

**16. SATELLITE DUCTED TYPE  
PACKAGED AIR-CONDITIONER  
( Split system, Air to air heat  
pump type )**

**FDUM308HEN-SB  
308HES-SB  
408HES-SB  
508HES-SB**

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# 16.1 GENERAL INFORMATION

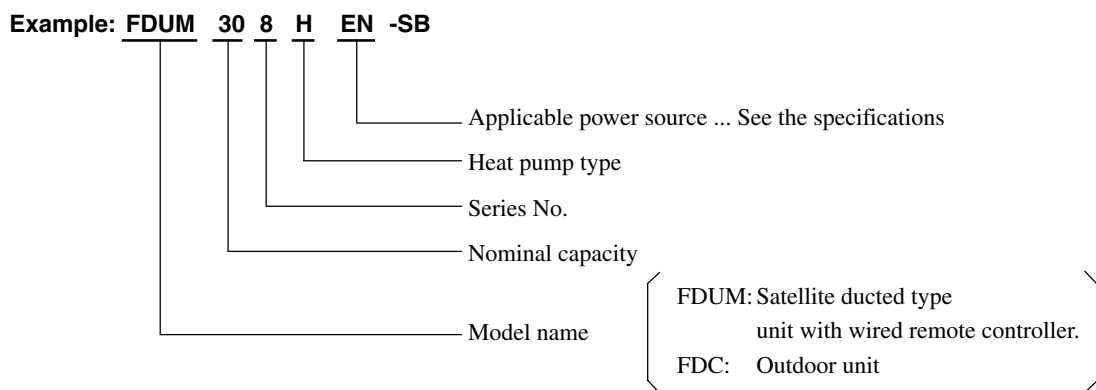
## 16.1.1 Specific features

- (1) Less refrigerant charge amount due to use of double phase refrigerant flow system. The total refrigerant charge amount has been reduced by more than 50%.
- (2) The indoor outdoor interconnection signal wiring has been done away with. The microcomputer chip is installed in the indoor unit. There is no need for the unit to communicate between the outdoor and indoor units so the unit is more resistant to electromagnetic noise thus the incidence of microcomputer malfunction has been reduced. The compressor in the outdoor unit has its own self protection function, that reacts according to abnormal high pressure and excessive high temperature.
- (3) There are only five power lines with earth line between the outdoor and indoor unit. As no signal wire is used there is no need to separate the power line from the signal line. One cable with 6 wires encased in one sheath is enough for conducting the wiring work between the outdoor unit and the indoor unit. This contributes to simpler wiring work in the field.
- (4) **External static pressure**
  - (i) Higher external static pressure type (Refer to the specification in page 572 for the external static pressure)
  - (ii) Maximum duct length is two times of conventional types. Adaptable to an extra long duct of one spot 20 meters extension.
- (5) **Self-diagnosing function**

If any of troubles, such as an abnormality with the power supply and disconnection in the thermistor circuit, has occurred, such abnormality, etc. are indicated by a blinking signal, displaying the trouble mode in letters on the liquid crystal display of the remote controller. It is also possible to monitor any such abnormality with a checking switch. When plural units are controlled, No. of the unit in trouble is also indicated.
- (6) **600 mm high drain head**

Adoption of drain pump with high drain head and high capacity (600 cc/min) has made it possible to have maximum 600 mm [from below ceiling] drain head. [In case 600 mm drain head is required, set it up close to the unit. It is impossible to do piping on down slope.]

## 16.1.2 How to read the model name



## 16.2 SELECTION DATA

### 16.2.1 Specifications

#### Model FDUM308HEN-SB

Item		Model	FDUM308HEN-SB	
			FDUM308-A	FDC308HEN3B
<b>Nominal cooling capacity<sup>(1)</sup></b>		W	7100	
<b>Nominal heating capacity<sup>(1)</sup></b>		W	8000	
<b>Power source</b>			1 Phase, 220/240V, 50Hz	
<b>Operation data<sup>(2)</sup></b>	Cooling input	kW	3.02/3.22	
	Running current (Cooling)	A	14.0/14.5	
	Power factor (Cooling)	%	98/93	
	Heating input	kW	2.88/3.04	
	Running current (Heating)	A	13.4/13.8	
	Power factor (Heating)	%	98/92	
	Inrush current	A	95	
	Noise level	dB(A)	Hi: 36 Lo: 30	52
<b>Exterior dimensions</b>				
<b>Height × Width × Depth</b>		mm	299 × 950 × 635	845 × 880 × 340
<b>Net weight</b>		kg	40	74
<b>Refrigerant equipment</b>				
<b>Compressor type &amp; Q'ty</b>			–	GT-A5534EN41 × 1
Motor		kW	–	2.5
Starting method			–	Line starting
<b>Heat exchanger</b>			Louver fines & inner grooved tubing	Slitted fines & bare tubing
Refrigerant control			Capillary tube	
<b>Refrigerant</b>			R22	
<b>Quantity</b>		kg	–	1.4 [Pre-charged up to the piping length of 5m]
<b>Refrigerant oil</b>		ℓ	–	1.45 [BARREL FREEZE32SAM]
Defrost control			MC controlled De-Icer	
High pressure control			High pressure switch	
<b>Air handling equipment</b>				
<b>Fan type &amp; Q'ty</b>			Multibade centrifugal fan × 2	Propeller fan × 1
Motor		W	100 × 1	55 × 1
Starting method			Line starting	Line starting
<b>Air flow (Standard)</b>		CMM	Hi:20 Lo:15	58
<b>Available static pressure (at Me)</b>		Pa	Standard: 50 High speed: 85	–
Fresh air intake			Available	–
Air filter, Q'ty			–	–
Shock & vibration absorber			Rubber sleeve (for fan motor)	Rubber mount (for compressor)
Electric heater		W	–	33 (Crank case heater)
<b>Operation control</b>				
Operation switch			Wired remote control switch (Optional : RCD-H-E)	– (Indoor unit side)
Room temperature control			Thermostat by electronics	–
<b>Safety equipment</b>			Internal thermostat for fan motor. Frost protection thermostat.	Internal thermostat for fan motor. Abnormal discharge temperature protection.
<b>Installation data</b>				
<b>Refrigerant piping size</b>		mm (in)	Liquid line: φ9.52 (3/8") Gas line: φ15.88 (5/8")	
<b>Connecting method</b>			Flare piping	
<b>Drain hose</b>			(Connectable with VP25)	–
Insulation for piping			Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit.	
Optional parts			–	

Notes (1) The data are measured at the following conditions.

Operation	Item	Indoor air temperature		Outdoor air temperature		Standards
		DB	WB	DB	WB	
Cooling		27°C	19°C	35°C	24°C	ISO-T1, JIS B8616
Heating		20°C	–	7°C	6°C	

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

(3) The operation data indicate when the air-conditioner is operated at 220/240V 50Hz.

## Model FDUM308HES-SB

Item		Model	FDUM308HES-SB	
			FDUM308-A	FDC308HES3B
<b>Nominal cooling capacity<sup>(1)</sup></b>		W	7100	
<b>Nominal heating capacity<sup>(1)</sup></b>		W	8000	
<b>Power source</b>			3 Phase, 380/415V, 50Hz	
Operation data <sup>(2)</sup>	Cooling input	kW	2.94/3.00	
	Running current (Cooling)	A	5.2/5.6	
	Power factor (Cooling)	%	86/75	
	Heating input	kW	2.58/2.64	
	Running current (Heating)	A	4.7/4.9	
	Power factor (Heating)	%	83/75	
	Inrush current	A	45	
	Noise level	dB(A)	Hi: 36 Lo: 30	52
<b>Exterior dimensions Height × Width × Depth</b>		mm	299 × 950 × 635	
<b>Net weight</b>		kg	40	
<b>Refrigerant equipment Compressor type &amp; Q'ty</b>			GT-A5534ES41 × 1	
Motor		kW	2.5	
Starting method			Line starting	
<b>Heat exchanger</b>			Louver fines & inner grooved tubing	
Refrigerant control			Slitted fines & bare tubing	
<b>Refrigerant</b>			Capillary tube	
<b>Quantity</b>		kg	R22	
<b>Refrigerant oil</b>		ℓ	1.4 [Pre-charged up to the piping length of 5m]	
Defrost control			1.45 [BARREL FREEZE32SAM]	
High pressure control			MC controlled De-Icer	
<b>Air handling equipment Fan type &amp; Q'ty</b>			High pressure switch	
Motor		W	Multibade centrifugal fan × 2	
Starting method			Propeller fan × 1	
<b>Air flow (Standard)</b>		CMM	100 × 1	
<b>Available static pressure (at Me)</b>		Pa	55 × 1	
Fresh air intake			Line starting	
Air filter, Q'ty			Hi:20 Lo:15	
Shock & vibration absorber			Standard: 50 High speed: 85	
Electric heater		W	Available	
<b>Operation control</b>			-	
Operation switch			Wierd remote control switch (Optional : RCD-H-E)	
Room temperature control			- (Indoor unit side)	
<b>Safety equipment</b>			Thermostat by electronics	
Internal thermostat for fan motor.			-	
Frost protection thermostat.			Internal thermostat for fan motor. Abnormal discharge temperature protection.	
<b>Installation data</b>				
<b>Refrigerant piping size</b>		mm (in)	Liquid line: φ9.52 (3/8") Gas line: φ15.88 (5/8")	
<b>Connecting method</b>			Flare piping	
<b>Drain hose</b>			(Connectable with VP25)	
Insulation for piping			-	
Accessories			Necessary (both Liquid & Gas lines)	
Optional parts			Mounting kit.	
			-	

Notes (1) The data are measured at the following conditions.

Operation	Item	Indoor air temperature		Outdoor air temperature		Standards
		DB	WB	DB	WB	
Cooling		27°C	19°C	35°C	24°C	ISO-T1, JIS B8616
Heating		20°C	-	7°C	6°C	

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

(3) The operation data indicate when the air-conditioner is operated at 380/415V 50Hz.

## Model FDUM408HES-SB

Item		Model	FDUM408HES-SB	
			FDUM408-A	FDC408HES3B
<b>Nominal cooling capacity<sup>(1)</sup></b>		W	<b>10000</b>	
<b>Nominal heating capacity<sup>(1)</sup></b>		W	<b>11200</b>	
<b>Power source</b>			<b>3 Phase, 380/415V, 50Hz</b>	
Operation data <sup>(3)</sup>	Cooling input	kW	4.48/4.58	
	Running current (Cooling)	A	7.6/7.9	
	Power factor (Cooling)	%	90/81	
	Heating input	kW	3.86/3.90	
	Running current (Heating)	A	6.9/7.3	
	Power factor (Heating)	%	85/74	
	Inrush current	A	53	
	Noise level	dB(A)	Hi: 38 Lo: 33	54
<b>Exterior dimensions</b>				
<b>Height × Width × Depth</b>		mm	<b>350 × 1370 × 635</b>	<b>1050 × 920 × 340</b>
<b>Net weight</b>		kg	<b>57</b>	<b>90</b>
<b>Refrigerant equipment</b>				
<b>Compressor type &amp; Q'ty</b>			-	<b>GU-A5550ES41 × 1</b>
Motor		kW	-	<b>2.8</b>
Starting method			-	Line starting
<b>Heat exchanger</b>			Louver fines & inner grooved tubing	Slitted fins & bare tubing
Refrigerant control			Capillary tube	
<b>Refrigerant</b>			<b>R22</b>	
<b>Quantity</b>		kg	-	<b>1.7 [Pre-charged up to the piping length of 5m]</b>
<b>Refrigerant oil</b>		ℓ	-	<b>1.6 [BARREL FREEZE32SAM]</b>
Defrost control			MC controlled De-Icer	
High pressure control			High pressure switch	
<b>Air handling equipment</b>				
<b>Fan type &amp; Q'ty</b>			Multibade centrifugal fan × 3	Propeller fan × 2
Motor		W	<b>45 × 1, 90 × 1</b>	<b>40 × 2</b>
Starting method			Line starting	Line starting
<b>Air flow (Standard)</b>		CMM	<b>Hi:28 Lo: 22</b>	<b>70</b>
<b>Available static pressure (at Me)</b>		Pa	<b>Standard: 60 High speed: 90</b>	-
Fresh air intake			Available	-
Air filter, Q'ty			-	-
Shock & vibration absorber			Rubber sleeve (for fan motor)	Rubber mount (for compressor)
Electric heater		W	-	40 (Crank case heater)
<b>Operation control</b>				
Operation switch			Wired remote control switch (Optional : RCD-H-E)	- (Indoor unit side)
Room temperature control			Thermostat by electronics	-
<b>Safety equipment</b>			Internal thermostat for fan motor. Frost protection thermostat.	Internal thermostat for fan motor. Abnormal discharge temperature protection.
<b>Installation data</b>				
<b>Refrigerant piping size</b>		mm (in)	<b>Liquid line: φ9.52 (3/8") Gas line: φ19.05 (3/4")</b>	
<b>Connecting method</b>			<b>Flare piping</b>	
<b>Drain hose</b>			(Connectable with VP25)	-
Insulation for piping			Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit.	
Optional parts			-	

Notes (1) The data are measured at the following conditions.

Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling	27°C	19°C	35°C	24°C	ISO-T1, JIS B8616
Heating	20°C	-	7°C	6°C	

- (2) This packaged air conditioner is manufactured and tested in conformity with the following standard. ISO-T1 "UNITARY AIR CONDITIONERS"  
(3) The operation data indicate when the air-conditioner is operated at 380/415V 50Hz.

## Model FDUM508HES-SB

Item		Model	FDUM508HES-SB	
			FDUM508-A	FDC508HES3B
<b>Nominal cooling capacity<sup>(1)</sup></b>		W	12500	
<b>Nominal heating capacity<sup>(1)</sup></b>		W	14000	
<b>Power source</b>			3 Phase, 380/415V, 50Hz	
Operation data <sup>(3)</sup>	Cooling input	kW	5.27/5.52	
	Running current (Cooling)	A	9.4/10.2	
	Power factor (Cooling)	%	85/75	
	Heating input	kW	4.82/4.95	
	Running current (Heating)	A	8.9/9.8	
	Power factor (Heating)	%	82/70	
	Inrush current	A	74	
	Noise level	dB(A)	Hi: 39 Lo: 34	55
<b>Exterior dimensions</b>				
<b>Height × Width × Depth</b>		mm	350 × 1370 × 635	1250 × 920 × 340
<b>Net weight</b>		kg	59	101
<b>Refrigerant equipment</b>				
<b>Compressor type &amp; Q'ty</b>			-	GU-A5570ES41 × 1
Motor		kW	-	3.75
Starting method			-	Line starting
<b>Heat exchanger</b>			Louver fines & inner grooved tubing	Slitted fins & bare tubing
Refrigerant control			Capillary tube	
<b>Refrigerant</b>			R22	
<b>Quantity</b>		kg	-	1.9 [Pre-charged up to the piping length of 5m]
<b>Refrigerant oil</b>		ℓ	-	1.6 [BARREL FREEZE32SAM]
Defrost control			MC controlled De-Icer	
High pressure control			High pressure switch	
<b>Air handling equipment</b>				
<b>Fan type &amp; Q'ty</b>			Multibade centrifugal fan × 3	Propeller fan × 2
Motor		W	50 × 1, 100 × 1	65 × 2
Starting method			Line starting	Line starting
<b>Air flow (Standard)</b>		CMM	Hi:34 Lo: 27	110
<b>Available static pressure (at Me)</b>		Pa	Standard: 60 High speed: 85	-
Fresh air intake			Available	-
Air filter, Q'ty			-	-
Shock & vibration absorber			Rubber sleeve (for fan motor)	Rubber mount (for compressor)
Electric heater		W	-	40 (Crank case heater)
<b>Operation control</b>				
Operation switch			Wierd remote control switch (Optional : RCD-H-E)	- (Indoor unit side)
Room temperature control			Thermostat by electronics	-
<b>Safety equipment</b>				
			Internal thermostat for fan motor. Frost protection thermostat.	Internal thermostat for fan motor. Abnormal discharge temperature protection.
<b>Installation data</b>				
<b>Refrigerant piping size</b>		mm (in)	Liquid line: φ9.52 (3/8") Gas line: φ19.05 (3/4")	
<b>Connecting method</b>			Flare piping	
<b>Drain hose</b>			(Connectable with VP25)	-
Insulation for piping			Necessary (both Liquid & Gas lines)	
Accessories			Mounting kit.	
Optional parts			-	

Notes (1) The data are measured at the following conditions.

Item	Indoor air temperature		Outdoor air temperature		Standards
	DB	WB	DB	WB	
Cooling	27°C	19°C	35°C	24°C	ISO-T1, JIS B8616
Heating	20°C	-	7°C	6°C	

- (2) This packaged air conditioner is manufactured and tested in conformity with the following standard. ISO-T1 "UNITARY AIR CONDITIONERS"  
(3) The operation data indicate when the air-conditioner is operated at 380/415V 50Hz.

## 16.2.2 Renge of usage & limitations

Item	Models	All models
Indoor return air temperature (Upper, lower limits)		Refer to the selection chart
Outdoor air temperature (Upper, lower limits)		
Indoor unit atmosphere (behind ceiling) temperature and humidity		Dew point temperature 28°C or less, relative humidity 80% or less
Refrigerant line (one way) length		<b>Max. 50 m</b>
Vertical height difference between outdoor unit and indoor unit		<b>Max. 30 m (Outdoor unit is higher)</b> <b>Max. 15 m (Outdoor unit is lower)</b>
Power source voltage		Rating $\pm$ 10%
Voltage at starting		Min. 85% of rating
Frequency of ON-OFF cycle		Max. 10 times/h
ON and OFF interval		Min. 3 minutes

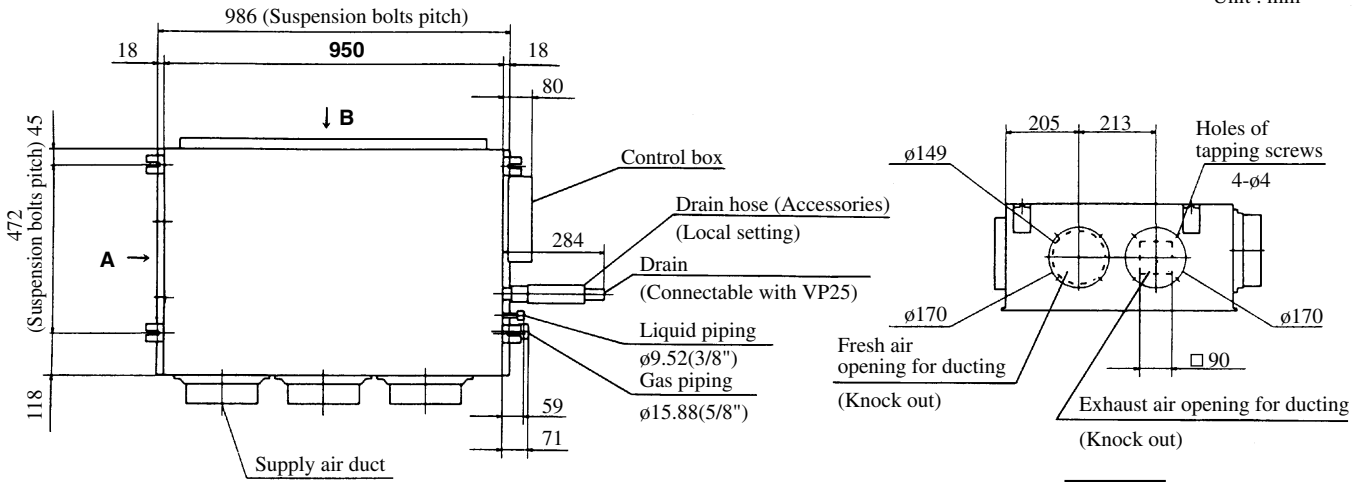


## 16.2.3 Exterior dimensions

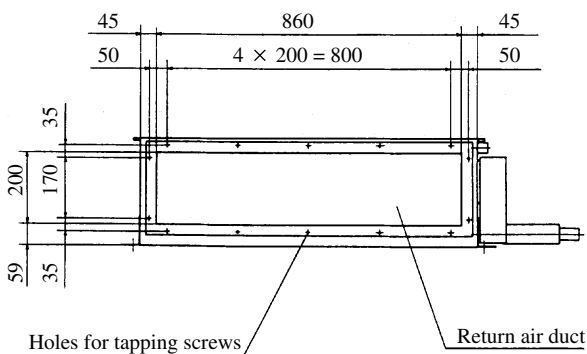
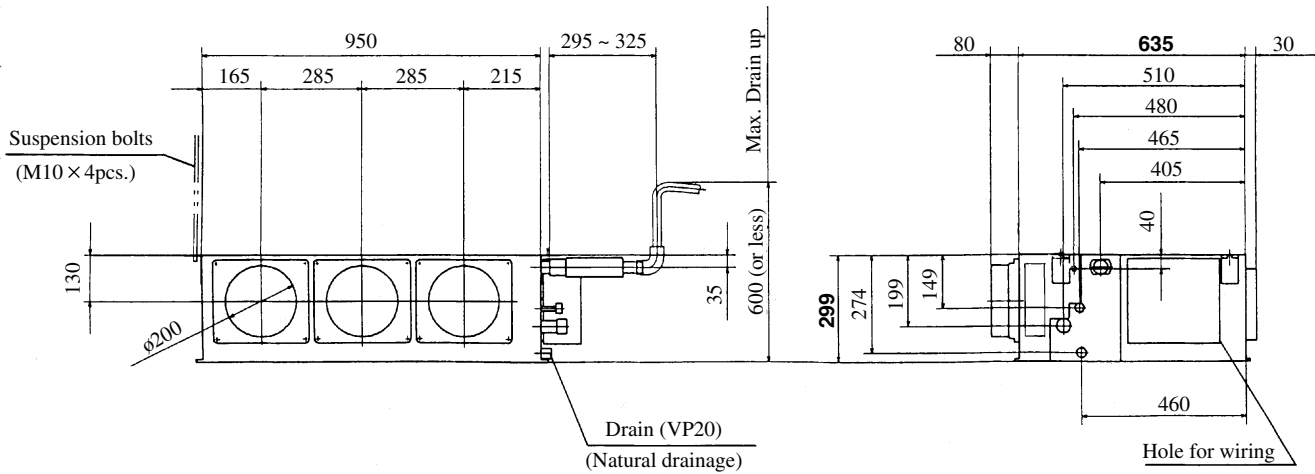
### (1) Indoor unit

Model FDUM308-A

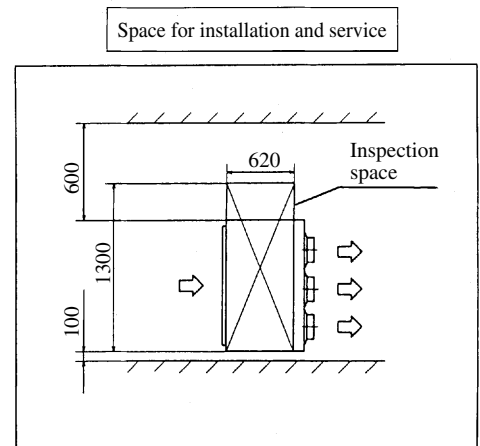
Unit : mm



**VIEW A**

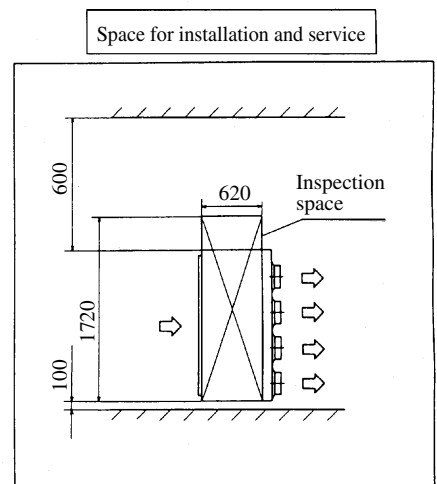
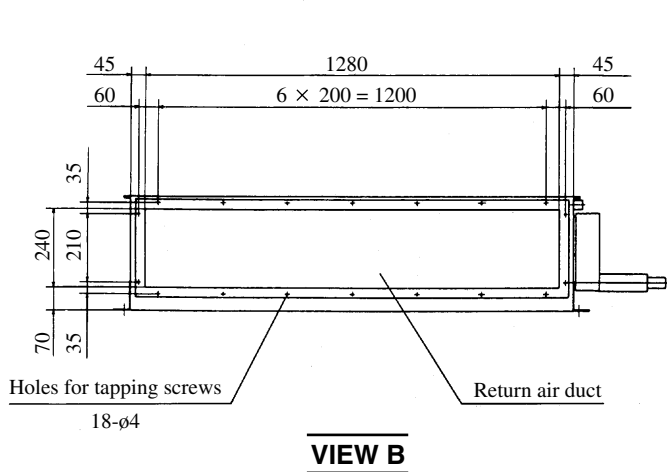
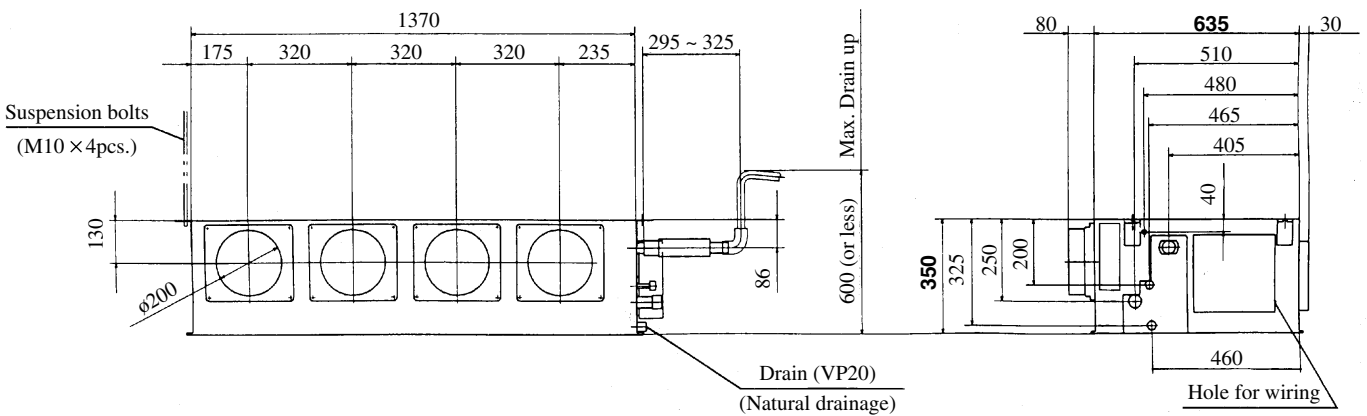
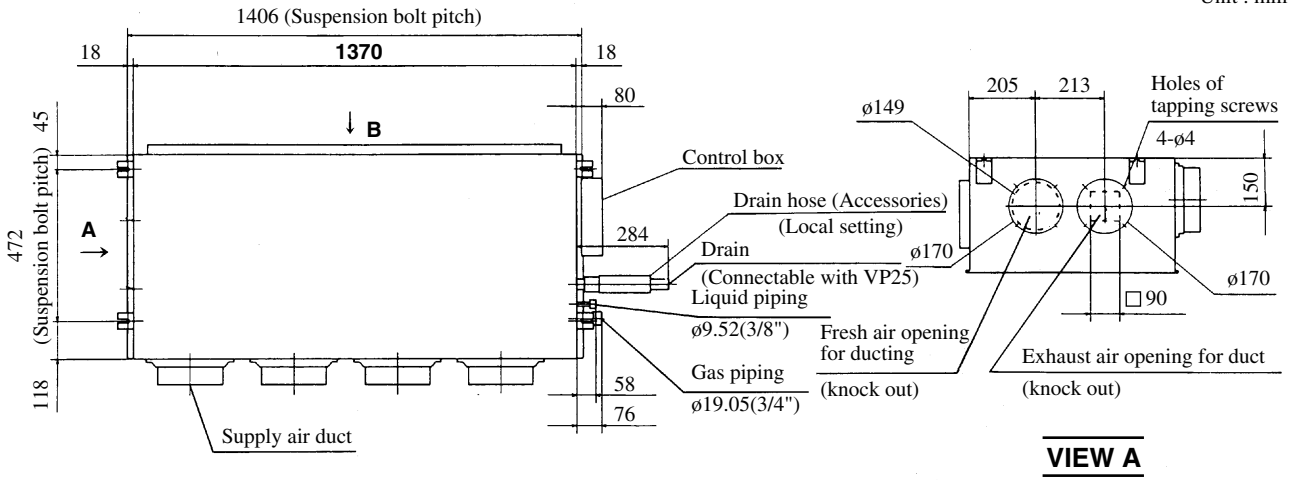


**VIEW B**



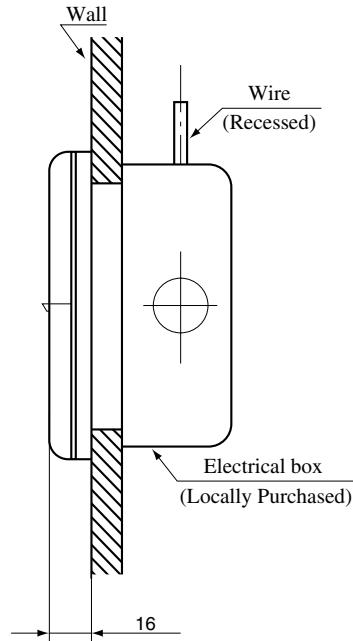
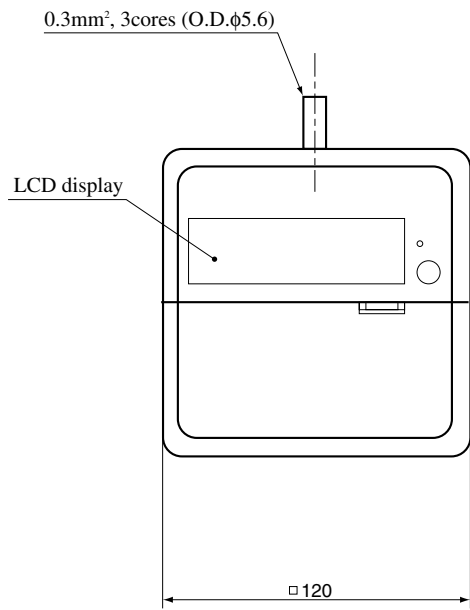
**Models FDUM408-A, 508-A**

Unit : mm

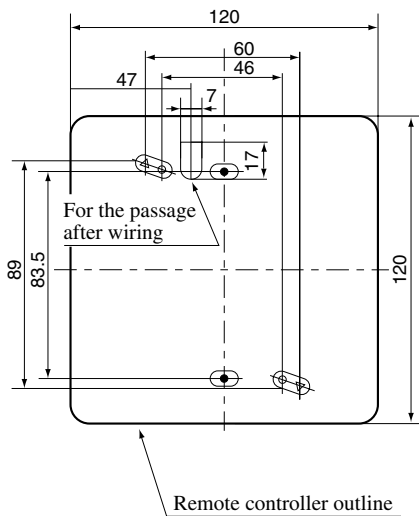


**(2) Remote controller (Optional parts)**

Unit: mm



Remote controller mounting dimensions



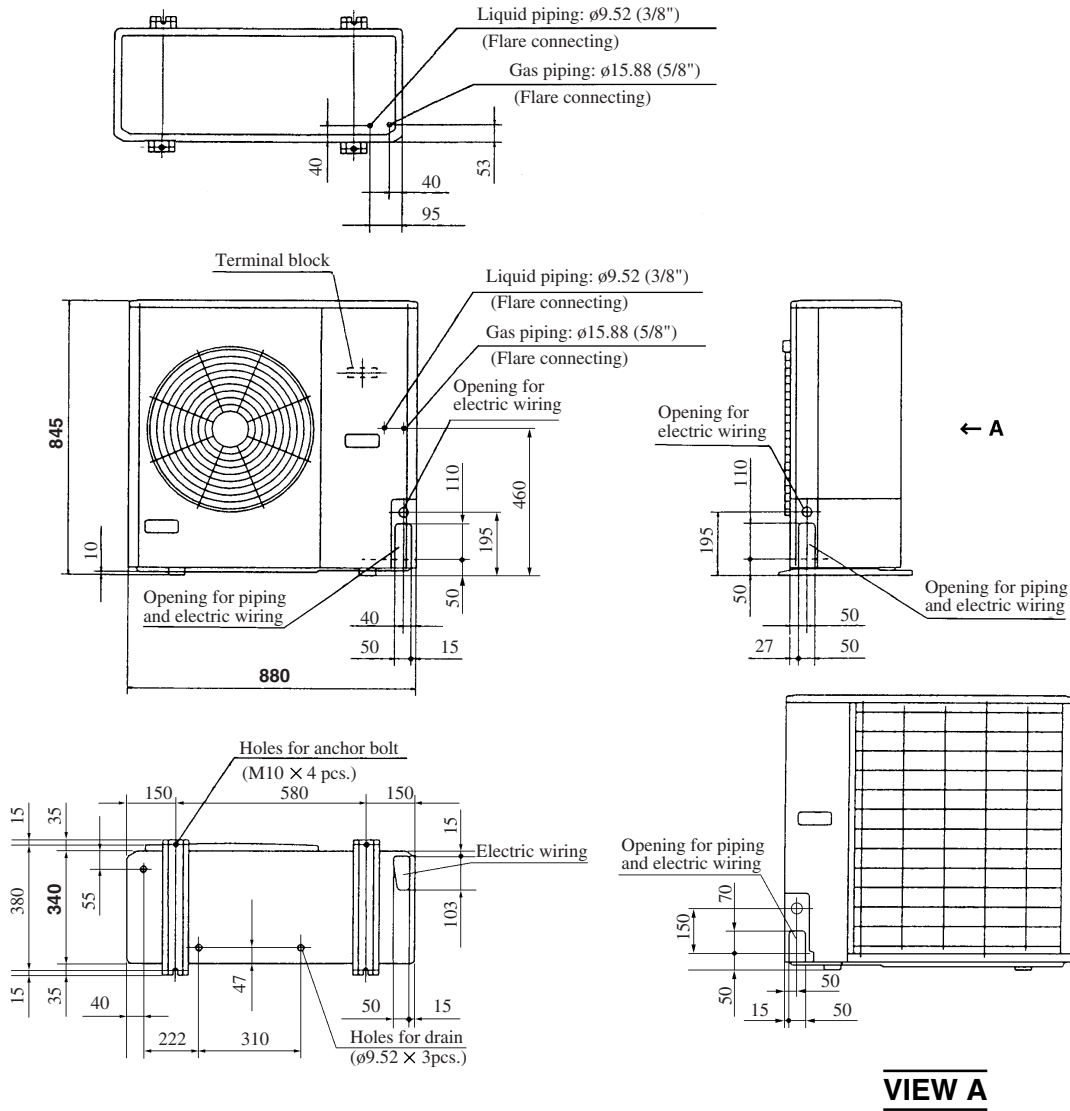
Note (1) Allowable length of remote controller cable: 600 m

**Allowable rang of wire thickness and length**

Standard Within	0.3 mm <sup>2</sup>	× Within 100 m
	0.5 mm <sup>2</sup>	× Within 200 m
	0.75 mm <sup>2</sup>	× Within 300 m
	1.25 mm <sup>2</sup>	× Within 400 m
	2 mm <sup>2</sup>	× Within 600 m

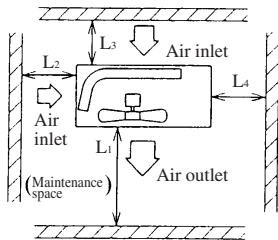
**(3) Outdoor unit**  
**Models FDC308HEN3B, 308HES3B**

Unit: mm



**VIEW A**

**Required space for maintenance and air flow**



**Minimum allowable space to the obstacles**

Unit:mm

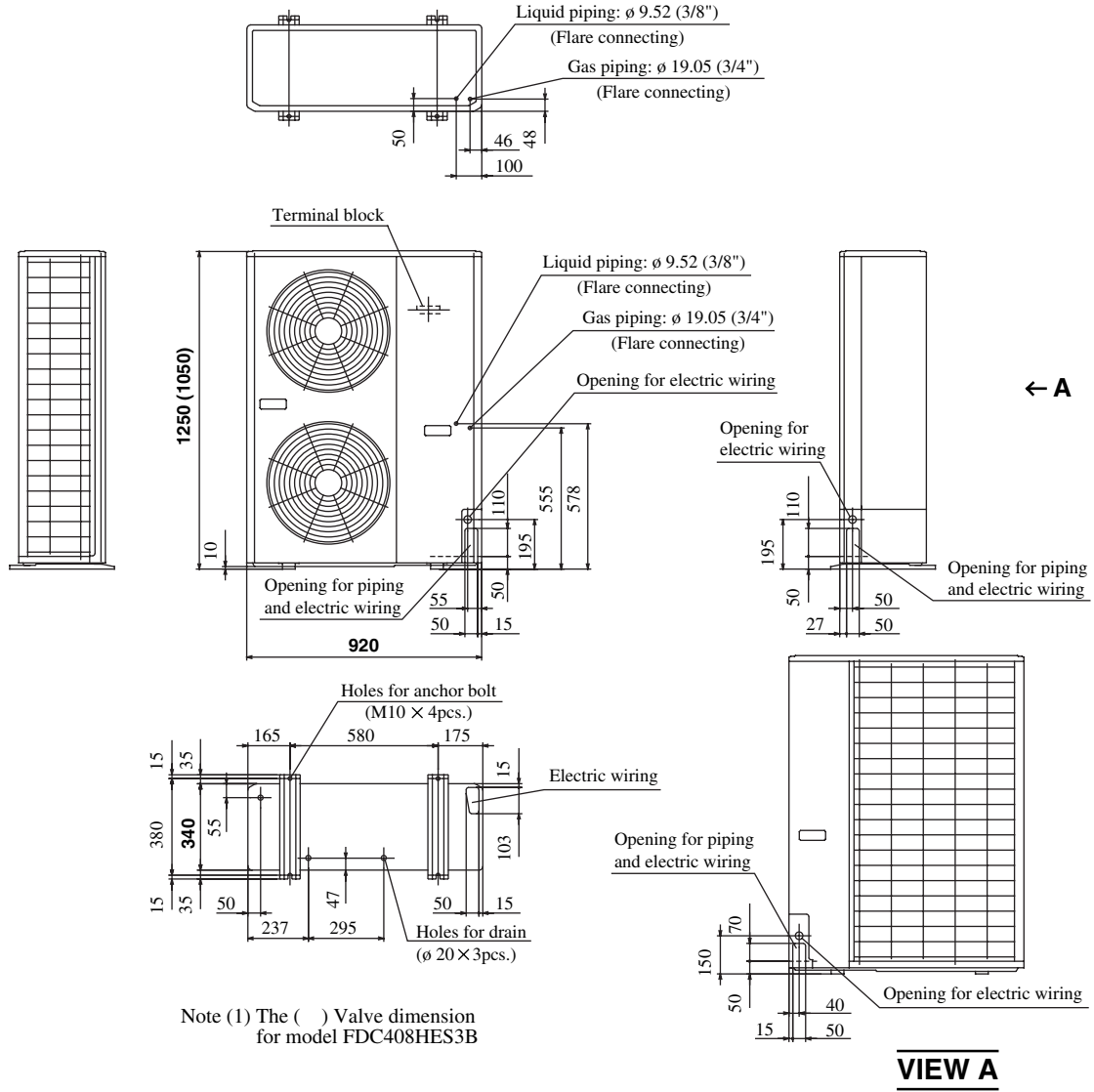
Mark	Installation type	Unit:mm		
		I	II	III
L1	Open	Open	Open	500
L2	300	5	Open	Open
L3	100	150	100	100
L4	5	5	5	5

**Notes**

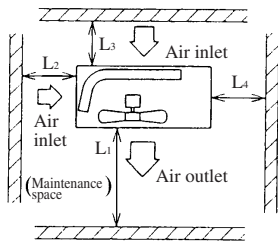
- (1) Avoid the location where four sides are entirely surrounded by walls.
- (2) Fix the unit by anchor bolts without fail. Restrict the protrusion length of anchor bolt to 15 mm and under.
- (3) When strong wind blows against the unit, direct the discharge port at a right angle to the wind direction.
- (4) Secure the space of 1 m and over at the top of unit.
- (5) Make the height of obstruction wall in front of discharge port lower than the height of unit.

**Models FDC408HES3B, 508HES3B**

Unit: mm



**Required space for maintenance and air flow**



**Minimum allowable space to the obstacles**

Unit:mm

Mark	Installation type	Unit:mm		
		I	II	III
L1	Open	Open	500	
L2	300	5	Open	
L3	150	300	150	
L4	5	5	5	

**Notes**

- (1) Avoid the location where four sides are entirely surrounded by walls.
- (2) Fix the unit by anchor bolts without fail. Restrict the protrusion length of anchor bolt to 15 mm and under.
- (3) When strong wind blows against the unit, direct the discharge port at a right angle to the wind direction.
- (4) Secure the space of 1 m and over at the top of unit.
- (5) Make the height of obstruction wall in front of discharge port lower than the height of unit.

## 16.2.4 Exterior appearance

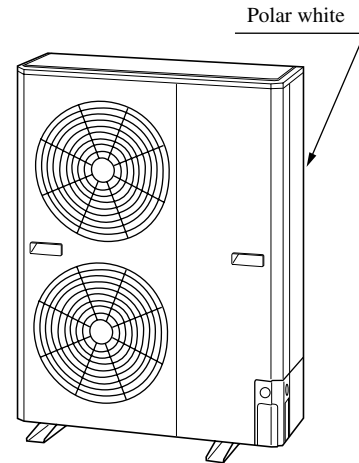
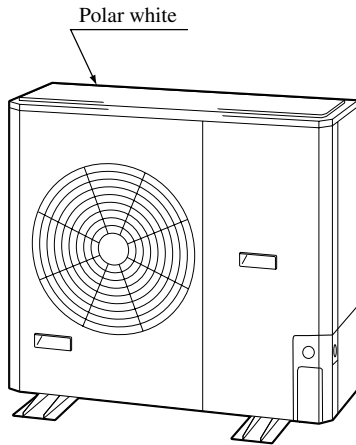
### (1) Indoor unit

All models ··· Zinc steel panel

### (2) Outdoor unit

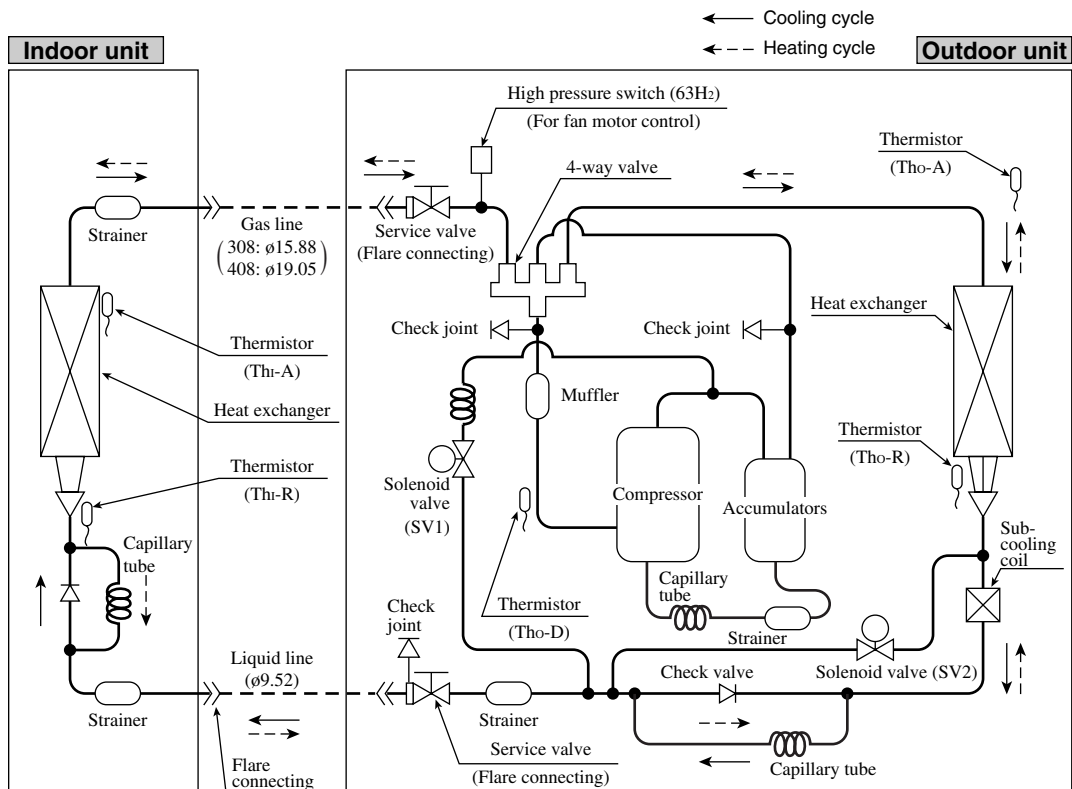
Models FDC308HEN3B, 308HES3B

Models FDC408HES3B, 508HES3B

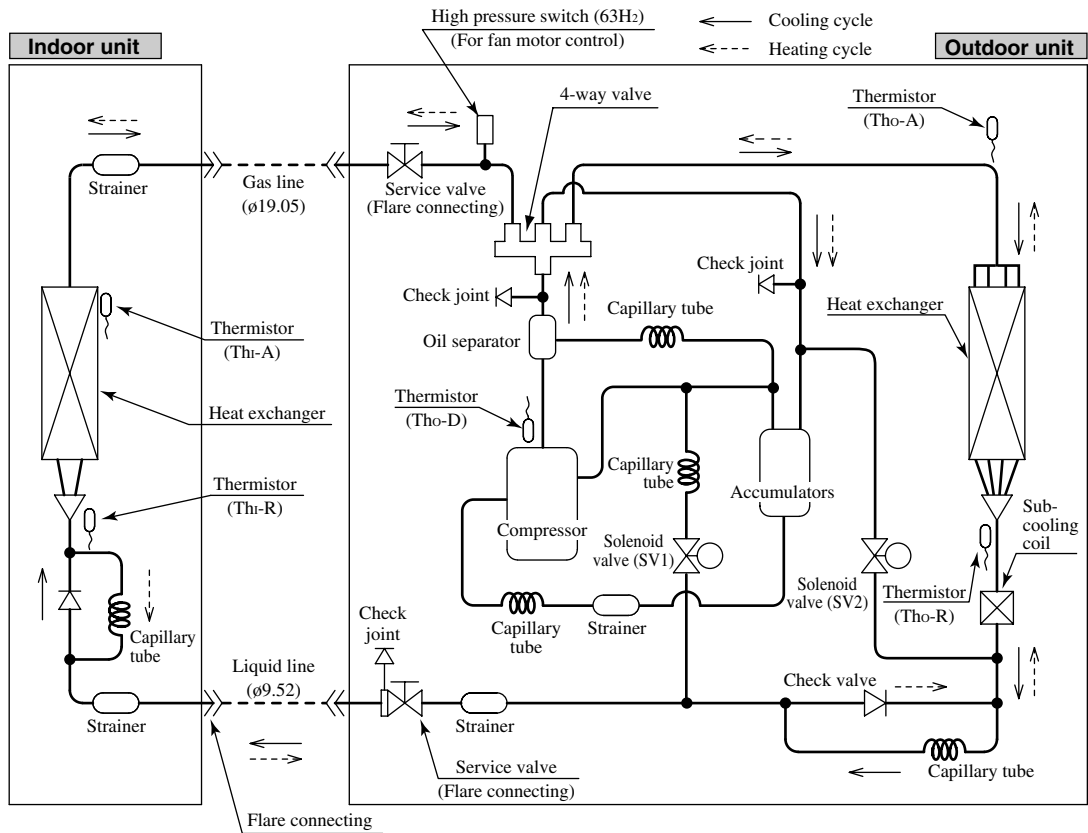


## 16.2.5 Piping system

Models FDUM308HEN-SB, 308HES-SB, 408HES-SB



**Model FDUM508HES-SB**



**Present point of the protective devices**

Part name	Mark	Equipped unit	All models
Thermistor (for protection over-loading in heating)	Thi-R	Indoor unit	OFF 68°C
			ON 61°C
Thermistor (for frost prevention)			OFF 2.5°C
			ON 10°C
Thermistor (for detecting discharge pipe temp.)	Tho-D	Outdoor unit	OFF 135°C
			ON 90°C
Thermistor (for detecting heat exchange temp.)	Tho-R	Outdoor unit	OFF 70°C
			ON 60°C
High pressure switch (for controlling FM <sub>0</sub> )	63H <sub>2</sub>	Outdoor unit	OFF 2.50MPa
			ON 2.06MPa

## 16.2.6 Selection chart

Correct the cooling and heating capacity in accordance with the conditions as follows. The net cooling and heating capacity can be obtained in the following way.

$$\text{Net capacity} = \text{Capacity shown on specifications} \times \text{Correction factors as follows.}$$

### (1) Coefficient of cooling and heating capacity in relation to temperatures

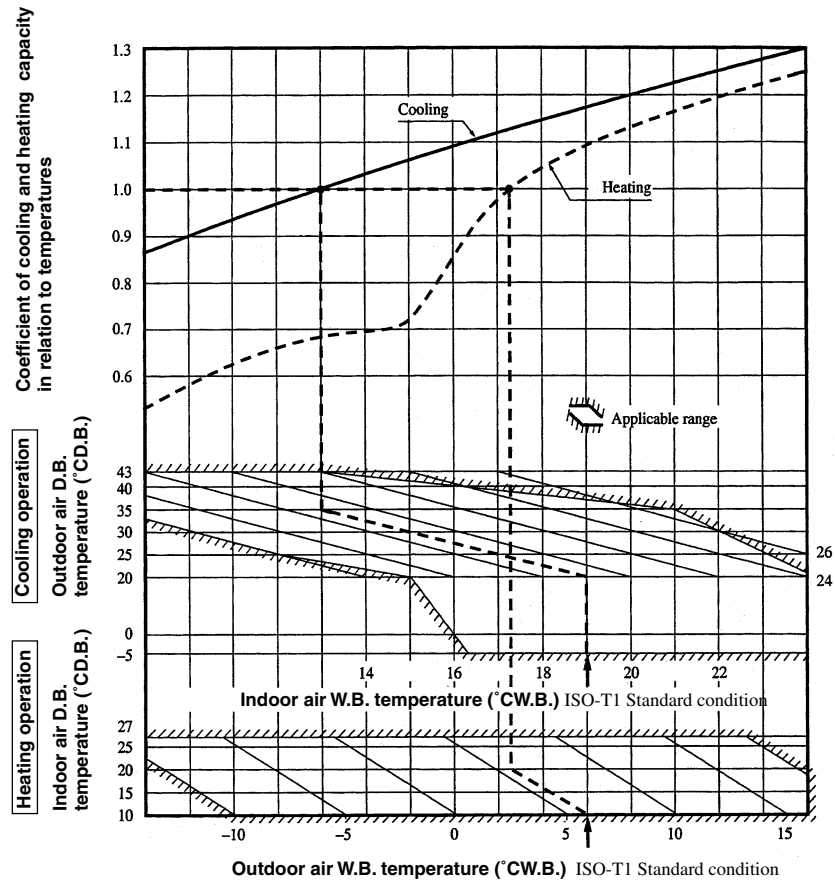


Table of bypass factor

Item	Model	FDUM308	FDUM408	FDUM508
Air folw	Hi	0.039	0.085	0.035
	Lo	0.023	0.060	0.023

### (2) Correction of cooling and heating capacity in relation to air flow rate control (fan speed)

Coefficient: 1.00 at High, 0.95 at Low



**(3) Capacity correction relative to piping length and height difference between indoor and outdoor units**

Correction of cooling and heating capacity becomes necessary depending on the length of refrigerant pipe extension (One-way distance between indoor and outdoor units) and the difference of height between the indoor and the outdoor units.

**(a) Correction coefficient relative to equivalent piping length**

Following table shows the correction coefficient adapted to the equivalent piping length when there is no difference (0m) in the height of indoor and outdoor units.

Equivalent piping length <sup>(1)</sup> m		7.5	10	15	20	25	30	35	40	45	50	55
Heating		1.0	1.0	1.0	1.0	1.0	0.998	0.998	0.993	0.993	0.988	0.988
Cooling	<b>FDUM308</b>	1.0	0.995	0.985	0.975	0.965	0.955	0.945	0.935	0.925	0.915	0.905
	<b>FDUM408</b>	1.0	0.998	0.990	0.985	0.975	0.970	0.960	0.955	0.945	0.940	0.930
	<b>FDUM508</b>	1.0	0.995	0.980	0.970	0.955	0.945	0.930	0.920	0.905	0.895	0.880

Note (1) Equivalent piping length can be obtained by calculating as follows.

308 series [φ15.88 (5/8")]: Equivalent piping length = Real piping length + (0.10 × Number or bend in piping)

408, 508 series [φ19.05 (3/4")]: Equivalent piping length = Real piping length + (0.15 × Number of bends sin piping)

[Equivalent piping length < Limitation length of piping + 5m]

**(b) Capacity correction relative to height difference between indoor and outdoor units**

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	5 m	10 m	15 m	20 m	25 m	30 m
<b>Adjustment coefficient</b>	0.01	0.02	0.03	0.04	0.05	0.06

**Piping length limitations**

Model	All models
Item	
<b>Max. one way piping length</b>	50 m
<b>Max. vertical height difference</b>	30m(Outdoor unit is higher), 15m(Outdoor unit is lower)

Note (1) Values in the table indicate the one way piping length between the indoor and outdoor units.

**How to obtain the cooling capacity**

**Example :** The net cooling capacity of the model FDUM308HEN-SB with the air flow "High", the piping length of 15 m, the outdoor unit located 5 m lower than the indoor unit, indoor wet-bulb temperature at 19.0°C and outdoor dry-bulb temperature 35°C is

$$\text{Net cooling capacity} = \underset{\substack{\uparrow \\ \text{FDUM308HEN-SB}}}{7100} \times \underset{\substack{\uparrow \\ \text{Air flow} \\ \text{"High"}}}{1.00} \times \underset{\substack{\uparrow \\ \text{Length 15 m,} \\ \text{Height difference 5 m}}}{(0.985 - 0.01)} \times \underset{\substack{\uparrow \\ \text{Factor by air} \\ \text{temperatures}}}{1.0} = 6923 \text{ W}$$

## 16.2.7 Characteristics of fan

### • External static pressure table

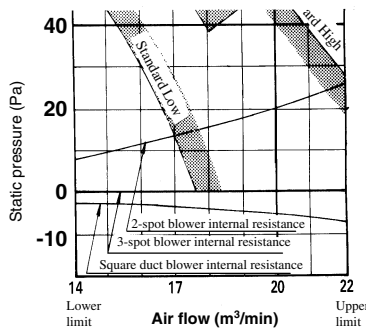
Unit : Pa

Model	Duct specs.		1 spot closing		Standard		Square duct	
	Air flow (m <sup>3</sup> /min)		Standard	High <sup>(1)</sup> speed	Standard	High <sup>(1)</sup> speed	Standard	High <sup>(1)</sup> speed
	20	28						
FDUM308	20	30	65	50	85	55	90	
FDUM408	28	50	80	60	90	65	95	
FDUM508	34	50	75	60	85	65	95	

Notes (1) For high speed operation, insert the white connector and the red connector beside the control box in other places respectively.

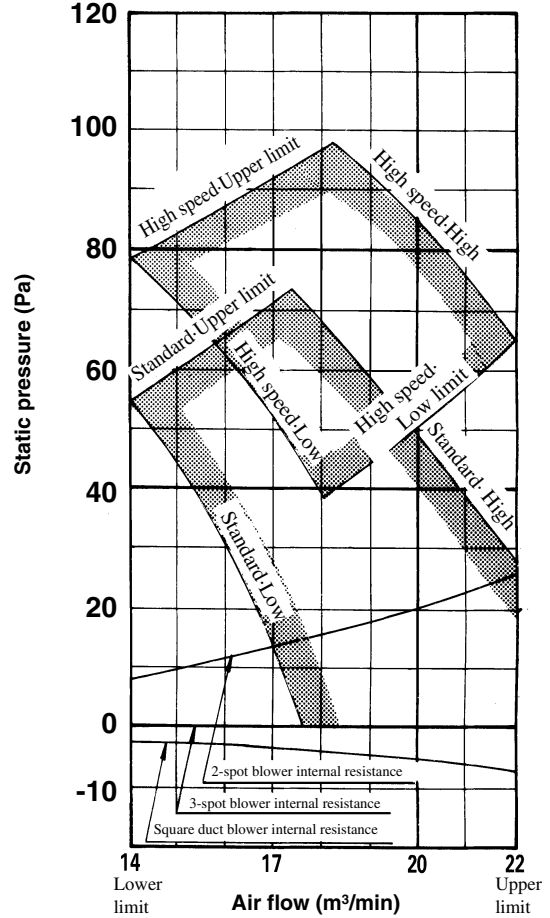
### How to interpret the blower characteristics table

#### Example: Case of FDUM308HEN-SB

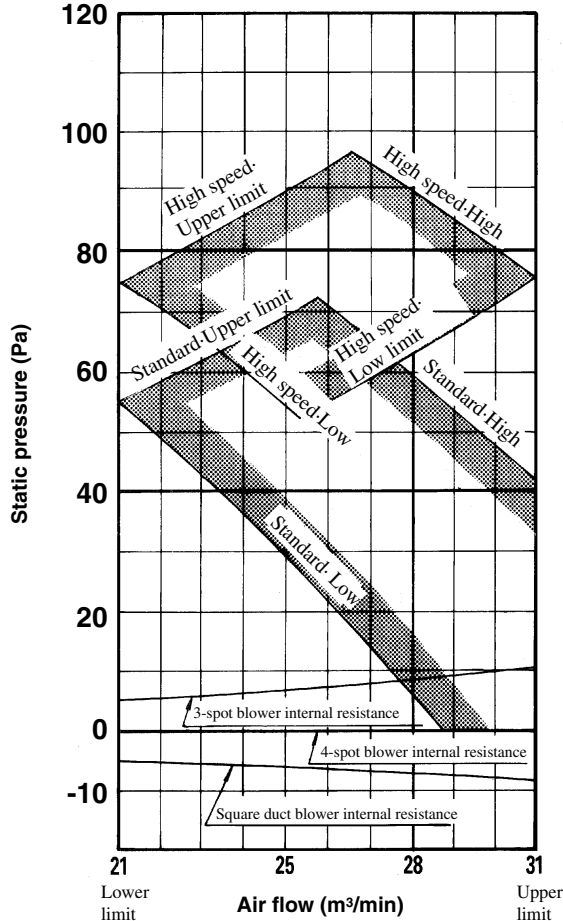


- 2-spot blowout.....**  
Internal resistance increases more than the standard 2-spot blowout. Approx. 14 Pa at 17 m<sup>3</sup>/min
- Square duct blowout.....**  
Internal resistance decreases more than the standard round duct (ø200 3-spot). 3 Pa at 17 m<sup>3</sup>/min. (External static pressure increases in reverse.)

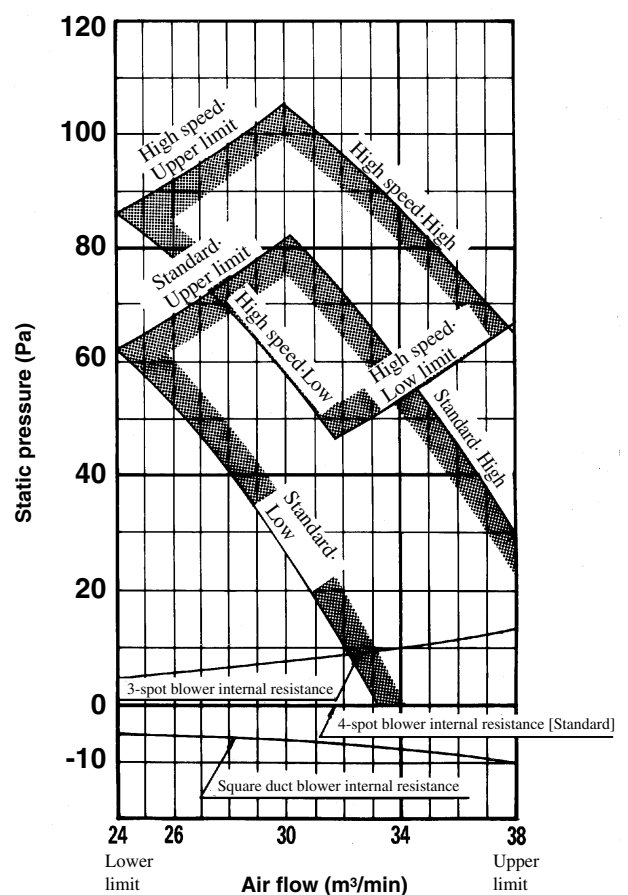
### Models FDUM308HEN-SB, 308HES-SB



### Model FDUM408HES-SB



### Model FDUM508HES-SB



## 16.2.8 Noise level

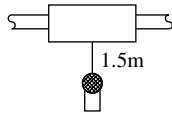
Notes (1) The data are based on the following conditions.

Ambient air temperature:

Indoor unit 27°C DB, 19°C WB.

Outdoor unit 35°C DB

**Indoor unit**  
**Measured based on JIS B 8616**  
 Mike position as below



Mike (center & low points)

**Outdoor unit**

**Measured on JIS B 8616**

Mike position: at highest noise level

in position as below

Distance from front side 1m

Height 1m

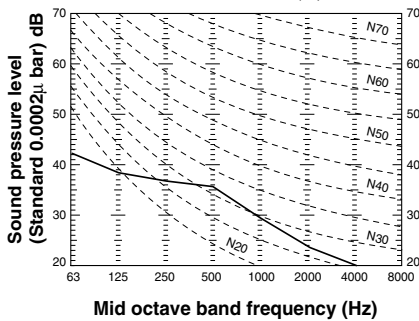
(2) The data in the chart are measured in an unechoic room.

(3) The noise levels measured in the field are usually higher than the data because of reflection.

### (1) Indoor unit

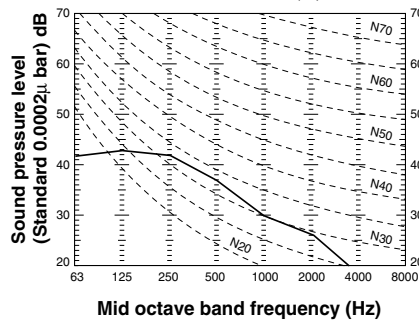
**Model FDUM308-A**

Noise level 36 dB (A) at HIGH  
 30 dB (A) at LOW



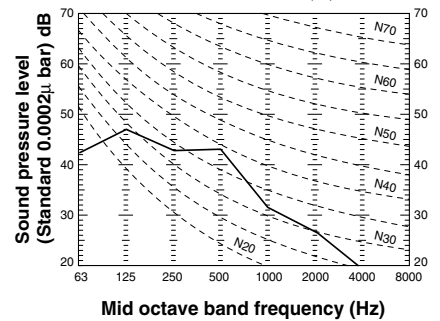
**Model FDUM408-A**

Noise level 38 dB (A) at HIGH  
 33 dB (A) at LOW



**Model FDUM508-A**

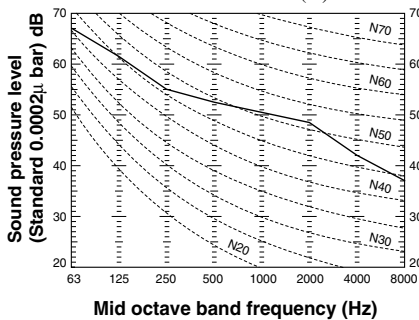
Noise level 39 dB (A) at HIGH  
 34 dB (A) at LOW



### (2) Outdoor unit

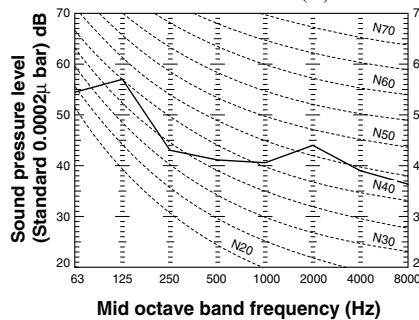
**Models FDC308HEN3B, 308HES3B**

Noise level 52 dB (A)



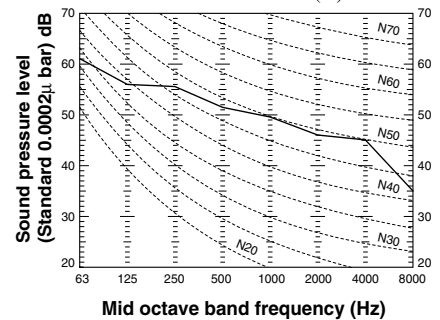
**Model FDC408HES3B**

Noise level 54 dB (A)



**Model FDC508HES3B**

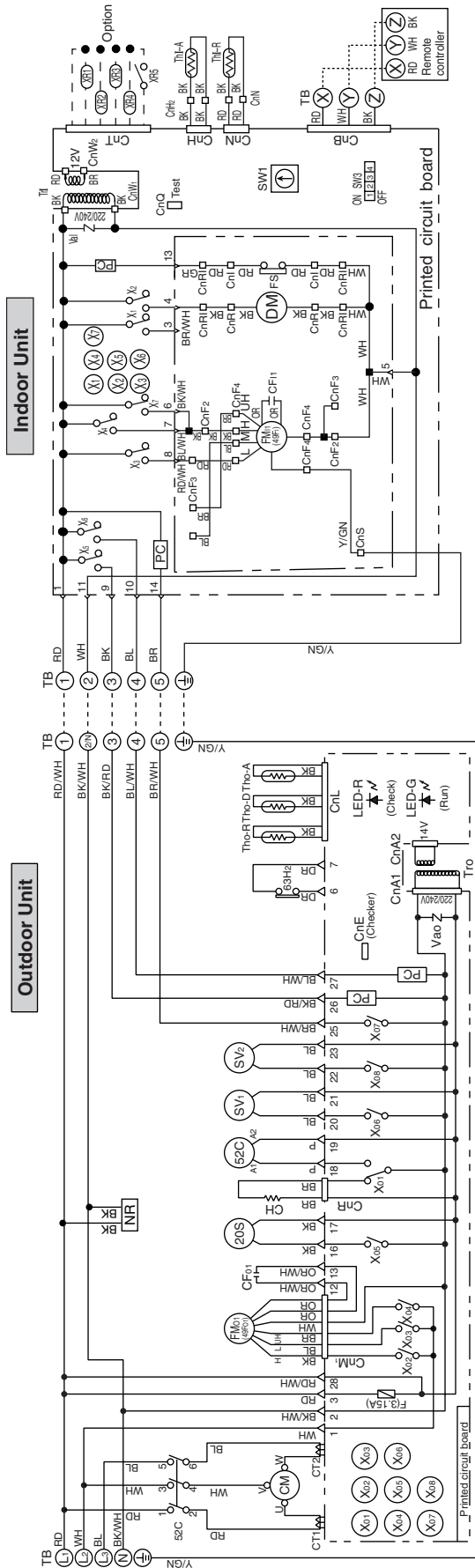
Noise level 55 dB (A)





**Model FDUM308HES-SB**

**Power source**  
3 Phase 380-415V 50Hz



**Color mark**

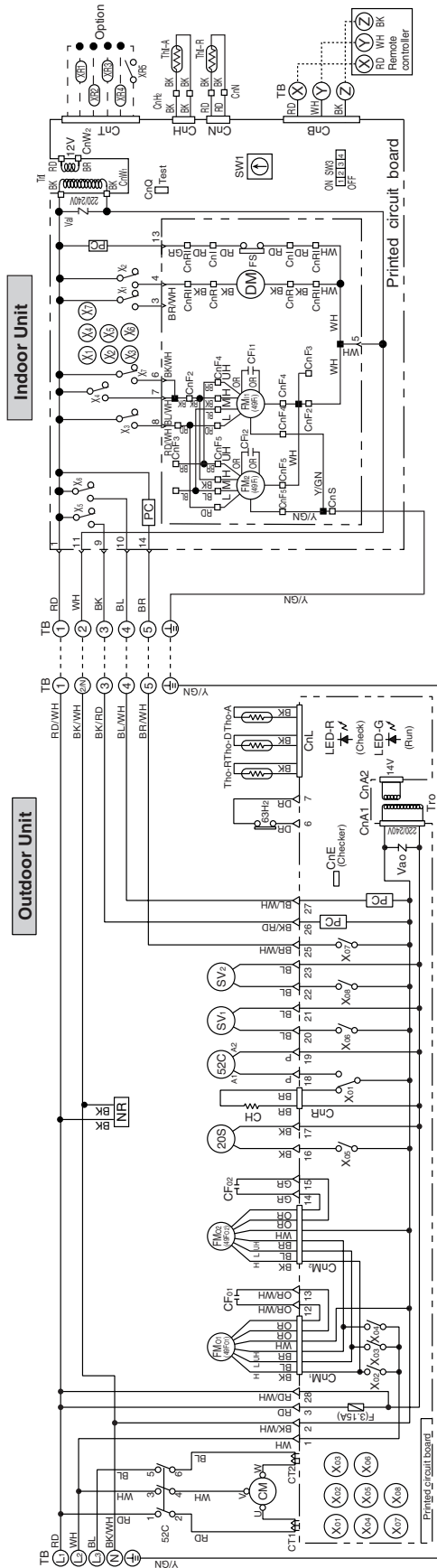
Mark	Color	Mark	Color
BK	Black	BK/RD	Black/Red
BL	Blue	BK/WH	Black/White
BR	Brown	BL/WH	Blue/White
GR	Gray	BR/WH	Brown/White
OR	Orange	OR/WH	Orange/White
P	Pink	RD/WH	Red/White
RD	Red	Y/GN	Yellow/Green
WH	White		

**Meaning of marks**

Mark	Parts name	Mark	Parts name
CF1	Capacitor for FMi	Tho-D	Thermistor
CF01	Capacitor for FMo	Tho-R	Thermistor
CH	Crankcase heater	Tr	Transformer (Indoor unit)
CM	Compressor motor	TrO	Transformer (Outdoor unit)
CnA ~ Z	Connector (□ mark)	Val	Valvistor
CT1,2	Current sensor	Vao	Varistor
DM	Drain motor	20S	4-way valve solenoid
FS	Float switch	49F1	Internal thermostat for FMi
F	Fuse	49F01,2	Internal thermostat for FMo
FMi	Fan motor (Indoor unit)	52C	Magnetic contactor for CM
FMo1	Fan motor (Outdoor unit)	X1~7	Auxiliary relay
NR	Surge suppressor	X01-08	High pressure relay
PC	Photo coupler	63H2	Terminal (F)
SV1,2	Solenoid coil (for control)	LED-G	Indication lamp (Green)
SW1	Switch (Address set)	LED-R	Indication lamp (Red)
SW3	Changeover switch		
TB	Terminal block (○ mark)		
Thi-A	Thermistor		
Thi-R	Thermistor		
Tho-A	Thermistor		

Models **FDUM408HES-SB, 508HES-SB**

**Power source**  
3 Phase 380-415V 50Hz



**Meaning of marks**

Mark	Parts name	Mark	Parts name
CF1,2	Capacitor for FMO	Tho-D	Thermistor
CF01,2	Capacitor for FMO	Tho-R	Thermistor
CH	Crankcase heater	Tr	Transformer (Indoor unit)
CM	Compressor motor	TrO	Transformer (Outdoor unit)
CnA ~ Z	Connector (□ mark)	Val	Valve
CT1,2	Current sensor	Vao	Varistor
DM	Drain motor	20S	4-way valve solenoid
FS	Float switch	49FI	Internal thermostat for FMO
F	Fuse	52C	Internal thermostat for FMO
FM1,2	Fan motor (Indoor unit)	X1-7	Magnetic contactor for CM
FMO1,2	Fan motor (Outdoor unit)	X01-08	Auxiliary relay
NR	Surge suppressor	63Hz	High pressure switch (for control)
PC	Photo coupler	▽	Terminal (F)
SV1,2	Solenoid coil (for control)	■	LED-G
SW1	Switch (Address set)	LED-R	LED-R
SW3	Changeover switch		Indicator lamp (Green)
TB	Terminal block (□ mark)		Indicator lamp (Red)
Th-A	Thermistor		
Th-R	Thermistor		
Tho-A	Thermistor		

**Color mark**

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

## 16.4 OUTLINE OF OPERATION CONTROL BY MICROCOMPUTER

Some as the cooling/heating equipment for FDUR heat pump type. Refer to page 306.

## 16.5 APPLICATION DATA

### SAFETY PRECAUTIONS

- Please read these “Safety Precautions” 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 abnormalities 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.

### **⚠WARNING**

- This system should be applied to places of office, restaurant, residence and the like. Application to inferior environment such as engineering shop could cause equipment malfunction.
- Please entrust installation to either the company which sold you the equipment or to a professional contractor. Defects from improper installations can be the cause of water leakage, electric shocks and fires.
- Execute the installation accurately, based on following the installation manual. Again, improper installations can result in water leakage, electric shocks and fires.
- When a large air-conditioning system is installed to a small room, it is necessary to have a prior planned countermeasure for the rare case of a refrigerant leakage, to prevent the exceeding of threshold concentration. In regards to preparing this countermeasure, consult with the company from which you purchased the equipment, and make the installation accordingly. In the rare event that a refrigerant leakage and exceeding of threshold concentration does occur, there is the danger of a resultant oxygen deficiency accident.
- For installation, confirm that the installation site can sufficiently support heavy weight. When strength is insufficient, injury can result from a falling of the unit.
- Execute the prescribed installation construction to prepare for earthquakes and the strong winds of typhoons and hurricanes, etc. Improper installations can result in accidents due to a violent falling over of the unit.
- For electrical work, please see that a licensed electrician executes the work while following the safety standards related to electrical equipment, and local regulations as well as the installation instructions, and that only exclusive use circuits are used.  
Insufficient power source circuit capacity and defective installment execution can be the cause of electric shocks and fires.
- Accurately connect wiring using the proper cable, and insure that the external force of the cable is not conducted to the terminal connection part, through properly securing it. Improper connection or securing can result in heat generation or fire.
- Take care that wiring does not rise upward, and accurately install the lid/service panel. Its improper installation can also result in heat generation or fire.
- When setting up or moving the location of the air conditioner, do not mix air etc. or anything other than the designated refrigerant within the refrigeration cycle.  
Rupture and injury caused by abnormal high pressure can result from such mixing.
- Always use accessory parts and authorized parts for installation construction. Using parts not authorized by this company can result in water leakage, electric shock, fire and refrigerant leakage.

### **⚠CAUTION**

- Execute proper grounding. Do not connect the ground wire to a gas pipe, water pipe, lightning rod or a telephone ground wire. Improper placement of ground wires can result in electric shock.
- The installation of an earth leakage breaker is necessary depending on the established location of the unit. Not installing an earth leakage breaker may result in electric shock.
- Do not install the unit where there is a concern about leakage of combustible gas.  
The rare event of leaked gas collecting around the unit could result in an outbreak of fire.
- For the drain pipe, follow the installation manual to insure that it allows proper drainage and thermally insulate it to prevent condensation. Inadequate plumbing can result in water leakage and water damage to interior items.

## 16.5.1 Installation of indoor unit

### ⚠ NOTICE

All phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES. These instructions do not cover all variations for every kind of installation circumstance. Should further information be desired or should particular problems occur, the matter should be referred to Mitsubishi Heavy Industries, Ltd. through your local distributor.

### ⚠ WARNING

BE SURE TO READ THESE INSTRUCTIONS CAREFULLY BEFORE BEGINNING INSTALLATION. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD CAUSE SERIOUS INJURY OR DEATH, EQUIPMENT MALFUNCTION AND/OR PROPERTY DAMAGE.

#### (1) Avoid installation and use at those places listed below.

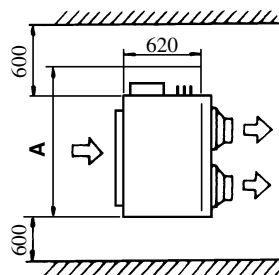
- (a) Places exposed to oil splashes or steam (e.g. kitchens and machine plants.)  
Installation and use at such places will incur deteriorations in the performance or corrosion with the heat exchanger or damage in molded synthetic resin parts.
- (b) Places where corrosive gas (such as sulfurous acid 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 is 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 following conditions and, at the same time, obtain the consent on the part of your client user.

- (a) Places where chilled 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 or 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.



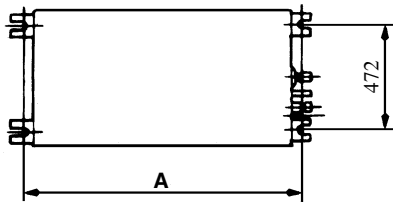
Unit: mm

Models	Mark	A
FDUM308		1300
FDUM408,508		1720



#### (4) Suspension

Be sure to observe the finished length of the suspension bolts given below.

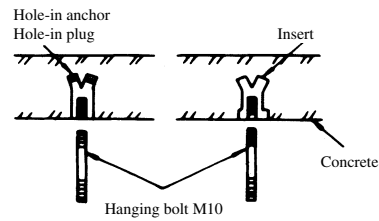


Unit: mm

Models	Mark	A
FDUM308		986
FDUM408,508		1406

#### Hanger bolts installation

- Use care of the piping direction when the unit is installed.

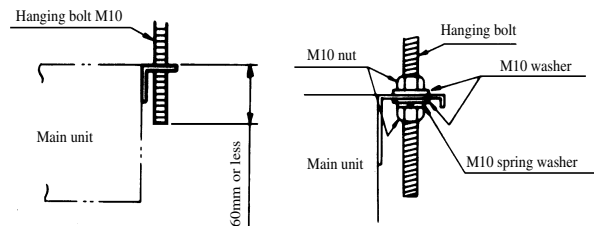


#### (5) Installation of indoor unit

- 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.



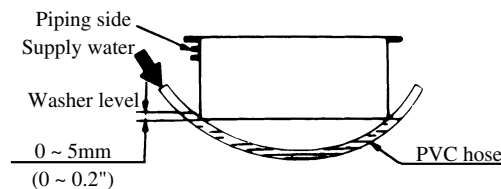
#### Note

When the dimensions of main unit and ceiling holes does not match, it can be adjusted with the slot holes of hanging bracket.

#### Adjusting to the levelness

- Adjust the out-of levelness using a level 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 as given below.



Bring the piping side slightly lower.

- Unless the adjustment to the levelness is made properly, malfunctioning or failure of the float switch may occur.

#### Tap selection on blower unit

(When the high performance filter is used.)

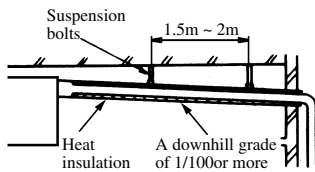
Taps of blower unit are set at the standard selection at the shipping from factory. Where the static pressure is raised by employing such option as the high performance filter, etc., change the connection of connectors provided at the flank of control box as shown below.

Standard tap (at shipping)				High speed tap			
Control box side	Red	Connector, white	White	Red	Motor side	Red	Blue
	Blue			Blue		Black	
	Black			Black		Brown	
	White			White		White	

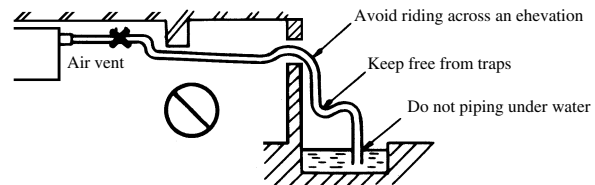
## (6) Drain Piping

- (a) Drain piping should always be in a downhill grade (1/50~1/100) and avoid riding across an elevation or making traps.

### • Good piping

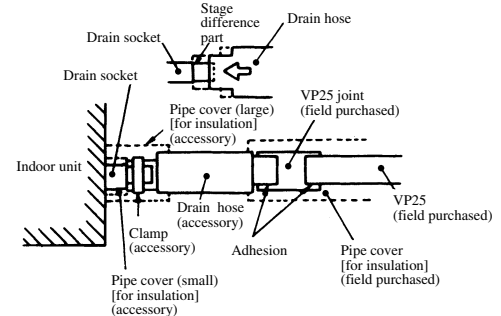


### • Improper piping



- (b) When connecting the drain pipe to unit, pay sufficient attention not to apply excess force to the piping to the unit side. Also, fix the piping at a point as close as possible to the unit.

- (c) For drain pipe, use hard PVC general purpose pipe VP-25 (I.D. 1") which can be purchased locally. When connecting, insert a PVC pipe end securely into the drain socket before tightening securely using the attached drain hose and clamp. Adhesive must not be used connection of the drain socket and drain hose (accessory).

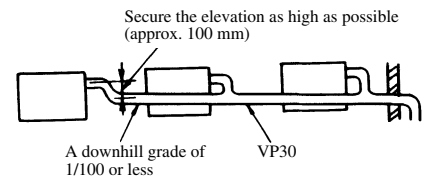


- (d) When constructing drain piping for several units, position the common pipe about 100mm below the drain outlet of each unit as shown in the sketch. Use VP-30 (1 1/4") or thicker pipe for this purpose.

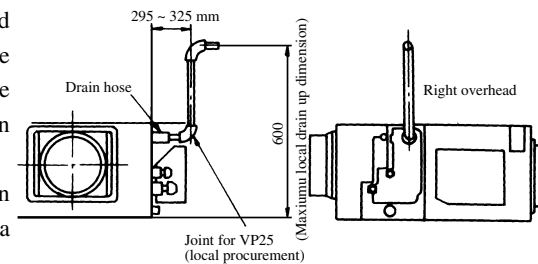
- (e) Be sure to provide heat insulation to hard PVC pipes of indoor placement.

- (f) Do not ever provide an air vent.

- (g) The height of the drain head can be elevated up to a point 600mm from the bottom of unit, and when an obstacle exists in the ceiling space, elevate the piping to avoid the obstacle using an elbow or corresponding gadget. When doing this, if the stretch for the needed height is higher than 600mm, the back-flow quantity of drain at the event of interruption of the operation gets too much and it may cause over flow at the drain pan. Therefore, make the height of the drain pipe within the distance given in the sketch below.



- (h) Avoid positioning the drain piping outlet at a place where generation of odor may be stimulated. Do not lead the drain piping direct into a sewer from where sulfur gas may generate.

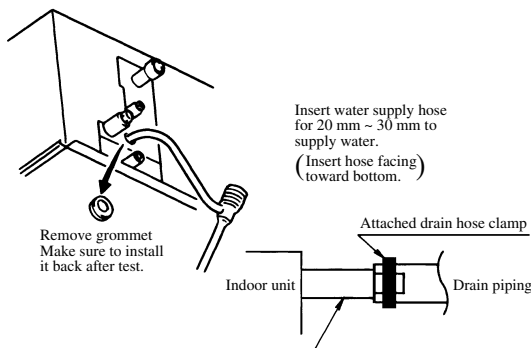


### Drainage Test

- 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 1000cc of water to the unit through the air outlet using a feed water pump.
- ② Check the drain while cooling operation.



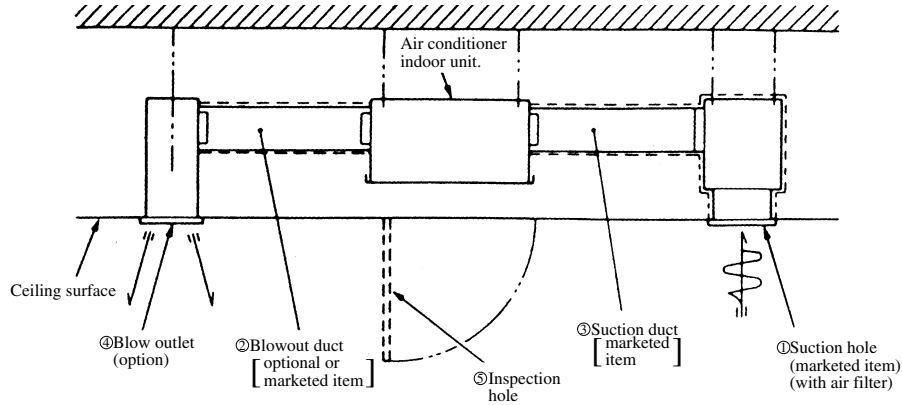
Drain situation can be checked with transparent socket.

Pour water into a convex joint.



( In 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. )

## (7) Duct work



- ① Air filter is not installed in the indoor unit of air conditioner. Air filter should be installed in the suction grill which allows an ample access for cleaning.

### ② Blowout duct

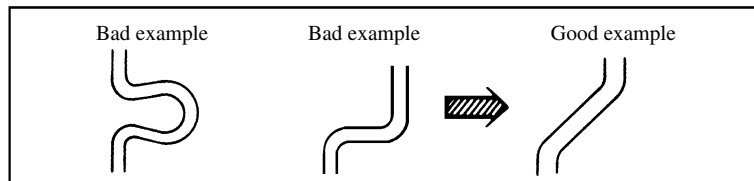
- 2-spot, 3-spot and 4-spot with  $\phi 200$  type duct are the standard specifications. Determine the number of spots based on following table.

FDUM308	FDUM408,508
2~3-spot <sup>(1)</sup>	3~4-spot <sup>(2)</sup>

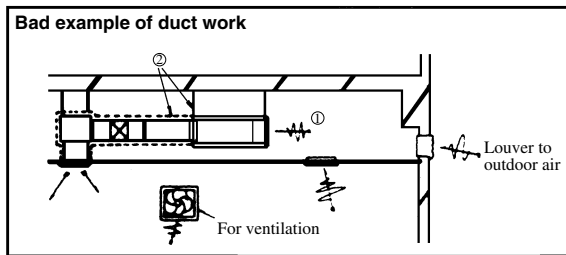
Notes (1) Shield the central blowout hole for 2-spot.

(2) Shield the blowout hole around the center for 3-spot.

- Limit the difference in length between spots at less than 2 : 1.
- Reduce the length of duct as much as possible.
- Reduce the number of bends as much as possible. (Corner R should be as larger as possible.)



- Use a band, etc, to connect the indoor unit and the blowout duct flange.
  - Conduct the duct installation work before finishing the ceiling.
- ③ Make sure to insulate the duct to prevent dewing on it.
- ④ 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.
- ⑤ Make sure provide an inspection hole on the ceiling. It is indispensable to service electric equipment, motor, functional components and cleaning exchanger.



⑥ If a duct is not provided at the intake 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 outdoor air louver, weather (rainy day) and other.

a) 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 wind volume.

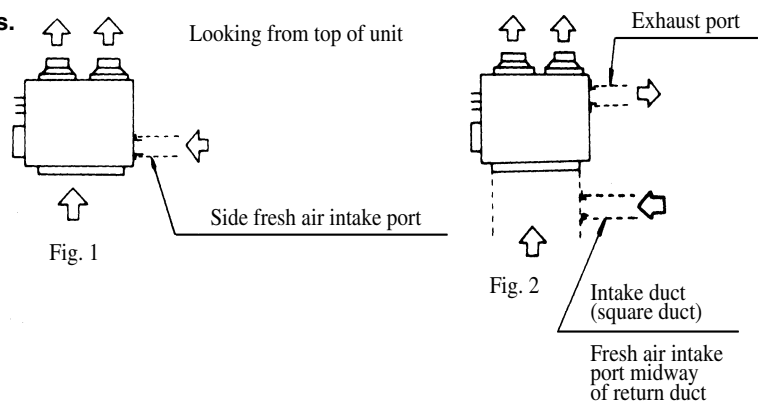
When the building is a concrete structure, especially immediately after the construction, humidity tends to rise even if the space over the ceiling is not substituted in place of a duct.

In such occasion, it is necessary to insulate the entire unit with glass wool (25 mm). (Use a wire net or equivalent to hold the glass wool in place.)

b) It may run out the allowable limit of unit operation (Example: When outdoor air temperature is 35°CDB, return air temperature is 27°CWB) and it could result in such troubles as compressor overload, etc.

c) There is a possibility that the blow 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 the heat exchanger may fail to reach the drain pan but leak outside (e.g. drip on the ceiling) with consequential water leakage in the room.

**(8) Connection of intake, and exhaust ducts.**



**(a) Duct connecting position.**

**i) Fresh air intake**

- Use side air intake port.
- 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.

**ii) Exhaust** Make sure to use suction as well.

- Use a side exhaust port.

**(b) Duct connection**

Use intake and exhaust duct flange of separately sold (for connection of  $\phi 125$  mm round duct) to connect  $\phi 125$  mm round duct. The duct clamped by bands must be thermally insulated to prevent dew condensation.

**16.5.2 Installation of remote controller**

This is same as FDUR heat pump series. Refer to page 329.

**16.5.3 Installation of outdoor unit**

This is same as FDUR heat pump series. Refer to page 330.

**16.6 MAINTENANCE DATA**

This is same as FDUR heat pump series. Refer to page 340.