

— INSTALLATION & OPERATION MANUAL

— SET FREE SERIES

Heat pump system
Heat recovery system

MODELS

RAS-(8-96)FSXNS2E - air365 Max
RAS-(5-54)FSXNP2E - air365 Max Pro



Cooling & Heating

EN

The English version is the original one; other languages are translated from English. Should any discrepancy occur between the English and the translated versions, the English version shall prevail.

ES

La versión en inglés es la original, y las versiones en otros idiomas son traducciones de la inglesa. En caso de discrepancias entre la versión inglesa y las versiones traducidas, prevalecerá la versión inglesa.

DE

Die englische Fassung ist das Original, und die Fassungen in anderen Sprachen werden aus dem Englischen übersetzt. Sollten die englische und die übersetzten Fassungen voneinander abweichen, so hat die englische Fassung Vorrang.

FR

La version anglaise est la version originale; les autres langues sont traduites de l'anglais. En cas de divergence entre les versions anglaise et traduite, la version anglaise prévaudra.

IT

La versione inglese è l'originale e le versioni in altre lingue sono traduzioni dall'inglese. In caso di divergenze tra la versione inglese e quelle tradotte, fa fede la versione inglese.

PT

A versão inglesa é a original; as versões em outras línguas são traduzidas do inglês. Em caso de divergência entre a versão em língua inglesa e as versões traduzidas, faz fé a versão em língua inglesa.

DA

Den engelske udgave er originalen, og udgaverne på andre sprog er oversat fra engelsk. Hvis der forekommer uoverensstemmelser mellem den engelske og den oversatte sprogudgave, vil den engelske udgave være gældende.

NL

De Engelse versie is de originele; andere talen zijn vertaald uit het Engels. In geval van verschillen tussen de Engelse versie en de vertaalde versies, heeft de Engelse versie voorrang.

SV

Den engelska versionen är originalet, och versionerna på andra språk är från engelska översättningar. I händelse av bristande överensstämmelse mellan den engelska och den översatta versionerna, skall den engelska versionen vara giltig.

EL

Η αγγλική έκδοση είναι το πρωτότυπο και οι εκδόσεις σε άλλες γλώσσες μεταφράζονται από τα αγγλικά. Σε περίπτωση που διαπιστωθούν διαφορές μεταξύ της αγγλικής και της μεταφρασμένης έκδοσης, η αγγλική έκδοση είναι επικρατέστερη.

BG

Версията на английски език е оригиналната; версията на останалите езици са в превод от английски език. При различие между английската версия и преводна версия на друг език за меродавна се счита английската версия.

CS

Originální verze tohoto dokumentu je v angličtině; ostatní jazykové varianty jsou z angličtiny

přeložené. Pokud mezi anglickou a jakoukoli jinou jazykovou verzí dojde k rozporu, bude převažovat anglická verze.

ET

Originaalversioon on ingliskeelne; teised keeled on tõlge inglise keelest. Vastuolude korral ingliskeelse ja tõlkeversioonide vahel kehtib eesõiguslikult ingliskeelne versioon.

HU

Az eredeti változat az angol; az egyéb nyelvű változatok angolról lettek fordítva. Amennyiben az angol és a fordított verziók között bármilyen eltérés mutatkozik, az angol nyelvű változat a mérvadó.

LV

Angļu valodas versija ir oriģināla; citas valodas tiek tulkotas no angļu valodas. Ja starp angļu valodu un tulkoto versiju rodas jebkādas neatbilstības, noteicošais ir angļu valodas variants.

LT

Versija angļų kalba yra originali; versijos kitomis kalbomis yra išverstos iš angļų kalbos. Jei yra neatitikimų tarp versijos angļų kalba ir verstinių versijų, pirmenybė teikiama versijai angļų kalba.

PL

Wersja angielska jest wersją oryginalną - wszystkie pozostałe stanowią jej tłumaczenie na odpowiednie języki. W przypadku stwierdzenia jakichkolwiek rozbieżności między oryginałem a jego tłumaczeniem, rozstrzygająca jest wersja w języku angielskim.

RO

Versiunea originală este cea în limba engleză; versiunile în alte limbi sunt traduse din limba engleză. Dacă există vreo discrepanță între versiunile în limba engleză și versiunea tradusă, prevalează versiunea în limba engleză.

RU

Английская версия является оригинальной; другие языки переведены с английского. В случае любого расхождения между английской и переведенной версиями, английская версия имеет преимущественную силу.

EN	English	Original version
ES	Español	Versión traducida
DE	Deutsch	Übersetzte Version
FR	Français	Version traduite
IT	Italiano	Versione tradotta
PT	Português	Versão traduzida
DA	Dansk	Oversat version
NL	Nederlands	Vertaalde versie
SV	Svenska	Översatt version
EL	Ελληνικά	Μεταφρασμένη έκδοση
BG	Български	Преведена версия
CS	Čeština	Přeložená verze
ET	Eesti	Tõlgitud versioon
HU	Magyar	Lefordított változat
LV	Latviešu	Tulkotā versija
LT	Lietuvių	Versta versija
PL	Polski	Tłumaczenie wersji oryginalnej
RO	Română	Versiune tradusă
RU	Tulkotā versija	Переведенная версия



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1.1 General notes

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As a result, some of the images or data used to illustrate this document may not refer to specific models. No claims will be accepted based on the data, illustrations and descriptions included in this manual.

No type of modification must be made to the equipment without prior, written authorisation from the manufacturer.

Appropriate refrigerant

The refrigerant used in each unit is identified on the specification label and manuals of the unit. Hitachi shall not be held liable for any failure, trouble, malfunction or accident caused by units illegally charged with refrigerants other than the specified one.

Consequences of charging non-specified refrigerant

It may cause mechanical failure, malfunction and other accidents. It may cause operational failure of protection and safety devices of air conditioners. It may also cause lubrication failure of the sliding part of the compressor due to deterioration of refrigerant oil.

In particular, hydrocarbon refrigerants (such as propane, R441A, R443A, GF-08, etc) are not allowed, since these are combustible and may cause major accidents such as fire and explosion in case of improper handling.

Once a non-specified refrigerant has been charged, no further servicing (including draining of refrigerant) shall be performed, even in case of malfunction. Improper handling of refrigerant may be a cause of fire and explosion, and servicing in such cases may be considered an illegal act.

End clients and costumers shall be informed that servicing is not approved, and the installer who charged the nonspecified refrigerant shall be asked to fix the unit.

Hitachi will accept no responsibility for units that have been charged with non-specified refrigerant once.

1.2 Applied symbols

During normal heat pump system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid damage to the unit, the installation or the building or property.

Situations that jeopardise the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.

A series of special symbols are used to clearly identify these situations.

Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

DANGER

- *The text following this symbol contains information and instructions relating directly to your safety, in addition to hazards or unsafe practices which could result in severe personal injuries or death.*
- *Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others.*

In the texts following the danger symbol you can also find information on safety procedures during unit installation.

CAUTION

- *The text following this symbol contains information and instructions relating directly to your safety, in addition to hazards or unsafe practices which could result in minor personal injury or product or property damage.*
- *Not taking these instructions into account could lead to minor injuries to you and others in the proximities of the unit.*
- *Not taking these instructions into account could lead to unit damage.*

In the texts following the caution symbol you can also find information on safety procedures during unit installation.

NOTE







- *The text following this symbol contains information or instructions that may be of use or that require a more thorough explanation.*
- *Instructions regarding inspections to be made on unit parts or systems may also be included.*

1.3 Product guide

Unit type: RAS								
Position-separating hyphen (fixed)								
System capacity (HP): air365 Max (8-96), air365 Max Pro (5-54)								
SET FREE series								
X: Heat Recovery system (3 pipes)								
Refrigerant type N: R410A								
S: air365 Max P: air365 Max Pro								
2: series								
Made in Europe								
RAS	-	X	FS	X	N	(X)	2	E

1.4 Product list

☀️ : Heating operation
 ❄️ : Cooling operation

air365 Max (Pro) ❄️ ☀️					
Type	Model	Power supply	Cabinet size	Picture	
air365 Max Heat Recovery (3 pipe system) Heat Pump (2 pipe system)	RAS-8FSXNS2E	3N~ 400V 50Hz	S		
	RAS-10FSXNS2E				
	RAS-12FSXNS2E				
	RAS-14FSXNS2E		M	3N~ 400V 50Hz	
	RAS-16FSXNS2E				
	RAS-18FSXNS2E				
	RAS-20FSXNS2E				
	RAS-22FSXNS2E		L		
RAS-24FSXNS2E					
air365 Max Pro Heat Recovery (3 pipe system) Heat Pump (2 pipe system)	RAS-5FSXNP2E	3N~ 400V 50Hz	S		
	RAS-6FSXNP2E				
	RAS-8FSXNP2E		M		
	RAS-10FSXNP2E				
	RAS-12FSXNP2E				
	RAS-14FSXNP2E		L		
	RAS-16FSXNP2E				
	RAS-18FSXNP2E				

1.5 Combination of base units

1.5.1 Base units

◆ air365 Max

HP	8	10	12	14	16
Model	RAS-8FSXNS2E	RAS-10FSXNS2E	RAS-12FSXNS2E	RAS-14FSXNS2E	RAS-16FSXNS2E

HP	18	20	22	24
Model	RAS-18FSXNS2E	RAS-20FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E

◆ air365 Max Pro

HP	5	6	8	10	12
Model	RAS-5FSXNP2E	RAS-6FSXNP2E	RAS-8FSXNP2E	RAS-10FSXNP2E	RAS-12FSXNP2E

HP	14	16	18
Model	RAS-14FSXNP2E	RAS-16FSXNP2E	RAS-18FSXNP2E

1.5.2 Build up capacity combination

	Base unit	Build up the total capacity Heat Recovery (3 pipe system)	Build up the total capacity Heat Pump (2 pipe system)
air365 Max	from 8 to 24 HP	from 8 to 54 HP	from 8 to 96 HP
air365 Max Pro	from 5 to 18 HP	from 5 to 54 HP	from 5 to 54 HP

1.5.3 Units combination

◆ air365 Max

HP	26	28	30	32	34
Model	RAS-26FSXNS2E	RAS-28FSXNS2E	RAS-30FSXNS2E	RAS-32FSXNS2E	RAS-34FSXNS2E
Combination	RAS-14FSXNS2E	RAS-16FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E
	RAS-12FSXNS2E	RAS-12FSXNS2E	RAS-12FSXNS2E	RAS-14FSXNS2E	RAS-16FSXNS2E
	-	-	-	-	-
	-	-	-	-	-

HP	36	38	40	42	44
Model	RAS-36FSXNS2E	RAS-38FSXNS2E	RAS-40FSXNS2E	RAS-42FSXNS2E	RAS-44FSXNS2E
Combination	RAS-18FSXNS2E	RAS-22FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E	RAS-22FSXNS2E
	RAS-18FSXNS2E	RAS-16FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-22FSXNS2E
	-	-	-	-	-
	-	-	-	-	-
HP	46	48	50	52	54
Model	RAS-46FSXNS2E	RAS-48FSXNS2E	RAS-50FSXNS2E	RAS-52FSXNS2E	RAS-54FSXNS2E
Combination	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E
	RAS-22FSXNS2E	RAS-24FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E
	-	-	RAS-14FSXNS2E	RAS-16FSXNS2E	RAS-18FSXNS2E
	-	-	-	-	-
HP	56	58	60	62	64
Model	RAS-56FSXNS2E	RAS-58FSXNS2E	RAS-60FSXNS2E	RAS-62FSXNS2E	RAS-64FSXNS2E
Combination	RAS-22FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E
	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-22FSXNS2E	RAS-22FSXNS2E
	RAS-16FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E
	-	-	-	-	-
HP	66	68	70	72	74
Model	RAS-66FSXNS2E	RAS-68FSXNS2E	RAS-70FSXNS2E	RAS-72FSXNS2E	RAS-74FSXNS2E
Combination	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-22FSXNS2E
	RAS-24FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-18FSXNS2E
	RAS-18FSXNS2E	RAS-22FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E	RAS-18FSXNS2E
	-	-	-	-	RAS-16FSXNS2E
HP	76	78	80	82	84
Model	RAS-76FSXNS2E	RAS-78FSXNS2E	RAS-80FSXNS2E	RAS-82FSXNS2E	RAS-84FSXNS2E
Combination	RAS-22FSXNS2E	RAS-24FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E
	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-22FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E
	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E
	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E
HP	86	88	90	92	94
Model	RAS-86FSXNS2E	RAS-88FSXNS2E	RAS-90FSXNS2E	RAS-92FSXNS2E	RAS-94FSXNS2E
Combination	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E
	RAS-22FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E	RAS-24FSXNS2E
	RAS-22FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E	RAS-22FSXNS2E	RAS-24FSXNS2E
	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-18FSXNS2E	RAS-22FSXNS2E	RAS-22FSXNS2E
HP	96				
Model	RAS-96FSXNS2E				
Combination	RAS-24FSXNS2E				
	RAS-24FSXNS2E				
	RAS-24FSXNS2E				
	RAS-24FSXNS2E				

◆ air365 Max Pro

HP	20	22	24	26	28
Model	RAS-20FSXNP2E	RAS-22FSXNP2E	RAS-24FSXNP2E	RAS-26FSXNP2E	RAS-28FSXNP2E
Combination	RAS-10FSXNP2E	RAS-12FSXNP2E	RAS-12FSXNP2E	RAS-16FSXNP2E	RAS-16FSXNP2E
	RAS-10FSXNP2E	RAS-10FSXNP2E	RAS-12FSXNP2E	RAS-10FSXNP2E	RAS-12FSXNP2E
	-	-	-	-	-
	-	-	-	-	-

HP	30	32	34	36	38
Model	RAS-30FSXNP2E	RAS-32FSXNP2E	RAS-34FSXNP2E	RAS-36FSXNP2E	RAS-38FSXNP2E
Combination	RAS-18FSXNP2E	RAS-18FSXNP2E	RAS-18FSXNP2E	RAS-18FSXNP2E	RAS-14FSXNP2E
	RAS-12FSXNP2E	RAS-14FSXNP2E	RAS-16FSXNP2E	RAS-18FSXNP2E	RAS-12FSXNP2E
	-	-	-	-	RAS-12FSXNP2E
	-	-	-	-	-

HP	40	42	44	46	48
Model	RAS-40FSXNP2E	RAS-42FSXNP2E	RAS-44FSXNP2E	RAS-46FSXNP2E	RAS-48FSXNP2E
Combination	RAS-14FSXNP2E	RAS-14FSXNP2E	RAS-18FSXNP2E	RAS-18FSXNP2E	RAS-18FSXNP2E
	RAS-14FSXNP2E	RAS-14FSXNP2E	RAS-14FSXNP2E	RAS-14FSXNP2E	RAS-16FSXNP2E
	RAS-12FSXNP2E	RAS-14FSXNP2E	RAS-12FSXNP2E	RAS-14FSXNP2E	RAS-14FSXNP2E
	-	-	-	-	-

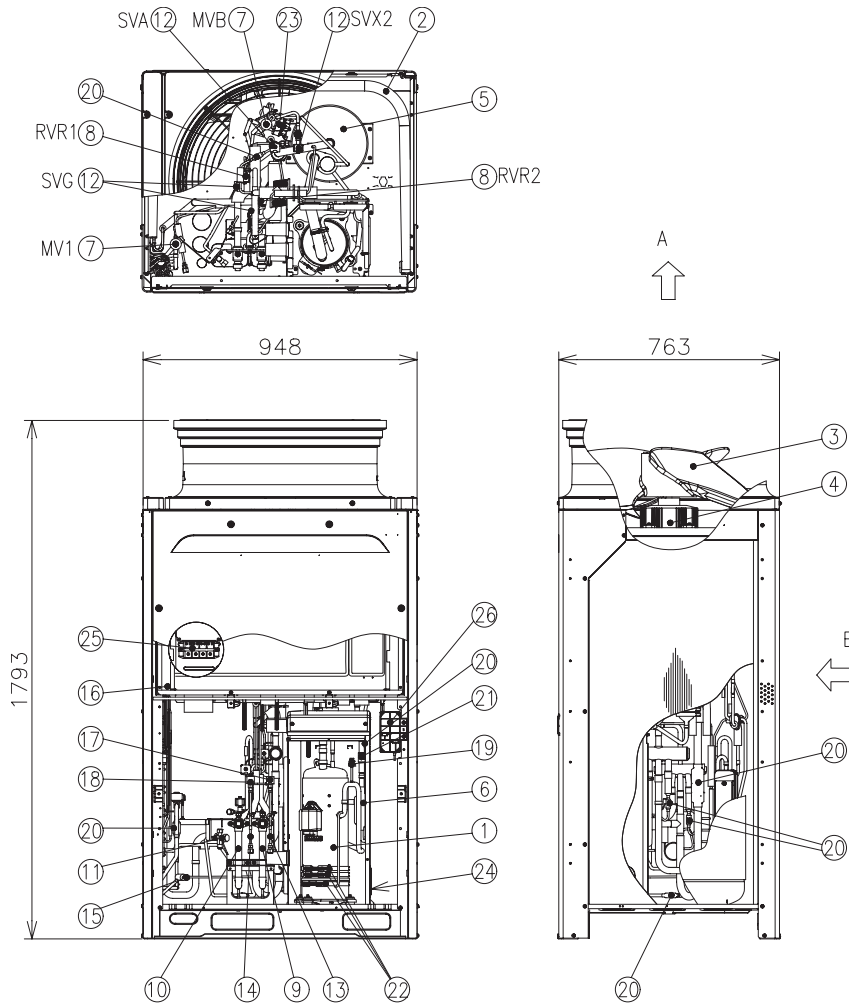
HP	50	52	54
Model	RAS-50FSXNP2E	RAS-52FSXNP2E	RAS-54FSXNP2E
Combination	RAS-18FSXNP2E	RAS-18FSXNP2E	RAS-18FSXNP2E
	RAS-18FSXNP2E	RAS-18FSXNP2E	RAS-18FSXNP2E
	RAS-14FSXNP2E	RAS-16FSXNP2E	RAS-18FSXNP2E
	-	-	-



Name of parts

2.1	Cabinet size S	10
2.2	Cabinet size M	11
2.3	Cabinet size L	12

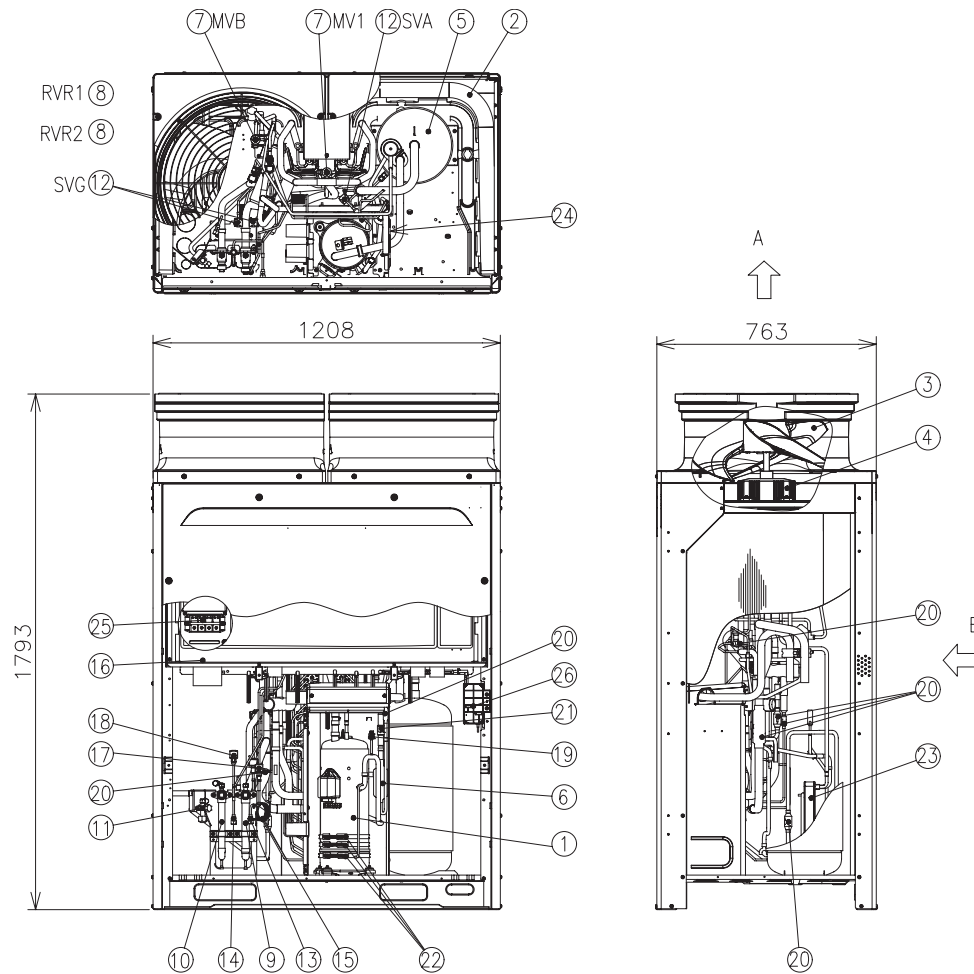
2.1 Cabinet size S



No.	Part Name	No.	Part Name
1	Compressor (inverter)	14	Check Joint (High)
2	Heat Exchanger	15	Check Joint (for Oil)
3	Propeller Fan	16	Electrical Box
4	Fan Motor	17	Low Pressure Sensor
5	Accumulator (Pressure Vessel)	18	High Pressure Sensor
6	Oil Separator (Not Pressure Vessel)	19	High Pressure Switch for Protection (1 piece: RAS-(8-12)FSXNS2E, RAS-(5/6)FSXNP2E)
7	Micro-Computer Control Expansion Valve (MVB,MV1) (2 pieces: RAS-(8-12)FSXNS2E, RAS-(5/6)FSXNP2E)	20	Strainer (7 pieces)
8	Reversing Valve (RVR1,RVR2) (2 pieces)	21	Check Valve
9	Stop Valve (Gas) (Low Pressure)	22	Crankcase Heater (3 pieces: RAS-(8-12)FSXNS2E,RAS-(5/6)FSXNP2E)
10	Stop Valve (Gas) (High/Low Pressure)	23	Plate Heat Exchanger
11	Stop Valve (Liquid)	24	Compressor Cover
12	Solenoid Valve (SVA,SVG, SVX2) (4 pieces)	25	TB (Terminal Block)
13	Check Joint (Low)	26	NFC (Near Field Communication)

A: Air outlet
B: Air inlet

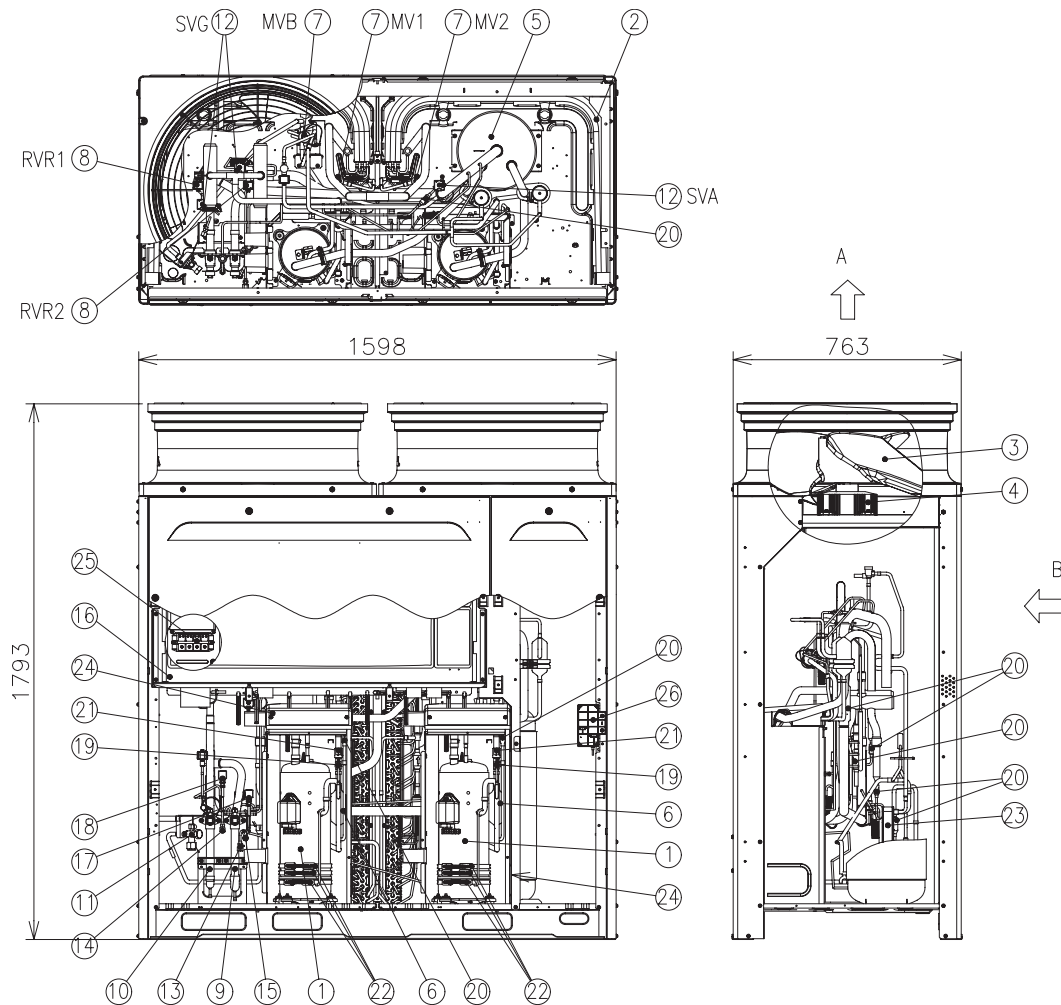
2.2 Cabinet size M



No.	Part Name	No.	Part Name
1	Compressor (inverter)	14	Check Joint (High)
2	Heat Exchanger	15	Check Joint (for Oil)
3	Propeller Fan (2 pieces)	16	Electrical Box
4	Fan Motor (2 pieces)	17	Low Pressure Sensor
5	Accumulator (Pressure Vessel)	18	High Pressure Sensor
6	Oil Separator (Not Pressure Vessel)	19	High Pressure Switch for Protection (1 piece: RAS-(14-18)FSXNS2E, RAS-(8-14)FSXNP2E)
7	Micro-Computer Control Expansion Valve (MVB,MV1) (2 pieces: RAS-(14-18)FSXNS2E, RAS-(8-14)FSXNP2E)	20	Strainer (7 pieces)
8	Reversing Valve (RVR1,RVR2) (2 pieces)	21	Check Valve
9	Stop Valve (Gas) (Low Pressure)	22	Crankcase Heater (3 pieces: RAS-(14-18)FSXNS2E, RAS-(8-14)FSXNP2E)
10	Stop Valve (Gas) (High/Low Pressure)	23	Plate Heat Exchanger
11	Stop Valve (Liquid)	24	Compressor Cover
12	Solenoid Valve (SVA,SVG) (3 pieces)	25	TB (Terminal Block)
13	Check Joint (Low)	26	NFC (Near Field Communication)

A: Air outlet
B: Air inlet

2.3 Cabinet size L



No.	Part Name	No.	Part Name
1	Compressor (inverter)	14	Check Joint (High)
2	Heat Exchanger	15	Check Joint (for Oil)
3	Propeller Fan (2 pieces)	16	Electrical Box
4	Fan Motor (2 pieces)	17	Low Pressure Sensor
5	Accumulator (Pressure Vessel)	18	High Pressure Sensor
6	Oil Separator (Not Pressure Vessel)	19	High Pressure Switch for Protection (2 pieces: RAS-(20-24)FSXNS2E, RAS-(16/18)FSXNP2E)
7	Micro-Computer Control Expansion Valve (MVB,MV1,MV2) (3 pieces: RAS-(20-24)FSXNS2E, RAS-(16/18)FSXNP2E)	20	Strainer (9 pieces)
8	Reversing Valve (RVR1,RVR2) (2 pieces)	21	Check Valve
9	Stop Valve (Gas) (Low Pressure)	22	Crankcase Heater (6 pieces: RAS-(20-24)FSXNS2E, RAS-(16/18)FSXNP2E)
10	Stop Valve (Gas) (High/Low Pressure)	23	Plate Heat Exchanger
11	Stop Valve (Liquid)	24	Compressor Cover
12	Solenoid Valve (SVA,SVG) (3 pieces)	25	TB (Terminal Block)
13	Check Joint (Low)	26	NFC (Near Field Communication)

A: Air outlet

B: Air inlet

Piping work and refrigerant charge

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3.1 Connection kit selection

CAUTION

When brazing pipes, always protect the surrounding elements of the working area in order to avoid damage due to the high temperature of the flame.

The optional piping connection kit is required for the combination unit.

Operation mode	Outdoor unit	Number of outdoor units	Connection kit	
Heat pump system	air365 Max	26 - 48	2	MC-21AN1
		50 - 54	3	MC-30AN1
		56 - 72	3	MC-NP31SA
	74 - 96	4	MC-NP40SA	
	air365 Max Pro	20 - 24	2	MC-20AN1
		26 - 36	2	MC-21AN1
38 - 54		3	MC-30AN1	
Heat recovery system	air365 Max	26 - 48	2	MC-21XN1
		50 - 54	3	MC-30XN1
	air365 Max Pro	20 - 24	2	MC-20XN1
		26 - 36	2	MC-21XN1
		38 - 54	3	MC-30XN1

3.2 Pipe size selection

Select the pipe size in line with the following instructions:

- Between the outdoor unit and the branch pipe (multi-kit): select the same pipe connection size as for the outdoor unit.
- Between the branch pipe (multi-kit) and the indoor unit: select the same pipe connection size as for the indoor unit.

CAUTION

- Do not use refrigerant pipe sizes other than those indicated in the technical information. The diameter of the refrigerant pipes depends directly on the power of the outdoor unit.
- If larger diameter refrigerant pipes are used, the circuit lubrication oil tends to separate from the gas carrying it. The compressor will be seriously damaged due to a lack of lubrication.
- If smaller diameter refrigerant pipes are used, the gas or liquid refrigerant will have serious difficulties in circulating. System performance will be affected. The compressor will run under more severe conditions than foreseen and will be damaged in a short space of time.
- The copper pipe used in the refrigeration installations is different to the copper pipe used in installations carrying domestic or heating water.

- The copper pipe for refrigeration installations is especially treated for outdoors and indoors. The interior surface finish makes it easier for the refrigerant to circulate and withstands the action of the lubricant oil applied to outdoor equipment.

Nominal diameter		Thickness mm	Supply	Alternative pipe and reducer
mm	Inches			
Ø6.35	1/4	0.80	Coil	-
Ø9.52	3/8	0.80	Coil	(Ø9.52-Ø12.7)
Ø12.7	1/2	0.80	Coil	(Ø12.7-Ø15.88)
Ø15.88	5/8	1.00	Coil	(Ø15.88-Ø19.05)
Ø19.05	3/4	1.00	Straight lengths	(Ø19.05-Ø22.2)
Ø22.2	7/8	1.00	Straight lengths	(Ø22.2-Ø25.4)
Ø25.4	1	1.00	Straight lengths	(Ø25.4-Ø28.58)
Ø28.58	1-1/8	1.00	Straight lengths	(Ø28.58-Ø31.75)
Ø31.75	1-1/4	1.10	Straight lengths	(Ø31.75-Ø34.9)
Ø38.1	1-1/2	1.35	Straight lengths	(Ø38.1-Ø41.3)
Ø41.3	1-5/8	1.45	Straight lengths	-
Ø44.45	1-3/4	1.55	Straight lengths	-
Ø50.8	2	1.78	Straight lengths	-

Always use clean copper pipes with no signs of knocks or cracks. Make sure there is no dust or dampness on the inside. Before you install the pipes, clean the inside with oxygen-free nitrogen gas to eliminate any remains of dust or other substances.

CAUTION

- Do not use hand saws, circular saws, abrasive grinders or other tools that generate shavings.
- Strictly follow national or local regulations regarding occupational health and safety.
- Wear appropriate means of protection during cutting or brazing operations and installation (gloves, eye protection, etc).

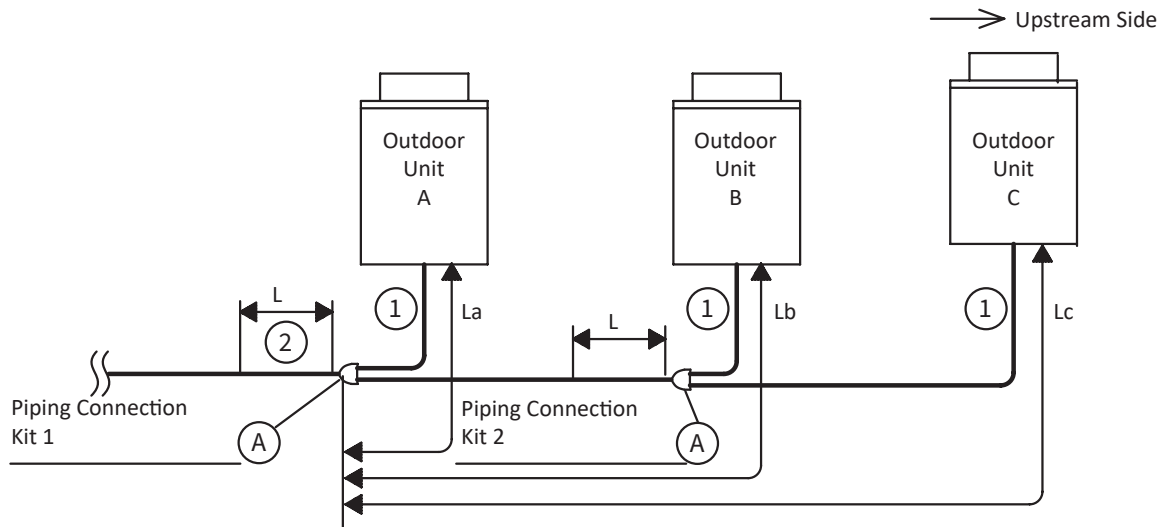
On completing the installation of the refrigerant pipes, insulate them appropriately using suitable insulating material and seal the open space between the holes made and the pipe.

3.2.1 Size of pipes (Ø mm)

◆ For heat pump systems (2 pipe)

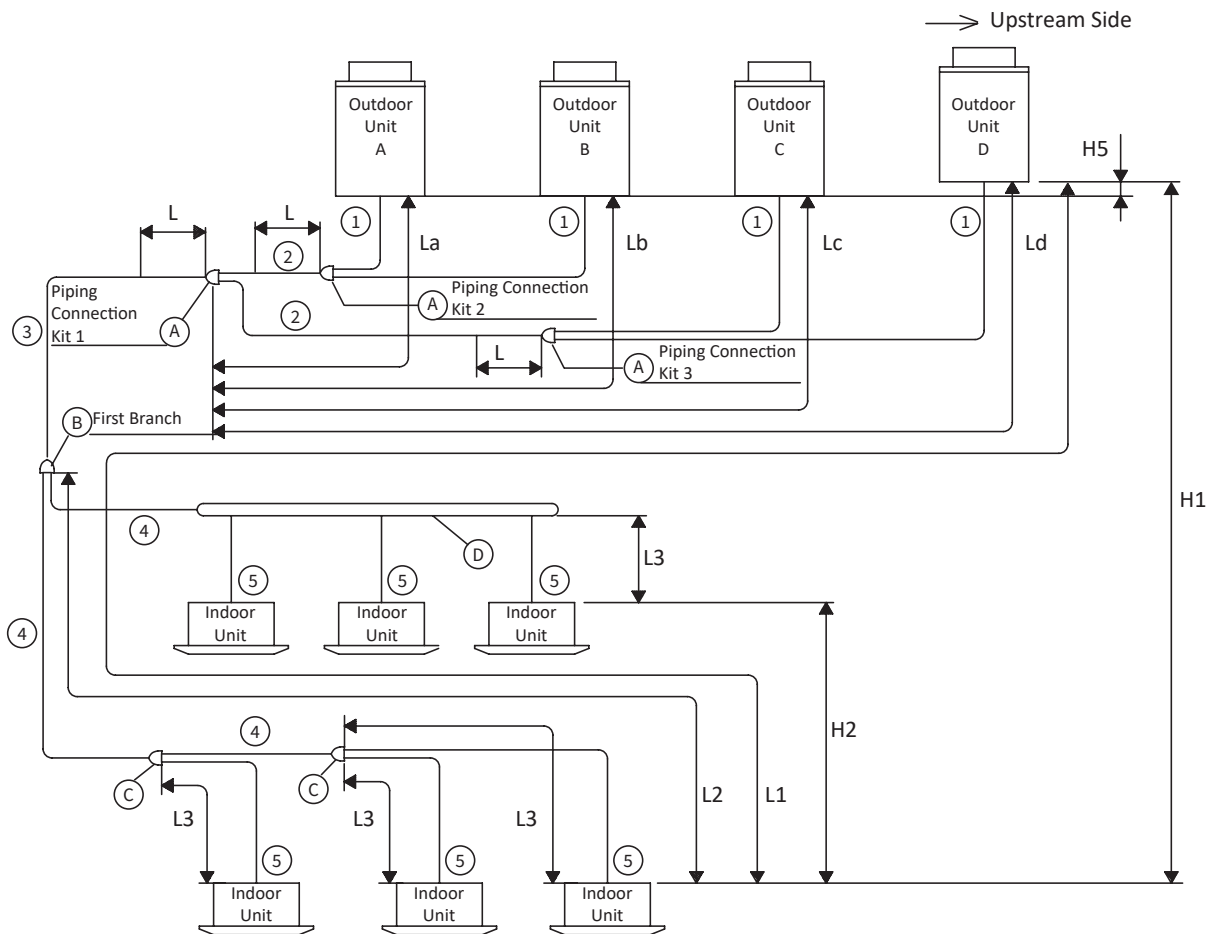
For selecting the pipe sizes between the outdoor unit and the piping connection kit 1, between the piping connection kit 2 and for piping connection kit (A), refer to the print version of the manual.

Combination of 2 and 3 units



L: Keep the straight line distance of 500mm or more after the piping connection kit.

Combination of 4 units



L: Keep the straight line distance of 500mm or more after the piping connection kit.

Part	Mark	Maximum measure (m)
Total piping length	Total liquid piping actual length	1000
Maximum piping length	Actual length	200
	Equivalent length	225
Maximum pipe length between the multi-kit of the first branch and each indoor unit	L2	100
Maximum pipe length between each multi-kit and each indoor unit	L3	60
Pipe length between connection kit 1 and each outdoor unit	La, Lb, Lc, Ld	25 *6
Difference in height between outdoor and indoor units - outdoor unit is upper	H1 *4	50 *1
Difference in height between outdoor and indoor units - outdoor unit is lower		40 *2
Difference in height between indoor units	H2*3, *5	40
Difference in height between outdoor units	H5	2

*1. The maximum piping length of 110 m is available on request. The following restrictions apply when the height difference between the outdoor units and the indoor units (the outdoor unit is higher) are 50 m or more.

- The maximum outdoor temperature during cooling operation is 43 °C.
- The height difference between the outdoor units and the indoor units must be 50 m or less when the outdoor units are operated at an outside temperature of -10 °C or less.
- The connectable indoor unit capacity ratio is ≤ 100 %.
- To protect the system, the thermo OFF may be activated to turn the system off when the outside temperature is 38 °C or more.
- Performance priority mode is disabled.

*2. The maximum piping length of 110 m is available on request. The following restrictions apply when the height difference between the outdoor units and the indoor units (the outdoor unit is lower) are 40 m or more.

- The maximum outdoor temperature during cooling operation is 43 °C.
- The minimum outdoor temperature during cooling operation is 10 °C.
- The connectable indoor unit capacity ratio is ≤ 130 %.

*3. The piping length must be 15 m or less when even one dedicated outside air system (DOAS) is connected to the system.

*4. When there are height differences between outdoor units, use the outdoor unit that has the largest height difference from the indoor unit as the height reference.

*5. When H2 is 30 m or more, the connectable indoor unit capacity ratio is ≤ 100 %.

*6. The piping length between outdoor units should be

$$La \leq Lb \leq Lc \leq Ld \leq 25 \text{ m.}$$

$$Lb - La \leq 10 \text{ m, } Lc - La \leq 10 \text{ m, } Ld - La \leq 10 \text{ m.}$$

(If the piping length is incorrect, it may cause failure of outdoor unit due to flowing back of the refrigerant.)

NOTE

- Install the indoor unit and the multi-kit according to the instructions given in the manual.
- The connection kit is taken into account from the side of the indoor unit (as connection kit 1).

- The installation conditions for the refrigerant pipes are different depending on the number of indoor units connected.
- For 2 to 4 outdoor unit combination, the outdoor unit "A" should be connected to the piping connection kit 1. The details of piping connection kit shall be referred to the installation manual of itself.
- Check that the gas pipe and the liquid pipe are equivalent in terms of length and installation system.
- The total pipe length permitted must be less than 1000 m due to the maximum additional refrigerant charge limitation.
- Where the length of pipe L3 between each multi-kit and each indoor unit is considerably longer than to another indoor unit, the refrigerant will not flow correctly and performance is diminished in comparison to other models (recommended pipe length: up to 15 m).

Ⓑ First branch

Outdoor unit HP	Model
5-10	E-102SN4
12-16	E-162SN4
18-24	E-242SN3
26-54	E-302SN3
56-96	MW-NP2682A3

Ⓒ Multi-Kit after first branch

Total indoor unit HP	Model
<12	E-102SN4
12-17.99	E-162SN4
18-25.99	E-242SN3
26-55.99	E-302SN3
≥ 56	MW-NP2682A3

Ⓓ Header branch

Total indoor unit HP	Number of header branches	Model
5-8	4	MH-84AN1
5-10	8	MH-108AN

③ Diameter of the main pipe (from the base of the unit or connection kit 1 to the first branch).

Outdoor unit (HP)	Equivalent pipe length < 100 m	
	Gas (∅)	Liquid (∅)
5	15.88	9.52
(6/8)	19.05	9.52
10	22.20	9.52

Outdoor unit (HP)	Equivalent pipe length < 100 m	
	Gas (∅)	Liquid (∅)
(12/14)	25.40	12.70
16	28.58	12.70
(18-24)	28.58	15.88
(26-34)	31.75	19.05
(36-54)	38.10	19.05
(56-66)	44.45	19.05
(68-72)	44.45	22.20
(72-88)	50.80	22.20
≥ 90	50.80	25.40

NOTE

When the maximum length of the equivalent refrigerant pipe from the piping connection kit 1 to the indoor unit is over 100m, the pipe size of gas and liquid lines from the piping connection kit 1 to first branch should be increased by one size with reducers (field-supplied).

- ④ Pipe diameter after first branch or between Multi-Kits in the main branch.

Total indoor unit capacity after the first branch (HP)	Gas (∅)	Liquid (∅)
< 6	15.88	9.52
(6-8.99)	19.05	9.52
(9-11.99)	22.20	9.52
(12/15.99)	25.40	12.70
(16-17.99)	28.58	12.70
(18-25.99)	28.58	15.88
(26-35.99)	31.75	19.05
(36-55.99)	38.10	19.05
(56-67.99)	44.45	19.05
(68-73.99)	44.45	22.20
(74-89.99)	50.80	22.20
≥ 90	50.80	25.40

NOTE

- In the case that the piping length from the Multi-Kit at the first branch to the terminal indoor unit is over 40m, the size of the main piping should be increased by one size with reducers (field-supplied). Refer to Piping Branch Restriction for details.
- Even if the equivalent refrigerant piping length is more than 100m, no need to increase the pipe size after first branch. If the Multi-Kit size is larger than the first branch, adjust the Multi-Kit size to the first branch. In case that the selected pipe size after the first branch is larger than the pipe size before the first branch, use the same pipe size as before the branch.

- ⑤ Pipe diameter between Multi-Kit and indoor unit

Indoor unit (HP)	Gas (∅)	Liquid (∅)
(0.4-1.5)	12.70	6.35 ^(*)
2.0	15.88	6.35 ^(*)
(2.5-6.0)	15.88	9.52
8.0	19.05	9.52
10.0	22.20	9.52
16.0	28.58	12.70
20.0	28.58	15.88

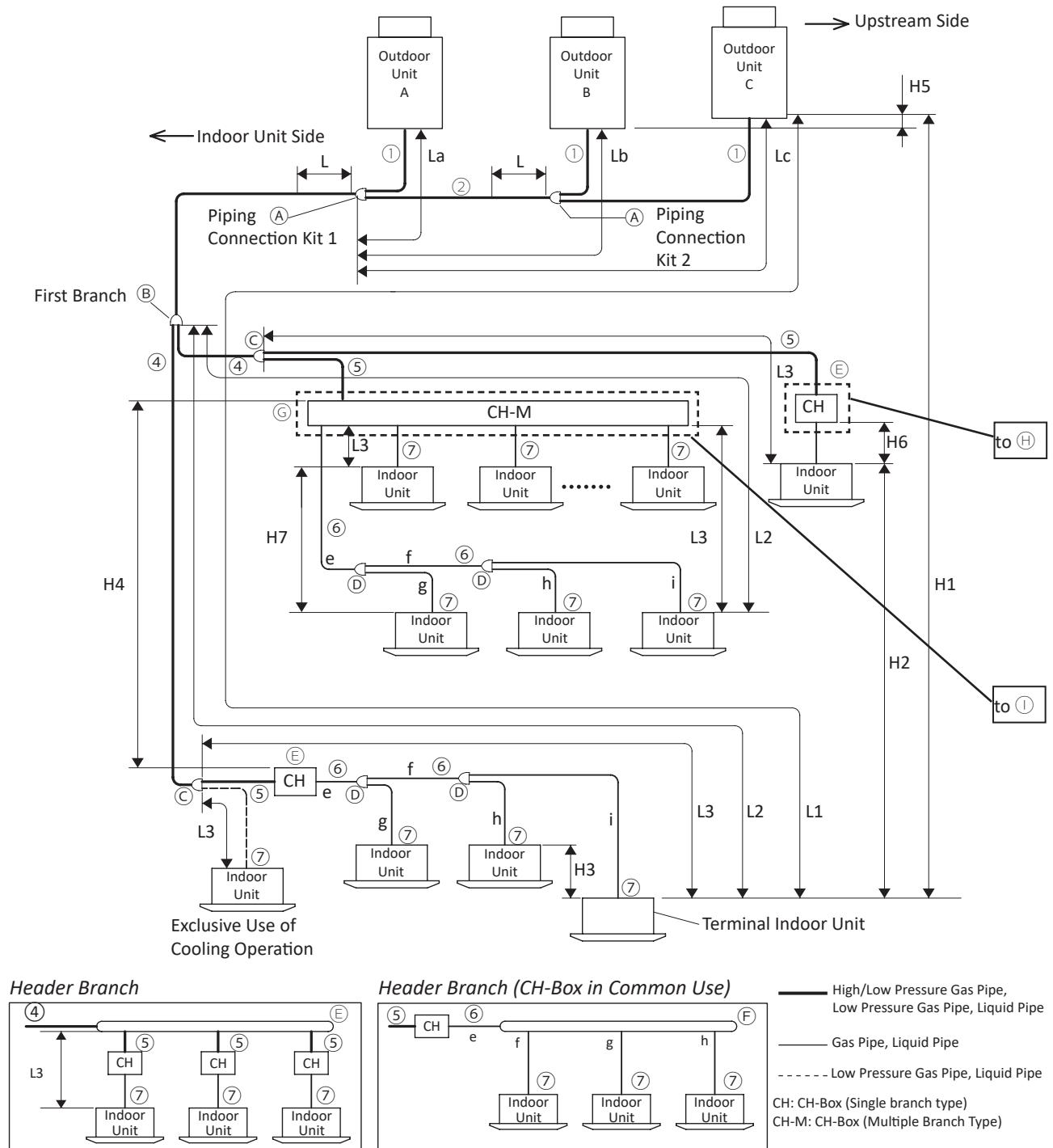
i NOTE

- *(*)*: When the liquid piping length is longer than 15m, use ∅9.52 pipe and reducer (field-supplied).
- The pipe diameter should be the same as the indoor unit piping connection size.
- Check the corresponding Indoor unit connection sizes.

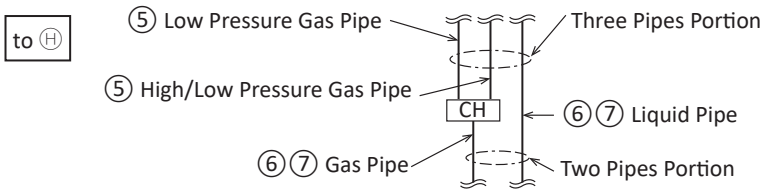
◆ For heat recovery systems (3 pipes)

For selecting the pipe sizes between the outdoor unit and the piping connection kit 1, between the piping connection kit 2 and for piping connection kit (A), refer to the print version of the manual.

Combination of 2 and 3 units

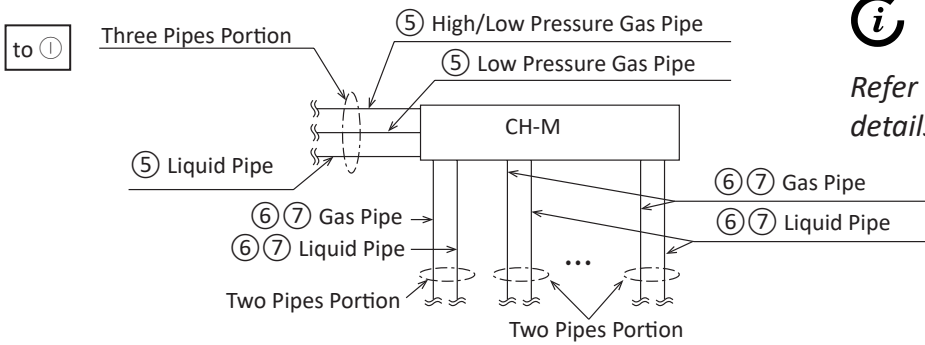


L: Keep the straight line distance of 500mm or more after the piping connection kit.



i NOTE

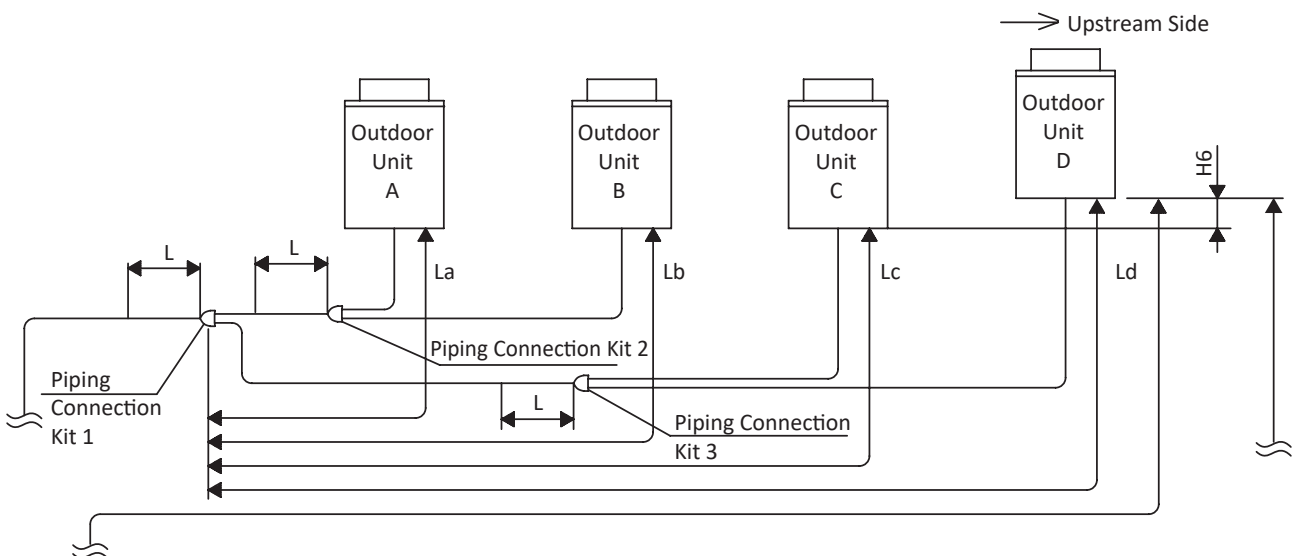
CH-Box (single branch type) is not connected to liquid pipe.



i NOTE

Refer to “E CH-Box” for details of branch number.

Combination of 4 units



L: Keep the straight line distance of 500mm or more after the piping connection kit.

PIPE SIZE SELECTION

3

PIPING WORK AND REFRIGERANT CHARGE

Item	Mark	Allowables Piping Length (m)
Total Piping Length	Total Liquid Piping Actual Length	≤1000
Maximum Piping Length	Actual Length	≤200
	Equivalent Length	≤225
Maximum Piping Length between Multi-kit of 1st Branch and Each Indoor Unit	L2	≤100
Maximum Piping Length between Each Multi-kit / CH-Box (Multiple Branch Type) and Each Indoor Unit	L3 ^{*3}	≤40
Total Piping Length between CH-Box and Each Indoor Unit	e+f+g+h+i	≤40
Piping Length between Piping Connection Kit 1 and Each Outdoor Unit	La, Lb, Lc, Ld	≤25
Height Difference between Outdoor Units and Indoor Units	OU is Higher	≤50 ^{*1}
	OU is Lower	≤40 ^{*2}
Height Difference between Indoor Units	H2	≤40 ^{*4}
Height Difference between Indoor Units using the Same Branch of CH-Box	H3	≤4
Height Difference between CH-Boxes	H4	≤40
Height Difference between Outdoor Units	H5	≤2.0
Height Difference between CH-Box and Indoor Units	H6	≤15

^{*1}: The maximum piping length of 110m is available on request. The following restrictions apply when the height difference between the outdoor units and the indoor units (the outdoor unit is higher) are 50m or more.

- The maximum outdoor temperature during cooling operation is 43°C.
- The height difference between the outdoor units and the indoor units must be 50m or less when the outdoor units are operated at an outside temperature of -10°C or less.
- The connectable indoor unit capacity ratio is ≤ 100%.
- To protect the system, the Thermo-OFF may be activated to turn the system off when the outside temperature is 38°C or more.
- Performance priority mode is disabled.

^{*2}: The maximum piping length of 110m is available on request. The following restrictions apply when the height difference between the outdoor units and the indoor units (the outdoor unit is lower) are 40m or more.

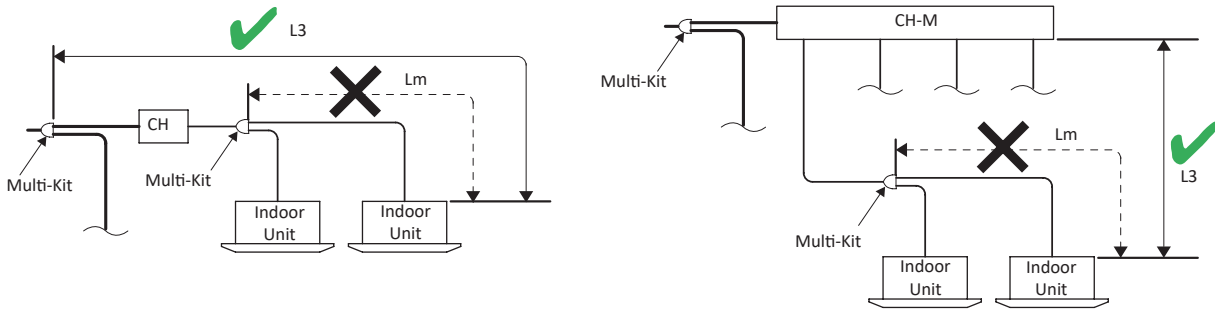
- The maximum outdoor temperature during cooling operation is 43°C.
- The minimum outdoor temperature during cooling operation is 10°C.
- The connectable indoor unit capacity ratio is ≤ 130%.

^{*3}: The piping length calculation is not included the Multi-Kit between CH-Box and Indoor Unit(s). (Lm in following examples are NOT L3.)

^{*4}: If the height difference between indoor units or the height difference between CH-Boxes exceed 15m, the liquid lines after the Multi-kit of first branch should be selected according to Height Difference between Indoor Units Restriction.

⚠ CAUTION

Header branch cannot be connected to upstream or downstream piping of CH-Box multiple.



Ⓑ First branch

Outdoor unit HP	Model
5	E-52XN3
6-10	E-102XN3
12-16	E-162XN3
18/20	E-202XN3
22/24	E-242XN3
26-54	E-322XN3

Ⓒ Multi-Kit after first branch (3 pipes section)

Total indoor unit HP	Model
<6	E-52XN3
6-11.99	E-102XN3
12-17.99	E-162XN3
18-21.99	E-202XN3
22-25.99	E-242XN3
≥ 26	E-322XN3

Ⓓ Multi-Kit after first CH-Box or cooling only section (2 pipes section)

Total indoor unit HP	Model
<12	E-102SN4
12-17.99	E-162SN4
18-25.99	E-242SN3
≥ 26	E-302SN3

Ⓔ Header branch for 3 pipes section

Total indoor unit HP	Number of header branches	Model
5-10	8	MH-108XN

⑥ Header branch for 2 pipes section

Total indoor unit HP	Number of header branches	Model
5-8	4	MH-84AN1
5-10	8	MH-108AN

③ Diameter of the main pipe (from the base of the unit or connection kit 1 to the first branch)

Outdoor unit (HP)	Gas, low pressure (∅)	Gas, high/low pressure (∅)	Liquid (∅)
5	15.88	12.70	9.52
(6/8)	19.05	15.88	9.52
10	22.20	19.05	9.52
(12/14)	25.40	22.20	12.70
16	28.58	22.20	12.70
(18/20)	28.58	22.20	15.88
(22/24)	28.58	25.40	15.88
26	31.75	25.40	19.05
(28-34)	31.75	28.58	19.05
36	38.10	28.58	19.05
(38-54)	38.10	31.75	19.05

i NOTE

When the maximum length of the equivalent refrigerant pipe from the piping connection kit 1 to the indoor unit is over 100m, the pipe size of liquid line from the piping connection kit 1 to first branch should be increased by one size with reducers (field-supplied).

④ Pipe diameter after first branch or between Multi-Kits in the main branch (3 pipes section)

⑤ Pipe diameter between the Multi-Kit and the CH-Box

Total indoor unit (HP)	Gas, low pressure (∅)	Gas, high/low pressure (∅)	Liquid (∅)
<6	15.88	12.70	9.52
(6/8.99)	19.05	15.88	9.52
(9-11.99)	22.20	19.05	9.52
(12/15.99)	25.40	22.20	12.70
(16-17.99)	28.58	22.20	12.70
(18/21.99)	28.58	22.20	15.88
(22/25.99)	28.58	25.40	15.88
(26-35.99)	31.75	28.58	19.05
≥ 36	38.10	31.75	19.05

i NOTE

Even if the equivalent refrigerant piping length is more than 100m, no need to increase the pipe size after first branch. If the multi-kit size is larger than the first branch, adjust the multi-kit size to the first branch. In case that the selected pipe size after the first branch is larger than the pipe size before the first branch, use the same pipe size as before the branch.

⑥ Pipe diameter for 2 pipes and Multi-Kit

Total indoor unit (HP)	Gas (∅)	Liquid (∅)
<6	15.88	9.52
(6/8.99)	19.05	9.52
(9-11.99)	22.20	9.52
(12/15.99)	25.40	12.70
(16-17.99)	28.58	12.70
(18/25.99)	28.58	15.88

⑦ Pipe diameter between Multi-Kit and indoor unit

Indoor unit (HP)	Gas (∅)	Liquid (∅)
(0.8/1.5)	12.70	6.35 ^(*)
2.0	12.70 / 15.88	6.35 ^(*)
(2.5-6.0)	15.88	9.52
8.0	19.05	9.52
10.0	22.20	9.52
16.0	28.58	12.70
20.0	28.58	15.88

(*): When the liquid piping length is longer than 15m, use ∅9.52 pipe and reducer (field-supplied).

The pipe diameter should be the same as the indoor unit piping connection size.

Check the corresponding Indoor unit connection sizes.

⑧ CH-Box

Type	CH-Box Model	Branch	Number of connectable indoor unit per branch ^{*4}	Available combination of indoor unit capacity (HP)	
				per CH-Box	per Branch
Single ^{*3}	CH-AP160SSX	1	1 - 7 ^{*1}	6.0	≤6.0
	CH-AP280SSX	1	1 - 8 ^{*1}	10.0	≤10.0
Multiple	CH-AP04MSSX	4	1 - 6 ^{*2}	16.0	≤6.0 / 1x8.0HP / 1x10.0HP
	CH-AP08MSSX	8	1 - 6 ^{*2}	30.0	≤6.0 / 1x8.0HP / 1x10.0HP
	CH-AP12MSSX	12	1 - 6 ^{*2}	30.0	≤6.0 / 1x8.0HP / 1x10.0HP
	CH-AP16MSSX	16	1 - 6 ^{*2}	30.0	≤6.0 / 1x8.0HP / 1x10.0HP

^{*1}: When multiple indoor units are connected to the same CH-Box, they are controlled with the same operation mode.

^{*2}: The indoor units connected to the same branch of the CH-Box are controlled with the same operation mode.

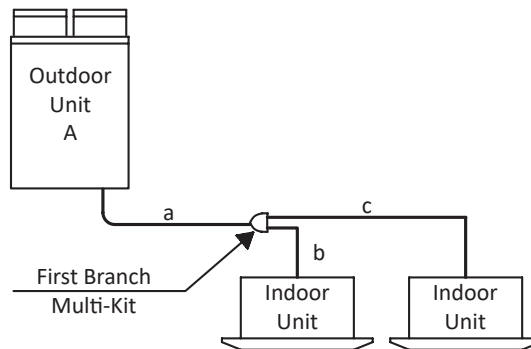
^{*3}: The liquid pipe is not required to connect to the CH-Box.

^{*4}: In case that the number of connectable indoor unit exceeds four, the high/low pressure gas pipe, gas pipe and liquid pipe need to increase one size respectively.

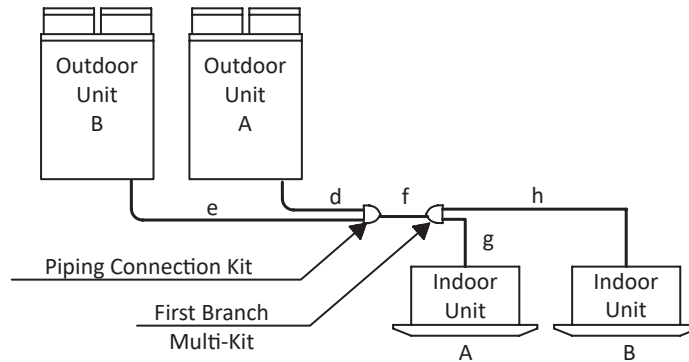
3.2.2 Examples

Term	Symbol	Description
Total Piping Length	Example 1 $a+b+c$	Total length of all liquid pipes (sum)
	Example 2 $d+e+f+g+h$	
Maximum Piping Length	Example 1 $a+c$	Actual length of the liquid pipe from outdoor unit stop valve or piping connecting kit to the terminal unit.
	Example 2 $f+h$	
Piping Length	-	Actual length of liquid pipe out of consideration of local resistance, such as bent or elbow.
Equivalent Length	-	This length is obtained by converting local resistance, such as bent or elbow, to straight pipe length.

◆ Example 1: Line branch (including main pipe branch)



◆ Example 2: Using piping connection kit



3.3 Pipe connection

3.3.1 Three principles on work with refrigerant pipes

The basic refrigerant pipe installation work must be carried out paying particular attention to avoid the infiltration of humidity or dust while working with the refrigerant piping. Otherwise, rust may appear inside the system or the units and cause serious faults.

Therefore, all work carried out on the copper pipes for refrigerant must follow the three principles described below:

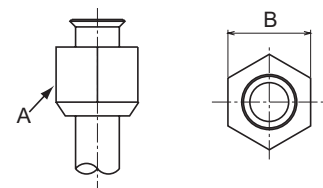
Principle	Cause of the fault	Possible fault	Preventive measure
Absence of humidity	Water infiltration due to insufficient protection on the ends of the pipes.	Ice on the inside of the pipe, on the expansion valve (water obstruction)	Seal the ends of the pipes. Protect and insulate the ends of the pipes.
	Condensation on the inside of the pipes.	Absorption of oil humidity and oxidation	↓ Wash
	Insufficient vacuum.	↓ Filter clogging, insulation and compressor fault	↓ Vacuum dry (*)
Cleaning	Dust or other elements entering the ends of the pipes.	Expansion valve, capillary tube and filter clogging, oil oxidation	Fit caps to the ends of the pipes. Protect and insulate the ends of the pipes.
	Film of rust formed during brazing without nitrogen injection.	↓ Compressor fault, insufficient cooling or heating	↓ Wash
	Insufficient nitrogen wash after brazing.		
Absence of leaks	Brazing fault.	Lack of refrigerant, drop in performance, compressor fault, oil oxidation	Carry out basic brazing → flaring → connection work carefully
	Flaring fault and insufficient torque.	↓ Compressor overheating	↓ Airtight test
	Insufficient torque on compressor connectors.		↓ Preserving of vacuum

(*) One gram of water becomes approximately 1000 l of steam at 1 Torr. (1 Torr = 1mmHg = 133.32 Pa). Therefore, a long time must be spent on vacuum work using a small pump.

3.3.2 Selection of the connection with flare fitting

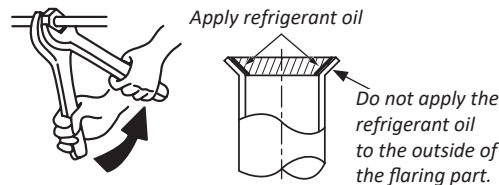
If it is not possible to perform the widening operation, use a connection with flare fitting.

Distance between sides -B- of the nut -A-	
Diameters (mm)	-B- (mm)
Ø6.35	17
Ø9.52	22
Ø12.7	26
Ø15.88	29
Ø19.05	36



Check that there are no scratches, adhered grinding swarf, deformation or surface unevenness at the flaring part.

Before tightening the flare nut, apply the refrigerant oil (field-supplied) of the same type and brand that the compressor installed in the outdoor unit is using in thin layer over the flaring part. Do not apply the oil on other portions. Tighten the flare nut for the liquid pipe to the specified torque with two spanners. Then, tighten the flare nut for the gas pipe in the same way. After tightening work, check that there is no refrigerant leakage.



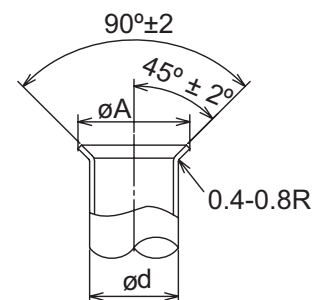
⚠ CAUTION

For units with air panel be careful that the refrigerant oil does not contact the air panel because it may cause a crack.

3.3.3 Dimensions of flared pipe

Perform the widening operations in accordance with the measurements shown below.

Diameters (mm)	$A^{+0}_{-0.4}$ (mm)
∅6.35	9.1
∅9.52	13.2
∅12.7	16.6
∅15.88	19.7
∅19.05	- ⁽¹⁾



⁽¹⁾ Not possible to perform the widening using pipe. In this case, use a connection with flare fitting.

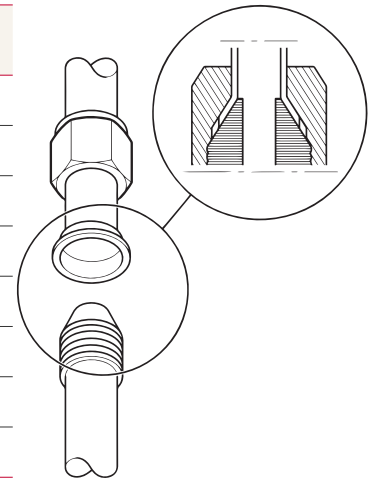
3.3.4 Flared connection mounting

Apply a thin layer of oil to the cone opening for refrigeration systems. Line up the end of the flared pipe to face the fitting to which it is to be threaded.

Gently rest the female cone on the male cone and check that the measurement is correct. Keep the connection lined up with one hand and gently thread on the flare nut with the other.

Tighten the connection to the corresponding tightening torque indicated in the table below.

Nominal diameter		Tightening torque
mm	Inches	
Ø6.35	1/4	20 N·m
Ø9.52	3/8	40 N·m
Ø12.7	1/2	60 N·m
Ø15.88	5/8	80 N·m
Ø19.05	3/4	100 N·m
Ø22.2	7/8	-
Ø25.4	1	-
Ø28.6	1-1/8	-



⚠ CAUTION

- Secure the fixed connection with a suitable wrench and use a torque wrench to tighten the flare nut on the threaded connections.
- Do not exceed the torque value indicated in the table. The fitting can become misshapen and the connection may leak.

If temperature and humidity inside the ceiling exceed 27 °C/RH80%, dew condensation occurs on the surface of the accessory insulation. Wrap additional insulation (approx. 5~10 mm thickness) around the accessory insulation of the refrigerant pipe as a preventive measure.

For buried pipe with joints such as an elbow or a socket, provide service access doors to facilitate the check for connection.

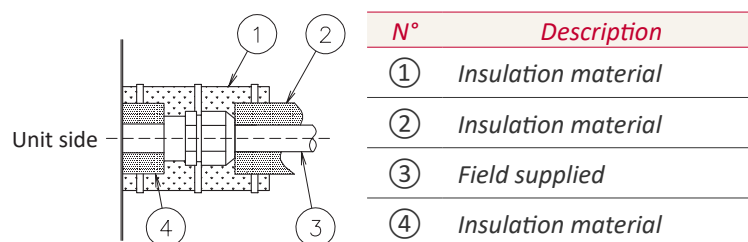
The pipes must be reinforced by an earthquake resistant support so that they will not be damaged by an external force.

Do not clamp the refrigerant pipe tightly when supporting them for prevention of heat stress.

When connecting indoor/outdoor units with refrigerant pipes, fix the pipes as required so that the pipes may not to contact weak portions of the wall, ceiling, etc. Failure to take this measure may lead to an abnormal sound caused by the vibration of the pipe.

Perform the air tight test according to Installation and Operation Manual of the outdoor unit.

After connecting the refrigerant piping, seal the open space between knockout hole and refrigerant pipes by using insulation material.



NOTE

- Where polyethylene foam insulation is used, a 10mm thick layer should be used for the liquid pipe and between 15 and 20 mm for the gas pipe.
- Install the insulation after the pipe surface temperature has dropped to the same temperature as that of the room, otherwise the insulation may melt.

Do not use insulating material that contains NH₃ (ammonium), as it could damage the copper in the pipe and subsequently cause leaks.

Where the fitter has supplied his own branches, these should be appropriately insulated to avoid decreases in capacity in line with environmental conditions and dew on the surface of the piping due to low pressure.

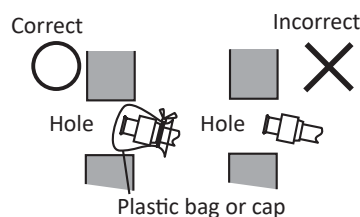
3.3.5 Preparing copper refrigeration pipes

Clean the area where the copper refrigeration pipe preparation work is to be carried out. It must particularly be free of waste, soil, wood or metal shavings and, in general, any substance that could enter the ends of the pipe during handling. The copper pipe must be clean and have no remains of adhesive, cement, dust or other substances adhered to it.

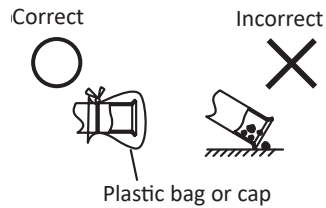
CAUTION

- Before you install the pipes, blow the inside with oxygen-free nitrogen gas to eliminate any remains of dust or other substances.
- Use nitrogen gas for blowing during pipe brazing work. Otherwise a lot of oxidation film will occur inside of tubes. This film will be flecked off after operation and will circulate in the cycle, resulting in clogged expansion valves, bad influence to the compressor, etc.
- Cap the end of the pipe when pipe is to be inserted through a hole or while other installation work is being carried out, do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.
- If piping installation is not completed until next day or over a longer period of time, braze off the ends of the piping and charge with oxygen free nitrogen through a Schrader valve type access fitting to prevent moisture and particle contamination.

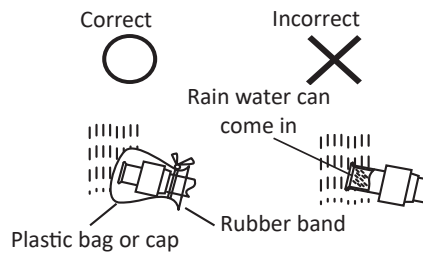
In case of getting the pipe through a hole in the wall.



Do not place the pipe directly on the ground.



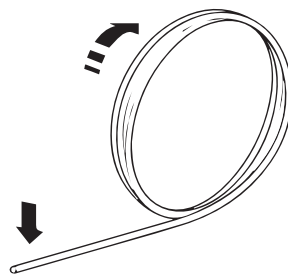
In case of rain.



Where the copper pipe is supplied in rolls, fit a cap on the end and unwind it while it is resting on the ground so that the turning movement of the roll as it is unwound forms a straight pipe.

i NOTE

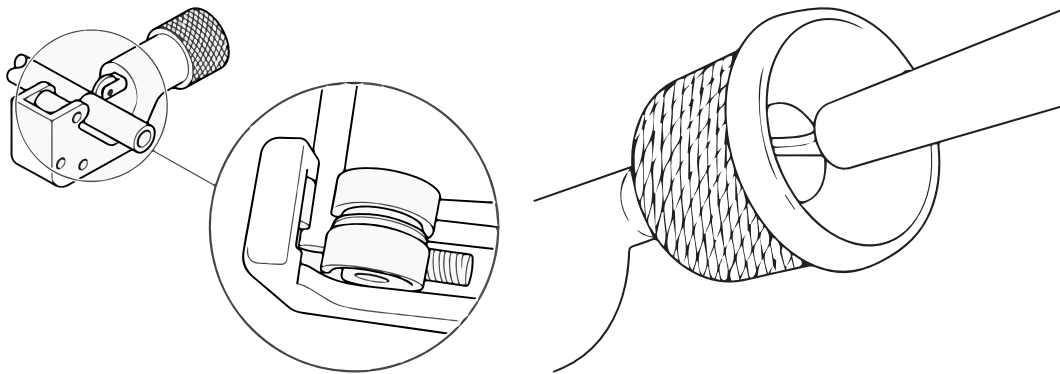
- The rolls of copper refrigeration pipe are normally supplied with caps on their ends.
- Where the roll of pipe does not come supplied with caps, check that the inside of the pipe is clean. If it is not, use a new roll of pipe.
- It is also possible to cover the end of the pipe temporarily using high quality adhesive tape.
- Do not wind and unwind the pipe continuously, as the properties of the copper for refrigeration pipes are altered, making it more rigid and brittle.



3.3.6 Cutting copper refrigeration pipes

Use a pipe cutter and define the necessary length of pipe and add a few more centimetres to give yourself enough margin in case the cut has to be repeated.

Remove any internal burrs arising from the pipe cutter using a pipe reamer. While making the cut, slant the pipe downwards to prevent burrs or shavings from falling inside the pipe.



⚠ CAUTION

- *Ensure the pipe cutter rollers remain perfectly seated on the copper pipe.*
- *Do not use hand saws, circular saws, abrasive grinders or other tools that generate shavings.*
- *Wear appropriate means of protection during cutting or brazing operations and installation (gloves, eye protection, etc).*
- *Strictly follow national or local regulations regarding occupational health and safety.*

3.3.7 Bending copper pipes

Where the refrigerant pipes are to be bent, always use a bending tool or a spring, both of a diameter that is adapted to the pipe to be bent. The bending radii must be as wide as possible so that the gas or liquid refrigerant flow is not altered and no circulation noise is generated during operation.

⚠ CAUTION

Never bend pipes with radii of less than 90°.

i NOTE

- *Bends in refrigerant pipes reduce system performance due to changes in the flow of gas and liquid refrigerant circulation.*
- *Do not use any other tool to bend pipes, as the pipe may be excessively bent or crushed and its inner diameter reduced.*

3.3.8 Brazing copper refrigerant pipes

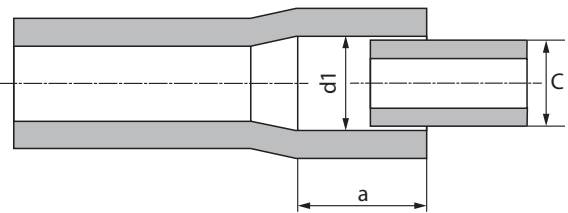
Brazing is the most important job in the installation of refrigeration pipes. In the event of an accidental leak due to negligence during the brazing process, the capillary tubes, expansion valves, etc., will be obstructed or the compressor seriously damaged.

To guarantee correct brazing between pipe surfaces, prepare them for widening according to the data in the following table.

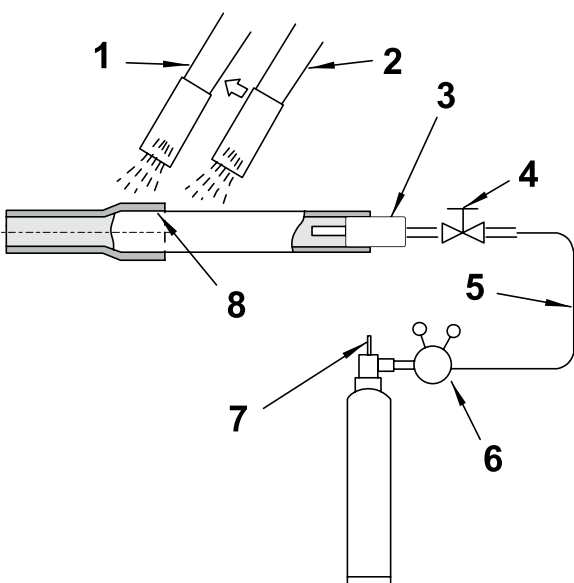
⚠ CAUTION

- It is important to check the pipe fitting measurement as indicated in the following table.
- If a tool is used to widen the copper pipe, the dimensions indicated must be respected.

Copper pipe size (C)	Ø d1	Tolerance between d1 and C	a (Unit: mm)
Ø6.35 ^{+0.08} / _{-0.08}	Ø6.5 ^{+0.1} / ₀	^{+0.33} / _{0.07}	6
Ø9.52 ^{+0.08} / _{-0.08}	Ø9.7 ^{+0.1} / ₀	^{+0.36} / _{0.10}	8
Ø12.7 ^{+0.08} / _{-0.08}	Ø12.9 ^{+0.1} / ₀	^{+0.38} / _{0.12}	8
Ø15.88 ^{+0.09} / _{-0.09}	Ø16.1 ^{+0.1} / ₀	^{+0.41} / _{0.13}	8
Ø19.05 ^{+0.09} / _{-0.09}	Ø19.3 ^{+0.1} / ₀	^{+0.44} / _{0.16}	10
Ø22.22 ^{+0.09} / _{-0.09}	Ø22.42 ^{+0.1} / ₀	^{+0.39} / _{0.11}	10
Ø25.4 ^{+0.12} / _{-0.12}	Ø25.6 ^{+0.1} / ₀	^{+0.42} / _{0.08}	12
Ø28.58 ^{+0.12} / _{-0.12}	Ø28.78 ^{+0.1} / ₀	^{+0.42} / _{0.08}	12
Ø31.75 ^{+0.12} / _{-0.12}	Ø32 ^{+0.1} / ₀	^{+0.47} / _{0.13}	12
Ø38.1 ^{+0.12} / _{-0.12}	Ø38.3 ^{+0.1} / ₀	^{+0.42} / _{0.08}	14



The necessary brazing must be done by brazing, using a copper and silver alloy. Before you start brazing, install a dry nitrogen gas injection system inside the pipes to prevent the copper from being exposed to the air while it is subjected to high temperatures.



1. Heat the outer pipe previously to ensure the filler metal flows more easily.
2. Heat the inner pipe evenly.
3. Rubber cap.
4. Valve with no packing.
5. High pressure pipe.
6. 0.03 to 0.05 MPa (0.3 to 0.5 kg/cm² G).
7. Reducer valve: only open the valve when gas is required.
8. Nitrogen gas flow, 0.05 m³/h or less.

⚠ CAUTION

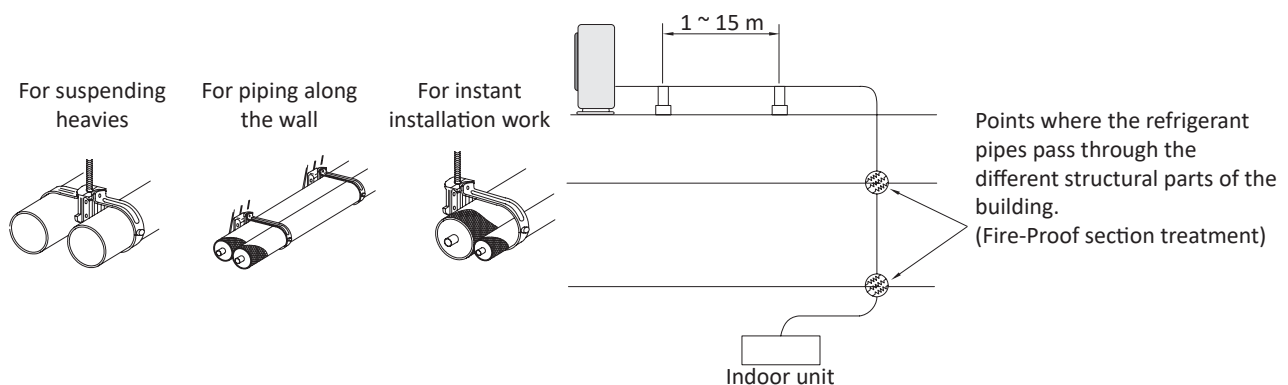
- Do not braze on refrigerant pipes without a dry nitrogen gas injection system. Otherwise, a layer of rust will form that may become detached when the refrigeration system is started, causing filter or compressor blockages.
- NEVER USE oxygen, acetylene or fluorocarbonated gas to replace nitrogen gas: this will cause an explosion or will generate toxic gas.
- Keep the nitrogen gas pressure within the indicated values. A rise in the pipe could cause an explosion.

3.4 Suspension of refrigerant piping

Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching the weak part of the building such as wall, ceiling, etc... (If touched, abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length).

Do not fix the refrigerant piping directly with the metal fittings. (The refrigerant piping may expand and contract).

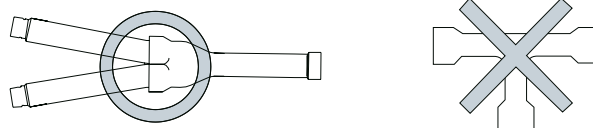
Some examples for suspension method are shown below.



3.4.1 Line branch and header branch installation

Install the distributor supplied by Hitachi on request.

A tee can not be installed instead of a branch pipe.



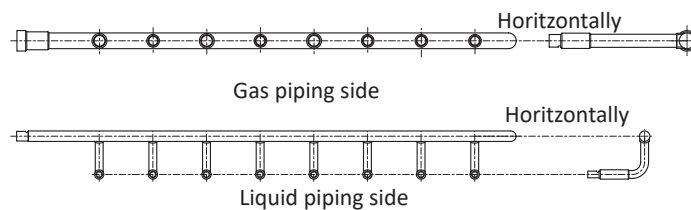
Fix the branch pipe horizontally to the pillar, wall or ceiling. Piping must not be fixed rigidly to the wall as thermal expansion and contraction can cause pipe fracture.

◆ Correct position of Line Branch E-SN/E-XN series

Horizontal	Vertical
<p>Locate the branch pipes on the same horizontal plane. (Inclination within 30°)</p> <p>Make the straight length a minimum of 0.5m after the vertical bend.</p>	<p>Straight length of the pipe connection on the outdoor unit side is made as follows:</p> <ul style="list-style-type: none"> - The collective pipe connection part is installed upward, the straight length must be minimum 0.5m. - The collective pipe connection part is installed downward, the straight length must be minimum 0.3m.

◆ Correct position of distributor MH series

Perform to install horizontally always (Example.: In case of model MH-108AN)



⚠ CAUTION

Seal the end of branch pipes which are not connected, by brazing factory supplied closing pipes.

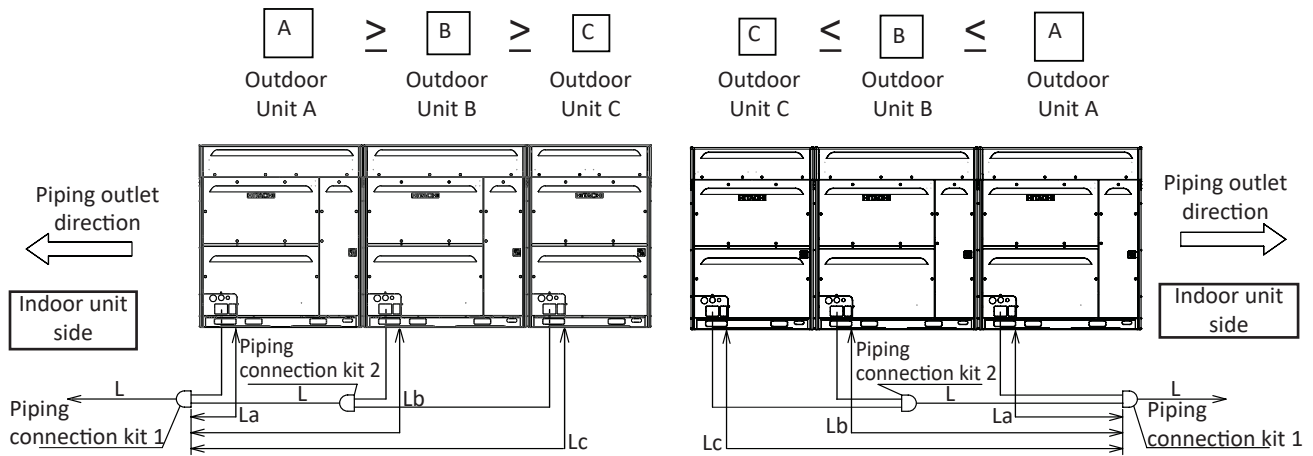
3.4.2 Precautions for the installation of the outdoor unit

When the installation and piping work for the multiple outdoor units is performed, it is required the arrangement for outdoor units and piping length. Perform securely the installation work according to the following restrictions. If the arrangement for outdoor units is incorrect, it may cause flowback of the refrigerant and result in failure of outdoor unit.

◆ Restrictions for 2 and 3 unit combination

- 1 For 2 and 3 outdoor units combination, align the outdoor units from largest capacity to smallest as $A > B > C$ and outdoor unit "A" should be connected to the piping connection kit 1.
- 2 The piping length between the piping connection kit 1 and the outdoor unit should be $L_a < L_b < L_c < 25m$.

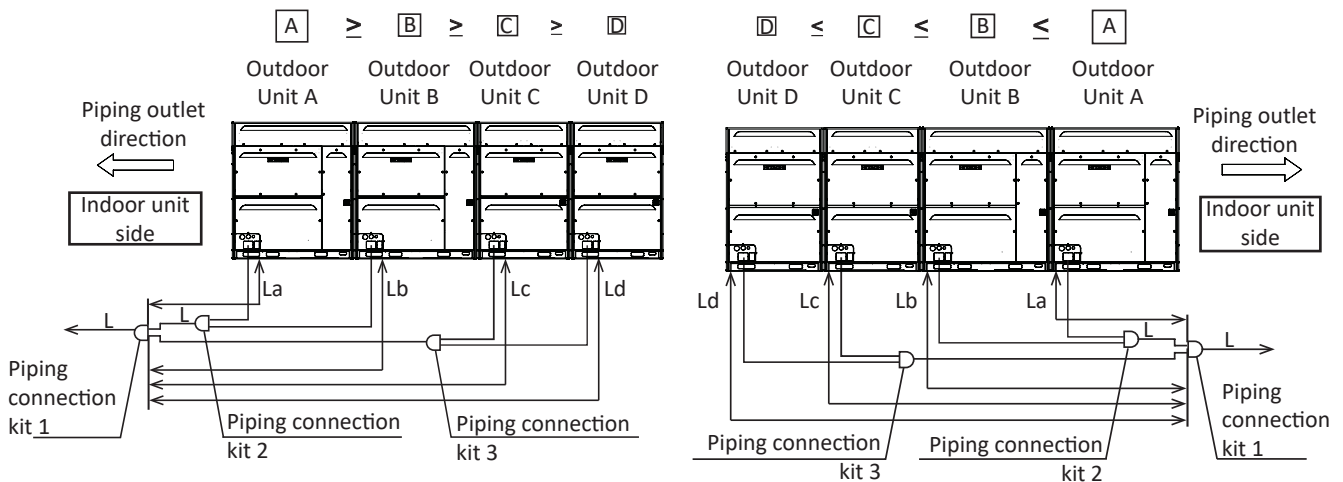
- For maintenance, attach "Main unit label" to the service cover (back side surface) of the outdoor unit "A".



L: Keep the straight-line distance of 500mm or more for piping after the piping connection kit.

◆ Restrictions for 4 unit combination

- For 4 outdoor unit combination, align the outdoor units from largest capacity to smallest as $A > B > C > D$. The outdoor units "A" and "B" should be connected to the piping connection kit 2 and the outdoor unit "C" and "D" should be connected to the piping connection kit 3.
- The piping length between the piping connection kit 1 and each outdoor unit should be $L_a < L_b < L_c < L_d < 25m$.
- For maintenance, attach "Main unit label" to the service cover (back side surface) of the outdoor unit "A".



L: Keep the straight-line distance of 500mm or more for piping after the piping connection kit.

◆ Refrigerant pipe installation between outdoor units

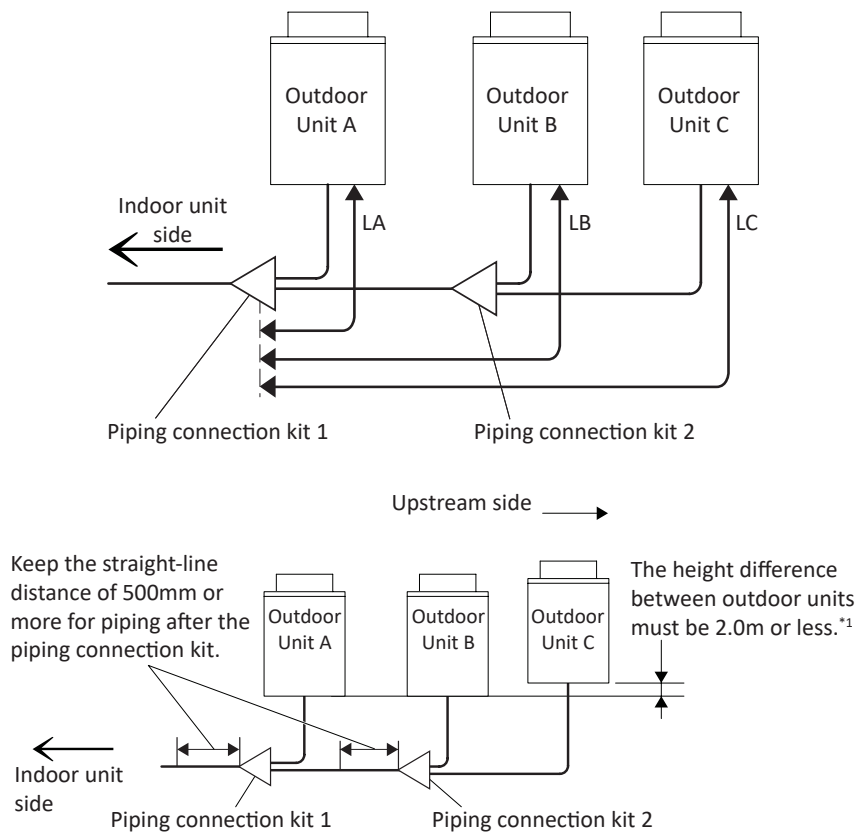
For refrigerant piping work, the optional piping connection kit is required to branch the pipe between outdoor units.

The arrangement for outdoor units should be determined depending on the piping direction when the refrigerant piping work and installation work are planned. When the outdoor unit is installed, perform the installation work according to the following restrictions.

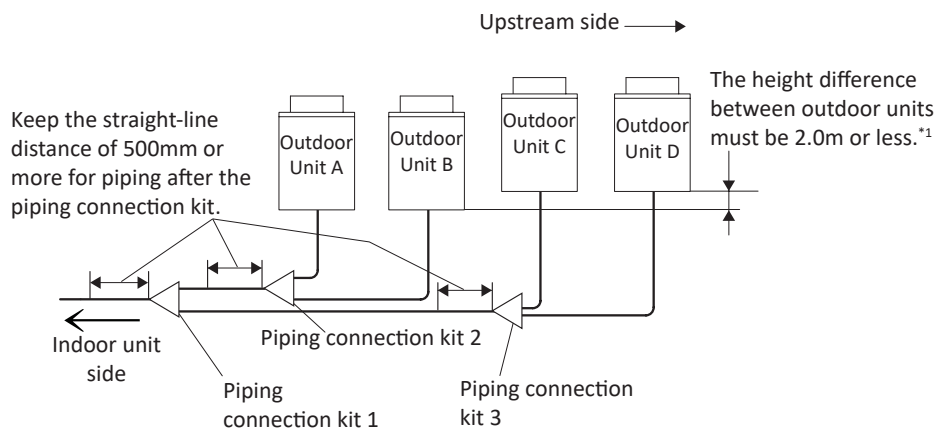
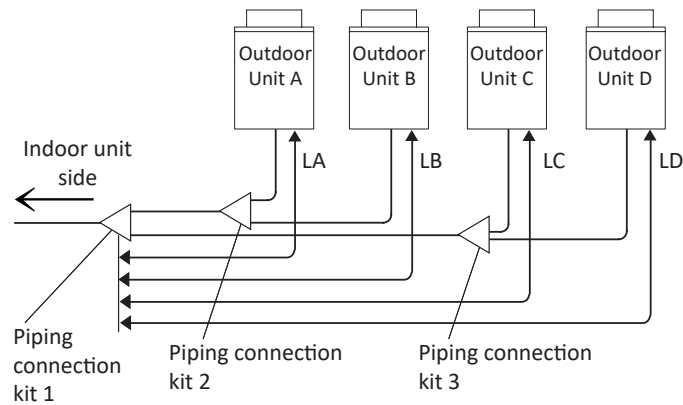
1 Piping length between piping connection kit 1 and each outdoor unit should be:

- ✓ $LA < LB < LC < 25\text{m}$
- ✓ $LD - LA \leq 10\text{m}$
- ✓ $LC - LA \leq 10\text{m}$

Keep the straight-line distance of 500mm or more for piping after the piping connection kit 1.

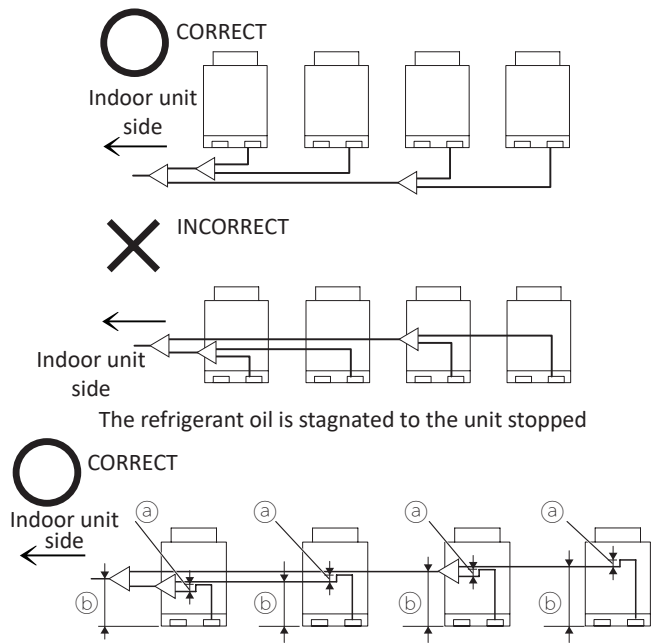
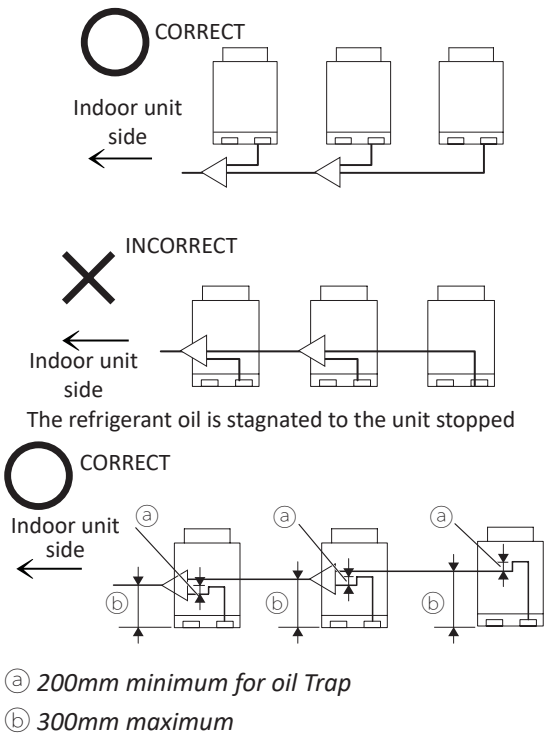


*1: If it exceeds 100mm, follow step 7.



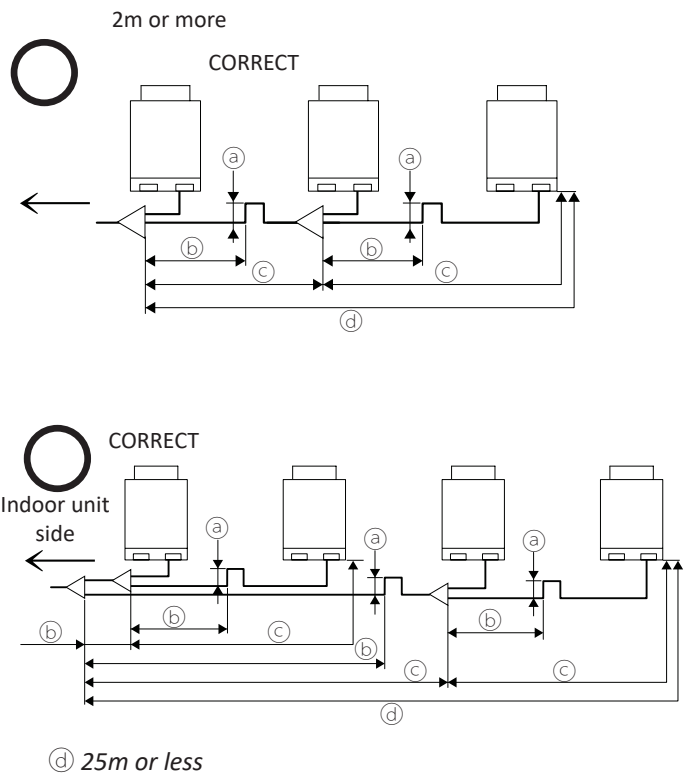
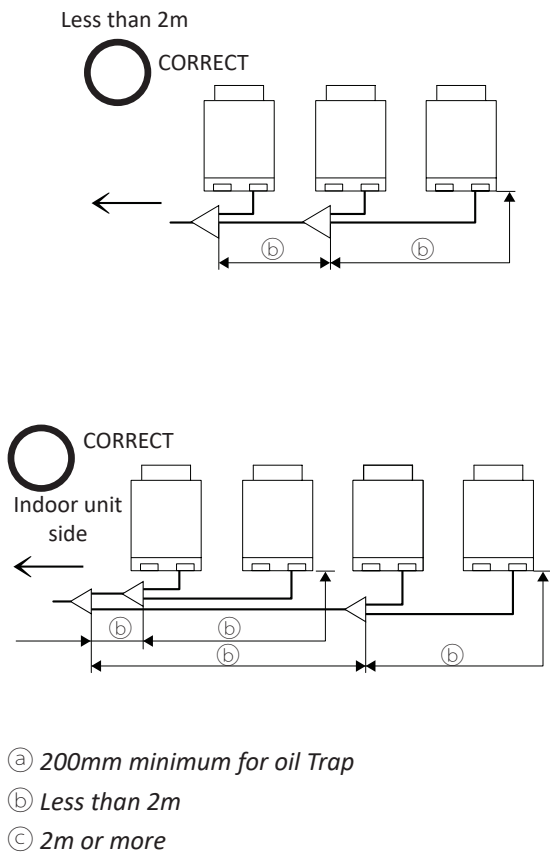
*1: If it exceeds 100mm, follow step 7.

- 2 Place the piping connection kit lower than the outdoor unit piping connection. In case that the piping connection kit is placed higher than the outdoor unit piping connection, keep 300mm (maximum) between the piping connection kit and the bottom of the outdoor unit. Also, provide the oil trap (minimum 200mm) between the piping connection kit and the outdoor unit.

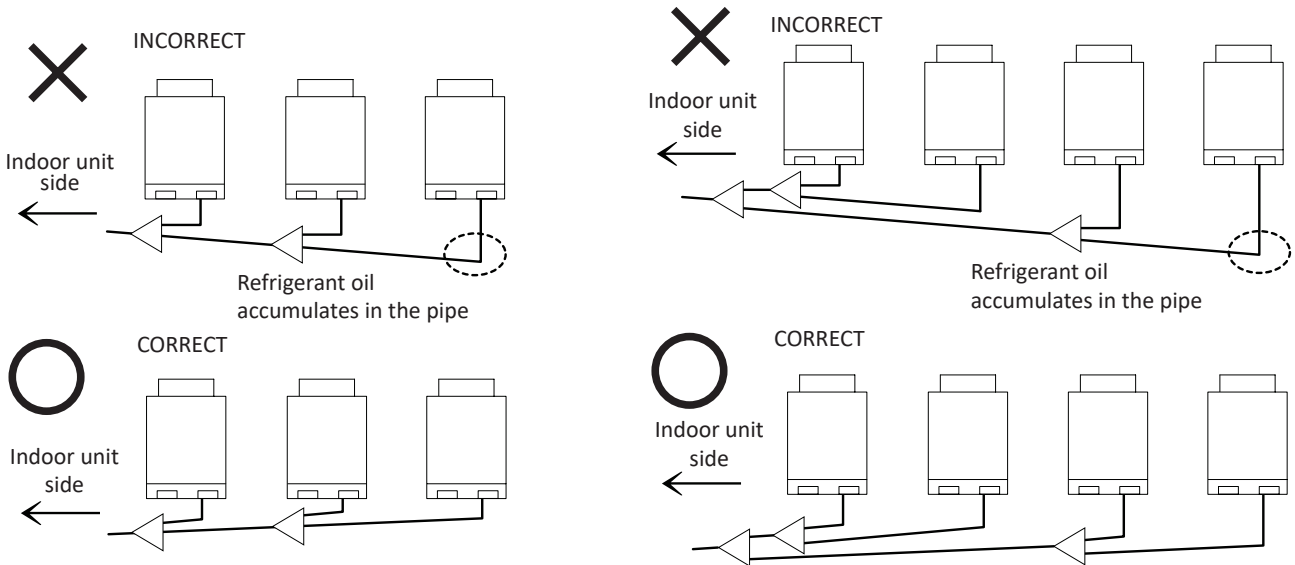


The refrigerant oil stagnates in the stopped outdoor unit during system operation.

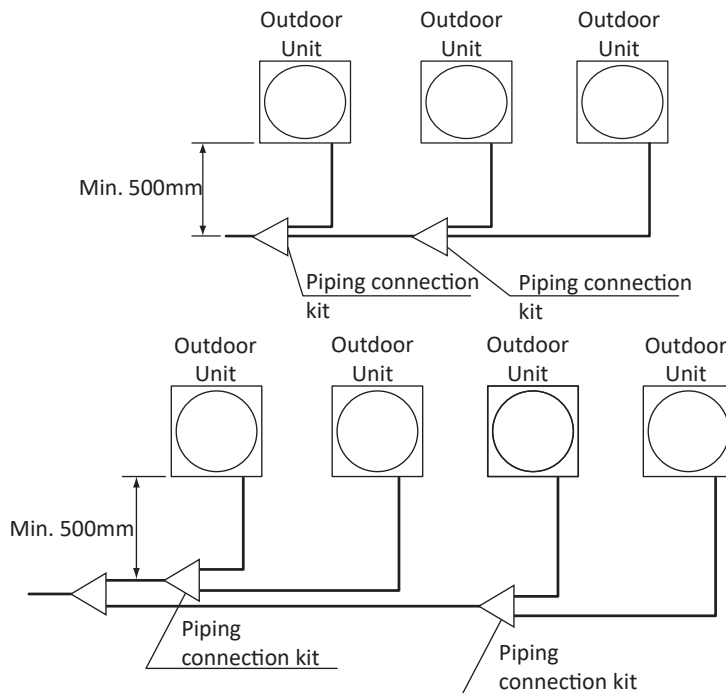
3 Install an oil trap for the gas piping when the piping length between the piping connection kits, or the outdoor unit and the piping connection kit is 2m or more to prevent any accumulation of refrigerant oil.



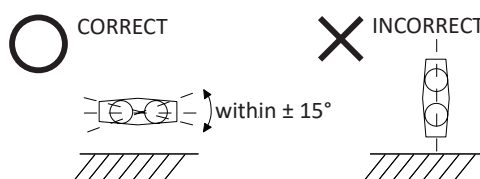
- 4 Place the outdoor unit pipe horizontally or with the pipe slanted downward towards the indoor unit side so that accumulation of refrigerant oil may not occur in the pipe.



- 5 For servicing, in case that the pipe is placed forward of the outdoor unit, secure minimum 500mm between the outdoor unit and piping connection kits. (When the compressor is replaced, a space of minimum 500mm is required.)



- 6 Place the piping connection kit parallel to the ground (the slope must be within $\pm 15^\circ$) as shown in the figure.

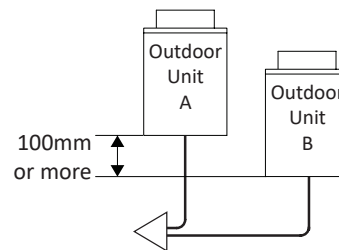
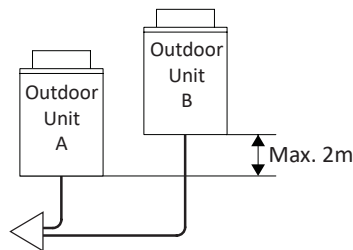


i NOTE

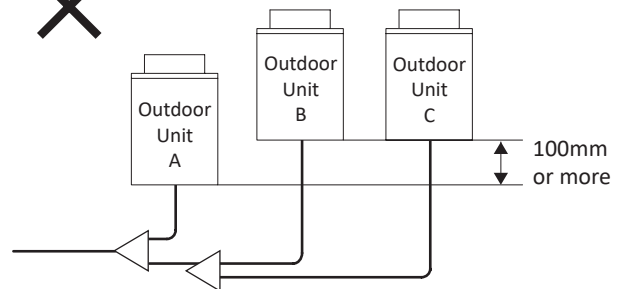
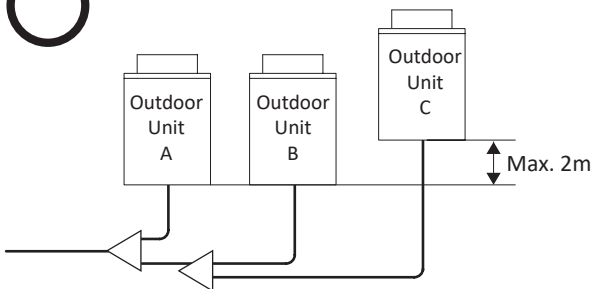
The refrigerant system may be damaged if the slope of the piping connection kit exceeds +15°.

7 When the height difference between the outdoor units exceeds 100mm, there are restrictions depending on the number of connected outdoor units. Incorrect positioning of the outdoor units may cause failure of outdoor units due to flowing back of the refrigerant.

- a. Two outdoor unit combination.
Outdoor unit A must be lower than outdoor unit B.



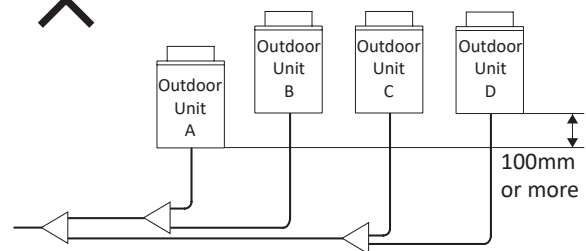
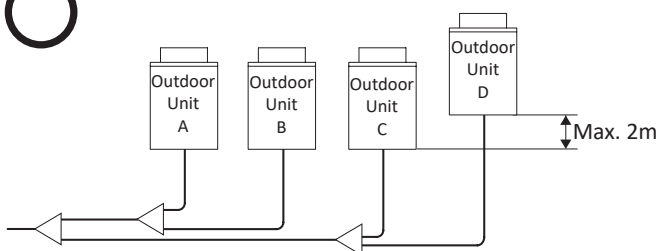
- b. Three outdoor unit combination.
Two outdoor units must be lower than the third outdoor unit.



i NOTE

The example shows Outdoor Units A and B are lower than Outdoor Unit C.

- c. Four outdoor unit combination.
Three outdoor units must be lower than the fourth outdoor unit.



i NOTE

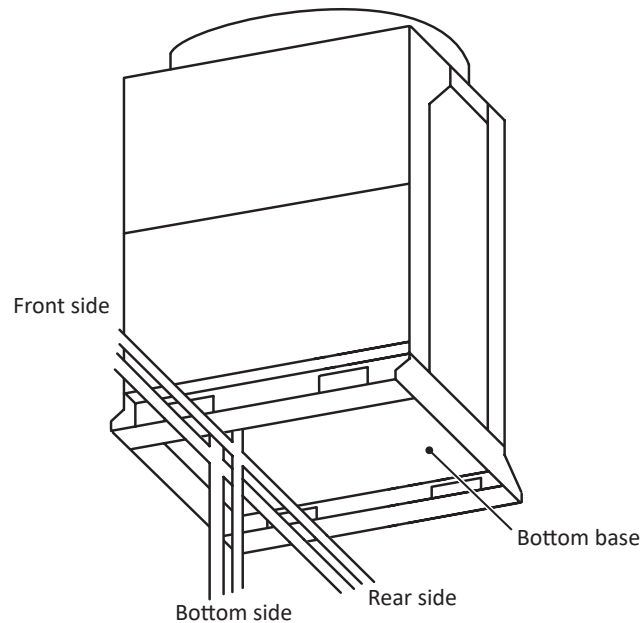
The example shows Outdoor Units A, B and C are lower than Outdoor Unit D.

3.4.3 Piping direction

Fix the pipes adequately in order to avoid vibration and excessive force to the valve.

- 1 The pipes can be installed in four directions (front, rear, right or bottom side) from the bottom base.

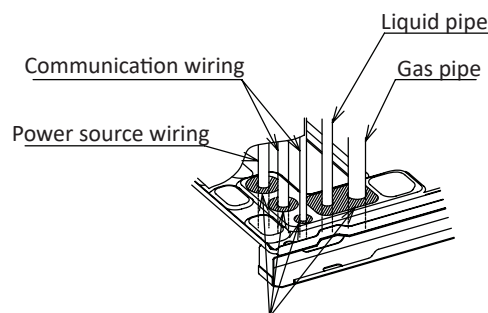
For vibration protection, properly fix the piping connection and check that no excessive force is applied to the stop valve.



- a. Operation of the stop valve should be performed according to the specified in this manual.
- b. Connect the pipes according to the tables.
- c. Completely seal the penetration part at the bottom of the pipes with insulation in order to prevent rain water from entering the conduit.

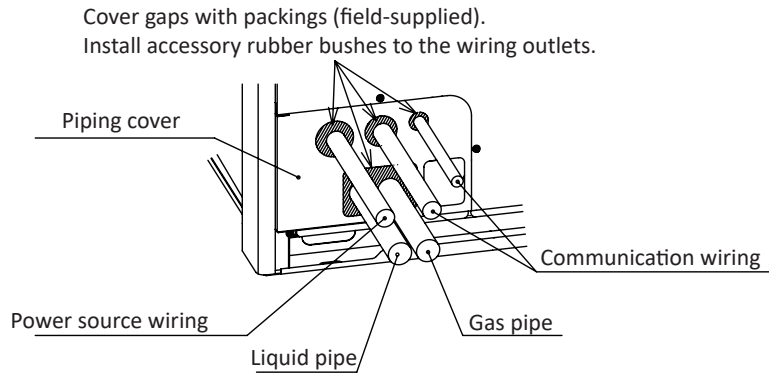
◆ Heat pump

- For piping from bottom base



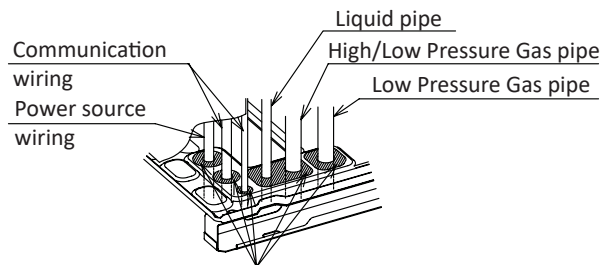
Cover gaps with packings (field-supplied).
Install accessory rubber bushes to the wiring outlets.

- For piping from front or rear side piping cover



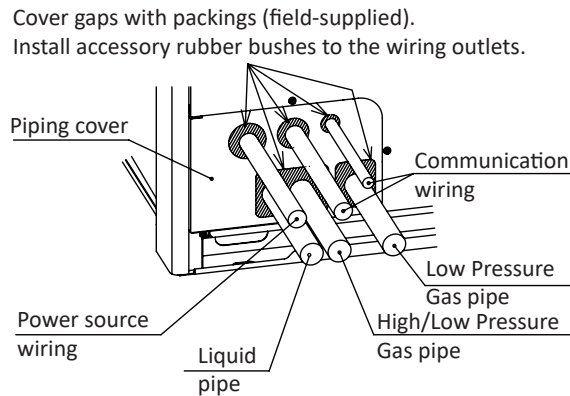
◆ Heat recovery

- For piping from bottom base



Cover gaps with packings (field-supplied).
Install accessory rubber bushes to the wiring outlets.

- For piping from front or rear side piping cover



i NOTE

After removing the pipes and completing insulation work, cover the gap between the pipe cover and the pipes with packing (field-supplied). If the gap is not covered, the unit may be damaged if snow, rain water or animals enter the unit.

3.4.4 Piping connection

After connecting the pipes, remove the caps of stop valves for gas and liquid.

Tighten the open-close spindle in the closing direction according to the following tightening torque.

- 1 Make sure that the stop valves are closed.
- 2 Fill pipes with nitrogen gas before brazing.
- 3 Protect the compressor and sound-proof cover with a metal plate when brazing the gas pipe.

CAUTION

Pay attention to the flame of the burner does not burn the stop valve body.

- 4 Connect the indoor unit and outdoor units with refrigerant piping. Fix the pipes and take special care no to contact with weak portions such as wall, ceiling, etc. Otherwise, abnormal sound may be heard due to vibration of the piping.

NOTE

Where pipes are buried in situ with joints such as elbows or sockets, provide a service access door to facilitate checking of the connecting part.

- 5 As for the flaring work of the field pipe, use the specified tightening torque.
- 6 Insulate the gas pipe and liquid pipe completely.
- 7 Mount the pipe cover equipped with the outdoor unit after connecting the pipes. Otherwise, the unit may be damaged due to snow or rainwater entering the pipes.

Pipe size \varnothing (mm)	Tightening Torque (N·m)
6.35	14 to 18
9.52	34 to 42
12.7	49 to 61
15.88	68 to 82
19.05	100 to 120

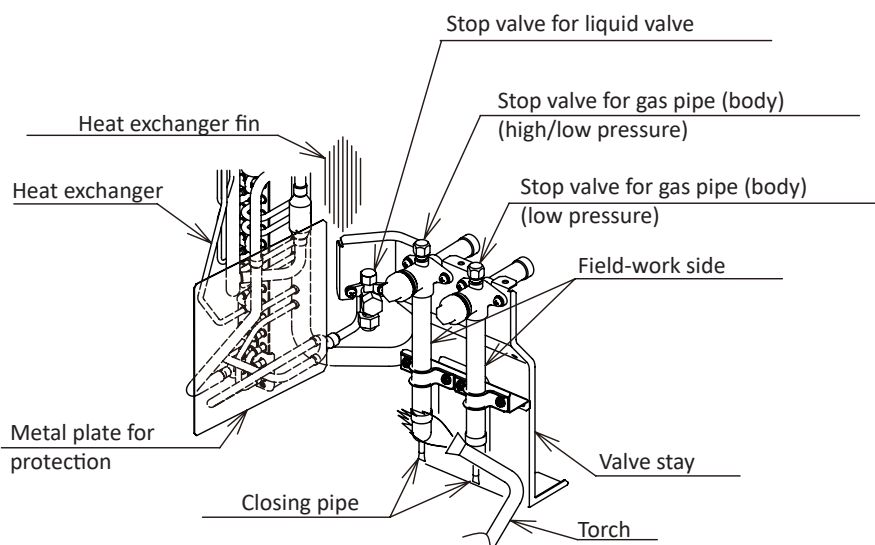
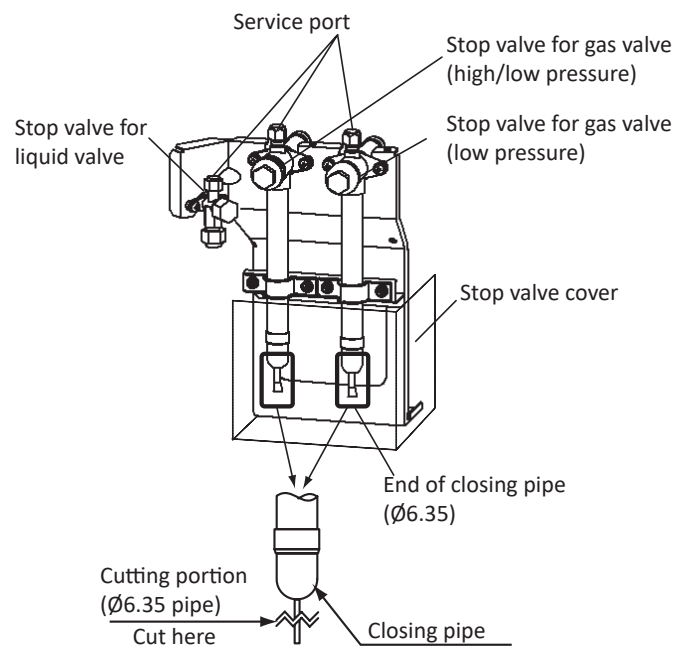
3.4.5 Stop valve

Follow the restrictions for refrigerant piping (permissible length, height difference). If not, the outdoor unit may be damaged or fail.

The stop valves shall be closed completely (factory setting) when the refrigerant piping connection is performed. Do not open the stop valves until all the refrigerant piping connections, air-tight test and vacuuming have been completed.

◆ Gas valve

- 1 Make sure that all the spindles are closed completely.
- 2 Connect the charging hose to the service port and release the gas inside the piping from the high/low and low pressure gas pipes.
- 3 Cut the end of the closing pipes and check that no gas exists inside the high/low and low pressure gas pipes.
- 4 Remove the stop valve cover.
- 5 Remove the closing pipe from the brazing portion with a burner. Pay attention to the flame from the burner not to burn the stop valve body.



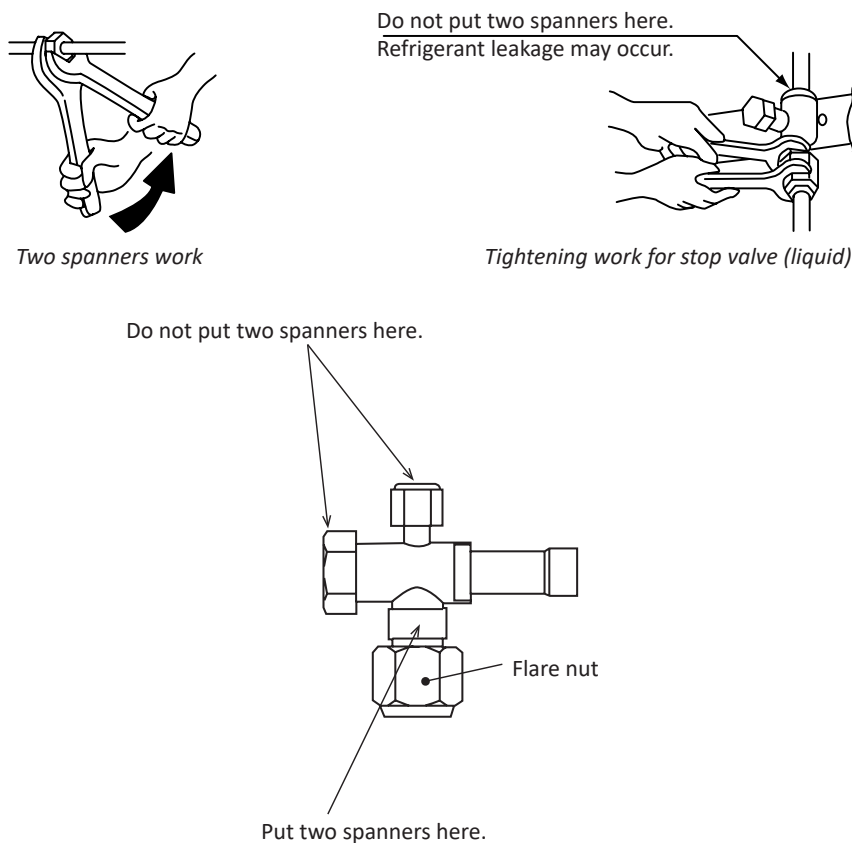
⚠ CAUTION

- Ensure that there is no gas inside the pipe when removing the closing pipe. Otherwise, the pipe may be blown out and it may lead to injury.
- Protect the return oil pipe and vibration proof of the compressor with a metal plate when using a burner.

◆ Liquid valve

Tighten the flare nut for liquid stop valve according to the following torque. If an excessive force is applied to the flare nut, the refrigerant leakage may occur from the spindle part.

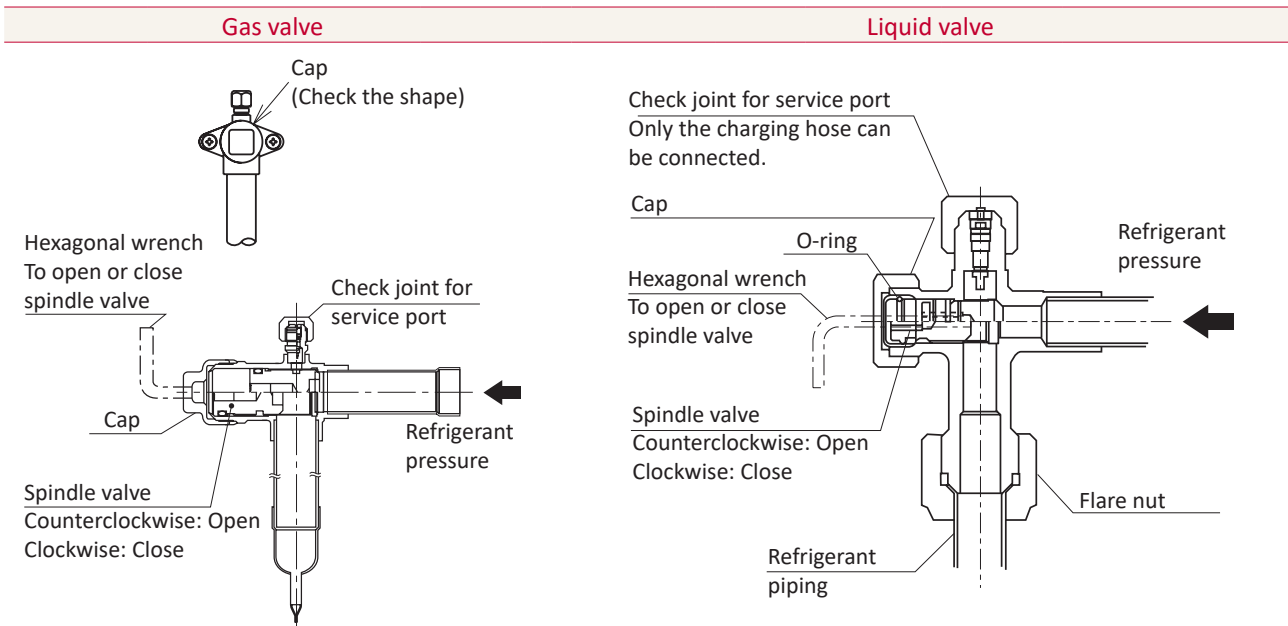
Put two spanners when the piping is removed and attached. If not, the refrigerant leakage may occur.



⚠ CAUTION

- Do not apply an excessive force to the spindle valve after fully opening the spindle. The back seat construction is not provided.
- After the test run, fully open the spindle. If it is not fully opened, the devices will be damaged.

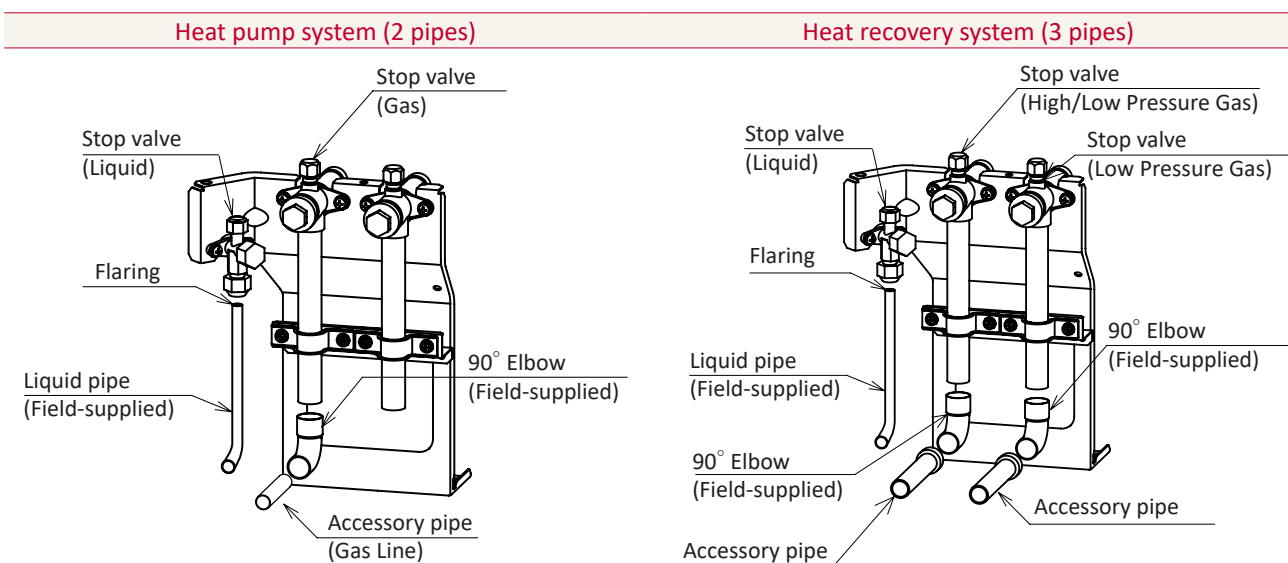
◆ Details of stop valves



Outdoor unit (Base unit)	Tightening torque (N·m)		
	Cap	Spindle valve	Check Joint
air365 Max (Pro)	42.0 - 48.0	22.0 - 28.0	9.0 - 14.0

Outdoor unit (Base unit)	Tightening torque (N·m)			Wrench size (mm)	
	Cap	Spindle valve	Flare nut		
air365 Max	8 - 12	33.0 - 42.0	7.0 - 9.0	33.0 - 42.0	4
	14 - 18	33.0 - 42.0	7.0 - 9.0	50.0 - 62.0	4
	20 - 24	50.0 - 62.0	9.0 - 11.0	68.0 - 82.0	5
air365 Max Pro	5 - 6	33.0 - 42.0	7.0 - 9.0	33.0 - 42.0	4
	8 - 14	33.0 - 42.0	7.0 - 9.0	50.0 - 62.0	4
	16 - 18	50.0 - 62.0	9.0 - 11.0	68.0 - 82.0	5
air365 Max (Pro)	Check Joint		14.0 - 18.0		

◆ Details of stop valve piping connection



- Special care should be taken to ensure that the flame from the blow torch does not fall on the body of the stop valve, on the compressor and cover or on the insulation bushings; insert a metal plate in front of the oil return pipe.
- Connect the indoor units to the outdoor units using copper pipes specifically for use with refrigerant. When laying the pipes make sure that they do not directly rest on or touch walls or other parts of the building (when the refrigerant is flowing through the pipes, this could cause strange noises).
- Check the specific torques for the flared connections.
- While brazing, apply a flow of nitrogen gas inside the pipe.
- Fully insulate the refrigerant pipes.

For heat pump systems (2 pipes)

- Refer to the accessories factory-supplied for the details of the accessory pipes.
- Ensure that the closing pipes of the high/low and low pressure gas stop valves (2 parts) are removed firstly.

For heat recovery systems (3 pipes)

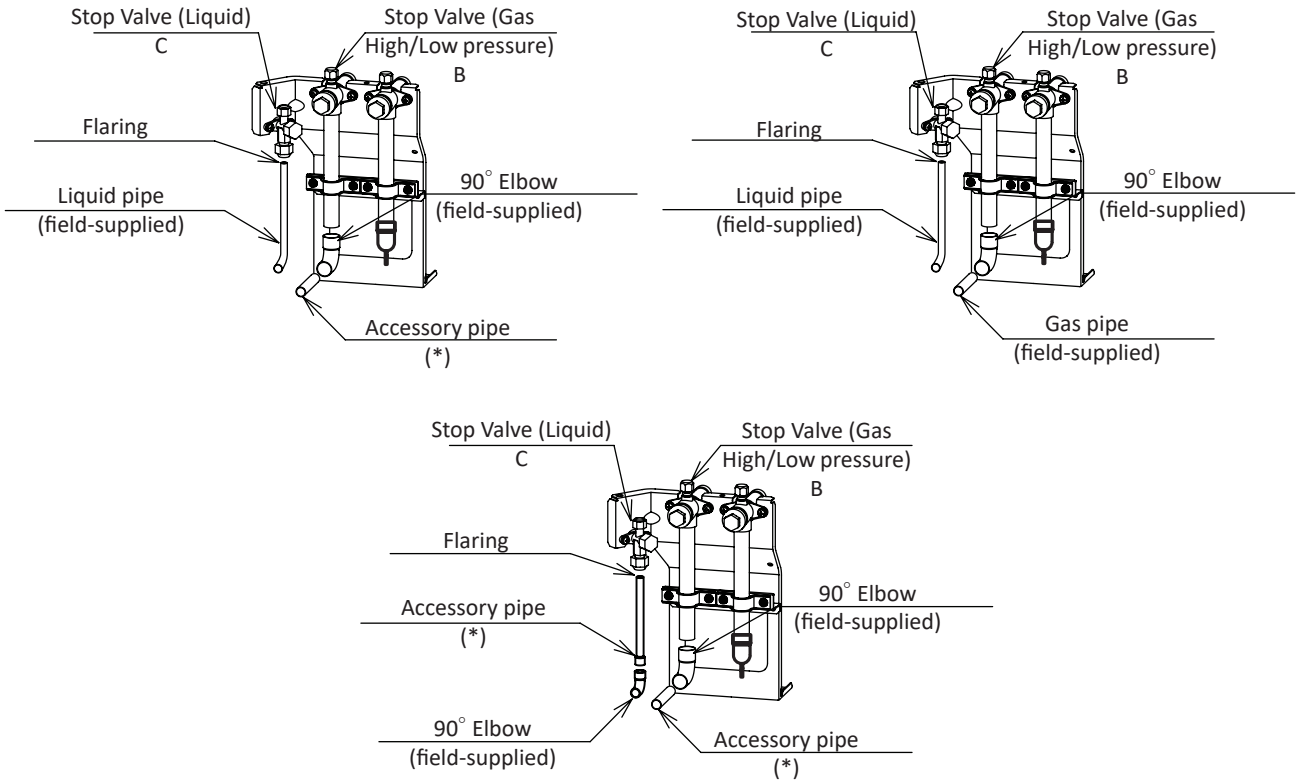
- Refer to the accessories factory-supplied for the details of the accessory pipes.
- Ensure that the closing pipes of the high/low and low pressure gas stop valves (1 part) are removed firstly.

DANGER

- ***Check that the gas and liquid stop valves are fully closed.***
- ***Check that there is no gas inside the pipe before removing the stop pipe. Otherwise, the pipe may explode when heated with the blow torch.***

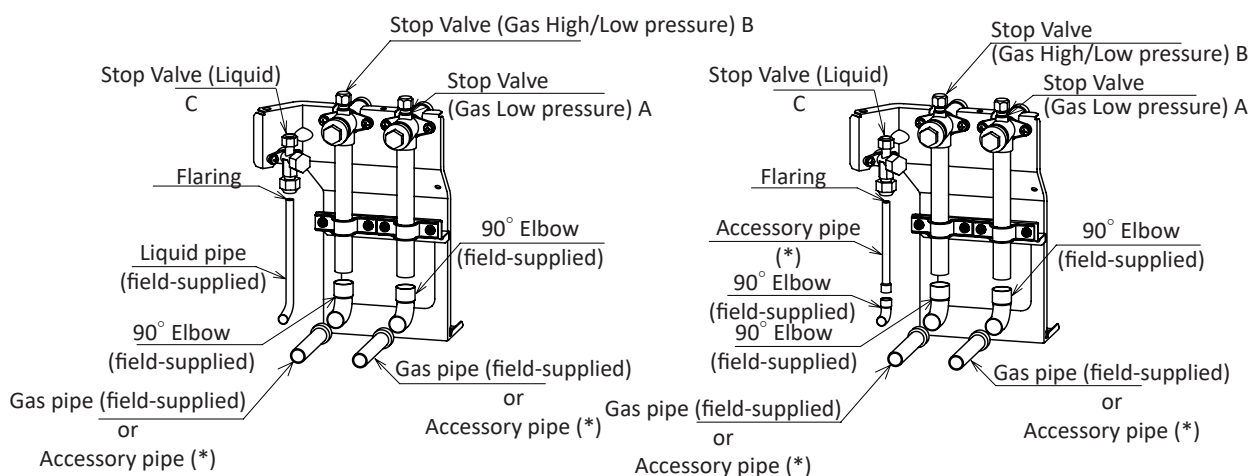
3.5 Connection scenarios

2 pipes system



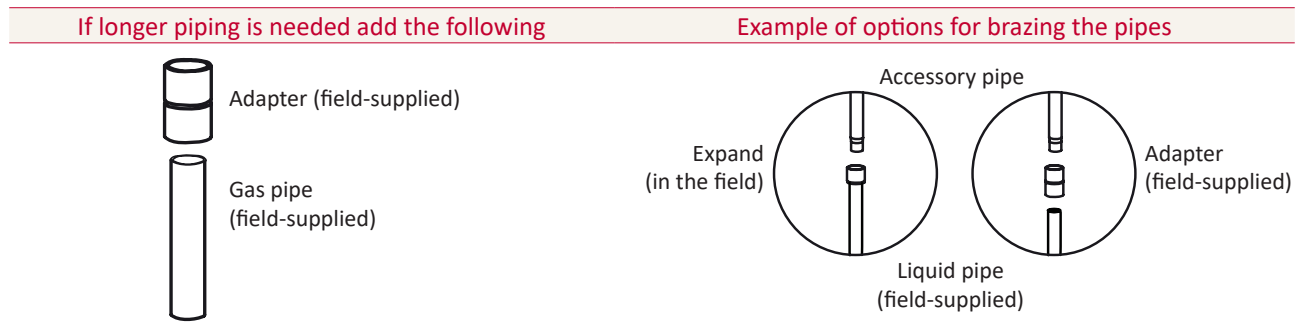
(*) Each accessory pipe has to be checked in the table below for the correct piping connection between outdoor unit system and the installation main pipe.

3 pipes system



(*) Each accessory pipe has to be checked in the table below for the correct piping connection between outdoor unit system and the installation main pipe.

Additional brazing works



◆ air365 Max scenarios

Model	2 pipes system		3 pipes system		
	Gas \varnothing High / Low	Liquid \varnothing	Gas \varnothing		Liquid \varnothing
			Low pressure	High / Low pressure	
	B	C	A	B	C
RAS-8FSXNS2E	ID22.2 →OD19.05	-	ID22.2 →OD19.05	ID22.2 →OD15.88	-
RAS-10FSXNS2E	-	-	-	ID22.2 →OD19.05	-
RAS-12FSXNS2E	-	-	ID22.2 →OD25.4	-	OD9.52 →OD12.7
RAS-14FSXNS2E	ID22.2 →OD25.4	-	-	-	-
RAS-16FSXNS2E	ID22.2 →OD28.58	-	ID25.4 →OD28.58	-	-
RAS-18FSXNS2E	ID22.2 →OD28.58	OD12.7 →OD15.88	ID25.4 →OD28.58	-	OD12.7 →OD15.88
RAS-20FSXNS2E	ID25.4 →OD28.58	-	-	ID25.4 →OD22.2	-
RAS-22FSXNS2E	ID25.4 →OD28.58	-	-	-	-
RAS-24FSXNS2E	ID25.4 →OD28.58	-	-	-	-

◆ air365 Max Pro scenarios

Model	2 pipes system		3 pipes system		
	Gas Ø High / Low	Liquid Ø	Gas Ø		Liquid Ø
			Low pressure	High / Low pressure	
	B	C	A	B	C
RAS-5FSXNP2E	ID22.2 →OD15.88	-	ID22.2 →OD15.88	ID22.2 →OD12.7	-
RAS-6FSXNP2E	ID22.2 →OD19.05	-	ID22.2 →OD19.05	ID22.2 →OD15.88	-
RAS-8FSXNP2E	ID22.2 →OD19.05	ID12.7 →OD9.52	ID25.4 →OD19.05	ID22.2 →OD15.88	ID12.7 →OD9.52
RAS-10FSXNP2E	-	ID12.7 →OD9.52	ID25.4 →OD22.2	ID22.2 →OD19.05	ID12.7 →OD9.52
RAS-12FSXNP2E	ID22.2 →OD25.4	-	-	-	-
RAS-14FSXNP2E	ID22.2 →OD25.4	-	-	-	-
RAS-16FSXNP2E	ID25.4 →OD28.58	OD15.88 →OD12.7	-	ID25.4 →OD22.2	OD15.88 →OD12.7
RAS-18FSXNP2E	ID25.4 →OD28.58	-	-	ID25.4 →OD22.2	-

3.6 Air-Tight Test

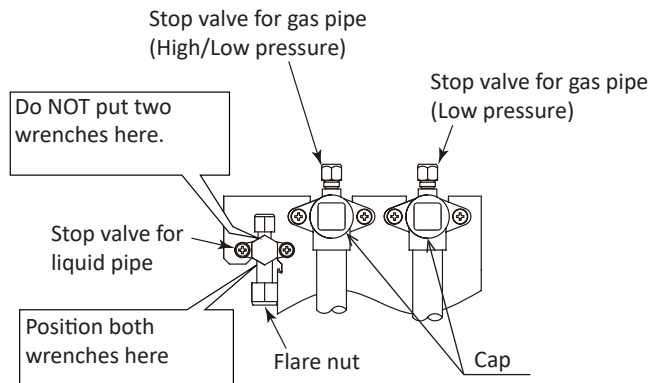
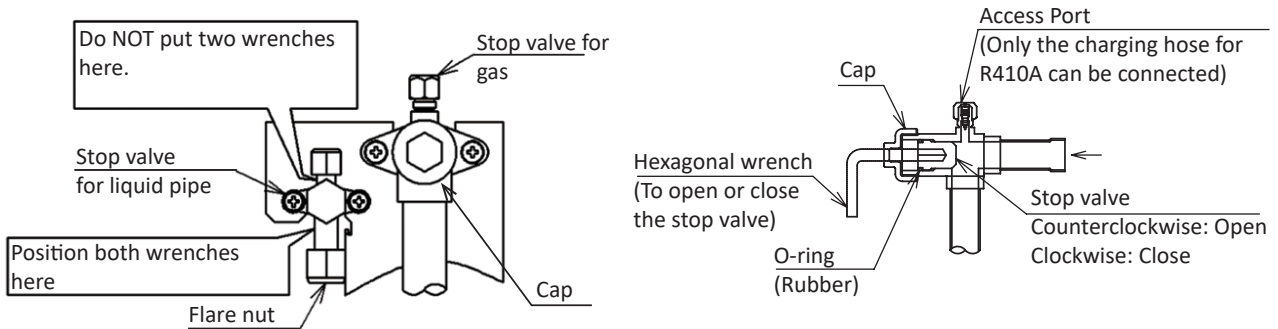
- 1 Check to ensure that spindles of the stop valves for High/Low pressure gas, Low pressure gas and Liquid pipes are closed completely before air-tight test.
- 2 The refrigerant used for this outdoor unit is R410A only. Use the manifold gauge and the charging hose for exclusive use of R410A.

3.6.1 Tightening check of stop valves

After connecting the pipe, remove the caps of stop valves for high/low pressure gas, low pressure gas (for heat recovery system only) and liquid. Tighten the open-close spindle in the closing direction according to the following tightening torque.

- 1 Remove the stop valve caps before performing the airtight test after connecting the refrigerant piping. Tighten the spindle (valve) in clockwise direction according to the following tightening torque.
- 2 Perform the work after warming the spindle part with a dryer etc. when controlling the stop valve in a cold area. O-ring of the spindle part will harden at the low temperature and the refrigerant leakage may occur.
- 3 Do not apply an excessive force after fully opening the spindle. (Tightening Torque: < 5.0N·m)
The back seat is not provided.
- 4 When each valve is opened, remove tags "Close" (Accessories) and attach tags "Open" instead.

- 5 Tighten securely the caps according to the following tightening torque after each spindle valve is opened.



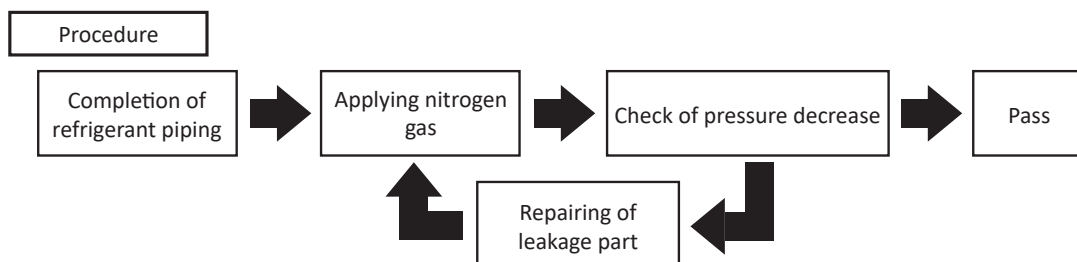
3.6.2 Air-tight test method

Connect the manifold gauge to the check joints of the liquid line and the gas line stop valves using charging hoses with a vacuum pump or a nitrogen cylinder. Perform the air-tight test.

Do not open the stop valves. Apply nitrogen gas pressure of 4.15MPa for air365 Max and air365 Max Pro series. For checking gas leakage, use the leak detector or forming agent. If there is any leakage, fix the leaking part.

For checking gas leakage, do not use a forming agent which generates ammonia. Additionally, do NOT use a household detergent as forming agent whose components are not clear.

The recommended foaming agent for checking gas leakage is shown below.



Recommended forming agent or equivalent

Guproflex

Manufacturer

Yokogawa & CO., Ltd

 **DANGER**

Be sure to use Nitrogen Gas for air-tight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause an explosion or gas intoxication.

3.6.3 Insulation work

- 1 Securely insulate high/low pressure and low pressure (for heat recovery system only) gas piping side and liquid piping side individually. Make sure to insulate the union flare nut for the piping connection as well.
- 2 Mount the piping cover equipped with the outdoor unit after connecting the pipe. Completely seal the penetration part at the bottom of the pipes with insulation in order to prevent rain water from entering the conduit.
- 3 Cover the gap between the piping cover and pipes with a packing (field-supplied) after the insulation work is completed.

 **NOTE**

If the gap is not covered, the unit may be damaged if snow, rain water or animals enter the unit.

3.7 Vacuuming

Connect a manifold gauge and vacuum pump to the check joints.

Heat pump system	High/low pressure gas stop valve Liquid stop valve
Heat recovery system	High/low pressure gas stop valve Low pressure gas stop valve Liquid stop valve

3.7.1 Basic Method

If the penetration of moisture is suspected, perform "**3.7.2 Triple Evacuation Method**" that is described in the next paragraph.

- 1 Vacuum until the pressure reaches 500 microns (0.5 mmHg) or Lower for two hours.
- 2 After vacuum pumping work, stop the vacuum pumping and leave the gauge for one hour.
- 3 Check to ensure that the pressure in the vacuum gauge does not increase.
- 4 Tighten the caps of check joint according to the specified torque after the vacuum drying work.
- 5 If the pressure inside the gauge does not reach 500 microns, it is considered that there is gas leakage.
- 6 Check for any gas leakage once again.
- 7 If no leakage exists, it might be moisture remains inside the pipes. Perform "**3.7.2 Triple Evacuation Method**".

3.7.2 Triple Evacuation Method

According to the following [Step 1] [Step 2] [Step 3] in order, conduct vacuum drying work.

Step 1

- 1 Vacuum until the pressure reaches 2000 microns (2.0 mmHg).
- 2 Pressurize with nitrogen up to 0.3 MPaG (50 PSIG) for 15 minutes.
- 3 Release pressure until reaching the atmosphere level, as low as 0.03 MPaG (5 PSIG).

Step 2

- 1 Vacuum until the pressure reaches 1000 microns (1.0 mmHg).
- 2 Pressurize with nitrogen up to 0.3 MPaG (50 PSIG) for 15 minutes.
- 3 Release pressure until reaching the atmosphere level, as low as 0.03 MPaG (5 PSIG).

Step 3

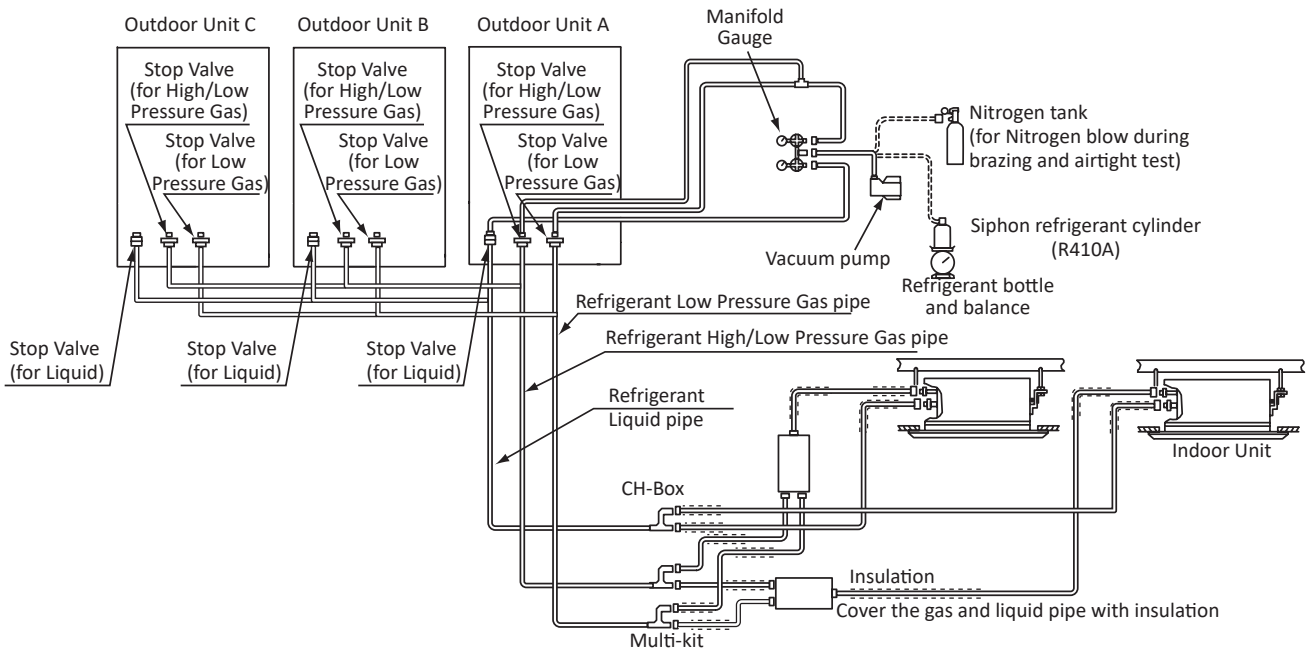
- 1 Vacuum until the pressure reaches 500 microns (0.5 mmHg).
- 2 Stop vacuum pump.
- 3 Check that the vacuum 500 microns (0.5 mmHG) can maintain for one hour.



NOTE

- *If tool or measuring instruments come into contact with the refrigerant, use the tools or the measuring instruments exclusively for R410A.*
- *Do not perform vacuuming pumping work with valves of the outdoor units open. Otherwise, the refrigerant charged before shipment may leak and it may result in failure. If moisture remains inside the pipes, the compressor may be damaged.*

◆ air365 Max (Pro) - Heat recovery



3.8 Charging work

After vacuum pumping work, check that the high/low pressure gas valve, low pressure gas valve (low pressure gas valve is for heat recovery system only) and liquid stop valve are fully closed. Charge the additional refrigerant from the check joint of liquid stop valve (acceptable error must be within 0.5 kg).

After the refrigerant has been charged, fully open the liquid stop valve and the gas stop valves.

If it is impossible to charge the specified quantity of refrigerant, fully open the stop valve for the gas line. For heat recovery system, both stop valves of high/low pressure and low pressure side.

Charge the correct refrigerant quantity according to Additional refrigerant charge calculation. If not, a compressor may be damaged due to an excess or insufficient refrigerant charge.

Refrigerant charge from check joint of gas stop valve may lead to compressor failure. Be sure to charge refrigerant from the check joint of liquid stop valve.

Insulate the liquid piping and gas piping completely to avoid decreasing of performance and dewing on the surface of the pipe.

Insulate the flare nut and union of the piping connection with insulation.

Check to ensure that there is no gas leakage. If a large refrigerant leakage occurs, it will cause difficulty with breathing or harmful gases would occur if a fire was being used in the room.

i NOTE

The gas staying at O-ring or screw part may make sound when removing the cap of the spindle. However, it is not gas leakage.

 **CAUTION**

Do not apply an excessive force to the spindle valve after fully opening the spindle. Otherwise, the spindle valve flies out due to refrigerant pressure. At the test run, open fully the spindle valve, otherwise, the devices will be damaged. It is closed before shipment.

Caution for opening stop valve

- 1 Do not apply an excessive force after fully opening the spindle. (Tightening Torque: < 5.0N·m).
- 2 Tighten securely the caps according to the properly tightening torque each spindle valve is opened.
 - a. Operate the compressor in the cooling mode and charge the additional refrigerant from the check joint of the liquid stop valve (acceptable error must be within 0.5 kg). At this time, keep the liquid stop valve slightly opened.
 - b. After the refrigerant is charged, fully open the liquid stop valve and the gas stop valve.
 - c. Calculate securely the additional refrigerant quantity for charging. If the quantity of additional refrigerant is not correct, it may cause compressor failure. The additional refrigerant must be charged in a liquid condition.
 - d. Refrigerant charge from check joint of gas stop valve may lead to compressor failure. Be sure to charge refrigerant from the check joint of liquid stop valve.

3.8.1 Maximum permitted concentration of hydrofluorcarbon (HFC) refrigerant

 **DANGER**

- ***Fitters and the designers of the installations must strictly observe local and national legislation, and local codes regarding safety requirements in the event of refrigerant leaks.***
- ***In the event of a leak, the gas will spread around the room, displacing the air, and could therefore result in asphyxia.***
- ***Special attention should be given to areas where the refrigerant may be deposited and stay in the room, such as basements or similar, as it is heavier than air.***

The R410A refrigerant gas, used in the equipment, is fireproof and not toxic.

The maximum permitted concentration of HFC R410A gas in the air is 0.44 kg/m³, in accordance with standard EN378-1. Therefore, efficient measures should be adopted to ensure the concentration of R410A gas in the air is kept below 0.44 kg/m³ in the event of a leak.

◆ Calculation of the refrigerant concentration

- 1 Calculate the total quantity of refrigerant R (kg) charged in the system; to do so, connect all the indoor units of the rooms in which you wish to have air conditioning.
- 2 Calculate the volume V (m³) of each room.
- 3 Calculate the refrigerant concentration C (kg/m³) of the room according to the following formula:

$$R / V = C$$

R: total quantity of refrigerant charged (kg).

V: volume of the room (m³).

C: concentration of refrigerant (= 0.44 kg/m³ for R410A gas).

◆ Countermeasures in the event of refrigerant leaks

Pay attention to the critical gas concentration to avoid accidental refrigerant gas leakage before installing air conditioning systems.

In the case that the calculated critical concentration is higher than the maximum permissible concentration of HFC gas (R410A) in air, take the following actions.

- 1 Provide each effective opening at the wall or door for ventilation to next door so that the critical gas concentration can be maintained lower than the above value. Provide an opening more than 0.15% of floor surface at the lower part of a door.
- 2 Opening without shutter to permit the circulation of fresh air in the room.
- 3 A fan with a capacity of at least 0.4 m³/minute per tonne of Japanese refrigerant (= volume displaced by the compressor / 5.7 m³/h) or greater, connected to a gas sensor (gas leakage detector) in the air conditioning system which uses the refrigerant.

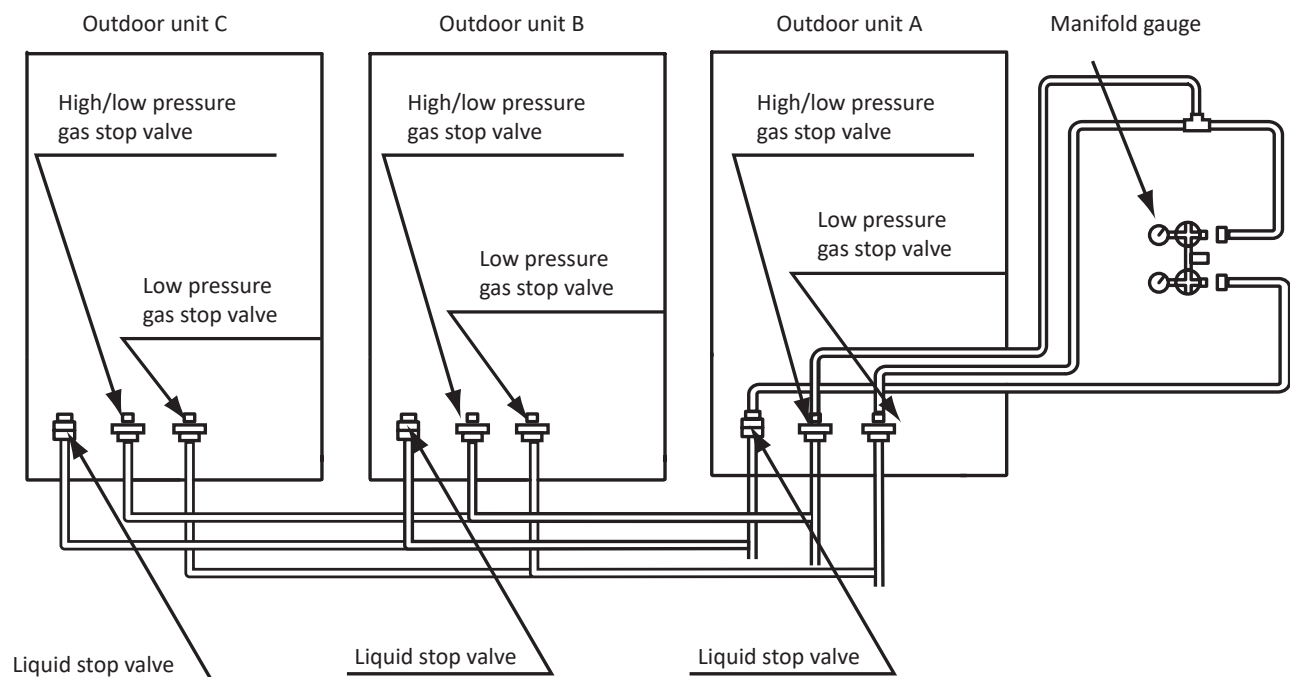
3.9 Refrigerant pump down

When the refrigerant should be collected into the outdoor unit due to indoor/outdoor unit relocation, collect the refrigerant as follows:

- Attach the manifold gauge to the gas stop valve and the liquid stop valve.
- Turn ON the power source.
- Set the DSW4 - pin 1 of the outdoor unit PCB at the "ON" side for cooling operation.
- Close the valves indicated depending on the unit series and collect the refrigerant.
 - ✓ Heat pump system → Liquid stop valve
 - ✓ Heat recovery system → Low pressure gas stop valve and Liquid stop valve
- When the pressure at lower pressure side (gas stop valve) indicates -0.01 MPa (-100 mmHg), perform the following procedures immediately.
 - ✓ Close the "gas stop valve" or the "High/ Low gas stop valve" depending on the unit series.
 - ✓ Set the DSW turned ON before at the OFF side (To stop the unit operation).
- Turn OFF the power source.

CAUTION

- Measure the low pressure by the pressure gauge and keep it not to decrease than -0.01 MPa.
- If the pressure is lower than -0.01 MPa, the compressor may be faulty.





Drain piping

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4.1 Condensation drainage system

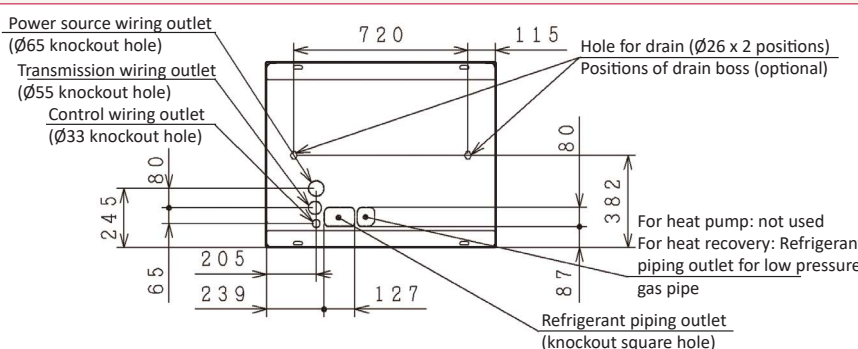
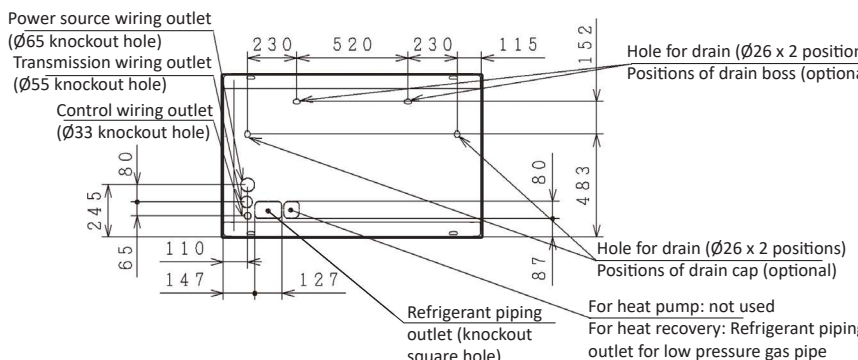
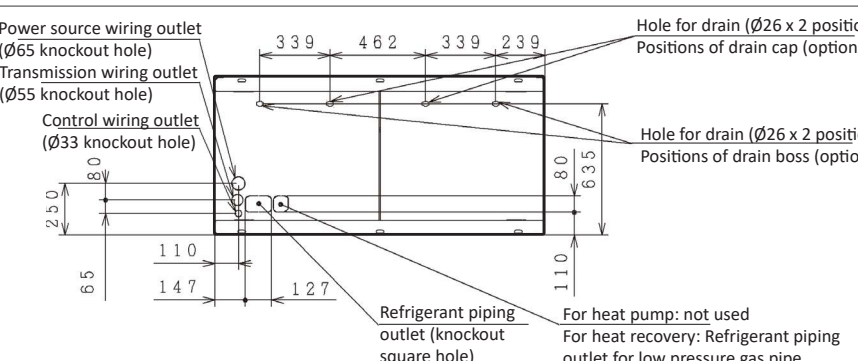
When the outdoor unit operates in heating mode, there is a build-up of condensation of the ambient humidity which, together with rain water, requires draining.

Select a location for the unit which permits adequate drainage. If necessary, mount an installation suitable for the drainage of condensation.

DANGER

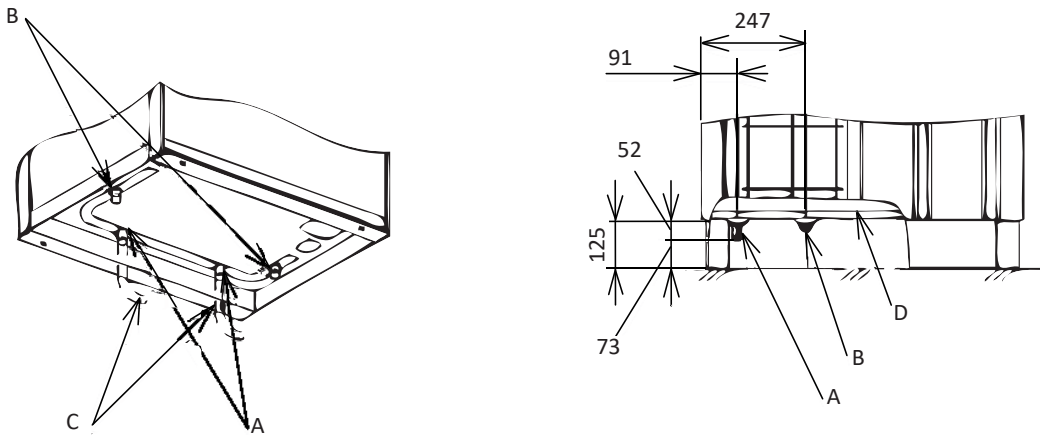
- **Drainage must not take place in areas frequented by pedestrians. In low temperatures, the drainage water could freeze and lead to falls. If it is necessary to install the outdoor unit in an area frequented by pedestrians, an additional drainage tray should be fitted.**
- **Do not fit drainage pipes or collection trays in cold climates, as they could freeze and break.**

If a condensation drainage kit is required for the outdoor unit, use the optional drainage kit DBS-TP10A.

air365 Max	air365 Max Pro	Dimension
8 - 12 HP	5 - 6 HP	
14 - 18 HP	8 - 14 HP	
20 - 24 HP	16 - 18 HP	

4.2 Installation position of the optional drainage kit DBS-TP10A

Installation position (example: RAS-10FSXNP2E, lower and side views).



A	Drain pipe	C	Drain pipes (field-supplied)
B	Optional drain plug	D	Base of unit

4.2.1 Drain kit components

Model	Description	Material/colour	Qty	Application
DBS-TP10A	Drain boss	PP/black	2	Connecting for Drain Piping
	Drain cap	PP/black	2	Embolization for Drain Hole
	Rubber cap	CR/black	2	Sealing for boss and cap

4.2.2 Quantity

Model	air365 Max	air365 Max Pro	Qty
DBS-TP10A	8-18	5-14	1
	20-36	16-24	2
	38-40	26-32	3
	42-48	34/36	4
	50-54	38-42	3
	56-60	44/46	4
	62-66	48/50	5
	68-72	52/54	6
	74-78	-	5
	80-84	-	6
	86-90	-	7
92-96	-	8	



Electric wiring

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5.1 General information

CAUTION

- *Before any work to the electrical wiring or regular inspections, switch off the mains power supply of the indoor and outdoor units. Wait three minutes before starting installation or maintenance work.*
- *Make sure that the interior and exterior fans have come to a complete standstill before starting work on the electrical wiring or regular inspections.*
- *Protect cables, the drainage pipe, electrical components, etc. from rodents and insects; otherwise these might damage unprotected components and this could result in fire.*
- *Do not allow cables to come into contact with the refrigerant pipes, metal edges, printed circuit boards (PCB) or the electric components inside the unit; the cables may be damaged and this could result in fire.*
- *Connecting the operating line cables incorrectly may lead to faults in the PCB.*
- *Firmly secure the cables inside the indoor unit with plastic flanges.*

DANGER

- ***Use an earth leakage breaker with medium sensitivity, and an activation speed of 0.1 or less. If this is not fitted, there is a risk of electric shock and/or fire.***
- ***Install an earth leakage breaker, fuse and circuit breaker for each outdoor unit power line. Not fitting it may cause an electric shock or fire.***

5.2 General verifications

- 1 Make sure the electric components in the installation (earth leakage breaker, circuit breaker, cables, connectors, cable terminals and main power switches) have been selected correctly in line with the electrical data given in this Manual. Also make sure that these components are compliant with national and local codes.
 - a. The electricity supply to the unit should be via an exclusive power control switch and protective circuit breaker, certified and installed in accordance with local or national safety regulations.
 - b. Connect the power supply wiring for each group of indoor units to its outdoor unit group (maximum capacity for each group of indoor units: 26 HP). Do not mix units of different groups.
 - c. For heat recovery systems, the CH-Box and the indoor unit of the same refrigerant cycle can be supplied from the same mains power switch.
- 2 Check that the supply voltage is between 90 and 110% of the rated voltage. Where the voltage capacity is too low, it will not be possible to start the system due to the drop in voltage.

3 Sometimes, the refrigeration/heating system is not able to operate correctly in the following cases:

- ✓ When the system is supplied from the same supply line as other major consumers (heavy machinery, power inverter systems, cranes, welding machinery, etc).
- ✓ When the supply cables of the major consumers and the refrigeration/heating system are very close together. In these cases, induction in the wiring to the refrigeration/heating system may arise due to a rapid change in the electricity consumption of the above consumers and their start-up. Therefore before starting installation work, check the regulations and standards concerning adequate protection of the power supply line.

NOTE

For further information, please refer to the applicable legislation in the country in which the unit is to be fitted.

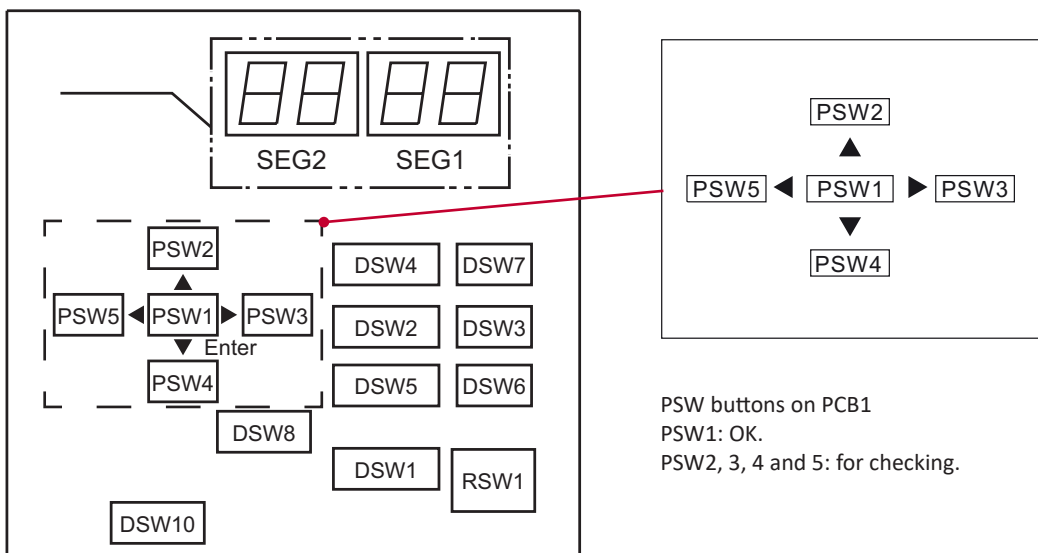
- 4 During the preliminary preparation work of the electricity supply line for the unit, the provisions in local and national legislation must never be violated.
- 5 Check that the earth cable is correctly connected.

DANGER

- **Never connect the earth cable to the refrigerant pipes. The gas in the pipes could cause a fire.**
- **Do not connect the earth cable to the lighting rod. The electrical potential of earth would increase abnormally.**

5.3 Setting of the DSW switches on PCB1

Location of the DSW switches on PCB1.



PSW buttons on PCB1
 PSW1: OK.
 PSW2, 3, 4 and 5: for checking.

CAUTION

Before changing the settings of the DIP switches, the voltage supply should be disconnected. Otherwise, the new settings will not be valid.

i NOTE

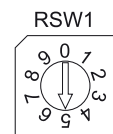
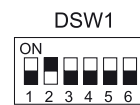
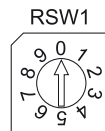
- DSW4-No.1, 2, 4, 5, 6 and push switches can be operated while power source is ON.
- It may take up to 20 seconds for the change of operation state (RUN/STOP) to be effective after having set DSW4.
- The symbol “■” indicates the position of the DIP switches. The figures show the position of the DIP switch once the position setting has been completed.

◆ **DSW1, RSW1: refrigerant cycle number setting**

Setting example for refrigerant cycle number 25

- Setting required.
- Set each main outdoor unit number on each refrigerant cycle (Sub-units setting are not required).
- Outdoor and indoor units belonging to the same refrigerant cycle: setting the same cycle number in the outdoor and indoor units.

Setting before shipment:



i NOTE

Maximum refrigerant cycle number setting: 63

◆ **DSW2: capacity setting**

Setting not required

	8HP	10HP	12HP	14HP	16HP
air365 Max					

◆ DSW3

Setting not required

Setting before shipment



NOTE

Do not change DSW3 setting. Otherwise, it may cause abnormal operation.



High Heating Mode



NOTE

High Heating mode is only configurable for air365 Max Pro units.



CAUTION

Use the specific cable sizes and main breaker switch for this configuration.

◆ DSW4: Emergency or test running/service

Setting not required

Setting before shipment

Cooling test run

Heating test run

NFC Communication restrictions (Write protected)

System forced stop

Except compressor 1

Except compressor 2



◆ DSW5: Function setting

Setting not required

Setting before shipment

Indoor fan limited

Fan speed fine adjustment disable



◆ DSW6: Outdoor unit setting/Function setting

Single unit

Combined units

Setting not required

Unit A (No. 0)

Unit B (No. 1)

Unit C (No. 2)

Unit D (No. 3)



NOTE

The combination setting is necessary in outdoor units consisting of multiple modules. Be sure to perform this setting.



Low ambient temperature

Set the No. 4 pin to ON side

CAUTION



When setting low ambient temperature at cooling operation, make sure to attach the snow protection hood to the outdoor unit.

◆ DSW7: Unit model setting

Setting required	
2 pipes system	
3 pipes system	

◆ DSW8: High static pressure mode setting

Setting required			
Setting before shipment	HSP setting: 30 Pa	HSP setting: 60 Pa	HSP setting: 80 Pa

NOTE

When adopting the air outlet duct (field-supplied), make sure to set DSW8.

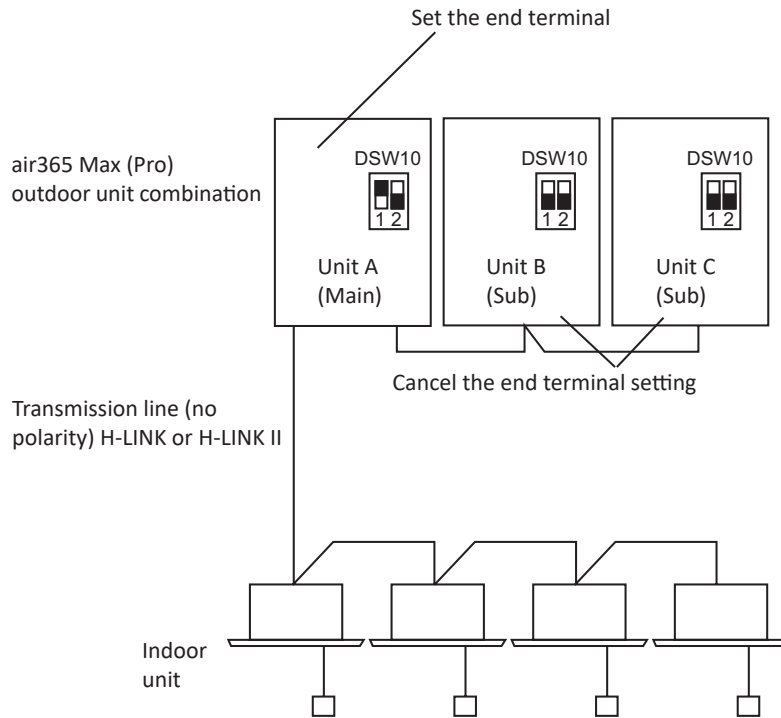
◆ DSW10: Communication

Setting required		
Setting before shipment	End resistance cancellation *1	Fuse recovery *2

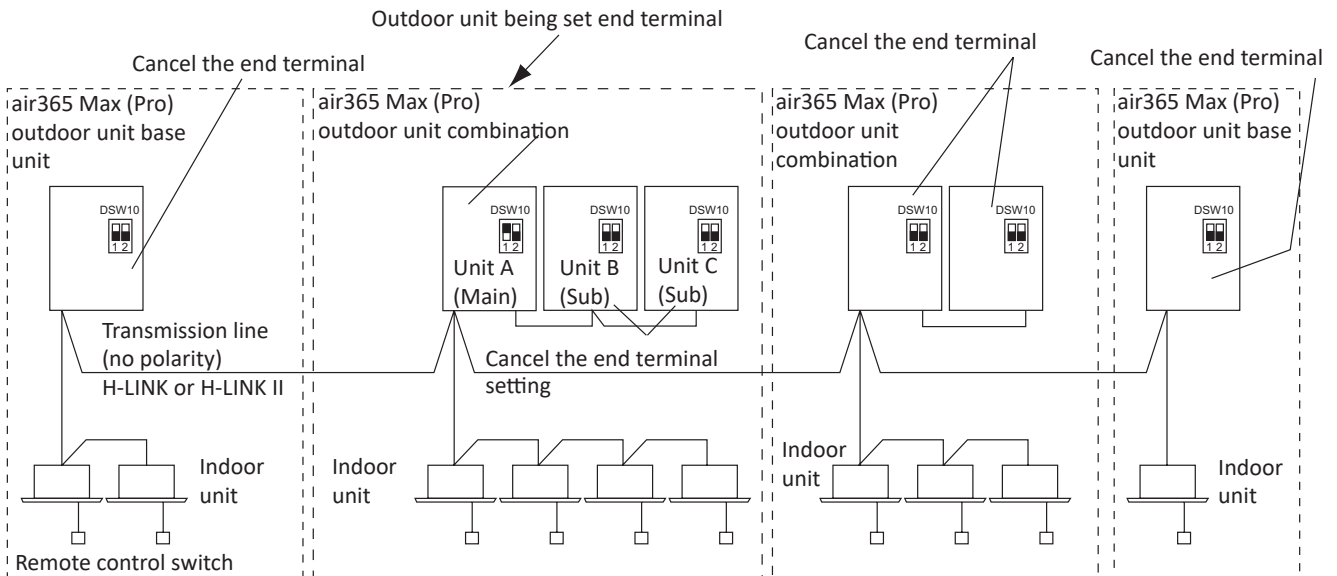
*1: Turn OFF No.1 pin for all of the outdoor units in the same H-LINK system except one outdoor unit (main outdoor unit).

*2: If the fuse (EF1) is melted, set No.2 pin to ON for recovery.





DSW10 setting example



In the case of more than one refrigerant cycles in the same H-LINK or H-LINK II, set all No. 1 pins of DSW10 in the “OFF” position except the main outdoor unit A.



◆ DSW101 (INV1, 2): INV unit setting/Service

Setting not required			
Setting before shipment		Cancellation of current detection	
INV1	INV2	INV1	INV2
			

NOTE

If cancellation of current detection is set, make sure to return the setting, after service works.



Commissioning

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6.1 Before operation

Supply electrical power to the system for approximately 12 hours before start-up after long shutdown. Do not start the system immediately after power supply, it may cause a compressor failure, because the compressor is not heated well.

Make sure that the outdoor unit is not covered with snow or ice. If covered, remove it by using hot water (approximately 50°C). If the water temperature is higher than 50°C, it will cause damage to plastic parts.

When the system is started after a shutdown longer than approximately 3 months, it is recommended that the system be checked by your service contractor.

Turn OFF the main switch when the system is stopped for a long period of time. If the main switch is not turned OFF, electricity is consumed, because the oil heater is always energized during compressor stopping.

6.2 Preliminary checks

The test run must be carried out according to the instructions given in chapter "6.3 Carry out the Test Run".

DANGER

Do not use the system until all of the check points have been verified. As with the test run for the indoor unit, check the Installation and maintenance manual for the indoor unit and the CH-Box.

Make sure the refrigerant pipes and communication cables between the outdoor and indoor units are connected to the same refrigeration cycle. Failure to do so could lead to abnormal operations or a serious accident. Check that the setting of the refrigerant cycle DSW switches (DSW1 and RSW1 on outdoor units, DSW5 and RSW2 on indoor units) and of the unit number of the indoor units is suitable for the system. Check whether the DIP switch setting specified on the printed circuit of the indoor and outdoor units is correct. Pay particular attention to the outdoor unit number, the refrigerant cycle number and the terminal resistance.

Make sure the electrical resistance is greater than 1 MΩ by measuring the resistance between the ground and the terminal of the electrical components. If not, do not use the system until the electrical leak has been detected and repaired. Do not apply voltage to the communication terminals.

Check that all cables, L1, L2, L3 and N (R, S, T and N) are correctly connected to the power line. If they are not correctly connected, the unit will not work and the remote control will indicate alarm code "05". When this occurs, check and change the power line phase according to the sheet attached to the rear of the service cover.

CAUTION

Make sure the main power supply switch has been on for over 12 hours to heat up the compressor oil using the heating elements.

The air365 Max (Pro) series outdoor units do not work for 4 hours after the power supply line has been connected (stoppage code d1-22). Where the unit is to be started within 4 hours, release the protection control as follows:

- 1 Switch on the power supply to the outdoor unit.
- 2 Wait 30 seconds.
- 3 Press PSW5 on the outdoor unit PCB for more than 3 seconds to release code d1-22. Where a remote control is used for releasing, press Air Flow and Auto Louver at the same time for 3 seconds.

Where several base units are combined, stick the label on the main unit in a visible place (outdoor unit 1) so that the outdoor unit A can be easily identified. Do not stick the main label on the secondary unit (outdoor units 2 and 3).

CAUTION

Where the total insulation resistance of the unit is below 1 MΩ, the compressor insulation resistance may be low due to the refrigerant held in the compressor. This may occur if the unit is not used for long periods.

- 1 Disconnect the compressor cables and measure the insulation resistance of the compressor. If the resistance value is greater than 1 MΩ, the insulation fault has occurred in another electrical component.
- 2 If the insulation resistance is below 1 MΩ, disconnect the compressor cable on the inverter PCB. Then switch on the main power supply to apply current to the crankcase heating elements. Once current has been received for more than 3 hours, re-measure the insulation resistance. Current may be required for longer, depending on the air conditions, the pipe length or the condition of the refrigerant. Check the insulation resistance and re-connect the compressor. Where the earth leakage breaker is tripped, check the recommended size in the Instruction Manual.

NOTE

- *Make sure the electric components in the installation (earth leakage breaker, circuit breaker, cables, connectors, cable terminals and main power switches) have been selected correctly in line with the electrical data given in this Manual. Also make sure that these components are compliant with national and local codes.*
- *Use shielded cables (> 0.75 mm²) for communication installation wiring to avoid electromagnetic noise. Shielded cable must be less than 1000 m in total length and its size must be compliant with local codes.*
- *Check the connection of the power wiring terminals (terminals “L1” to “L1” and “N” to “N”). AC supply voltage 3N~ 400V 50Hz. If it is different, some components could be damaged.*

6.3 Carry out the Test Run

- Check that the stop valves on the outdoor unit are fully open (gas, low-pressure: only in heat recovery systems) and start the system. Where base units are combined, check that the stop

valves on all outdoor units connected are fully open.

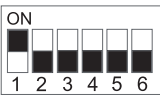
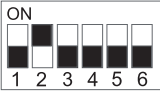
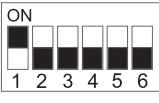
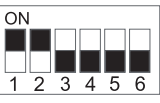



- Carry out the test run on the indoor units in sequence, one by one. Then check the concordance of the refrigerant pipe system and the electrical wiring system. System conformity cannot be checked if there are several indoor units operating at the same time.
- Follow the procedure indicated below to carry out the test run. Make sure the test run is completed problem-free.

NOTE

Where there are two remote controls, main and secondary, first carry out the test run using the main remote control.

CAUTION

- Do not touch any other electrical parts when operating switches on the PCB
- Do not attach or detach service cover when the power source for the outdoor unit is ON and the outdoor unit is operated.
- Turn all pins of DSW4 OFF when the test run operation is completed.

Operation	DSW Setting	Operation	Remarks
Test run	<p>① Setting of operation mode:</p> <p>Cooling: Set DSW4-2 OFF.</p>  <p>Heating: Set DSW4-2 ON</p> 	<p>① The indoor unit automatically start to operate when the test run of the outdoor unit is set.</p> <p>② The ON/OFF operation can be performed from the remote control switch or DSW4-1 of the outdoor unit.</p> <p>③ Continuous operation during 2 hours is performed without Thermo-OFF.</p>	<p>Take care that the indoor units start operation in accord with the test run operation of the outdoor unit.</p> <p>The test run is started from the outdoor unit and stopped from the remote control switch, the test run function of the remote control switch is cancelled. However, the test run function of the outdoor unit is not cancelled</p> <p>In case that the plural indoor units are connected with one remote control switch, all the units start test run operation at the same time, therefore, turn the power source OFF for the indoor units not to operate test run. In this case, the "TEST RUN" indication of the remote control switch may flicker, and this is not abnormal.</p> <p>The setting of DSW1 is not required for the test run from the remote control switch.</p>
	<p>② Starting test run:</p> <p>Set DSW4-1 ON and the operation is started after a few ~20 seconds.</p> <p>Cooling  Heating </p>	<p> NOTE</p> <p><i>TEST RUN operation time can be increased depressing the time switch in the Remote Control.</i></p>	
Manual OFF of compressor	<p>① Setting:</p> <p>Compressor manual OFF: DSW4-4 ON</p>  <p>Compressor ON: DSW4-4 OFF</p> 	<p>① When DSW4-4 is ON during compressor operation, the compressor stops to operate immediately and the indoor unit is under the condition of Thermo-OFF.</p> <p>② When DSW4-4 is OFF, the compressor starts to operate after the cancellation of 3-minutes guard.</p>	<p>Do not repeat compressor ON/OFF frequently.</p>
Manual defrost	<p>① Manual defrost operation starts</p> <p>Press PSW5 for more than 3 seconds during heating operation, the defrost operation is started after 2 minutes. This function is not available within 5 minutes after starting heating operation.</p> <p>② Manual defrost operation finishes</p> <p>Defrost operation is automatically ended and the heating operation is started.</p>	<p>① Defrost operation is available regardless of frosting condition and total time of heating operation.</p> <p>② Defrost operation is not performed when the temperature of outdoor heat exchanger is higher than 10 °C, high pressure is higher than 3.3 MPa (33kgf/cm²G) or Thermo-OFF.</p>	<p>Do not repeat defrost operation frequently.</p>

MODEL: SERIAL NUMBER COMPRESSOR MFG. NUMBER:
 CUSTOMER'S NAME AND ADDRESS: DATE:

- 1 Is the rotation direction of the indoor fan correct?
- 2 Is the rotation direction of the outdoor fan correct?
- 3 Are there any abnormal compressor sounds?
- 4 Has the unit been operated at least twenty (20) minutes?

5 Check room temperature

- Inlet: No. 1 DB ___/WB ___°C No. 2DB ___/WB ___°C No. 3DB ___/WB ___°C No. 4DB ___/WB ___°C
- Outlet: DB___/WB ___°C DB ___/WB ___°C DB ___/WB ___°C DB ___/WB ___°C
- Inlet: No. 5DB ___ /WB ___°C No. 6DB ___/WB ___°C No. 7DB ___ /WB ___°C No. 8DB ___ /WB ___°C
- Outlet: DB___/WB ___°C DB___/WB ___°C DB___/WB ___°C DB___/WB ___°C

6 Check outdoor ambient temperature

- Inlet: DB _____°C WB _____°C
- Outlet: DB _____°C WB _____°C

7 Check refrigerant temperature

- Liquid temperature: _____°C
- Discharge gas temperature: _____°C

8 Check pressure

- Discharge pressure: _____ Mpa
- Suction pressure: _____ Mpa

9 Check voltage

- Rated voltage: _____ V
- Operating voltage: L1-L2 _____ V L1-L3 _____ V L2-L3 _____ V
- Starting voltage: _____ V
- Phase imbalance: $1 - \frac{V}{V_m} =$ _____ V

10 Check compressor input running current

- Input: _____ kW
- Running current: _____ A

- 11 Is the refrigerant charge adequate?
- 12 Do the operation control devices operate correctly?
- 13 Do the safety devices operate correctly?
- 14 Has the unit been checked for refrigerant leakage?
- 15 Is the unit clean inside and outside?
- 16 Are all cabinet panels free from rattles?
- 17 Is the filter clean?
- 18 Is the heat exchanger clean?
- 19 Are the stop valves open?
- 20 Does the drain water flow smoothly from the drain pipe?



Maintenance

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7.1 General remarks

DANGER

- **Turn OFF the power source before the maintenance work. If not, it may cause a fire or an electric shock.**
- **Perform the maintenance work with stable footing. If not, it may cause falling or injury.**

CAUTION

When the indoor unit flat panel is opened (closed) or the air filter is attached (removed), perform the work according to the Installation and Operation Manual according to your model unit. If not, it may cause falling or injury.

NOTE

Do not operate the system without the air filter to protect the indoor unit heat exchanger against being clogged.

◆ Maintenance Beginning and Ending of Use

Beginning of use

- 1 Remove obstacles for the air inlet grilles of indoor unit and outdoor unit and the air outlet.
- 2 Check that the air filter is not clogged.

Ending of use

- 1 Clean the air filter, the air inlet grille and the flat panel.

7.2 General maintenance work

For the indoor unit and the outdoor unit

- 1 Fan and fan motor
 - ✓ Lubrication: All the fan motors are pre-lubricated and sealed at the factory. Therefore no lubrication maintenance is required.
 - ✓ Sound and vibration: Check for abnormal sounds and vibrations.
 - ✓ Insulation: Check the electrical insulation resistance.
- 2 Heat exchanger
 - ✓ Clog: Inspect the heat exchanger at regular intervals and remove any accumulated dirt and any accumulated dust from the heat exchanger. You should also remove from the outdoor units other obstacles such as the growing grass and the pieces of paper which might restrict the airflow.

3 Piping connection

- ✓ Leakage: Check for the refrigerant leakage at the piping connection.

4 Cabinet

- ✓ Stain and lubrication: Check for any stain and any lubrication. Remove the stain and the lubrication.
- ✓ Fixing screw: Check for any loosened screw or any lost screw. Fix the loosened screws and the lost screws.
- ✓ Insulation material: Check for any peeled thermal insulator on the cabinet. Repair the thermal insulator.

5 Electrical equipment

- ✓ Activation: Check for an abnormal activation of the magnetic contactor the auxiliary relay the PCB and others.
- ✓ Line condition: Pay attention to the working voltage the working amperage and the working phase balance. Check for any faulty contact that is caused by the loosened terminal connections the oxidized contacts the foreign matter and other items. Check the electrical insulation resistance.

6 Control device and protection device

- ✓ Setting: Do not readjust the setting in the field unless the setting is maintained at a point that is different from the point listed in the service manual of the unit.

For the outdoor unit

1 Compressor

- ✓ Sound and vibration: Check for abnormal sounds and vibrations.
- ✓ Activation: Check that the voltage drop of the power supply line is within 15% at the start and within 2% during the operation.

2 Fan

- ✓ Rotation: Check the counter clockwise (or Clockwise according to de outdoor unit model) rotation and the rotating speed.

3 Reverse valve

- ✓ Activation: Check for any abnormal activation sound.

4 Strainer

- ✓ Clog: Check that there is no temperature difference between both ends.

5 Ground wire

- ✓ Ground line: Check for the continuity to earth.

6 Oil heater

- ✓ Activation: You should activate the oil heater at least twelve hours before the start-up by turning ON the main switch.

Cooling & Heating

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