

MHI

DATA BOOK

DRAFT

Manual No. '13•KX-DB-199D

INVERTER DRIVEN MULTI-HEAT SOURCE UNIT CLIMATE CONTROL SYSTEM

(HEAT SOURCE UNIT)

KXVW series (Heat pump type)

- **Single use (Used also for combination)**
FDC224KXVWE1, 280KXVWE1, 335KXVWE1
- **Combination use**
FDC450KXVWE1, 500KXVWE1, 560KXVWE1, 615KXVWE1, 670KXVWE1, 730KXVWE1, 775KXVWE1,
850KXVWE1, 900KXVWE1, 950KXVWE1, 1000KXVWE1

Notes:

- (1) KXVW is a tentative model name.
- (2) Production schedule : to be advised

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1. GENERAL INFORMATION

1.1 Specific features

New Water cooled Multi KXVW

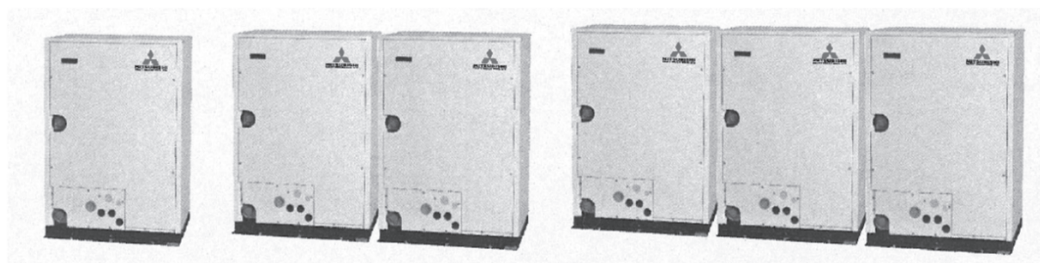


The specification is not final. It may be changed depend on our test result or development policy.

Application

Suitable application to . . .

1. High-rise Building
- 100m or higher in height -
2. Glass-exterior facade Building
- Possible to hide heat source units -



<8,10,12HP>

<16,18,20,22,24HP>

<26,28,30,32,34,36HP>

Special Features

1. EER/COP (High efficiency)

- Energy saving ➡ Reduction of operation cost !

2. Design Flexibility

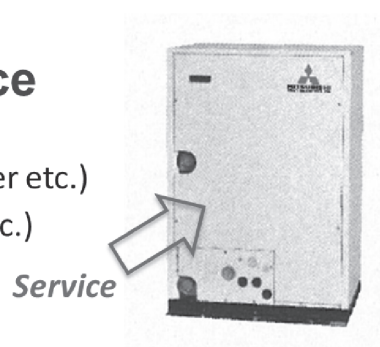
- Compact design
- Easy transportation and installation

3. BMS (Building Management System)

- Same system to the air-cooled KX

4. Serviceability & Maintenance

- Front side service of main parts
(Compressor, Controller, Plate heat exchanger etc.)
- Useful service tools (Mente-PC, SL-Checker etc.)



Specifications

High efficiency & Compact design

- Cooling EER : 4.1 or higher (Max.5.3)
- Unit Size : H1100 × W780 × D550 (185kg)

Nominal horse power			8HP	10HP	12HP	16HP	18HP	20HP	22HP	24HP	26HP	28HP	30HP	32HP	34HP	36HP
Power source			3 phase 380~415V 50Hz, 380V 60Hz													
Capacity	Cooling	kW	22.4	28.0	33.5	45.0	50.0	56.0	61.5	67.0	73.0	77.5	85.0	90.0	95.0	100.0
	Heating	kW	25.0	31.5	37.5	50.0	56.0	63.0	69.0	75.0	82.5	90.0	95.0	100.0	106.0	112.0
Power	Cooling	kW	4.23	5.75	8.13	8.49	9.8	11.5	13.7	16.3	14.2	15.5	17.5	19.5	21.7	24.3
	Heating	kW	4.24	5.10	6.30	8.47	9.3	10.2	11.4	12.6	13.8	14.8	15.4	16.4	17.8	18.8
EER	Cooling		5.3	4.9	4.1	5.3	5.1	4.9	4.5	4.1	5.1	5.0	4.9	4.6	4.4	4.1
COP	Heating		5.9	6.2	6.0	5.9	6.0	6.2	6.1	6.0	6.0	6.1	6.2	6.1	6.0	6.0
Size H × W × D		mm	1100 × 780 × 550			1100 × 780 × 550 × 2units					1100 × 780 × 550 × 3units					
Sound pressure level		dB(A)	48	50	52	51	52	53	54	55	54	54	55	56	56	57
Weight		kg	185			185+185					185+185+185					

The data based on the rating condition:

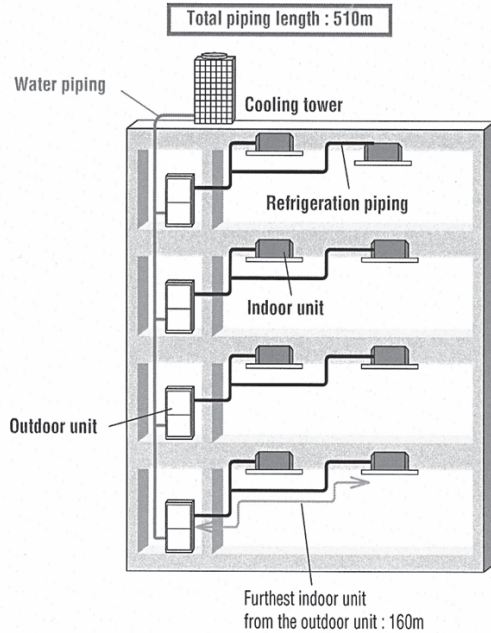
Cooling: Indoor temp. of 27°C DB, 19°C WB, and outdoor inlet water temp. of 30°C, water flow volume 96ℓ/min

Heating: Indoor temp. of 20°C DB, 15°C WB, and outdoor inlet water temp. of 20°C, water flow volume 96ℓ/min

Installation

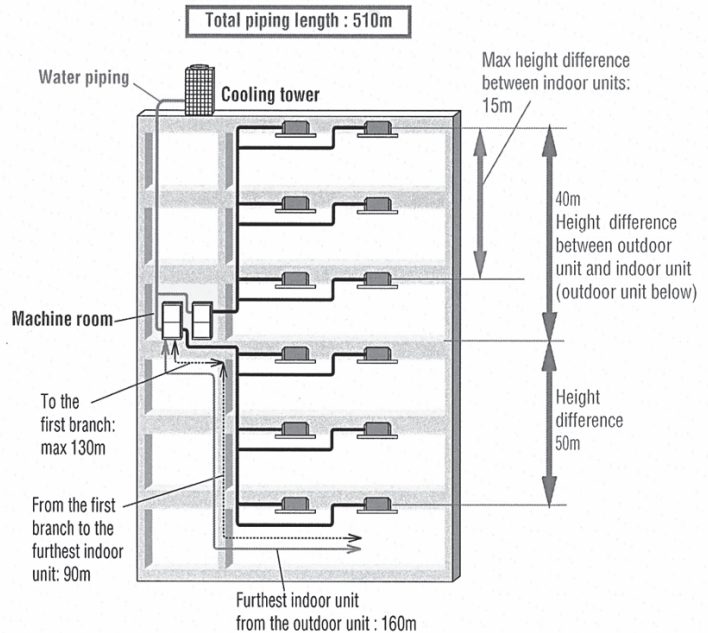
Every floor Installation

Outdoor units on every floor
- New building projects -



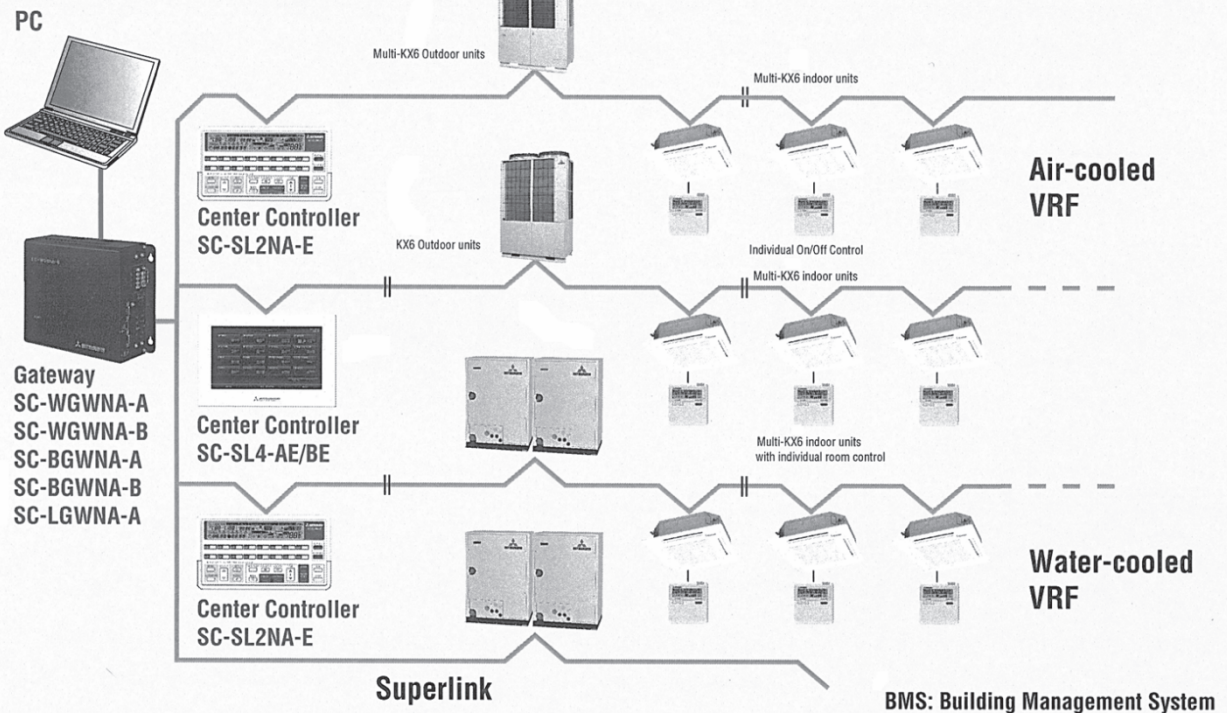
Machine room Installation

Outdoor units in the machine room
- Renovation projects -



BMS

Control system SUPERLINK II



1.2 How to read the model name

(1) Heat source unit

Example: FDC 335 KXVW E 1

Series No.
Application power source...See the specifications
Multi KXVW series
Nominal capacity (nominal cooling capacity : 33.5kW)
Model name (Heat source unit)

(2) Indoor unit

Example: FDT 28 KX E 6F

Series No.
Application power source...See the specifications
Multi KX series
Nominal capacity (nominal cooling capacity : 2.8 kW)
Model name { Indoor unit : FDT, FDTC, FDTW, FDTS, FDTQ, FDU, FDUM, FDUT, FDK, FDE, FDFL, FDFU, FDFW, FDUH, FDU-F }

1.3 Table of indoor unit models

Model \ Capacity	15	22	28	36	45	56	71	90	112	140	160	224	280
Ceiling cassette-4 way type (FDT)			(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)		
Ceiling cassette-4 way compact type (FDTC)	(C)	(A)	(A)	(A)	(A)	(A)							
Ceiling cassette-2 way type (FDTW)			(A)		(A)	(A)	(A)	(A)	(A)	(A)			
Ceiling cassette-1 way type (FDTS)					(B)		(B)						
Ceiling cassette-1 way compact type (FDTQ)		(A)	(A)	(A)									
Duct connected-High static pressure type (FDU)					(B)	(B)	(B)	(B)	(B)	(B)	(B)	(A)	(A)
Duct connected-Low/Middle static pressure type (FDUM)		(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)		
Duct connected (thin)-Low static pressure type (FDUT)	(C)	(A)	(A)	(A)	(A)	(A)	(A)						
Wall mounted type (FDK)		(A)	(A)	(A)	(A)	(A)	(A)						
Ceiling suspended type (FDE)				(A)	(A)	(A)	(A)		(A)	(A)			
Floor standing (with casing) type (FDFL)							(A)						
Floor standing (without casing) type (FDFU)			(A)		(A)	(A)	(A)						
Floor standing-2 way type (FDFW)		(A)		(A)	(A)								
Duct connected-compact and Flexible type (FDUH)		(A)	(A)	(A)									
Outdoor air processing unit (FDU-F)								(A)		(A)		(A)	(A)

Note (1) Reference No. of data book.

(A) ... '12-KX-DB-175

(B) ... '12-KX-DB-177

(C) ... '12-KX-DB-181

1.4 Heat source units combination table

(a) Models FDC224, 280, 335KXVWE1 (Single unit combination)

Item Models	Indoor unit	
	Connectable capacity ⁽¹⁾	Number of connectable units
FDC224KXVWE1	112 - 336	1 to 22 units
FDC280KXVWE1	140 - 420	1 to 28 units
FDC335KXVWE1	167 - 503	1 to 33 units

Note (1) If one or more indoor units of FDK, FDFL, FDFU and/or FDFW series are connected to the system, the total connecting capacity of indoor units should not exceed 130%.

(b) Models FDC450, 500, 560, 615, 670KXVWE1 (2-heat source units combination)

Item Models	Combination heat source unit models			Indoor unit	
	FDC224KXVWE1	FDC280KXVWE1	FDC335KXVWE1	Connectable ⁽¹⁾ capacity	Number of connectable units
FDC450KXVWE1	2			224 - 672	1 to 44 units
FDC500KXVWE1	1	1		252 - 756	1 to 50 units
FDC560KXVWE1		2		280 - 840	1 to 56 units
FDC615KXVWE1		1	1	307 - 923	1 to 56 units
FDC670KXVWE1			2	335 - 1005	1 to 61 units

Note (1) If one or more indoor units of FDK, FDFL, FDFU and/or FDFW series are connected to the system, the total connecting capacity of indoor units should not exceed 130%.

(c) Models FDC730, 775, 850, 900, 950, 1000KXVWE1 (3-heat source units combination)

Item Models	Combination heat source unit models			Indoor unit	
	FDC224KXVWE1	FDC280KXVWE1	FDC335KXVWE1	Connectable ⁽¹⁾ capacity	Number of connectable units
FDC730KXVWE1	2	1		364 - 1092	2 to 61 units
FDC775KXVWE1	1	2		392 - 1176	2 to 67 units
FDC850KXVWE1		3		420 - 1275	2 to 72 units
FDC900KXVWE1		2	1	447 - 1343	2 to 78 units
FDC950KXVWE1		1	2	475 - 1425	2 to 80 units
FDC1000KXVWE1			3	502 - 1508	2 to 80 units

Note (1) If one or more indoor units of FDK, FDFL, FDFU and/or FDFW series are connected to the system, the total connecting capacity of indoor units should not exceed 130%.

(d) Heat source unit side branch pipe set (Option)

Heat source unit	Branch pipe set
For 2-units (for FDC450 - 670KXVWE1)	DOS-2A-2
For 3-units (for FDC730 - 1000KXVWE1)	DOS-3A-2

(e) Branch pipe set (Option)

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

(f) Header pipe set (Option)

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

2. HEAT SOURCE UNIT

2.1 Specifications

Models	FDC224KXVWE1	FDC280KXVWE1	FDC335KXVWE1	FDC450KXVWE1	FDC500KXVWE1	FDC560KXVWE1	FDC615KXVWE1	FDC670KXVWE1
Combination unit	-	-	-	FDC224KXVWE1	FDC224KXVWE1	FDC280KXVWE1	FDC280KXVWE1	FDC335KXVWE1
	-	-	-	FDC224KXVWE1	FDC280KXVWE1	FDC280KXVWE1	FDC335KXVWE1	FDC335KXVWE1
	-	-	-	-	-	-	-	-
	22.4	28.0	33.5	45.0	50.0	56.0	61.5	67.0
Nominal cooling capacity	25.0	31.5	37.5	50.0	56.0	63.0	69.0	75.0
Nominal heating capacity								
Power source	3 Phase 380-415V 50Hz							
Power consumption	Cooling	4.23	5.75	8.13	8.49	9.8	11.5	13.7
	Heating	4.24	5.10	6.30	8.47	9.3	10.2	11.4
Running current	Cooling	7.14/6.46	9.64/8.72	13.4/12.1	14.3/13.1	16.5/15.1	19.3/17.7	22.7/20.8
	Heating	7.13/6.45	8.59/7.77	10.5/9.52	14.3/13.1	15.6/14.3	17.2/15.7	19.1/17.5
Power factor	Cooling	90	91	92	90	90	91	92
	Heating	90	90	91	90	90	91	91
Sound pressure level	48	50	52	51	52	53	54	55
Exterior dimensions	1100×780×550							
Height × Width × Depth								
Exterior appearance (Munsell color)	Stucco white (4.2Y7.5/1.16 near equivalent)							
Net weight	185		185×2					
Refrigerant equipment	GTC5150NH48L × 1							
compressor type & Qty								
Starting method	Direct line starting							
Shock & vibration	Rubber mount (for compressor)							
Capacity control	15-100	13-100	11-100	8-100	7-100	6-100	6-100	5-100
Crankcase heater	33		33×2					
Refrigerant equipment	Plate heat exchanger							
Heat exchanger	Electronic expansion valve							
Refrigerant control	R410A							
Refrigerant	Name	9.9	9.9×2					
	Quantity							
Refrigerant oil	Name	M-MA32R						
	Quantity	2.2	2.2×2					
Safety equipment	Compressor overheat protection / Overcurrent protection / Power transistor overheating protection / Abnormal high pressure protection							
Refrigerant piping size	Liquid line	φ 9.52	φ 12.7					
	High/low gas line *1	φ 19.05	φ 22.22	φ 25.4	φ 28.58			
	Discharge gas line *2	φ 15.88	φ 19.05		φ 22.22	φ 25.4		
	Suction gas line *2	φ 19.05	φ 22.22	φ 25.4	φ 28.58			
Connecting method	Oil equalization	-	-	-	φ 9.52			
	Gas line: Flange / Liquid line: Flare							
MAX. pressure	High: 4.15 Low: 2.21							
Water piping size	Water inlet	R1 1/4						
	Water outlet	R1 1/4						
	Drain outlet	Rp 1/2 (internal thread)						
Insulation for piping	Necessary (both Liquid & Gas lines)							

Notes

(1) The data based on the rating condition:
Cooling : Indoor temp. of 27 °C DB, 19 °C WB, and outdoor inlet water temp. of 30°C, water flow volume 96 ℓ /min
Heating : Indoor temp. of 20 °C DB, 15 °C WB, and outdoor inlet water temp. of 20°C, water flow volume 96 ℓ /min

(2) Holding water quantity of the plate heat exchanger : 2.7L

(3) Waterproof pressure : 1.01 MPa (G)

(4) Heat rejection from the casing : 0.7kW/unit

(5) * 1 In case of heat pump system

(6) * 2 In case of heat recovery system

Notes (1) The data based on the rating condition:

Cooling : Indoor temp. of 27 °C DB, 19 °C WB, and outdoor inlet water temp. of 30 °C, water flow volume 96 ℓ /min

Heating : Indoor temp. of 20 °C DB, 15 °C WB, and outdoor inlet water temp. of 20 °C, water flow volume 96 ℓ /min

(2) Holding water quantity of the plate heat exchanger : 2.7L

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(4) Heat rejection from the casing : 0.7kW/unit

(5) * 1 In case of heat pump system

(6) * 2 In case of heat recovery system

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Models		FDC730KXVWE1	FDC775KXVWE1	FDC850KXVWE1	FDC900KXVWE1	FDC950KXVWE1	FDC1000KXVWE1
Combination unit		FDC224KXVWE1	FDC224KXVWE1	FDC280KXVWE1	FDC280KXVWE1	FDC280KXVWE1	FDC335KXVWE1
		FDC224KXVWE1	FDC280KXVWE1	FDC280KXVWE1	FDC280KXVWE1	FDC335KXVWE1	FDC335KXVWE1
		FDC280KXVWE1	FDC280KXVWE1	FDC280KXVWE1	FDC335KXVWE1	FDC335KXVWE1	FDC335KXVWE1
		73.0	77.5	85.0	90.0	95.0	100
Nominal cooling capacity		82.5	90.0	95.0	100	106	112
Nominal heating capacity							
Power source					3 Phase 380-415V 50Hz		
Power consumption	Cooling	14.2	15.5	17.5	19.5	21.7	24.3
	Heating	13.8	14.8	15.4	16.4	17.6	18.8
Running current	Cooling	23.8/21.8	26.0/23.8	29.3/26.8	32.5/29.7	36.0/33.0	40.0/36.6
	Heating	23.2/21.3	24.9/22.8	25.9/23.7	27.5/25.2	29.4/26.9	31.4/28.7
Power factor	Cooling	90	90	91	91	92	92
	Heating	90	90	90	91	91	91
Sound pressure level		54	54	55	56	56	57
Exterior dimensions Height × Width × Depth					1100×780×550		
Exterior appearance (Munsell color)					Stucco white (4.2Y7.5/1.1.6 near equivalent)		
Net weight					185 × 3		
Refrigerant equipment compressor type & Qty					GTC5150NH48L × 3		
Starting method					Direct line starting		
Shock & vibration					Rubber mount (for compressor)		
Capacity control			5-100	5-100	4-100	4-100	4-100
Crankcase heater					33 × 3		
Refrigerant equipment					Plate heat exchanger		
Heat exchanger					Electronic expansion valve		
Refrigerant control							
Refrigerant	Name				R410A		
	Quantity				9.9 × 3		
Refrigerant oil	Name				M-MA32R		
	Quantity				2.2 × 3		
Safety equipment					Compressor overheat protection / Overcurrent protection / Power transistor overheating protection / Abnormal high pressure protection		
Refrigerant piping size	Liquid line				φ 15.88		
	High/low gas line *1						
	Discharge gas line *2				φ 31.75	φ 28.58	φ 38.1
	Suction gas line *2				φ 31.75		φ 38.1
Connecting method MAX. pressure	Oil equalization				φ 9.52		
					Gas line: Flange / Liquid line: Flare		
Water piping size					High: 4.15 Low: 2.21		
	Water inlet				R1 1/4		
	Water outlet				R1 1/4		
Insulation for piping	Drain outlet				Rp 1/2 (internal thread)		
Notes		Necessary (both Liquid & Gas lines)					
(1) The data based on the rating condition:							
Cooling: Indoor temp. of 27 °C DB, 19 °C WB, and outdoor inlet water temp. of 30 °C, water flow volume 96 ℓ /min							
Heating: Indoor temp. of 20 °C DB, 15 °C WB, and outdoor inlet water temp. of 20 °C, water flow volume 96 ℓ /min							
(2) Holding water quantity of the plate heat exchanger : 2.7L							
(3) Waterproof pressure : 1.01 MPa (G)							
(4) Heat rejection from the casing : 0.7kW/unit							
(5) *1 In case of heat pump system							
(6) *2 In case of heat recovery system							

PCB003Z748

Models FDC224KXVWE1, 280KXVWE1, 335KXVWE1



BK	Black
BL	Blue
BR	Brown
GN	Green
GY	Gray
OR	Orange
RD	Red
WH	White
YE	Yellow
YG	Yellow/Green
PK	Pink

Tho-H	Sub-cooling coil thermostat 2
Tho-P1	Power transistor thermostat
Tho-R1	Heat exchanger thermostat 1 (Liquid)
Tho-R2	Heat exchanger thermostat 2 (Gas)
Tho-S	Suction pipe thermostat
Tho-SC	Sub-cooling coil thermostat 1
Val-1-3	Valve stop
7-SEG1	7-segment LED (Function indication)
7-SEG2	7-segment LED (Data indication)
205H	4-way switching solenoid (Heat exchanger)
205M	4-way switching solenoid (Main)
52X1.2	Solenoid for CM
52P-a	Water pump interlock (Locally produced)
63H1	High pressure switch (for protection)

CH1	Crankcase heater	R1.2	Rush current suppression resistor	SW4-7,8	Address setting switch (master+slave)
CM	Compressor motor	R3.4	Electric discharge resistance	SW5-1	ON Trial operation
CNA-Z	Connector	SA	Airestor	SW5-2	OFF Regular operation
CT1	Current sensor	SV/B	Solenoid valve (gas bypass)	SW5-2	ON Trial operation mode / cooling
C1.2	Electrolytic capacitor	SVO	Solenoid valve (oil return)	SW5-3	OFF Trial operation mode / heating
DM	Diode module	SV/R	Solenoid valve (degas receiver)	SW5-3	ON Pump down operation
EEV/G	Expansion valve for gas bypass	SW1	Address setting SW outdoor unit No. 2 (digits)	SW5-4	OFF Regular operation
EEV/S	Expansion valve for sub-cooling coil	SW2	Address setting SW outdoor unit No. 1 (digit)	SW5-4	Spare
EEVWT-2	Expansion valve for water heat exchanger	SW3-1	Inspection LED reset	SW5-5	ON Super Link communication
FMC1	Fan for IPM	SW3-2	Auto backup operation	SW5-5	OFF Super Link communication
IPM	Intelligent power module	SW3-3	Regular operation	SW5-6~8	Spare
J11,12	Set up model (volt)	SW3-3	Spare	SW6-1	Spare
J13	External input select level / pulse	SW3-4	Spare	SW6-2	ON Heat recovery system
J14~16	Spare	SW3-5	ON Check operation	SW6-2	OFF Heat pump system
LED1	Inspection (Red)	SW3-5	OFF Regular operation	SW6-3~8	Spare
LED1 (INV)	Normal (Yellow) Flashing	SW3-6	Spare	SW7	Data clear / insert
LED2	Normal (Green)	SW3-7	ON Forced heating / cooling mode	SW8	7-segment indication up (1 digit)
LED3	Service (Green)	SW3-7	OFF Regular operation	SW9	7-segment indication up (2 digits)
L1,1.2	DC reactor	SW3-8	ON Test mode	TB1.2	Terminal block
PSH	High pressure sensor	SW3-8	OFF Regular operation	Tho-A	Ambient thermistor
PSL	Low pressure sensor	SW4-1~4	Model setting	Tho-C1	Under-dome thermistor
PWR1~3	Printed wiring board (PBR)	SW4-5,6	Demand	Tho-D1	Discharge pipe thermistor

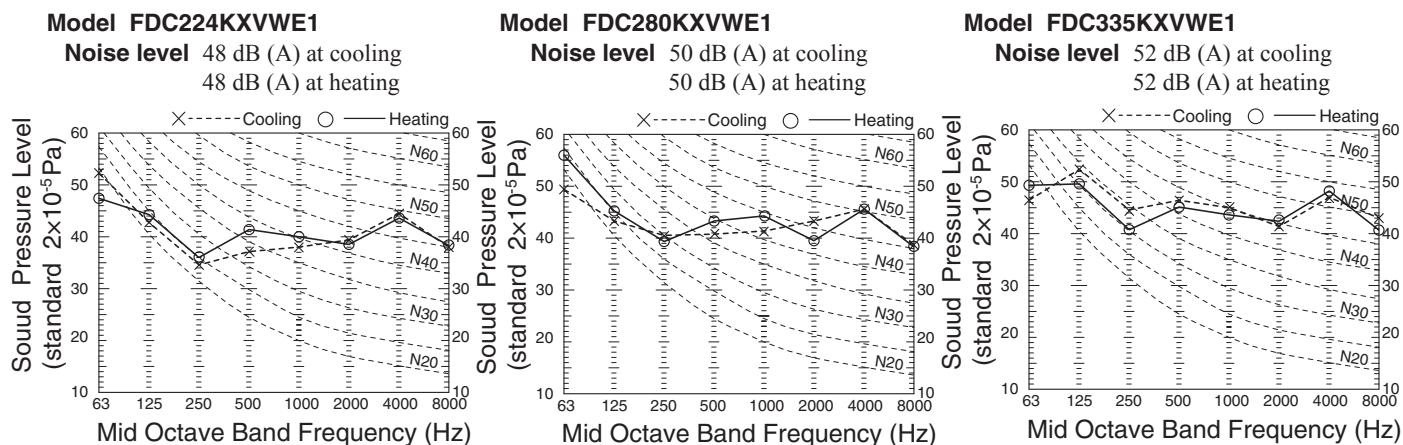
2.4 Noise level

Measured based on JIS B 8616

Mike position as highest noise level in position as below

Distance from front side 1m

Height 1m

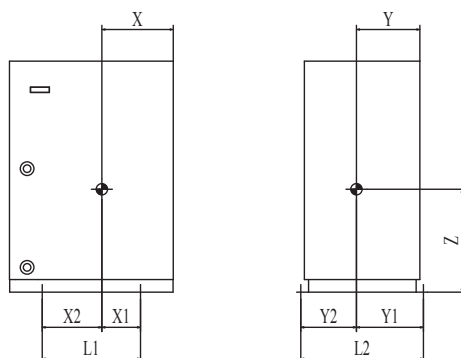


2.5 Vibration-proof design data

(1) Quake-resistance data

Item Heat source unit	Dimension H x W x D (mm)	Weight (kg)	Center-of-gravity position (mm) ⁽¹⁾								
			Width direction				Depth direction				Height Z
			X	X1	X2	L1	Y	Y1	Y2	L2	
FDC224KXVWE1 FDC280KXVWE1 FDC335KXVWE1	1100x780x550	185	340	184	284	468	302	319	265	584	490

Note (1) The dimensions of L1 (X1, X2), L2 (Y1, Y2) show the positions of the anchor bolts.



(2) Vibration-proofing data

Heat source unit	Compressor speed (min ⁻¹)
FDC223KXVWE1	4800
FDC280KXVWE1	6000
FDC335KXVWE1	7200

3. RANGE OF USAGE & LIMITATIONS

• Single use (also for combined use)

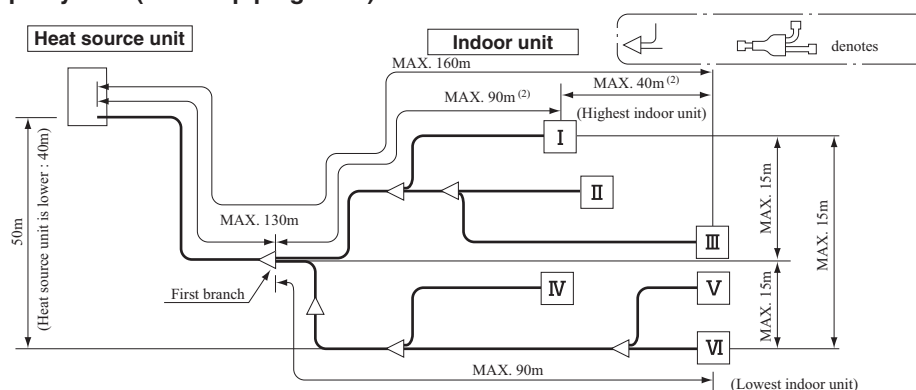
System		FDC224KXVWE1	FDC280KXVWE1	FDC335KXVWE1
Item				
Indoor air temperature (Upper, lower limits)		Refer to page 15		
Water temperature (Upper, lower limits)				
Flow rate		50L/min - 150L/min (per one unit)		
Indoor units that can be used in combination	Number of connected units	1 to 22 unit	1 to 28 unit	1 to 33 unit
	Connectable capacity ⁽¹⁾	112 ~ 336	140 ~ 420	167 ~ 503
Total piping length		510m or less		
Main pipe length		130m or less		
Single direction piping length		Actual length : 160m or less, Equivalent length : 185m or less		
Allowable pipe length from the first branching		90m or less (However, difference between the longest and shortest piping : 40m or less)		
Elevation difference between the first branching point and the indoor unit		15m or less		
Difference in height between indoor and outdoor units	Heat source unit is higher	50m or less		
	Heat source unit is lower	40m or less		
Difference in the elevation of indoor units in a system		15m or less		
Indoor unit atmosphere (behind ceiling) temperature and humidity (Only models FDT, FDTC, FDTW, FDTS, FDTQ,) (FDE, FDK, FDFW, FDFL, FDFU : Dew point temperature 23℃ or less, relative humidity 80% or less)		Dew point temperature 28℃ or less, relative humidity 80% or less (FDE, FDK, FDFW, FDFL, FDFU : Dew point temperature 23℃ or less, relative humidity 80% or less)		
Compressor stop/start frequency	1 cycle time	6 min or more (3 minutes or more from start to stop or 3 minutes or more from stop to start)		
	Stop time	3 min or more		
Power source voltage	Voltage fluctuation	Within ±10% of rated voltage		
	Voltage drop during start	Within -15% of rated voltage		
	Phase unbalance	Within ±3% of rated voltage		

Note (1) If one or more indoor units of FDK, FDFL, FDFU and/or FDFW series are connected to the system, the total connecting capacity of indoor units should not exceed 130%.

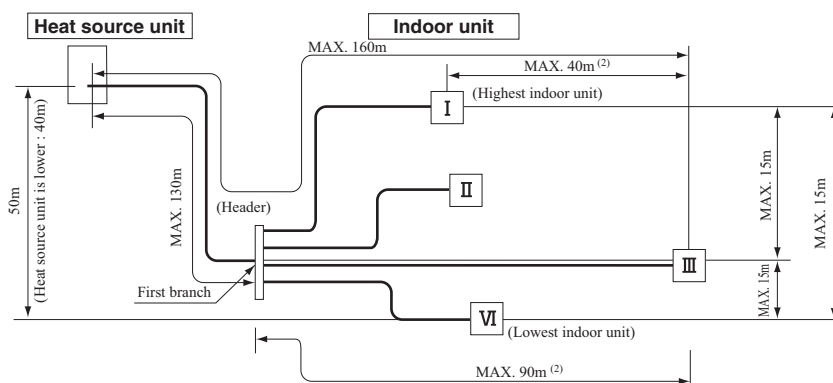
PCB003Z749

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

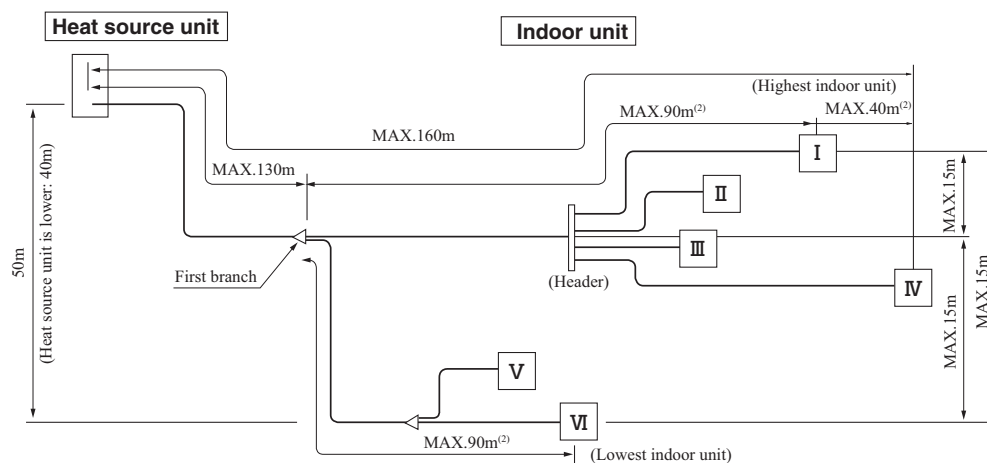
(1) Branch pipe System (Branch piping used)



(2) Header System (Header used)



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



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

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

(4) Maximum refrigerant quantity

Combination heat source unit	Max. quantity (kg)
Single	25
2-units	50
3-units	75

(5) Other requirements to water piping system

- Need pumping operation signal for interlock (from customers).
- Be sure to install the closed water circuit in order to water quality control.
- Water pressure drop : Refer to Fig. 1 (Page 15)
- Water quality : Refer to Table 1 (Page 16)

• Combination use

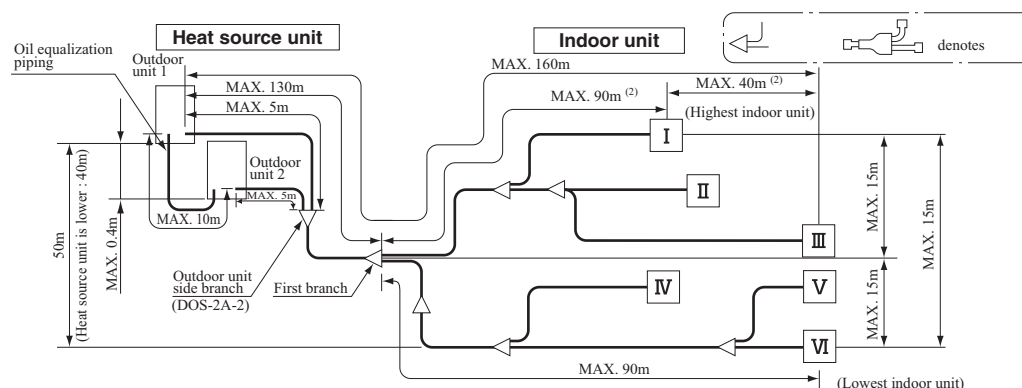
System		FDC450KXVWE1	FDC500KXVWE1	FDC560KXVWE1	FDC615KXVWE1	FDC670KXVWE1
Item						
Indoor air temperature (Upper, lower limits)		Refer to page 15				
Water temperature (Upper, lower limits)						
Flow rate		50L/min - 150L/min (Per one unit)				
Indoor units that can be used in combination	Number of connected units	1 to 44 units	1 to 50 units	1 to 56 units	2 to 61 units	2 to 67 units
	Connectable capacity ⁽¹⁾	224 - 672	252 - 756	280 - 840	307 - 923	335 - 1005
Total piping length		510m or less				
Single direction piping length		Actual length : 160m or less, Equival length : 185m or less				
Main pipe length		130m or less				
Allowable pipe length from the first branching		90m or less (However, difference between the longest and shortest piping : 40m or less)				
Elevation difference between the first branching point and the indoor unit		15m or less				
Difference in height between indoor and outdoor units	Heat source unit is higher	50m or less				
	Heat source unit is lower	40m or less				
Difference in the elevation of indoor units in a system		15m or less				
Difference in height between outdoor units (Same system)		MAX. 0.4m				
Difference between an outdoor unit and on outdoor unit side branch pipe		MAX. 5m				
Length of oil equalization piping		MAX. 10m				
Indoor unit atmosphere (behind ceiling) temperature and humidity Only models FDT, FDTG, FDTW, FDTQ, FDU, FDUM, FDUH, FDU-F		Dew point temperature 28 ℃ or less, relative humidity 80% or less (FDE, FDK, FDFW, FDFL, FDFU : Dew point temperature 23 ℃ or less, relative humidity 80% or less)				
Compressor stop/start frequency	1 cycle time	6 min or more (3 minutes or more from start to stop or 3 minutes or more from stop to start)				
	Stop time	3 min or more				
Power source voltage	Voltage fluctuation	Within ±10% of rated voltage				
	Voltage drop during start	Within -15% of rated voltage				
	Phase unbalance	Within ±3% of rated voltage				

System		FDC730 KXVWE1	FDC775 KXVWE1	FDC850 KXVWE1	FDC900 KXVWE1	FDC950 KXVWE1	FDC1000 KXVWE1
Item							
Indoor air temperature (Upper, lower limits)		Refer to page 15					
Water temperature (Upper, lower limits)							
Flow rate		50L/min - 150L/min (per one unit)					
Indoor units that can be used in combination	Number of connected units	2 to 72 units	2 to 78 units	2 to 80 units	2 to 80 units	2 to 80 units	2 to 80 units
	Connectable capacity ⁽¹⁾	364 - 1092	392 - 1176	420 - 1275	447 - 1343	475 - 1425	502 - 1508
Total piping length		510m or less					
Single direction piping length		Actual length : 160m or less, Equival length : 185m or less					
Main pipe length		130m or less					
Allowable pipe length from the first branching		90m or less (However, difference between the longest and shortest piping : 40m or less)					
Elevation difference between the first branching point and the indoor unit		15m or less					
Difference in height between indoor and outdoor units	Heat source unit is higher	50m or less					
	Heat source unit is lower	40m or less					
Difference in the elevation of indoor units in a system		15m or less					
Difference in height between outdoor units (Same system)		MAX. 0.4m					
Difference between an outdoor unit and on outdoor unit side branch pipe		MAX. 5m					
Length of oil equalization piping		MAX. 10m					
Indoor unit atmosphere (behind ceiling) temperature and humidity Only models FDT, FDTG, FDTW, FDTQ, FDU, FDUM, FDUH, FDU-F		Dew point temperature 28 ℃ or less, relative humidity 80% or less (FDE, FDK, FDFW, FDFL, FDFU : Dew point temperature 23 ℃ or less, relative humidity 80% or less)					
Compressor stop/start frequency	1 cycle time	6 min or more (3 minutes or more from start to stop or 3 minutes or more from stop to start)					
	Stop time	3 min or more					
Power source voltage	Voltage fluctuation	Within ±10% of rated voltage					
	Voltage drop during start	Within -15% of rated voltage					
	Phase unbalance	Within ±3% of rated voltage					

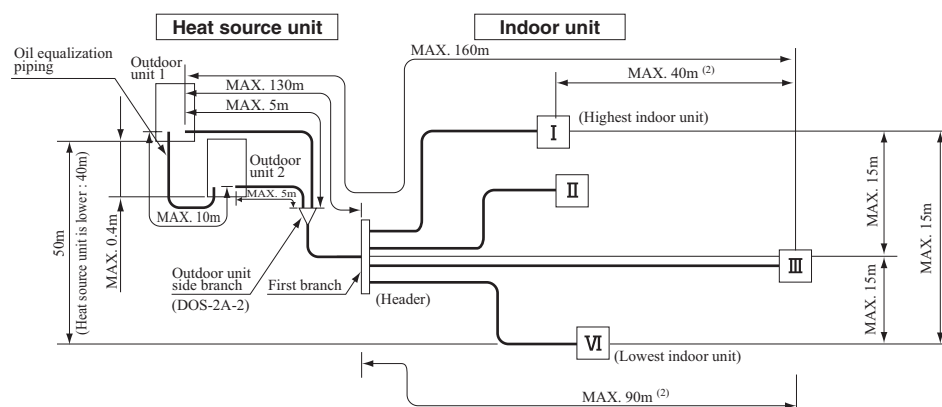
Note (1) If one or more indoor units of FDK, FDFL, FDFU and/or FDFW series are connected to the system.
the total connecting capacity of indoor units should not exceed 130%.

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

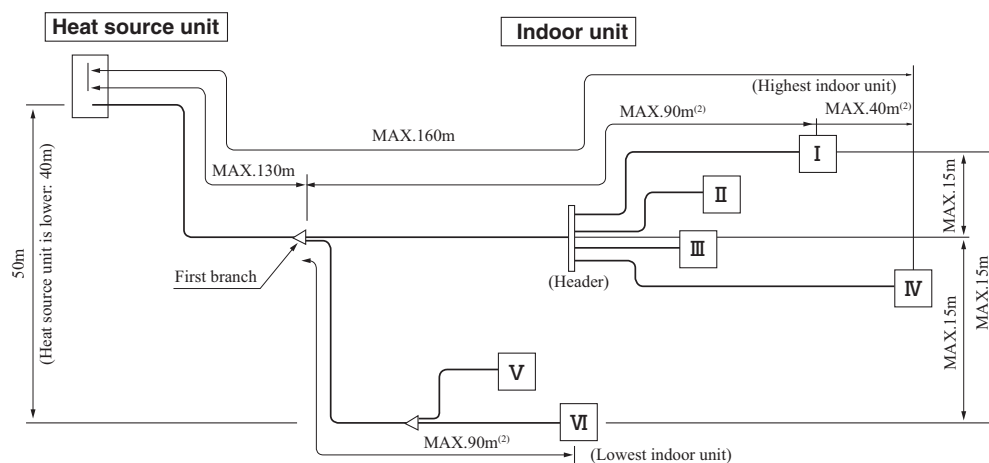
(1) Branch pipe System (Branch piping used)



(2) Header System (Header used)



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



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

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

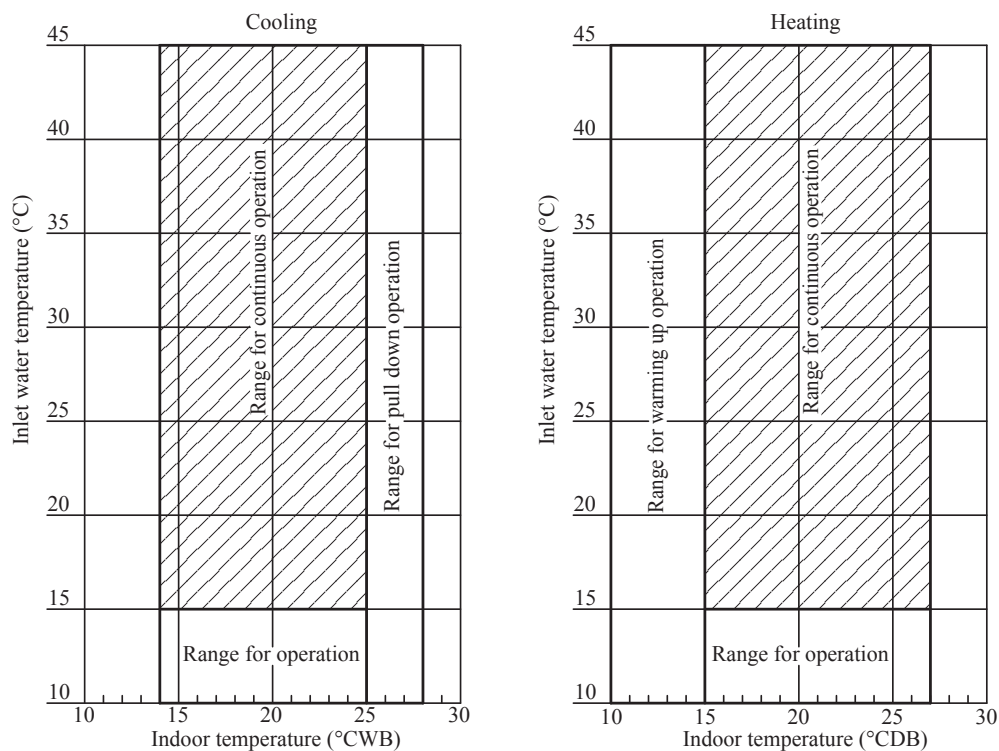
(4) Maximum refrigerant quantity

Combination heat source unit	Max. quantity (kg)
Single	25
2-units	50
3-units	75

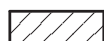
(5) Other requirements to water piping system

- Need pumping operation signal for interlock (from customers).
- Be sure to install the closed water circuit in order to water quality control.
- Water pressure drop : Refer to Fig. 1 (Page 15)
- Water quality : Refer to Table 1 (Page 16)

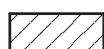
Operation Limit



[Range for continuous operation]



: Cooling

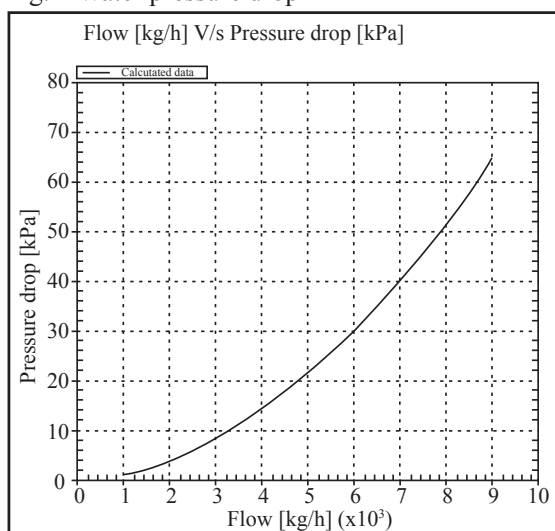


: Heating

- Notes (1) This figure shows the range for operation, when water flow rate is 50-150L/min. per one unit.
 (2) Design in the following condition
 Water temperature 20-35°C
 Water flow rate 60L/min or more

PCB003Z750

Fig. 1 Water pressure drop



Fluid name : Water
 Reference temperature : 30°C

Table 1 Water quality standards

Item ⁽¹⁾			Cooling water system ⁽²⁾		Hot water system ⁽³⁾		Tendency ⁽⁴⁾	
			Circulation system	Makeup water	Circulation system (20°C~60°C)	Makeup water	Corrosion	Scale
Standard items	pH (25°C)	-	6.5 - 8.2	6.0 - 8.0	7.0 - 8.0	7.0 - 8.0	○	○
	Electric conductivity(25°C)	mS/m	≤80	≤30	≤30	≤30	○	○
	Chloride ion	mgCl ⁻ /L	≤200	≤50	≤50	≤50	○	
	Sulphate ion	mgSO ₄ ²⁻ /L	≤200	≤50	≤50	≤50	○	
	Acid consumption (pH4.8)	mgCaCO ₃ /L	≤100	≤50	≤50	≤50		○
	Total hardness	mgCaCO ₃ /L	≤200	≤70	≤70	≤70		○
	Calcium hardness	mgCaCO ₃ /L	≤150	≤50	≤50	≤50		○
	Ionic silica	mgSiO ₂ /L	≤50	≤30	≤30	≤30		○
Reference items	Iron	mgFe/L	≤1.0	≤0.3	≤1.0	≤0.3	○	○
	Copper	mgCu/L	≤0.3	≤0.1	≤1.0	≤0.1	○	
	Sulphide ion	mgS ²⁻ /L	Not detected	Not detected	Not detected	Not detected	○	
	Ammonium ion	mgNH ₄ ⁺ /L	≤1.0	≤0.1	≤0.3	≤0.1	○	
	Residual chlorine	mgCl/L	≤0.3	≤0.3	≤0.25	≤0.3	○	
	Free carbon	mgCO ₂ /L	≤4.0	≤4.0	≤0.4	≤4.0	○	
	Stability index	-	6.0 - 7.0	-	-	-	○	○

Notes (1) The fifteen items in the table represent typical causes of corrosion and scale.

(2) In a condenser water circuit that uses a closed cooling tower, the closed circuit circulating water and makeup water must satisfy its water quality standards for the hot water systems, and passing water and makeup water must satisfy those for the circulation type cooling water system.

(3) Corrosion has a tendency to occur when water temperature is high (40°C or higher), and if metals with no protective coating whatever are directly exposed to water, it would be a good idea to take effective measures against corrosion such as adding a corrosion inhibitor or deaeration treatment.

(4) The columns show a factor of corrosion or scale.

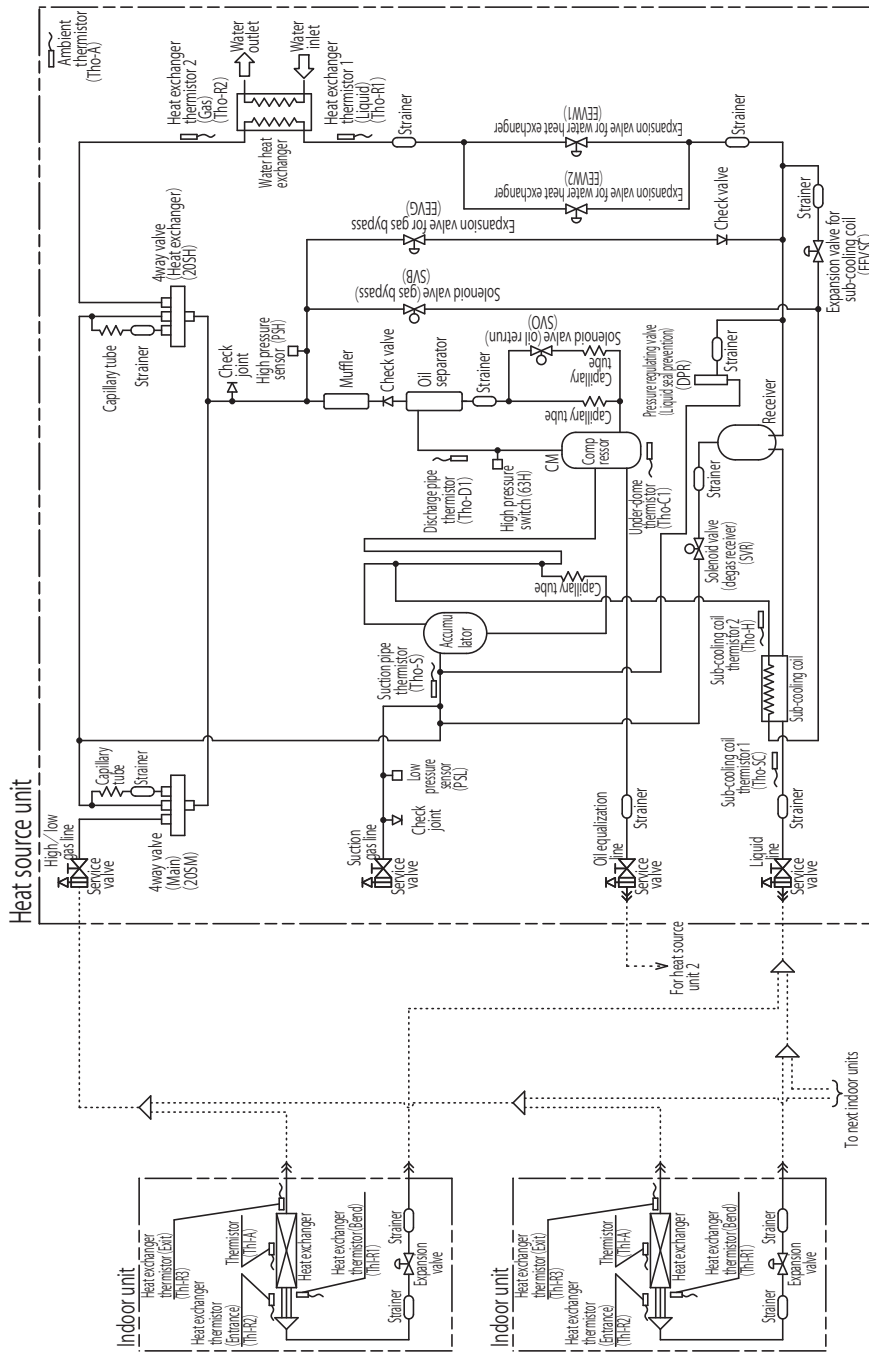
(5) The supply water must be clean tap water, industrial water or clean ground water.

PCB003Z751

4. PIPING SYSTEM

Models FDC224KXVWE1, 280KXVWE1, 335KXVWE1

•In case of heat pump system



Notes (1) Preset point of protective devices

63H : Open 4.15MPa, Close 3.15MPa

(For protection)

(2) Function of thermistor

PSH : For compressor control

Cooling: 3.70 ON (MPa)

Heating: 3.00 ON (MPa)

PSL : ON 0.18MPa, OFF 0.20MPa

(For compressor control)

ON 0.134MPa, OFF 0.18MPa

(For protection)

Th-R1, R2 : Heating operation : Indoor fan control.

Cooling operation : Frost prevention control.

Super heat control.

Th-R3 : For super heat control of cooling operation.

Tho-D1 : For control of discharge pipe temperature.

Tho-C1 : For control of temperature under the dome.

Tho-S : For control of suction pipe temperature.

Tho-R1, R2 : Electronic expansion valve (EEVW1, 2) control

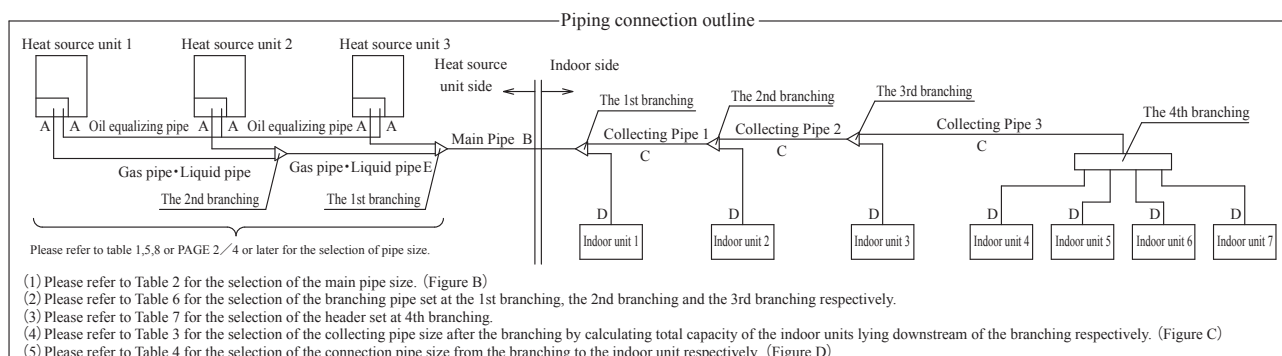
Tho-SC : Electronic expansion valve (EEVSC) control of cooling operation.

Tho-H : For super heat control of sub-cooling coil.

PCB003Z593

5. APPLICATION DATA

5.1 Installation of heat source unit



(1) Pipe size selection

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

(a) The connection pipe to heat source unit before the branching : Selection A in above figure

- Basically the pipe size should be selected as same as the connection pipe size of the heat source unit.
- The heat source unit connection pipe size is mentioned in following table.

Table 1

Heat source unit	Heat source unit connection pipe specification					
	Gas pipe	Connection method	Liquid pipe	Connection method	Oil equalizing pipe	Connection method
224	$\phi 19.05 \times 1.0$	Flange	$\phi 9.52 \times 0.8$	Flare	$\phi 9.52 \times 0.8$ (* 1)	Flare
280	$\phi 22.22 \times 1.0$		$\phi 12.7 \times 0.8$			
335	$\phi 25.4 \times 1.0$					

* 1 When three heat source units combination, please connect using a tee joint (locally procured).

(b) Main Pipe (The 1st branching on the heat source unit side-The 1st branching on the indoor side) : Selection B in above figure

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

Table 2

Heat source unit	Main pipe size (normal)		Pipe size for an actual length of 90m or longer	
	Gas pipe	Liquid pipe	Gas pipe	Liquid pipe
224	$\phi 19.05 \times 1.0$	$\phi 9.52 \times 0.8$	$\phi 22.22 \times 1.0$	$\phi 12.7 \times 0.8$
280	$\phi 22.22 \times 1.0$		$\phi 25.4 \times 1.0$	
335	$\phi 25.4 \times 1.0$			
450	$\phi 28.58 \times 1.0$	$\phi 12.7 \times 0.8$	$\phi 31.75 \times 1.1$	$\phi 15.88 \times 1.0$
500				
560				
615				
670	$\phi 31.75 \times 1.1$	$\phi 15.88 \times 1.0$	$\phi 38.1 \times 1.35$	$\phi 19.05 \times 1.0$
730				
775				
850				
900				
950				
1000	$\phi 38.1 \times 1.35$			

(c) The collecting pipe after the branching : Selection C in above figure

- Please select an appropriate pipe size from the following table by calculating total capacity of indoor units lying downstream of the branching.
- However the pipe size selected from this table should not exceed the main pipe size. (Selection B in above figure)

Table 3

Total capacity of indoor units	Gas pipe	Liquid pipe
Less than 70	$\phi 12.7 \times 1.0$	$\phi 9.52 \times 0.8$
70 or more but less than 180	$\phi 15.88 \times 1.0$	
180 or more but less than 371	$\phi 19.05 \times 1.0$ ※1	$\phi 12.7 \times 0.8$
371 or more but less than 540	$\phi 25.4 \times 1.0$	$\phi 15.88 \times 1.0$
540 or more but less than 1100	$\phi 28.58 \times 1.0$	
1100 or more	$\phi 31.75 \times 1.1$	$\phi 19.05 \times 1.0$
	$\phi 38.1 \times 1.35$	

※1 : When the indoor unit of 280 capacity is connected and main pipe size is $\phi 22.22$ or bigger, the pipe of $\phi 22.22 \times 1.0$ should be used.

(d) The connection pipe to indoor unit after the branching : Selection D in above figure

- The connection pipe size to indoor unit is mentioned in following table.

Table 4

	Capacity	Gas pipe	Liquid pipe
Indoor unit	15, 22, 28	ϕ 9.52xt0.8	ϕ 6.35xt0.8
	36, 45, 56	ϕ 12.7xt0.8	
	71, 90, 112, 140, 160	ϕ 15.88xt1.0	ϕ 9.52xt0.8
	224	ϕ 19.05xt1.0	
	280	ϕ 22.22xt1.0	

(2) Selection of heat source unit side branching pipe set

Table 5

Heat source unit	Branching pipe set
For two units (for450-670)	DOS-2A-2
For three units (for730-1000)	DOS-3A-2

Please note

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

(3) Selection of an indoor unit side branching pipe set

(a) Method of selecting a branching pipe set

- Please select an appropriate branching pipe set from the following table by calculating total capacity of indoor units lying downstream of the branching.

Table 6

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

Please note

- The size of branching pipe connecting to the pipe from the indoor should fit to the connection pipe size of the indoor unit.
- The branching pipes (for both gas and liquid) must always be positioned to keep refrigerant flow after branching in the same level either horizontally or vertically.

(b) Header method

- Depending on the number of connected indoor units, the pipe unconnected to the indoor unit should be plugged with a cap or a pinched pipe. (locally procured)
- Regarding the size of a cap or a pinched pipe, refer to the technical manual for the header set.

Table 7

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

Please note

- The size of connection pipe from the header to the indoor unit should be selected as same as the connection pipe size of indoor unit.
- The headers (for both gas and liquid) must always be positioned in such away that it branches either horizontally or vertically.
- The indoor unit of 224 or 280 capacity cannot be connected to the header.

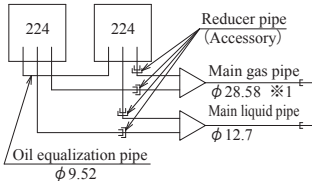
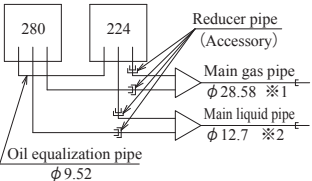
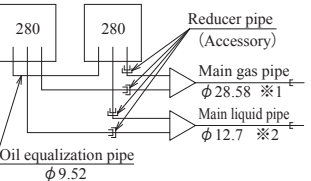
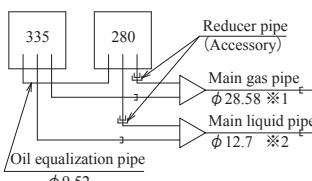
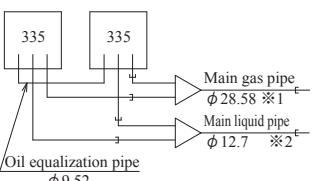
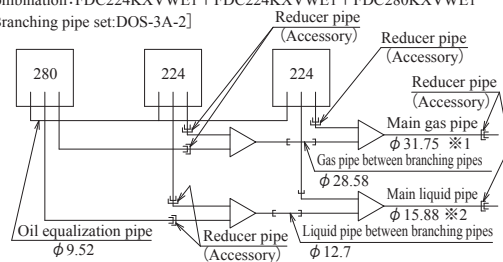
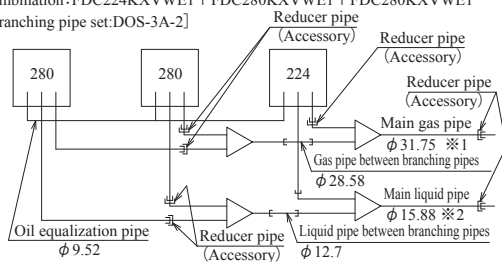
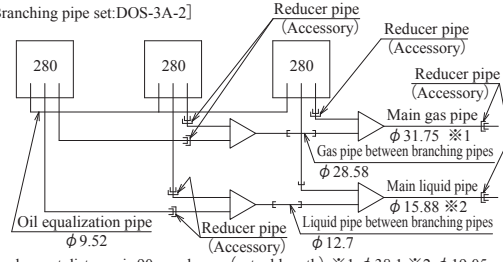
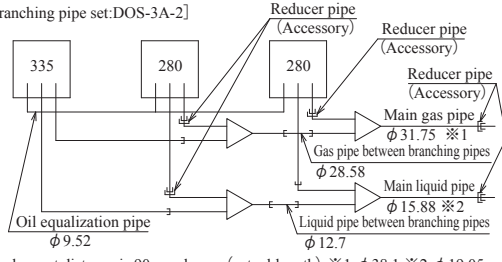
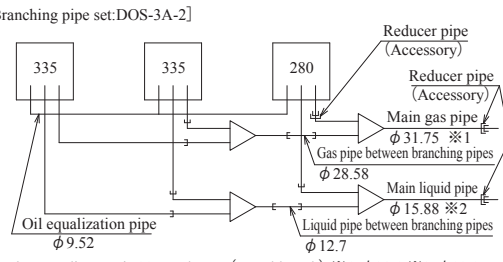
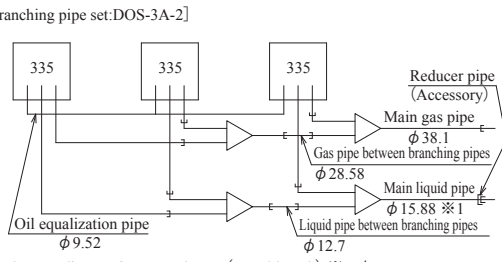
(4) Selection of the connection pipe to branching pipes for three heat source units combination : Selection E in above figure

Table 8

Total capacity of heat source units	Pipe size between branching pipes	
	Gas pipe	Liquid pipe
500	ϕ 28.58xt1.0	ϕ 12.7xt0.8
560		
615		
670		

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(5) Combination use

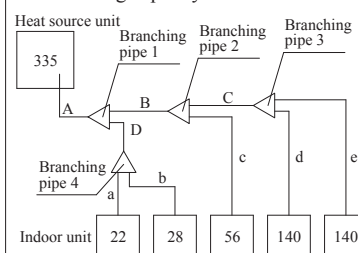
FDC450KXVWE1 Combination: FDC224KXVWE1 + FDC224KXVWE1 [Branching pipe set: DOS-2A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 31.75	FDC500KXVWE1 Combination: FDC224KXVWE1 + FDC280KXVWE1 [Branching pipe set: DOS-2A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 31.75, ※2 φ 15.88	FDC560KXVWE1 Combination: FDC280KXVWE1 + FDC280KXVWE1 [Branching pipe set: DOS-2A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 31.75, ※2 φ 15.88
FDC615KXVWE1 Combination: FDC280KXVWE1 + FDC335KXVWE1 [Branching pipe set: DOS-2A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 31.75, ※2 φ 15.88	FDC670KXVWE1 Combination: FDC335KXVWE1 + FDC335KXVWE1 [Branching pipe set: DOS-2A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 31.75, ※2 φ 15.88	
FDC730KXVWE1 Combination: FDC224KXVWE1 + FDC224KXVWE1 + FDC280KXVWE1 [Branching pipe set: DOS-3A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 38.1, ※2 φ 19.05	FDC775KXVWE1 Combination: FDC224KXVWE1 + FDC280KXVWE1 + FDC280KXVWE1 [Branching pipe set: DOS-3A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 38.1, ※2 φ 19.05	
FDC850KXVWE1 Combination: FDC280KXVWE1 + FDC280KXVWE1 + FDC280KXVWE1 [Branching pipe set: DOS-3A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 38.1, ※2 φ 19.05	FDC900KXVWE1 Combination: FDC280KXVWE1 + FDC280KXVWE1 + FDC335KXVWE1 [Branching pipe set: DOS-3A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 38.1, ※2 φ 19.05	
FDC950KXVWE1 Combination: FDC280KXVWE1 + FDC335KXVWE1 + FDC335KXVWE1 [Branching pipe set: DOS-3A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 38.1, ※2 φ 19.05	FDC1000KXVWE1 Combination: FDC335KXVWE1 + FDC335KXVWE1 + FDC335KXVWE1 [Branching pipe set: DOS-3A-2]  If the longest distance is 90m or longer (actual length) ※1 φ 19.05	

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(6) Example

Example 1: Branch system

Connecting capacity: 386



Selecting piping size

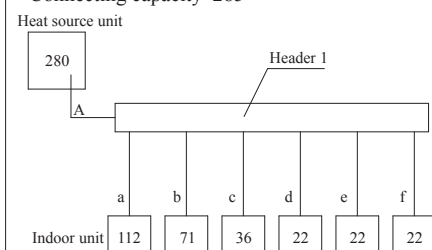
Item	Selection procedure	Piping size		Selection table of PCB003Z811
		Gas pipe	Liquid pipe	
A	If the longest distance is less than 90m (actual length) If the longest distance is 90m or longer (actual length)	$\phi 25.4$ $\phi 25.4$	$\phi 12.7$ $\phi 12.7$	Table 1 and table 2
B	Downstream indoor unit capacity total (56+140+140) = 336	$\phi 19.05$	$\phi 12.7$	Table 3
C	Downstream indoor unit capacity total (140+140) = 280	$\phi 19.05$	$\phi 12.7$	Table 3
D	Downstream indoor unit capacity total (22+28) = 50	$\phi 12.7$	$\phi 9.52$	Table 3
a	Indoor unit piping size (22)	$\phi 9.52$	$\phi 6.35$	Table 4
b	Indoor unit piping size (28)	$\phi 9.52$	$\phi 6.35$	Table 4
c	Indoor unit piping size (56)	$\phi 12.7$	$\phi 6.35$	Table 4
d	Indoor unit piping size (140)	$\phi 15.88$	$\phi 9.52$	Table 4
e	Indoor unit piping size (140)	$\phi 15.88$	$\phi 9.52$	Table 4

Selection of branching pipe set. (Than table 6 of PCB003Z811)

Item	Selection procedure	Branching pipe set
Branching pipe 1	Downstream indoor unit capacity total (22+28+56+140+140) = 386	DIS-371-1G
Branching pipe 2	Downstream indoor unit capacity total (56+140+140) = 336	DIS-180-1G
Branching pipe 3	Downstream indoor unit capacity total (140+140) = 280	DIS-180-1G
Branching pipe 4	Downstream indoor unit capacity total (22+28) = 50	DIS-22-1G

Example 2: Header system

Connecting capacity: 285



Selecting piping size

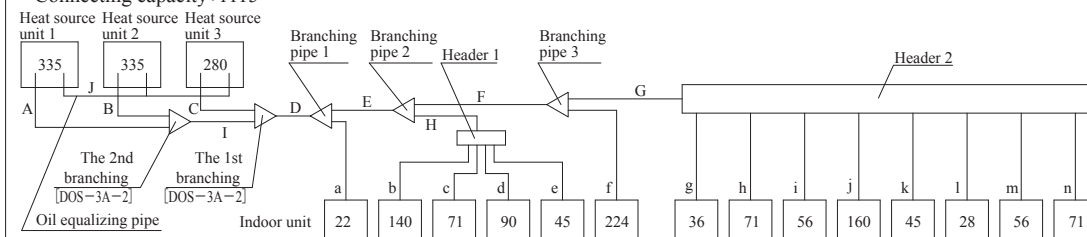
Item	Selection procedure	Piping size		Selection table of PCB003Z811
		Gas pipe	Liquid pipe	
A	If the longest distance is less than 90m (actual length) If the longest distance is 90m or longer (actual length)	$\phi 22.22$ $\phi 25.4$	$\phi 9.52$ $\phi 12.7$	Table 1 and table 2
a	Indoor unit piping size (112)	$\phi 15.88$	$\phi 9.52$	Table 4
b	Indoor unit piping size (71)	$\phi 15.88$	$\phi 9.52$	Table 4
c	Indoor unit piping size (36)	$\phi 12.7$	$\phi 6.35$	Table 4
d	Indoor unit piping size (22)	$\phi 9.52$	$\phi 6.35$	Table 4
e	Indoor unit piping size (22)	$\phi 9.52$	$\phi 6.35$	Table 4
f	Indoor unit piping size (22)	$\phi 9.52$	$\phi 6.35$	Table 4

Selection header set. (Than table 7 of PCB003Z811)

Item	Selection procedure	Header set
Header 1	Downstream indoor unit capacity total (112+71+36+22+22+22) = 285	HEAD6-180-1G

Example 3: Branch system + Header system

Connecting capacity: 1115



Selecting piping size

Item	Selection procedure	Piping size		Selection table of PCB003Z811
		Gas pipe	Liquid pipe	
A	Heat source unit piping size (335)	$\phi 25.4$	$\phi 12.7$	Table 1
B	Heat source unit piping size (335)	$\phi 25.4$	$\phi 12.7$	Table 1
C	Heat source unit piping size (280)	$\phi 22.22$	$\phi 9.52$	Table 1
D	If the longest distance is less than 90m (actual length) If the longest distance is 90m or longer (actual length)	$\phi 31.75$ $\phi 38.1$	$\phi 15.88$ $\phi 19.05$	Table 2
E	Downstream indoor unit capacity total (140+71+90+45+224+36+71+56+160+45+28+56+71) = 1093	$\phi 38.1$	$\phi 19.05$	Table 3
F	Downstream indoor unit capacity total (224+36+71+56+160+45+28+56+71) = 747	$\phi 31.75$	$\phi 15.88$	Table 3
G	Downstream indoor unit capacity total (36+71+56+160+45+28+56+71) = 523	$\phi 25.4$	$\phi 12.7$	Table 3
H	Downstream indoor unit capacity total (140+71+90+45) = 346	$\phi 22.22$	$\phi 12.7$	Table 3

In case of heat pump system

Item	Selection procedure	Piping size		Selection table of PCB003Z811
		Gas pipe	Liquid pipe	
I	Heat source unit capacity total connect to the 2nd branching (335+335) = 670	$\phi 28.58$	$\phi 12.7$	Table 8
a	Indoor unit piping size (22)	$\phi 9.52$	$\phi 6.35$	Table 4
b	Indoor unit piping size (140)	$\phi 15.88$	$\phi 9.52$	Table 4
c	Indoor unit piping size (71)	$\phi 15.88$	$\phi 9.52$	Table 4
d	Indoor unit piping size (90)	$\phi 15.88$	$\phi 9.52$	Table 4
e	Indoor unit piping size (45)	$\phi 12.7$	$\phi 6.35$	Table 4
f	Indoor unit piping size (224)	$\phi 19.05$	$\phi 9.52$	Table 4
g	Indoor unit piping size (36)	$\phi 12.7$	$\phi 6.35$	Table 4
h	Indoor unit piping size (71)	$\phi 15.88$	$\phi 9.52$	Table 4
i	Indoor unit piping size (160)	$\phi 15.88$	$\phi 9.52$	Table 4
k	Indoor unit piping size (45)	$\phi 12.7$	$\phi 6.35$	Table 4
l	Indoor unit piping size (28)	$\phi 9.52$	$\phi 6.35$	Table 4
m	Indoor unit piping size (56)	$\phi 12.7$	$\phi 6.35$	Table 4
n	Indoor unit piping size (71)	$\phi 15.88$	$\phi 9.52$	Table 4

Item	Selection procedure	Piping size	Selection table of PCB003Z811
J	Oil equalizing pipe	$\phi 9.52$	Table 1

Selection of branching pipe set. (Than table 6 of PCB003Z811)

Item	Selection procedure	Branching pipe set
Branching pipe 1	Downstream indoor unit capacity total (22+140+71+90+45+224+36+71+56+160+45+28+56+71) = 1115	DIS-540-2G
Branching pipe 2	Downstream indoor unit capacity total (140+71+90+45+224+36+71+56+160+45+28+56+71) = 1093	DIS-540-2G
Branching pipe 3	Downstream indoor unit capacity total (224+36+71+56+160+45+28+56+71) = 747	DIS-540-2G

Selection header set. (Than table 7 of PCB003Z811)

Item	Selection procedure	Header set
Header 1	Downstream indoor unit capacity total (140+71+90+45) = 346	HEAD8-180-1G
Header 2	Downstream indoor unit capacity total (36+71+56+160+45+28+56+71) = 523	HEAD8-371-1G

PCB003Z812

INVERTER DRIVEN MULTI-HEAT SOURCE UNIT CLIMATE CONTROL SYSTEM



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