



Engineering Data

TVR 7G Series

Modular Cooling Only – UAE
8 to 30HP



Models:

4TVVT086DD07CAG
4TVVT096DD07CAG
4TVVT115DD07CAG
4TVVT140DD07CAG
4TVVT155DD07CAG
4TVVT172DD07CAG
4TVVT192DD07CAG
4TVVT211DD07CAG
4TVVT228DD07CAG
4TVVT251DD07CAG
4TVVT270DD07CAG
4TVVT288DD07CAG

Feb 2024

TVR-EM-032A

TRANE
TECHNOLOGIES

CONTENTS

Part 1 General Information	3
Part 2 Outdoor Unit Engineering Date.....	16
Part 3 System Design and Installation	113

Part 1

General Information

1 Indoor and Outdoor Unit Capacities.....	4
2 External Appearance.....	6
3 Outdoor Unit Combinations.....	8
4 Combination Ratio.....	9
5 Selection Procedure.....	11

1 Indoor and Outdoor Unit Capacities

1.1 Indoor Units

1.1.1 Standard indoor units

Table 1-1.1: Standard indoor unit abbreviation codes

Abbreviation code	Type
4TVA	One-way Cassette
4TVE	Two-way Cassette
4TVB	Compact Four-way Cassette
4TVC	Four-way Cassette
4TVL	Arc Duct
4TVD	Medium Static Pressure Duct

Abbreviation code	Type
4TVH	High Static Pressure Duct
4TVW	Wall-mounted
4TVX	Ceiling & Floor
4TV (J/K)	Floor Standing (Exposed/Concealed)
4TVI	Floor Standing (Top/Side discharge)

Table 1-1.2: Standard indoor unit capacity range

Capacity		Capacity index	4TVA	4TVE	4TVB	4TVC	4TVL	4TVD	4TVH	4TVW	4TVX	4TV(J/K)	4TVI
kW	HP												
1.5	0.5	15	—	—	15	—	15	15	—	15	—	—	—
1.8	0.6	18	18	—	—	—	—	—	—	—	—	—	—
2.2	0.8	22	22	22	22	—	22	22	—	22	—	22	—
2.8	1	28	28	28	28	28	28	28	—	28	—	28	—
3.6	1.25	36	36	36	36	36	36	36	—	36	36	36	—
4.5	1.6	45	45	45	45	45	45	45	—	45	45	45	—
5.6	2	56	56	56	56	56	56	56	56	56	56	56	—
6.3	2.25	63	—	—	63	—	—	—	—	—	—	—	—
7.1	2.5	71	71	71	—	71	71	71	71	71	71	71	—
8.0	3	80	—	—	—	80	80	80	80	80	80	80	—
9.0	3.2	90	—	—	—	90	90	90	90	—	90	—	—
10.0	3.6	100	—	—	—	100	—	—	—	—	100	—	—
11.2	4	112	—	—	—	112	112	112	112	—	112	—	—
12.5	4.5	125	—	—	—	—	—	125	125	—	125	—	—
14.0	5	140	—	—	—	140	—	140	140	—	140	—	—
16.0	6	160	—	—	—	160	—	160	160	—	—	—	—
18.0	6.4	180	—	—	—	180	—	—	—	—	—	—	—
20.0	7	200	—	—	—	—	—	—	200	—	—	—	—
22.4	8	224	—	—	—	—	—	—	224	—	—	—	224
25.2	9	252	—	—	—	—	—	—	252	—	—	—	252
28.0	10	280	—	—	—	—	—	—	280	—	—	—	280
33.5	12	335	—	—	—	—	—	—	335	—	—	—	335
40.0	14	400	—	—	—	—	—	—	400	—	—	—	400
45.0	16	450	—	—	—	—	—	—	450	—	—	—	450
56.0	20	560	—	—	—	—	—	—	560	—	—	—	560
61.5	22	615	—	—	—	—	—	—	—	—	—	—	615
68.0	24	680	—	—	—	—	—	—	—	—	—	—	680
73.5	26	735	—	—	—	—	—	—	—	—	—	—	735

1.1.2 Fresh air processing unit

Table 1-1.3: Fresh air processing unit capacity range

Capacity	9kW	14kW	16kW	22.4kW	25kW	28kW	33.5kW	45kW	56kW
Capacity index	90	140	160	224	250	280	335	450	560

1.2 Heat recovery ventilator

Table 1-1.4: Heat recovery ventilator capacity range

Airflow rate	200m ³ /h	300m ³ /h	400m ³ /h	500m ³ /h	800m ³ /h	1000m ³ /h	1500m ³ /h	2000m ³ /h
--------------	----------------------	----------------------	----------------------	----------------------	----------------------	-----------------------	-----------------------	-----------------------

1.3 Outdoor Units

Table 1-1.5: Outdoor unit capacity range

Capacity	Model Name	Combination Type
8HP	4TVVT086DD07CAG	/
10HP	4TVVT096DD07CAG	/
12HP	4TVVT115DD07CAG	/
14HP	4TVVT140DD07CAG	/
16HP	4TVVT155DD07CAG	/
18HP	4TVVT172DD07CAG	/
20HP	4TVVT192DD07CAG	/
22HP	4TVVT211DD07CAG	/
24HP	4TVVT228DD07CAG	/
26HP	4TVVT251DD07CAG	/
28HP	4TVVT270DD07CAG	/
30HP	4TVVT288DD07CAG	/
32HP	4TVVT310DD07CAG	16HP+16HP
34HP	4TVVT332DD07CAG	14HP+20HP
36HP	4TVVT347DD07CAG	16HP+20HP
38HP	4TVVT364DD07CAG	18HP+20HP
40HP	4TVVT383DD07CAG	16HP+24HP
42HP	4TVVT400DD07CAG	18HP+24HP
44HP	4TVVT420DD07CAG	20HP+24HP
46HP	4TVVT443DD07CAG	16HP+30HP
48HP	4TVVT460DD07CAG	18HP+30HP
50HP	4TVVT480DD07CAG	20HP+30HP
52HP	4TVVT499DD07CAG	22HP+30HP
54HP	4TVVT516DD07CAG	24HP+30HP
56HP	4TVVT539DD07CAG	26HP+30HP
58HP	4TVVT558DD07CAG	28HP+30HP
60HP	4TVVT576DD07CAG	30HP+30HP
62HP	4TVVT598DD07CAG	16HP+16HP+30HP
64HP	4TVVT620DD07CAG	14HP+20HP+30HP
66HP	4TVVT635DD07CAG	16HP+20HP+30HP
68HP	4TVVT652DD07CAG	18HP+20HP+30HP
70HP	4TVVT671DD07CAG	16HP+24HP+30HP
72HP	4TVVT688DD07CAG	18HP+24HP+30HP
74HP	4TVVT708DD07CAG	20HP+24HP+30HP
76HP	4TVVT731DD07CAG	16HP+30HP+30HP
78HP	4TVVT748DD07CAG	18HP+30HP+30HP
80HP	4TVVT768DD07CAG	20HP+30HP+30HP
82HP	4TVVT787DD07CAG	22HP+30HP+30HP
84HP	4TVVT804DD07CAG	24HP+30HP+30HP
86HP	4TVVT827DD07CAG	26HP+30HP+30HP
88HP	4TVVT846DD07CAG	28HP+30HP+30HP
90HP	4TVVT864DD07CAG	30HP+30HP+30HP


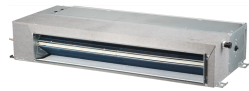



Note: The combinations of units shown in the table are factory-recommended. For other combinations of units please contact your local distributor or technical support engineer.

2 External Appearance

2.1 Indoor Units



2.1.1 Standard indoor units

Table 1-2.1: Standard indoor unit appearance

One-way Cassette 4TVA 	Two-way Cassette 4TVE 
Compact Four-way Cassette 4TVB 	Four-way Cassette 4TVC 
Arc Duct 4TVL 	Medium Static Pressure Duct 4TVD 
High Static Pressure Duct 4TVH 	Floor Standing 4TVI 
Wall-mounted 4TVW 	Ceiling & Floor 4TVX 
Floor Standing 4TV(J/K) 	

2.1.2 Fresh air processing unit

Table 1-2.2: Fresh air processing unit appearance

Fresh Air Processing Unit 	Small Airflow Rate Fresh Air Processing Unit 
--	---

2.2 Heat Recovery Ventilator



Table 1-2.3: Heat recovery ventilator appearance

Heat Recovery Ventilator TERV 

2.3 Outdoor Units







2.3.1 Single units

Table 1-2.4: Single outdoor unit appearance

8/10/12/14/16/18/20HP (with single fan)	22/24/26/28/30HP (with dual fans)
	

2.3.2 Combinations of units

Table 1-2.5: Combination outdoor unit appearance

32/34/36/38HP	40/42/44/46/48/50HP	52/54/56/58/60HP
		
62/64/66/68HP	70/72/74/76/78/80HP	82/84/86/88/90HP
		

3 Outdoor Unit Combinations

Table 1-3.1: Outdoor unit combinations

System capacity		No. of units	Modules ¹												Outdoor branch joint kit ²
kW	HP		8	10	12	14	16	18	20	22	24	26	28	30	
22.4	8	1	•												—
28.0	10	1		•											
33.5	12	1			•										
40.0	14	1				•									
45.0	16	1					•								
50.0	18	1						•							
56.0	20	1							•						
61.5	22	1								•					
67.0	24	1									•				
73.0	26	1										•			
78.5	28	1											•		
85.0	30	1												•	
90.0	32	1						••							FQZHW-02N1E
96.0	34	1				•			•						
101.0	36	1					•		•						
106.0	38	1						•	•						
112.0	40	1					•			•					
117.0	42	2						•		•					
123.0	44	2							•		•				
130.0	46	2					•							•	
135.0	48	2						•						•	
141.0	50	2							•					•	
146.5	52	2								•				•	
152.0	54	2									•			•	
158.0	56	2										•		•	
163.5	58	2											•	•	
170.0	60	2												••	
175.0	62	2						••						•	
181.0	64	2				•			•					•	
186.0	66	2					•		•					•	
191.0	68	2						•	•					•	
197.0	70	2				•				•				•	
202.0	72	2					•				•			•	
208.0	74	2						•			•			•	
215.0	76	2					•							••	
220.0	78	2						•						••	
226.0	80	2							•					••	
231.5	82	3								•				••	
237.0	84	3									•			••	
243.0	86	3										•		••	
248.5	88	3											•	••	
255.0	90	3												•••	

- Notes:
- The combinations of units shown in the table are factory-recommended. For other combinations of units please contact your local distributor or technical support engineer.
 - For systems with two or more outdoor units, outdoor branch joints (sold separately) are required.

4 Combination Ratio

$$\text{Combination ratio} = \frac{\text{Sum of capacity indexes of the indoor units}}{\text{Capacity index of the outdoor units}}$$

Table 1-5.1: Indoor and outdoor unit combination ratio limitations

Type	Minimum combination ratio	Maximum combination ratio		
		Standard indoor units only	Fresh air processing units only	Fresh air processing units and standard indoor units together
7G Cooling Series outdoor units	50%	200% ^{1,2,3} (Single ODU) 130% (Combined ODU)	100%	100% ⁴

Notes:

1. All the indoor units connected should be indoor units with ø5mm size copper tube heater exchanger. This limitation is to avoid too big indoor unit exchanger cause reliability and performance problem.
2. Piping between farthest indoor unit and first indoor branch joint should less than 40m.
3. Combination ratio greater than 130% is available as a customization option.
4. When fresh air processing units are installed together with standard indoor units, the total capacity of the fresh air processing units must not exceed 30% of the total capacity of the outdoor units and the total combination ratio must not exceed 100%.
5. The combinations of units shown in the table are factory-recommended. Four units combination are possible for the 8-24 HP models. For other combinations of units please contact your local distributor or technical support engineer.

Table 1-5.2: Combinations of indoor and outdoor units

Outdoor unit capacity			Sum of capacity indexes of connected indoor units (standard indoor units only)	Sum of capacity indexes of connected indoor units (fresh air processing units and standard indoor units together)	Maximum number of connected indoor units
kW	HP	Capacity index			
252	8	252	126 to 327.6	126 to 252	13
279	10	279	139.5 to 362.7	139.5 to 279	16
336	12	336	168 to 436.8	168 to 336	19
400	14	400	200 to 520	200 to 400	23
450	16	450	225 to 585	225 to 450	26
500	18	500	250 to 650	250 to 500	29
560	20	560	280 to 728	280 to 560	33
615	22	615	307.5 to 799.5	307.5 to 615	36
670	24	670	335 to 871	335 to 670	39
730	26	730	365 to 949	365 to 730	43
785	28	785	392.5 to 1020.5	392.5 to 785	46
850	30	850	425 to 1105	425 to 850	50
900	32	900	450 to 1170	450 to 900	53
960	34	960	480 to 1248	480 to 960	56
1010	36	1010	505 to 1313	505 to 1010	59
1060	38	1060	530 to 1378	530 to 1060	62
1120	40	1120	560 to 1456	560 to 1120	64
1170	42	1170	585 to 1521	585 to 1170	
1230	44	1230	615 to 1599	615 to 1230	
1300	46	1300	650 to 1690	650 to 1300	
1350	48	1350	675 to 1755	675 to 1350	
1410	50	1410	705 to 1833	705 to 1410	
1465	52	1465	732.5 to 1904.5	732.5 to 1465	
1520	54	1520	760 to 1976	760 to 1520	
1580	56	1580	790 to 2054	790 to 1580	
1635	58	1635	817.5 to 2125.5	817.5 to 1635	
1700	60	1700	850 to 2210	850 to 1700	
1750	62	1750	875 to 2275	875 to 1750	
1810	64	1810	905 to 2353	905 to 1810	
1860	66	1860	930 to 2418	930 to 1860	
1910	68	1910	955 to 2483	955 to 1910	
1970	70	1970	985 to 2561	985 to 1970	
2020	72	2020	1010 to 2626	1010 to 2020	
2080	74	2080	1040 to 2704	1040 to 2080	
2150	76	2150	1075 to 2795	1075 to 2150	
2200	78	2200	1100 to 2860	1100 to 2200	
2260	80	2260	1130 to 2938	1130 to 2260	
2315	82	2315	1157.5 to 3009.5	1157.5 to 2315	
2370	84	2370	1185 to 3081	1185 to 2370	
2430	86	2430	1215 to 3159	1215 to 2430	
2485	88	2485	1242.5 to 3230.5	1242.5 to 2485	
2550	90	2550	1275 to 3315	1275 to 2550	

5 Selection Procedure

5.1 Procedure

Step 1: Establish design conditions

Design temperature and humidity (indoor and outdoor)
 Required heat load of each room
 System peak load
 Piping length, level differences
 Indoor unit specifications (type and quantity)

Step 2: Select indoor units

Decide indoor unit safety factor

Select indoor unit models ensuring that:
 Indoor unit capacity corrected for indoor air temperature $WB^1 \geq$ Required heat load \times Indoor unit safety factor

Step 3: Select outdoor units

Determine required total heat load on outdoor units

Use the sum of the peak load of each room Use the system peak load

Provisionally select outdoor unit capacity based on combination ratio limitations

Confirm that the number of indoor units connected to the outdoor units is within limitation

Correct cooling and heating capacities of the outdoor units for the following items:
 Outdoor air temperature / Indoor air temperature WB / Combination ratio / Piping length, level difference
 / Piping heat loss / Frost accumulation (for heating capacity only)

Is corrected outdoor unit capacity \geq Required total heat load on outdoor units?

No

Yes

VRF system selection is complete

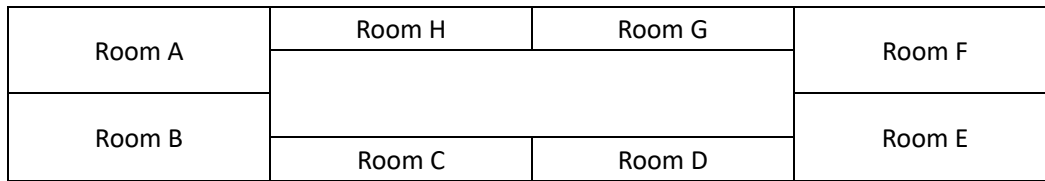
Notes:

1. If the indoor design temperature falls between two temperatures listed in the indoor unit's capacity table, calculate the corrected capacity by interpolation. If the indoor unit selection is to be based on total heat load and sensible heat load, select indoor units which satisfy not only the total heat load requirements of each room but also the sensible heat load requirements of each room. As with total heat capacity, the sensible heat capacity of indoor units should be corrected for indoor temperature, interpolating where necessary. For the indoor unit capacity tables, refer to the indoor unit technical manuals.

5.2 Example

The following is a selection example based on total heat load for cooling.

Figure 1-6.1: Room plan



Step 1: Establish design conditions

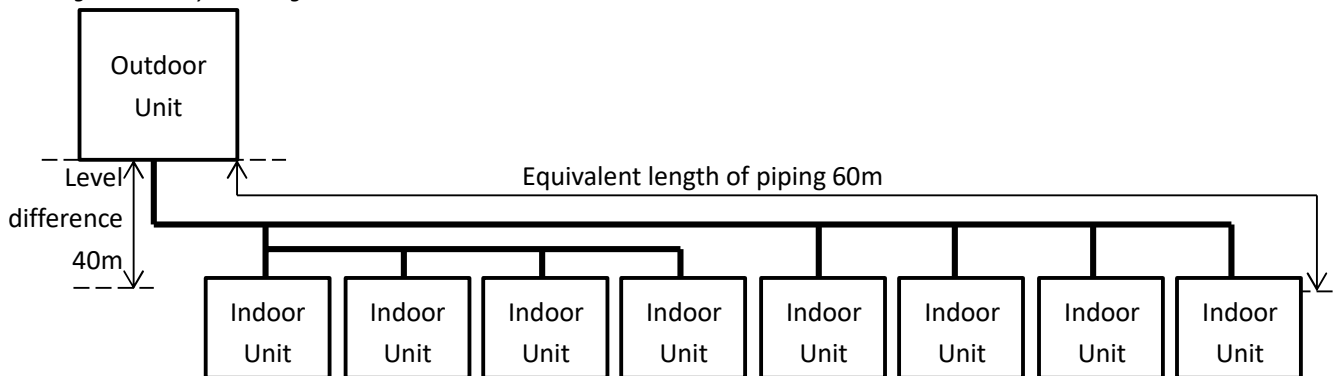
- Indoor air temperature 25.8°C DB, 18°C WB; outdoor air temperature 33°C DB.
- Determine peak load of each room and system peak load. As shown in Table 1-6.1, the system peak load is 50.7kW.

Table 1-6.1: Required heat load of each room (kW)

Time	Room A	Room B	Room C	Room D	Room E	Room F	Room G	Room H	Total
9:00	4.8	4.8	3.0	3.0	9.1	9.0	2.9	2.9	39.5
12:00	6.6	7.1	5.1	5.1	7.4	6.8	4.0	4.0	46.1
14:00	9.0	9.4	4.9	4.9	7.3	6.8	4.2	4.2	50.7
16:00	10.6	10.7	3.9	3.9	6.3	6.2	3.8	3.8	49.2

- The maximum piping lengths and level differences in this example are as given in Figure 1-6.2.

Figure 1-6.2: System diagram



- Indoor unit type for all rooms: Medium Static Pressure Duct (T2).

Step 2: Select indoor units

- In this example, a safety factor is not used (i.e. the safety factor is 1).
- Select indoor unit models using the medium static pressure duct cooling capacity table. Each indoor unit's corrected capacity needs to be greater than or equal to the peak load of the relevant room. The selected indoor units are shown in Table 1-6.3.

Table 1-6.2: Extract from medium static pressure duct (T2) cooling capacity table

Model	Capacity index	Indoor air temperature													
		14°C WB		16°C WB		18°C WB		19°C WB		20°C WB		22°C WB		24°C WB	
		20°C DB		23°C DB		26°C DB		27°C DB		28°C DB		30°C DB		32°C DB	
		TC	SC	TC	SC	TC	SC	TC	SC	TC	SC	TC	SC	TC	SC
T2	22	1.5	1.4	1.8	1.5	2.1	1.6	2.2	1.6	2.3	1.7	2.4	1.5	2.4	1.5
	28	1.9	1.7	2.3	1.9	2.6	2.1	2.8	2.1	3.0	2.1	3.1	2.0	3.1	1.9
	36	2.5	2.1	2.9	2.3	3.4	2.5	3.6	2.6	3.8	2.7	4.2	2.8	3.9	2.3
	45	3.1	2.6	3.7	2.8	4.2	3.1	4.5	3.2	4.8	3.2	4.9	3.1	5.1	2.9
	56	3.9	3.0	4.6	3.3	5.3	3.6	5.6	3.7	5.9	3.8	6.2	3.7	6.2	3.4
	71	4.9	3.9	5.8	4.3	6.7	4.7	7.1	4.9	7.5	4.8	7.8	4.6	7.8	4.3
	80	5.5	4.4	6.6	4.9	7.5	5.3	8.0	5.5	8.4	5.5	8.8	5.2	8.8	4.8
	90	6.2	5.3	7.3	5.8	8.4	6.3	9.0	6.4	9.6	6.5	9.9	6.1	9.9	5.7
	112	7.7	6.4	9.1	7.1	10.5	7.7	11.2	7.8	11.9	8.1	12.5	7.8	12.5	7.4
	140	9.7	7.8	11.3	8.6	13.2	9.6	14.0	9.8	14.8	9.8	15.7	9.7	15.4	8.8

Abbreviations:

TC: Total capacity (kW); SC: Sensible capacity (kW)

Table 1-6.3: Selected indoor units

	Room A	Room B	Room C	Room D
Peak heat load (kW)	10.6	10.7	5.1	5.1
Selected indoor unit	4TVDD048EB0WEAA	4TVDD048EB0WEAA	4TVDD019EB0WEAA	4TVDD019EB0WEAA
Corrected TC (kW)	13.2	13.2	5.3	5.3
	Room E	Room F	Room G	Room H
Peak heat load (kW)	9.1	9.0	4.2	4.2
Selected indoor unit	4TVDD038EB0WEAA	4TVDD038EB0WEAA	4TVDD015EB0WEAA	4TVDD015EB0WEAA
Corrected TC (kW)	10.5	10.5	4.2	4.2

Step 3: Select outdoor units

- Determine the required total heat load from the indoor units to the outdoor units based on either the sum of the peak loads of each room or the system peak load. In this example, it is determined based on the system peak load. Therefore, the required heat load is 50.7kW.
- Provisionally select outdoor units using the sum of the capacity indexes (CIs) of the selected indoor units (as shown in Table 1-6.4), ensuring that the combination ratio is between 50% and 130%. Refer to Table 1-6.5. As the sum of CIs of the indoor units is 706, outdoor units from 20HP to 50HP are potentially suitable. Start from the smallest, which is the 20HP unit.

Table 1-6.4: Sum of indoor unit capacity indexes

Model	Capacity Index	No. of units
4TVDD048EB0WEAA	140	2
4TVDD038EB0WEAA	112	2
4TVDD019EB0WEAA	56	2
4TVDD015EB0WEAA	45	2
Sum of CIs	706	

Table 1-6.5: Extract from Table 1-5.2 Combinations of Indoor and outdoor units

Outdoor unit capacity			Sum of capacity indexes of connected indoor units (standard indoor units only)	Maximum number of connected indoor units
kW	HP	Capacity index		
50.0	18	500	250 to 650	29
56.0	20	560	280 to 728	33
61.5	22	615	307.5 to 799.5	36
67.0	24	670	335 to 871	39
73.0	26	730	365 to 949	43
78.5	28	785	392.5 to 1020.5	46
85.0	30	850	425 to 1105	50
90.0	32	900	450 to 1170	53
95.0	34	960	480 to 1248	56
100.0	36	1010	505 to 1313	59
107.0	38	1060	530 to 1378	62
112.0	40	1120	560 to 1456	64
118.5	42	1170	585 to 1521	
123.5	44	1230	615 to 1599	
128.5	46	1300	650 to 1690	
134.5	48	1350	675 to 1755	
140.0	50	1410	705 to 1833	
145.5	52	1465	732.5 to 1904.5	

- The number of connected indoor units is 8 and the maximum number of connected indoor units on the 20HP outdoor unit is 33, so the number of connected indoor units is within the limitation.
- Calculate the corrected capacity of the outdoor units:
 - a) The sum of the indoor unit CIs is 706 and the CI of the 20HP outdoor unit 4TVVT192DD07CAG is 560, so the combination ratio is $706 / 560 = 126\%$.
 - b) Using the outdoor units' cooling capacity table, interpolate to obtain the capacity ("B") corrected for outdoor air temperature, indoor air temperature, and combination ratio. Refer to Tables 1-6.6 and 1-6.7.

Table 1-6.6: Extract from Table 2-8.7 4TVVT192DD07CAG cooling capacity

CR	Outdoor air temp. (°C DB)	Indoor air temp. (°C DB / °C WB)	
		25.8 / 18.0	
		TC	PI
		kW	kW
130%	31	61.73	15.45
	33	60.91	16.03
	35	59.88	16.64
120%	31	60.76	15.36
	33	59.94	15.92
	35	58.91	16.55

Table 1-6.7: Cooling capacity calculated by interpolation

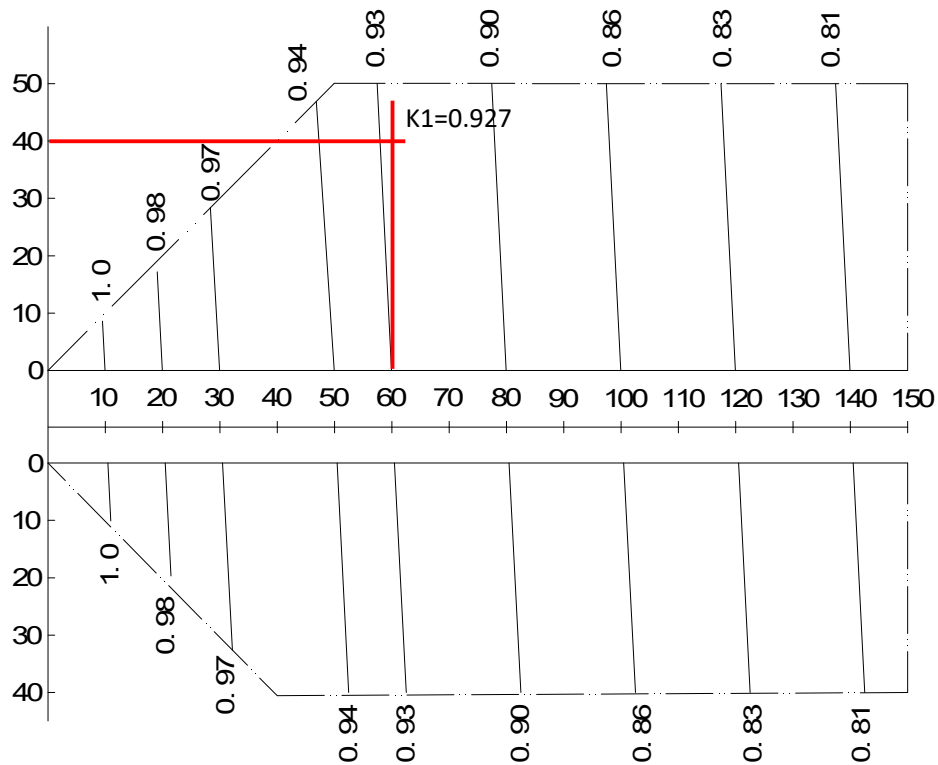
CR	Outdoor air temp. (°C DB)	Indoor air temp. (°C DB / °C WB)	
		25.8 / 18.0	
		TC	PI
		kW	kW
130%	33	60.91	16.03
		B = 60.52¹	
120%	33	59.94	15.92

Notes:

1. $59.94 + (60.91 - 59.94) \times (126 - 120) / (130 - 120) = 60.52$

c) Find the correction factor for piping length and level difference ("K1")

Figure 1-6.3: 7G rate of change in cooling capacity



Notes:

1. The horizontal axis shows equivalent length of piping between farthest indoor unit and first outdoor branch joint; the vertical axis shows the largest level difference between indoor unit and outdoor unit. For level differences, positive values indicate that the outdoor unit is above the indoor unit, negative values indicate that the outdoor unit is below the indoor unit.

d) Calculate the corrected capacity of 4TVVT192DD07CAG ("C") by using K1:

$$C = B \times K1 = 60.52 \times 0.927 = 56.10\text{kW}$$

- The corrected capacity 56.10kW is larger than required total heat load 50.7kW, so selection is complete. (In the event that the corrected capacity is lower than the required total heat load, Step 3 should be repeated from the point where the outdoor unit capacity is provisionally selected.)

Part 2

Outdoor Unit

Engineering Data

1 Specifications	17
2 Dimensions	29
3 Installation Space Requirements	34
4 Piping Diagrams	36
5 Wiring Diagrams	41
6 Electrical Characteristics	43
7 Functional Components and Safety Devices	45
8 Capacity Tables	46
9 Operating Limits	108
10 Sound Levels	109
11 Accessories	112

1 Specifications

8-14HP

Table 2-1.1: 8-14HP specifications

HP		8		10		12		14				
Model name		4TVVT086DD07CAG		4TVVT096DD07CAG		4TVVT115DD07CAG		4TVVT140DD07CAG				
Power supply		V/N/Hz		380-415/3/50(60)								
Cooling(T1) ¹	Capacity	kW		25.2		27.9		33.6		40.0		
		Btu/h		86000		95000		115000		137000		
	Power input	W		5665		6565		8550		10390		
	EER	Btu/(W.h)		15.15		14.50		13.40		13.15		
Cooling(T3) ¹	Capacity	kW		22.2		24.6		27.0		32.0		
		Btu/h		76000		84000		92000		109000		
	Power input	W		7280		8145		9510		10960		
	EER	Btu/(W.h)		10.40		10.30		9.65		9.95		
CSPF (T3)		Btu/(W.h)		21.12		21.29		21.60		20.51		
Connected indoor unit		Total capacity		50-130% of outdoor unit capacity								
		Maximum quantity		13		16		19		23		
Compressor		Type		DC scroll compressor								
		Quantity		1								
		Oil type		FV68H								
		Start-up method		Soft start								
Fan		Type		Propeller								
		Motor type		DC								
		Quantity		1								
		Motor output	kW		0.56				0.92			
		Static pressure	Pa		0-20 (default); 20-120 (customized)							
		Airflow rate	m ³ /h		12600		12600		13500		15600	
		Drive type		Direct								
Refrigerant		Type		R410A								
		Factory charge	kg		7.4		7.4		7.4		8.4	
Pipe connections ³		Liquid pipe	mm		Φ12.7				Φ15.9			
		Gas pipe	mm		Φ25.4				Φ28.6			
Sound pressure level ⁴		dB(A)		57		58		60				
Net dimensions (W×H×D)		mm		940×1760×825								
Packed dimensions (W×H×D)		mm		1010×1945×890								
Net weight		kg		185				200				
Gross weight		kg		200				215				
Ambient temp. operation ange	Cooling	°C		-15 to 55		-15 to 55		-15 to 55		-15 to 55		

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5m with zero level difference.
- Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
- Diameters given are those of the unit's stop valve.
- Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

16-22HP

Table 2-1.2: 16-22HP specifications

HP			16	18	20	22
Model name			4TVVT155DD07CAG	4TVVT172DD07CAG	4TVVT192DD07CAG	4TVVT211DD07CAG
Power supply		V/N/Hz	380-415/3/50(60)			
Cooling(T1) ¹	Capacity	kW	45.0	50.0	56.0	61.5
		Btu/h	154000	170000	190000	210000
	Power input	W	11905	13230	16095	17085
	EER	Btu/(W.h)	12.90	12.90	11.85	12.25
Cooling(T3) ¹	Capacity	kW	34.0	39.3	43.1	46.0
		Btu/h	116000	134000	147000	156000
	Power input	W	12145	13890	15850	17360
	EER	Btu/(W.h)	9.55	9.65	9.25	9.00
CSPF (T3)		Btu/(W.h)	20.50	20.00	19.55	19.80
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity			
	Maximum quantity		26	29	33	36
Compressor	Type		DC scroll compressor			
	Quantity		1			
	Oil type		FV68H			
	Start-up method		Soft start			
Fan	Type		Propeller			
	Motor type		DC			
	Quantity		1		2	
	Motor output	kW	0.92			0.56+0.56
	Static pressure	Pa	0-20 (default); 20-120 (customized)			
	Airflow rate	m ³ /h	15600	16500	16500	21500
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	8.4	10	10	12.8
Pipe connections ³	Liquid pipe	mm	Φ15.9			Φ19.1
	Gas pipe	mm	Φ28.6			Φ31.8
Sound pressure level ⁴		dB(A)	61	62	63	
Net dimensions (W×H×D)		mm	940×1760×825			1340×1760×825
Packed dimensions (W×H×D)		mm	1010×1945×890			1410×1945×890
Net weight		kg	200	212	225	260
Gross weight		kg	215	232	245	285
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55	-15 to 55	-15 to 55

Notes:

1. Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5m with zero level difference.
2. Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
3. Diameters given are those of the unit's stop valve.
4. Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

24-30HP
Table 2-1.3: 24-30HP specifications

HP			24	26	28	30
Model name			4TVVT228DD07CAG	4TVVT251DD07CAG	4TVVT270DD07CAG	4TVVT288DD07CAG
Power supply		V/N/Hz	380-415/3/50(60)			
Cooling(T1) ¹	Capacity	kW	67.0	73.0	78.5	85.0
		Btu/h	228000	250000	268000	290000
	Power input	W	19535	22395	24380	26400
	EER	Btu/(W.h)	11.70	11.10	11.00	11.00
Cooling(T3) ¹	Capacity	kW	52.0	57.0	61.0	62.5
		Btu/h	178000	194000	208000	214000
	Power input	W	20000	22620	24600	25720
	EER	Btu/(W.h)	8.85	8.60	8.45	8.25
CSPF (T3)		Btu/(W.h)	19.00	18.90	19.50	19.25
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity			
	Maximum quantity		39	43	46	50
Compressor	Type		DC scroll compressor			
	Quantity		1	2		
	Oil type		FV68H			
	Start-up method		Soft start			
Fan	Type		Propeller			
	Motor type		DC			
	Quantity		2			
	Motor output	kW	0.56+0.56			
	Static pressure	Pa	0-20 (default); 20-120 (customized)			
	Airflow rate	m ³ /h	21500	22000	22000	22000
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	12.8	15.4	15.4	15.4
Pipe connections ³	Liquid pipe	mm	Φ19.1	Φ22.2		
	Gas pipe	mm	Φ31.8			
Sound pressure level ⁴		dB(A)	64			
Net dimensions (W×H×D)		mm	1340×1760×825			
Packed dimensions (W×H×D)		mm	1410×1945×890			
Net weight		kg	260	325		
Gross weight		kg	285	350		
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55	-15 to 55	-15 to 55

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5m with zero level difference.
- Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
- Diameters given are those of the unit's stop valve.
- Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

32-38HP

Table 2-1.4: 32-38HP specifications

HP			32	34	36	38
Model name (Combination unit)			4TVVT310DD07CAG	4TVVT332DD07CAG	4TVVT347DD07CAG	4TVVT364DD07CAG
Combination type			16HP+16HP	14HP+20HP	16HP+20HP	18HP+20HP
Power supply		V/N/Hz	380-415/3/50(60)			
Cooling(T1) ¹	Capacity	kW	90.0	96.0	101.0	106.0
		Btu/h	308000	327000	344000	360000
	Power input	W	23810	26485	28000	29325
	EER	Btu/(W.h)	12.94	12.35	12.29	12.28
Cooling(T3) ¹	Capacity	kW	68.0	75.1	77.1	82.4
		Btu/h	232000	256000	263000	281000
	Power input	W	24290	26810	27995	29740
	EER	Btu/(W.h)	9.55	9.55	9.39	9.45
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity			
	Maximum quantity		56	59	63	64
Compressor	Type		DC scroll compressor			
	Quantity		2			
	Oil type		FV68H			
	Start-up method		Soft start			
Fan	Type		Propeller			
	Motor type		DC			
	Quantity		2			
	Motor output	kW	0.92×2			
	Static pressure	Pa	0-20 (default); 20-120 (customized)			
	Airflow rate	m ³ /h	31200	32100	32100	33000
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	8.4×2	8.4+10	8.4+10	10×2
Pipe connections ³	Liquid pipe	mm	Φ19.1			
	Gas pipe	mm	Φ31.8		Φ38.1	
Sound pressure level ⁴		dB(A)	64	65		66
Net dimensions (W×H×D)		mm	(940×1760×825)×2			
Packed dimensions (W×H×D)		mm	(1010×1945×890)×2			
Net weight		kg	200×2	200+225		212+225
Gross weight		kg	215×2	215+245		232+245
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55	-15 to 55	-15 to 55

- Notes:
- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5mm with zero level difference.
 - Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
 - Diameters given are those for the pipe connecting the outdoor unit combination to the first indoor branch joint for systems with total equivalent liquid piping lengths of less than 90m. For systems with total equivalent liquid piping lengths of 90m or longer, please refer to Part 3 "System Design and Installation" for connection piping diameters..
 - Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

40-46HP

Table 2-1.5: 40-46HP specifications

HP			40	42	44	46
Model name (Combination unit)			4TVVT383DD07CAG	4TVVT400DD07CAG	4TVVT420DD07CAG	4TVVT443DD07CAG
Combination type			16HP+24HP	18HP+24HP	20HP+24HP	16HP+30HP
Power supply		V/N/Hz	380-415/3/50(60)			
Cooling(T1) ¹	Capacity	kW	112.0	117.0	123.0	130.0
		Btu/h	382000	398000	418000	444000
	Power input	W	31440	32765	35630	38305.0
	EER	Btu/(W.h)	12.15	12.15	11.73	11.5911760866728
Cooling(T3) ¹	Capacity	kW	86.0	91.3	95.1	96.5
		Btu/h	294000	312000	325000	330000
	Power input	W	32145	33890	35850	37865.0
	EER	Btu/(W.h)	9.15	9.21	9.07	8.71517232272547
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity			
	Maximum quantity		64	64	64	64
Compressor	Type		DC scroll compressor			
	Quantity		2			3
	Oil type		FV68H			
	Start-up method		Soft start			
Fan	Type		Propeller			
	Motor type		DC			
	Quantity		3			
	Motor output	kW	0.92+(0.56+0.56)			
	Static pressure	Pa	0-20 (default); 20-120 (customized)			
	Airflow rate	m ³ /h	37100	38000	38000	37600
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	8.4+12.8	10+12.8	10+12.8	8.4+15.4
Pipe connections ³	Liquid pipe	mm	Φ19.1			
	Gas pipe	mm	Φ38.1			
Sound pressure level ⁴		dB(A)	66		67	66
Net dimensions (W×H×D)		mm	(940×1760×825)+(1340×1760×825)			
Packed dimensions (W×H×D)		mm	(1010×1945×890)+(1410×1945×890)			
Net weight		kg	200+260	212+260	225+260	200+325
Gross weight		kg	215+285	232+285	245+285	215+350
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55	-15 to 55	-15 to 55

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5m with zero level difference.
- Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
- Diameters given are those for the pipe connecting the outdoor unit combination to the first indoor branch joint for systems with total equivalent liquid piping lengths of less than 90m. For systems with total equivalent liquid piping lengths of 90m or longer, please refer to Part 3 "System Design and Installation" for connection piping diameters..
- Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

48-54HP

Table 2-1.6: 48-54HP specifications

HP			48	50	52	54
Model name (Combination unit)			4TVVT460DD07CAG	4TVVT480DD07CAG	4TVVT499DD07CAG	4TVVT516DD07CAG
Combination type			18HP+30HP	20HP+30HP	22HP+30HP	24HP+30HP
Power supply		V/N/Hz	380-415/3/50(60)			
Cooling(T1) ¹	Capacity	kW	135.0	141.0	146.5	152.0
		Btu/h	460000	480000	500000	518000
	Power input	W	39630	42495	43485	45935
	EER	Btu/(W.h)	11.61	11.30	11.50	11.28
Cooling(T3) ¹	Capacity	kW	101.8	105.6	108.5	114.5
		Btu/h	348000	361000	370000	392000
	Power input	W	39610	41570	43080	45720
	EER	Btu/(W.h)	8.79	8.68	8.59	8.57
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity			
	Maximum quantity		64	64	64	64
Compressor	Type		DC scroll compressor			
	Quantity		3			
	Oil type		FV68H			
	Start-up method		Soft start			
Fan	Type		Propeller			
	Motor type		DC			
	Quantity		3		4	
	Motor output	kW	0.92+(0.56+0.56)		(0.56+0.56)×2	
	Static pressure	Pa	0-20 (default); 20-120 (customized)			
	Airflow rate	m ³ /h	38500	38500	43500	43500
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	10+15.4	10+15.4	12.8+15.4	12.8+15.4
Pipe connections ³	Liquid pipe	mm	Φ19.1			
	Gas pipe	mm	Φ38.1			
Sound pressure level ⁴		dB(A)	66	67		
Net dimensions (W×H×D)		mm	(940×1760×825)+(1340×1760×825)		(1340×1760×825)×2	
Packed dimensions (W×H×D)		mm	(1010×1945×890)+(1410×1945×890)		(1410×1945×890)×2	
Net weight		kg	212+325	225+325	260+325	
Gross weight		kg	232+350	245+350	285+350	
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55	-15 to 55	-15 to 55

- Notes:
- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5mm with zero level difference.
 - Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
 - Diameters given are those for the pipe connecting the outdoor unit combination to the first indoor branch joint for systems with total equivalent liquid piping lengths of less than 90m. For systems with total equivalent liquid piping lengths of 90m or longer, please refer to Part 3 "System Design and Installation" for connection piping diameters..
 - Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

56-62HP
Table 2-1.7: 56-62HP specifications

HP			56	58	60	62
Model name (Combination unit)			4TVVT539DD07CAG	4TVVT558DD07CAG	4TVVT576DD07CAG	4TVVT598DD07CAG
Combination type			26HP+30HP	28HP+30HP	30HP+30HP	16HP+16HP+30HP
Power supply		V/N/Hz	380-415/3/50(60)			
Cooling(T1) ¹	Capacity	kW	158.0	163.5	170.0	175.0
		Btu/h	540000	558000	580000	598000
	Power input	W	48795	50780	52800	50210
	EER	Btu/(W.h)	11.07	10.99	10.98	11.91
Cooling(T3) ¹	Capacity	kW	119.5	123.5	125.0	130.5
		Btu/h	408000	422000	428000	446000
	Power input	W	48340	50320	51440	50010
	EER	Btu/(W.h)	8.44	8.39	8.32	8.92
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity			
	Maximum quantity		64	64	64	64
Compressor	Type		DC scroll compressor			
	Quantity		4			
	Oil type		FV68H			
	Start-up method		Soft start			
Fan	Type		Propeller			
	Motor type		DC			
	Quantity		4			
	Motor output	kW	(0.56+0.56)×2			0.92×2+(0.56+0.56)
	Static pressure	Pa	0-20 (default); 20-120 (customized)			
	Airflow rate	m ³ /h	44000	44000	44000	53200
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	15.4×2	15.4×2	15.4×2	8.4×2+15.4
Pipe connections ³	Liquid pipe	mm	Φ19.1			
	Gas pipe	mm	Φ41.3			
Sound pressure level ⁴		dB(A)	67			
Net dimensions (W×H×D)		mm	(1340×1760×825)×2			(940×1760×825)×2+(1340×1760×825)
Packed dimensions (W×H×D)		mm	(1410×1945×890)×2			(1010×1945×890)×2+(1410×1945×890)
Net weight		kg	325×2			200×2+325
Gross weight		kg	350×2			215×2+350
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55	-15 to 55	-15 to 55

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5m with zero level difference.
- Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
- Diameters given are those for the pipe connecting the outdoor unit combination to the first indoor branch joint for systems with total equivalent liquid piping lengths of less than 90m. For systems with total equivalent liquid piping lengths of 90m or longer, please refer to Part 3 "System Design and Installation" for connection piping diameters..
- Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

64-70HP

Table 2-1.8: 64-70HP specifications

HP			64	66	68	70
Model name (Combination unit)			4TVVT620DD07CAG	4TVVT635DD07CAG	4TVVT652DD07CAG	4TVVT671DD07CAG
Combination type			14HP+20HP+30HP	16HP+20HP+30HP	18HP+20HP+30HP	16HP+24HP+30HP
Power supply		V/N/Hz	380-415/3/50(60)			
Cooling(T1) ¹	Capacity	kW	181.0	186.0	191.0	197.0
		Btu/h	617000	634000	650000	672000
	Power input	W	52885	54400	55725	57840
	EER	Btu/(W.h)	11.67	11.65	11.66	11.62
Cooling(T3) ¹	Capacity	kW	137.6	139.6	144.9	148.5
		Btu/h	470000	477000	495000	508000
	Power input	W	52530	53715	55460	57865
	EER	Btu/(W.h)	8.95	8.88	8.93	8.78
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity			
	Maximum quantity		64	64	64	64
Compressor	Type		DC scroll compressor			
	Quantity		4			
	Oil type		FV68H			
	Start-up method		Soft start			
Fan	Type		Propeller			
	Motor type		DC			
	Quantity		4			5
	Motor output	kW	0.92×2+(0.56+0.56)			0.92+(0.56+0.56)×2
	Static pressure	Pa	0-20 (default); 20-120 (customized)			
	Airflow rate	m ³ /h	54100	54100	55000	59100
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	8.4+10+15.4	8.4+10+15.4	10×2+15.4	8.4+12.8+15.4
Pipe connections ³	Liquid pipe	mm	Φ19.1		Φ22.2	
	Gas pipe	mm	Φ41.3		Φ44.5	
Sound pressure level ⁴		dB(A)	67	68		
Net dimensions (W×H×D)		mm	(940×1760×825)×2+(1340×1760×825)			(940×1760×825)+(1340×1760×825)×2
Packed dimensions (W×H×D)		mm	(1010×1945×890)×2+(1410×1945×890)			(1010×1945×890)+(1410×1945×890)×2
Net weight		kg	200+225+325		212+225+325	200+260+325
Gross weight		kg	215+245+350		232+245+350	215+285+350
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55	-15 to 55	-15 to 55

Notes:
 1. Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5m with zero level difference.
 2. Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
 3. Diameters given are those for the pipe connecting the outdoor unit combination to the first indoor branch joint for systems with total equivalent liquid piping lengths of less than 90m. For systems with total equivalent liquid piping lengths of 90m or longer, please refer to Part 3 "System Design and Installation" for

connection piping diameters..

4. Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

72-78HP

Table 2-1.9: 72-78HP specifications

HP			72	74	76	78
Model name (Combination unit)			4TVVT688DD07CAG	4TVVT708DD07CAG	4TVVT731DD07CAG	4TVVT748DD07CAG
Combination type			18HP+24HP+30HP	20HP+24HP+30HP	16HP+30HP+30HP	18HP+30HP+30HP
Power supply		V/N/Hz	380-415/3/50(60)			
Cooling(T1) ¹	Capacity	kW	202.0	208.0	215.0	220.0
		Btu/h	688000	708000	734000	750000
	Power input	W	59165	62030	64705	66030
	EER	Btu/(W.h)	11.63	11.41	11.34	11.36
Cooling(T3) ¹	Capacity	kW	153.8	157.6	159.0	164.3
		Btu/h	526000	539000	544000	562000
	Power input	W	59610	61570	63585	65330
	EER	Btu/(W.h)	8.82	8.75	8.56	8.60
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity			
	Maximum quantity		64	64	64	64
Compressor	Type		DC scroll compressor			
	Quantity		4		5	
	Oil type		FV68H			
	Start-up method		Soft start			
Fan	Type		Propeller			
	Motor type		DC			
	Quantity		5			
	Motor output	kW	0.92+(0.56+0.56)×2			
	Static pressure	Pa	0-20 (default); 20-120 (customized)			
	Airflow rate	m ³ /h	60000	60000	59600	60500
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	10+12.8+15.4	10+12.8+15.4	8.4+15.4×2	10+15.4×2
Pipe connections ³	Liquid pipe	mm	Φ22.2			
	Gas pipe	mm	Φ44.5			
Sound pressure level ⁴		dB(A)	68	69	68	
Net dimensions (W×H×D)		mm	(940×1760×825)+(1340×1760×825)×2			
Packed dimensions (W×H×D)		mm	(1010×1945×890)+(1410×1945×890)×2			
Net weight		kg	212+260+325	225+260+325	200+325×2	212+325×2
Gross weight		kg	232+285+350	245+285+350	215+350×2	232+350×2
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55	-15 to 55	-15 to 55

- Notes:
- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5m with zero level difference.
 - Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
 - Diameters given are those for the pipe connecting the outdoor unit combination to the first indoor branch joint for systems with total equivalent liquid piping lengths of less than 90m. For systems with total equivalent liquid piping lengths of 90m or longer, please refer to Part 3 "System Design and Installation" for connection piping diameters.
 - Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

80-86HP
Table 2-1.10: 80-86HP specifications

HP			80	82	84	86
Model name (Combination unit)			4TVVT768DD07CAG	4TVVT787DD07CAG	4TVVT804DD07CAG	4TVVT827DD07CAG
Combination type			20HP+30HP+30HP	22HP+30HP+30HP	24HP+30HP+30HP	26HP+30HP+30HP
Power supply		V/N/Hz	380-415/3/50(60)			
Cooling(T1) ¹	Capacity	kW	226.0	231.5	237.0	243.0
		Btu/h	770000	790000	808000	830000
	Power input	W	68895	69885	72335	75195
	EER	Btu/(W.h)	11.18	11.30	11.17	11.04
Cooling(T3) ¹	Capacity	kW	168.1	171.0	177.0	182.0
		Btu/h	575000	584000	606000	622000
	Power input	W	67290	68800	71440	74060
	EER	Btu/(W.h)	8.55	8.49	8.48	8.40
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity			
	Maximum quantity		64	64	64	64
Compressor	Type		DC scroll compressor			
	Quantity		5			6
	Oil type		FV68H			
	Start-up method		Soft start			
Fan	Type		Propeller			
	Motor type		DC			
	Quantity		5	6		
	Motor output	kW	0.92+(0.56+0.56)×2		(0.56+0.56)×3	
	Static pressure	Pa	0-20 (default); 20-120 (customized)			
	Airflow rate	m ³ /h	60500	65500	65500	66000
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	10+15.4×2	12.8+15.4×2	12.8+15.4×2	15.4×3
Pipe connections ³	Liquid pipe	mm	Φ22.2		Φ25.4	
	Gas pipe	mm	Φ44.5		Φ50.8	
Sound pressure level ⁴		dB(A)	69			
Net dimensions (W×H×D)		mm	(940×1760×825)+(1340×1760×825)×2	(1340×1760×825)×3		
Packed dimensions (W×H×D)		mm	(1010×1945×890)+(1410×1945×890)×2	(1410×1945×890)×3		
Net weight		kg	225+325×2	260+325×2		325×3
Gross weight		kg	245+350×2	285+350×2		350×3
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55	-15 to 55	-15 to 55

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5m with zero level difference.
- Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
- Diameters given are those for the pipe connecting the outdoor unit combination to the first indoor branch joint for systems with total equivalent liquid piping lengths of less than 90m. For systems with total equivalent liquid piping lengths of 90m or longer, please refer to Part 3 "System Design and Installation" for connection piping diameters..
- Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

88-90HP

Table 2-1.11: 88-90HP specifications

HP			88	90
Model name (Combination unit)			4TVVT846DD07CAG	4TVVT864DD07CAG
Combination type			28HP+30HP+30HP	30HP+30HP+30HP
Power supply		V/N/Hz	380-415/3/50(60)	
Cooling(T1) ¹	Capacity	kW	248.5	255.0
		Btu/h	848000	870000
	Power input	W	77180	79200
	EER	Btu/(W.h)	10.99	10.98
Cooling(T3) ¹	Capacity	kW	186.0	187.5
		Btu/h	636000	642000
	Power input	W	76040	77160
	EER	Btu/(W.h)	8.36	8.32
Connected indoor unit	Total capacity		50-130% of outdoor unit capacity	
	Maximum quantity		64	64
Compressor	Type		DC scroll compressor	
	Quantity		6	
	Oil type		FV68H	
	Start-up method		Soft start	
Fan	Type		Propeller	
	Motor type		DC	
	Quantity		6	
	Motor output	kW	(0.56+0.56)×3	
	Static pressure	Pa	0-20 (default); 20-120 (customized)	
	Airflow rate	m ³ /h	66000	66000
	Drive type		Direct	
Refrigerant	Type		R410A	
	Factory charge	kg	15.4×3	15.4×3
Pipe connections ³	Liquid pipe	mm	Φ25.4	
	Gas pipe	mm	Φ50.8	
Sound pressure level ⁴		dB(A)	69	
Net dimensions (W×H×D)		mm	(1340×1760×825)×3	
Packed dimensions (W×H×D)		mm	(1410×1945×890)×3	
Net weight		kg	325×3	
Gross weight		kg	350×3	
Ambient temp. operation range	Cooling	°C	-15 to 55	-15 to 55

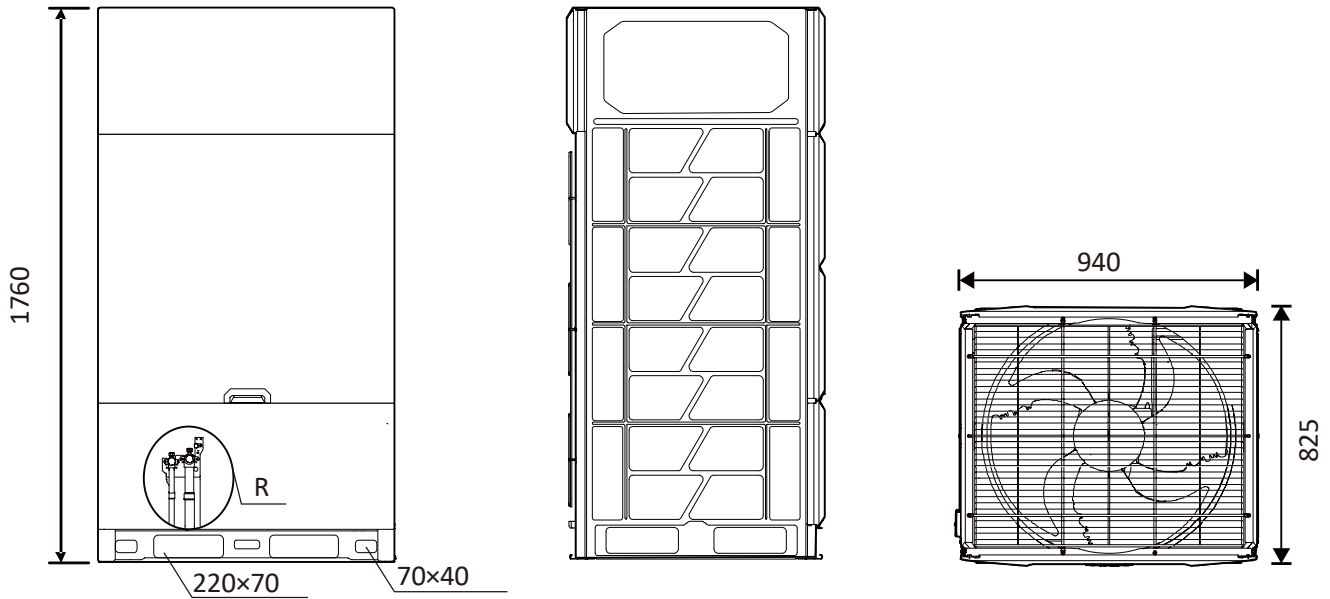
- Notes:
- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 5m with zero level difference.
 - Indoor air temperature 20°C DB; outdoor air temperature 7°C DB, 6°C WB; equivalent refrigerant piping length 5m with zero level difference.
 - Diameters given are those for the pipe connecting the outdoor unit combination to the first indoor branch joint for systems with total equivalent liquid piping lengths of less than 90m. For systems with total equivalent liquid piping lengths of 90m or longer, please refer to Part 3 "System Design and Installation" for connection piping diameters..
 - Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber.

2 Dimensions

2.1 Single Units

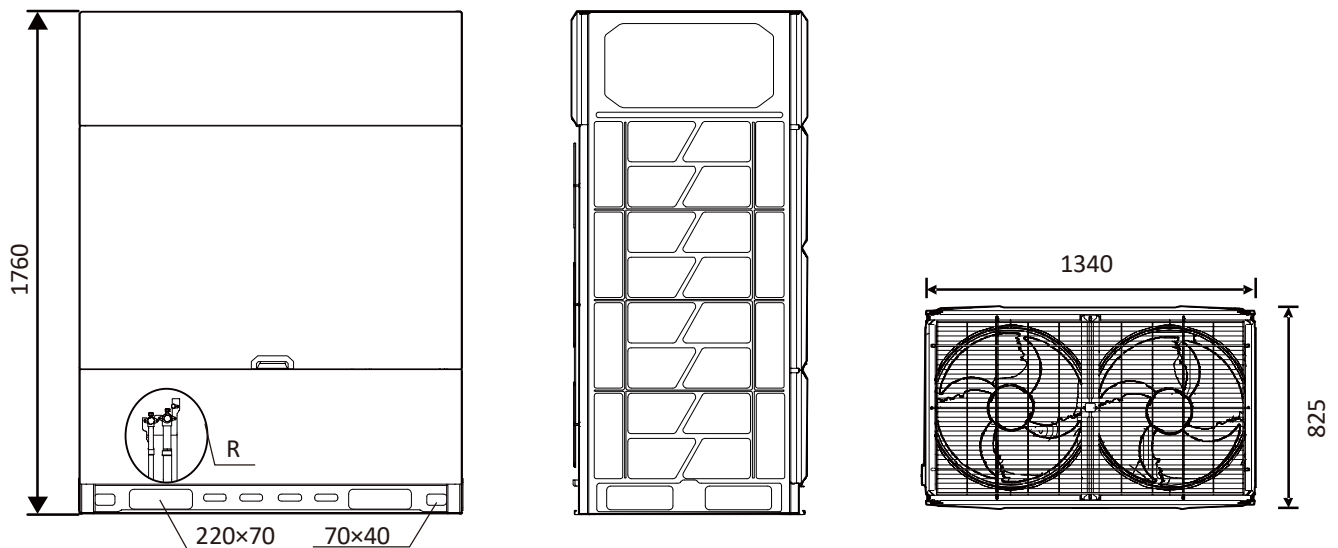
8/10/12/14/16/18/20HP

Figure 2-2.1: 8/10/12/14/16/18/20HP dimensions (unit: mm)



22/24/26/28/30HP

Figure 2-2.2: 22/24/26/28/30HP dimensions (unit: mm)



Detail R

Figure 2-2.3: Detail R (unit: mm)

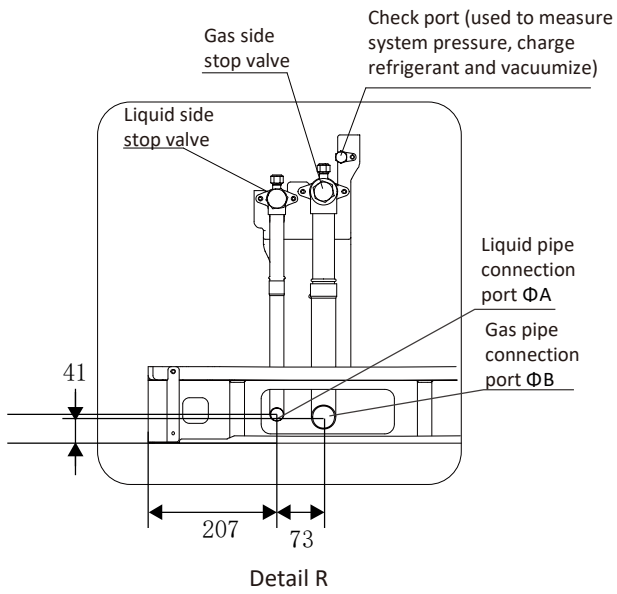
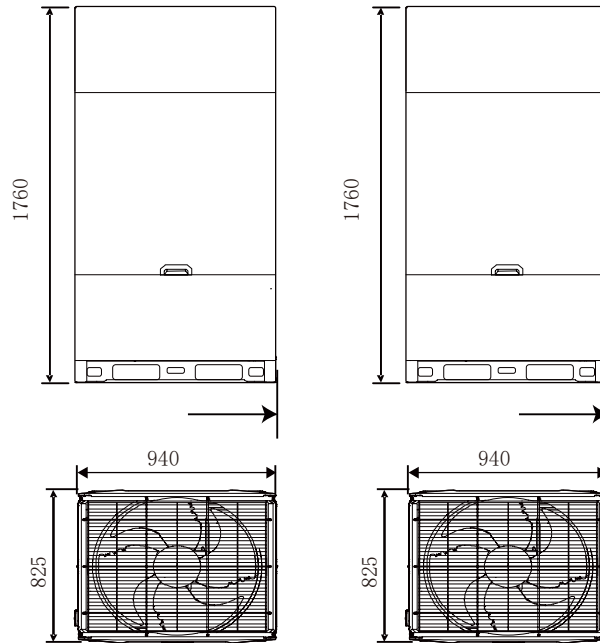
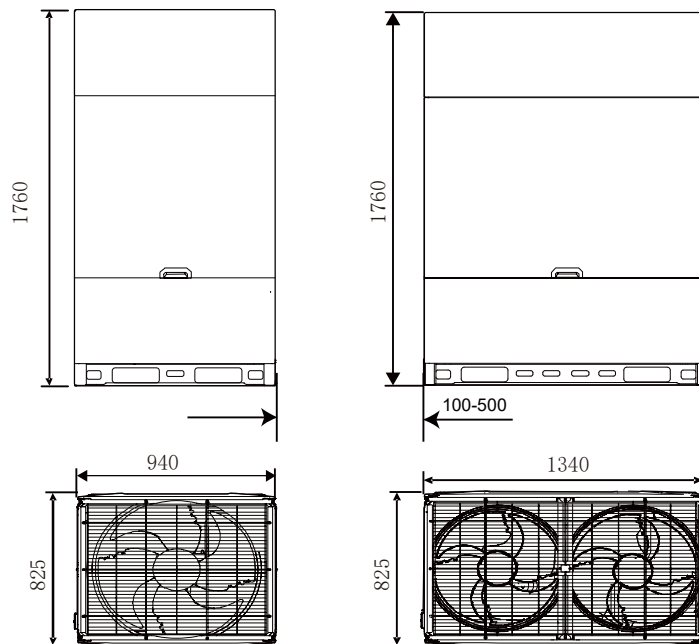


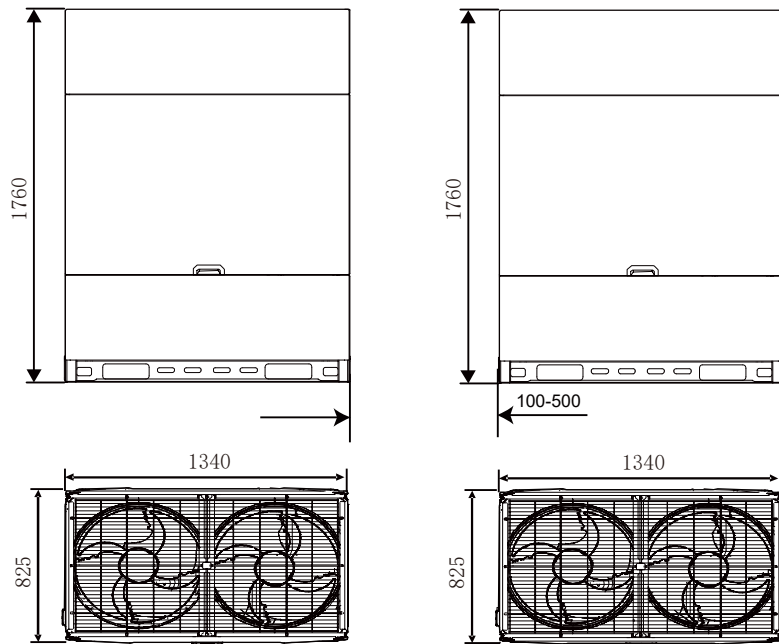
Table 2-2.1: Connection piping diameter (unit: mm)

Size	ΦA	ΦB
8HP	$\Phi 12.7$	$\Phi 25.4$
10HP	$\Phi 12.7$	$\Phi 25.4$
12HP	$\Phi 12.7$	$\Phi 25.4$
14HP	$\Phi 15.9$	$\Phi 28.6$
16HP	$\Phi 15.9$	$\Phi 28.6$
18HP	$\Phi 15.9$	$\Phi 28.6$
20HP	$\Phi 15.9$	$\Phi 28.6$
22HP	$\Phi 19.1$	$\Phi 31.8$
24HP	$\Phi 19.1$	$\Phi 31.8$
26HP	$\Phi 22.2$	$\Phi 31.8$
28HP	$\Phi 22.2$	$\Phi 31.8$
30HP	$\Phi 22.2$	$\Phi 31.8$

2.2 Combinations of Units
32/34/36/38HP
Figure 2-2.5: 32/34/36/38HP dimensions (unit: mm)

40/42/44/46/48/50HP
Figure 2-2.6: 40/42/44/46/48/50HP dimensions (unit: mm)


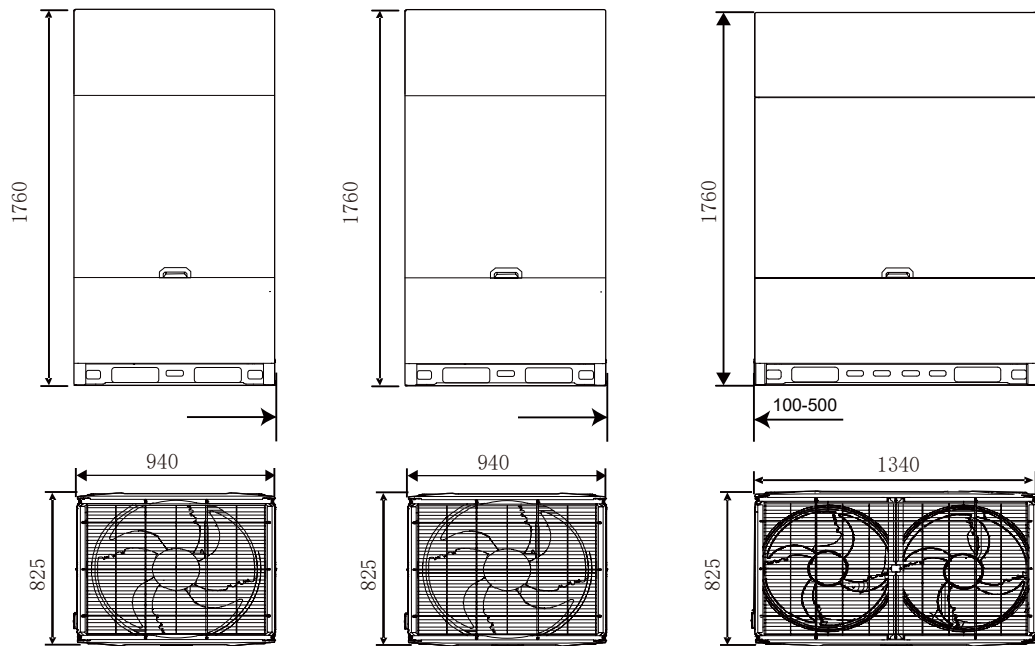
52/56/58/60HP

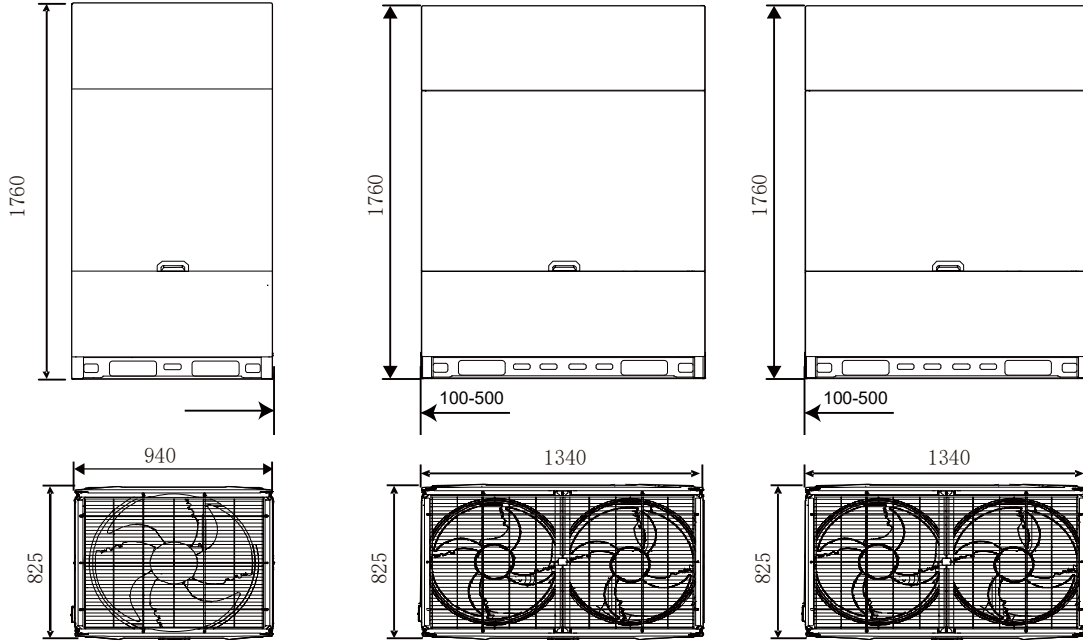
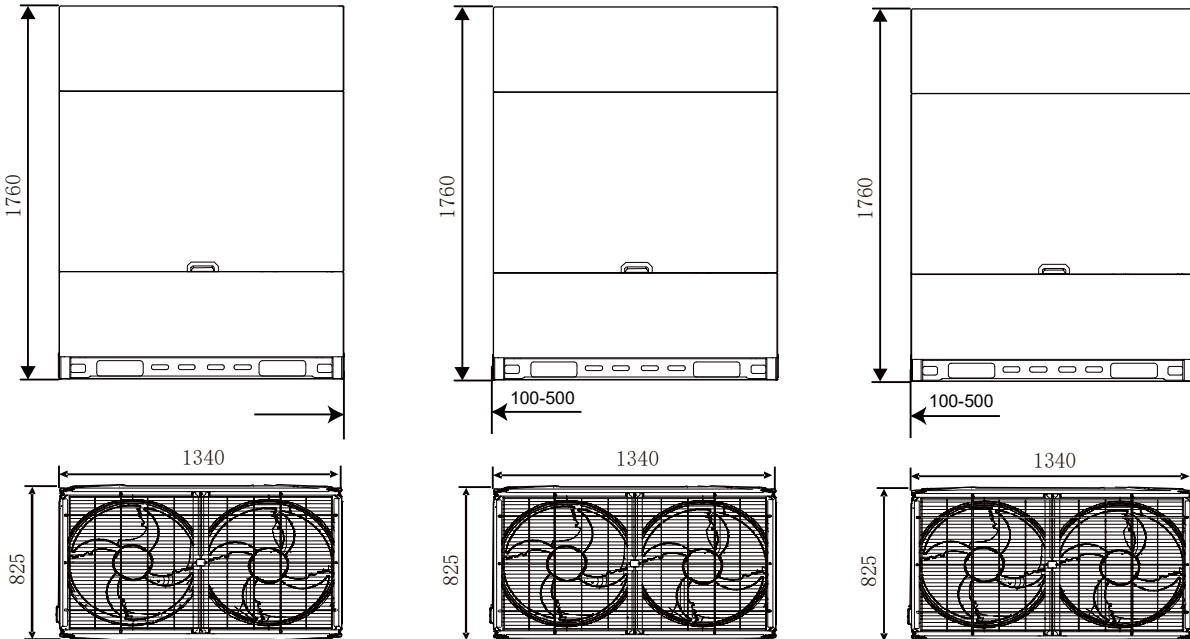
Figure 2-2.7: 52/56/58/60HP dimensions (unit: mm)



62/64/66/68HP

Figure 2-2.8: 62/64/66/68HP dimensions (unit: mm)



70/72/74/76/78/80HP
Figure 2-2.9: 70/72/74/76/78/80HP dimensions (unit: mm)

82/84/86/88/90HP
Figure 2-2.10: 82/84/86/88/90HP dimensions (unit: mm)


3 Installation Space Requirements

Make sure there is sufficient space around the unit for maintenance work, and the minimum space for air inlet and air outlet is reserved (see below to select a feasible method).

Ensure there is enough space for maintenance. The units in the same system must be placed at the same height.

Outdoor units must be spaced so that sufficient air may flow through each unit. Sufficient airflow across heat exchangers is essential for outdoor units to function properly.

For single unit installation

Figure 2-3.1: Single unit installation (unit: mm)

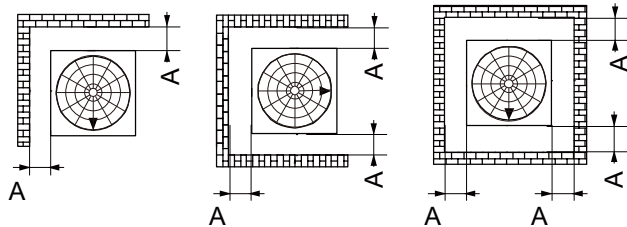
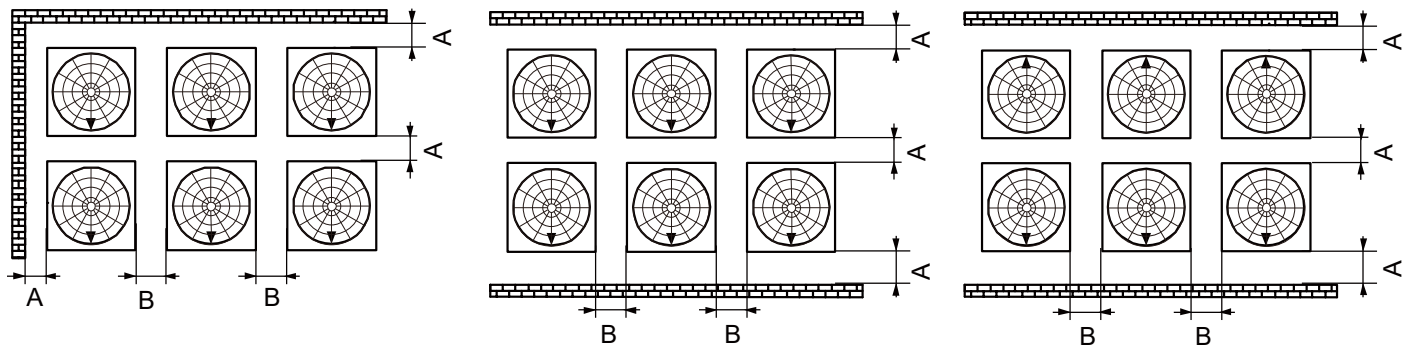


Table 2-3.1: significance of symbol

symbol	significance	Value
arrow ▼	the front of the unit	-
A	distance	$A \geq 1000\text{mm}$
B	distance	$500\text{mm} \geq B \geq 100\text{mm}$.

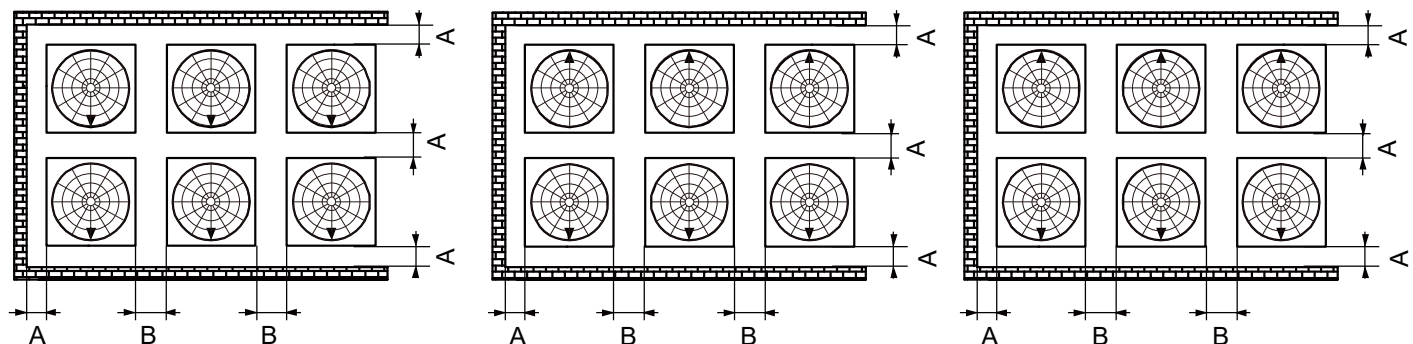
Installation with walls in two directions

Figure 2-3.2: installation with walls in two directions (unit: mm)



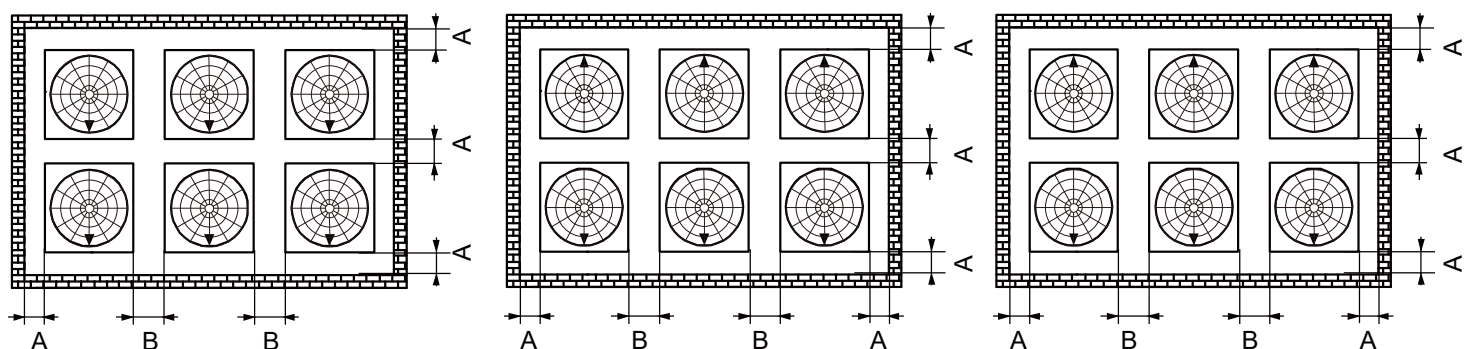
Installation with walls in three directions

Figure 2-3.3: installation with walls in three directions (unit: mm)



Installation with walls in four directions

Figure 2-3.4: installation with walls in four directions (unit: mm)



The dimensions in the above figures (*Figure 2-3.1 to Figure 2-3.4*) provide sufficient space for operation and maintenance under normal operating conditions (refrigeration mode at an outdoor temperature of 35°C).

If the outdoor temperature is higher and ventilation short circuiting may occur, choose the most suitable dimensions by calculating the return air flow.

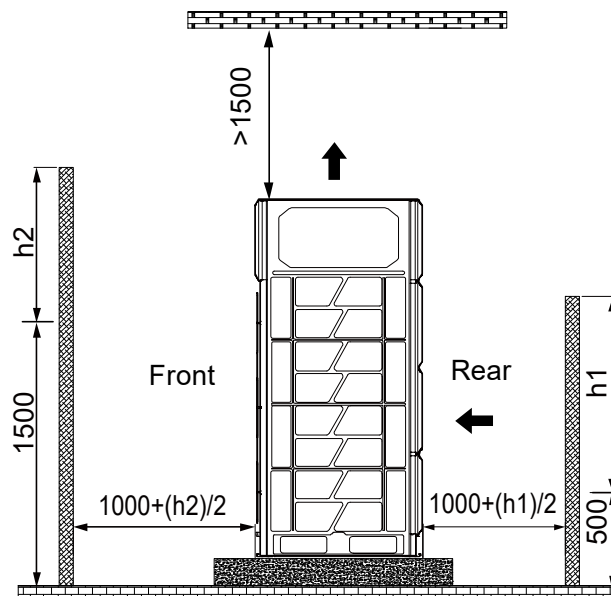
Keep the inlet and outlet of each ODU open and avoid interference.

If there is an obstacle in the space over the unit, the four sides of the unit should be open.

In the situation depicted in following Figure 2-3.5

- If there are no walls in front of or behind the unit, it is necessary to reserve a space of 1000mm on both sides.
- If the front wall is higher than 1500mm, a space of at least $(1000 + (h_2)/2)$ mm is required at the front
- If the rear wall is higher than 500mm, a space of at least $(1000 + (h_1)/2)$ mm is required at the back.
- When the space above the unit is less than 1500mm, an air ducting device shall be installed to prevent ventilation from short circuiting.
- When the space over the unit is greater than 1500mm, an air ducting device shall be installed if the air circulation is not smooth at the top of the unit.

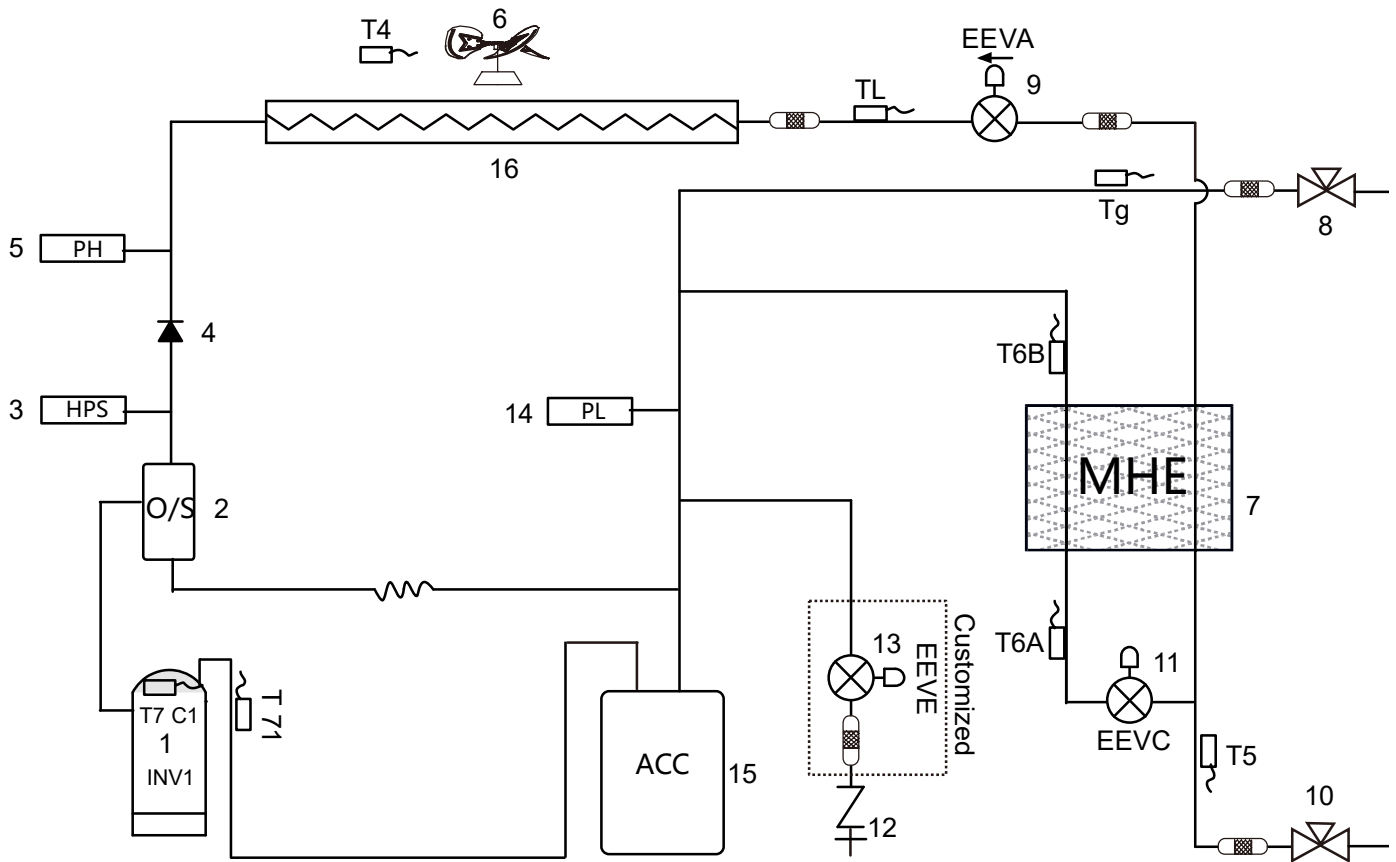
Figure 2-3.5: Top of unit below top of adjacent wall unit (mm)



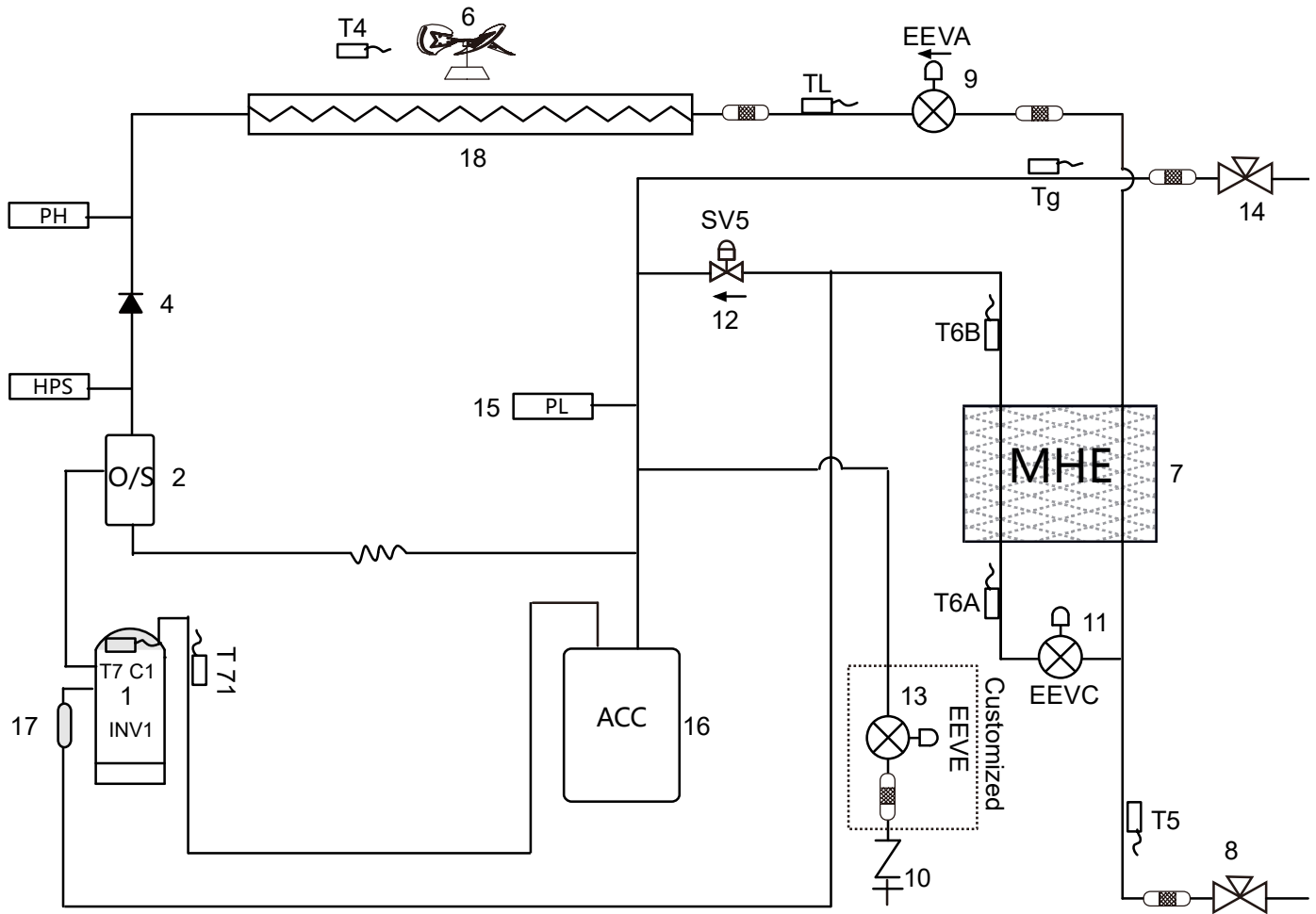
4 Piping Diagrams

8-12HP

Figure 2-4.1: 8-12HP piping diagram



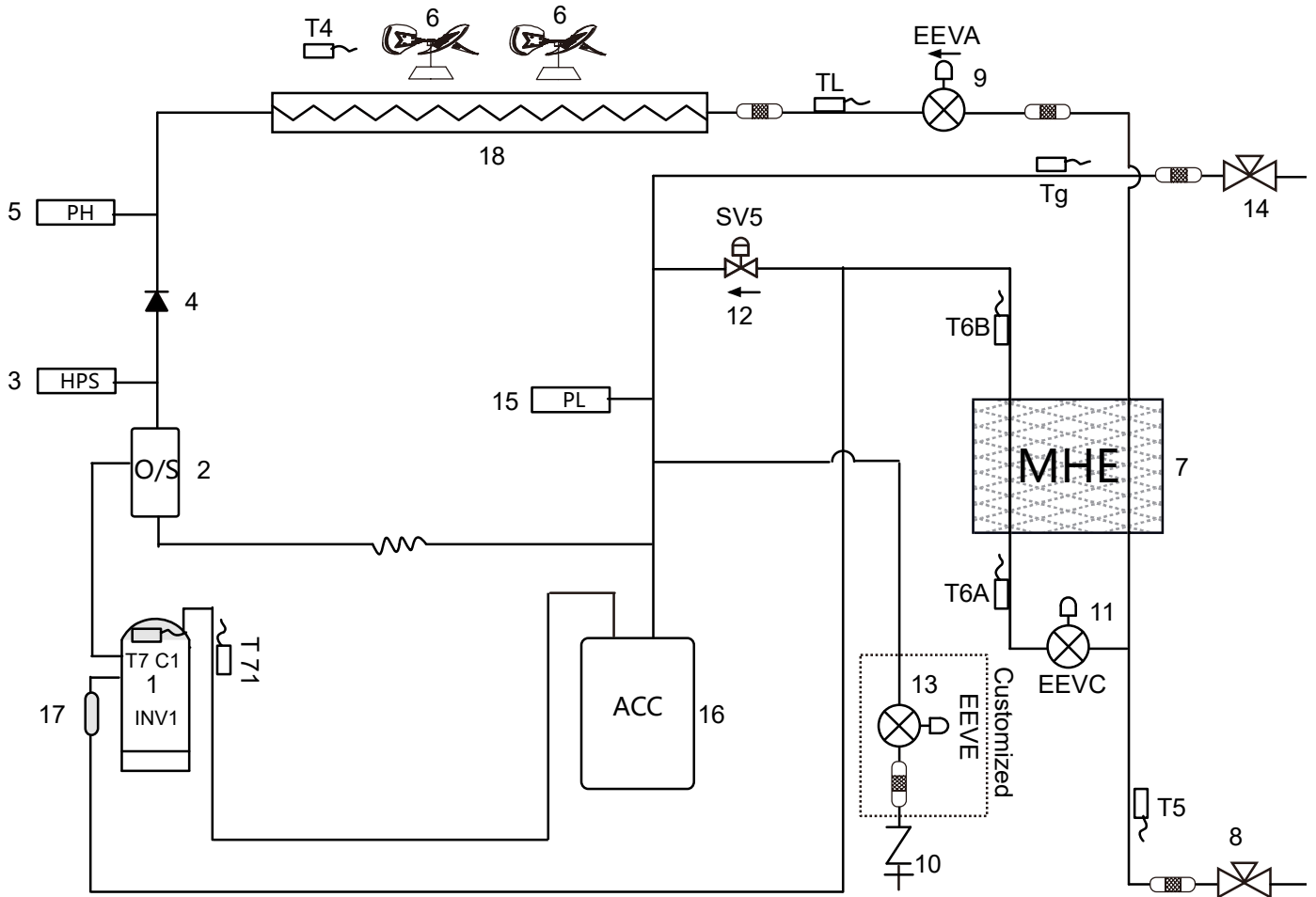
Legend			
No.	Parts name	No.	Parts name
1	Compressor	14	Low pressure sensor
2	Oil separator	15	Gas-liquid separator
3	High pressure switch	16	Heat exchanger
4	Check value		Sensor Code Description
5	High pressure sensor	T4	Outdoor air temperature sensor
6	Fan	T5	Liquid pipe temperature sensor
7	Microchannel heat exchanger	T6A	Microchannel heat exchanger inlet pipe temperature sensor
8	Stop valve (gas side)	T6B	Microchannel heat exchanger outlet pipe temperature sensor
9	Electronic expansion valve (EEVA)	T71/T72	Suction temperature sensor
10	Stop valve (liquid side)	Tg	Gas pipe temperature sensor
11	Electronic expansion valve (EEVC)	TL	Heat exchanger liquid temperature sensor
12	Charge port	T7C1/T7C2	Compressor discharge temperature sensor
13	Electronic expansion valve (Optional EEVE)	Tb	Electric control box chamber temperature sensor

14-20HP
Figure 2-4.2: 14-20HP piping diagram


Legend	
No.	Parts name
1	Compressor
2	Oil separator
3	High pressure switch
4	Check value
5	High pressure sensor
6	Fan
7	Microchannel heat exchanger
8	Stop valve (liquid side)
9	Electronic expansion valve (EEVA)
10	Charge port
11	Electronic expansion valve (EEVC)
12	Injection bypass solenoid valve (SV5)
13	Electronic expansion valve (Optional EEVE)
14	Stop valve (gas side)
15	Low pressure sensor
16	Gas-liquid separator
17	Muffler
18	Heat exchanger
Sensor Code	Description
T4	Outdoor air temperature sensor
T5	Liquid pipe temperature sensor
T6A	Microchannel heat exchanger inlet pipe temperature sensor
T6B	Microchannel heat exchanger outlet pipe temperature sensor
T71/T72	Suction temperature sensor
Tg	Gas pipe temperature sensor
TL	Heat exchanger liquid temperature sensor
T7C1/T7C2	Compressor discharge temperature sensor
Tb	Electric control box chamber temperature sensor

22-24HP

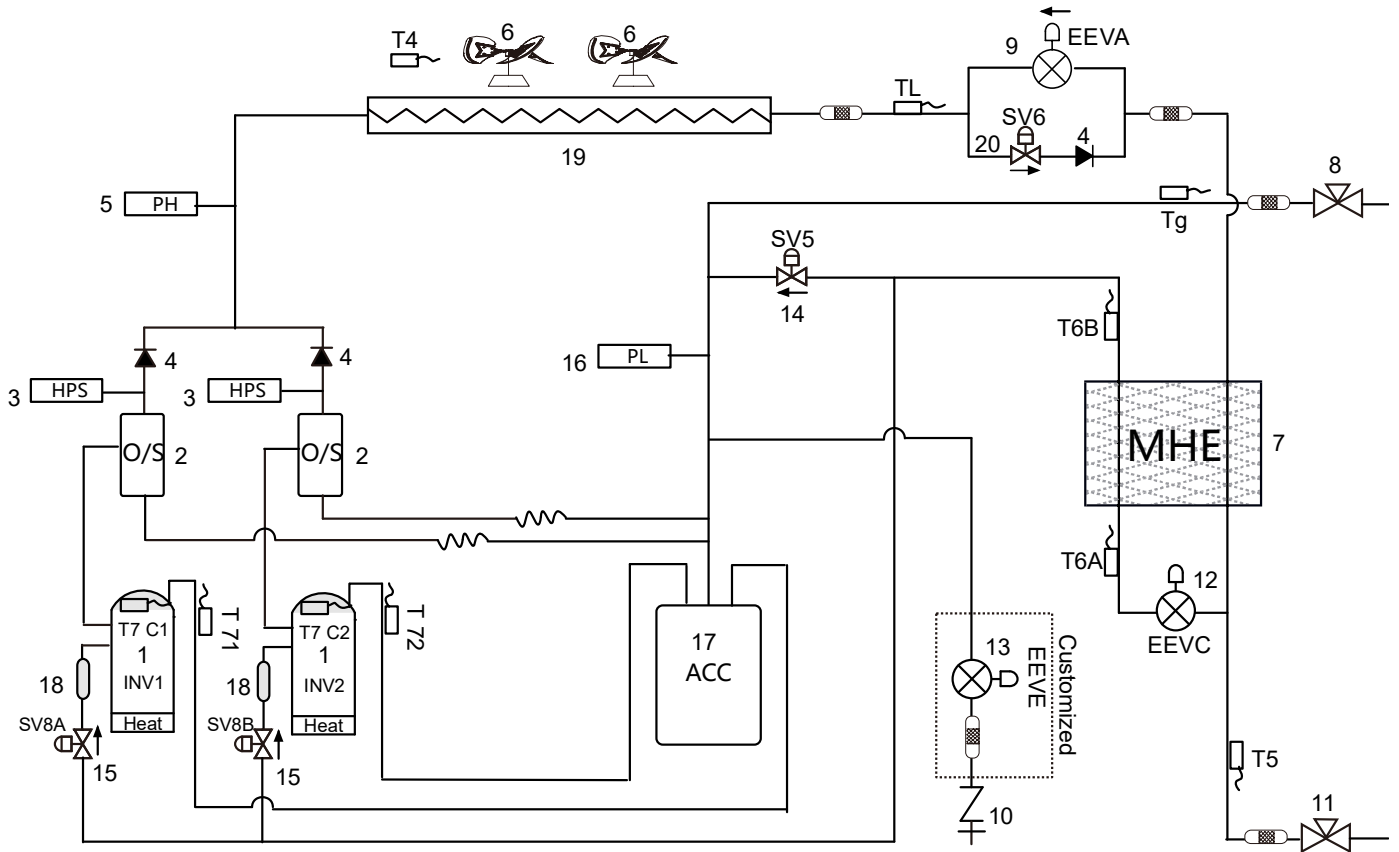
Figure 2-4.3: 22-24HP piping diagram



Legend			
No.	Parts name	No.	Parts name
1	Compressor	15	Low pressure sensor
2	Oil separator	16	Gas-liquid separator
3	High pressure switch	17	Muffler
4	Check value	18	Heat exchanger
5	High pressure sensor	Sensor Code Description	
6	Fan	T4	Outdoor air temperature sensor
7	Microchannel heat exchanger	T5	Liquid pipe temperature sensor
8	Stop valve (liquid side)	T6A	Microchannel heat exchanger inlet pipe temperature sensor
9	Electronic expansion valve (EEVA)	T6B	Microchannel heat exchanger outlet pipe temperature sensor
10	Charge port	T71/T72	Suction temperature sensor
11	Electronic expansion valve (EEVC)	Tg	Gas pipe temperature sensor
12	Injection bypass solenoid valve (SV5)	TL	Heat exchanger liquid temperature sensor
13	Electronic expansion valve (Optional EEVE)	T7C1/T7C2	Compressor discharge temperature sensor
14	Stop valve (gas side)	Tb	Electric control box chamber temperature sensor

26-30HP

Figure 2-4.3: 26-30HP piping diagram



Legend	
No.	Parts name
1	Compressor
2	Oil separator
3	High pressure switch
4	Check value
5	High pressure sensor
6	Fan
7	Microchannel heat exchanger
8	Stop valve (gas side)
9	Electronic expansion valve (EEVA)
10	Charge port
11	Stop valve (liquid side)
12	Electronic expansion valve (EEVC)
13	Electronic expansion valve (Optional EEVE)
14	Injection bypass solenoid valve (SV5)
15	Compressor vapor injection valve (SV8A/B)
No.	Parts name
16	Low pressure sensor
17	Gas-liquid separator
18	Muller
19	Heat exchanger
20	Liquid bypass valve (SV6)
Sensor Code	Description
T4	Outdoor air temperature sensor
T5	Liquid pipe temperature sensor
T6A	Microchannel heat exchanger inlet pipe temperature sensor
T6B	Microchannel heat exchanger outlet pipe temperature sensor
T71/T72	Suction temperature sensor
Tg	Gas pipe temperature sensor
TL	Heat exchanger liquid temperature sensor
T7C1/T7C2	Compressor discharge temperature sensor
Tb	Electric control box chamber temperature sensor

Key components:

- 1. Oil separator:**

Separates oil from gas refrigerant pumped out of the compressor and quickly returns it to the compressor. Separation efficiency is up to 99%.
- 2. Gas-liquid separator:**

Separates liquid refrigerant from gas refrigerant, stores liquid refrigerant and oil to protect compressor from liquid hammering.
- 3. Electronic expansion valve (EEVA):**

Controls refrigerant flow and reduces refrigerant pressure.
- 4. Microchannel heat exchanger:**

In cooling mode, it can improve super-cooling degree and the super-cooled refrigerant can achieve better heat exchange in indoor side. Refrigerant volume in microchannel heat exchanger is controlled according to temperature different between microchannel heat exchanger inlet and outlet or the temperature different between discharge temperature and target discharge temperature.
- 5. Solenoid valve SV5:**

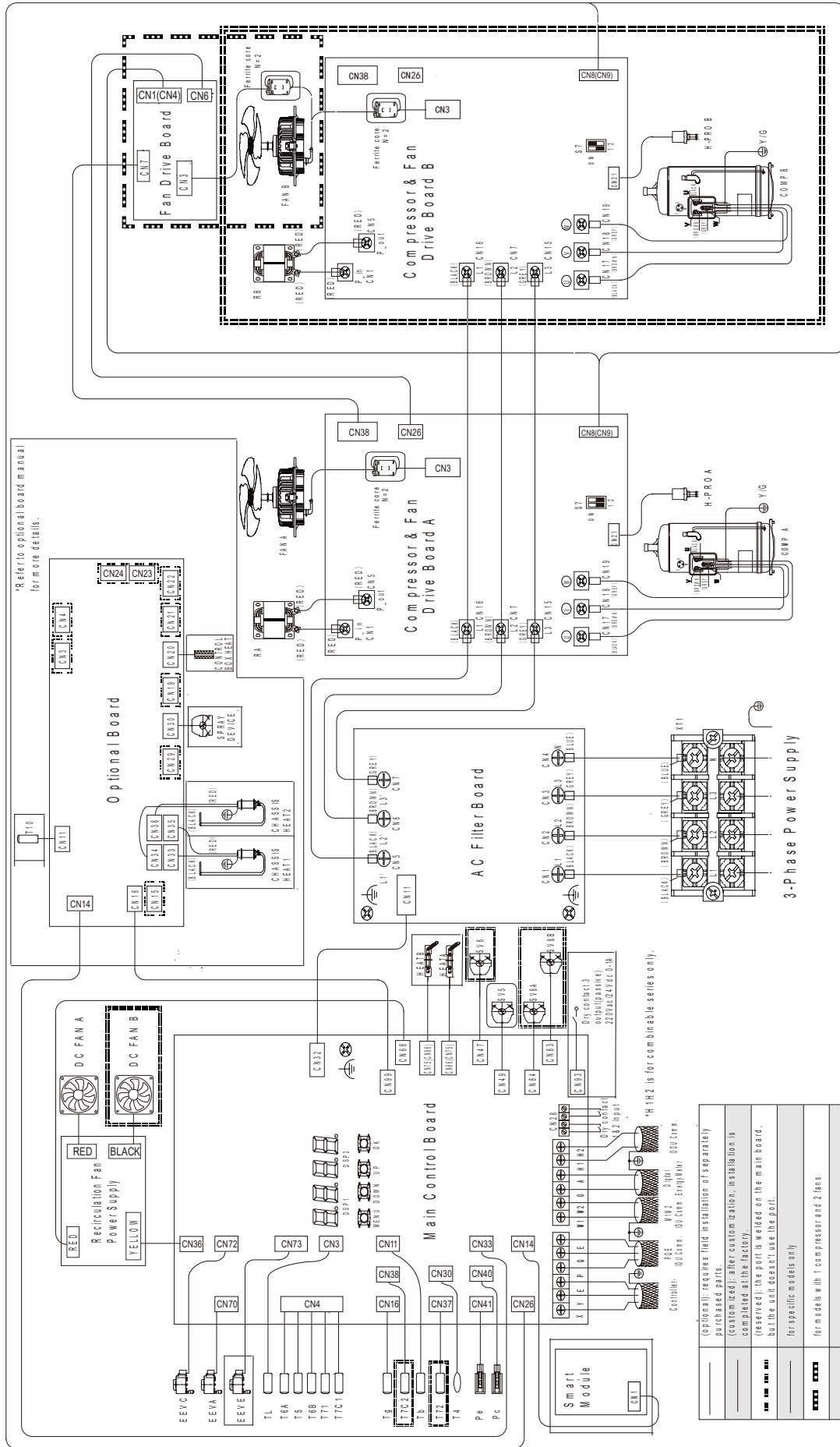
Controls the refrigerant from microchannel heat exchanger to gas-liquid separator.
- 6. Solenoid valve SV8A/B:**

Allows refrigerant from microchannel heat exchanger inject directly to the compressor. SV8A/B opens when compressor startup and closes when compressor stop.
- 7. High pressure switch:**

Regulate system pressure. When system pressure rises above the upper limit, the high pressure switch turn off, stopping the compressor. When the high pressure protection recovers, the compressor restarts.
- 8. High/Low pressure sensor**

Used to detect the system high/low pressure.

5 Wiring Diagrams



Optional	requires field installation of separately purchased parts
Customized	after customization, installation is completed at the factory.
Reserved	the port is welded on the main board, but the unit doesn't use the port.
Reserved	for specific models only
Reserved	for models with 1 compressor and 2 fans
Reserved	for models with 2 compressors and 2 fans

Legend			
Code	Name	Code	Name
COMP A/ COMP B	Compressor	T3	Main exchanger pipe temperature sensor
EEVA/EEVC	Electronic expansion valve	T4	Outdoor ambient temperature sensor
FAN A/ FAN B	DC Fan	T5	Liquid pipe temperature sensor
DC FAN A/DC FAN B	Recirculation Fan	T6A	Microchannel heat exchanger inlet pipe temperature sensor
HEAT A/ HEAT B	Crankcase heater	T6B	Microchannel heat exchanger outlet pipe temperature sensor
RA/RB	Reactance	T71/T72	Suction temperature sensor
ST1	Four-way valve	T8	Heat exchanger gas temperature sensor
SV5-SV8A/B	Solenoid valve	Tg	Gas pipe temperature sensor
H-PRO A/ H-PRO B	High pressure switch	TL	Heat exchanger liquid temperature sensor
Pc	High pressure sensor	T7C1/T7C2	Compressor discharge temperature sensor
Pe	Low pressure sensor	Tb	Electric control box chamber temperature sensor
XT1	Terminal block		

6 Electrical Characteristics

Table 2-6.1: Outdoor unit electrical characteristics

Model				Power Supply ¹							Compressor			OFM	
Capacity	Modules			Hz	Volts	Min.	Max.	MCA ²	TOCA ³	MFA ⁴	MSC ⁵	RLA ⁶	kW	FLA	
						volts	volts								
8HP				50/60	380~415	342	440	18.3	22.8	25	-	12.1	0.56	1.7	
10HP				50/60	380~415	342	440	22.2	26.7	32	-	14.3	0.56	1.7	
12HP				50/60	380~415	342	440	24.7	29.2	32	-	18.2	0.56	1.7	
14HP				50/60	380~415	342	440	28.6	33.1	40	-	20.5	0.92	1.8	
16HP				50/60	380~415	342	440	30.3	34.8	40	-	24	0.92	2.8	
18HP				50/60	380~415	342	440	33	37.5	40	-	29	0.92	2.8	
20HP				50/60	380~415	342	440	42	47	50	-	37	0.92	2.8	
22HP				50/60	380~415	342	440	42.5	47.5	50	-	38	0.56+0.56	1.8+1.8	
24HP				50/60	380~415	342	440	44.5	49.5	63	-	41	0.56+0.56	2.0+2.0	
26HP				50/60	380~415	342	440	50.5	55	63	-	19.0+19.2	0.56+0.56	2.2+2.2	
28HP				50/60	380~415	342	440	53	57.5	63	-	20.3+20.2	0.56+0.56	2.2+2.2	
30HP				50/60	380~415	342	440	55.1	59.6	63	-	21.0+21.3	0.56+0.56	2.2+2.2	
32HP	16HP	16HP		50/60	380~415	342	440	60.6	69.6	80.0		24+24	0.92+0.92	2.8+2.8	
34HP	14HP	20HP		50/60	380~415	342	440	70.6	80.1	90.0		20.5+37	0.92+0.92	1.8+2.8	
36HP	16HP	20HP		50/60	380~415	342	440	72.3	81.8	90.0		24+37	0.92+0.92	2.8+2.8	
38HP	18HP	20HP		50/60	380~415	342	440	75.0	84.5	90.0		29+37	0.92+0.92	2.8+2.8	
40HP	16HP	24HP		50/60	380~415	342	440	74.8	84.3	103.0		24+41	0.92+0.56+0.56	2.8+2.0+2.0	
42HP	18HP	24HP		50/60	380~415	342	440	77.5	87.0	103.0		29+41	0.92+0.56+0.56	2.8+2.0+2.0	
44HP	20HP	24HP		50/60	380~415	342	440	86.5	96.5	113.0		37+41	0.92+0.56+0.56	2.8+2.0+2.0	
46HP	16HP	30HP		50/60	380~415	342	440	85.4	94.4	103.0		24+21.0+21.3	0.92+0.56+0.56	2.8+2.2+2.2	
48HP	18HP	30HP		50/60	380~415	342	440	88.1	97.1	103.0		29+21.0+21.3	0.92+0.56+0.56	2.8+2.2+2.2	
50HP	20HP	30HP		50/60	380~415	342	440	97.1	106.6	113.0		37+21.0+21.3	0.92+0.56+0.56	2.8+2.2+2.2	
52HP	22HP	30HP		50/60	380~415	342	440	97.6	107.1	113.0		38+21.0+21.3	0.56+0.56+0.56 +0.56	1.8+1.8+2.2+2.2	
54HP	24HP	30HP		50/60	380~415	342	440	99.6	109.1	126.0		41+21.0+21.3	0.56+0.56+0.56 +0.56	2.0+2.0+2.2+2.2	
56HP	26HP	30HP		50/60	380~415	342	440	105.6	114.6	126.0		19.0+19.2+21.0+21.3	0.56+0.56+0.56 +0.56	2.2+2.2+2.2+2.2	
58HP	28HP	30HP		50/60	380~415	342	440	108.1	117.1	126.0		20.3+20.2+21.0+21.3	0.56+0.56+0.56 +0.56	2.2+2.2+2.2+2.2	
60HP	30HP	30HP		50/60	380~415	342	440	110.2	119.2	126.0		21.0+21.3+21.0+21.3	0.56+0.56+0.56 +0.56	2.2+2.2+2.2+2.2	
62HP	16HP	16HP	30HP	50/60	380~415	342	440	115.7	129.2	143.0		24+24+21.0+21.3	0.92+0.92+0.56 +0.56	2.8+2.8+2.2+2.2	
64HP	14HP	20HP	30HP	50/60	380~415	342	440	125.7	139.7	153.0		20.5+37+21.0+21.3	0.92+0.92+0.56 +0.56	1.8+2.8+2.2+2.2	
66HP	16HP	20HP	30HP	50/60	380~415	342	440	127.4	141.4	153.0		24+37+21.0+21.3	0.92+0.92+0.56 +0.56	2.8+2.8+2.2+2.2	
68HP	18HP	20HP	30HP	50/60	380~415	342	440	130.1	144.1	153.0		29+37+21.0+21.3	0.92+0.92+0.56 +0.56	2.8+2.8+2.2+2.2	
70HP	16HP	24HP	30HP	50/60	380~415	342	440	129.9	143.9	166.0		24+41+21.0+21.3	0.92+0.56+0.56 +0.56+0.56	2.8+2.0+2.0+2.2 +2.2	

Abbreviations:

MCA: Minimum Circuit Amps; TOCA: Total Over-current Amps; MFA: Maximum Fuse Amps; MSC: Maximum Starting Current (A); RLA: Rated Load Amps; FLA: Full Load Amps

Notes:

- Units are suitable for use on electrical systems where voltage supplied to unit terminals is not below or above listed range limits. Maximum allowable voltage variation between phases is 2%.
- Select wire size based on the value of MCA.
- TOCA indicates the total overcurrent amps value of each OC set.
- MFA is used to select overcurrent circuit breakers and residual-current circuit breakers.
- MSC indicates the maximum current on compressor start-up in amps.
- RLA is based on the following conditions: indoor temperature 27°C DB, 19°C WB; outdoor temperature 35°C DB

Table continued on next page ...

Table 2-6.1: Outdoor unit electrical characteristics (continued)

Model				Power Supply ¹						Compressor		OFM		
Capacity	Modules			Hz	Volts	Min.	Max.	MCA ²	TOCA ³	MFA ⁴	MSC ⁵	RLA ⁶	kW	FLA
						volts	volts							
72HP	18HP	24HP	30HP	50/60	380~415	342	440	132.6	146.6	166.0		29+41+21.0+21.3	0.92+0.56+0.56+0.56+0.56	2.8+2.0+2.0+2.2+2.2
74HP	20HP	24HP	30HP	50/60	380~415	342	440	141.6	156.1	176.0		37+41+21.0+21.3	0.92+0.56+0.56+0.56+0.56	2.8+2.0+2.0+2.2+2.2
76HP	16HP	30HP	30HP	50/60	380~415	342	440	140.5	154.0	166.0		24+21.0+21.3+21.0+21.3	0.92+0.56+0.56+0.56+0.56	2.8+2.2+2.2+2.2+2.2
78HP	18HP	30HP	30HP	50/60	380~415	342	440	143.2	156.7	166.0		29+21.0+21.3+21.0+21.3	0.92+0.56+0.56+0.56+0.56	2.8+2.2+2.2+2.2+2.2
80HP	20HP	30HP	30HP	50/60	380~415	342	440	152.2	166.2	176.0		37+21.0+21.3+21.0+21.3	0.92+0.56+0.56+0.56+0.56	2.8+2.2+2.2+2.2+2.2
82HP	22HP	30HP	30HP	50/60	380~415	342	440	152.7	166.7	176.0		38+21.0+21.3+21.0+21.3	0.56+0.56+0.56+0.56+0.56	1.8+1.8+2.2+2.2+2.2+2.2
84HP	24HP	30HP	30HP	50/60	380~415	342	440	154.7	168.7	189.0		41+21.0+21.3+21.0+21.3	0.56+0.56+0.56+0.56+0.56	2.0+2.0+2.2+2.2+2.2+2.2
86HP	26HP	30HP	30HP	50/60	380~415	342	440	160.7	174.2	189.0		19.0+19.2+21.0+21.3+21.0+21.3	0.56+0.56+0.56+0.56+0.56	2.2+2.2+2.2+2.2+2.2+2.2
88HP	28HP	30HP	30HP	50/60	380~415	342	440	163.2	176.7	189.0		20.3+20.2+21.0+21.3+21.0+21.3	0.56+0.56+0.56+0.56+0.56	2.2+2.2+2.2+2.2+2.2+2.2
90HP	30HP	30HP	30HP	50/60	380~415	342	440	165.3	178.8	189.0		21.0+21.3+21.0+21.3+21.0+21.3	0.56+0.56+0.56+0.56+0.56	2.2+2.2+2.2+2.2+2.2+2.2

Abbreviations:

MCA: Minimum Circuit Amps; TOCA: Total Over-current Amps; MFA: Maximum Fuse Amps; MSC: Maximum Starting Current (A); RLA: Rated Load Amps; FLA: Full Load Amps

Notes:

1. Units are suitable for use on electrical systems where voltage supplied to unit terminals is not below or above listed range limits. Maximum allowable voltage variation between phases is 2%.
2. Select wire size based on the value of MCA.
3. TOCA indicates the total overcurrent amps value of each OC set.
4. MFA is used to select overcurrent circuit breakers and residual-current circuit breakers.
5. MSC indicates the maximum current on compressor start-up in amps.
6. RLA is based on the following conditions: indoor temperature 27°C DB, 19°C WB; outdoor temperature 35°C DB

7 Functional Components and Safety Devices

Table 2-7.1: 8/10/12/14/16/18HP functional components and safety devices

Item		8HP	10HP	12HP	14HP	16HP	18HP
Compressor	Compressor top and discharge pipe temperature sensors	115°C = 5kΩ ± 3%					
Inverter module	Inverter module temperature sensor	90°C = 5kΩ ± 5%					
System	High pressure switch	Off: 4.2 (±0.1) MPa / On: 3.2 (±0.1) MPa					
	High pressure sensor	Output voltage (V) = 0.8696 × P + 0.5 (where P is the discharge pressure in MPa)					
	Heat exchanger temperature sensor	25°C = 10kΩ					
	Outdoor ambient temperature sensor	25°C = 10kΩ					

Table 2-7.2: 20/22/24/26/28/30HP functional components and safety devices

Item		20HP	22HP	24HP	26HP	28HP	30HP
Compressor	Compressor top and discharge pipe temperature sensors	115°C = 5kΩ ± 3%					
Inverter module	Inverter module temperature sensor	90°C = 5kΩ ± 5%					
System	High pressure switch	Off: 4.2 (±0.1) MPa / On: 3.2 (±0.1) MPa					
	High pressure sensor	Output voltage (V) = 0.8696 × P + 0.5 (where P is the discharge pressure in MPa)					
	Heat exchanger temperature sensor	25°C = 10kΩ					
	Outdoor ambient temperature sensor	25°C = 10kΩ					



8 Capacity Tables

8.1 Cooling Capacity Tables

Table 2-8.1: 8HP Cooling capacity

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC KW	PI KW	TC KW	PI KW	TC KW	PI KW	TC KW	PI KW	TC KW	PI KW	TC KW	PI KW	TC KW	PI KW
130%	-15	20.41	1.73	24.17	2.10	28.34	2.28	29.33	2.36	30.13	2.38	31.22	2.62	36.32	2.92
	-10	20.41	1.87	24.17	2.27	28.34	2.45	29.33	2.56	30.13	2.57	31.22	2.82	36.32	3.15
	-5	20.41	2.02	24.17	2.44	28.34	2.66	29.33	2.76	30.13	2.78	31.22	3.05	36.32	3.41
	-2	20.41	2.03	24.17	2.50	28.34	2.66	29.33	2.77	30.13	2.77	31.22	3.09	36.32	3.44
	0	20.41	2.06	24.17	2.54	28.34	2.75	29.33	2.92	30.13	2.94	31.22	3.14	36.32	3.48
	2	20.41	2.10	24.17	2.54	28.34	2.84	29.33	3.09	30.13	2.97	31.22	3.16	36.32	3.53
	4	20.41	2.14	24.17	2.60	28.34	2.95	29.33	3.11	30.13	3.02	31.22	3.19	36.32	3.61
	6	20.41	2.19	24.17	2.64	28.34	3.06	29.33	3.11	29.77	3.11	30.85	3.25	35.91	3.63
	8	20.41	2.24	24.17	2.70	28.34	3.21	29.33	3.28	29.41	3.20	30.48	3.26	35.39	3.67
	10	20.41	2.29	24.17	2.76	28.34	3.33	29.33	3.39	29.04	3.27	30.12	3.30	34.97	3.76
	12	20.41	2.33	24.17	2.81	28.34	3.40	28.87	3.44	28.77	3.31	29.75	3.37	34.56	3.79
	14	20.41	2.37	24.17	2.88	28.24	3.44	28.60	3.49	28.32	3.37	29.38	3.41	34.14	3.88
	16	20.41	2.40	24.17	2.92	27.87	3.49	28.14	3.53	27.96	3.46	29.02	3.47	33.73	3.95
	18	20.41	2.45	24.17	2.99	27.50	3.54	27.77	3.55	27.60	3.51	28.65	3.57	33.31	4.00
	20	20.41	2.50	24.17	3.17	27.04	3.72	27.40	3.73	27.23	3.68	28.29	3.76	32.90	4.20
	21	20.41	2.58	24.17	3.28	26.95	3.81	27.21	3.81	27.05	3.77	28.10	3.84	32.69	4.29
	23	20.41	2.75	24.17	3.53	26.58	3.99	26.84	3.99	26.60	3.93	27.64	4.01	32.17	4.50
	25	20.41	2.94	24.17	3.79	26.21	4.15	26.38	4.16	26.33	4.11	27.37	4.20	31.86	4.68
	27	20.41	3.16	24.17	4.04	25.84	4.34	26.11	4.33	25.88	4.28	26.91	4.38	31.34	4.89
	29	20.41	3.36	24.17	4.33	25.37	4.52	25.64	4.52	25.61	4.45	26.64	4.56	31.03	5.09
	31	20.41	3.59	24.07	4.58	25.00	4.69	25.28	4.70	25.15	4.63	26.18	4.73	30.51	5.28
	33	20.41	3.82	23.62	4.75	24.63	4.87	24.91	4.85	24.79	4.81	25.91	4.90	30.10	5.49
	35	20.41	4.08	23.25	4.92	24.26	5.04	24.54	5.04	24.43	4.98	25.45	5.09	29.68	5.71
	37	20.41	4.33	22.88	5.10	23.89	5.21	24.17	5.23	24.07	5.17	25.08	5.27	29.27	5.91
	39	20.41	4.62	22.52	5.17	23.52	5.41	23.80	5.39	23.71	5.33	24.72	5.46	28.85	6.12
41	20.41	4.86	22.24	5.21	23.24	5.45	23.62	5.46	23.43	5.39	24.44	5.47	27.71	6.17	
43	20.41	4.99	22.06	5.23	23.15	5.47	23.43	5.48	23.25	5.38	23.98	5.49	27.40	6.19	
46	20.41	5.24	21.97	5.29	22.87	5.50	23.25	5.51	22.89	5.41	23.34	5.51	26.88	6.31	
48	20.41	5.42	21.88	5.46	22.50	5.57	22.88	5.55	22.62	5.47	22.79	5.58	26.26	6.32	
50	19.39	5.25	20.78	5.28	21.38	5.40	21.73	5.41	21.49	5.32	21.65	5.42	24.94	6.15	
52	18.22	5.04	19.54	5.08	20.09	5.20	20.43	5.19	20.20	5.12	20.35	5.21	23.45	5.92	
55	17.13	4.85	18.36	4.88	18.89	4.98	19.20	5.00	18.99	4.92	19.13	5.02	22.04	5.67	
120%	-15	18.51	1.65	22.50	2.03	25.63	2.35	27.94	2.62	29.07	2.71	29.92	2.82	34.38	3.18
	-10	18.51	1.78	22.50	2.20	25.63	2.55	27.94	2.83	29.07	2.93	29.92	3.04	34.38	3.44
	-5	18.51	1.93	22.50	2.38	25.63	2.75	27.94	3.06	29.07	3.16	29.92	3.28	34.38	3.72
	-2	18.51	1.94	22.50	2.40	25.63	2.77	27.94	3.08	29.07	3.19	29.92	3.31	34.38	3.72
	0	18.51	1.96	22.50	2.41	25.63	2.81	27.94	3.09	29.07	3.23	29.92	3.32	34.38	3.72
	2	18.51	1.96	22.50	2.44	25.63	2.83	27.94	3.11	29.07	3.24	29.92	3.36	34.38	3.73
	4	18.51	1.98	22.50	2.47	25.63	2.87	27.94	3.14	29.07	3.28	29.92	3.37	34.38	3.74
	6	18.51	2.01	22.50	2.49	25.63	2.90	27.94	3.18	29.07	3.32	29.92	3.40	34.38	3.75
	8	18.51	2.02	22.50	2.52	25.63	2.93	27.94	3.21	29.07	3.35	29.92	3.40	34.38	3.77
	10	18.51	2.04	22.50	2.56	25.63	2.96	27.94	3.28	29.07	3.35	29.92	3.41	34.38	3.80
	12	18.51	2.09	22.50	2.60	25.63	3.03	27.94	3.34	28.62	3.38	29.45	3.39	33.97	3.80
	14	18.51	2.13	22.50	2.65	25.63	3.09	27.94	3.40	28.25	3.39	29.18	3.45	33.55	3.87
	16	18.51	2.16	22.50	2.71	25.63	3.15	27.85	3.47	27.88	3.44	28.72	3.51	33.14	3.91
	18	18.51	2.20	22.50	2.76	25.63	3.25	27.38	3.54	27.51	3.52	28.35	3.57	32.72	3.98
	20	18.51	2.24	22.50	2.87	25.63	3.49	27.01	3.72	27.15	3.70	27.98	3.76	32.31	4.15
	21	18.51	2.28	22.50	2.97	25.63	3.62	26.83	3.81	26.87	3.79	27.89	3.83	32.10	4.27
	23	18.51	2.43	22.50	3.18	25.63	3.88	26.46	3.97	26.60	3.95	27.42	4.02	31.58	4.46
	25	18.51	2.60	22.50	3.40	25.18	4.04	26.09	4.15	26.14	4.12	27.05	4.20	31.27	4.64
	27	18.51	2.77	22.50	3.64	24.82	4.20	25.72	4.32	25.86	4.31	26.68	4.36	30.75	4.87
	29	18.51	2.95	22.50	3.88	24.45	4.38	25.35	4.50	25.41	4.48	26.22	4.56	30.33	5.05
	31	18.51	3.15	22.50	4.13	24.00	4.55	24.98	4.66	25.13	4.65	25.95	4.74	29.92	5.25
	33	18.51	3.35	22.50	4.42	23.73	4.72	24.52	4.87	24.67	4.84	25.48	4.91	29.40	5.45
	35	18.51	3.56	22.50	4.72	23.28	4.90	24.15	5.02	24.30	5.01	25.21	5.10	29.09	5.65
	37	18.51	3.79	22.50	5.02	23.00	5.07	23.78	5.20	23.94	5.19	24.75	5.28	28.57	5.87
	39	18.51	4.03	22.41	5.31	22.55	5.23	23.41	5.40	23.57	5.38	24.47	5.47	28.25	6.08
41	18.51	4.14	22.22	5.33	22.37	5.28	23.22	5.43	23.39	5.40	24.28	5.48	27.42	6.10	
43	18.51	4.21	22.13	5.37	22.19	5.30	23.04	5.44	23.20	5.44	23.82	5.49	27.01	6.23	
46	18.51	4.27	22.04	5.42	22.01	5.37	22.76	5.50	22.93	5.47	23.36	5.50	26.70	6.38	
48	18.51	4.29	21.85	5.48	21.74	5.39	22.39	5.54	22.75	5.53	22.99	5.58	26.38	6.45	
50	17.59	4.17	20.76	5.34	20.65	5.26	21.27	5.37	21.61	5.37	21.84	5.41	25.07	6.25	
52	16.53	4.00	19.52	5.12	19.41	5.06	19.99	5.17	20.31	5.14	20.53	5.20	23.56	6.01	
55	15.54	3.86	18.34	4.93	18.25	4.86	18.79	4.96	19.09	4.95	19.30	5.01	22.15	5.78	

Abbreviations:

CR: Combination ratio TC: Total capacity (kW) PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table continued on next page ...

Table 2-8.1: 8HP Cooling capacity (continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	8.67	0.74	10.39	0.85	12.05	0.98	13.11	1.06	13.95	1.11	15.30	1.23	17.20	1.35
	-10	8.67	0.80	10.39	0.92	12.05	1.06	13.11	1.14	13.95	1.20	15.30	1.33	17.20	1.46
	-5	8.67	0.86	10.39	0.99	12.05	1.15	13.11	1.23	13.95	1.29	15.30	1.44	17.20	1.57
	-2	8.67	0.88	10.39	1.01	12.05	1.16	13.11	1.24	13.95	1.32	15.30	1.46	17.20	1.59
	0	8.67	0.88	10.39	1.04	12.05	1.18	13.11	1.26	13.95	1.33	15.30	1.49	17.20	1.62
	2	8.67	0.89	10.39	1.05	12.05	1.21	13.11	1.29	13.95	1.36	15.30	1.49	17.20	1.65
	4	8.67	0.90	10.39	1.07	12.05	1.22	13.11	1.29	13.95	1.38	15.30	1.53	17.20	1.69
	6	8.67	0.93	10.39	1.08	12.05	1.24	13.11	1.33	13.95	1.41	15.30	1.55	17.20	1.73
	8	8.67	0.95	10.39	1.11	12.05	1.26	13.11	1.36	13.95	1.43	15.30	1.58	17.20	1.80
	10	8.67	0.96	10.39	1.12	12.05	1.28	13.11	1.38	13.95	1.47	15.30	1.62	17.20	1.83
	12	8.67	0.98	10.39	1.13	12.05	1.30	13.11	1.41	13.95	1.50	15.30	1.65	17.20	1.85
	14	8.67	0.99	10.39	1.15	12.05	1.31	13.11	1.44	13.95	1.52	15.30	1.68	17.20	1.89
	16	8.67	1.00	10.39	1.15	12.05	1.33	13.11	1.46	13.95	1.54	15.30	1.71	17.20	1.92
	18	8.67	1.02	10.39	1.17	12.05	1.36	13.11	1.48	13.95	1.57	15.30	1.73	17.20	1.95
	20	8.67	1.03	10.39	1.20	12.05	1.38	13.11	1.50	13.95	1.60	15.30	1.76	17.20	1.99
	21	8.67	1.04	10.39	1.21	12.05	1.39	13.11	1.51	13.95	1.62	15.30	1.78	17.20	2.01
	23	8.67	1.05	10.39	1.23	12.05	1.41	13.11	1.54	13.95	1.65	15.30	1.81	17.20	2.05
	25	8.67	1.07	10.39	1.25	12.05	1.44	13.11	1.57	13.95	1.69	15.30	1.91	17.20	2.20
	27	8.67	1.09	10.39	1.30	12.05	1.52	13.11	1.67	13.95	1.79	15.30	2.03	17.20	2.33
	29	8.67	1.14	10.39	1.37	12.05	1.61	13.11	1.78	13.95	1.92	15.30	2.16	17.20	2.49
	31	8.67	1.21	10.39	1.45	12.05	1.71	13.11	1.89	13.95	2.03	15.30	2.29	17.20	2.65
33	8.67	1.28	10.39	1.52	12.05	1.82	13.11	2.00	13.95	2.16	15.30	2.44	17.20	2.82	
35	8.67	1.36	10.39	1.62	12.05	1.91	13.11	2.11	13.95	2.29	15.30	2.60	17.20	3.00	
37	8.67	1.43	10.39	1.71	12.05	2.03	13.11	2.24	13.95	2.42	15.30	2.75	17.20	3.17	
39	8.67	1.51	10.39	1.81	12.05	2.15	13.11	2.37	13.95	2.56	15.30	2.91	17.20	3.38	
41	8.67	1.57	10.39	1.88	12.05	2.22	13.11	2.49	13.95	2.68	15.30	3.07	17.20	3.53	
43	8.67	1.67	10.39	2.01	12.05	2.31	13.11	2.60	13.95	2.76	15.30	3.23	17.20	3.70	
46	8.67	1.71	10.39	2.06	12.05	2.46	13.11	2.80	13.95	2.86	15.30	3.53	17.20	4.00	
48	8.67	1.74	10.39	2.11	12.05	2.60	13.11	2.99	13.95	3.01	15.30	3.82	17.20	4.32	
50	8.24	1.69	9.87	2.05	11.44	2.52	12.46	2.91	13.25	2.92	14.53	3.71	16.34	4.20	
52	7.74	1.63	9.28	1.97	10.76	2.43	11.71	2.79	12.45	2.81	13.66	3.55	15.36	4.04	
55	7.28	1.56	8.72	1.90	10.11	2.33	11.01	2.68	11.71	2.69	12.84	3.42	14.44	3.87	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table2-8.2:10HP Cooling capacity(continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	9.78	0.96	11.61	1.10	13.46	1.27	14.45	1.34	15.20	1.39	17.33	1.61	19.14	1.71
	-10	9.78	1.03	11.61	1.19	13.46	1.37	14.45	1.44	15.20	1.50	17.33	1.73	19.14	1.86
	-5	9.78	1.12	11.61	1.29	13.46	1.48	14.45	1.56	15.20	1.61	17.33	1.88	19.14	2.00
	-2	9.78	1.13	11.61	1.31	13.46	1.50	14.45	1.58	15.20	1.65	17.33	1.90	19.14	2.04
	0	9.78	1.14	11.61	1.33	13.46	1.52	14.45	1.59	15.20	1.67	17.33	1.94	19.14	2.07
	2	9.78	1.16	11.61	1.36	13.46	1.55	14.45	1.62	15.20	1.69	17.33	1.95	19.14	2.10
	4	9.78	1.17	11.61	1.38	13.46	1.57	14.45	1.63	15.20	1.73	17.33	1.99	19.14	2.16
	6	9.78	1.19	11.61	1.40	13.46	1.58	14.45	1.68	15.20	1.77	17.33	2.02	19.14	2.23
	8	9.78	1.21	11.61	1.42	13.46	1.62	14.45	1.72	15.20	1.79	17.33	2.05	19.14	2.30
	10	9.78	1.25	11.61	1.43	13.46	1.64	14.45	1.74	15.20	1.84	17.33	2.11	19.14	2.33
	12	9.78	1.25	11.61	1.45	13.46	1.67	14.45	1.78	15.20	1.87	17.33	2.14	19.14	2.36
	14	9.78	1.27	11.61	1.48	13.46	1.69	14.45	1.81	15.20	1.90	17.33	2.17	19.14	2.41
	16	9.78	1.29	11.61	1.49	13.46	1.71	14.45	1.85	15.20	1.93	17.33	2.22	19.14	2.45
	18	9.78	1.32	11.61	1.52	13.46	1.74	14.45	1.86	15.20	1.96	17.33	2.26	19.14	2.50
	20	9.78	1.33	11.61	1.54	13.46	1.77	14.45	1.90	15.20	2.01	17.33	2.29	19.14	2.54
	21	9.78	1.34	11.61	1.55	13.46	1.79	14.45	1.92	15.20	2.02	17.33	2.31	19.14	2.57
	23	9.78	1.36	11.61	1.57	13.46	1.81	14.45	1.95	15.20	2.06	17.33	2.37	19.14	2.63
	25	9.78	1.37	11.61	1.61	13.46	1.86	14.45	1.99	15.20	2.12	17.33	2.49	19.14	2.80
	27	9.78	1.40	11.61	1.68	13.46	1.96	14.45	2.12	15.20	2.26	17.33	2.64	19.14	2.98
	29	9.78	1.48	11.61	1.76	13.46	2.07	14.45	2.25	15.20	2.40	17.33	2.80	19.14	3.19
	31	9.78	1.55	11.61	1.86	13.46	2.20	14.45	2.39	15.20	2.55	17.33	2.98	19.14	3.38
33	9.78	1.65	11.61	1.98	13.46	2.34	14.45	2.53	15.20	2.70	17.33	3.16	19.14	3.60	
35	9.78	1.74	11.61	2.09	13.46	2.46	14.45	2.68	15.20	2.87	17.33	3.37	19.14	3.83	
37	9.78	1.84	11.61	2.21	13.46	2.61	14.45	2.84	15.20	3.03	17.33	3.58	19.14	4.06	
39	9.78	1.94	11.61	2.32	13.46	2.77	14.45	3.01	15.20	3.23	17.33	3.78	19.14	4.31	
41	9.78	2.02	11.61	2.43	13.46	2.87	14.45	3.14	15.20	3.36	17.33	4.00	19.14	4.50	
43	9.78	2.16	11.61	2.59	13.46	2.96	14.45	3.28	15.20	3.43	17.33	4.20	19.14	4.72	
46	9.78	2.20	11.61	2.65	13.46	3.17	14.45	3.55	15.20	3.60	17.33	4.60	19.14	5.11	
48	9.78	2.24	11.61	2.73	13.46	3.33	14.45	3.78	15.20	3.76	17.33	4.96	19.14	5.52	
50	9.29	2.18	11.03	2.64	12.79	3.24	13.72	3.66	14.44	3.66	16.46	4.82	18.18	5.34	
52	8.74	2.10	10.37	2.55	12.02	3.12	12.90	3.52	13.57	3.52	15.48	4.63	17.09	5.13	
55	8.21	2.02	9.75	2.44	11.30	2.99	12.13	3.39	12.76	3.38	14.55	4.45	16.06	4.95	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table2-8.3:12HP Cooling capacity(continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	11.50	1.15	13.71	1.34	16.24	1.56	17.45	1.64	18.08	1.69	20.38	1.93	22.94	2.09
	-10	11.50	1.25	13.71	1.44	16.24	1.68	17.45	1.77	18.08	1.83	20.38	2.09	22.94	2.26
	-5	11.50	1.35	13.71	1.56	16.24	1.82	17.45	1.91	18.08	1.98	20.38	2.25	22.94	2.44
	-2	11.50	1.36	13.71	1.58	16.24	1.83	17.45	1.94	18.08	2.00	20.38	2.28	22.94	2.49
	0	11.50	1.38	13.71	1.61	16.24	1.86	17.45	1.96	18.08	2.03	20.38	2.32	22.94	2.53
	2	11.50	1.40	13.71	1.63	16.24	1.90	17.45	1.99	18.08	2.06	20.38	2.33	22.94	2.57
	4	11.50	1.42	13.71	1.66	16.24	1.92	17.45	2.02	18.08	2.11	20.38	2.38	22.94	2.63
	6	11.50	1.44	13.71	1.69	16.24	1.95	17.45	2.06	18.08	2.15	20.38	2.42	22.94	2.72
	8	11.50	1.47	13.71	1.72	16.24	1.98	17.45	2.11	18.08	2.18	20.38	2.46	22.94	2.80
	10	11.50	1.50	13.71	1.73	16.24	2.02	17.45	2.14	18.08	2.23	20.38	2.53	22.94	2.84
	12	11.50	1.51	13.71	1.76	16.24	2.05	17.45	2.18	18.08	2.28	20.38	2.56	22.94	2.89
	14	11.50	1.54	13.71	1.78	16.24	2.07	17.45	2.24	18.08	2.32	20.38	2.61	22.94	2.95
	16	11.50	1.56	13.71	1.80	16.24	2.11	17.45	2.26	18.08	2.35	20.38	2.66	22.94	3.00
	18	11.50	1.58	13.71	1.83	16.24	2.14	17.45	2.30	18.08	2.39	20.38	2.71	22.94	3.04
	20	11.50	1.61	13.71	1.86	16.24	2.17	17.45	2.33	18.08	2.44	20.38	2.75	22.94	3.10
	21	11.50	1.61	13.71	1.88	16.24	2.19	17.45	2.36	18.08	2.46	20.38	2.78	22.94	3.15
	23	11.50	1.63	13.71	1.90	16.24	2.23	17.45	2.40	18.08	2.51	20.38	2.82	22.94	3.21
	25	11.50	1.66	13.71	1.94	16.24	2.28	17.45	2.45	18.08	2.59	20.38	2.97	22.94	3.42
	27	11.50	1.69	13.71	2.01	16.24	2.40	17.45	2.61	18.08	2.74	20.38	3.17	22.94	3.65
	29	11.50	1.78	13.71	2.13	16.24	2.55	17.45	2.77	18.08	2.92	20.38	3.36	22.94	3.89
31	11.50	1.88	13.71	2.25	16.24	2.70	17.45	2.94	18.08	3.11	20.38	3.57	22.94	4.14	
33	11.50	2.00	13.71	2.39	16.24	2.87	17.45	3.11	18.08	3.30	20.38	3.80	22.94	4.40	
35	11.50	2.11	13.71	2.52	16.24	3.03	17.45	3.30	18.08	3.48	20.38	4.04	22.94	4.66	
37	11.50	2.22	13.71	2.67	16.24	3.21	17.45	3.49	18.08	3.70	20.38	4.29	22.94	4.95	
39	11.50	2.35	13.71	2.80	16.24	3.39	17.45	3.70	18.08	3.91	20.38	4.55	22.94	5.26	
41	11.50	2.44	13.71	2.93	16.24	3.52	17.45	3.86	18.08	4.09	20.38	4.79	22.94	5.50	
43	11.50	2.60	13.71	3.13	16.24	3.64	17.45	4.04	18.08	4.20	20.38	5.02	22.94	5.77	
46	11.50	2.66	13.71	3.21	16.24	3.88	17.45	4.36	18.08	4.37	20.38	5.52	22.94	6.23	
48	11.50	2.71	13.71	3.29	16.24	4.10	17.45	4.64	18.08	4.57	20.38	5.93	22.94	6.73	
50	10.93	2.64	13.03	3.18	15.43	3.98	16.58	4.50	17.18	4.44	19.36	5.76	21.79	6.53	
52	10.27	2.54	12.25	3.06	14.51	3.82	15.58	4.34	16.15	4.26	18.20	5.55	20.49	6.29	
55	9.65	2.43	11.51	2.95	13.64	3.68	14.65	4.16	15.18	4.11	17.10	5.33	19.26	6.03	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table2-8.4:14HP Cooling capacity(continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	14.01	1.41	16.56	1.61	19.42	1.87	20.36	1.91	21.89	2.04	24.35	2.30	27.34	2.51
	-10	14.01	1.52	16.56	1.74	19.42	2.01	20.36	2.07	21.89	2.21	24.35	2.49	27.34	2.71
	-5	14.01	1.64	16.56	1.88	19.42	2.18	20.36	2.23	21.89	2.39	24.35	2.69	27.34	2.93
	-2	14.01	1.65	16.56	1.93	19.42	2.20	20.36	2.26	21.89	2.43	24.35	2.72	27.34	2.96
	0	14.01	1.69	16.56	1.95	19.42	2.24	20.36	2.31	21.89	2.46	24.35	2.76	27.34	3.01
	2	14.01	1.70	16.56	1.97	19.42	2.28	20.36	2.34	21.89	2.50	24.35	2.78	27.34	3.07
	4	14.01	1.72	16.56	2.01	19.42	2.31	20.36	2.36	21.89	2.55	24.35	2.84	27.34	3.14
	6	14.01	1.76	16.56	2.05	19.42	2.34	20.36	2.41	21.89	2.58	24.35	2.89	27.34	3.24
	8	14.01	1.79	16.56	2.08	19.42	2.38	20.36	2.47	21.89	2.64	24.35	2.95	27.34	3.33
	10	14.01	1.83	16.56	2.10	19.42	2.42	20.36	2.50	21.89	2.70	24.35	3.01	27.34	3.40
	12	14.01	1.84	16.56	2.13	19.42	2.47	20.36	2.56	21.89	2.76	24.35	3.07	27.34	3.45
	14	14.01	1.86	16.56	2.15	19.42	2.48	20.36	2.61	21.89	2.81	24.35	3.12	27.34	3.52
	16	14.01	1.89	16.56	2.18	19.42	2.52	20.36	2.66	21.89	2.84	24.35	3.17	27.34	3.58
	18	14.01	1.93	16.56	2.21	19.42	2.56	20.36	2.70	21.89	2.89	24.35	3.22	27.34	3.64
	20	14.01	1.95	16.56	2.25	19.42	2.60	20.36	2.73	21.89	2.94	24.35	3.28	27.34	3.70
	21	14.01	1.97	16.56	2.28	19.42	2.64	20.36	2.75	21.89	2.98	24.35	3.32	27.34	3.74
	23	14.01	1.99	16.56	2.30	19.42	2.68	20.36	2.81	21.89	3.03	24.35	3.39	27.34	3.83
	25	14.01	2.02	16.56	2.34	19.42	2.73	20.36	2.87	21.89	3.13	24.35	3.55	27.34	4.08
	27	14.01	2.06	16.56	2.44	19.42	2.88	20.36	3.06	21.89	3.31	24.35	3.77	27.34	4.35
	29	14.01	2.18	16.56	2.57	19.42	3.06	20.36	3.23	21.89	3.53	24.35	4.01	27.34	4.64
31	14.01	2.30	16.56	2.72	19.42	3.24	20.36	3.45	21.89	3.75	24.35	4.27	27.34	4.95	
33	14.01	2.43	16.56	2.89	19.42	3.46	20.36	3.63	21.89	3.97	24.35	4.55	27.34	5.25	
35	14.01	2.57	16.56	3.05	19.42	3.63	20.36	3.84	21.89	4.21	24.35	4.82	27.34	5.57	
37	14.01	2.70	16.56	3.22	19.42	3.85	20.36	4.07	21.89	4.46	24.35	5.12	27.34	5.91	
39	14.01	2.85	16.56	3.40	19.42	4.08	20.36	4.33	21.89	4.72	24.35	5.41	27.34	6.30	
41	14.01	2.97	16.56	3.55	19.42	4.22	20.36	4.52	21.89	4.93	24.35	5.71	27.34	6.57	
43	14.01	3.17	16.56	3.78	19.42	4.36	20.36	4.74	21.89	5.06	24.35	6.02	27.34	6.87	
46	14.01	3.24	16.56	3.88	19.42	4.67	20.36	5.11	21.89	5.29	24.35	6.60	27.34	7.45	
48	14.01	3.30	16.56	3.98	19.42	4.91	20.36	5.45	21.89	5.51	24.35	7.11	27.34	8.03	
50	13.31	3.20	15.74	3.87	18.45	4.79	19.34	5.30	20.80	5.37	23.13	6.90	25.97	7.79	
52	12.51	3.08	14.79	3.71	17.35	4.59	18.18	5.07	19.55	5.16	21.75	6.63	24.41	7.48	
55	11.76	2.97	13.90	3.56	16.31	4.40	17.09	4.88	18.38	4.96	20.44	6.38	22.95	7.20	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table 2-8.5: 16HP Cooling capacity (continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	15.77	1.67	18.49	1.90	21.41	2.17	23.12	2.30	24.54	2.43	27.49	2.76	30.37	2.94
	-10	15.77	1.81	18.49	2.04	21.41	2.35	23.12	2.49	24.54	2.62	27.49	2.98	30.37	3.17
	-5	15.77	1.95	18.49	2.21	21.41	2.54	23.12	2.69	24.54	2.83	27.49	3.22	30.37	3.42
	-2	15.77	1.97	18.49	2.25	21.41	2.56	23.12	2.73	24.54	2.89	27.49	3.26	30.37	3.47
	0	15.77	2.00	18.49	2.29	21.41	2.60	23.12	2.77	24.54	2.91	27.49	3.32	30.37	3.53
	2	15.77	2.03	18.49	2.32	21.41	2.65	23.12	2.81	24.54	2.97	27.49	3.33	30.37	3.60
	4	15.77	2.05	18.49	2.36	21.41	2.68	23.12	2.84	24.54	3.03	27.49	3.42	30.37	3.70
	6	15.77	2.07	18.49	2.40	21.41	2.72	23.12	2.91	24.54	3.09	27.49	3.46	30.37	3.81
	8	15.77	2.13	18.49	2.44	21.41	2.77	23.12	2.96	24.54	3.11	27.49	3.52	30.37	3.92
	10	15.77	2.18	18.49	2.47	21.41	2.81	23.12	3.02	24.54	3.21	27.49	3.62	30.37	3.99
	12	15.77	2.19	18.49	2.50	21.41	2.85	23.12	3.07	24.54	3.29	27.49	3.67	30.37	4.05
	14	15.77	2.23	18.49	2.52	21.41	2.89	23.12	3.13	24.54	3.34	27.49	3.74	30.37	4.14
	16	15.77	2.26	18.49	2.55	21.41	2.94	23.12	3.18	24.54	3.37	27.49	3.79	30.37	4.20
	18	15.77	2.29	18.49	2.60	21.41	2.99	23.12	3.23	24.54	3.43	27.49	3.87	30.37	4.28
	20	15.77	2.32	18.49	2.64	21.41	3.04	23.12	3.28	24.54	3.50	27.49	3.94	30.37	4.35
	21	15.77	2.34	18.49	2.67	21.41	3.06	23.12	3.31	24.54	3.53	27.49	3.99	30.37	4.40
	23	15.77	2.37	18.49	2.70	21.41	3.11	23.12	3.39	24.54	3.60	27.49	4.05	30.37	4.50
	25	15.77	2.40	18.49	2.76	21.41	3.17	23.12	3.44	24.54	3.72	27.49	4.25	30.37	4.81
	27	15.77	2.45	18.49	2.85	21.41	3.34	23.12	3.67	24.54	3.94	27.49	4.53	30.37	5.13
	29	15.77	2.58	18.49	3.01	21.41	3.55	23.12	3.89	24.54	4.20	27.49	4.81	30.37	5.46
31	15.77	2.73	18.49	3.19	21.41	3.76	23.12	4.13	24.54	4.45	27.49	5.13	30.37	5.80	
33	15.77	2.89	18.49	3.38	21.41	4.01	23.12	4.37	24.54	4.71	27.49	5.45	30.37	6.15	
35	15.77	3.06	18.49	3.58	21.41	4.21	23.12	4.64	24.54	4.99	27.49	5.77	30.37	6.55	
37	15.77	3.22	18.49	3.78	21.41	4.47	23.12	4.90	24.54	5.30	27.49	6.13	30.37	6.96	
39	15.77	3.40	18.49	3.99	21.41	4.74	23.12	5.19	24.54	5.61	27.49	6.50	30.37	7.39	
41	15.77	3.53	18.49	4.15	21.41	4.90	23.12	5.45	24.54	5.87	27.49	6.84	30.37	7.72	
43	15.77	3.76	18.49	4.44	21.41	5.08	23.12	5.67	24.54	6.03	27.49	7.19	30.37	8.09	
46	15.77	3.86	18.49	4.57	21.41	5.42	23.12	6.11	24.54	6.28	27.49	7.89	30.37	8.76	
48	15.77	3.93	18.49	4.67	21.41	5.71	23.12	6.52	24.54	6.57	27.49	8.49	30.37	9.41	
50	14.98	3.82	17.56	4.54	20.34	5.55	21.97	6.35	23.31	6.39	26.12	8.26	28.86	9.15	
52	14.08	3.67	16.51	4.36	19.12	5.34	20.65	6.10	21.91	6.13	24.55	7.94	27.12	8.82	
55	13.24	3.52	15.52	4.19	17.98	5.12	19.41	5.86	20.60	5.91	23.08	7.65	25.50	8.46	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table2-8.6:18HP Cooling capacity(continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	17.25	1.79	21.02	2.12	23.89	2.38	25.97	2.53	27.42	2.66	30.63	3.02	34.12	3.26
	-10	17.25	1.94	21.02	2.29	23.89	2.58	25.97	2.74	27.42	2.87	30.63	3.27	34.12	3.51
	-5	17.25	2.09	21.02	2.47	23.89	2.78	25.97	2.95	27.42	3.10	30.63	3.52	34.12	3.79
	-2	17.25	2.11	21.02	2.52	23.89	2.82	25.97	3.00	27.42	3.16	30.63	3.57	34.12	3.85
	0	17.25	2.15	21.02	2.56	23.89	2.86	25.97	3.04	27.42	3.19	30.63	3.62	34.12	3.91
	2	17.25	2.17	21.02	2.60	23.89	2.91	25.97	3.10	27.42	3.25	30.63	3.63	34.12	3.97
	4	17.25	2.19	21.02	2.63	23.89	2.94	25.97	3.12	27.42	3.31	30.63	3.72	34.12	4.07
	6	17.25	2.23	21.02	2.68	23.89	2.99	25.97	3.19	27.42	3.37	30.63	3.79	34.12	4.22
	8	17.25	2.29	21.02	2.72	23.89	3.03	25.97	3.26	27.42	3.42	30.63	3.85	34.12	4.35
	10	17.25	2.34	21.02	2.76	23.89	3.09	25.97	3.32	27.42	3.52	30.63	3.94	34.12	4.40
	12	17.25	2.34	21.02	2.78	23.89	3.13	25.97	3.39	27.42	3.59	30.63	4.01	34.12	4.47
	14	17.25	2.39	21.02	2.83	23.89	3.18	25.97	3.46	27.42	3.64	30.63	4.08	34.12	4.57
	16	17.25	2.42	21.02	2.86	23.89	3.23	25.97	3.52	27.42	3.69	30.63	4.16	34.12	4.62
	18	17.25	2.46	21.02	2.91	23.89	3.27	25.97	3.57	27.42	3.76	30.63	4.23	34.12	4.72
	20	17.25	2.49	21.02	2.96	23.89	3.33	25.97	3.62	27.42	3.84	30.63	4.31	34.12	4.82
	21	17.25	2.51	21.02	2.99	23.89	3.36	25.97	3.65	27.42	3.88	30.63	4.35	34.12	4.85
	23	17.25	2.54	21.02	3.02	23.89	3.41	25.97	3.73	27.42	3.93	30.63	4.42	34.12	4.96
	25	17.25	2.57	21.02	3.07	23.89	3.49	25.97	3.79	27.42	4.06	30.63	4.64	34.12	5.31
	27	17.25	2.62	21.02	3.19	23.89	3.68	25.97	4.04	27.42	4.32	30.63	4.94	34.12	5.63
	29	17.25	2.77	21.02	3.37	23.89	3.89	25.97	4.29	27.42	4.60	30.63	5.27	34.12	6.02
31	17.25	2.92	21.02	3.57	23.89	4.12	25.97	4.55	27.42	4.87	30.63	5.60	34.12	6.42	
33	17.25	3.10	21.02	3.79	23.89	4.38	25.97	4.82	27.42	5.18	30.63	5.95	34.12	6.80	
35	17.25	3.27	21.02	4.00	23.89	4.62	25.97	5.10	27.42	5.46	30.63	6.30	34.12	7.21	
37	17.25	3.46	21.02	4.23	23.89	4.91	25.97	5.42	27.42	5.80	30.63	6.68	34.12	7.68	
39	17.25	3.64	21.02	4.46	23.89	5.20	25.97	5.74	27.42	6.15	30.63	7.11	34.12	8.15	
41	17.25	3.79	21.02	4.65	23.89	5.39	25.97	5.99	27.42	6.42	30.63	7.48	34.12	8.53	
43	17.25	4.04	21.02	4.98	23.89	5.56	25.97	6.26	27.42	6.58	30.63	7.85	34.12	8.91	
46	17.25	4.15	21.02	5.08	23.89	5.94	25.97	6.73	27.42	6.86	30.63	8.64	34.12	9.68	
48	17.25	4.21	21.02	5.22	23.89	6.26	25.97	7.19	27.42	7.19	30.63	9.31	34.12	10.41	
50	16.39	4.11	19.97	5.07	22.69	6.10	24.67	7.00	26.05	7.00	29.10	9.02	32.42	10.10	
52	15.41	3.95	18.77	4.87	21.33	5.86	23.19	6.72	24.49	6.72	27.35	8.70	30.47	9.70	
55	14.48	3.78	17.65	4.69	20.05	5.62	21.80	6.45	23.02	6.44	25.71	8.33	28.64	9.35	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table 2-8. 7:20HP Cooling capacity(continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	19.69	2.16	23.50	2.50	26.96	2.83	28.81	2.97	30.42	3.11	34.36	3.57	38.35	3.85
	-10	19.69	2.32	23.50	2.69	26.96	3.06	28.81	3.20	30.42	3.35	34.36	3.85	38.35	4.15
	-5	19.69	2.51	23.50	2.91	26.96	3.30	28.81	3.46	30.42	3.62	34.36	4.15	38.35	4.48
	-2	19.69	2.54	23.50	2.97	26.96	3.33	28.81	3.51	30.42	3.68	34.36	4.19	38.35	4.53
	0	19.69	2.58	23.50	3.01	26.96	3.40	28.81	3.54	30.42	3.73	34.36	4.27	38.35	4.61
	2	19.69	2.62	23.50	3.05	26.96	3.46	28.81	3.61	30.42	3.79	34.36	4.29	38.35	4.72
	4	19.69	2.64	23.50	3.10	26.96	3.49	28.81	3.65	30.42	3.87	34.36	4.39	38.35	4.83
	6	19.69	2.69	23.50	3.15	26.96	3.55	28.81	3.74	30.42	3.95	34.36	4.46	38.35	4.98
	8	19.69	2.75	23.50	3.21	26.96	3.61	28.81	3.81	30.42	4.00	34.36	4.54	38.35	5.13
	10	19.69	2.81	23.50	3.24	26.96	3.66	28.81	3.87	30.42	4.11	34.36	4.65	38.35	5.21
	12	19.69	2.83	23.50	3.28	26.96	3.72	28.81	3.97	30.42	4.19	34.36	4.73	38.35	5.28
	14	19.69	2.87	23.50	3.33	26.96	3.76	28.81	4.04	30.42	4.25	34.36	4.81	38.35	5.39
	16	19.69	2.91	23.50	3.37	26.96	3.83	28.81	4.09	30.42	4.32	34.36	4.91	38.35	5.49
	18	19.69	2.96	23.50	3.43	26.96	3.90	28.81	4.16	30.42	4.40	34.36	4.98	38.35	5.58
	20	19.69	3.00	23.50	3.48	26.96	3.95	28.81	4.21	30.42	4.49	34.36	5.08	38.35	5.69
	21	19.69	3.02	23.50	3.52	26.96	4.00	28.81	4.27	30.42	4.52	34.36	5.13	38.35	5.74
	23	19.69	3.07	23.50	3.56	26.96	4.05	28.81	4.34	30.42	4.61	34.36	5.23	38.35	5.88
	25	19.69	3.10	23.50	3.61	26.96	4.15	28.81	4.43	30.42	4.74	34.36	5.48	38.35	6.27
	27	19.69	3.16	23.50	3.77	26.96	4.37	28.81	4.73	30.42	5.03	34.36	5.83	38.35	6.69
	29	19.69	3.34	23.50	3.97	26.96	4.64	28.81	5.01	30.42	5.35	34.36	6.21	38.35	7.13
31	19.69	3.52	23.50	4.21	26.96	4.91	28.81	5.31	30.42	5.71	34.36	6.62	38.35	7.58	
33	19.69	3.73	23.50	4.46	26.96	5.23	28.81	5.63	30.42	6.03	34.36	7.03	38.35	8.04	
35	19.69	3.95	23.50	4.70	26.96	5.50	28.81	5.97	30.42	6.38	34.36	7.47	38.35	8.56	
37	19.69	4.15	23.50	4.97	26.96	5.85	28.81	6.32	30.42	6.77	34.36	7.89	38.35	9.08	
39	19.69	4.39	23.50	5.27	26.96	6.17	28.81	6.68	30.42	7.19	34.36	8.39	38.35	9.65	
41	19.69	4.57	23.50	5.49	26.96	6.40	28.81	6.99	30.42	7.52	34.36	8.82	38.35	10.09	
43	19.69	4.87	23.50	5.84	26.96	6.60	28.81	7.30	30.42	7.69	34.36	9.29	38.35	10.56	
46	19.69	4.98	23.50	6.02	26.96	7.05	28.81	7.88	30.42	8.00	34.36	10.19	38.35	11.42	
48	19.69	5.06	23.50	6.14	26.96	7.47	28.81	8.40	30.42	8.40	34.36	10.97	38.35	12.31	
50	18.70	4.92	22.32	5.97	25.61	7.24	27.37	8.17	28.90	8.14	32.64	10.64	36.43	11.93	
52	17.58	4.73	20.98	5.75	24.07	6.96	25.72	7.85	27.17	7.84	30.69	10.24	34.24	11.48	
55	16.53	4.56	19.73	5.52	22.63	6.69	24.18	7.54	25.54	7.55	28.84	9.83	32.19	11.04	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table2-8.8:22HP Cooling capacity(continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	21.44	2.54	25.76	2.95	29.43	3.35	31.69	3.51	34.03	3.76	37.79	4.23	42.04	4.56
	-10	21.44	2.74	25.76	3.19	29.43	3.61	31.69	3.81	34.03	4.07	37.79	4.57	42.04	4.93
	-5	21.44	2.96	25.76	3.45	29.43	3.90	31.69	4.11	34.03	4.39	37.79	4.93	42.04	5.30
	-2	21.44	2.98	25.76	3.51	29.43	3.95	31.69	4.17	34.03	4.47	37.79	5.00	42.04	5.39
	0	21.44	3.03	25.76	3.58	29.43	4.01	31.69	4.23	34.03	4.52	37.79	5.08	42.04	5.47
	2	21.44	3.07	25.76	3.62	29.43	4.08	31.69	4.29	34.03	4.60	37.79	5.10	42.04	5.57
	4	21.44	3.11	25.76	3.68	29.43	4.12	31.69	4.34	34.03	4.68	37.79	5.24	42.04	5.72
	6	21.44	3.16	25.76	3.74	29.43	4.20	31.69	4.43	34.03	4.77	37.79	5.31	42.04	5.89
	8	21.44	3.25	25.76	3.80	29.43	4.25	31.69	4.53	34.03	4.84	37.79	5.41	42.04	6.09
	10	21.44	3.30	25.76	3.84	29.43	4.33	31.69	4.59	34.03	4.99	37.79	5.55	42.04	6.15
	12	21.44	3.33	25.76	3.90	29.43	4.39	31.69	4.70	34.03	5.07	37.79	5.65	42.04	6.26
	14	21.44	3.38	25.76	3.94	29.43	4.43	31.69	4.81	34.03	5.15	37.79	5.74	42.04	6.39
	16	21.44	3.43	25.76	4.00	29.43	4.53	31.69	4.86	34.03	5.24	37.79	5.85	42.04	6.49
	18	21.44	3.48	25.76	4.08	29.43	4.60	31.69	4.94	34.03	5.33	37.79	5.94	42.04	6.61
	20	21.44	3.52	25.76	4.13	29.43	4.68	31.69	5.01	34.03	5.44	37.79	6.03	42.04	6.72
	21	21.44	3.54	25.76	4.17	29.43	4.71	31.69	5.07	34.03	5.47	37.79	6.09	42.04	6.82
	23	21.44	3.59	25.76	4.23	29.43	4.79	31.69	5.16	34.03	5.56	37.79	6.21	42.04	6.95
	25	21.44	3.64	25.76	4.29	29.43	4.89	31.69	5.27	34.03	5.75	37.79	6.54	42.04	7.43
	27	21.44	3.72	25.76	4.46	29.43	5.16	31.69	5.62	34.03	6.08	37.79	6.95	42.04	7.89
	29	21.44	3.92	25.76	4.72	29.43	5.47	31.69	5.95	34.03	6.51	37.79	7.37	42.04	8.41
	31	21.44	4.14	25.76	4.98	29.43	5.79	31.69	6.32	34.03	6.90	37.79	7.85	42.04	8.98
33	21.44	4.39	25.76	5.29	29.43	6.15	31.69	6.67	34.03	7.31	37.79	8.35	42.04	9.54	
35	21.44	4.62	25.76	5.59	29.43	6.49	31.69	7.08	34.03	7.74	37.79	8.86	42.04	10.12	
37	21.44	4.87	25.76	5.91	29.43	6.88	31.69	7.49	34.03	8.20	37.79	9.39	42.04	10.75	
39	21.44	5.15	25.76	6.22	29.43	7.29	31.69	7.93	34.03	8.72	37.79	9.97	42.04	11.41	
41	21.44	5.37	25.76	6.49	29.43	7.55	31.69	8.30	34.03	9.06	37.79	10.51	42.04	11.95	
43	21.44	5.70	25.76	6.94	29.43	7.79	31.69	8.68	34.03	9.33	37.79	11.01	42.04	12.49	
46	21.44	5.87	25.76	7.14	29.43	8.35	31.69	9.36	34.03	9.70	37.79	12.07	42.04	13.57	
48	21.44	5.96	25.76	7.29	29.43	8.80	31.69	9.99	34.03	10.17	37.79	13.06	42.04	14.56	
50	20.37	5.80	24.47	7.08	27.96	8.55	30.10	9.69	32.33	9.90	35.90	12.69	39.94	14.13	
52	19.15	5.57	23.00	6.81	26.28	8.20	28.30	9.32	30.39	9.50	33.75	12.18	37.54	13.58	
55	18.00	5.34	21.62	6.53	24.70	7.88	26.60	8.98	28.57	9.13	31.73	11.71	35.29	13.05	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table2-8.9:24HP Cooling capacity(continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	23.00	2.66	27.48	3.08	32.39	3.60	34.46	3.74	36.94	3.97	41.47	4.53	46.09	4.88
	-10	23.00	2.88	27.48	3.32	32.39	3.87	34.46	4.04	36.94	4.28	41.47	4.89	46.09	5.27
	-5	23.00	3.10	27.48	3.59	32.39	4.20	34.46	4.37	36.94	4.64	41.47	5.28	46.09	5.67
	-2	23.00	3.12	27.48	3.66	32.39	4.23	34.46	4.43	36.94	4.71	41.47	5.36	46.09	5.77
	0	23.00	3.19	27.48	3.72	32.39	4.31	34.46	4.48	36.94	4.78	41.47	5.43	46.09	5.86
	2	23.00	3.22	27.48	3.77	32.39	4.39	34.46	4.56	36.94	4.85	41.47	5.46	46.09	5.98
	4	23.00	3.26	27.48	3.83	32.39	4.44	34.46	4.61	36.94	4.94	41.47	5.58	46.09	6.13
	6	23.00	3.31	27.48	3.89	32.39	4.51	34.46	4.72	36.94	5.04	41.47	5.67	46.09	6.29
	8	23.00	3.39	27.48	3.97	32.39	4.58	34.46	4.83	36.94	5.10	41.47	5.77	46.09	6.50
	10	23.00	3.47	27.48	4.01	32.39	4.66	34.46	4.91	36.94	5.26	41.47	5.93	46.09	6.60
	12	23.00	3.49	27.48	4.05	32.39	4.73	34.46	4.99	36.94	5.36	41.47	6.05	46.09	6.70
	14	23.00	3.54	27.48	4.10	32.39	4.79	34.46	5.11	36.94	5.45	41.47	6.13	46.09	6.85
	16	23.00	3.59	27.48	4.17	32.39	4.87	34.46	5.17	36.94	5.52	41.47	6.24	46.09	6.96
	18	23.00	3.65	27.48	4.25	32.39	4.96	34.46	5.26	36.94	5.62	41.47	6.36	46.09	7.06
	20	23.00	3.71	27.48	4.29	32.39	5.03	34.46	5.34	36.94	5.74	41.47	6.46	46.09	7.22
	21	23.00	3.73	27.48	4.35	32.39	5.08	34.46	5.37	36.94	5.78	41.47	6.53	46.09	7.30
	23	23.00	3.77	27.48	4.40	32.39	5.15	34.46	5.50	36.94	5.90	41.47	6.63	46.09	7.44
	25	23.00	3.82	27.48	4.47	32.39	5.26	34.46	5.60	36.94	6.07	41.47	6.99	46.09	7.94
	27	23.00	3.90	27.48	4.65	32.39	5.54	34.46	5.97	36.94	6.44	41.47	7.42	46.09	8.47
	29	23.00	4.12	27.48	4.91	32.39	5.87	34.46	6.33	36.94	6.85	41.47	7.90	46.09	9.03
	31	23.00	4.35	27.48	5.20	32.39	6.24	34.46	6.71	36.94	7.30	41.47	8.40	46.09	9.60
33	23.00	4.59	27.48	5.52	32.39	6.63	34.46	7.10	36.94	7.72	41.47	8.91	46.09	10.19	
35	23.00	4.87	27.48	5.82	32.39	6.99	34.46	7.51	36.94	8.19	41.47	9.49	46.09	10.84	
37	23.00	5.12	27.48	6.16	32.39	7.43	34.46	7.97	36.94	8.68	41.47	10.04	46.09	11.50	
39	23.00	5.40	27.48	6.49	32.39	7.85	34.46	8.46	36.94	9.19	41.47	10.66	46.09	12.21	
41	23.00	5.63	27.48	6.79	32.39	8.12	34.46	8.84	36.94	9.60	41.47	11.26	46.09	12.79	
43	23.00	5.99	27.48	7.24	32.39	8.42	34.46	9.24	36.94	9.86	41.47	11.79	46.09	13.38	
46	23.00	6.13	27.48	7.43	32.39	8.95	34.46	9.94	36.94	10.24	41.47	12.95	46.09	14.54	
48	23.00	6.26	27.48	7.61	32.39	9.48	34.46	10.62	36.94	10.76	41.47	13.93	46.09	15.61	
50	21.85	6.09	26.11	7.37	30.77	9.21	32.74	10.30	35.09	10.46	39.39	13.59	43.78	15.18	
52	20.54	5.84	24.54	7.09	28.92	8.83	30.78	9.88	32.99	10.04	37.03	13.02	41.16	14.59	
55	19.31	5.62	23.07	6.83	27.19	8.49	28.93	9.54	31.01	9.64	34.81	12.52	38.69	14.02	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table2-8.10:26HP Cooling capacity(continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	25.55	3.00	30.64	3.48	34.98	3.92	37.55	4.13	40.31	4.40	44.37	4.93	50.58	5.42
	-10	25.55	3.24	30.64	3.75	34.98	4.24	37.55	4.45	40.31	4.75	44.37	5.32	50.58	5.86
	-5	25.55	3.51	30.64	4.05	34.98	4.58	37.55	4.82	40.31	5.13	44.37	5.75	50.58	6.31
	-2	25.55	3.52	30.64	4.13	34.98	4.64	37.55	4.89	40.31	5.23	44.37	5.80	50.58	6.42
	0	25.55	3.58	30.64	4.21	34.98	4.71	37.55	4.95	40.31	5.30	44.37	5.92	50.58	6.53
	2	25.55	3.64	30.64	4.25	34.98	4.80	37.55	5.05	40.31	5.39	44.37	5.93	50.58	6.65
	4	25.55	3.67	30.64	4.33	34.98	4.85	37.55	5.10	40.31	5.50	44.37	6.08	50.58	6.82
	6	25.55	3.73	30.64	4.38	34.98	4.93	37.55	5.21	40.31	5.59	44.37	6.17	50.58	7.02
	8	25.55	3.82	30.64	4.48	34.98	5.01	37.55	5.31	40.31	5.69	44.37	6.28	50.58	7.26
	10	25.55	3.90	30.64	4.53	34.98	5.08	37.55	5.40	40.31	5.83	44.37	6.44	50.58	7.35
	12	25.55	3.93	30.64	4.58	34.98	5.17	37.55	5.53	40.31	5.95	44.37	6.54	50.58	7.47
	14	25.55	4.00	30.64	4.64	34.98	5.23	37.55	5.62	40.31	6.05	44.37	6.68	50.58	7.61
	16	25.55	4.05	30.64	4.69	34.98	5.32	37.55	5.73	40.31	6.11	44.37	6.79	50.58	7.72
	18	25.55	4.11	30.64	4.78	34.98	5.40	37.55	5.81	40.31	6.23	44.37	6.90	50.58	7.88
	20	25.55	4.18	30.64	4.85	34.98	5.48	37.55	5.90	40.31	6.36	44.37	7.01	50.58	8.03
	21	25.55	4.20	30.64	4.90	34.98	5.54	37.55	5.94	40.31	6.43	44.37	7.10	50.58	8.11
	23	25.55	4.26	30.64	4.96	34.98	5.62	37.55	6.07	40.31	6.55	44.37	7.23	50.58	8.30
	25	25.55	4.33	30.64	5.05	34.98	5.75	37.55	6.17	40.31	6.76	44.37	7.57	50.58	8.84
	27	25.55	4.41	30.64	5.26	34.98	6.04	37.55	6.60	40.31	7.13	44.37	8.06	50.58	9.44
	29	25.55	4.65	30.64	5.54	34.98	6.45	37.55	7.00	40.31	7.63	44.37	8.58	50.58	10.02
	31	25.55	4.90	30.64	5.85	34.98	6.79	37.55	7.43	40.31	8.09	44.37	9.12	50.58	10.67
	33	25.55	5.19	30.64	6.20	34.98	7.25	37.55	7.84	40.31	8.58	44.37	9.73	50.58	11.34
	35	25.55	5.49	30.64	6.55	34.98	7.64	37.55	8.30	40.31	9.07	44.37	10.31	50.58	12.07
	37	25.55	5.78	30.64	6.95	34.98	8.09	37.55	8.79	40.31	9.64	44.37	10.94	50.58	12.83
39	25.55	6.10	30.64	7.33	34.98	8.54	37.55	9.35	40.31	10.23	44.37	11.60	50.58	13.59	
41	25.55	6.34	30.64	7.64	34.98	8.89	37.55	9.75	40.31	10.65	44.37	12.21	50.58	14.24	
43	25.55	6.76	30.64	8.16	34.98	9.19	37.55	10.19	40.31	10.92	44.37	12.83	50.58	14.88	
46	25.55	6.93	30.64	8.38	34.98	9.79	37.55	10.99	40.31	11.38	44.37	14.08	50.58	16.18	
48	25.55	7.04	30.64	8.56	34.98	10.33	37.55	11.73	40.31	11.92	44.37	15.17	50.58	17.39	
50	24.28	6.84	29.11	8.34	33.23	10.05	35.68	11.41	38.29	11.61	42.15	14.73	48.05	16.84	
52	22.82	6.58	27.37	8.00	31.24	9.64	33.54	10.94	35.99	11.15	39.62	14.16	45.16	16.22	
55	21.45	6.33	25.72	7.69	29.37	9.29	31.52	10.51	33.83	10.71	37.24	13.58	42.45	15.61	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table 2-8.11: 28HP Cooling capacity (continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	27.29	3.39	32.39	3.90	38.31	4.56	40.16	4.69	43.63	5.05	48.71	5.72	53.14	6.03
	-10	27.29	3.67	32.39	4.21	38.31	4.94	40.16	5.07	43.63	5.47	48.71	6.19	53.14	6.52
	-5	27.29	3.95	32.39	4.55	38.31	5.33	40.16	5.45	43.63	5.90	48.71	6.67	53.14	7.05
	-2	27.29	3.98	32.39	4.63	38.31	5.40	40.16	5.54	43.63	5.98	48.71	6.78	53.14	7.14
	0	27.29	4.05	32.39	4.72	38.31	5.49	40.16	5.60	43.63	6.07	48.71	6.89	53.14	7.27
	2	27.29	4.12	32.39	4.77	38.31	5.57	40.16	5.70	43.63	6.18	48.71	6.91	53.14	7.41
	4	27.29	4.15	32.39	4.84	38.31	5.64	40.16	5.76	43.63	6.29	48.71	7.09	53.14	7.59
	6	27.29	4.22	32.39	4.92	38.31	5.72	40.16	5.91	43.63	6.41	48.71	7.21	53.14	7.83
	8	27.29	4.32	32.39	5.01	38.31	5.82	40.16	6.02	43.63	6.51	48.71	7.32	53.14	8.05
	10	27.29	4.42	32.39	5.07	38.31	5.90	40.16	6.11	43.63	6.68	48.71	7.50	53.14	8.21
	12	27.29	4.44	32.39	5.13	38.31	6.00	40.16	6.24	43.63	6.80	48.71	7.62	53.14	8.34
	14	27.29	4.51	32.39	5.19	38.31	6.08	40.16	6.37	43.63	6.90	48.71	7.75	53.14	8.49
	16	27.29	4.57	32.39	5.28	38.31	6.18	40.16	6.48	43.63	7.03	48.71	7.89	53.14	8.61
	18	27.29	4.65	32.39	5.37	38.31	6.27	40.16	6.56	43.63	7.15	48.71	8.02	53.14	8.77
	20	27.29	4.71	32.39	5.44	38.31	6.38	40.16	6.66	43.63	7.29	48.71	8.17	53.14	8.96
	21	27.29	4.76	32.39	5.48	38.31	6.44	40.16	6.74	43.63	7.36	48.71	8.27	53.14	9.04
	23	27.29	4.80	32.39	5.57	38.31	6.55	40.16	6.88	43.63	7.50	48.71	8.39	53.14	9.23
	25	27.29	4.88	32.39	5.67	38.31	6.69	40.16	6.99	43.63	7.72	48.71	8.83	53.14	9.86
	27	27.29	4.98	32.39	5.88	38.31	7.04	40.16	7.45	43.63	8.17	48.71	9.42	53.14	10.52
	29	27.29	5.24	32.39	6.21	38.31	7.48	40.16	7.91	43.63	8.72	48.71	9.99	53.14	11.18
31	27.29	5.55	32.39	6.58	38.31	7.93	40.16	8.39	43.63	9.23	48.71	10.60	53.14	11.90	
33	27.29	5.87	32.39	6.98	38.31	8.41	40.16	8.88	43.63	9.85	48.71	11.32	53.14	12.67	
35	27.29	6.20	32.39	7.36	38.31	8.90	40.16	9.44	43.63	10.38	48.71	11.99	53.14	13.43	
37	27.29	6.52	32.39	7.80	38.31	9.41	40.16	9.97	43.63	11.02	48.71	12.71	53.14	14.29	
39	27.29	6.89	32.39	8.22	38.31	9.96	40.16	10.56	43.63	11.70	48.71	13.52	53.14	15.19	
41	27.29	7.17	32.39	8.57	38.31	10.33	40.16	11.07	43.63	12.22	48.71	14.23	53.14	15.85	
43	27.29	7.65	32.39	9.13	38.31	10.69	40.16	11.54	43.63	12.52	48.71	14.95	53.14	16.55	
46	27.29	7.84	32.39	9.38	38.31	11.38	40.16	12.42	43.63	13.02	48.71	16.35	53.14	18.01	
48	27.29	7.98	32.39	9.62	38.31	12.03	40.16	13.26	43.63	13.69	48.71	17.67	53.14	19.41	
50	25.93	7.76	30.77	9.32	36.39	11.66	38.15	12.91	41.45	13.26	46.28	17.18	50.48	18.81	
52	24.37	7.45	28.93	8.96	34.21	11.23	35.86	12.41	38.96	12.77	43.50	16.45	47.45	18.08	
55	22.91	7.15	27.19	8.64	32.16	10.79	33.71	11.94	36.63	12.25	40.89	15.86	44.60	17.38	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

Table2-8.12:30HP Cooling capacity(continued)

CR	Outdoor air temp. (°CDB)	Indoor air temp. (°C DB/WD)													
		20.8/14		23.3/16		25.8/18		27/19		28.2/20		30.7/22		32/24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-15	29.18	3.80	35.22	4.44	40.95	5.10	43.39	5.32	46.86	5.70	52.21	6.41	58.24	6.94
	-10	29.18	4.09	35.22	4.79	40.95	5.52	43.39	5.73	46.86	6.14	52.21	6.93	58.24	7.50
	-5	29.18	4.42	35.22	5.19	40.95	5.96	43.39	6.19	46.86	6.63	52.21	7.48	58.24	8.10
	-2	29.18	4.46	35.22	5.27	40.95	6.03	43.39	6.28	46.86	6.73	52.21	7.61	58.24	8.19
	0	29.18	4.54	35.22	5.37	40.95	6.14	43.39	6.36	46.86	6.82	52.21	7.72	58.24	8.33
	2	29.18	4.59	35.22	5.43	40.95	6.24	43.39	6.44	46.86	6.94	52.21	7.75	58.24	8.48
	4	29.18	4.64	35.22	5.54	40.95	6.30	43.39	6.53	46.86	7.07	52.21	7.94	58.24	8.70
	6	29.18	4.73	35.22	5.62	40.95	6.41	43.39	6.67	46.86	7.20	52.21	8.07	58.24	8.98
	8	29.18	4.85	35.22	5.72	40.95	6.50	43.39	6.84	46.86	7.31	52.21	8.18	58.24	9.24
	10	29.18	4.95	35.22	5.77	40.95	6.63	43.39	6.92	46.86	7.51	52.21	8.39	58.24	9.38
	12	29.18	4.99	35.22	5.84	40.95	6.72	43.39	7.07	46.86	7.69	52.21	8.57	58.24	9.53
	14	29.18	5.05	35.22	5.92	40.95	6.81	43.39	7.23	46.86	7.78	52.21	8.71	58.24	9.73
	16	29.18	5.12	35.22	5.99	40.95	6.89	43.39	7.33	46.86	7.90	52.21	8.85	58.24	9.86
	18	29.18	5.22	35.22	6.12	40.95	7.02	43.39	7.44	46.86	8.05	52.21	9.02	58.24	10.07
	20	29.18	5.28	35.22	6.19	40.95	7.14	43.39	7.55	46.86	8.21	52.21	9.15	58.24	10.26
	21	29.18	5.32	35.22	6.25	40.95	7.20	43.39	7.63	46.86	8.29	52.21	9.26	58.24	10.36
	23	29.18	5.39	35.22	6.34	40.95	7.33	43.39	7.78	46.86	8.43	52.21	9.39	58.24	10.58
	25	29.18	5.45	35.22	6.45	40.95	7.47	43.39	7.93	46.86	8.69	52.21	9.92	58.24	11.28
	27	29.18	5.59	35.22	6.71	40.95	7.89	43.39	8.46	46.86	9.20	52.21	10.52	58.24	12.06
	29	29.18	5.85	35.22	7.08	40.95	8.35	43.39	8.97	46.86	9.80	52.21	11.24	58.24	12.82
31	29.18	6.20	35.22	7.47	40.95	8.84	43.39	9.53	46.86	10.43	52.21	11.93	58.24	13.68	
33	29.18	6.56	35.22	7.92	40.95	9.41	43.39	10.08	46.86	11.06	52.21	12.66	58.24	14.52	
35	29.18	6.94	35.22	8.38	40.95	9.95	43.39	10.68	46.86	11.72	52.21	13.44	58.24	15.38	
37	29.18	7.29	35.22	8.86	40.95	10.50	43.39	11.31	46.86	12.41	52.21	14.24	58.24	16.35	
39	29.18	7.70	35.22	9.37	40.95	11.12	43.39	11.99	46.86	13.19	52.21	15.10	58.24	17.39	
41	29.18	8.02	35.22	9.74	40.95	11.53	43.39	12.50	46.86	13.76	52.21	15.97	58.24	18.20	
43	29.18	8.57	35.22	10.43	40.95	11.91	43.39	13.06	46.86	14.08	52.21	16.72	58.24	19.04	
46	29.18	8.75	35.22	10.72	40.95	12.73	43.39	14.11	46.86	14.70	52.21	18.38	58.24	20.67	
48	29.18	8.94	35.22	10.95	40.95	13.42	43.39	15.05	46.86	15.37	52.21	19.81	58.24	22.20	
50	27.73	8.68	33.46	10.62	38.90	13.03	41.22	14.61	44.52	14.95	49.60	19.28	55.33	21.54	
52	26.06	8.35	31.45	10.23	36.56	12.56	38.74	14.05	41.85	14.37	46.62	18.46	52.01	20.76	
55	24.50	7.99	29.56	9.84	34.37	12.07	36.42	13.49	39.34	13.83	43.83	17.79	48.89	19.92	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition. Test standard: ISO 15042:2011.

8.2 Capacity Correction Factors for Piping Length and Level Difference

Figure 2-8.1: Rate of change cooling capacity

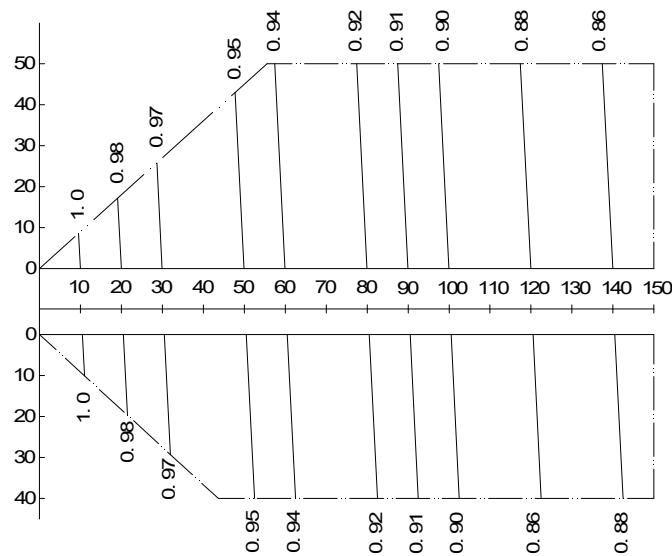
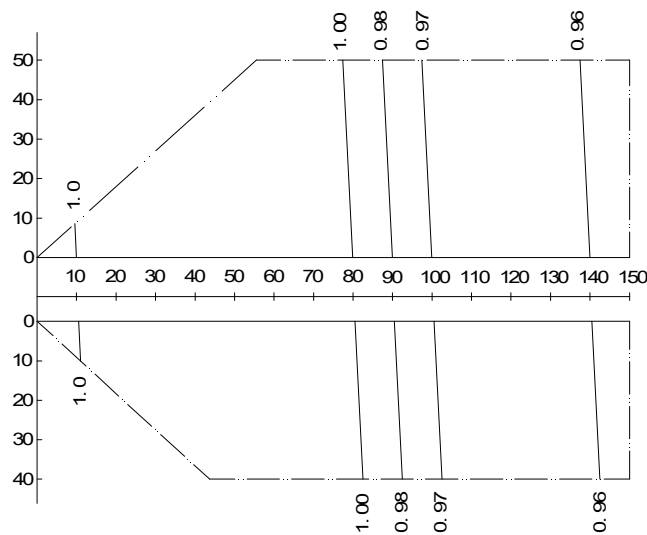


Figure 2-8.2: Rate of change in heating capacity



Notes:

1. The horizontal axis shows equivalent length of piping between farthest indoor unit and first outdoor branch joint; the vertical axis shows the largest level difference between indoor unit and outdoor unit. For level differences, positive values indicate that the outdoor unit is above the indoor unit, negative values indicate that the outdoor unit is below the indoor unit.
2. These figures illustrate the rate of change in capacity of a system with only standard indoor units at maximum load (with the thermostat set to maximum) under standard conditions. Under partial load conditions there is only a minor deviation from the rate of change in capacity shown in these figures.
3. The capacity of the system is either the total capacity of the indoor units obtained from indoor unit capacity tables or the corrected capacity of the outdoor units as per the calculations below, whichever is smaller.

Corrected capacity of outdoor units	=	Capacity of outdoor units obtained from outdoor unit capacity tables at the combination ratio	x	Capacity correction factor
-------------------------------------	---	---	---	----------------------------

8.3 Capacity Correction Factors for Frost Accumulation

The heating capacity tables do not take account of the reduction in capacity when frost has accumulated or while the defrosting operation is in progress. If snow has accumulated against the outside surface of the outdoor unit heat exchanger heating capacity is reduced. The reduction in heating capacity is dependent on a number of factors including the outdoor temperature, the relative humidity and the amount of frosting which has occurred.

Corrected heating capacity values, which take these factors into account, can be calculated as follows, using the correction factors for frost accumulation given in Table 2-8.27:

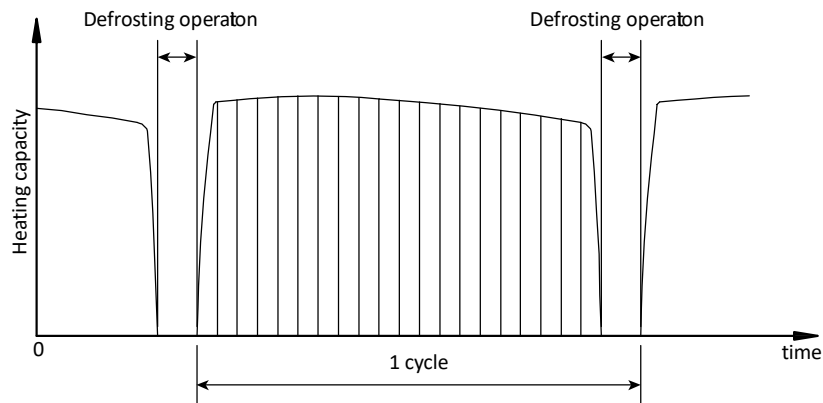
$$\text{Corrected heating capacity} = \text{Value given in outdoor heating capacity table} \times \text{Correction factor for frost accumulation}$$

Table 2-8.19: Correction factor for frost accumulation

Heat exchanger inlet port temperature (°C / RH 85%)	-7	-5	-2	0	2	5	7
Correction factor for frost accumulation	0.94	0.93	0.89	0.8	0.83	0.88	1

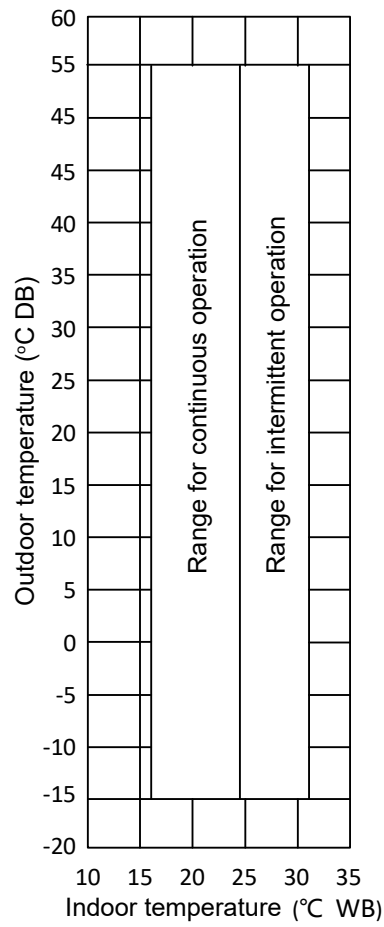
Corrected heating capacities express the heating capacity over the heating/defrosting cycle shown in Figure 2-8.3.

Figure 2-8.3: Defrosting cycle



9 Operating Limits

Figure 2-9.1: Cooling operating limits



Notes:

1. These figures assume the following operating conditions:
 - Equivalent piping length: 5m
 - Level difference: 0

10 Sound Levels

10.1 Overall

Table 2-10.1: Sound pressure level

Model	dB(A)
8HP	57
10HP	58
12HP	60
14HP	60
16HP	61
18HP	62
20HP	63
22HP	63
24HP	64
26HP	64
28HP	64
30HP	64
32HP	64
34HP	65

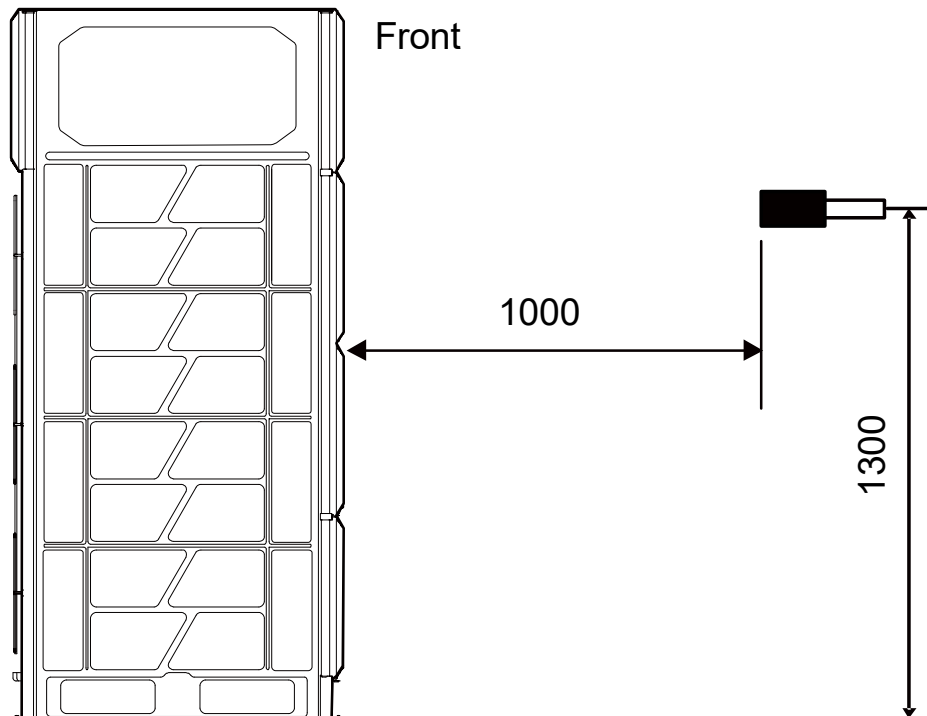
Model	dB(A)
36HP	65
38HP	66
40HP	66
42HP	66
44HP	67
46HP	66
48HP	66
50HP	67
52HP	67
54HP	67
56HP	67
58HP	67
60HP	67
62HP	67

Model	dB(A)
64HP	67
66HP	68
68HP	68
70HP	68
72HP	68
74HP	69
76HP	68
78HP	68
80HP	69
82HP	69
84HP	69
86HP	69
88HP	69
90HP	69

Notes:

1. Sound pressure level is measured at a position 1m in front of the unit and 1.3m above the floor in a semi-anechoic chamber. During in-situ operation, sound pressure levels may be higher as a result of ambient noise.

Figure 2-10.1: Sound pressure level measurement (unit: mm)



10.2 Octave Band Levels

Figure 2-10.2: 8HP octave band level

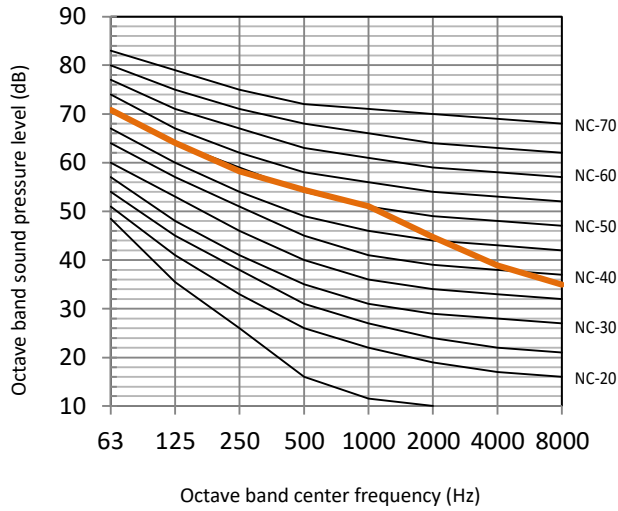


Figure 2-10.3: 10HP octave band level

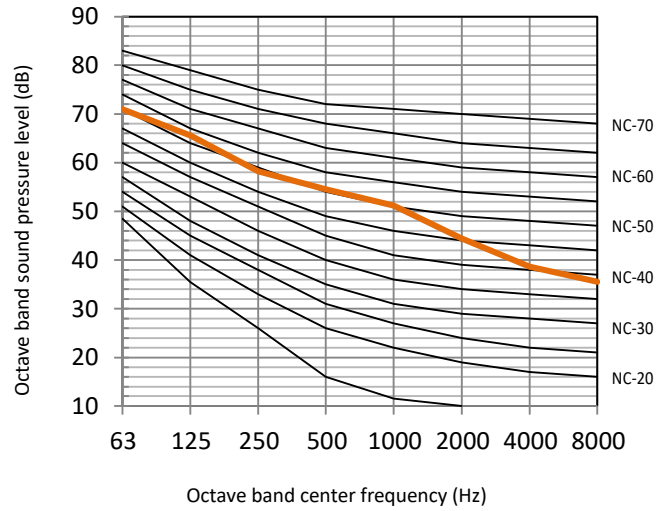


Figure 2-10.4: 12HP octave band level

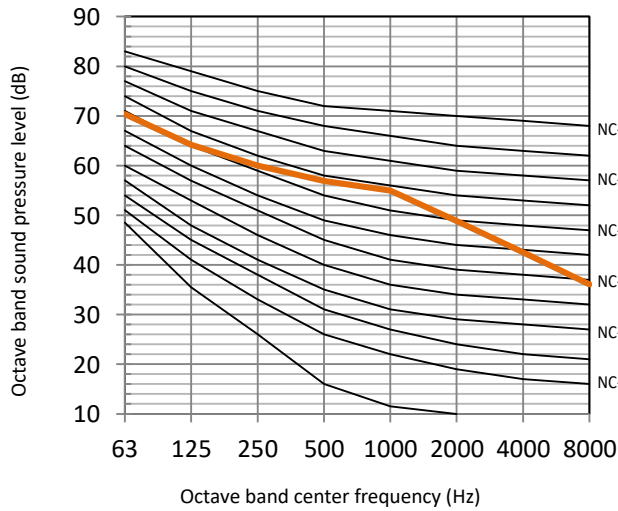


Figure 2-10.5: 14HP octave band level

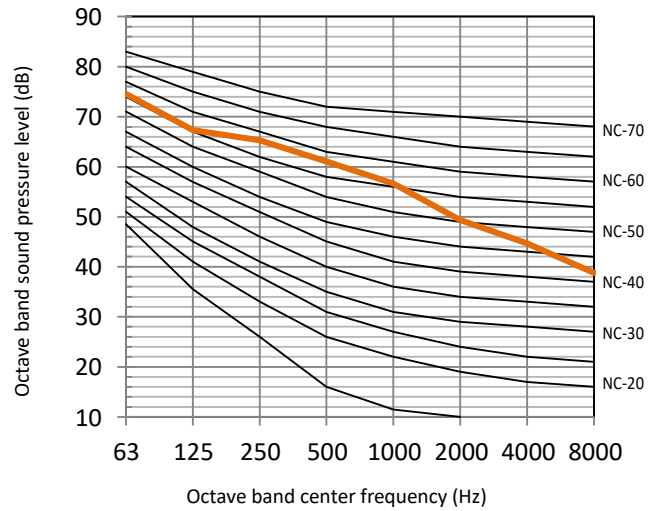


Figure 2-10.6: 16HP octave band level

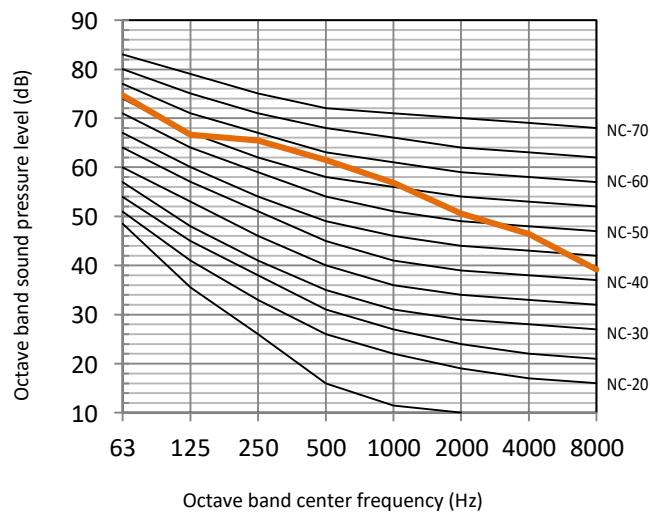


Figure 2-10.7: 18HP octave band level

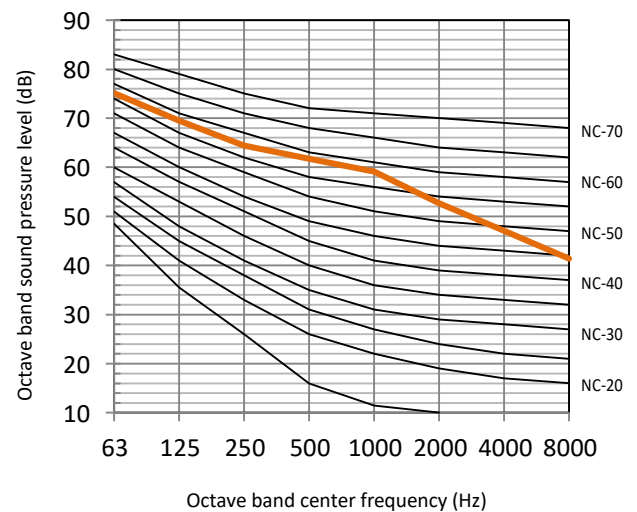


Figure 2-10.8: 20HP octave band level

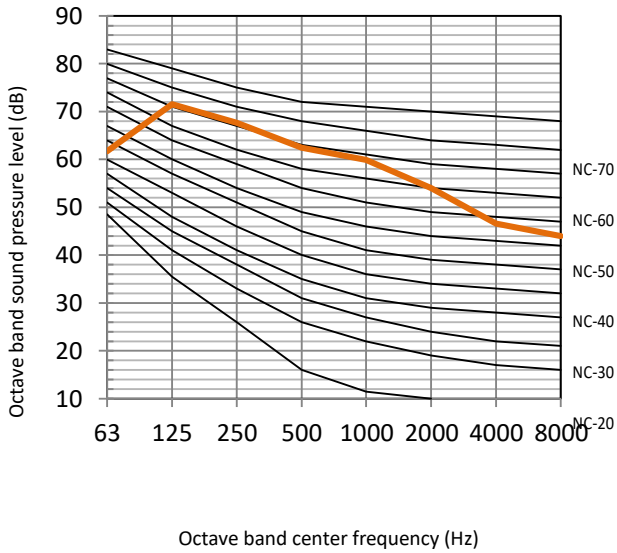


Figure 2-10.9: 22HP octave band level

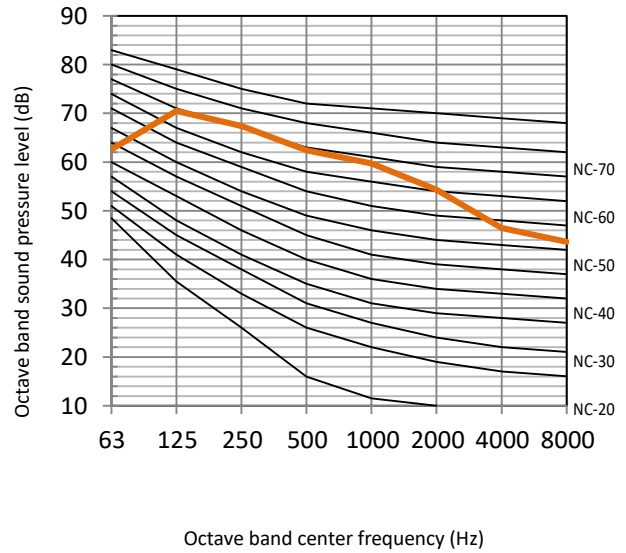


Figure 2-10.10: 24HP octave band level

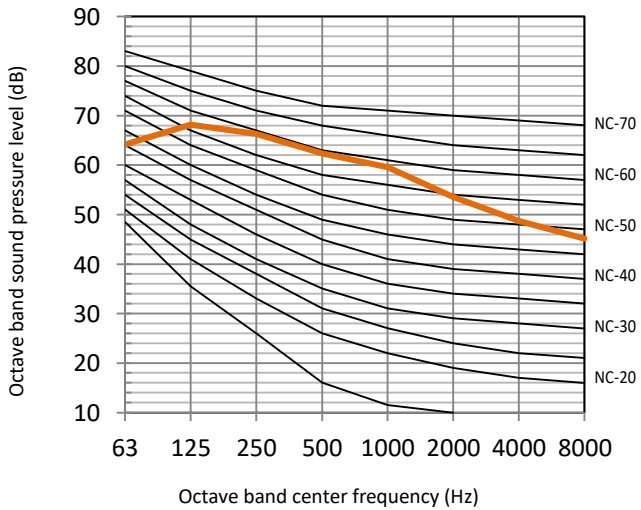


Figure 2-10.11: 26HP octave band level

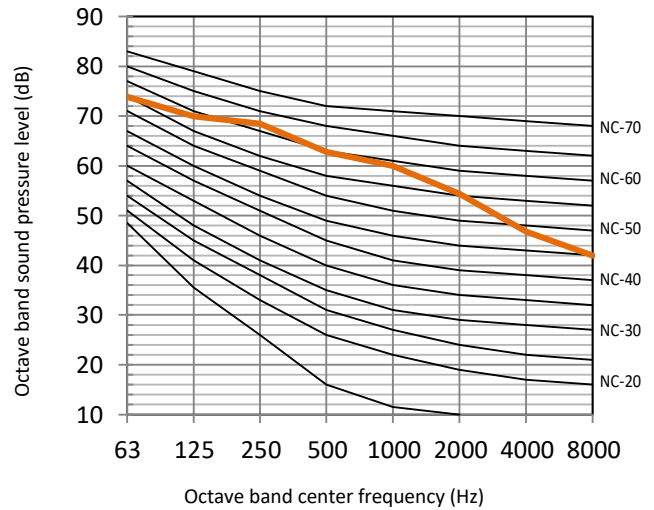


Figure 2-10.12: 28HP octave band level

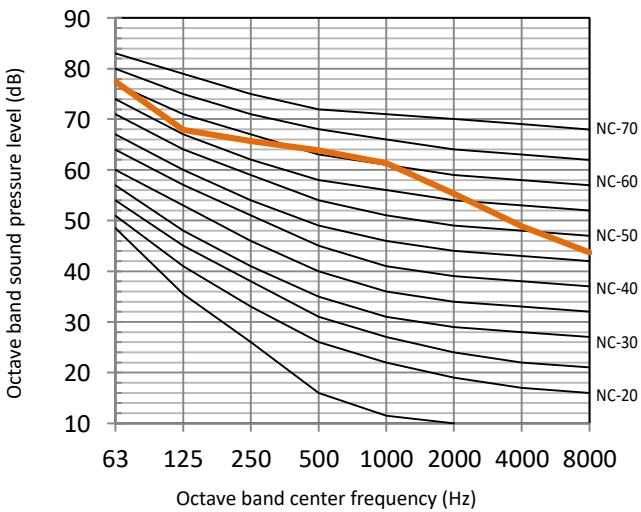
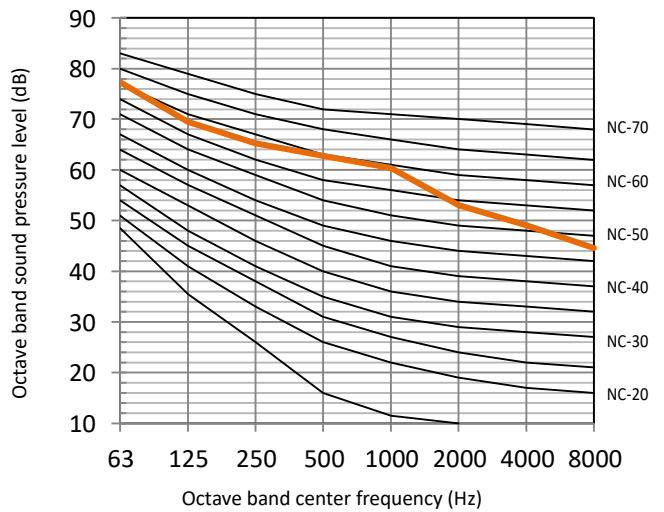


Figure 2-10.13: 30HP octave band level



11 Accessories

11.1 Standard Accessories

Table 2-11.1: Standard accessories

Name	Shape	Quantity	Function
Owner's and installation manual		1	
L-shaped connection pipe		2	To connect gas and liquid pipes
Wrench		1	Removing the side plate screws
Build-out resistor		1	Enhances communication stability

L-shaped pipe

Figure 2-11.1: L-shaped pipe size (unit: mm)

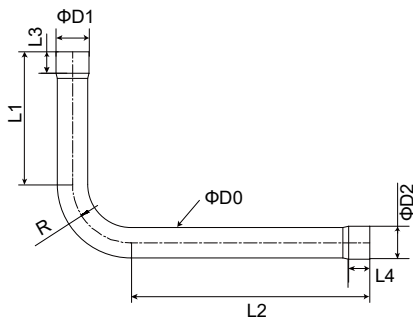


Table 2-11.2: L-shaped pipe size (unit: mm)

	8-12HP		14-16HP		18-20HP		22-24HP		26-30HP	
	Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid
ΦD0(OD)	25.4	12.7	28.6	15.9	28.6	15.9	31.8	19.1	31.8	22.2
ΦD1(ID)	25.4	12.7	28.6	15.9	28.6	15.9	31.8	15.9	31.8	22.2
ΦD2(ID)	25.4	12.7	28.6	15.9	28.6	15.9	31.8	19.1	31.8	22.2
L1	130	160	125	155	125	155	130	162	130	165
L2	230	265	225	255	225	255	130	245	130	165
L3	20	15	20	15	20	15	25	15	25	20
L4	20	15	20	15	20	15	25	15	25	20
R	50	25	55	30	55	30	60	40	60	40

11.2 Optional Accessories

Table 2-11.3: Optional accessories

Optional accessories	Model	Packed dimensions (mm)	Net/gross weight (kg)	Function
Outdoor branch joint kits	4TV0ODK20CA007G	255×150×185	1.8 / 2.0	Distribute refrigerant to indoor units and balance flow resistance between outdoor units
	4TV0ODK21CA007G	405×120×270	2.3 / 2.8	
	4TV0ODK30CA007G	345×160×285	3.7 / 4.3	
	4TV0ODK31CA007G	585×340×140	4.2 / 5.0	
Indoor branch joint kits	4TV0RDK01CA007G	290×105×100	0.3 / 0.4	
	4TV0RDK02CA007G	290×105×100	0.4 / 0.6	
	4TV0RDK03CA007G	310×130×125	0.6 / 0.9	
	4TV0RDK04CA007G	350×170×180	1.1 / 1.5	
	4TV0RDK05CA007G	365×195×215	1.4 / 1.9	
	4TV0RDK06CA007G	390×230×255	2.5 / 3.1	
	4TV0RDK07CA007G	390×230×255	2.8 / 3.4	

Part 3

System Design and Installation

1 Preface to Part 3	114
2 Unit Placement and Installation	115
3 Outdoor Unit Ducting and Shielding.....	119
4 Refrigerant Piping Design	122
5 Refrigerant Piping Installation.....	133
6 Drain Piping	145
7 Insulation.....	148
8 Charging Refrigerant	151
9 Electrical Wiring.....	153
10 Installation in Areas of High Salinity	160
11 Commissioning	161
12 Appendix to Part 3 – System Commissioning Report	165

1 Preface to Part 3

1.1 Notes for Installers Boxes

The information contained in this Engineering Data Book may primarily be of use during the system design stage of a Trane 7G Cooling Series VRF project. Additional important information which may primarily be of use during field installation has been placed in boxes, such as the example below, titled “Notes for installers”.

Notes for installers



Notes for installers boxes contain important information which may primarily be of use during field installation, rather than during desk-based system design.

1.2 Definitions

In this Engineering Data Book, the term “applicable legislation” refers to all national, local and other laws, standards, codes, rules, regulations and other legislation that apply in a given situation.

1.3 Precautions

All system installation including installation of piping and electrical works must only be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation.

2 Unit Placement and Installation

2.1 Outdoor Units

2.1.1 Placement considerations

Placement of outdoor units should take account of the following considerations:

Air conditioners should not be exposed to direct radiation from a high-temperature heat source.

Air conditioners should not be installed in positions where dust or dirt may affect heat exchangers.

Air conditioners should not be installed in locations where exposure to oil or to corrosive or harmful gases, such as acidic or alkaline gases, may occur.

Air conditioners should not be installed in locations where exposure to salinity may occur unless the anti-corrosion treatment for high-salinity areas customization option has been added and the precautions described in Part 3, 10 "Installation in Areas of High Salinity" are taken.

Outdoor units should be installed in well-drained, well-ventilated positions that are as close as possible to the indoor units.

2.1.2 Spacing

Outdoor units must be spaced such that sufficient air may flow through each unit. Sufficient airflow across heat exchangers is essential for outdoor units to function properly. Figures 3-2.1 to 3-2.3 show spacing requirements in three different scenarios.

If the particular circumstances of an installation require a unit to be placed closer to a wall than specified in Figures 3-2.1 to 3-2.3, a discharge duct should be installed. Refer to Part 3, 3 "Outdoor Unit Ducting and Shielding". Depending on the height of adjacent walls relative to the height of the units, ducting may be required. Refer to Part 3, 3 "Outdoor Unit Ducting and Shielding".

Figure 3-2.1: Single unit installation (unit: mm)

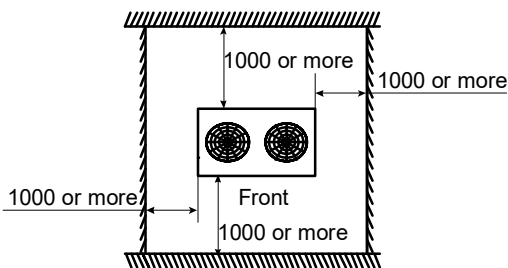


Figure 3-2.2: Single row installation (unit: mm)

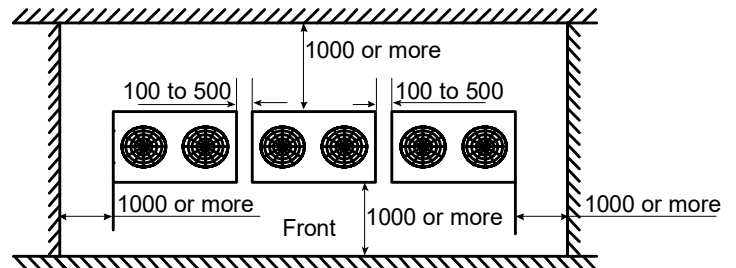
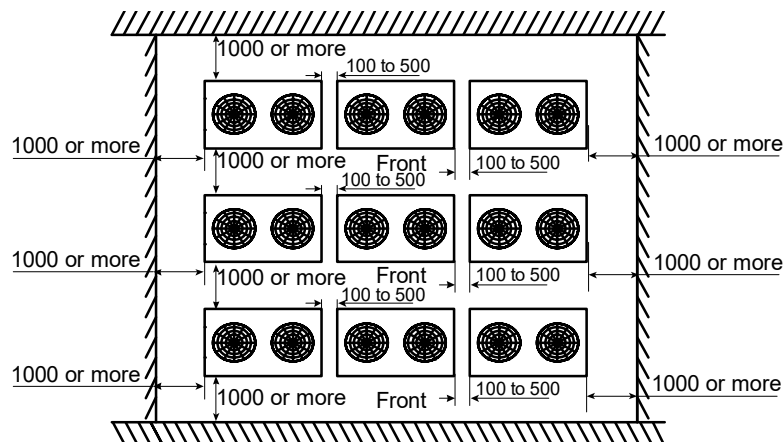


Figure 3-2.3: Multi-row installation (unit: mm)



2.1.3 Master and slave unit positioning

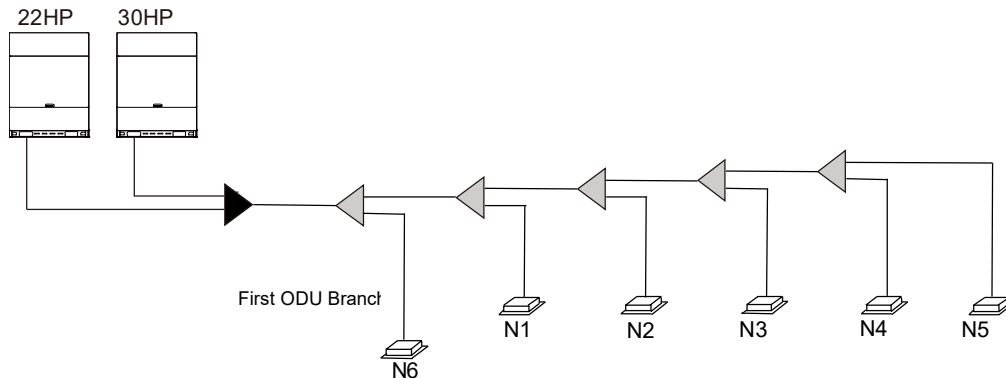
In systems with multiple outdoor units, the units should be placed in order from largest capacity unit to smallest capacity unit. The largest capacity unit must be placed on the first branch, and be set as the master unit, while the others should be set as slave units. Refer to the 7G Cooling Service Manual, Part 4 for details of how to set units as master/slave.

The example in Figure 3-2.4 illustrates the placing of units in a 52 (30+22) HP combination:

Place the 30HP unit on the first branch and set it as the master unit.

Place the 22HP units on the next branches and set it as slave units.

Figure 3-2.4: Positioning of master and slave units



2.1.4 Base structures

Outdoor unit base structure design should take account of the following considerations:

A solid base prevents excess vibration and noise. Outdoor unit bases should be constructed on solid ground or on structures of sufficient strength to support the units' weight.

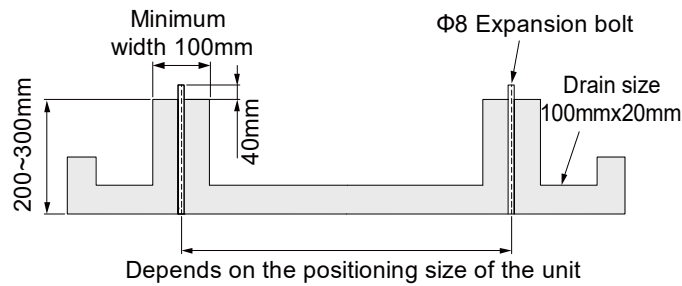
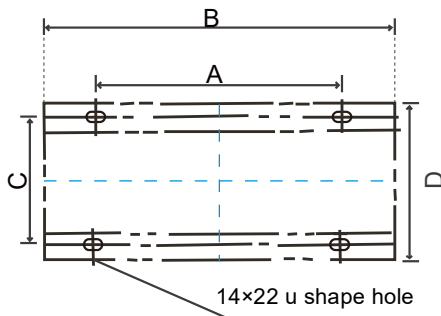
Bases should be at least 200mm high to provide sufficient access for installation of piping.

Either steel or concrete bases may be suitable.

A typical concrete base design is shown in Figure 3-2.5. A typical concrete specification is 1 part cement, 2 parts sand and 4 parts crushed stone with $\Phi 8$ mm steel reinforcing bar. The edges of the base should be chamfered.

Use four ground bolts (M8) to secure the unit in place. Best is to screw in the ground bolt until it is embedded in the base surface by at least 3 threads.

To ensure that all contact points are equally secure, bases should be completely level. Base design should ensure that the points on the units' bases designed for weight-bearing support are fully supported. Bolt spacings should be as per Figure 3-2.6 and Table 3-2.1.

Figure 3-2.5: Outdoor unit typical concrete base structure design (unit: mm)

Figure 3-2.6: Expansion bolt positioning

Table 3-2.1: Expansion bolt spacings (unit: mm)

Dimension	8-20HP	22-30HP
A	705	1105
B	960	1360
C	710	710
D	850	850

2.1.5 Acceptance and unpacking

Notes for installers



When units are delivered check whether any damage occurred during shipment. If there is damage to the surface or outside of a unit, submit a written report to the shipping company.

Check that the model, specifications and quantity of the units delivered are as ordered.

Check that all accessories ordered have been included. Retain the Installation and Owner's Manual for future reference.

2.1.6 Hoisting

Notes for installers



Do not remove any packaging before hoisting. If units are not packaged or if the packaging is damaged, use suitable boards or packing material to protect the units.

Hoist one unit at a time, using two ropes to ensure stability.

Keep units upright during hoisting, ensuring that the angle to the vertical does not exceed 30°.

It is better to use a crane and two long belts to lift the unit as per Figure 3-2.7.

Handle the unit carefully to protect it, and note the position of the center of gravity of the unit.

Figure 3-2.7: Hoisting

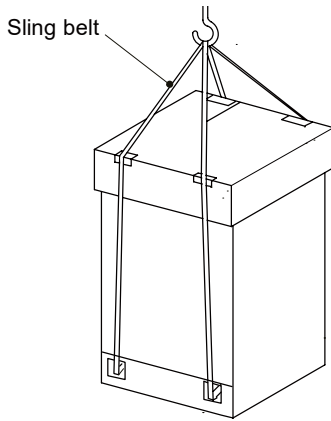


Figure 3-2.8: 8-20HP Center of gravity

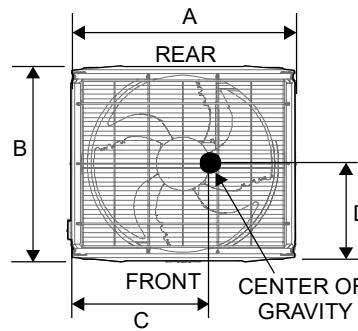
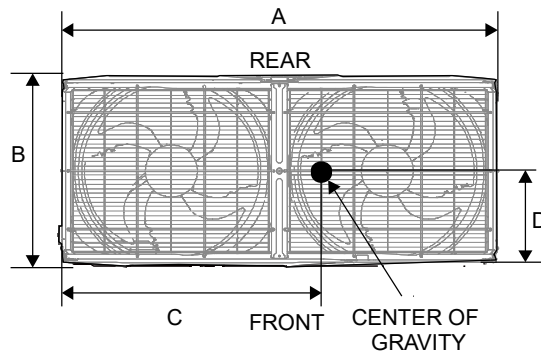


Figure 3-2.9: 22-30HP Center of gravity



Dimension	8-20HP	22-30HP
A	940	1340
B	825	825
C	449	609
D	487	424

2.2 Indoor Units

2.2.1 Placement considerations

Placement of indoor units should take account of the following considerations:

Sufficient space for drain piping and for access during servicing and maintenance should be allowed.

To ensure a good cooling effect, short-circuit ventilation (where outlet air returns quickly to a unit’s air inlet) should be avoided.

To prevent excessive noise or vibration during operation, suspension rods or other weight-bearing fixings should typically be able to bear twice the unit’s weight.

Notes for installers



Before installing an indoor unit, check that the model to be installed is as specified in the construction drawings and confirm the correct orientation of the unit.

Ensure that units are installed at the correct height.

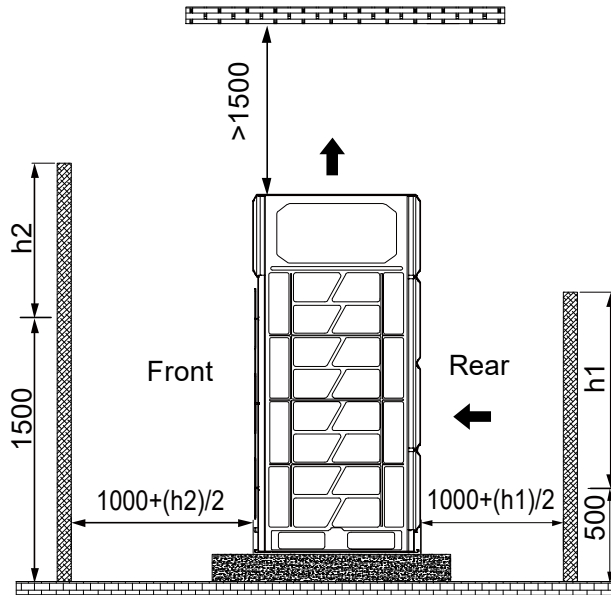
To allow smooth condensate drainage and to ensure unit stability (to prevent excessive noise or vibration), ensure that units are level to within 1° of the horizontal. If a unit is not level to within 1° of the horizontal, water leakage or abnormal vibration/noise may occur.

3 Outdoor Unit Ducting and Shielding

3.1 Ducting Requirements

Depending on the height of adjacent walls relative to the height of the units, ducting may be required to ensure proper air discharge. In the situation depicted in Figure 3-3.1, when the space over the unit is less than 1500mm, ducting is required to ensure proper air discharge. When the space over the unit is greater than 1500mm, ducting may be required if the air discharge is not smooth.

Figure 3-3.1: Top of unit below top of adjacent wall unit (mm)



3.2 Design Considerations

Outdoor unit ducting design should take account of the following:

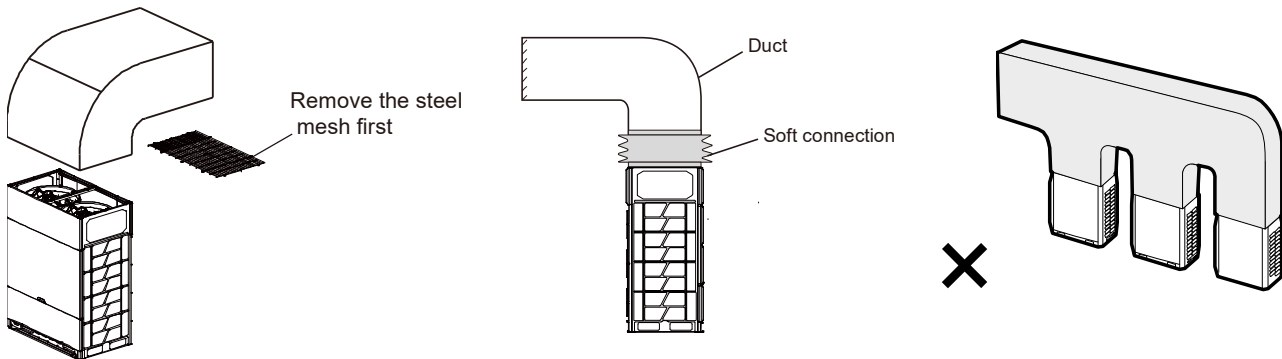
Each duct should contain no more than one bend.

Vibration isolation should be added to the connection between the unit and the ducting to avoid vibration/noise.

If more than one outdoor units need ducting, each outdoor unit should have independent ducting, it cannot share one ducting for more than one outdoor units.

Installing louvers is required as doing for safety, they should be installed at an angle no greater than 15° to the horizontal, to minimize the impact on airflow.

Figure 3-3.2: Ducting requirements



3.3 Transverse Ducting

Figure 3-3.2: Transverse ducting (unit: mm)

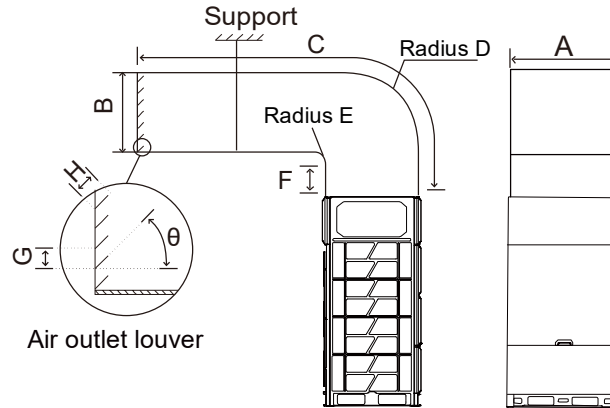


Table 3-3.1: Duct dimensions (unit: mm)

	8-20HP	22-30HP
A	800	1290
B	$770 \leq B \leq 800$	$770 \leq B \leq 800$
C	≤ 3000	≤ 3000
D	$D = E + 770$	$D = E + 770$
E	≥ 300	≥ 300
F	≥ 250	≥ 250
θ	$\theta \leq 15^\circ$	$\theta \leq 15^\circ$
G	≥ 100	≥ 100
H	≤ 90	≤ 90

Table 3-3.2: External static pressure

ESP (Pa)	Remarks
0	Factory default
0 – 20	Remove steel mesh and connect to duct < 3m long
> 20	Customization option

3.4 Longitudinal Ducting

Figure 3-3.3: Longitudinal ducting units (unit: mm)

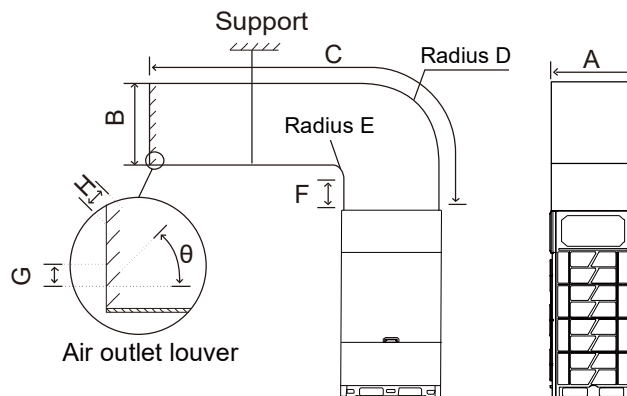


Table 3-3.3: Duct dimensions (unit: mm)

	8-20HP	22-30HP
A	770	770
B	820	1310
C	≤ 3000	≤ 3000
D	$D = E + 800$	$D = E + 1290$
E	≥ 300	≥ 300
F	≥ 250	≥ 250
θ	$\theta \leq 15^\circ$	$\theta \leq 15^\circ$
G	≥ 100	≥ 100
H	≤ 90	≤ 90

Table 3-3.4: External static pressure

ESP (Pa)	Remarks
0	Factory default
0 – 20	Remove steel mesh and connect to duct < 3m long
> 20	Customization option

3.5 Fan Performance

The default external static pressure of outdoor units' air outlets is zero. With the steel mesh cover removed the external static pressure is 20Pa. Static pressure exceeds 20Pa needs to be customized.

Figure 3-3.9: 8-12HP units fan performance

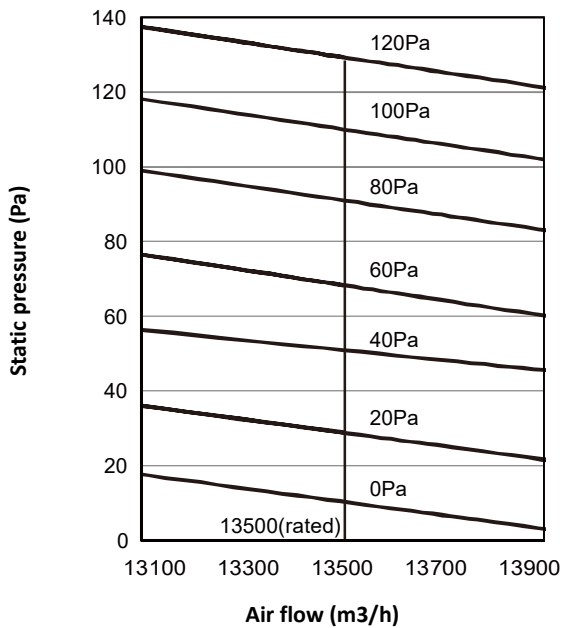


Figure 3-3.10: 14-20HP units fan performance

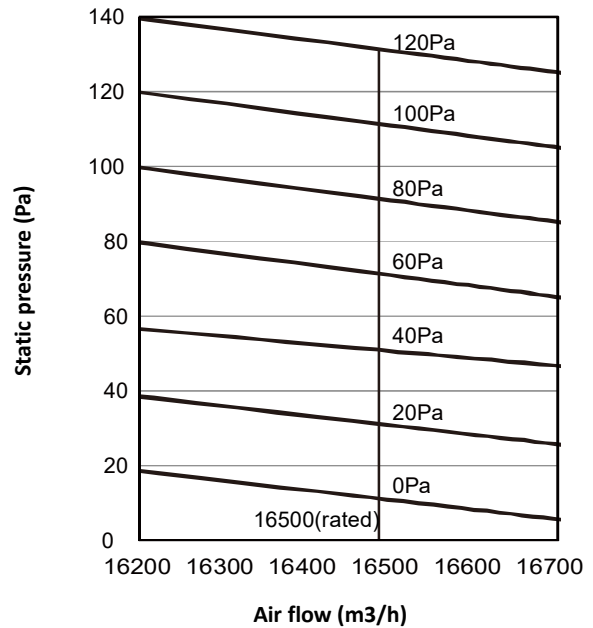
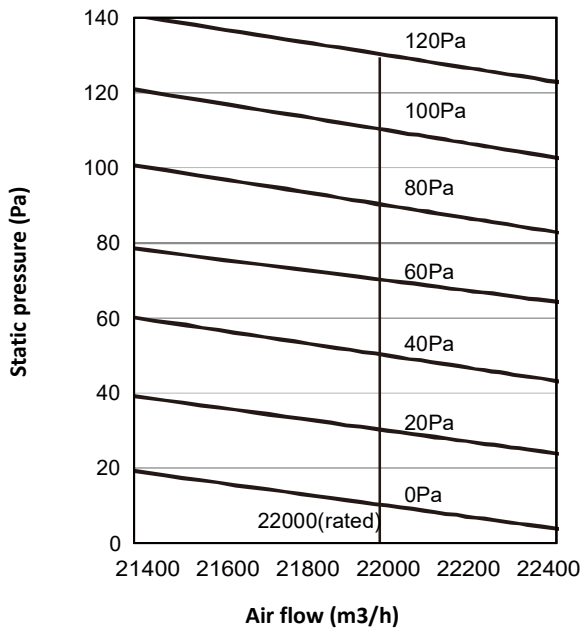


Figure 3-3.11: 22-30HP units fan performance



Notes for installers

Before installing outdoor unit ducting, be sure to remove the unit's steel mesh cover, otherwise airflow will be adversely affected.

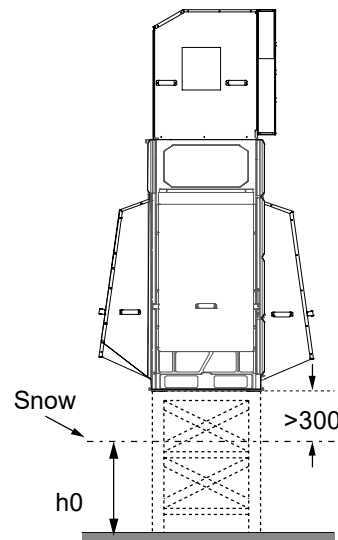
Notes for installers

Before installing outdoor unit ducting, be sure to remove the unit's steel mesh cover, otherwise airflow will be adversely affected.

3.6 Snow Shielding

In areas of high snowfall, snow shields should be installed on air inlets and outlets to prevent snow from entering the units. Additionally, the foundation or base height of ODU is required to be the expected maximum snowfall thickness $h_0 + 300\text{mm}$, preventing the snow from exceeding the bottom of the unit.

Figure 3-3.14: Outdoor unit snow shielding



4 Refrigerant Piping Design

4.1 Design Considerations

Refrigerant piping design should take account of the following considerations:

The amount of brazing required should be kept to a minimum.

On the two inside sides of the first indoor branch joint ("A" in Figures 3-4.2, 3-4.3 and 3-4.4) the system should, as far as possible, be equal in terms of number of units, total capacities and total piping lengths.

4.2 Material Specification

Only seamless phosphorus-deoxidized copper piping that complies with all applicable legislation should be used. Temper grades and minimum thicknesses for different diameters of piping are specified in Table 3-4.1.

Table 3-4.1: Piping temper and thickness

Piping outer diameter (mm)	Temper ¹	Minimum thickness (mm)
Φ6.35	O (annealed)	0.8
Φ9.53		0.8
Φ12.7		0.8
Φ15.9		1.0
Φ19.1		1.0
Φ22.2	1/2H (half hard)	1.2
Φ25.4		1.2
Φ28.6		1.3
Φ31.8		1.5
Φ38.1		1.5
Φ41.3		1.5
Φ44.5		1.5
Φ50.8		1.8
Φ54.0		1.8
Φ63.5	2.1	

Notes:

1. O: coiled piping; 1/2H: straight piping.

4.3 Permitted Piping Lengths and Level Differences

The piping length and level difference requirements that apply are summarized in Table 3-4.3 and are fully described as follows (refer to Figure 3-4.2):

1. **Requirement 1:** The total length of piping in one refrigerant system should not exceed 1100m. When calculating the total length of piping, the actual length of the indoor main pipes (the piping between the first indoor branch joint and all other indoor branch joints, L_2 to L_{10}) should be doubled.
2. **Requirement 2:** The piping between the farthest indoor unit (N_{11}) and the first outdoor branch joint (L) should not exceed 220m (actual length) and 260m (equivalent length). (The equivalent length of each branch joint is 0.5m.)
3. **Requirement 3:** The piping between the farthest indoor unit (N_{11}) and first indoor branch joint (A) should not exceed 40m in length ($\sum\{L_6 \text{ to } L_{10}\} + k \leq 40\text{m}$) unless the following conditions are met and the following measures are taken, in which case the permitted length is up to 120m:

Conditions:

- a) Each indoor auxiliary pipe (from each indoor unit to its nearest branch joint) joint does not exceed 40m in length (a to k each $\leq 40\text{m}$).
- b) The difference in length between {the piping from first indoor branch joint (A) to the farthest indoor unit (N_{11})} and {the piping from the first indoor branch joint (A) to the nearest indoor unit (N_1)} does not exceed 40m. That is: $(\sum\{L_6 \text{ to } L_{10}\} + k) - (L_2 + a) \leq 40\text{m}$.

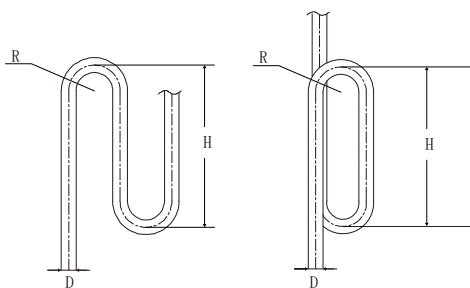
Measures:

- a) Increase the diameter of the indoor main pipes (the gas and liquid piping between the first indoor branch joint and all other indoor branch joints, L_2 to L_{10}) as per Table 3-4.2, except for indoor main pipes which are already the same size as the main pipe (L_1), for which no diameter increases are required.
4. **Requirement 4:** The largest level difference between indoor unit and outdoor unit should not exceed 110m. Additionally: (i) If the outdoor unit is above and the level difference is greater than 20m, it is recommended that an oil return bend with dimensions as specified in Figure 3-4.1 is set every 10m in the gas pipe of the main pipe; and (ii) if the level difference is more than 50m (the outdoor unit is above) or 40m (the outdoor unit is below), the liquid pipe of the main pipe (L_1) should be selected according to Table 3-4.5 when equivalent length to the farthest IDU $\geq 90\text{m}$.

Table 3-4.2: Diameter increase requirements

Original (mm)	Increased (mm)
Φ9.52	Φ12.7
Φ12.7	Φ15.9
Φ15.9	Φ19.1
Φ19.1	Φ22.2
Φ22.2	Φ25.4
Φ25.4	Φ28.6
Φ28.6	Φ31.8
Φ31.8	Φ38.1
Φ38.1	Φ41.3
Φ41.3	Φ44.5
Φ44.5	Φ50.8
Φ50.8	Φ54.0

Figure 3-4.1: Oil return bend



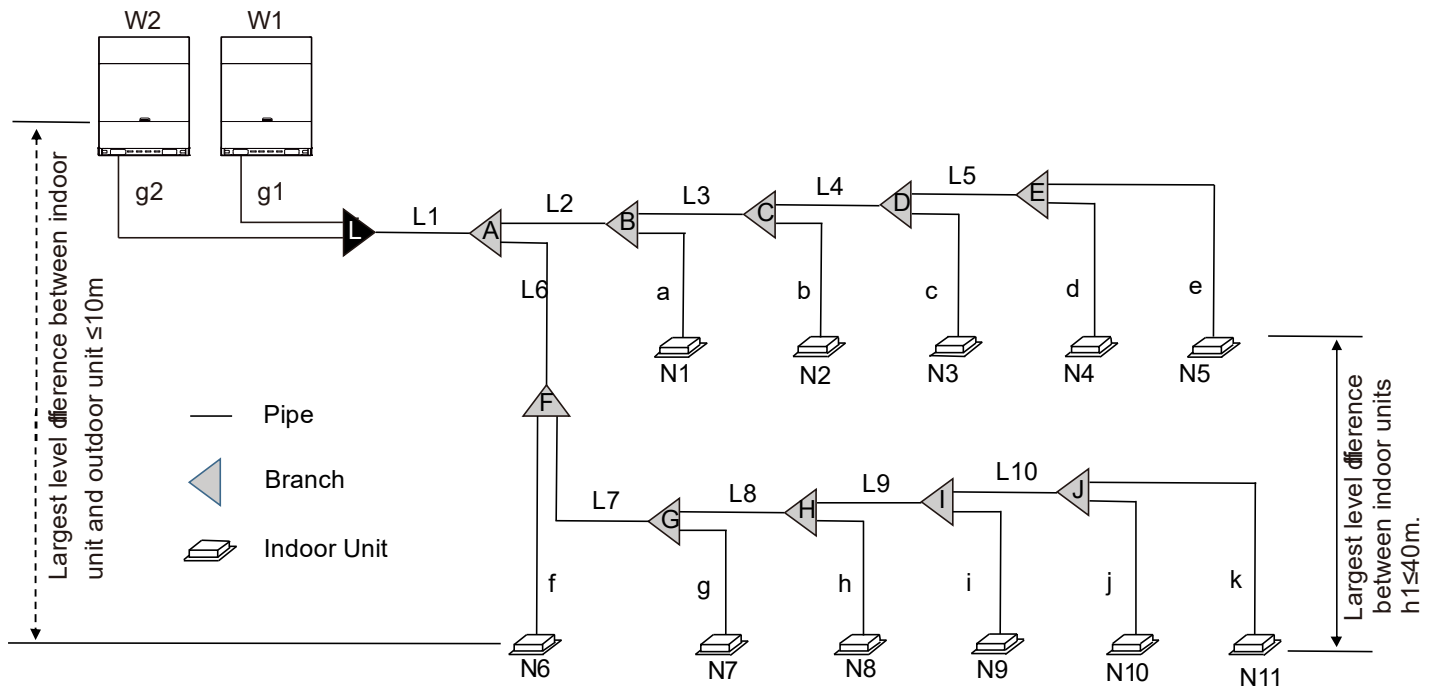
5. **Requirement 5:** The largest level difference between indoor units should not exceed 40m.

Table 3-4.3: Oil return bend requirements unit (mm)

Pipe dimension	Bend radius R	Hight H
Φ19.1	≥ 31	≥ 300

Φ25.4	≥ 45	≥ 300
Φ31.8	≥ 60	≥ 300
Φ41.3	≥ 80	≥ 500
Φ50.8	≥ 90	≥ 500
Φ63.5	≥ 90	≥ 500

Figure 3-4.2: Permitted refrigerant piping lengths and level differences



— Pipe
 Branch
 Indoor Unit

Legend		Figures in parentheses indicate indoor unit capacity indexes.
L ₁	Main pipe	
L ₂ to L ₁₀	Indoor main pipes	
a to k	Indoor auxiliary pipes	
A to J	Indoor branch joints	
L, M	Outdoor branch joints	
g ₁ to g ₃ , G ₁	Outdoor connection pipes	

Table 3-4.4: Summary of permitted refrigerant piping lengths and level differences

		Permitted values	Piping in Figure 3-4.2
Piping lengths	Total piping length ¹	≤ 1100m	$L_1 + 2 \times \sum\{L_2 \text{ to } L_{10}\} + \sum\{a \text{ to } k\}$
	Piping between farthest indoor unit and first outdoor branch joint ²	Actual length	≤ 220m
		Equivalent length	≤ 260m
	Piping between farthest indoor unit and first indoor branch joint ³	≤ 40m/120m	$\sum\{L_6 \text{ to } L_{10}\} + k$
Piping between outdoor unit and outdoor branch joint	≤ 10m	$g_1 + G_1 \leq 10\text{m}; g_2 + G_1 \leq 10\text{m}; g_3 \leq 10\text{m}$	
Level differences	Largest level difference between indoor unit and outdoor unit ⁴	≤ 110m	
	Largest level difference between indoor units ⁵	≤ 40m	

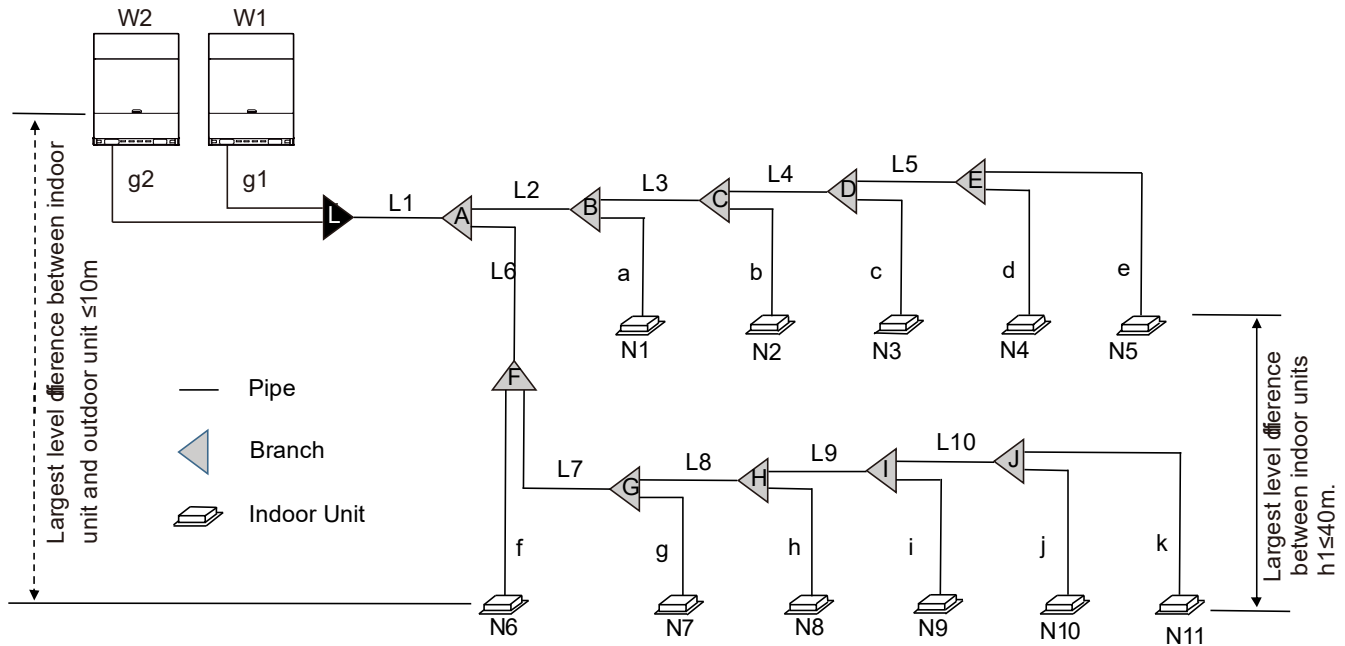
Notes:

1. Refer to Requirement 1, above.
2. Refer to Requirement 2, above.
3. Refer to Requirement 3, above.
4. Refer to Requirement 4, above.
5. Refer to Requirement 5, above.

4.4 Selecting Piping Diameters

Tables 3-4.5 to 3-4.9, below, specify the required pipe diameters for the indoor and outdoor piping. The main pipe (L₁) and first indoor branch joint (A) should be sized according to 3-4.5.

Figure 3-4.3: Selecting piping diameters



Legend		
L ₁	Main pipe	Figures in parentheses indicate indoor unit capacity indexes.
L ₂ to L ₁₀	Indoor main pipes	
a to k	Indoor auxiliary pipes	
A to J	Indoor branch joints	
L, M	Outdoor branch joints	
g ₁ to g ₃ , G ₁	Outdoor connection pipes	

Table 3-4.5: Main pipe¹ (L₁) and first indoor branch joint (A)

Total capacity of outdoor units	Equivalent length to the farthest IDU < 90m			Equivalent length to the farthest IDU ≥ 90m		
	Gas pipe (mm)	Liquid pipe (mm)	Branch joint kit	Gas pipe (mm)	Liquid pipe (mm)	Branch joint kit
8HP	Φ19.1	Φ9.52	4TV0RDK01CA007G	Φ22.2	Φ12.7	4TV0RDK02CA007G
10HP	Φ22.2	Φ9.52	4TV0RDK02CA007G	Φ25.4	Φ12.7	4TV0RDK02CA007G
12-14HP	Φ25.4	Φ12.7	4TV0RDK02CA007G	Φ28.6	Φ15.9	4TV0RDK03CA007G
16HP	Φ28.6	Φ12.7	4TV0RDK03CA007G	Φ31.8	Φ15.9	4TV0RDK03CA007G
18HP	Φ28.6	Φ15.9	4TV0RDK03CA007G	Φ31.8	Φ15.9	4TV0RDK03CA007G
20-24HP	Φ28.6	Φ15.9	4TV0RDK03CA007G	Φ31.8	Φ19.1	4TV0RDK03CA007G
26-34HP	Φ31.8	Φ19.1	4TV0RDK03CA007G	Φ38.1	Φ22.2	4TV0RDK04CA007G
36-54HP	Φ38.1	Φ19.1	4TV0RDK04CA007G	Φ41.3	Φ22.2	4TV0RDK05CA007G
56-66HP	Φ41.3	Φ19.1	4TV0RDK05CA007G	Φ44.5	Φ22.2	4TV0RDK05CA007G
68-82HP	Φ44.5	Φ22.2	4TV0RDK05CA007G	Φ50.8	Φ25.4	4TV0RDK06CA007G
84-90HP	Φ50.8	Φ22.2	4TV0RDK06CA007G	Φ54.0	Φ25.4	4TV0RDK06CA007G

Notes:

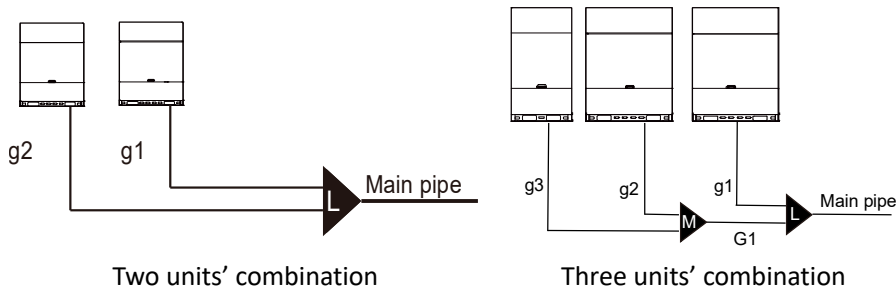
1. If the level difference is more than 50m (the outdoor unit is above) or 40m (the outdoor unit is below), the liquid pipe of the main pipe (L₁) should be selected according to equivalent length to the farthest IDU ≥ 90m.

Table 3-4.6: Indoor main pipes (L₂ to L₁₀) and indoor branch joint kits

Total capacity indexes of indoor units	Gas pipe (mm)	Liquid pipe (mm)	Branch joint kit
Capacity indexes < 168	Φ15.9	Φ9.52	4TV0RDK01CA007G
168 ≤ Capacity indexes < 224	Φ19.1	Φ9.52	4TV0RDK01CA007G
224 ≤ Capacity indexes < 330	Φ22.2	Φ9.52	4TV0RDK02CA007G
330 ≤ Capacity indexes < 470	Φ28.6	Φ12.7	4TV0RDK03CA007G
470 ≤ Capacity indexes < 710	Φ28.6	Φ15.9	4TV0RDK03CA007G
710 ≤ Capacity indexes < 1040	Φ31.8	Φ19.1	4TV0RDK03CA007G
1040 ≤ Capacity indexes < 1540	Φ38.1	Φ19.1	4TV0RDK04CA007G
1540 ≤ Capacity indexes < 1900	Φ41.3	Φ19.1	4TV0RDK05CA007G
1900 ≤ Capacity indexes < 2350	Φ44.5	Φ22.2	4TV0RDK05CA007G
2350 ≤ Capacity indexes < 500	Φ50.8	Φ22.2	4TV0RDK06CA007G
2500 ≤ Capacity indexes < 3024	Φ50.8	Φ25.4	4TV0RDK06CA007G
3024 ≤ Capacity indexes	Φ54.0	Φ28.6	4TV0RDK07CA007G

Notes:

- If indoor main pipes (L₂ to L₁₀) are larger than the main pipe (L₁), indoor main pipes should reduce to the main pipe's size.

Figure 3-4.4: Outdoor connection pipes


Pipes	Outdoor unit capacity	Gas pipe (mm)	Liquid pipe (mm)
g1 to g2	8-12HP	Φ25.4	Φ12.7
	14-24HP	Φ31.8	Φ15.9
	26-30HP	Φ38.1	Φ19.1

Pipes	Outdoor unit capacity	Gas pipe (mm)	Liquid pipe (mm)
g1 to g3	8-12HP	Φ25.4	Φ12.7
	14-24HP	Φ31.8	Φ15.9
	26-30HP	Φ38.1	Φ19.1
G1	/	Φ41.3	Φ22.2

Table 3-4.0: Outdoor branch joint kits (L to M)

No. of outdoor units	Branch joint kit
2	4TV0ODK20CA007G
3	4TV0ODK30CA007G

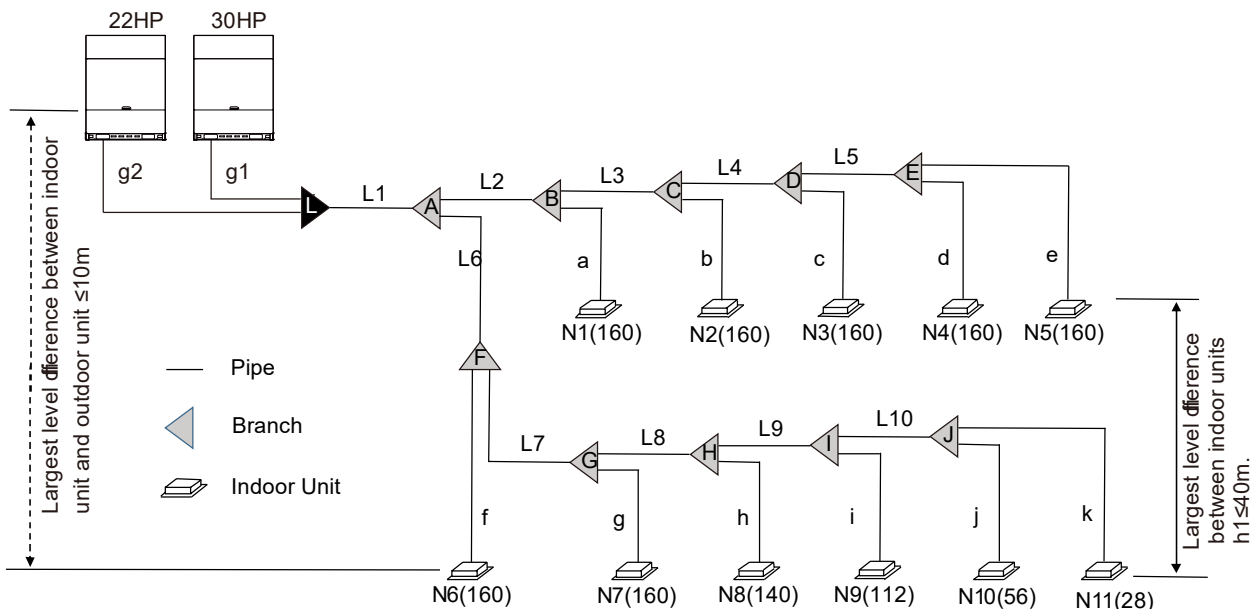
Table 3-4.10: Indoor auxiliary pipes (a to k)

Capacity of indoor unit (kW)	Gas pipe (mm)	Liquid pipe (mm)
Capacity ≤ 5.6	Φ12.7	Φ6.35
5.6 < Capacity ≤ 16	Φ15.9	Φ9.52
16 < Capacity ≤ 22.4	Φ19.1	Φ9.52
22.4 < Capacity ≤ 28	Φ22.2	Φ12.7
28 < Capacity ≤ 40	Φ25.4	Φ12.7
40 < Capacity ≤ 56	Φ28.6	Φ15.9
16 < Capacity ≤ 22.4	Φ19.1	Φ9.52
22.4 < Capacity ≤ 28	Φ22.2	Φ12.7

4.5 Refrigerant Piping Selection Example

The example below illustrates the piping selection procedure for a system consisting of two outdoor units (36HP + 16HP) and 11 indoor units. The system's equivalent length of all liquid pipes is in excess of 90m; the piping between the farthest indoor unit and the first indoor branch joint is less than 40m in length.

Figure 3-4.4: Refrigerant piping selection example



Legend	
L ₁	Main pipe
L ₂ to L ₁₀	Indoor main pipes
a to k	Indoor auxiliary pipes
A to J	Indoor branch joints
L	Outdoor branch joints
g ₁ , g ₂	Outdoor connection pipes
Figures in parentheses indicate indoor unit capacity indexes.	

Step 1: Select indoor auxiliary pipes

Indoor units N₁ to N₉ are of capacity greater than 5.6kW. Refer to Table 3-4.8. Indoor auxiliary pipes a to i are Φ15.9 / Φ9.52.

Indoor units N₁₀ and N₁₁ are of capacity 5.6kW or less. Refer to Table 3-4.8. Indoor auxiliary pipes g and l are Φ12.7 / Φ6.35.

Step 2: Select indoor main pipes and indoor branch joints B to J

The indoor units (N₄ and N₅) downstream of indoor branch E have total capacity of 16 x 2=32kW. Refer to Table 3-4.6. Indoor main pipe L₅ is Φ22.2 / Φ9.52. Indoor branch joint E is 4TV0RDK02CA007G.

The indoor units (N₃ to N₅) downstream of indoor branch E have total capacity of 16 x 3=48kW. Refer to Table 3-

Table 3-4.9: Indoor branch joint dimensions (unit: mm)

Model	Gas side joints	Liquid side joints
4TV0RDK01CA007G		
4TV0RDK02CA007G		
4TV0RDK03CA007G		
4TV0RDK04CA007G		
4TV0RDK05CA007G		
4TV0RDK06CA007G		

Table continued on next page ...

Table 3-4.9: Indoor branch joint dimensions (unit: mm) (continued)

Model	Gas side joints	Liquid side joints
4TV0RDK07CA007G		

Table 3-4.10: Outdoor branch joint dimensions combined units (unit: mm)

No. of outdoor units	Model	Gas side joints	Liquid side joints
2	4TV00DK20CA007G		
3	4TV00DK30CA007G		

4.7 Refrigerant Leakage Precautions

R410A refrigerant is not flammable in air at temperatures up to 100°C at atmospheric pressure and is generally considered a safe substance to use in air conditioning systems. Nevertheless, precautions should be taken to avoid danger to life in the unlikely event of a major refrigerant leakage. Precautions should be taken in accordance with all applicable legislation. Where no applicable legislation exists, the following may be used as a guide:

Air conditioned rooms should be large enough that if leakage of all the refrigerant in the system occurs, the concentration of the refrigerant in the room does not reach a level dangerous to health.

A critical concentration (at which point R410A becomes dangerous to human health) of 0.44 kg/m³ can be used.

The potential concentration of refrigerant in a room following a leak can be calculated as follows:

- Calculate the total amount in of refrigerant in the system (“A”) as the nameplate charge (the charge in the system when delivered from the factory) plus the additional charge added as per Part 3, 8.1 “Calculating Additional Refrigerant Charge”.
- Calculate the total volume (“B”) of the smallest room into which refrigerant could potentially leak.
- Calculate the potential refrigerant concentration as A divided by B.
- If A/B is not less than 0.44 kg/m³, countermeasures such installing mechanical ventilators (either ventilating regularly or controlled by refrigerant leakage detectors) should be taken.

Since R410A is heavier than air, particular consideration should be given to leak scenarios in basement rooms.

Figure 3-4.6: Potential refrigerant leak scenario

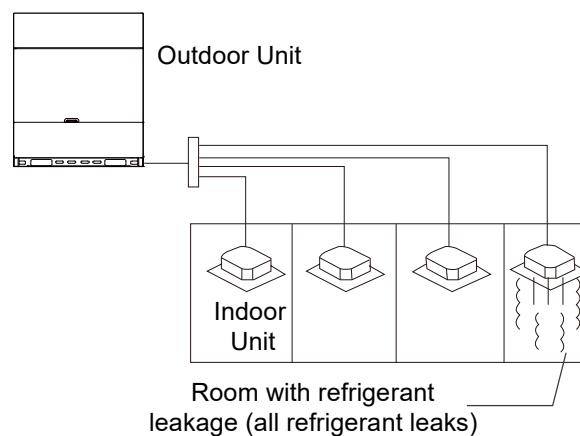
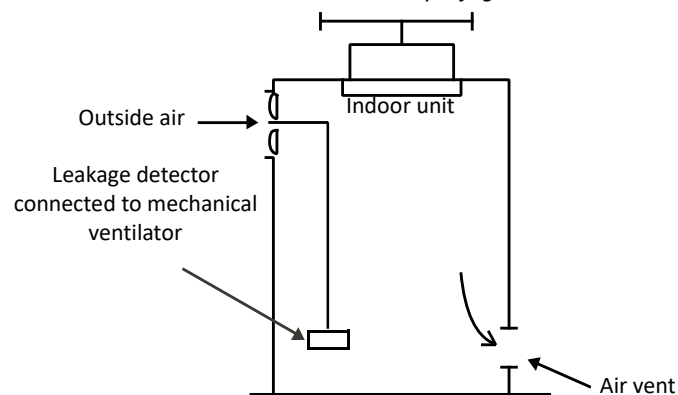



Figure 3-4.7: Mechanical ventilator controlled by refrigerant leak detector



5 Refrigerant Piping Installation

5.1 Procedure and Principles

5.1.1 Installation procedure

Notes for installers 

Installation of the refrigerant piping system should proceed in the following order:

Pipe
insulation

Pipe brazing
and installation

Pipe
flushing

Gastightness
test

Joint
insulation

Vacuum drying

Note: Pipe flushing should be performed once the brazed connections have been completed with the exception of the final connections to the indoor units. That is, flushing should be performed once the outdoor units have been connected but before the indoor units are connected.

5.1.2 Three principles for refrigerant piping

	Reasons	Measures
CLEAN	Particles such as oxide produced during brazing and/or building dust can lead to compressor malfunction	<ul style="list-style-type: none"> ▪ Seal piping during storage¹ ▪ Flow nitrogen during brazing² ▪ Pipe flushing³
DRY	Moisture can lead to ice formation or oxidization of internal components leading to abnormal operation or compressor damage	<ul style="list-style-type: none"> ▪ Pipe flushing³ ▪ Vacuum drying⁴
SEALED	Imperfect seals can lead to refrigerant leakage	<ul style="list-style-type: none"> ▪ Pipe manipulation⁵ and brazing² techniques ▪ Gastightness test⁶

Notes:

1. See Part 3, 5.2.1 "Pipe delivery, storage and sealing".
2. See Part 3, 5.5 "Brazing".
3. See Part 3, 5.8 "Pipe Flushing".
4. See Part 3, 5.10 "Vacuum Drying".
5. See Part 3, 5.3 "Manipulating Copper Piping".
6. See Part 3, 5.9 "Gastightness Test".

5.2 Storing Copper Piping

5.2.1 Pipe delivery, storage and sealing

Notes for installers



Ensure that piping does not get bent or deformed during delivery or whilst stored.

On construction sites store piping in a designated location.

To prevent dust or moisture entering, piping should be kept sealed whilst in storage and until it is about to be connected. If piping is to be used soon, seal the openings with plugs or adhesive tape. If piping is to be stored for a long time, charge the piping with nitrogen at 0.2-0.5MPa and seal the openings by brazing. Storing piping directly on the ground risks dust or water ingress. Wooden supports can be used to raise piping off the ground.

During installation, ensure that piping to be inserted through a hole in a wall is sealed to ensure dust and/or fragments of wall do not enter.

Be sure to seal piping being installed outdoors (especially if being installed vertically) to prevent rain

5.3 Manipulating Copper Piping

5.3.1 De-oiling

Notes for installers



Lubrication oil used during some copper pipe manufacturing processes can cause deposits to form in R410A refrigerant systems, causing system errors. Oil-free copper piping should therefore be selected. If ordinary (oily) copper piping is used, it must be cleaned with gauze dipped in tetrachloroethylene solution prior to installation.

Caution

Never use carbon tetrachloride (CCl₄) for pipe cleansing or flushing, as doing so will seriously damage the

5.3.2 Cutting copper piping and removing burrs

Notes for installers



Use a pipe cutter rather than a saw or cutting machine to cut piping. Rotate the piping evenly and slowly, applying even force to ensure that the piping does not become deformed during cutting. Using a saw or cutting machine to cut piping runs the risk of copper shavings entering the piping. Copper shavings are difficult to remove and pose a serious risk to the system if they enter the compressor or block the throttling unit.

After cutting using a pipe cutter, use a reamer/scrapper to remove any burrs that have formed at the opening, keeping the opening of the piping downwards to avoid copper shavings from entering the piping.

Remove burrs carefully to avoid scratches, which may prevent a proper seal being formed and lead to

5.3.3 Expanding copper piping ends

Notes for installers

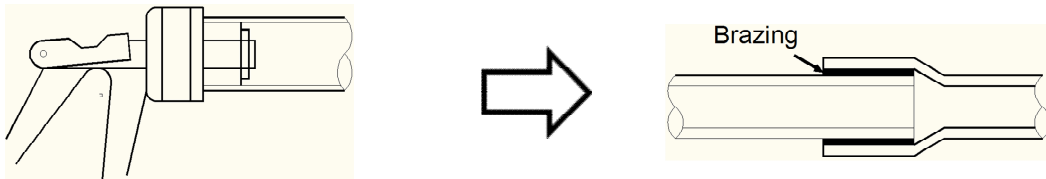


Ends of copper piping can be expanded so that another length of piping can be inserted and the joint brazed. Insert the expanding head of the pipe expander into the pipe. After completing pipe expansion, rotate the copper pipe a few degrees to rectify the straight line mark left by the expanding head.

Caution

Ensure that the expanded section of piping is smooth and even. Remove any burrs that remain after cutting.

Figure 3-5.1: Expanding copper piping ends



5.3.4 Flared joints

Flared joints should be used where a screw thread connection is required.

Notes for installers



Before flaring 1/2H (half hard) piping, anneal the end of the pipe to be flared.

Remember to place the flare nut on the piping before flaring.

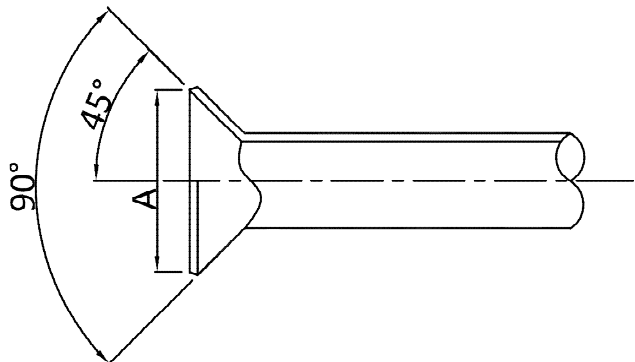
Ensure the flared opening is not cracked, deformed or scratched, otherwise it will not form a good seal and refrigerant leakage may occur.

The diameter of the flared opening should be within the ranges specified in Table 3-5.1. Refer to Figure 3-5.2.

Table 3-5.1: Flared opening size ranges

Pipe (mm)	Flared opening diameter (A) (mm)
Φ6.35	8.7 - 9.1
Φ9.53	12.8 - 13.2
Φ12.7	16.2 - 16.6
Φ15.9	19.3 - 19.7
Φ19.1	23.6 - 24.0

Figure 3-5.2: Flared opening



5.3.5 Bending piping

Bending copper piping reduces the number of brazed joints required and can improve quality and save material.

Notes for installers

Piping bending methods

Hand bending is suitable for thin copper piping ($\Phi 6.35\text{mm} - \Phi 12.7\text{mm}$).
 Mechanical bending (using a bending spring, manual bending machine or powered bending machine) is suitable for a wide range of diameters ($\Phi 6.35\text{mm} - \Phi 54.0\text{mm}$).

Caution

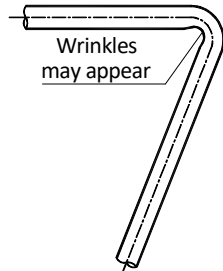
When using a spring bender, ensure that the bender is clean before inserting it in the piping.

After bending a copper pipe, ensure that there are no wrinkles or deformation on either side of the pipe.

Ensure that bend angles do not exceed 90° , otherwise wrinkles may appear on the inner side of the pipe, and the pipe may buckle or crack. Refer to Figure 3-5.3.

Do not use a pipe that has buckled during the bending process; ensure that the cross section at the bend is greater than $2/3$ of the original area.

Figure 3-5.3: Pipe bending in excess of 90°



5.4 Refrigerant Piping Supports

When the air conditioning is running, the refrigerant piping will deform (shrink, expand, droop). To avoid damage to piping, hangers or supports should be spaced as per the criteria in the Table 3-5.2. In general, the gas and liquid pipes should be suspended in parallel and the interval between support points should be selected according to the diameter of the gas pipe.

Table 3-5.2: Refrigerant piping support spacings

Pipe (mm)	Interval between support points (m)	
	Horizontal Piping	Vertical Piping
$< \Phi 20$	1	1.5
$\Phi 20 - \Phi 40$	1.5	2
$> \Phi 40$	2	2.5

Suitable insulation should be provided between the piping and the supports. If wooden dowels or blocks are to be used, use wood that has undergone preservative treatment.

Changes in refrigerant flow direction and refrigerant temperature result in movement, expansion and shrinkage of the refrigerant piping. Piping should therefore not be fixed too tightly, otherwise stress concentrations may occur in the piping, with the potential for rupturing.

5.5 Brazing

Care must be taken to prevent oxide forming on the inside of copper piping during brazing. The presence of oxide in a refrigerant system adversely affects the operation of valves and compressors, potentially leading to low efficiency or even compressor failure. To prevent oxidation, during brazing nitrogen should be flowed through the refrigerant piping.

Notes for installers



Warning

Never flow oxygen through piping as doing so aids oxidation and could easily lead to explosion and as such is extremely dangerous.

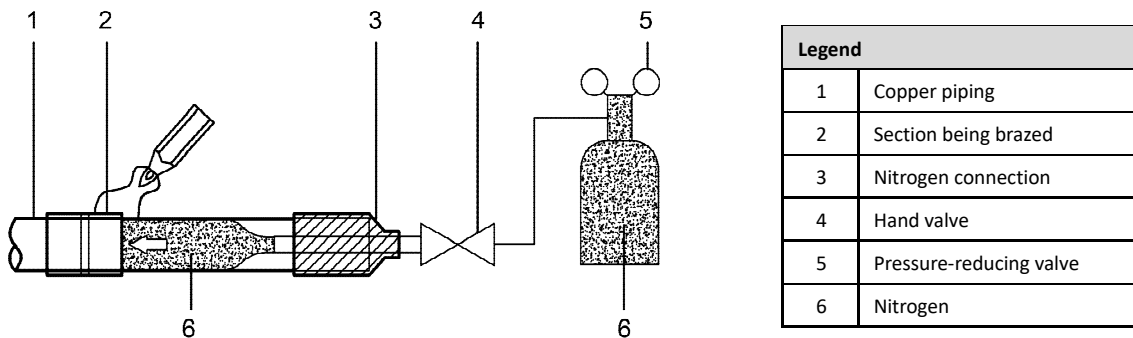
Take appropriate safety precautions such as having a fire extinguisher to hand whilst brazing.

Flowing nitrogen during brazing

Use a pressure reducing valve to flow nitrogen through copper piping at 0.02-0.03MPa during brazing.

Start the flow before brazing starts and ensure that the nitrogen continuously passes through the section being brazed until the brazing is complete and the copper has cooled down completely.

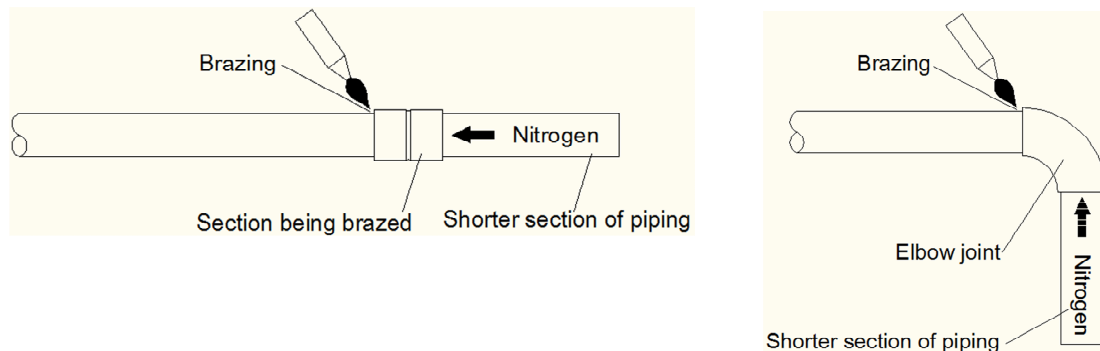
Figure 3-5.4: Flowing nitrogen through piping during brazing



When joining a shorter section of piping to a longer section, flow nitrogen from the shorter side to allow better displacement of air with nitrogen.

If the distance from the point where nitrogen enters the piping to the joint to be brazed is long, ensure that the nitrogen is flowed for sufficient time to discharge all the air from the section to be brazed before commencing brazing.

Figure 3-5.5: Flowing nitrogen from shorter side during brazing



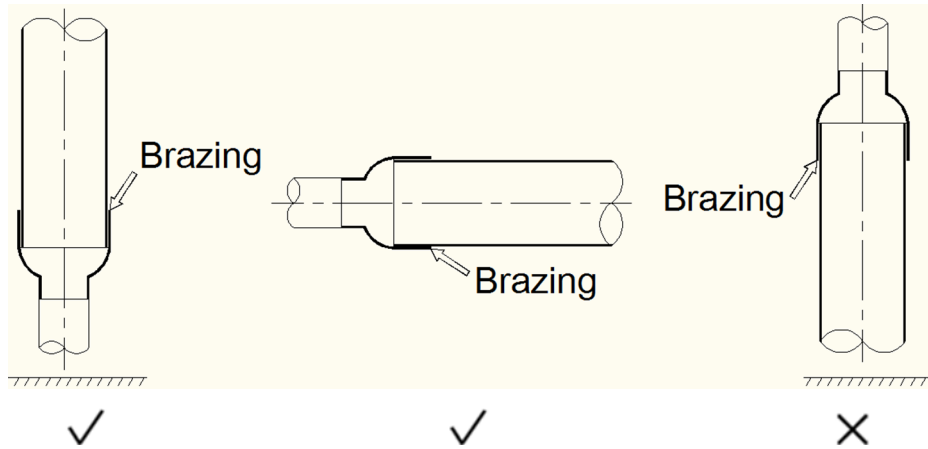
Box continued on next page ...

... box continued from previous page

Piping orientation during brazing

Brazing should be conducted downwards or horizontally to avoid filler leakage.

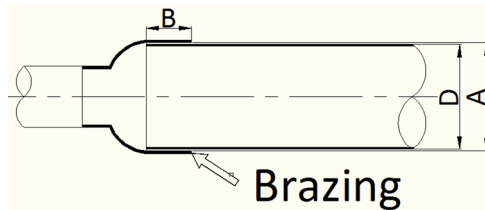
Figure 3-5.6: Piping orientation during brazing



Piping overlap during brazing

Table 3-5.3 specifies the minimum permissible piping overlap and the range of permissible gap sizes for brazed joints on piping of different diameters. Refer also to Figure 3-5.7.

Figure 3-5.7: Piping overlap and gap for brazed joints



Legend	
A	Inner diameter of larger pipe
D	Outer diameter of smaller pipe
B	Inlaid depth (overlap)

Table 3-5.3: Piping overlap and gap for brazed joints¹

D (mm)	Minimum permissible B (mm)	Permissible A – D (mm)
5 < D < 8	6	0.05 - 0.21
8 < D < 12	7	
12 < D < 16	8	0.05 - 0.27
16 < D < 25	10	
25 < D < 35	12	0.05 - 0.35
35 < D < 45	14	

Notes:

1. A, B, D refer to the dimensions shown in Figure 3-5.7.

Filler

Use a copper/phosphorus brazing alloy (BCuP) filler that does not require flux.

Do not use flux. Flux can cause corrosion of piping and can affect the performance of compressor oil.

Do not use anti-oxidants when brazing. Residue can clog piping and damage components.

5.6 Branch Joints
Notes for installers


Use U-shaped branch joints as specified on the construction drawings – do not replace U-shaped branch joints with tee joints.

To avoid accumulation of oil in the outdoor units, outdoor branch joints should be installed horizontally and must not be higher than the outdoor unit refrigerant outlets. Refer to Figure 3-5.9.

Indoor branch joints may be installed either horizontally or vertically. Horizontal branch joints must be installed at an angle to the horizontal not exceeding 10° in order to avoid uneven distribution of refrigerant and possible malfunction. Refer to Figure 3-5.8.

Figure 3-5.8: Branch joint orientation

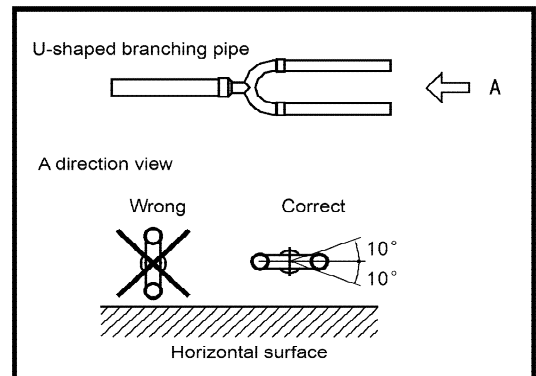
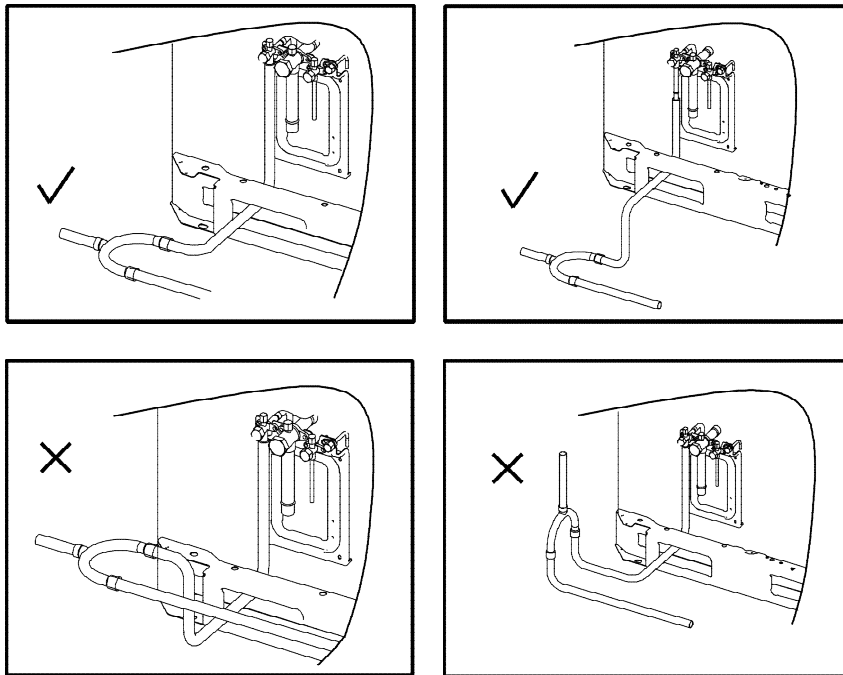


Figure 3-5.9: Installation of outdoor branch joints

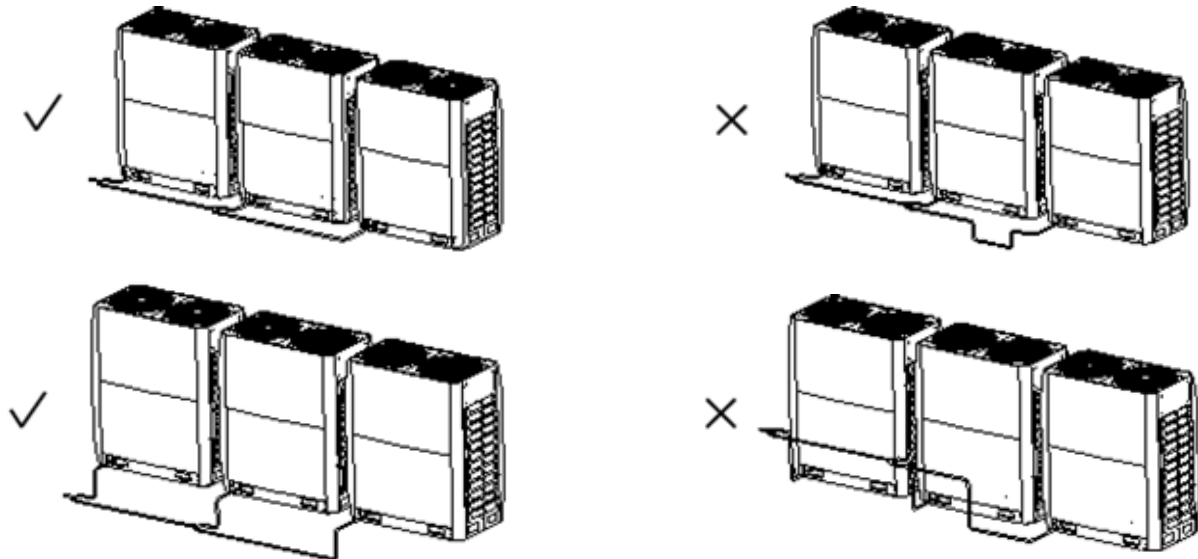


To ensure even distribution of refrigerant, a limitation is placed on how close branch joints may be installed to bends, other branch joints and the straight sections of piping leading to indoor units. Refer to Part 3, 4.6

5.7 Piping Connections between Outdoor Units

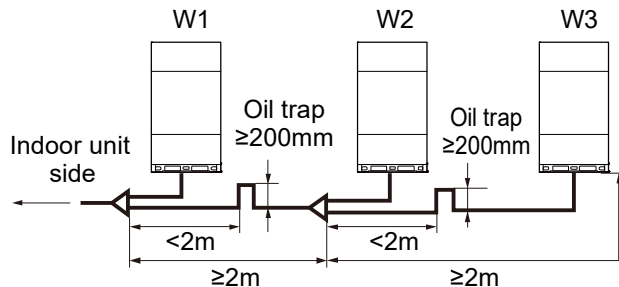
The piping connecting the outdoor units should be horizontal and must not be higher than the refrigerant outlets. If necessary, to avoid obstacles the piping may be vertically offset below the outlets. When inserting a vertical offset to avoid an obstacle, the whole outdoor piping should be offset, rather than just the section adjacent to the obstacle. Refer to Figure 3-5.10.

Figure 3-5.10: Piping connections between outdoor units



In case that the piping length between outdoor units is 2m or more, the oil trap for the gas pipe should be provided so that accumulation of refrigerant oil may not occur.

Figure 3-5.11: Oil trap between outdoor units



Outdoor piping should be installed in a metal casing to protect against exposure to sunlight, rain, wind and other potential causes of damage.

5.8 Pipe Flushing

5.8.1 Purpose

To remove dust, other particles and moisture, which could cause compressor malfunction if not flushed out before the system is run, the refrigerant piping should be flushed using nitrogen. As described in Part 3, 5.1.1 "Installation procedure", pipe flushing should be performed once the piping connections have been completed with the exception of the final connections to the indoor units. That is, flushing should be performed once the outdoor units have been connected but before the indoor units are connected.

5.8.2 Procedure
Notes for installers

Warning

Only use nitrogen for flushing. Using carbon dioxide risks leaving condensation in the piping. Oxygen, air, refrigerant, flammable gases and toxic gases must not be used for flushing. Use of such gases may result in fire or explosion.

Procedure

The liquid and gas sides can be flushed simultaneously; alternatively, one side can be flushed first and then Steps 1 to 8 repeated, for the other side. The flushing procedure is as follows:

1. Cover the inlets and outlets of the indoor units to prevent dirt getting blown in during pipe flushing. (Pipe flushing should be carried out before connecting the indoor units to the piping system.)
2. Attach a pressure reducing valve to a nitrogen cylinder.
3. Connect the pressure reducing valve outlet to the inlet on the liquid (or gas) side of the outdoor unit.
4. Use blind plugs to block all liquid (gas) side openings, except for the opening at the indoor unit which is furthest from the outdoor units ("Indoor unit A" in Figure 3-5.12).
5. Start to open the nitrogen cylinder valve and gradually increase the pressure to 0.5MPa.
6. Allow time for nitrogen to flow as far as the opening at indoor unit A.
7. Flush the first opening:
 - a) Using suitable material, such as a bag or cloth, press firmly against the opening at indoor unit A.
 - b) When the pressure becomes too high to block with your hand, suddenly remove your hand allowing gas to rush out.
 - c) Repeatedly flush in this manner until no further dirt or moisture is emitted from the piping. Use a clean cloth to check for dirt or moisture being emitted. Seal the opening once it has been flushed.
8. Flush the other openings in the same manner, working in sequence from indoor unit A towards the outdoor units. Refer to Figure 3-5.13.
9. Once flushing is complete, seal all openings to prevent dust and moisture from entering.

Figure 3-5.12: Pipe flushing using nitrogen

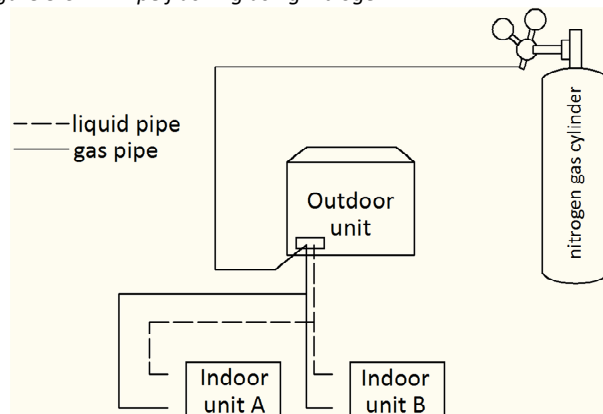
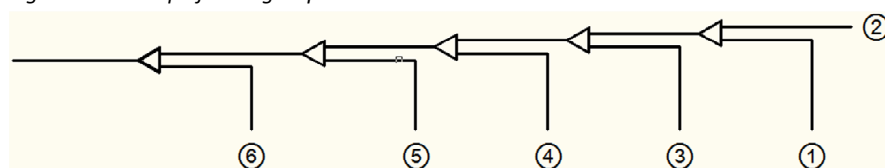


Figure 3-5.13: Pipe flushing sequence¹



Notes:

1. 1-2-3-4-5-6 working towards the outdoor units.

5.9 Gastightness Test

5.9.1 Purpose

To prevent faults caused by refrigerant leakage, a gastightness test should be performed before system commissioning.

5.9.2 Procedure

Notes for installers



Warning

Only dry nitrogen should be used for gastightness testing. Oxygen, air, flammable gases and toxic gases must not be used for gastightness testing. Use of such gases may result in fire or explosion.

Procedure

The gastightness test procedure is as follows:

Step 1

Once the piping system is complete and the indoor and outdoor units have been connected, vacuum the piping to -0.1MPa.

Step 2

Charge the indoor piping with nitrogen at 0.3MPa through the needle valves on the liquid and gas stop valves and leave for at least 3 minutes (do not open the liquid or gas stop valves). Observe the pressure gauge to check for large leakages. If there is a large leakage, the pressure gauge will drop quickly.

If there are no large leakages, charge the piping with nitrogen at 1.5MPa and leave for at least 3 minutes. Observe the pressure gauge to check for small leakages. If there is a small leakage, the pressure gauge will drop distinctly.

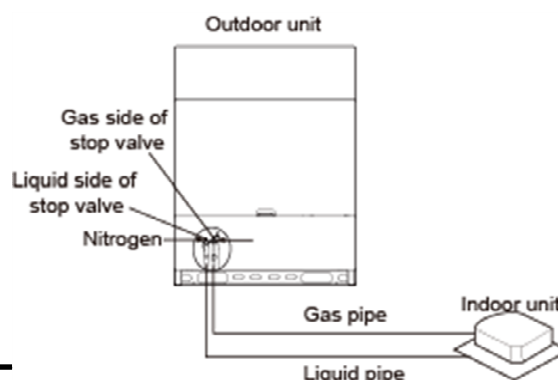
If there are no small leakages, charge the piping with nitrogen at 4.2MPa and leave for at least 24 hours to check for micro leakages. Micro leakages are difficult to detect. To check for micro leakages, allow for any change in ambient temperature over the test period by adjusting the reference pressure by 0.01MPa per 1°C of temperature difference. Adjusted reference pressure = Pressure at pressurization + (temperature at observation – temperature at pressurization) x 0.01MPa. Compare the observed pressure with the adjusted reference pressure. If they are the same, the piping has passed the gastightness test. If the observed pressure is lower than the adjusted reference pressure, the piping has a micro leakage.

If the leakage is detected, refer to Part 3, 5.9.3 “Leak detection”. Once the leak has been found and fixed, the gastightness test should be repeated.

Step 3

If not continuing straight to vacuum drying (see Part 3, 5.10 “Vacuum Drying”) once the gastightness test is complete, reduce the system pressure to 0.5-0.8MPa and leave the system pressurized until ready to carry out the vacuum drying procedure.

Figure 3-5.14: Gastightness test



5.9.3 Leak detection

Notes for installers



The general methods for identifying the source of a leak are as follows:

1. Audio detection: relatively large leaks are audible.
2. Touch detection: place your hand at joints to feel for escaping gas.
3. Soapy water detection: small leaks can be detected by the formation of bubbles when soapy water is applied to a joint.
4. Refrigerant leak detection: for leaks that are difficult to detect, refrigerant leak detection may be used as follows:
 - a) Pressurize the piping with nitrogen at 0.3MPa.
 - b) Add refrigerant into the piping until the pressure reaches 0.5MPa.
 - c) Use a halogen refrigerant detector to find the leak.
 - d) If the leak source cannot be found, continuing charging with refrigerant to a pressure of 4MPa and then search again.

5.10 Vacuum Drying

5.10.1 Purpose

Vacuum drying should be performed in order to remove moisture and non-condensable gases from the system. Removing moisture prevents ice formation and oxidization of copper piping or other internal components. The presence of ice particles in the system would cause abnormal operation, whilst particles of oxidized copper can cause compressor damage. The presence of non-condensable gases in the system would lead to pressure fluctuations and poor heat exchange performance.

Vacuum drying also provides additional leak detection (in addition to the gastightness test).

5.10.2 Procedure

Notes for installers



During vacuum drying, a vacuum pump is used to lower the pressure in the piping to the extent that any moisture present evaporates. At 5mmHg (755mmHg below typical atmospheric pressure) the boiling point of water is 0°C. Therefore a vacuum pump capable of maintaining a pressure of -756mmHg or lower should be used. Using a vacuum pump with a discharge in excess of 4L/s and a precision level of 0.02mmHg is recommended.

Caution

Before performing vacuum drying, make sure that all the outdoor unit stop valves are firmly closed. Once the vacuum drying is complete and the vacuum pump is stopped, the low pressure in the piping could suck vacuum pump lubricant into the air conditioning system. The same could happen if the vacuum pump stops unexpectedly during the vacuum drying procedure. Mixing of pump lubricant with compressor oil could cause compressor malfunction and a one-way valve should therefore be used to prevent vacuum pump lubricant seeping into the piping system.

Procedure

The vacuum drying procedure is as follows:

Step 1

Connect the blue (low pressure side) hose of a pressure gauge to the master unit gas pipe stop valve, the red (high pressure side) hose to the master unit liquid pipe stop valve and the yellow hose to the vacuum pump.

Step 2

Start the vacuum pump and then open the pressure gauge valves to start vacuum the system. After 30 minutes, close the pressure gauge valves. After a further 5 to 10 minutes check the pressure gauge. If the gauge has returned to zero, check for leakages in the refrigerant piping.

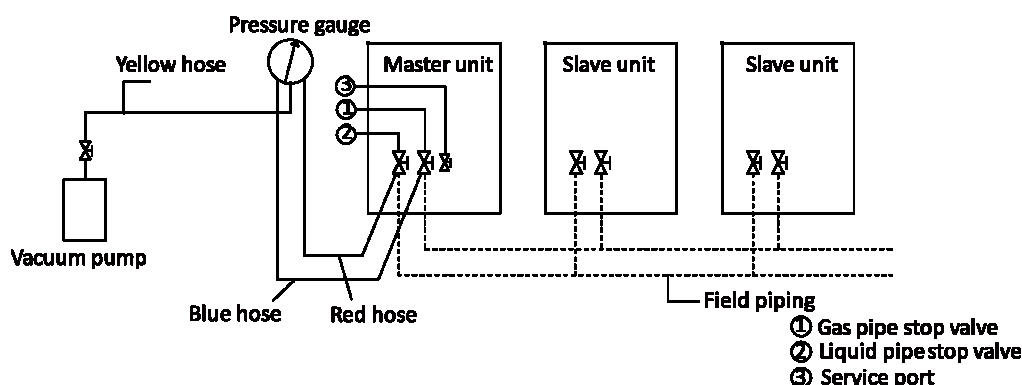
Step 3

Re-open the pressure gauge valves and continue vacuum drying for at least 2 hours and until a pressure difference of 756mmHg or more has been achieved. Once the pressure difference of at least 756mmHg has been achieved, continue vacuum drying for 2 hours.

Step 4

Close the pressure gauge valves and then stop the vacuum pump. After 1 hour, check the pressure gauge. If the pressure in the piping has not increased, the procedure is finished. If the pressure has increased, check for leakages. After vacuum drying, **keep the blue and red hoses connected to the pressure gauge and to the master unit stop valves**, in preparation for refrigerant charging (see Part 3, 8 "Charging Refrigerant").

Figure 3-5.15: Vacuum drying



Pressure gauge

6 Drain Piping

6.1 Design Considerations

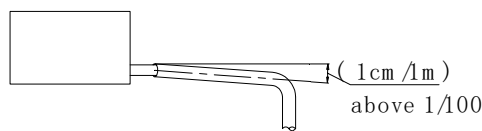
Drain piping design should take account of the following considerations:

Indoor unit condensate drain piping needs to be of sufficient diameter to carry the volume of condensate produced at the indoor units and installed at a slope sufficient to allow drainage. Discharge as close as possible to the indoor units is usually preferable.

To prevent the drain piping becoming excessively long, consideration should be given to installing multiple drain piping systems, with each system having its own drainage point and providing drainage for a subset of the overall set of indoor units.

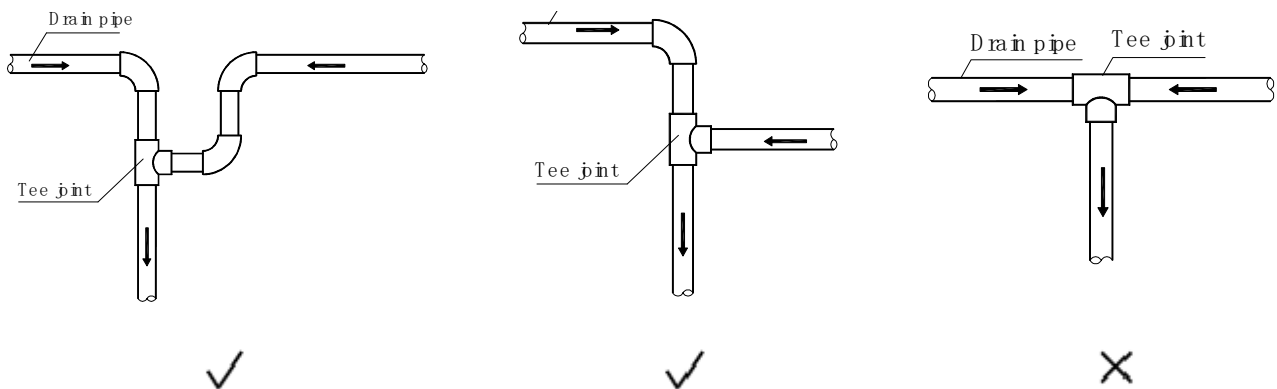
The routing of drain piping should take into consideration the need to maintain sufficient slope for drainage whilst avoiding obstacles such as beams and ducting. The drain piping slope should be at least 1:100 away from indoor units. Refer to Figure 3-6.1.

Figure 3-6.1: Drain piping minimum slope requirement



To avoid backflow and other potential complications, two horizontal drain pipes should not meet at the same level. Refer to the Figure 3-6.2 for suitable connection arrangements. Such arrangements also allow the slope of the two horizontal pipes to be selected independently.

Figure 3-6.2: Drain piping joints – correct and incorrect configurations



Branch drain piping should join main drain piping from the top, as shown in Figure 3-6.3.

Recommended support/hanger spacing is 0.8 – 1.0m for horizontal piping and 1.5 – 2.0m for vertical piping. Each vertical section should be fitted with at least two supports. For horizontal piping, spacing greater than those recommended leads to sagging and deformation of the pipe profile at the supports which impedes water flow and should therefore be avoided.

Air vents should be fitted at the highest point of each drain piping system to ensure that condensation is discharged smoothly. U-bends or elbow joints should be used such that the vents face downwards, to prevent dust entering the piping. Refer to Figure 3-6.5. Air vents should not be installed too close to indoor

Figure 3-6.3: Branch drain piping joining main drain piping

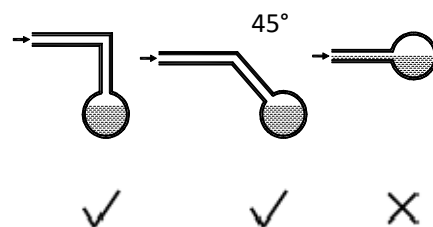
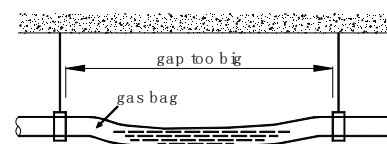
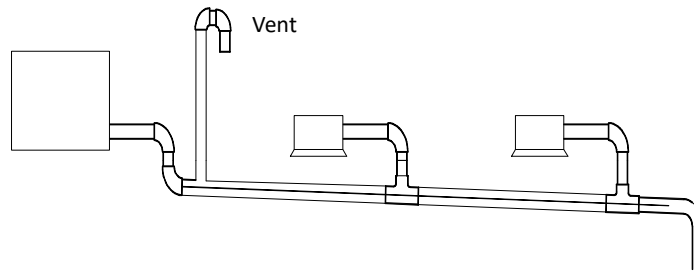


Figure 3-6.4: Effect of insufficient drain piping support



unit lift pumps.

Figure 3-6.5: Drain piping air vents



Air conditioner drain piping should be installed separately from waste, rainwater and other drain piping and should not come into direct contact with the ground.

Drain piping diameter should be not less than the indoor units’ drain piping connection.

To allow inspection and maintenance, the piping clamps shipped with units should be used to attach drain piping to indoor units – adhesive should not be used.

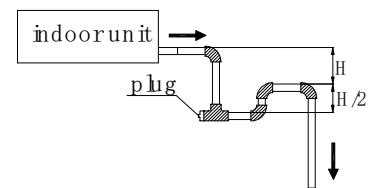
Thermal insulation should be added to drain piping to prevent condensation forming. Thermal insulation should extend all the way to the connection with the indoor unit.

Units with drain pumps should have separate drain piping systems from systems that use natural drainage.

6.2 Water Traps

For indoor units with a high negative pressure differential at the outlet of the drainage pan, a trap should be fitted to the drain piping to prevent poor drainage and/or water being blown back into the drainage pan. Traps should be arranged as in Figure 3-6.6. The vertical separation H should be in excess of 50mm. A plug may be fitted to allow cleaning or inspection.

Figure 3-6.6: Drain piping water traps



6.3 Selecting Piping Diameters

Select branch drainage piping (the drain piping connection to each unit) diameters according to indoor unit flow volume and select main drainage piping diameters according to the combined flow volume of the upstream indoor units. Use a design assumption of 2 liters of condensate per horsepower per hour. For example, the combined flow volume of three 2HP units and two 1.5HP units would be calculated as follows:

$$\begin{aligned} \text{Combined flow volume} &= 3 \times 2 \text{ L/HP/h} \times 2\text{HP} + 2 \times 2 \text{ L/HP/h} \times 1.5\text{HP} = 18 \text{ L/h} \end{aligned}$$

Tables 3-6.1 and 3-6.2 specify the required piping diameters for horizontal and vertical branch piping and for main piping. Note that main piping should use PVC40 or larger.

Table 3-6.1: Horizontal drain piping diameters

PVC piping	Nominal diameter (mm)	Capacity (L/h)		Remarks
		Slope 1:50	Slope 1:100	
PVC25	25	39	27	Branch piping only
PVC32	32	70	50	
PVC40	40	125	88	Branch or main piping
PVC50	50	247	175	
PVC63	63	473	334	

Table 3-6.2: Vertical drain piping diameters

PVC piping	Nominal diameter (mm)	Capacity (L/h)	Remarks
PVC25	25	220	Branch piping only
PVC32	32	410	
PVC40	40	730	Branch or main piping
PVC50	50	1440	
PVC63	63	2760	
PVC75	75	5710	
PVC90	90	8280	

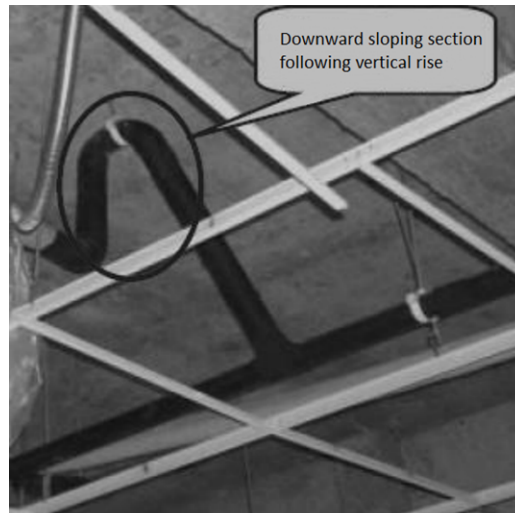
6.4 Drain Piping for Units with Lift Pumps

Drain piping for units with lift pumps should take account of the following additional considerations:

A downward sloping section should immediately follow the vertically rising section adjacent to the unit, otherwise a water pump error will occur. Refer to Figure 3-6.7.

Air vents should not be installed on vertically rising sections of drain piping, otherwise water may be discharged through the air vent or water flow may be impeded.

Figure 3-6.7: Downward sloping section of drain piping



6.5 Drain Piping Installation

Notes for installers


Installation of the drain piping should proceed in the following order:


Caution

Ensure that all joints are firm and once the drain piping is all connected conduct a watertightness test and water flow test.

Do not connect air conditioner drain piping to waste, rainwater or other drain piping and do not let air conditioner drain piping come into direct contact with the ground.

For units with drain pumps, test that the drain pump functions properly by adding water to the unit's drainage pan and running the unit. To allow inspection and maintenance, the pipe clamps shipped with units should be used to attach drain piping to indoor units – adhesive should not be used.

6.6 Watertightness Test and Water Flow Test

Once installation of a drainage piping system is complete, watertightness and water flow tests should be performed.

Notes for installers

Watertightness test

Fill the piping with water and test for leakages over a 24-hour period.

Water flow test (natural drainage test)

Slowly fill the drainage pan of each indoor unit with at least 600ml of water through the inspection port and check that the water is discharged through the outlet of the drain piping.

Caution

The drain plug in the drainage pan is for removing accumulated water prior to performing indoor unit maintenance. During normal operation, the drain should be plugged to prevent leakage.

7 Insulation

7.1 Refrigerant Piping Insulation

7.1.1 Purpose

During operation, the temperature of the refrigerant piping varies. Insulation is required to ensure unit performance and compressor lifespan. During cooling, the gas pipe temperature can be very low. Insulation prevents condensation forming on the piping.

7.1.2 Selecting insulation materials

Refrigerant piping insulation should be closed-cell foam of B1 fire resistance rating that can withstand a constant temperature of over 120°C and that complies with all applicable legislation.

7.1.3 Thickness of insulation

Minimum thicknesses for refrigerant piping insulation are specified in Table 3-7.1. In hot, humid environments, the thickness of insulation should be increased over and above the specifications in Table 3-7.1.

Table 3-7.1: Refrigerant piping insulation thickness

Pipe outer diameter (mm)	Minimum insulation thickness (mm) Humidity < 80%RH	Minimum insulation thickness (mm) Humidity ≥ 80%RH
Φ6.35	15	20
Φ9.53		
Φ12.7		
Φ15.9		
Φ19.1		
Φ22.2		
Φ25.4		
Φ28.6		
Φ31.8		
Φ38.1		
Φ41.3	20	25
Φ44.5		
Φ54.0		

7.1.4 Installation of piping insulation

With the exception of joint insulation, insulation should be applied to piping before fixing the piping in place. Insulation at joints in refrigerant piping should be applied after the gastightness test has been completed.

Notes for installers



Installation of insulation should be carried out in a manner suited to the type of insulation material being used.

Ensure there are no gaps at the joints between sections of insulation.

Do not apply tape too tightly as doing so may shrink insulation, reducing its insulating properties leading to condensation and loss of efficiency.

Insulate gas and liquid pipes separately, otherwise heat exchange between the two sides will greatly impact efficiency.

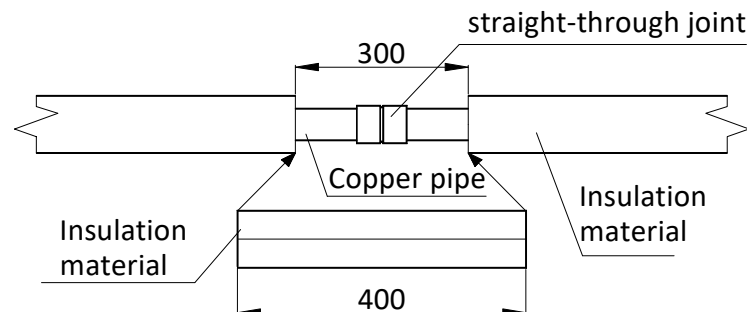
Do not bind the separately insulated gas and liquid pipes together too tightly as doing so can damage the

7.1.5 Installation of joint insulation

Insulation at joints in the refrigerant piping should be installed after the gastightness test has been successfully completed. The procedure at each joint is as follows:

1. Cut a section of insulation 50 to 100mm longer than the gap to be filled. Ensure that the cross-sectional and longitudinal openings are all cut evenly.
2. Embed the section into the gap ensuring that the ends abut tightly to the sections of insulation either side of the gap.
3. Glue the longitudinal cut and the joints with the sections of insulation either side of the gap.
4. Seal the seams with tape.

Figure 3-7.1: Installation of joint insulation (unit: mm)



7.2 Drain Piping Insulation

Use rubber/plastic insulating tube with a B1 fire resistance rating.

The insulation should typically be in excess of 10mm thick.

For drain piping installed inside a wall, insulation is not required.

Use suitable adhesive to seal seams and joints in the insulation and then bind with cloth reinforced tape of width not less than 50mm. Ensure tape is fixed firmly to avoid condensation.

Ensure the drain piping insulation adjacent to the indoor unit drainage water outlet is fixed to the unit itself using adhesive, to prevent condensation and dripping.

7.3 Ducting Insulation

Suitable insulation should be added to ducting in according with all applicable legislation.

8 Charging Refrigerant

8.1 Calculating Additional Refrigerant Charge

The additional refrigerant charge required depends on the lengths and diameters of the outdoor and indoor liquid pipes. Table 3-8.1 shows the additional refrigerant charge required per meter of equivalent pipe length for different diameters of pipe. The total additional refrigerant charge is obtained by summing the additional charge requirements for each of the outdoor and indoor liquid pipes, as in the following formula, where L₁ to L₈ represent the equivalent lengths of the pipes of different diameters. Assume 0.5m for the equivalent pipe length of each branch joint.

$$\begin{aligned}
 \text{Additional refrigerant charge R (kg)} &= L_1 (\Phi 6.35) \times 0.022 \\
 &+ L_2 (\Phi 9.52) \times 0.057 \\
 &+ L_3 (\Phi 12.7) \times 0.110 \\
 &+ L_4 (\Phi 15.9) \times 0.170 \\
 &+ L_5 (\Phi 19.1) \times 0.260 \\
 &+ L_6 (\Phi 22.2) \times 0.360 \\
 &+ L_7 (\Phi 25.4) \times 0.520 \\
 &+ L_8 (\Phi 28.6) \times 0.680
 \end{aligned}$$

Table 3-8.1: Additional refrigerant charge

Liquid side piping (mm)	Additional refrigerant charge per meter of equivalent length of piping (kg)
Φ6.35	0.022
Φ9.52	0.057
Φ12.7	0.110
Φ15.9	0.170
Φ19.1	0.260
Φ22.2	0.360
Φ25.4	0.520
Φ28.6	0.680

Strictly following the additional refrigerant charging amount calculation method, and determine that the additional amount shall not exceed the maximum refrigerant additional amount shown in table 3-8.2. If the additional refrigerant amount exceeds the limits, the total length of the pipeline construction scheme shall be shortened and the refrigerant charging amount shall be recalculated to meet the requirements.

Table 3-8.2: Maximum additional refrigerant charge amount (unit: kg)

Model	Maximum additional refrigerant	Model	Maximum additional refrigerant	Model	Maximum additional refrigerant
8HP	28.1	36HP	67.8	64HP	74.6
10HP	29.8	38HP	67.8	66HP	74.9
12HP	32.7	40HP	67.8	68HP	92.8
14HP	33.9	42HP	67.8	70HP	93.1
16HP	35.8	44HP	71.5	72HP	93.4
18HP	36.6	46HP	73.3	74HP	93.7
20HP	38.8	48HP	73.3	76HP	94.0
22HP	38.8	50HP	74.2	78HP	94.3
24HP	38.8	52HP	74.6	80HP	94.6
26HP	50.3	54HP	74.6	82HP	94.8
28HP	50.3	56HP	74.6	84HP	95.2
30HP	50.3	58HP	74.6	86HP	95.5
32HP	63.5	60HP	74.6	88HP	95.7
34HP	66.8	62HP	74.6	90HP	96.1

Notes:

1. The maximum addition refrigerant charge amount is based on the recommended combination.

8.2 Adding Refrigerant

Notes for installers



Caution

Only charge refrigerant after performing a gastightness test and vacuum drying.
 Never charge more refrigerant than required as doing so can lead to liquid hammering.
 Only use refrigerant R410A - charging with an unsuitable substance may cause explosions or accidents.
 Use tools and equipment designed for use with R410A to ensure required pressure resistance and to prevent foreign materials from entering the system.
 Refrigerant must be treated in accordance with applicable legislation.
 Always use protective gloves and protect your eyes when charging refrigerant.
 Open refrigerant containers slowly.

Procedure

The procedure for adding refrigerant is as follows:

Step 1

Calculate additional refrigerant charge R (kg) (see Part 3, 8.1 “Calculating Additional Refrigerant Charge”)

Step 2

Place a tank of R410A refrigerant on a weighing scale. Turn the tank upside down to ensure refrigerant is charged in a liquid state. (R410A is a blend of two different chemicals compounds. Charging gaseous R410A into the system could mean that the refrigerant charged is not of the correct composition).

After vacuum drying (see Part 3, 5.10 “Vacuum Drying”), the blue and red pressure gauge hoses should still be connected to the pressure gauge and to the master unit stop valves.

Connect the yellow hose from the pressure gauge to the R410A refrigerant tank.

Step 3

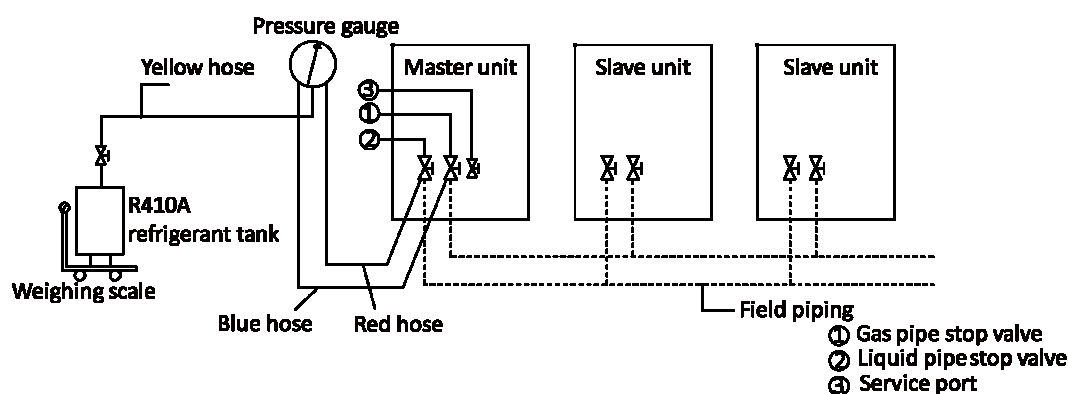
Open the valve where the yellow hose meets the pressure gauge, and open the refrigerant tank slightly to let the refrigerant eliminate the air. Caution: open the tank slowly to avoid freezing your hand.

Set the weighing scale to zero.

Step 4

- Open the three valves on the pressure gauge to begin charging refrigerant.
- When the amount charged reaches R (kg), close the three valves. If the amount charged has not reached R (kg) but no additional refrigerant can be charged, close the three valves on the pressure gauge, run the outdoor units in cooling mode, and then open the yellow and blue valves. Continue charging until the full R (kg) of refrigerant has been charged, then close the yellow and blue valves. Note: Before running the system, be sure to complete all the pre-commissioning checks as listed in Part 3, 11.3 “Pre-commissioning Checks” and be sure to open all stop valves as running the system with the stop valves closed would damage the compressor.

Figure 3-8.1: Charging refrigerant



9 Electrical Wiring

9.1 General

Notes for installers



Caution

All installation and wiring must be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation.

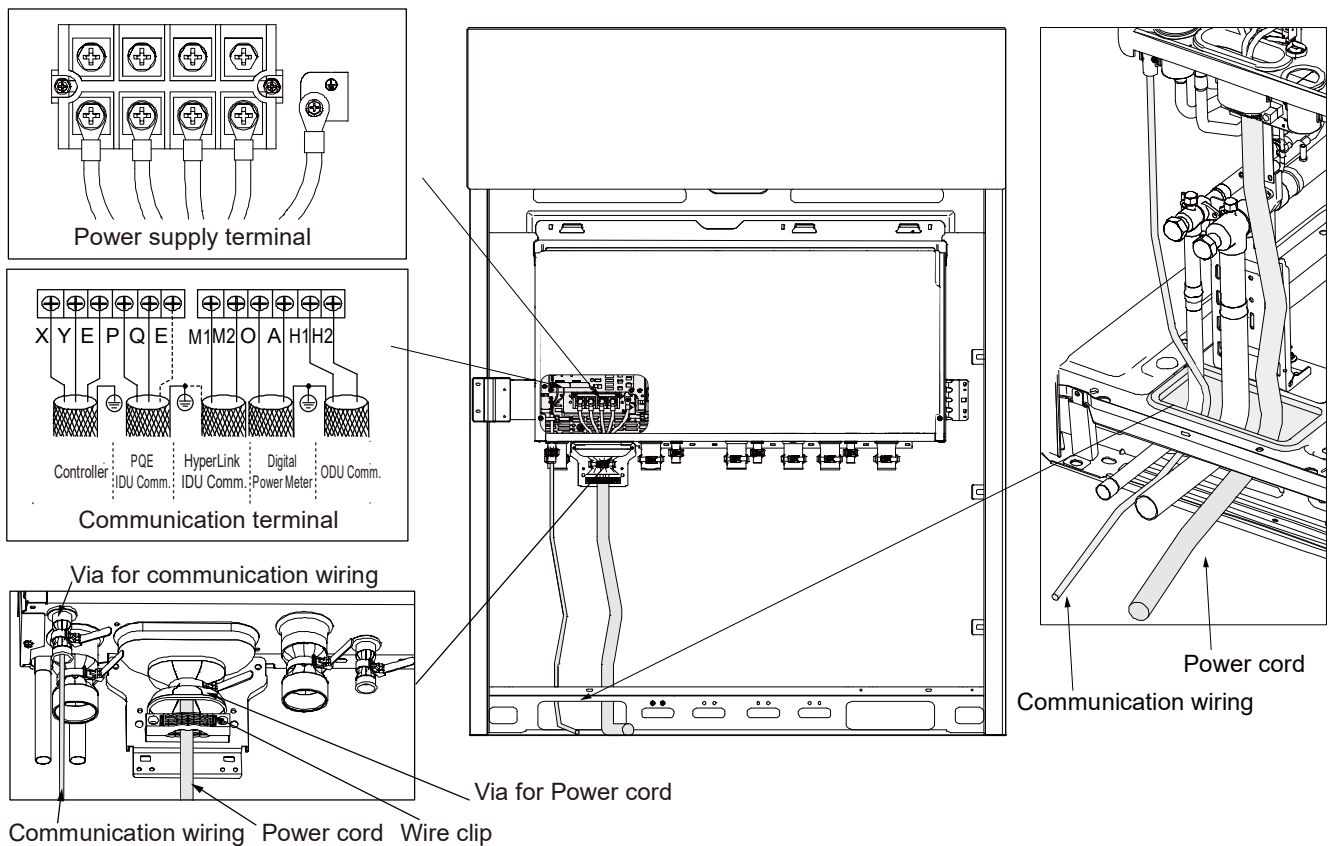
Electrical systems should be grounded in accordance with all applicable legislation.

Overcurrent circuit breakers and residual-current circuit breakers (ground fault circuit interrupters) should be used in accordance with all applicable legislation.

Wiring patterns shown in this data book are general connection guides only and are not intended for, or to include all details for, any specific installation.

The refrigerant piping, power wiring and communication wiring are typically run in parallel. However, if TVRLink communication is not activated, the communication wiring should not be bound together with the refrigerant piping or power wiring. To prevent signal interference, the power wiring and communication wiring should not be run in the same conduit. If the power supply is less than 10A, a separation of at least 300mm between power wiring and communication wiring conduits should be maintained; if the power supply is in the range 10A to 50A then a separation of at least 500mm should be maintained.

Figure 3-9.1: Wiring layout



9.2 Power Supply Wiring

Power supply wiring design and installation should adhere to the following requirements:

Separate power supplies should be provided for the indoor units and outdoor units.

Where five or more outdoor units are installed, additional residual current protection (leakage protection) should be installed as shown in Figure 3-9.1.

All the indoor units in a system (i.e. all the indoor units connected to the same set of outdoor units) should be tied into the same power circuit with the same power supply, overcurrent and residual current protection (leakage protection) and manual switch, as shown in Figure 3-9.2. Do not install separate protectors or manual switches for each indoor unit. Powering on and shutting down all indoor units in a system should be done simultaneously. The reason for this is that if an indoor unit that is running were to suddenly power off whilst the other indoor units continued running, the evaporator of the powered-off unit would freeze since refrigerant would continue flowing to that unit (its expansion valve would still be open) but its fan would have stopped. The indoor units that remain running would not get sufficient refrigerant so their performance would suffer. Additionally, liquid refrigerant returning directly to the compressor from the powered-off unit would cause liquid hammering, potentially damaging the compressor.

Indoor units can be powered separate when TVRLink communication is activated, refer to Part3, 9.3.4 “M1 M2 communication”.

For outdoor unit power wire sizing and circuit breaker sizing, refer to Table 2-6.1 in Part 2, 6 “Electrical Characteristics”.

Figure 3-9.2: Outdoor unit power supply wiring

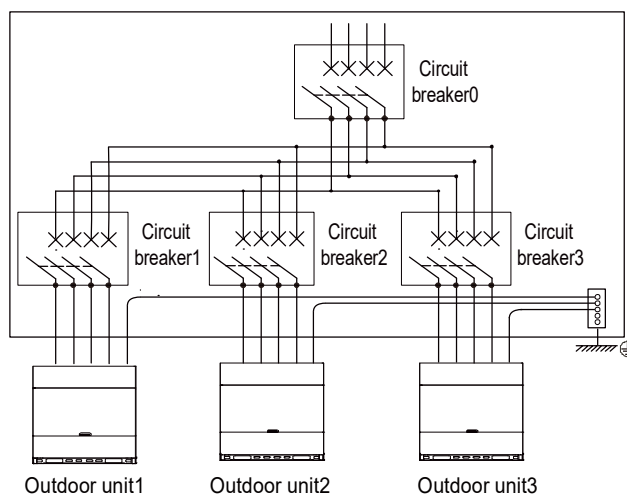
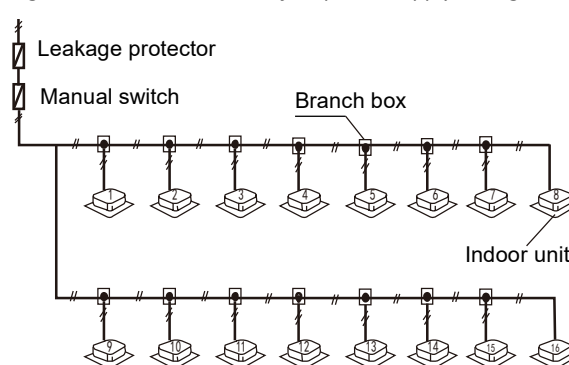


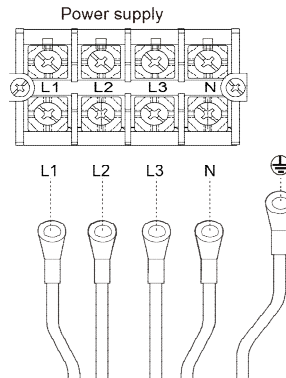
Figure 3-9.3: Indoor unit unified power supply wiring



Notes for installers


The 3-phase, 380-415V, 50 or 60Hz power supply should be connected to the outdoor unit power supply terminals as shown in Figure 3-9.4.

Figure 3-9.4: Outdoor unit 3-phase power supply terminals



9.3 Communication Wiring

Communication wiring design and installation should adhere to the following requirements:

Do not connect the communication line when the power is on.

Connect the shielding nets at both ends of the shielded wire to the sheet metal “⊕” of the electronic control box.

Do not connect the power cable to the terminal of communication line, otherwise, the motherboard will be damaged.

Do not connect a system with both TVRLink (M1 M2) communication lines and P Q communication lines.

It is forbidden to reverse the connection of the two communication ports (to up IDU) and (to down IDU) of the repeater.

The communication wiring of the indoor and ODUs can only be connected to the master ODU.

The ODU is often parallel type of multi modules, and the communication lines between the ODUs must be connected in series.

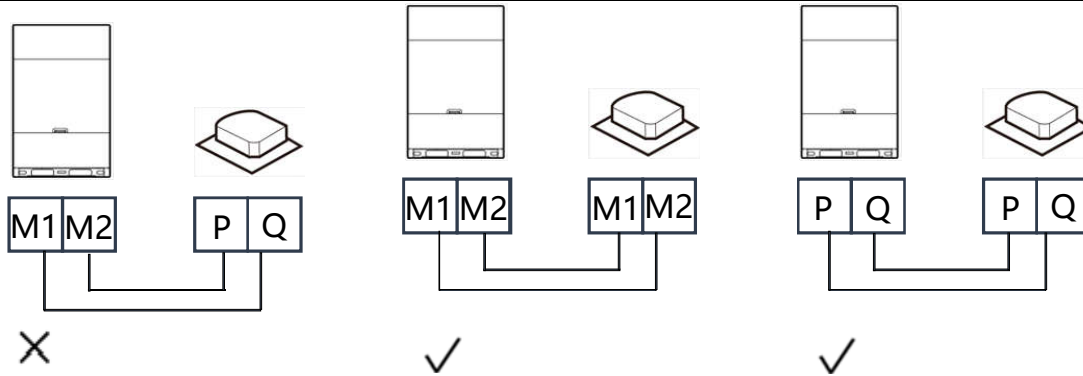
When a single communication wire is not long enough, the joint must be crimped or soldered, and the copper wire at the joint shall not be exposed.

7G Cooling outdoor unit compatible with different generation indoor units, the communication connection type should follow table 3-9.1.

Table 3-9.1: Communication connection between ODU and IDUs

Indoor unit generation	Communication connection type	Wire diameter (mm ²)	Length limitation (m)
All 7G indoor units and unified power supply	M1 M2 / P Q	2x0.75	2000 / 1200
All 7G indoor units and separate power supply	M1 M2	2x1.5	600
Once there is 2 nd generation indoor unit in the system	P Q E	3x0.75	1200

Figure 3-9.5: Communication wiring



9.3.1 Outdoor units' H1 H2 communication

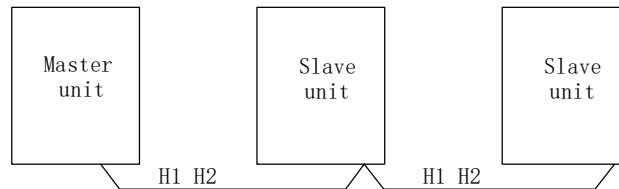
The outdoor unit's combined system, and the communication lines between the ODUs must be connected in series.

The H1 H2 communication wires should be connected one unit after another in a daisy chain from the master outdoor unit to the final slave outdoor unit.

0.75mm² two-core shielded cable should be used for communication wiring.

Connect the shielding nets at both ends of the shielded wire to the sheet metal "⊕" of the electronic control box.

Figure 3-9.6: Outdoor units' communication



9.3.2 Outdoor unit and indoor units' P Q E communication

Communication wiring design and installation should adhere to the following requirements:

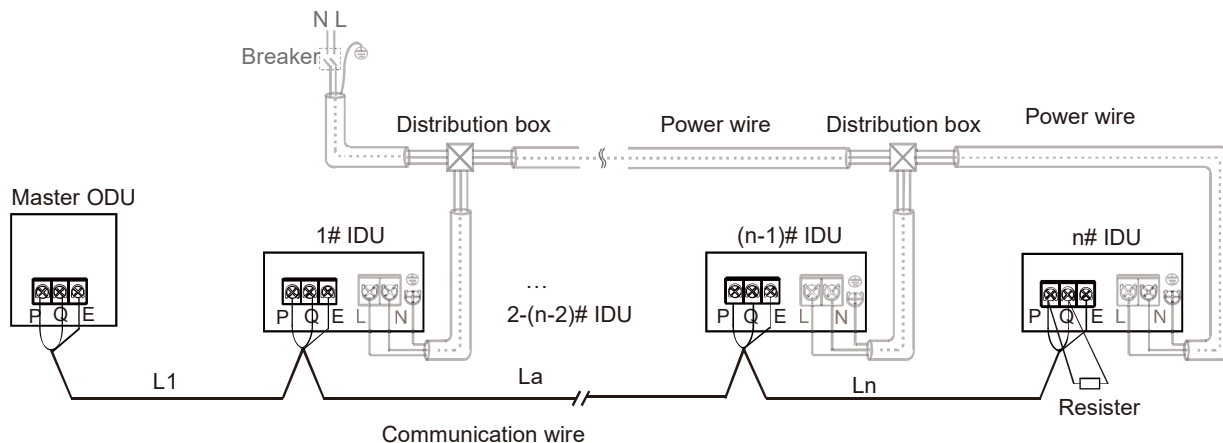
0.75mm² three-core shielded cable should be used for communication wiring. Using other types of cable can lead to interference and malfunction.

The P Q E communication wires should be connected one unit after another in a daisy chain from the outdoor unit to the final indoor unit as shown in Figure 3-9.7. At the final indoor unit, a 120Ω resistor should be connected between the P and Q terminals. After the final indoor unit, the communication wiring should NOT be continued back to the outdoor unit – that is, do not attempt to form a closed loop.

The P and Q communication wires should NOT be connecting to E.

The shielding nets of the communication wires should be connected together and grounded. Grounding can be achieved by connecting to the metal casing adjacent to the P Q E terminals of the outdoor unit electrical control box.

Figure 3-9.7: P Q E communication wiring configuration – IDUs uniform power supplied



9.3.3 Outdoor unit and indoor units' P Q communication

Communication wiring design and installation should adhere to the following requirements:

0.75mm² two-core shielded cable should be used for communication wiring. Using other types of cable can lead to interference and malfunction.

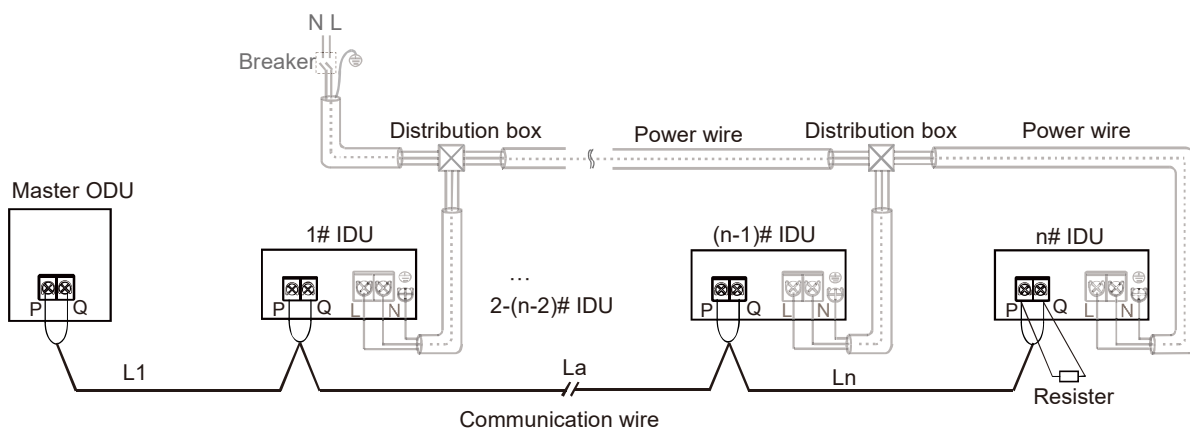
The P Q communication wires should be connected one unit after another in a daisy chain from the outdoor unit to the final indoor unit as shown in Figure 3-9.8. At the final indoor unit, a 120Ω resistor should be connected between the P and Q terminals. After the final indoor unit, the communication wiring should NOT be continued back to the outdoor unit – that is, do not attempt to form a closed loop.

The P and Q communication wires should NOT be connecting to E.

The shielding nets of the communication wires should be connected together and grounded. Grounding can be achieved by connecting to the metal casing adjacent to the P Q E terminals of the outdoor unit electrical control box.

All IDUs in a system must be powered through a uniform power supply so that they can be powered on or off at the same time

Figure 3-9.8: P Q communication wiring configuration – IDUs uniform power supplied



9.3.4 Outdoor unit and indoor units' M1, M2 communication-IDUs uniform power supplied

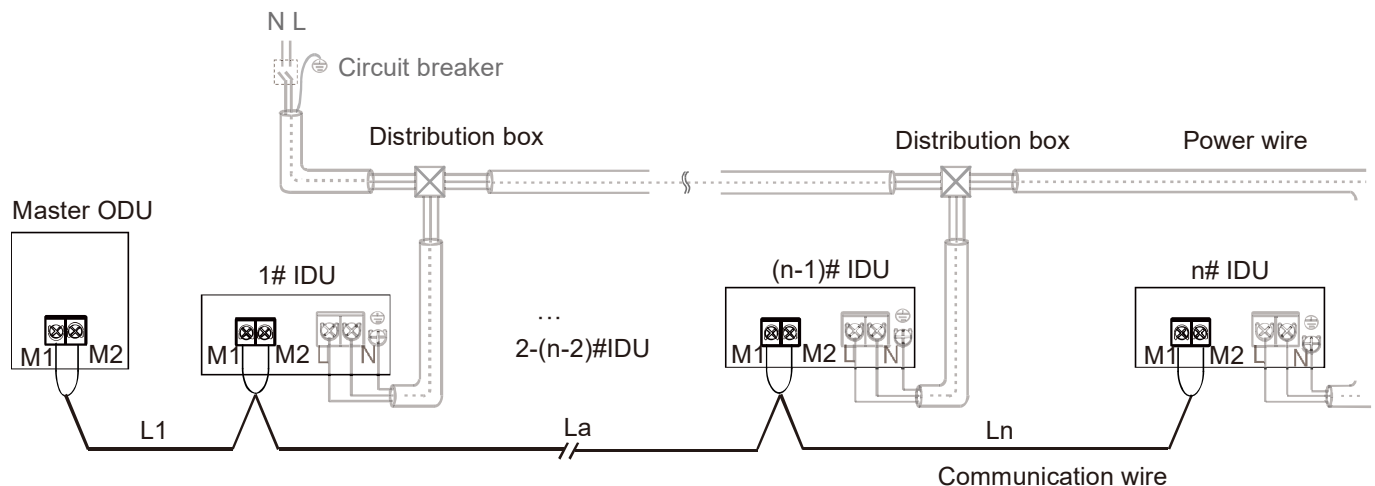
Communication wiring design and installation should adhere to the following requirements when all IDUs uniform power supplied:

0.75mm² two-core cable should be used for communication wiring when all the indoor units are uniform power supplied.

All indoor units in the system are 7G Cooling indoor units.

After the final indoor unit, the communication wiring CAN be continued back to the outdoor unit to ensure communication in case of disconnection point. In this situation, M1 M2 are polarized and M1 should connect to M1, M2 should connect to M2.

Figure 3-9.9: M1 M2 communication wiring configuration – IDUs uniform power supplied



9.3.5 Outdoor unit and indoor units' M1, M2 communication- IDUs with separate power supply

Communication wiring design and installation should adhere to the following requirements when IDUs separate power supplied.

1.5mm² two-core cable should be used for communication wiring when there is indoor unit separate power supplied.

All indoor units in the system are 7G Cooling indoor units.

If the total distance is less than or equal to 200m and the total number of IDUs is less than or equal to 10 sets, the valve is powered and controlled by the master ODU.

If the total distance is longer than 200m or the total number of IDUs is more than 10 sets, a repeater is required to increase the bus voltage. The load capacity of the repeater is the same as that of the ODU, and it can load a bus length of 200m or 10 IDUs.

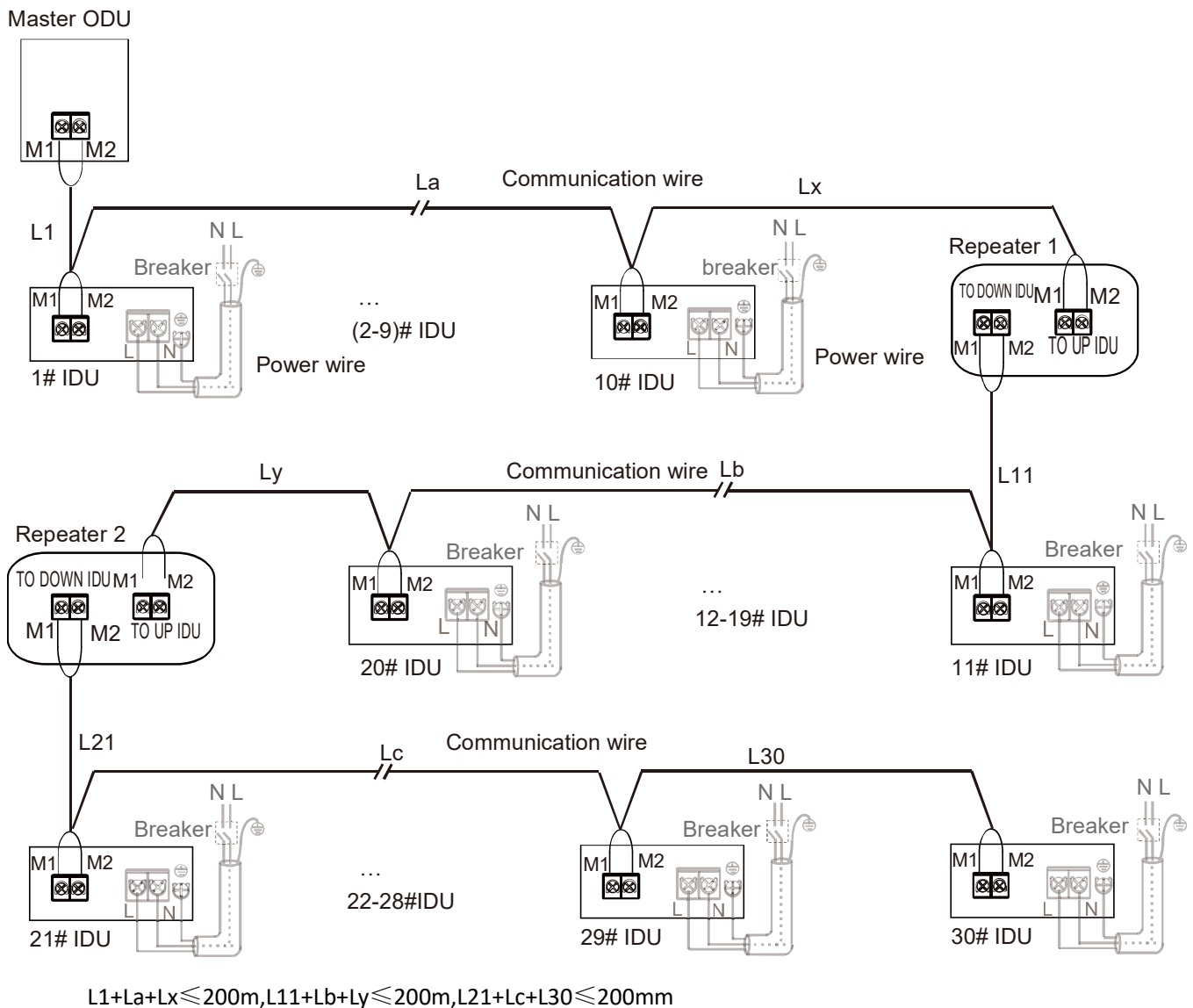
Maximum two repeaters can be installed in the same refrigerant system.

The number of IDUs requiring power supply in the same refrigerant system is less than or equal to 30 sets.

Keep the power on/off for both the repeater and the ODUs, or the repeater use an uninterruptible power supply. For repeater installation, please refer to the repeater installation manual. Do not reversely connect the upstream and downstream IDU ports of the repeater; otherwise, it will cause a communication failure

After the final indoor unit, the communication wiring CAN be continued back to the outdoor unit. In this situation, M1 M2 are polarized and M1 should connect to M1, M2 should connect to M2. Repeaters CANNOT be installed in the refrigerant system, and the total number of IDUs CANNOT exceed 10 sets.

Figure 3-9.10: M1 M2 communication wiring configuration – IDUs separate power supplied



Notes for installers


The communication wires should be connected to the master outdoor unit terminals indicated in Figure 3-9.11 and Table 3-9.2.

Caution

Communication wiring has polarity. Care should be taken to connect the poles correctly.

Figure 3-9.11: Master outdoor unit communication terminals

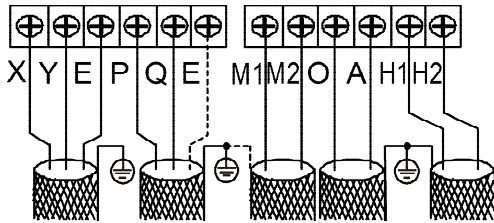


Table 3-9.2: Communication connections

Terminals	Connection
X Y E	Connect to centralized controller
P Q E	Communication connection between indoor units and master outdoor unit
M1 M2	TVRLink communication connection between indoor units and master outdoor unit
O A	Connect to digital energy meter
H1 H2	Connect between outdoor units

10 Installation in Areas of High Salinity

10.1 Caution

Do not install outdoor units where they could be directly exposed to sea air. Corrosion, particularly on the condenser and evaporator fins, could cause product malfunction or inefficient performance.

Outdoor units installed in seaside locations should be placed such as to avoid direct exposure to the sea air and additional anticorrosion treatment options should be selected, otherwise the service life of the outdoor units will be seriously affected.

Air conditioning installed in seaside locations should be run regularly as the running of the outdoor unit fans helps prevent build-up of salt on the outdoor unit heat exchangers.

10.2 Placement and Installation

Outdoor units should be installed 300m or more from the sea. If possible, well-ventilated indoor locations should be chosen. (When installing outdoor units indoors, outdoor unit discharge ducts should be added. See Part 3, 3 “Outdoor Unit Ducting and Shielding”.) Refer to Figure 3-10.1. If it is necessary to install outdoor units outside, direct exposure to the sea air should be avoided. A canopy should be added to shield the units from sea air and rain, as shown in Figure 3-10.2.

Ensure that base structures drain well so that outdoor unit footings do not become waterlogged. Check that outdoor unit casing drainage holes are not blocked.

Figure 3-10.1: Installation in a well-ventilated indoor area

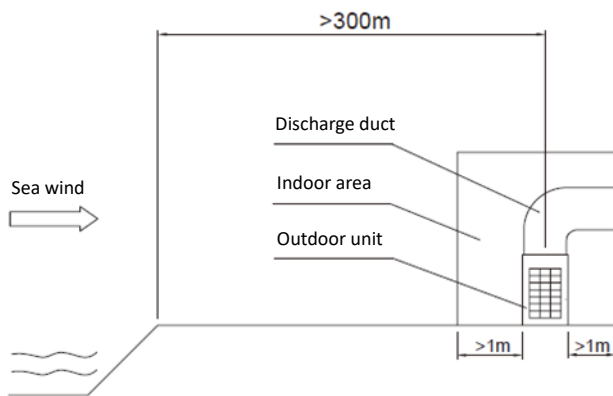
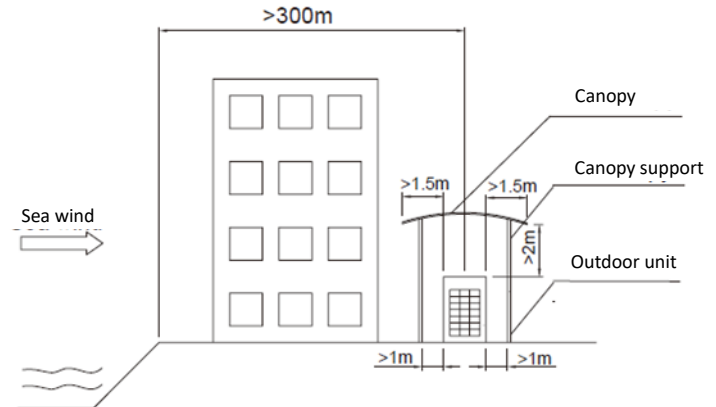


Figure 3-10.2: Installation outdoors under a canopy



10.3 Inspection and maintenance

In addition to standard outdoor unit servicing and maintenance, the following additional inspections and maintenance should be undertaken for outdoor units installed in seaside locations:

A comprehensive post-installation inspection should check for any scratches or other damage to painted surfaces and any damaged areas should be repainted/repaired immediately.

The units should be regularly cleaned using (non-salty) water to remove any salt that has accumulated. Areas cleaned should include the condenser, the refrigerant piping system, the outside surface of the unit casing and the outside surface of the electric control box.

Regular inspections should check for corrosion and if necessary corroded components should be replaced and/or anti-corrosion treatments should be added.

11 Commissioning

11.1 Outdoor Unit Address and Communication Type Setting

Step 1: Power on

Cover the lower panel of the ODU, and power on all IDUs and ODUs.

Step 2: Enter commissioning mode

When the ODU is first powered on, it displays "-. -. -. .-", which means the unit is not commissioned. Long press the "DOWN" and "UP" buttons simultaneously for 5s on the master ODU to enter commissioning mode.

Step 3: Set the number of IDUs in a system

Set the total number of IDUs of the refrigerant system on the master ODU by the menu. The digital display of the master ODU displays "01 01". The 3rd and 4th digits represent the number of IDUs, the initial value is 1, and the value range is 1–64, short press the "DOWN" or "UP" button to change the number. Once the number of IDUs has been set, short press the "OK" button to confirm and automatically proceed to the next step.

Step 4: Select the system communication protocol

Enter the communication protocol setting interface, the digital display of master ODU displays "02 0". The 4th digit of the digital display represents the communication protocol type, the initial value is 0. Short press the "DOWN" or "UP" button to change the communication protocol.

If the system is **all 7G indoor units**, and the 7G Cooling protocol RS-485 (P Q) communication function is required to be enabled, set the 4th digit of the master ODU digital display to **0**, ODU factory default 7G Cooling protocol RS-485 (P Q) communication.

If the system has **2nd generation DC/AC indoor units**, and the non-7G Cooling protocol RS-485 (P Q E) communication function is required to be enabled, set the 4th digit of the master ODU digital display to **1**.

If the system is **all 7G indoor units**, and the TVRLink (M1 M2) communication function is required to be enabled, and there is **uniform power supply** for indoor units, set the 4th digit of the master ODU digital display to **2**.

If the system is **all 7G indoor units**, and the TVRLink (M1 M2) communication function is required to be enabled, and there is **separate power supply** for indoor units, set the 4th digit of the master ODU digital display to **3**.

Once the communication protocol has been set, short press the "OK" button to confirm and automatically proceed to the next step.

Step 5: IDU and ODUs address setting

Auto address: Enter the auto addressing function, the digital display of master ODU flashes "AU Ad" and "X YZ" in rotation. "AU Ad" means the auto addressing is in progress, "X" represents the address of the ODU, "YZ" represents the number of detected IDUs, the auto addressing takes about 5-7 minutes, and automatically proceed to the next step after completion.

Step 6: System initialization

Entering system initialization, the digital display of master ODU flashes "AU Ad" and "X YZ" in rotation. "INIT" means initialization is in progress, "X" represents the address of the ODU, "YZ" represents the number of detected IDUs, the system initialization takes about 3-5 minutes, and automatically proceed to the next step after completion.

Step 7: Test run

During a test run, the system automatically diagnoses the air outlet static pressure of the ODU, the stop valve status, the consistency of the refrigerant piping and communication wiring, and the installation environment.

If the system is wired and installed correctly, the test run will last for about 40 to 60 minutes, the ODU digital display will show "STP1" to "STP7". After the test run, the digital display will show "End", 10 seconds after which the system will automatically proceed to the next step.

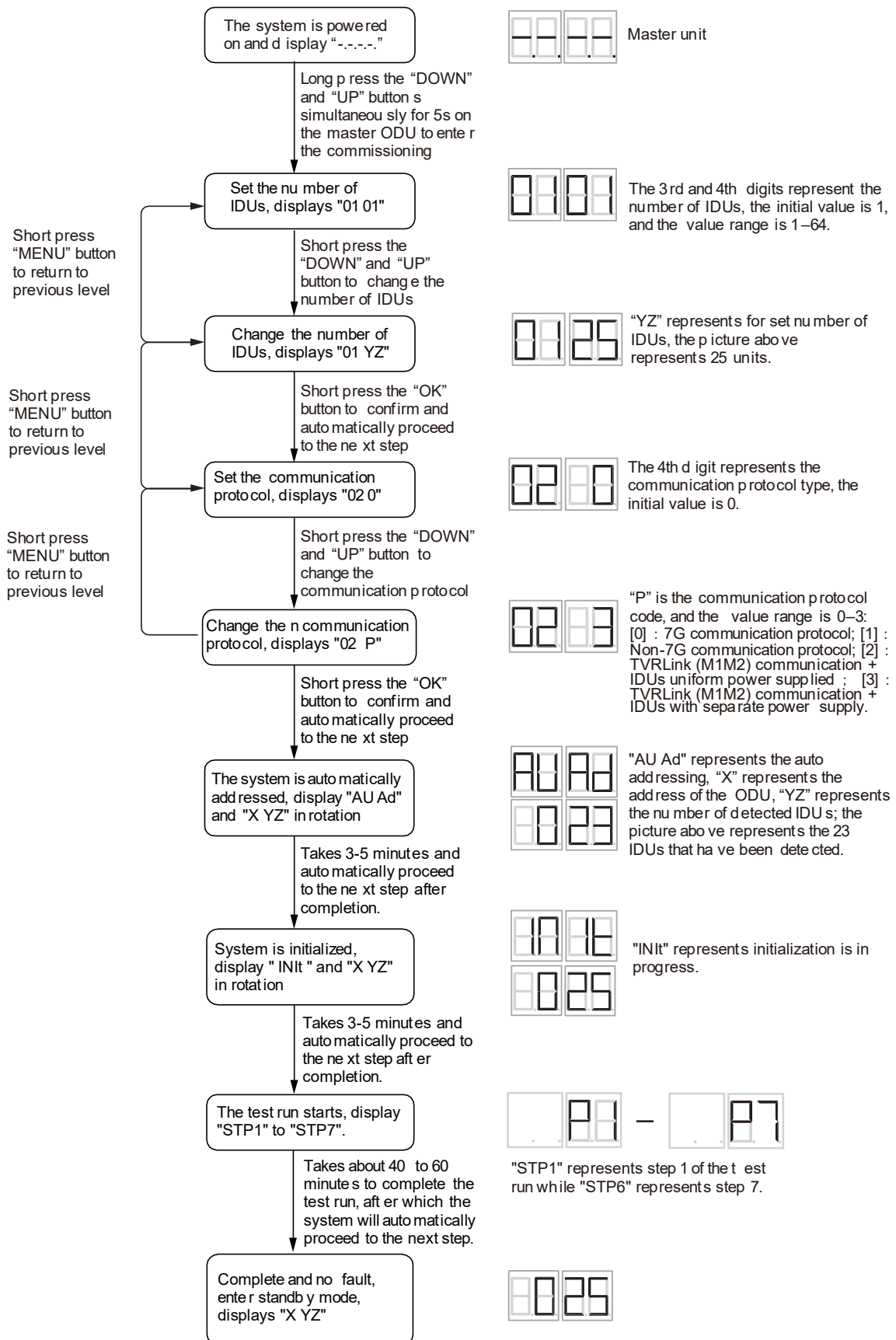
If the ODU detects a fault, the digital display will show an error code. Please refer to the Error Code Table for troubleshooting. After troubleshooting, the test run will restart through the menu "n11-2" on the master unit until the digital display shows "End" and the system proceeds to the next step. Then, the test run is completed.

Step 8: End

After system test run, all ODUs will enter standby mode and the digital display will display "X YZ" ("X" represents the address of the ODUs, "YZ" represents the number of detected IDUs), and the unit can be turned on normally.

Figure 3-11.1: Commissioning Procedure

commissioning flow chart



11.2 Multi-system Projects

For projects with multiple refrigerant systems, each independent refrigeration system (i.e. each system of up to three outdoor units and their connected indoor units) should be given a test run independently, before the multiple systems that make up a project are run simultaneously.

11.3 Pre-commissioning Checks

Before turning on the power to the indoor and outdoor units, ensure the following:

1. All indoor and outdoor refrigeration piping and communication wiring has been connected to the correct refrigeration system and the system to which each indoor and outdoor unit belongs is clearly marked on each unit or recorded in some other suitable place.
2. Pipe flushing, gastightness testing and vacuum drying have been satisfactorily completed as per instructions.
3. All condensate drain piping is complete and a water tightness test has been satisfactorily completed.
4. All power and communication wiring is connected to the correct terminals on units and controllers. (Check that the different phases of the 3-phase power supplies have been connected to the correct terminals).
5. No wiring has been connected in a short-circuit except TVRLink M1 M2 communication.
6. The power supplies to indoor and outdoor units have been checked and the power supply voltages are within $\pm 10\%$ of the rated voltages for each product.
7. All control wiring is selected according to Part 3, 9.3 "Communication Wiring" and the shielding has been grounded.
8. All other indoor and outdoor unit field settings have been set as required.
9. The additional refrigerant charge has been added as per Part 3, 8 "Charging Refrigerant". Note: In some circumstances it may be necessary to run the system in cooling mode during the refrigerant charging procedure. In such circumstances, points 1 to 8 above should be checked before running the system for the purpose of charging refrigerant and the outdoor unit liquid, gas and oil balance valves should be opened.

During commissioning, it is important that you:

Keep a supply of R410A refrigerant at hand.

Keep the system layout, system piping and control wiring diagrams at hand.

11.4 Operating the system

11.4.1 Operating single refrigerant system

After completing the above steps, operate the system and operation reports (see Part 3, 12 “Appendix to Part 3 – System Operating Report”) should be completed as a record of the operating status of the system.

Note: When operating the system, if the combination ratio is 100% or less, run all the indoor units and if the combination ratio is more than 100%, run indoor units with total capacity equal to the total capacity of the outdoor units.

The Operating procedure is as follows:

1. Ensure that the liquid and gas stop valves of outdoor unit has been opened.
2. Ensure that both the indoor and outdoor units have been powered on
3. If manual addressing is being used, set the addresses of each indoor unit.
4. Leave the power on for a minimum of 12 hours prior to running the system to ensure that the crankcase heaters have heated the compressor oil sufficiently.
5. Operating the system:
 - a) Run the system in cooling mode with the following settings: temperature 17°C; fan speed high.
 - b) After one hour, complete Sheet A of the system operating report then check the system parameters using the UP/DOWN button on each outdoor unit’s main PCB and complete the cooling mode columns of one Sheet D and one Sheet E of the system operating report for each outdoor unit.
6. Finally, complete Sheet C of the system operating report.

11.4.2 Operating multiple refrigerant systems

Once the operating of each refrigerant system has been satisfactorily completed as per Part 3, “Operating single refrigerant system”, run the multiple systems that make up a project simultaneously and check for any abnormalities.

12 Appendix to Part 3 – System Commissioning Report

A total of up to 11 report sheets should be completed for each system:

One Sheet A, one Sheet B and one Sheet C per system.

One Sheet D and one Sheet E per outdoor unit.

7G Cooling Series System Commissioning Report – Sheet A

SYSTEM INFORMATION			
Project name and location		Customer company	
System name		Installation company	
Commissioning date		Agent company	
Outdoor ambient temp.		Commissioning engineer	
Power supply (V)	L1-L2	L2-L3	L3-L1

OUTDOOR UNIT INFORMATION				
	Master unit	Slave unit 1	Slave unit 2	
Model				
Serial no.				

	OUTDOOR UNITS												
	Master unit			Slave unit 1			Slave unit 2			Slave unit 3			
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Compressor suction pipe temperature													
System pressure at check port													
Phase currents (A)													
Within normal range?													

INDOOR UNITS							
(Sample of over 20% of the indoor units including the unit farthest from the outdoor units)							
Room no.	Model	Address	Set temp. (°C)	Inlet temp. (°C)	Outlet temp. (°C)	Drainage OK?	Abnormal noise/vibration?

COOLING MODE PARAMETER RECORD
(After running in cooling mode for one hour)

7G Cooling Series System Commissioning Report – Sheet C

Project name and location	System name
----------------------------------	--------------------

RECORD OF ISSUES SEEN DURING COMMISSIONING				
No.	Description of observed issue	Suspected cause	Troubleshooting undertaken	Serial no. of relevant unit
1				
2				
3				

OUTDOOR UNIT FINAL CHECKLIST				
	Master unit	Slave unit 1	Slave unit 2	Slave unit 3
System check performed?				
Any abnormal noise?				
Any abnormal vibration?				
Fan rotation normal?				

	Commissioning engineer	Dealer	Trane representative
Name:			
Signature:			
Date:			

7G Cooling Series System Commissioning Report – Sheet D

Project name and location	System name
---------------------------	-------------

			Observed
DSP1 content	Parameters displayed on DSP2	Remarks	Cooling mode
--.--	"Standby (ODU address+ IDU number)/frequency/special status"		
0.--	Outdoor unit address	Master unit: 0; slave units: 1, 2 255 represents invalid address.	
1.--	Outdoor unit capacity	Actual value = value displayed (HP)	
2.--	Number of outdoor units	Only available for master unit, 1-4	
3.--	Number of indoor units set	Only available for master unit, 1-64	
4.--	Total capacity of outdoor unit	Only available for master unit, 0 displayed on slave units has no sense	
5.--	Target frequency of this ODU	Refer to Note 1	
6.--	Target frequency of ODU system	Target frequency= value displayed ×10	
7.--	Inverter compressor A actual frequency (Hz)	Actual value = value displayed	
8.--	Inverter compressor B actual frequency (Hz)	Actual value = value displayed	
9.--	Operating mode	Refer to Note 2	
10.--	Fan A speed index (rpm)	Actual value = value displayed	
11.--	Fan B speed index (rpm)	Actual value = value displayed	
12.--	Indoor heat exchanger pipe (T2) average temperature (°C)	Actual value = value displayed	
13.--	Indoor heat exchanger pipe (T2B) average temperature (°C)	Actual value = value displayed	
14.--	Main heat exchanger pipe (T3) temperature (°C)	Actual value = value displayed	
15.--	Outdoor ambient (T4) temperature (°C)	Actual value = value displayed	
16.--	Liquid pipe (T5) temperature (°C)	Actual value = value displayed	
17.--	Microchannel heat exchanger inlet pipe (T6A) temperature (°C)	Actual value = value displayed	
18.--	Microchannel heat exchanger outlet pipe (T6B) temperature (°C)	Actual value = value displayed	
19.--	Inverter compressor A discharge (T7C1)temperature (°C)	Actual value = value displayed	
20.--	Inverter compressor B discharge (T7C2) temperature (°C)	Actual value = value displayed	
21.--	Inverter compressor A suction (T71) temperature (°C)	Actual value = value displayed	
22.--	Inverter compressor B suction (T72) temperature (°C)	Actual value = value displayed	
23.--	Outdoor heat exchanger gas (T8) temperature (°C)	Actual value = value displayed	
24.--	Inverter module heatsink (Ntc)temperature (°C)	Actual value = value displayed	
25.--	Reserved for heat recovery unit's T9 temperature (°C)	Actual value = value displayed	
26.--	Outdoor heat exchanger liquid (TL)temperature (°C)	Actual value = value displayed	
27.--	Discharge superheat degree (°C)	Actual value = value displayed	
28.--	Primary current (A)	Actual value = value displayed /10	
29.--	Inverter compressor A current (A)	Actual value = value displayed /10	
30.--	Inverter compressor B current (A)	Actual value = value displayed /10	
31.--	EXVA position	Actual value = value displayed × 24	
32.--	EXVB position	Actual value = value displayed × 24	
33.--	EXVC position	Actual value = value displayed × 4	

7G Cooling Series System Commissioning Report – Sheet E

Project name and location	System name
----------------------------------	--------------------

... table continued from previous page

DSP1 content	Parameters displayed on DSP2	Remarks	Observed Cooling mode
34.--	EXVE position	Actual value = value displayed × 4	
35.--	Compressor discharge pressure (MPa)	Actual value = value displayed × 0.01	
36.--	Compressor suction pressure (MPa)	Actual value = value displayed × 0.01	
37.--	Number of indoor units on line	Actual value = value displayed	
38.--	Number of indoor units operating	Displayed on master unit PCB only	
39.--	Heat exchanger status (outdoor unit)	Refer to Note 3	
40.--	Special mode	Refer to Note 4	
41.--	Silent mode	0-14 ,14 represents the most silent	
42.--	Static pressure mode	Refer to Note 5	
43.--	Target evaporator (Tes) temperature (°C)	Actual value = value displayed Refer to Note 6	
43.--	Target condenser (Tcs) temperature (°C)	Actual value = value displayed Refer to Note 6	
45.--	DC Voltage (V)	Actual value = value displayed	
46.--	AC Voltage (V)	Actual value = value displayed	
47.--	Number of cooling mode IDUs	Actual value = value displayed	
48.--	Reserved for number of heating mode IDUs	Actual value = value displayed	
49.--	Capacity of cooling mode IDUs (HP)	Actual value = value displayed	
50.--	Reserved for capacity of heating mode IDUs (HP)	Actual value = value displayed	
51.--	Refrigerant volume judgment	Refer to Note 7	
52.--	Dirty blockage rate	0~10, 10 represents the worst	
53.--	Fan error		
54.--	Software version		
55.--	Most recent error or protection code		
-- --	--	End	

Notes:

1. Need to convert to current compressor output volume, example: compressor output volume is 70, Target frequency = Actual frequency * 70 / 60 Outdoor unit capacity setting;
2. Operating mode:
 - 0: off; 2: cooling; 3: reserved; 5: reserved; 6: reserved.
3. Heat exchanger status:
 - 0: off; 1: C1 (Condenser. Running) 2: D1 (Condenser. Not running); 3: D2(Reserved); 4: E1 (Evaporator. Running) 5: F1:(Reserved); 6: F2 (Evaporator. Not running)
4. Special mode:
 - 0: no special mode; 1: oil return; 2: reserved; 3: start up; 4: stop; 5: quick check; 6: self cleaning.
5. Static pressure mode:
 - 0: 0 Pa; 1: 20 Pa; 2: 40 Pa; 3: 60 Pa; 4: 80 Pa; 5: 100 Pa; 6: 120 Pa.
6. Te: Low pressure equivalent saturation temperature (°C) Tes: Target Te value.
Tc: High pressure equivalent saturation temperature (°C) Tcs: Target Tc value.
7. Refrigerant volume:
 - 0: no result; 1: significantly insufficient; 2: insufficient; 3: normal; 4: excessive; 5: significantly insufficient.

Trane - by Trane Technologies, a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice. We are committed to using environmentally conscious print practices.

© 2020 Trane

Confidential and proprietary Trane information