

Engineering Data

TVR Pro CO Series



4TVY0077HE000AA

4TVY0192HE000AA

4TVY0096HE000AA

4TVY0210HE000AA

4TVY0115HE000AA

4TVY0229HE000AA

4TVY0140HE000AA

4TVY0249HE000AA

4TVY0155HE000AA

4TVY0268HE000AA

4TVY0170HE000AA

4TVY0290HE000AA

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Part 1

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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
Q1	One-way Cassette
Q2	Two-way Cassette
Q4C	Compact Four-way Cassette
Q4	Four-way Cassette
T2	Medium Static Pressure Duct

Abbreviation code	Type
T1	High Static Pressure Duct
G	Wall-mounted
DL	Ceiling & Floor
F	Floor Standing

Table 1-1.2: Standard indoor unit capacity range

Capacity		Capacity index	Q1	Q2	Q4C	Q4	T2	T1	G	DL	F
kW	HP										
1.8	0.6	18	18	—	—	—	—	—	—	—	—
2.2	0.8	22	22	22	22	—	22	—	22	—	22
2.8	1	28	28	28	28	28	28	—	28	—	28
3.6	1.25	36	36	36	36	36	36	—	36	36	36
4.5	1.6	45	45	45	45	45	45	—	45	45	45
5.6	2	56	56	56	—	56	56	—	56	56	56
7.1	2.5	71	71	71	—	71	71	71	71	71	71
8.0	3	80	—	—	—	80	80	80	80	80	80
9.0	3.2	90	—	—	—	90	90	90	90	90	—
10.0	3.6	100	—	—	—	100	—	—	—	—	—
11.2	4	112	—	—	—	112	112	112	—	112	—
14.0	5	140	—	—	—	140	140	140	—	140	—
16.0	6	160	—	—	—	—	—	160	—	160	—
20.0	7	200	—	—	—	—	—	200	—	—	—
25.0	9	250	—	—	—	—	—	250	—	—	—
28.0	10	280	—	—	—	—	—	280	—	—	—
40.0	14	400	—	—	—	—	—	400	—	—	—
45.0	16	450	—	—	—	—	—	450	—	—	—
56.0	20	560	—	—	—	—	—	560	—	—	—

1.1.2 Fresh air processing unit

Table 1-1.3: Fresh air processing unit capacity range

Capacity	12.5kW	14kW	20kW	25kW	28kW	45kW	56kW
Capacity index	125	140	200	250	280	450	560

1.2 Heat recovery ventilator

Table 1-1.4: Heat recovery ventilator capacity range

Capacity	200m ³ /h	300m ³ /h	400m ³ /h	500m ³ /h	800m ³ /h	1000m ³ /h	1500m ³ /h	2000m ³ /h
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1.3 Outdoor Units

Table 1-1.5: Outdoor unit capacity range

Capacity	Model Name	Combination Type
8HP	4TVY0077HE000AA	/
10HP	4TVY0096HE000AA	/
12HP	4TVY0115HE000AA	/
14HP	4TVY0140HE000AA	/
16HP	4TVY0155HE000AA	/
18HP	4TVY0170HE000AA	/
20HP	4TVY0192HE000AA	/
22HP	4TVY0210HE000AA	/
24HP	4TVY0229HE000AA	/
26HP	4TVY0249HE000AA	/
28HP	4TVY0268HE000AA	/
30HP	4TVY0290HE000AA	/
32HP	4TVY0310HE000AA	16HP+16HP
34HP	4TVY0325HE000AA	22HP+12HP
36HP	4TVY0347HE000AA	20HP+16HP
38HP	4TVY0365HE000AA	22HP+16HP
40HP	4TVY0384HE000AA	24HP+16HP
42HP	4TVY0404HE000AA	26HP+16HP
44HP	4TVY0423HE000AA	28HP+16HP
46HP	4TVY0445HE000AA	30HP+16HP
48HP	4TVY0459HE000AA	26HP+22HP
50HP	4TVY0478HE000AA	28HP+22HP
52HP	4TVY0500HE000AA	30HP+22HP
54HP	4TVY0517HE000AA	28HP+26HP
56HP	4TVY0536HE000AA	28HP+28HP
58HP	4TVY0558HE000AA	30HP+28HP
60HP	4TVY0580HE000AA	30HP+30HP
62HP	4TVY0600HE000AA	30HP+16HP+16HP
64HP	4TVY0614HE000AA	26HP+22HP+16HP
66HP	4TVY0633HE000AA	28HP+22HP+16HP
68HP	4TVY0655HE000AA	30HP+22HP+16HP
70HP	4TVY0672HE000AA	28HP+26HP+16HP
72HP	4TVY0691HE000AA	28HP+28HP+16HP
74HP	4TVY0713HE000AA	30HP+28HP+16HP
76HP	4TVY0735HE000AA	30HP+30HP+16HP
78HP	4TVY0746HE000AA	28HP+28HP+22HP
80HP	4TVY0768HE000AA	30HP+28HP+22HP
82HP	4TVY0790HE000AA	30HP+30HP+22HP
84HP	4TVY0804HE000AA	28HP+28HP+28HP
86HP	4TVY0826HE000AA	30HP+28HP+28HP
88HP	4TVY0848HE000AA	30HP+30HP+28HP
90HP	4TVY0870HE000AA	30HP+30HP+30HP

Notes:





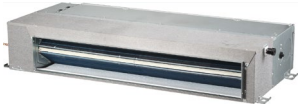




1. The combinations of units shown in the table are factory-recommended. Other combinations of units are also possible.

2 External Appearance

2.1 Indoor Units

2.1.1 Standard indoor unit

Table 1-2.1: Standard indoor unit appearance

<p>One-way Cassette</p> <p>Q1</p> 	<p>Two-way Cassette</p> <p>Q2</p> 
<p>Compact Four-way Cassette</p> <p>Q4C</p> 	<p>Four-way Cassette</p> <p>Q4</p> 
<p>Medium Static Pressure Duct</p> <p>T2</p> 	<p>High Static Pressure Duct</p> <p>T1</p> 
<p>Wall-mounted</p> <p>G</p> 	<p>Ceiling & Floor</p> <p>DL</p> 
<p>Floor Standing</p> <p>F</p> 	


2.1.2 Fresh air processing unit

Table 1-2.2: Fresh air processing unit appearance

<p>Fresh Air Processing Unit</p> <p>FA</p> 
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2.2 Heat Recovery Ventilator

Table 1-2.3: Heat recovery ventilator appearance

<p>Heat Recovery Ventilator</p> 

2.3 Outdoor Units

2.3.1 Single units

Table 1-2.4: Single outdoor unit appearance

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

2.3.2 Combinations of units

Table 1-2.5: Combination outdoor unit appearance









<p>32HP</p> 	<p>34/36/38/HP</p> 
<p>40/42/44/46HP</p> 	<p>48/50/52HP</p> 
<p>54/56/58/60HP</p> 	<p>62HP</p> 
<p>64/66/68HP</p> 	<p>70/72/74/76HP</p> 

Table 1-2.5: Combination outdoor unit appearance



3 Outdoor Unit Combinations

Table 1-3.1: Outdoor unit combinations

System capacity		Number 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	2						●●									
95.0	34	2			●					●							
101.0	36	2						●		●							
106.5	38	2						●			●						
112.0	40	2						●				●					
118.0	42	2						●					●				
123.5	44	2						●						●			
130.0	46	2						●									●
134.5	48	2								●			●				
140.0	50	2									●			●			
146.5	52	2									●						●
151.5	54	2										●		●			
157.0	56	2												●●			
163.5	58	2												●			●
170.0	60	2														●●	
175.0	62	3						●●									●
179.5	64	3						●			●						
185.0	66	3						●			●			●			
191.5	68	3						●			●						●
196.5	70	3						●				●		●			
202.0	72	3						●						●●			
208.5	74	3						●						●			●
215.0	76	3						●								●●	
218.5	78	3								●				●●			
225.0	80	3									●			●			●
231.5	82	3									●					●●	
235.5	84	3												●●●			

Table 1-3.1: Outdoor unit combinations

System capacity		Number of units	Modules ¹										Outdoor branch joint kit ²		
242.0	86	3											••	•	TODK03UTHP
248.5	88	3											•	••	
255.0	90	3												•••	

Notes:

1. The combinations of units shown in the table are factory-recommended. Other combinations of units are also possible.
2. For systems with two or more outdoor units, outdoor branch joints (sold separately) are required.

4 Nomenclature

4.1 Indoor Units

4.1.1 Standard indoor units

4 T V E 0 0 0 7 E F 0 0 0 A A
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Legend		
No.	Code	Remarks
1	4	R-410A
2	T	Trane
3	V	TVR
4		Indoor Unit Type E: One - Way Cassette G: Two - Way Cassette B: Compact Four - Way Cassette C: Four - Way Cassette D: Medium Static Pressure Duct A: High Static Pressure Duct W: Wall - Mounted C: Ceiling & Floor S, N, U: Floor Standing F: Fresh air processing unit
5	0	Currently not used
6	0	Btu/h x 1000
7	0	
8	7	
9	E	TVR Ultra
10	F	380V50-60Hz/1P
11	0	Currently not used
12	0	Currently not used
13	0	Currently not used
14	A	First design sequence
15	A	First service sequence

4.2 Heat recovery ventilator

AC Series

T E R V 0 1 2 0 A B 0 A A
 1 2 3 4 5 6 7 8 9 10 11 12 13

Legend		
No.	Code	Remarks
1	T	Energy recovery Fan Trane TVR
2	E	
3	R	
4	V	
5	0	CFM
6	1	
7	2	
8	0	
9	A	TVR
10	B	1: 380V/60Hz/1Ph B: 380/50Hz/1Ph
11	0	Currently not used
12	A	First design sequence
13	A	First service sequence

4.3 Outdoor Units

4 T V Y 0 0 7 7 H E 0 0 0 A A
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Legend		
No.	Code	Remarks
1	4	R-410A
2	T	Trane
3	V	Air Cooled
4	Y	Cooling Only
5	0	Currently not used
6	0	Btu/h x 1000
7	7	
8	7	
9	H	TVR Pro CO
10	E	380V50-60Hz/1P
11	0	Currently not used
12	0	Currently not used
13	0	0: Standard C: Corrosion treatment
14	A	First design sequence
15	A	First design sequence

5 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
TVR Pro CO series ODU	50%	130% ¹	100%	100% ²

Notes:

1. The total capacity of the indoor units can be up to a maximum of 130% of the combined capacity of the outdoor unit for a system where not all the indoor units are operating at the same time.
2. 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 combination ratio must not exceed 100%.

Table 1-5.2: Combinations of Indoor and outdoor units

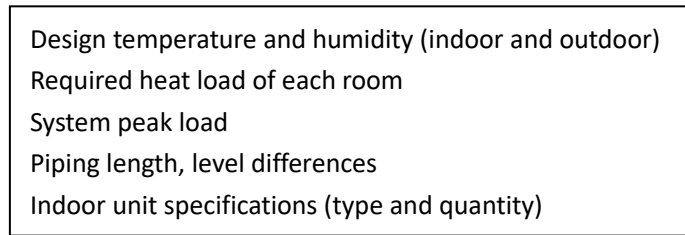
Outdoor unit capacity			Sum of capacity indexes of connected indoor units (standard indoor units only)	Sum of capacity indexes of connected indoor units (fresh air processing units and standard indoor units together)	Maximum number of connected indoor units
kW	HP	Capacity index			
22.4	8	224	112 to 291.2	112 to 224	13
28	10	280	140 to 364	140 to 280	16
33.5	12	335	167.5 to 435.5	167.5 to 335	20
40	14	400	200 to 520	200 to 400	23
45	16	450	225 to 585	225 to 450	26
50	18	500	250 to 650	250 to 500	29
56	20	560	280 to 728	280 to 560	33
61.5	22	615	307.5 to 799.5	307.5 to 615	36
67	24	670	335 to 871	335 to 670	39
73	26	730	365 to 949	365 to 730	43
78.5	28	785	392.5 to 1020.5	392.5 to 785	46
85	30	850	425 to 1105	425 to 850	50
90	32	900	450 to 1170	450 to 900	53
95	34	950	475 to 1235	475 to 950	56
101	36	1010	505 to 1313	505 to 1010	59
106.5	38	1065	532.5 to 1384.5	532.5 to 1065	63
112	40	1120	560 to 1456	560 to 1120	64
118	42	1180	590 to 1534	590 to 1180	
123.5	44	1235	617.5 to 1605.5	617.5 to 1235	
130	46	1300	650 to 1690	650 to 1300	
134.5	48	1345	672.5 to 1748.5	672.5 to 1345	
140	50	1400	700 to 1820	700 to 1400	
146.5	52	1465	732.5 to 1904.5	732.5 to 1465	
151.5	54	1515	757.5 to 1969.5	757.5 to 1515	
157	56	1570	785 to 2041	785 to 1570	
163.5	58	1635	817.5 to 2125.5	817.5 to 1635	
170	60	1700	850 to 2210	850 to 1700	
175	62	1750	875 to 2275	875 to 1750	
179.5	64	1795	897.5 to 2333.5	897.5 to 1795	
185	66	1850	925 to 2405	925 to 1850	
191.5	68	1915	957.5 to 2489.5	957.5 to 1915	
196.5	70	1965	982.5 to 2554.5	982.5 to 1965	
202	72	2020	1010 to 2626	1010 to 2020	
208.5	74	2085	1042.5 to 2710.5	1042.5 to 2085	

215	76	2150	1075 to 2795	1075 to 2150
218.5	78	2185	1092.5 to 2840.5	1092.5 to 2185
225	80	2250	1125 to 2925	1125 to 2250
231.5	82	2315	1157.5 to 3009.5	1157.5 to 2315
235.5	84	2355	1177.5 to 3061.5	1177.5 to 2355
242	86	2420	1210 to 3146	1210 to 2420
248.5	88	2485	1242.5 to 3230.5	1242.5 to 2485
255	90	2550	1275 to 3315	1275 to 2550

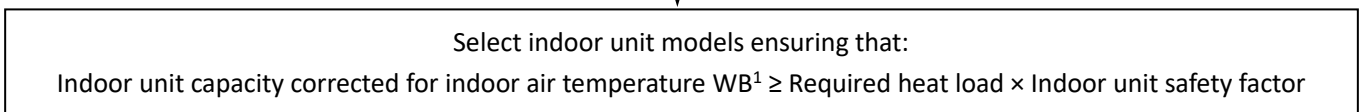
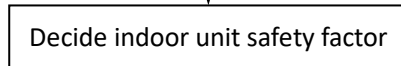
6 Selection Procedure

6.1 Procedure

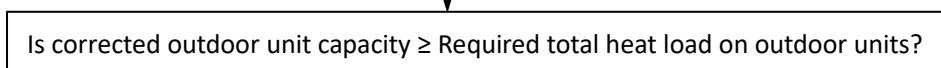
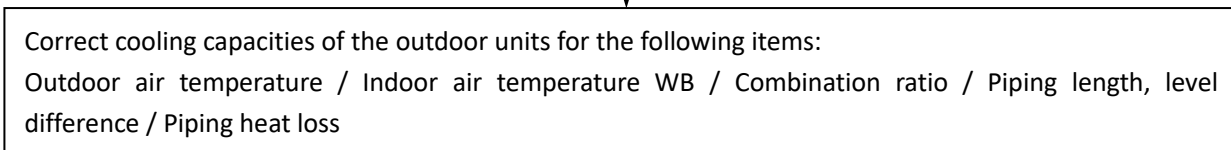
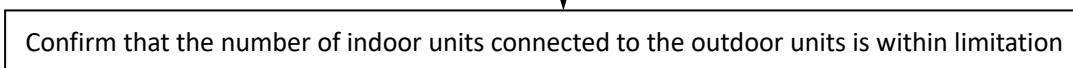
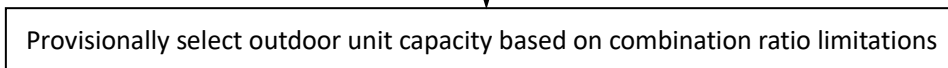
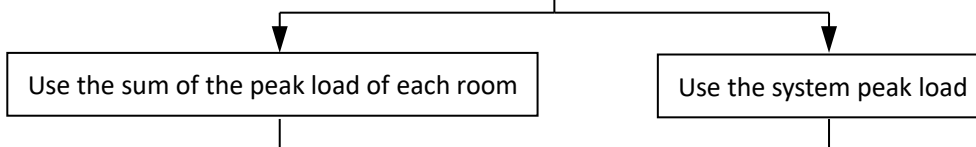
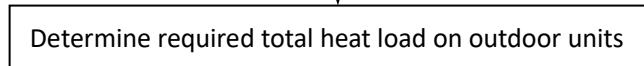
Step 1: Establish design conditions



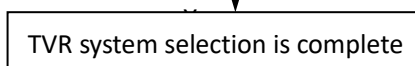
Step 2: Select indoor units



Step 3: Select outdoor units



No



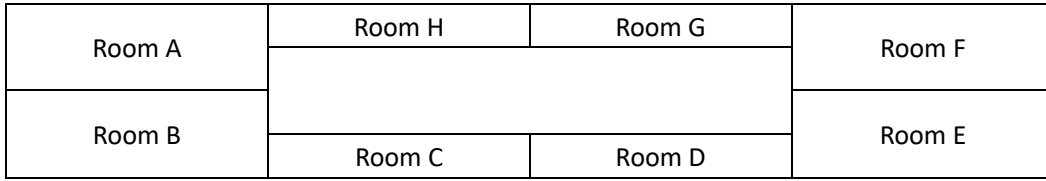
Notes:

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.

6.2 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

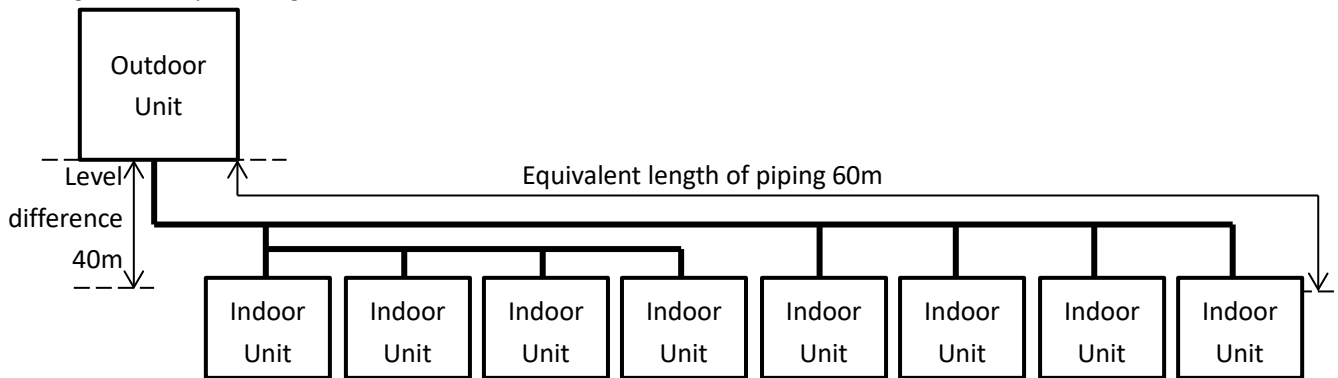
- Indoor air temperature 25°C DB, 18°C WB; outdoor air temperature 33°C DB.
- Determine peak load of each room and system peak load. As shown in Table 1-6.1, the system peak load is 50.7kW.

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	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC
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); SHC: Sensible heat 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	4TVD0048EF000AA	4TVD0048EF000AA	4TVD0018EF000AA	4TVD0018EF000AA
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	4TVD0038EF000AA	4TVD0038EF000AA	4TVD0015EF000AA	4TVD0015EF000AA
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
4TVD0048EF000AA	140	2
4TVD0038EF000AA	112	2
4TVD0018EF000AA	56	2
4TVD0015EF000AA	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	950	475 to 1235	56
101.0	36	1010	505 to 1313	59
106.5	38	1065	532.5 to 1384.5	63
112.0	40	1120	560 to 1456	64
118.0	42	1180	590 to 1534	
123.5	44	1235	617.5 to 1605.5	
130.0	46	1300	650 to 1690	
134.5	48	1345	672.5 to 1748.5	
140.0	50	1400	700 to 1820	
146.5	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 (4TVY0192HE000AA) 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 4TVY0192HE000AA 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	61.3	15.94
	33	60.37	16.55
	35	59.47	17.19
120%	31	60.2	15.44
	33	59.32	16.06
	35	58.37	16.68

Table 1-6.7: Cooling capacity calculated by interpolation

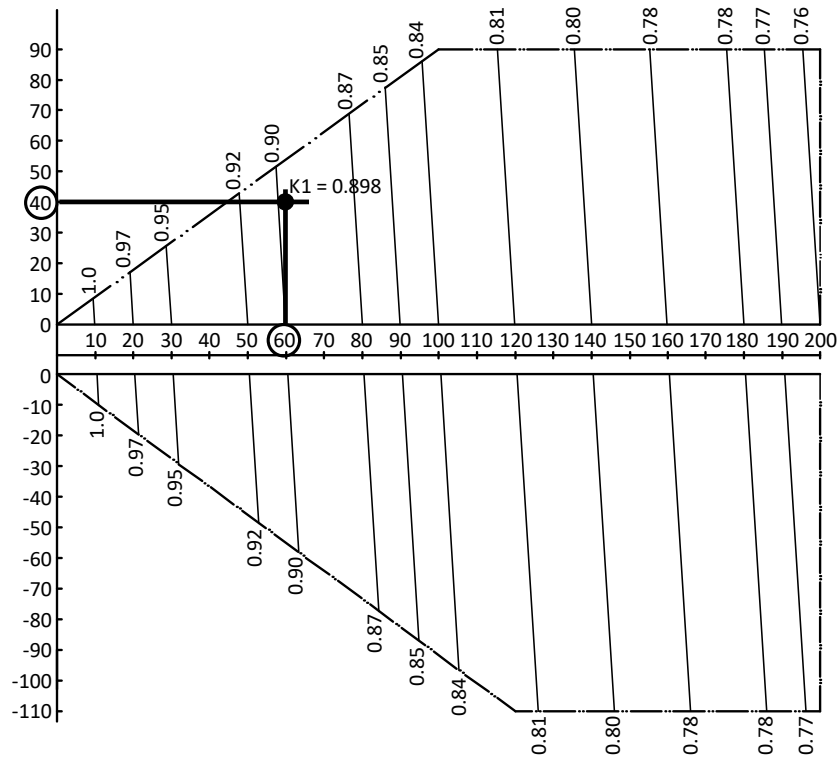
CR	Outdoor air temp. (°C DB)	Indoor air temp. (°C DB / °C WB)	
		25.8 / 18.0	
		TC	PI
		kW	kW
130%	33	60.37	16.55
		B = 59.95¹	
120%	33	59.32	16.06

Notes:

1. $59.32 + (60.37 - 59.32) \times (126 - 120) / (130 - 120) = 59.95$

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

Figure 1-6.3: ODU 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 4TVY0192HE000AA ("C") by using K1:

$$C = B \times K1 = 59.95 \times 0.898 = 53.8\text{kW}$$

- The corrected capacity 53.8kW 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

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1 Specifications

8-12HP

Table 2-1.1: 8-12HP specifications

HP			8	10	12
Model name			4TVY0077HE000AA	4TVY0096HE000AA	4TVY0115HE000AA
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ		
Cooling ¹	Capacity	kW	22.4	28.0	33.5
		kBtu/h	76.5	95.6	114.4
	Power input	kW	5.13	6.75	9.03
	EER			4.37	4.15
Connected indoor unit	Total capacity		50-130%		
	Maximum quantity		13	16	20
Compressor	Type		DC inverter		
	Quantity		1		
	Oil type		FV 50s		
	Start-up method		Soft start		
Fan	Type		DC		
	Quantity		1		
	Motor output	kW	0.56		
	ESP	Pa	20 default;60 customization option		
	Airflow rate	m ³ /h	10400		10800
	Drive type		Direct		
Refrigerant	Type		R410A		
	Factory charge	kg	8		
Pipe connections ²	Liquid pipe	mm	Φ12.7		Φ15.9
	Gas pipe	mm	Φ25.4		Φ28.6
Sound pressure level ³		dB(A)	57	58	60
Net dimensions (W×H×D)		mm	960×1615×765		
Packed dimensions (W×H×D)		mm	1025×1790×830		
Net weight		kg	188		
Gross weight		kg	204		
Ambient temp.	Cooling	°C	-5 to 55		

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

14-20HP

Table 2-1.2: 14-20HP specifications

HP			14	16	18	20
Model name			4TVY0140HE000AA	4TVY0155HE000AA	4TVY0170HE000AA	4TVY0192HE000AA
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ			
Cooling ¹	Capacity	kW	40.0	45.0	50.0	56.0
		kBtu/h	136.6	153.7	170.8	191.3
	Power input	kW	10.42	12.15	14.68	17.41
	EER			3.84	3.70	3.41
Connected indoor unit	Total capacity		50-130%			
	Maximum quantity		23	26	29	33
Compressor	Type		DC inverter			
	Quantity		1		2	
	Oil type		FV 50s			
	Start-up method		Soft start			
Fan	Type		DC			
	Quantity		1		2	
	Motor output	kW	0.75		0.56×2	
	ESP	Pa	20 default;60 customization option			
	Airflow rate	m ³ /h	11600		12000	12200
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	11		13	
Pipe connections ²	Liquid pipe	mm	Φ15.9			Φ19.1
	Gas pipe	mm	Φ31.8			Φ31.8
Sound pressure level ³		dB(A)	60	61	62	63
Net dimensions (W×H×D)		mm	960×1615×765			1250×1615×765
Packed dimensions (W×H×D)		mm	1025×1790×830			1305×1790×820
Net weight		kg	197			278
Gross weight		kg	213			297
Ambient temp.	Cooling	°C	-5 to 55			

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

22-26HP

Table 2-1.3: 22-26HP specifications

HP			22	24	26
Model name			4TVY0210HE000AA	4TVY0229HE000AA	4TVY0249HE000AA
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ		
Cooling ¹	Capacity	kW	61.5	67.0	73.0
		kBtu/h	210.0	228.8	249.3
	Power input	kW	19.95	20.65	22.8
	EER			3.08	3.24
Connected indoor unit	Total capacity		50-130%		
	Maximum quantity		36	39	43
Compressor	Type		DC inverter		
	Quantity		2		
	Oil type		FV 50s		
	Start-up method		Soft start		
Fan	Type		DC		
	Quantity		2		
	Motor output	kW	0.56×2		
	ESP	Pa	20 default;60 customization option		
	Airflow rate	m ³ /h	12200	19600	
	Drive type		Direct		
Refrigerant	Type		R410A		
	Factory charge	kg	13	19	
Pipe connections ²	Liquid pipe	mm	Φ19.1		Φ22.2
	Gas pipe	mm	Φ31.8		Φ31.8
Sound pressure level ³		dB(A)	63	64	
Net dimensions (W×H×D)		mm	1250×1615×765	1585×1615×765	
Packed dimensions (W×H×D)		mm	1305×1790×820	1650×1810×840	
Net weight		kg	278	338	
Gross weight		kg	297	362	
Ambient temp.	Cooling	°C	-5 to 55		

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

28-30HP

Table 2-1.4: 28-30HP specifications

HP			28	30
Model name			4TVY0268HE000AA	4TVY0290HE000AA
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ	
Cooling ¹	Capacity	kW	78.5	85.0
		kBtu/h	268.1	290.3
	Power input	kW	25.48	28.9
	EER			3.08
Connected indoor unit	Total capacity		50-130%	
	Maximum quantity		46	50
Compressor	Type		DC inverter	
	Quantity		2	
	Oil type		FV 50s	
	Start-up method		Soft start	
Fan	Type		DC	
	Quantity		2	
	Motor output	kW	0.56×2	
	ESP	Pa	20 default;60 customization option	
	Airflow rate	m ³ /h	20600	
	Drive type		Direct	
Refrigerant	Type		R410A	
	Factory charge	kg	19	
Pipe connections ²	Liquid pipe	mm	Φ22.2	Φ22.2
	Gas pipe	mm	Φ31.8	Φ38.1
Sound pressure level ³		dB(A)	64	
Net dimensions (W×H×D)		mm	1585×1615×765	
Packed dimensions (W×H×D)		mm	1650×1810×840	
Net weight		kg	338	
Gross weight		kg	362	
Ambient temp.	Cooling	°C	-5 to 55	

Notes:

1. Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
2. Diameters given are those of the unit's accessories.
3. 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 2-1.5: 32-38HP specifications

HP			32	34	36	38
Model name			4TVY0310HE000AA	4TVY0325HE000AA	4TVY0347HE000AA	4TVY0365HE000AA
Combination type			16HP+16HP	22HP+12HP	20HP+16HP	22HP+16HP
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ			
Cooling ¹	Capacity	kW	90.0	95.0	101.0	106.5
		kBtu/h	307.4	324.4	345.0	363.7
	Power input	kW	24.3	28.98	29.56	32.1
	EER			3.70	3.28	3.42
Connected indoor unit	Total capacity		50-130%			
	Maximum quantity		53	56	59	63
Compressor	Type		DC inverter			
	Quantity		2	3		
	Oil type		FV 50s			
	Start-up method		Soft start			
Fan	Type		DC			
	Quantity		2	3		
	Motor output	kW	0.75×2	0.56×3	0.56×2+0.75	
	ESP	Pa	20 default;60 customization option			
	Airflow rate	m3/h	23200	23000	23800	
	Drive type		Direct			
Refrigerant	Type		R410A			
	Factory charge	kg	11×2	13+8	13+11	
Pipe connections ²	Liquid pipe	mm	19.1	19.1	19.1	
	Gas pipe	mm	31.8	31.8	38.1	
Sound pressure level ³		dB(A)	64	65		
Net dimensions (W×H×D)		mm	(960×1615×765)×2	(1250×1615×765)+(960×1615×765)		
Packed dimensions (W×H×D)		mm	(1025×1790×830)×2	(1305×1790×820)+(1025×1790×830)		
Net weight		kg	188×2	278+188		
Gross weight		kg	204×2	297+204		
Ambient temp.	Cooling	°C	-5 to 55			

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

40-44HP

Table 2-1.6: 40-44HP specifications

HP			40	42	44
Model name			4TVY0384HE000AA	4TVY0404HE000AA	4TVY0423HE000AA
Combination type			24HP+16HP	26HP+16HP	28HP+16HP
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ		
Cooling ¹	Capacity	kW	112.0	118.0	123.5
		kBtu/h	382.5	403.0	421.8
	Power input	kW	32.8	34.95	37.63
	EER			3.41	3.38
Connected indoor unit	Total capacity		50-130%		
	Maximum quantity		64		
Compressor	Type		DC inverter		
	Quantity		3		
	Oil type		FV 50s		
	Start-up method		Soft start		
Fan	Type		DC		
	Quantity		3		
	Motor output	kW	0.56×2+0.75		
	ESP	Pa	20 default;60 customization option		
	Airflow rate	m ³ /h	31200		32200
	Drive type		Direct		
Refrigerant	Type		R410A		
	Factory charge	kg	19+11		
Pipe connections ²	Liquid pipe	mm	19.1		
	Gas pipe	mm	38.1		
Sound pressure level ³		dB(A)	65		66
Net dimensions (W×H×D)		mm	(1585×1615×765)+(960×1615×765)		
Packed dimensions (W×H×D)		mm	(1650×1810×840)+(1025×1790×830)		
Net weight		kg	338+188		
Gross weight		kg	362+204		
Ambient temp.	Cooling	°C	-5 to 55		

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

46-52HP

Table 2-1.7: 46-52HP specifications

HP		46	48	50	52	
Model name		4TVY0445HE000AA	4TVY0459HE000AA	4TVY0478HE000AA	4TVY0500HE000AA	
Combination type		30HP+16HP	26HP+22HP	28HP+22HP	30HP+22HP	
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ			
Cooling ¹	Capacity	kW	130.0	134.5	140.0	146.5
		kBtu/h	444.0	459.3	478.1	500.3
	Power input	kW	41.05	42.75	45.43	48.85
	EER		3.17	3.15	3.08	3.00
Connected indoor unit	Total capacity	50-130%				
	Maximum quantity	64				
Compressor	Type	DC inverter				
	Quantity	3	4			
	Oil type	FV 50s				
	Start-up method	Soft start				
Fan	Type	DC				
	Quantity	3	4			
	Motor output	kW	0.56×2+0.75	0.56×4		
	ESP	Pa	20 default;60 customization option			
	Airflow rate	m ³ /h	32200	31800	32800	
	Drive type		20 default;60 customization option			
Refrigerant	Type	R410A				
	Factory charge	kg	19+11	19+13		
Pipe connections ²	Liquid pipe	mm	19.1			
	Gas pipe	mm	38.1			
Sound pressure level ³		dB(A)	66			
Net dimensions (W×H×D)		mm	(1585×1615×765)+ (960×1615×765)	(1585×1615×765)+(1250×1615×765)		
Packed dimensions (W×H×D)		mm	(1650×1810×840)+ (1025×1790×830)	(1650×1810×840)+(1305×1790×820)		
Net weight		kg	338+188			
Gross weight		kg	362+204			
Ambient temp.	Cooling	°C	-5 to 55			

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

54-58HP

Table 2-1.8: 54-58HP specifications

HP		54		56		58				
Model name		4TVY0517HE000AA		4TVY0536HE000AA		4TVY0558HE000AA				
Combination type		28HP+26HP		28HP+28HP		30HP+28HP				
Power supply		V/Ph/Hz		380-415V 3N~50/60HZ						
Cooling ¹	Capacity	kW		151.5		157.0		163.5		
		kBtu/h		517.4		536.2		558.4		
	Power input		kW		48.28		50.96		54.38	
	EER		3.14		3.08		3.01			
Connected indoor unit	Total capacity		50-130%							
	Maximum quantity		64							
Compressor	Type		DC inverter							
	Quantity		4							
	Oil type		FV 50s							
	Start-up method		Soft start							
Fan	Type		DC							
	Quantity		4							
	Motor output		kW		0.56×4					
	ESP		Pa		20 default;60 customization option					
	Airflow rate		m3/h		40200		41200			
	Drive type		20 default;60 customization option							
Refrigerant	Type		R410A							
	Factory charge		kg		19×2					
Pipe connections ²	Liquid pipe		mm		19.1					
	Gas pipe		mm		38.1		41.2			
Sound pressure level ³		dB(A)		66		66				
Net dimensions (W×H×D)		mm		(1585×1615×765)×2						
Packed dimensions (W×H×D)		mm		(1650×1810×840)×2						
Net weight		kg		338×2						
Gross weight		kg		362×2						
Ambient	Cooling	°C		-5 to 55						

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

60-66HP

Table 2-1.9: 60-66HP specifications

HP		60	62	64	66	
Model name		4TVY0580HE000AA	4TVY0600HE000AA	4TVY0614HE000AA	4TVY0633HE000AA	
Combination type		30HP+30HP	30HP+16HP+16HP	26HP+22HP+16HP	28HP+22HP+16HP	
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ			
Cooling ¹	Capacity	kW	170.0	175.0	179.5	185.0
		kBtu/h	580.6	597.8	613.0	631.8
	Power input	kW	57.8	53.2	54.9	57.58
	EER		2.94	3.29	3.27	3.21
Connected indoor unit	Total capacity		50-130%			
	Maximum quantity		64			
Compressor	Type		DC inverter			
	Quantity		4	5		
	Oil type		FV 50s			
	Start-up method		Soft start			
Fan	Type		DC			
	Quantity		4	5		
	Motor output	kW	0.56×4	0.56×2+0.75×2	0.56×4+0.75	
	Static pressure	Pa	20 default;60 customization option			
	Airflow rate	m ³ /h	41200	43800	43400	44400
	Drive type		20 default;60 customization option			
Refrigerant	Type		R410A			
	Factory charge	kg	19×2	19+11×2	19+13+11	
Pipe connections ²	Liquid pipe	mm	19.1			
	Gas pipe	mm	41.2			
Sound pressure level ³		dB(A)	66			
Net dimensions (W×H×D)		mm	(1585×1615×765)×2	(1585×1615×765)+ (960×1615×765)×2	(1585×1615×765)+(1250×1615×765)+(960×1615×765)	
Packed dimensions (W×H×D)		mm	(1650×1810×840)×2	(1650×1810×840)+ (1025×1790×830)×2	(1650×1810×840)+(1305×1790×820)+(1025×1790×830)	
Net weight		kg	338×2	338+188×2	338+278+197	
Gross weight		kg	362×2	362+204×2	362+297+213	
Ambient temp.	Cooling	°C	-5 to 55			

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

68-74HP

Table 2-1.10: 68-74HP specifications

HP		68	70	72	74	
Model name		4TVY0655HE000AA	4TVY0672HE000AA	4TVY0691HE000AA	4TVY0713HE000AA	
Combination type		30HP+22HP+16HP	28HP+26HP+16HP	28HP+28HP+16HP	30HP+28HP+16HP	
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ			
Cooling ¹	Capacity	kW	191.5	196.5	202.0	208.5
		kBtu/h	654.1	671.1	689.9	712.2
	Power input	kW	61	60.43	63.11	66.53
	EER		3.14	3.25	3.20	3.13
Connected indoor unit	Total capacity		50-130%			
	Maximum quantity		64			
Compressor	Type		DC inverter			
	Quantity		5			
	Oil type		FV 50s			
	Start-up method		Soft start			
Fan	Type		DC			
	Quantity		5			
	Motor output	kW	0.56×4+0.75			
	Static pressure	Pa	20 default;60 customization option			
	Airflow rate	m ³ /h	44400	51800	52800	
	Drive type		20 default;60 customization option			
Refrigerant	Type		R410A			
	Factory charge	kg	19+13+11	19×2+11		
Pipe connections ²	Liquid pipe	mm	22.2			
	Gas pipe	mm	44.5			
Sound pressure level ³		dB(A)	67		68	
Net dimensions (W×H×D)		mm	(1585×1615×765)+ (1250×1615×765)+ (960×1615×765)	(1585×1615×765)×2+(960×1615×765)		
Packed dimensions (W×H×D)		mm	(1650×1810×840)+ (1305×1790×820)+ (1025×1790×830)	(1650×1810×840)×2+(1025×1790×830)		
Net weight		kg	338+278+197	338×2+188		
Gross weight		kg	362+297+213	362×2+204		
Ambient temp.	Cooling	°C	-5 to 55			

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

76-82HP

Table 2-1.11: 76-82HP specifications

HP		76	78	80	82	
Model name		4TVY0735HE000AA	4TVY0746HE000AA	4TVY0768HE000AA	4TVY0790HE000AA	
Combination type		30HP+30HP+16HP	28HP+28HP+22HP	30HP+28HP+22HP	30HP+30HP+22HP	
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ			
Cooling ¹	Capacity	kW	215.0	218.5	225.0	231.5
		kBtu/h	734.4	746.2	768.4	790.6
	Power input	kW	69.95	70.91	74.33	77.75
	EER		3.07	3.08	3.03	2.98
Connected indoor unit	Total capacity		50-130%			
	Maximum quantity		64			
Compressor	Type		DC inverter			
	Quantity		5	6		
	Oil type		FV 50s			
	Start-up method		Soft start			
Fan	Type		DC			
	Quantity		5	6		
	Motor output	kW	0.56×4+0.75	0.56×6		
	Static pressure	Pa	20 default;60 customization option			
	Airflow rate	m ³ /h	52800	53400		
	Drive type		20 default;60 customization option			
Refrigerant	Type		R410A			
	Factory charge	kg	19×2+11	19×2+13		
Pipe connections ²	Liquid pipe	mm	22.2			
	Gas pipe	mm	44.5			
Sound pressure level ³		dB(A)	68			
Net dimensions (W×H×D)		mm	(1585×1615×765)×2 +(960×1615×765)	(1585×1615×765)×2+(1250×1615×765)		
Packed dimensions (W×H×D)		mm	(1650×1810×840)×2 +(1025×1790×830)	(1650×1810×840)×2+(1305×1790×820)		
Net weight		kg	338×2+188			
Gross weight		kg	362×2+204			
Ambient temp.	Cooling	°C	-5 to 55			

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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.

84-90HP

Table 2-1.12: 84-90HP specifications

HP			84	86	88	90
Model name			4TVY0804HE000AA	4TVY0826HE000AA	4TVY0848HE000AA	4TVY0870HE000AA
Combination type			28HP+28HP+28HP	30HP+28HP+28HP	30HP+30HP+28HP	30HP+30HP+30HP
Power supply		V/Ph/Hz	380-415V 3N~50/60HZ			
Cooling ¹	Capacity	kW	235.5	242.0	248.5	255.0
		kBtu/h	804.3	826.5	848.7	870.9
	Power input	kW	76.44	79.86	83.28	86.7
	EER			3.08	3.03	2.98
Connected indoor unit	Total capacity		50-130%			
	Maximum quantity		64			
Compressor	Type		DC inverter			
	Quantity		6			
	Oil type		FV 50s			
	Start-up method		Soft start			
Fan	Type		DC			
	Quantity		6			
	Motor output	kW	0.56×6			
	Static pressure	Pa	20 default;60 customization option			
	Airflow rate	m ³ /h	61800			
	Drive type		20 default;60 customization option			
Refrigerant	Type		R410A			
	Factory charge	kg	19×3			
Pipe connections ²	Liquid pipe	mm	25.4			
	Gas pipe	mm	50.8			
Sound pressure level ³		dB(A)	68			
Net dimensions (W×H×D)		mm	(1585×1615×765)×3			
Packed dimensions (W×H×D)		mm	(1650×1810×840)×3			
Net weight		kg	338×3			
Gross weight		kg	362×3			
Ambient temp.	Cooling	°C	-5 to 55			

Notes:

- Indoor air temperature 27°C DB, 19°C WB; outdoor air temperature 35°C DB; equivalent refrigerant piping length 7.5m with zero level difference.
- Diameters given are those of the unit's accessories.
- 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

8/10/12/14/16HP

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

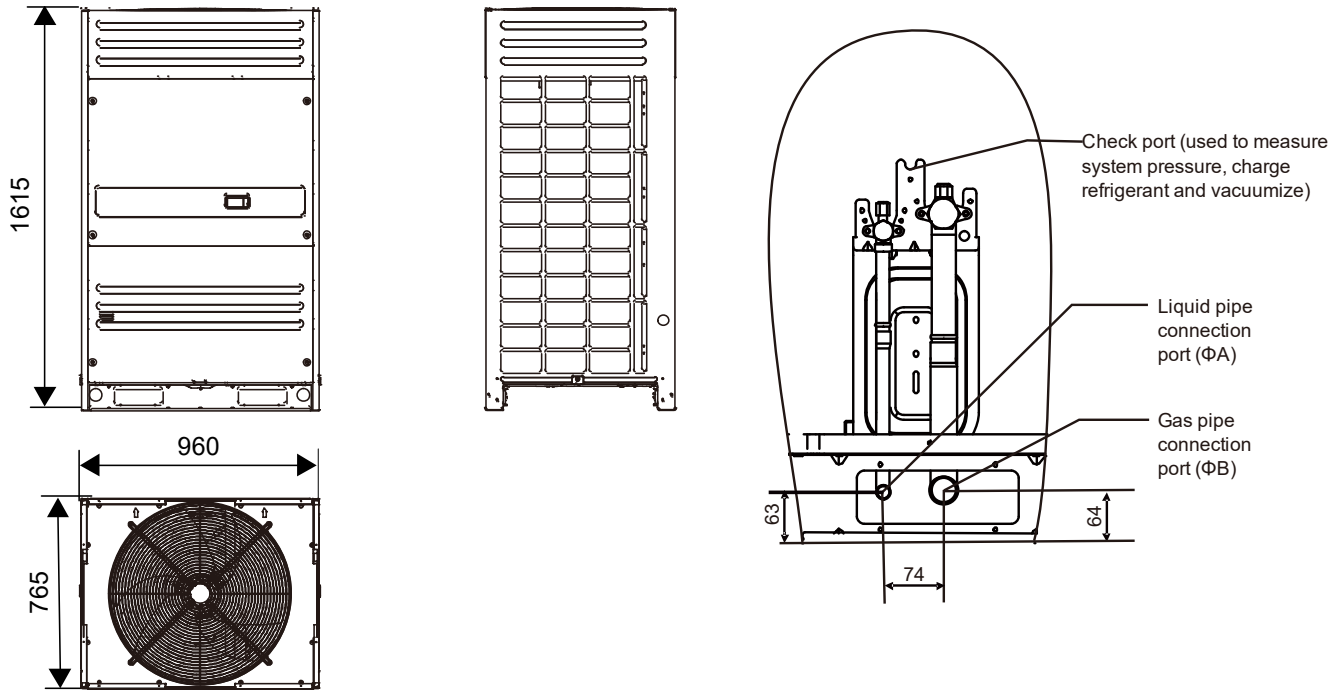
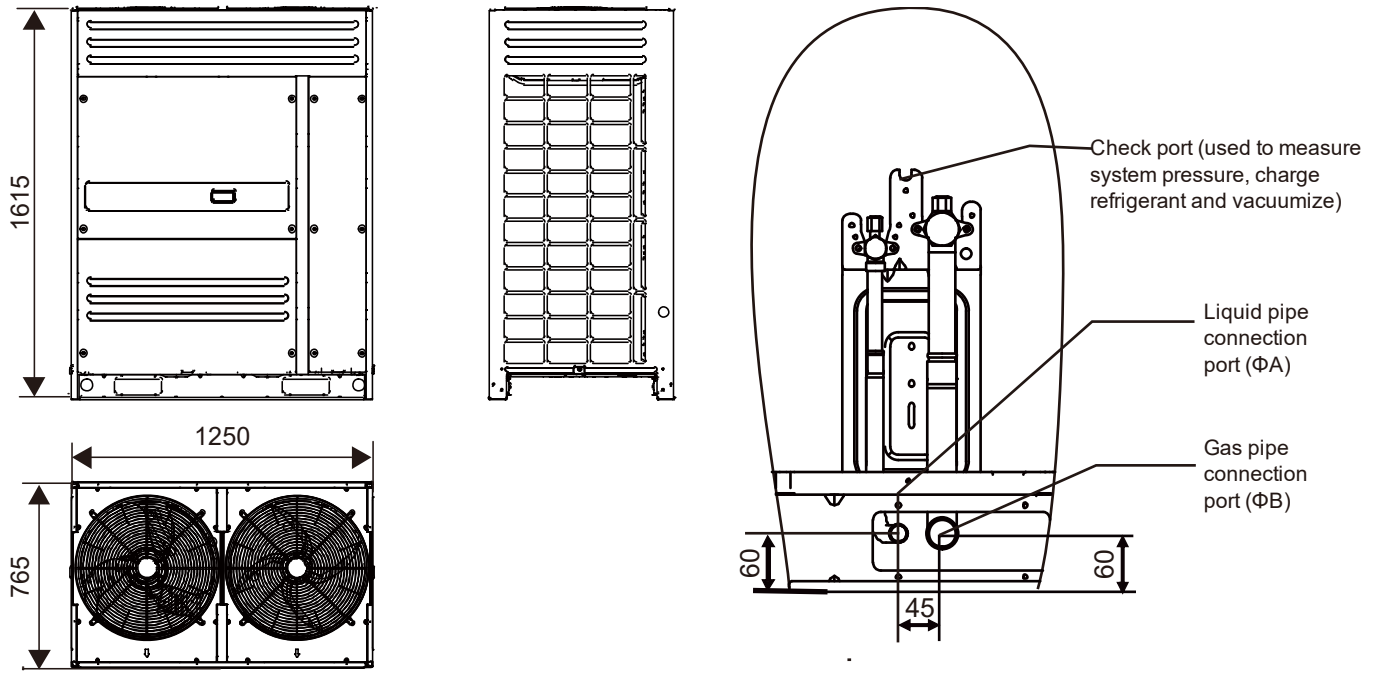


Table 2-2.1: 8/10/12/14/16HP connection piping diameter (unit: mm)

Size	8-10HP	12HP	14-16HP
A	Φ12.7	Φ15.9	Φ15.9
B	Φ25.4	Φ28.6	Φ31.8

18/20/22HP

Figure 2-2.2: 18/20/22HP dimensions (unit: mm)



Detail R

Table 2-2.2: 18/20/22HP connection piping diameter (unit: mm)

Size	18-22HP
A	Φ19.1
B	Φ31.8

24/26/28/30HP

Figure 2-2.3: 24/26/28/30HP dimensions (unit: mm)

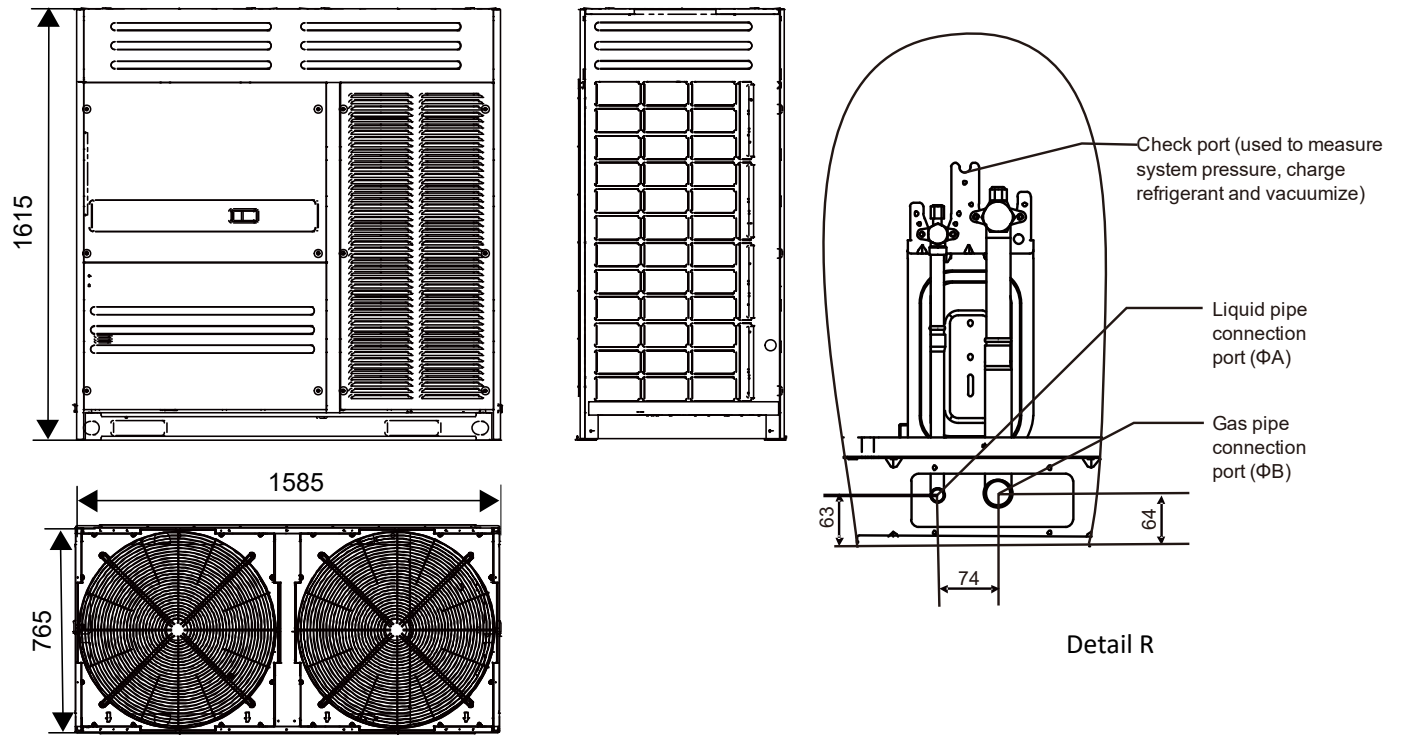


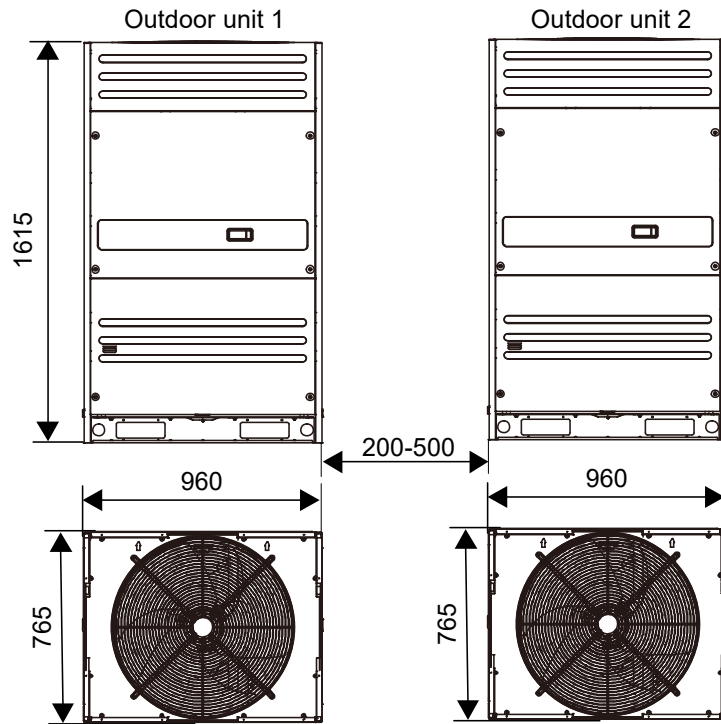
Table 2-2.3: 24/26/28/30HP connection piping diameter (unit: mm)

Size	24HP	26HP	28-30HP
A	Φ19.1	Φ22.2	Φ22.2
B	Φ31.8	Φ31.8	Φ38.1

2.2 Combinations of Units

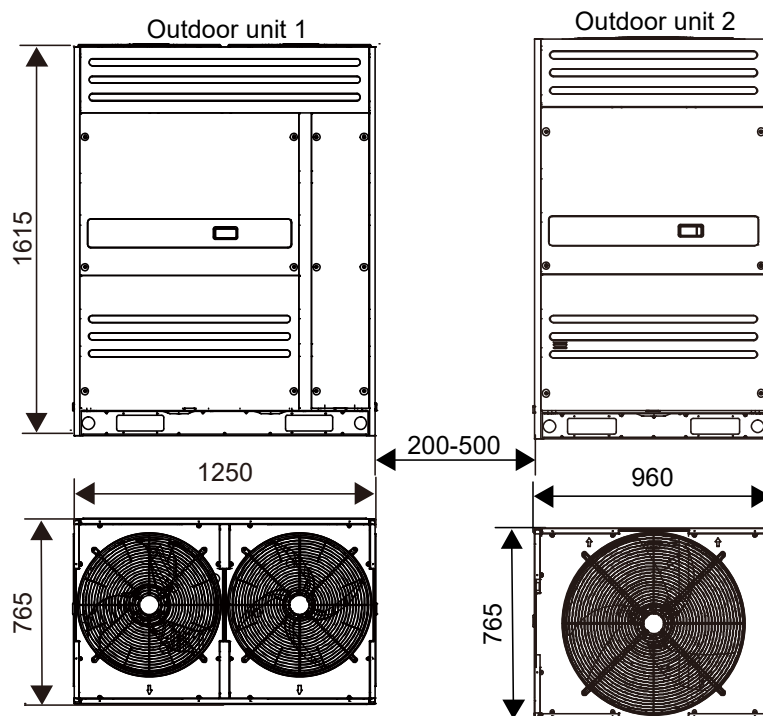
32HP

Figure 2-2.4: 32HP dimensions (unit: mm)



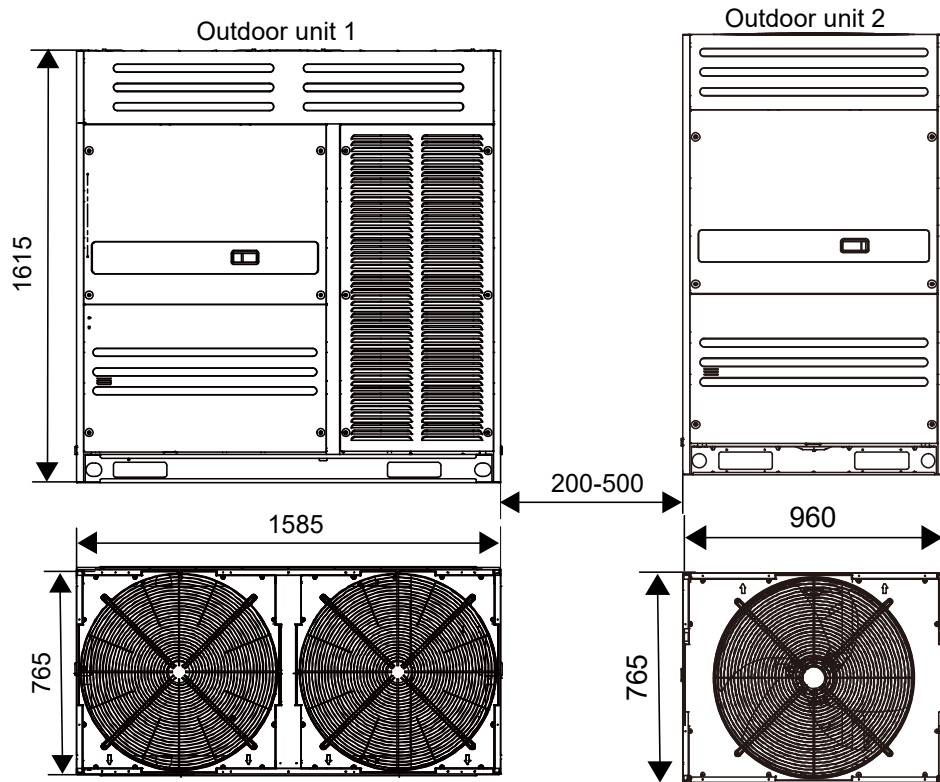
34/36/38HP

Figure 2-2.5: 34/36/38HP dimensions (unit: mm)



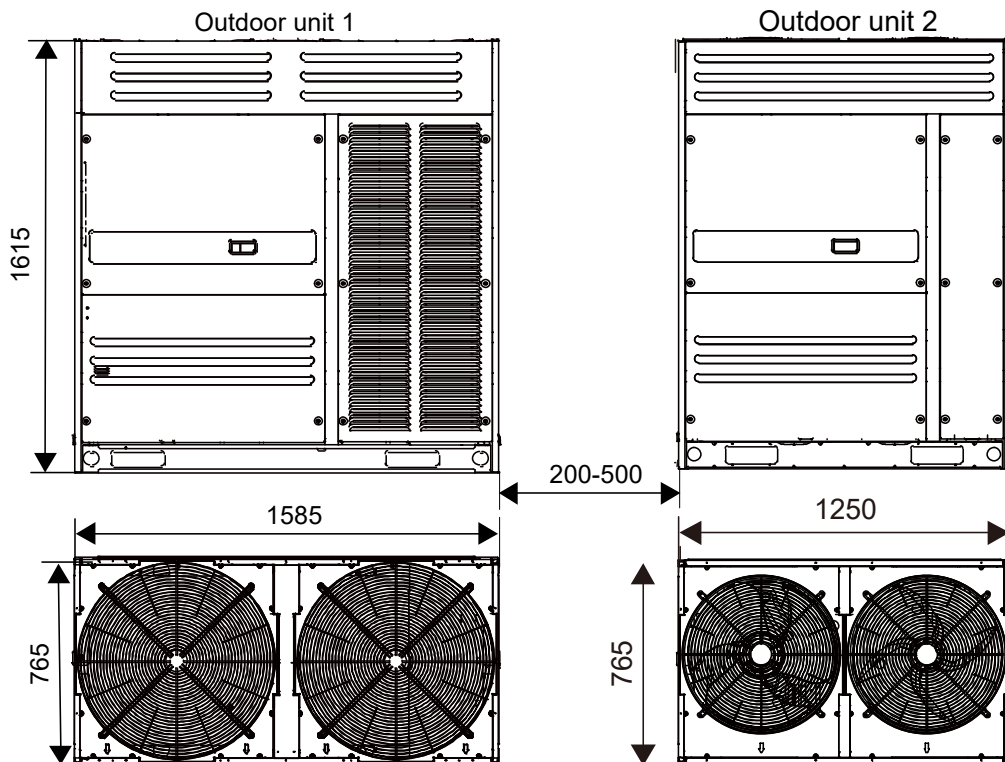
40/42/44/46HP

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



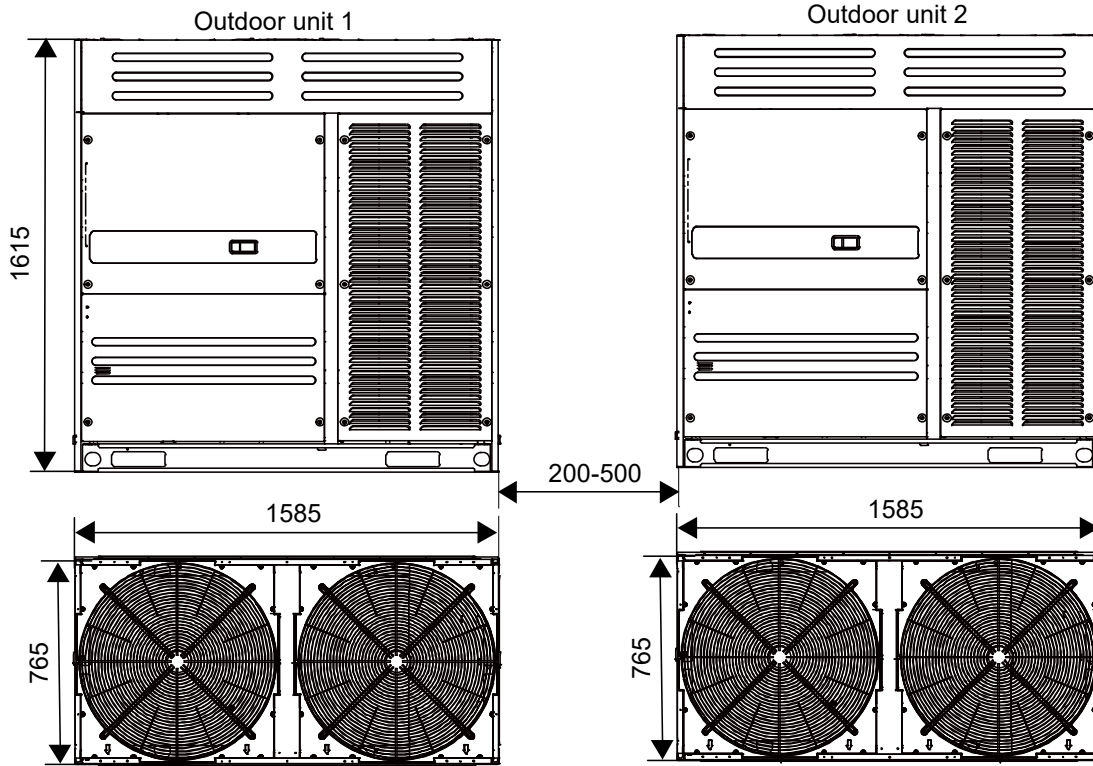
48/50/52HP

Figure 2-2.7: 48/50/52HP dimensions (unit: mm)



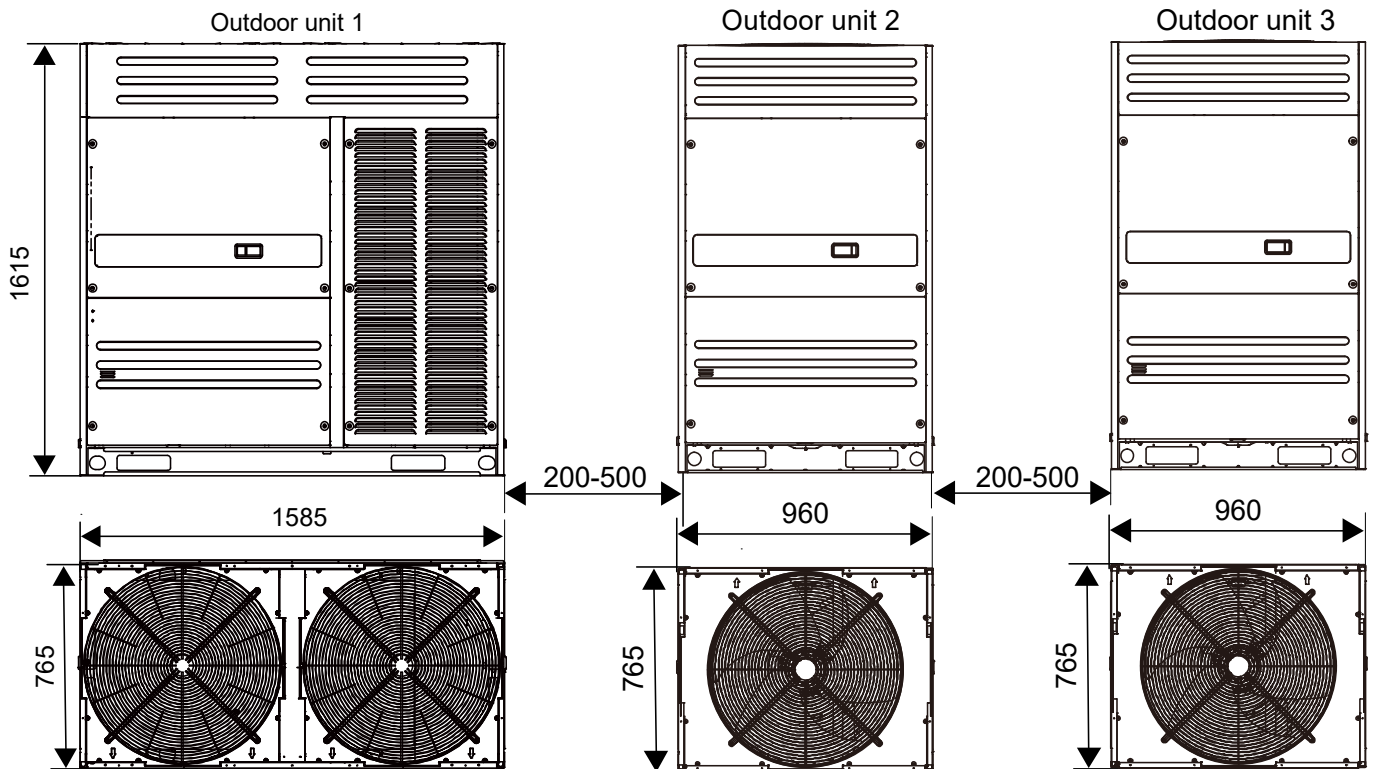
54/56/58/60HP

Figure 2-2.8: 54/56/58/60HP dimensions (unit: mm)



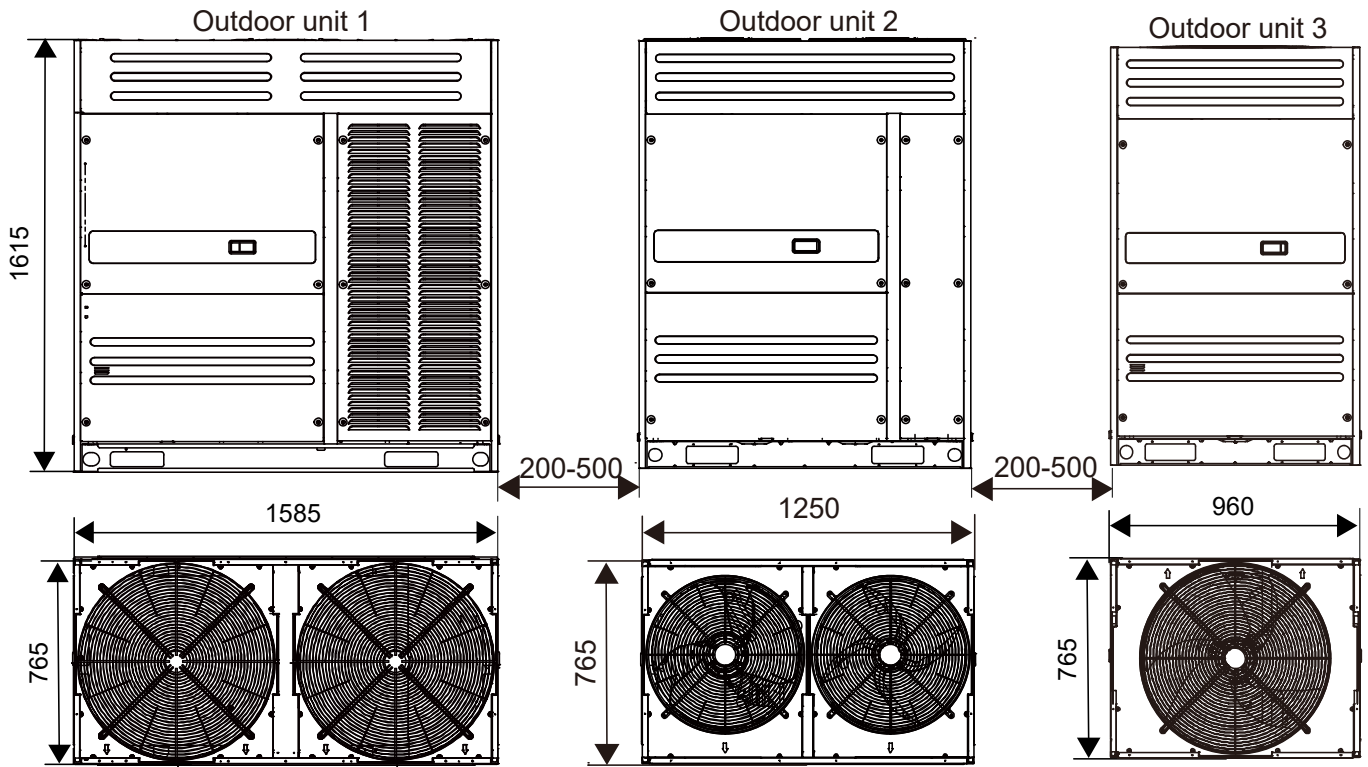
62HP

Figure 2-2.9: 62HP dimensions (unit: mm)



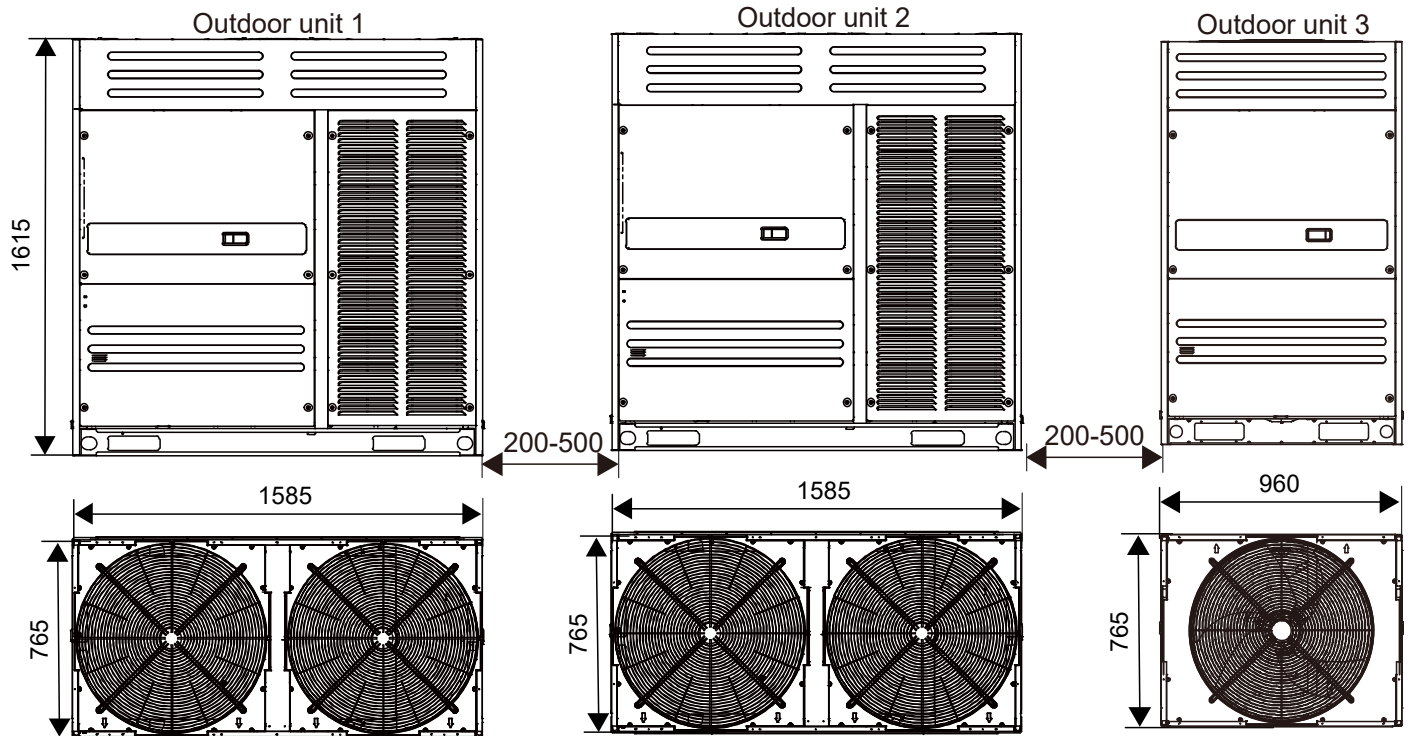
64/66/68HP

Figure 2-2.10: 64/66/68HP dimensions (unit: mm)



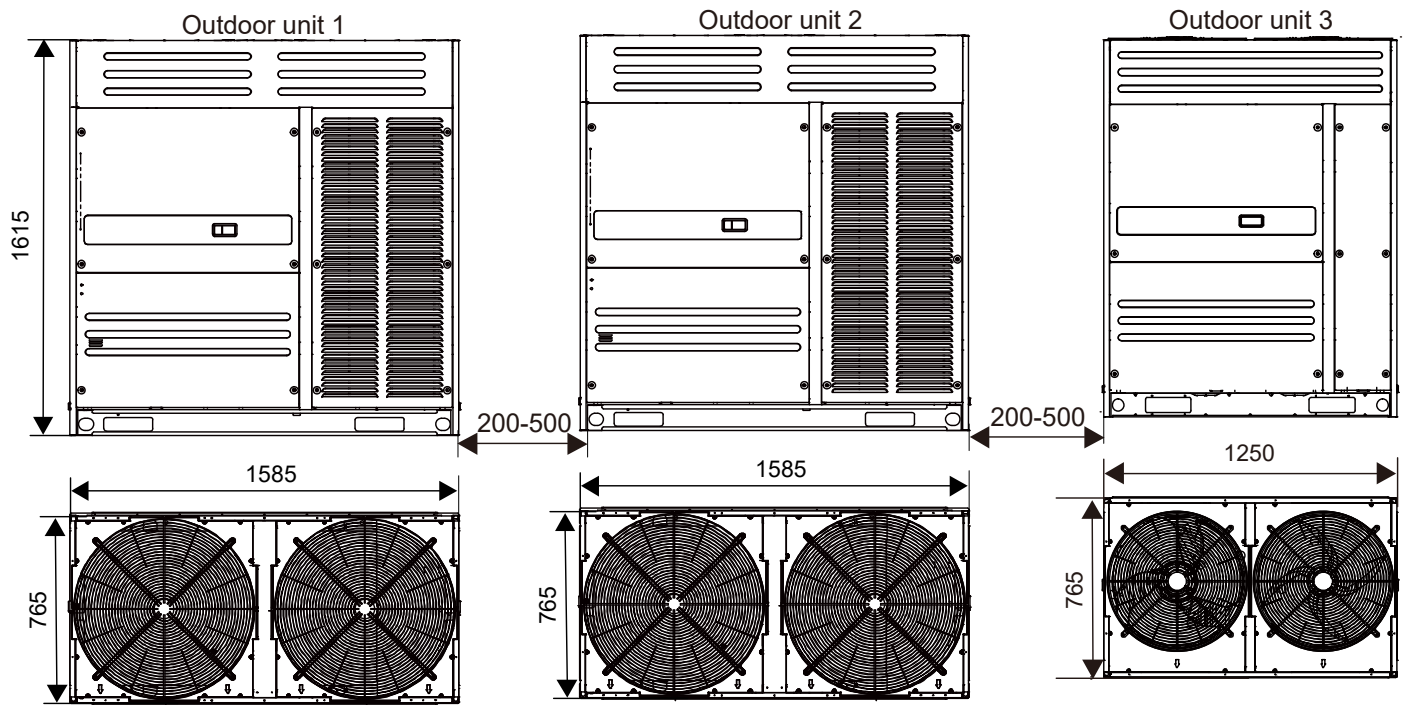
70/72/74/76HP

Figure 2-2.11: 70/72/74/76HP dimensions (unit: mm)



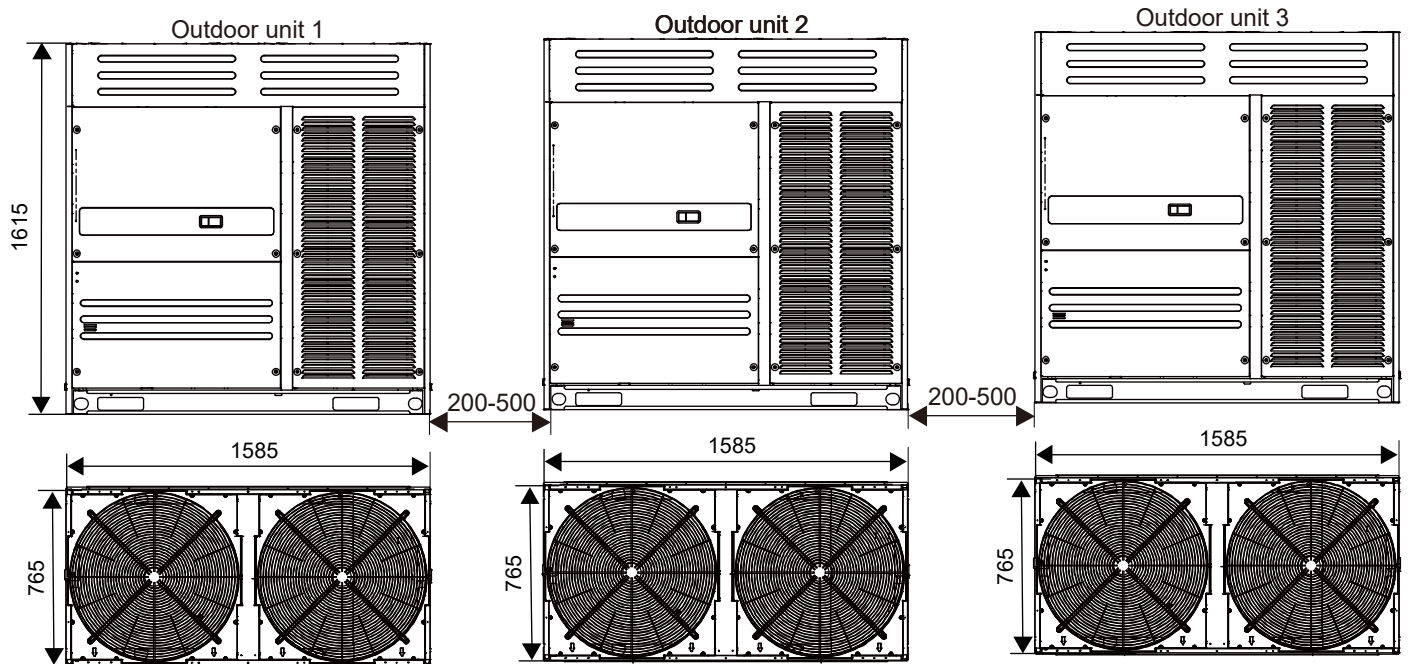
78/80/82HP

Figure 2-2.12: 78/80/82HP dimensions (unit: mm)



84/86/88/90HP

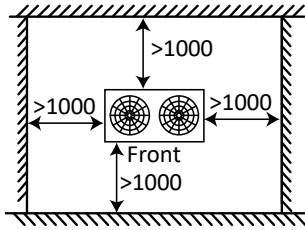
Figure 2-2.13: 84/86/88/90HP dimensions (unit: mm)



3 Installation Space Requirements

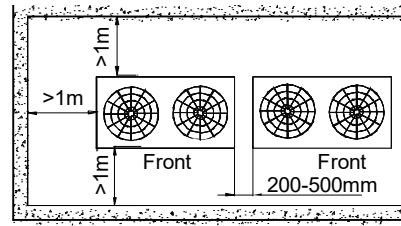
For single unit installation

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



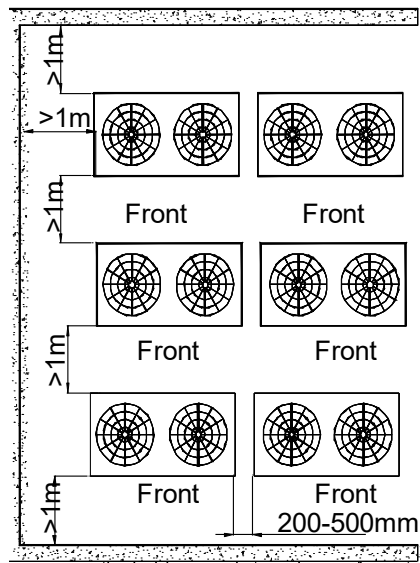
For single row installation

Figure 2-3.2: Single row installation (unit: mm)



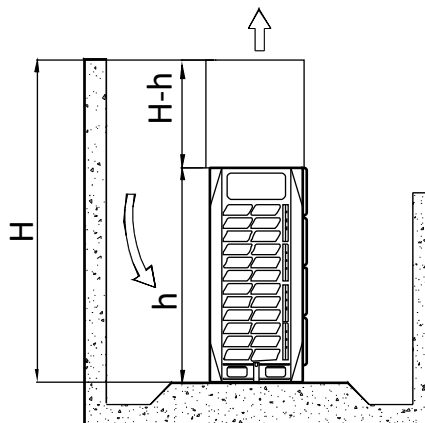
For multi-row installation

Figure 2-3.3: Multi-row installation (unit: mm)



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 2-3.4, the vertical section of ducting should be at least $H-h$ high.

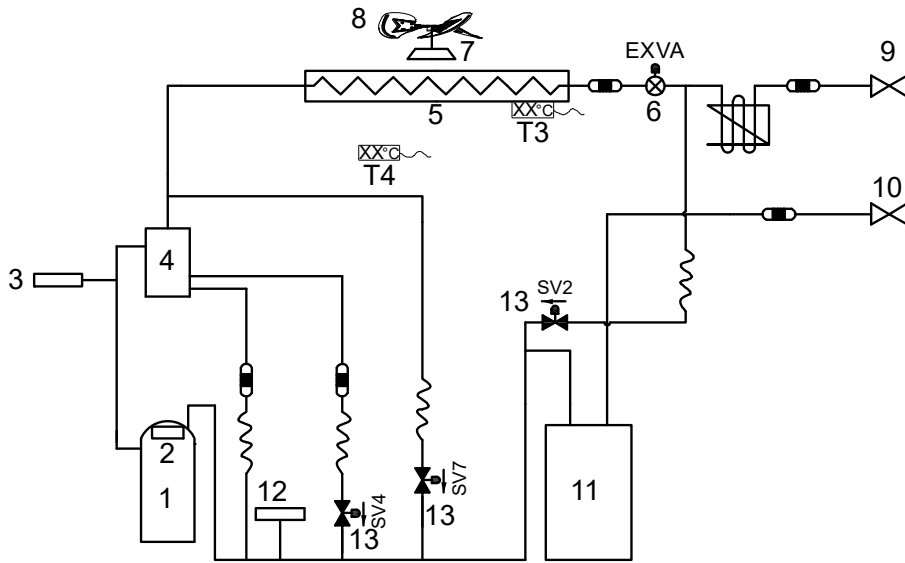
Figure 2-3.4: Top of unit below top of adjacent wall



4 Piping Diagrams

8-16HP

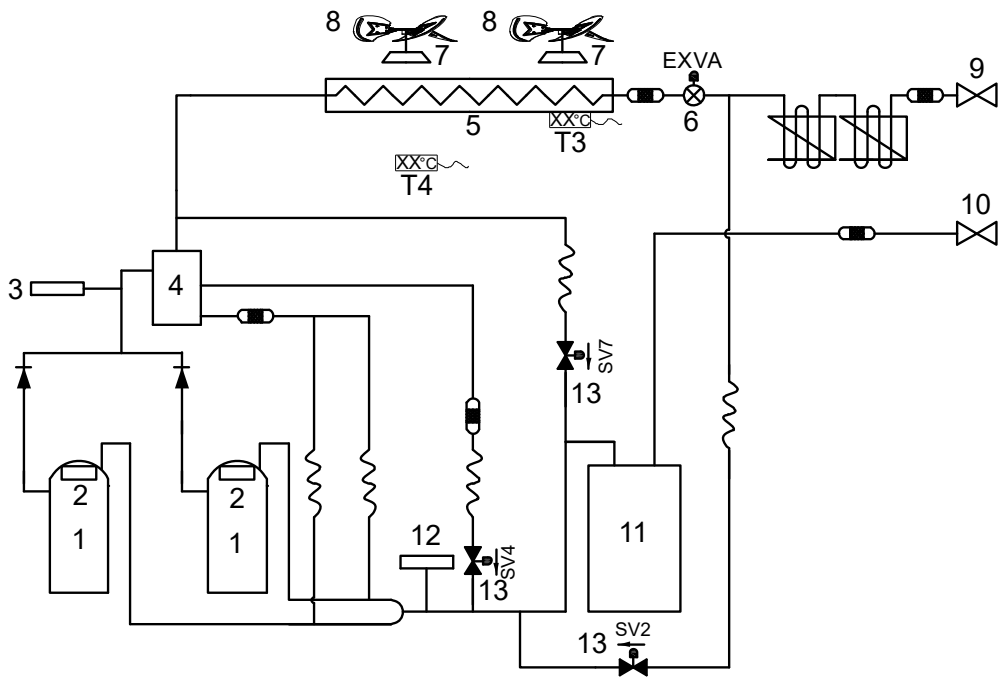
Figure 2-4.1: 8-16HP piping diagram



Legend			
No.	Parts name	No.	Parts name
1	Compressor	10	Stop valve (gas side)
2	Discharge temperature sensor	11	Accumulator
3	High pressure sensor	12	Low pressure switch
4	Oil separator	13	Solenoid valve
5	Heat exchanger	T3	Heat exchanger temperature sensor
6	Electronic expansion valve (EXV)	T4	Outdoor ambient temperature sensor
7	Fan motor	SV2	Liquid injection valve
8	Fan	SV4	Oil return valve
9	Stop valve (liquid side)	SV7	Pressure valve

18-22HP

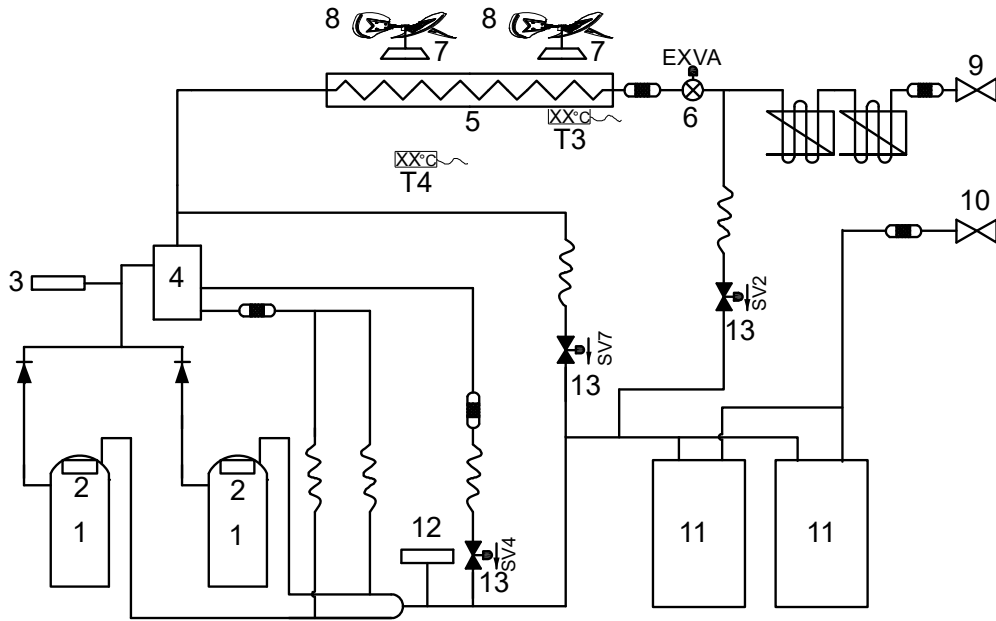
Figure 2-4.2: 18-22HP piping diagram



Legend			
No.	Parts name	No.	Parts name
1	Compressor	10	Stop valve (gas side)
2	Discharge temperature sensor	11	Accumulator
3	High pressure sensor	12	Low pressure switch
4	Oil separator	13	Solenoid valve
5	Heat exchanger	T3	Heat exchanger temperature sensor
6	Electronic expansion valve (EXV)	T4	Outdoor ambient temperature sensor
7	Fan motor	SV2	Liquid injection valve
8	Fan	SV4	Oil return valve
9	Stop valve (liquid side)	SV7	Pressure valve

24-30HP

Figure 2-4.3: 24-30HP piping diagram



Legend			
No.	Parts name	No.	Parts name
1	Compressor	10	Stop valve (gas side)
2	Discharge temperature sensor	11	Accumulator
3	High pressure sensor	12	Low pressure switch
4	Oil separator	13	Solenoid valve
5	Heat exchanger	T3	Heat exchanger temperature sensor
6	Electronic expansion valve (EXV)	T4	Outdoor ambient temperature sensor
7	Fan motor	SV2	Liquid injection valve
8	Fan	SV4	Oil return valve
9	Stop valve (liquid side)	SV7	Pressure valve

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. **Accumulator:**
Stores liquid refrigerant to protect compressor from liquid hammering.
3. **Electronic expansion valve (EXV):**
Controls refrigerant flow and reduces refrigerant pressure.
4. **Solenoid valve SV2:**
Protects the compressor. If compressor discharge temperature rises above 100°C, SV2 opens and sprays a small amount of liquid refrigerant to cool the compressor. SV2 closes again once the discharge temperature has fallen below 90°C.
5. **Solenoid valve SV4:**
Returns oil to the compressor. Opens once the compressor has run for 200 seconds and closes 600 seconds later and then opens for 3 minutes every 20 minutes.
6. **Solenoid valve SV7:**
Allows refrigerant to return directly to the compressor. Opens when indoor air temperature is close to the set temperature to avoid frequent compressor on/off. Opens when superheat degree is insufficient to avoid liquid hammer to compressor.
7. **low pressure switches:**
Regulate system pressure. When system pressure falls below the lower limit, the low pressure switches turn off, stopping the compressor. After 10 minutes, the compressor restarts.

5 Electrical Characteristics

Table 2-6.1: Outdoor unit electrical characteristics

Model				Power Supply ¹						Compressor		OFM		
Capacity	Modules			Hz	Volts	Min. volts	Max. volts	MCA ²	TOCA ³	MFA ⁴	MSC ⁵	RLA ⁶	kW	FLA
8HP				50/60	380~415	342	456	24	29.4	32	/	10	0.56	2.1
10HP				50/60	380~415	342	456	24.5	29.4	32	/	11.1	0.56	2.1
12HP				50/60	380~415	342	456	24.7	29.4	32	/	14.8	0.56	2.1
14HP				50/60	380~415	342	456	29.7	36.3	40	/	26	0.75	2.5
16HP				50/60	380~415	342	456	30.3	36.3	40	/	26.5	0.75	2.5
18HP				50/60	380~415	342	456	45	56.8	50	/	16+15	0.56×2	2.2
20HP				50/60	380~415	342	456	45.5	56.8	50	/	19+18	0.56×2	2.2
22HP				50/60	380~415	342	456	46	56.8	50	/	20+19	0.56×2	2.2
24HP				50/60	380~415	342	456	57	71.7	63	/	20.9+19.8	0.56×2	5.1
26HP				50/60	380~415	342	456	57.8	71.7	63	/	21.2+20.5	0.56×2	5.1
28HP				50/60	380~415	342	456	58.3	71.7	63	/	26+25	0.56×2	5.1
30HP				50/60	380~415	342	456	58.8	71.7	63	/	27+26	0.56×2	5.1
32HP	16HP	16HP		50/60	380~415	342	456	60.6	72.6	40+40	/	26.5+26.5	0.75*2	5
34HP	12HP	22HP		50/60	380~415	342	456	70.7	86.2	32+50	/	14.8+20+19	0.56*3	4.3
36HP	16HP	20HP		50/60	380~415	342	456	75.8	93.1	40+50	/	26.5+19+18	0.75+0.52*2	4.7
38HP	16HP	22HP		50/60	380~415	342	456	76.3	93.1	40+50	/	26.5+20+19	0.75+0.52*2	4.7
40HP	16HP	24HP		50/60	380~415	342	456	87.3	108	40+63	/	26.5+20.9+19.8	0.75+0.52*2	7.6
42HP	16HP	26HP		50/60	380~415	342	456	88.1	108	40+63	/	26.5+21.2+20.5	0.75+0.52*2	7.6
44HP	16HP	28HP		50/60	380~415	342	456	88.6	108	40+63	/	26.5+26+25	0.75+0.52*2	7.6
46HP	16HP	30HP		50/60	380~415	342	456	89.1	108	40+63	/	26.5+27+26	0.75+0.52*2	7.6
48HP	22HP	26HP		50/60	380~415	342	456	103.8	128.5	50+63	/	20+19+21.2+20.5	0.56*4	7.3
50HP	22HP	28HP		50/60	380~415	342	456	104.3	128.5	50+63	/	20+19+26+25	0.56*4	7.3
52HP	22HP	30HP		50/60	380~415	342	456	104.8	128.5	50+63	/	20+19+27+26	0.56*4	7.3
54HP	26HP	28HP		50/60	380~415	342	456	116.1	143.4	63+63	/	21.2+20.5+26+25	0.56*4	10.2
56HP	28HP	28HP		50/60	380~415	342	456	116.6	143.4	63+63	/	26+25+26+25	0.56*4	10.2
58HP	28HP	30HP		50/60	380~415	342	456	117.1	143.4	63+63	/	26+25+27+26	0.56*4	10.2
60HP	30HP	30HP		50/60	380~415	342	456	117.6	143.4	63+63	/	27+26+27+26	0.56*4	10.2
62HP	16HP	16HP	30HP	50/60	380~415	342	456	119.4	144.3	40+40+63	/	26.5+26.5+27+26	0.75*2+0.56*2	10.1
64HP	16HP	22HP	26HP	50/60	380~415	342	456	134.1	164.8	40+50+63	/	26.5+20+19+21.2+20.5	0.75+0.56*4	9.8
66HP	16HP	22HP	28HP	50/60	380~415	342	456	134.6	164.8	40+50+63	/	26.5+20+19+26+25	0.75+0.56*4	9.8
68HP	16HP	22HP	30HP	50/60	380~415	342	456	135.1	164.8	40+50+63	/	26.5+20+19+27+26	0.75+0.56*4	9.8
70HP	16HP	26HP	28HP	50/60	380~415	342	456	146.4	179.7	40+63+63	/	26.5+21.2+20.5+26+25	0.75+0.56*4	12.7
72HP	16HP	28HP	28HP	50/60	380~415	342	456	146.9	179.7	40+63+63	/	26.5+26+25+26+25	0.75+0.56*4	12.7
74HP	16HP	28HP	30HP	50/60	380~415	342	456	147.4	179.7	40+63+63	/	26.5+26+25+27+26	0.75+0.56*4	12.7
76HP	16HP	30HP	30HP	50/60	380~415	342	456	147.9	179.7	40+63+63	/	26.5+27+26+27+26	0.75+0.56*4	12.7
78HP	22HP	28HP	28HP	50/60	380~415	342	456	162.6	200.2	50+63+63	/	20+19+26+25+26+25	0.56*6	12.4
80HP	22HP	28HP	30HP	50/60	380~415	342	456	163.1	200.2	50+63+63	/	20+19+26+25+27+26	0.56*6	12.4
82HP	22HP	30HP	30HP	50/60	380~415	342	456	163.6	200.2	50+63+63	/	20+19+27+26+27+26	0.56*6	12.4
84HP	28HP	28HP	28HP	50/60	380~415	342	456	174.9	215.1	63+63+63	/	26+25+26+25+26+25	0.56*6	15.3
86HP	28HP	28HP	30HP	50/60	380~415	342	456	175.4	215.1	63+63+63	/	26+25+26+25+27+26	0.56*6	15.3
88HP	28HP	30HP	30HP	50/60	380~415	342	456	175.9	215.1	63+63+63	/	26+25+27+26+27+26	0.56*6	15.3
90HP	30HP	30HP	30HP	50/60	380~415	342	456	176.4	215.1	63+63+63	/	27+26+27+26+27+26	0.56*6	15.3

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.

6 Functional Components and Safety Devices

Table 2-7.1: 8-30HP functional components and safety devices

Item		8-30HP
Compressor	Compressor top and discharge pipe temperature sensors	90°C = 5kΩ ± 3%
Inverter module	Inverter module temperature sensor	90°C = 5kΩ ± 5%
Fan motor	Limit temperature	On
		Off
System	Low pressure switch	Off: 0.05 (±0.05) MPa / On: 0.15 (±0.05) MPa
	High pressure sensor	Output voltage (V) = 1.1603 × 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 2-8.1: 8HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB: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
50%	-5	7.56	0.83	9.04	0.96	10.48	1.10	11.20	1.15	11.92	1.22	13.36	1.39	14.88	1.49
	-2	7.56	0.84	9.04	0.98	10.48	1.11	11.20	1.17	11.92	1.24	13.36	1.40	14.88	1.51
	0	7.56	0.85	9.04	1.00	10.48	1.13	11.20	1.19	11.92	1.25	13.36	1.43	14.88	1.54
	2	7.56	0.86	9.04	1.01	10.48	1.15	11.20	1.20	11.92	1.28	13.36	1.43	14.88	1.57
	4	7.56	0.87	9.04	1.03	10.48	1.17	11.20	1.22	11.92	1.30	13.36	1.47	14.88	1.61
	6	7.56	0.89	9.04	1.04	10.48	1.18	11.20	1.25	11.92	1.33	13.36	1.49	14.88	1.66
	8	7.56	0.91	9.04	1.06	10.48	1.20	11.20	1.27	11.92	1.34	13.36	1.52	14.88	1.71
	10	7.56	0.93	9.04	1.07	10.48	1.22	11.20	1.29	11.92	1.38	13.36	1.56	14.88	1.74
	12	7.56	0.93	9.04	1.09	10.48	1.24	11.20	1.32	11.92	1.41	13.36	1.58	14.88	1.76
	14	7.56	0.95	9.04	1.10	10.48	1.26	11.20	1.35	11.92	1.43	13.36	1.61	14.88	1.80
	16	7.56	0.96	9.04	1.11	10.48	1.28	11.20	1.37	11.92	1.45	13.36	1.64	14.88	1.83
	18	7.56	0.97	9.04	1.13	10.48	1.30	11.20	1.39	11.92	1.48	13.36	1.67	14.88	1.86
	20	7.56	0.99	9.04	1.15	10.48	1.32	11.20	1.41	11.92	1.51	13.36	1.69	14.88	1.89
	21	7.56	1.00	9.04	1.16	10.48	1.33	11.20	1.42	11.92	1.52	13.36	1.71	14.88	1.91
	23	7.56	1.01	9.04	1.18	10.48	1.36	11.20	1.45	11.92	1.55	13.36	1.74	14.88	1.96
	25	7.56	1.02	9.04	1.20	10.48	1.38	11.20	1.48	11.92	1.60	13.36	1.83	14.88	2.09
	27	7.56	1.04	9.04	1.24	10.48	1.46	11.20	1.58	11.92	1.69	13.36	1.95	14.88	2.23
	29	7.56	1.10	9.04	1.31	10.48	1.55	11.20	1.67	11.92	1.80	13.36	2.07	14.88	2.37
	31	7.56	1.16	9.04	1.39	10.48	1.64	11.20	1.78	11.92	1.91	13.36	2.21	14.88	2.52
	33	7.56	1.23	9.04	1.47	10.48	1.74	11.20	1.88	11.92	2.03	13.36	2.34	14.88	2.68
	35	7.56	1.30	9.04	1.56	10.48	1.84	11.20	1.99	11.92	2.15	13.36	2.49	14.88	2.85
37	7.56	1.37	9.04	1.65	10.48	1.95	11.20	2.11	11.92	2.28	13.36	2.64	14.88	3.03	
39	7.56	1.44	9.04	1.74	10.48	2.06	11.20	2.23	11.92	2.42	13.36	2.80	14.88	3.21	
41	7.56	1.50	9.04	1.81	10.48	2.13	11.20	2.34	11.92	2.52	13.36	2.95	14.88	3.36	
43	7.56	1.60	9.04	1.93	10.48	2.21	11.20	2.44	11.92	2.59	13.36	3.10	14.88	3.51	
46	7.56	1.64	9.04	1.98	10.48	2.36	11.20	2.63	11.92	2.70	13.36	3.40	14.88	3.81	
48	7.56	1.67	9.04	2.03	10.48	2.49	11.20	2.81	11.92	2.83	13.36	3.66	14.88	4.10	
50	7.47	1.68	8.98	2.05	10.40	2.51	11.11	2.81	11.83	2.83	13.25	3.69	14.75	4.13	
52	7.38	1.69	8.80	2.06	10.23	2.52	10.93	2.82	11.65	2.84	13.07	3.70	14.49	4.14	
54	7.29	1.70	8.71	2.08	10.05	2.54	10.75	2.84	11.47	2.86	12.80	3.73	14.31	4.16	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

Table 2-8.2: 10HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB: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
50%	-5	9.45	1.09	11.30	1.26	13.10	1.45	14.00	1.52	14.90	1.60	16.70	1.82	18.60	1.96
	-2	9.45	1.10	11.30	1.29	13.10	1.47	14.00	1.54	14.90	1.63	16.70	1.85	18.60	1.99
	0	9.45	1.12	11.30	1.31	13.10	1.49	14.00	1.56	14.90	1.65	16.70	1.88	18.60	2.03
	2	9.45	1.13	11.30	1.33	13.10	1.52	14.00	1.58	14.90	1.68	16.70	1.89	18.60	2.06
	4	9.45	1.15	11.30	1.35	13.10	1.54	14.00	1.60	14.90	1.71	16.70	1.93	18.60	2.12
	6	9.45	1.17	11.30	1.37	13.10	1.56	14.00	1.64	14.90	1.74	16.70	1.96	18.60	2.18
	8	9.45	1.19	11.30	1.39	13.10	1.59	14.00	1.68	14.90	1.77	16.70	1.99	18.60	2.25
	10	9.45	1.22	11.30	1.41	13.10	1.61	14.00	1.70	14.90	1.82	16.70	2.05	18.60	2.28
	12	9.45	1.23	11.30	1.43	13.10	1.64	14.00	1.74	14.90	1.86	16.70	2.08	18.60	2.32
	14	9.45	1.25	11.30	1.45	13.10	1.66	14.00	1.77	14.90	1.88	16.70	2.12	18.60	2.37
	16	9.45	1.26	11.30	1.46	13.10	1.68	14.00	1.80	14.90	1.91	16.70	2.16	18.60	2.40
	18	9.45	1.28	11.30	1.49	13.10	1.71	14.00	1.83	14.90	1.95	16.70	2.19	18.60	2.45
	20	9.45	1.30	11.30	1.51	13.10	1.74	14.00	1.86	14.90	1.98	16.70	2.23	18.60	2.49
	21	9.45	1.31	11.30	1.53	13.10	1.76	14.00	1.87	14.90	2.00	16.70	2.26	18.60	2.52
	23	9.45	1.33	11.30	1.55	13.10	1.78	14.00	1.91	14.90	2.04	16.70	2.29	18.60	2.57
	25	9.45	1.35	11.30	1.57	13.10	1.82	14.00	1.95	14.90	2.10	16.70	2.41	18.60	2.75
	27	9.45	1.37	11.30	1.64	13.10	1.92	14.00	2.07	14.90	2.23	16.70	2.57	18.60	2.93
	29	9.45	1.45	11.30	1.73	13.10	2.04	14.00	2.20	14.90	2.37	16.70	2.73	18.60	3.12
	31	9.45	1.53	11.30	1.83	13.10	2.16	14.00	2.34	14.90	2.52	16.70	2.90	18.60	3.32
	33	9.45	1.62	11.30	1.94	13.10	2.29	14.00	2.47	14.90	2.67	16.70	3.08	18.60	3.53
	35	9.45	1.71	11.30	2.05	13.10	2.42	14.00	2.62	14.90	2.83	16.70	3.27	18.60	3.75
37	9.45	1.80	11.30	2.16	13.10	2.57	14.00	2.77	14.90	3.00	16.70	3.47	18.60	3.98	
39	9.45	1.90	11.30	2.28	13.10	2.71	14.00	2.94	14.90	3.18	16.70	3.68	18.60	4.23	
41	9.45	1.98	11.30	2.38	13.10	2.81	14.00	3.08	14.90	3.32	16.70	3.88	18.60	4.43	
43	9.39	2.10	11.23	2.53	13.01	2.89	13.91	3.19	14.80	3.38	16.59	4.05	18.48	4.59	
46	9.39	2.14	11.23	2.59	13.01	3.08	13.91	3.44	14.80	3.53	16.59	4.44	18.48	4.98	
48	9.39	2.19	11.23	2.65	13.01	3.25	13.91	3.67	14.80	3.70	16.59	4.79	18.48	5.36	
50	9.28	2.20	11.15	2.68	12.92	3.28	13.80	3.68	14.69	3.70	16.45	4.82	18.32	5.39	
52	9.17	2.21	10.93	2.69	12.70	3.29	13.57	3.69	14.46	3.72	16.23	4.84	18.00	5.41	
54	9.05	2.23	10.82	2.71	12.48	3.32	13.35	3.72	14.24	3.74	15.90	4.88	17.78	5.44	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

Table 2-8.3: 12HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB: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
50%	-5	11.31	1.46	13.52	1.69	15.67	1.94	16.75	2.03	17.83	2.14	19.98	2.44	22.25	2.63
	-2	11.31	1.47	13.52	1.72	15.67	1.96	16.75	2.06	17.83	2.18	19.98	2.47	22.25	2.66
	0	11.31	1.50	13.52	1.75	15.67	2.00	16.75	2.09	17.83	2.21	19.98	2.51	22.25	2.71
	2	11.31	1.52	13.52	1.77	15.67	2.03	16.75	2.12	17.83	2.25	19.98	2.52	22.25	2.76
	4	11.31	1.53	13.52	1.80	15.67	2.05	16.75	2.14	17.83	2.29	19.98	2.59	22.25	2.83
	6	11.31	1.56	13.52	1.83	15.67	2.09	16.75	2.19	17.83	2.33	19.98	2.63	22.25	2.92
	8	11.31	1.60	13.52	1.87	15.67	2.12	16.75	2.24	17.83	2.37	19.98	2.67	22.25	3.01
	10	11.31	1.63	13.52	1.89	15.67	2.15	16.75	2.28	17.83	2.43	19.98	2.74	22.25	3.05
	12	11.31	1.64	13.52	1.91	15.67	2.19	16.75	2.32	17.83	2.48	19.98	2.79	22.25	3.10
	14	11.31	1.67	13.52	1.93	15.67	2.21	16.75	2.37	17.83	2.52	19.98	2.84	22.25	3.16
	16	11.31	1.69	13.52	1.96	15.67	2.25	16.75	2.41	17.83	2.56	19.98	2.88	22.25	3.21
	18	11.31	1.72	13.52	2.00	15.67	2.29	16.75	2.45	17.83	2.60	19.98	2.93	22.25	3.27
	20	11.31	1.74	13.52	2.02	15.67	2.32	16.75	2.48	17.83	2.65	19.98	2.98	22.25	3.33
	21	11.31	1.75	13.52	2.04	15.67	2.35	16.75	2.51	17.83	2.68	19.98	3.02	22.25	3.37
	23	11.31	1.78	13.52	2.07	15.67	2.39	16.75	2.56	17.83	2.73	19.98	3.07	22.25	3.44
	25	11.31	1.80	13.52	2.11	15.67	2.43	16.75	2.60	17.83	2.81	19.98	3.22	22.25	3.67
	27	11.31	1.84	13.52	2.19	15.67	2.57	16.75	2.77	17.83	2.98	19.98	3.43	22.25	3.92
	29	11.31	1.93	13.52	2.31	15.67	2.73	16.75	2.94	17.83	3.18	19.98	3.65	22.25	4.17
	31	11.31	2.04	13.52	2.45	15.67	2.88	16.75	3.13	17.83	3.37	19.98	3.88	22.25	4.44
	33	11.31	2.17	13.52	2.59	15.67	3.07	16.75	3.31	17.83	3.58	19.98	4.13	22.25	4.72
	35	11.31	2.29	13.52	2.74	15.67	3.24	16.75	3.50	17.83	3.78	19.98	4.38	22.25	5.01
	37	11.31	2.41	13.52	2.90	15.67	3.43	16.75	3.71	17.83	4.02	19.98	4.65	22.25	5.33
	39	11.31	2.54	13.52	3.05	15.67	3.63	16.75	3.93	17.83	4.26	19.98	4.93	22.25	5.66
	41	11.31	2.65	13.52	3.19	15.67	3.76	16.75	4.11	17.83	4.44	19.98	5.19	22.25	5.92
43	11.11	2.77	13.28	3.34	15.40	3.82	16.46	4.22	17.52	4.47	19.63	5.36	21.87	6.07	
46	11.11	2.84	13.28	3.43	15.40	4.08	16.46	4.55	17.52	4.66	19.63	5.87	21.87	6.59	
48	11.11	2.89	13.28	3.51	15.40	4.30	16.46	4.85	17.52	4.89	19.63	6.33	21.87	7.09	
50	10.98	2.91	13.20	3.54	15.29	4.33	16.33	4.86	17.38	4.90	19.47	6.37	21.68	7.13	
52	10.85	2.93	12.94	3.56	15.03	4.35	16.06	4.88	17.12	4.91	19.21	6.40	21.30	7.15	
54	10.71	2.95	12.80	3.59	14.76	4.38	15.80	4.91	16.85	4.94	18.81	6.45	21.03	7.20	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

Table 2-8.4: 14HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB: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
50%	-5	13.50	1.69	16.14	1.95	18.71	2.24	20.00	2.35	21.29	2.47	23.86	2.81	26.57	3.03
	-2	13.50	1.70	16.14	1.99	18.71	2.26	20.00	2.38	21.29	2.52	23.86	2.85	26.57	3.07
	0	13.50	1.73	16.14	2.02	18.71	2.31	20.00	2.41	21.29	2.55	23.86	2.90	26.57	3.13
	2	13.50	1.75	16.14	2.05	18.71	2.35	20.00	2.45	21.29	2.59	23.86	2.91	26.57	3.19
	4	13.50	1.77	16.14	2.08	18.71	2.37	20.00	2.47	21.29	2.64	23.86	2.98	26.57	3.27
	6	13.50	1.80	16.14	2.12	18.71	2.41	20.00	2.53	21.29	2.69	23.86	3.03	26.57	3.36
	8	13.50	1.84	16.14	2.15	18.71	2.45	20.00	2.59	21.29	2.73	23.86	3.08	26.57	3.47
	10	13.50	1.88	16.14	2.18	18.71	2.49	20.00	2.63	21.29	2.81	23.86	3.16	26.57	3.52
	12	13.50	1.90	16.14	2.20	18.71	2.53	20.00	2.68	21.29	2.86	23.86	3.22	26.57	3.58
	14	13.50	1.92	16.14	2.23	18.71	2.56	20.00	2.74	21.29	2.91	23.86	3.27	26.57	3.65
	16	13.50	1.95	16.14	2.26	18.71	2.60	20.00	2.78	21.29	2.95	23.86	3.33	26.57	3.71
	18	13.50	1.98	16.14	2.30	18.71	2.64	20.00	2.82	21.29	3.01	23.86	3.38	26.57	3.78
	20	13.50	2.01	16.14	2.33	18.71	2.68	20.00	2.86	21.29	3.06	23.86	3.44	26.57	3.85
	21	13.50	2.02	16.14	2.36	18.71	2.71	20.00	2.89	21.29	3.09	23.86	3.48	26.57	3.89
	23	13.50	2.05	16.14	2.39	18.71	2.75	20.00	2.95	21.29	3.15	23.86	3.54	26.57	3.97
	25	13.50	2.08	16.14	2.43	18.71	2.81	20.00	3.01	21.29	3.24	23.86	3.72	26.57	4.24
	27	13.50	2.12	16.14	2.53	18.71	2.96	20.00	3.20	21.29	3.44	23.86	3.96	26.57	4.52
	29	13.50	2.23	16.14	2.67	18.71	3.15	20.00	3.40	21.29	3.67	23.86	4.21	26.57	4.82
	31	13.50	2.36	16.14	2.82	18.71	3.33	20.00	3.61	21.29	3.89	23.86	4.48	26.57	5.13
	33	13.50	2.50	16.14	2.99	18.71	3.54	20.00	3.82	21.29	4.13	23.86	4.76	26.57	5.45
	35	13.50	2.64	16.14	3.16	18.71	3.74	20.00	4.04	21.29	4.37	23.86	5.06	26.57	5.79
	37	13.50	2.78	16.14	3.34	18.71	3.96	20.00	4.28	21.29	4.63	23.86	5.36	26.57	6.15
	39	13.50	2.93	16.14	3.52	18.71	4.18	20.00	4.54	21.29	4.91	23.86	5.69	26.57	6.53
	41	13.50	3.06	16.14	3.68	18.71	4.34	20.00	4.75	21.29	5.13	23.86	5.99	26.57	6.83
43	13.50	3.26	16.14	3.93	18.71	4.49	20.00	4.96	21.29	5.26	23.86	6.29	26.57	7.14	
46	13.50	3.33	16.14	4.03	18.71	4.79	20.00	5.34	21.29	5.48	23.86	6.90	26.57	7.74	
48	13.50	3.40	16.14	4.12	18.71	5.06	20.00	5.70	21.29	5.74	23.86	7.44	26.57	8.33	
50	13.34	3.42	16.04	4.16	18.58	5.09	19.84	5.71	21.12	5.75	23.66	7.49	26.34	8.38	
52	13.18	3.44	15.72	4.18	18.26	5.11	19.52	5.73	20.80	5.77	23.34	7.52	25.88	8.40	
54	13.02	3.46	15.56	4.22	17.94	5.15	19.20	5.77	20.48	5.81	22.86	7.58	25.56	8.46	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

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

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB: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
50%	-5	15.19	1.97	18.16	2.27	21.05	2.61	22.50	2.73	23.95	2.89	26.84	3.28	29.89	3.54
	-2	15.19	1.98	18.16	2.32	21.05	2.64	22.50	2.77	23.95	2.94	26.84	3.32	29.89	3.58
	0	15.19	2.01	18.16	2.36	21.05	2.69	22.50	2.81	23.95	2.97	26.84	3.38	29.89	3.65
	2	15.19	2.04	18.16	2.39	21.05	2.73	22.50	2.85	23.95	3.02	26.84	3.40	29.89	3.72
	4	15.19	2.06	18.16	2.43	21.05	2.76	22.50	2.89	23.95	3.08	26.84	3.48	29.89	3.81
	6	15.19	2.10	18.16	2.47	21.05	2.81	22.50	2.95	23.95	3.14	26.84	3.53	29.89	3.92
	8	15.19	2.15	18.16	2.51	21.05	2.85	22.50	3.02	23.95	3.18	26.84	3.59	29.89	4.05
	10	15.19	2.19	18.16	2.54	21.05	2.90	22.50	3.07	23.95	3.27	26.84	3.68	29.89	4.11
	12	15.19	2.21	18.16	2.57	21.05	2.95	22.50	3.13	23.95	3.34	26.84	3.75	29.89	4.18
	14	15.19	2.24	18.16	2.60	21.05	2.98	22.50	3.19	23.95	3.39	26.84	3.81	29.89	4.26
	16	15.19	2.28	18.16	2.64	21.05	3.03	22.50	3.24	23.95	3.44	26.84	3.88	29.89	4.32
	18	15.19	2.31	18.16	2.68	21.05	3.08	22.50	3.29	23.95	3.50	26.84	3.95	29.89	4.40
	20	15.19	2.34	18.16	2.72	21.05	3.13	22.50	3.34	23.95	3.57	26.84	4.01	29.89	4.49
	21	15.19	2.36	18.16	2.75	21.05	3.16	22.50	3.37	23.95	3.60	26.84	4.06	29.89	4.54
	23	15.19	2.39	18.16	2.78	21.05	3.21	22.50	3.44	23.95	3.67	26.84	4.13	29.89	4.63
	25	15.19	2.42	18.16	2.83	21.05	3.27	22.50	3.50	23.95	3.78	26.84	4.34	29.89	4.94
	27	15.19	2.47	18.16	2.95	21.05	3.45	22.50	3.73	23.95	4.01	26.84	4.62	29.89	5.27
	29	15.19	2.60	18.16	3.11	21.05	3.67	22.50	3.96	23.95	4.27	26.84	4.91	29.89	5.62
	31	15.19	2.75	18.16	3.29	21.05	3.88	22.50	4.21	23.95	4.54	26.84	5.22	29.89	5.98
	33	15.19	2.91	18.16	3.49	21.05	4.13	22.50	4.45	23.95	4.81	26.84	5.55	29.89	6.35
	35	15.19	3.08	18.16	3.68	21.05	4.36	22.50	4.72	23.95	5.09	26.84	5.89	29.89	6.75
	37	15.19	3.24	18.16	3.90	21.05	4.62	22.50	4.99	23.95	5.40	26.84	6.25	29.89	7.17
	39	15.19	3.42	18.16	4.11	21.05	4.88	22.50	5.29	23.95	5.73	26.84	6.63	29.89	7.61
	41	15.19	3.56	18.16	4.29	21.05	5.06	22.50	5.54	23.95	5.98	26.84	6.98	29.89	7.97
43	14.92	3.73	17.84	4.50	20.69	5.14	22.11	5.68	23.53	6.02	26.37	7.21	29.37	8.17	
46	14.92	3.82	17.84	4.61	20.69	5.49	22.11	6.12	23.53	6.28	26.37	7.90	29.37	8.86	
48	14.92	3.89	17.84	4.72	20.69	5.79	22.11	6.53	23.53	6.57	26.37	8.52	29.37	9.54	
50	14.75	3.92	17.73	4.76	20.54	5.83	21.93	6.54	23.35	6.59	26.15	8.57	29.12	9.59	
52	14.57	3.94	17.38	4.79	20.18	5.85	21.58	6.57	22.99	6.61	25.80	8.61	28.61	9.62	
54	14.39	3.96	17.20	4.83	19.83	5.90	21.22	6.61	22.64	6.65	25.27	8.68	28.25	9.68	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

Table 2-8.6: 18HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature (°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB:24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-5	16.88	2.38	20.18	2.75	23.39	3.16	25.00	3.30	26.61	3.49	29.82	3.97	33.22	4.27
	-2	16.88	2.39	20.18	2.80	23.39	3.19	25.00	3.35	26.61	3.55	29.82	4.02	33.22	4.33
	0	16.88	2.43	20.18	2.85	23.39	3.25	25.00	3.40	26.61	3.59	29.82	4.08	33.22	4.40
	2	16.88	2.47	20.18	2.88	23.39	3.30	25.00	3.45	26.61	3.65	29.82	4.10	33.22	4.49
	4	16.88	2.49	20.18	2.93	23.39	3.34	25.00	3.49	26.61	3.73	29.82	4.20	33.22	4.60
	6	16.88	2.54	20.18	2.98	23.39	3.39	25.00	3.57	26.61	3.79	29.82	4.27	33.22	4.74
	8	16.88	2.60	20.18	3.03	23.39	3.45	25.00	3.65	26.61	3.85	29.82	4.34	33.22	4.89
	10	16.88	2.65	20.18	3.07	23.39	3.50	25.00	3.70	26.61	3.96	29.82	4.45	33.22	4.97
	12	16.88	2.67	20.18	3.11	23.39	3.56	25.00	3.78	26.61	4.04	29.82	4.53	33.22	5.04
	14	16.88	2.71	20.18	3.15	23.39	3.60	25.00	3.86	26.61	4.10	29.82	4.61	33.22	5.14
	16	16.88	2.75	20.18	3.18	23.39	3.66	25.00	3.92	26.61	4.15	29.82	4.69	33.22	5.22
	18	16.88	2.79	20.18	3.24	23.39	3.72	25.00	3.98	26.61	4.23	29.82	4.77	33.22	5.32
	20	16.88	2.83	20.18	3.28	23.39	3.78	25.00	4.04	26.61	4.31	29.82	4.85	33.22	5.42
	21	16.88	2.85	20.18	3.32	23.39	3.82	25.00	4.08	26.61	4.35	29.82	4.91	33.22	5.48
	23	16.88	2.89	20.18	3.36	23.39	3.88	25.00	4.15	26.61	4.43	29.82	4.99	33.22	5.60
	25	16.88	2.93	20.18	3.42	23.39	3.96	25.00	4.23	26.61	4.57	29.82	5.24	33.22	5.97
	27	16.88	2.99	20.18	3.56	23.39	4.17	25.00	4.51	26.61	4.85	29.82	5.58	33.22	6.37
	29	16.88	3.15	20.18	3.76	23.39	4.43	25.00	4.79	26.61	5.16	29.82	5.93	33.22	6.79
	31	16.88	3.32	20.18	3.98	23.39	4.69	25.00	5.08	26.61	5.48	29.82	6.31	33.22	7.22
	33	16.88	3.52	20.18	4.21	23.39	4.99	25.00	5.38	26.61	5.82	29.82	6.71	33.22	7.68
	35	16.88	3.72	20.18	4.45	23.39	5.26	25.00	5.70	26.61	6.15	29.82	7.12	33.22	8.15
37	16.88	3.92	20.18	4.71	23.39	5.58	25.00	6.03	26.61	6.53	29.82	7.56	33.22	8.66	
39	16.88	4.13	20.18	4.97	23.39	5.90	25.00	6.39	26.61	6.92	29.82	8.01	33.22	9.20	
41	16.88	4.31	20.18	5.18	23.39	6.11	25.00	6.69	26.61	7.22	29.82	8.44	33.22	9.63	
43	16.88	4.59	20.18	5.53	23.39	6.32	25.00	6.99	26.61	7.41	29.82	8.87	33.22	10.05	
46	16.88	4.70	20.18	5.68	23.39	6.75	25.00	7.53	26.61	7.72	29.82	9.72	33.22	10.91	
48	16.88	4.79	20.18	5.81	23.39	7.12	25.00	8.03	26.61	8.09	29.82	10.48	33.22	11.74	
50	16.68	4.82	20.05	5.86	23.23	7.17	24.80	8.05	26.40	8.11	29.58	10.55	32.93	11.80	
52	16.48	4.85	19.65	5.89	22.83	7.20	24.40	8.08	26.00	8.14	29.18	10.60	32.35	11.83	
54	16.28	4.88	19.45	5.94	22.43	7.26	24.00	8.14	25.60	8.19	28.58	10.68	31.95	11.91	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

Table 2-8.7: 20HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB:24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
		kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
50%	-5	18.90	2.82	22.60	3.26	26.20	3.74	28.00	3.92	29.80	4.14	33.40	4.70	37.20	5.07
	-2	18.90	2.84	22.60	3.32	26.20	3.78	28.00	3.97	29.80	4.21	33.40	4.76	37.20	5.14
	0	18.90	2.89	22.60	3.38	26.20	3.85	28.00	4.03	29.80	4.26	33.40	4.84	37.20	5.22
	2	18.90	2.93	22.60	3.42	26.20	3.92	28.00	4.09	29.80	4.33	33.40	4.86	37.20	5.32
	4	18.90	2.95	22.60	3.48	26.20	3.96	28.00	4.14	29.80	4.42	33.40	4.99	37.20	5.46
	6	18.90	3.01	22.60	3.53	26.20	4.02	28.00	4.23	29.80	4.50	33.40	5.06	37.20	5.62
	8	18.90	3.08	22.60	3.60	26.20	4.09	28.00	4.32	29.80	4.56	33.40	5.14	37.20	5.80
	10	18.90	3.14	22.60	3.64	26.20	4.15	28.00	4.39	29.80	4.69	33.40	5.28	37.20	5.89
	12	18.90	3.17	22.60	3.68	26.20	4.22	28.00	4.48	29.80	4.79	33.40	5.37	37.20	5.98
	14	18.90	3.21	22.60	3.73	26.20	4.27	28.00	4.58	29.80	4.86	33.40	5.47	37.20	6.10
	16	18.90	3.26	22.60	3.78	26.20	4.34	28.00	4.65	29.80	4.93	33.40	5.56	37.20	6.19
	18	18.90	3.31	22.60	3.85	26.20	4.41	28.00	4.72	29.80	5.02	33.40	5.65	37.20	6.31
	20	18.90	3.35	22.60	3.89	26.20	4.48	28.00	4.79	29.80	5.11	33.40	5.75	37.20	6.43
	21	18.90	3.38	22.60	3.94	26.20	4.53	28.00	4.83	29.80	5.16	33.40	5.82	37.20	6.50
	23	18.90	3.43	22.60	3.99	26.20	4.60	28.00	4.93	29.80	5.26	33.40	5.91	37.20	6.64
	25	18.90	3.47	22.60	4.06	26.20	4.69	28.00	5.02	29.80	5.42	33.40	6.22	37.20	7.09
	27	18.90	3.54	22.60	4.22	26.20	4.95	28.00	5.35	29.80	5.75	33.40	6.62	37.20	7.55
	29	18.90	3.73	22.60	4.46	26.20	5.26	28.00	5.68	29.80	6.12	33.40	7.04	37.20	8.05
	31	18.90	3.94	22.60	4.72	26.20	5.56	28.00	6.03	29.80	6.50	33.40	7.48	37.20	8.56
	33	18.90	4.18	22.60	5.00	26.20	5.91	28.00	6.38	29.80	6.90	33.40	7.95	37.20	9.10
	35	18.90	4.41	22.60	5.28	26.20	6.24	28.00	6.76	29.80	7.30	33.40	8.45	37.20	9.67
	37	18.90	4.65	22.60	5.58	26.20	6.62	28.00	7.16	29.80	7.74	33.40	8.96	37.20	10.28
	39	18.90	4.90	22.60	5.89	26.20	6.99	28.00	7.58	29.80	8.21	33.40	9.50	37.20	10.91
	41	18.90	5.11	22.60	6.14	26.20	7.24	28.00	7.93	29.80	8.57	33.40	10.01	37.20	11.42
43	18.78	5.41	22.45	6.52	26.03	7.45	27.82	8.23	29.61	8.73	33.18	10.45	36.96	11.84	
46	18.78	5.53	22.45	6.69	26.03	7.95	27.82	8.87	29.61	9.10	33.18	11.45	36.96	12.85	
48	18.78	5.64	22.45	6.85	26.03	8.39	27.82	9.46	29.61	9.53	33.18	12.35	36.96	13.83	
50	18.55	5.68	22.31	6.91	25.84	8.45	27.59	9.48	29.37	9.55	32.91	12.42	36.63	13.91	
52	18.33	5.71	21.86	6.94	25.40	8.48	27.15	9.52	28.93	9.59	32.46	12.48	36.00	13.94	
54	18.11	5.75	21.64	7.00	24.95	8.55	26.70	9.59	28.48	9.65	31.79	12.59	35.55	14.04	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

Table 2-8.8: 22HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB:24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
		kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
50%	-5	20.76	3.23	24.82	3.73	28.77	4.29	30.75	4.49	32.73	4.74	36.68	5.39	40.85	5.81
	-2	20.76	3.25	24.82	3.81	28.77	4.34	30.75	4.55	32.73	4.82	36.68	5.46	40.85	5.88
	0	20.76	3.31	24.82	3.87	28.77	4.41	30.75	4.61	32.73	4.88	36.68	5.55	40.85	5.99
	2	20.76	3.35	24.82	3.92	28.77	4.49	30.75	4.68	32.73	4.96	36.68	5.57	40.85	6.10
	4	20.76	3.39	24.82	3.99	28.77	4.54	30.75	4.74	32.73	5.06	36.68	5.71	40.85	6.26
	6	20.76	3.45	24.82	4.05	28.77	4.61	30.75	4.85	32.73	5.16	36.68	5.80	40.85	6.44
	8	20.76	3.53	24.82	4.12	28.77	4.69	30.75	4.96	32.73	5.23	36.68	5.89	40.85	6.65
	10	20.76	3.60	24.82	4.17	28.77	4.76	30.75	5.03	32.73	5.38	36.68	6.05	40.85	6.75
	12	20.76	3.63	24.82	4.22	28.77	4.84	30.75	5.13	32.73	5.48	36.68	6.16	40.85	6.86
	14	20.76	3.68	24.82	4.27	28.77	4.89	30.75	5.24	32.73	5.57	36.68	6.26	40.85	6.99
	16	20.76	3.74	24.82	4.33	28.77	4.97	30.75	5.32	32.73	5.65	36.68	6.37	40.85	7.10
	18	20.76	3.79	24.82	4.41	28.77	5.05	30.75	5.40	32.73	5.75	36.68	6.48	40.85	7.23
	20	20.76	3.84	24.82	4.46	28.77	5.13	30.75	5.48	32.73	5.86	36.68	6.59	40.85	7.37
	21	20.76	3.87	24.82	4.52	28.77	5.19	30.75	5.54	32.73	5.91	36.68	6.67	40.85	7.45
	23	20.76	3.92	24.82	4.57	28.77	5.27	30.75	5.65	32.73	6.02	36.68	6.77	40.85	7.61
	25	20.76	3.98	24.82	4.65	28.77	5.38	30.75	5.75	32.73	6.21	36.68	7.12	40.85	8.12
	27	20.76	4.06	24.82	4.84	28.77	5.67	30.75	6.13	32.73	6.59	36.68	7.58	40.85	8.66
	29	20.76	4.27	24.82	5.11	28.77	6.02	30.75	6.51	32.73	7.02	36.68	8.07	40.85	9.22
	31	20.76	4.52	24.82	5.40	28.77	6.37	30.75	6.91	32.73	7.45	36.68	8.58	40.85	9.81
	33	20.76	4.79	24.82	5.73	28.77	6.77	30.75	7.31	32.73	7.90	36.68	9.11	40.85	10.43
	35	20.76	5.05	24.82	6.05	28.77	7.15	30.75	7.74	32.73	8.36	36.68	9.68	40.85	11.08
	37	20.76	5.32	24.82	6.40	28.77	7.58	30.75	8.20	32.73	8.87	36.68	10.27	40.85	11.77
	39	20.76	5.62	24.82	6.75	28.77	8.01	30.75	8.68	32.73	9.41	36.68	10.89	40.85	12.50
	41	20.76	5.85	24.82	7.04	28.77	8.30	30.75	9.09	32.73	9.82	36.68	11.47	40.85	13.08
43	20.39	6.13	24.39	7.39	28.27	8.44	30.21	9.32	32.16	9.89	36.04	11.83	40.14	13.42	
46	20.39	6.27	24.39	7.58	28.27	9.01	30.21	10.05	32.16	10.30	36.04	12.97	40.14	14.56	
48	20.39	6.39	24.39	7.75	28.27	9.50	30.21	10.72	32.16	10.80	36.04	13.99	40.14	15.66	
50	20.15	6.43	24.23	7.82	28.07	9.57	29.97	10.74	31.91	10.82	35.74	14.07	39.79	15.75	
52	19.91	6.47	23.75	7.86	27.59	9.61	29.49	10.78	31.42	10.86	35.26	14.14	39.10	15.79	
54	19.67	6.51	23.51	7.93	27.10	9.69	29.01	10.86	30.94	10.92	34.53	14.25	38.61	15.90	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

Table 2-8.9: 24HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB:24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-5	22.61	3.34	27.04	3.86	31.35	4.44	33.50	4.65	35.65	4.90	39.96	5.58	44.51	6.01
	-2	22.61	3.37	27.04	3.94	31.35	4.49	33.50	4.71	35.65	4.99	39.96	5.65	44.51	6.09
	0	22.61	3.42	27.04	4.01	31.35	4.57	33.50	4.78	35.65	5.05	39.96	5.75	44.51	6.20
	2	22.61	3.47	27.04	4.06	31.35	4.65	33.50	4.85	35.65	5.14	39.96	5.77	44.51	6.32
	4	22.61	3.50	27.04	4.13	31.35	4.70	33.50	4.90	35.65	5.24	39.96	5.91	44.51	6.48
	6	22.61	3.57	27.04	4.19	31.35	4.77	33.50	5.02	35.65	5.34	39.96	6.01	44.51	6.67
	8	22.61	3.65	27.04	4.27	31.35	4.85	33.50	5.13	35.65	5.41	39.96	6.10	44.51	6.88
	10	22.61	3.73	27.04	4.31	31.35	4.93	33.50	5.21	35.65	5.57	39.96	6.26	44.51	6.98
	12	22.61	3.76	27.04	4.37	31.35	5.01	33.50	5.32	35.65	5.68	39.96	6.37	44.51	7.10
	14	22.61	3.81	27.04	4.42	31.35	5.06	33.50	5.43	35.65	5.76	39.96	6.48	44.51	7.24
	16	22.61	3.87	27.04	4.48	31.35	5.15	33.50	5.51	35.65	5.84	39.96	6.59	44.51	7.35
	18	22.61	3.92	27.04	4.56	31.35	5.23	33.50	5.59	35.65	5.96	39.96	6.71	44.51	7.49
	20	22.61	3.98	27.04	4.62	31.35	5.32	33.50	5.68	35.65	6.07	39.96	6.82	44.51	7.62
	21	22.61	4.01	27.04	4.67	31.35	5.37	33.50	5.73	35.65	6.12	39.96	6.90	44.51	7.71
	23	22.61	4.06	27.04	4.73	31.35	5.45	33.50	5.84	35.65	6.23	39.96	7.01	44.51	7.87
	25	22.61	4.12	27.04	4.81	31.35	5.57	33.50	5.96	35.65	6.43	39.96	7.37	44.51	8.40
	27	22.61	4.20	27.04	5.01	31.35	5.87	33.50	6.34	35.65	6.82	39.96	7.85	44.51	8.96
	29	22.61	4.42	27.04	5.29	31.35	6.23	33.50	6.73	35.65	7.26	39.96	8.35	44.51	9.54
	31	22.61	4.67	27.04	5.59	31.35	6.59	33.50	7.15	35.65	7.71	39.96	8.88	44.51	10.16
	33	22.61	4.95	27.04	5.93	31.35	7.01	33.50	7.57	35.65	8.18	39.96	9.43	44.51	10.80
	35	22.61	5.23	27.04	6.26	31.35	7.40	33.50	8.01	35.65	8.66	39.96	10.02	44.51	11.47
37	22.61	5.51	27.04	6.62	31.35	7.85	33.50	8.49	35.65	9.18	39.96	10.63	44.51	12.19	
39	22.61	5.82	27.04	6.98	31.35	8.29	33.50	8.99	35.65	9.74	39.96	11.27	44.51	12.94	
41	22.61	6.06	27.04	7.28	31.35	8.59	33.50	9.41	35.65	10.16	39.96	11.87	44.51	13.54	
43	22.61	6.46	27.04	7.79	31.35	8.89	33.50	9.83	35.65	10.42	39.96	12.47	44.51	14.14	
46	22.61	6.60	27.04	7.99	31.35	9.49	33.50	10.59	35.65	10.86	39.96	13.67	44.51	15.34	
48	22.61	6.73	27.04	8.17	31.35	10.02	33.50	11.30	35.65	11.38	39.96	14.75	44.51	16.51	
50	22.34	6.78	26.87	8.25	31.12	10.09	33.23	11.32	35.38	11.40	39.63	14.83	44.12	16.61	
52	22.08	6.82	26.33	8.29	30.59	10.13	32.70	11.36	34.84	11.44	39.09	14.91	43.35	16.65	
54	21.81	6.86	26.06	8.36	30.05	10.21	32.16	11.44	34.30	11.52	38.29	15.03	42.81	16.76	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

Table 2-8.10: 26HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB:24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-5	24.64	3.69	29.46	4.27	34.15	4.90	36.50	5.13	38.85	5.42	43.54	6.16	48.49	6.64
	-2	24.64	3.72	29.46	4.35	34.15	4.96	36.50	5.20	38.85	5.51	43.54	6.24	48.49	6.72
	0	24.64	3.78	29.46	4.42	34.15	5.04	36.50	5.27	38.85	5.57	43.54	6.34	48.49	6.84
	2	24.64	3.83	29.46	4.48	34.15	5.13	36.50	5.35	38.85	5.67	43.54	6.37	48.49	6.97
	4	24.64	3.87	29.46	4.56	34.15	5.19	36.50	5.42	38.85	5.79	43.54	6.53	48.49	7.15
	6	24.64	3.94	29.46	4.63	34.15	5.26	36.50	5.54	38.85	5.89	43.54	6.63	48.49	7.36
	8	24.64	4.03	29.46	4.71	34.15	5.35	36.50	5.66	38.85	5.97	43.54	6.74	48.49	7.60
	10	24.64	4.12	29.46	4.76	34.15	5.44	36.50	5.75	38.85	6.14	43.54	6.91	48.49	7.71
	12	24.64	4.15	29.46	4.82	34.15	5.53	36.50	5.87	38.85	6.27	43.54	7.04	48.49	7.83
	14	24.64	4.21	29.46	4.89	34.15	5.59	36.50	5.99	38.85	6.36	43.54	7.16	48.49	7.99
	16	24.64	4.27	29.46	4.95	34.15	5.68	36.50	6.08	38.85	6.45	43.54	7.28	48.49	8.11
	18	24.64	4.33	29.46	5.04	34.15	5.78	36.50	6.18	38.85	6.58	43.54	7.40	48.49	8.26
	20	24.64	4.39	29.46	5.10	34.15	5.87	36.50	6.27	38.85	6.70	43.54	7.53	48.49	8.42
	21	24.64	4.42	29.46	5.16	34.15	5.93	36.50	6.33	38.85	6.76	43.54	7.62	48.49	8.51
	23	24.64	4.49	29.46	5.22	34.15	6.02	36.50	6.45	38.85	6.88	43.54	7.74	48.49	8.69
	25	24.64	4.55	29.46	5.32	34.15	6.14	36.50	6.58	38.85	7.10	43.54	8.14	48.49	9.28
	27	24.64	4.64	29.46	5.53	34.15	6.48	36.50	7.01	38.85	7.53	43.54	8.66	48.49	9.89
	29	24.64	4.89	29.46	5.84	34.15	6.88	36.50	7.44	38.85	8.02	43.54	9.22	48.49	10.54
	31	24.64	5.16	29.46	6.18	34.15	7.28	36.50	7.90	38.85	8.51	43.54	9.80	48.49	11.21
	33	24.64	5.47	29.46	6.54	34.15	7.74	36.50	8.36	38.85	9.03	43.54	10.42	48.49	11.92
	35	24.64	5.78	29.46	6.91	34.15	8.17	36.50	8.85	38.85	9.56	43.54	11.06	48.49	12.66
	37	24.64	6.08	29.46	7.31	34.15	8.66	36.50	9.37	38.85	10.14	43.54	11.74	48.49	13.46
	39	24.64	6.42	29.46	7.71	34.15	9.16	36.50	9.92	38.85	10.75	43.54	12.44	48.49	14.29
	41	24.64	6.69	29.46	8.04	34.15	9.49	36.50	10.39	38.85	11.22	43.54	13.11	48.49	14.95
43	24.48	7.08	29.27	8.54	33.93	9.75	36.26	10.78	38.59	11.43	43.26	13.68	48.18	15.51	
46	24.48	7.24	29.27	8.76	33.93	10.41	36.26	11.62	38.59	11.91	43.26	15.00	48.18	16.83	
48	24.48	7.38	29.27	8.97	33.93	10.99	36.26	12.39	38.59	12.48	43.26	16.17	48.18	18.11	
50	24.19	7.44	29.08	9.05	33.69	11.07	35.97	12.42	38.29	12.51	42.90	16.27	47.76	18.21	
52	23.90	7.48	28.50	9.09	33.11	11.11	35.39	12.46	37.71	12.55	42.32	16.35	46.92	18.26	
54	23.61	7.52	28.21	9.17	32.53	11.20	34.81	12.55	37.13	12.63	41.45	16.48	46.34	18.38	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

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

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB:24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
50%	-5	26.49	4.12	31.68	4.77	36.73	5.48	39.25	5.74	41.77	6.05	46.82	6.88	52.15	7.42
	-2	26.49	4.15	31.68	4.87	36.73	5.54	39.25	5.81	41.77	6.16	46.82	6.97	52.15	7.52
	0	26.49	4.22	31.68	4.94	36.73	5.64	39.25	5.89	41.77	6.23	46.82	7.09	52.15	7.64
	2	26.49	4.28	31.68	5.00	36.73	5.74	39.25	5.98	41.77	6.34	46.82	7.12	52.15	7.79
	4	26.49	4.32	31.68	5.09	36.73	5.79	39.25	6.05	41.77	6.47	46.82	7.30	52.15	7.99
	6	26.49	4.40	31.68	5.17	36.73	5.88	39.25	6.19	41.77	6.59	46.82	7.41	52.15	8.23
	8	26.49	4.51	31.68	5.26	36.73	5.98	39.25	6.33	41.77	6.67	46.82	7.53	52.15	8.49
	10	26.49	4.60	31.68	5.32	36.73	6.08	39.25	6.43	41.77	6.87	46.82	7.73	52.15	8.62
	12	26.49	4.64	31.68	5.39	36.73	6.18	39.25	6.56	41.77	7.00	46.82	7.86	52.15	8.76
	14	26.49	4.70	31.68	5.46	36.73	6.25	39.25	6.70	41.77	7.11	46.82	8.00	52.15	8.93
	16	26.49	4.77	31.68	5.53	36.73	6.35	39.25	6.80	41.77	7.21	46.82	8.14	52.15	9.07
	18	26.49	4.84	31.68	5.63	36.73	6.46	39.25	6.90	41.77	7.35	46.82	8.27	52.15	9.24
	20	26.49	4.91	31.68	5.70	36.73	6.56	39.25	7.00	41.77	7.48	46.82	8.41	52.15	9.41
	21	26.49	4.94	31.68	5.77	36.73	6.63	39.25	7.07	41.77	7.55	46.82	8.52	52.15	9.51
	23	26.49	5.01	31.68	5.84	36.73	6.73	39.25	7.21	41.77	7.69	46.82	8.65	52.15	9.72
	25	26.49	5.08	31.68	5.94	36.73	6.87	39.25	7.35	41.77	7.93	46.82	9.10	52.15	10.37
	27	26.49	5.18	31.68	6.18	36.73	7.24	39.25	7.83	41.77	8.41	46.82	9.68	52.15	11.06
	29	26.49	5.46	31.68	6.52	36.73	7.69	39.25	8.31	41.77	8.96	46.82	10.30	52.15	11.78
	31	26.49	5.77	31.68	6.90	36.73	8.14	39.25	8.82	41.77	9.51	46.82	10.95	52.15	12.53
	33	26.49	6.11	31.68	7.31	36.73	8.65	39.25	9.34	41.77	10.09	46.82	11.64	52.15	13.32
	35	26.49	6.46	31.68	7.73	36.73	9.13	39.25	9.89	41.77	10.68	46.82	12.36	52.15	14.15
	37	26.49	6.80	31.68	8.17	36.73	9.68	39.25	10.47	41.77	11.33	46.82	13.12	52.15	15.04
	39	26.49	7.18	31.68	8.62	36.73	10.23	39.25	11.09	41.77	12.02	46.82	13.91	52.15	15.97
	41	26.49	7.47	31.68	8.99	36.73	10.60	39.25	11.61	41.77	12.54	46.82	14.65	52.15	16.71
43	26.03	7.82	31.13	9.43	36.09	10.77	38.57	11.91	41.05	12.63	46.01	15.11	51.24	17.13	
46	26.03	8.00	31.13	9.68	36.09	11.50	38.57	12.83	41.05	13.16	46.01	16.57	51.24	18.59	
48	26.03	8.16	31.13	9.90	36.09	12.14	38.57	13.69	41.05	13.79	46.01	17.87	51.24	20.00	
50	25.72	8.21	30.93	9.99	35.83	12.22	38.26	13.72	40.73	13.82	45.62	17.97	50.79	20.12	
52	25.41	8.26	30.31	10.04	35.21	12.27	37.64	13.77	40.11	13.87	45.01	18.06	49.90	20.17	
54	25.11	8.31	30.00	10.13	34.59	12.37	37.02	13.87	39.49	13.95	44.08	18.21	49.29	20.30	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

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

Notes:

Shaded cells indicate rating condition.

Table 2-8.12: 30HP cooling capacity (continued)

Combination (%) (Capacity index)	Outdoor temperature (°C DB)	Indoor temperature(°C DB/WB)													
		DB:20.8,WB:14		DB:23.3,WB:16		DB:25.8,WB:18		DB:27,WB:19		DB:28.2,WB:20		DB:30.7,WB:22		DB:32,WB:24	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
		kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
50%	-5	28.69	4.68	34.30	5.41	39.77	6.21	42.50	6.51	45.23	6.86	50.70	7.81	56.47	8.41
	-2	28.69	4.71	34.30	5.52	39.77	6.28	42.50	6.59	45.23	6.99	50.70	7.91	56.47	8.52
	0	28.69	4.79	34.30	5.61	39.77	6.39	42.50	6.68	45.23	7.07	50.70	8.04	56.47	8.67
	2	28.69	4.86	34.30	5.68	39.77	6.51	42.50	6.79	45.23	7.19	50.70	8.08	56.47	8.84
	4	28.69	4.90	34.30	5.78	39.77	6.57	42.50	6.86	45.23	7.34	50.70	8.28	56.47	9.06
	6	28.69	4.99	34.30	5.87	39.77	6.67	42.50	7.02	45.23	7.47	50.70	8.40	56.47	9.33
	8	28.69	5.11	34.30	5.97	39.77	6.79	42.50	7.18	45.23	7.57	50.70	8.54	56.47	9.63
	10	28.69	5.22	34.30	6.04	39.77	6.89	42.50	7.29	45.23	7.79	50.70	8.76	56.47	9.77
	12	28.69	5.26	34.30	6.11	39.77	7.01	42.50	7.44	45.23	7.94	50.70	8.92	56.47	9.93
	14	28.69	5.34	34.30	6.19	39.77	7.09	42.50	7.59	45.23	8.06	50.70	9.07	56.47	10.13
	16	28.69	5.41	34.30	6.27	39.77	7.21	42.50	7.71	45.23	8.18	50.70	9.23	56.47	10.28
	18	28.69	5.49	34.30	6.39	39.77	7.32	42.50	7.83	45.23	8.33	50.70	9.39	56.47	10.48
	20	28.69	5.57	34.30	6.46	39.77	7.44	42.50	7.94	45.23	8.49	50.70	9.54	56.47	10.67
	21	28.69	5.61	34.30	6.54	39.77	7.52	42.50	8.02	45.23	8.57	50.70	9.66	56.47	10.79
	23	28.69	5.69	34.30	6.62	39.77	7.63	42.50	8.18	45.23	8.72	50.70	9.81	56.47	11.02
	25	28.69	5.76	34.30	6.74	39.77	7.79	42.50	8.33	45.23	9.00	50.70	10.32	56.47	11.76
	27	28.69	5.88	34.30	7.01	39.77	8.22	42.50	8.88	45.23	9.54	50.70	10.98	56.47	12.54
	29	28.69	6.19	34.30	7.40	39.77	8.72	42.50	9.42	45.23	10.17	50.70	11.68	56.47	13.36
	31	28.69	6.54	34.30	7.83	39.77	9.23	42.50	10.01	45.23	10.79	50.70	12.42	56.47	14.22
	33	28.69	6.93	34.30	8.30	39.77	9.81	42.50	10.59	45.23	11.45	50.70	13.20	56.47	15.11
	35	28.69	7.32	34.30	8.76	39.77	10.36	42.50	11.22	45.23	12.11	50.70	14.02	56.47	16.05
37	28.69	7.71	34.30	9.27	39.77	10.98	42.50	11.88	45.23	12.85	50.70	14.88	56.47	17.06	
39	28.69	8.14	34.30	9.77	39.77	11.61	42.50	12.58	45.23	13.63	50.70	15.77	56.47	18.11	
41	28.69	8.48	34.30	10.20	39.77	12.03	42.50	13.17	45.23	14.22	50.70	16.61	56.47	18.95	
43	28.69	9.04	34.30	10.90	39.77	12.45	42.50	13.76	45.23	14.58	50.70	17.46	56.47	19.79	
46	28.69	9.24	34.30	11.18	39.77	13.29	42.50	14.82	45.23	15.20	50.70	19.14	56.47	21.47	
48	28.69	9.42	34.30	11.44	39.77	14.02	42.50	15.81	45.23	15.93	50.70	20.64	56.47	23.11	
50	28.35	9.49	34.09	11.54	39.48	14.12	42.16	15.85	44.88	15.96	50.28	20.76	55.97	23.24	
52	28.01	9.54	33.41	11.60	38.80	14.18	41.48	15.90	44.20	16.02	49.60	20.86	55.00	23.30	
54	27.67	9.60	33.07	11.70	38.12	14.29	40.80	16.02	43.52	16.12	48.58	21.03	54.32	23.45	

Abbreviations:

CR: Combination ratio

TC: Total capacity (kW)

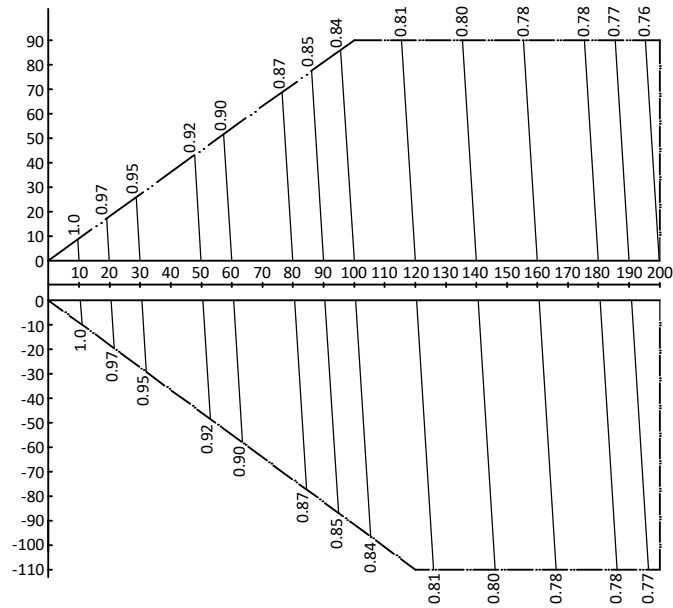
PI: Power input (compressor + outdoor fan motor) (kW)

Notes:

Shaded cells indicate rating condition.

7.2 Capacity Correction Factors for Piping Length and Level Difference

Figure 2-8.1: Rate of change in cooling capacity



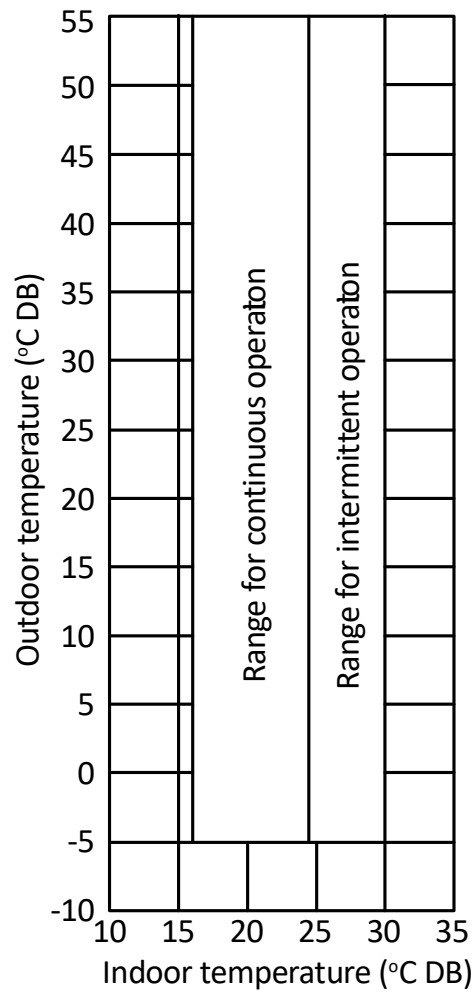
Notes:

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.
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 Operating Limits

Figure 2-9.1: Cooling operating limits



Notes:

1. These figures assume the following operating conditions:
 - Equivalent piping length: 7.5m
 - Level difference: 0

9 Sound Levels

9.1 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

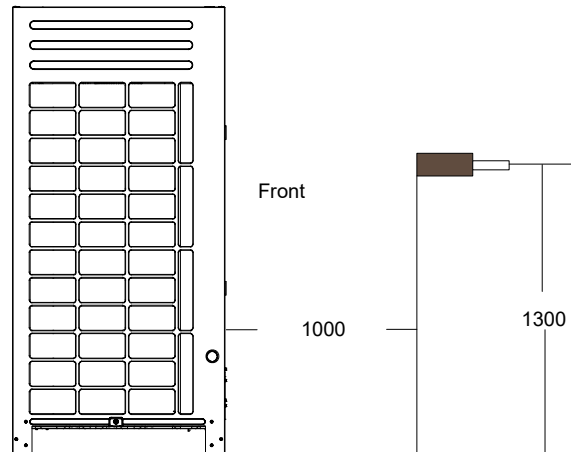
Model	dB(A)
36HP	65
38HP	65
40HP	65
42HP	65
44HP	66
46HP	66
48HP	66
50HP	66
52HP	66
54HP	66
56HP	66
58HP	66
60HP	66
62HP	66

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

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

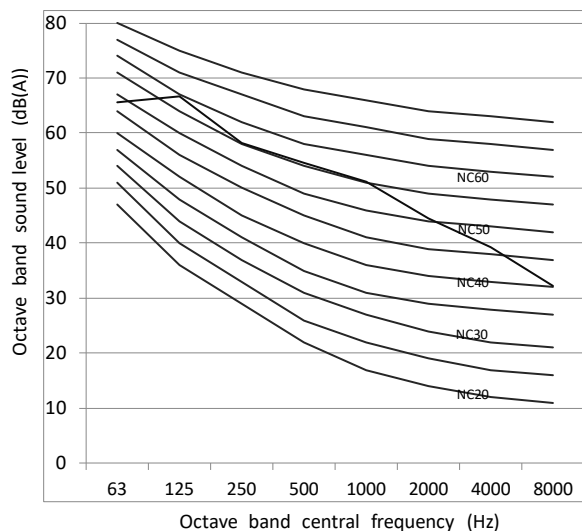


Figure 2-10.3 10HP octave band level

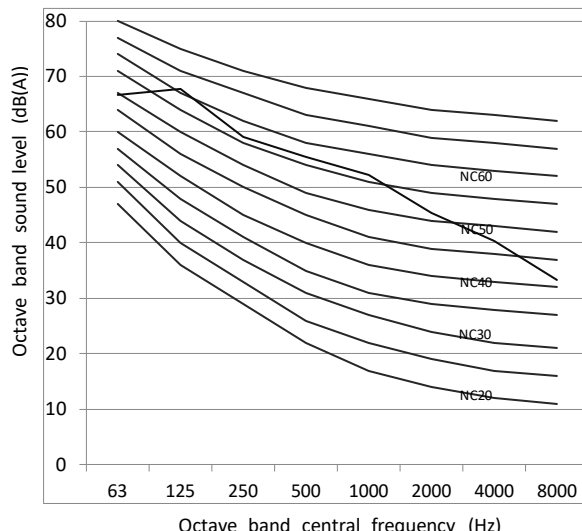


Figure 2-10.4 12/14HP octave band level

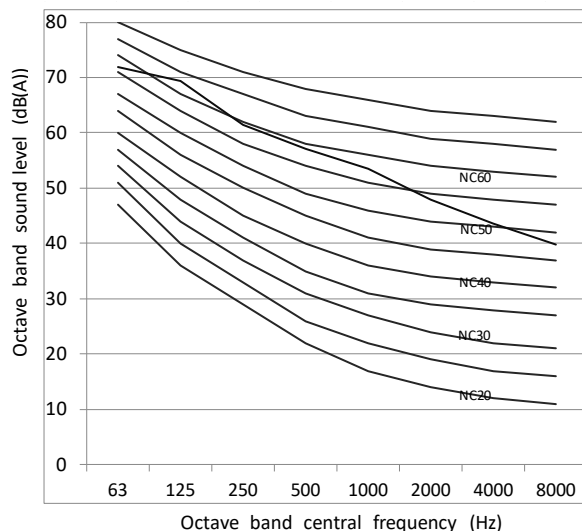


Figure 2-10.5 16HP octave band level

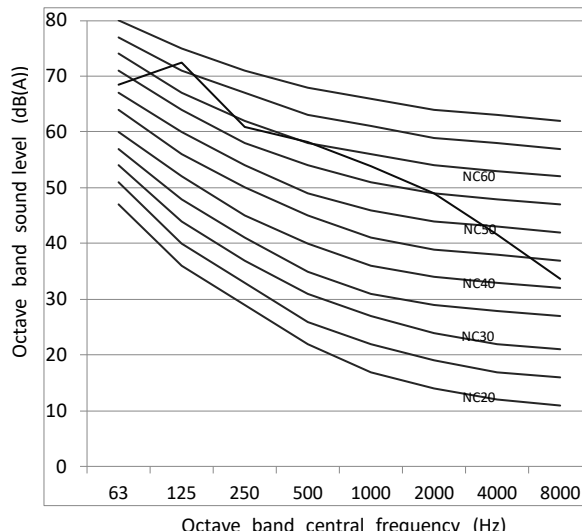


Figure 2-10.6 18HP octave band level

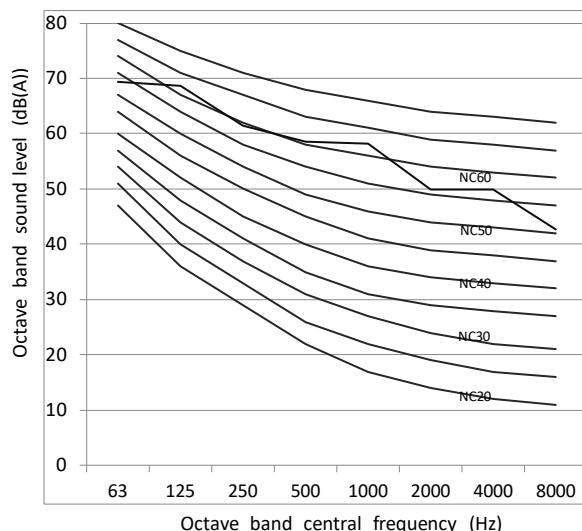


Figure 2-10.7 20/22HP octave band level

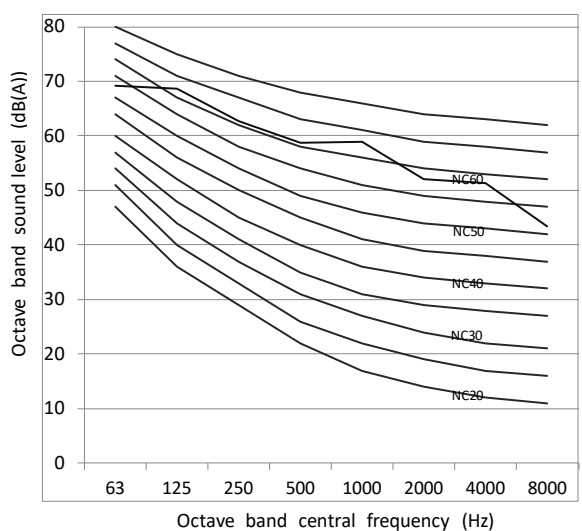
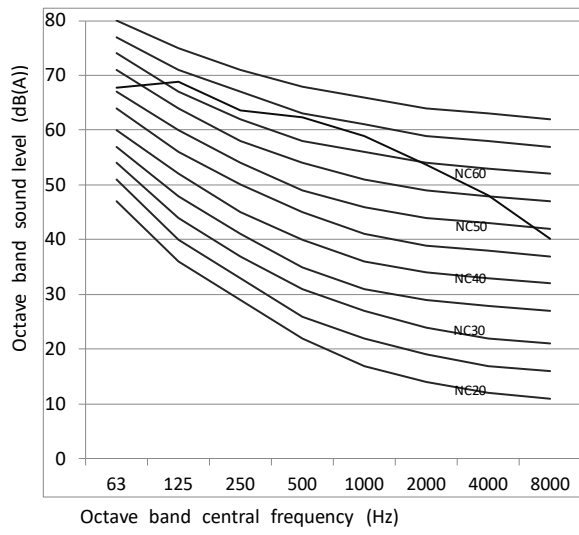








Figure 2-10.8 24/26/28/30HP octave band level



10 Accessories

10.1 Standard Accessories

Table 2-11.1: Standard accessories

Name	Shape	Quantity	Function
Outdoor unit installation manual		1	
Outdoor unit owner's manual		1	
Indoor unit owner's manual		2	
Flat-blade screwdriver	-	1	Adjusting indoor and outdoor unit dial switches
90° elbow		1	Connecting pipes
Seal plug		8	Used in pipe flushing
Connection pipe		3	Connecting pipes
Matched resistor		2	Enhances communication stability
Wrench		1	Removing side plate
Accessory bag	-	1	

10.2 Optional Accessories

Table 2-11.2: Optional accessories

Optional accessories	Model	Packed dimensions (mm)	Net/gross weight (kg)	Function
Outdoor branch joint kits	TODK02UTHP	255×150×185	1.8 / 2.0	Distribute refrigerant to indoor units and balance flow resistance between outdoor units
	TODK03UTHP	345×160×285	3.7 / 4.3	
Indoor branch joint kits	TRDK056HP	290×105×100	0.3 / 0.4	
	TRDK112HP	290×105×100	0.4 / 0.6	
	TRDK225HP	310×130×125	0.6 / 0.9	
	TRDK314HP	350×170×180	1.1 / 1.5	
	TRDK768HP	365×195×215	1.4 / 1.9	
	TRDK840HP	390×230×255	2.5 / 3.1	
	TRDK918HP	390×230×255	2.8 / 3.4	

Part 3

System Design and Installation

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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 TVR Pro CO Series 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)

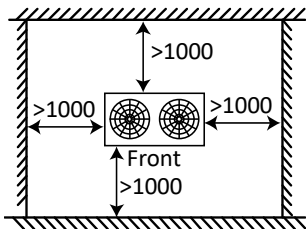


Figure 3-2.2: Single row installation (unit: mm)

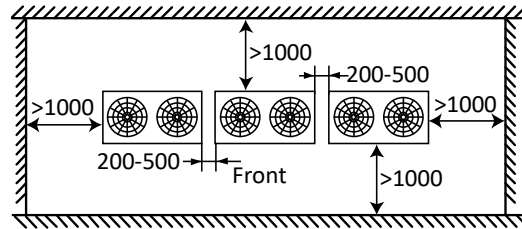
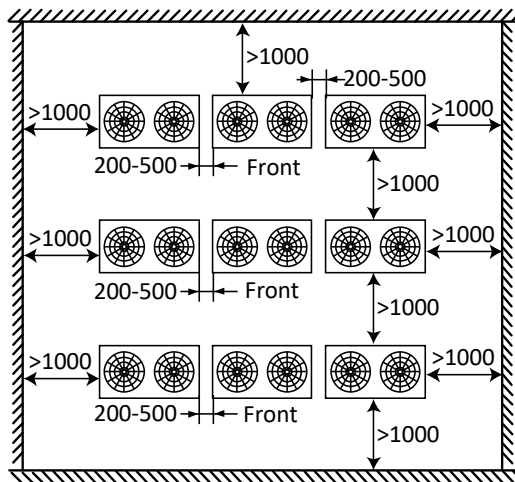


Figure 3-2.3: Multi-row installation (unit: mm)

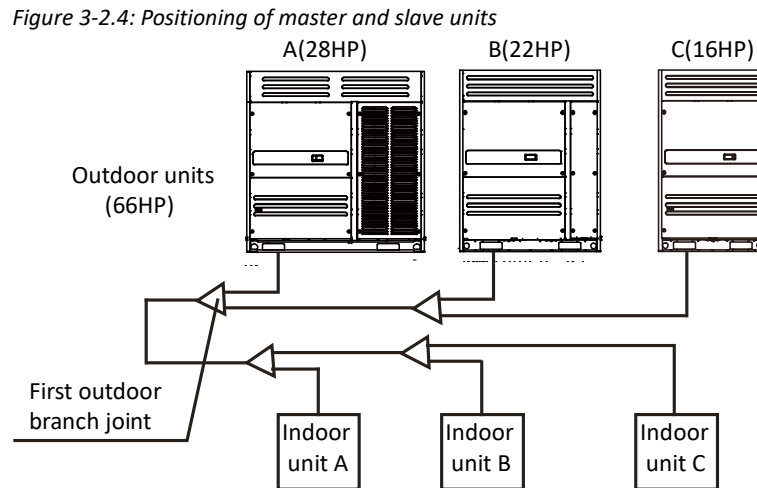


2.1.3 Master and slave unit positioning

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 TVR Pro CO 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 66HP combination:

- Place the 28HP unit on the first branch and set it as the master unit.
- Place the 22HP and 16HP units on the next branches and set them as 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 $\Phi 10\text{mm}$ steel reinforcing bar. The edges of the base should be chamfered.
- 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)

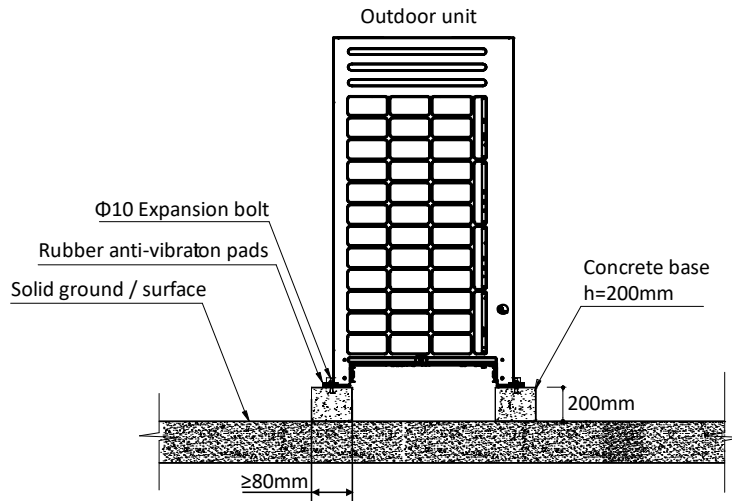


Figure 3-2.6: Expansion bolt positioning

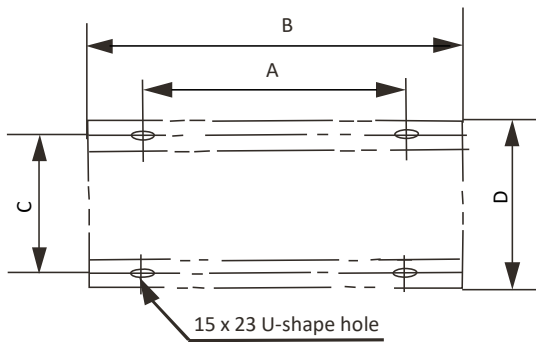


Table 3-2.1: Expansion bolt spacings

Dimension (mm)	8-16HP	18-22HP	24-30HP
A	830	1120	1455
B	960	1250	1585
C	736	736	736
D	765	765	765

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 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°.

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



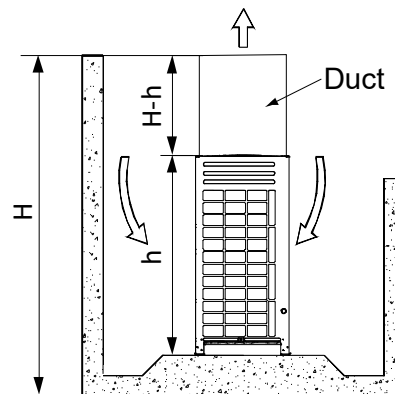
- Before installing an indoor unit, check that the model to be installed is as specified in the construction drawings and confirm the correct orientation of the unit.
- Ensure that units are installed at the correct height.
- To allow smooth condensate drainage and to ensure unit stability (to prevent 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, the vertical section of ducting should be at least H-h high.

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



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.
- 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.

3.3 Ducting for 8-16HP Units

3.3.1 Option A – Transverse ducting

Figure 3-3.2: Transverse ducting for 8-16HP units (unit: mm)

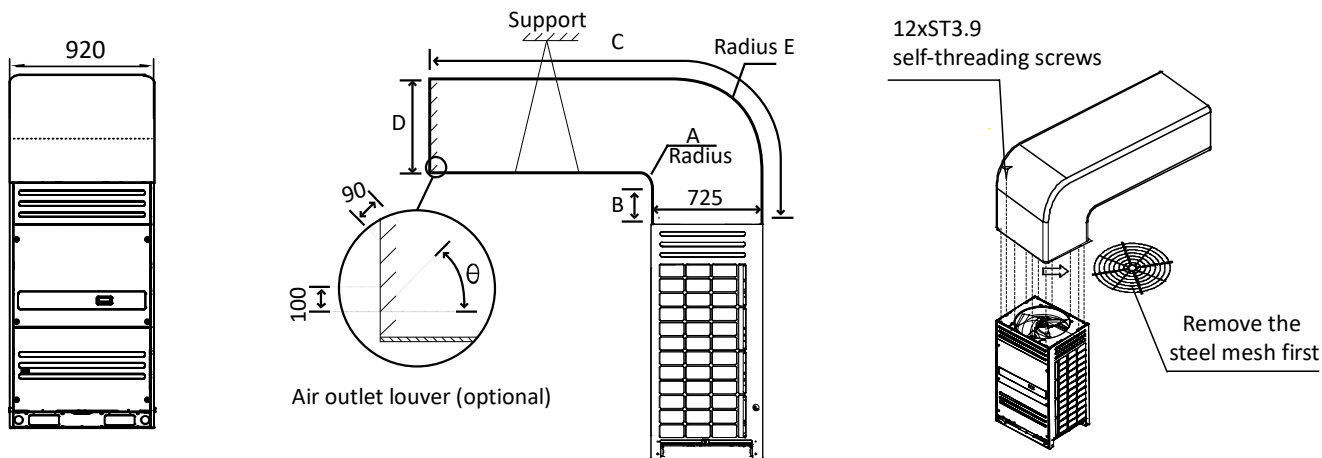


Table 3-3.1: Duct dimensions

Dimensions (mm)	
A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$725 \leq D \leq 760$
E	$E = A + 725$
θ	$\theta \leq 15^\circ$

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

3.3.2 Option B – Longitudinal ducting

Figure 3-3.3: Longitudinal ducting for 8-16HP units (unit: mm)

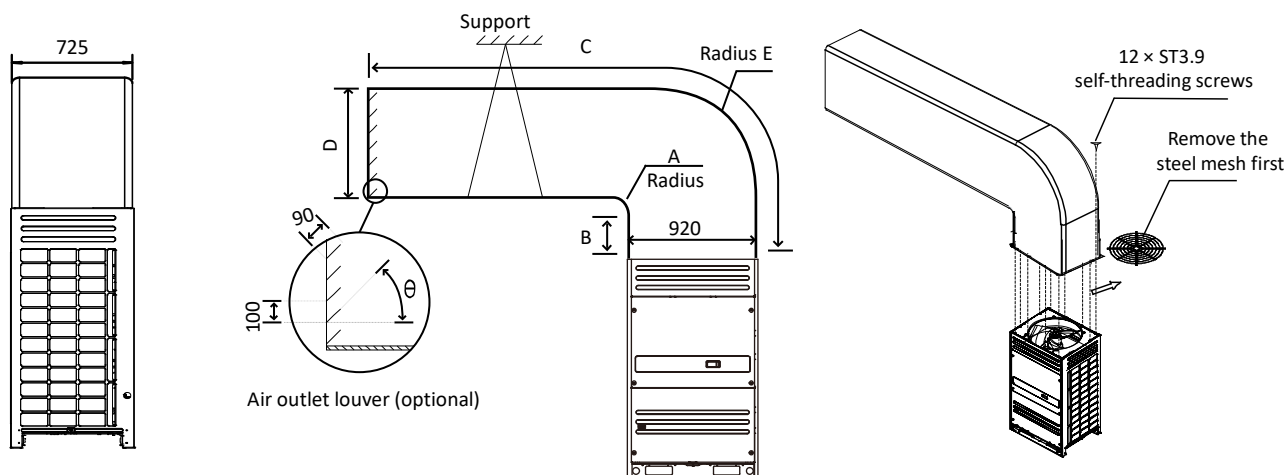


Table 3-3.3: Duct dimensions

Dimensions (mm)	
A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$D \geq 940$
E	$E = A + 920$
θ	$\theta \leq 15^\circ$

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

Ducting for 18-22HP Units

3.3.3 Option A – Transverse ducting

Figure 3-3.4: Transverse ducting for 18-22HP units (unit: mm)

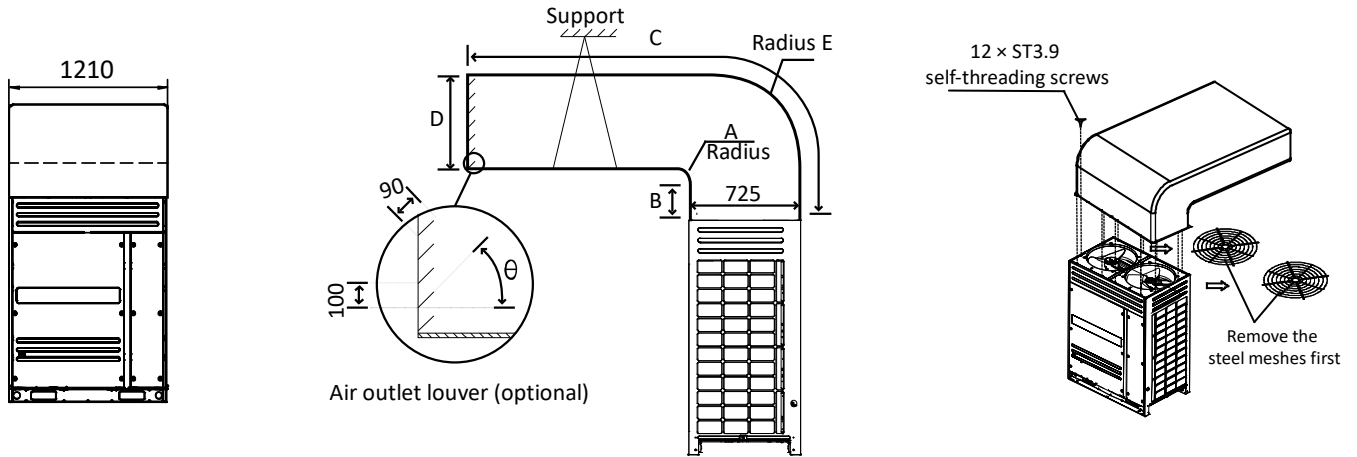


Table 3-3.5: Duct dimensions

Dimensions (mm)	
A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$725 \leq D \leq 760$
E	$E = A + 725$
θ	$\theta \leq 15^\circ$

Table 3-3.6: External static pressure

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

3.3.4 Option B – Longitudinal ducting

Figure 3-3.5: Longitudinal ducting for 18-22HP units (unit: mm)

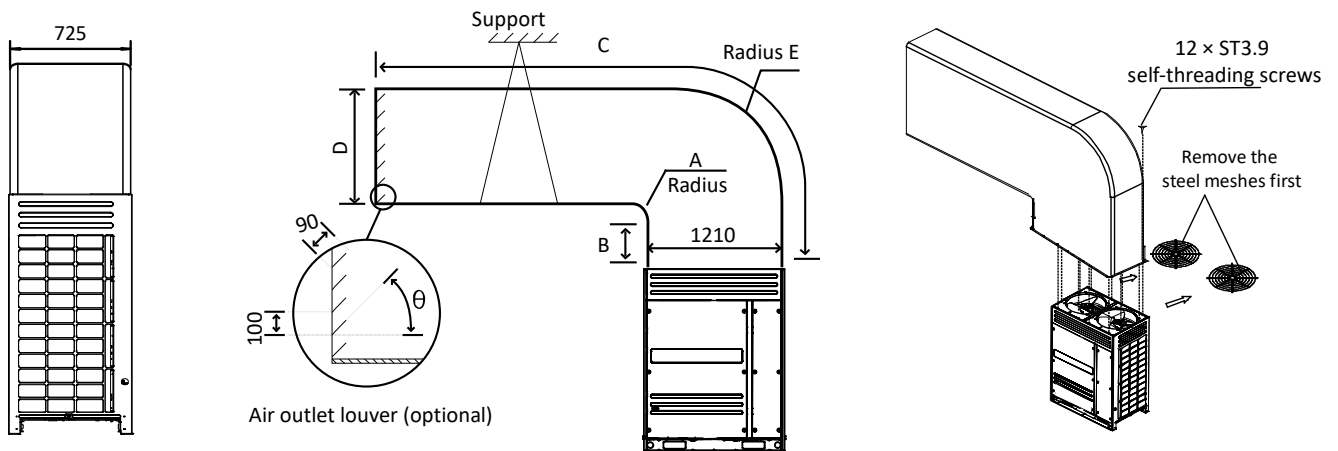


Table 3-3.7: Duct dimensions

Dimensions (mm)	
A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$D \geq 1290$
E	$E = A + 1210$
θ	$\theta \leq 15^\circ$

Table 3-3.8: External static pressure

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

Ducting for 24-30HP Units

3.3.5 Transverse ducting only

Figure 3-3.6: Transverse ducting for 24-30HP units (unit: mm)

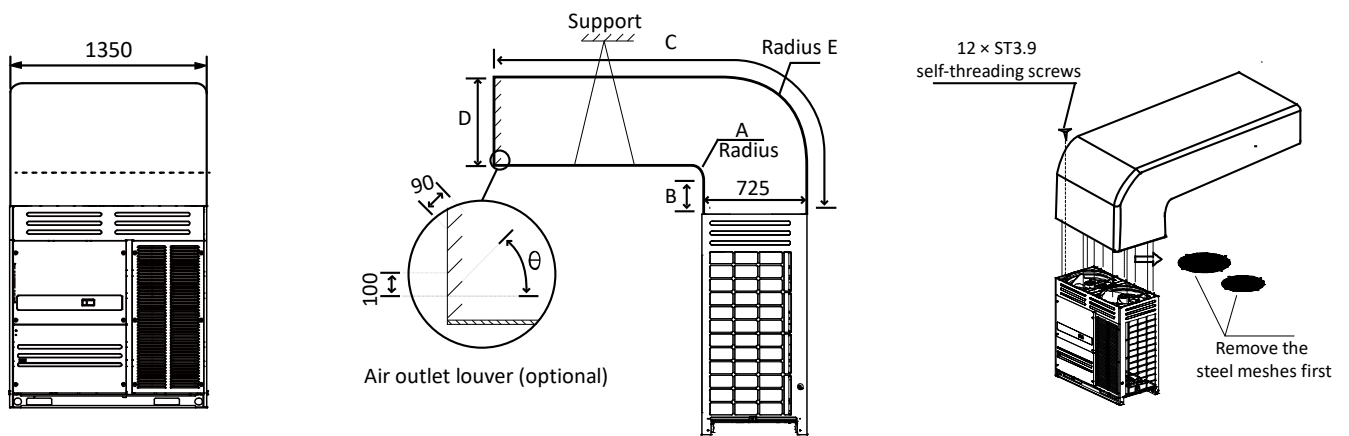


Table 3-3.9: Duct dimensions

Dimensions (mm)	
A	$A \geq 300$
B	$B \geq 250$
C	$C \leq 3000$
D	$725 \leq D \leq 760$
E	$E = A + 725$
θ	$\theta \leq 15^\circ$

Table 3-3.10: 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 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.

Figure 3-3.7: 8-10HP units fan performance

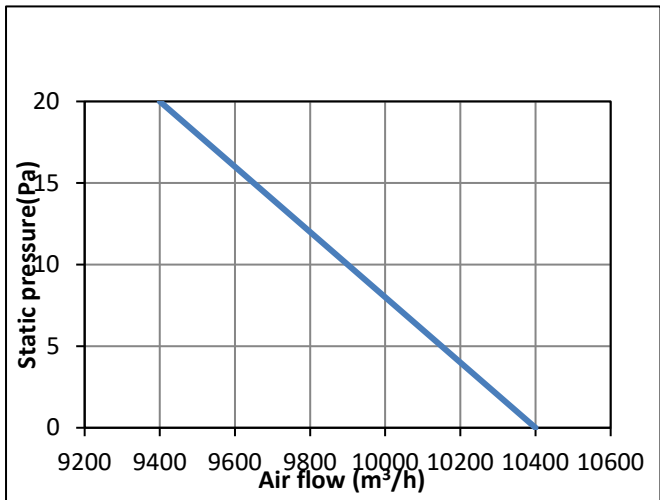


Figure 3-3.8: 12HP units fan performance

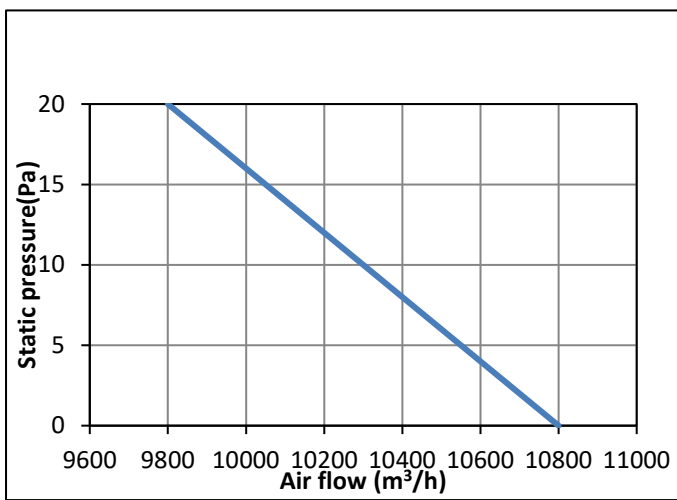


Figure 3-3.9: 14-16HP units fan performance

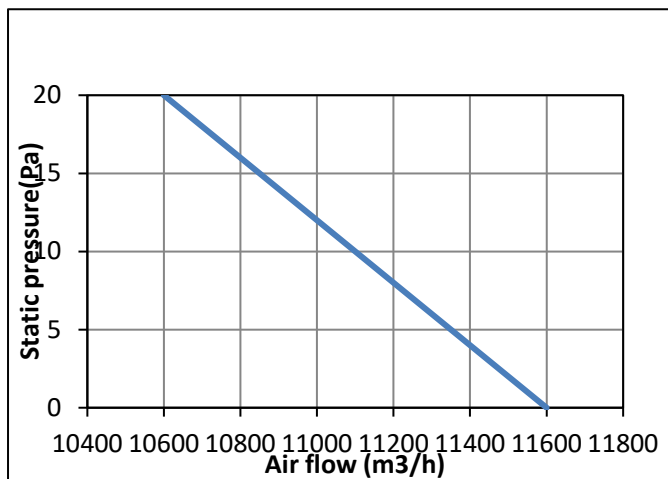


Figure 3-3.10: 18HP units fan performance

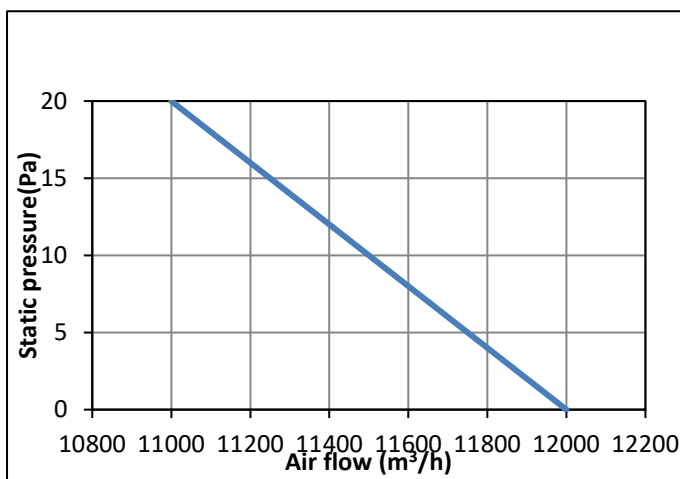


Figure 3-3.11: 20-22HP units fan performance

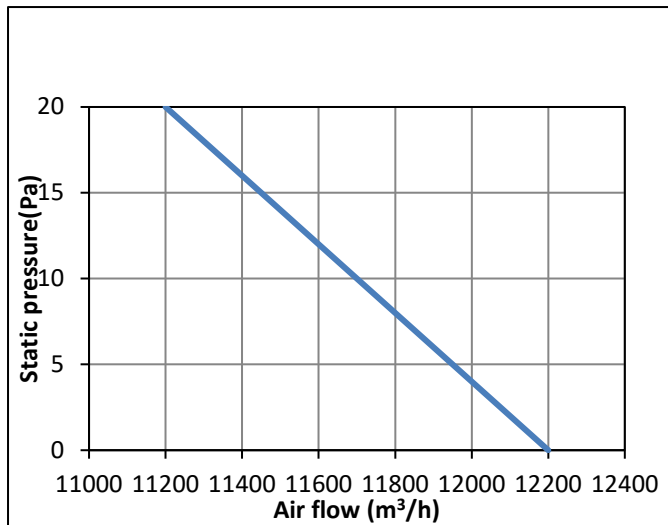


Figure 3-3.12: 24-26HP units fan performance

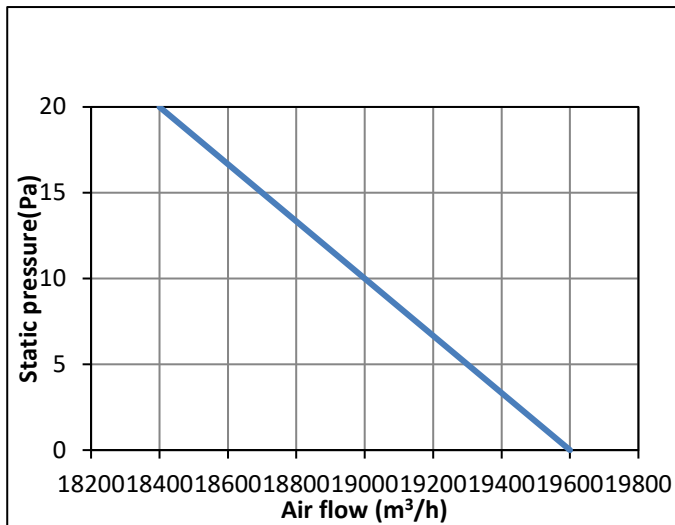
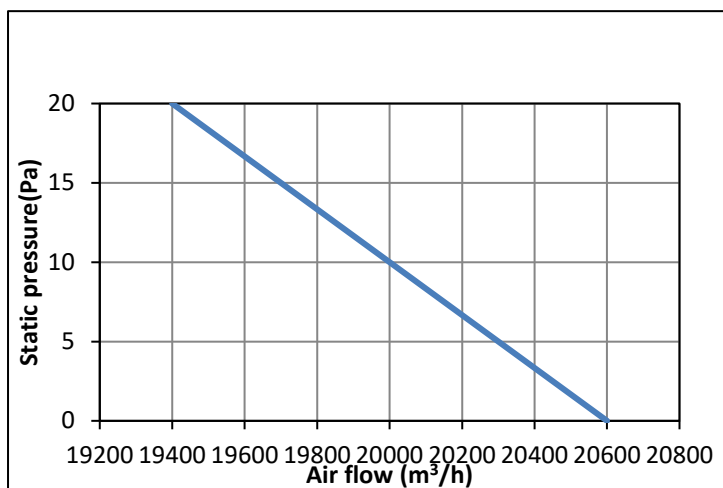


Figure 3-3.13: 28-30HP units fan performance



Notes for installers

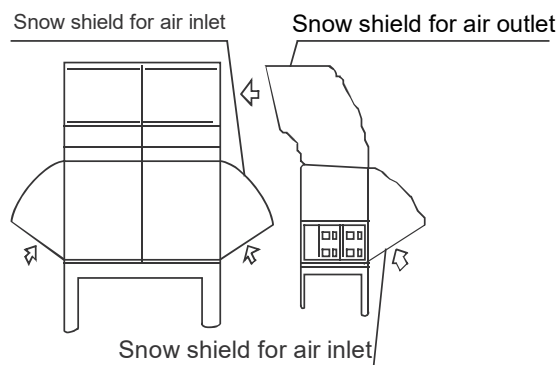


- Before installing outdoor unit ducting, be sure to remove the unit's steel mesh cover, otherwise airflow will be adversely affected.

3.5 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 height of the base structures should be increased so as to raise the units further off the ground.

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	Minimum thickness (mm)
Φ6.35	M-type	0.8
Φ9.53		0.8
Φ12.7		1.0
Φ15.9		1.0
Φ19.1		1.0
Φ22.2	Y2-type	1.0
Φ25.4		1.0
Φ28.6		1.0
Φ31.8		1.25
Φ34.5		1.25
Φ38.1		1.5
Φ41.3		1.5
Φ44.5		1.5
Φ50.8		1.8
Φ54.0		1.8

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 1000m. 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_{16}) 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 175m (actual length) and 200m (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 ($\sum\{L_9 \text{ to } L_{13}\} + k \leq 40\text{m}$) unless the following conditions are met and the following measures are taken, in which case the permitted length is up to 90m:

Conditions:

- a) Each indoor auxiliary pipe (from each indoor unit to its nearest branch joint) joint does not exceed 20m in length (a to q each $\leq 20\text{m}$).
- 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: $(\sum\{L_9 \text{ to } L_{13}\} + k) - (\sum\{L_2 \text{ to } L_3\} + a) \leq 40\text{m}$.

Measures:

- a) Increase the diameter of the indoor main pipes (the piping between the first indoor branch joint and all other indoor branch joints, L_2 to L_{16}) 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 90m (if the outdoor unit is above) or 110m (if the outdoor unit is below). 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 outdoor unit is below and the level difference is more than 40m, the liquid pipe of the main pipe (L_1) should be increased as per Table 3-4.2.
5. **Requirement 5:** The largest level difference between indoor units should not exceed 30m.

Table 3-4.2: Diameter increase requirements

Original (mm)	Increased (mm)
Φ9.53	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	Φ54.0

Figure 3-4.1: Oil return bend (unit: mm)

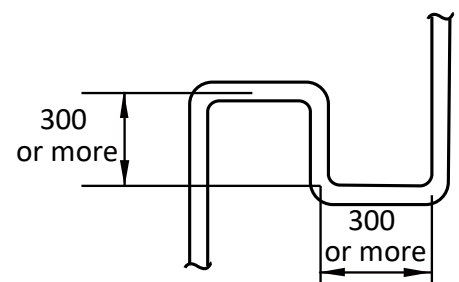
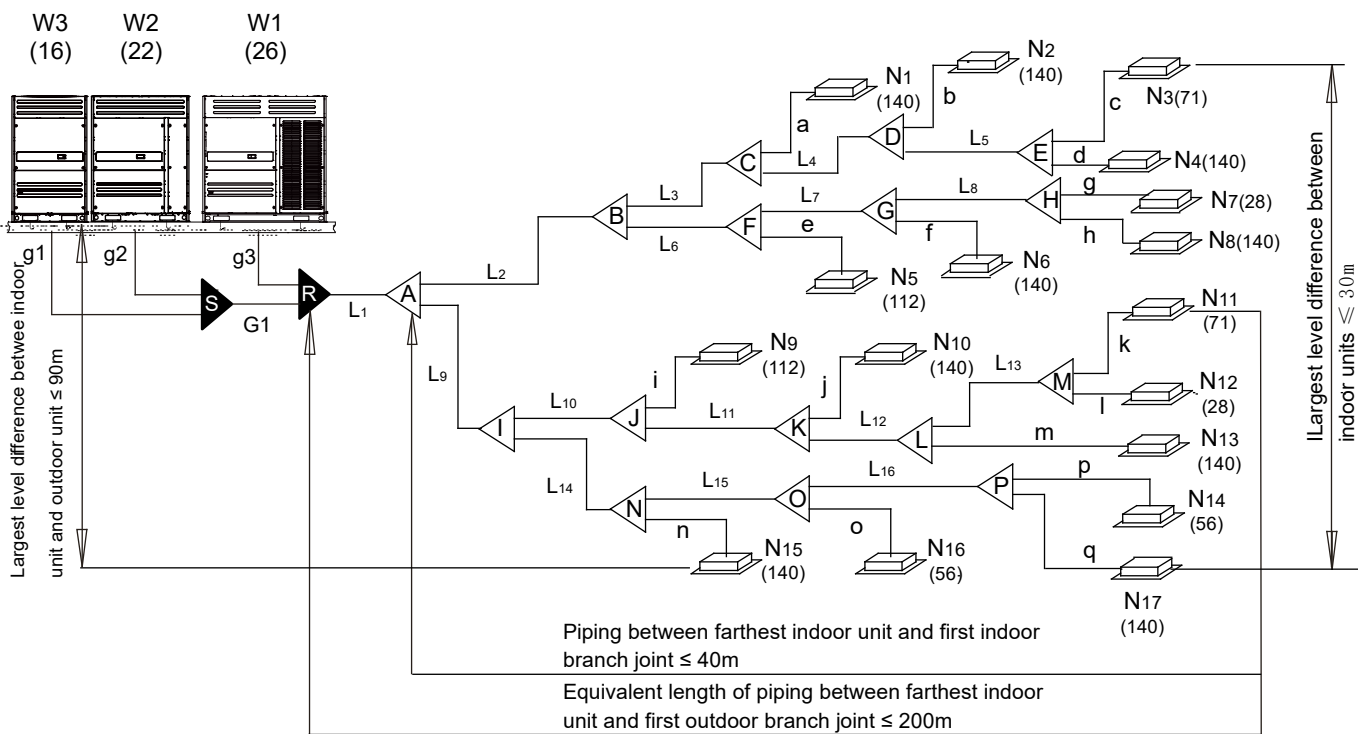


Figure 3-4.2: Permitted refrigerant piping lengths and level differences



Legend		Figures in parentheses indicate indoor unit capacity indexes.
L ₁	Main pipe	
L ₂ to L ₁₆	Indoor main pipes	
a to q	Indoor auxiliary pipes	
A to P	Indoor branch joints	
S, R	Outdoor branch joints	
g ₁ to g ₃ , G ₁	Outdoor connection pipes	

Table 3-4.3: Summary of permitted refrigerant piping lengths and level differences

		Permitted values	Piping in Figure 3-4.2	
Piping lengths	Total piping length ¹	≤ 1000m	$L_1 + 2 \times \sum\{L_2 \text{ to } L_{16}\} + \sum\{a \text{ to } q\}$	
	Piping between farthest indoor unit and first outdoor branch joint ²	Actual length	≤ 175m	$L_1 + \sum\{L_9 \text{ to } L_{13}\} + k$
		Equivalent length	≤ 200m	
	Piping between farthest indoor unit and first indoor branch joint ³		≤ 40m / 90m	$\sum\{L_9 \text{ to } L_{13}\} + k$
Piping between outdoor unit and outdoor branch joint		≤ 10m	$g_1 + G_1 \leq 10m; g_2 + G_1 \leq 10m; g_3 \leq 10m$	
Level differences	Largest level difference between indoor unit and outdoor unit ⁴	Outdoor unit is above	≤ 90m	
		Outdoor unit is below	≤ 110m	
	Largest level difference between indoor units ⁵		≤ 30m	

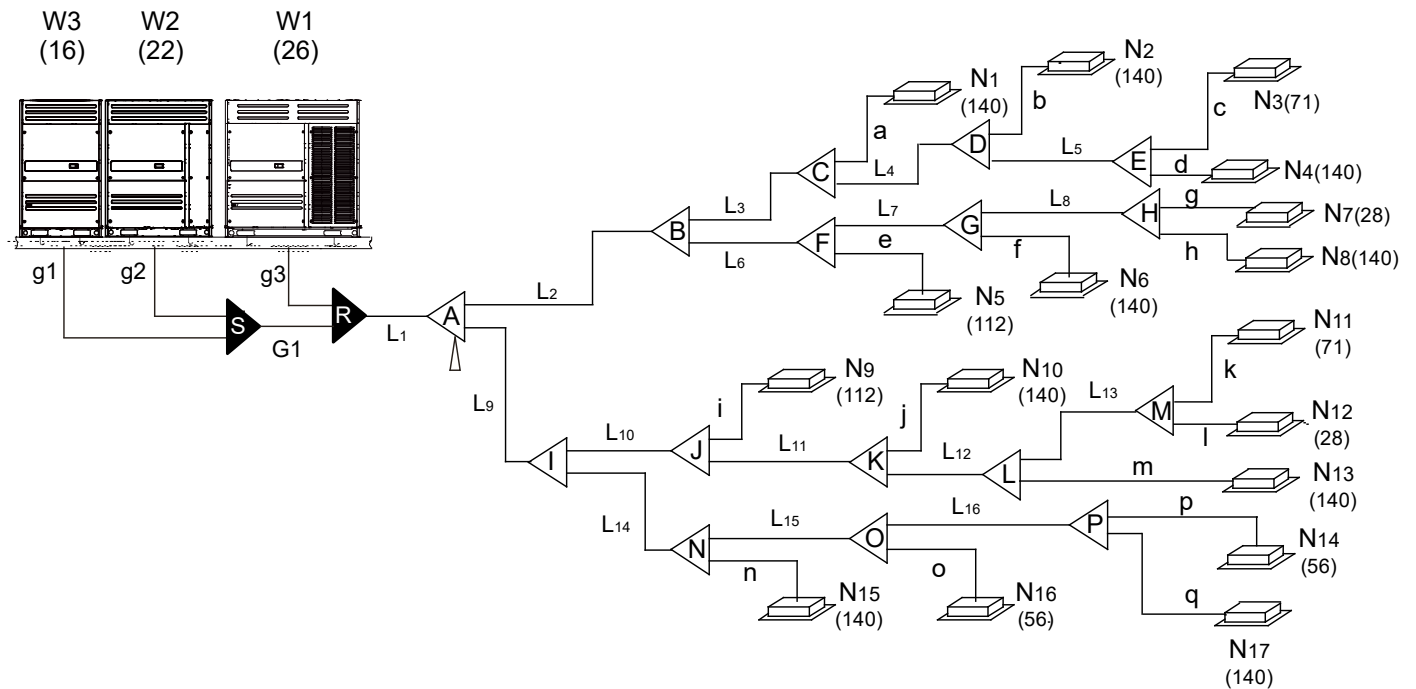
Notes:

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 3-4.4 to 3-4.8, 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 whichever of Tables 3-4.4 and 3-4.5 indicates the larger size.

Figure 3-4.3: Selecting piping diameters



Legend		Figures in parentheses indicate indoor unit capacity indexes.
L ₁	Main pipe	
L ₂ to L ₁₆	Indoor main pipes	
a to q	Indoor auxiliary pipes	
A to P	Indoor branch joints	
S, R	Outdoor branch joints	
g1 to g3, G ₁	Outdoor connection pipes	

Table 3-4.4: Main pipe¹ (L₁), indoor main pipes (L₂ to L₁₆) 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	Φ9.53	TRDK056HP
168 ≤ Capacity indexes < 224	Φ19.1	Φ9.53	TRDK056HP
224 ≤ Capacity indexes < 330	Φ22.2	Φ9.53	TRDK112HP
330 ≤ Capacity indexes < 470	Φ28.6	Φ12.7	TRDK225HP
470 ≤ Capacity indexes < 710	Φ28.6	Φ15.9	TRDK225HP
710 ≤ Capacity indexes < 1040	Φ31.8	Φ19.1	TRDK225HP
1040 ≤ Capacity indexes < 1540	Φ38.1	Φ19.1	TRDK314HP
1540 ≤ Capacity indexes < 1800	Φ41.3	Φ19.1	TRDK768HP
1800 ≤ Capacity indexes < 2450	Φ44.5	Φ22.2	TRDK768HP
2450 ≤ Capacity indexes < 2690	Φ54.0	Φ25.4	TRDK840HP
2690 ≤ Capacity indexes	Φ54.0	Φ28.6	TRDK918HP

Notes:

- The main pipe (L₁) and first indoor branch joint (A) should be sized according to whichever of Tables 3-4.4 and 3-4.5 indicates the larger size.

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

Total capacity of outdoor units	Equivalent length of all liquid pipes < 90m			Equivalent length of all liquid pipes ≥ 90m		
	Gas pipe (mm)	Liquid pipe (mm)	Branch joint kit	Gas pipe (mm)	Liquid pipe (mm)	Branch joint kit
8HP	Φ19.1	Φ9.53	TRDK112HP	Φ22.2	Φ9.53	TRDK112HP
10HP	Φ22.2	Φ9.53	TRDK112HP	Φ25.4	Φ9.53	TRDK112HP
12-14HP	Φ25.4	Φ12.7	TRDK112HP	Φ28.6	Φ12.7	TRDK225HP
16HP	Φ28.6	Φ12.7	TRDK225HP	Φ31.8	Φ12.7	TRDK225HP
18-24HP	Φ28.6	Φ15.9	TRDK225HP	Φ31.8	Φ15.9	TRDK225HP
26-34HP	Φ31.8	Φ19.1	TRDK225HP	Φ38.1	Φ19.1	TRDK314HP
36-54HP	Φ38.1	Φ19.1	TRDK314HP	Φ41.3	Φ19.1	TRDK314HP
56-66HP	Φ41.3	Φ19.1	TRDK768HP	Φ44.5	Φ19.1	TRDK768HP
68-82HP	Φ44.5	Φ22.2	TRDK768HP	Φ54.0	Φ22.2	TRDK840HP
84-90HP	Φ50.8	Φ25.4	TRDK768HP	Φ54.0	Φ25.4	TRDK918HP

Notes:

- The main pipe (L₁) and first indoor branch joint (A) should be sized according to whichever of Tables 3-4.4 and 3-4.5 indicates the larger size.

Figure 3-4.4: Outdoor connection pipes

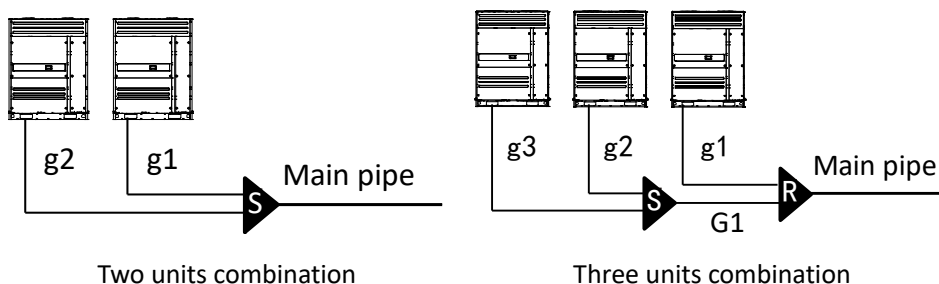


Table 3-4.6: Outdoor connection pipes (g1 to g3, G₁)

Pipes	Outdoor unit capacity	Gas pipe (mm)	Liquid pipe (mm)
g1 to g3	8-12HP	Φ25.4	Φ12.7
	14-22HP	Φ31.8	Φ15.9
	24-30HP	Φ38.1	Φ19.1
G ₁		Φ41.3	Φ22.2

Table 3-4.7: Outdoor branch joint kits (L to M)

No. of outdoor units	Branch joint kit
2	TODK02UTHP
3	TODK03UTHP

Table 3-4.8: Indoor auxiliary pipes (a to q)

Capacity of indoor unit (kW)	Pipe length ≤ 10m		Pipe length > 10m ¹	
	Gas pipe (mm)	Liquid pipe (mm)	Gas pipe (mm)	Liquid pipe (mm)
≤ 4.5	Φ12.7	Φ6.35	Φ15.9	Φ9.53
≥ 5.6	Φ15.9	Φ9.53	Φ19.1	Φ12.7

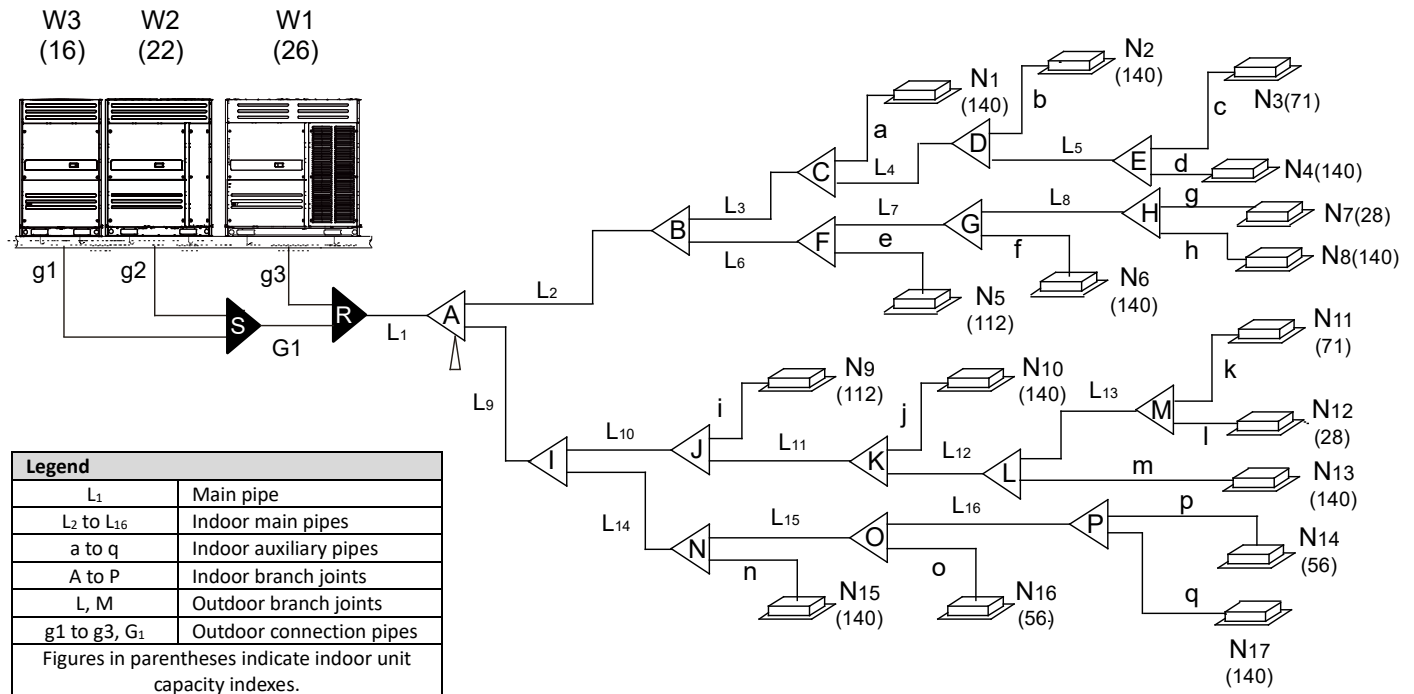
Notes:

- An indoor auxiliary pipe should not be larger than the indoor main pipe immediately upstream of it. For indoor auxiliary pipes greater than 10m in length with indoor units of capacity great than or equal to 5.6kW, the gas and liquid side pipes should each either be sized according to this table, or else be the same size as the indoor main pipe immediately upstream, whichever is smaller.

4.5 Refrigerant Piping Selection Example

The example below illustrates the piping selection procedure for a system consisting of three outdoor units (32HP + 22HP + 12HP) and 17 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; and each indoor auxiliary pipe (from each indoor unit to its nearest branch joint) is less than 10m in length.

Figure 3-4.4: Refrigerant piping selection example



Step 1: Select indoor auxiliary pipes

- Indoor units N₁ to N₆, N₈ to N₁₁ and N₁₃ to N₁₇ are of capacity 5.6kW or greater and their indoor auxiliary pipes are less than 10m in length. Refer to Table 3-4.8. Indoor auxiliary pipes a to f, h to k, and m to q are $\Phi 15.9 / \Phi 9.53$.
- Indoor units N₇ and N₁₂ are of capacity less than 4.5kW and their indoor auxiliary pipes are less than 10m in length. Refer to Table 3-4.8. Indoor auxiliary pipes g and l are $\Phi 12.7 / \Phi 6.35$.

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

- The indoor units (N₃ and N₄) downstream of indoor branch joint E have total capacity of $14 + 7.1 = 21.1$ kW. Refer to Table 3-4.4. Indoor main pipe L₅ is $\Phi 19.1 / \Phi 9.53$. Indoor branch joint E is TRDK056HP.
- The indoor units (N₁ to N₈) downstream of indoor branch joint B have total capacity of $14 \times 5 + 11.2 + 7.1 + 2.8 = 91.1$ kW. Refer to Table 3-4.4. Indoor main pipe L₂ is $\Phi 31.8 / \Phi 19.1$. Indoor branch joint B is TRDK225HP.
- The other indoor main pipes and indoor branch joints are selected in the same fashion.

Step 3: Select main pipe and indoor branch joint A

- The indoor units (N₁ to N₁₇) downstream of indoor branch joint A have total capacity of $14 \times 9 + 11.2 \times 2 + 7.1 \times 2 + 5.6 \times 2 + 2.8 \times 2 = 179.4$ kW. The system's equivalent length of all liquid pipes is in excess of 90m. The total capacity of the outdoor units is $32 + 22 + 12 = 66$ HP. Refer to Tables 3-4.4 and 3-4.5. Main pipe L₁ is the larger of $\Phi 41.3 / \Phi 19.1$ and $\Phi 44.5 / \Phi 19.1$, hence $\Phi 44.5 / \Phi 19.1$. Indoor branch joint A is TRDK768HP.

Step 4: Select outdoor connection pipes and outdoor branch joints

- The master unit is 32HP and the slave units are 22HP and 12HP. Refer to Table 3-4.6. Outdoor connection pipes g₁ is $\Phi 25.4 / \Phi 12.7$, g₂ is $\Phi 31.8 / \Phi 15.9$ and g₃ is $\Phi 38.1 / \Phi 19.1$.
- Refer to Table 3-4.6. Outdoor connection pipe G₁ is $\Phi 41.3 / \Phi 22.2$.
- There are three outdoor units in the system. Refer to Table 3-4.7. Outdoor branch joints S and R are TODK03UTHP.

4.6 Branch Joints

Branch joint design should take account of the following:

- U-shaped branch joints should be used – tee joints are not suitable. Branch joint dimensions are given in Tables 3-4.9 and 3-4.10.
- 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 in Part 3, 5.6 “Branch Joints”. Indoor branch joints may be installed either horizontally or vertically.
- To ensure even distribution of refrigerant, branch joints should not be installed within 500mm of a 90° bend, another branch joint or the straight section of piping leading to an indoor unit, with the minimum 500mm being measured from the point where the branch joint is connected to the piping, as shown in Figure 3-4.5.

Figure 3-4.5: Branch joint spacing and separation from bends (unit: mm)

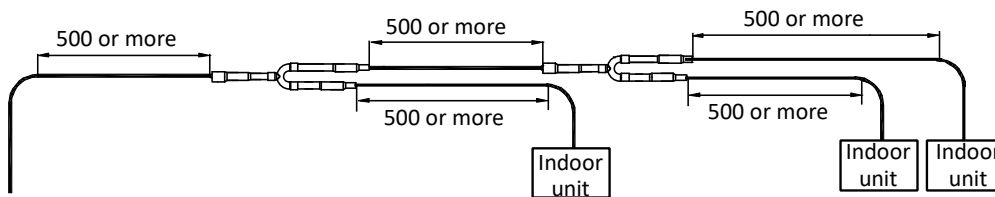


Table 3-4.9: Indoor branch joint dimensions (unit: mm)

Model	Gas side joints	Liquid side joints
TRDK056HP		
TRDK112HP		
TRDK225HP		
TRDK314HP		
TRDK768HP		
TRDK840HP		

Table continued on next page ...

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

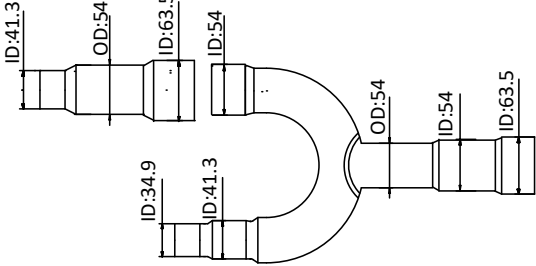
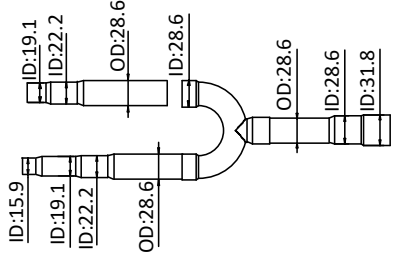
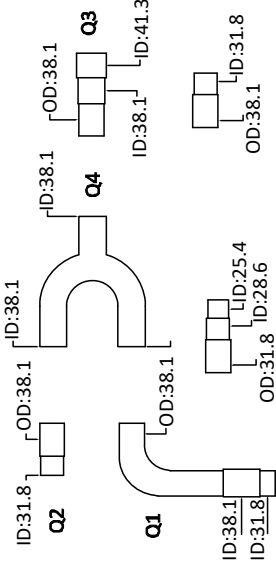
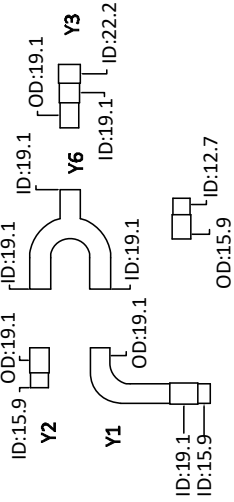
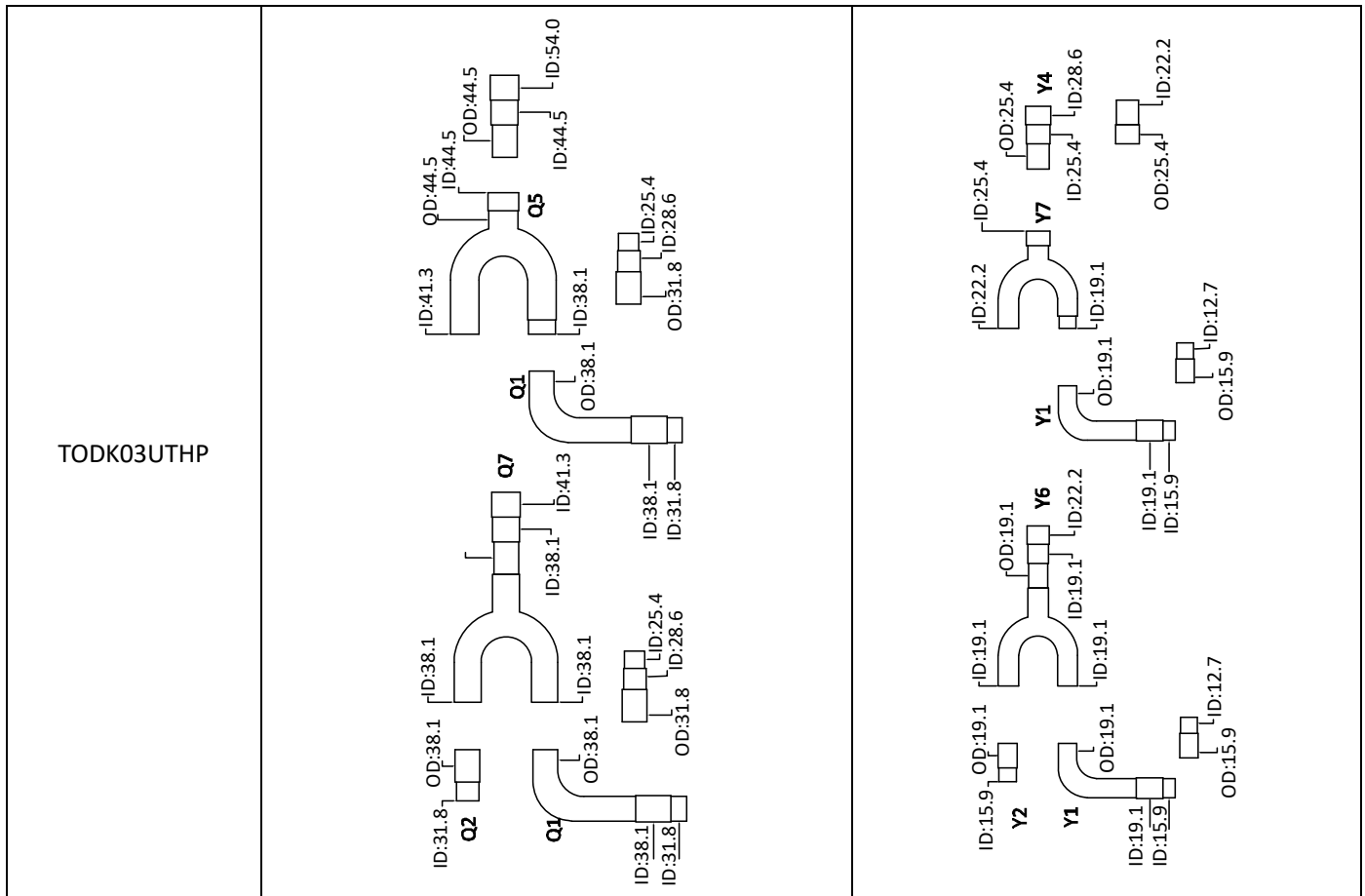
Model	Gas side joints	Liquid side joints
TRDK918HP		

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

Model	Gas side joints	Liquid side joints
TODK02UTHP		



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

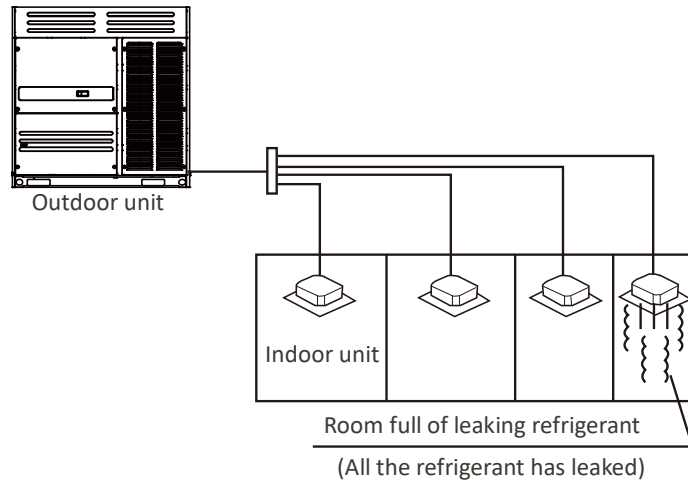
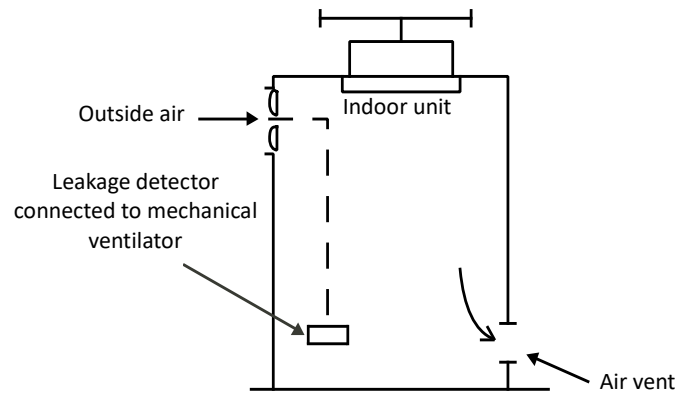


Figure 3-4.7: Mechanical ventilator controlled by refrigerant leak detector



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 entering.

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 system.

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 refrigerant leakage.

5.3.3 Expanding copper piping ends

Notes for installers

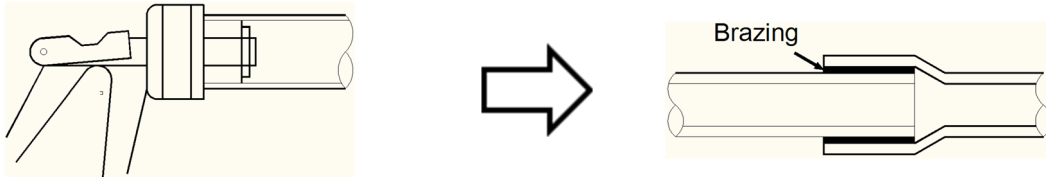


- Ends of copper piping can be expanded so that another length of piping can be inserted and the joint brazed.
- Insert the expanding head of the pipe expander into the pipe. After completing pipe expansion, rotate the copper pipe a few degrees to rectify the straight line mark left by the expanding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

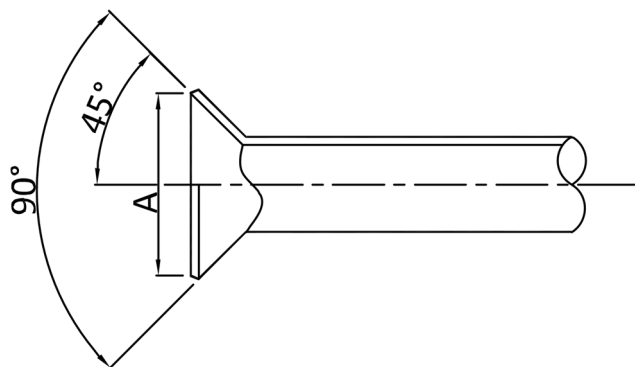


- Before flaring Y2-type piping, anneal the end of the pipe to be flared.
- Remember to place the flare nut on the piping before flaring.
- Ensure the flared opening is not cracked, deformed or scratched, otherwise it will not form a good seal and refrigerant leakage may occur.
- The diameter of the 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



- When connecting a flared joint, apply some compressor oil to the inner and outer surfaces of the 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



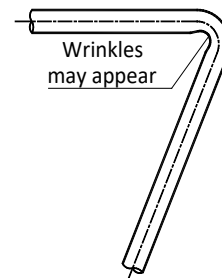
Piping bending methods

- 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



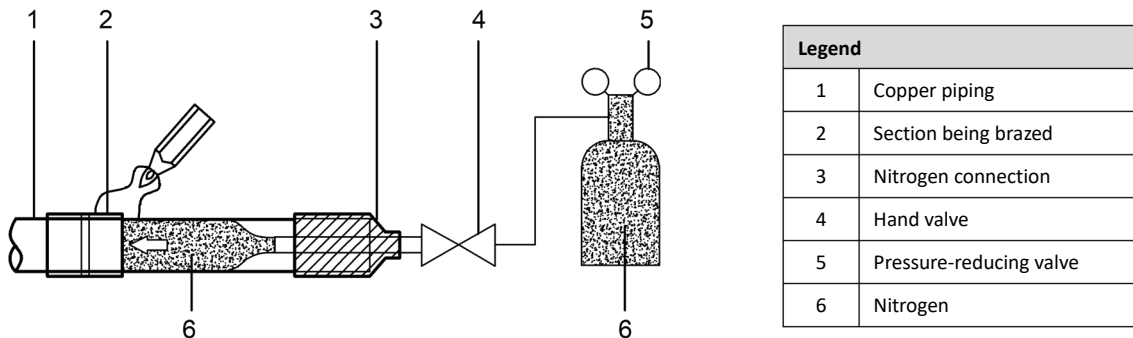
Warning

- 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

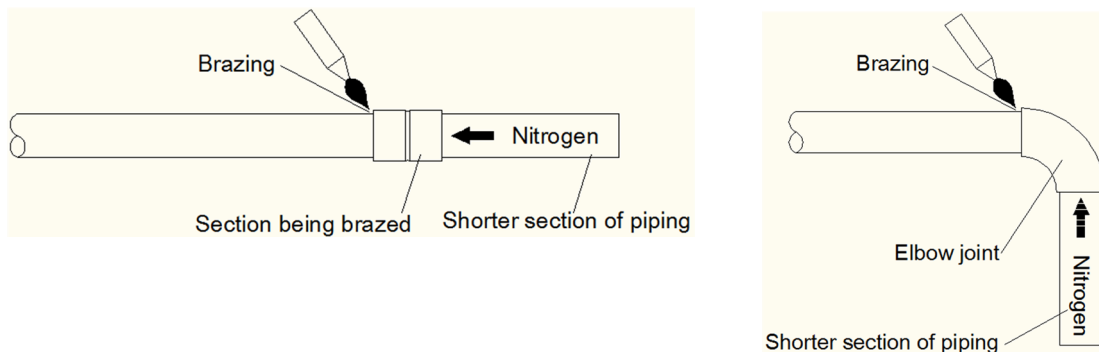
- Use a pressure reducing valve to flow nitrogen through copper piping at 0.02-0.03MPa during brazing.
- Start the flow before brazing starts and ensure that the nitrogen continuously passes through the section being brazed until the brazing is complete and the copper has cooled down completely.

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

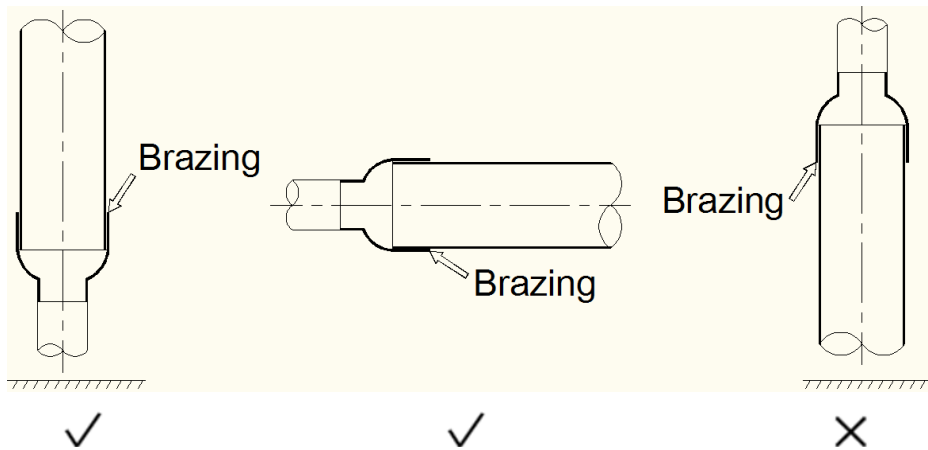


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Piping orientation during brazing

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

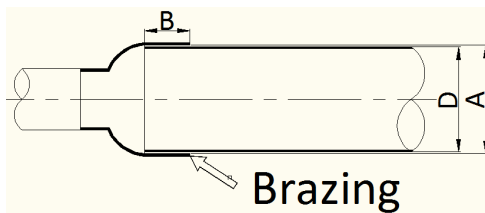
Figure 3-5.6: Piping orientation during brazing



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

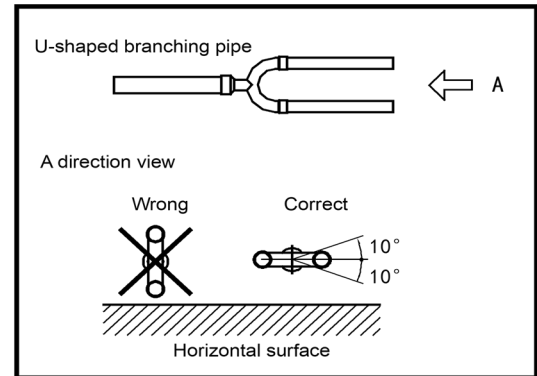
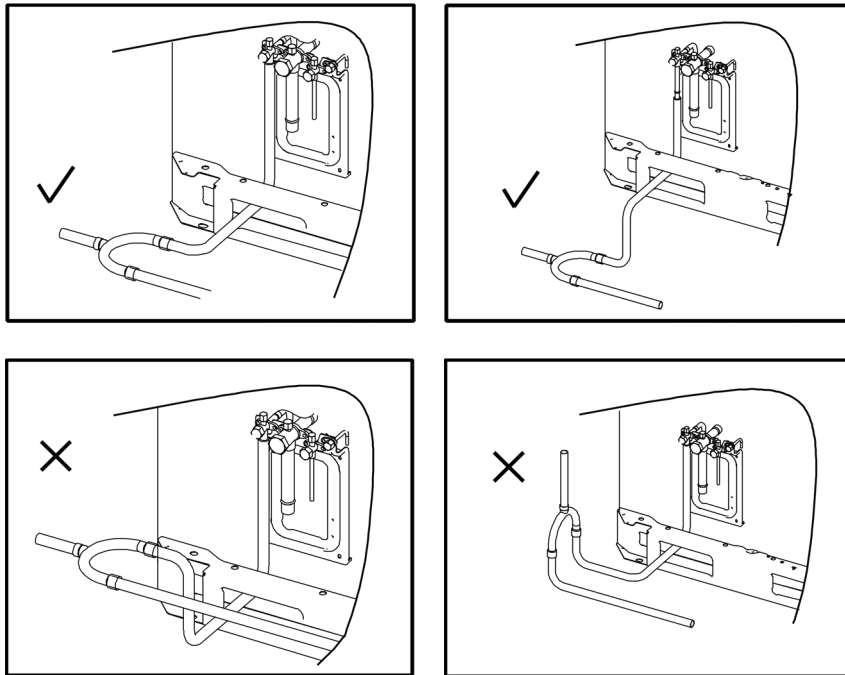


Figure 3-5.9: Installation of outdoor branch joints

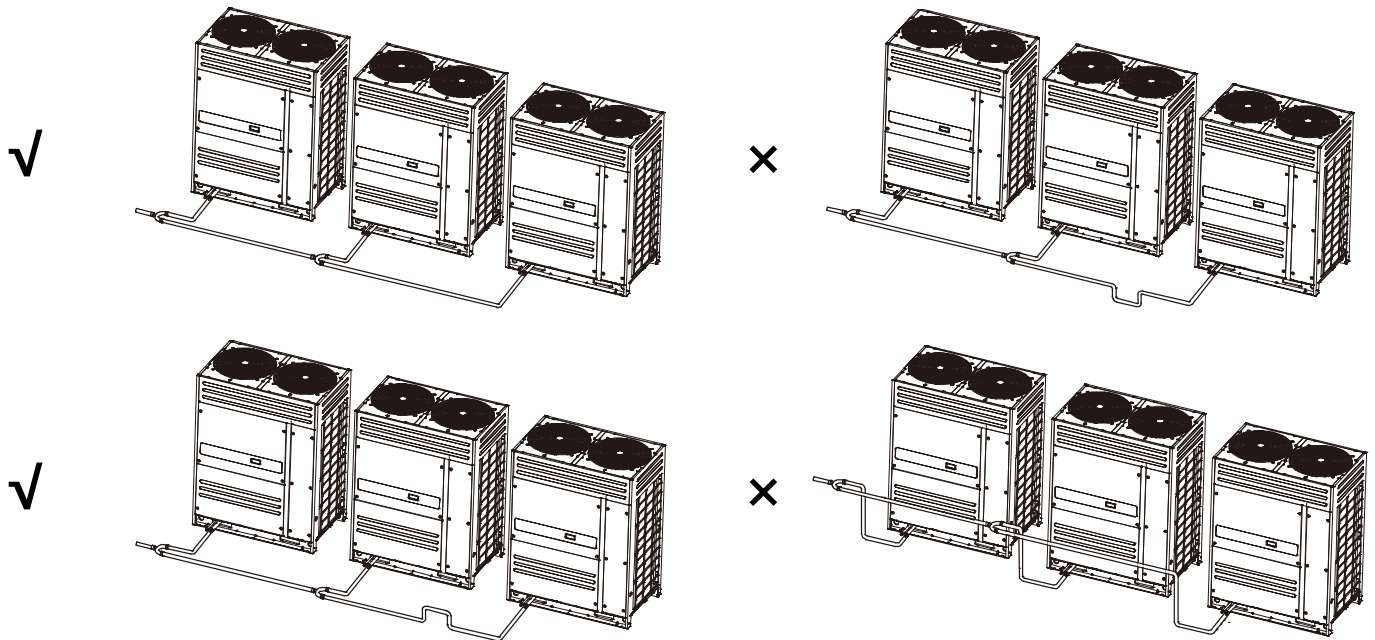


- To ensure even distribution of refrigerant, a limitation is placed on how close branch joints may be installed to bends, other branch joints and the straight sections of piping leading to indoor units. Refer to Part 3, 4.6 “Branch Joints”.

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



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.

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 3-5.11).
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 3-5.12.
9. Once flushing is complete, seal all openings to prevent dust and moisture from entering.

Figure 3-5.11: Pipe flushing using nitrogen

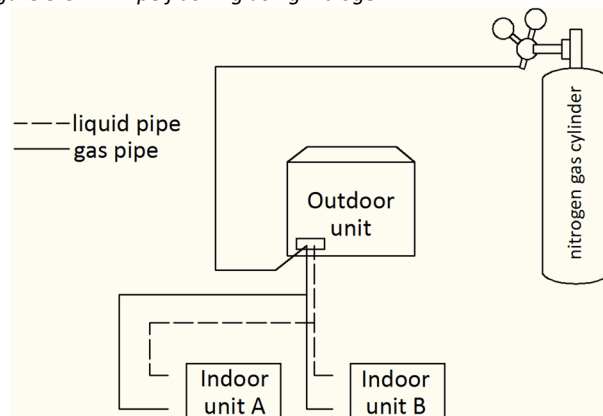
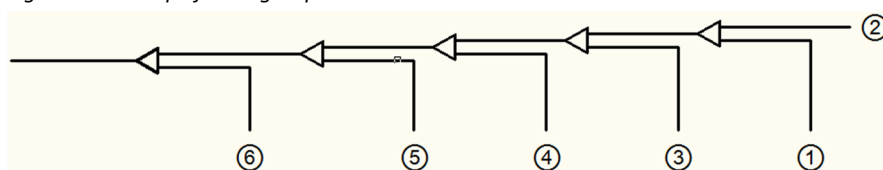


Figure 3-5.12: Pipe flushing sequence¹

**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.

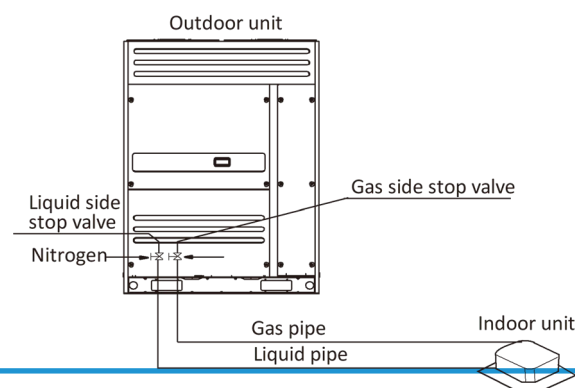
Step 2

- 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 3-5.13: 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.

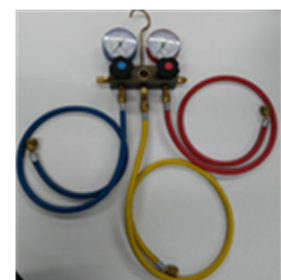
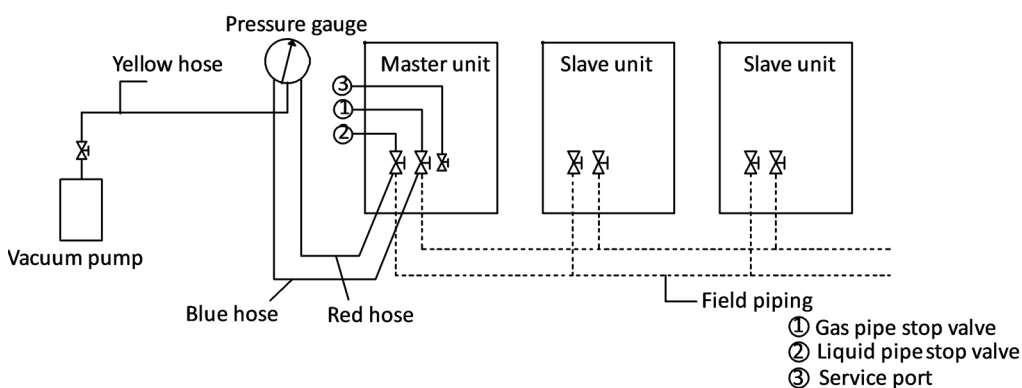
Step 3

- 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 3-5.14: Vacuum drying



Pressure gauge

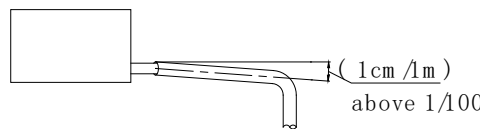
6 Drain Piping

6.1 Design Considerations

Drain piping design should take account of the following considerations:

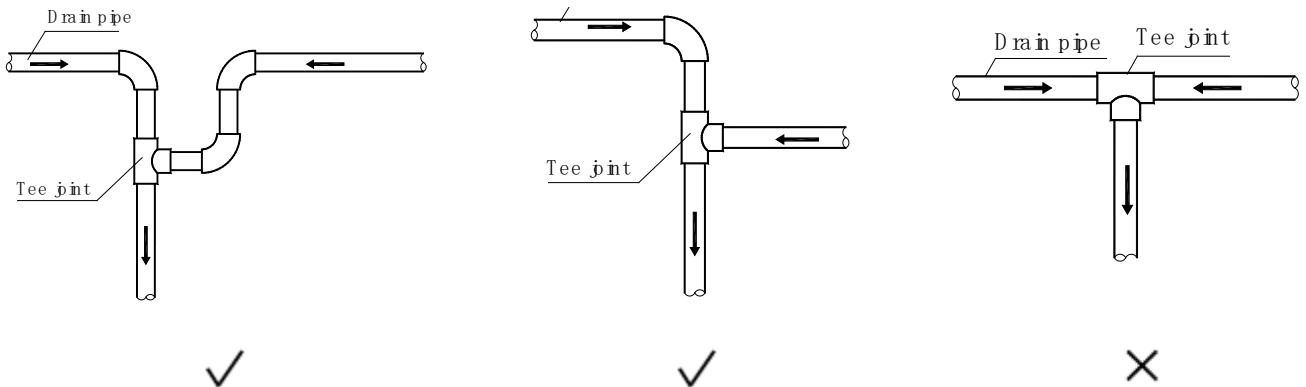
- Indoor unit condensate drain piping needs to be of sufficient diameter to carry the volume of condensate produced at the indoor units and installed at a slope sufficient to allow drainage. Discharge as close as possible to the indoor units is usually preferable.
- To prevent the drain piping becoming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

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

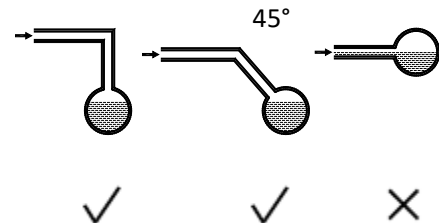


Figure 3-6.4: Effect of insufficient drain piping support

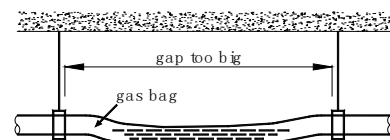
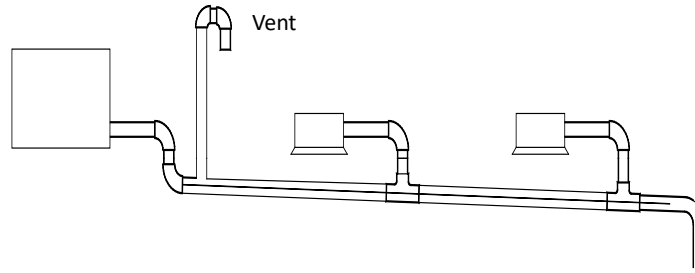


Figure 3-6.5: Drain piping air vents

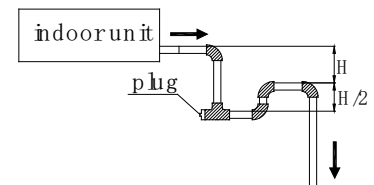


- Air conditioner drain piping should be installed separately from waste, rainwater and other drain piping and should not come into direct contact with the ground.
- Drain piping diameter should be not less than the indoor units’ drain piping connection.
- To allow inspection and maintenance, the piping 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:

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

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	
PVC50	50	247	175	Branch or main piping
PVC63	63	473	334	

Table 3-6.2: Vertical drain piping diameters

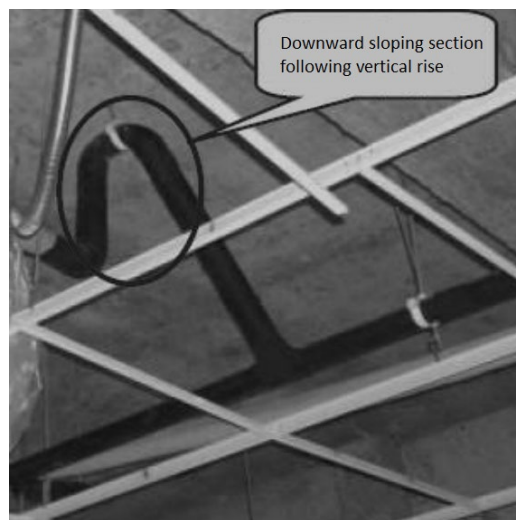
PVC piping	Nominal diameter (mm)	Capacity (L/h)	Remarks
PVC25	25	220	Branch piping only
PVC32	32	410	
PVC40	40	730	Branch or main piping
PVC50	50	1440	
PVC63	63	2760	
PVC75	75	5710	
PVC90	90	8280	

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

Use heat-resistant polyethylene foam for the liquid pipes (able to withstand temperature of 70°C), and polyethylene foam for the gas pipes (able to withstand temperature of 120°C). Reinforce the insulation layer of the refrigerant piping based on the installation environment.

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	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



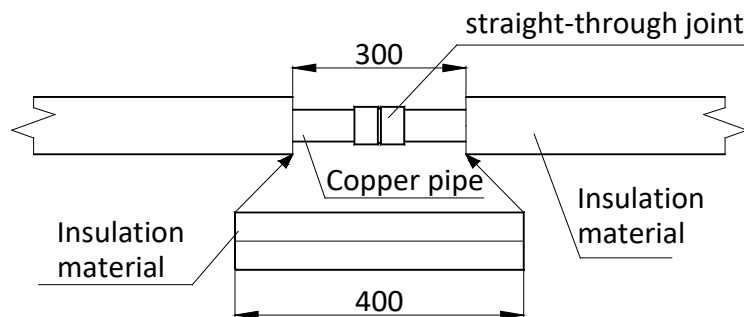
- Installation of insulation should be carried out in a manner suited to the type of insulation material being used.
- Ensure there are no gaps at the joints between sections of insulation.
- Do not apply tape too tightly as doing so may shrink insulation, reducing its insulating properties leading to 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 joints between sections of insulation.

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 L_1 to L_8 represent the equivalent lengths of the pipes of different diameters. Assume 0.5m for the equivalent pipe length of each branch joint.

$$\begin{aligned}
 \text{Additional refrigerant charge R (kg)} &= L_1 (\Phi 6.35) \times 0.022 \\
 &+ L_2 (\Phi 9.53) \times 0.057 \\
 &+ L_3 (\Phi 12.7) \times 0.110 \\
 &+ L_4 (\Phi 15.9) \times 0.170 \\
 &+ L_5 (\Phi 19.1) \times 0.260 \\
 &+ L_6 (\Phi 22.2) \times 0.360 \\
 &+ L_7 (\Phi 25.4) \times 0.520 \\
 &+ L_8 (\Phi 28.6) \times 0.680
 \end{aligned}$$

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
Φ9.53	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

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 chemical 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.

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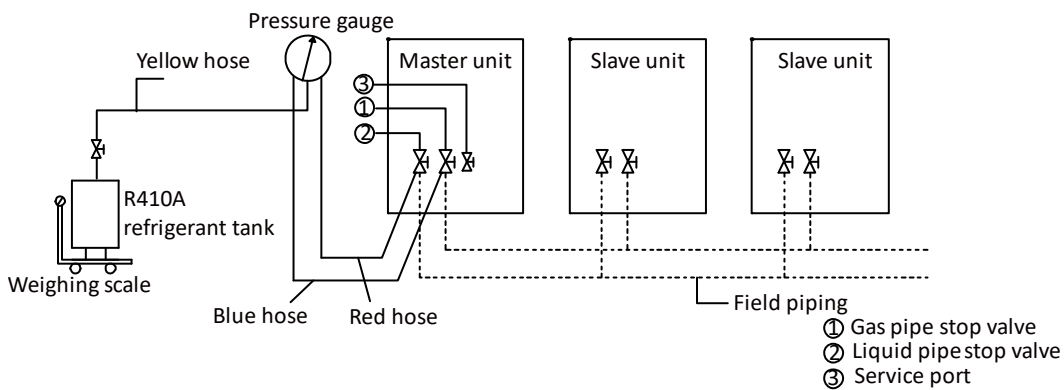
Step 3

- 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



Pressure gauge

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 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.

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

Figure 3-9.1: Outdoor unit power supply wiring

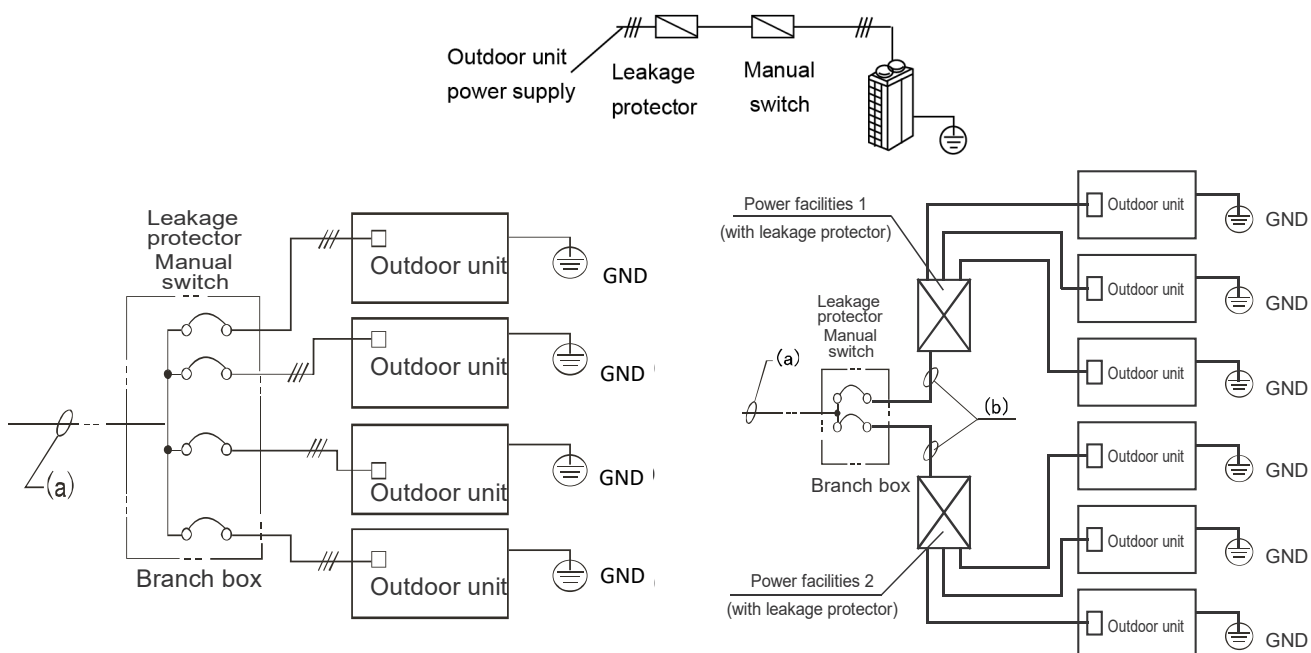
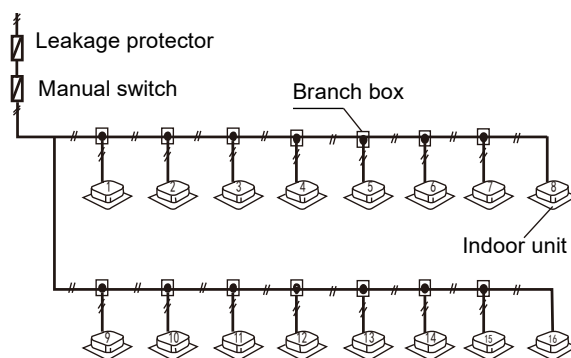


Figure 3-9.2: Indoor unit power supply wiring

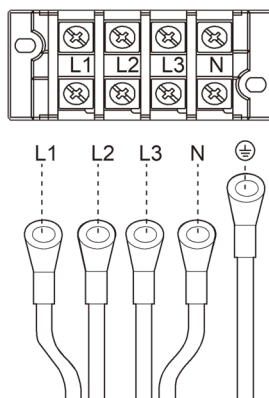


Notes for installers



The 3-phase, 380-415V, 50 or 60Hz power supply should be connected to the outdoor unit power supply terminals as shown in Figure 3-9.3.

Figure 3-9.3: Outdoor unit 3-phase power supply terminals

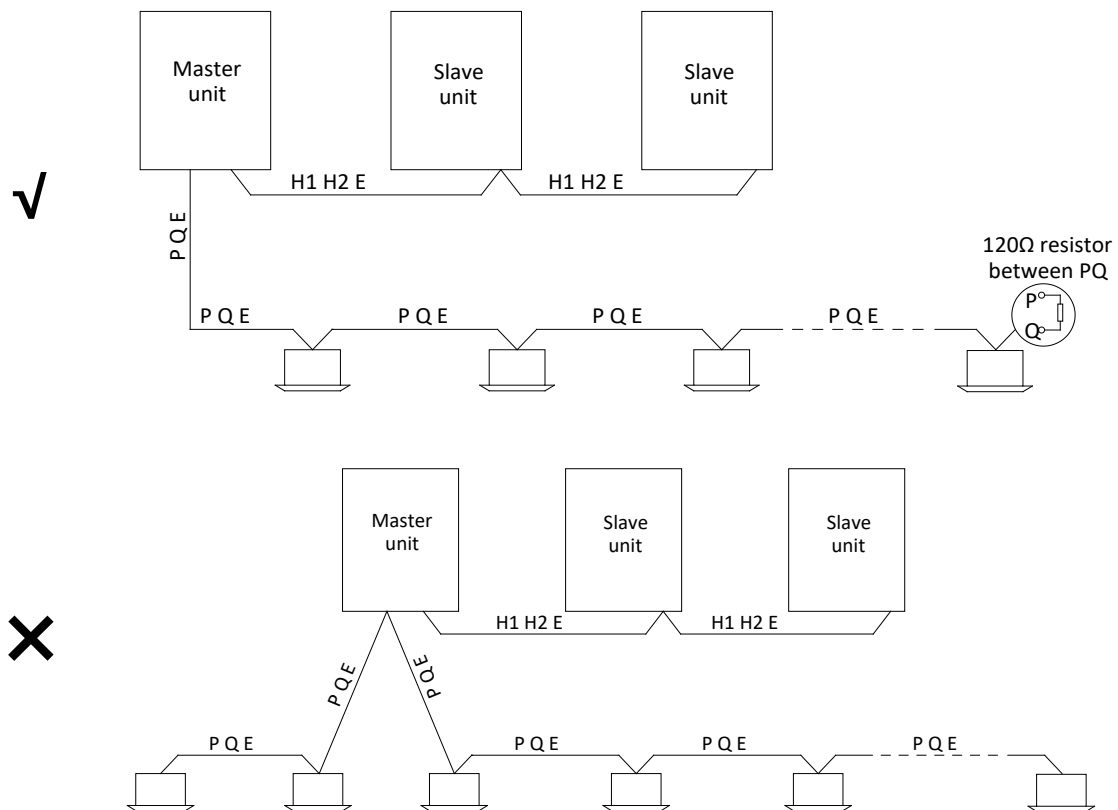


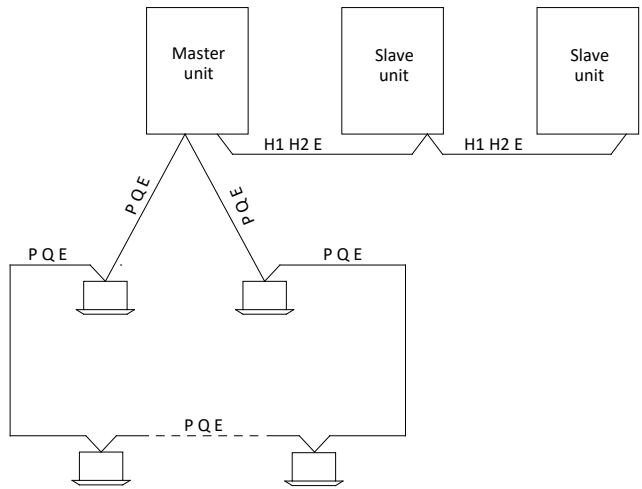
9.3 Communication Wiring

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.
- **Indoor communication wiring:**
 - 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 3-9.4. 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 grounded.
 - 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.
- **Outdoor communication wiring:**
 - The H1 H2 E communication wires should be connected one unit after another in a daisy chain from the master outdoor unit to the final slave outdoor unit as shown in Figure 3-9.4.

Figure 3-9.4: Communication wiring configurations – correct and incorrect examples





Notes for installers



The communication wires should be connected to the master outdoor unit terminals indicated in Figure 3-9.5 and Table 3-9.1.

Caution

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

Figure 3-9.5: Master outdoor unit communication terminals

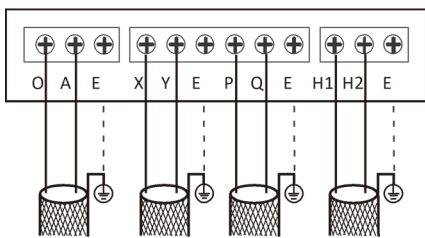
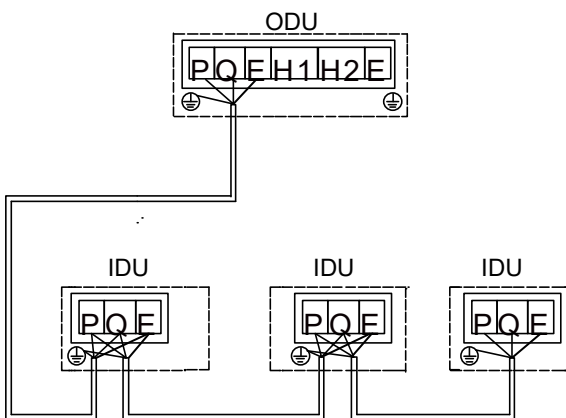


Table 3-9.1: Communication connections

Terminals	Connection
O A	Connect to digital energy meter
X Y	Connect to centralized controller
P Q	Connect between indoor units and master outdoor unit
H1 H2	Connect between outdoor units

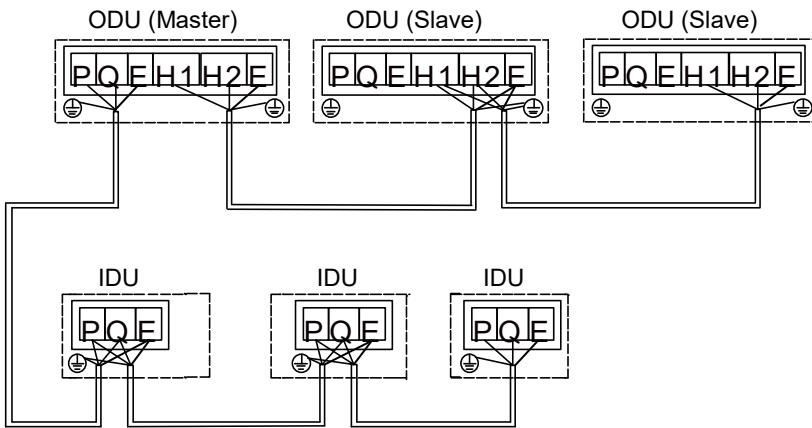
Communication wiring for a single outdoor unit system

Figure 3-9.6: Communication wiring for a single outdoor unit system



- **Communication wiring for a multi outdoor unit system**

Figure 3-9.7: Communication wiring for a multi outdoor unit system



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.

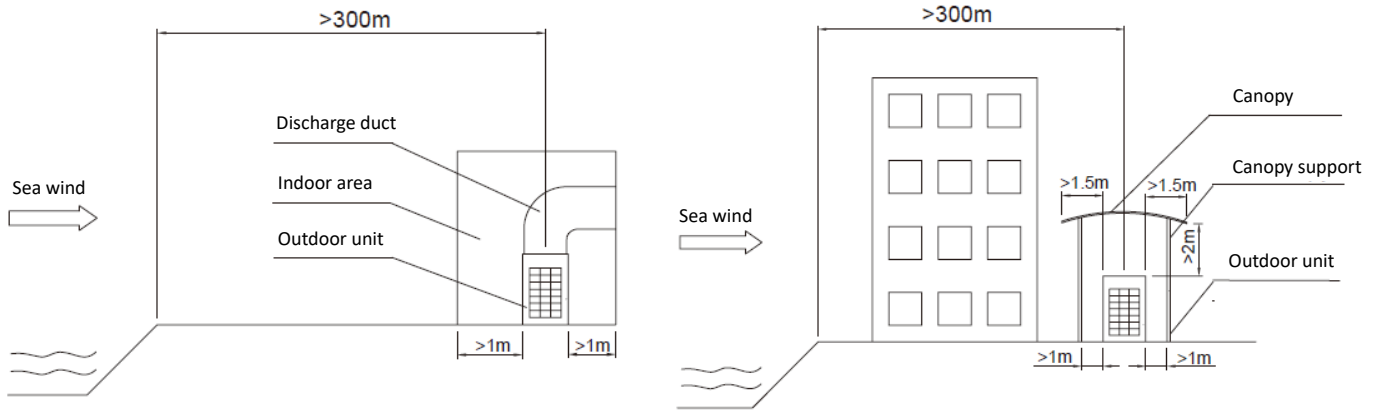
10.2 Placement and Installation

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 Capacity Settings

Before running a system for the first time, set each outdoor unit's address on switch ENC1 on each outdoor unit's main PCB. Refer to Table 3-11.1. The capacity of each outdoor unit (on switch ENC2 on each outdoor unit's main PCB) is factory-set and should not need changing. Check that the capacity settings are correct. Refer to Table 3-11.1.

Table 3-11.1: Outdoor unit address and capacity settings

Address settings		Capacity settings			
0	Master unit	0	8HP	6	20HP
1	Slave unit 1	1	10HP	7	22HP
2	Slave unit 2	2	12HP	8	24HP
≥3	Invalid	3	14HP	9	26HP
		4	16HP	A	28HP
		5	18HP	B	30HP

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 watertightness 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.
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 0.75mm² three-core shielded cable and the shielding has been grounded.
8. The outdoor units' address and capacity switches are set correctly (see Part 3, 11.1 "Outdoor Unit Address and Capacity Settings") and 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 Commissioning Trial Runs

11.4.1 Commissioning test run of single refrigerant system

Once all the pre-commissioning checks in Part 3, 11.3 "Pre-commissioning Checks" have been completed, a test run should be performed as described below and a TVR Pro CO Series System Commissioning Report (see Part 3, 12 "Appendix to Part 3 – System Commissioning Report") should be completed as a record of the operating status of the system during commissioning.

Note: When running the system for commissioning test runs, 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 test run procedure is as follows:

1. Open the outdoor unit liquid and gas stop valves.
2. Turn on the power to the outdoor units.
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. Run 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 commissioning 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 commissioning report for each outdoor unit.
6. Finally, complete Sheet B of the system commissioning report.

11.4.2 Commissioning test run of multiple refrigerant systems

Once the commissioning test run of each refrigerant system has been satisfactorily completed as per Part 3, 11.4.1 "Commissioning test run of 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
- One Sheet D and one Sheet E per outdoor unit.

TVR Pro CO 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)	A-B			B-C			C-A						
OUTDOOR UNIT INFORMATION													
	Master unit			Slave unit 1			Slave unit 2			Slave unit 3			
Model													
Serial no.													
COOLING MODE PARAMETER RECORD (After running in cooling mode for one hour)	OUTDOOR UNITS												
		Master unit			Slave unit 1			Slave unit 2			Slave unit 3		
	Compressor suction pipe temperature												
	System pressure at check port												
		A	B	C	A	B	C	A	B	C	A	B	C
	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?						

TVR Pro CO Series System Commissioning Report – Sheet B

Project name and location	System name
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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
SW2 system check performed?				
Any abnormal noise?				
Any abnormal vibration?				
Fan rotation normal?				

Commissioning engineer	Dealer	Trane representative
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Name:			
Signature:			
Date:			

TVR Pro CO Series System Commissioning Report – Sheet C

Project name and location	System name
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DSP1 content	Parameters displayed on DSP2	Remarks	Cooling mode
0.--	Unit address	Master unit: 0; slave units: 1, 2	
1.--	Unit capacity	Refer to Note 1	
2.--	Number of outdoor units	Displayed on master unit PCB only	
3.--	Number of indoor units as set on PCB	Displayed on master unit PCB only	
4.--	Total capacity of outdoor unit	Only available for master unit, displayed on slave units has no sense	
5.--	Total capacity requirement of indoor units	Displayed on master unit PCB only	
6.--	Total corrected capacity requirement of master units	Displayed on master unit PCB only	
7.--	Operating mode	Refer to Note 2	
8.--	Outdoor unit actual operating capacity		
9.--	Fan A speed index	Refer to Note 3	
10.--	Fan B speed index	Refer to Note 3	
11.--	Indoor heat exchanger pipe (T2/T2B) temperature (°C)	Actual value = value displayed	
12.--	Main heat exchanger pipe (T3) temperature (°C)	Actual value = value displayed	
13.--	Outdoor ambient (T4) temperature (°C)	Actual value = value displayed	
14.--	Inverter compressor A discharge temperature (°C)	Actual value = value displayed	
15.--	Inverter compressor B discharge temperature (°C)	Actual value = value displayed	
16.--	Inverter module A heatsink temperature (°C)	Actual value = value displayed	
17.--	Inverter module B heatsink temperature (°C)	Actual value = value displayed	
18.--	Discharge superheat degree (°C)	Actual value = value displayed	
19.--	Reserved		
20.--	Reserved		
21.--	EXVA position	Refer to Note 4	
22.--	Compressor discharge pressure (MPa)	Actual value = value displayed × 0.1	
23.--	Reserved		
24.--	Number of indoor units currently in communication with master unit	Actual value = value displayed	
25.--	Number of indoor units currently operating	Displayed on master unit PCB only	
26.--	Reserved		
27.--	Silent mode	Refer to Note 5	
28.--	Static pressure mode	Refer to Note 6	
29.--	Reserved		
30.--	Reserved		
31.--	DC voltage A	Actual value = value displayed × 10	
32.--	DC voltage B	Actual value = value displayed × 10	
33.--	Reserved		
34.--	Address of VIP indoor unit		

Table continued on next page ...

TVR Pro CO Series System Commissioning Report – Sheet D

Project name and location	System name
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... table continued from previous page

DSP1 content	Parameters displayed on DSP2	Remarks	Cooling mode
35.--	Reserved		
36.--	Reserved		
37.--	Refrigerant quantity	Refer to Note 7	
38.--	Reserved		
39.--	Power mode	Refer to Note 8	
40.--	Most recent error or protection code	"--" is displayed if no error or protection events have occurred since start-up	
--	--	End	

Notes:

1. Outdoor unit capacity setting:
 - 0: 8HP; 1: 10HP; 2: 12HP; 3: 14HP; 4: 16HP; 5: 18HP; 6: 20HP; 7: 22HP; 8: 24HP; 9: 26HP; A: 28HP; B: 30HP.
2. Operating mode:
 - 0: off; 2: cooling; 3: null; 4: forced cooling.
3. The fan speed index is related to the fan speed in rpm and can take any integer value in the range 1 (slowest) to 37 (fastest).
4. 480P: steps = value displayed × 4; 3000P: steps = value displayed × 24.
5. Silent mode:
 - 0: night silent time 6h/10h; 1: night silent time 6h/12h; 2: night silent time 8h/10h; 3: night silent time 8h/12h; 4: no silent mode; 5: silent mode 1; 6: silent mode 2; 7: silent mode 3; 8: super silent mode 1; 9: super silent mode 2; 10: super silent mode 3; 11: super silent mode 4.
6. Static pressure mode:
 - 0: standard static pressure; 1: low static pressure; 2: medium static pressure; 3: high static pressure; 4: super high static pressure.
7. Refrigerant quantity:
 - 0: normal; 1: slightly excessive; 2: significantly excessive; 3: slightly insufficient; 4: significantly insufficient; 5: critically insufficient.
8. Power mode:
 - 0: 100% capacity output; 1: 90% capacity output; 2: 80% capacity output; 3: 70% capacity output; 4: 60% capacity output; 5: 50% capacity output; 6: 40% capacity output; 10: auto power save mode, 100% capacity output; 11: auto power save mode, 90% capacity output; 12: auto power save mode, 80% capacity output; 13: auto power save mode, 70% capacity output; 14: auto power save mode, 60% capacity output; 15: auto power save mode, 50% capacity output; 16: auto power save mode, 40% capacity output;