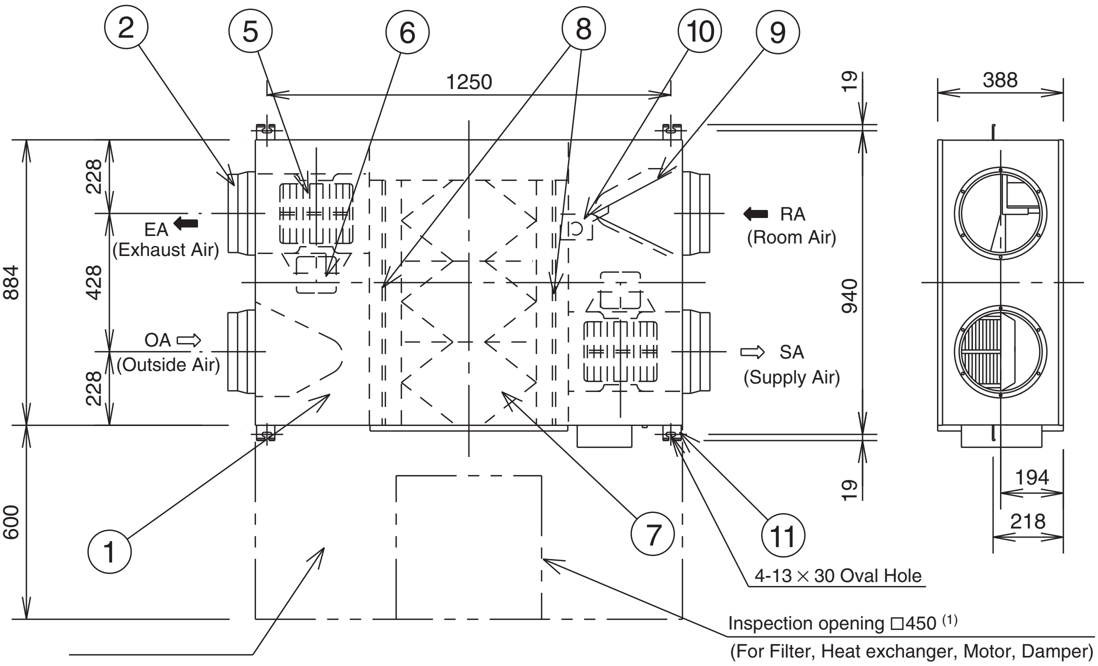


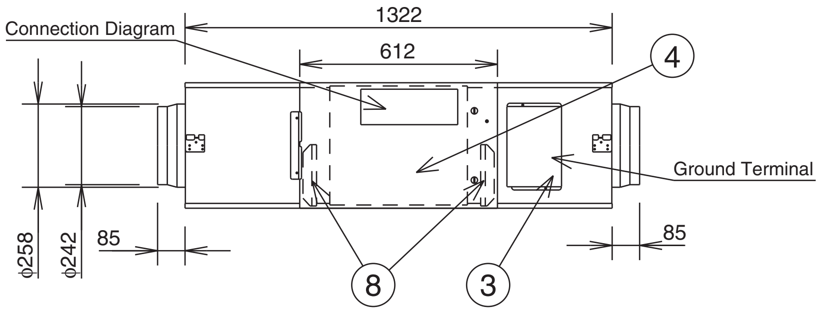
Be sure to cover the two outside air ducts (outside intake air and exhaust air ducts) with insulation to prevent condensation.
(Material: Grasswool, 25 mm thick)

Caution 1. Connection Duct: Nominal diameter φ200
2. The above dimensions do not include the thickness of the insulation.

SAF800E4

Unit : mm

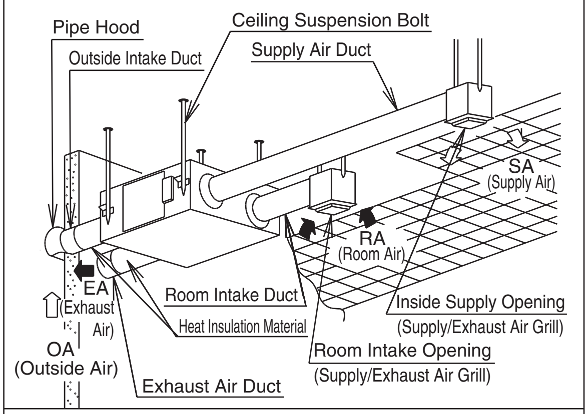




No.	Name	Quantity	Material	Remarks
1	Frame	1	Zinc-plated Steel	
2	Adapter	4	Zinc-plated Steel	
3	Electrical Equipment Box	1		
4	Inspention Cover	1	Zinc-plated Steel	
5	Fan	2	ABS Resin	
6	Motor	2		
7	Heat Exchange Element	2	Flame Retardant Paper + Plastic	Entire Heat Exchanger
8	Filter	2	Non-woven Cloth	Collection Efficiency Weighing Method 82%
9	Damper	1		
10	Damper Motor	1		
11	Ceiling Suspension Fixture	4	Zinc-plated Steel	

Note (1) An inspection port is needed for cleaning the heat exchanger and filter 1 or 2 times a year.

Installation Reference Diagram

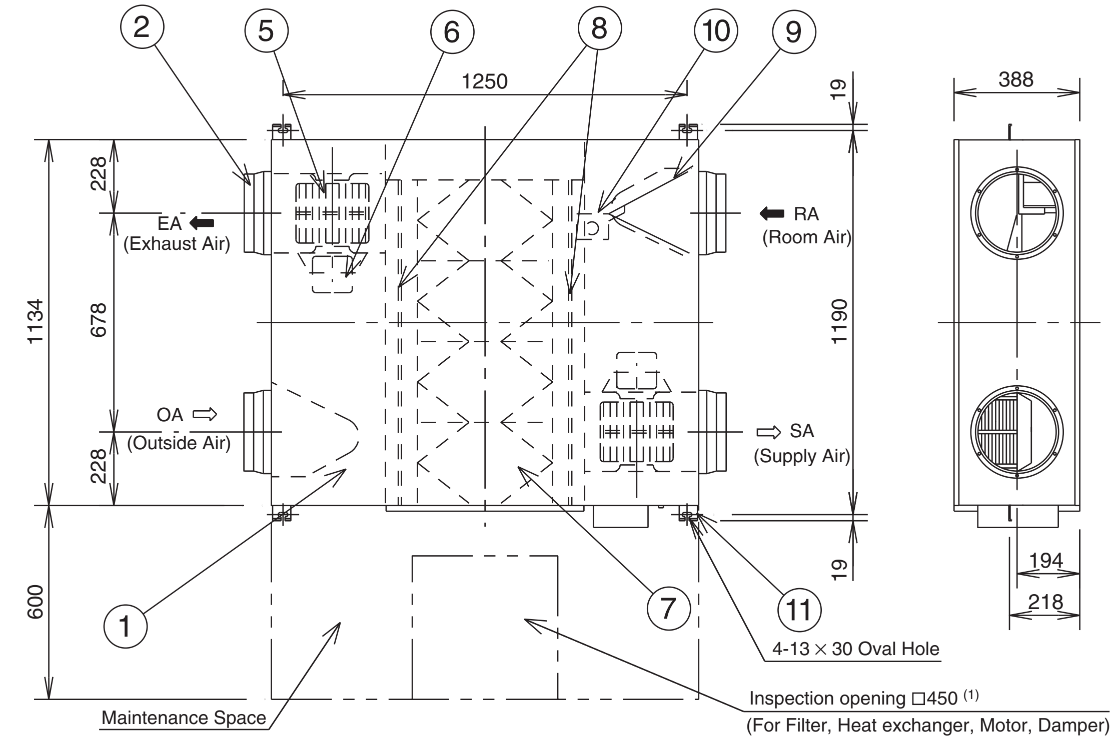


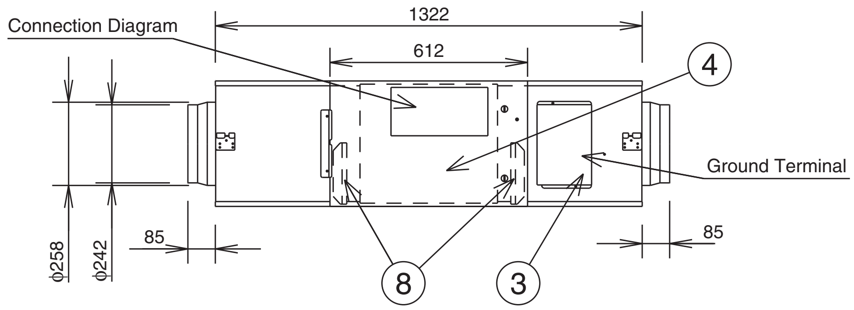
Be sure to cover the two outside air ducts (outside intake air and exhaust air ducts) with insulation to prevent condensation.
(Material: Grasswool, 25 mm thick)

Caution 1. Connection Duct: Nominal diameter φ250
2. The above dimensions do not include the thickness of the insulation.

SAF1000E4

Unit : mm

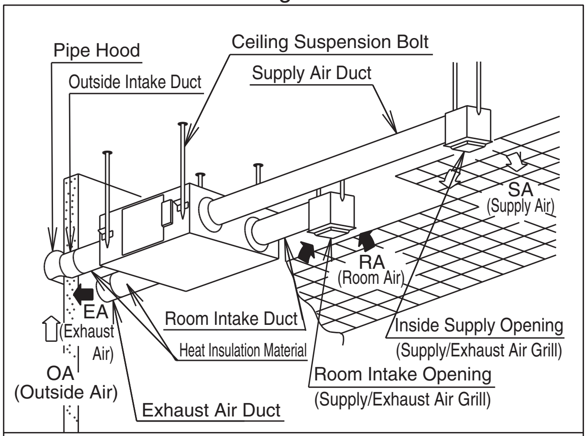




No.	Name	Quantity	Material	Remarks
1	Frame	1	Zinc-plated Steel	
2	Adapter	4	Zinc-plated Steel	
3	Electrical Equipment Box	1		
4	Inspection Cover	1	Zinc-plated Steel	
5	Fan	2	ABS Resin	
6	Motor	2		
7	Heat Exchange Element	4	Flame Retardant Paper + Plastic	Entire Heat Exchanger
8	Filter	2	Non-woven Cloth	Collection Efficiency Weighing Method 82%
9	Damper	1		
10	Damper Motor	1		
11	Ceiling Suspension Fixture	4	Zinc-plated Steel	

Note (1) An inspection port is needed for cleaning the heat exchanger and filter 1 or 2 times a year.

Installation Reference Diagram

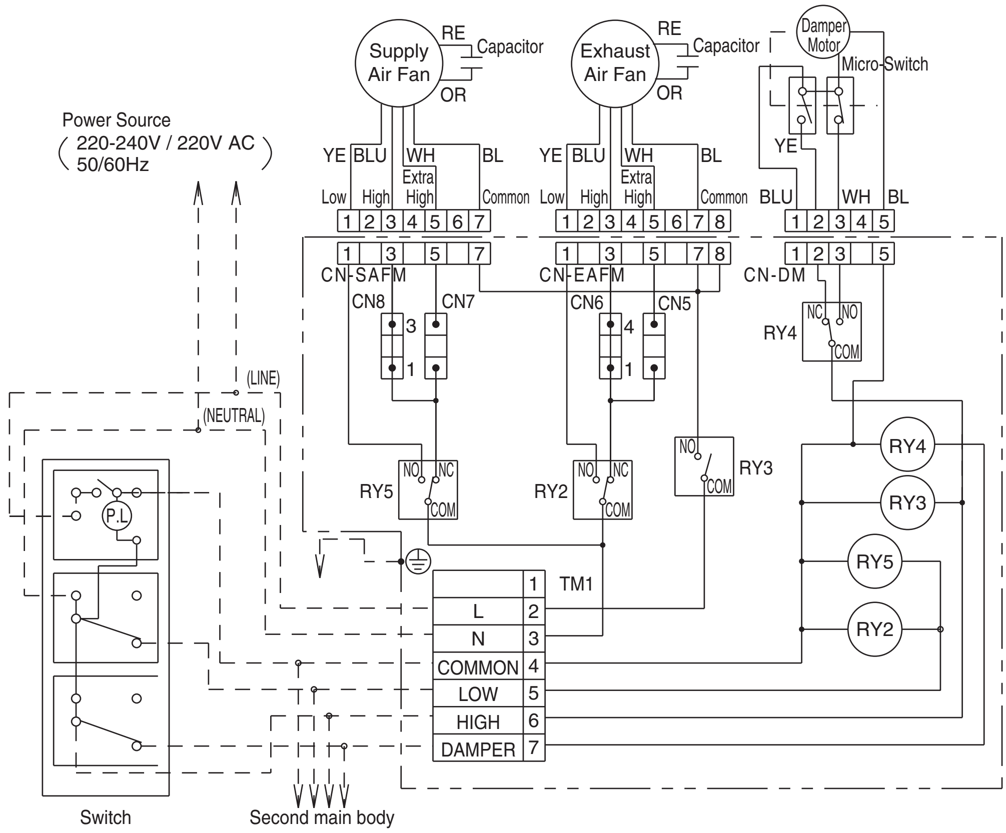


Be sure to cover the two outside air ducts (outside intake air and exhaust air ducts) with insulation to prevent condensation.
(Material: Grasswool, 25 mm thick)

Caution 1. Connection Duct: Nominal diameter ϕ250
2. The above dimensions do not include the thickness of the insulation.

3.13.3 Electrical wiring

SAF250E4, 350E4, 500E4



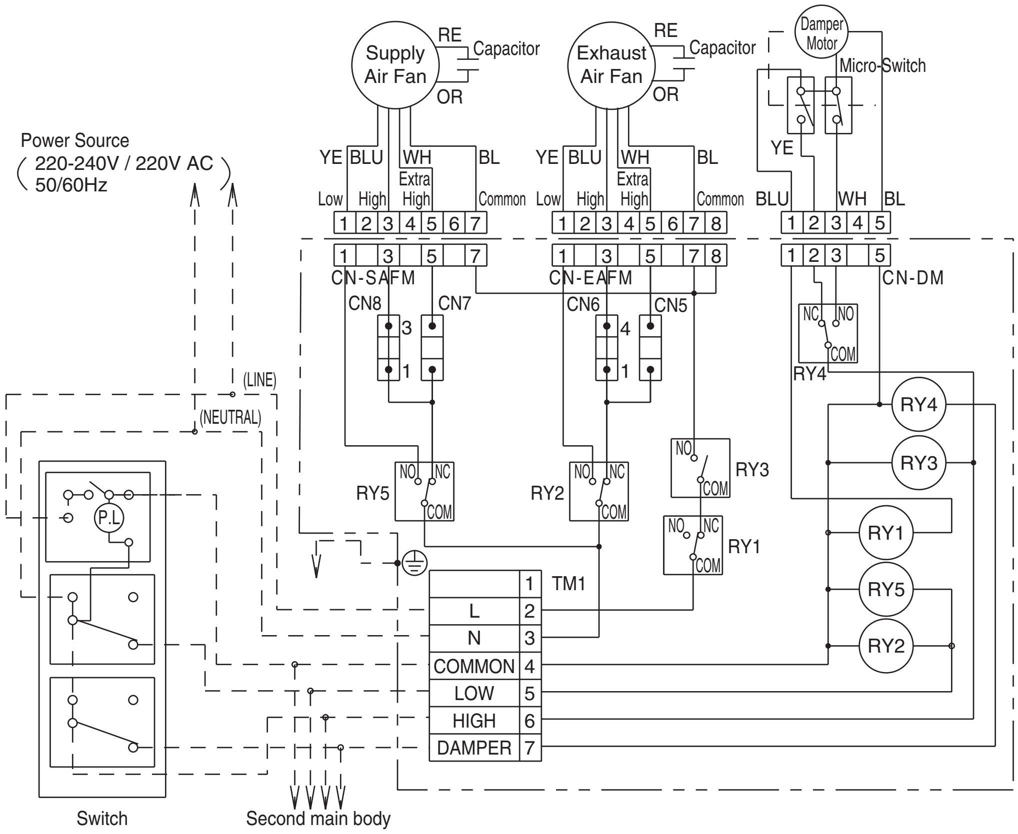
Model No.	Capacitor
SAF250E4	2.0μF 450VAC
SAF350E4	3.0μF 450VAC
SAF500E4	3.5μF 450VAC

Color mark

Mark	Color	Mark	Color	Mark	Color
BL	Black	GR	Gray	RE	Red
BLU	Blue	OR	Orange	WH	White
BR	Brown	PR	Purple	YE	Yellow

Notes (1) Have an electrical contractor perform wire connections in hard wired units.
(2) It is set on the "Hi" or "Lo" notch when shipped from the factory.
If you use it set on the "UHi" notch, change CN6 to CN5 and change CN8 to CN7, respectively.
(3) Check the wiring connections carefully once more before turning on the power when installation is completed.
(4) Use IEC60227-4 compatible 1.6~2.0 mm or 2.0~3.1 mm PVC insulated cable with sheathing when wiring this unit.

SAF800E4, 1000E4



Model No.	Capacitor
SAF800E4	8.0μF 450VAC
SAF1000E4 (50Hz)	10.0μF 450VAC
SAF1000E4S (60Hz)	10.0μF 450VAC

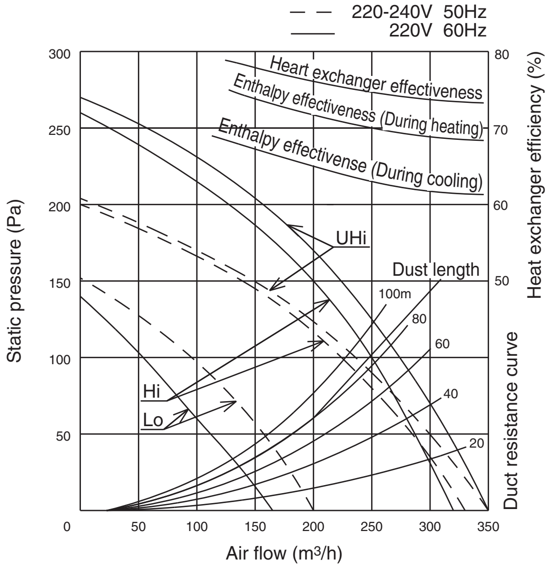
Color mark

Mark	Color	Mark	Color	Mark	Color
BL	Black	GR	Gray	RE	Red
BLU	Blue	OR	Orange	WH	White
BR	Brown	PR	Purple	YE	Yellow

Notes (1) Have an electrical contractor perform wire connections in hard wired units.
(2) It is set on the "Hi" or "Lo" notch when shipped from the factory.
If you use it set on the "UHi" notch, change CN6 to CN5 and change CN8 to CN7, respectively.
(3) Check the wiring connections carefully once more before turning on the power when installation is completed.
(4) Use IEC60227-4 compatible 1.6~2.0 mm or 2.0~3.1 mm PVC insulated cable with sheathing when wiring this unit.

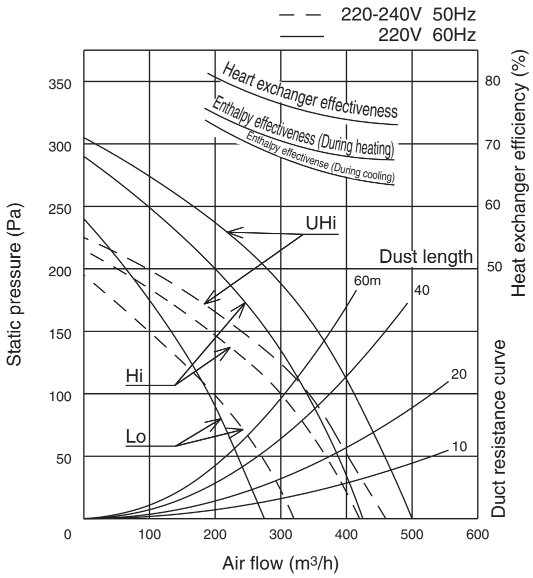
3.13.4 Characteristics of fan

SAF250E4



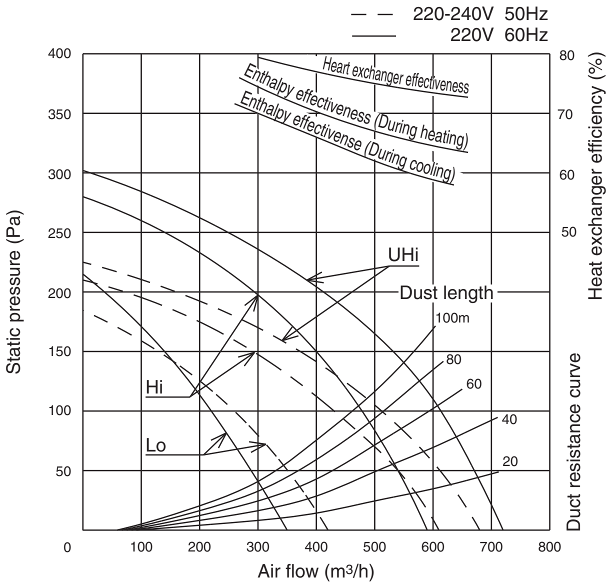
Note (1) Duct length is equicalent to the length of straight pipe when λ (Resistance coefficient) = 0.020 (Friction loss coefficient).

SAF350E4



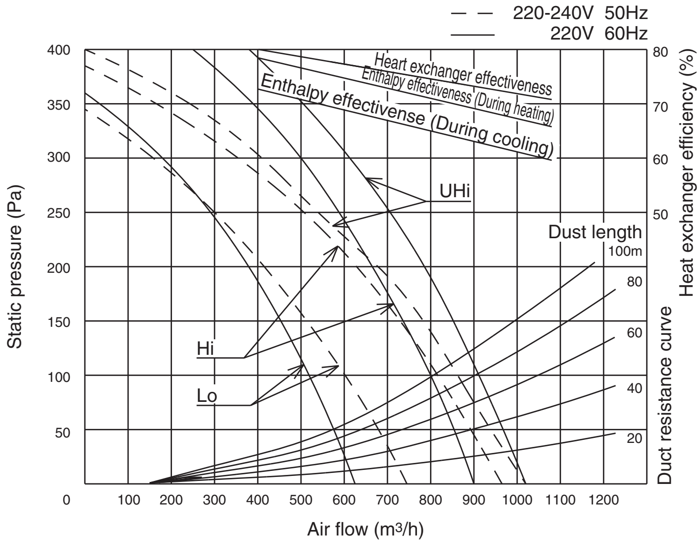
Note (1) Duct length is equicalent to the length of straight pipe when λ (Resistance coefficient) = 0.020 (Friction loss coefficient).

SAF500E4



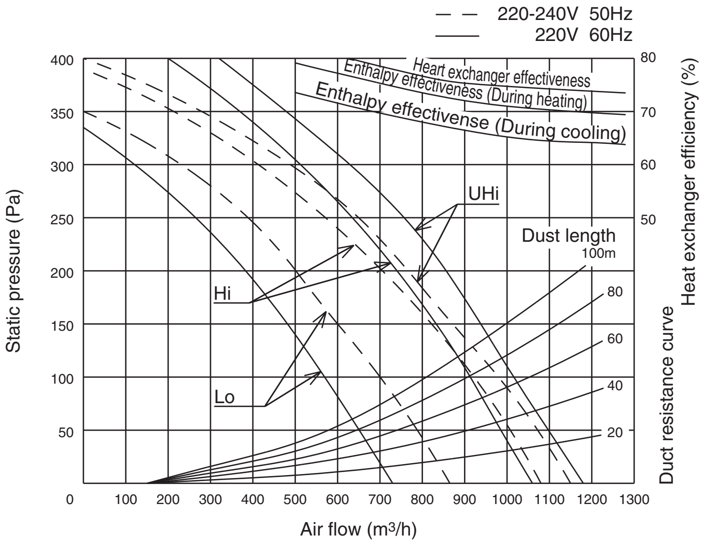
Note (1) Duct length is equicalent to the length of straight pipe when λ (Resistance coefficient) = 0.020 (Friction loss coefficient).

SAF800E4



Note (1) Duct length is equicalent to the length of straight pipe when λ (Resistance coefficient) = 0.020 (Friction loss coefficient).

SAF1000E4



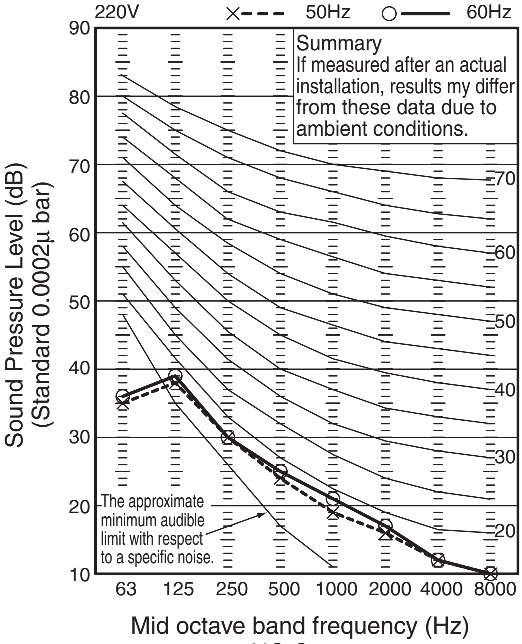
Note (1) Duct length is equicalent to the length of straight pipe when λ (Resistance coefficient) = 0.020 (Friction loss coefficient).

3.13.5 Noise level

Notes (1) The data are based on the following condition.
Distance center & low point: 1.5 m.
(2) The data in the chart are measured in an anechoic room.
(3) The noise level measured in the friend are usually higher than data because of reflection.

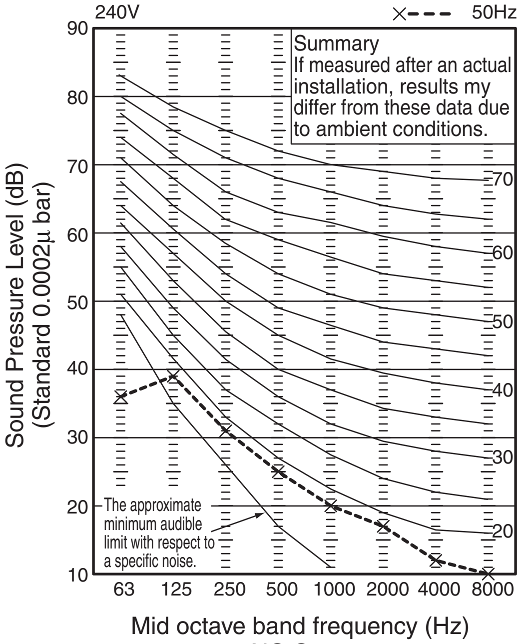
Model SAF250E4

Noise level 27/28 dB (A) at UHi
26/26 dB (A) at Hi
21/21 dB (A) at Lo



NC Curve

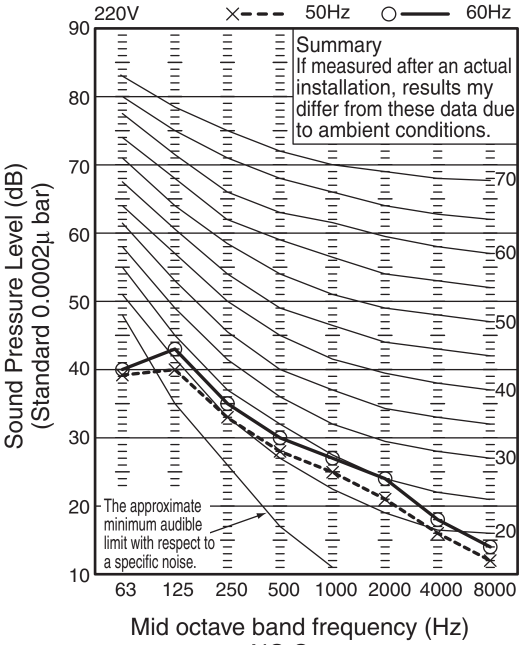
Noise level 28 dB (A) at UHi
27 dB (A) at Hi
27 dB (A) at Lo



NC Curve

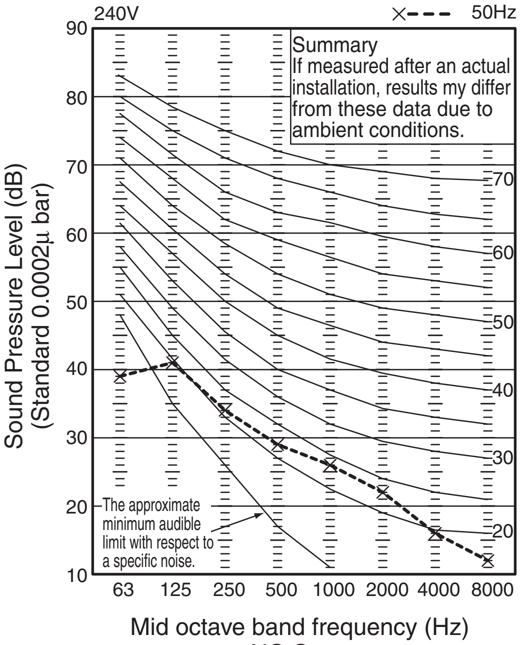
Model SAF350E4

Noise level 31/33 dB (A) at UHi
29/30 dB (A) at Hi
25/22 dB (A) at Lo



NC Curve

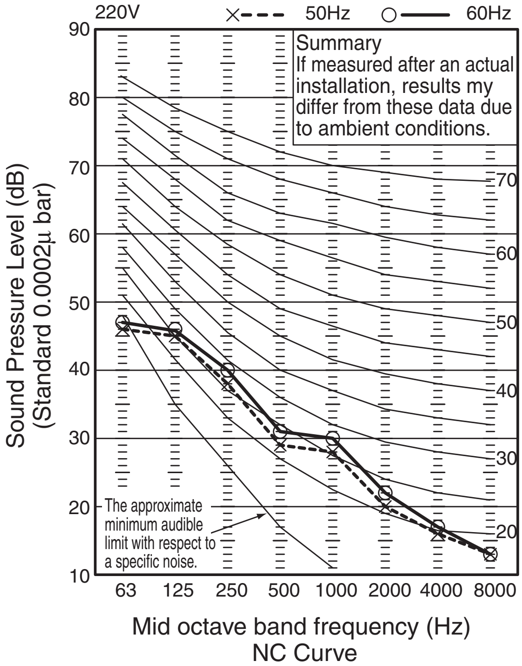
Noise level 32 dB (A) at UHi
30 dB (A) at Hi
26 dB (A) at Lo



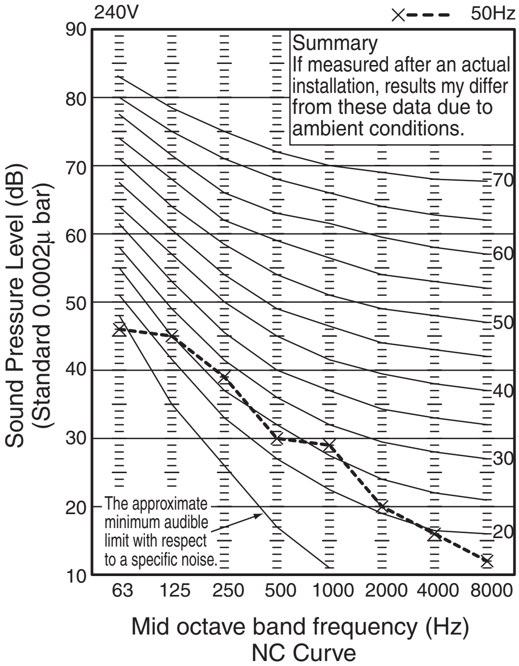
NC Curve

Model SAF500E4

Noise level 33/35 dB (A) at UHi
31/31 dB (A) at Hi
25/23 dB (A) at Lo

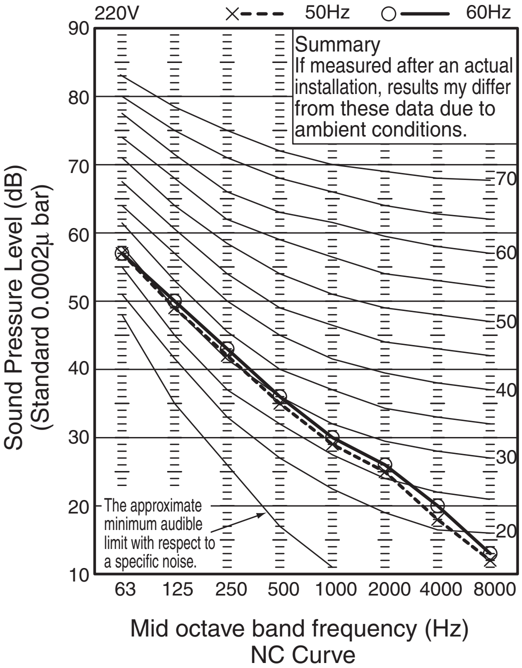


Noise level 34 dB (A) at UHi
32 dB (A) at Hi
26 dB (A) at Lo

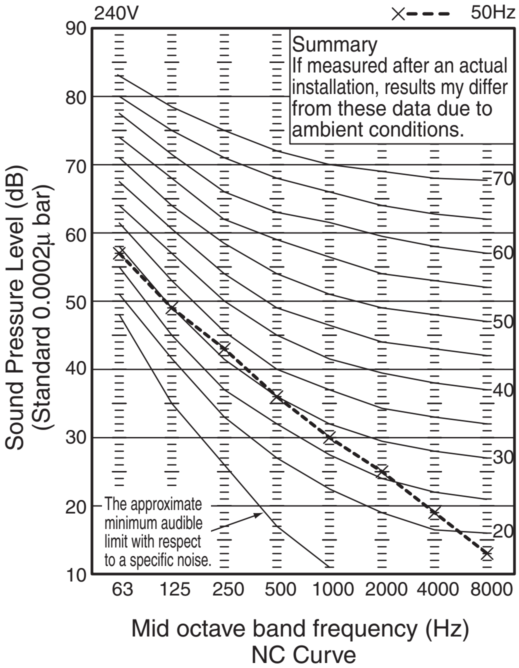


Model SAF800E4

Noise level 38/39 dB (A) at UHi
36.5/36 dB (A) at Hi
32/31 dB (A) at Lo

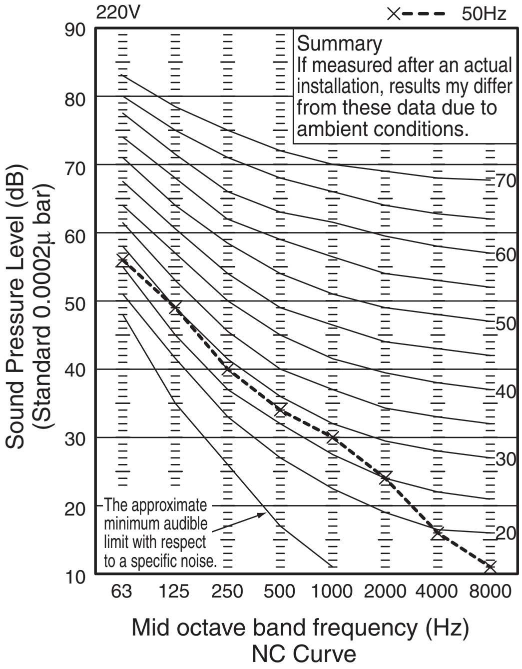


Noise level 39 dB (A) at UHi
37.5 dB (A) at Hi
34 dB (A) at Lo

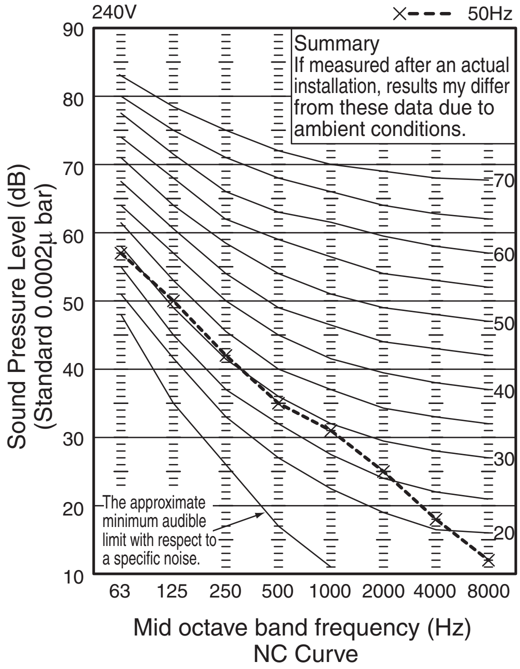


Model SAF1000E4

Noise level 37.5 dB (A) at UHi
36 dB (A) at Hi
31 dB (A) at Lo



Noise level 38.5 dB (A) at UHi
37 dB (A) at Hi
33 dB (A) at Lo



3.14 Operating characteristic of indoor unit

FDTA Series (220/240V)

Models / Item	FDTA							
	28	36	45	56	71	90	112	140
Power input (kW)	Cooling: 0.05/0.05, Heating: 0.04/0.05		0.05/0.05		0.06/0.07	0.10/0.11	0.20/0.24	0.23/0.27
Running current (A)	0.23				0.32/0.30	0.46/0.46	0.90/0.98	1.03/1.13

FDTCA Series (220/240V)

Models / Item	FDTC Series				
	22	28	36	45	56
Power consumption (kW)	0.027/0.027		0.034/0.034	0.043/0.043	0.046/0.046
Running current (A)	0.10/0.09		0.11/0.10	0.15/0.13	0.15/0.14

FDTWA Series (220/240V)

Models / Item	FDTWA						
	28	45	56	71	90	112	140
Power input (kW)	0.09/0.10			0.10/0.11	0.12/0.13	0.18/0.20	0.20/0.24
Running current (A)	0.43/0.44			0.48/0.50	0.57/0.59	0.86/0.89	0.90/0.98

FDTQA Series (220/240V)

Models / Item	FDTQA (direct blow panel)			FDTQA (duct panel)		
	22	28	36	22	28	36
Power input (kW)	0.045/0.050			0.050/0.055		
Running current (A)	0.21/0.22			0.23/0.24		

FDTSA Series (220/240V)

Models / Item	FDTSA	
	45	71
Power input (kW)	0.09/0.11	0.12/0.15
Running current (A)	0.43/0.46	0.58/0.63

FDRA Series (220/240V)

Models / Item	FDRA					
	45	56	71	90	112	140
Power input (kW)	0.14/0.16		0.15/0.17	0.16/0.19	0.24/0.28	0.28/0.32
Running current (A)	0.63/0.67		0.68/0.71	0.73/0.79	1.07/1.17	1.28/1.32

FDQMA, FDUMA Series (220/240V)

Models / Item	FDQMA			FDUMA					
	22	28	36	45	56	71	90	112	140
Power input (kW)	0.050/0.055			0.14/0.16		0.15/0.17	0.16/0.19	0.24/0.28	0.28/0.32
Running current (A)	0.23/0.24			0.63/0.67		0.68/0.71	0.73/0.79	1.07/1.17	1.28/1.32

Note (1) The above table is common for both cooling and heating.

FDURA Series (220/240V)

Item \ Models	FDURA					
	45	56	71	90	112	140
Power input (kW)	0.15/0.17	0.21/0.24	0.23/0.26	0.34/0.40		0.39/0.45
Running current (A)	0.69/0.73	0.95/1.01	1.05/1.11	1.55/1.64		1.79/1.90

FDEA Series (220/240V)

Item \ Models	FDEA					
	36	45	56	71	112	140
Power input (kW)	0.07/0.08			0.09/0.10	0.14/0.15	0.16/0.17
Running current (A)	0.3/0.3			0.4/0.4	0.6/0.6	0.7/0.7

FDKA, FDFLA, FDFUA Series (220/240V)

Item \ Models	FDK Series							FDFLA,FDFUA Series	
	22	28	36	45	56	71	28	45, 56	71
Power consumption (kW)	Cooling: 0.05/0.05 Heating: 0.04/0.05			0.05/0.05		0.09/0.11	0.09/0.10	0.09/0.10	0.09/0.10
Running current (A)	0.23/0.21			0.23/0.21		0.41/0.48	0.41/0.42	0.40/0.41	0.40/0.41

Note (1) The above table is common for both cooling and heating.

Product Specifications

MEMO

Part 3
Application Data

Application Data

Application Data

1. Safety Precautions

- Please read these "Safety Precaution" first then accurately execute the installation work.
- Though the precautionary points indicated herein are divided under two headings, ⚠**WARNING** and ⚠**CAUTION** , those points which are related to the strong possibility of an installation done in error resulting in death or serious injury are listed in the ⚠**WARNING** section. However, there is also a possibility of serious consequences in relationship to the points listed in the ⚠**CAUTION** section as well.
  In either case, important safety related information is indicated, so by all means, properly observe all that is mentioned.
- After completing the installation, along with confirming that no anomalies were seen from the operation tests, please explain operating methods as well as maintenance methods to the user (customer) of this equipment, based on the owner's manual.
  Moreover, ask the customer to keep this sheet together with the owner's manual.
- For outdoor unit, EN60555-2 and EN60555-3 are not applicable as consent by the utility company or notification to the utility company is given before usage.

⚠ WARNING

- Installation should be performed by the dealer or a company speciallizing in this type of installarion. If you install the equipment yourself, installation errors could result in water leaks, electric shock, and/or a fire, as well as other hazards.
- Conduct installation work in accordance with the instructions in this installation manual. Installation errors could result in water leaks, electric shock, or fire.
- Sling the unit at the specified points with ropes property rated for the weight in liftting it for portage. An improper manner of portage can result in a fail of the unit resulting in an accident invoiving personal death or injury.
- When installing a unit in a small rooms, take measure so that if the refrigerant leaks, it does not exceed the concentration limit. For information regarding measures to prevent the concentration limit from being exceed, please contact the dealer.
- It refrigerant leaks and the concentration limit is exceeded, suffocation could occur.
- Install the equipment in a location that can sufficiently support the weight of the equipment. If the area is not strong enough, an accident could result from the unit falling.
- Install the equipment in a location that can withstand strong winds, such as typhoons, and earthquakes. If the installation is not secure, an accident could result from the unit falling.
- Always turn off power before work is performed inside the unit such as for installation or servicing. A failure to observe this instruction can cause a danger or electric shock.
- Electrical work should be done by a licensed electrician who shall do the work in accordance with the Technical Standards Regarding Electrical Equipment. Indoor Wiring Provisions, and this installation manual. The electrician shall use specified circuit for the equipment. If the power supply circuit capacity is insuficient or the work is not done correcty, it could result in electric shock or a fire.
- For wiring, the specified cable should be used, the connections should be secure, and the fixtures shall be strong enough to prevent cables from being pulled out from the terminal connections. Incorrect connections or work fixtures could result in heat generation or a fire.
- In wiring, arrange cables suitably so that they may not get off their support and then fix the service panel securely. Improper installation can cause heat generation and a resultant fire. Please prevent any substance other than the specified refrigerant (R410A) such as air from entering the refrigerant cycle in installing or moving the air conditioning system. Contamination by air or a foreign substance can cause an anomalous pressure build-up inside the refrigerant cycle and a resultant explosion and personaly injury.
- Use only parts supplied with the unit and specified supply parts for installation. The use of unauthorized parts may cause the leaking of water or electricity causing a danger of electric shock or a fire, a refrigerant leak, performance degradation, and control failures.
- Do not open operation valves (either liquid or gas or both) until refrigerant piping, an air-tightness test and an air purge are completed.
  When a leak of refrigerant gas occurs during piping work, stop brazing pipes and ventilate the room. Refrigerant gas, when it comes into contact with bare fire, can generate a toxic gas.
- When installation is completed, check for refrigerant gas leaks. If the refrigerant gas leaks indoors, it could come in contact with a fan heater, burner, or hot plate, which could generate a poisonous gas.

CAUTION

- Ground the equipment. Do not connect the ground wire to gas piping, water piping, a lightning rod, or telephone ground wires. It grounding is not performed correctly electric shock could occur.
- Depending on the installation location, a circuit breaker may need to be installed. It a circuit breaker is not installed, electric shock may occur.
- Please follow this manual faithfully in performing installation work. Improper installation work can cause anomalous vibrations and noise generation.
- Do not install the equipment in areas where there is danger of flammable gas leaks. It such gas does leak it could collect around the units and cause a fire.
- Install the drain piping in accordance with the installation manual so that it properly discharges waste water and is maintained at a temperature that prevents condensation.
- Do not install the outdoor unit where winds from its fan blow directly onto a plant, etc. Winds can affect adversely to the plant, etc.
- Secure a space for inspection and maintenance as specified in the manual. An insufficient space can result in an accident such as a fall from the installation point and a resultant personal injury.
- When the outdoor unit is installed on a roof or at an elevated point, provide permanent ladders and handrails along the access route and fences and handrails around the outdoor unit.
- In tightening a flare nut, use a double spanner and observe the specified tightening torque. Care must be taken so as not to overtighten a nut and damage the flare part. (Please refer to the tightening torque) The loosening or damage of the flare part can cause a refrigerant gas leak and a resultant lack-of-oxygen accident.
- Please dress the refrigerant piping with a heat insulation material for prevention of dew condensation. Improper heat insulation for prevention of dew condensation can cause the leaking or dripping of water and a resultant soaking of household effects.
- When refrigerant piping is completed, check its air-tighteness with nitrogen gas to make sure it does not have a leak. A leak of refrigerant gas in a narrow room beyond the safety limit concentration can cause a lack-of oxygen accident.

2. Installation Sequence

	<Sequence>	<Key Points>
Prior to construction	Preparation of construction drawings	• Configuration of indoor and outdoor units • Power source capacity, position of circuit breakers, wiring for indoor and outdoor units, remote control line • Position of remote controller • Specifications and routes of the refrigerant and drain piping. • Address setting of indoor and outdoor units
	Obtaining of owner's approval	Owner's approval must be obtained prior to the construction.
	Preparation of pipes and other materials.	Confirmation with the owner on quality of the pipes, wires and other materials.
	Confirmation of moving-in route	Ensure sufficient space for moving-in route, elevator as well as the parking of the wrecking truck.
Construction Works	Sleeves and embedded Parts	Consideration should be given to the gradient of the drain pipes.
	Installation of the indoor units	Check the model and assure the correct installation.
	Refrigerant piping works	Special care is required to ensure that the piping is dry, clean and properly sealed.
	Drain pipes works	Adjustment of the downward gradient
	Air duct works	Sufficient air rate must be guaranteed.
	Heat insulation works	Seamless joints must be assured for the heat insulation materials.
	Electric works (Connection loop and drive loop)	Multi-core wires must not be used (suitable cables should be selected).
	Setting of the indoor unit setting switches	The control circuit diagram must be strictly followed.
	Outdoor unit base works	The base must be kept horizontal.
	Installation of the outdoor units	Actions should be taken to prevent short-circuit of air ventilation and sufficient servicing space should be assured.
	Setting of the outdoor unit setting switches	The control circuit diagram must be strictly followed.
	Air-tightness test	The final check should be performed at a pressure of 2.74MPa and there should be no pressure drop within 24 hours.
	Vacuum drying	The vacuum pump used should have a capacity of at least 5mmHg.
	Additional charging of refrigerant	The amount of refrigerant additionally charged should be recorded on the body of outdoor unit and the record sheet.

Remarks (1) What is listed above is the normal operation sequence, which is subject to change if on-site condition allows.
(2) Refer to the comparison table for the reference page.

(Table referred)

Sequence \ Model	4-way outlet ceiling recessed type (FDTA)	4-way outlet ceiling recessed compact type (FDTCA)	2-way outlet ceiling recessed type (FDTWA)	Ceiling recessed single air supply port type (FDTQA)	1-way outlet ceiling recessed type (FDTSA)	Casse-tteria type (FDRA)	Medium static pressure ducted type (FDQMA)	Satellite ducted type (FDUMA)	Ceiling mounted duct type (FDURA)	Ceiling suspen-sion type (FDEA)	Wall mounted type (FDKA)	Floor standing exposed type (FDFLA)	Floor standing hidden type (FDFUA)	Air to air heat exchan-ge unit (SAF)
Preparation of construction drawings	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Obtaining of owner's approval	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Preparation of pipes and other materials	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Confirmation of moving-in route	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sleeves and embedded Parts	—	—	—	—	—	—	—	—	—	P.314	—	—	—	—
Installation of the indoor units	P.253	P.260	P.266	P.272	P.280	P.286	P.296	P.300	P.306	P.314	P.318	P.324	P.327	P.329
Refrigerant piping works	P.334	P.334	P.334	P.334	P.334	P.334	P.334	P.334	P.334	P.334	P.334	P.334	P.334	P.334
Drain pipes works	P.255	P.263	P.268	P.274	P.283	P.293	P.298	P.303	P.308	P.317	P.320	P.326	P.329	—
Air duct works	—	—	—	—	—	P.292	P.297	P.302	P.311	—	—	—	—	P.332
Heat insulation works	P.349	P.349	P.349	P.349	P.349	P.349	P.349	P.349	P.349	P.349	P.349	P.349	P.349	P.349
Electric works(Connection loop and drive loop)	P.352	P.352	P.352	P.352	P.352	P.352	P.352	P.352	P.352	P.352	P.352	P.352	P.352	P.352
Setting of the indoor unit setting switches	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357
Outdoor unit base works	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Installation of the outdoor units	P.246	P.246	P.246	P.246	P.246	P.246	P.246	P.246	P.246	P.246	P.246	P.246	P.246	P.246
Setting of the outdoor unit setting switches	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357	P.357
Air-tightness test	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347
Vacuum drying	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347	P.347
Additional charging of refrigerant	P.348	P.348	P.348	P.348	P.348	P.348	P.348	P.348	P.348	P.348	P.348	P.348	P.348	P.348

3. Installation of Outdoor Unit

3.1 Selecting the Installation Location

1. Where air is not trapped.
2. Where the installation fittings can be firmly installed.
3. Where wind does not hinder the intake and outlet pipes.
4. Out the heat range of other heat sources.
5. Where it is safe for the condensate water to be discharged.
6. Where noise and hot air will not bother neighboring residents.
7. Where snow will not accumulate.
8. Where strong winds will not blow against the outlet pipe.

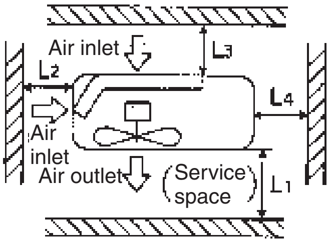
Notes (1) A four-sided enclosure cannot be used. Leave a space of at least 1m above the unit.
(2) If there is a danger of an air short-circuit, then install a wind direction variable adapter.
(3) When installing multiple units, provide sufficient intake space so that an air short-circuit does not occur.
(4) In areas where there is snowfall, install the unit in a frame or under a snow hood to prevent snow from accumulating on it.
(Inhibition of collective drain discharge in a snowy country)
(5) Do not install the equipment in areas where there is a danger of flammable gas leaks.
* Please ask your distributor about optional parts such as wind vane adapters, snow guard hoods, etc.

3.2 Installation Space (Service Space) Example

Please secure sufficient clearance (room for maintenance work, passage, draft and piping). (If your installation site does not fulfill the installation condition requirements set out on this drawing, please consult with your distributor or the manufacturer)

3.2.1 FDCA140HKXEN4

Make sure to allow the air inlet and air outlet as well service space as shown in the following figure.



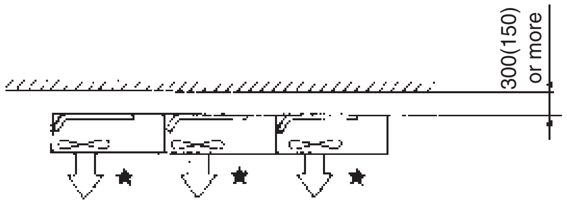
Unit : mm

Installation example / Dimensions	I	II	III
L1	open	open	500
L2	300	5	open
L3	150	300	150
L4	5	5	5

1. Make sure the barrier in front of air outlet below the height of the unit.
2. It is improper that barriers enclose the unit. Make sure to allow the space of 1m or more above the unit.
3. Make sure to allow the space of 10 mm between units, when mounted continuously side-by-side.
4. Please install guide louver in the place where short circuit maybe happen.
5. Please secure the air inlet space enough so as not to cause an air short circuit especially when setting several units.
6. Please install construction against snow to the place where the outdoor unit maybe is closed with the snowfall.
7. Please adopt measures against wind to the place where the influence of the strong wind is undergone easily.

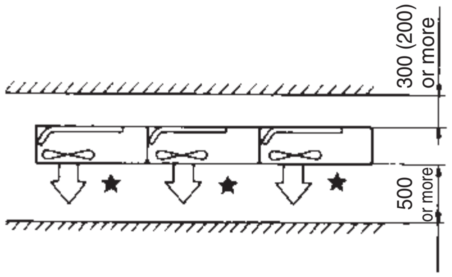
a) **Installing several units**

■ **Continuous installation side-by-side**
(Make sure to allow the space of 10 mm between units)
① **Air outlet side open**

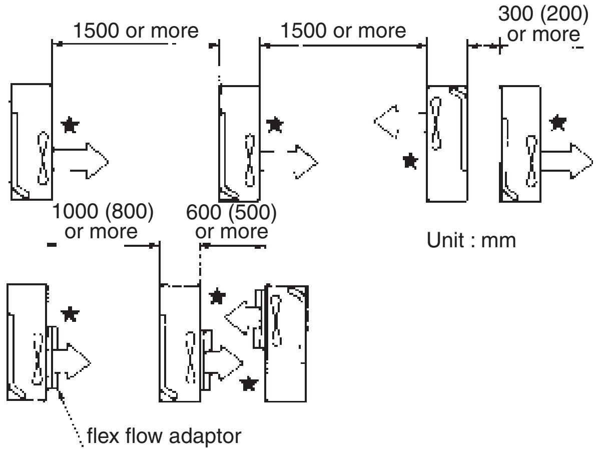


★**Mark denotes the side of the service panel**

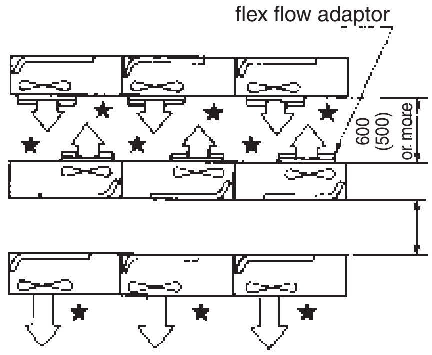
② **There is some barrier on air outlet side**



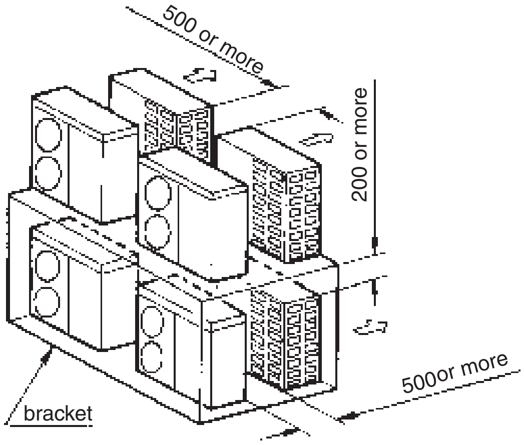
■ **Opposing installation**



■ **Continuous side-by-side and opposing installation**
(Make sure to allow the space of 10 mm between units)

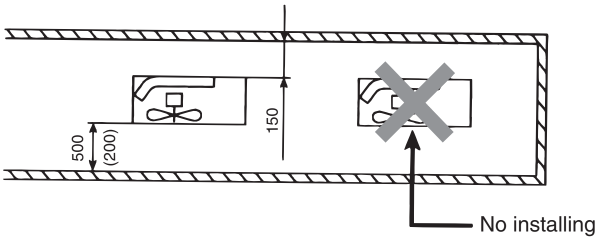


■ **Using bracket**



b) When installed on a narrow alley

Install several units ⇨ the installation is improper. (Around the unit there are barriers in all direction.)



Notes (1) The value enclosed by ( ) denotes the case for using guide louver

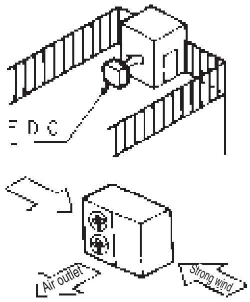
(2) Because the unit in the interior can be considered to be enclosed by barriers, it is unallowable to install it.

(3) If the above-mentioned requirement for installation to be allowable for the case in which barriers enclose it is met, it is possible to install.

c) when strong wind blows

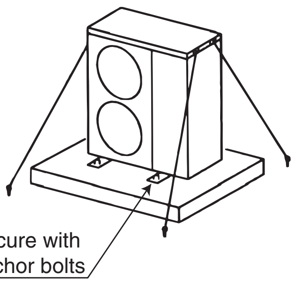
① Please separate the air outlet 500mm or more from wall.

② Make the air outlet perpendicular to wind direction.



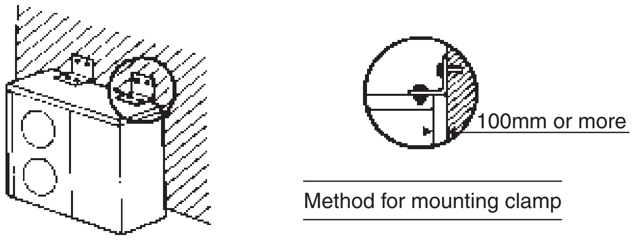
③ Fall prevention points

Please fix the unit through putting a wire on the hole on its side.



The wire used must be rust preventive and have high strength. ((example) SUS304-W1 (No.1 of softness) line diameter of ϕ2.9mm)

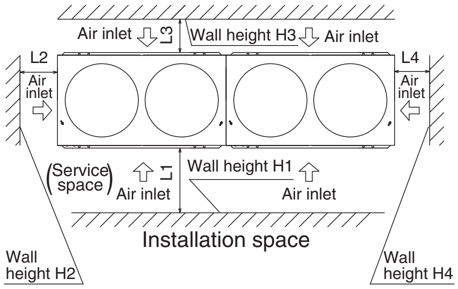
④ Fix with the fall prevention clamp (local arrangements).
The dowels that show the clamp fixing position on the wall are made in the ceiling.



Method for mounting clamp

3.2.2 FDCA224 ~ 1360HKXE4

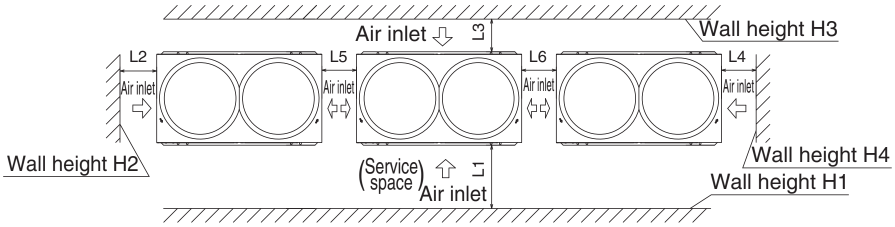
1. When one unit is installed



Unit: mm

Dimensions \ Installation example	I	II
L1	500	Open
L2	10	10
L3	100	100
L4	10	Open
H1	1500	–
H2	No limit	No limit
H3	1000	No limit
H4	No limit	–

2. When multiple units are installed (installation in one row side-by-side: no number limitation)



Installation space

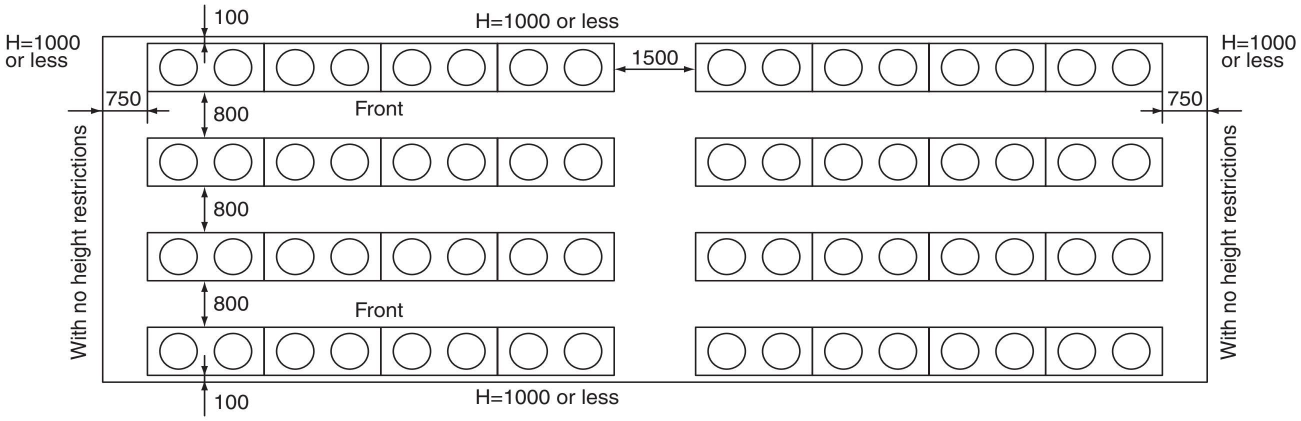
Unit : mm

Dimensions \ Installation example	1	2
L1	500	open
L2	10	200
L3	100	300
L4	10	open
L5	0	400
L6	0	400
H1	1500	No limit
H2	No limit	No limit
H3	1000	No limit
H4	No limit	No limit

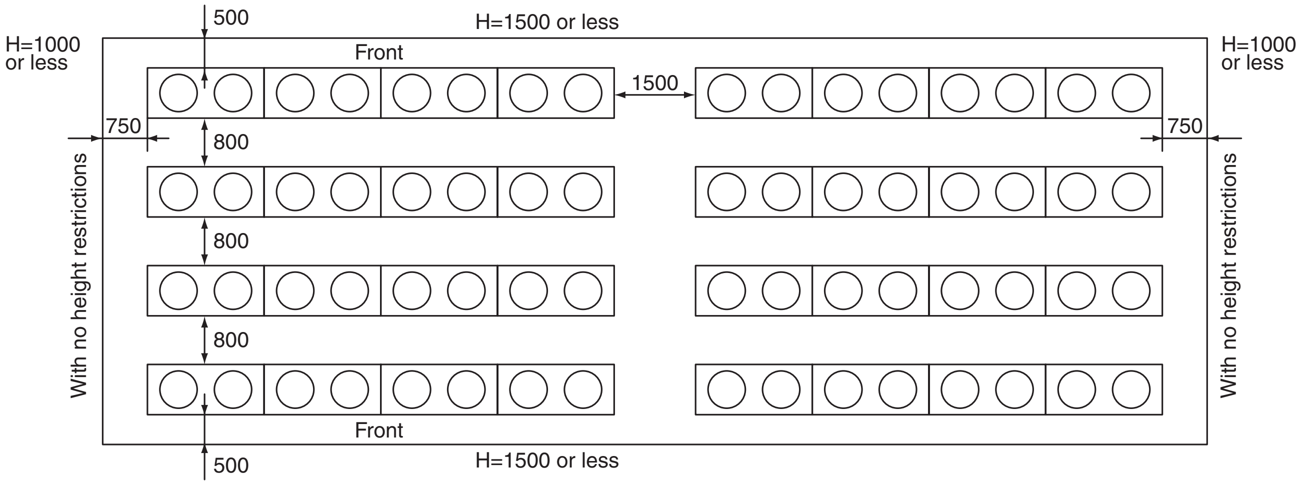
3. Multiple units installed in vertical and horizontal rows

■ [Ex.1]

Unit : mm

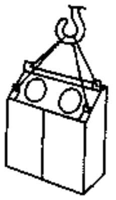


■ [Ex.2]



3.3 Carry-in and Installation of Unit

3.3.1 Carry-in



- When carrying-in the unit, carry it in as packed condition to the installation site as near as possible.
- If you are compelled to carry-in the unit unpacked condition, lift the unit with the rope, while preventing it from being injured.

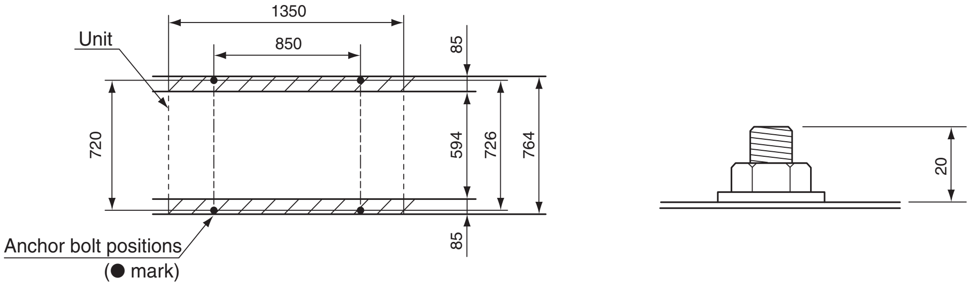
Request

- Lift the unit on four or more points.
- When lifting the unit, do not load on the unit.

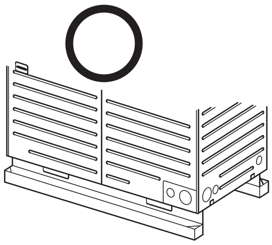
3.3.2 Notabilia for installation

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.

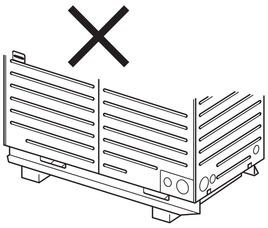
Unit : mm



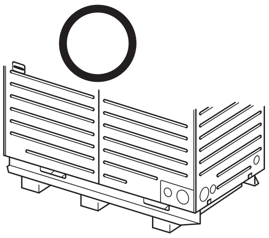
2. Base
   1) Please install a unit after ascertaining that the bases have been made to sufficient strength and level to ensure the unit against vibration or noise generation.
   2) Please construct a base to the size of a shadowed area (the entire bottom area of an outdoor unit's anchoring leg) shown on the above drawing or larger.



Normally, it is desirable that a base as specified in the drawing above is provided.

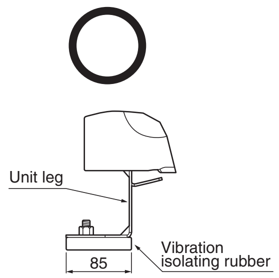


A base used for a former model is wrongly oriented and not acceptable.

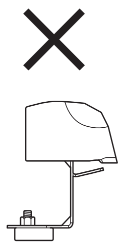


Please use it for renewal installation. (Please add a base on the center)

3. Vibration isolating rubber
   1) A vibration isolating rubber must support an outdoor unit's anchoring leg by its entire bottom area.



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.



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.

4. Installation of Indoor Unit

4.1 Ceiling Recessed Type (FDTA)

4.1.1 Selection of installation location

1. Select location where the space above ceiling is larger than those mentioned below and perfect condensate draining can be assured.

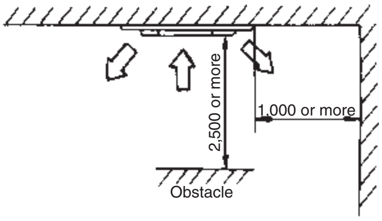
Model	Space above ceiling (h)
FDTA28, 36, 45, 56, 71	Over 290mm
FDTA90	Over 315mm
FDTA112, 140	Over 385mm

2. With the customer's consent, select a location with following suitable conditions.
   a) Where cool air or hot air can easily pass through.
      If the height of the location exceeds 3 m, hot air will gather in the ceiling. Suggest to the customer to also install a circulator.
   b) Where water can be completely drained. A sloping location for drainage.
   c) Where there are no wind disturbances to the suction inlet and blowing outlet, where the fire alarm will not be set off erroneosly, where no short circuits occur.
   d) Where there is no direct sunlight.
   e) Where the dew point temperature is below 28°C and the relative humidity is below 80%.
      The unit has been tested according to JIS dew point conditions and has been confirmed to operate without any problems. However, if the unit is operated in an environment with the humidity higher than the above limit, water condensation may occur. Accordingly, all pipes and drain pipes should be further covered with insulation materials of 10 - 20 mm thick.
3. Consider the supporting strength of the location. If the strength is not sufficient to sustain the unit weight, use reinforcing materials.

4.1.2 Installation space for unit

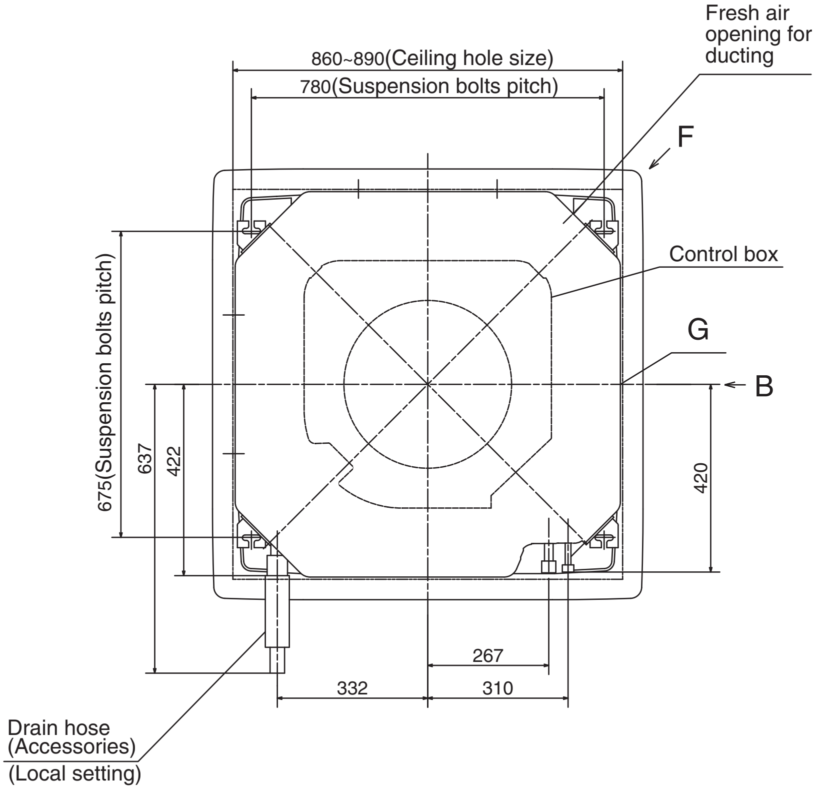
1. When a sufficient interval cannot be secured between the unit and a wall or another unit, shut up diffusers on that side to block winds and make sure that no short-circuiting is occurring. (A wind blocking material is available as an optional part)
   Do not use the unit in the "LO" wind mode, when winds are blown into two or three directions.

● Installtation space Unit : mm

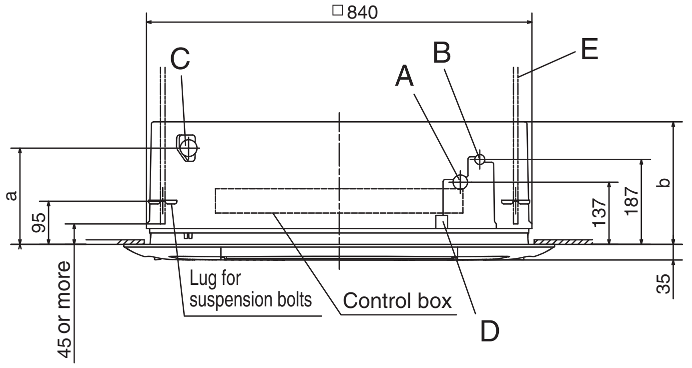


2. When the unit has 2500 mm or less clearance, attach a fan guard (option part) on the intake side of the fan.

Unit : mm



A	Gas tube connecting port
B	Liquid tube connecting port
C	Drain line connecting port
D	Power intake
E	Hanging bolt
F	OA intake
G	Blowout branch duct connecting port



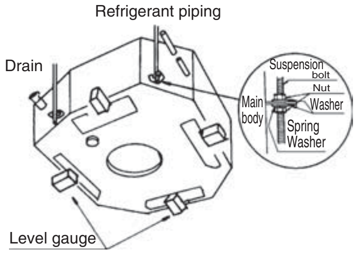
Model	a	b
FDTA 28~71	212	270
FDTA 90	212	295
FDTA 112, 140	269	365

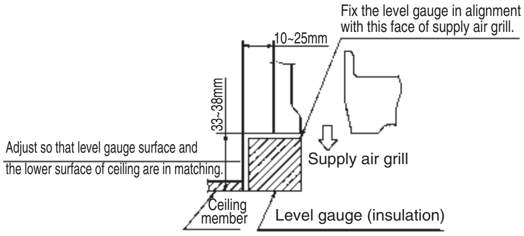
4.1.3 Suspension

- Please arrange four sets of a hanging bolt (M10 or M8), a nut matching the bolt, a flat washers and a spring washer on the installation site.

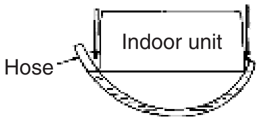
When suspension from the ceiling

1. In the case of the standard series: Cut and opening of □860 ~ □890
   In cutting an operating on the ceiling, use the unit's cardboard container for shipment as a reference of the size of opening.
   ■The center of the opening on the ceiling must match with the center of the unit.
2. Determine the positions of suspension bolts (675 × 780).
3. Use four suspension bolts, each fastened in such a manner that it can withstand pull force of 50 kgf.
4. Make suspension bolts to the length that leaves approximately 70 mm of them above the ceiling.
5. After hoisting in the unit, attach level gauges supplied as accessories and determine the unit position (height).





6. Use a transparent tube with water filled inside to check the level of the unit. (A tolerable height difference at an end of the unit is within 3 mm)

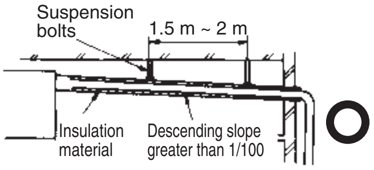


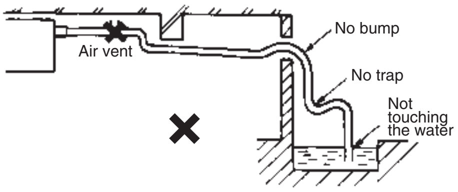
When embedded into ceiling

1. Determine the positions of hanging bolts (675 × 780).
   The pitch center of a hanging bolt must accord with the center of the unit.
2. Use four suspension bolts, each fastened in such a manner that it can withstand pull force of 50 kgf.
3. In cutting an opening on the ceiling, use the unit's cardboad container for shipment as a reference of the size of opening.
4. Fix the unit as per A-5 and 6 above.
   The unit's cardboard container for shipment can be used to cover the indoor unit.
   Note (1): When a hanging bolt exceeds 1.3 m in length, use an M10 bolt and give it reinforcements such as braces.

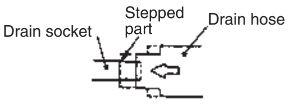
4.1.4 Drain piping

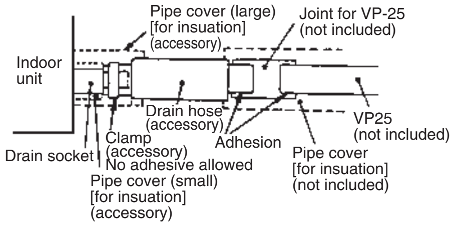
1. Glue the drain hose supplied as an accessory and a VP-25 joint before lifting the unit.

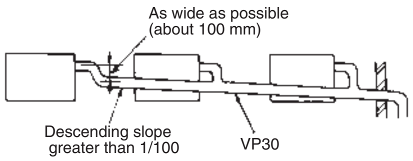


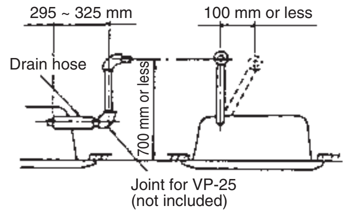


2. The drain hose is to provide a buffer to absorb a slight dislocation of the unit or the drain piping during installation work. If it is subject to abuse such as being bent or pulled deliberately, it may break, which will result in a water leak.
3. Care must be taken so as not to allow an adhesive to run into the drain hose. When it is hardened, it can cause a breakage of a flexible part, if the flexible part receives stress.
4. Use VP-25 general-purpose hard PVC pipes for drain piping.
5. Insert the drain hose supplied as an accessory (soft PVC end) to the stepped part of the unit's drain socket and then fasten it with the clamp also supplied as an accessory.
6. Adhesive must not be used.
   a) Glue a VP-25 joint (to be procured locally) to joint it with the drain hose (hard PVC end) and then glue a VP-25 (to be procured locally) to the joint.
   b) Give the drain piping a descending grade (1/50-1/100) and never create a bump to go over or a trap.
   c) In connecting drain pipes, care must be taken so as not to apply force to the unit side piping and fix the pipe at a point as close to the unit as possible.
   d) Do not create an air vent under any circumstances.
   e) When drain piping is implemented for more than one unit, provide a collecting main about 100 mm below the units' drain outlets from which it collects drain. Use a VP-30 or larger pipe for a collecting main.
   f) Do not fail to provide heat insulation at the following two points because they can cause dew condensation and a resultant water leak.
7. Drain socket
   After a drain test is completed, apply a pipe cover (small: accessory) onto the drain socket, cover the pipe cover (small), the clamp and part of the drain hose with a pipe cover (large: accessory) and wrap it with a tape completely without leaving any gaps.
   (Cut pipe covers into appropriate shapes)
8. Hard PVC pipes laid indoor
   a) Since a drain pipe outlet can be raised up to 700 mm from the ceiling, use elbows, etc. to install drain pipes, it there are obstacles preventing normal drain pipe arrangement. When the drain pipe is raised at a point far from a unit, it can cause an overflow due to a back flow of drain upon stoppage, so arrange piping to keep the dimensions specified in the illustration shown on the left.
   b) Install the drain pipe outlet where no odor is likely to be generated.
   c) Do not lead the drain pipe into a ditch where the generation of harmful gas such as sulfuric gas or flammable gas is expected. A failure to observe this instruction may cause such harmful or flammable gas to flow into the room.



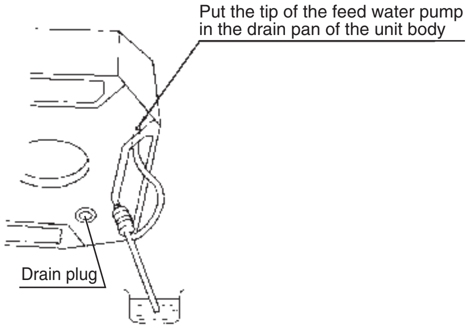






Drainage test

1. Check that water is draining thoroghly during test run, and that there are no water leaks from the joints and the drain pan.
2. The test has to be performed even if the unit is installed in the season when the unit is used for heating.
3. In a new house, perform the test before the ceiling is fitted.
   - Using a water pump, pour about 1000 cc of water to the drain pan through the blowing outlet.
   - Check the transparent drain-out section of the drain hose for normal flow of drainage.
     While observing the noise from the drain motor, test drain operation.
   - Take off the drain plug to release the water. After the water is drained, place the drain plug back where it was.
     While observing the noise from the drain motor, test drain operation.



Forced drain pump operation

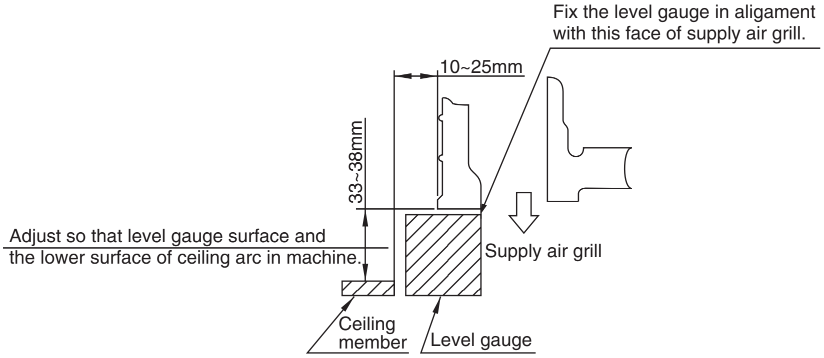
- Set up from a unit side.
  ① Turn on DIP switch 5-1 on the PCB of the indoor unit. The drain pump operates continuously.
  ② After the test, be sure to turn off the DIP switch.
  (When electrical work is not completed, connect a convex joint to the drain pipe joint area, arrange an inlet and check leaks and drain connections of the pipe)
- Setup from a remote controller side.
  Drain pump operation from a recomte controller unit is possible. Operate a remote controller unit by following the steps described below.
  1. To start a forced drain pump operation.
     ① Press the TEST button for three seconds or longer.
     The display will change from " SELECT ITEM " → " SET " → " TEST RUN ▼ "
     ② Press the ▼ button once while " TEST RUN ▼ " is displayed, and cause "DRAIN PUMP " to be displayed.
     ③ When the SET button is pressed, a drain pump operation will start.
     Display: " DRAIN PUMP RUN " → " →STOP "
  2. To cancel a drain pump operation.
     If either SET or ON/OFF button is pressed, a forced drain pump operation will stop.
     The air conditioning system will become OFF.

4.1.5 Panel installation

1. Accessories

Name	Quantity	Remarks
Air inlet grille	1	
Air filter	1	
Suspension bolts	4	For panel installation

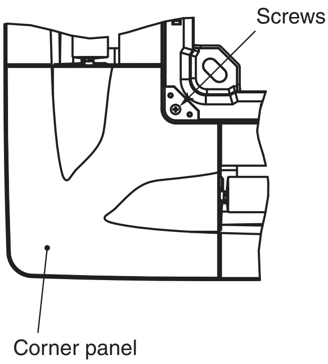
2. Confirm the unit's installation level.
   a) Make sure from the level gauge (insulation) packed with the air conditioner unit that the installation height of the unit and the dimensions of the opening in the ceiling are correct.
   b) Confirm the installation level of the air conditioner unit and ceiling material.
   c) Affix the level gauge included with the air conditioner unit and fix the unit's installation height.
   d) Remove the level gauge before installing the unit.
   e) The unit's installation height can be minutely adjusted by means of the corner openings after the panel is installed. (For details, see 6) "Installing the Panel.")

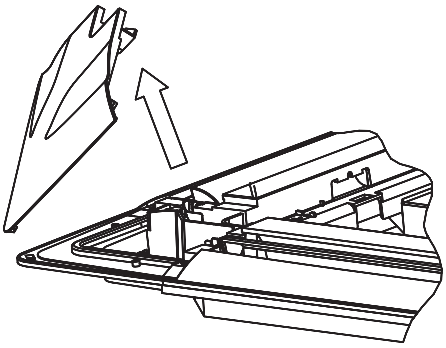


Note :If the installation level of the air conditioner unit and ceiling material exceed the proper range, it will cause an undue load to be borne during installation of the panel and could cause damage.

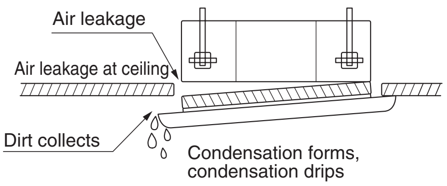
3. Unit installation direction and panel and air inlet grille direction
   a) The unit and panel installation orientation is directional.
      • Match up the outlet (small) parts with the refrigerant piping direction.
      • Make sure of the motor and switch connector connection directions. (For details, see 6) "Installing the Panel.")
   b) The panel and air inlet grille installation orientation is not directional.
      If you are changing the direction of the air inlet grille, change the panel's striker installation position to the "Pull" character position direction on the surface of the grille.

4. Removing the air inlet grille
   ① Raise up the notched portion of the air inlet grille and open it.
   ② With the air inlet grille open, remove the air inlet grille hinge from the decorator panel.
5. Removing the corner panel
   Take out the screw in the corner, then lift up the corner panel in the arrow direction and remove it.

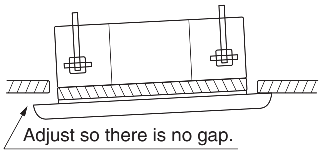




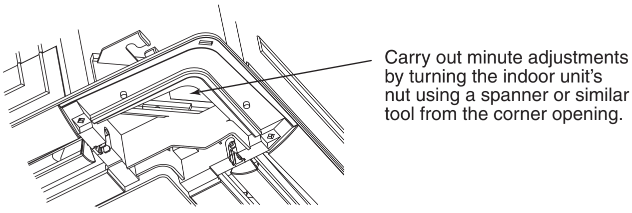
6. Panel installation
   ① Screw in lightly 2 of the 4 air conditioner unit suspension bolts in opposite corners from each other by about 5 mm.(Fasten the drain piping side and the opposite corner temporarily.)
   ② Hang the panel on the two suspension bolts to install it temporarily.
   ③ Install the two remaining suspension bolts and tighten all four of the bolts.
   ⚠ **Notes** :If the suspension bolts are not tightened sufficiently, it could cause the following trouble, so tighten the bolts securely.



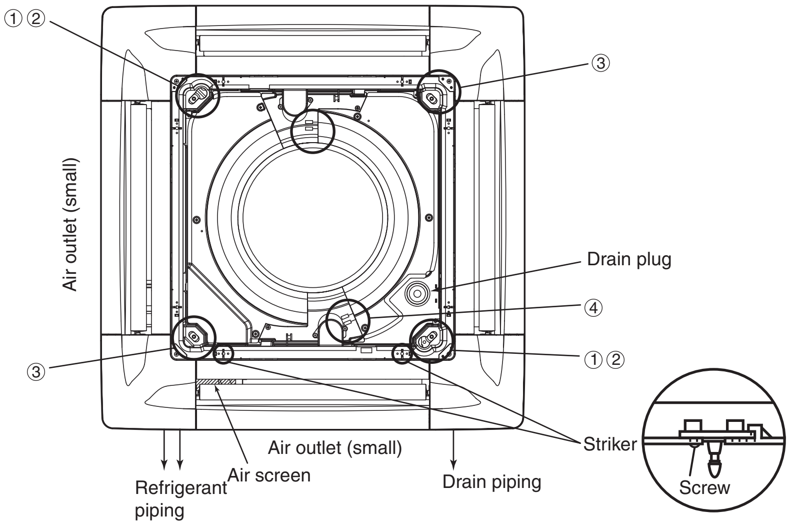
If there is still a gap between the ceiling and the decorator panel even after the suspension bolts are tightened, readjust the height of the indoor unit.



The unit's installation height can be minutely adjusted with the decorator panel as is as long as the indoor unit is level and drain piping are not affected.



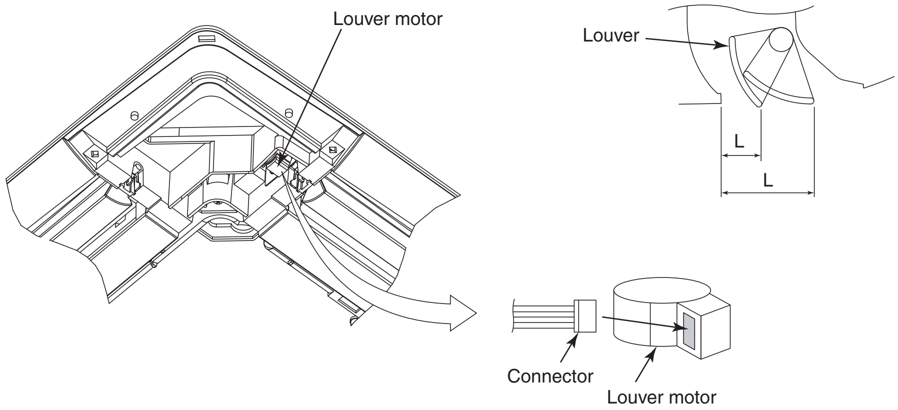
   ④ Connect the (white, 5p) louver motor connector.
   ⑤ Place each of the connectors inside the control box.



Note (1) : If the air outlet louver does not operate using the remote controller, check the connector's connection, then turn the main power supply OFF for 10 seconds or longer and turn the power ON again.

7. If the vertical air-flow direction is fixed
   This decorator panel is designed so that you can fix the vertical air-flow direction at each air outlet to match the environment at your installation location. Set it as required by the customer. Furthermore, when the vertical air-flow direction is fixed, remote control operation and all automatic controls are disabled. The actual setting may also differ from the LCD display in the remote controller.
   ① Turn off the main power supply (turn it off at the ground fault circuit breaker).
   ② Disconnect the connector to the louver motor at the air outlet you want to fix the position of.
   Wrap vinyl electrical tape around the disconnected connector to insulate it.

③ Slowly move the vertical air-flow louver you want to fix the position of by hand and set the vertical air-flow direction so that it is within the range shown in the table below.



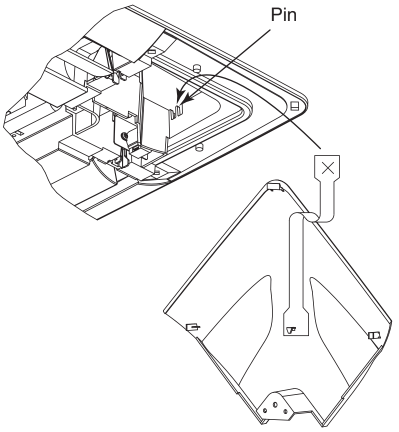
<Setting Range>

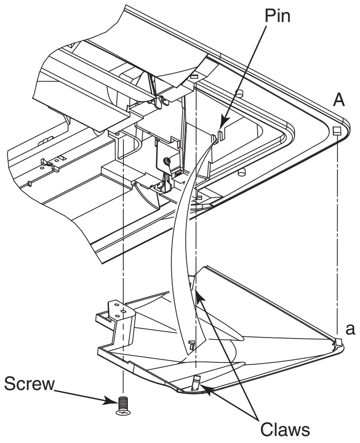
Vertical air-flow direction criterion	Horizontal 30°	Downward 70°
L Dimension (mm)	36.5	22.5

It can be set anywhere desires as long as it is within a range of 22.5 and 36.5mm.

Note : Do not set the position outside this range.
Doing so causes condensate to drip and to form as well as dirtying of the ceiling surface, and could cause abnormal operation.

8. Corner panel installation
   ① Hook the corner panel strap to the pin on the decorator panel as shown in the figure.
   ② Insert part a on the corner panel in part A on the decorator panel, then fit the 2 claws and fasten the corner panel screw.





9. Installing the air inlet grille
   Install the air inlet grille by following the removal procedure (item 4) in reverse order.
   Note: Match up the installation position of the panel's striker and the "Pull" character position direction on the surface of the grille. If these do not match, the striker could be damaged.

Application Data

4.2 Ceiling recessed compact type (FDTCA)

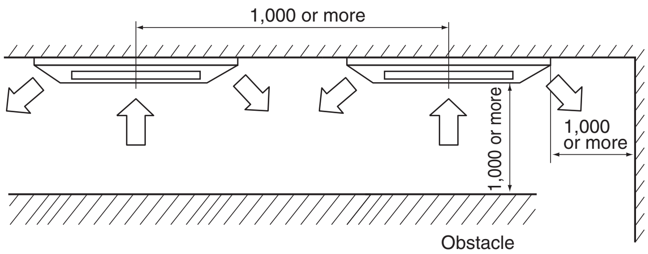
4.2.1 Selection of installation location

1. Select location where the space above ceiling is larger than those mentioned below and perfect draining can be assured.
2. With the customer's consent, select a location with following suitable conditions.
   a) Where cool air or hot air can easily pass through.
      If the height of the location exceeds 3 m, hot air will gather in the ceiling. Suggest to the customer to also install a circulator.
   b) Where water can be completely drained. A sloping location for drainage.
   c) Where there are no wind disturbances to the suction inlet and blowing outlet, where the fire alarm will not be set off erroneosly, where no short circuits occur.
   d) Where there is no direct sunlight.
   e) If the humidity above the ceiling exceeds 80% or the condensation temperature above the ceiling exceeds 28°C, affix polyurethane foam (with a thickness to 10 or greater) above the insulation in the ceiling panels.
      (Carry out tests of the main unit under the above conditions and confirm that there is no failure. However, if the environment where the unit is installed exceeds the above conditions and the unit is operated in high humidity conditions, there is danger of water drops dripping down. If there is a possibility that the unit will be used under such conditions, install 10 to 20 mm of insulation material to the main unit, piping and drain pipes.)
3. Consider the supporting strength of the location. If the strength is not sufficient to sustain the unit weight, use reinforcing materials.

4.2.2 Installation space for unit

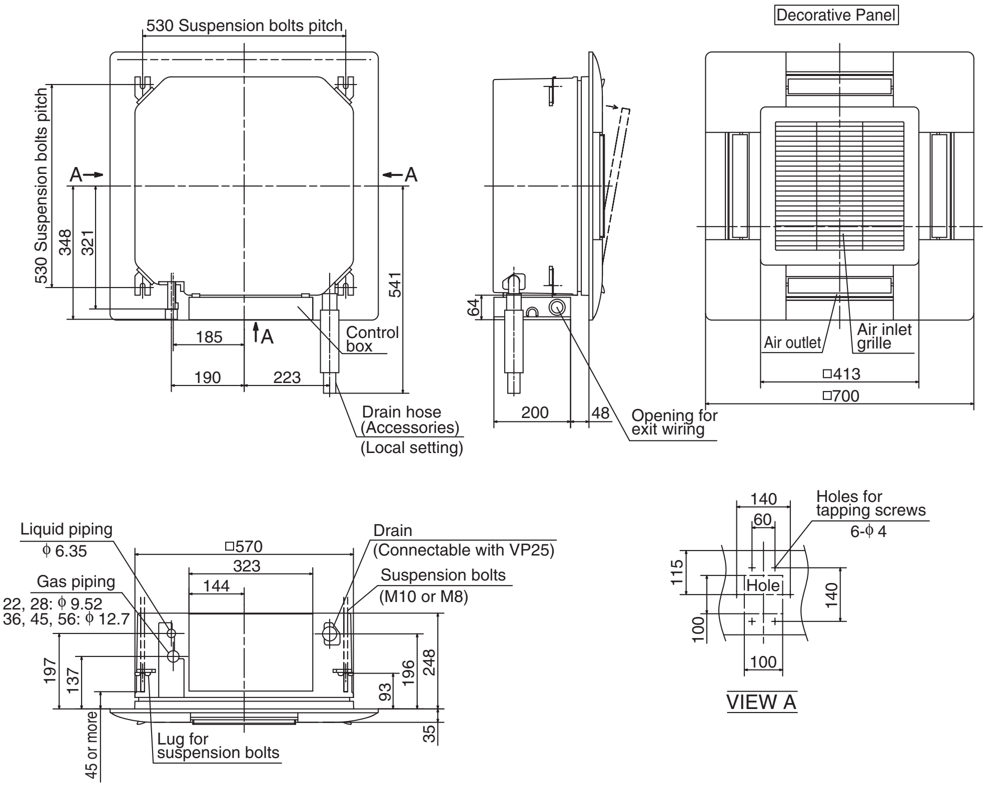
1. When a sufficient interval cannot be secured between the unit and a wall or another unit, shut up diffusers on that side to block winds and make sure that no short-circuiting is occurring. (A wind blocking material is available as an optional part)
   - ■ Do not use the unit in the "Lo" wind mode, when winds are blown into two or three directions.

● Installtation space (mm)



Note (1) This shows the installation interval dimensions between units centered on the units.

Unit:mm

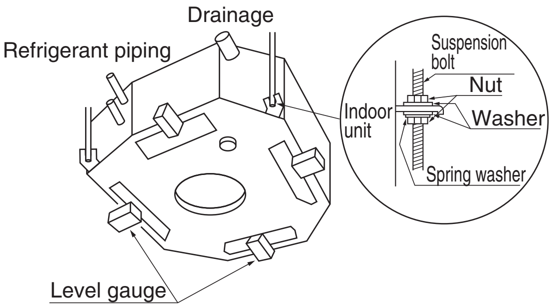


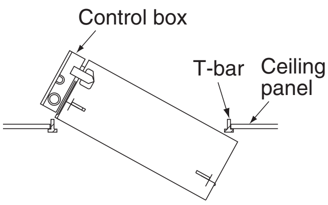
4.2.3 Suspension

- Please arrange four sets of a suspension bolt (M10 or M8), a nut matching the bolt, a flat washers and a spring washer on the installation site.

When suspension from the ceiling

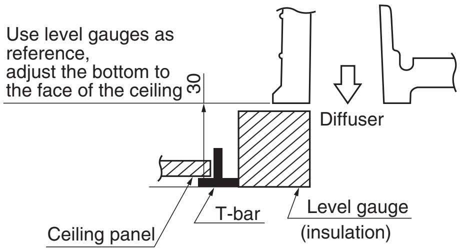
1. This unit is designed for installation on a 2 × 2 grid ceiling.
   If necessary, please detach the T bar temporarily before you install it.
   (When it is installed on a ceiling other than 2 × 2 grid ceiling, please do not fail to provide an inspection port on the control box side.)
2. Determine the positions of suspension bolts (530 × 530).
3. Use four suspension bolts, each fastened in such a manner that it can withstand pull force of 50kgf.
4. Make suspension bolts to the length that leaves approximately 45mm of them above the ceiling. In hoisting the unit main body in, temporarily fasten the four lower nuts of the suspension bolts approx. 93 mm from the ceiling and the four upper nuts at positions sufficiently far from the lower nuts so that they may not hamper installation work when the unit is hoisted in or the height is adjusted.
5. Put in the unit on an angle.

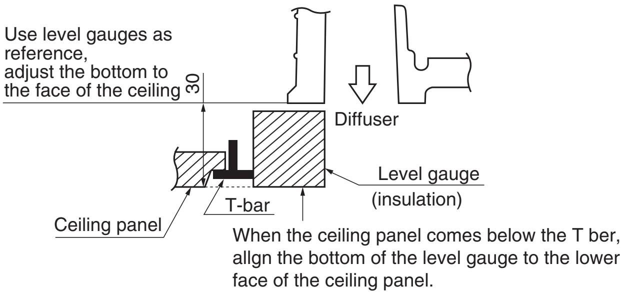


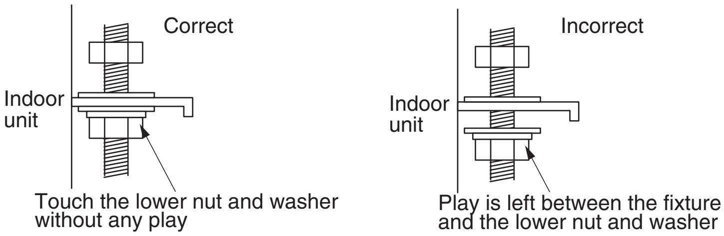


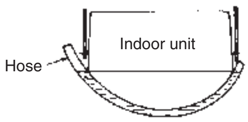
Application Data

6. After hoisting in the unit, attach level gauges supplied as accessories and determine the unit position (height). To adjust height, use the four lower nuts with the four upper nuts left loose. Please make sure that the unit s four hanging fixtures touch the four lower nuts and washers evenly without any play.









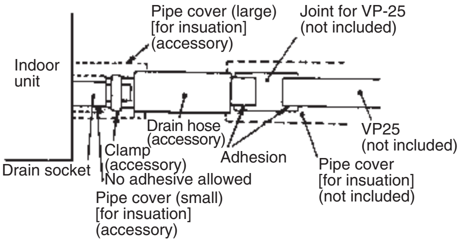
7. Please make sure that the unit main body is installed levelly. Level must be checked with a level or a clear hose filled with water. (A tolerable height difference at an end of the unit is eithin 3 mm)
8. After you have adjusted the height and level of the unit, fasten the four upper nuts to fix the unit.
   Note (1) Do not adjust the height with the upper nuts. It may cause deformation due to excessive force working on the unit main body, which can result in such problems that you cannot attach the panel or noises are generated from the interfering fan.

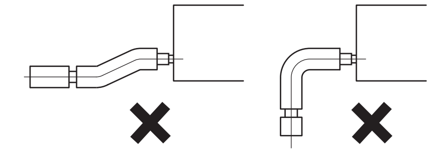
When embedded into ceiling

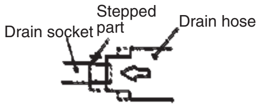
1. Determine the positions of hanging bolts (530 × 530).
   The pitch center of a suspension bolt must accord with the center of the unit.
2. Use four suspension bolts, each fastened in such a manner that it can withstand pull force of 50 kgf.
3. Fix the unit as per "4.2.3" "5" and "7"above.
   Note (1) When a suspension bolt exceeds 1.3 m in length, use an M10 bolt and give it reinforcements such as braces.

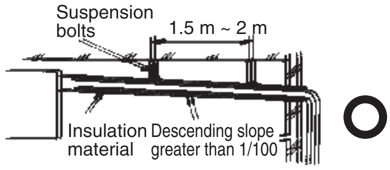
4.2.4 Drain Piping

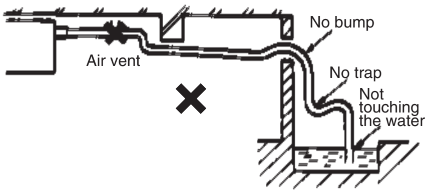
1. Glue the drain hose supplied as an accessory and a VP-25 joint before lifting the unit.
2. The drain hose is to provide a buffer to absorb a slight dislocation of the unit or the drain piping during installation work. If it is subject to abuse such as being bent or pulled deliberately, it may break, which will result in a water leak.
3. Care must be taken so as not to allow an adhesive to run into the drain hose. When it is hardened, it can cause a breakage of a flexible part, if the flexible part receives stress.
4. Use VP-25 general-purpose hard PVC pipes for drain piping.
5. Insert the drain hose supplied as an accessory (soft PVC end) to the stepped part of the unit's drain socket and then fasten it with the clamp also supplied as an accessory.
6. Adhesive must not be used.
   a) Glue a VP-25 joint (to be procured locally) to joint it with the drain hose (hard PVC end) and then glue a VP-25 (to be procured locally) to the joint.
   b) Give the drain piping a descending grade (1/50-1/100) and never create a bump to go over or a trap.
   c) In connecting drain pipes, care must be taken so as not to apply force to the unit side piping and fix the pipe at a point as close to the unit as possible.
   d) Do not create an air vent under any circumstances.
   e) When drain piping is implemented for more than one unit, provide a collecting main about 100 mm below the units' drain outlets from which it collects drain. Use a VP-30 or larger pipe for a collecting main.
   f) Do not fail to provide heat insulation at the following two points because they can cause dew condensation and a resultant water leak.
7. Drain socket
   After a drain test is completed, apply a pipe cover (small: accessory) onto the drain socket, cover the pipe cover (small), the clamp and part of the drain hose with a pipe cover (large: accessory) and wrap it with a tape completely without leaving any gaps.
   (Cut pipe covers into appropriate shapes)
8. Hard PVC pipes laid indoor
   a) Since a drain pipe outlet can be raised up to 600 mm from the ceiling, use elbows, etc. to install drain pipes, it there are obstacles preventing normal drain pipe arrangement. When the drain pipe is raised at a point far from a unit, it can cause an overflow due to a back flow of drain upon stoppage, so arrange piping to keep the dimensions specified in the illustration shown on the left.
   b) Install the drain pipe outlet where no odor is likely to be generated.
   c) Do not lead the drain pipe into a ditch where the generation of harmful gas such as sulfuric gas or flammable gas is expected. A failure to observe this instruction may cause such harmful or flammable gas to flow into the room.

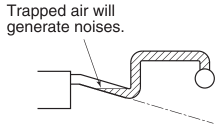


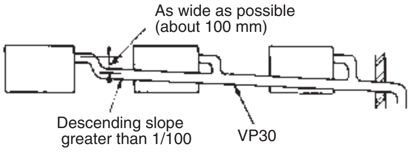


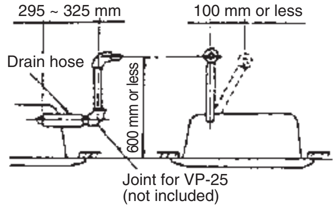






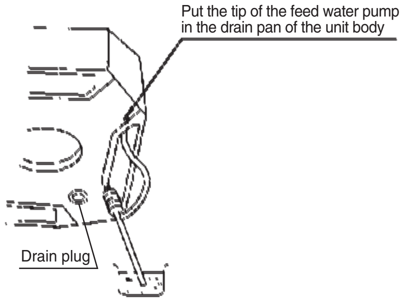






Drainage test

1. Check that water is draining thoroghly during test run, and that there are no water leaks from the joints and the drain pan.
2. The test has to be performed even if the unit is installed in the season when the unit is used for healting.
3. In a new house, perform the test before the ceiling is fitted.
   - Using a water pump, pour about 1000 cc of water to the drain pan through the blowing outlet.



Application Data

- Check the transparent drain-out section of the drain hose for normal flow of drainage.
  * While observing the noise from the drain motor, test drain operation.
- Take off the drain plug to release the water. After the water is drained, place the drain pulg back where it was..
  * Be careful not to get splashed when pulling the drain plug.

Forced drain pump operation

- Set up from a unit side.

1. Turn on DIP switch SW5-1 on the PCB of the indoor unit. The drain pump operates continuously.
2. After the test, be sure to turn off the DIP switch.
   (When electrical work is not completed, connect a convex joint to the drain pipe joint area, arrange an inlet and check leaks and drain connections of the pipe)

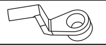
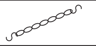
- Setup from a remote controller side.

Drain pump operation from a recomte controller unit is possible. Operate a remote controller unit by following the steps described below.

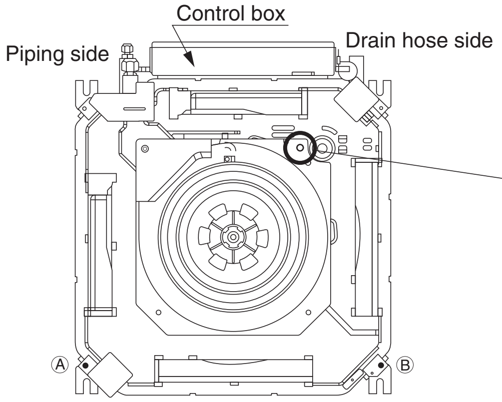
1. To start a forced drain pump operation.
   ① Press the TEST button for three seconds or longer.
   The display will change from " ⇕☝ SELECT ITEM" → " (○)☝ SET" → " ⁂ TEST RUN ▼ "
   ② Press the ▼ button once while " ⁂ TEST RUN ▼ " is displayed, and cause "DRAIN PUMP ⇕ " to be displayed.
   ③ When the SET button is pressed, a drain pump operation will start.
   Display: " DRAIN PUMP RUN" → " (○)☝ → STOP"
2. To cancel a drain pump operation.
   If either SET or ON/OFF button is pressed, a forced drain pump operation will stop.
   The air conditioning system will become OFF.

4.2.5 Panel installation

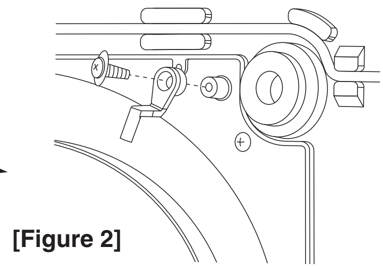
1. Accessories (It is attach to the panel)

1	Hook		1 piece	For fixing temporarily
2	Chain		2 piece	
3	Screw		4 piece	For hoisting the panel
4	Screw		1 piece	For attaching a hook
5	Screw		2 piece	For attaching a chain

2. Make sure that the unit main body is positioned at the correct height and the opening on the ceiling is made to the correct dimensions with the level gauge supplied with the main body.
   Remove the level gauge before you attach the panel.
3. Screw in two bolts out of the four supplied with the panel by about slightly less than 5mm. (v mark ⒶⒷ) [Figure 1]



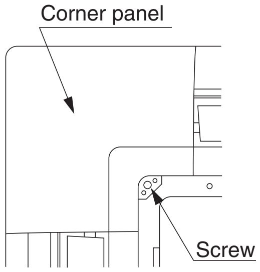
[Figure 1]



[Figure 2]

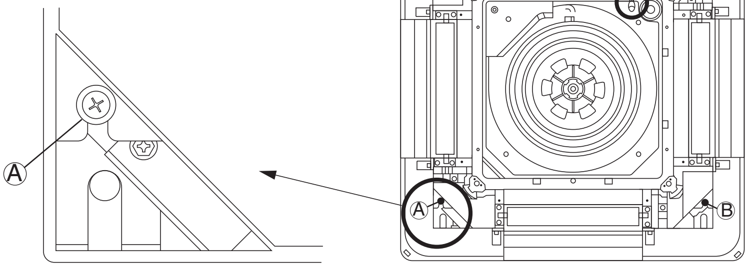
4. Attach the hook supplied with the panel to the main body with the hook fixing screw (1 screw). [Figure 2]
5. Open the air inlet grille.

6. Please remove the screw of a corner panel and remove a corner panel. (four places) [Figure 3]

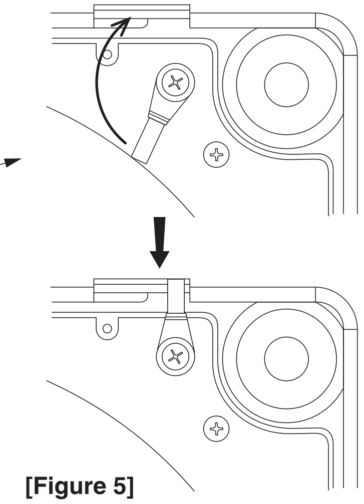


[Figure 3]

7. A panel is hooked on two bolts (○ mark Ⓐ Ⓑ) [Figure 4]

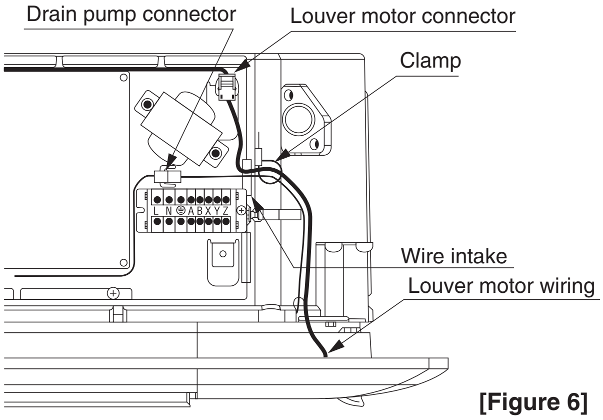


[Figure 4]



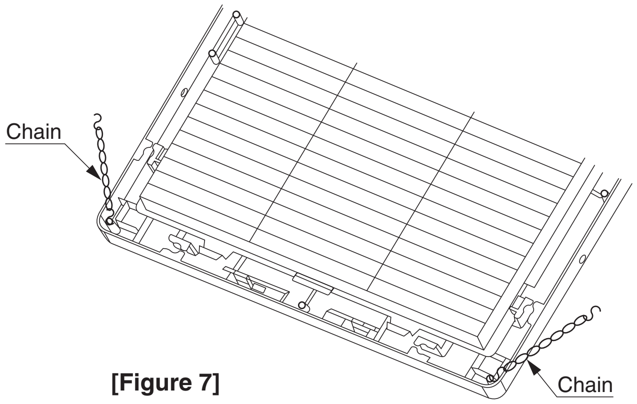
[Figure 5]

8. Please rotate a hook, put in the slot on the panel, and carry out fixing the panel temporarily. [Figure 5]
9. Tighten the two bolts used for fixing the panel temporarily and the other two.
10. Please open the lid of a control box.
11. Like drain pump wiring, please band together by the clamp and put in louver motor wiring into a control box. [Figure 6]
12. Please connect a louver motor connector. [Figure 6]



[Figure 6]

13. Attach two chains to the air inlet grille with two screws. [Figure 7]



[Figure 7]

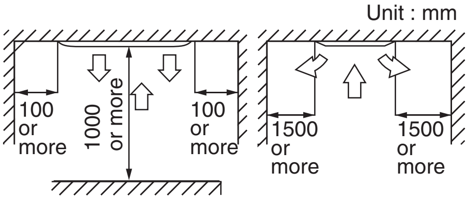
14. Replace the corner panels. Please also close a chain with a screw together then.
15. Close the air inlet grille.

4.3 2-way Outlet Ceiling Recessed Type (FDTWA)

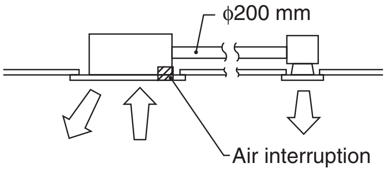
4.3.1 Selection of installation location

1. This unit is a ceiling surface direct return air and direct supply air type.
   Install the unit a place the allows air to reach every part of the room, in accordance with the shape and heigh of the room.

Installation space



2. This unit permits connecting a branch duct (ϕ 200 mm) according to the method shown in the figure below so that air disribution may be improved to the shape of the room. (For the connecting port of the duct, refer to the exterior dimension on page 104 ~ 114.)



3. Cold air throw

Unit : m

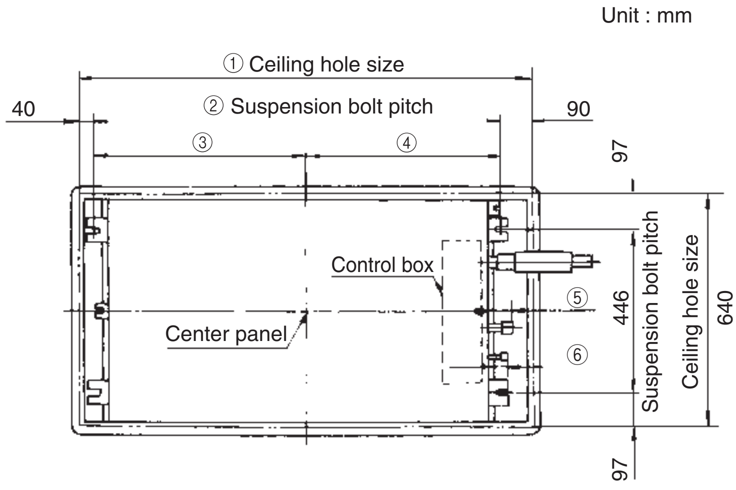
Item \ Models	FDTWA28, 45, 56	FDTWA71, 90	FDTWA112	FDTWA140
Standard	4.0	4.5	4.7	5.0
UHi	4.5	5.0	5.2	5.5

Note(1) The cold air throw is the same in 2 directions.
Conditions:
① Unit height: 3.0 m above the floor
② Fan speed: Hi
③ Location: Freee space without obstacle
④ The throw is as the per the table above
⑤ Air velocity at the throw: 0.3(m/s)

4. Places where cooled or heated air circulates freely. When the installation height exceeds 3.5m, warmed air stays close to the ceiling. In such cases, suggest your client users to install air circulators.
5. Places where perfect drainage can be prepared and sufficient drainage gradient is available.
6. Places free from air disturbances to the return air port and supply hole of the indoor unit, places where the fire alarm may not malfunction to short circuit.
7. Places with the environmental dew-point temperature is lower than 28°C and the relative humidity is less than 80%. (When installing at a place under a high humidity environment, pay suffcient attention to prevention of dewing such as thermally insulating the unit properly.)
8. Places exposed to oil splashes or steam (e.g. kitchens and machine plants.)
   Installation and use at such places will incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic resin parts.
9. Places where corrosive gas (such as sulfurous acid gas) or inflammable gas (thinner, gasoline, etc.) is generated or remains.
   Installation and use at such places will cause corrosion in the heat exchanger and damage in molded synthetic resin parts.
10. Place adjacent to equipment generating electromagnetic waves or high-frquency waves such as in hospitals. Generated noise may cause malfunctioning of the controller.

4.3.2 Preparations for installation

1. Ceiling hole and suspension bolt positions
   a) The pattern sheet shrinks or expands as humidity changes, so check the actual size before use.
   b) The ceiling hole sizes and suspension bolt sizes are shown in the following figure.



Dimension table

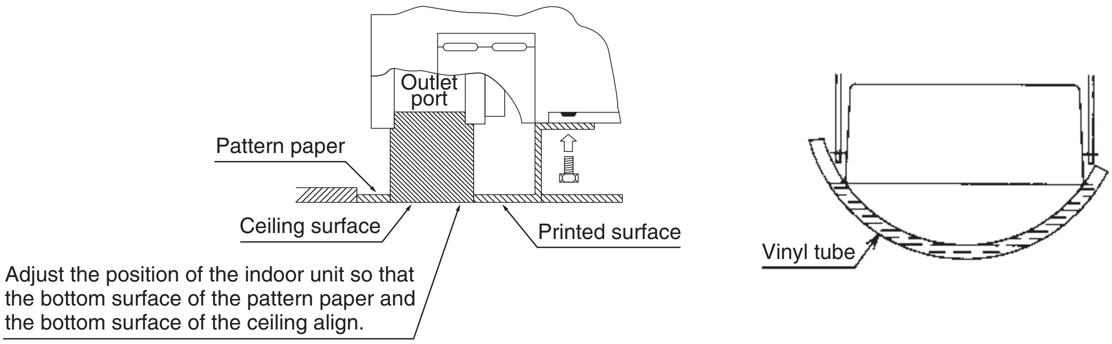
Unit : mm

Mark / Models	①	②	③	④	⑤	⑥
FDTWA28, 45, 56	1015	885	468	417	70	60
FDTWA71, 90	1260	1130	590	540	87.5	65
FDTWA112, 140	1730	1600	825	775	80.5	70

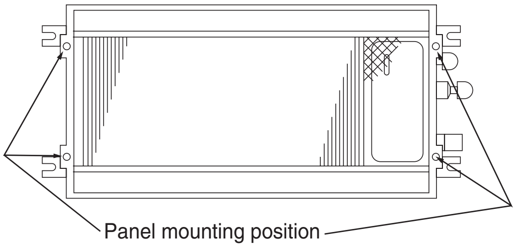
4.3.3 Installation

For the suspension bolt, use four M10 or W 3/8 bolts and secure so that each bolt can withstand a 50 kg/f pullout load. Use a suspension bolt length that extends approximately 95 mm for the ceiling surface.

1. If there is a ceiling
   a) Open the hole in the installation location to the ceiling opening dimensions.
   b) Install the suspension bolts (procured locally) at the designated locations.
   (Use care as the center of the spacing for the suspension bolts is not at the center of the panel.)
   c) Hang the unit, use the four bolts to mount the pattern paper provided to the panel mounting section and adjust the height.
   d) Use a level or transparent hose with water in it to confirm that the unit is level. If the unit is not level, problems such as water leakage or improper operation of the float switch could occur.

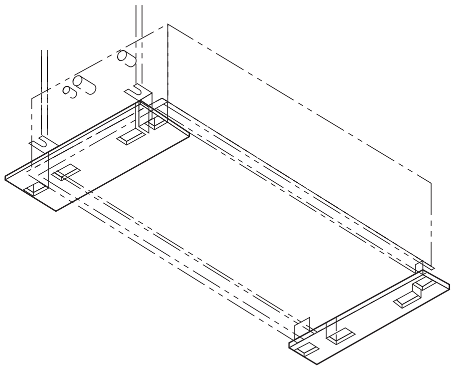


e) After confirming the above, secure the unit in position.



<Panel mounting position>

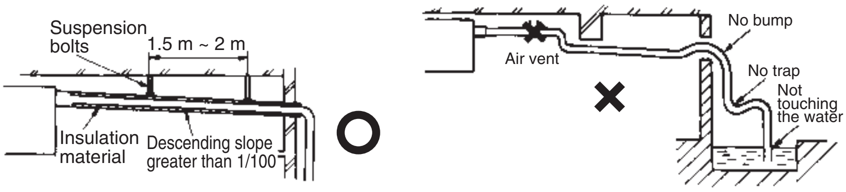
2. If ceiling is to be installed later
   a) Follow steps (a) to (d) in the previous section "1. If there is a ceiling" to install the unit and mount the pattern paper.
   b) When the ceiling is installed, the outer perimeter of the pattern paper can be referred to for making the opening in the ceiling.
   c) After checking the height and that the unit is level, secure the unit in position.



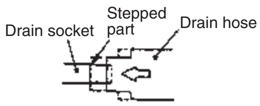
<Pattern paper mounting configuration>

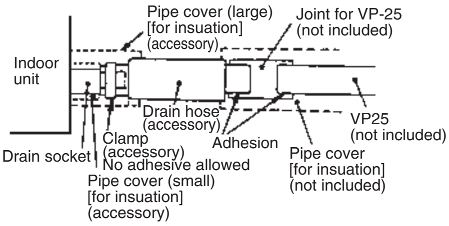
4.3.4 Drain piping

1. Glue the drain hose supplied as an accessory and a VP-25 joint before lifting the unit.

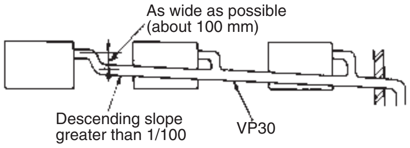


2. The drain hose is to provide a buffer to absorb a slight dislocation of the unit or the drain piping during installation work. If it is subject to abuse such as being bent or pulled deliberately, it may break, which will result in a water leak.
3. Care must be taken so as not to allow an adhesive to run into the drain hose. When it is hardened, it can cause a breakage of a flexible part, if the flexible part receives stress.

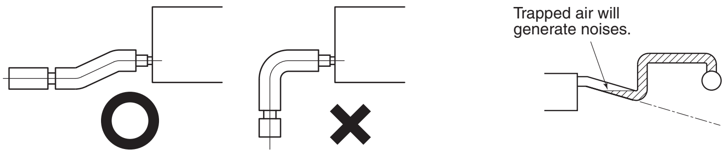




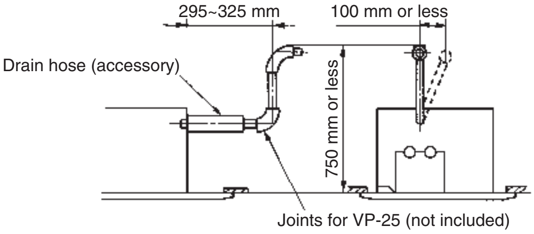
4. Use VP-25 general-purpose hard PVC pipes for drain piping.



5. Insert the drain hose supplied as an accessory (soft PVC end) to the stepped part of the unit's drain socket and then fasten it with the clamp also supplied as an accessory.
6. Adhesive must not be used.



   a) Glue a VP-25 joint (to be procured locally) to joint it with the drain hose (hard PVC end) and then glue a VP-25 (to be procured locally) to the joint.
   b) Give the drain piping a descending grade (1/50-1/100) and never create a bump to go over or a trap.
   c) In connecting drain pipes, care must be taken so as not to apply force to the unit side piping and fix the pipe at a point as close to the unit as possible.
   d) Do not create an air vent under any circumstances.
   e) When drain piping is implemented for more than one unit, provide a collecting main about 100 mm below the units' drain outlets from which it collects drain. Use a VP-30 or larger pipe for a collecting main.
   f) Do not fail to provide heat insulation at the following two points because they can cause dew condensation and a resultant water leak.
7. Drain socket
   After a drain test is completed, apply a pipe cover (small: accessory) onto the drain socket, cover the pipe cover (small), the clamp and part of the drain hose with a pipe cover (large: accessory) and wrap it with a tape completely without leaving any gaps.
   (Cut pipe covers into appropriate shapes)



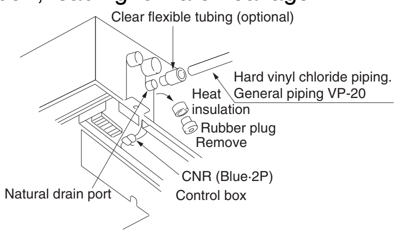
8. Hard PVC pipes laid indoor
   a) Since a drain pipe outlet can be raised up to 750 mm from the ceiling, use elbows, etc. to install drain pipes, it there are obstacles preventing normal drain pipe arrangement. When the drain pipe is raised at a point far from a unit, it can cause an overflow due to a back flow of drain upon stoppage, so arrange piping to keep the dimensions specified in the illustration shown on the left.
   b) Install the drain pipe outlet where no odor is likely to be generated.
   c) Do not lead the drain pipe into a ditch where the generation of harmful gas such as sulfuric gas or flammable gas is expected. A failure to observe this instruction may cause such harmful or flammable gas to flow into the room.

When using a natural drain port

1. Remove the heat insulating material and rubber plug of the gravity drain port.
2. By using the gravity drain connecting tube (option), connect the drain pipe (VP-20) and completely clamp it with a clamp.

   ⚠ **Note** (1) If the drain pipe is directly connected to the natural drain port, the drain pan becomes unremovable.
3. Disconnect the connector CNR (blue, 2P) for the drain motor.

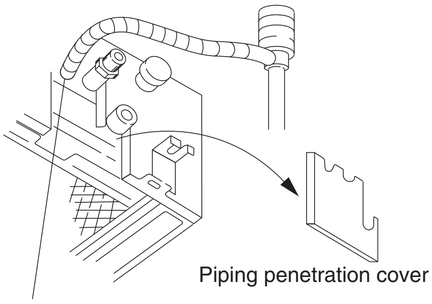
   ⚠ **Note** (1) If the connector remains connected, drain water is discharged from the standard pipe connecting port, leading to water leakage.



Drainage test

When using the standard drain port, execute a drainage test after completion of electric work.

1. During the test run, make sure that drain flows properly through the piping and that no water leaks from connections.
2. Be sure to conduct this test even when the unit is installed in the heating season.
3. In case of a new building, conduct the test before it is furnished with the ceiling.
   a) Inject about 1,000cc by using a feed water pump from the grommet on the drain pump side.
   b) At the drain port (transparent portion), check if drainage is performed.
   c) After completion of the drain test, completely perform heat insulation fot the drain pipe up to the indoor unit.



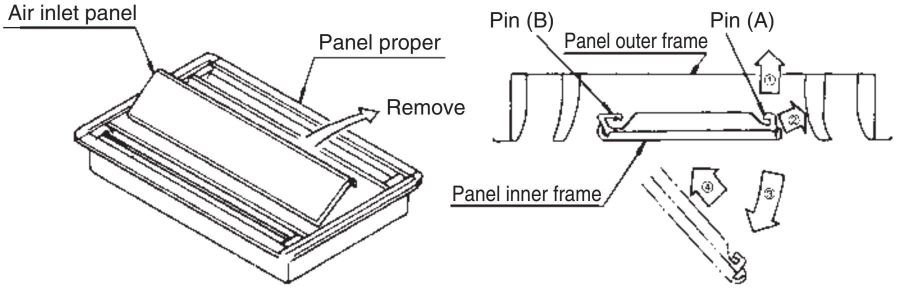
Forced drain pump operation

- Setup from a unit side.
  ① Turn on DIP switch SW5-1 on the PCB of the indoor unit. The drain pump operates continuously.
  ② After the test, be sure to turn off the DIP switch.
  When electrical work is not completed, connect a convex joint to the drain pipe joint area, arrange an inlet and check leaks and drain conditions of the pipe.
- Setup from a remote controller side.
  Drain pump operation from a remote controller unit is possible. Operate a remote controller unit by following the steps described below.
  1. To start a forced drain pump operation
     ① Press the TEST button for three seconds or longer.
     The display will change from " ⬍ SELECT ITEM" → " SET" → " TEST RUN ▼ "
     ② Press the ▼ button once while " TEST RUN ▼ " is displayed, and cause "DRAIN PUMP ⬍ " to be displayed.
     ③ When the SET button is pressed, a drain pump operation will start.
     Display:"DRAIN PUMP RUN" → " → STOP"
  2. To cancel a drain pump operation.
     If either SET or ON/OFF button is pressed, a forced drain pump operation will stop.
     The air conditioning system will become OFF.

4.3.5 Fixing of panel (The panel fixing bolts are attached on the panel.)

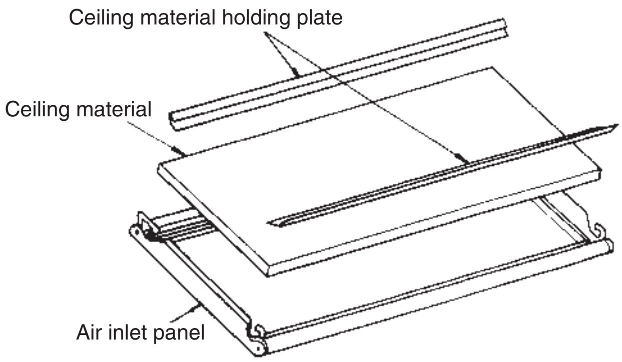
⚠ **Note** (1) Care should be exercised in handling the supply air port on the panel because it is easily depressed by finger nail.

1. Check with the accessory level gauges that the indoor unit height and the size of ceiling hole are correct.
   Notes (1) Remove the level gauge from the indoor unit before fixing the panel.
   (2) Remove the Air inlet panel from the panel proper.
   Procedure for dismounting the air inlet panel
   ① Remove the panel from the pin (A) in the order of the arrows ① and ②.
   ② Open the panel slightly as shown by the arrow ③ and move it to the arrow ④. Then remove it from the pin (B).



2. Screw two bolts out of four accessory bolts less than 5mm in the panel diagonally.
3. Hook the panel on the two bolts and set it temporarily.
4. Tighten the bolts fixed temporarily and the remaining two bolts.
5. Connect the louver motor connector (white, 3P) and the limit switch connector (white, 2P) to the panel respectively.
6. When the louver motor cannot be operated by remote controller operation, check the connector connections and turn off the power suppy for 10 sceonds or more for restting.

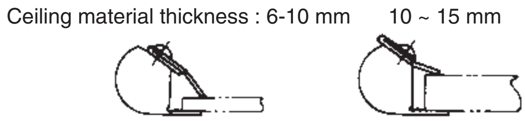
For ceiling material inlaid panel



Ceiling material dimensions — Unit : mm

Item \ Models	FDTWA28, 45, 56	FDTWA71, 90	FDTWA112, 140
Width	300	300	300
Length	970	1215	1685

① Remove the air inlet panel from panel proper.
② Remove the ceiling holding plates (2 sheets) temporarily set on the suction panel with screws.
③ Install the ceiling material on the air intel panel and fix it with the ceiling holding plates so as not to produce any play.
Note (1) Use a ceiling material with a thickness of 6-15mm and a side length of 300mm or more.



Ceiling material installing direction.

4.4 Ceiling Recessed Single Air Supply Port Type (FDTQA)

4.4.1 Selection of installation location

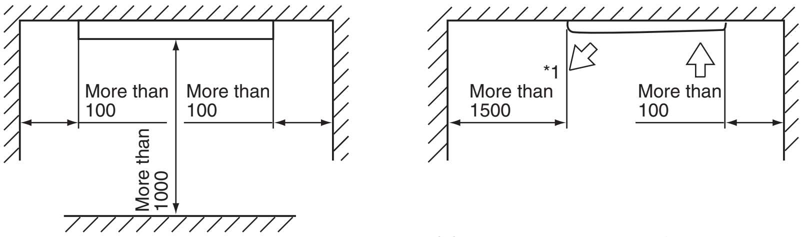
Avoid the following locations for installation and uses

1. Locations where oil splashes and moisture are abundant (e.g., kitchens, mechanical workshops).
   These locations may result in corrosion and lower performance of the heat exchanger and cause damage to plastic parts.
2. Locations with corrosive gases (such as sulfurous acid gas), flammable gases (such as thinners, gasoline) and areas where there are possibilities of gas accumulation. These locations can result in corrosion of the heat exchanger and damage plastic parts. Also, the flammable gas could cause a fire.
3. Locations near medical equipment radiating electromagnetic waves in hospitals or other facilities, and around appliances emitting high frequencies. The electromagnetic noise may cause the controller to malfunction.
4. Locations exposed to sea breezes (seaside areas). Sea breezes may cause corrosion of the outer frame and the heat exchanger.

4.4.2 Installation space for the indoor unit

Unit : mm

Installation space



Note (1) *1 shows the case of direct blow.

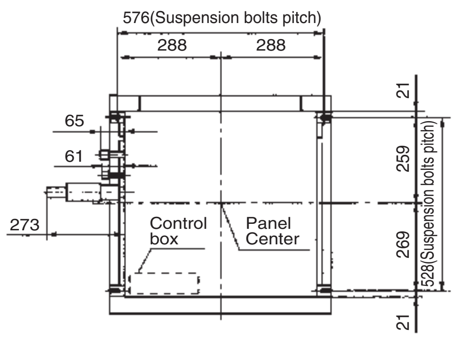
1. With the customer's consent, select a suitable location according to the following conditions.
   a) Where cool air or hot air can easily pass through.
      If the height of the location exceeds 3 m, hot air will gather below the ceiling. Suggest to the customer to also install a circulation fan.
   b) Where wiring and plumbing to outdoor areas may easily be conducted.
   c) Where water can be completely drained. A sloping location for drainage.
   d) Where there is no wind disturbance to the suction inlet and blowing outlet, the fire alarm will not be set off erroneously, and no air short circuits occur.
   e) Where there is no direct sunlight.
   f) Where the ambient dew point temperature is below 28°C and the relative humidity is below 80%.
      The unit has been tested according to JIS dew point conditions and has been confirmed to operate without any problems. However, if the unit is operated in an environment with a humidity higher than the above limit, condensation may occur. Accordingly, all pipes and drain pipes should be further covered with insulation materials 10 - 20 mm thick.
2. Consider the supporting strength of the location. If the strength is not sufficient to sustain the unit weight, use reinforcing materials.

4.4.3 Suspension the unit

Use four (4) M10 or W3/8 suspension bolts. Secure them firmly so that each can withstand a pull-out load of 50 kg/f. Adjust their length to approximately 40 mm from the ceiling.

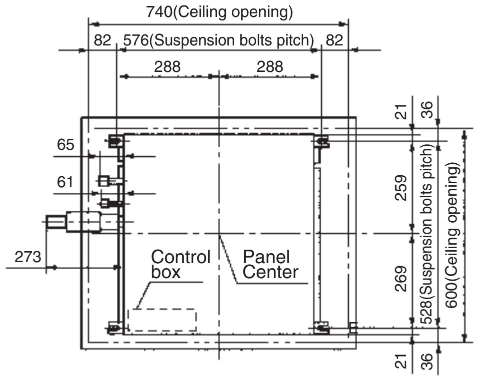
- **For TQ-PSA-13W-E panel**

Unit : mm



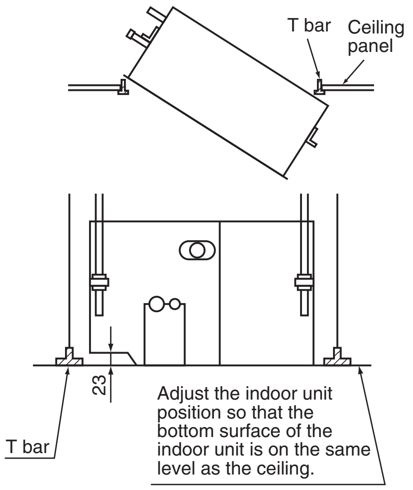
- **For TQ-PSB-13W-E panel**

Unit : mm

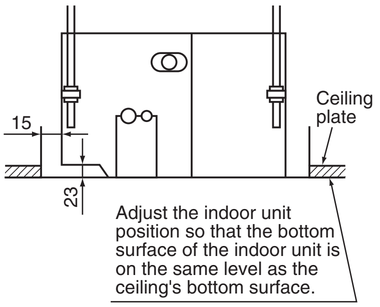


1. When hanging from the ceiling
   a) The panel has two types: for 2 × 2 grid ceiling and for conventional ceiling.
      ① When installing on a 2 × 2 grid ceiling, put in the unit on an angle, or hang the unit with the T bar temporarily removed.
      ② When installing on a conventional ceiling, cut an installation opening (740 mm × 600 mm) in the ceiling, and hang the unit.
   b) Set the suspension bolts (to be prepared at job site) in place.
   c) Adjust the unit's height so that the bottom surface of the unit is on the same level as the ceiling (bottom surface of the T bar). (The blow outlet is contained in the ceiling.)
      The allowable difference in height between the bottom surface of the ceiling and that of the indoor unit is when the indoor unit face is no higher than 5 mm.
      Caution
      Do not install the indoor unit lower than the bottom surface of the ceiling.

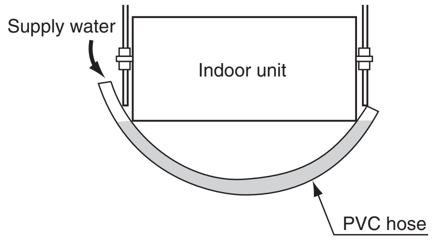
- **For TQ-PSA-13W-E panel**



- **For TQ-PSB-13W-E panel**



d) Level the unit using a hose filled with water. If the unit is out of level, water leaks or malfunctioning of the floating switch may occur.

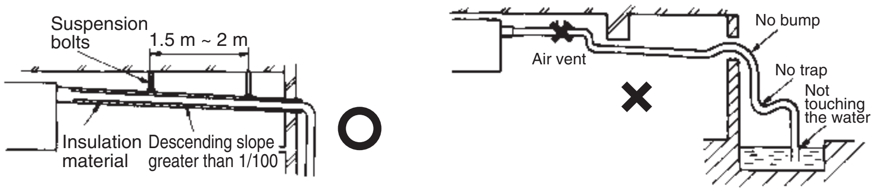


e) After ensuring the above, secure the unit.

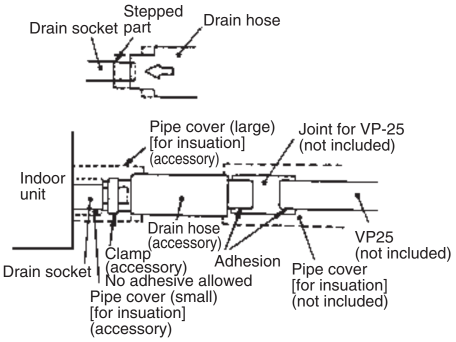
2. When embedded into ceiling
   a) Install the unit following steps b) and c) of the above part 1).
   b) When installing on a conventional ceiling, cut an installation opening (740 mm × 600 mm) in the ceiling.
   c) Check the installation height and level, and after that, secure the unit.

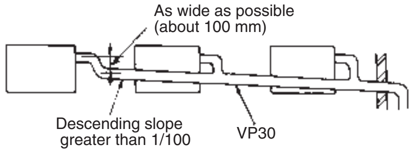
4.4.4 Drain piping

1. Glue the drain hose supplied as an accessory and a VP-25 joint before lifting the unit.

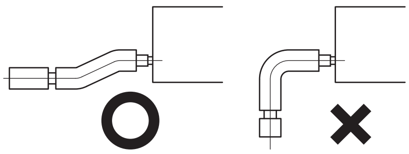


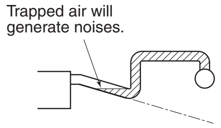
2. The drain hose is to provide a buffer to absorb a slight dislocation of the unit or the drain piping during installation work. If it is subject to abuse such as being bent or pulled deliberately, it may break, which will result in a water leak.
3. Care must be taken so as not to allow an adhesive to run into the drain hose. When it is hardened, it can cause a breakage of a flexible part, if the flexible part receives stress.
4. Use VP-25 general-purpose hard PVC pipes for drain piping.



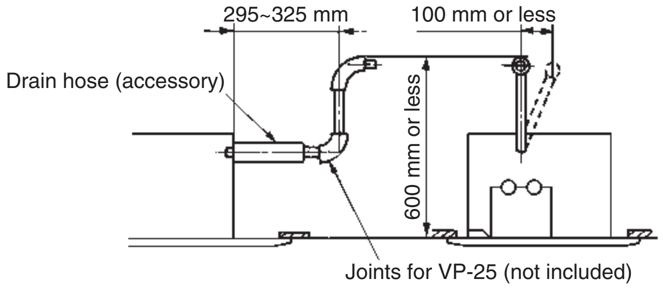


5. Insert the drain hose supplied as an accessory (soft PVC end) to the stepped part of the unit's drain socket and then fasten it with the clamp also supplied as an accessory.
6. Adhesive must not be used.
   a) Glue a VP-25 joint (to be procured locally) to joint it with the drain hose (hard PVC end) and then glue a VP-25 (to be procured locally) to the joint.
   b) Give the drain piping a descending grade (1/50-1/100) and never create a bump to go over or a trap.
   c) In connecting drain pipes, care must be taken so as not to apply force to the unit side piping and fix the pipe at a point as close to the unit as possible.
   d) Do not create an air vent under any circumstances.
   e) When drain piping is implemented for more than one unit, provide a collecting main about 100 mm below the units' drain outlets from which it collects drain. Use a VP-30 or larger pipe for a collecting main.
   f) Do not fail to provide heat insulation at the following two points because they can cause dew condensation and a resultant water leak.





7. Drain socket
   After a drain test is completed, apply a pipe cover (small: accessory) onto the drain socket, cover the pipe cover (small), the clamp and part of the drain hose with a pipe cover (large: accessory) and wrap it with a tape completely without leaving any gaps.
   (Cut pipe covers into appropriate shapes)

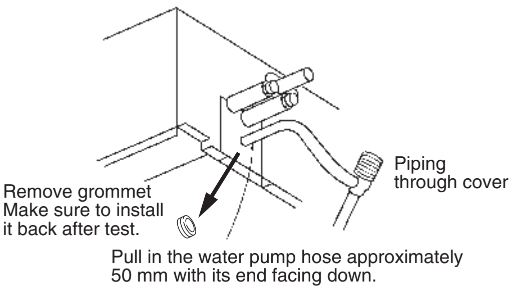


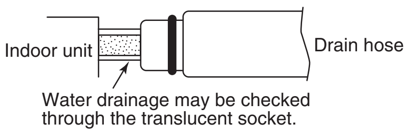
8. Hard PVC pipes laid indoor
   a) Since a drain pipe outlet can be raised up to 600 mm from the ceiling, use elbows, etc. to install drain pipes, it there are obstacles preventing normal drain pipe arrangement. When the drain pipe is raised at a point far from a unit, it can cause an overflow due to a back flow of drain upon stoppage, so arrange piping to keep the dimensions specified in the illustration shown on the left.
   b) Install the drain pipe outlet where no odor is likely to be generated.
   c) Do not lead the drain pipe into a ditch where the generation of harmful gas such as sulfuric gas or flammable gas is expected. A failure to observe this instruction may cause such harmful or flammable gas to flow into the room.

4.4.5 Drain test (Perform the drain test after the electrical wiring work has been finished.)

- Check that water is draining thoroughly during the test run, and that there are no water leaks from the joints.
- The test has to be performed even if the unit is installed in a season when the unit is used for heating.
- In a new house, perform the test before the ceiling is fitted.

1. Remove the grommet, and using a water pump, pour about 1000cc of water, from the position shown in the left figure.
   Caution
   When pour water, be sure to perform the drain pump forced operation.
2. Check the drain-out section (transparent section) for normal flow of drainage.
3. Take off the drain plug to release the water. After water release has been confirmed, replace the drain plug as it was.
   *Be careful not to get splashed when pulling the drain plug.
4. After the drain test, thoroughly insulate the drain pipe, up to the main unit.





Forced drain pump operation

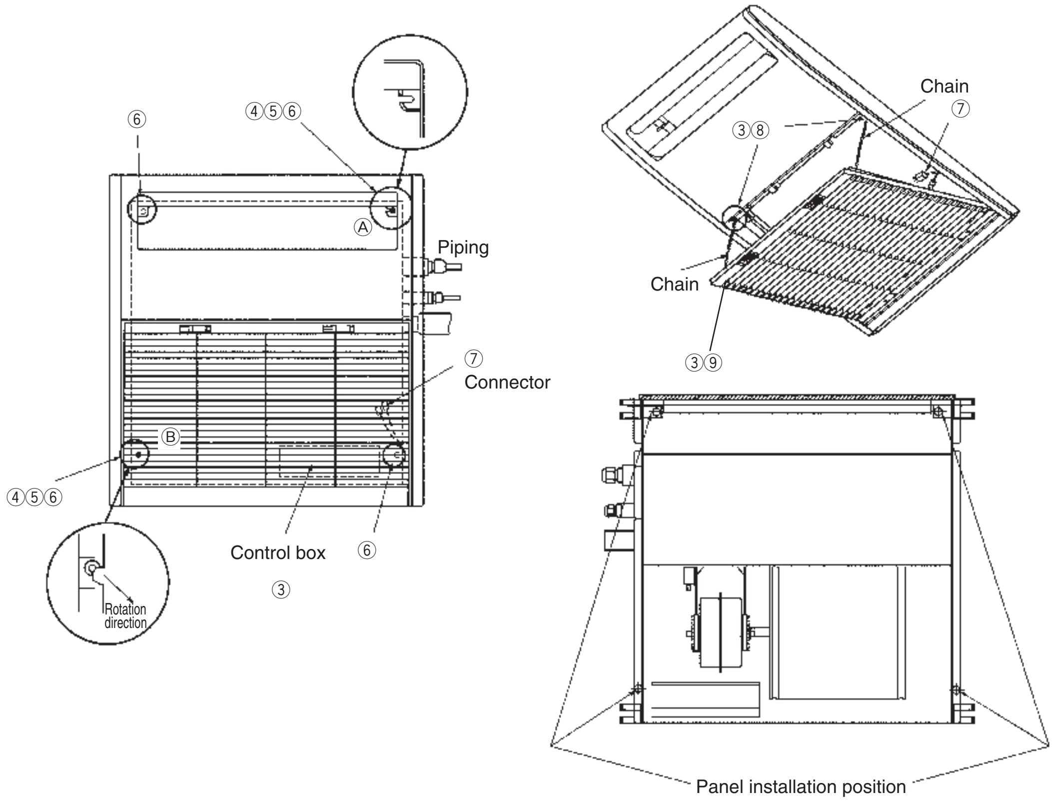
- Setup from a unit side.
  Turn on DIP switch SW5-1 on the PCB of the indoor unit. The drain pump will operate continuously.
  After the drain test, be sure to turn off the DIP switch.
  When electrical work is not completed, connect a convex joint to the drain pipe joint area, arrange an inlet and check leaks and drain conditions of the pipe.

Setup from a remote controller side.

- Drain pump operation from a remote controller unit is possible. Operate a remote controller unit by following the steps described below.
  1. To start a forced drain pump operation
     ① Press the TEST button for three seconds or longer.
     The display will change from" ⇕☝SELECT ITEM" → " (○)☝ SET" → " ⁂ TEST RUN ▼ "
     ② Press the ▼ button once while" ⁂ TEST RUN ▼ "is displayed, and cause"DRAIN PUMP ⇕ "to be displayed.
     ③ When the SET button is pressed, a drain pump operation will start.
     Display:"DRAIN PUMP RUN" → " (○)☝ → STOP"
  2. To cancel a drain pump operation.
     ① If either SET or ON/OFF button is pressed, a forced drain pump operation will stop.
     The air conditioning system will become OFF.

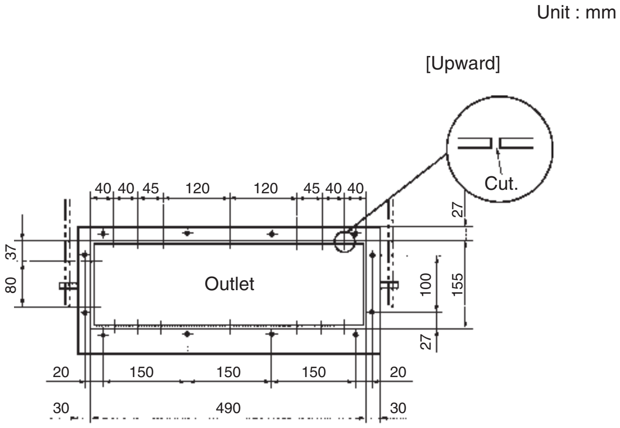
4.4.6 Panel installation (Panel installing bolts are attached to the panel.)

1. Check that the indoor unit's height and opening dimensions in the ceiling are correct.
2. Check that level is ensured.
3. Open the suction grill.
4. Screw in two of the four suspension bolts attached to the panel, on the piping side and at its opposite angle, by a little less than 5 mm (● marks).
5. Hook the panel into two of the suspension bolts to pre-install it.
   With pre-installation is performed, first hook the panel to bolt A, then to bolt B while rotating the panel.
   (Take care so that the unit does not rotate during pre-installation.)
6. Tighten the pre-installed suspension bolts and two remaining suspension bolts.
7. Attach the louver motor connector (white, 4P) and the limit switch connector (white, 2P).
8. Use the provided screws to tighten chains to the panel. Chain installing screws is contained in the same bag as suspension bolts.
9. Close the suction grill. Now installation is complete.
10. When the louver motor does not operate with the remote control, check connections of the connectors, turn off the power for more than 10 seconds and reset.

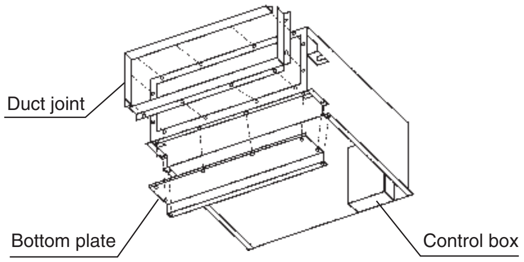


4.4.7 Indoor unit repair procedure for duct connection

1. Drill hole for duct
   a) While referring to the following dimensions, notch the insulation. (The insulation is equipped with the marks in advance.)
   b) Cut joints for the hole, and drill hole.
   c) Connect the duct joint using screws attached to the panel.



   d) Connect the bottom plate using screws attached to the panel.



   e) Blower fan tap switch
      The following two methods are available in switching the blower fan tap. Switch to the high-speed tap with one of these methods.
      ① Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control,high speed (High ceiling)
	OFF	Fan control,standard

      ② By means of function setting from the remote control unit, set the setting ⓒ of "I/U FUNCTION ▲ " (indoor unit function) to "Hi CEILING 1" (high-speed tap) as shown below.
      For the details of operating procedures, please refer to the installation manual of your remote control unit.

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

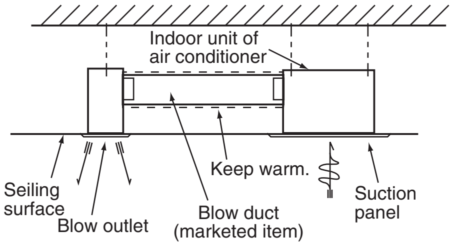
   f) LOUVER switch disabled setting
      By means of function setting from the remote control unit, set the setting ⓒ of " FUNCTION ▲ " (remote control unit function) to" INVALID"(LOUVER switch disabled) as shown below.
      For the details of operating procedures, please refer to the installation manual of your remote control unit.

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
07	LOUVER S/W	INVALID

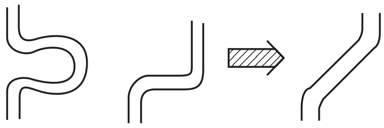
2. Duct work

a) Calculate air capacity and the outside static pressure to select the duct's length and shape, and blow outlet.

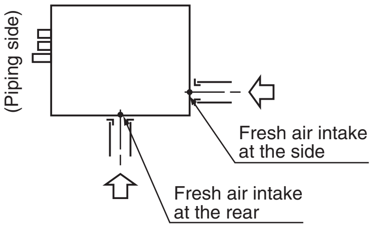
Caution Take care that the outside static pressure does not exceed 30 Pa.
The unit has condensation owing to the decrease in air capacity, possibly causing the ceiling and household goods to become wet.



b) Reduce the number of bends as much as possible. (Corner R should be as larger as possible.)



c) Connecting the air inlet duct



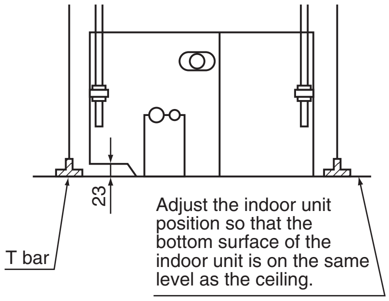
d) Fresh air intake
Use the intake, which is easier for work, either at the rear or the side.

e) Duct connection
Connect the 125 mm diameter round duct, using the air inlet/exhaust duct flange separately sold (for connecting the 125 mm diameter round duct). (Band clamp)
Keep the duct warm to protect from condensation.

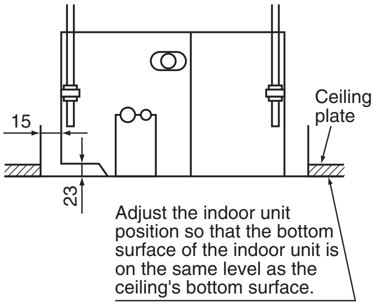
f) Checking of indoor unit installation level

- There are two kinds of panel, which are TQ-PSA-13W-E panel and TQ-PSB-13W-E panel. When installing to the existing ceiling, check that opening dimensions in the ceiling are correct.
  Check the installation level of the air-conditioner indoor unit and the ceiling members.
- Adjust the air-conditioner indoor unit height so that the under surface of the indoor unit and the under surface of the ceiling agree with each other. (The blowout port shall be housed in the ceiling.)
- The allowable height difference between the under surface of the ceiling and the under surface of the indoor unit is less than 5 mm upward shift of the indoor unit.
  Do not install the indoor unit lower than the bottom surface of the ceiling.

■For TQ-PSA-13W-E panel



■For TQ-PSB-13W-E panel



g) Panel installation

① Insert a flat head screw driver, etc. into the slot on the blowout port cover of the panel to remove the cover from the panel.

② Open suction grill.

③ Screw in two of the four suspension bolts attached to the panel, on the piping side and at its opposite angle, by a little less than 5 mm (● marks).

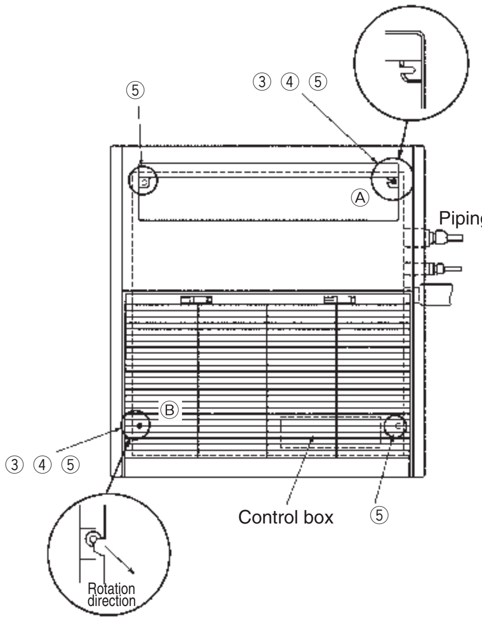
④ Hook the panel into two of the suspension bolts to pre-install it.
With pre-installation is performed, first hook the panel on the bolt A Then to the bolt B .While rotating the panel.
(Take care so that the unit does not rotate during pre-installation.)

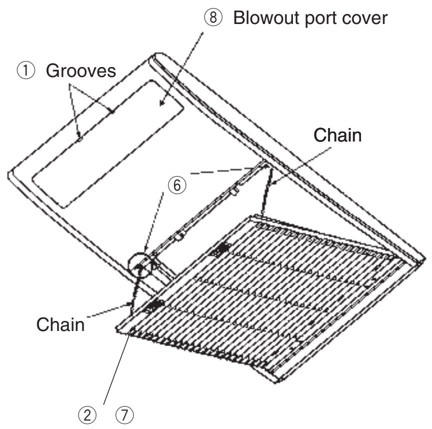
⑤ Tighten the pre-installed suspension bolts and two remaining suspension bolts.

⑥ Use the provided screws to tighten chains to the panel. Chain installing screws is contained in the same bag as suspension bolts.

⑦ Close the suction grill. (Check whether the chain is installed securely.)

⑧ Push the blow outlet cover into place from the bottom of the panel, and fit it as it was.
Check that the blow outlet cover is securely fitted and does not fall.



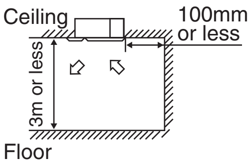
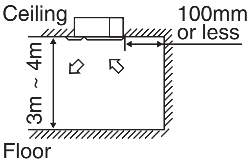


Application Data

4.5 1-way Outlet Ceiling Recessed Type (FDTSA)

4.5.1 Preparation of indoor unit

It can be installed by either one of the following methods. Select the most adequate method for your particular case.

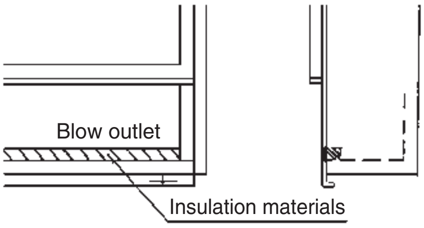
	Ⓐ Standard installation	Ⓑ Higher ceiling
Installation example and limitation		

Note (1) In the case of installing on the high ceiling, part of indoor unit requires some modification.

Procedures of rework

Installation on higher ceiling

Adhere the insulation materials attached to the direct blow panel on the blow outlet of indoor unit.



4.5.2 Selection of installation location

1. Where cool and hot air will be distributed sufficiently.
   Where the installation heigh exceeds 3m, warmed air is likely to concentrate close to the ceiling. In such case, you should install also a circulator.

   [Reference]

   Cold air throw Unit : m

Item / Models	Air throw distance	
	Standard	Higher ceiling
All models	7	

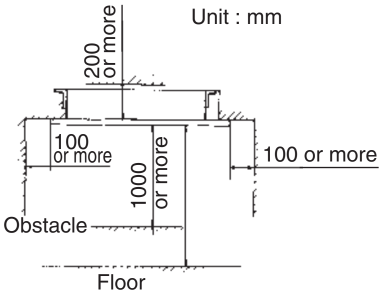
   [Conditions]

   ① Unit heigh
   Standard ceiling: 2.4 ~ 3.0(m) above floor Higher ceiling: 3.0 ~ 4.0(m) above floor
   ② Kind of operation: Hi
   ③ Place: Free space without obstruction;
   ④ Throw distance means the horizontal distance for the wind to reach the floor.
   ⑤ Wind velocity at the reaching distance: 0.5m/s

   Note (1) Wind capacity is UHi in case of a higher ceiling. It is value of Hi for other cases.

2. Where the ceiling has sufficient rigidity.
3. Where there is no obstacles in front of the suction inlet and blow outlet.
4. It should be avoided such places as kitchen, machine factory, etc. where there profuse liquid splashes or thick steam.
5. Where the height of ceiling exceeds 200mm.

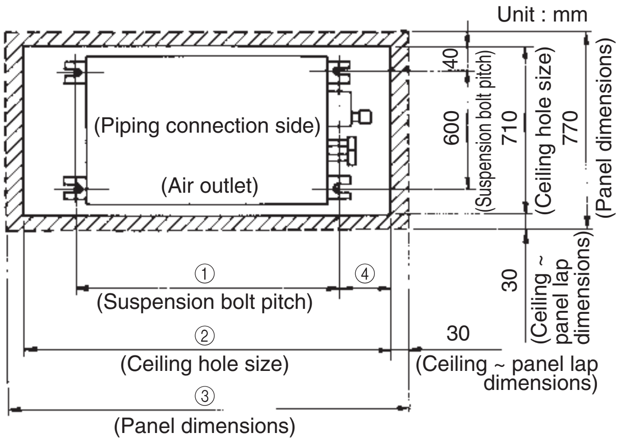
6. Where a space as shown below can be secured.



7. It should be avoided where a machine generating high frequency waves is installed.
8. Select a place to branch the piping so that same distance will be a obtained for each of one way piping.
9. Where humidity may exceed 80% behind the ceiling or the dew point may exceed 28×C, adhere polyurethane foam materials (t 10 or more) over the insulation materials on the external plate.
10. Where it is convenient for the piping and wiring to the outdoor.
11. Where protected from direct exposure to sun beams.
12. Where it is free from volatile gas generation.

4.5.3 Standard location

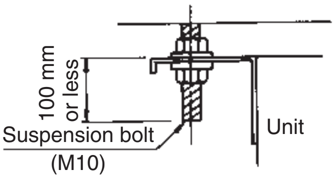
1. Installation
   a) Ceiling hole size and position of suspension bolt



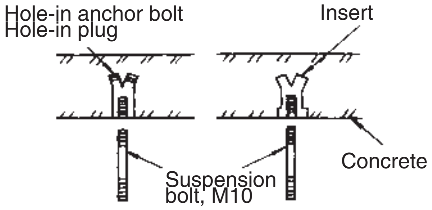
Unit : mm

Models \ Mark	①	②	③	④
FDTSA45	990	1230	1290	180
FDTSA71	1250	1440	1500	145

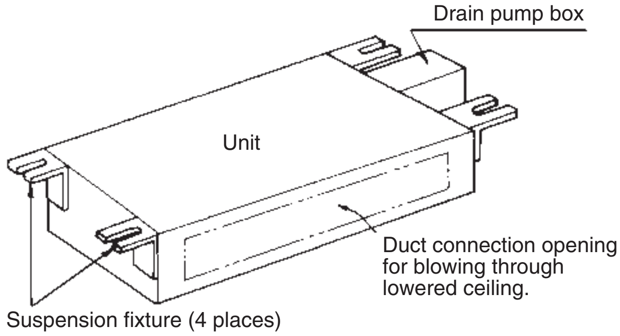
b) Length of fixed suspension bolt (customer orderd parts M10)
[Reference] Suspension bolt pitch is adjustable within ±10mm in sidewise direction. Since there is no adjustment allowance in back and forth direction, determine the position exactly with a measure. (Lap margin between ceiling and panel is 30mm.)



c) Fixing of suspension bolt.
   Fix the bolts securely as shown below or by any other adequate means.



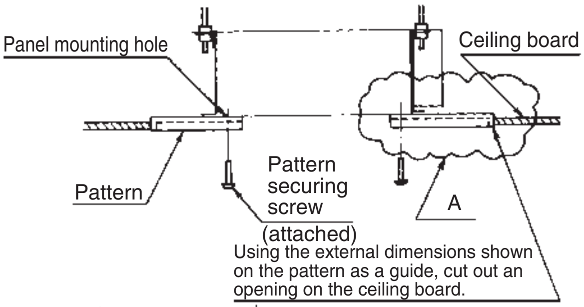
d) Installation

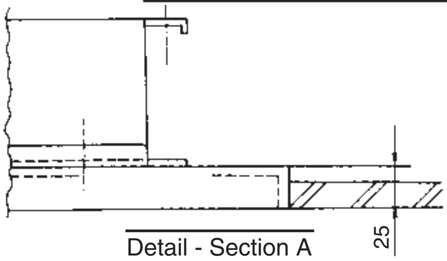


Procedures

① Install nuts on the Suspension bolts at onside. Suspension the suspension fixtures on the Suspension bolts first and then insert the remaining fixtures on the remaining Suspension bolts at and lock them with nuts.

② Since the indoor unit and the panel height cannot be adjusted, adjust the height using an attached pattern before fixing the indoor unit.



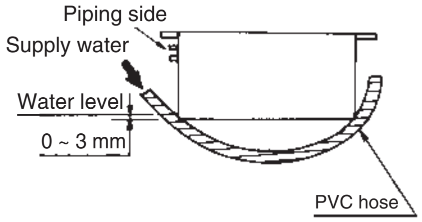


Detail - Section A

Check of levelness

Check the levelness as follows. Use a level gauge or adjust the levelness with the following method.

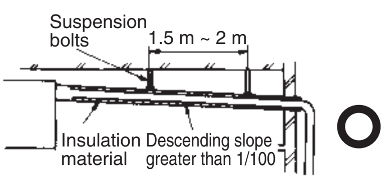
■ Adjust the bottom of indoor unit and the water level as shown below.

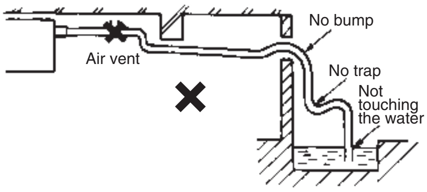


Slightly lower the piping side

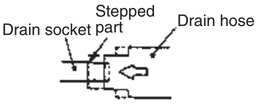
4.5.4 Drain piping

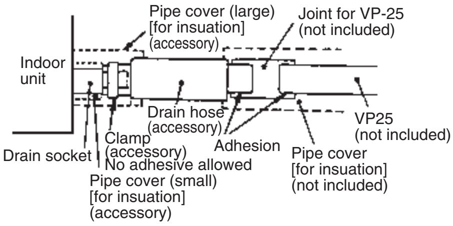
1. Glue the drain hose supplied as an accessory and a VP-25 joint before lifting the unit.



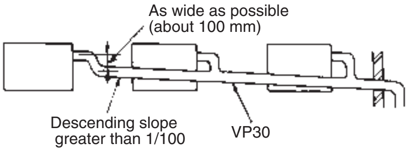


2. The drain hose is to provide a buffer to absorb a slight dislocation of the unit or the drain piping during installation work. If it is subject to abuse such as being bent or pulled deliberately, it may break, which will result in a water leak.
3. Care must be taken so as not to allow an adhesive to run into the drain hose. When it is hardened, it can cause a breakage of a flexible part, if the flexible part receives stress.

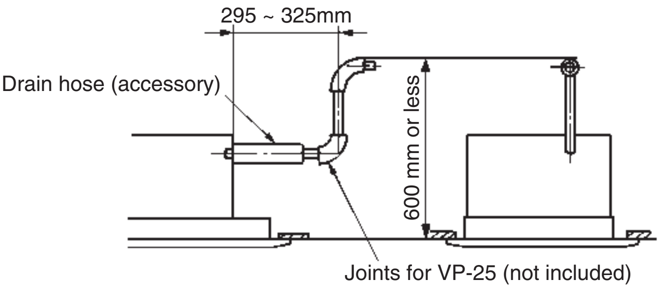




4. Use VP-25 general-purpose hard PVC pipes for drain piping.

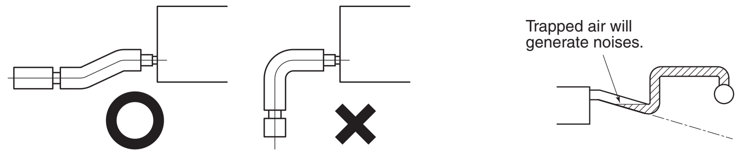


5. Insert the drain hose supplied as an accessory (soft PVC end) to the stepped part of the unit's drain socket and then fasten it with the clamp also supplied as an accessory.
6. Adhesive must not be used.
   a) Glue a VP-25 joint (to be procured locally) to joint it with the drain hose (hard PVC end) and then glue a VP-25 (to be procured locally) to the joint.
   b) Give the drain piping a descending grade (1/50-1/100) and never create a bump to go over or a trap.
   c) In connecting drain pipes, care must be taken so as not to apply force to the unit side piping and fix the pipe at a point as close to the unit as possible.
   d) Do not create an air vent under any circumstances.
   e) When drain piping is implemented for more than one unit, provide a collecting main about 100 mm below the unit's drain outlets from which it collects drain. Use a VP-30 or larger pipe for a collecting main.
   f) Do not fail to provide heat insulation at the following two points because they can cause dew condensation and a resultant water leak.



7. Drain socket
   After a drain test is completed, apply a pipe cover (small: accessory) onto the drain socket, cover the pipe cover (small), the clamp and part of the drain hose with a pipe cover (large: accessory) and wrap it with a tape completely without leaving any gaps.
   (Cut pipe covers into appropriate shapes)

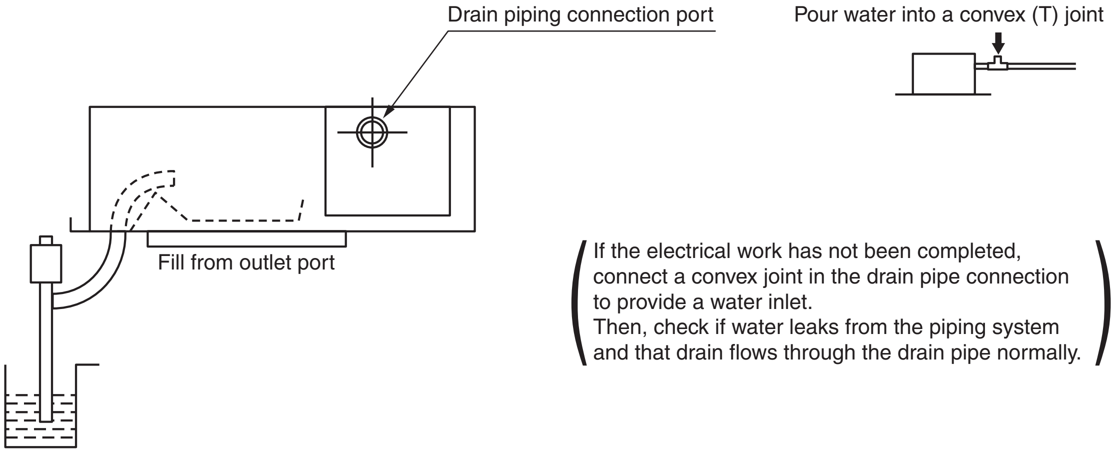
8. Hard PVC pipes laid indoor
   a) Since a drain pipe outlet can be raised up to 600 mm from the ceiling, use elbows, etc. to install drain pipes, it there are obstacles preventing normal drain pipe arrangement. When the drain pipe is raised at a point far from a unit, it can cause an overflow due to a back flow of drain upon stoppage, so arrange piping to keep the dimensions specified in the illustration shown on the left.
   b) Install the drain pipe outlet where no odor is likely to be generated.
   c) Do not lead the drain pipe into a ditch where the generation of harmful gas such as sulfuric gas or flammable gas is expected. A failure to observe this instruction may cause such harmful or flammable gas to flow into the room.



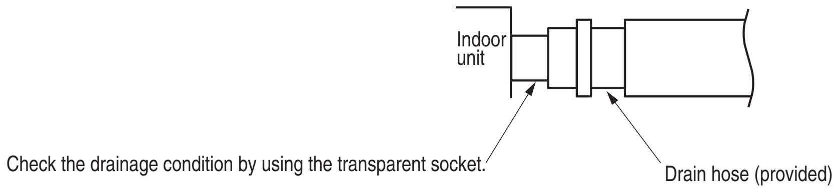
Drain test

[Perform this before installing the ornament panel]

- Perform this upon completion of electrical work.
- Gradually introduce 2,000~3,000cc of water as shown below.



- Connect the remote control switch and set to cooling operation. The drain pump will operate with the compressor on.
- Test whether or not the water is draining while listening to the operating sounds of the electric motor for the drain water.



- Check that water is draining smoothly and that there is no water dripping from the connections or other areas.

Forced drain pump operation

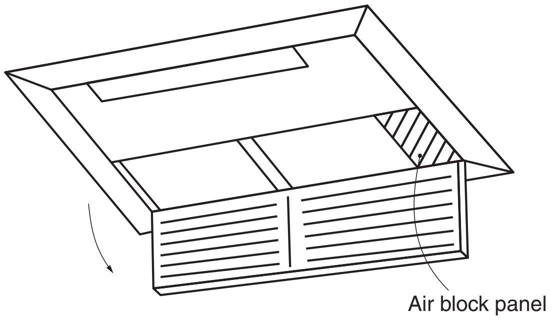
- Setup from a unit side.
  ① Turn on DIP switch SW5-1 on the PCB of the indoor unit. The drain pump operates continuously.
  ② After the test, be sure to turn off the DIP switch.
  When electrical work is not completed, connect a convex joint to the drain pipe joint area, arrange an inlet and check leaks and drain conditions of the pipe.
- Setup from a remote controller side.
  Drain pump operation from a remote controller unit is possible. Operate a remote controller unit by following the steps described below.
  1. To start a forced drain pump operation
     ① Press the TEST button for three seconds or longer.
     The display will change from " ⬍☝SELECT ITEM" → " (○)☝SET" → " ⁂ TEST RUN ▼ "
     ② Press the ▼ button once while " ⁂ TEST RUN ▼ " is displayed, and cause "DRAIN PUMP ⬍ "to be displayed.
     ③ When the SET button is pressed, a drain pump operation will start.

Display: DRAIN PUMP RUN" → " ○ ☝ → STOP"

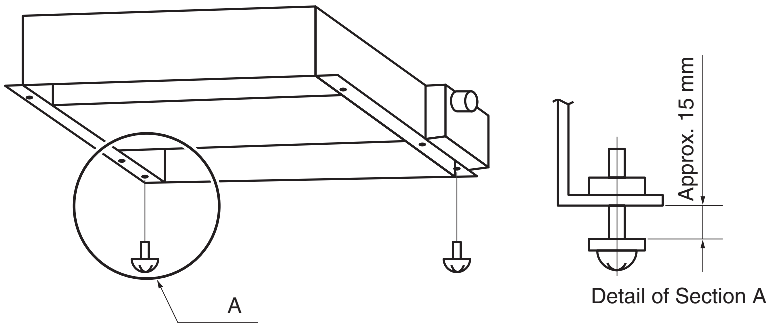
2. To cancel a drain pump operation.
   If either SET or ON/OFF button is pressed, a forced drain pump operation will stop.
   The air conditioning system will become OFF.

4.5.5 Mounting the panel

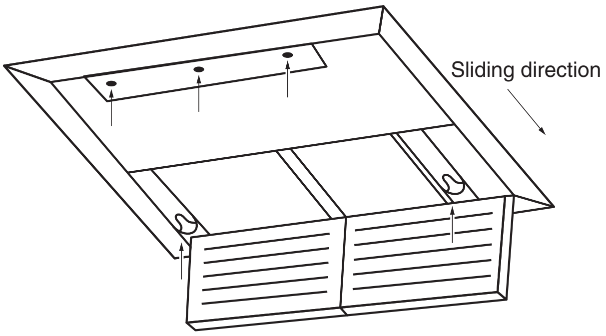
1. Open the inlet grille and remove the air block panel from the inside. (Remove the 2 screws.)



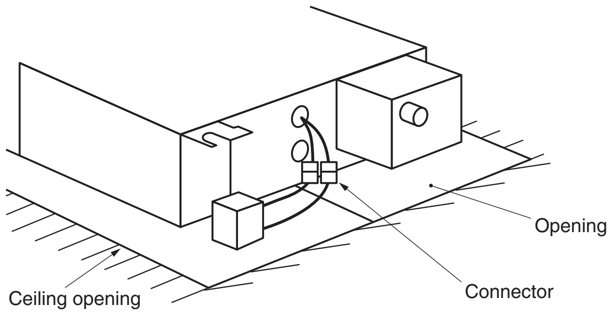
2. Mount the two (M5 × 35) panel mounting screws to the indoor unit



3. Hang the panel on the two mounting screws on the indoor unit by using the two ♁ shaped holes. Slide the panel approximately 10 mm. Use the 5 panel mounting screws to secure the panel.



4. Use the opening to connect the connectors for the louver motor and limit switches.



5. Reinstall the wind shield plate.

Installation on higher ceiling

Adhere the insulation materials on the blow outlet of the indoor unit. All others are same as the standard installation.

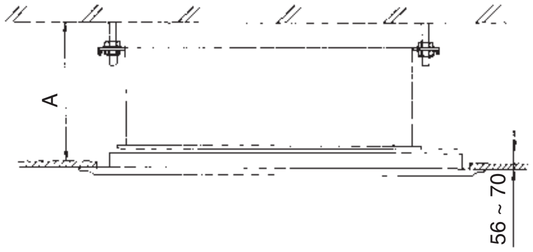
4.6 Cassetteria Type (FDRA)

4.6.1 Selection of installation location

1. Preparation of indoor unit
   Before of during the installation of the unit, assemble necessary optional panel, etc. depending on the specific type.
2. Select places for installation satisfying following conditions and, at the same time, obtain the consent on the part of your client user.
   a) Places where cooled or heated air circulates freely.
      When the installation height exceeds 3 m, warmed air stays close to the ceiling. In such cases, suggest your client users to install air circulators.
   b) Places where perfect drainage can be prepared and sufficient drainage.
   c) Places free from air disturbances to the suction port and blowout hole of the indoor unit, places where the fire alarm may not malfunction or short-circuit.
   d) Places with the environmental dew-point temperature is lower that 28°C and the relative humidity is less than 80%.
      (When installing at a place under a high humidity environment, pay sufficient attention the prevention of dewing such as thermal insulation of the unit properly.)
3. Avoid installation and use at those place listed below.
   a) Places exposed to oil splashes or steam (e.g. kitchens and machine plants).
      Installation and use at such places incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic vesin parts.
   b) Places where corrosive gas (such as sulfurous acid gas) or inflammable gas (thinner, gasoline, etc) in generated or remains.
      Installation and use at such places cause corrosion in the heat exchanger and damage in molded synthetic resin parts.
   c) Places adjacent to equipment generating electromagnetic waves or high-frequency waves such as in hospitals.
      Generated noise may cause malfunctioning of the controller.

4.6.2 Preparation for installation

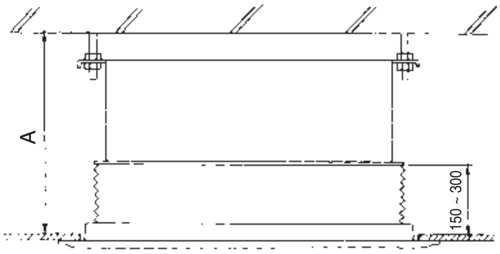
1. Selection of suspension pattern
   When the unit is hanged from ceiling, select one of following patterns depending on the dimensions of the ceiling.
   < Combination with silent panel >



Unit : mm

Models \ Mark	A
FDRA45, 56, 71, 90	365 or more
FDRA112, 140	416 or more

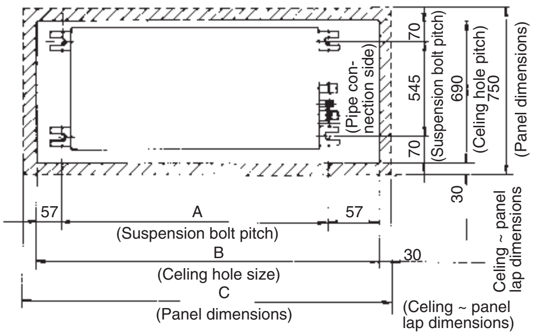
< Combination with canvas panel >



Unit : mm

Models \ Mark	A
FDRA45, 56, 71, 90	495 or more
FDRA112, 140	510 or more

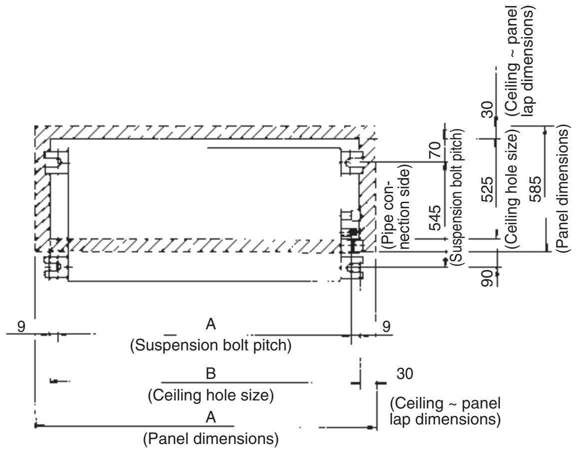
2. Ceiling hole size and position of suspension bolt
   When boring at the ceiling, use the pattern sheet included in the accessory of the unit.
   Leave the pattern sheet on the unit till decorative panel is installed.
   < Combination with silent panel >



Unit : mm

Models \ Mark	A	B	C
FDRA45, 56	786	980	1040
FDRA71, 80	986	1180	1240
FDRA112, 140	1406	1600	1660

< Combination with canvas panel >

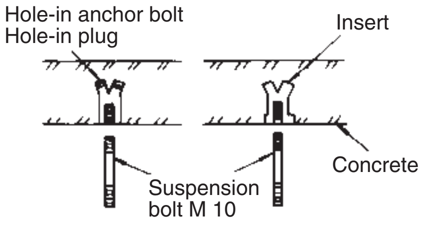


Unit : mm

Models \ Mark	A	B	C
FDRA45, 56	786	804	864
FDRA71, 80	986	1004	1064
FDRA112, 140	1406	1424	1484

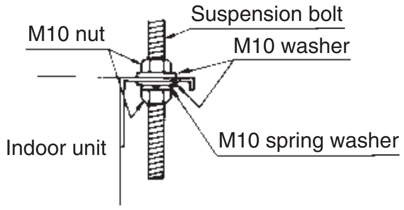
Application Data

3. Suspension bolts installation
   Locate the suspension bolts position by using the pattern sheet
   (Use care of the piping direction when the unit is installed)



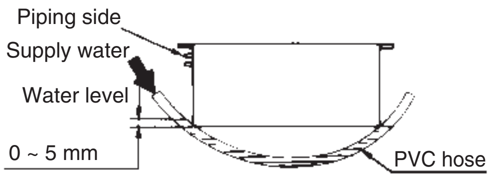
4.6.3 Installation of indoor unit

1. Fix the indoor unit to the suspension bolts.
   If required, it is possible to suspend the unit to the beam, etc. Directly by use of the bolts without using the suspension bolts.



Note (1) When the dimensions of indoor unit and ceiling holes does not match, it can be adjusted with the slot holes of mounting bracket.

2. Adjusting the unit's levelness
   ① Adjust the out-of levelness using a level vial or by following method.
   - Make adjustment so that the relation between the lower surface of the indoor unit proper and water level in the hose becomes as given below.



Bring the piping side slightly lower.

   ② Unless the adjustment to the levelness is made properly, malfunctioning or failure of the float switch may occur.

3. Blower fan tap switch
   The following two methods are available in switching the blower fan tap. Switch to the high-speed tap with one of these methods.
   - Set SW9-4 provided on the indoor unit PCB to ON.

SW9-4	ON	Fan control,high speed (High ceiling)
	OFF	Fan control,standard

   - By means of function setting from the remote control unit, set the setting ⓒ of "I/U FUNCTION ▲ " (indoor unit function) to "Hi CEILING 1" (high-speed tap) as shown below.

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

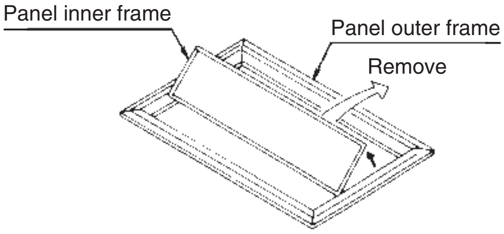
For the details of operating procedures, please refer to the installation manual of your remote control unit.

4.6.4 Installation of decorative panel

1. Case of silent pane
   1) Accessory

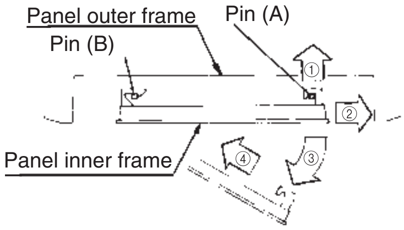
Name	Q'ty	Position
Round head machine screw (M5 × 35) 	4 pcs.	Securing the panel

2. Installation procedures
   ① Remove the inner frame of panel

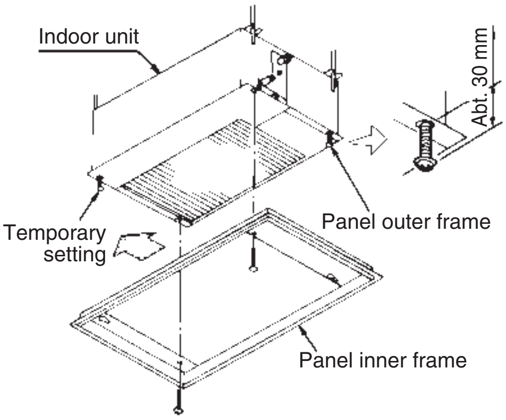


< How to remove the panel inner frame >

- Detach from pins (A) in the order of arrow ① → ②
- Open slightly as the arrow ③ and move toward the arrow ④ and detach from pin (B)



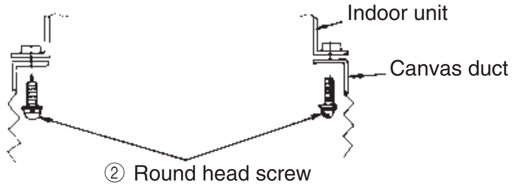
② Install the panel outer frame on the indoor unit.
Procedures of installation
① Secure the panel tentatively with 2 of 4 panel set screws (panel accessory) as shown above.
② When the panel is supported with a pair of set screws, slide it in the arrow direction.
Note (1) Panel outer frame has the orientation.
③ Lock the former 2 and remaining 2 set screws.
④ Install the panel inner frame in the reverse order of removal.



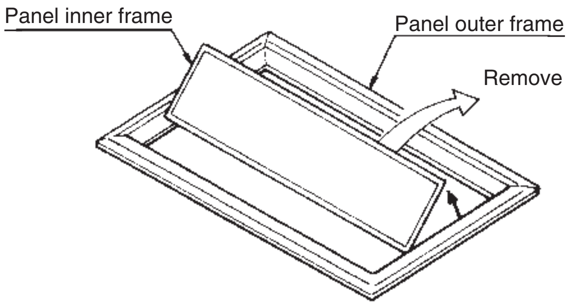
3. Case of canvas panel
   (Canvas duct (option) is necessary to install the canvas panel.)
   1) Accessory

Symbol	Name	Q' ty	Position
①	Round head machine screw (M4 × 16) 	4	Panel securing
②	Round head machine screw (M5 × 16) 	8	Canvas duct securing
③	Round head machine screw (M5 × 25) 	4	Chain securing
④	Holder 	4	
⑤	Chain 	4	

   2) Mounting procedures
   ① Install the canvas duct (option, 4 places) on the Indoor unit.

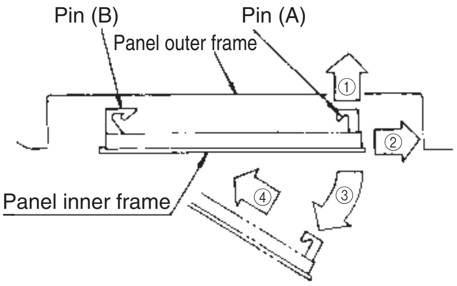


   ② Remove the panel inner frame.
   It can be removed same as the silent panel.

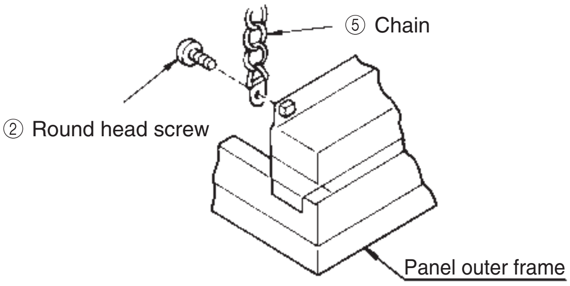


< How to remove the panel inner frame >

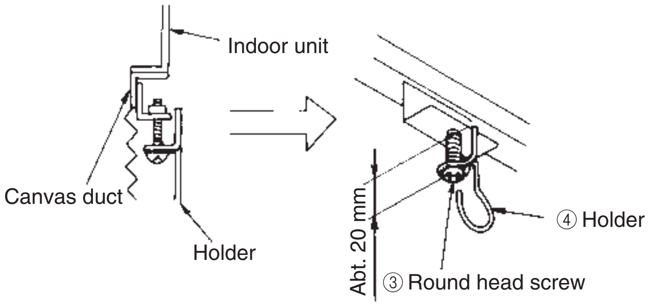
- ■ Detach from pins (A) in the order of arrow ① → ②
- ■ Open slightly as shown by the arrow ③ . move in the ④ arrow direction and detach from pin (B).



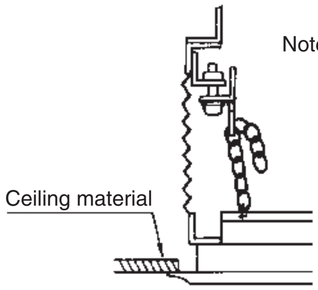
   ③ Install the chains on the panel outer frame. (4 places)



④ Install the panel outer frame.
Procedures of installation
- Secure the holder tentatively as shown below. (4 places)

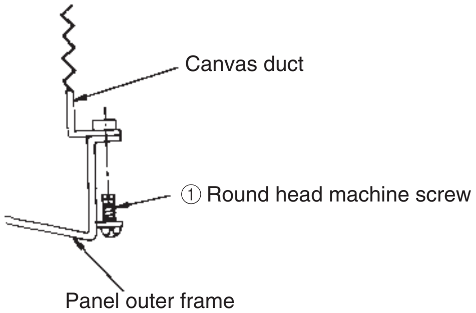


- Hook the chain of panel outer panel on the holder.

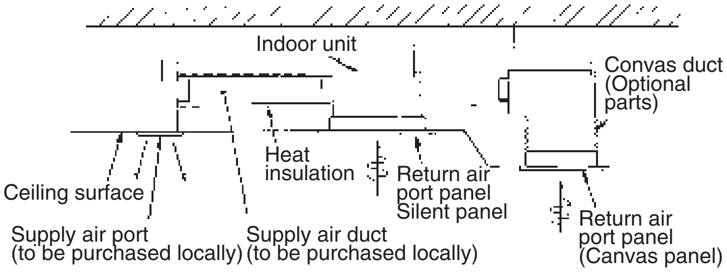


Note (1) When hooking the chain. make sure to avoid slack-ness on it by pushing hard the panel outer frame against the ceiling material.

- Tighten ③ screw in the step ① till the panel outer frame contacts closely with the ceiling material.
- Secure the canvas duct and the panel outer frame with screws.



⑤ Remove the panel inner frame and install in the reverse order of removal.
⑥ Cautions for duct installation work



Calculate the draft and external static pressure and select the length, shape and blowout.

- Supply air duct

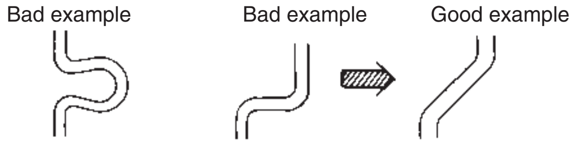
① 2-spot, 3-spot and 4-spot with φ200 type duct are the standard specifications. Determine the number of spots based on following table.

FDRA45, 56	FDRA71, 90	FDRA112, 140
2-spot	2 ~ 3-spot (1)	3 ~ 4-spot (2)

Notes (1) Shield the central supply air port for 2-spot.
(2) Shield the supply air port around the center for 3-spot.

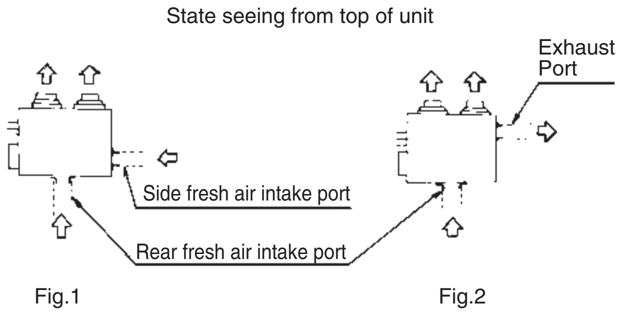
Application Data

② Limit the difference in length between spots at less than 2:1.
③ Reduce the length of duct as much as possible.



④ Use a band, etc. to connect the indoor unit and the supply air duct flange.
⑤ Conduct the duct installation work before finshing the ceiling.

4.6.5 Connection of air intake and exhaust ducts



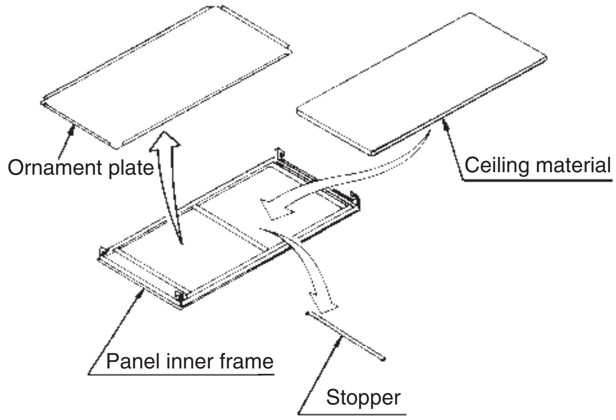
Duct connecting position

a) Fresh air intake
Inlet can be selected from the side or rear faces depending on the working conditions.
Use the rear fresh air inlte when the simultaneous intake and exhaust is conducted. (Side inlet cannot be used.)

b) Exhaust (Make sure to use also the air intake.)
Use the side exhaust port.

Attachment of ceiling material

Ceiling material can be attached to the panel inner frame.
(Plate thickness max. 15mm)

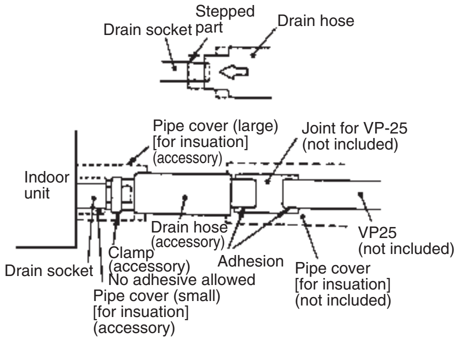


Attachment procedures
① Remove the stopper.
② Remove the ornament plate and attach the ceiling material.
③ Hold down the ceiling material and return the stopper in position.
Note (1) If the ceiling material is attached, the ornament plate is not used.

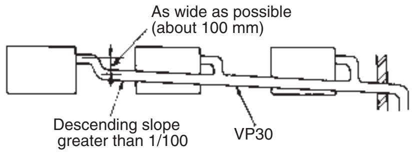
4.6.6 Drain piping

1. Glue the drain hose supplied as an accessory and a VP-25 joint before lifting the unit.

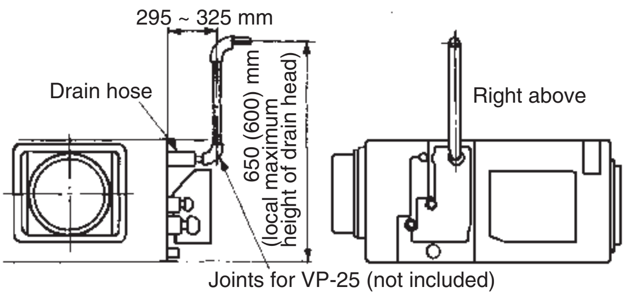
2. The drain hose is to provide a buffer to absorb a slight dislocation of the unit or the drain piping during installation work. If it is subject to abuse such as being bent or pulled deliberately, it may break, which will result in a water leak.
3. Care must be taken so as not to allow an adhesive to run into the drain hose. When it is hardened, it can cause a breakage of a flexible part, if the flexible part receives stress.



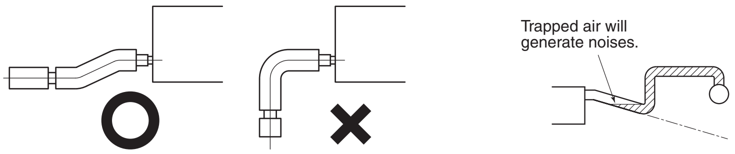
4. Use VP-25 general-purpose hard PVC pipes for drain piping.



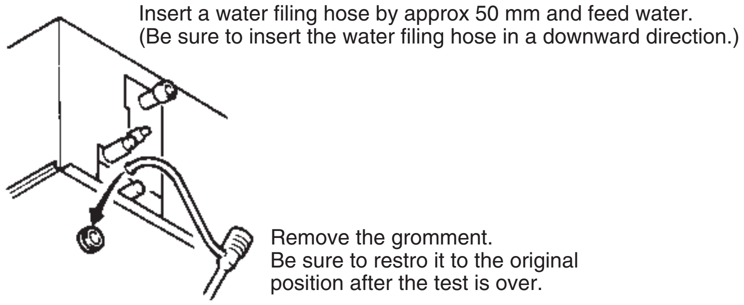
5. Insert the drain hose supplied as an accessory (soft PVC end) to the stepped part of the unit's drain socket and then fasten it with the clamp also supplied as an accessory.
6. Adhesive must not be used.
   a) Glue a VP-25 joint (to be procured locally) to joint it with the drain hose (hard PVC end) and then glue a VP-25 (to be procured locally) to the joint.
   b) Give the drain piping a descending grade (1/50-1/100) and never create a bump to go over or a trap.
   c) In connecting drain pipes, care must be taken so as not to apply force to the unit side piping and fix the pipe at a point as close to the unit as possible.
   d) Do not create an air vent under any circumstances.
   e) When drain piping is implemented for more than one unit, provide a collecting main about 100 mm below the unit's drain outlets from which it collects drain. Use a VP-30 or larger pipe for a collecting main.
   f) Do not fail to provide heat insulation at the following two points because they can cause dew condensation and a resultant water leak.
7. Drain socket
   After a drain test is completed, apply a pipe cover (small: accessory) onto the drain socket, cover the pipe cover (small), the clamp and part of the drain hose with a pipe cover (large: accessory) and wrap it with a tape completely without leaving any gaps.
   (Cut pipe covers into appropriate shapes)



8. Hard PVC pipes laid indoor
   a) Since a drain pipe outlet can be raised up to 650 (600: Canvas panel) mm from the ceiling, use elbows, etc. to install drain pipes, it there are obstacles preventing normal drain pipe arrangement. When the drain pipe is raised at a point far from a unit, it can cause an overflow due to a back flow of drain upon stoppage, so arrange piping to keep the dimensions specified in the illustration shown on the left.
   b) Install the drain pipe outlet where no odor is likely to be generated.
   c) Do not lead the drain pipe into a ditch where the generation of harmful gas such as sulfuric gas or flammable gas is expected. A failure to observe this instruction may cause such harmful or flammable gas to flow into the room.



9. Drainage test
   a) During trial operation, make sure that drainage is properly executed and check that leakage is not found at connections.
   b) Be sure to carry out a drainage test when installing the system during a heating season.
   c) When installing the system in a building under construction, carry out the drainage test before ceiling tiles are installed.

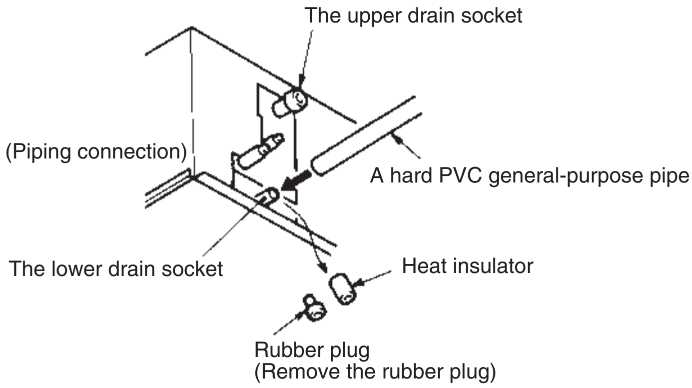


- Supply approx 1000cc of water through the outlet of the unit using a feed water pump.
- Make sure that drainage is proceeding properly at the see-through outlet of the unit.
  *Also confirm the revolving sound of the condensate motor when checking the drainage.
- Then remove the drain plug at lower section of the unit to drain water off. After making sure water is not left, restore the drain plug to the original position.

Forced drain pump operation

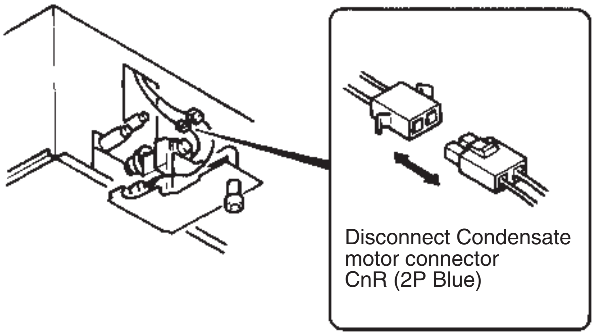
- Setup from a unit side.
  ① Turn on DIP switch 5-1 on the PCB of the indoor unit. The drain pump operates continuously.
  ② After the test, be sure to turn off the DIP switch.
  When electrical work is not completed, connect a convex joint to the drain pipe joint area, arrange an inlet and check leaks and drain conditions of the pipe.
- Setup from a remote controller side.
  Drain pump operation from a remote controller unit is possible. Operate a remote controller unit by following the steps described below.
  1. To start a forced drain pump operation
     ① Press the TEST button for three seconds or longer.
     The display will change from " ⇕☝ SELECT ITEM" → " ○☝ SET" → " ☼ TEST RUN ▼ "
     ② Press ▼ the button once while " ☼ TEST RUN ▼ " is displayed, and cause "DRAIN PUMP ⇕ "to be displayed.
     ③ When the SET button is pressed, a drain pump operation will start.
     Display: "DRAIN PUMP RUN" → " ○☝ → STOP"
  2. To cancel a drain pump operation.
     If either SET or ON/OFF button is pressed, a forced drain pump operation will stop.
     The air conditioning system will become OFF.

10. Drainage from the lower drain socket
    Only if the drain pipe can be installed in a downhill grade (1/50-1/100), the lower drain socket can be used for connecting to the drain pipe as illustrated.



(Disconnect the connector for the drain motor)
As shown in the sketch to the right, disconnect the drain motor connector CnR (blue color coding).

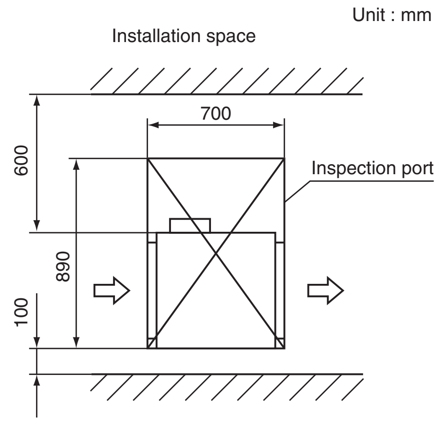
⚠ **Caution** If the system is started with this connector connected as is, drain water is discharged out of the upper drain socket causing a heavy water lekage.



4.7 Medium Static Pressure Ducted Type (FDQMA)

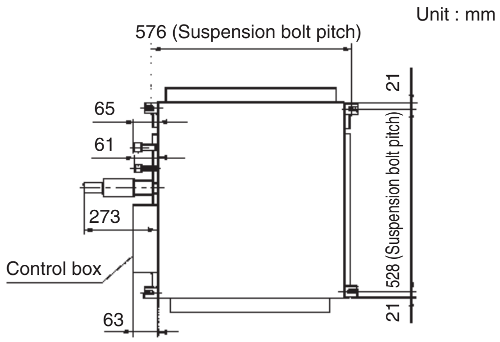
4.7.1 Selection of installation location

1. Avoid installation and use at those places listed below.
   a) Places exposed to oil splashes or steam (e.g. kitchens and machine plants).
   Installation and use at such places will incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic resin parts.
   b) Places where corrosive gas (such as sulfurous acid gas) or inflammable gas (thinner, gasoline, etc.) is gnerated or remains. Installation and use at such places will cause corrosion in the heat exchanger and damage in molded synthetic resin parts.
   c) Places adjacent to equipment generating electromagnetic waves or high-frequency waves such as in hospitals. Generated noise may cause malfunctioning of the controller.
2. Select places for installation satisfying the following conditions and, at the same time, obtain the consent on the part of your client user.
   a) Places where cooled or heated air circulates freely. When the installation height exceeds 3m, warmed air stays close to the ceiling. In such cases, suggest your client users to install air circulators.
   b) Places where perfect drainage can be prepared and sufficient drainage gradient is available.
   c) Places free from air disturbances to the return air port and supply hole of the indoor unit, places where the fire alarm may not malfunction to short circuit.
   d) Places with the environmental dew-point temperature is lower than 28°C and the relative humidity is less than 80%.
   (When installing at a place under a high humidity environment, pay sufficient attention to prevention of dewing such as thermally insulating the unit properly.)
3. Check if the selected place for installation is rigid enough to stand the weight of the unit.
   Otherwise, apply reinforcement using boards and beams before starting the installation work.

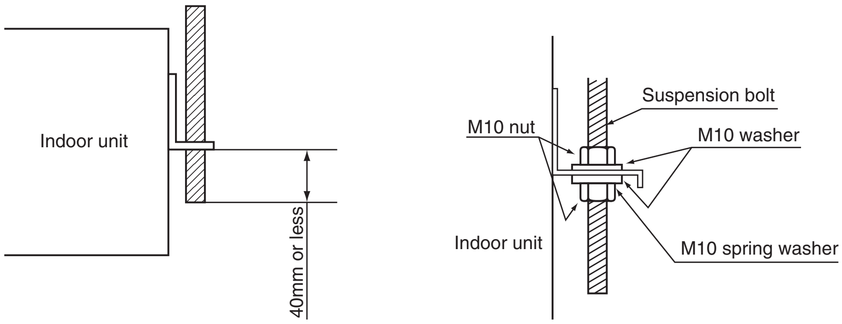


4.7.2 Suspension the unit

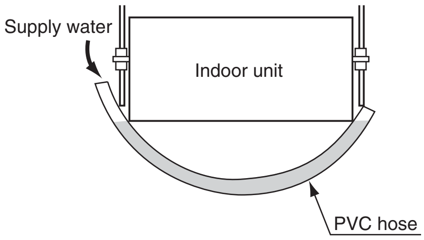
Use four (4) M10 or W3/8 suspension bolts. Secure them firmly so that each can withstand a pull-out load of 50 kg/f.



1. Adjust suspension bolts length to the following dimension.

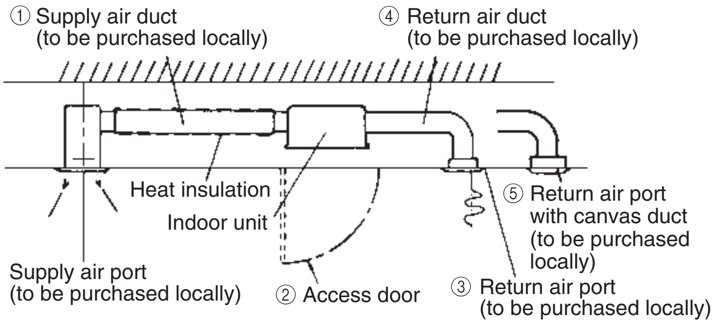


2. Set the suspension bolts (to be prepared at job site) in place.
3. Level the unit using a level or a hose filled with water. If the unit is out of level, water leaks or malfunctioning of the floating switch may occur.

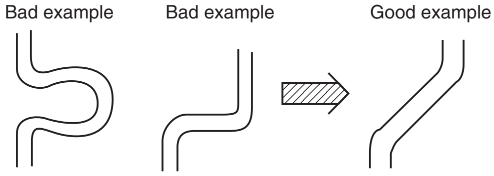


4. After ensuring the above, secure the unit.

4.7.3 Duct installation



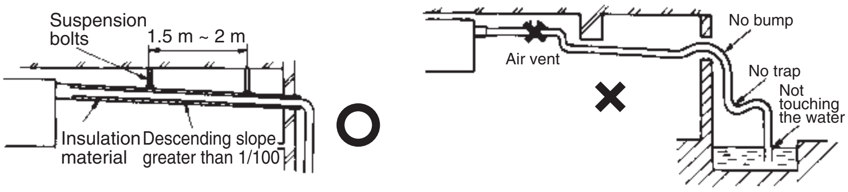
1. Calculate air capacity and the outside static pressure to select the duct's length and shape, and blow outlet.
   ⚠ **Caution** Take care that the outside atatic pressure does not exceed 30 Pa. The unit has condensation owing to the decrease in air capacity, possibly causing the ceiling and household goods to become wet.
2. The indoor unit is not provided with an air filter. Assemble it into the suction grill for which cleaning is easy.
3. Make the duct the shortest in length.



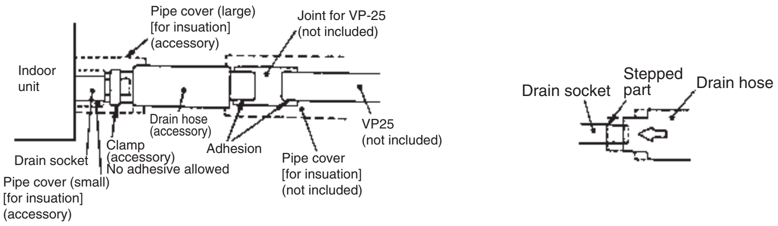
4. Bend a lot less abruptly. (Make the bend radius a lot larger.)
5. When connecting the indoor unit to the duct flange of the blow outlet, attach the insulation material to the fixed portion to protect it from condensation.
6. Conduct the duct work before ceiling attachment.
7. Make sure to keep the suction duct warm to protect it from condensation.
8. Install the blowout hole where air can flow all over the room.
9. Make sure to install the inspection opening in the ceiling. It is needed for the maintenance of electrical parts, the motor and other parts.

4.7.4 Drain piping

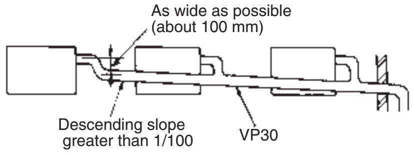
1. Glue the drain hose supplied as an accessory and a VP-25 joint before lifting the unit.



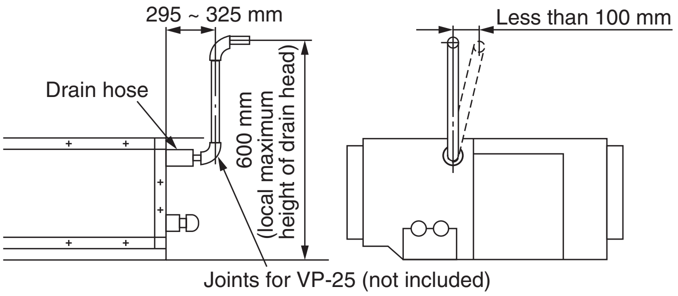
2. The drain hose is to provide a buffer to absorb a slight dislocation of the unit or the drain piping during installation work. If it is subject to abuse such as being bent or pulled deliberately, it may break, which will result in a water leak.
3. Care must be taken so as not to allow an adhesive to run into the drain hose. When it is hardened, it can cause a breakage of a flexible part, if the flexible part receives stress.



4. Use VP-25 general-purpose hard PVC pipes for drain piping.



5. Insert the drain hose supplied as an accessory (soft PVC end) to the stepped part of the unit's drain socket and then fasten it with the clamp also supplied as an accessory.
6. Adhesive must not be used.
   a) Glue a VP-25 joint (to be procured locally) to joint it with the drain hose (hard PVC end) and then glue a VP-25 (to be procured locally) to the joint.
   b) Give the drain piping a descending grade (1/50-1/100) and never create a bump to go over or a trap.
   c) In connecting drain pipes, care must be taken so as not to apply force to the unit side piping and fix the pipe at a point as close to the unit as possible.
   d) Do not create an air vent under any circumstances.
   e) When drain piping is implemented for more than one unit, provide a collecting main about 100 mm below the units' drain outlets from which it collects drain. Use a VP-30 or larger pipe for a collecting main.
   f) Do not fail to provide heat insulation at the following two points because they can cause dew condensation and a resultant water leak.
7. Drain socket
   After a drain test is completed, apply a pipe cover (small: accessory) onto the drain socket, cover the pipe cover (small), the clamp and part of the drain hose with a pipe cover (large: accessory) and wrap it with a tape completely without leaving any gaps.
   (Cut pipe covers into appropriate shapes)



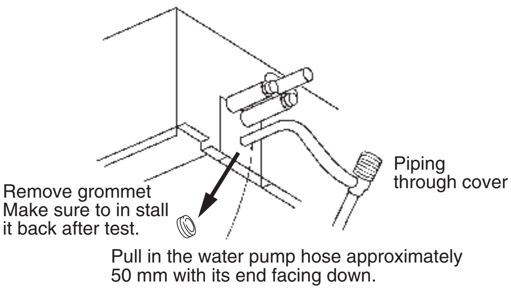
8. Hard PVC pipes laid indoor
   a) Since a drain pipe outlet can be raised up to 600 mm from the ceiling, use elbows, etc. to install drain pipes, it there are obstacles preventing normal drain pipe arrangement. When the drain pipe is raised at a point far from a unit, it can cause an overflow due to a back flow of drain upon stoppage, so arrange piping to keep the dimensions specified in the illustration shown on the left.
   b) Install the drain pipe outlet where no odor is likely to be generated.
   c) Do not lead the drain pipe into a ditch where the generation of harmful gas such as sulfuric gas or flammable gas is expected. A failure to observe this instruction may cause such harmful or flammable gas to flow into the room.

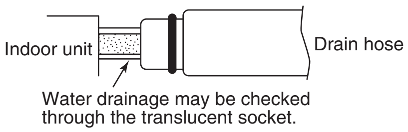
4.7.5 Drain test (Perform the drain test after the electrical wiring work has been finished.)

- Check that water is draining thoroughly during the test run, and that there are no water leaks from the joints.
- The test has to be performed even if the unit is installed in a season when the unit is used for heating.
- In a new house, perform the test before the ceiling is fitted.

Forced drain pump operation

- Setup from a unit side.
  ① Turn on DIP switch SW5-1 on the PCB of the indoor unit. The drain pump operates continuously.
  ② After the test, be sure to turn off the DIP switch.
  When electrical work is not completed, connect a convex joint to the drain pipe joint area, arrange an inlet and check leaks and drain conditions of the pipe.
- Setup from a remote controller side.
  Drain pump operation from a remote controller unit is possible. Operate a remote controller unit by following the steps described below.
  1. To start a forced drain pump operation
     ① Press the TEST button for three seconds or longer.
     The display will change from " ⬍ SELECT ITEM" → " (○) SET" → " TEST RUN ▼ "
     ② Press the ▼ button once while " TEST RUN ▲ " is displayed, and cause [DRAIN PUMP ⬍ " to be displayed.
     ③ When the SET button is pressed, a drain pump operation will start.
     Display: "DRAIN PUMP RUN" → " (○) → STOP"
  2. To cancel a drain pump operation.
     If either SET or ON/OFF button is pressed, a forced drain pump operation will stop.
     The air conditioning system will become OFF.



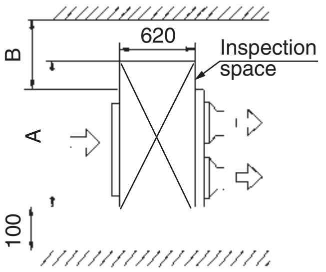


1) Remove the piping through cover, and using a water pump, pour about 1000cc of water, from the position shown in the left figure.
   Caution
   When pour water, be sure to perform the drain pump forced operation.
2) Check the drain-out section (transparent section) for normal flow of drainage.
3) Take off the drain plug to release the water. After water release has been confirmed, replace the drain plug as it was.
   Be careful not to get splashed when pulling the drain plug.
4) After the drain test, thoroughly insulate the drain pipe, up to the indoor unit.

4.8 Satellite Ducted Type (FDUMA)

4.8.1 Selection of installation location

1. Avoid installation and use at those places listed below.
   a) Places exposed to oil splashes or steam (e.g. kitchens and machine plants).
   Installation and use at such places will incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic resin parts.
   b) Places where corrosive gas (such as sulfurous acid gas) or inflammable gas (thinner, gasoline, etc.) is generated or remains. Installation and use at such places will cause corrosion in the heat exchanger and damage in molded synthetic resin parts.
   c) Places adjacent to equipment generating electromagnetic waves or high-frequency waves such as in hospitals. Generated noise may cause malfunctioning of the controller.
2. Select places for installation satisfying the following conditions and, at the same time, obtain the consent on the part of your client user.
   a) Places where cooled or heated air circulates freely. When the installation height exceeds 3m, warmed air stays close to the ceiling. In such cases, suggest your client users to install air circulators.
   b) Places where perfect drainage can be prepared and sufficient drainage gradient is available.
   c) Places free from air disturbances to the return air port and supply port of the indoor unit, places where the fire alarm may not malfunction to short circuit.
   d) Places with the environmental dew-point temperature is lower than 28°C and the relative humidity is less than 80%.
   (When installing at a place under a high humidity environment, pay sufficient attention to prevention of dewing such as thermally insulating the unit properly.)
3. Check if the selected place for installation is rigid enough to stand the weight of the unit.
   Otherwise, apply reinforcement using boards and beams before starting the installation work.

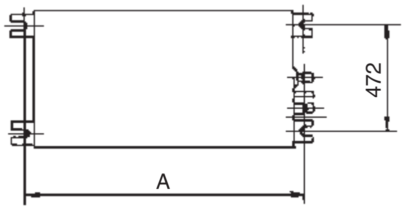


Unit : mm

Models \ Mark	A	B
FDUMA45, 56	1100	630
FDUMA71, 90	1300	830
FDUMA112, 140	1720	1250

4.8.2 Suspension

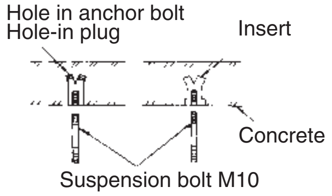
Be sure to observe the finished length of the suspension bolts given below.

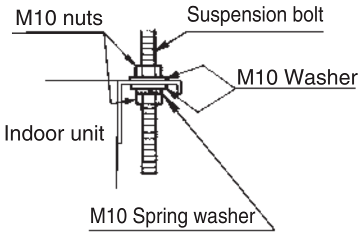


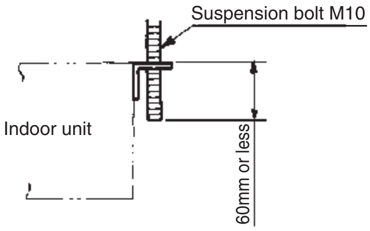
Unit : mm

Models \ Mark	A
FDUMA45, 56	786
FDUMA71, 90	986
FDUMA112, 140	1406

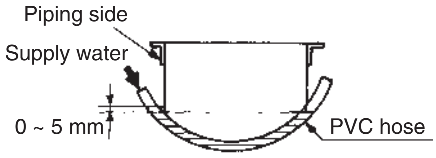
1. Fixing the suspension bolt (customer ordered parts M10)
   Securely fix the suspension bolt as illustrated below or in another way.







2. Adjusting the unitfs levelness
   a) Adjust the out-levelness using a level vial or by the following method.
      - Make adjustment so that the relation between the lower surface of the indoor unit proper and water level in the hose becomes given below.



Bring the piping side slightly lower

   b) Unless the levelness is adjusted properly, the malfunction of the float switch will occur.
3. Blower fan tap switch
   The following two methods are available in switching the blower fan tap. Switch to the high-speed tap with one of these methods.
   ① Set SW9-4 provided on the indoor unit PCB to ON.

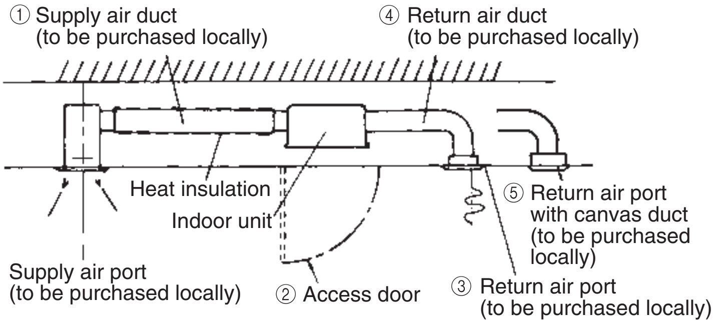
SW9-4	ON	Fan control, high speed (High ceiling)
	OFF	Fan control, standard

   ② By means of function setting from the remote control unit, set the setting ⓒ of "I/U FUNCTION ▲ " (indoor unit function) to "Hi CEILING 1" (high-speed tap) as shown below.

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

For the details of operating procedures, please refer to the installation manual of your remote control unit.

4.8.3 Duct installation



1. Supply air duct
   Same as FDRA series. Refer to page 292.
2. Access door
   Access door must be provided without fail.
   Dimensions of access door and service space
   (See exterior dimensions in page 104 to 114.)
3. Return air port
   An air filter is not included in the indoor unit. Use the return air port with air filter.
4. Return air duct: Use square duct.
5. Return air port with canvas duct
   1. Connection of intake and exhaust ducts.

Looking from top of unit

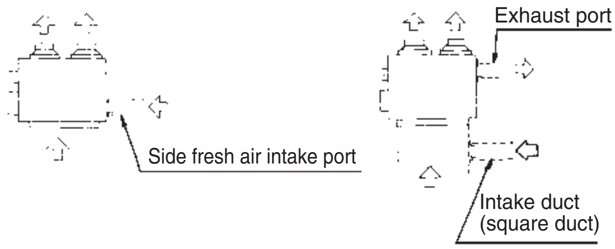
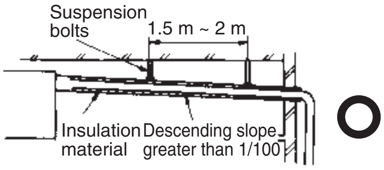


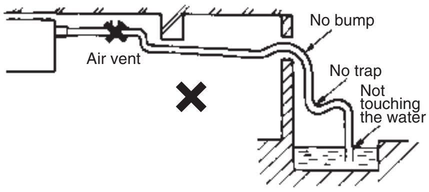
Fig.1 Fig.2

2. Duct connecting position.
   < Fresh air intake >
   a) Use side air intake port.
   b) In case of simultaneous intake and exhaust, the side air intake port cannot be used, therefore, take air from the midway air intake port along the intake duct.
   < Exhaust > Make sure to use suction as well.
   c) Use a side exhaust port.
3. Duct connection
   Use intake and exhaust duct flange of separately sold (for connection of ϕ125mm round duct) to connect ϕ125mm round duct. The duct clamped by bands must be thermally insulated to prevent dew condensation.

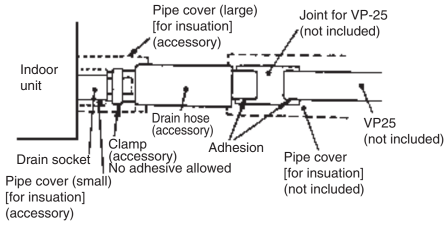
4.8.4 Drain piping

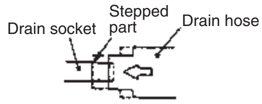
1. Glue the drain hose supplied as an accessory and a VP-25 joint before lifting the unit.



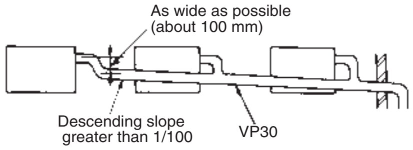


2. The drain hose is to provide a buffer to absorb a slight dislocation of the unit or the drain piping during installation work. If it is subject to abuse such as being bent or pulled deliberately, it may break, which will result in a water leak.
3. Care must be taken so as not to allow an adhesive to run into the drain hose. When it is hardened, it can cause a breakage of a flexible part, if the flexible part receives stress.

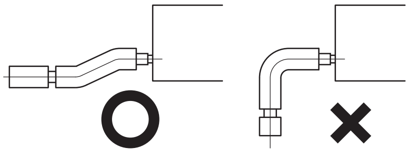


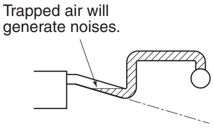


4. Use VP-25 general-purpose hard PVC pipes for drain piping.

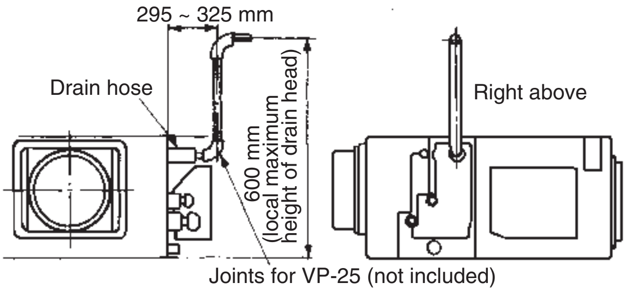


5. Insert the drain hose supplied as an accessory (soft PVC end) to the stepped part of the unit's drain socket and then fasten it with the clamp also supplied as an accessory.
6. Adhesive must not be used.
   a) Glue a VP-25 joint (to be procured locally) to joint it with the drain hose (hard PVC end) and then glue a VP-25 (to be procured locally) to the joint.
   b) Give the drain piping a descending grade (1/50-1/100) and never create a bump to go over or a trap.
   c) In connecting drain pipes, care must be taken so as not to apply force to the unit side piping and fix the pipe at a point as close to the unit as possible.
   d) Do not create an air vent under any circumstances.
   e) When drain piping is implemented for more than one unit, provide a collecting main about 100 mm below the units' drain outlets from which it collects drain. Use a VP-30 or larger pipe for a collecting main.
   f) Do not fail to provide heat insulation at the following two points because they can cause dew condensation and a resultant water leak.

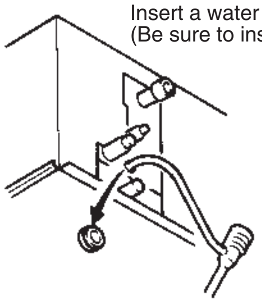




7. Drain socket
   After a drain test is completed, apply a pipe cover (small: accessory) onto the drain socket, cover the pipe cover (small), the clamp and part of the drain hose with a pipe cover (large: accessory) and wrap it with a tape completely without leaving any gaps.
   (Cut pipe covers into appropriate shapes)



8. Hard PVC pipes laid indoor
   a) Since a drain pipe outlet can be raised up to 600 mm from the ceiling, use elbows, etc. to install drain pipes, it there are obstacles preventing normal drain pipe arrangement. When the drain pipe is raised at a point far from a unit, it can cause an overflow due to a back flow of drain upon stoppage, so arrange piping to keep the dimensions specified in the illustration shown on the left.
   b) Install the drain pipe outlet where no odor is likely to be generated.
   c) Do not lead the drain pipe into a ditch where the generation of harmful gas such as sulfuric gas or flammable gas is expected. A failure to observe this instruction may cause such harmful or flammable gas to flow into the room.
9. Drainage test
   a) During trial operation, make sure that drainage is properly execued and check that leakage is not found at connections.
   b) Be sure to carry out a drainage test when installing the system during a heating season.
   c) When installing the system in a building under construction, carry out the drainage test before ceiling tiles are installed.



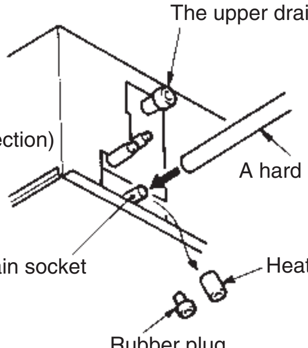
① Supply approx 1000cc of water through the outlet of the unit using a feed water pump.
② Make sure that drainage is proceeding properly at the see-through outlet of the unit.
* Also confirm the revolving sound of the condensate motor when checking the drainage.
③ Then remove the drain plug at lower section of the unit to drain water off. After making sure water is not left, restore the drain plug to the original position.

Forced drain pump operation

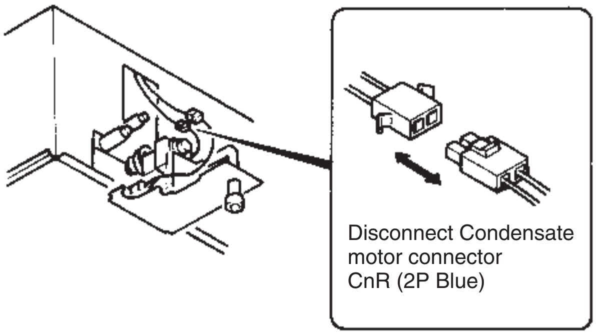
■ Setup from a unit side.
① Turn on DIP switch SW5-1 on the PCB of the indoor unit. The drain pump operates continuously.
② After the test, be sure to turn off the DIP switch.
When electrical work is not completed, connect a convex joint to the drain pipe joint area, arrange an inlet and check leaks and drain conditions of the pipe.

■ Setup from a remote controller side.
Drain pump operation from a remote controller unit is possible. Operate a remote controller unit by following the steps described below.

1. To start a forced drain pump operation
   ① Press the TEST button for three seconds or longer.
   The display will change from " ⇕ SELECT ITEM" → " ○ SET" → " TEST RUN ▼ "
   ② Press the ▼ button once while " TEST RUN ▼ " is displayed, and cause "DRAIN PUMP ⇕ " to be displayed.
   ③ When the SET button is pressed, a drain pump operation will start.
   Display: "DRAIN PUMP RUN" → " ○ → STOP"
2. To cancel a drain pump operation.
   ① If either SET or ON/OFF button is pressed, a forced drain pump operation will stop.
   The air conditioning system will become OFF.



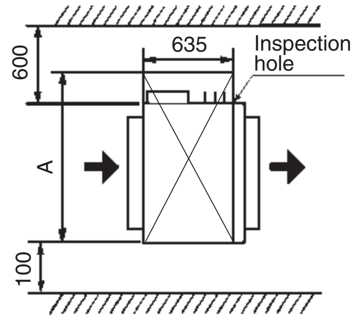
10. Drainage from the lower drain socket
    Only if the drain pipe can be installed in a downhill grade (1/50-1/100), the lower drain socket can be used for connecting to the drain pipe as illustrated.
    (Disconnect the connector for the drain motor)
    As shown in the sketch to the right, disconnect the drain motor connector CnR (blue color coding).
    If the system is started with this connector connected as is, drain water is discharged out of the upper drain socket causing a heavy water lekage.



4.9 Ceiling Mounted Duct Type (FDURA)

4.9.1 Selection of installation location

1. Avoid installation and use at those places listed below.
   a) Places exposed to oil splashes or steam (e.g. kitchens and machine plants).
      Installation and use at such places will incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic resin parts.
   b) Places where corrosive gas (such as sulfurous acid gas) or inflammable gas (thinner, gasoline, etc.) is gnerated or remains. Installation and use at such places will cause corrosion in the heat exchanger and damage in molded synthetic resin parts.
   c) Places adjacent to equipment generating electromagnetic waves or high-frequency waves such as in hospitals. Generated noise may cause malfunctioning of the controller.
2. Select places for installation satisfying the following conditions and, at the same time, obtain the consent on the part of your client user.
   a) Places where cooled or heated air circulates freely. When the installation height exceeds 3m, warmed air stays close to the ceiling. In such cases, suggest your client users to install air circulators.
   b) Places where perfect drainage can be prepared and sufficient drainage gradient is available.
   c) Places free from air disturbances to the return air port and supply hole of the indoor unit, places where the fire alarm may not malfunction to short circuit.
   d) Places with the environmental dew-point temperature is lower than 28°C and the relative humidity is less than 80%.
      (When installing at a place under a high humidity environment, pay sufficient attention to prevention of dewing such as thermally insulating the unit properly.)
3. Check if the selected place for installation is rigid enough to stand the weight of thew unit.
   Otherwise, apply reinforcement using boards and beams before starting the installation work.

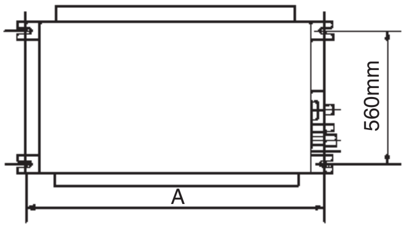


Unit : mm

Models \ Mark	A
FDURA45, 56, 71	1200
FDURA90, 112, 140	1720

4.9.2 Suspension

Be sure to observe the finished length of the suspension bolts given below.

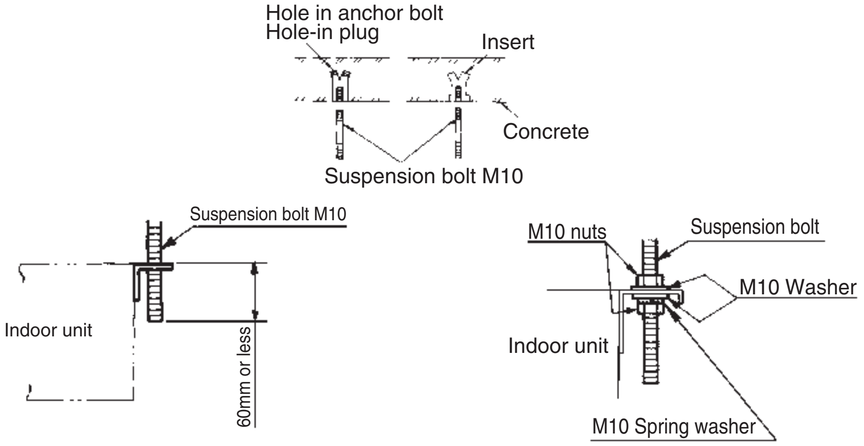


Unit : mm

Models \ Mark	A
FDURA45, 56, 71	886
FDURA90, 112, 140	1406

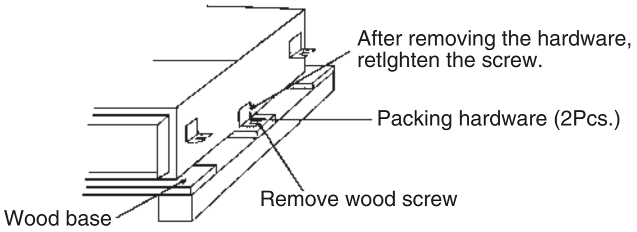
Fixing the suspension bolt (customer ordered parts M10)

Securely fix the suspension bolt as illustrated below or in another way.



4.9.3 Installation of indoor unit packing hardware

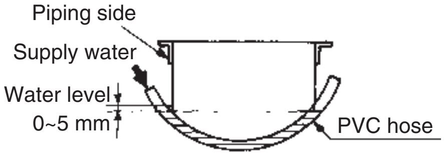
Two pieces of packing handware are used.
Discard them after unpacking.



When installing the unit, heed must be taken that the side touching the wood frame is the top surface of the unit.

Fix the indoor unit to the hanger bolts.
If required, it is possible to suspend the unit to the beam,etc.
Directly by use of the bolts without using the hanger bolts.
Note (1) When the dimensions of indoor unit and ceiling holes does not match, it can be adjusted with the slot holes of hanging bracket.

1. Adjusting the unit's levelness
   a) Adjust the out-levelness using a level vial or by the following method.
   Make adjustment so that the relation between the lower surface of the unit proper and water level in the hose becomes given below.



Bring the piping side slightly lower

   b) Unless the levelness is adjusted properly, the malfunction of the float switch will occur.
2. Blower fan tap switch
   The following two methods are available in switching the blower fan tap. Switch to the high-speed tap with one of these methods.
   ① Set SW9-4 provided on the indoor unit PCB to ON.

SW9 - 4	ON	Fan control, high speed (High ceiling)
	OFF	Fan control, standard

   By means of function setting from the remote control unit, set the setting Ⓒ of "I/U FUNCTION ▲ " (indoor unit function) to "Hi CEILING 1" (high-speed tap) as shown below.

Function number Ⓐ	Function description Ⓑ	Setting Ⓒ
01	Hi CEILING SET	Hi CEILING 1

   For the details of operating procedures, please refer to the installation manual of your remote control unit.

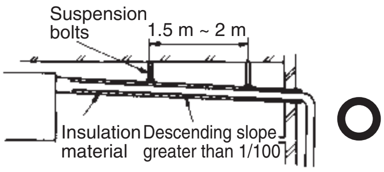
Unit : Pa

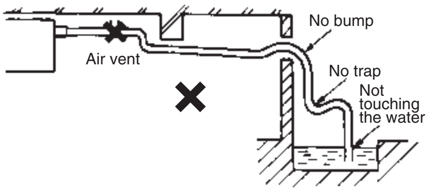
Static Pressure / Models	Standard tap	High tap
FDURA45, 56, 71	50	85
FDURA90, 112, 140	50	130

CAUTION (1) Taps should not be used under static pressure outside the unit mentioned above. Dew condensation may occur with the unit and wet the ceiling or furniture.
(2) Do not use under static pressure outside the unit of 50Pa or less. Water drops may be blown from the diffuser outlet of the unit and wet the ceiling or furniture.

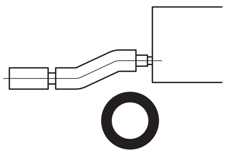
4.9.4 Drain piping

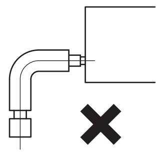
1. Glue the drain hose supplied as an accessory and a VP-25 joint before lifting the unit.

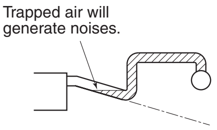




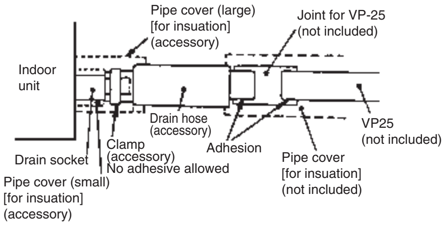
2. The drain hose is to provide a buffer to absorb a slight dislocation of the unit or the drain piping during installation work. If it is subject to abuse such as being bent or pulled deliberately, it may break, which will result in a water leak.

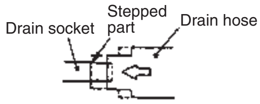




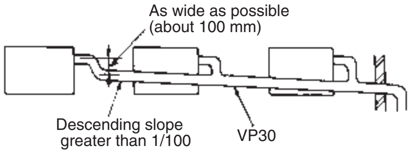


3. Care must be taken so as not to allow an adhesive to run into the drain hose. When it is hardened, it can cause a breakage of a flexible part, if the flexible part receives stress.

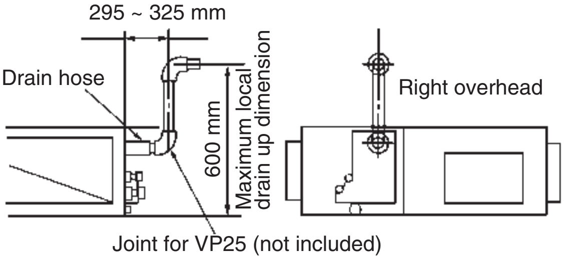




4. Use VP-25 general-purpose hard PVC pipes for drain piping.



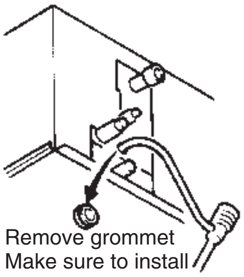
5. Insert the drain hose supplied as an accessory (soft PVC end) to the stepped part of the unit's drain socket and then fasten it with the clamp also supplied as an accessory.
6. Adhesive must not be used.
   a) Glue a VP-25 joint (to be procured locally) to joint it with the drain hose (hard PVC end) and then glue a VP-25 (to be procured locally) to the joint.
   b) Give the drain piping a descending grade (1/50-1/100) and never create a bump to go over or a trap.
   c) In connecting drain pipes, care must be taken so as not to apply force to the unit side piping and fix the pipe at a point as close to the unit as possible.
   d) Do not create an air vent under any circumstances.
   e) When drain piping is implemented for more than one unit, provide a collecting main about 100 mm below the units' drain outlets from which it collects drain. Use a VP-30 or larger pipe for a collecting main.
   f) Do not fail to provide heat insulation at the following two points because they can cause dew condensation and a resultant water leak.
7. Drain socket
   After a drain test is completed, apply a pipe cover (small: accessory) onto the drain socket, cover the pipe cover (small), the clamp and part of the drain hose with a pipe cover (large: accessory) and wrap it with a tape completely without leaving any gaps.
   (Cut pipe covers into appropriate shapes)

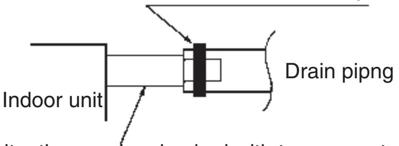


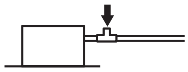
8. Hard PVC pipes laid indoor
   a) Since a drain pipe outlet can be raised up to 600 mm from the ceiling, use elbows, etc. to install drain pipes, it there are obstacles preventing normal drain pipe arrangement. When the drain pipe is raised at a point far from a unit, it can cause an overflow due to a back flow of drain upon stoppage, so arrange piping to keep the dimensions specified in the illustration shown on the left.
   b) Install the drain pipe outlet where no odor is likely to be generated.
   c) Do not lead the drain pipe into a ditch where the generation of harmful gas such as sulfuric gas or flammable gas is expected. A failure to observe this instruction may cause such harmful or flammable gas to flow into the room.
9. Drainage test
   1) Conduct a drainage test after completion of the electrical work.
   2) During the trial, make sure that drain flows properly through the piping and that no water leaks from connections.
   3) In case of a new building, conduct the test before it is furnished with the ceiling.
   4) Be sure to conduct this test even when the unit is installed in the heating season.

Procedures

① Supply about 1000 cc of water to the unit through ghe air outlet by using a feed water pump.
② Check the drain while cooling operation.



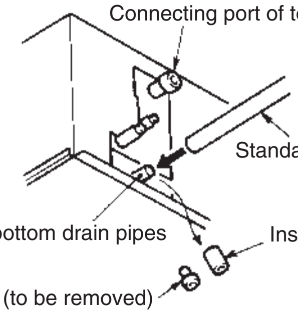




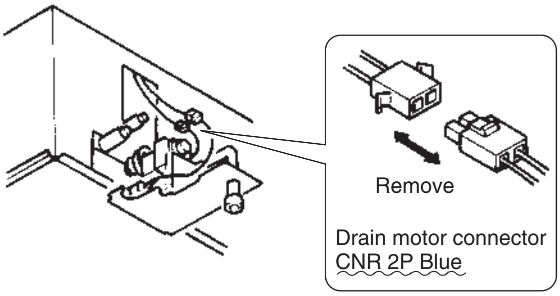
(If the electrical work has not been completed, connect a convex joint in the drain pipe connection to provide a water inlet.
Then, check if water leaks from the piping system and that drain flows through the drain pipe normally.)

10. Outline of bottom drain piping work
    a) If the bottom drain piping can be done with a descending gradient (1/50-1/100), it is possible to connect the pipes as shown in the drawing below.

[Connection of pipes]
(Removing drain motor connector)
Remove drain motor connector CNP (blue) as shown in the drawing on the nght. (Note: If the connector is left connected, drain water is discharged from the conncting port of top pipes, causing leakage.)



    b) Do not use acetone-based adhesives to connect to the drain socket.



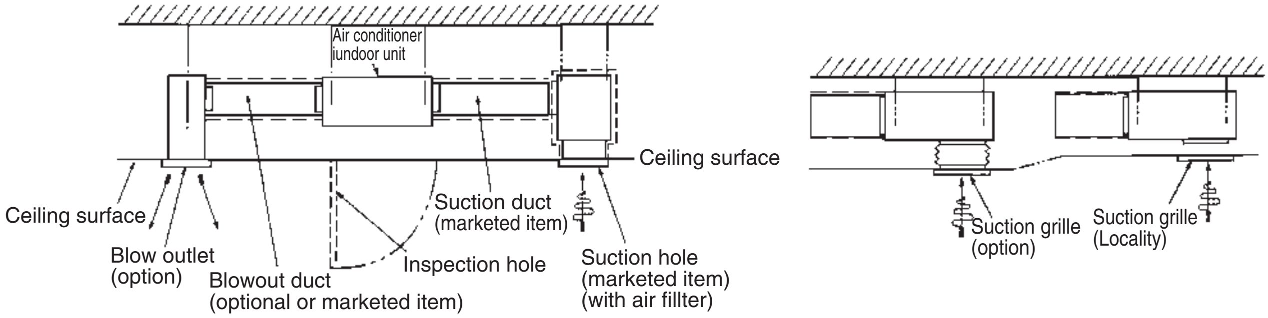
Forced drain pump operation

■Setup from a unit side.
① Turn on DIP switch SW5-1 on the PCB of the indoor unit. The drain pump operates continuously.
② After the test, be sure to turn off the DIP switch.
When electrical work is not completed, connect a convex joint to the drain pipe joint area, arrange an inlet and check leaks and drain conditions of the pipe.

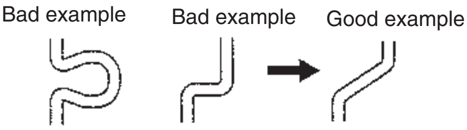
■Setup from a remote controller side.
Drain pump operation from a remote controller unit is possible. Operate a remote controller unit by following the steps described below.

1. To start a forced drain pump operation
   ① Press the TEST button for three seconds or longer.
   The display will change from " ⇕☝ SELECT ITEM" → " ⬭☝ SET → " ⁂ TEST RUN ▼ "
   ② Press the ▼ button once while " ⁂ TEST RUN ▼ " is displayed, and cause "DRAIN PUMP ⇕ " to be displayed.
   ③ When the SET button is pressed, a drain pump operation will start.
   Display: "DRAIN PUMP RUN" → " ⬭☝ → STOP"
2. To cancel a drain pump operation.
   If either SET or ON/OFF button is pressed, a forced drain pump operation will stop.
   The air conditioning system will become OFF.

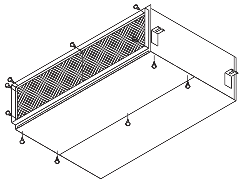
4.9.5 Duct work



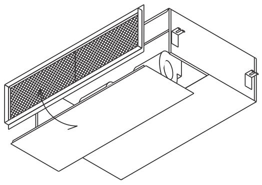
1. A corrugated board (for preventing sputtering) is attached to the main body of the air conditioner (on the outlet port). Do not remove it until connecting the duct.
   a) An air filter is provided on the main body of the air conditioner (on the inlet port). Remove it when connecting the duct on the inlet port.
2. Blowout duct
   a) Reduce the length of duct as much as possible.
   b) Reduce the number of bends as much as possible.
   c) (Corner R should be as larger as possible.)



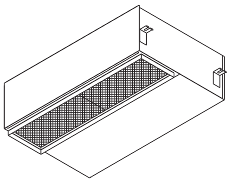
   d) Conduct the duct installation work before finishing the ceiling.
3. Inlet port
   a) When shipped, the inlet port lies on the back.
   b) When connecting the duct to the inlet port, remove the air filter fitted to the inlet port.
   c) When placing the inlet port to carry out suction from the bottom side, use the following procedure to replace the suction duct joint and the bottom plate.



•Remove the screws which fasten the bottom plate and the duct joiht on the inlet port side of the unit.



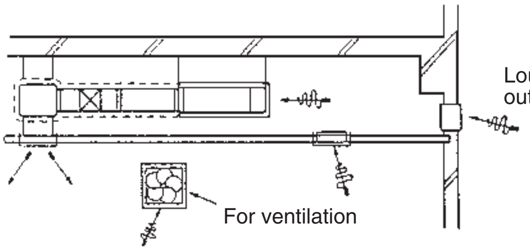
•Replace the removed bottom plate and duct joint



•Fit the duct joint with a screw, fit the bottom plate.

4. Make sure to insulate the duct to prevent dewing on it.
5. Location and form of blow outlet should be selected so that air from the outlet will be distributed all over the room, and equipped with a device to control air volume.
6. Make sure provide an inspection hole on the ceiling. It is indispensable to service electric equipment, motor, functional components and cleaning of heat exchanger.

Bad example of duct work



7. If a duct is not provided at the suction side but it is substituted with the space over the ceiling, humidity in the space will increase by the influence of capacity of ventilation fan, strength of wind blowing against the out door air louver, weather (rainy day) and others.

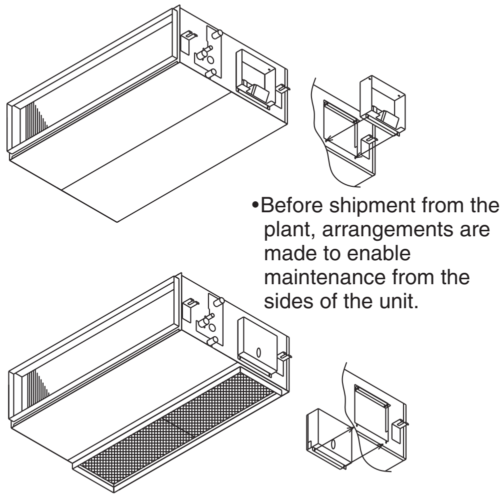
Notes (1) Moisture in air is likely to condense over the external plates of the unit and to drip on the ceiling.
Unit should be operated under the conditions as listed in the above table and within the limitation of air flow rate.
When the building is a concrete structure, especially immediately after the construction, humidity tends to rise even if the space over the ceiling is not substituted in place of a duct. In such occasion, it is necessary to insulate the entire unit with glass wool (25mm). (Use a wire net or equivalent to hold the glass wool in place.)

(2) It may run out the allowable limit of unit operation (Example: When outdoor air temperature is 35°C DB, suction air temperature is 27°C WB) and it could result in such troubles as compressor overload, etc..

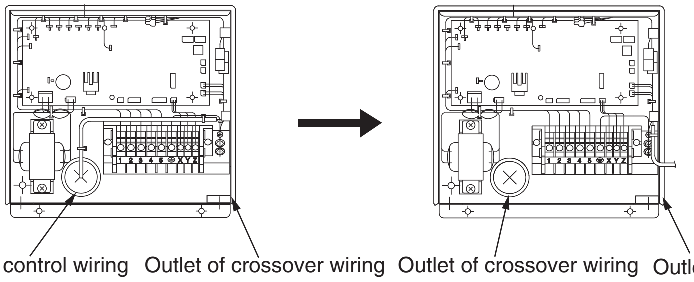
(3) There is a possibillty that the fan air volume may exceed the allowable range of operation due to the capacity of ventilation fan or strength of wind blowing against external air louver so that drainage from be heat exchanger may fail to reach the drain pan but leak outside (e. g. drip on to the ceiling) with consequential water leakage in the room.

4.9.6 Control box (Only case of FDURA90, 112, 140)

- During bottom side suction, the orientation of the control box can be changed to allow the control box to be maintained from the inlet port.



1. Remove the bottom plate (on the inlet port side), and all wiring connectors from the control box.
2. Remove the three screws that fasten the cabinet inside the control box.
3. Pull the control box toward the outside of the unit.
4. Change the exit position of the wiring from inside the control box.
5. Fit the control box from the inside of the unit.
6. Fit the three screws that fasten the cabinet.
7. Correctly connect all wiring connectors.



4.10 Ceiling Suspension Type (FDEA)

4.10.1 Selection of installation location

1. A place where good air circulation and delivery can be obtained.
   Cold air throw

Unit: m

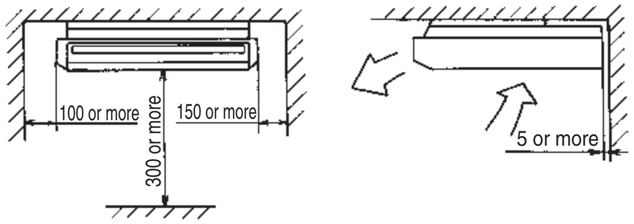
Models	FDEA36, 45	FDEA56, 71	FDEA112, 140
Air throw	7.5	8	9

Conditions
① Installation height: 2.4 ~ 3.0 m above the floor
② Fan speed: Hi
③ Location: Free space without obstacles
④ Distance of reach indicates the horizontal distance after the wind touched down the floor.
⑤ Air velocity at the throw: 0.5 (m / sec.)

2. A place where ceiling has enough strength to support the unit.
3. A place where there is no obstruction to the return air inlet and supply air outlet ports.
4. Places exposed to oil splashes or steam (e.g. kitchens and machine plants).
   Installation and use at such places will incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic resin parts.
5. A place where the space shown below may be secured.

Ceiling mouting installation

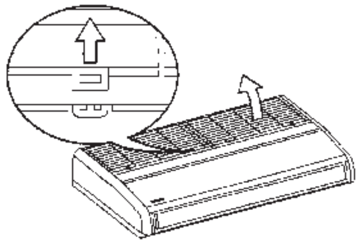
Unit : mm

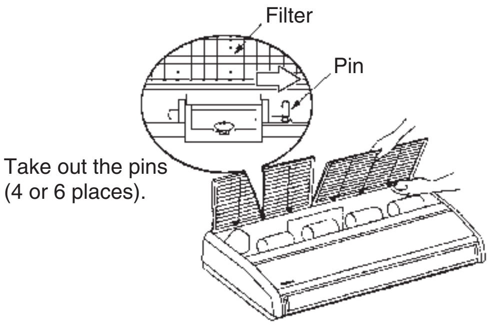


6. This unit uses a microcomputer as a control device. Therefore avoid installing the unit near the equipment that generates strong electromagnetic waves and noise.

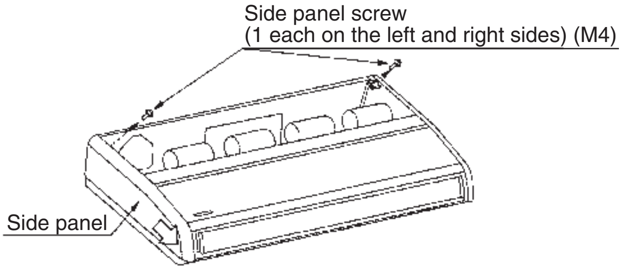
4.10.2 Installation preparation

1. Remove the air inlet grille.
   Slide the stoppers (4 places).

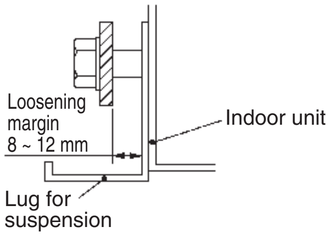


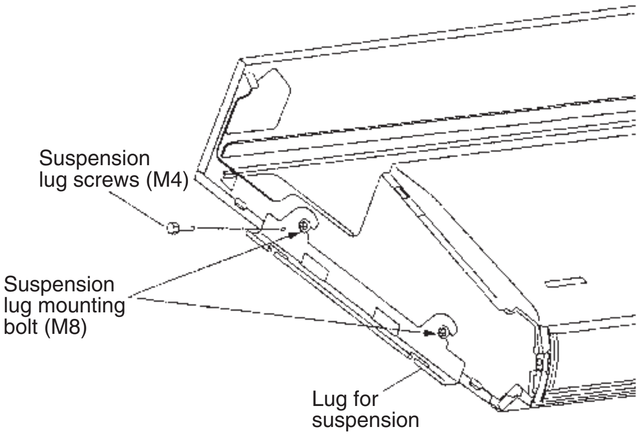


2. Remove the side panels.
   Take out the screws, then slide the side panels in the arrow direction to remove them.

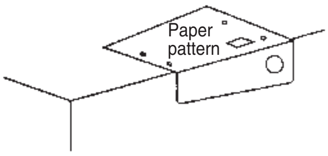


3. Remove the suspension lug.
   Take out the screws, then loosen the installation bolt.

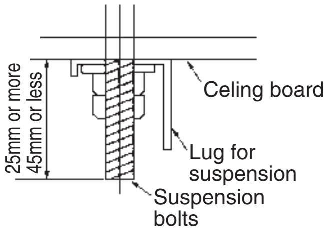


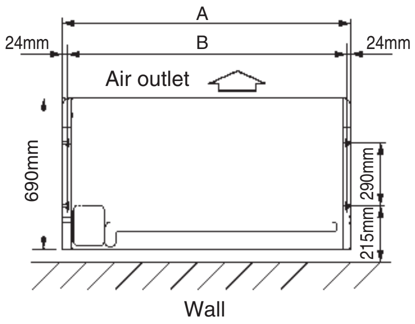


4. Suspension bolt position
   a) Using the paper pattern supplied as an accessory as a criterion, select suspension bolt positions and piping hole positions, then install the suspension bolts and make holes for piping. After positioning, remove the paper pattern.



   b) Keep strictly to the suspension bolt lengths specified below.



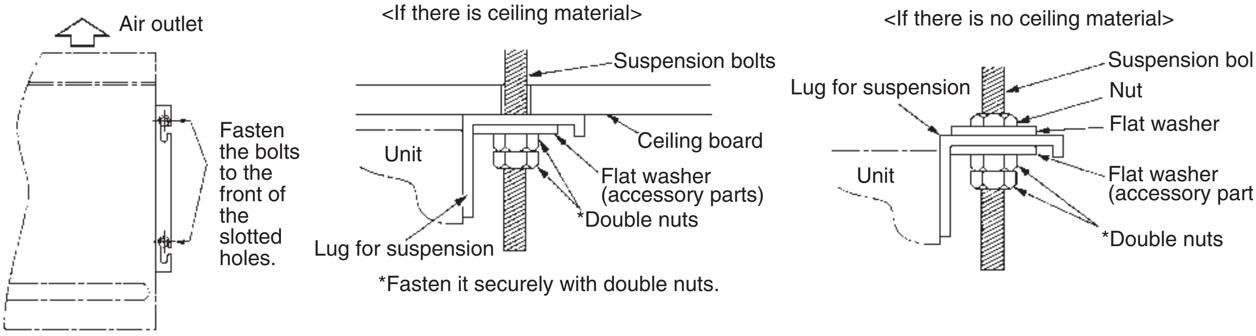


Unit : mm

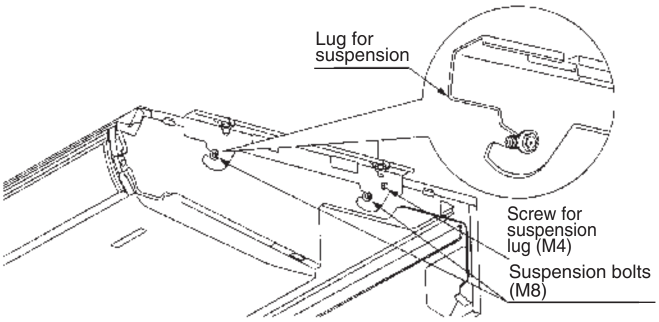
Model	A	B
FDEA 36, 45	1070	1022
FDEA 56, 71	1320	1272
FDEA 112, 140	1620	1572

4.10.3 Installation

1. Fasten the suspension lugs to the suspension bolts.

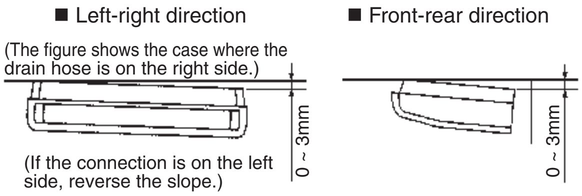


2. Attach the unit to the suspension lugs.
   ① Slide the unit onto the suspension lugs from the front, hanging it on the bolts.
   ② Fasten the unit securely on the left and right sides with 4 suspension bolts (M8).
   ③ Tighten the 2 screws (M4) on the left and right sides.



Note (1) After sliding the side panels on from the front to rear, fasten them securely with the screws.

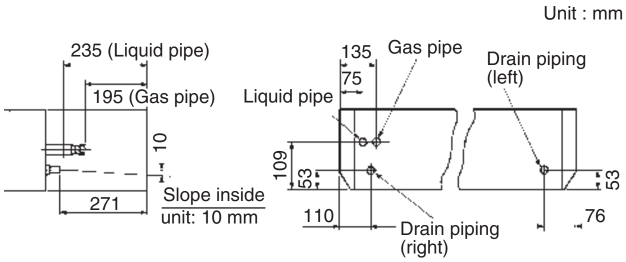
3. In order to make it easier for water to drain out. install the unit so that the water drain side slopes downward.



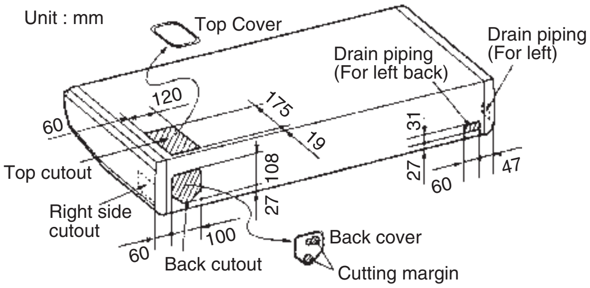
⚠ **Note**: If the slope is reversed, there is danger of water leaking out.

4.10.4 Refrigerant piping

1. Piping position



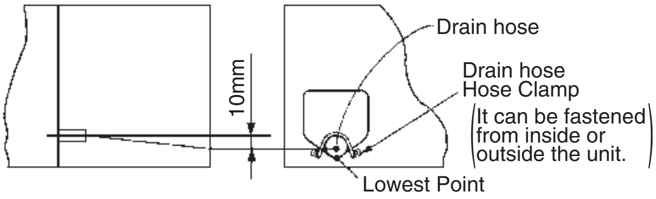
2. Piping connection position
   Piping can be connection from 3 different directions. Remove the cutout from hole where the piping will be connected using side cutters or similar tool. Cut a hole for the piping connection in the back cover according to the cutting margin shown. Cut a hole in the ceiling side in accordance with the position of the piping. Also, after the piping is installed, seal the space around the piping with putty, etc. to keep dust from getting inside the unit. (In order to prevent damage to wires from the edges, be sure to use the back and top covers.)



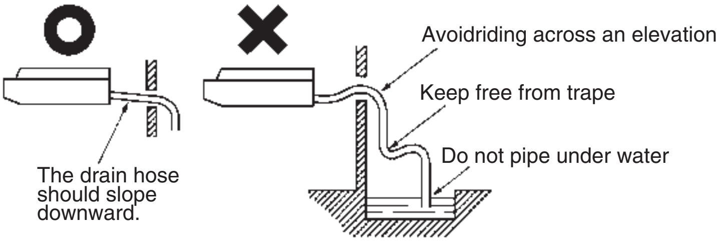
4.10.5 Drain piping

1. Drain piping can be connected from the back, right and left sides.
2. When installing drain piping, be sure to use the insulating material supplied for the drain hose and drain hose clamp.
   (a) Connect the drain hose fully all the way to the base of the fitting.
   (b) Fasten the hose securely with the drain hose clamp.
   (c) Keep strictly within the lengths specified below for the suspension bolts.
3. If drain piping is installed on the left side, change the rubber plug and insulating material (tubular) from the left side piping connection port to the right side.
   ⚠ **Note**: Be careful that water doesn't pour out when the drain plug is removed.

   ⚠ **Warning**: Use the fitting supplied with the unit to connect the drain hose, fastening it at the lowest point so that there is no slack, and establishing a 10 mm drain slope.
   * Keep electrical wiring from running beneath the drain hose.



⚠ **Note**: Be sure to fasten the drain hose down with a clamp.
There is danger of water overflowing the drain hose.



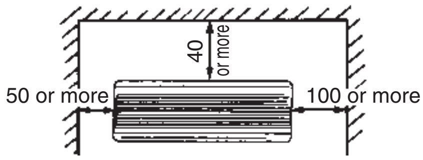
4. After piping has been installed, check to make sure water drains well and that there is no overflow.

4.11 Wall Mounted Type (FDKA)

4.11.1 FDKA22~56KXE4A

4.11.1.1 Selection of installation location

Unit : mm



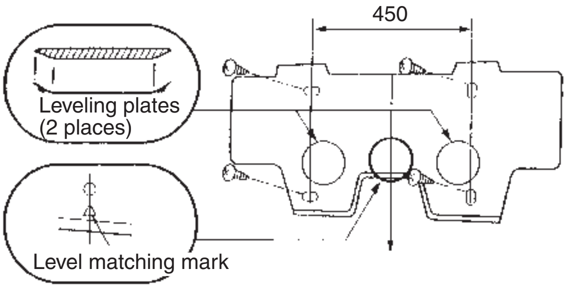
Select the installation location that meets the following conditions and obtain the customer's consent.

a) Location where cold and warm air spread all over the room.
b) Location where piping and wiring to the outdoors can easily be laid down.
c) Location where the drain can be discharged completely.
d) Location where the wall to mount the unit is rigid.
e) Location where there is no wind obstruction to the return air and supply air grills.
f) Location not exposed to direct sunshine.
g) Avoid the location exposed to oil splash or vapor.
h) Avoid the location near to the machine emitting high-frequency radio wave.
i) Avoid the location where the receiver of remote control is subject to strong illumination.
j) Select the location where the unit can securely be operated by the wireless remote controller referring to the Article "Effective distance of wireless remote controller" indicated at the backside.
k) Secure the space for inspection and maintenance work.

4.11.1.2 Attaching of mounting plate

1. The indoor unit weighs approx, FDKA22~56 model : 12kg. Therefore, check whether the portion to install the unit can bear the weight of unit. If it seems to be danger, reinforce the portion by a plate or a beam before installing the unit. It is not allowed to install the unit directly on the wall. Whenever you install the unit, use the attached mounting plate.
2. Find structural members (Intermediate pillar, etc.) suitable for mounting the unit, then install the unit firmly while checking levelness.

Unit : mm



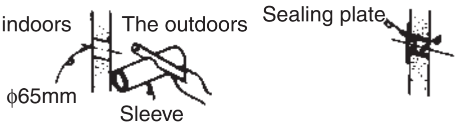
3. Adjust the level of mounting plate under the condition that four screws are tightened temporarily.

4. Turn the mounting plate around the reference hole to adjust the levelness.

⚠ **WARNING** Install the unit where it can bear the weight with sufficient strength margin. In the case of insufficient strength or insufficient installation work, the unit may fall and cause injury.

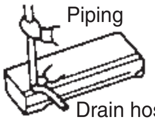
4.11.1.3 Procedure for making hole on the wall

Make a downgrade (5°) from the indoors toward the outdoors.



4.11.1.4 Forming of piping and drain hose

1. Rear take out case
   a) Forming of piping



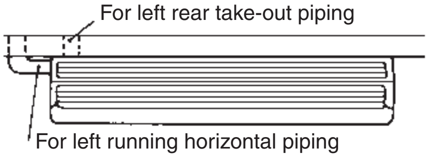
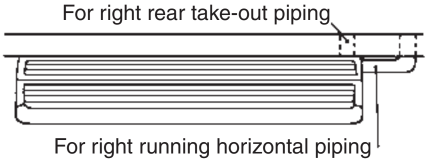
Hold the root portion of piping, change the direction then expand and make forming.

   b) Tape winding

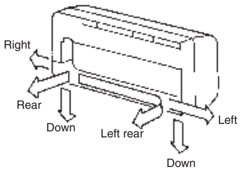
Wind the tape on the portion which passes through the hole on the wall.
Always make taping on the wiring which crosses with the piping, if any.

Note (1)After forming of piping and before tape winding, confirm that the connecting wire is securely fixed to the terminal block.

2. Cautions for left take-out and rear take-out case
   a) Looking down

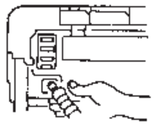
For left running horizontal piping	For right running horizontal piping
	

   b) The piping can be taken out from the rear, left, left rear, right and down.

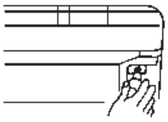


   c) Procedure for changing drain hose

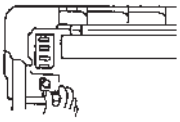
① Remove the drain hose.
Pull the drain hose off while turning the end around.



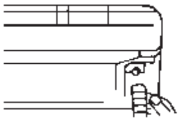
② Remove the drain cap.
Remove by hand or pliers.



③ Insert the drain cap.
Insert the drain cap which was removed in procedure 2 securely using a hexagonal wrench, etc.
⚠ **Note** When it is not inserted securely, water leakage may occur.

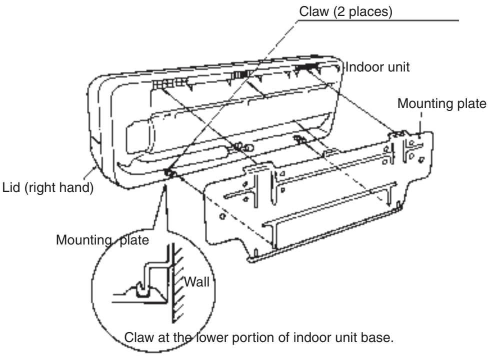


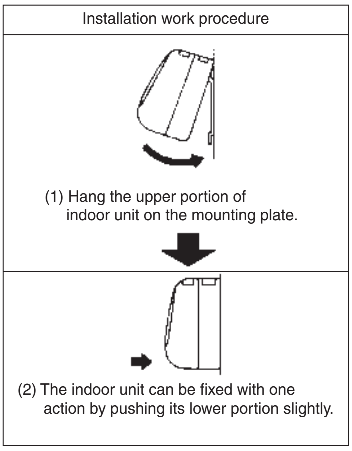
④ Connect the drain hose.
Push the end of the drain hose onto the fitting while turning it around
Note When it is not inserted securely, water leakage may occur.



4.11.1.5 Installation of unit

To remove the unit from the mounting plate, remove the right and left lids then remove the claw at the lower portion of base.





4.11.1.6 Drain piping

1. Lay the drain piping with downgrade to facilitate flow of drain,and do not make a trap or chevron-shaped bend. (The drain piping can be taken out from the unit to the left, right, rear and down direction.)
2. Wrap the thermal insulator on the hard vinyl chloride pipe (VP-16) laid in the room.
3. Run the drain piping in a place where there is no fear of abnormal odors being generated at the end of the drain hose.
4. Do not run the drain piping directly into a sewer where sulfur-based poisonous or flammable gases are generated. There is danger of poisonous or flammable gases penetrating into the building through the drain piping.
5. Pour water into the drain pan below the heat exchanger to check that water is drained outdoors.

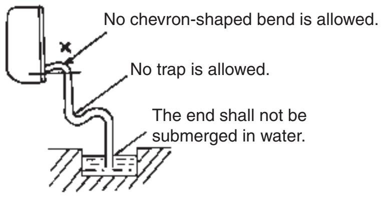
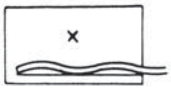


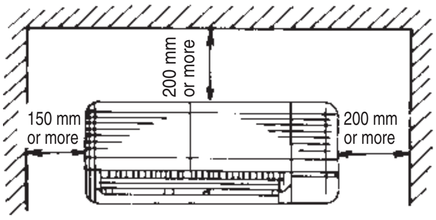
Illustration showing the end of drain hose



4.11.2 FDKA71KXE4A

4.11.2.1 Selection of installation location

1. Select the best position and direction depending on the shape of room and height of ceiling to ensure that the cooled or warmed air will be circulated sufficiently.



Cold air throw Unit : m

Item \ Model	FDKA71
Air throw	8

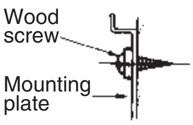
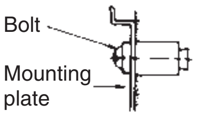
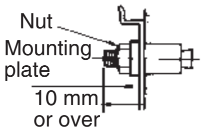
[Conditions]

① Fan speed: Hi
② Location: Free space without obstacles
③ Distance of reach indicates the horizontal distance after the wind touched down the floor.
④ Air yelocity at the throw:0.5 (m/sec.)

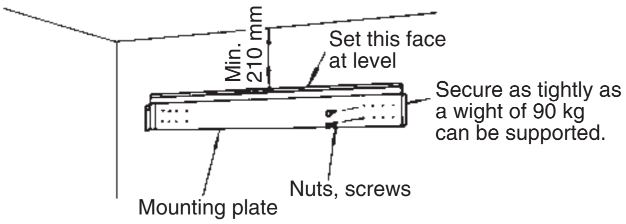
2. Where there is no obstacle around the air inlet port or air outlet port.
3. Where a sufficient space can be reserved for the service of air filter and the attachment/removal of panels.
4. Places exposed to oil splashes or steam (e.g. kitchens and machine plants).
   Installation and use at such place will incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic resin parts.
5. Where pipes and wires can be arranged conveniently.
6. On the solid floor
7. Where the unit is not exposed directly to sun light.
8. Place where corrosive gas (such as sulfurous acid gas) or inflammable gas (thinner, gasoline, etc.) is generated or remains.
   Installation and use at such places will cause corrosion in the heat exchanger and damage in molded synthetic resin parts.
9. Where a complete draining can be assured.
10. Where a sufficient space can be reserved for service.

4.11.2.2 Method to install the mounting plate

1. Indoor unit weighs about 20 kgs. Be sure to check closely the installation place and, if any risk is expected, provide a sufficient reinforcement with plates or beams. Indoor unit cannot be secured directly on the wall, etc. Attached mounting plate must be used.

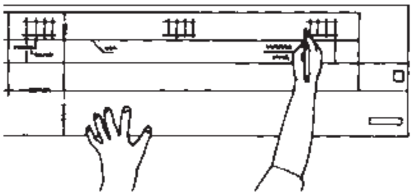
Wooden wall	Concrete wall (Use marketed anchors (M6))	
	Example of nut anchor	Example of bolt anchor
		

2. When installing a mounting plate on the wall, adjust it at level precisely and fix securely. Use the marketed anchor bolts (M6) when the wall is made of concrete.

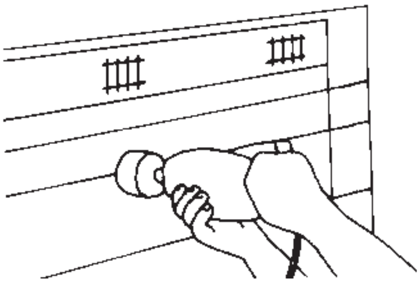


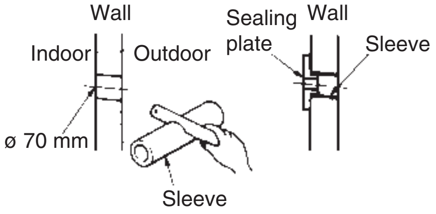
4.11.2.3 Installation

1. Use an attached pattern sheet and mark the position of screws to attach the mounting plate.



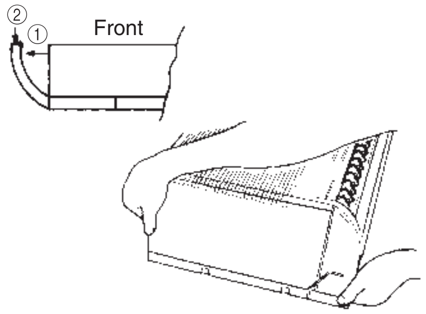
2. Determine the direction to lead the pipe and bore a through hole on the wall aligning with the pipe hole of unit.



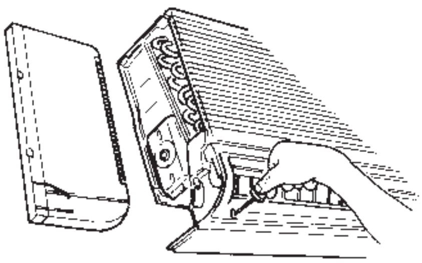


Cut the sleeve for the thickness of wall and insert in the hole.

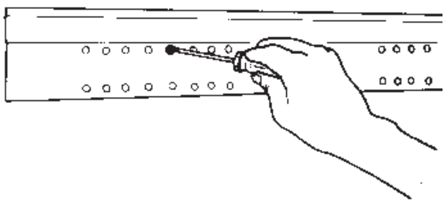
3. Remove screws (2 pcs.) and remove the right and left panels from the Indoor unit. (Remove screws first, move slightl to remove.)



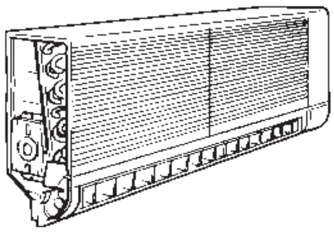
4. Remove the lower panel from the Indoor unit. It can be remove if 3 screws are loosened but not removed.



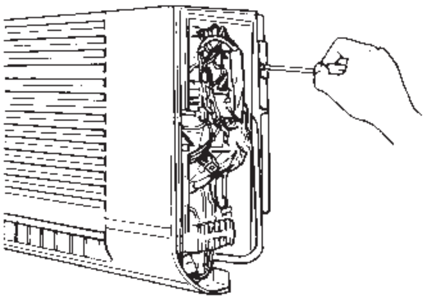
5. Secure the mounting plate with screws at a selected place on the wall. When the wall is made of concrete, use the marketed anchor bolts (M6)



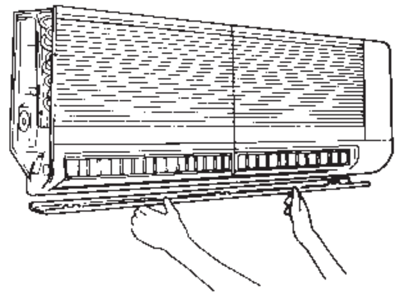
6. Hook and install the indoor unit on the mounting plate from top. Hook slightly at left at first and return to right.



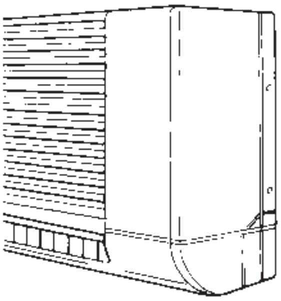
7. Fix the indoor unit on the mounting plate with a screw.



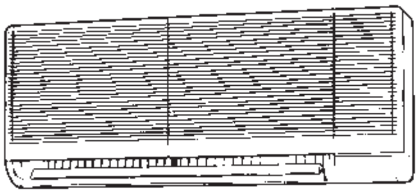
8. Install the lower panel at the original position.



9. Install the right and left side panels at their original position.



10. This is all for the installation.



4.12 Floor Standing Exposed Type (FDFLA)

4.12.1 Selection of installation location

1. A place where good air circulation and delivery can be obtained.

   Cold air throw   Unit : m

Item \ Models	All models
Air throw	4

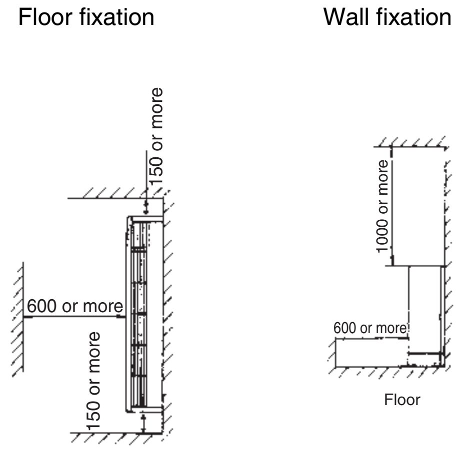
   [Conditions]

   ① Fan speed: Hi
   ② Location: Free space without obstacles
   ③ Distance of reach indicates the horizontal distance after the wind touched down the floor.
   ④ Air velocity at the throw: 0.5 (m/sec.)

2. Where there is no obstacle around the Air inlet port or Air outlet port.
3. Where a sufficient space can be reserved for the service of air filter and the attachment/removal of panels.
4. Places exposed to oil splashes or steam (e.g. kitchens and machine plants).
   Installation and use at such places will incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic resin parts.
5. Where pipes and wires can be arranged conveniently.
6. On the solid floor
7. Where the unit is not exposed directly to sun light.
8. Places where corrosive gas (such as sulfurous acid gas) or inflammable gas (thinner, gasoline, etc.) is generated or remains.
   Installation and use at such place will cause corrosion in the heat exchanger and damage in molded synthtic resin parts.
9. Where a complete draining can be assured.
10. Where a sufficient space can be reserved for service.

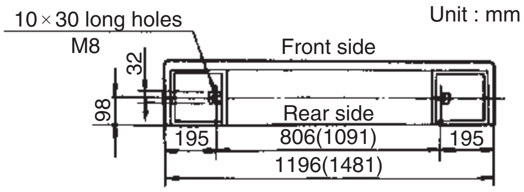
Floor standing installation

Unit : mm



4.12.2 Bolt positions

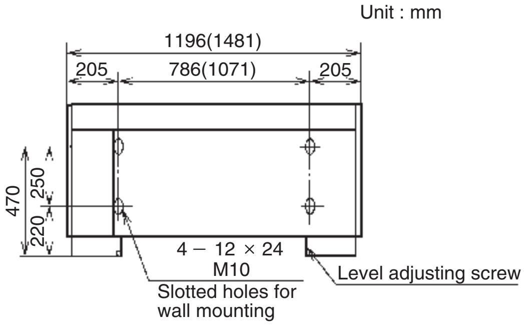
1. Bolt positions for metal settings used for floor fixation.
   Metal fitting used for floor fixation (accessories).



View from the floor

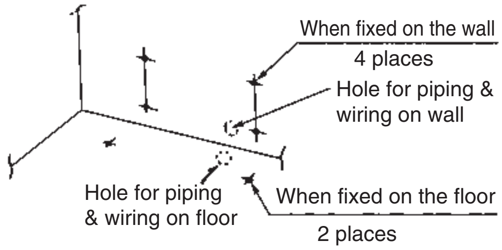
Note (1) Value in ( ) indicates 71 type.

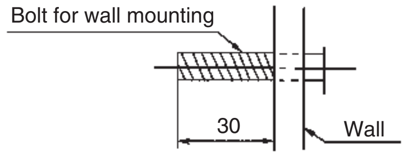
2. Bolt positions for wall fixation



4.12.3 Installation of unit

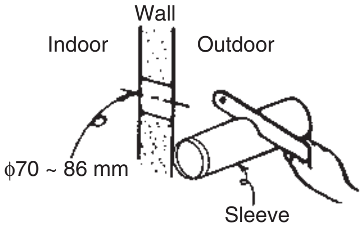
1. Floor standing installation
   a) Position of mounting bracket fixing bolts Drill holes by referring to figures below.

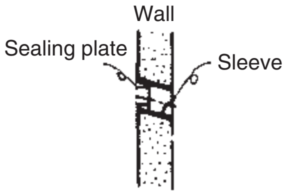




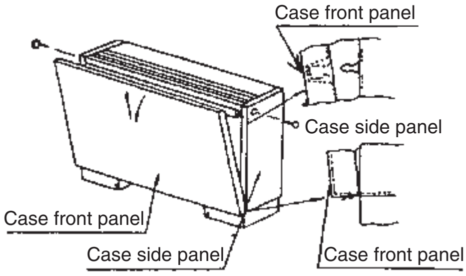
Note (1) Be sure to use a bolt of the length for wall mouning.

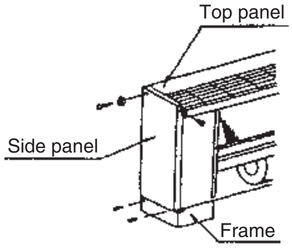
   b) The methed of drilling the wall is as follows.





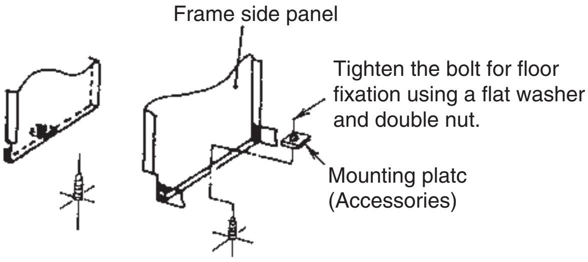
   c) Remove the front and side panels.



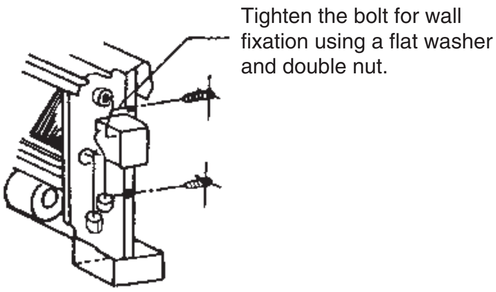


   d) Level the unit using the level adjusting screw. Installation will be completed after attaching side and front panel.
   e) Exceute fixation following the directions described below.

■ When fixed on the floor



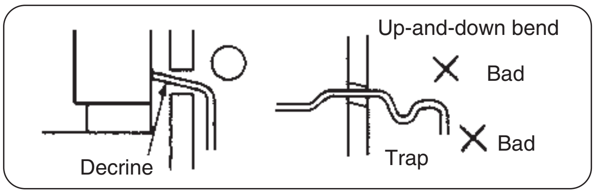
■ When fixed on the wall



4.12.4 Drain piping

The drain piping can be directed to the floor or rear sides as follows.

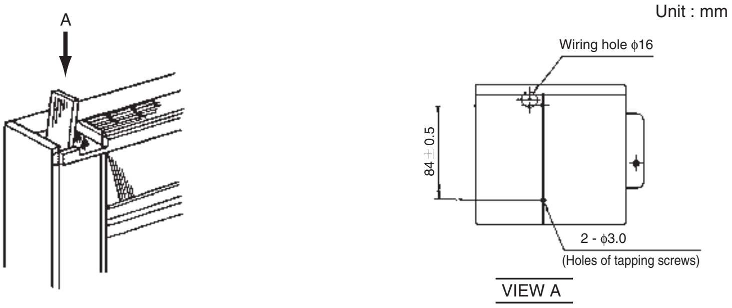
1. Connect a drain piping to the drain outlet and fix it by use of tigghening band.
2. Indoor side drain piping must be thermally insulated.
3. After finishing the drain piping, check the drainage by pouring some water in the drain pan.



4.12.5 Installation of remote controller (on the indoor unit)

Attached remote controller may be installed on the indoor unit as shown below. The work can be done on the spot when the customer asks so or by other reasons.

4.12.5.1 Detach the front panel

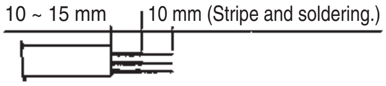


4.12.5.2 Remote controller installation

- Attach the lower case with the screws (M4 × 128) accessory.

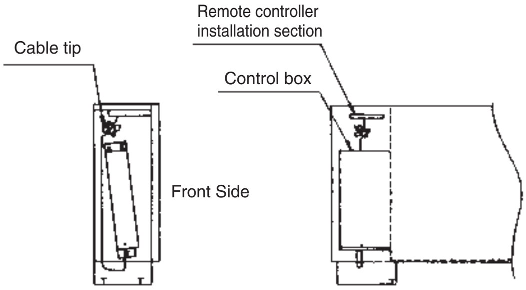
4.12.5.3 Remote controller wiring

1. Connect the terminals between the remote controller and the control box as per these wire color codes:[(X) (red). (Y) (white), (Z) (black)], using the wires included in the kit.
2. The wires should have a surplus length of approximately 30 cm. (Necessary when servicing with the front panel detached.)
3. Strip and solder as shown below when cutting the wire. (Omitting the soldering process may cause looseness of the wiring.)



4.12.5.4 Wiring route

1. Wire from the wiring hole through the rear side of the control box to the terminal block.
2. Any surplus wires should be tied up with a cable tie.



4.13 Floor Standing Hidden Type (FDFUA)

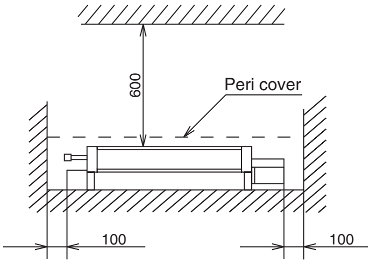
4.13.1 Selection of installation hidden location

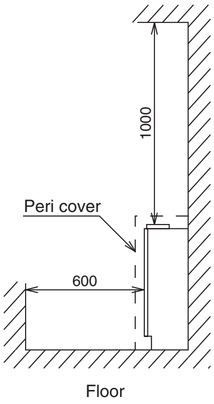
1. A place where good air circulation and delivery can be obtained.
   ■ Cold air throw Unit : m

Item \ Models	All models
Air throw	4

   [Conditions]
   ① Fan speed: Hi
   ② Location: Free space without obstacles
   ③ Distance of reach indicates the horizontal distance after the wind touched down the floor.
   ④ Air velocity at the throw: 0.5 (m/sec.)
2. Where there is no obstacle around the Air inlet port or Air outlet port.
3. Where a sufficient space can be reserved for the service of air filter and the attachment/removal of panels.
4. Places exposed to oil splashes or steam (e.g. kitchens and machine plants).
   Installation and use at such places will incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic resin parts.
5. Where pipes and wires can be arranged conveniently.
6. On the solid floor
7. Where the unit is not exposed directly to sun light.
8. Places where corrosive gas (such as sulfurous acid gas) or inflammable gas (thinner, gasoline, etc.) is generated or remains.
   Installation and use at such place will cause corrosion in the heat exchanger and damage in molded synthtic resin parts.
9. Where a complete draining can be assured.
10. Where a sufficient space can be reserved for service.
    Floor standing installation

Unit : mm



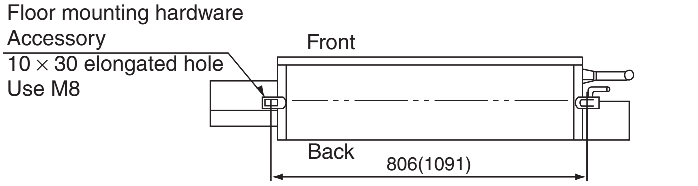


4.13.2 Bolt positions

1. Bolt positions for metal settings used for floor fixation.
   Metal fitting used for floor fixation (accessories).

Unit : mm

Bolt positions for floor mounting hardware

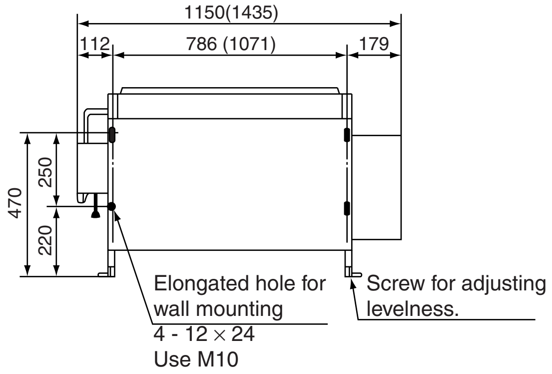


As viewed from floor side.

Note (1) Value in ( ) indicates 71 type.

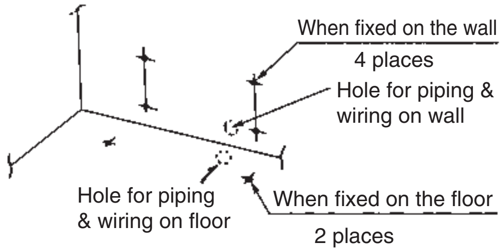
2. Bolt positions for wall fixation

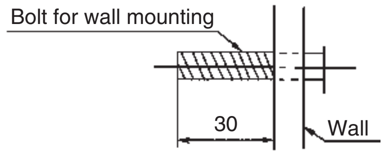
Unit : mm



4.13.3 Installation of unit

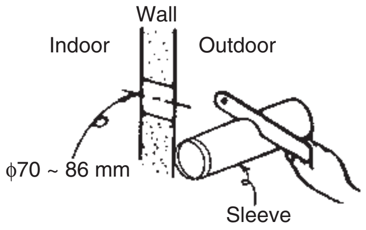
1. Floor standing installation
   a) Position of mounting bracket fixing bolts
   Drill holes by referring to figures below.

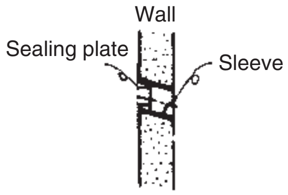




Note (1) Be sure to use a bolt of the length for wall mouning.

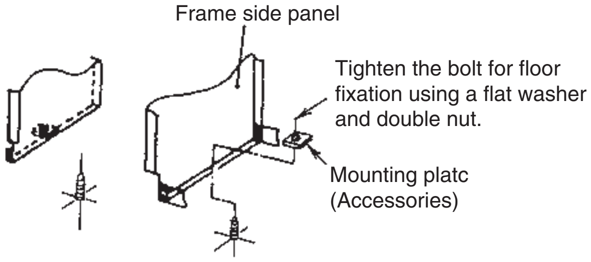
   b) The methed of drilling the wall is as follows.

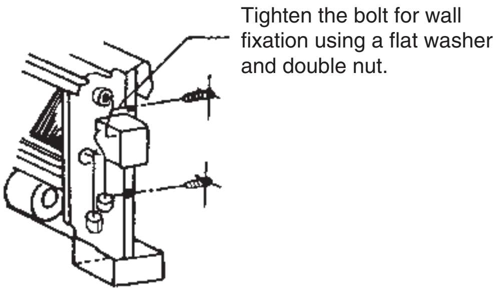




   c) Level the unit using the level adjusting screw. Installation will be completed after attaching side and front panel.
   d) Exceute fixation following the directions described below.

- When fixed on the floor
- When fixed on the wall

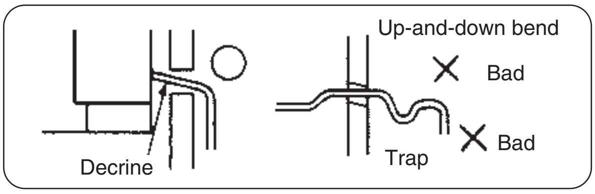




4.13.4 Drain piping

The condensate drain piping can be directed to the floor or rear sides as follows.

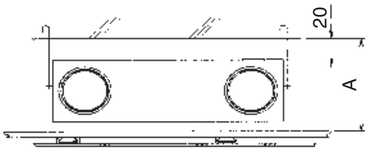
1. Connect a drain piping to the drain outlet and fix it by use of tigghening band.
2. Indoor side drain piping must be thermally insulated.
3. After finishing the drain piping, check the drainage by pouring some water in the drain pan.



4.14 Air-to-air Heat Exchange Unit (SAF)

4.14.1 Cautions for installation

1. This air-to-air Heat Exchange Unit should be installed at the place where a larger space than the sizes shown below can be secured for the ceiling space.

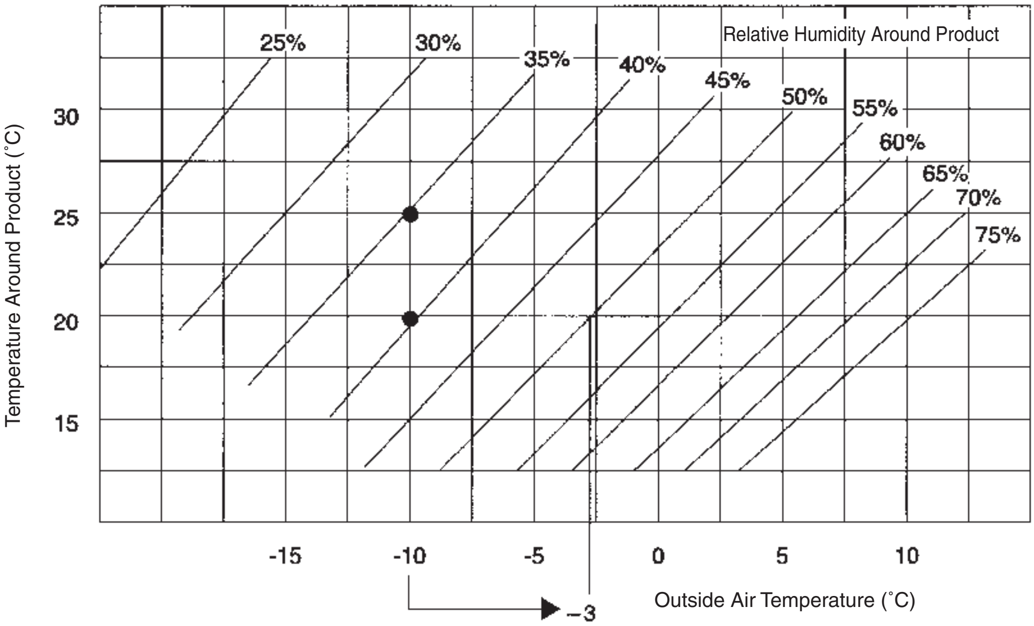


Unit : mm

Model No.	Ceiling Space A	Model No.	Ceiling Space A
SAF250E4	320	SAF800E4	440
SAF350E4		SAF1000E4	
SAF500E4		SAF1000E4S	

2. Don't install it near the water-heater.
3. Do not use in bathrooms or food preparation areas etc.
   If you use the unit at the place of much soot and high humidity, the filter or the heat exchange element gets clogged and disables you to use it.
4. Use the air-to-air Heat Exchange Unit in the ambient temperature of 40°C or less.
   Never install the unit at the place where the flame likely reaches directly the unit. If you use it at the atmosphere of more than 40°C, it is likely to cause deterioration or deformation or damege of the resin part.

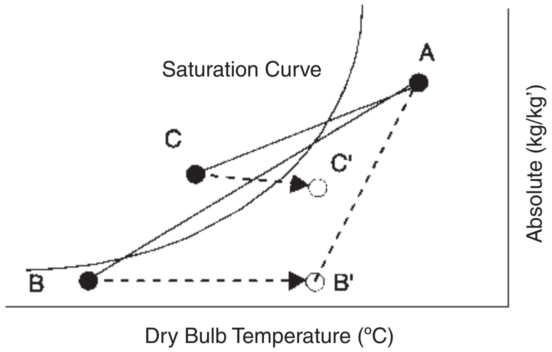
5. Be careful of dewing and frosting.
   a) Condensation on the product's surface
   If the temperature and humidity in the air around the product are high and the outside temperature is low, condensation may form on the outside surface of the product. The following graph shows the limit conditions for occurrence of condensation on the product's surface relative to the temperature and humidity surrounding the product and the outside air temperature.



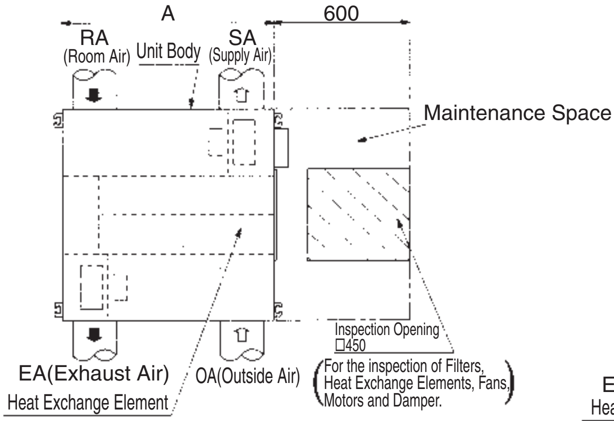
Use the humidity around the product determined from this graph as shown below.

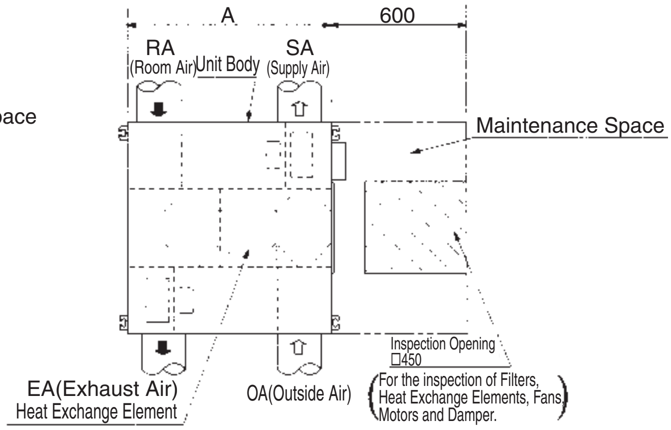
[Example 1]
If the outside air temperature is –10°C and the temperature of the air around the product is 20°C, condensation will not form on the product's surface if the relative humidity around the product is below 40%. However, if the temperature of the air around the product is 25°C, it is necessary for the relative humidity around the product to be below approximately 35%.
[Example 2]
In places where the outside air temperature is –10°C and the temperature of the air around the product is 20°C, and there is danger of the relative humidity around the product changing to 40~50%, condensation may form on the surface of the product, so countermeasures to preheat the outside air from –10°C to –3°C are necessary.

   b) Condensation on the Heat Exchanger Element
   As shown in the graph at right, points are plotted along the line between condition A, with high temperature air being drawn in, and condition B, with low temperature air being drawn in. Heat is obtained by the heat in the air from high temperature side A being exchanged at the heat exchanger unit, and in the case where the air conditions exceed the saturation curve, as in the case of point C, condensation forms on the heat exchanger element or frost forms. In such a case, Use low temperature side air B by heating it to point B' so that point C does not exceed the saturation curve but remains inside it at point C'.



6. The inspection opening shown below is necessary to clean the heat exchange element and the filter once or twice a year. If not cleaned, they are likely to get clogged, resulting in poor performance.





Note) Model SAF250E4 has one Heat Exchange Element.

Unit : mm

Model No.	A
SAF250E4	599
SAF350E4	804
SAF500E4	904

Note) Model SAF1000E4 and SAF1000E4S have four Heat Exchange Elements.

Unit : mm

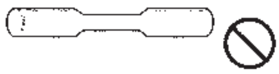
Model No.	A
SAF800E4	884
SAF1000E4	1134
SAF1000E4S	1134

7. Avoid the following duct installation works.

(1) Excessive bending

(2) Multi-time bending

(3) Making the connecting duct smaller



4.14.2 Unit suspension

1. You are required to prepare the ceiling suspension bolts, nuts and washers.
2. Install the unit firmly and horizontally enough to support its weight. (Fig. 1)

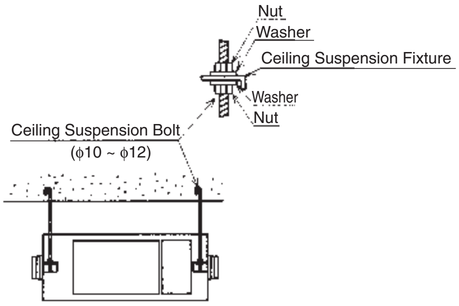


Fig. 1

3. If you do not fit it securely, it is not only dangerous but also can easily vibrate.
   If it is not fitted horizontally, the damper unit becomes defective in operation.

Caution
(1) When you are required to be cautious on prevention of vibration, we recommend you to use the anti-vibration ceiling suspension fixtures.
(2) Never fail to make an inspection opening with □450mm or more at the place shown on the paragraph of "Cautions For Installation", so that you can inspect filters, Heat Exchange Elements, power source and motors.
(3) Cautions on installing the unit body upside down
   a) Re-fit the ceiling suspension fixture in an opposite side.
      (If they are left as it is, the foolproof function of ceiling suspension bolts do not work and will cause the danger of dropping of the unit.)
   b) Printed indication is in a reversed position.
      In particular, be careful of the arrow mark [⇧] showing the direction of inserting a Heat Exchange Element.

4.14.3 Duct installation

1. Seal the junction of an adaptor and a duct with an aluminum tape firmly to prevent any air leakage.
2. The room intake opening should be positioned as far as possible from the inside supply opening.
3. Use the specified ducts. (See the table below.)

Model	Nominal Diameter
SAF250E4	ϕ150
SAF350E4	
SAF500E4	ϕ200
SAF800E4	ϕ250
SAF1000E4	

4. Install two outdoor ducts so they will be in the down gradient toward outside to prevent water from coming in. (Gradient : 1/100~1/50) (Fig. 2)

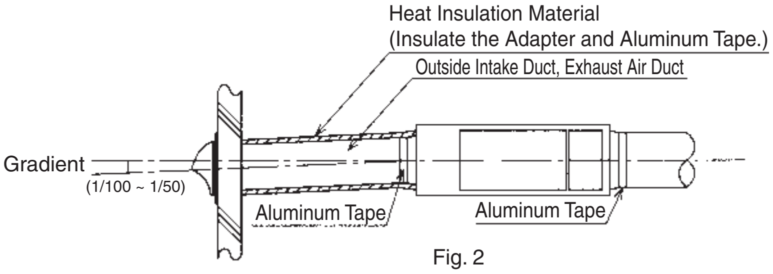


Fig. 2

5. Never fail to heat-insulate two outdoor ducts (including outside air and exhaust air duct) to prevent dewing. (Material : Glass Wool, Thickness-25mm) (Fig. 2)
6. When you want to pierce the metal duct through the metal lath or the wire lath or the wire lath or the metal plate of the wooden facility, do not forget to insulate electrically between the duct and the wall.
 (Refer to the laws and regulations of the country concerned and the technical standard.)

4.15 Notice on Installation

No.	Classification		Items to be Checked	Standard	Reference Page	Remarks
1	Indoor / Out-door	Insta-llation	Is the installation space for indoor and outdoor units within the specified limit? ■ Ventilation space ■ Indoor unit: dimension above the ceiling	1. Check whether the outdoor unit has any index of air circulation short circuit; the difference between the ambient air temperature and the air suction temperature of the outdoor unit must not exceed 3deg. 2. Indoor unit: are the air reaching distance limit, the air circulation short circuit limit and the upper dimension of the ceiling appropriate?	P.253, 260, 266, 272, 296, 300, 314, 318	■ The following troubles might occur if the outdoor units suffer from any short circuit of air circulation: 1. Malfunction: high pressure stop (E40), abnormal discharge temperature (E36), defrosting difficulty. 2. Poor heating and cooling effect due to capability decline. 3. Compressor failures
2			Has the base of outdoor units been processed? Have any base bolts been installed? ■ Have any anti-tipping methods been discussed? ■ Is the drainage of condensed water and rain water being obstructed?	■ A structure that enables the smooth drainage of rain water and condensed water is required to be available.	P.246	■ Malfunctions such as abnormal vibrations occur.
3	Indoor		Is the installation position for the indoor unit (the position of the suspension bolts) consistent with the position of the holes drilled on the ceiling?	1. The positions must be consistent.	P.254, 261,267, 273, 281, 296, 300, 315, 318	1. Position inconsistency →abnormal vibration; air leakage between the panel and the main body leads to poor cooling, heating effect and water leakage.
4			Is the size of the suspension bolts used the same as specified?	■ Confirmation is a must.		Abnormal vibrations and fall-off of air-conditioning units might occur.
5			Have any protection measures been taken to the indoor units to prevent possible contamination from the construction soldering material splashes?	1. The unit must not be unpacked until the installation starts. 2. The corrugated boards included must be used as a protection measure after the unit is installed.	—	■ Welding substances may splash onto and penetrate the drain pan, resulting in hazardous water leaking accidents.
6			Is the air condition inside the ceiling within the specified limit?	■ 28°CDB, relative humidity below 80%	—	■ Indoor unit: non-compliant air-conditions inside the ceiling →hazardous dew condensation and water leakage.
7	Outdoor		Are the combination air-conditioner and the main unit installed at the first branch manifold closest to the indoor unit?	1. The main unit must be located at the first branch manifold closest to the indoor unit.	—	1. The following malfunctions may arise when the sub unit stops for a long time due to excessively light load: ■ Abnormal discharge temperature: refrigerant permeating into the sub unit →E36 ■ Main unit: No. 1 compressor in poor condition: oil permeation into the sub unit.
8	System		Is the length of the refrigerant piping within the specified limit?	■ Confirmation is a must.	P.342	
9			Is the height difference between the indoor unit and the outdoor unit within the specified limit?	■ Confirmation is a must.	P.342	
10	Indoor	Drain Piping	Does the drain piping incline downward during the construction?	■ Appropriate gradient = 1/50 - 1/100	P.255, 263,268 274, 283, 298, 303, 317, 320	■ If the drain piping is not kept inclined, back-flow and water leakage may occur.
11			Are "water return pipes" installed in the drain piping?	■ No water return pipe should be installed in units having an exterior static pressure of 0Pa.		■ If return pipes are installed, the water won't flow smoothly and water contained in the drain pan of the unit may spill over (leak).
12			Is the main drain pipe connected to the top of the main pipe?			■ When the indoor unit stops, water may back flow from the general piping.
13			Does the drain piping of the units using drain pumps (built-in or optional) have a suitable vertical height?	■ 600 - 750mm(calculated from under the ceiling or the unit)		■ If the height limit is exceeded, drainage will become impossible and water leakage will happen. ■ In addition, back-flow may result in spillage of the drain pan.
14			Are the attached standard drain hoses used in the units using the drain pump?	■ Standard hoses must be used.		■ If the drain piping on site is directly connected to the units instead of using the standard hoses, the connection will be very difficult (due to no margin specified in the dimension).
15			Are the attached straps used for fixing the typically supplied hoses?	■ No adhesives are permitted.		■ Adhesives, a solvent in nature, will dissolve the hoses and form holes and voids on the hoses.
16			Is the site drain piping of the units using drain pumps adjacent to the units?	■ Between 295 and 325mm.		■ If the limits are exceeded, drainage failure or back-flow will occur when the drain pump stops running and water spillage (leakage) will be caused in the drain pans as a result.
17			Does the drain piping absorb any peculiar smell?			

5. Refrigerant Piping

5.1 Pipe Size Selection

5.1.1 Main (Outdoor unit side branching pipe – Indoor unit side first branching Pipe)

1) If the longest distance (measured between the outdoor unit and the farthest indoor unit) is 90m or longer (equivalent length), please change the main pipe size according to the table below.
2) When the capacity of the outdoor unit 1010 or more, the size of the gas pipe must be not increased, but the size of the liquid pipe must be increased as shown in the table below.

<table>
<tr><th rowspan="2">Outdoor unit</th><th colspan="2">Main pipe (normal)</th><th colspan="2">Pipe size for an actual length of 90m or longer</th></tr>
<tr><th>Gas pipe</th><th>Liquid pipe</th><th>Gas pipe</th><th>Liquid pipe</th></tr>
<tr><td>140</td><td>φ15.88 × t1.0 (Flare)</td><td>φ9.52 × t0.8 (Flare)</td><td>—</td><td>—</td></tr>
<tr><td>224</td><td>φ19.05 × t1.0 (Brazing)</td><td rowspan="2">φ9.52 × t0.8 (Flare)</td><td>φ22.22 × t1.0 (Brazing)</td><td rowspan="5">φ12.7 × t0.8 (Flare)</td></tr>
<tr><td>280</td><td>φ22.22 × t1.0 (Brazing)</td><td rowspan="2">φ25.4 × t1.0 (Brazing)</td></tr>
<tr><td>335</td><td rowspan="2">φ25.4 × t1.0 (Brazing)</td><td rowspan="7">φ12.7 × t0.8 (Flare)</td></tr>
<tr><td>400</td><td>φ28.58 × t1.0 (Brazing)</td></tr>
<tr><td>450</td><td rowspan="5">φ28.58 × t1.0 (Brazing)</td><td rowspan="5">φ31.8 × t1.1 (Brazing)</td></tr>
<tr><td>504</td><td rowspan="4">φ15.88 × t1.0 (Flare)</td></tr>
<tr><td>560</td></tr>
<tr><td>615</td></tr>
<tr><td>680</td></tr>
<tr><td>735</td><td rowspan="5">φ31.8 × t1.1 (Brazing)</td><td rowspan="6">φ15.88 × t1.0 (Brazing)</td><td rowspan="13">φ38.1 × t1.35 (Brazing)</td><td rowspan="6">φ19.05 × t1.0 (Brazing)</td></tr>
<tr><td>800</td></tr>
<tr><td>850</td></tr>
<tr><td>900</td></tr>
<tr><td>960</td></tr>
<tr><td>1010</td><td rowspan="7">φ38.1 × t1.35 (Brazing)</td></tr>
<tr><td>1065</td><td rowspan="6">φ19.05 × t1.0 (Brazing)</td><td rowspan="6">φ22.22 × t1.0 (Brazing)</td></tr>
<tr><td>1130</td></tr>
<tr><td>1180</td></tr>
<tr><td>1235</td></tr>
<tr><td>1300</td></tr>
<tr><td>1360</td></tr>
</table>

5.1.2 Indoor unit side first branching pipe – Indoor unit side branching pipe

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 .

<table>
<tr><th rowspan="2">Total capacity of indoor units</th><th rowspan="2">Gas pipe</th><th rowspan="2">Liquid pipe</th><th rowspan="2">Branch pipe set</th><th colspan="2">Header pipe set</th></tr>
<tr><th>Model</th><th>Branches</th></tr>
<tr><td>Less than 70</td><td>φ12.70 × t1.0</td><td rowspan="2">φ9.52 × t0.8</td><td rowspan="2">DIS-22-1</td><td rowspan="2">HEAD 4-22-1</td><td rowspan="2">Max 4 branches</td></tr>
<tr><td>70 or more but less than 180</td><td>φ15.88 × t1.0</td></tr>
<tr><td>180 or more but less than 371</td><td>φ19.05 × t1.0</td><td>φ12.7 × t0.8</td><td>DIS-180-1</td><td>HEAD 6-180-1</td><td>Max 6 branches</td></tr>
<tr><td>371 or more but less than 540</td><td>φ25.40 × t1.0</td><td rowspan="2">φ15.88 × t1.0</td><td>DIS-371-1</td><td>HEAD 8-371-1</td><td>Max 8 branches</td></tr>
<tr><td>540 or more but less than 700</td><td>φ28.58 × t1.0</td><td rowspan="3">DIS-540-1</td><td rowspan="3">HEAD 8-540-1</td><td rowspan="3">Max 8 branches</td></tr>
<tr><td>700 or more but less than 1100</td><td>φ31.80 × t1.1</td><td rowspan="2">φ19.05 × t1.0</td></tr>
<tr><td>1100 or more</td><td>φ38.10 × t1.35</td></tr>
</table>

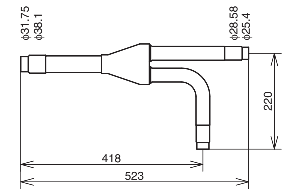
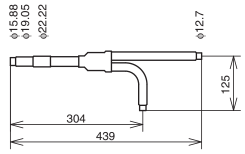
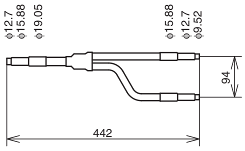
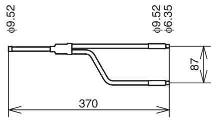
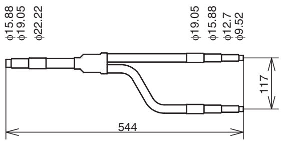
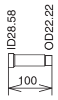
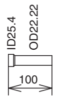
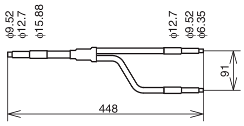
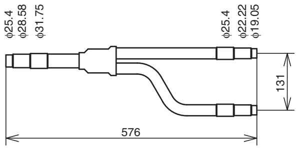
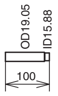
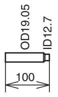
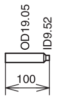
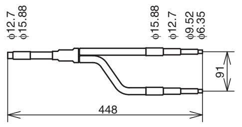
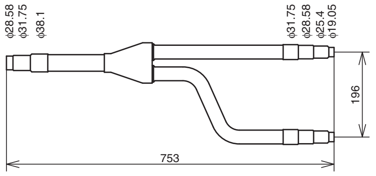
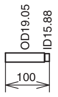
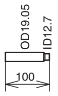
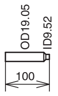
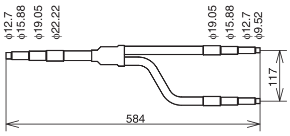
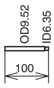
5.1.3 Indoor unit side branching pipe – Indoor unit pipe

Connection pipe size for indoor units (Connecting method: Flare)

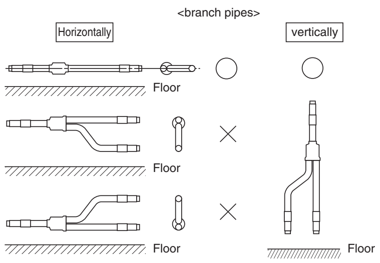
<table>
<tr><th colspan="2">Total capacity of indoor units</th><th>Gas pipe</th><th>Liquid pipe</th></tr>
<tr><td rowspan="5">Indoor unit</td><td>22, 28</td><td>φ9.52 × t0.8</td><td rowspan="2">φ6.35 × t0.8</td></tr>
<tr><td>36, 45, 56</td><td>φ12.7 × t0.8</td></tr>
<tr><td>71, 80, 90, 112, 140, 160</td><td>φ15.88 × t1.0</td><td rowspan="3">φ9.52 × t0.8</td></tr>
<tr><td>224</td><td>φ19.05 × t1.0</td></tr>
<tr><td>280</td><td>φ22.22 × t1.0</td></tr>
</table>

5.1.4 Branch pipe set shapes

Unit : mm

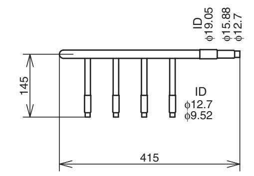
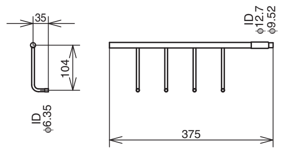
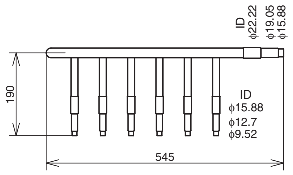
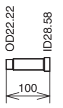
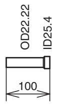
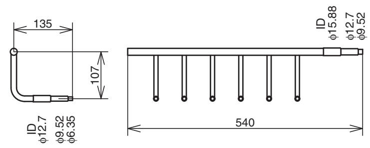
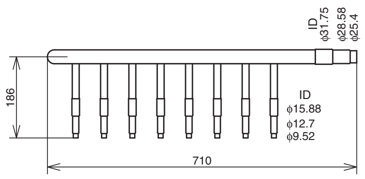
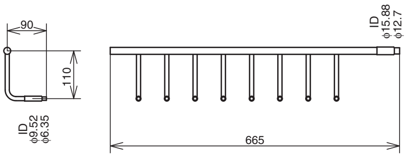
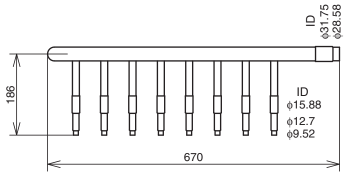
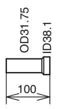
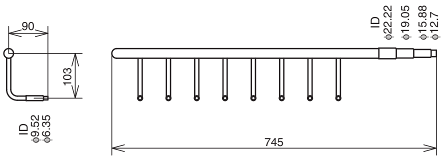
Model	Item	Branch pipe	Reducer	Item	Branch pipe	Reducer
DOS-2A-1	Gas line		—	Liquid line		—
DIS-22-1	Gas line		—	Liquid line		—
DIS-180-1	Gas line		 	Liquid line		—
DIS-371-1	Gas line		  	Liquid line		—
DIS-540-1	Gas line		  	Liquid line		

Notes: (1) Insulation is provided with the branch pipes.
(2) Pipes should be cut to the installation site requirements, with the pipe being severed at the center part of the desired diameter.
(3) Branch joints (gas & liquid) must be installed as either a "horizontal branch" or a "vertical branch".



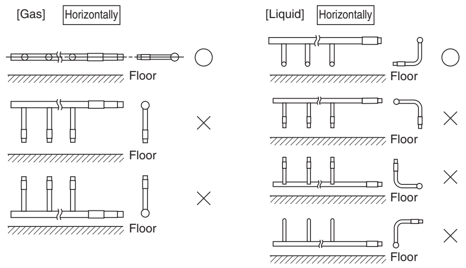
5.1.5 Header pipe set shapes

Unit : mm

<table>
<tr><th>Model</th><th>Item</th><th>Header pipe</th><th>Reducer</th><th>Item</th><th>Header pipe</th></tr>
<tr><td>HEAD4-22-1</td><td>Gas line</td><td></td><td>—</td><td>Liquid line</td><td></td></tr>
<tr><td>HEAD6-180-1</td><td>Gas line</td><td></td><td></td><td>Liquid line</td><td></td></tr>
<tr><td>HEAD8-371-1</td><td>Gas line</td><td></td><td>—</td><td>Liquid line</td><td></td></tr>
<tr><td>HEAD8-540-1</td><td>Gas line</td><td></td><td></td><td>Liquid line</td><td></td></tr>
</table>

Notes: (1) Insulation is provided with both gas and liquid pipes, and should be used.
(2) Pipes should be cut to the installation site requirements, with the pipe being severed at the center part of the desired diameter.
(3) Headers (gas & liquid) must be installed as a "horizontal branch".

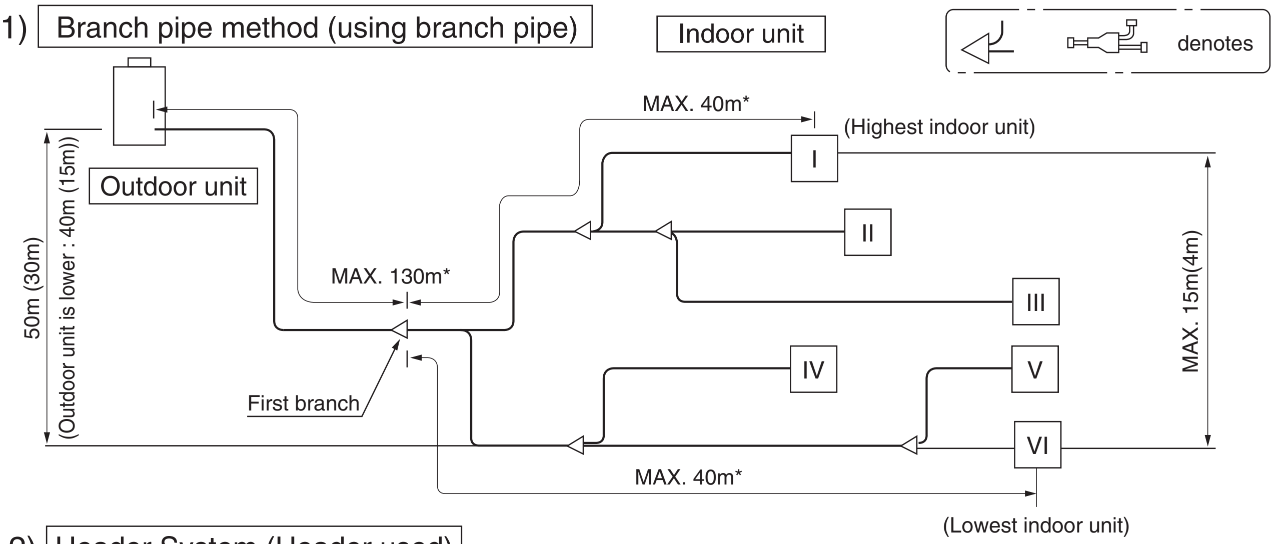
<Header pipe>



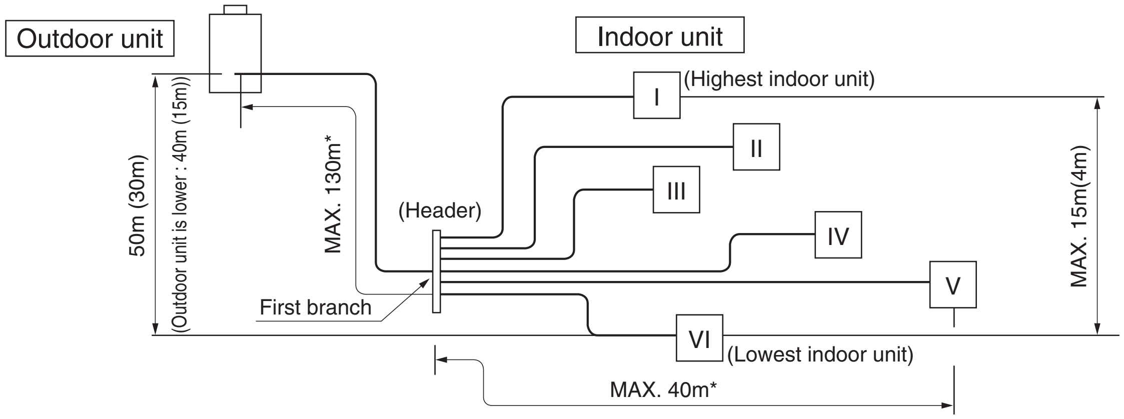
5.1.6 Allowable length of refrigerant piping, height difference between indoor and outdoor unit

(a)FDCA140HKXEN4 ~ 680HKXE4 (integrated)

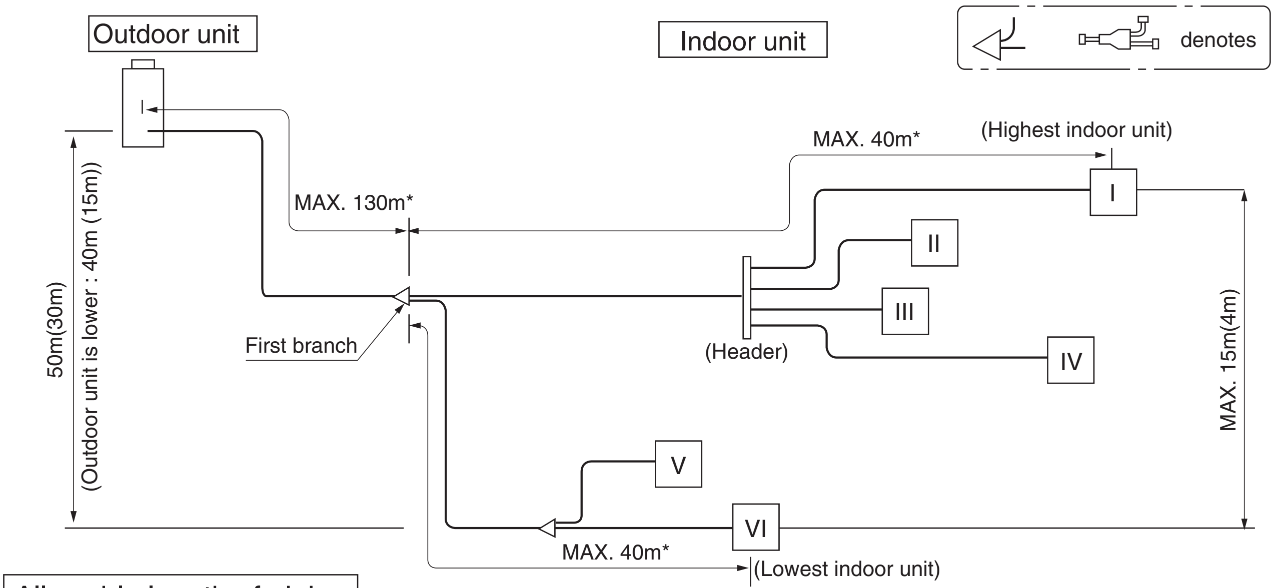
1) Branch pipe method (using branch pipe)



2) Header System (Header used)



3) Mixture System (Branch Pipe and Header Used in Combination)



Allowable length of piping

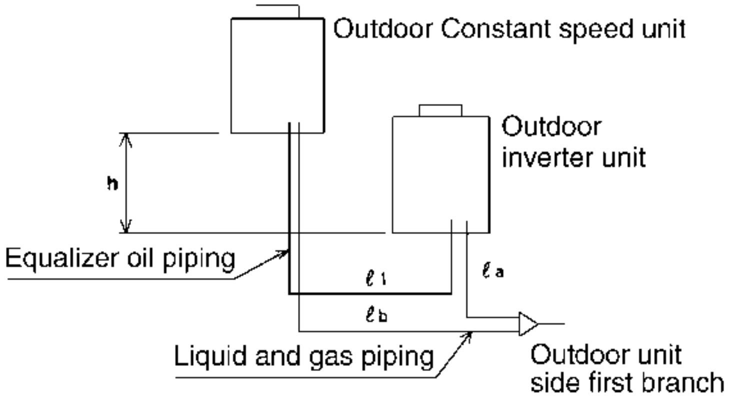
- ■Outdoor unit ~ the first branch (manifold (main pipe)) : within 130m (Real length)
- ■the first branch ~ indoor unit : within 40m (for each indoor unit) (Real length)

Notes (1) Though there are no limitations for piping length of the manifold (main pipe) and the acceptable piping length from the first branch, please ensure the total length of liquid pipe of ϕ9.52 within 50m.

(2) The figure shown inside ( ) is for FDCA140HKXEN4.

(b)FDCA735HKXE4 ~ A1360HKXE4 (Combination use)
(The Limitations are the same as integrated type, except those for piping length between outdoor units)

1) Limitation between outdoor units of combination multi-situation



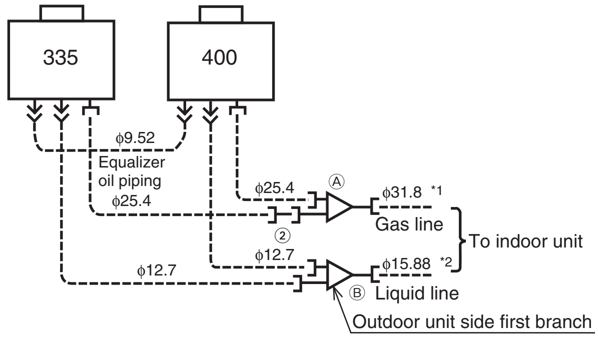
Liquid and gas piping (ℓ a to ℓ b): ℓ a + ℓ b ≤ 5m
Difference in length between outdoor units (h): h ≤ 1m
Equalizer oil piping (ℓ 1): ℓ 1≤ 5m

Note (1) Select the nearer unit to the outdoor unit side first branch as the inverter unit.

2) Outdoor unit patterns

FDCA735HKXE4 : 26 HP

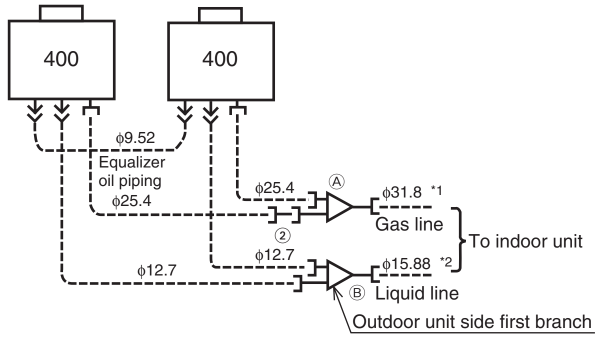
Combination (split) : FDCA335HKXE4-K + FDCA400HKXE4
[Branch pipe set : DOS-2A-1]



When the manifold (main pipe) exceeds 90m (equivalent length),
*1should be changed into φ38.1 and *2 should be changed into φ19.05.

FDCA800HKXE4 : 28 HP

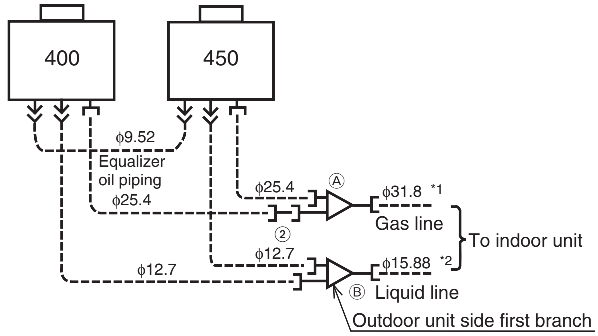
Combination (split) : FDCA400HKXE4 + FDCA400HKXE4
[Branch pipe set : DOS-2A-1]



When the manifold (main pipe) exceeds 90m (equivalent length),
*1should be changed into φ38.1 and *2 should be changed into φ19.05.

FDCA850HKXE4 : 30 HP

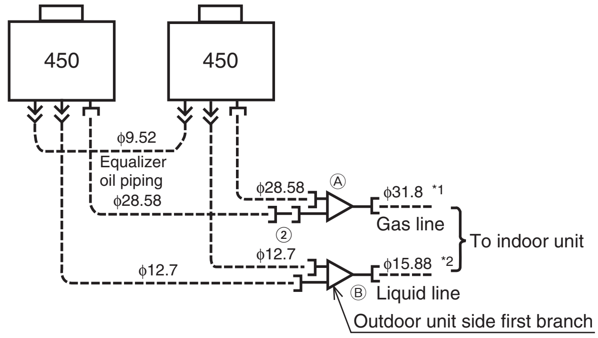
Combination (split) : FDCA400HKXE4 + FDCA450HKXE4
[Branch pipe set : DOS-2A-1]



When the manifold (main pipe) exceeds 90m (equivalent length),
*1should be changed into φ38.1 and *2 should be changed into φ19.05.

FDCA900HKXE4 : 32 HP

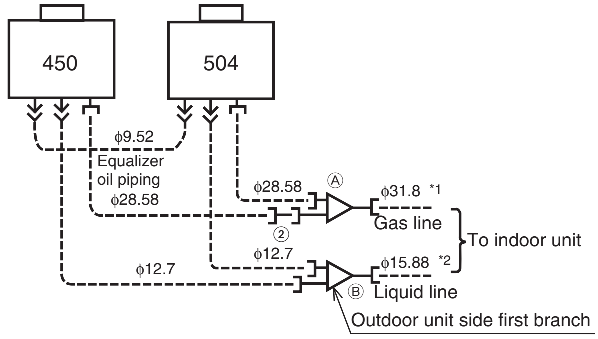
Combination (split) : FDCA450HKXE4 + FDCA450HKXE4
[Branch pipe set : DOS-2A-1]



When the manifold (main pipe) exceeds 90m (equivalent length),
*1should be changed into φ38.1 and *2 should be changed into φ19.05.

FDCA960HKXE4 : 34 HP

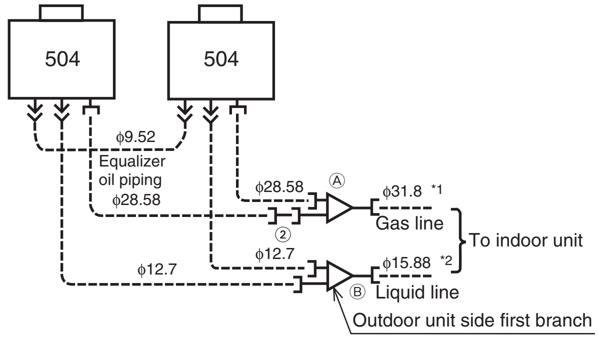
Combination (split) : FDCA450HKXE4+FDCA504HKXE4
[Branch pipe set : DOS-2A-1]



When the manifold (main pipe) exceeds 90m (equivalent length),
*1should be changed into φ38.1 and *2 should be changed into φ19.05.

FDCA1010HKXE4 : 36 HP

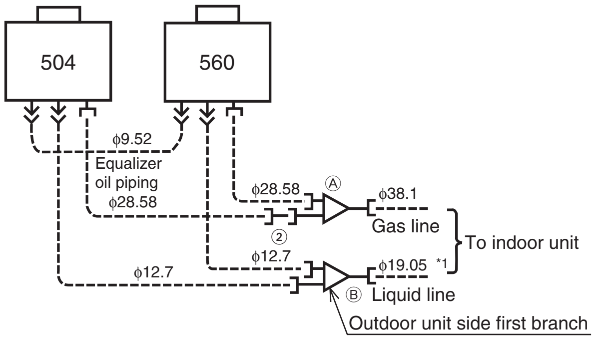
Combination (split) : FDCA504HKXE4+FDCA504HKXE4
[Branch pipe set : DOS-2A-1]



When the manifold (main pipe) exceeds 90m (equivalent length),
*1should be changed into φ38.1 and *2 should be changed into φ19.05.

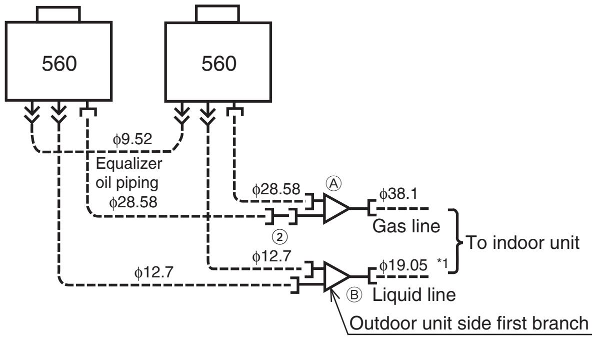
■ Flare Brazing

FDCA1065HKXE4 : 38 HP
Combination (split) : FDCA504HKXE4 + FDCA560HKXE4
[Branch pipe set : DOS-2A-1]



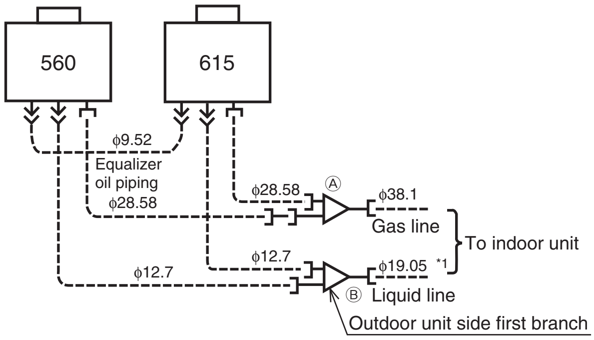
When the manifold (main pipe) exceeds 90m (equivalent length), *1should be changed into ϕ22.22.

FDCA1130HKXE4 : 40 HP
Combination (split) : FDCA560HKXE4 + FDCA560HKXE4
[Branch pipe set : DOS-2A-1]



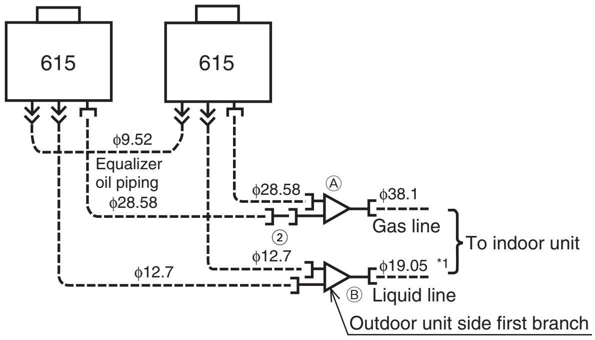
When the manifold (main pipe) exceeds 90m (equivalent length), *1should be changed into ϕ22.22.

FDCA1180HKXE4 : 42 HP
Combination (split) : FDCA560HKXE4 + FDCA615HKXE4
[Branch pipe set : DOS-2A-1]



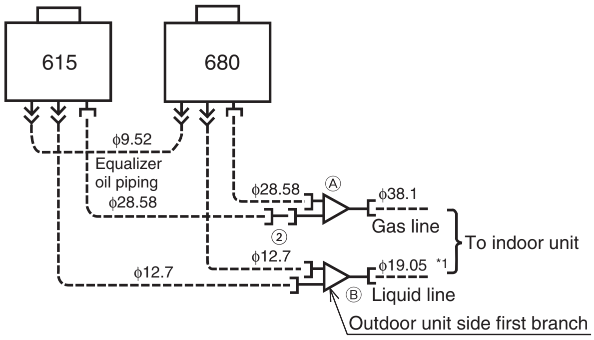
When the manifold (main pipe) exceeds 90m (equivalent length), *1should be changed into ϕ22.22.

FDCA1235HKXE4 : 44 HP
Combination (split) : FDCA615HKXE4 + FDCA615HKXE4
[Branch pipe set : DOS-2A-1]



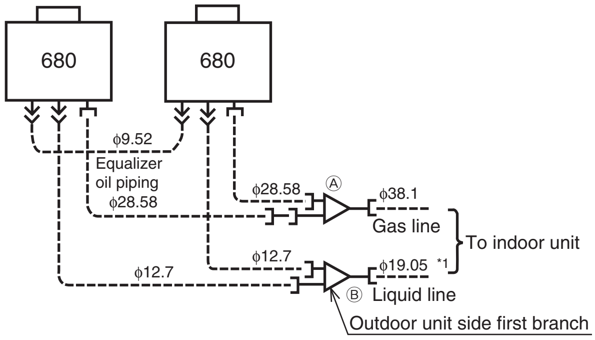
When the manifold (main pipe) exceeds 90m (equivalent length), *1should be changed into ϕ22.22.

FDCA1300HKXE4 : 46 HP
Combination (split) : FDCA615HKXE4 + FDCA680HKXE4
[Branch pipe set : DOS-2A-1]



When the manifold (main pipe) exceeds 90m (equivalent length), *1should be changed into ϕ22.22.

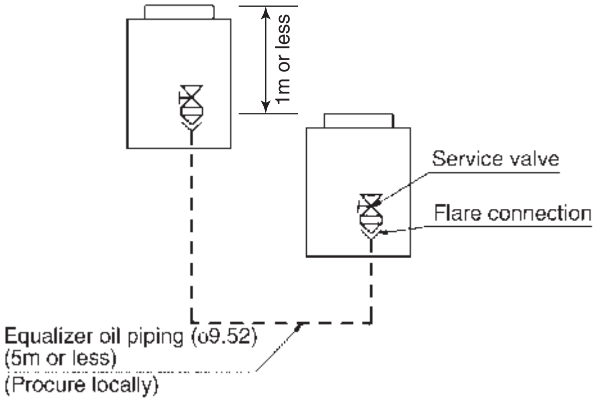
FDCA1360HKXE4 : 48 HP
Combination (split) : FDCA680HKXE4 + FDCA680HKXE4
[Branch pipe set : DOS-2A-1]



When the manifold (main pipe) exceeds 90m (equivalent length), *1should be changed into ϕ22.22.

■ Flare Brazing

5.1.7 Piping outline of equalizer oil piping



5.2 Piping Material Selection

1. 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.
2. Use the following material for refrigerant piping.
   Material: phosphorus deoxidized seamless copper pipe (C1120T-0, 1/2H, JIS H3300)
   Use C1220T-1/2H for ϕ19.05 or larger, or C1220T-0 for ϕ15.88 or smaller
3. Do not use ϕ28.58 × t1.0, ϕ31.8 × t1.1 and ϕ38.1 × t1.35 as a bent pipe.
4. Thickness and size: Please select proper pipes according to the pipe size selection guideline.
   (Since this used R410A, always use 1/2H pipes of a specified minimum thickness or thicker for all pipes of ϕ19.05 or langer, because the pressure resistance requirement is not satisfied with O-type pipes).
5. For branching pipes, use a genuine branching pipe set or header set at all times. (optional parts)
6. For the handling of service valves, please refer to Section 5.8 : Handling of service valves.
7. In installing pipes, observe the restrictions on the use of pipes set out in Section 5.3 (Maximum length, total pipe length, allowable pipe length from the first branching, allowable elevation difference (head difference)) without fail.
8. Install a branching pipe set, playing attention to the direction of attachment, after your have perused through the installation manual supplied with it.

5.3 Restrictions on the Use of Pipes

1. Maximum length (from an outdoor unit to the farthest indoor unit)
   .... 160 m or less as actual pipe length [10m or less as actual pipe length]
   (When an actual pipe length exceeds 90 m, 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 5.3. (b))
2. Total pipe length.. 510 m or less [100 m or less]
3. Main pipe length.. 130 m or less*
4. Allowable pipe length from the first branching.. 40 m or less*
5. Allowable elevation difference (head difference)
   1) When an outdoor unit is installed above.. 50 m or less [30 m or less]
   2) When an outdoor unit is installed below.. 40 m or less [15 m or less]
   3) Difference in the elevation of indoor units in a system .... 15 m or less
   4) Height difference from the first branch to the indoor unit.................................... 15 m or less
6. Restrictions on piping applicable to the section between an outdoor unit and an outdoor unit side branching pipe (combination unit)
   1) Difference in the elevation .... 1 m or less
   2) Distance between an outdoor unit and an outdoor unit side branching pipe...... 5 m or less [4 m or less]
   3) Length of oil equalization piping .... 10 m or less

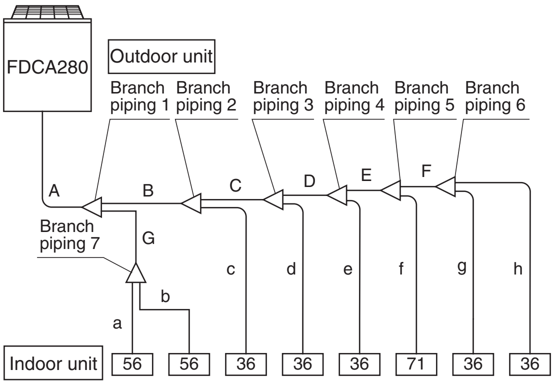
Notes (1) The figure shown inside [ ] is for five horsepower type.
(2) * is for five horsepower type. Though there are no limitations for piping length of the manifold (main pipe) and the acceptable piping length from the first branch, please ensure the total length of liquid pipe of ϕ9.52 within 50m.

5.4 Example of Refrigerant Piping

Details refer to P.334 "Refrigerant Piping" and P.339 "Outdoor unit patterns".

5.4.1 Branch system

Outdoor unit: FDCA280HKXE4
Indoor unit: Combination of 8 units
[Branch pipe set: DIS-180-1 × 3 set, DIS-22-1 × 4 set]
[Total capacity: 363 (36300W)]



• Selecting piping size

Item	Selection procedure	Piping size (mm)	
		Gas line	Liquid line
A	Same as the outdoor unit piping size	*1 ϕ22.22	*2 ϕ9.52
B	Total capacity of the connected indoor units 251	ϕ19.05	ϕ9.52
C	Total capacity of the connected indoor units 215	ϕ19.05	ϕ9.52
D	Total capacity of the connected indoor units 179	ϕ15.88	ϕ9.52
E	Total capacity of the connected indoor units 143	ϕ15.88	ϕ9.52
F	Total capacity of the connected indoor units 72	ϕ15.88	ϕ9.52
G	Total capacity of the connected indoor units 112	ϕ15.88	ϕ9.52
a	Indoor unit piping size (56).	ϕ12.7	ϕ6.35
b	Indoor unit piping size (56).	ϕ12.7	ϕ6.35
c	Indoor unit piping size (36).	ϕ12.7	ϕ6.35
d	Indoor unit piping size (36).	ϕ12.7	ϕ6.35
e	Indoor unit piping size (36).	ϕ12.7	ϕ6.35
f	Indoor unit piping size (71).	ϕ15.88	ϕ9.52
g	Indoor unit piping size (36).	ϕ12.7	ϕ6.35
h	Indoor unit piping size (36).	ϕ12.7	ϕ6.35

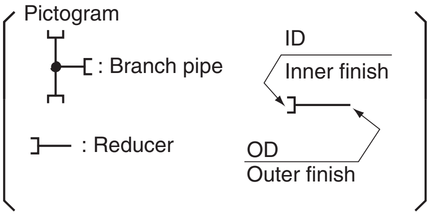
*1 When piping size is over 90mm: ϕ25.4.
*2 When piping size is over 90mm: ϕ12.7.

Selection of branch piping size.

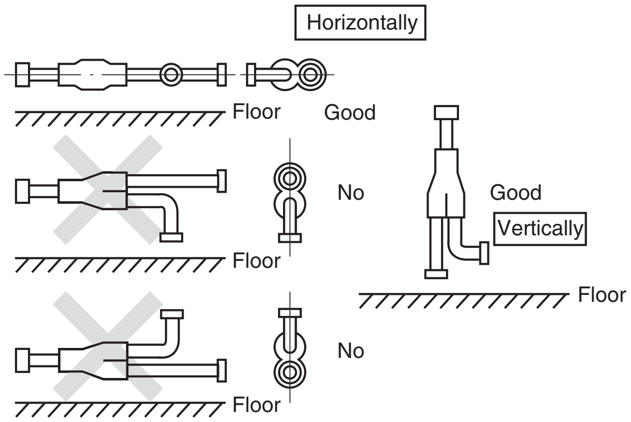
Item	Selection procedure	Branch piping set
Branch piping 1	Total capacity of the connected indoor units 363	DIS-180-1
Branch piping 2	Total capacity of the connected indoor units 251	DIS-180-1
Branch piping 3	Total capacity of the connected indoor units 215	DIS-180-1
Branch piping 4	Total capacity of the connected indoor units 179	DIS-22-1
Branch piping 5	Total capacity of the connected indoor units 143	DIS-22-1
Branch piping 6	Total capacity of the connected indoor units 72	DIS-22-1
Branch piping 7	Total capacity of the connected indoor units 112	DIS-22-1

Notes (1) Make the selection based on the size of each piping for branch piping sets with different size connections.
(2) If diameter adjustment is need for branch connection and on the indoor unit side, always makes the adjustment at the branch connection.

Reference: The shape of the flow divider pipe and reducer is shown on the 321 page.

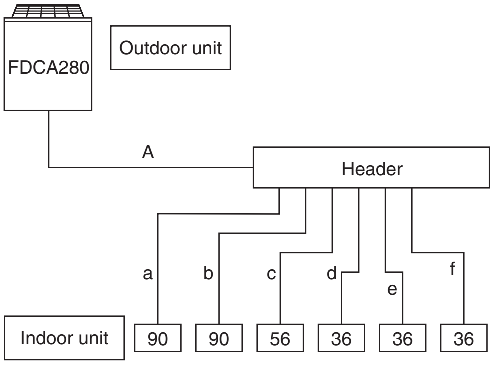


Notes (1) Use the designated piping size for the piping between the outdoor unit and the first branch.
(2) Choose the appropriate sized reducer for piping between the branch pipe and the indoor unit. The size of reducer should match the piping size of the indoor unit.
(3) Locate the branch pipe horizontally or vertically as illustrated to the right.



5.4.2 Header system

Outdoor unit: FDCA280HKXE4
Indoor unit: Combination of 8 units
[Header pipe set: HEAD6-180-1 × 1 set]
[Total capacity: 344 (34400W)]

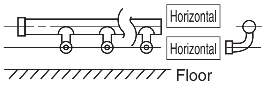


(1) Selecting piping size

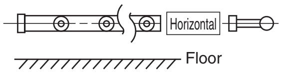
Item	Selection procedure	Piping size (mm)	
		Gas line	Liquid line
A	Same as the outdoor unit piping size (280)	ϕ22.22	ϕ9.52
a	Indoor unit piping size (90)	ϕ15.88	ϕ9.52
b	Indoor unit piping size (90)	ϕ15.88	ϕ9.52
c	Indoor unit piping size (56)	ϕ12.7	ϕ6.35
d			
e	Indoor unit piping size (36)	ϕ12.7	ϕ6.35
f			

Remarks 1. Install the header so that both the gas pipe and liquid pipe are horizontal and so that branches are horizontal.
2. It is not necessary to install a trap in the stand pipe.

Liquid side



Gas side



(2) Selection header pipe size

Item	Selection point	Model
Header	Total indoor unit capacity	HEAD6-180-1

Notes (1) Select the appropriate size of each pipe for the offset pipe joints included with the header set.
(2) If it is necessary to adjust the diameter of the header and indoor unit side piping, be sure to do so on the header side.

5.4.3 Specification of unit piping

Unit: mm

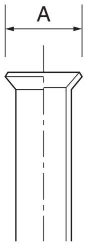
Item / Model	Gas line	Liquid line
22 type	ϕ12.7(1/2")	ϕ 6.35(1/4")
28 type	ϕ12.7(1/2")	ϕ 6.35(1/4")
36 type	ϕ12.7(1/2")	ϕ 6.35(1/4")
45 type	ϕ12.7(1/2")	ϕ 6.35(1/4")
56 type	ϕ15.88(3/8")	ϕ 9.52(13/8")
71 type	ϕ15.88(3/8")	ϕ 9.52(13/8")
90 type	ϕ15.88(3/8")	ϕ 9.52(13/8")
112 type	ϕ19.05(3/4")	ϕ 9.52(13/8")
140 type	ϕ19.05(3/4")	ϕ 9.52(13/8")

5.5 On-site Piping Work

5.5.1 Important

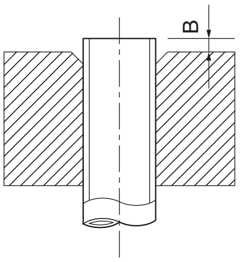
a) Please take care so that installed pipes may not touch components within a unit.
b) Keep service valves closed white pipe installation work is underway.
c) Give sufficient protections (compressed and brazed or by an adhesive tape) to pipe ends so that any water or foreign matters enter the pipes.
d) 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 corrent its from.
e) 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 R470C. 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.
f) As it is a unit designed for R410A, the use of ester oil as flare joint oil is recommended.

g) Tighten a flare joint securely with double spanners. Observe flare nut tightening torque specified in the table below.



Flared pipe end: A (mm)

Copper pipe outer diameter	A $^{0}_{-0.4}$
ϕ6.35	9.1
ϕ9.52	13.2
ϕ12.7	16.6
ϕ15.88	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
ϕ6.35	0 ~ 0.5	0.7 ~ 1.3
ϕ9.52		
ϕ12.7		
ϕ15.88		

Tightening torque

ϕ6.35	14 ~ 18N·m (1.4 ~ 1.8 kg·m)
ϕ9.52	34 ~ 42N·m (3.4 ~ 4.2 kg·m)
ϕ12.7	49 ~ 61N·m (4.9 ~ 6.1 kg·m)
ϕ15.88	68 ~ 82N·m (6.8 ~ 8.2 kg·m)

h) Pipes are to be brazed to connect an outdoor unit's gas pipe with refrigerant piping or refrigerant piping with a branching pipe set.

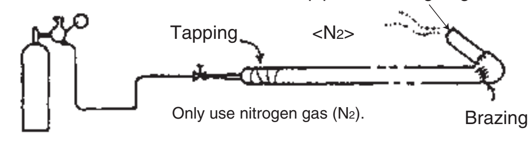
i) Brazing must be performed under a nitrogen gas flow. Without nitrogen gas, a large quantity of foreign matters (oxidized film) are created, causing a critical failure from capillary tube or expansion valve clogging.

j) Brazing of the service valve and the pipes should be performed while cooling the valve body with a wet towel.

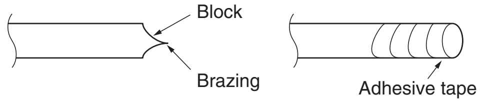
k) Perform flushing. To flush the piping, charge nitrogen gas at about 0.02 MPa with a pipe end closed with a hand. When pressure inside builds up to a sufficient level, remove the hand to flush. (in flushing a pipe, close the other end of the pipe with a plug).

5.5.2 Operation procedure

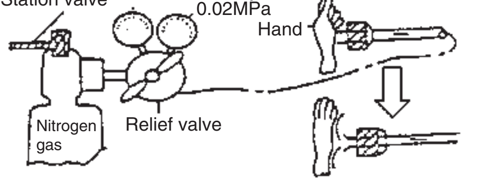
a) Brazing must be performed under a nitrogen gas flow. Without nitrogen gas, a large quantity of foreign matters (oxidized film) are created, causing a critical failure from capillary tube or expansion valve clogging.



b) Give sufficient protections (compressed and brazed) so that water or foreing matters may not enter the piping.



c) Perform flushing. To flush the piping. charge nitrogen gas at about 0.02 MPa 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).



d) In laying pipes on the installation site, keep the service valves shut all the time.

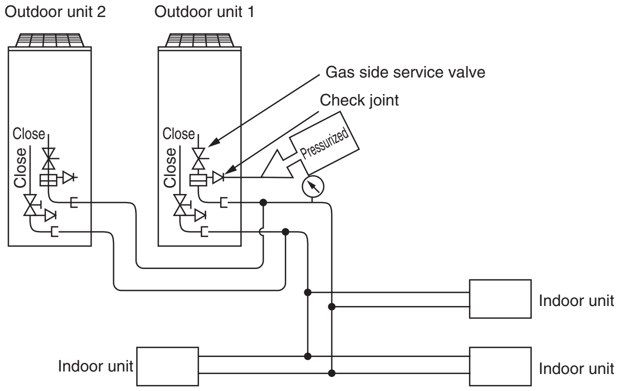
⚠ **Caution** : Please make sure that the operation valve is in the state of the "close" before waxing. If the flame touches the refrigerant gas, the noxious gas is generated, and it is likely to become poisoned.

e) In brazing an service valve and a pipe, braze them by cooling the valve main body with a wet towel or the like.
f) As it is a unit designed for R410A, the use of ester oil as flare joint oil is recommended.

5.6 Air Tightness Test

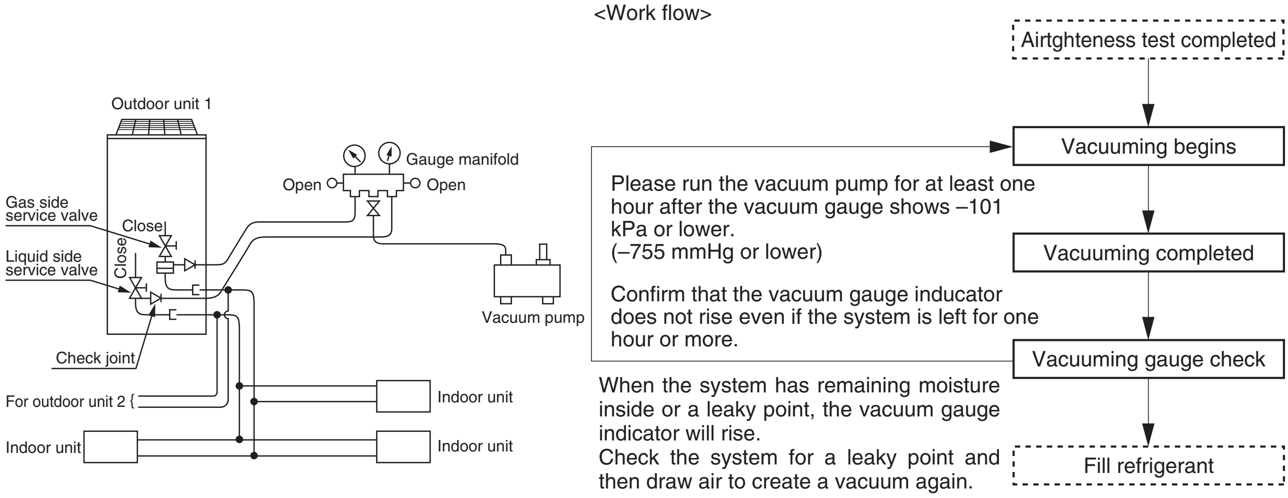
Caution : Please make an airtightness test using nitrogen gas and make sure no leakage after the refrigerant piping operation. When the refrigerant gas leaks in narrow indoor by any chance and the limiting concentration is exceeded, it might cause the hypoxia accident.

1. Although an outdoor unit itself has been tested for air tightness at the factory, please check the connected pipes and indoor units for air tightness from the check joint of the service valve on the outdoor unit side. While conducting a test, keep the service valve shut all the time.
2. Since refrigerant piping is pressurized to the design pressure of a unit with nitrogen gas for testing air tightness, please connect instruments according the drawing below.
   Under no circumstances should chorine-based refrigerant, oxygen or any other combustible gas be used to pressurize a system keep the service valve shut all the time. Do not open it under any circumstances.
   Pressurize all of the liquid, gas and oil equalization pipes.
3. In pressurizing the piping, do not apply the specified level of pressure all at once, but gradually raise pressure.
   a) Raise the pressure to 0.5 MPa, and stop. Leave it for five minutes to see if the pressure drops.
   b) Then raise the pressure to 1.5 MPa, and stop. Leave it for five more minutes to see if the pressure drops.
   c) Then raise the pressure to the specified level (4.15 MPa), and record the ambient temperature and the pressure.
   d) If no pressure drop is observed with an installation pressurized to the specifed level and left for about one day, It is acceptable. When the ambient temperature changes 1°C, the pressure also changes approximately 0.01 MPa. The pressure, if changed, should be compensated for.
   e) If a pressure drop is observed in checking e) and a) - d), a leak exists somewhere. Find a leak by applying bubble test liquid to welded parts and flare joints and repair it. After repair, conduct an air-tightness test again.
4. Always evacuate the pipes after the airtightness test.



5.7 Evacuation

Please pull air from the check joints of the service valves on both liquid and gas sides.
Please also pull air from the oil equalizing pipe. (Please pull air separately from the rest of the piping by using the oil equalizing valve check joint



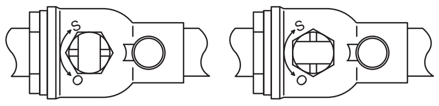
Pay attention to the following points in addition to the above for the R410A and compatible machines.

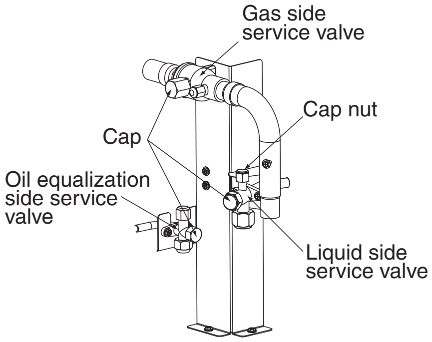
- To prevent a different oil from entering, please assign dedicated tools, etc. to each refrigerant type. Under no circumstances must a gauge manifold and a charge hose in particular be shared with other refrigerant types (R22, R470C, etc.).
- Use a counterflow prevention adapter to prevent vacuum pump oil from entering the refrigerant system.

5.8 Method of Operating Service Valves

Method of opening/closing a valve

1. Remove the cap, turn the gas pipe side until comes to the "Closed" position as indicated in the drawing on the right.
2. For the liquid side pipe and oil equalization 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.


Opened position Closed position



3. 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	7.85 (MAX 15.7)	29.4 (MAX 39.2)	8.8 (MAX 14.7)
For oil equalization pipes	4.9 (MAX 11.8)	16.2 (MAX 24.5)	8.8 (MAX 14.7)

For flare nut tightening torque, please refer to Section 5.4.1 Piping work on the installation site.

5.9 Additional Refrigerant Charge

1. Charge additional refrigerant in the liquid state.
2. Be sure to use a scale to measure the filling amount when 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. 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 30 min.)
3. Fill this unit only with the standard amount of refrigerant (piping length 0 m fill quantity).
   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 of the side panel.

Additional charge amount

Item / Model	Additional charge amount per 1 m of liquid pipe						Factory charge amount at time of shipment	
	ϕ 22.2	ϕ 19.05	ϕ 15.88	ϕ 12.7	ϕ 9.52	ϕ 6.35	Outdoor unit	Remarks
FDCA140HKXEN4	—	—	—	—	—	—	8.5	Additional charge is not required
FDCA224HKXE4	0.35	0.25	0.17	0.11	0.054	0.022	11.5kg	Additional refrigerant Charge is not required
FDCA280HKXE4							11.5kg	
FDCA335HKXE4							14.2kg	
FDCA335HKXE4-K							17.0kg	
FDCA400HKXE4							17.0kg	
FDCA450HKXE4							17.0kg	
FDCA504HKXE4							19.4kg	
FDCA560HKXE4							19.4kg	
FDCA615HKXE4							26.2kg	
FDCA680HKXE4							26.2kg	

Calculation of amount of refrigerant to be charged in local piping

The amount refrigerant additionally charged in local piping depends on connection pipe size but not on indoor unit type.

[Amount of refrigerant to be charged in the local piping = Actual length of liquid pipe × Amount of refrigerant additionally charged per meter of liquid pipe]

[Example] Amount of refrigerant additionally charged = (ℓ 1 × 0.35) + (ℓ 2 × 0.25) + (ℓ 3 × 0.17)
+ (ℓ 4 × 0.11) + (ℓ 5 × 0.054) + (ℓ 6 × 0.022)

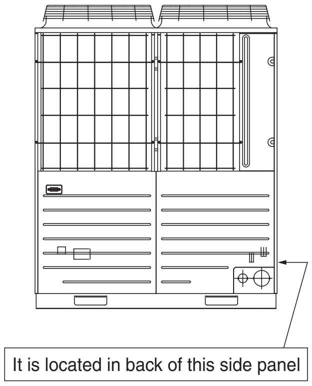
ℓ 1: Overall length (m) of ϕ 22.22 liquid pipe
ℓ 2: Overall length (m) of ϕ 19.05 liquid pipe
ℓ 3: Overall length (m) of ϕ 15.88 liquid pipe
ℓ 4: Overall length (m) of ϕ 12.7 liquid pipe
ℓ 5: Overall length (m) of ϕ 9.52 liquid pipe
ℓ 6: Overall length (m) of ϕ 6.35 liquid pipe

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.).
- 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 cylindser.
- When charging refrigerant, use liquid refrigrent from a cylinder. If refrigerant is charged in a gas form, the composition may change considerably.

Please note

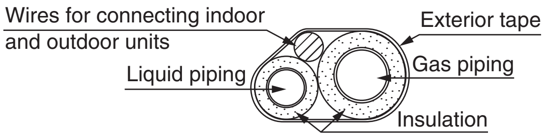
Put down on the refrigerant charge volume recording plate provided on the back of the side panel the amount of refrigerant calculated from the pipe length.

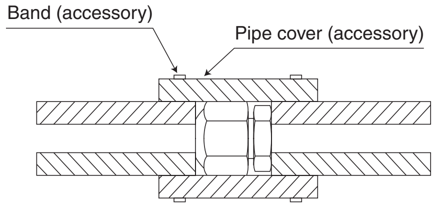


5.10 Heating and Condensation Prevention

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 bums, when touched accidentally. So, do not fail to dress it with a heat insulation material.
b) Warp indoor unit's 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 warp 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.





5.11 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 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 toola listed in the table below 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)

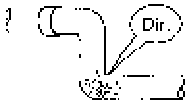
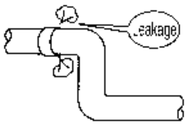
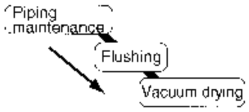
	Dedicated R410A tools
a	Gauge manifold
b	Charge hose
c	Electronic scale for refrigerant charging
d	Torque wrench
e	Flare tool
f	Protrusion control copper pipe gauge
g	Vaccum pump adapter
h	Gas leak detector

5.11.1 Key points for R410A new refrigerant piping installation

Three key points for refrigerant piping installation

Please pay special attention to the fact that the requirement for the refrigerant piping is different from that for the other facility piping of the building. Neglect of the following points may cause troubles. When installing the refrigerant piping, the inside piping should be kept "dry", "clean" and "air-tight", which are the three key points for the refrigerant piping installation.

Three key points for the refrigerant piping installation

	Dryness	Cleanness	Air-tightness
	No moisture inside the pipe	No contamination inside the pipe	No leakage inside the pipe
Legend			
Causes	■ Water enter from outside, such as rain water. ■ Condensed water in the piping	■ Oxide generated during braze welding. ■ Foreign contamination is mixed in from the outside, such as dirt and oil stain.	■ Infirm braze welding ■ Improper flare processing or incorrect tightening torque
Symptoms Shown	■ Clogging in the expansion valve or capillary tubes, etc. ■ Neither cooling nor heating ■ Deterioration of the refrigerator oil ■ Compressor failure	■ Clogging in the expansion valve or capillary tubes, etc. ■ Neither cooling nor heating ■ Deterioration of the refrigerator oil ■ Compressor failure	■ Insufficient gaseous refrigerant ■ Neither cooling nor heating ■ Rise of discharge gas temperature ■ Deterioration of the refrigerator oil ■ Compressor failure
Precautions		■ Same as the left ■ Do not use devices that have been used for other refrigerants.	■ Follow the basic operation rules for braze welding. ■ Follow the basic operation rules for flare processing. ■ Follow the basic operation rules for flange connection. ■ Carry out the air-tightness test.

5.11.2 R410A new refrigerant piping installation work

Note (1) All the equipment should be changed to the special ones for the new refrigerant, so as to prevent ozone layer destruction and global warming.
(2) As the property of each refrigerant is different, the specifications differ greatly. Please refer to the manuals issued by each manufacturer.

Confirmation before installation

1. **Type of the refrigerant to be charged**
   The old refrigerant is R22 and the new one is R410A.

2. **Confirmation of the installation place and specification**
   Ensure the installation place of the installation components and tools.

3. **Confirmation of the tools required**
   Be sure to use the tools applicable to the refrigerant type. Never mix the usage of pipe pressure testing devices, charge hoses, charge cylinders, vacuum pumps and other equipment.
   Be sure to use dedicated tools for the construction (otherwise malfunctions may occur).

4. **Confirmation of the connected piping (Pipes of fixed length, extended pipes)**
   Use the JIS specified piping (refer to the Refrigerant Piping Wall Thickness Comparison Table) to meet the requirement of the new refrigerant. Confirm that the end of the long piping has been treated (wrapping with clamp seal or tapes). When piping is buried, be sure to protect the piping end (wrapping with clamp seal or tapes).