14. CEILING RECESSED TYPE CASSETTERIA MODELS

(Split system, Air to air heat pump type)

FDR308HEN-SB
308HES-SB
408HES-SB
508HES-SB

CONTENTS

14.1 GENERAL INFORMATION

14.1.1 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 cabtyre 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) Quiet sound design

(a) Noise reducing effect has been improved significantly with the employment of large silent steam fans which are free from the wind swishing sound, and the special designing of noise shielding and acoustic suction panel.

(b) Ideal adaptation to the need for quiet sound at conference rooms, offices, etc.

(5) 2 types of optional decorative panel

(a) Optional decorative panel consists of silent panel and a canvas duct panel. [has smaller sizes and is prepared with canvas duct panel which provides higher drain head.]

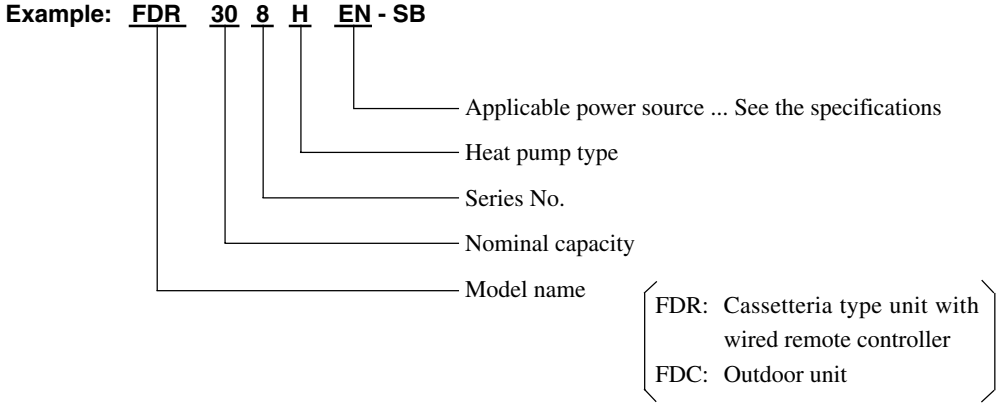
(b) Flexibility of installation is increased with 2 type panels.

(6) External static pressure

(a) High external static pressure type (Refer to the specification in clause 2 for the external static pressure.)

(b) Maximum duct length is two times of conventional types. Adaptable to an extra long duct of one spot 20 meters extention.

14.1.2 How to read the model name



14.2 SELECTION DATA

14.2.1 Specifications

Model FDR308HEN-SB

Item		Model	FDR308HEN-SB		
			FDR308-A		FDC308HEN3B
Decorative panel			**Silent panel**	**Canvas panel**	–
Panel model (Option)			**R-PNLS-36W-E**	**R-PNLC-36W-E**	–
Nominal cooling capacity (1)		W	**7100**		
Nominal heating capacity (1)		W	**8000**		
Power source			**1 Phase, 220/240V, 50Hz**		
Operation data(3)	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: 44 Lo: 38	Hi: 45 Lo: 39	52
Exterior dimensions Height × Width × Depth		**mm**	**Unit: 355 × 950 × 635 Panel: 10 × 1240 × 750**	**Unit: (299+α) × 950 × 635 Panel: 10 × 1064 × 585**	**845 × 880 × 340**
Net weight		**kg**	**Unit: 35 Panel: 8**	**Unit: 35 Panel: 6**	**74**
Refrigerant equipment Compressor type & Q'ty			—		**GT-A5534EN41 × 1**
Motor		kW	—		**2.5**
Starting method			—		Line starting
Heat exchanger			Louver fines & inner grooved tubing		Slitted fines & bare tubing
Refrigerant control			Capillary tube		
Refrigerant			**R22**		
Quantity		**kg**	—		**1.4 [Pre-charged up to the piping length of 5m]**
Refrigerant oil		ℓ	—		**1.45 (BARREL FREEZE 32SAM)**
Defrost control			MC controlled de-icer		
High pressure control			High pressure switch		
Air handling equipment Fan type & Q'ty			Multiblade centrifugal fan × 2		Propeller fan × 1
Motor		W	**100 × 1**		**55 × 1**
Starting method			Line starting		
Air flow (Standard)		**CMM**	**Hi: 20 Lo: 15**		**58**
Available static pressure		Pa	**Standard: 45 High: 80**		—
Fresh air intake			Available		—
Air filter, Q'ty			Polypropylene net × 2 (washable)		—
Shock & vibration absorber			Rubber sleeve (for fan motor)		Rubber mount (for compressor)
Electric heater		W	—		33 (Crank case heater)
Operation control Operation switch			Wired remote control switch (Optional : RCD-H-E)		— (Indoor unit side)
Room temperature control			Thermostat by electronics		—
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat.		Internal thermostat for fanmotor. Abnormal discharge temperature protection.
Installation data Refrigerant piping size		**mm (in)**	**Liquid line: ϕ9.52 (3/8″) Gas line: ϕ15.88 (5/8″)**		
Connecting method			**Flare piping**		
Drain hose			(Connectable with VP25)		—
Insulation for piping			Necessary (both Liquid & Gas lines)		
Accessories			Mounting kit, Drain hose		
Optional parts			Decorative Panel		

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

Item / Operation	Indoor air temperature DB	Indoor air temperature WB	Outdoor air temperature DB	Outdoor air temperature WB	Standards
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.
(4) Canvas panel is used in combination with following canvas duct. Canvas duct: HA01503
(5) Indoor unit height of canvas specification type is higher than the other type for canvas duct portion.

Model FDR308HES-SB

Item		Model	FDR308HES-SB		
			FDR308-A		FDC308HES3B
Decorative panel			**Silent panel**	**Canvas panel**	–
Panel model (Option)			**R-PNLS-36W-E**	**R-PNLC-36W-E**	–
Nominal cooling capacity (1)		W	**7100**		
Nominal heating capacity (1)		W	**8000**		
Power source			**3 Phase, 380/415V, 50Hz**		
Operation data(3)	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: 44 Lo: 38	Hi: 45 Lo: 39	52
Exterior dimensions Height × Width × Depth		**mm**	**Unit: 355 × 950 × 635 Panel: 10 × 1240 × 750**	**Unit: (299+α) × 950 × 635 Panel: 10 × 1064 × 585**	**845 × 880 × 340**
Net weight		**kg**	**Unit: 35 Panel: 8**	**Unit: 35 Panel: 6**	**74**
Refrigerant equipment Compressor type & Q'ty			—		**GT-A5534ES41 × 1**
Motor		kW	—		**2.5**
Starting method			—		Line starting
Heat exchanger			Louver fines & inner grooved tubing		Slitted fines & bare tubing
Refrigerant control			Capillary tube		
Refrigerant			**R22**		
Quantity		**kg**	—		**1.4 [Pre-charged up to the piping length of 5m]**
Refrigerant oil		ℓ	—		**1.45 (BARREL FREEZE 32SAM)**
Defrost control			MC controlled de-icer		
High pressure control			High pressure switch		
Air handling equipment Fan type & Q'ty			Multiblade centrifugal fan × 2		Propeller fan × 1
Motor		W	**100 × 1**		**55 × 1**
Starting method			Line starting		
Air flow (Standard)		**CMM**	**Hi: 20 Lo: 15**		**58**
Available static pressure		Pa	**Standard: 45 High: 80**		—
Fresh air intake			Available		—
Air filter, Q'ty			Polypropylene net × 2 (washable)		—
Shock & vibration absorber			Rubber sleeve (for fan motor)		Rubber mount (for compressor)
Electric heater		W	—		33 (Crank case heater)
Operation control Operation switch			Wired remote control switch (Optional : RCD-H-E)		— (Indoor unit side)
Room temperature control			Thermostat by electronics		—
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat.		Internal thermostat for fanmotor. Abnormal discharge temperature protection.
Installation data Refrigerant piping size		**mm (in)**	**Liquid line: ϕ9.52 (3/8″) Gas line: ϕ15.88 (5/8″)**		
Connecting method			**Flare piping**		
Drain hose			(Connectable with VP25)		—
Insulation for piping			Necessary (both Liquid & Gas lines)		
Accessories			Mounting kit, Drain hose		
Optional parts			Decorative Panel		

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

Item / Operation	Indoor air temperature DB	Indoor air temperature WB	Outdoor air temperature DB	Outdoor air temperature WB	Standards
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.
(4) Canvas panel is used in combination with following canvas duct. Canvas duct: HA01503
(5) Indoor unit height of canvas specification type is higher than the other type for canvas duct portion.

Model FDR408HES-SB

Item		Model	FDR408HES-SB		
			FDR408-A		FDC408HES3B
Decorative panel			**Silent panel**	**Canvas panel**	–
Panel model (Option)			**R-PNLS-46W-E**	**R-PNLC-46W-E**	–
Nominal cooling capacity (1)		W	**10000**		
Nominal heating capacity (1)		W	**11200**		
Power source			**3 Phase, 380/415V, 50Hz**		
Operation data(3)	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: 45 Lo: 38	Hi: 46 Lo: 39	54
Exterior dimensions Height × Width × Depth		**mm**	**Unit: 406 × 1370 × 635 Panel: 10 × 1660 × 750**	**Unit: (350+α) × 1370 × 635 Panel: 10 × 1484 × 585**	**1250 × 920 × 340**
Net weight		**kg**	**Unit: 50 Panel: 9**	**Unit: 50 Panel: 7**	**90**
Refrigerant equipment Compressor type & Q'ty			—		**GU-A5550ES41 × 1**
Motor		kW	—		**2.8**
Starting method			—		Line starting
Heat exchanger			Louver fines & inner grooved tubing		Slitted fines & bare tubing
Refrigerant control			Capillary tube		
Refrigerant			**R22**		
Quantity		**kg**	—		**1.7 [Pre-charged up to the piping length of 5m]**
Refrigerant oil		ℓ	—		**1.6 (BARREL FREEZE 32SAM)**
Defrost control			MC controlled de-icer		
High pressure control			High pressure switch		
Air handling equipment Fan type & Q'ty			Multiblade centrifugal fan × 3		Propeller fan × 2
Motor		W	**45 × 1 + 90 × 1**		**40 × 2**
Starting method			Line starting		
Air flow (Standard)		**CMM**	**Hi: 28 Lo: 22**		**70**
Available static pressure		Pa	**Standard: 50 High: 80**		—
Fresh air intake			Available		—
Air filter, Q'ty			Polypropylene net × 3 (washable)		—
Shock & vibration absorber			Rubber sleeve (for fan motor)		Rubber mount (for compressor)
Electric heater		W	—		70 (Crank case heater)
Operation control Operation switch			Wired remote control switch (Optional : RCD-H-E)		— (Indoor unit side)
Room temperature control			Thermostat by electronics		—
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat.		Internal thermostat for fanmotor. Abnormal discharge temperature protection.
Installation data Refrigerant piping size		**mm (in)**	**Liquid line: ϕ9.52 (3/8″) Gas line: ϕ19.05 (3/4″)**		
Connecting method			**Flare piping**		
Drain hose			(Connectable with VP25)		—
Insulation for piping			Necessary (both Liquid & Gas lines)		
Accessories			Mounting kit, Drain hose		
Optional parts			Decorative Panel		

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

Item / Operation	Indoor air temperature DB	Indoor air temperature WB	Outdoor air temperature DB	Outdoor air temperature WB	Standards
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.
(4) Canvas panel is used in combination with following canvas duct. Canvas duct: HA01503
(5) Indoor unit height of canvas specification type is higher than the other type for canvas duct portion.

Model FDR508HES-SB

Item		Model	FDR508HES-SB		
			FDR508-A		FDC508HES3B
Decorative panel			**Silent panel**	**Canvas panel**	–
Panel model (Option)			**R-PNLS-46W-E**	**R-PNLC-46W-E**	–
Nominal cooling capacity (1)		W	**12500**		
Nominal heating capacity (1)		W	**14000**		
Power source			**3 Phase, 380/415V, 50Hz**		
Operation data(3)	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: 46 Lo: 39	Hi: 47 Lo: 40	55
Exterior dimensions Height × Width × Depth		**mm**	**Unit: 406 × 1370 × 635 Panel: 10 × 1660 × 750**	**Unit: (350+α) × 1370 × 635 Panel: 10 × 1484 × 585**	**1250 × 920 × 340**
Net weight		**kg**	**Unit: 52 Panel: 9**	**Unit: 52 Panel: 7**	**101**
Refrigerant equipment Compressor type & Q'ty			—		**GU-A5570ES41 × 1**
Motor		kW	—		**3.75**
Starting method			—		Line starting
Heat exchanger			Louver fines & inner grooved tubing		Slitted fines & bare tubing
Refrigerant control			Capillary tube		
Refrigerant			**R22**		
Quantity		**kg**	—		**1.9 [Pre-charged up to the piping length of 5m]**
Refrigerant oil		ℓ	—		**1.6 (BARREL FREEZE 32SAM)**
Defrost control			MC controlled de-icer		
High pressure control			High pressure switch		
Air handling equipment Fan type & Q'ty			Multiblade centrifugal fan × 3		Propeller fan × 2
Motor		W	**50 × 1 + 100 × 1**		**65 × 2**
Starting method			Line starting		
Air flow (Standard)		**CMM**	**Hi: 34 Lo: 27**		**110**
Available static pressure		Pa	**Standard: 50 High: 80**		—
Fresh air intake			Available		—
Air filter, Q'ty			Polypropylene net × 3 (washable)		—
Shock & vibration absorber			Rubber sleeve (for fan motor)		Rubber mount (for compressor)
Electric heater		W	—		70 (Crank case heater)
Operation control Operation switch			Wired remote control switch (Optional : RCD-H-E)		— (Indoor unit side)
Room temperature control			Thermostat by electronics		—
Safety equipment			Internal thermostat for fan motor. Frost protection thermostat.		Internal thermostat for fanmotor. Abnormal discharge temperature protection.
Installation data Refrigerant piping size		**mm (in)**	**Liquid line: ϕ9.52 (3/8″) Gas line: ϕ19.05 (3/4″)**		
Connecting method			**Flare piping**		
Drain hose			(Connectable with VP25)		—
Insulation for piping			Necessary (both Liquid & Gas lines)		
Accessories			Mounting kit, Drain hose		
Optional parts			Decorative Panel		

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

Item / Operation	Indoor air temperature DB	Indoor air temperature WB	Outdoor air temperature DB	Outdoor air temperature WB	Standards
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.
(4) Canvas panel is used in combination with following canvas duct. Canvas duct: HA01503
(5) Indoor unit height of canvas specification type is higher than the other type for canvas duct portion.

14.2.2 Range 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	**Max. 50m**
Vertical height difference between outdoor unit and indoor unit	**Max. 30m (Outdoor unit is higher)** **Max. 15m (Outdoor unit is lower)**
Power source voltage	Rating ± 10%
Voltage at starting	Min. 85% of rating
Frequency of ON-OFF cycle	Max. 10 times/h
ON and OFF interval	Max. 3 minutes

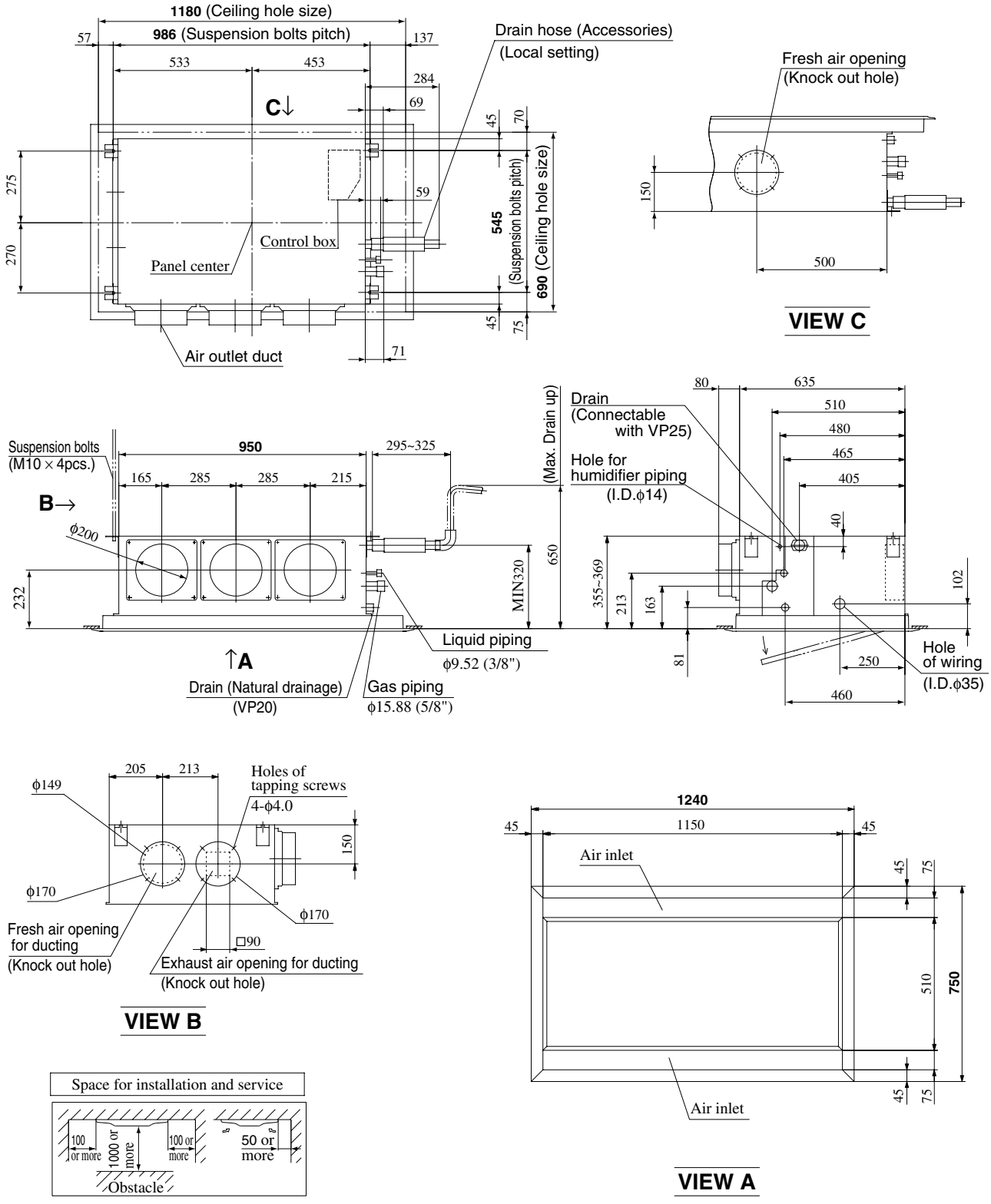
14.2.3 Exterior dimentions

(1) Indoor unit

Model FDR308-A

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

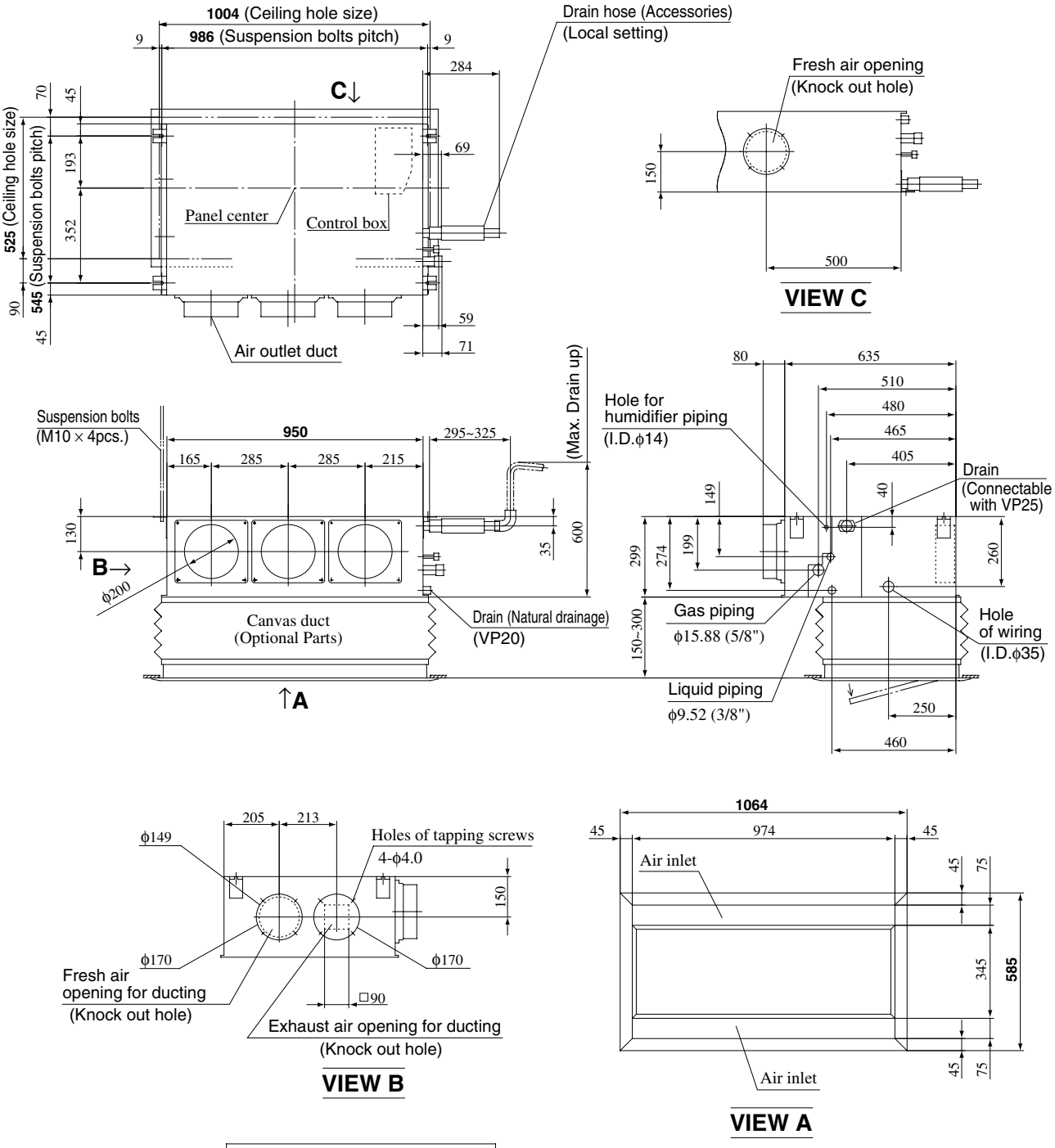
Unit : mm



Model FDR308-A

Canvas Panel (Model: R-PNLC-36W-E)

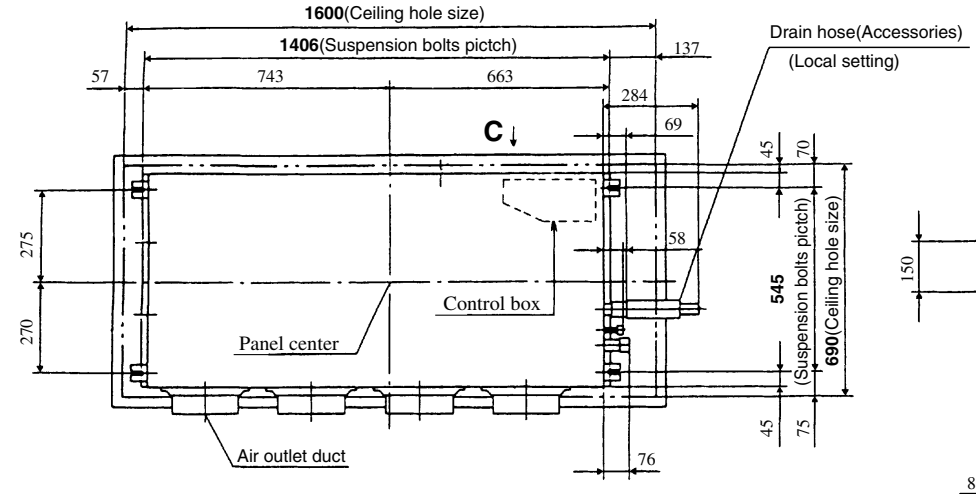
Unit : mm

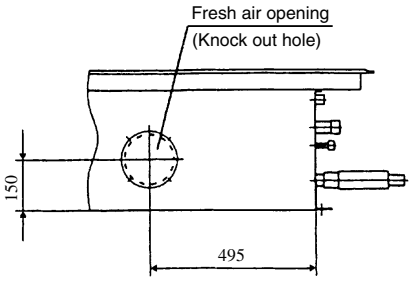


Models FDR408-A, 508-A

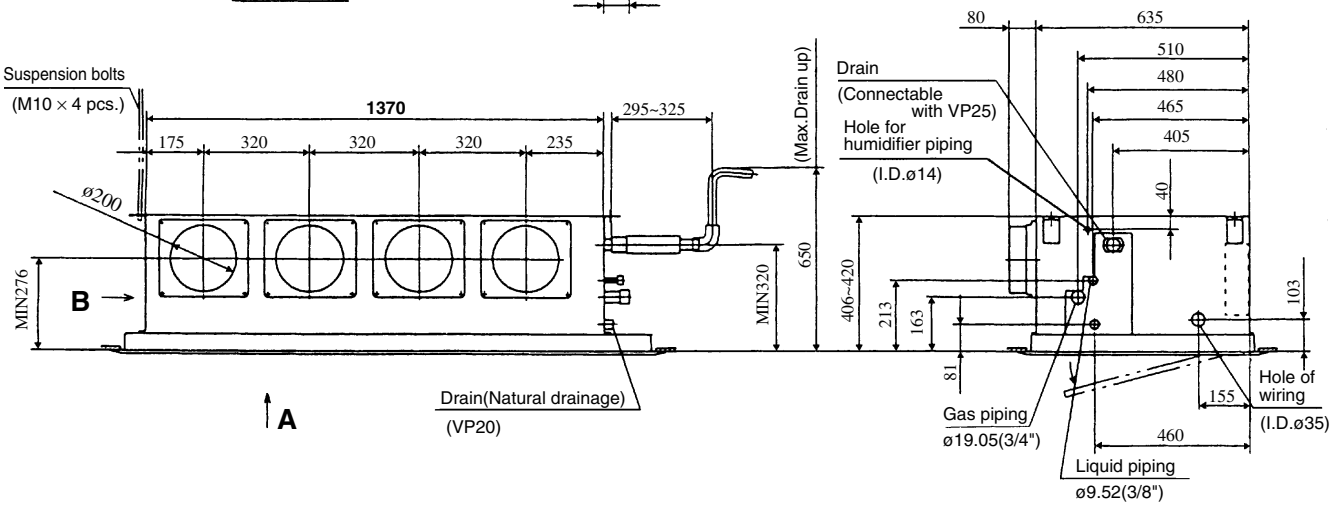
Unit : mm

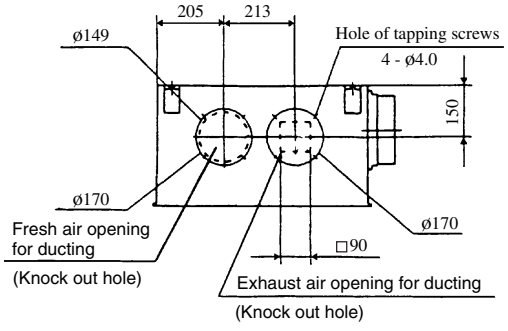
Silent Panel (Model:R-PNLS-46W-E)



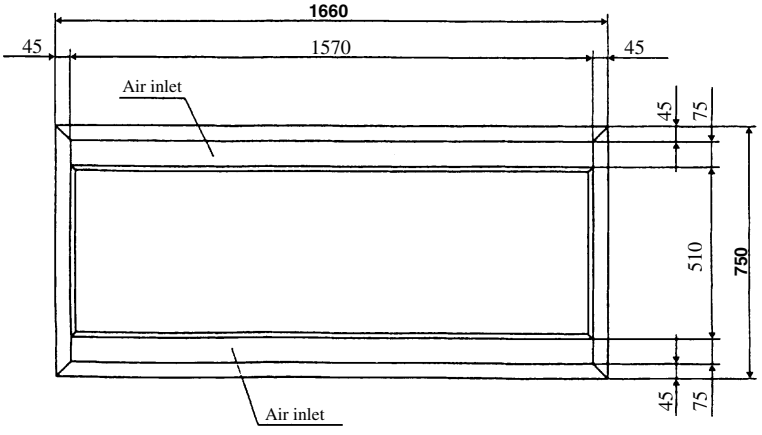


VIEW C

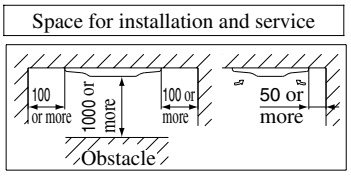




VIEW B



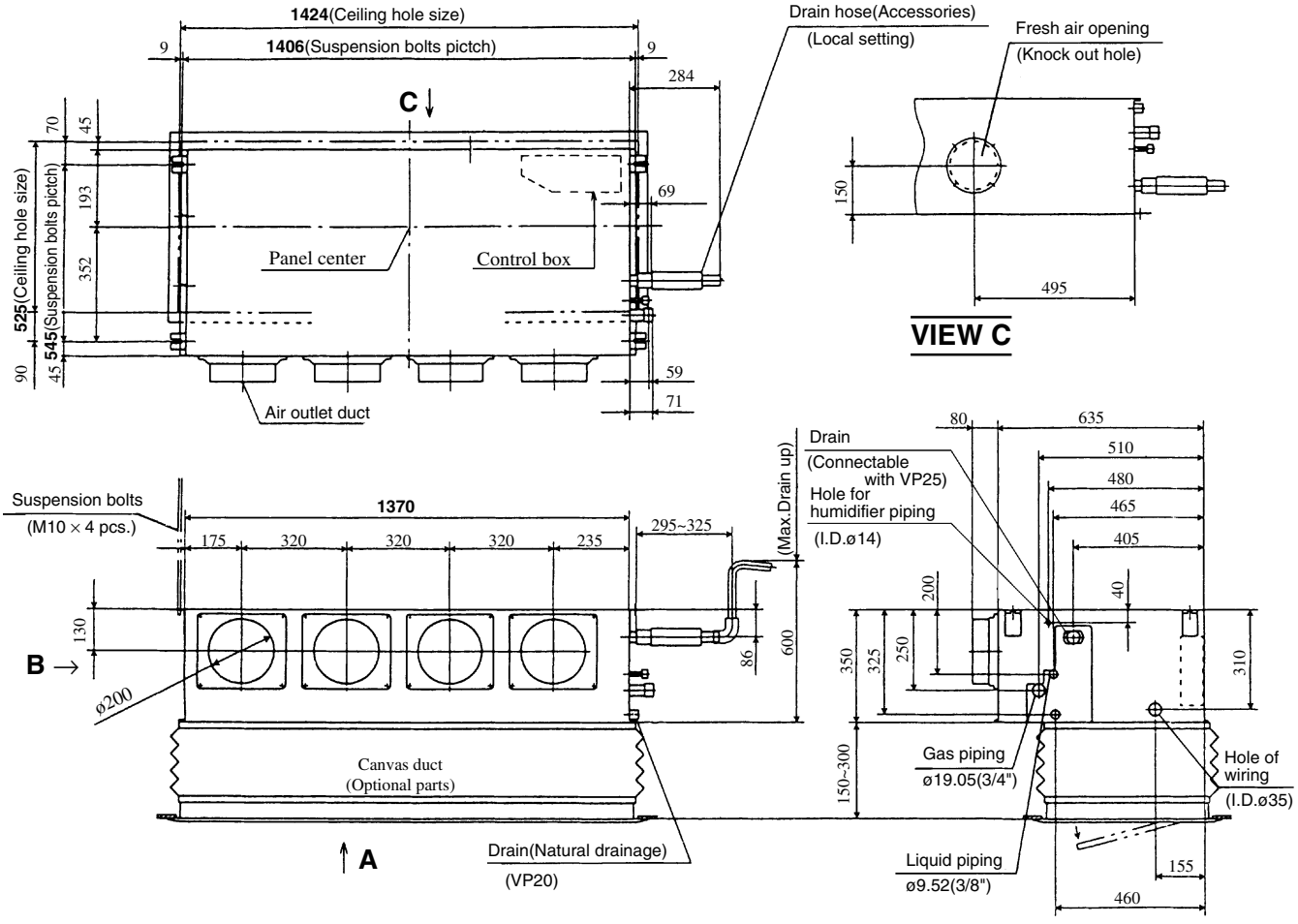
VIEW A

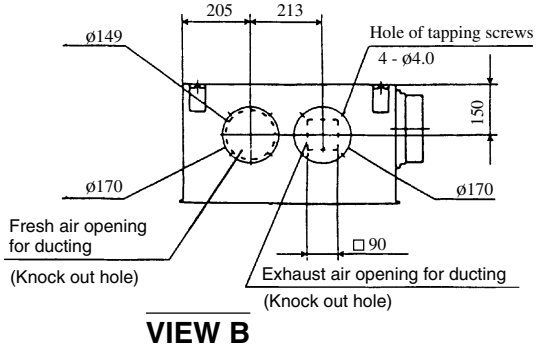


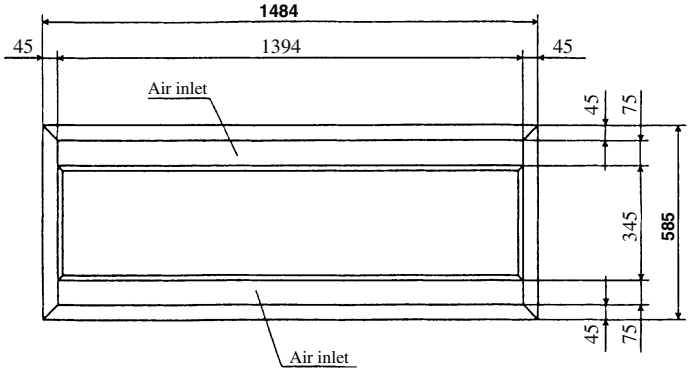
Models FDR408-A, 508-A

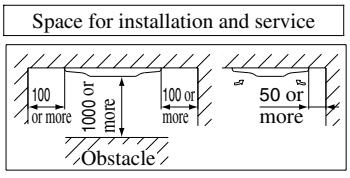
Unit : mm

Canvas Panel (Model: R-PNLC-46W-E)



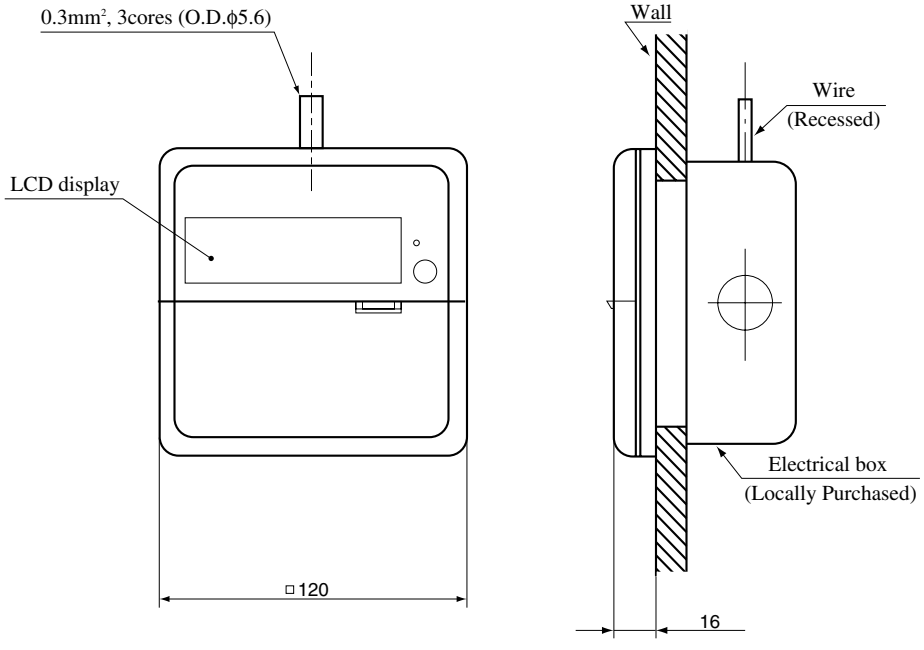




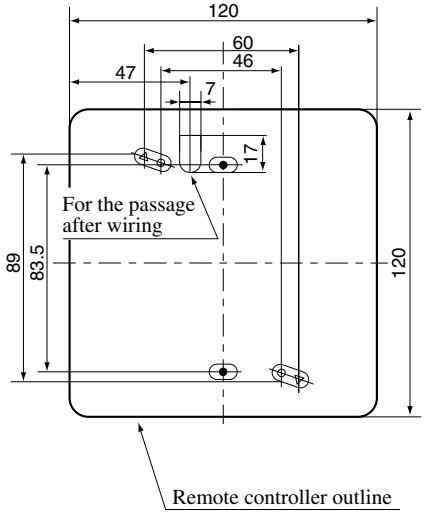


(2) Remote controller (Optional parts)

Unit : mm



Remote controller mounting dimensions



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

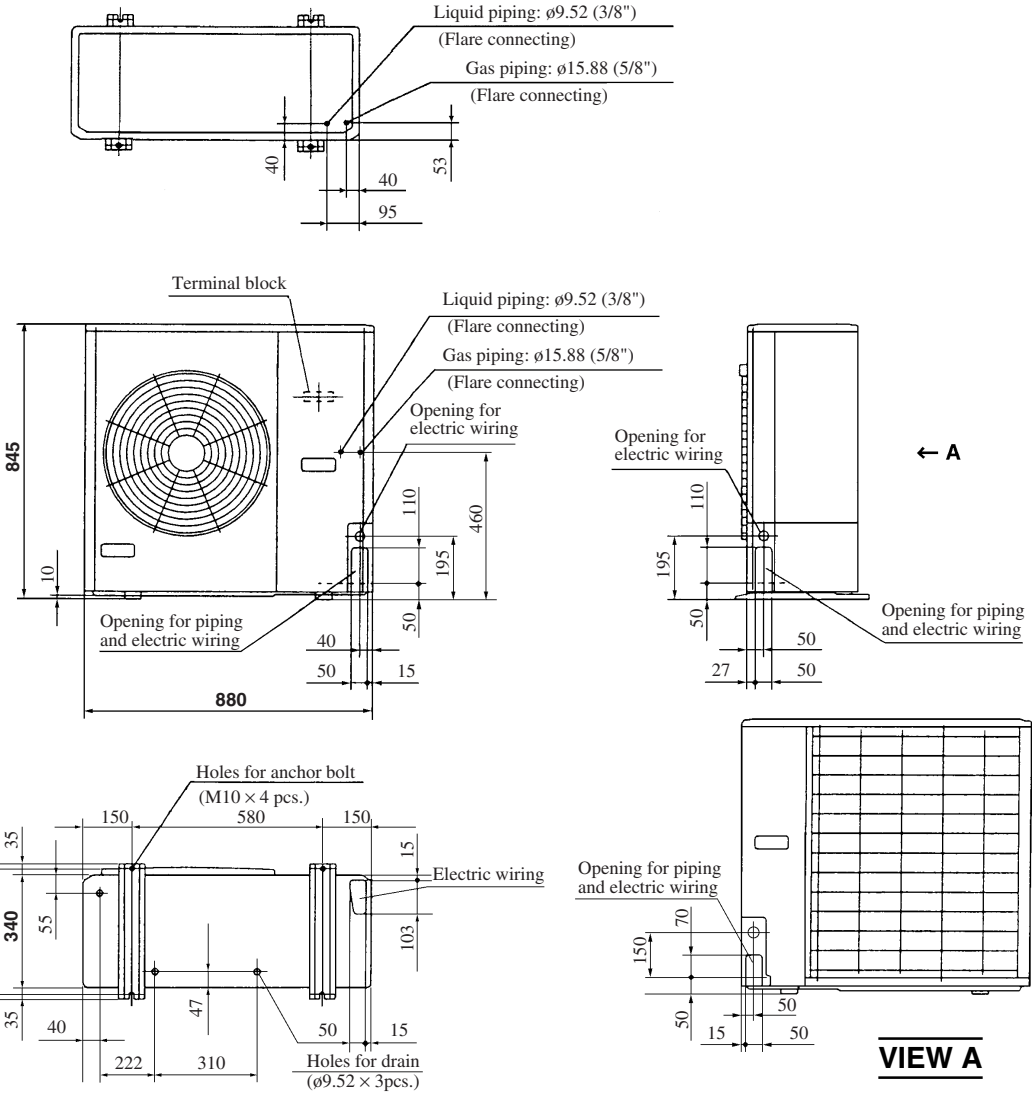
Allowable rang of wire thickness and length

Standard Within	0.3 mm²	× Within 100 m
	0.5 mm²	× Within 200 m
	0.75 mm²	× Within 300 m
	1.25 mm²	× Within 400 m
	2 mm²	× Within 600 m

(3) Outdoor unit

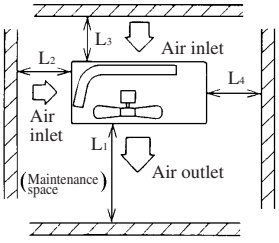
Models FDC308HEN3B, 308HES3B

Unit: mm



Unit:mm

Required space for maintenance and air flow



Minimum allowable space to the obstacles

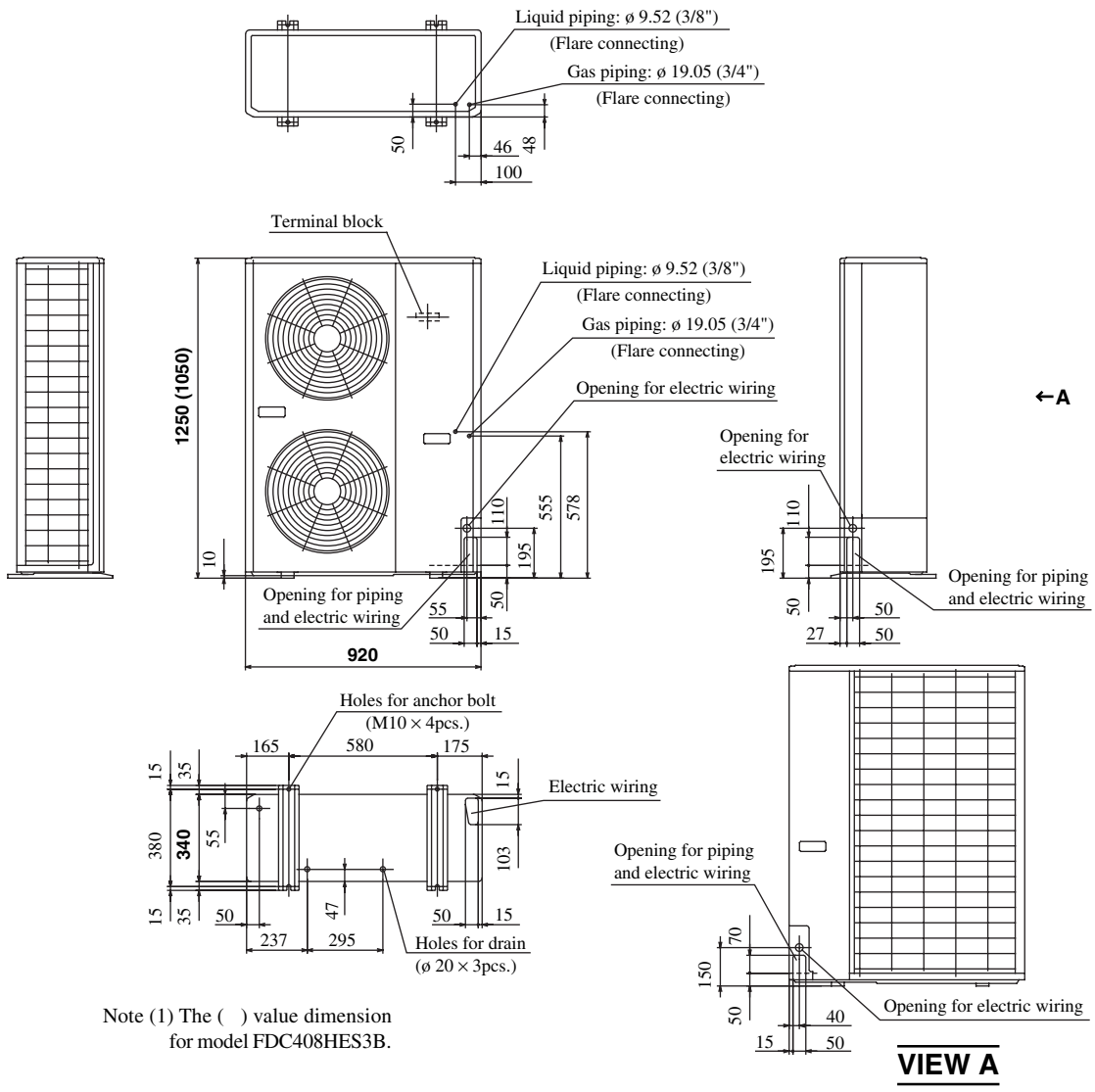
Mark \ Installation type	Ⅰ	Ⅱ	Ⅲ
L_1	Open	Open	500
L_2	300	5	Open
L_3	100	150	100
L_4	5	5	5

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.

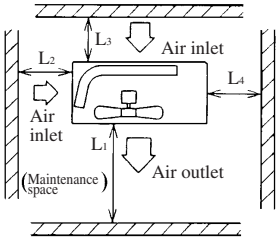
Models FDC408HES3B, 508HES3B

Unit: mm



Note (1) The ( ) value dimension
for model FDC408HES3B.

Required space for maintenance and air flow



Minimum allowable space to the obstacles

Unit:mm

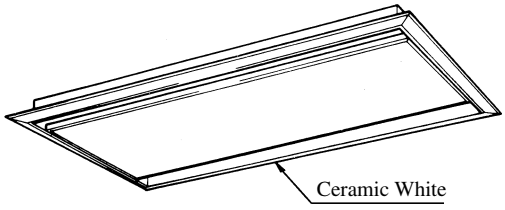
Mark \ Installation type	Ⅰ	Ⅱ	Ⅲ
L_1	Open	Open	500
L_2	300	5	Open
L_3	150	300	150
L_4	5	5	5

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.

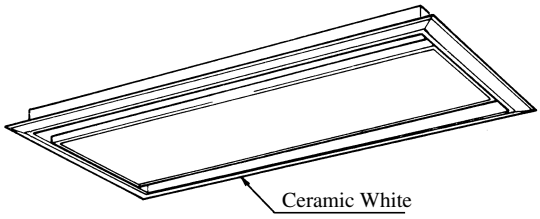
14.2.4 Exterior appearance

(1) Indoor unit (Optinal panel): All Models

Silent panel type

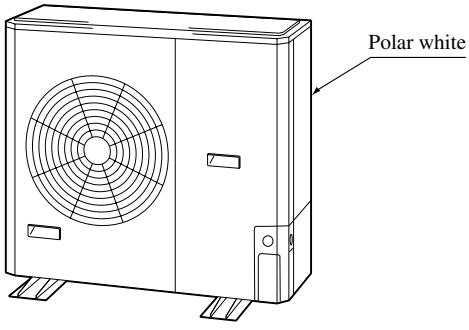


Canvas-duct panel type

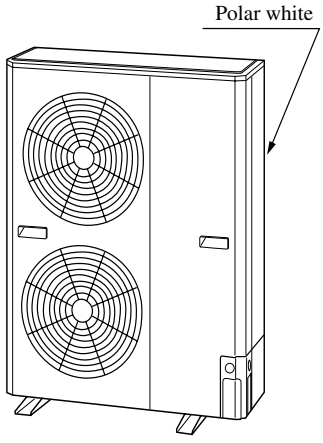


(2) Outdoor unit

Models FDC308HEN3B, 308HES3B

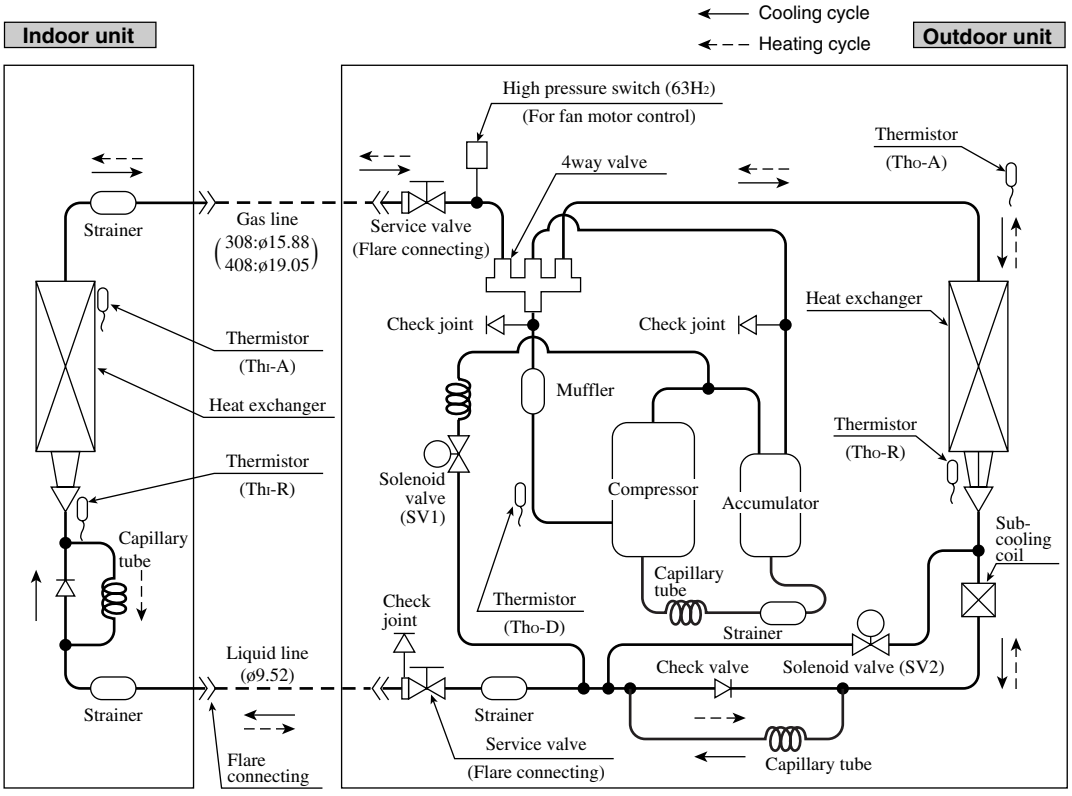


Models FDC408HEN3B, 508HES3B

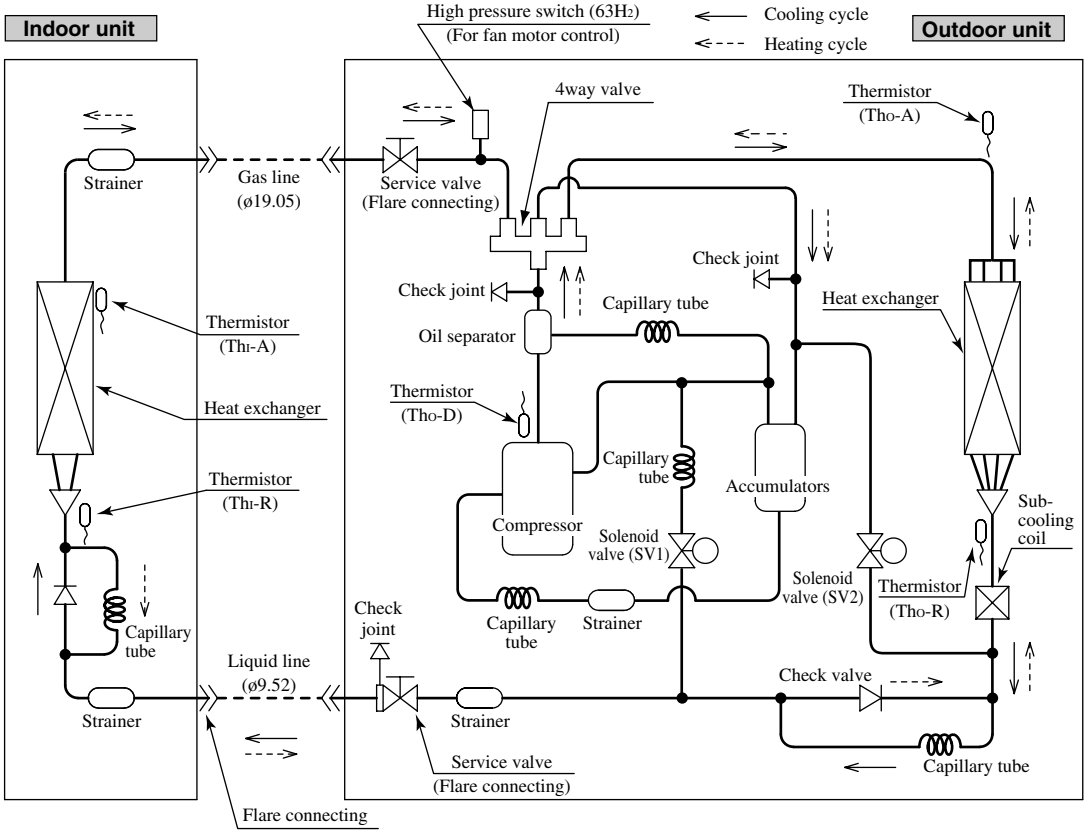


14.2.5 Piping system

Models FDR308HEN-SB, 308HES-SB, 408HES-SB



Model FDR508HES-SB



Preset point of the protective devices

Parts name	Mark	Equipped unit	All models
Thermistor (for protection over-loading in heating)	**Th_{I}-R**	Indoor unit	OFF 68˚C ON 61˚C
Thermistor (for frost prevention)			OFF 2.5˚C ON 10˚C
Thermistor (for detecting dis-charge 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_0)	**$63H_2$**	Outdoor unit	OFF 2.50MPa ON 2.06MPa

14.2.6 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.

Net capacity = Capacity shown on specification Correction factors as follows.

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

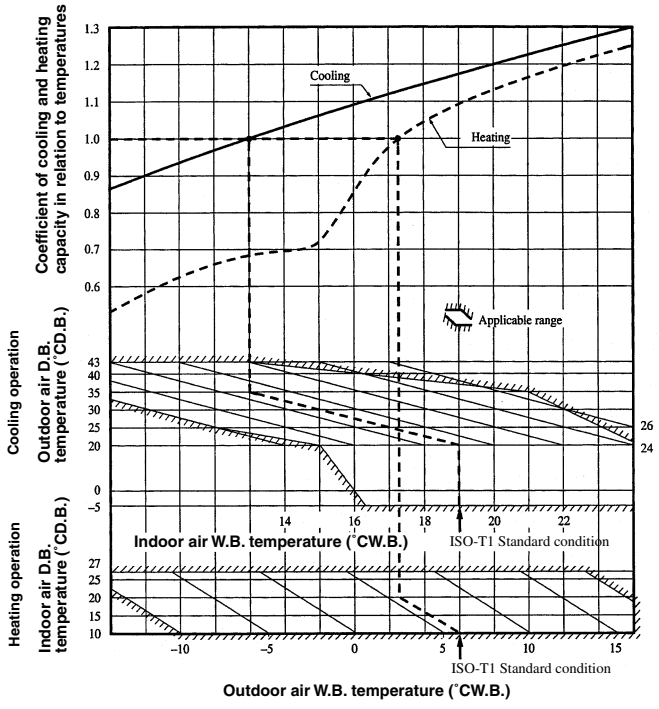


Table of bypass factor

Item \ Model		FDR 308	FDR 408	FDR 508
Air flow	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) Correction of cooling and heating capacity in relation to one way length of refrigerant piping

It is necessary to correct the cooling and heating capacity in relation to the one way equivalent piping length between the indoor and outdoor units.

Equivalent piping length(1) 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	FDR308	1.0	0.995	0.985	0.975	0.965	0.955	0.945	0.935	0.925	0.915	0.905
	FDR408	1.0	0.998	0.990	0.985	0.975	0.970	0.960	0.955	0.945	0.940	0.930
	FDR508	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 bends in piping)
408, 508 series [ϕ19.05(3/4″)]: Equivalent piping length = Real piping length + (0.15 × Number of bends in piping)
[Equivalent piping length < Limitation length of piping + 5m]

(4) 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	**5m**	**10m**	**15m**	**20m**	**25m**	**30m**
Adjustment coefficient	0.01	0.02	0.03	0.04	0.05	0.06

Piping length limitations

Item \ Model	All models
Max. one way piping length	50m
Max. vertical height difference	Outdoor unit is higher 30m Outdoor unit is lower 15m

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

How to obtain the cooling and heating capacity

Example : The net cooling capacity of the model FDR308HEN-SB with the air flow "High", the piping length of 15m, the outdoor unit located 5m lower than the indoor unit, indoor wet-bulb temperature at 19.0 ˚C and outdoor dry-bulb temperature 35 ˚C is

Net cooling capacity = 7100 × 1.00 × (0.985 - 0.01) × 1.0 = 6923 w

- 7100 : FDR308HEN-SB
- 1.00 : Air flow "High"
- (0.985 - 0.01) : Length 15m. Height difference 5 m
- 1.0 : Factor by air temperatures

14.2.7 Characteristics of fan

• External static pressure table

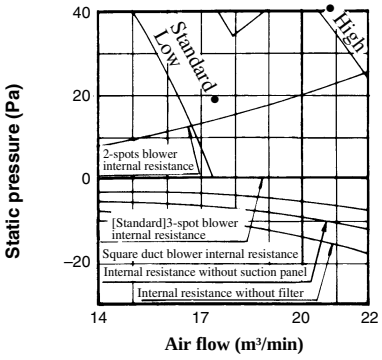
Unit: Pa

Model \ Duct specs. / Air flow (m³/min)		1 spot closing(1)		Standard(2)		Square duct(3)	
		Stan-dard	High speed(4)	Stan-dard	High speed(4)	Stan-dard	High speed(4)
FDR308-A	20	25	60	45	80	50	85
FDR408-A	28	40	70	50	80	55	85
FDR508-A	34	40	70	50	80	55	85

Notes (1) 1 spot closing: Round duct flange at center is removed and shield with a decorative panel (option).
(2) Standard: ø200 ducts are installed at all blowout holes.
(3) Square duct: All round ducts are removed and replaced with special square duct flanges (option).
(4) When operating at a high speed, invert the connection of white and red connectors on the flank of control box.

How to interpret the blower characteristics table

Example : Case of FDR308-A

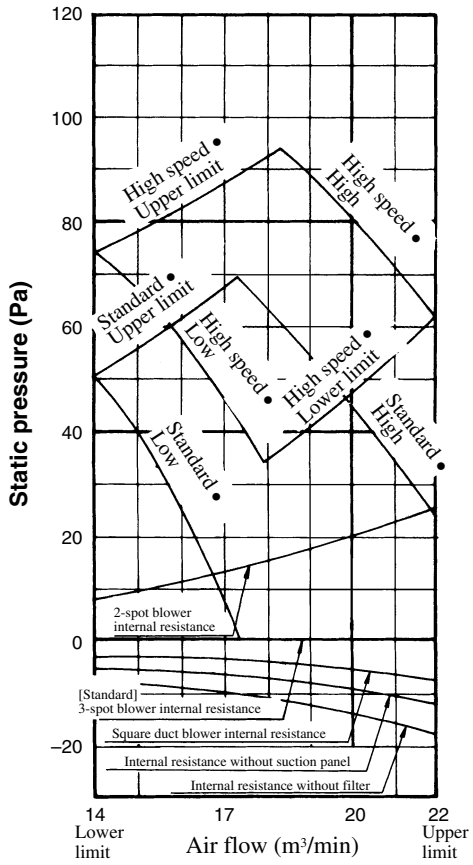


① **2-spot blowout.....**
Internal resistance increases more than the standard 3-spot blowout. Approx. 14 Pa at 17m³/min.

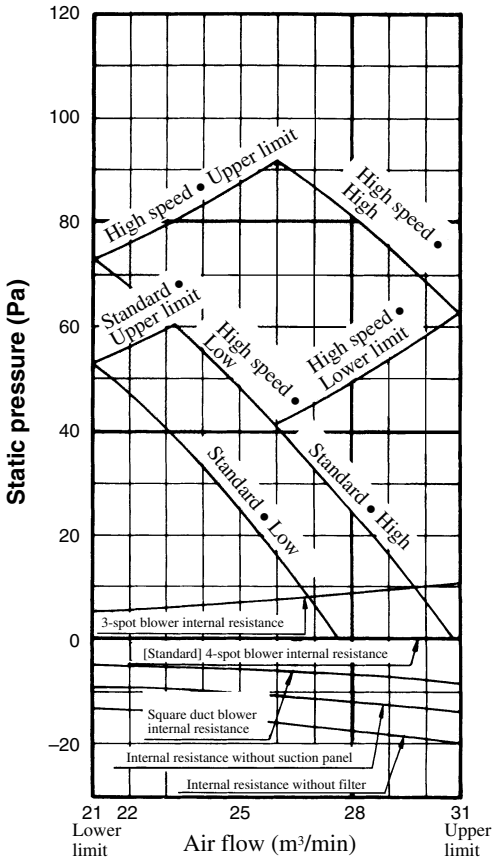
② **Square duct blowout.....**
Internal resistance decreases more than the standard round duct (ø200 3-spot). 3 Pa at 17 m³/nin. (External static pressure increases in reverse.).

③ **Decorative panel.....**
When the decorative panel is not used with the ceiling return type, the part of internal resistance related to the panel decrease. 3 Pa at 17mm³/min.

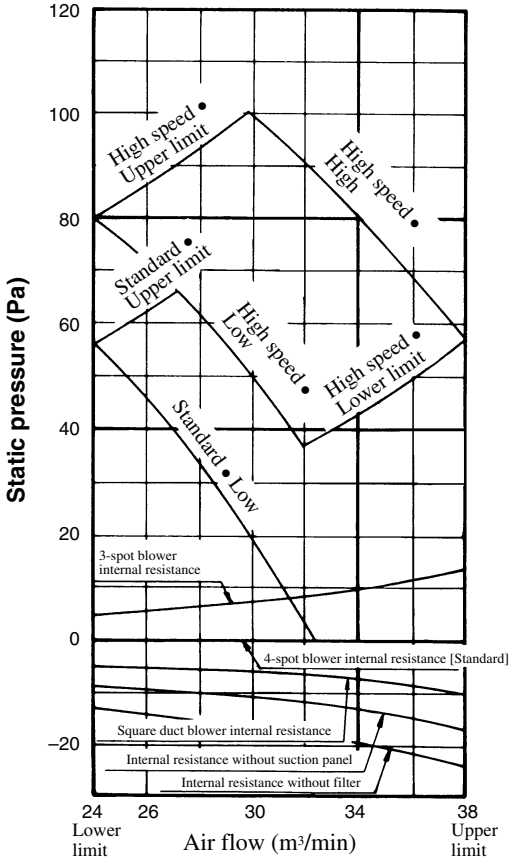
Model FDR308-A



Model FDR408-A



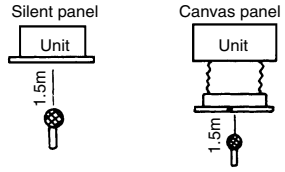
Model FDR508-A



14.2.8 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.

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



Outdoor unit
Measured based on JIS B 8616
Mike position: at highest noise level
in position as below
Distance from front side 1 m
Height 1 m

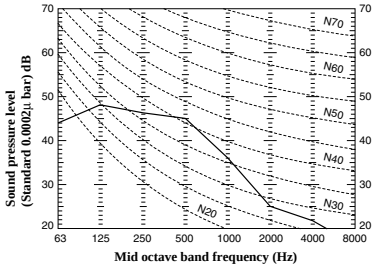
(2) The data in the chart are measeured in an unechonic room.
(3) The noise level measured in the field are usually higher than the data because of reflection.

(1) Indoor unit

(a) Silent panel

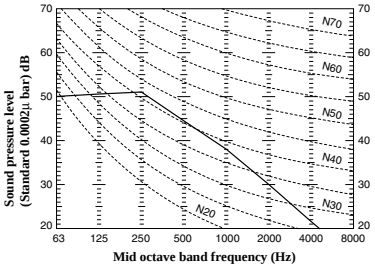
Model FDR308-A

Noise level 44 dB (A) at HIGH
38 dB (A) at LOW



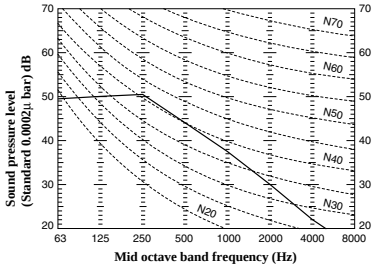
Model FDR408-A

Noise level 45 dB (A) at HIGH
38 dB (A) at LOW



Model FDR508-A

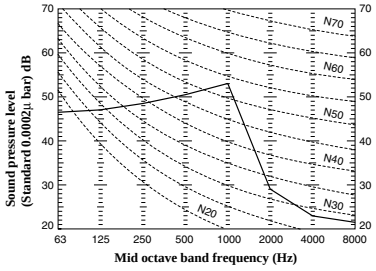
Noise level 46 dB (A) at HIGH
39 dB (A) at LOW



(b) Canvas panel

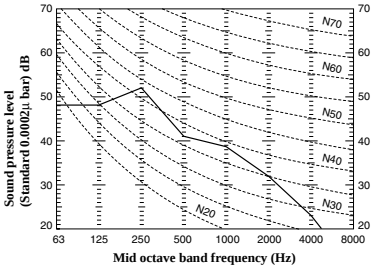
Model FDR308-A

Noise level 45 dB (A) at HIGH
39 dB (A) at LOW



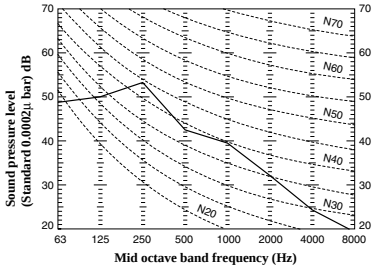
Model FDR408-A

Noise level 46 dB (A) at HIGH
39 dB (A) at LOW



Model FDR508-A

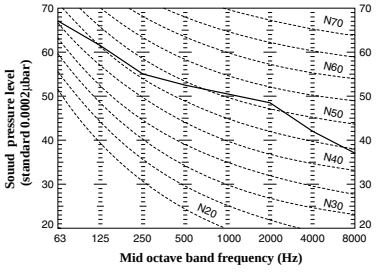
Noise level 47 dB (A) at HIGH
40 dB (A) at LOW



(2) Outdoor unit

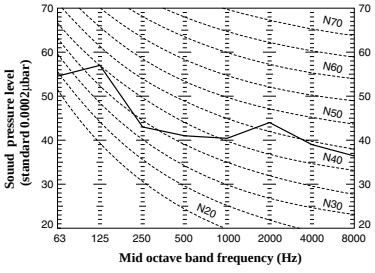
Models FDC308HEN3B, 308HES3B

Noise level 52 dB (A)



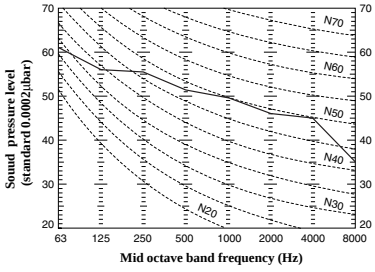
Model FDC408HES3B

Noise level 54 dB (A)



Model FDC508HES3B

Noise level 55 dB (A)

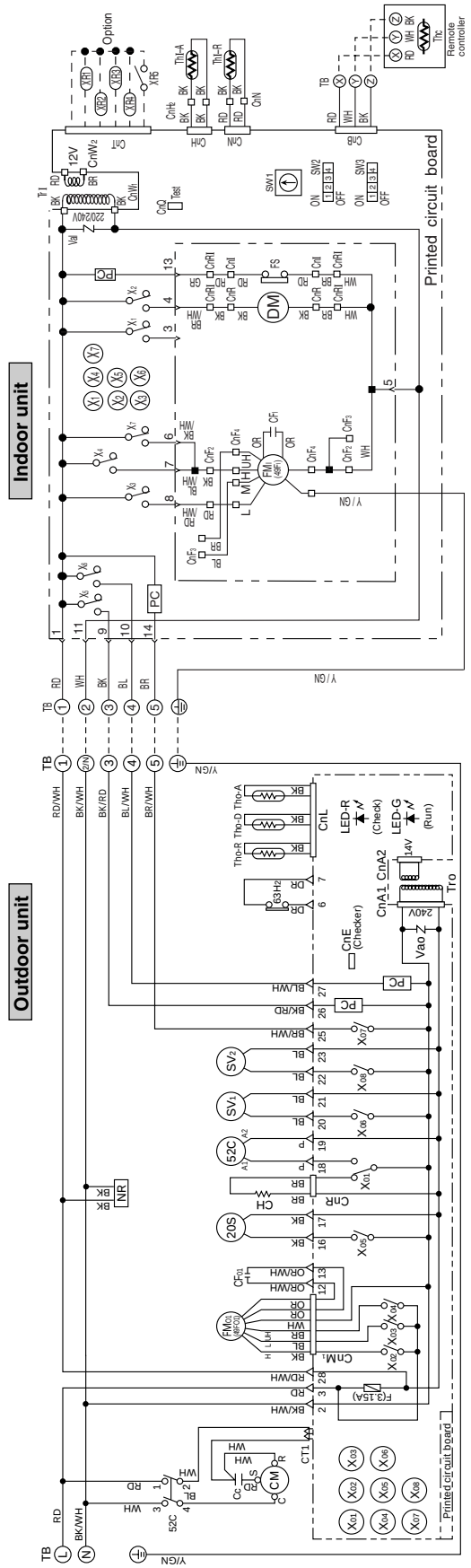


14.3 ELECTRICAL DATA

14.3.1 Electrical wiring

Model FDR308HEN-SB

Power source
1 Phase 220/240V 50Hz



Color mark

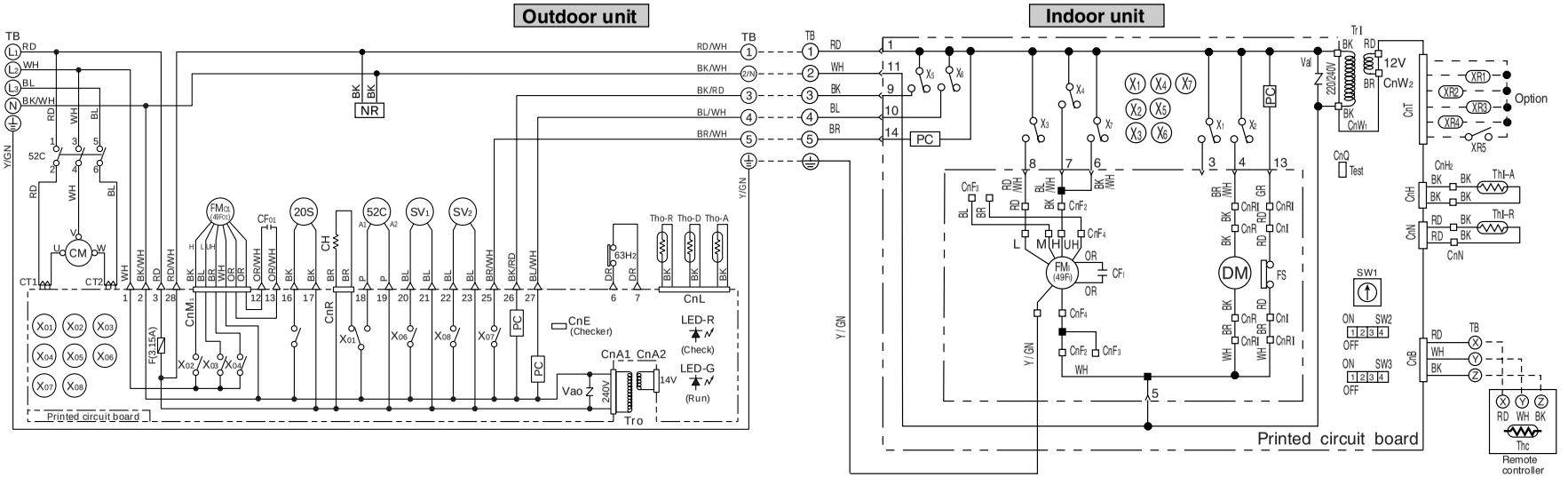
Mark	Color
BK	Black
BL	Blue
BR	Brown
GR	Gray
OR	Orange
P	Pink
RD	Red
WH	White

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

Meaning of marks

Mark	Parts name	Mark	Parts name
CC	Capacitor for CM	Thi-R	Thermistor
CFi	Capacitor for FMi	Tho-A	Thermistor
CFo	Capacitor for FMo	Tho-D	Thermistor
CH	Crankcase heater	Tho-R	Thermistor
CM	Compressor motor	Tri	Transformer (Indoor unit)
CnA ~ W	Connector (□ mark)	Tro	Transformer (Outdoor unit)
CTi	Current sensor	Val	Varistor
F	Fuse	Vao	Varistor
FMi	Fan motor (Indoor unit)	20S	4-way valve solenoid
FMo	Fan motor (Outdoor unit)	49Fi	Internal thermostat for FMi
DM	Drain motor	49Fo	Internal thermostat for FMo
FS	Float switch	52C	Magnetic contactor for CM
NR	Surge suppressor	X1~7	Auxiliary relay
PC	Photo coupler	X01~08	Auxiliary relay
SVi,2	Solenoid coil (for control)	63H2	High pressure switch (for control)
SW1	Switch (Address set)	▽	Terminal (F)
SW2,3	Changeover switch	■	Connector
TB	Terminal block (○ mark)	LED-G	Indication lamp (Green)
Thc	Thermistor	LED-R	Indication lamp (Red)
Thi-A	Thermistor		

Power source
3 Phase 380/415V 50Hz



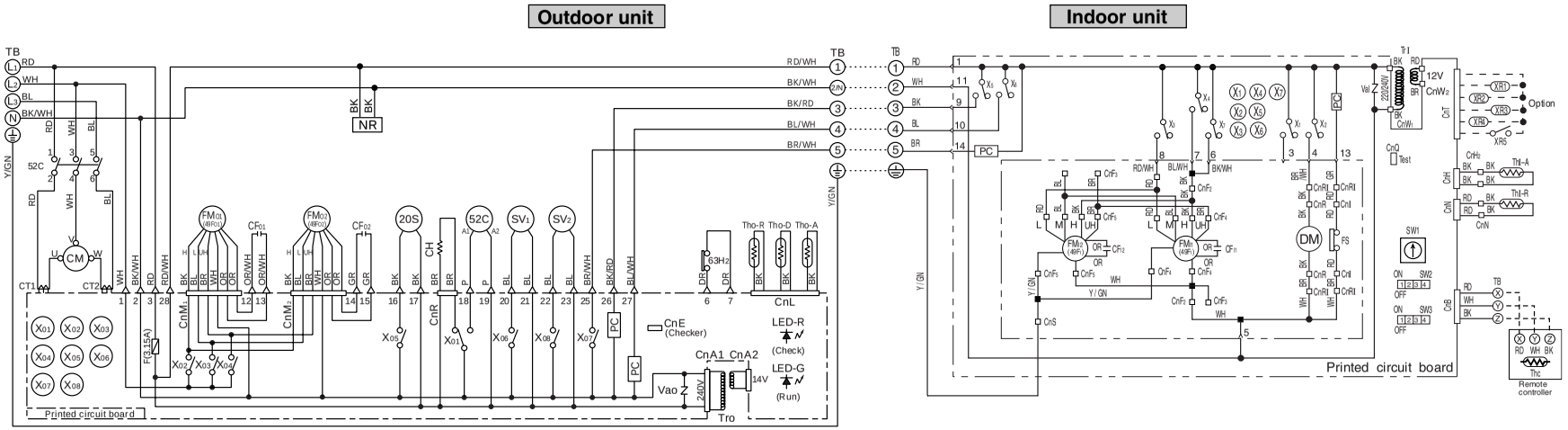
Meaning of marks

Mark	Parts name	Mark	Parts name
CFI	Capacitor for FMI	**Thc**	Thermistor
CFO1	Capacitor for FMO	**THI-A**	Thermistor
CH	Crankcase heater	**THI-R**	Thermistor
CM	Compressor motor	**THO-A**	Thermistor
CnA ~ Z	Connector (□ mark)	**THO-D**	Thermistor
CT1,2	Current sensor	**THO-R**	Thermistor
F	Fuse	**TrI**	Transformer (Indoor unit)
FMI	Fan motor (Indoor unit)	**Tro**	Transformer (Outdoor unit)
FMO1	Fan motor (Outdoor unit)	**VaI**	Varistor
DM	Drain motor	**Vao**	Varistor
FS	Float switch	**20S**	4-way valve solenoid
LED-G	Indication lamp (Green)	**49FI**	Internal thermostat for FMI
LED-R	Indication lamp (Red)	**49FO1**	Internal thermostat for FMO
NR	Surge suppressor	**52C**	Magnetic contactor for CM
PC	Photo coupler	**X1~7**	Auxiliary relay
SV1,2	Solenoid coil (for control)	**X01~08**	Auxiliary relay
SW1	Switch (Address set)	**63H2**	High pressure switch (for control)
SW2,3	Changeover switch	◁	Terminal (F)
TB	Terminal block (○ mark)	■	Connector

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		

Power source
3 Phase 380/415V 50Hz



Meaning of marks

Mark	Parts name	Mark	Parts name
CFi1,2	Capacitor for FMi	**Thc**	Thermistor
CFo1,2	Capacitor for FMo	**Thi-A**	Thermistor
CH	Crankcase heater	**Thi-R**	Thermistor
CM	Compressor motor	**Tho-A**	Thermistor
CnA ~ Z	Connector (□ mark)	**Tho-D**	Thermistor
CT1,2	Current sensor	**Tho-R**	Thermistor
F	Fuse	**Tri**	Transformer (Indoor unit)
FMi1,2	Fan motor (Indoor unit)	**Tro**	Transformer (Outdoor unit)
FMo1,2	Fan motor (Outdoor unit)	**Val**	Varistor
DM	Drain motor	**Vao**	Varistor
FS	Float switch	**20S**	4-way valve solenoid
LED-G	Indication lamp (Green)	**49Fi**	Internal thermostat for FMi
LED-R	Indication lamp (Red)	**49Fo1,2**	Internal thermostat for FMo
NR	Surge suppressor	**52C**	Magnetic contactor for CM
PC	Photo coupler	**X1~7**	Auxiliary relay
SV1,2	Solenoid coil (for control)	**X01~08**	Auxiliary relay
SW1	Switch (Address set)	**63H2**	High pressure switch (for control)
SW2,3	Changeover switch	◁	Terminal (F)
TB	Terminal block (○ mark)	■	Connector

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		

14.4 OUTLINE OF OPERATION CONTROL BY MICROCOMPUTER

This is same as FDUR heat pump series. Refer to page 306.

14.5 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 perchased 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.

⚠ 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.

14.5.1 Installation of indoor unit

(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 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.

(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.

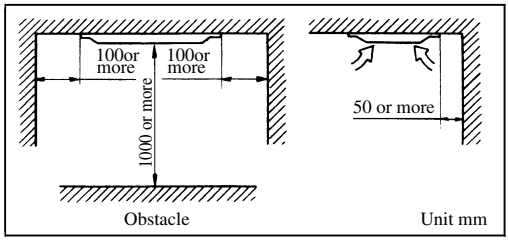
(d) Places with the environmental dew-point temperature is lower than 28°C and the relative humidity is less than 80%.

(When installing at a place under a high humidity environment, pay sufficient attention the prevention of dewing such as thermal insnlation of the unit proper.)

(e) Ceiling height shall have the following height.

Models / Panel	FDR308	FDR408,508
Combination with silent panel	365mm	416mm
Combination with canvas panel	459mm	510mm

● Installation space.



(3) 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 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) 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.

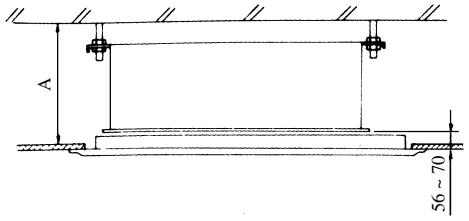
Generated noise may cause malfunctioning of the controller.

(4) Preparation for suspending the unit

(a) Selection of hanging pattern

When the unit is hanged from ceiling, select one of following patterns depending on the dimensions of the ceiling.

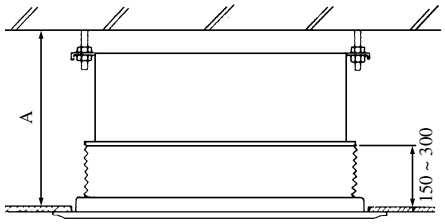
< Combination with silent panel >



Unit: mm

Models \ Dimentions	A
FDR308	365 or over
FDR408,508	416 or over

< Combination with canvas panel >

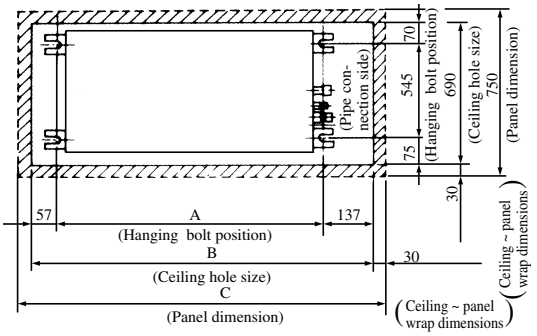


Unit: mm

Models \ Dimentions	A
FDR308	459 or over
FDR408,508	510 or over

(b) Size of hole at ceiling and position of hanging bolts

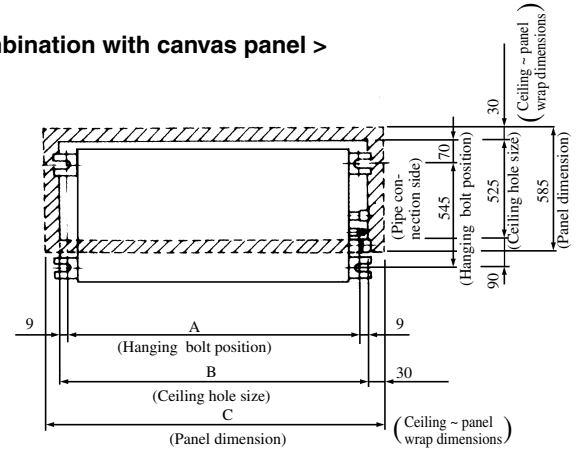
< Combination with silent panel >



Unit: mm

Models \ Dimentions	A	B	C
FDR308	986	1180	1240
FDR408,508	1406	1600	1660

< Combination with canvas panel >

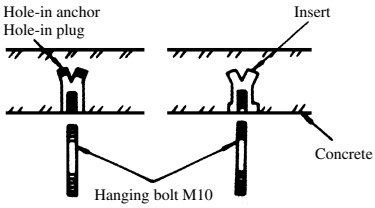


Unit: mm

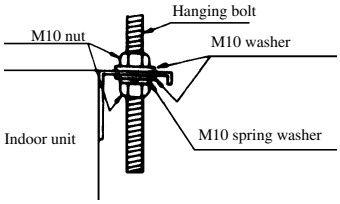
Models \ Dimentions	A	B	C
FDR308	986	1004	1064
FDR408,508	1406	1424	1484

(c) 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.

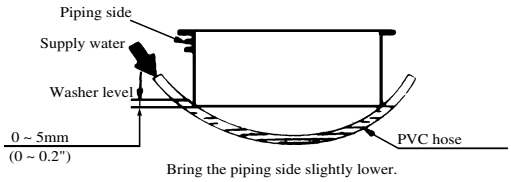
Note

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

Adjusting to the levelness

(a) Adjust the out-of levelness using a level or by the following method.

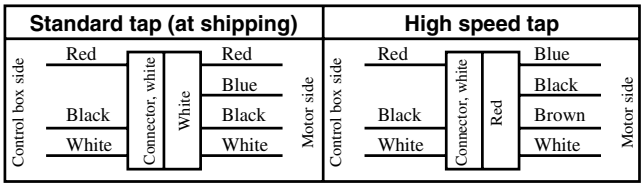
- Make adjustment so that the relation between the lower surface of the unit proper and water level in the hose becomes as given below.



(b) 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.)**

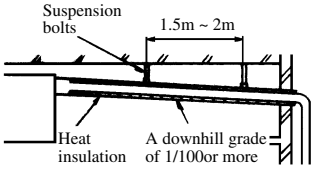
Taps of blower unit are set at the standard selection at the shipping from factory. Where the static pressure is raised by employing such option as the high performance filter, etc., change the connection of connectors provided at the flank of control box as shown below.



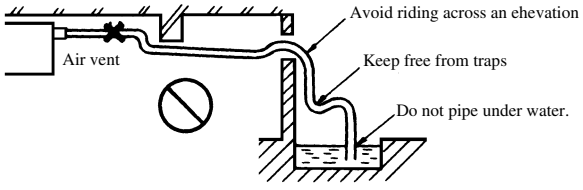
(6) Drain Piping

(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

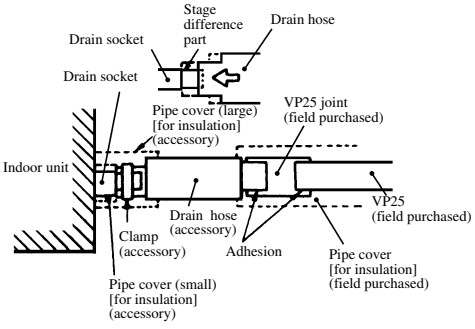


• Improper piping



(b) When connecting the drain pipe to unit, pay sufficient attention not to apply excess force to the piping on 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).



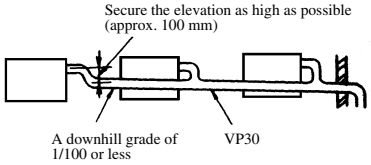
(d) When constructing drain piping for several units, position the common pipe about 100mm below the drain outlet of each unit as shown in the sketch. Use VP-30(11/4″) or thicker pipe for this purpose.

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

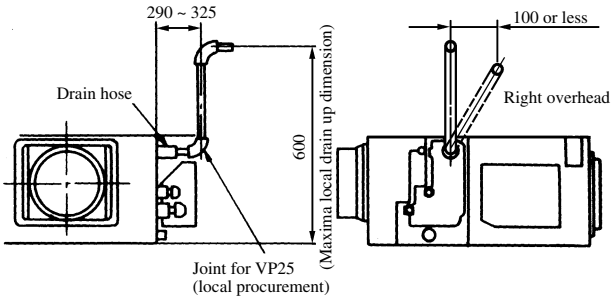
(f) Do not ever provide an air vent.

(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 mush and it may cause overflow at the 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.



Unit: mm



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.

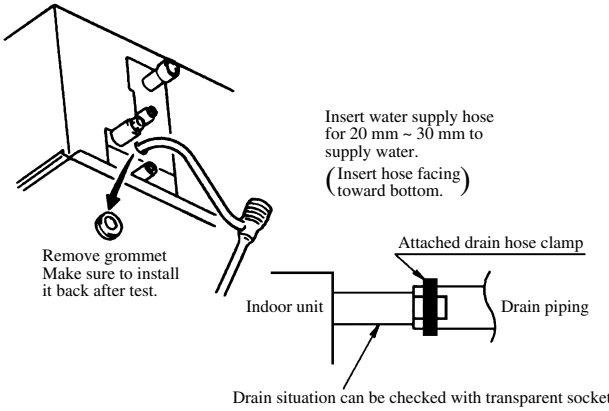
③ In case of a new building, conduct the test before it is furnished with the ceiling.

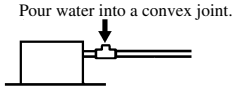
④ Be sure to conduct this test even when the unit is installed in the heating season.

Procedures

① Supply about 1000cc of water to the unit through the air outlet using a feed water pump.

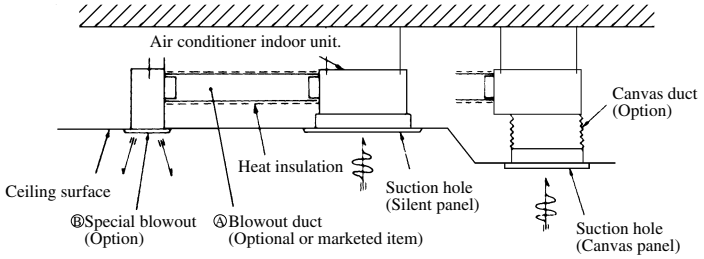
② Check the drain while cooling operation.





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) Installation work for air outlet ducts



Calculate the draft and external static pressure and select the length, shape and blowout.

A Blowout duct

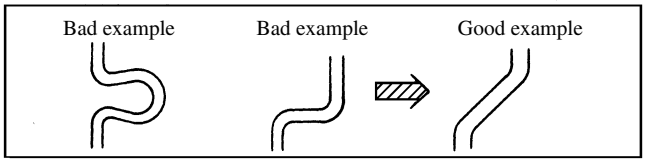
- 2-spot, 3-spot and 4-spot with ϕ 200 type duct are the standard specifications. Determine the number of spots based on following table.

FDR308	FDR408,508
2~3-spot(1)	3~4-spot(2)

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.

(8) Connection of suction, exhaust ducts

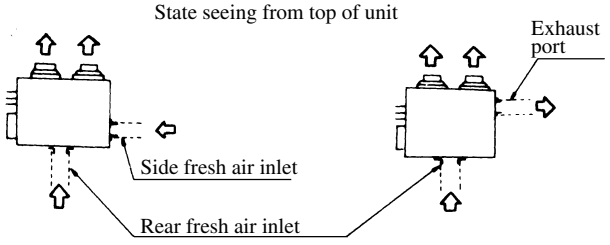


Fig. 1 Fig. 2

(a) Duct connecting position

1) Fresh air inlet

- Inlet can be selected from the side or rear faces depending on the working conditions.
- Use the rear fresh air inlet when the simultaneous intake and exhaust is conducted. (Side inlet cannot be used.)

2) Exhaust (Make sure to use also the suction.)

Use the side exhaust port.

(9) Installation of ornament panel

<Case of silent panel>

a) Accessory

Name	Q'ty	Position
Round head set screw (M5 × 35)	4 pcs.	Securing the panel

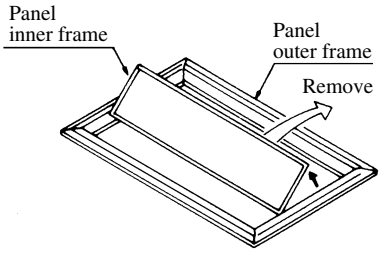
b) Installation procedures

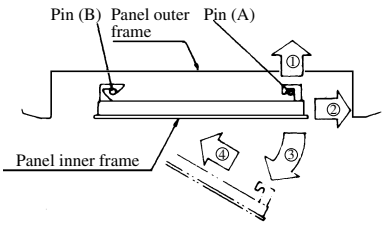
1) Remove the inner frame of panel

- **How to remove the panel inner frame**

① Detach from pins (A) in the order of arrow ①→②.

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.

- **Steps of installation**

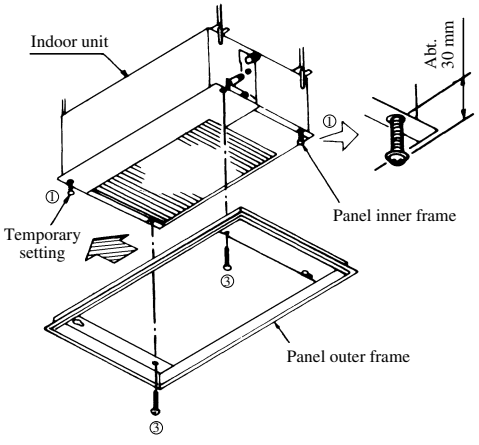
① Secure the panel tentatively with 2 of 4 panel set screws (panel accessory) as shown above.

② When the panel is supported with a pair of set screws, slide it in the arrow direction.

[Note: 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.



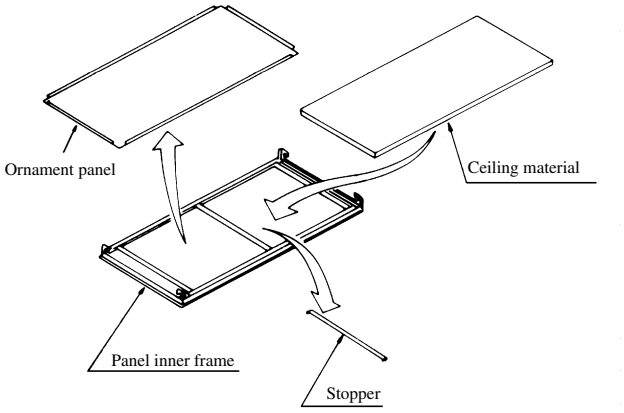
<Case of canvas panel>

See installation manual which is equipped with canvas panel.

a) Attachment of ceiling material

Ceiling material can be attached to the panel inner frame.

(Plate thickness max. 15mm)



b) 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.

14.5.2 Installation of remote controller

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

14.5.3 Installation of outdoor unit

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

14.6 MAINTENANCE DATA

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

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