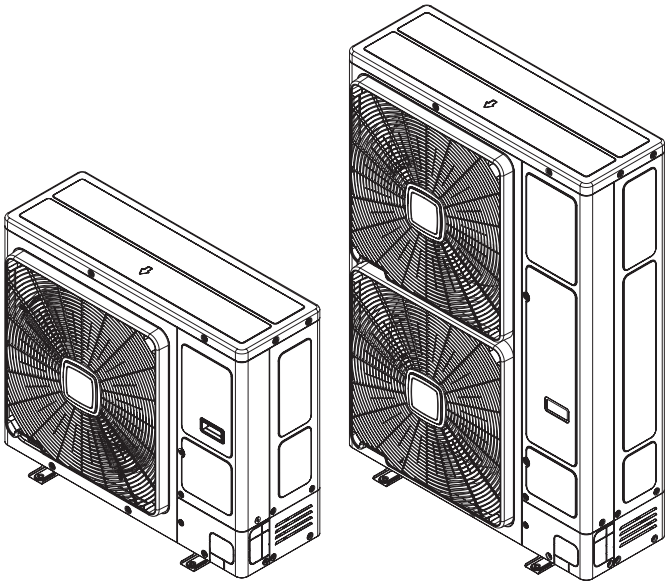
HITACHI

TECHNICAL CATALOGUE

HEAT PUMP AIR CONDITIONERS

- SET FREE mini-HNRQ1 SERIES VRF CONDITIONERS SYSTEM -



Technical Catalogue

< Outdoor Units >

Power Supply	Model
220-240V/1Ph/50Hz	RAS-3.0HNBRKQ1 RAS-3.5HNBRKQ1 RAS-4.0HNBRKQ1 RAS-4.5HNBRKQ1 RAS-5.0HNBRKQ1 RAS-6.0HNBRKQ1 RAS-6.5HNBRKQ1
380-415V/3Ph/50Hz	RAS-7.0HNBRMQ1 RAS-8.0HNBRMQ1 RAS-10HNBRMQ1 RAS-11HNBRMQ1 RAS-12HNBRMQ1

HC2019265A

IMPORTANT NOTICE

- The company pursues a policy of continuous improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- The company cannot anticipate every possible circumstance that might involve a potential hazard.
- This heat pump air conditioner is designed for standard air conditioning only. Do not use this heat pump air conditioner for other purposes such as drying clothes, refrigerating foods or for any other cooling or heating process.
- Do not install the unit in the following places. It may cause a fire, deformation, corrosion or failure:
  * Places where oil (including machinery oil).
  * Places where a lot of sulfide gas drifts such as in hot spring.
  * Places where inflammable gas may generate or flow.
  * Places where strong salty wind blows or with an atmosphere of acidity or alkalinity such as coastal regions.
- Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of heat exchanger, the fin surface repels water. As a result, drain water splashes outside the drain pan and splashed water runs into electrical box. In the end, water leakage or electrical devices failure may occur.
- Pay attention to the following points when the unit is installed in a hospital or other facilities where electromagnetic wave generates from medical equipment.
  * Do not install the unit in the place where the electromagnetic wave is directly radiated to the electrical box, wired controller cable or switch.
  * Install the unit at least 3 meters away from electromagnetic wave such as a radio.
- Do not install the unit in the place where the breeze directly blows to the animals and plants. It could adversely affect the animals and plants.
- The installation and service engineering should be in accordance with the local laws and regulations.
- If you have any questions, contact your distributor or dealer.
- The installation of this air conditioner can only be carried out by dealers or specialists. If the user installs the air conditioner by himself, it may cause leakage, electric shock or fire.
- This manual gives a common description and information for this heat pump air conditioner and also for other models.
- To protect the environment, do not discard the product at will, the company can provide recycling services as per the relevant provisions of the country, and provide replaceable components as per national standards.
- No part of this manual may be reproduced without written permission.
- It is assumed that this heat pump air conditioner will be operated and serviced by English speaking people. If this is not the case, the customer should be added safety, caution and operating signs in the native language.
- This heat pump air conditioner has been designed for the following temperatures. Operate the heat pump air conditioner within this range.

Temperature DB: Dry Bulb, WB: Wet Bulb

		Maximum	Minimum
Cooling Operation	Indoor	32°C DB/23°C WB	21°C DB/15°C WB
	Outdoor	Stable 48°C DB Interval 48~52°C DB	-5°C DB *
Heating Operation	Indoor	27°C DB	15°C DB
	Outdoor	24°C DB/15°C WB	Stable -15°C WB Interval -20~-15°C WB

NOTE:

*: When RAS-7.0~12HNBRMQ1 outdoor units are connected with the RCIM-0.8FSN4 or RCD-0.8~1.0FSN3 or RCS-0.8~1.0FSN, if only one of these indoor unit is operating in cooling mode, the minimum outdoor temperature is limited to 5°C DB.

<Signal Words>

● Signal words are used to identify levels of hazard seriousness.

Definitions for identifying hazard levels are provided below with their respective signal words.

⚠ DANGER : **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING : **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.

NOTICE : **NOTICE**, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTE : **NOTE** is useful information for operation and/or maintenance.

⚠ DANGER

- Do not perform installation work, refrigerant piping work, drain pump, drain piping and electrical wiring connection without referring to our installation manual. If performed without following the instructions, it may result in a system leakage, electric shock or a fire.
- Do not pour water into the indoor or outdoor unit. These products are equipped with electrical parts. If poured, it will cause a serious electrical shock.
- Do not open the service cover and the PCB for the indoor and outdoor unit without turning OFF the main power supply, this may lead to serious safety accidents.
- Do not touch or adjust safety devices inside the indoor or outdoor units. If these devices are touched or readjusted, serious accidents may occur.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air. If a refrigerant leakage is found, immediately turn OFF the main power supply, extinguish any open flame, and then contact the service dealer.
- Make sure to perform air-tight testing.
- The refrigerant R410A used in this product (fluorocarbon) is not flammable, non-toxic, and odourless. If there is refrigerant leakage, exposure to open flame produces toxic gases. Also, the refrigerant gas is heavier than air, if the area is filled with refrigerant gas, it may cause suffocation to the people in the vicinity.When conducting leak detection and air-tight testing, filling with oxygen, acetylene or flammable and toxic gas may cause explosion. Nitrogen is recommended for this test.
- The refrigerant safety leakage standard for construction and operation systems are determined as per local regulations or standards.
- Use a medium induction speed above ELB (Earth Leakage Breaker with action time of 0.1 seconds or less). Otherwise, this may cause electric shock or fire.
- Do not install the product in places where there is high density of oil mist, flammable gas, salt spray, or toxic gases (such as sulphide), and so on.
- During installation, connect the refrigerant pipe firmly before the compressor starts running. For maintenance, stop the compressor before moving, handling and removing the refrigerant pipe.
- Do not short-circuit the protective devices (such as pressure switches and so on) during operation. Otherwise it may cause a fire or explosion.

⚠ WARNING

- Please do not use sprays such as pesticide, oil paint, hair spray or other flammable gases within 1 meter of the unit.
- If the circuit breaker acts or fuse acts frequently, please stop the system operation immediately and contact your local dealer or customer service.
- Ensure that the grounding wire is securely connected. If not, it may cause an electrical failure. Do not connect the grounding wire to the gas pipe, tap water pipe, lightning rod or telephone grounding wire.
- Use fuse of specified capacity.
- While you perform brazing, ensure that there are no combustible around it. Please wear leather gloves while using refrigerant to prevent freezing.
- Prevent mice and other small animals damaging the wiring and the electrical components. If unprotected parts are bitten, it may lead to fire.
- Securely connect and fix the wiring, do not apply external force on terminal blocks, this may cause the terminal to loosen and can cause a fire.
- Ensure that the foundation is robust enough to install the unit. If not, the appliance can fall and break.
- Do not install the unit in the presence of large amounts of oil, steam, organic solvents and corrosive gases (ammonia, sulphide and acid, so on). Because corrosion may cause refrigerant leakage, electrical failure, performance degradation and unit damage.
- Please follow the installation manual and all the relevant provisions, standards for electrical construction. Otherwise, electric failure of fire may occur due to insufficient capacity or mismatch of specifications.
- Use specified wiring between the units and select the correct wiring between the appliances. Otherwise,it will cause an electrical malfunction or fire.
- Make sure that the terminals are tightened with the specified torque. Otherwise it will cause a fire or electrical fault at the terminal block.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- If there is fire, please cut-off the power supply immediately.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- Means for disconnection from the supply mains, which have a contact separation in all poles that provide full disconnection under overvoltage category III conditions, must be incorporated in the fixed wiring in accordance with the wiring rules.
- The appliance shall be installed in accordance with national wiring regulations.
- The maximum working pressure is 4.15MPa. This maximum working pressure shall be considered when connecting the outdoor unit to indoor units.
- The refrigerant used in the outdoor unit is R410A. Please refer to “Additional Refrigerant Charge” of this manual for the refrigerant charging.
- The outdoor unit shall only be connected to indoor units suitable for the same refrigerant (R410A).
- The unit is a partial unit air conditioner, complying with partial unit requirements of the International Standard, and must only be connected to other units that have been confirmed as complying with corresponding partial unit requirements of the International Standard.

NOTICE

- Do not tread on the product or place sundries on the product.
- Do not place or put any material on the product or inside the product.
- Provide a strong and correct foundation so that:

  A. The outdoor unit is not on an incline.

  B. Abnormal sound does not occur.

  C. The outdoor unit will not fall down due to a strong wind or earthquake.

NOTE:

- Please do not install indoor unit, outdoor unit, wired controller and wiring within 3m of strong electromagnetic radiation appliance (For example: medical device).
- After a long time shut down, if you want to restart the appliance, please power the crankcase heating band to work 12 hours prior to operation.
- Before switching on the outdoor unit, make sure that it is not covered by snow and ice.
- The heat pump air conditioner may not work properly if:

  * The power of the transformer which supplies power is equal or less than the electric power of the air conditioner.

  * Power supply for high-power equipment is too close to the power wire of the air conditioner.

  Device*: (Ex) Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor and large-sized switch. It consumes a large quantity of electrical power.

  In the case mentioned above, the power wire of the air conditioner generates a large induced surge voltage due to the abrupt change in the power consumption of the power equipment and the switch action.
- Therefore, to protect the power supply to the system, before performing electric construction, please carefully check the field installation specifications and standards.
- It is recommended to ventilate the room every 3 to 4 hours.
- Reduction in heat pump air conditioner heating capacity is observed due to the degradation of outdoor environmental temperature. Therefore, in some low temperature areas, it is recommended to use auxiliary heating device while installing heat pump air conditioner.
- Only a professional maintenance personnel can perform maintenance work for this air conditioner.

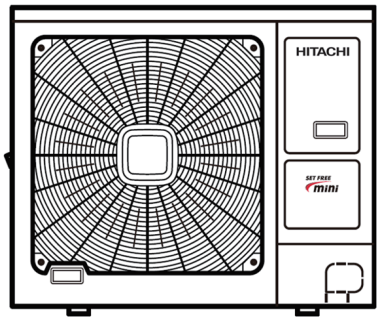
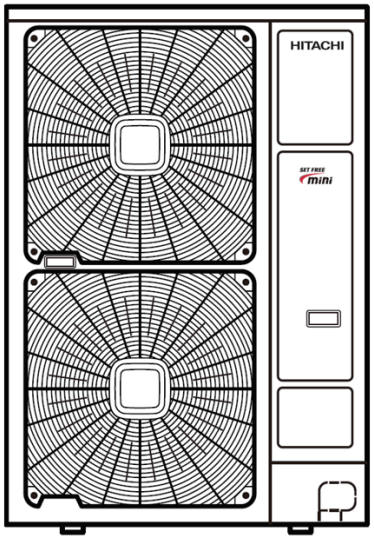
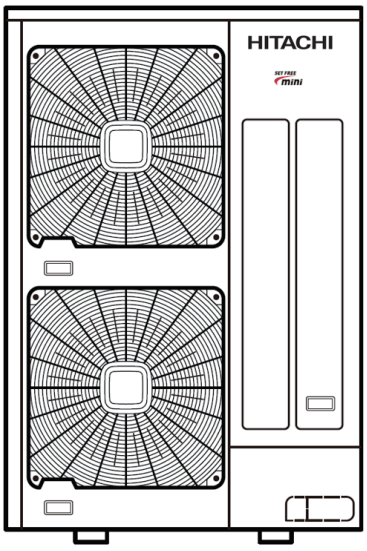
Contents

1. Product Features

1.1 Series Configuration

- Slimmer outdoor unit casing enables convenient installation and service;
- Fanshionable exterior design of the outdoor unit meets the requirements of residential customers;
- First-class energy efficiency in the industry.

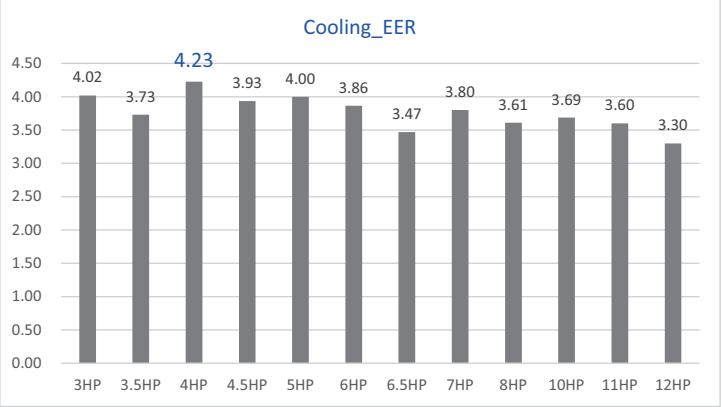
1.2 Product Line-up

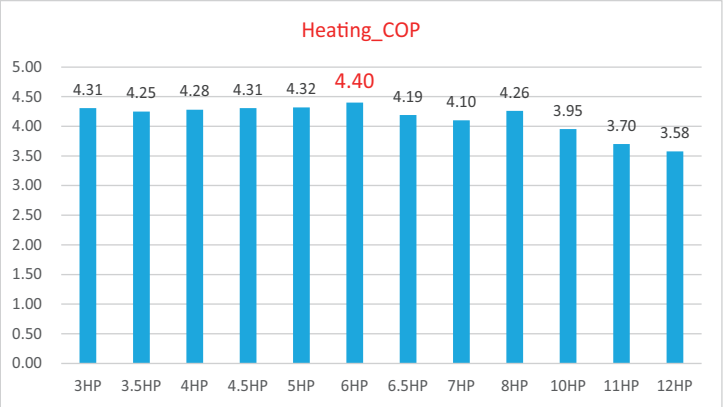
Model	Capacity	Appearance
RAS-3.0HNBRKQ1	3.0HP	
RAS-3.5HNBRKQ1	3.5HP	
RAS-4.0HNBRKQ1	4.0HP	
RAS-4.5HNBRKQ1	4.5HP	
RAS-5.0HNBRKQ1	5.0HP	
RAS-6.0HNBRKQ1	6.0HP	
RAS-6.5HNBRKQ1	6.5HP	
RAS-7.0HNBRMQ1	7.0HP	
RAS-8.0HNBRMQ1	8.0HP	
RAS-10HNBRMQ1	10HP	
RAS-11HNBRMQ1	11HP	
RAS-12HNBRMQ1	12HP	

- The footprint area of the new 12HP model is reduced by 43% and the net weight is reduced by 31%, compared to the top flow VRF products.
- With a width of 320mm, the new 3-6.5HP model can enlarge the air outlet space of the system and improve the ventilation.

1.3 High Efficiency and Energy Saving

The new product has achieved high EER/COP, considerable energy saving with improved performance of the compressor and optimized the refrigerant cycle system.The following graphs show the EER/COP.





NOTE:

The EER and COP are tested under the following conditions when it is combined with test indoor units.

(1) For EER:

- Indoor temperature: 27℃ DB/19℃ WB; Outdoor temperature: 35℃ DB
- Pipe length: 10m; Pipe lift: 0m

(2) For COP:

- Indoor temperature: 20℃ DB; Outdoor temperature: 7℃ DB/6℃ WB
- Pipe length: 10m; Pipe lift: 0m

1.4 Energy Saving Technology

The following designs are adopted to improve the efficiency of the new product.

1.4.1 Optimize Compressor Frequency

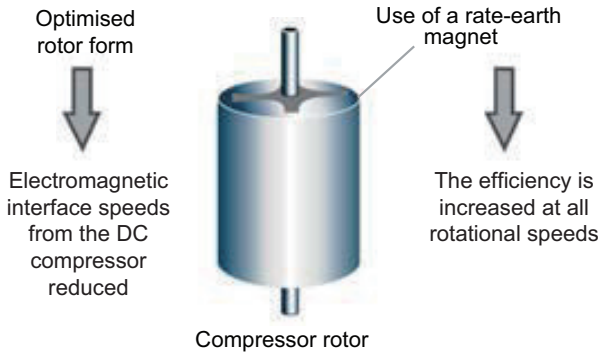
(1) The high efficiency rotary (3-6.5HP) and scroll (7-12HP) compressors are adopted here with the rare-earth magnets, which can improve the efficiency.

(2) The stepless frequency conversion is used. Can adapt the customer demand and keep room temperature more stability. Reduce the power consumption of system.

(3) The compressor of the 7-12HP model has the following advantages, which improve the air-conditioners reliability:

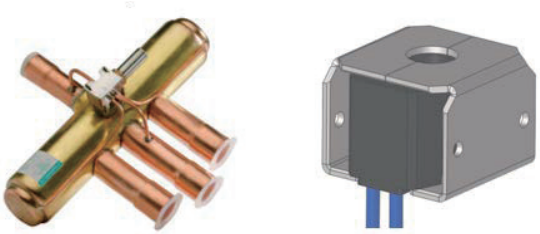
- Optimized bearing;
- Asymmetric scroll lap;
- Oil return circuit;
- High pressure shell;
- Protection to liquid return.

(4) A design of a split rotor with alternated electrical poles can prevent the compressor from electro-magnetic faults and noise development.

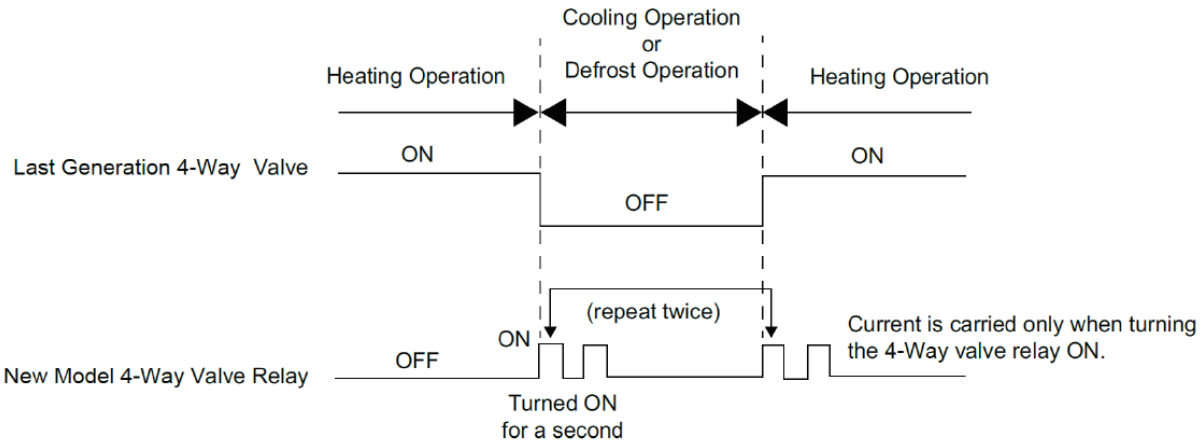


1.4.2 Selection of Components with Lower Power Consumption

The self-holding 4-way valve operates quickly by enabling the system to save energy and enhance the reliability.



4-Way Valve Appearance



1.5 Flexible Installation Location

SET FREE HNRQ1 series VRF air conditioner is developed to meet the requirements of customers. The system provides the customer with convenience for installation, which improves the air conditioning in complex facility structures.

1.5.1 30Pa ESP Setting for Outdoor Models

30Pa ESP is available for 3-8HP in order to avoid the air short-circuit situation.It makes sure the outdoor unit will run at good ventilation condition at different installation conditions. For example, which is in the behind of the blind windows.

1.5.2 Flexibility of Facility Design

The piping can be designed and constructed up to a maximum total liquid piping length of 180 meters (7-12HP).

(1) The distance between outdoor unit and the farthest indoor unit is 100 meters (7-12HP).

(2) Height difference between the outdoor unit and the indoor unit:

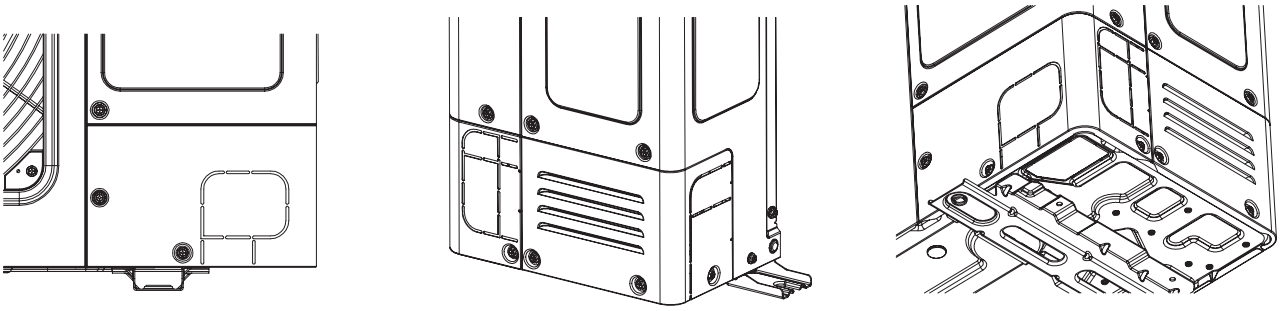
Model	The outdoor unit is higher	The outdoor unit is lower
3-6.5HP	30 meters	30 meters
7-12HP	50 meters	40 meters

(3) Height difference between indoor units is 15 meters.

(4) Maximum length after branch: between the first branch and each indoor unit is 40 meters.

1.5.3 Design for Convenient Installation and Service

Built in stop valves with four directions are available for easy piping. The refrigerant pipes can be connected with the stop valves from the front, right, rear, or bottom side of the unit. For example, the following figures show the pipe connect direction for 3-6.5HP.

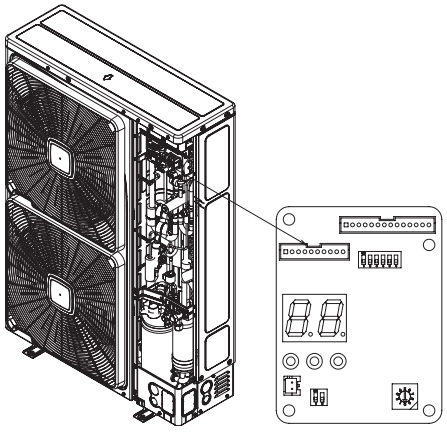


Pipe Connect Direction for 3-6.5HP

1.6 Service Convenience

There are several DIP switches in the front of the outdoor unit, which are designed for test and diagnostic more convenience. They have the advantages as follows:

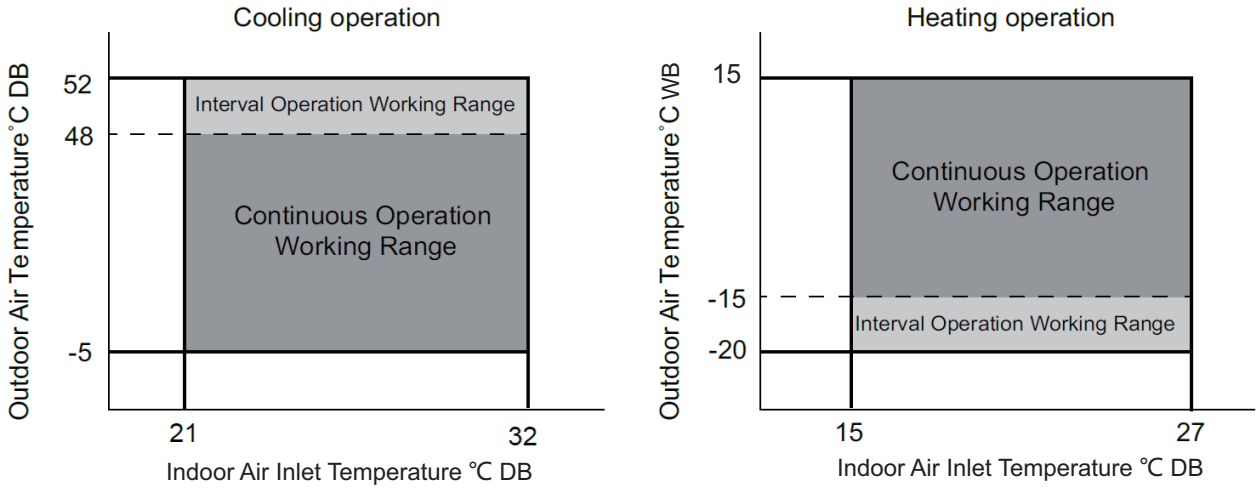
- Monitor the unit real-time working status;
- Display the fault code;
- View the historical fault code;
- Optimize the control parameters based on site.



Example: DIP Switches Position for 3-6.5HP

1.7 Wide Operation Range

- A kind of fresh air intake design is adopted for inverter driver which improves heat emission and allows the system to be running stably under high ambient conditions.
- Special 3-row coil design (3/3.5/6/6.5/10/11/12HP) and larger area of coil enhance heating capability, and enables heating as low as -20℃ ambient condition.



1.8 Operating Sound Reduction Function

1.8.1 Night Shift Mode (Optional)

When the night shift mode (optional function) is turned on, the rotation speed of the compressor and the outdoor fan are automatically lowered, if the ambient temperature is 30℃ or lower in a cooling operation. Besides,in the night shift mode , the noise can be reduced by 3-10dB(A) compared to the nominal operation.

NOTES:

- The night shift mode is recommended when the cooling capacity has sufficient margin compared to the cooling load and if you want to reduce the noise during night time.
- Also in the night shift mode, the cooling capacity will be reduced.
- Only for cooling operation.

1.8.2 Low Noise Setting Mode (Optional)

Low noise setting mode is an optional function where the rotation speed of the compressor is forcibly reduced irrespective of the ambient temperature. You can choose three levels (1, 2 or 3) in this mode, schedule and set the time with DIP switches. This mode reduces the noise by 1~4dB(A), depending on the level chosen.

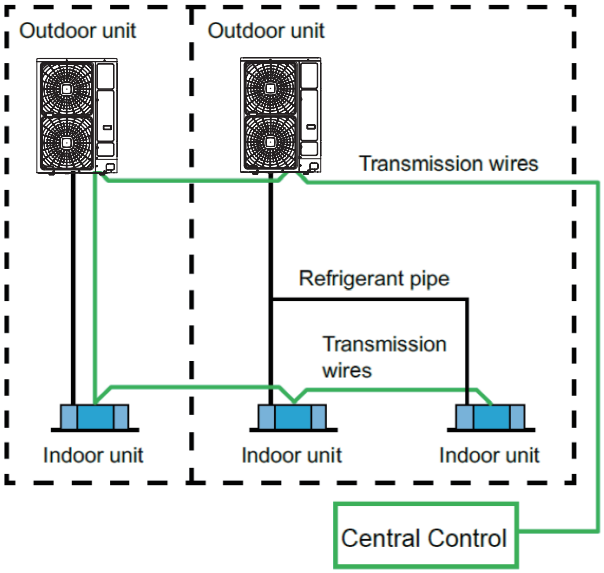
NOTE:

- The cooling and heating capacity may drop to 80%(level 1), 70%(level 2) or 60%(level 3) in low noise setting mode.

1.9 H-LINK Ⅱ System

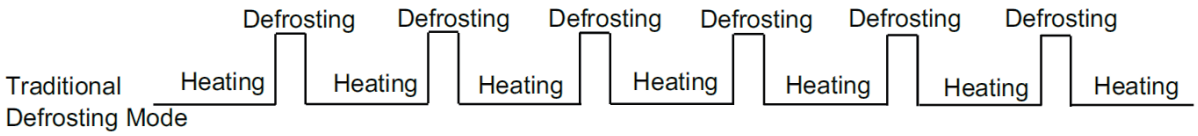
H-LINK Ⅱ System requires only two transmission wires connected with each outdoor unit.

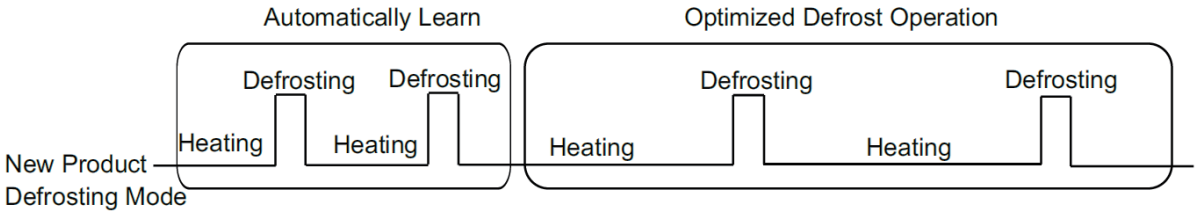
- Flexible installation options;
- No polarity requirements;
- Central Control is enabled via indoor or outdoor unit;
- Up to 160 indoor units can be connected;
- Possible to have a cable length of up to 1,000m (5,000m with H-LINK Ⅱ relay);
- Up to 64 refrigerant cycles.



1.10 Intelligent Defrosting

The frost on the outdoor heat exchanger will reduce heating capacity, thus defrost operation is needed and the temperature of the room is undulatory at the defrost operation. The intelligent defrosting technology automatically learns the operation data of the last defrosting, then determines the optimized defrost operation next time to decrease the defrost frequency, which can improve the comfortable of the room.





2. Outdoor Unit

2.1 General Data

Model				RAS-3.0 HNBRKQ1	RAS-3.5 HNBRKQ1	RAS-4.0 HNBRKQ1	RAS-4.5 HNBRKQ1	RAS-5.0 HNBRKQ1
Power Supply				220-240V/1Ph/50Hz				
Capacity	Cooling	Rated Capacity	kW	8.0	10.0	11.2	12.0	14.0
		Power Input	kW	1.99	2.68	2.65	3.05	3.50
	Heating	Rated Capacity	kW	9.0	11.0	12.5	14.0	16.0
		Power Input	kW	2.09	2.59	2.92	3.25	3.70
Noise (SPL)		Rated	dB(A)	51	53	54	54	54
Outer Dimensions (Height×Width×Depth)			mm	800×950×320		1380×950×320		
Package Dimensions (Height×Width×Depth)			mm	946×1070×472		1526×1070×472		
Total Indoor Unit Capacity Ratio			-	50%~130%				
No. of the indoor units can be connected			Q'ty	2~4	2~5	2~6	2~6	2~7
Weight		Net	kg	75	75	114	114	114
		Gross	kg	85	85	124	124	124
Heat Exchanger		Type	-	Multi-Pass Cross-Finned Tube				
		Material	-	Cu-Al				
Compressor		Type	-	Rotary	Rotary	Rotary	Rotary	Rotary
		Quantity	Q'ty	1	1	1	1	1
		Drive Mode	-	Inverter	Inverter	Inverter	Inverter	Inverter
		Crankcase Heater	W	24	24	28	28	28
Refrigerant Oil		Type	-	α 68HES-H	α 68HES-H	α 68HES-H	α 68HES-H	α 68HES-H
		Charge Amount	L	1.02	1.02	1.65	1.65	1.65
Fan		Quantity	Q'ty	1	1	2	2	2
		Motor Output	kW	0.18	0.18	0.18×2	0.18×2	0.18×2
		Airflow Rate	m^3/min	62	62	132	132	132
		Drive Mode	-	Driver outside				
Refrigerant		Type	-	R410A	R410A	R410A	R410A	R410A
		Charge Amount	kg	3.0	3.0	4.1	4.1	4.1
Gas Side Stop Valve			mm	Ø15.88	Ø15.88	Ø15.88	Ø15.88	Ø15.88
Liquid Side Stop Valve			mm	Ø9.52	Ø9.52	Ø9.52	Ø9.52	Ø9.52
Connection Method			-	Flare	Flare	Flare	Flare	Flare
Min. Circuit Amps			A	21	21	31	31	31
Max. Overcurrent Protective Device			A	32	32	40	40	40
High Pressure Switch			MPa	4.15	4.15	4.15	4.15	4.15
Working Temperature Range		Cooling	-	Max: stable work at 48ºC DB and interval work at 48ºC~52ºC DB; Min: -5ºC DB				
		Heating	-	Max: 24ºC DB/15ºC WB; Min: Stable work at -15ºC WB and interval work at -20~-15ºC WB				

OUTDOOR UNITS

Model				RAS-6.0 HNBRKQ1	RAS-6.5 HNBRKQ1	RAS-7.0 HNBRMQ1	RAS-8.0 HNBRMQ1
Power Supply				220-240V/1Ph/50Hz		380-415V/3Ph/50Hz	
Capacity	Cooling	Rated Capacity	kW	16.0	18.0	20.0	22.4
		Power Input	kW	4.14	5.19	5.26	6.21
	Heating	Rated Capacity	kW	18.0	20.0	22.4	25.0
		Power Input	kW	4.09	4.77	5.46	5.87
Noise (SPL)		Rated	dB(A)	55	55	56	56
Outer Dimensions (Height×Width×Depth)			mm	1380×950×320		1650×1100×390	
Package Dimensions (Height×Width×Depth)			mm	1526×1070×472		1800×1185×530	
Total Indoor Unit Capacity Ratio			-	50%~130%			
No. of the indoor units can be connected			Q'ty	2~8	2~9	2~10	2~10
Weight		Net	kg	118	118	154	154
		Gross	kg	128	128	168	168
Heat Exchanger		Type	-	Multi-Pass Cross-Finned Tube			
		Material	-	Cu-Al			
Compressor		Type	-	Rotary	Rotary	Scroll	Scroll
		Quantity	Q'ty	1	1	1	1
		Drive Mode	-	Inverter	Inverter	Inverter	Inverter
		Crankcase Heater	W	28	28	80	80
Refrigerant Oil		Type	-	α 68HES-H	α 68HES-H	FV68H	FV68H
		Charge Amount	L	1.65	1.65	1.60	1.60
Fan		Quantity	Q'ty	2	2	2	2
		Motor Output	kW	0.18×2	0.18×2	0.22×2	0.22×2
		Airflow Rate	m^3/min	135	135	162	162
		Drive Mode	-	Driver outside			
Refrigerant		Type	-	R410A	R410A	R410A	R410A
		Charge Amount	kg	4.4	4.4	5.5	5.5
Gas Side Stop Valve			mm	Ø15.88	Ø15.88	Ø19.05	Ø19.05
Liquid Side Stop Valve			mm	Ø9.52	Ø9.52	Ø9.52	Ø9.52
Connection Method			-	Flare	Flare	Flare	Flare
Min. Circuit Amps			A	31	31	20	20
Max. Overcurrent Protective Device			A	40	40	25	25
High Pressure Switch			MPa	4.15	4.15	4.15	4.15
Working Temperature Range		Cooling	-	Max: stable work at 48ºC DB and interval work at 48ºC~52ºC DB; Min: -5ºC DB			
		Heating	-	Max: 24ºC DB/15ºC WB; Min: Stable work at -15ºC WB and interval work at -20~-15ºC WB			

NOTES:

- When RAS-7.0~12HNBRMQ1 outdoor units are connected with the RCIM-0.8FSN4 or RCD-0.8~1.0FSN3 or RCS-0.8~1.0FSN, if only one of these indoor unit is operating in cooling mode, the minimum outdoor temperature is limited to 5℃ DB.

Model				RAS-10HNBRMQ1	RAS-11HNBRMQ1	RAS-12HNBRMQ1
Power Supply				380-415V/3Ph/50Hz		
Capacity	Cooling	Rated Capacity	kW	28.1	31.0	33.5
		Power Input	kW	7.62	8.61	10.14
	Heating	Rated Capacity	kW	31.5	33.9	37.5
		Power Input	kW	7.97	9.16	10.48
Noise (SPL)		Rated	dB(A)	59	59	60
Outer Dimensions (Height×Width×Depth)			mm	1650×1100×390		
Package Dimensions (Height×Width×Depth)			mm	1800×1185×530		
Total Indoor Unit Capacity Ratio			-	50%~130%		
No. of the indoor units can be connected			Q'ty	2~10(13)△	2~10(14)△	2~10(15)△
Weight		Net	kg	172	172	172
		Gross	kg	187	187	187
Heat Exchanger		Type	-	Multi-Pass Cross-Finned Tube		
		Material	-	Cu-Al		
Compressor		Type	-	Scroll	Scroll	Scroll
		Quantity	Q'ty	1	1	1
		Drive Mode	-	Inverter	Inverter	Inverter
		Crankcase Heater	W	80	80	80
Refrigerant Oil		Type	-	FV68H	FV68H	FV68H
		Charge Amount	L	1.60	1.60	1.60
Fan		Quantity	Q'ty	2	2	2
		Motor Output	kW	0.22×2	0.22×2	0.22×2
		Airflow Rate	m^3/min	172	172	172
		Drive Mode	-	Driver outside		
Refrigerant		Type	-	R410A	R410A	R410A
		Charge Amount	kg	6.5	6.5	6.5
Gas Side Stop Valve			mm	Ø19.05※	Ø19.05▲	Ø19.05▲
Liquid Side Stop Valve			mm	Ø12.7	Ø12.7	Ø12.7
Connection Method			-	Flare	Flare	Flare
Min. Circuit Amps			A	28	28	28
Max. Overcurrent Protective Device			A	40	40	40
High Pressure Switch			MPa	4.15	4.15	4.15
Working Temperature Range		Cooling	-	Max: stable work at 48ºC DB and interval work at 48ºC~52ºC DB; Min: -5ºC DB		
		Heating	-	Max: 24ºC DB/15ºC WB; Min: Stable work at -15ºC WB and interval work at -20~-15ºC WB		

NOTES:

- When RAS-7.0~12HNBRMQ1 outdoor units are connected with the RCIM-0.8FSN4 or RCD-0.8~1.0FSN3 or RCS-0.8~1.0FSN, if only one of these indoor unit is operating in cooling mode, the minimum outdoor temperature is limited to 5℃ DB.
- Mark "※" represent that there is a pipe adapter in the model of RAS-10HNBRMQ1, which is used to adjust the gas pipe between the outdoor unit and the first branch. Thus the Ø19.05 diameter pipe is converted to Ø22.2 diameter pipe.
- Mark "▲" represent that there is a pipe adapter in the model of RAS-11~12HNBRMQ1, which is used to adjust the gas pipe between the outdoor unit and the first branch. Thus the Ø19.05 diameter pipe is converted to Ø25.4 diameter pipe.
- Mark "△" represent that there are restrictions when the number of indoor unit connected is more than 10. Detail restrictions refer to chapter 2.14.
- The test is under the following working conditions when it is combined with test indoor units.

  Working condition for testing EER:
  Indoor temperature: 27℃ DB/19℃ WB; Outdoor temperature: 35℃ DB
  Pipe length: 10m; Pipe lift: 0m

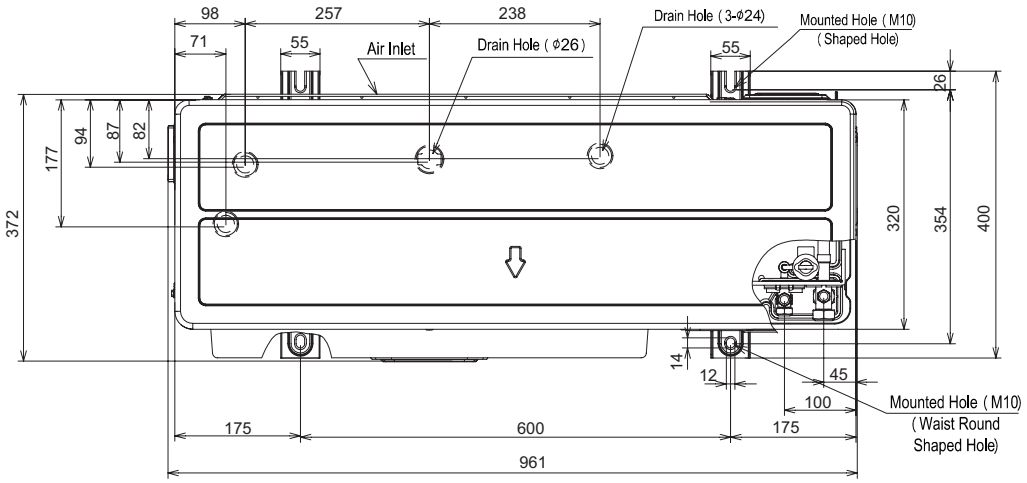
  Working condition for testing COP:
  Indoor temperature: 20℃ DB; Outdoor temperature: 7℃ DB/6℃ WB

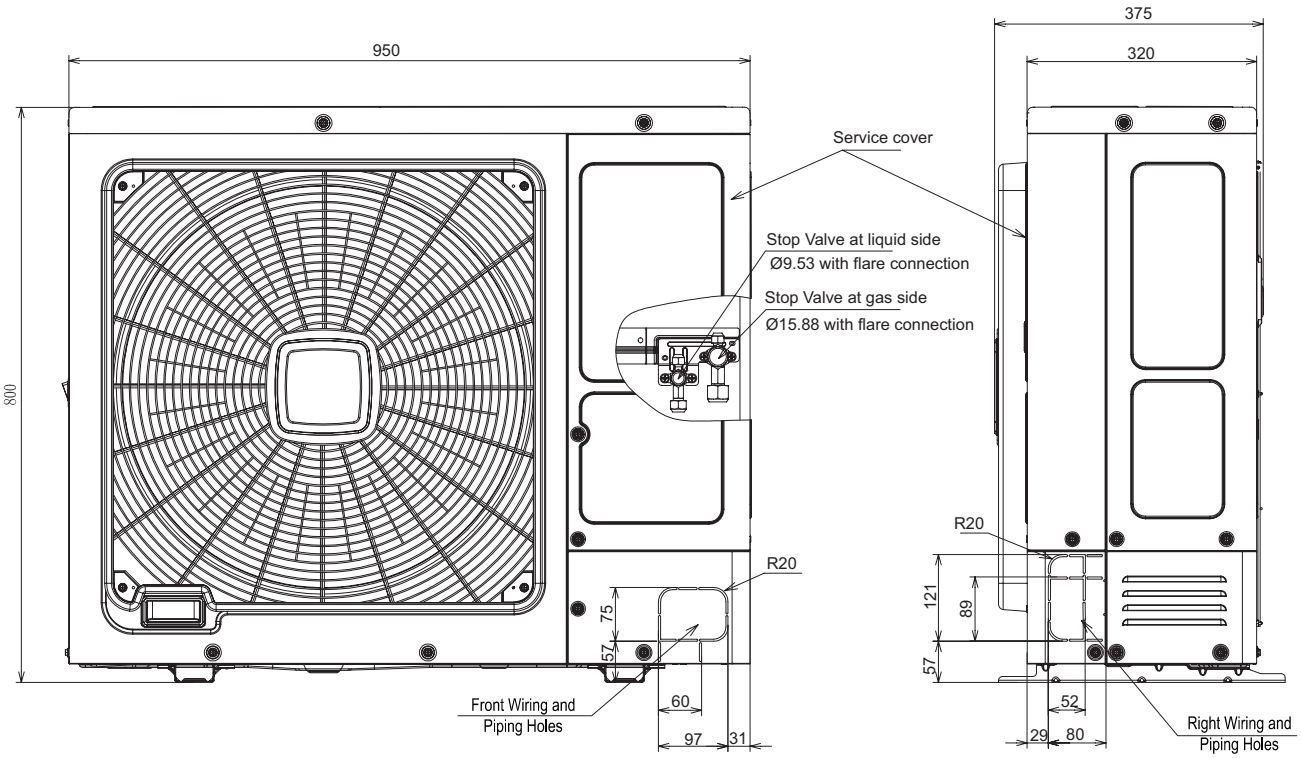
  Noise test conditions are specified belowed: Noise (SPL) is tested 1.5m above ground level and 1m away from the surface of the external service board on the outdoor unit. Noise parameters are tested in a semi-anechoic chamber.

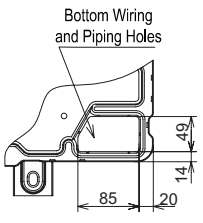
2.2 Dimensional Data

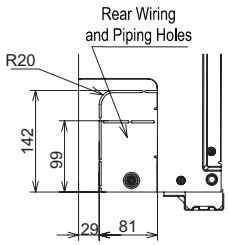
Model: RAS-3.0~3.5HNBRKQ1

Unit: mm



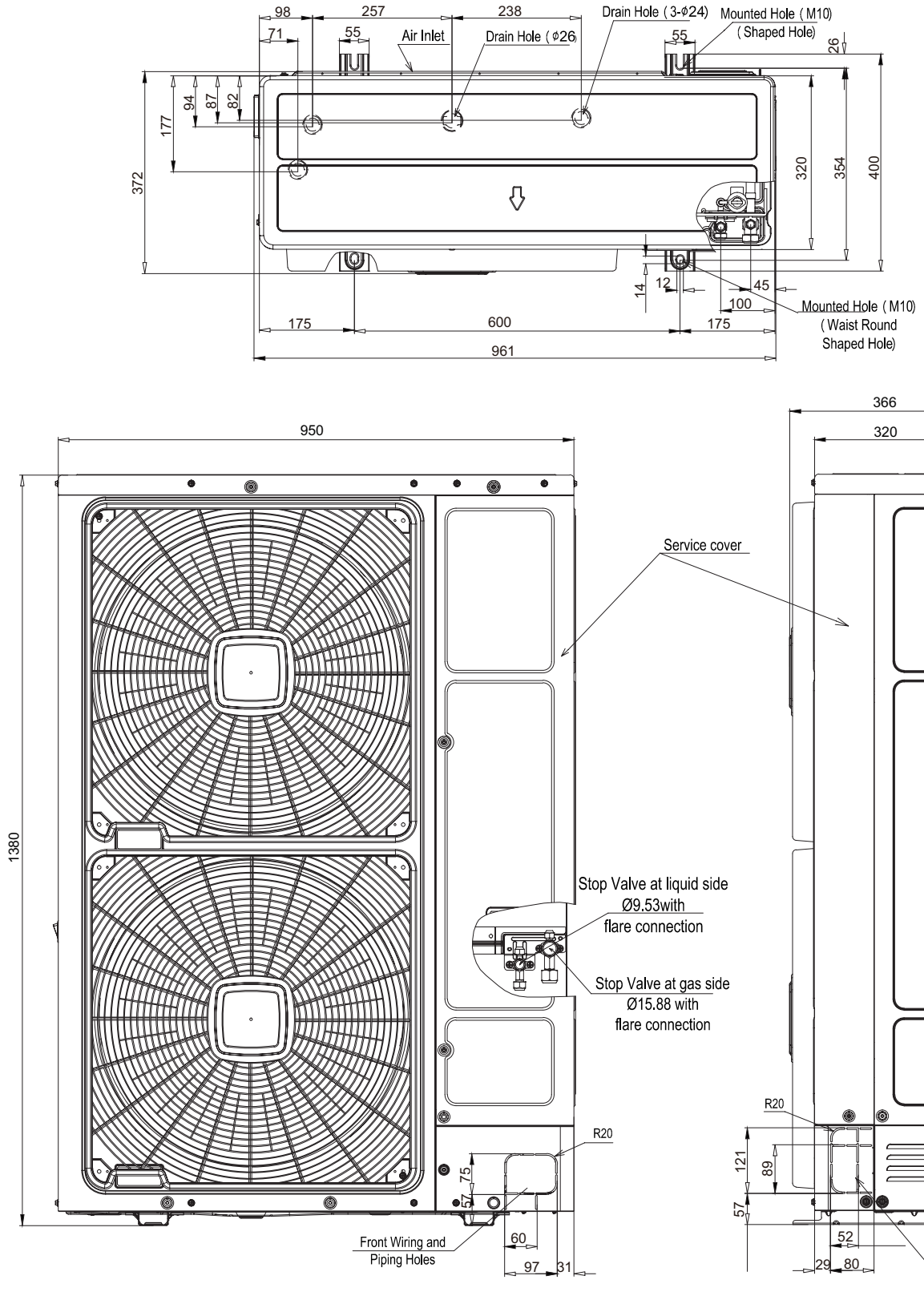






Model: RAS-4.0~6.5HNBRKQ1

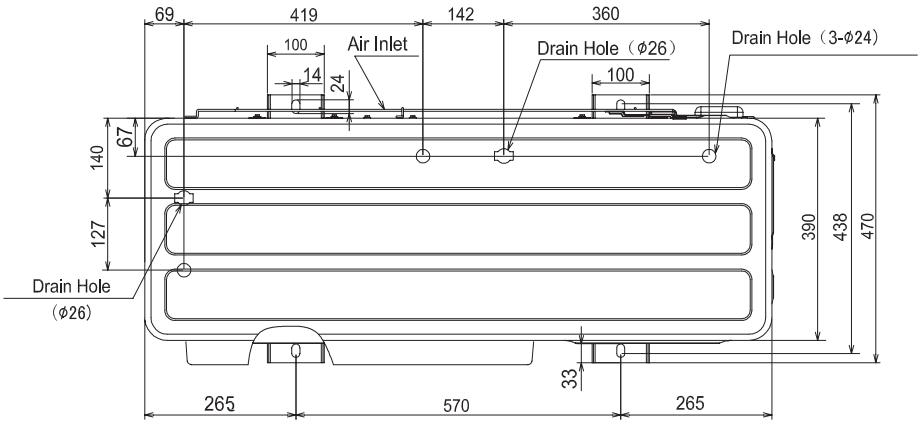
Unit: mm

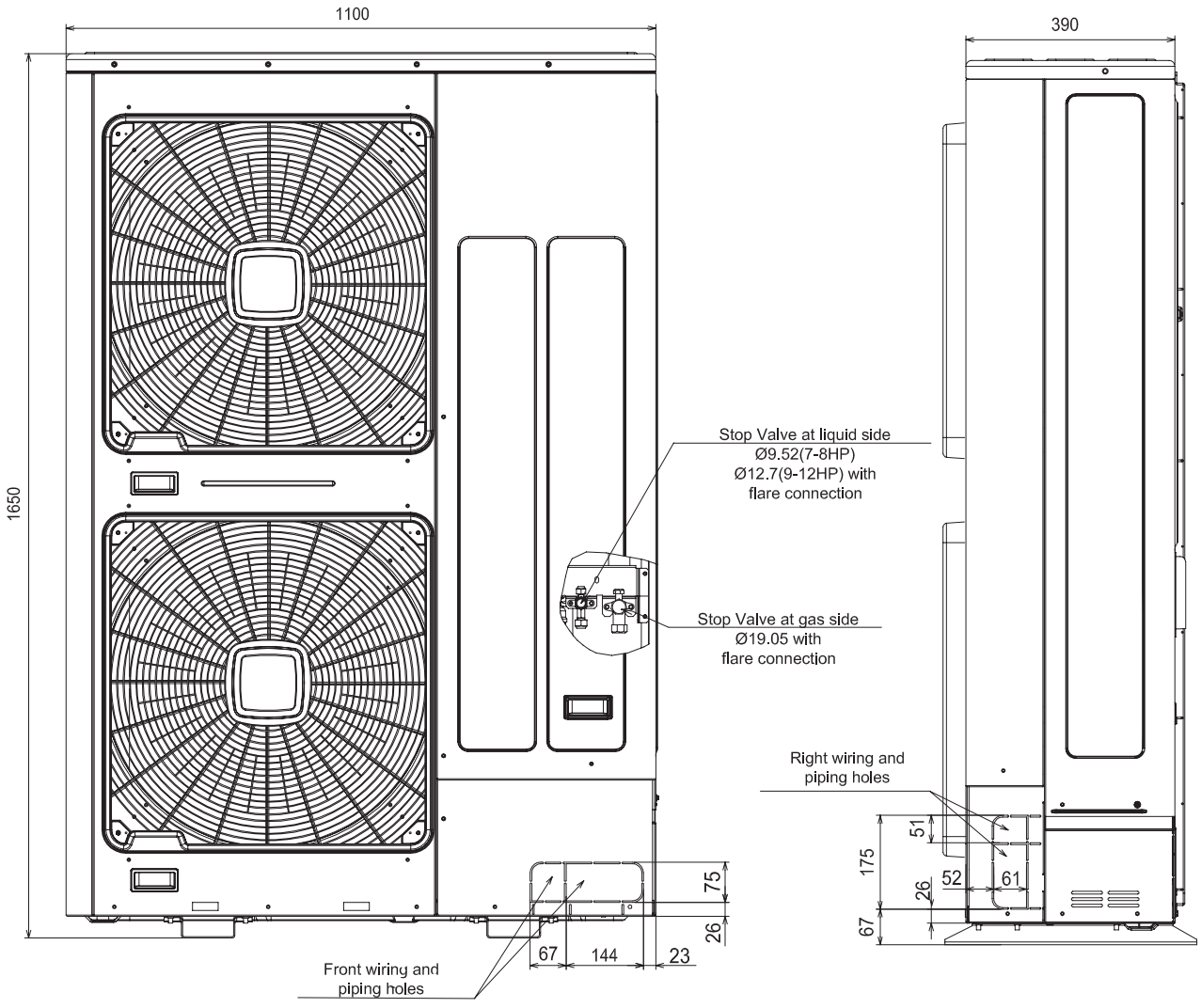


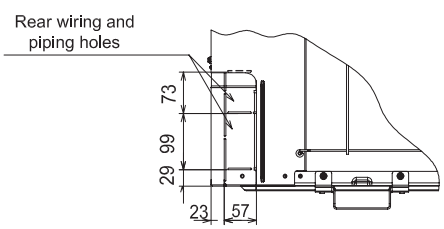
OUTDOOR UNITS

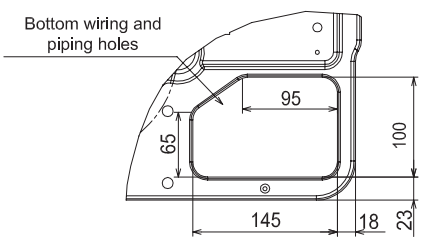
Model: RAS-7.0~12HNBRMQ1

Unit: mm



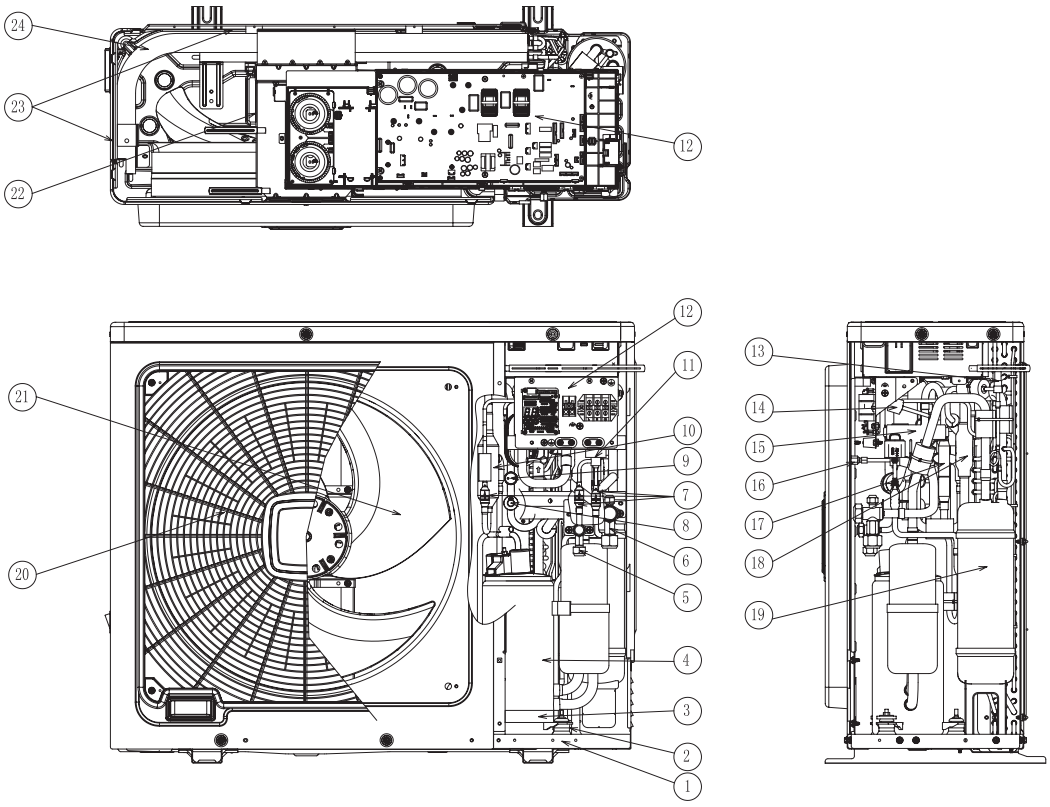






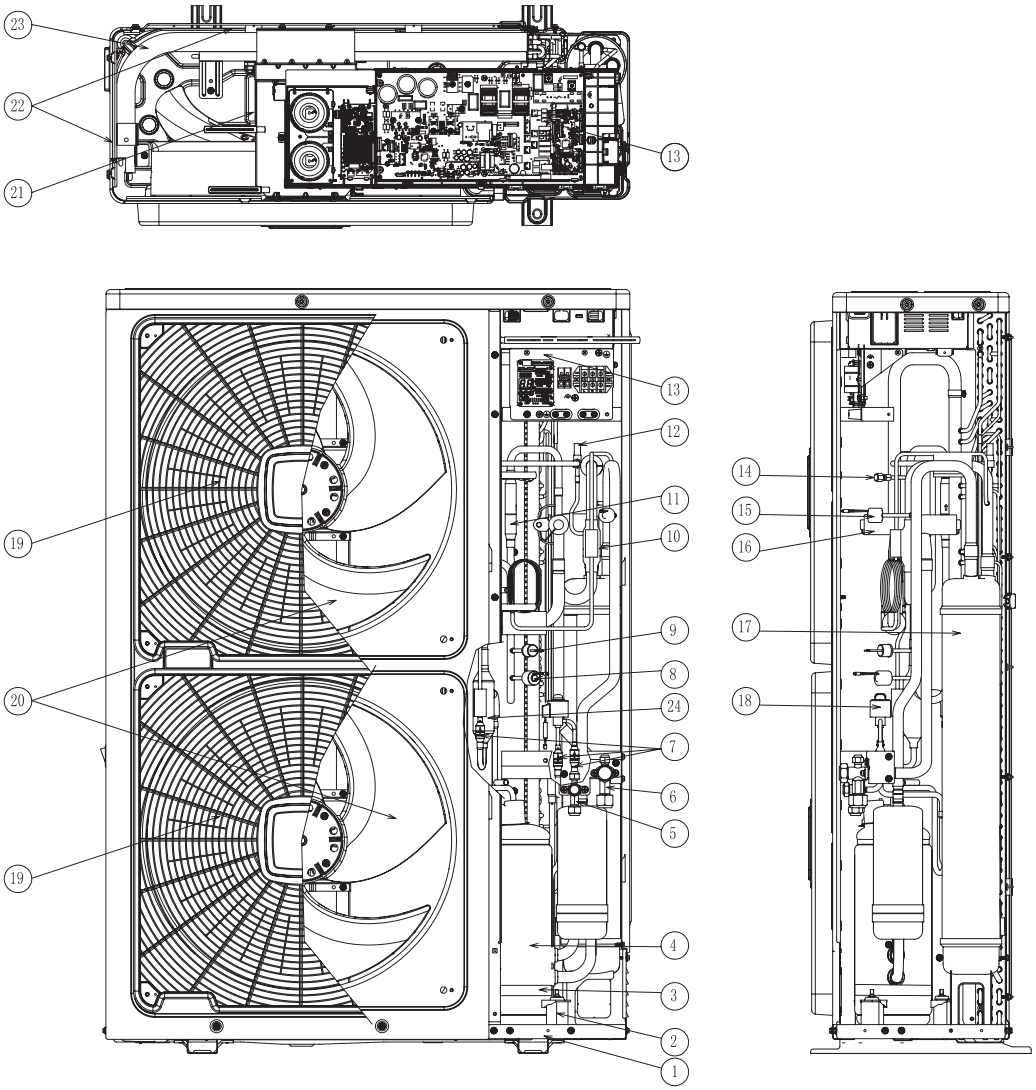
2.3 Structure

Model: RAS-3.0~3.5HNBRKQ1



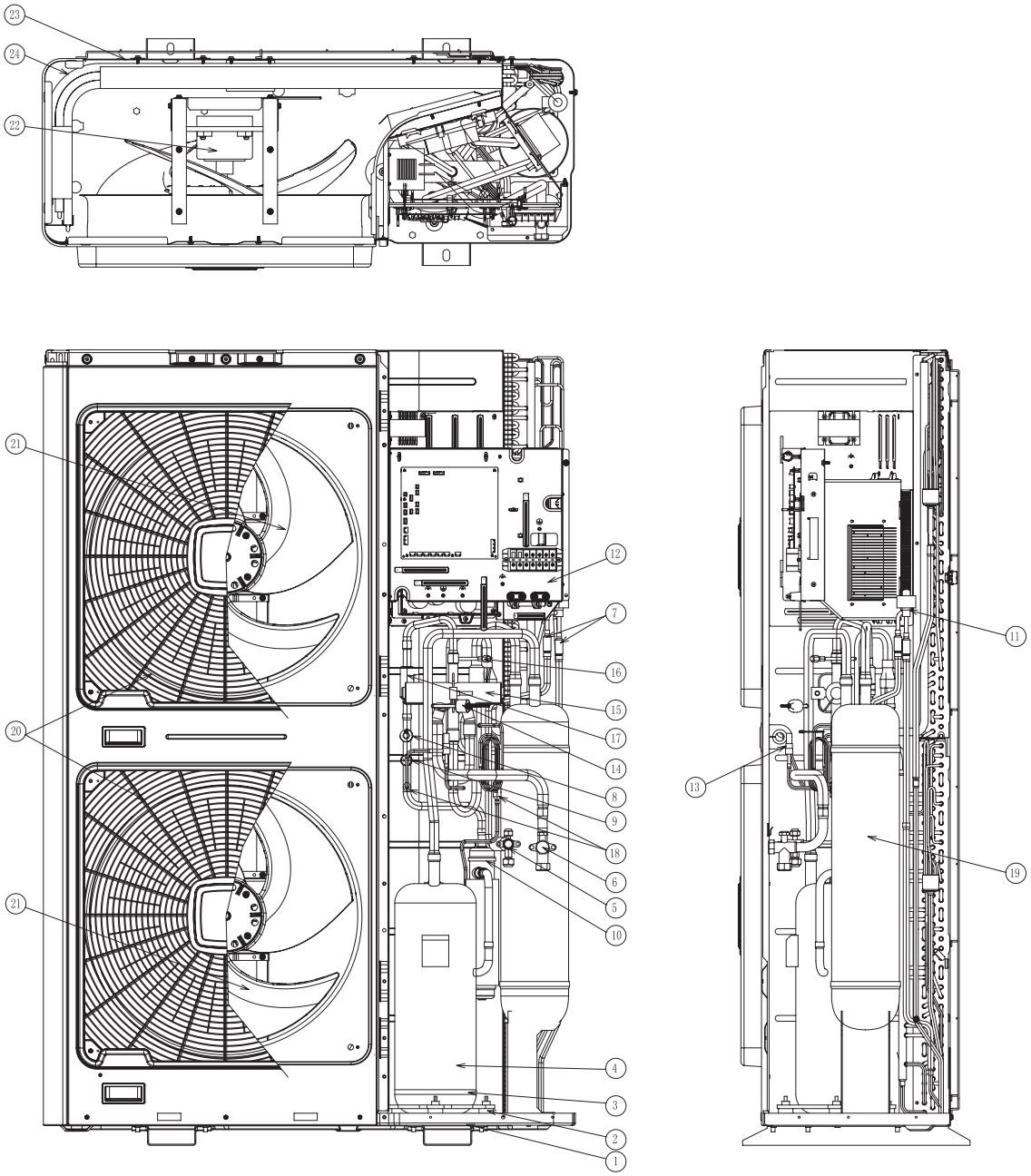
No.	Part Name	No.	Part Name	No.	Part Name	No.	Part Name
1	Chassis	7	Filter	13	Solenoid Valve	19	Accumulator
2	Vibration Absorber	8	High Pressure Sensor	14	Low Pressure Sensor	20	Air Outlet
3	Crankcase Heater	9	High Pressure Switch	15	4-Way Valve	21	Propeller Fan
4	Compressor	10	Oil Separator	16	Check Joint	22	Fan Motor
5	Liquid Stop Valve	11	Electronic Expansion Valve	17	Check Valve	23	Air Inlet
6	Gas Stop Valve	12	Electrical Box	18	Filter	24	Heat Exchanger

Model: RAS-4.0HNBRKQ1~RAS-6.5HNBRKQ1



No.	Part Name	No.	Part Name	No.	Part Name	No.	Part Name
1	Chassis	7	Filter	13	Electrical Box	19	Air Outlet
2	Vibration Absorber	8	High Pressure Sensor	14	Check Joint	20	Propeller Fan
3	Crankcase Heater	9	High Pressure Switch	15	Low Pressure Sensor	21	Fan Motor
4	Compressor	10	Filter	16	4-Way Valve	22	Air Inlet
5	Liquid Stop Valve	11	Check Valve	17	Accumulator	23	Heat Exchanger
6	Gas Stop Valve	12	Solenoid Valve	18	Electronic Expansion Valve	24	Oil Separator

Model: RAS-7.0HNBRMQ1~RAS-12HNBRMQ1



No.	Part Name	No.	Part Name	No.	Part Name	No.	Part Name
1	Chassis	7	Filter	13	Solenoid Valve	19	Accumulator
2	Vibration Absorber	8	High Pressure Sensor	14	Low Pressure Sensor	20	Air Outlet
3	Crankcase Heater	9	High Pressure Switch	15	4-Way Valve	21	Propeller Fan
4	Compressor	10	Oil Separator	16	Check Joint	22	Fan Motor
5	Liquid Stop Valve	11	Electronic Expansion Valve	17	Check Valve	23	Air Inlet
6	Gas Stop Valve	12	Electrical Box	18	Filter	24	Heat Exchanger

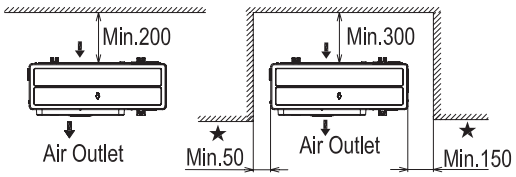
2.4 Service Space

When an outdoor unit is installed, the allowed service space is as follows:

- If there is not enough service space for air inlets and outlets, it may result in a performance drop-off and mechanical issues due to insufficient air intake.
- Additionally, adequate service space is required for service maintenance access.

(1) Obstacles on the inlet side

(a) There is no obstacle in the upper side. Unit: mm

<table>
<tr><th>Single Installation</th><th>Multiple Installation</th></tr>
<tr><td>
* No obstacle exists in the around.
* Obstacles exist in the left and right sides.


★ :It's better that the front side of unit is in a level with the obstacles.
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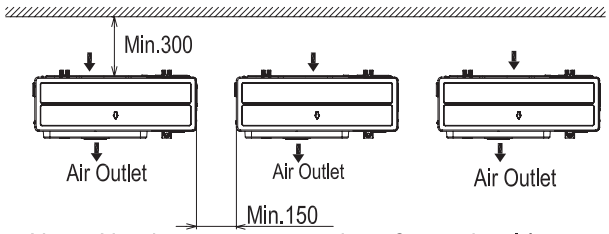
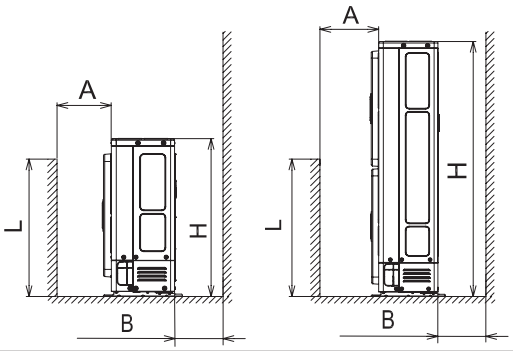
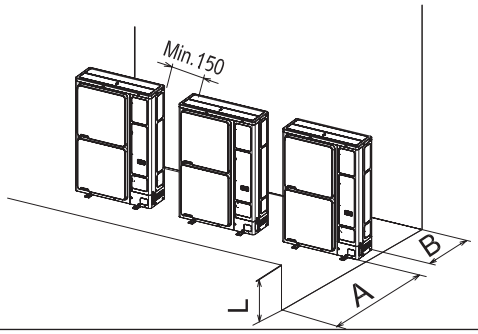


Note :No obstacle exists in the left or right side.
</td></tr>
<tr><td>
Note :No obstacle exists in the left or right side.


</td><td>
Note :No obstacle exists in the left or right side.


</td></tr>
</table>

(b) There are obstacles in the upper side. Unit: mm

<table>
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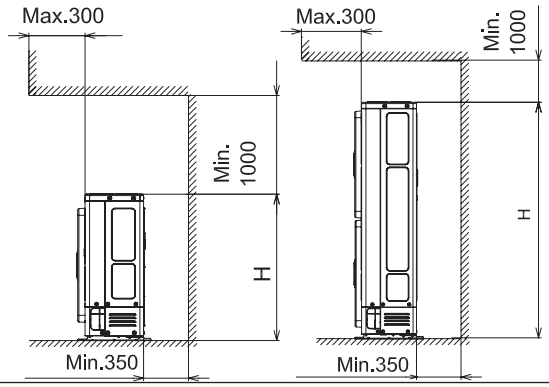
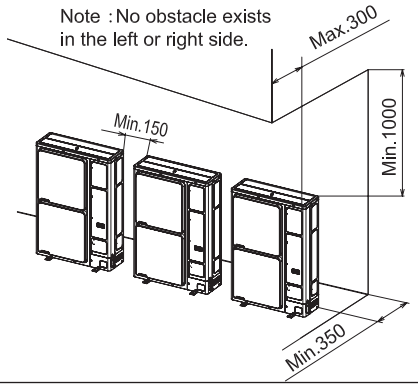
<tr><td>


</td><td>
Note :No obstacle exists in the left or right side.


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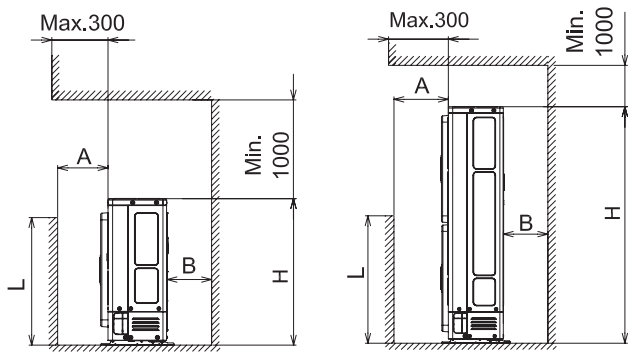
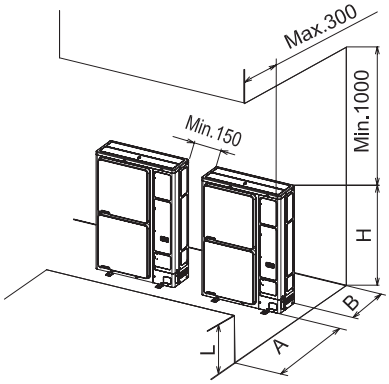
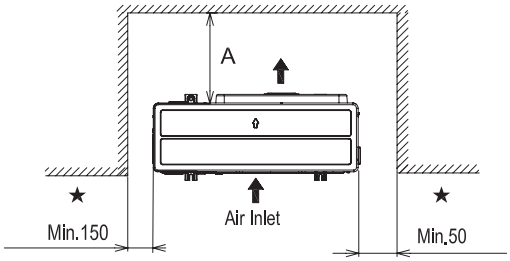
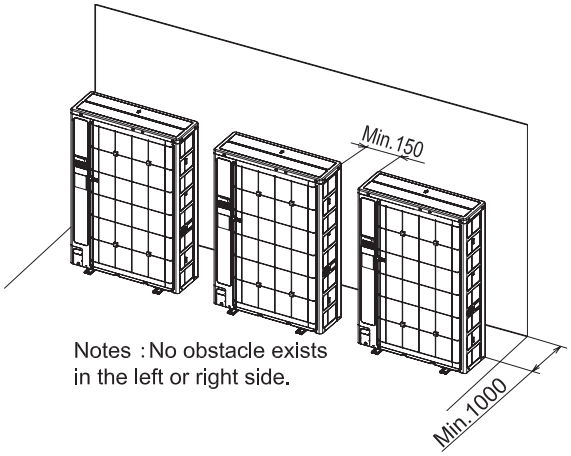
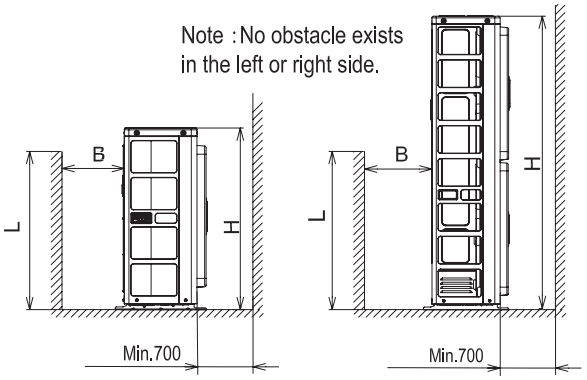
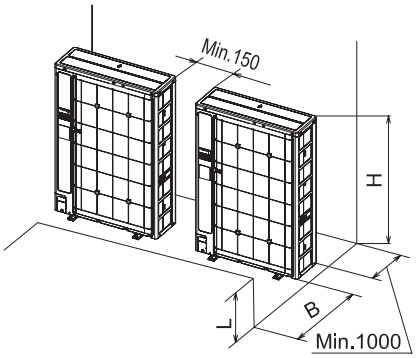


Note : No obstacle exists in the left or right side.

Notes :
No obstacle exists in the left or right side.
No more than two units for the installation



(2) Obstacles on the outlet side and no obstacle in the upper side. Unit: mm

Single Installation	Multiple Installation
	
	

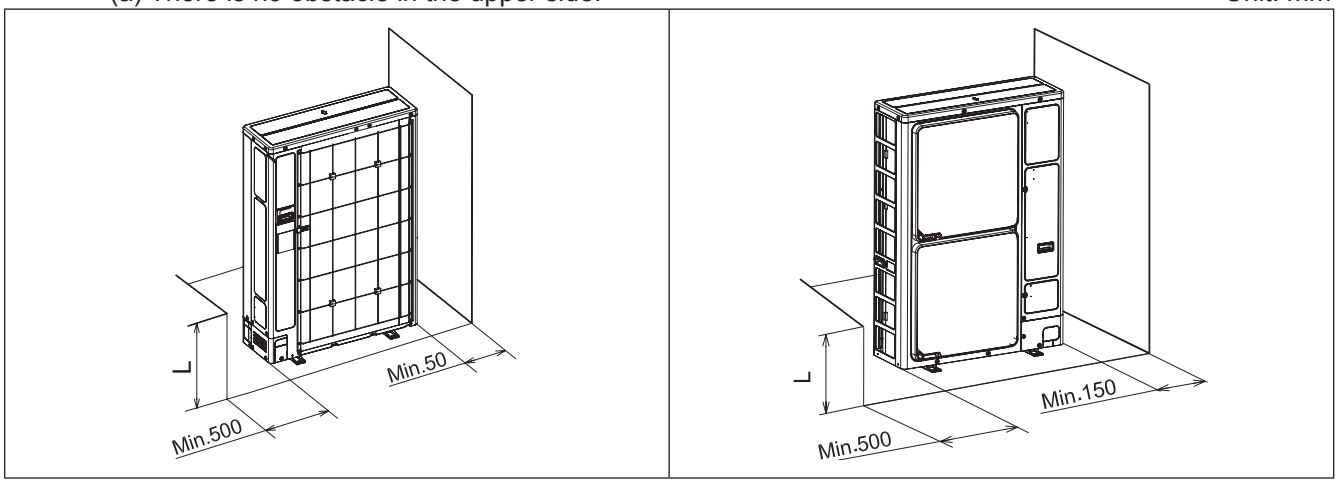
★ : It's better that the back side of unit is in a leve with the obstacles.
Note:Obstacles exist in the either left or right side.

Notes : No obstacle exists in the left or right side.

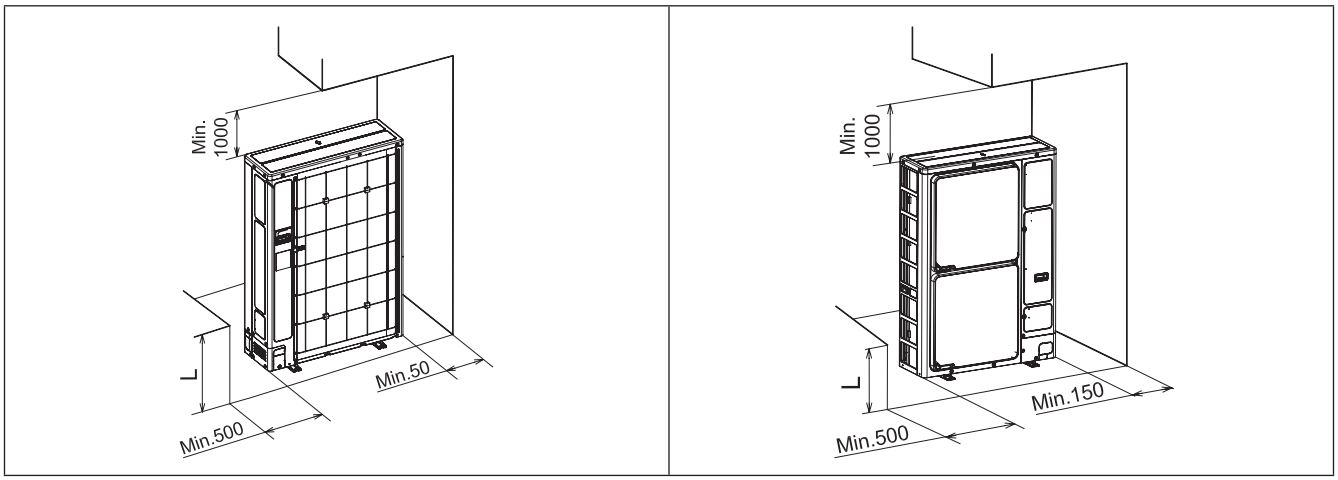
Notes :
No obstacle exists in the left or right side.
No more than two units for the installation

(3) Obstacles on right and left side of single installation.

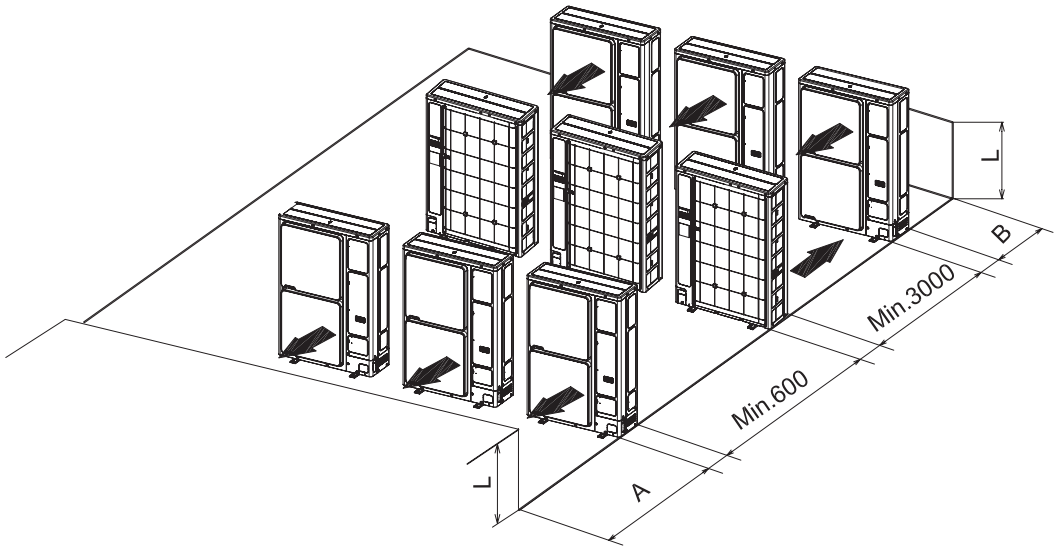
(a) There is no obstacle in the upper side. Unit: mm



(b) There are obstacles in the upper side. Unit: mm



(4) Multi-row and multiple installations. Unit: mm



NOTE:

- If L is larger than H, mount the units on a base so that H is greater or equal to L. Be sure to seal up every surface of the base. If the base allows the airflow to go, it may cause a short-circuit.

L	A (mm)	B (mm)
0 < L ≤ 1/2H	600 or more	300 or more
1/2H < L ≤ H	1400 or more	350 or more

2.5 Electrical Data

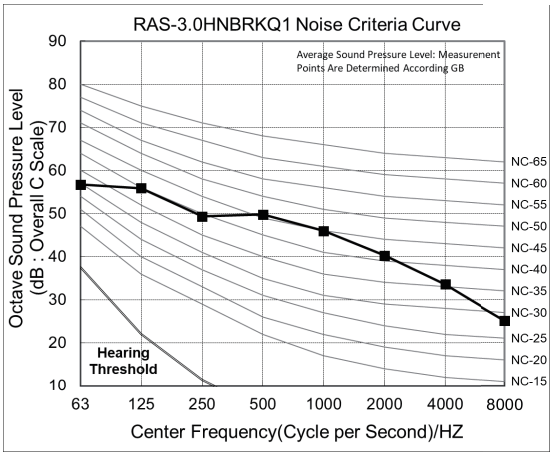
Model	Power Supply			Voltage Range		Start Current	Rated Current Input		MOP	MCA
	Voltage	PH	Hz	Max	Min		Cooling	Heating		
	(V)	Ø	Hz	(V)	(V)	(A)	(A)	(A)	(A)	(A)
RAS-3.0HNBRKQ1	220-240	1	50	264.0	198	8.7	9.5	9.9	32	21
RAS-3.5HNBRKQ1	220-240	1	50	264.0	198	8.7	12.9	12.3	32	21
RAS-4.0HNBRKQ1	220-240	1	50	264.0	198	10.6	12.6	14.0	40	31
RAS-4.5HNBRKQ1	220-240	1	50	264.0	198	10.6	14.8	16.1	40	31
RAS-5.0HNBRKQ1	220-240	1	50	264.0	198	10.6	18.3	19.2	40	31
RAS-6.0HNBRKQ1	220-240	1	50	264.0	198	10.6	20.2	20.7	40	31
RAS-6.5HNBRKQ1	220-240	1	50	264.0	198	10.6	26.0	24.0	40	31
RAS-7.0HNBRMQ1	380-415	3	50	456.5	342	8.5	13.0	12.0	25	20
RAS-8.0HNBRMQ1	380-415	3	50	456.5	342	8.5	14.0	13.0	25	20
RAS-10HNBRMQ1	380-415	3	50	456.5	342	20.0	19.0	18.0	40	28
RAS-11HNBRMQ1	380-415	3	50	456.5	342	20.0	20.0	19.0	40	28
RAS-12HNBRMQ1	380-415	3	50	456.5	342	20.0	21.0	20.0	40	28

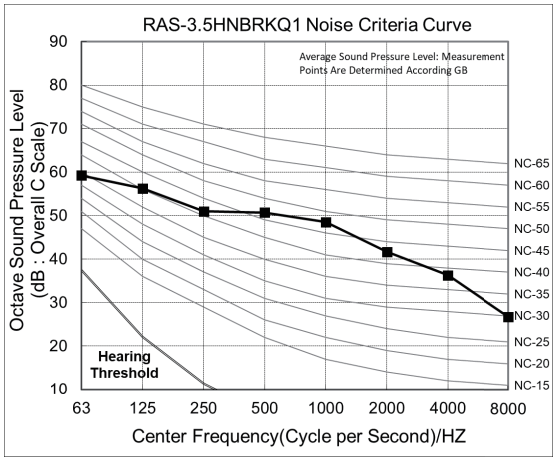
NOTES:

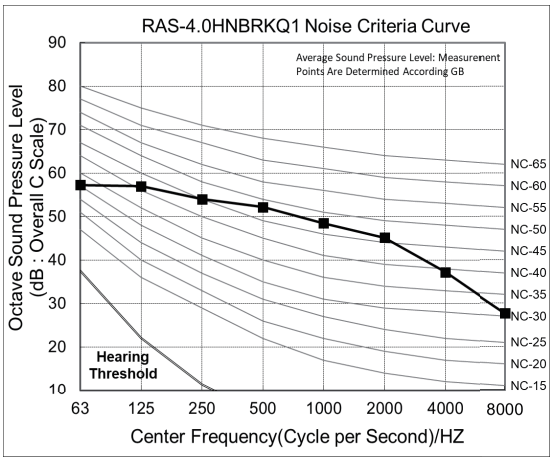
MCA: Minimum Circuit Ampacity (A);

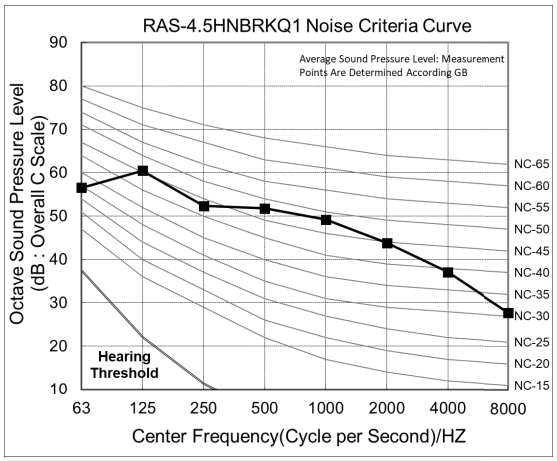
MOP: Maximum Overcurrent Protective Device (A).

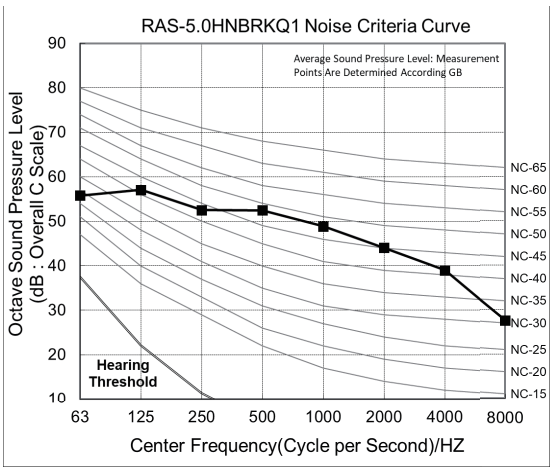
2.6 Sound Data

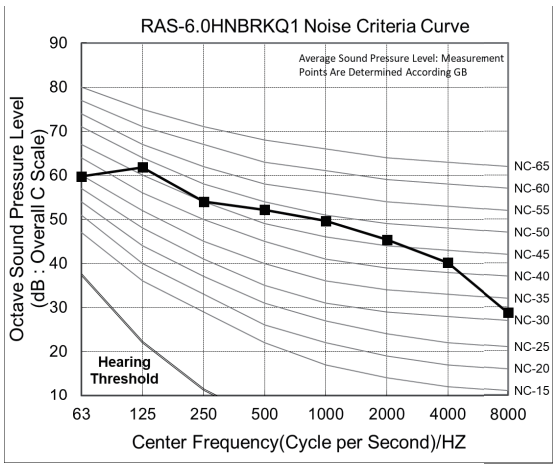


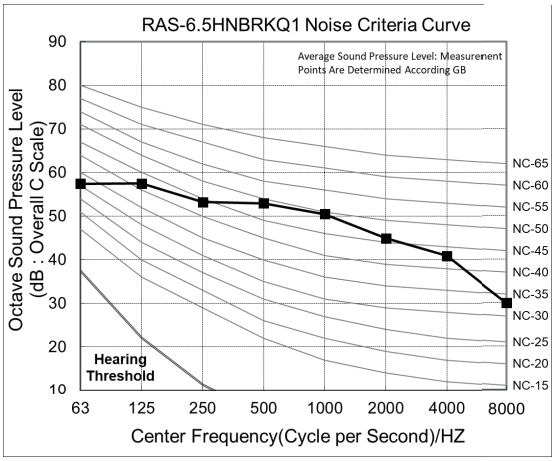


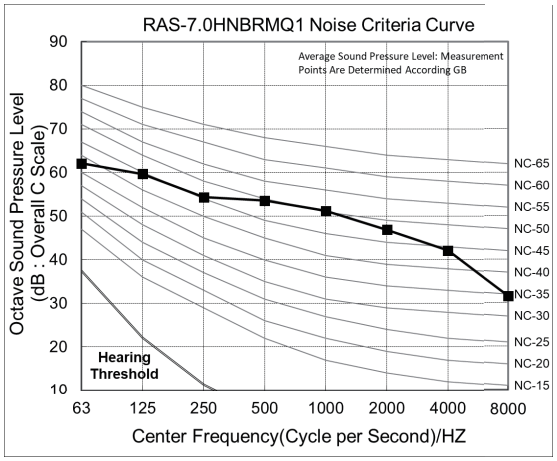


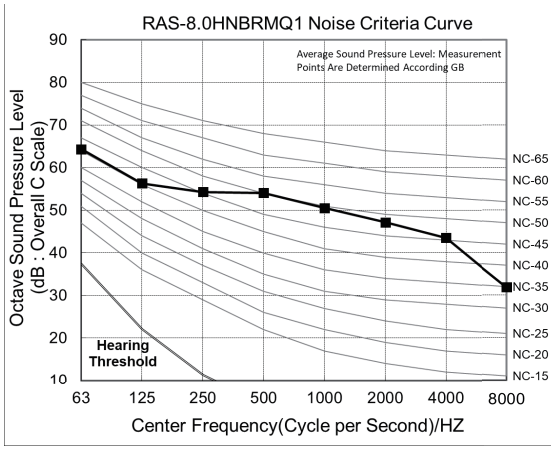


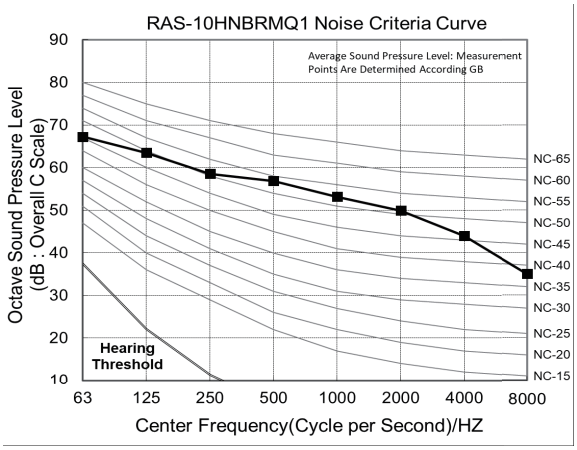


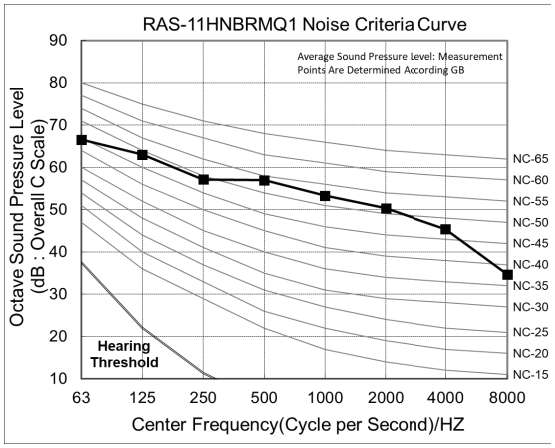


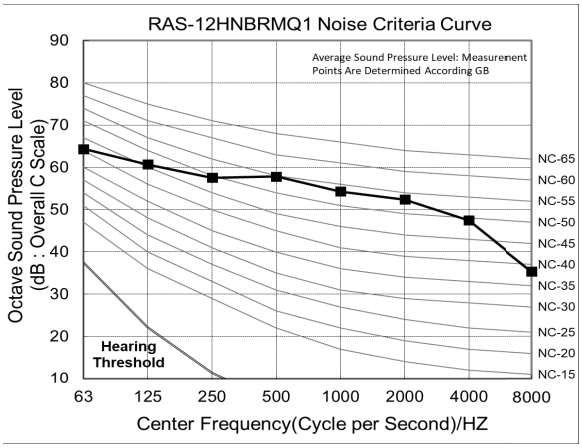










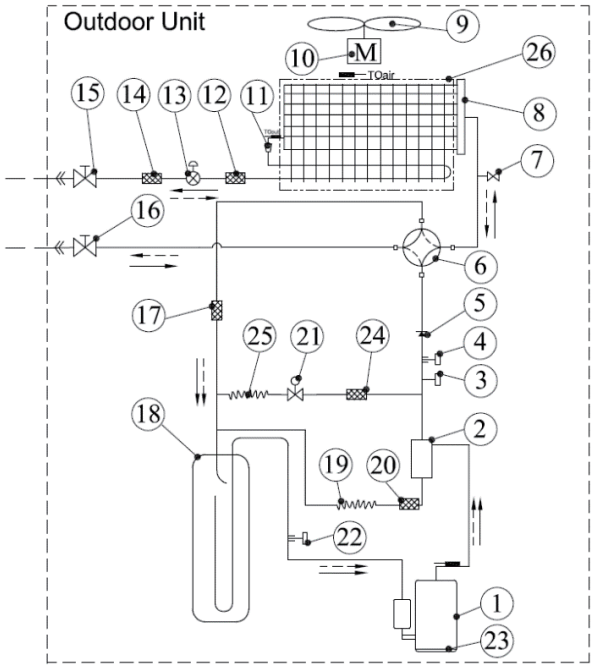


NOTE:

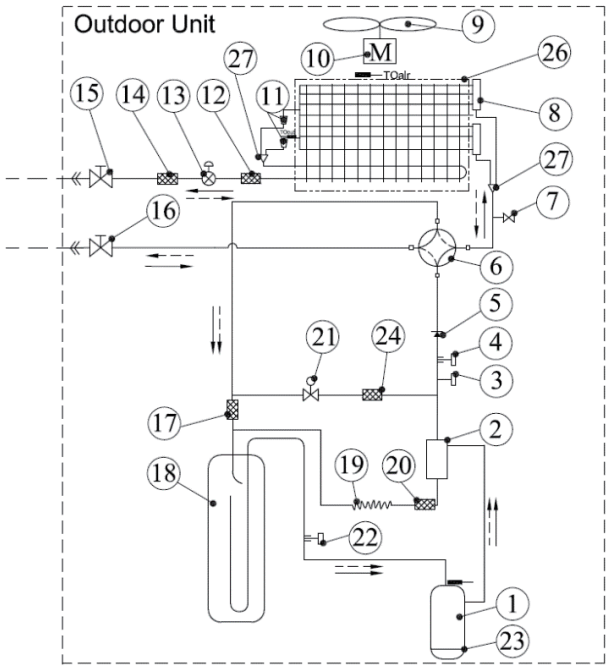
- Noise is tested 1.5m above ground level and 1m away from the surface of the external service cover on the outdoor unit. Noise parameters are tested in a semi-anechoic chamber.

2.7 Refrigerant Cycle Diagram

Model:RAS-3.0~6.5HNBRKQ1



Model:RAS-7.0~12HNBRMQ1



Cooling
Heating
Refrigerant Piping
Flare Connection

No.	Part Name	No.	Part Name	No.	Part Name
1	Compressor	10	Fan Motor	19	Oil Capillary Tube
2	Oil Separator	11	Distributor	20	Filter 4
3	High Pressure Switch	12	Filter 1	21	Solenoid Valve
4	High Pressure Sensor	13	Electronic Expansion Valve	22	Low Pressure Sensor
5	Check Valve	14	Filter 2	23	Crankcase Heater
6	4-Way Valve	15	Liquid Stop Valve	24	Filter 5
7	Check Joint	16	Gas Stop Valve	25	Bypass Capillary Tube
8	Gas Collector	17	Filter 3	26	Heat Exchanger
9	Propeller Fan	18	Accumulator	27	Y-shaped Joint

2.8 Control System

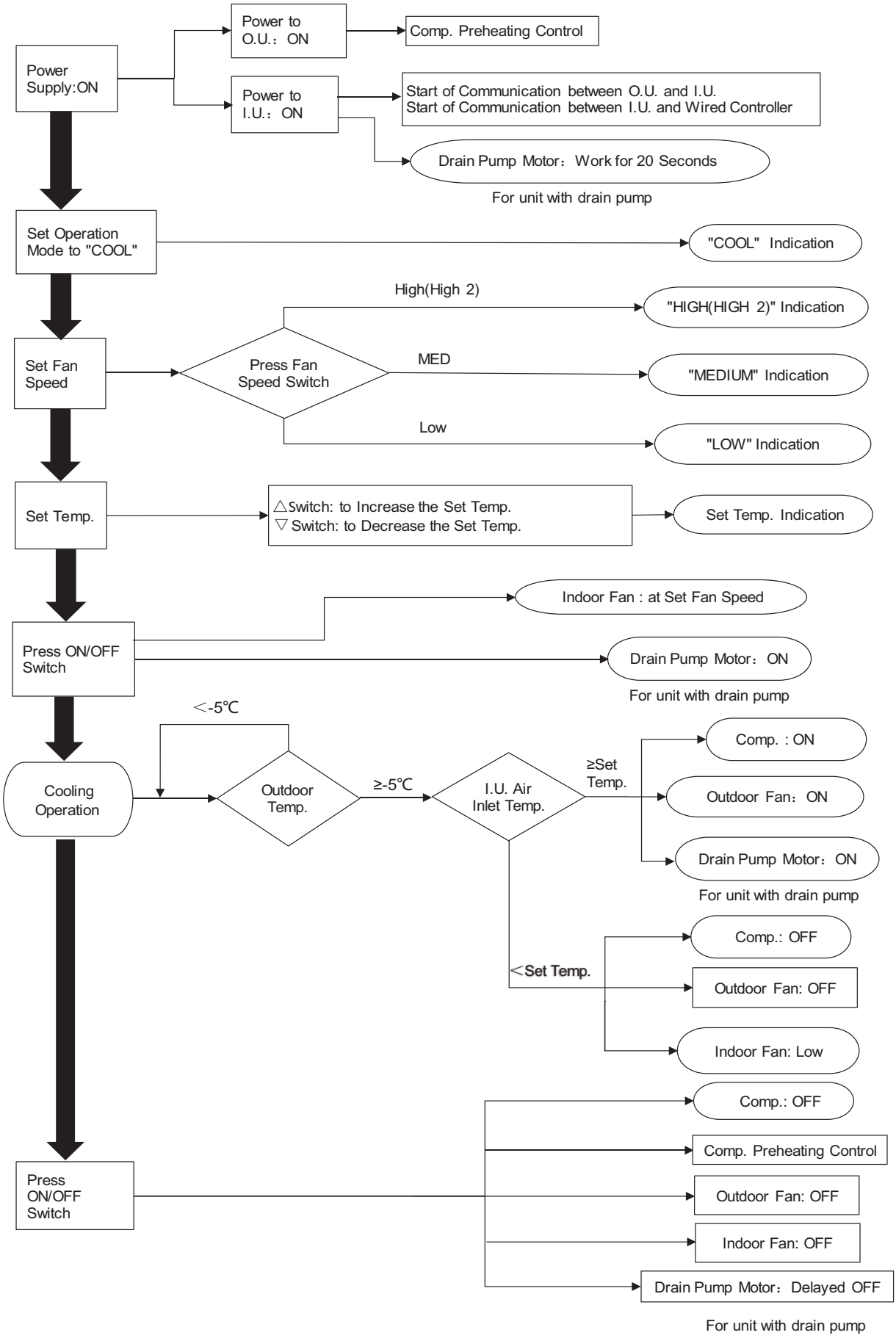
No.	Item		Details
1	Cooling Operation	Comp. Frequency Control	To determine the compressor frequency depending on (a) (b) and (c).
		I.U. Electronic Expansion Valve Control	● Quasi PI Control: To determine the I.U. electronic expansion valve opening so as to keep (d) at an optimum value. ● To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.
		O.U. Electronic Expansion Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To control the fan steps so that High Pressure is within a stable temperature range.
		4-Way Valve Control	OFF
		Control of Solenoid Valve for High/Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
		High/Low Pressure Control	SVA: ON (during Operation Stop)
2	Heating Operation	Comp. Frequency Control	● PI Control: To determine the compressor frequency so as to keep High Pressure. ● To determine the compressor frequency from (a) and (c) when heating operation is started or the number of operating indoor units is changed.
		I.U. Electronic Expansion Valve Control	● To determine the I.U. electronic expansion valve opening so that the indoor liquid pipe temperature is at an optimum value. ● To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.
		O.U. Electronic Expansion Valve Control	● Quasi PI Control: To determine the O.U. electronic expansion valve opening so as to keep the discharge temperature at an optimum level. ● When Operating Indoor Unit Number Changed: To determine the O.U. electronic expansion valve opening from the compressor frequency ratio before/after the change and Quasi PI Control.
		Outdoor Fan Control	The fan steps are dependent on Ta in the beginning. After that to control the fan steps so that Ps is within a stable pressure range.
		4-Way Valve Control	ON
		Control of Solenoid Valve for High/Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
		High/Low Pressure Control	SVA: ON (during operation stop)
3	Defrost Operation	Comp. Frequency Control	Fixed Compressor Frequency
		I.U. Electronic Expansion Valve Control	To determine the I.U. electronic expansion valve opening depending on discharge temperature (Td).
		O.U. Electronic Expansion Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To stop the outdoor fan.
		4-Way Valve Control	OFF
		Control of Solenoid Valve for High/Low Pressure Bypass (SVA)	At Start-up: ON
4	Comp. Preheating Control		Crankcase Heater Control

NOTES:

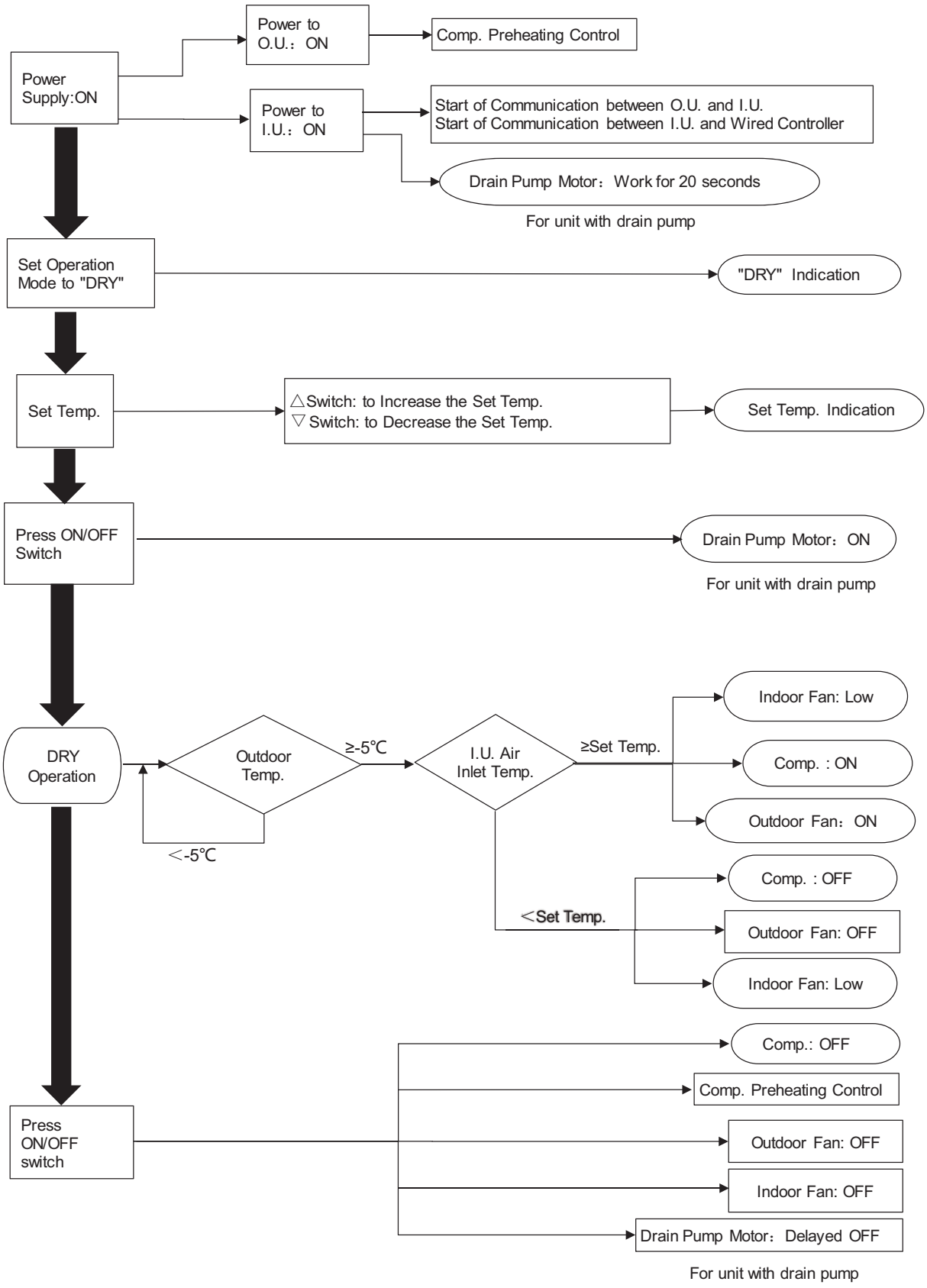
- Difference between Indoor Inlet Air Temperature and Setting Temperature;
- Amount of Temperature Difference Change;
- Capacity Ratio between Operating Indoor Unit and Outdoor Unit;
- Temperature Difference between Indoor Gas Pipe and Indoor Liquid Pipe
  = Indoor Gas Pipe Temperature - Indoor Liquid Pipe Temperature
- I.U: Indoor Unit; O.U: Outdoor Unit

2.9 Standard Operation Sequence

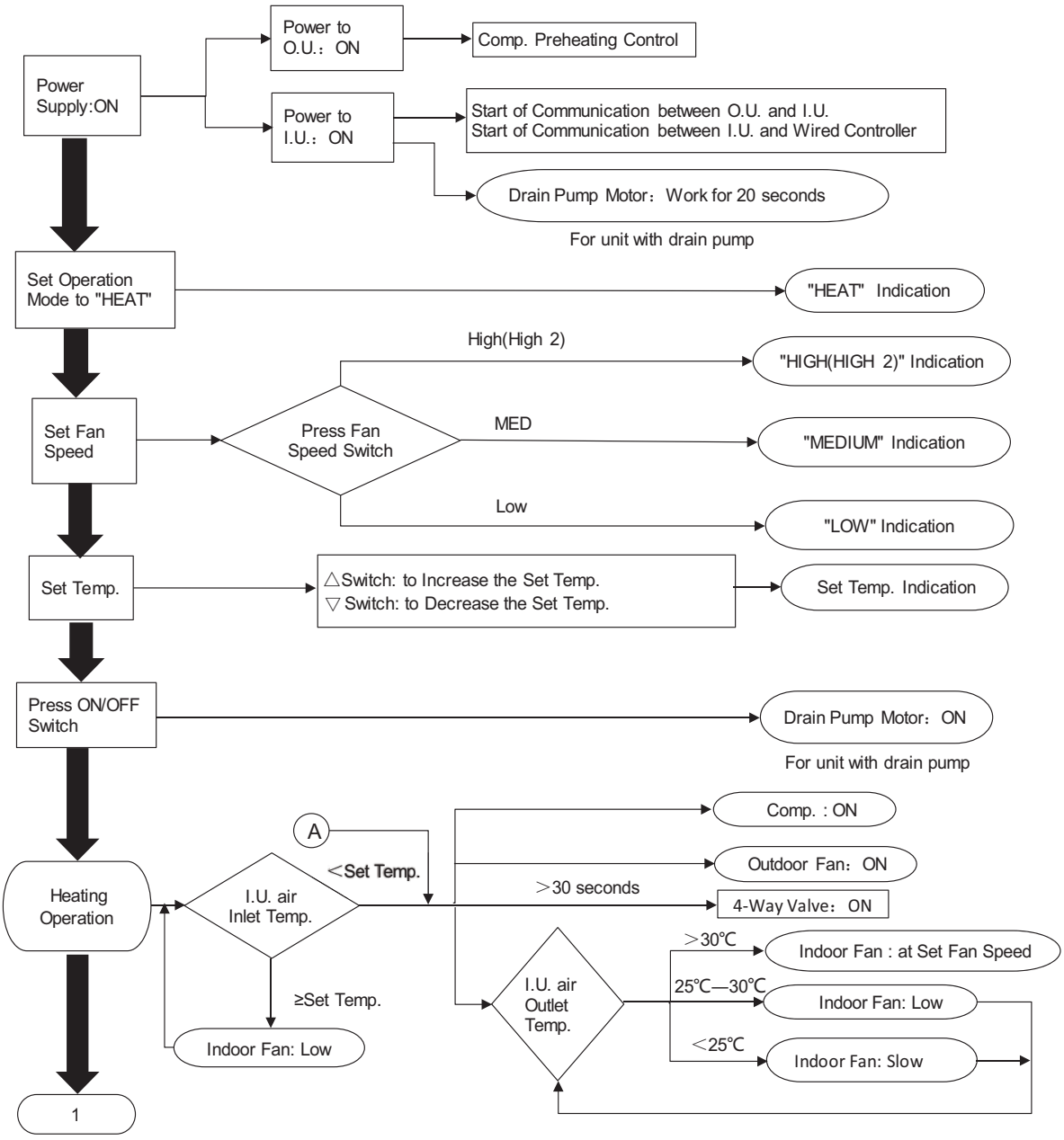
- Cooling Operation

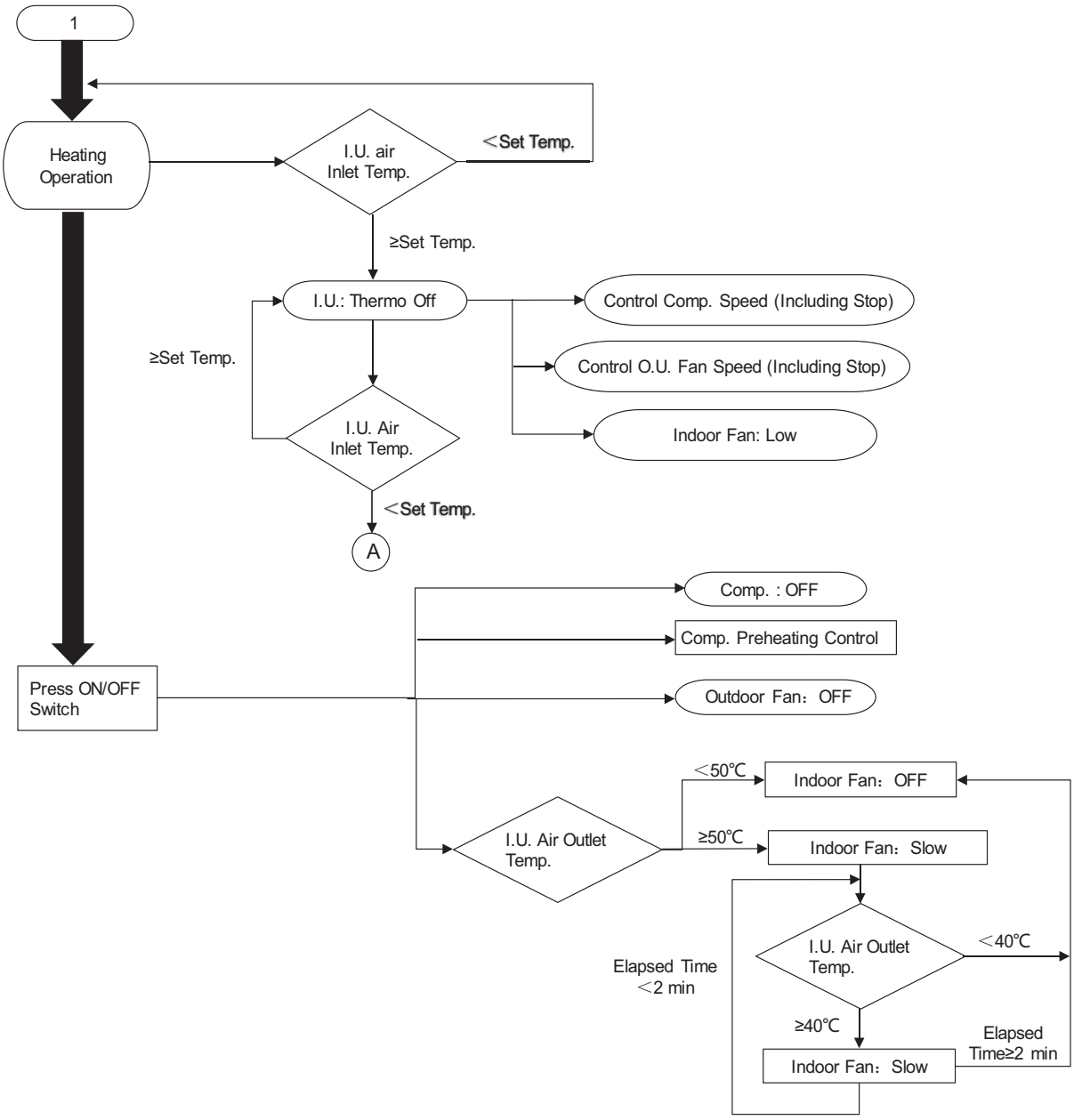


● Dry Operation

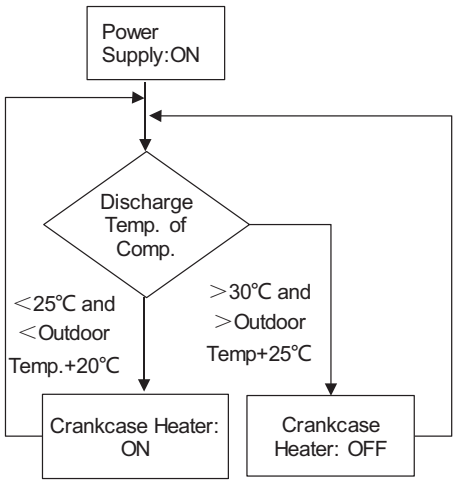


- Heating Operation

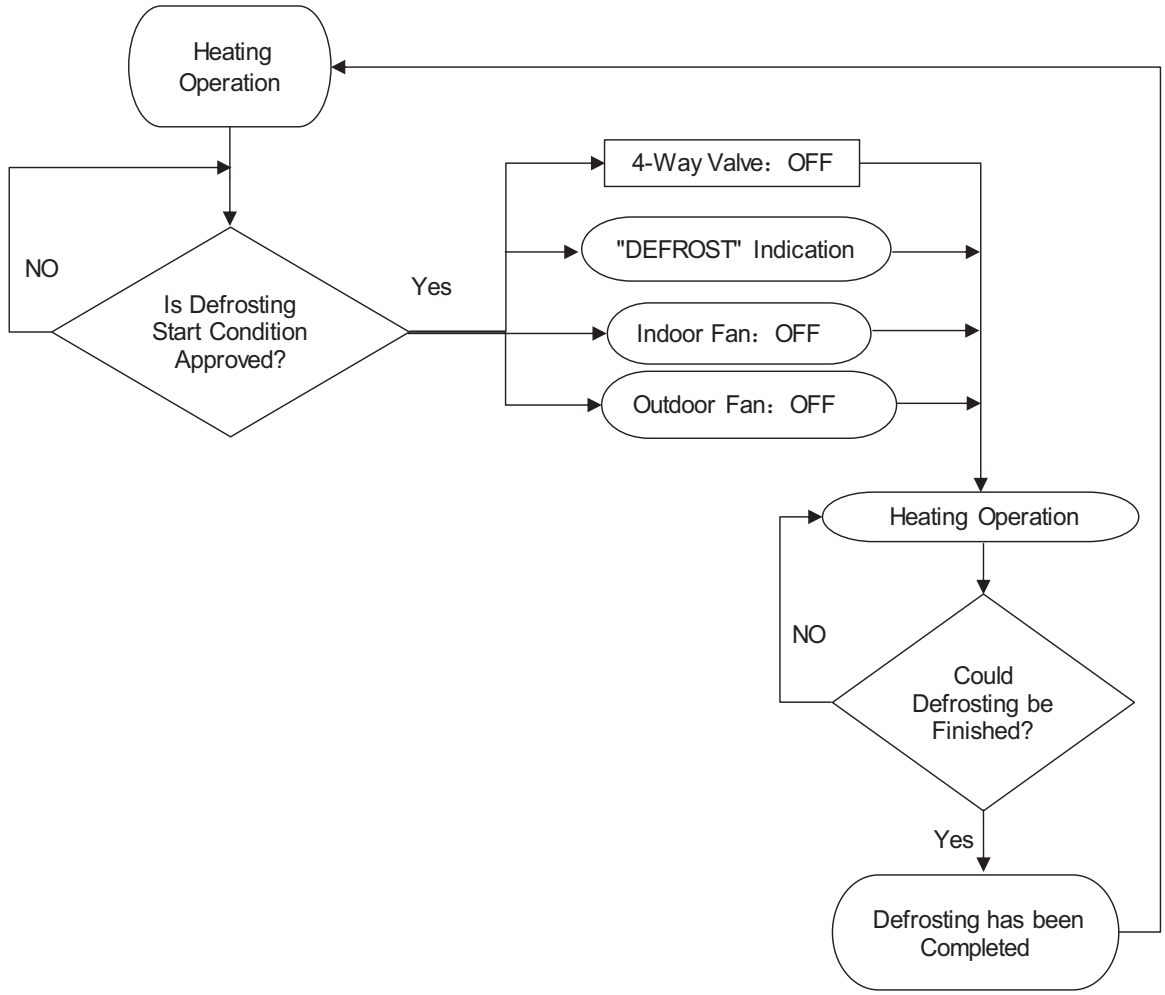




- Control of compressor preheat



- Defrost Operation



(1) Defrost Operation

The following defrost operations, “Standard Defrost”, “Forced Defrost“ and “Manual Defrost” are available.

- Standard Defrost

  This operation starts according to the outdoor temperature, the outdoor evaporating temperature and the operating time.

- Forced Defrost

  This operation starts when the indoor unit repeats Thermo-ON/OFF* operation and therefore cannot start the “Standard Defrost”.

- Manual Defrost

  This operation starts when the push switch “PSW1“ on the outdoor unit PCB is pressed for more than 3 seconds during maintenance, etc. (This function cannot be used when the pressure and the outdoor evaporating temperature is high or at the beginning of the operation.)

NOTE:

Do not repeatedly use “Manual Defrost” frequently.

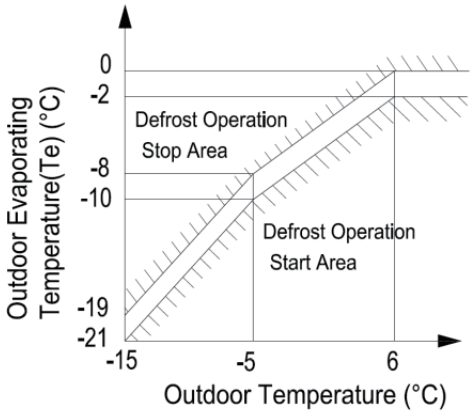
*Thermo-ON: The outdoor unit and some indoor units are running;

Thermo-OFF: The outdoor unit and some indoor units stay on, but don’t run.

(2) Condition for Starting Defrost Operation

- Standard Defrost

(a) Temperature Condition



Temperature Conditions under Defrost Operation

(b) Condition of Operating Time for Defrost Operation Start

The defrost operation starts when the temperature condition shown in "(a) Temperature Condition" is met after a heating operation of 30 to 120 minutes. The heating operation time is determined by estimating the amount of frost on the heat exchanger.

(3) Forced Defrost

The "Forced Defrost" starts when all the following conditions are met.

(a) The 4-Way valve is "ON" for more than 120 minutes.

(b) The outdoor temperature is 10℃ or lower.

(c) The accumulated heating operation time is more than 60 minutes. (The accumulated time is reset when the operation is stopped or the defrost operation is performed.)

(d) The compressor is operated continuously for more than 90 seconds.

(e) The outdoor evaporating temperature is lower than 5℃ when the compressor start operation is finished.

(f) The high pressure switch for control is "OFF".

(4) Condition for Completing Defrost Operation

The defrost operation stops when any of the following conditions is met.

(a) The outdoor evaporating temperature reaches 25℃ within 2 minutes after the defrost operation start.

(b) The outdoor evaporating temperature reaches 15℃ (the outdoor temperature < 10℃ after a lapse of 2 minutes or more from the defrost operation start.)

(c) The outdoor evaporating temperature reaches 5℃ (the outdoor temperature > 10℃ after a lapse of 2 minutes or more from the defrost operation start.)

(d) The discharge temperature reaches 100℃.

(e) The high pressure reaches 3.3MPa within 20 seconds after the defrost operation starts.

(f) The high pressure reaches 3.1MPa after a lapse of 2 minutes or more from the defrost operation start.

(g) More than 9 minutes have passed from the defrost operation start.

NOTES:

- The defrost operation does not start immediately even if the above conditions are met, because these conditions may be met temporarily depending on the refrigerant system variability.
- The defrost operations start when these conditions are met continuously for a certain period of time.

2.10 Protection Control

Whenever protection control sequences are activated , the corresponding code is displayed on the 7-segment LED array of the outdoor unit board or the service board.

Protection control code is displayed while a function is working, and goes out when released.

Indicated Contents

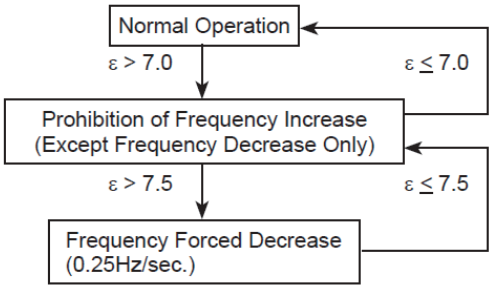
Indication	Protection Control Contents
P1	Pressure Ratio Protection Control
P2	High Pressure Increase Protection Control
P3	Inverter Current Protection Control
P4	Inverter Fin Temperature Increase Protection Control
P5	Discharge Temperature Increase Protection Control
P6	Low Pressure Decrease Protection Control
P9	High Pressure Decrease Protection Control
Pa	Demand Current Control
Pd	Low Pressure Increase Protection Control

(1) P1: Pressure Ratio Protection Control

(a) Pressure Ratio Increase Protection Control

Pressure Ratio Increase Protection Control is performed in order to protect the compressor from an increase of pressure ratio.

Details of Control:



NOTE:

The pressure ratio is calculated as follows.

ε= (Pd [MPa]+0.1) / (Ps [MPa]+0.1)

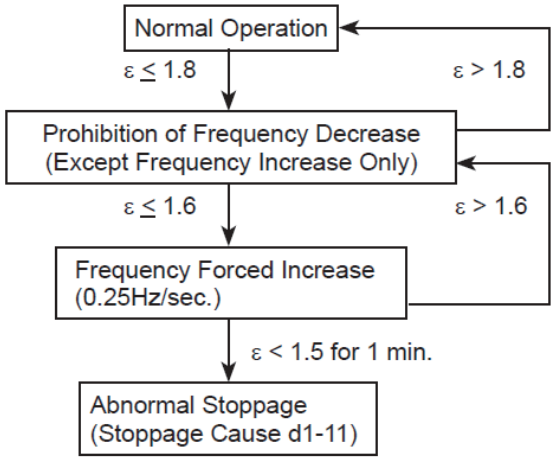
Pd: Detected Value of High Pressure Sensor [MPa]

Ps: Detected Value of Low Pressure Sensor [MPa]

(b) Low Compression Ratio Protection Function

This function is activated to protect the compressor during occurrences of low compression ratio.

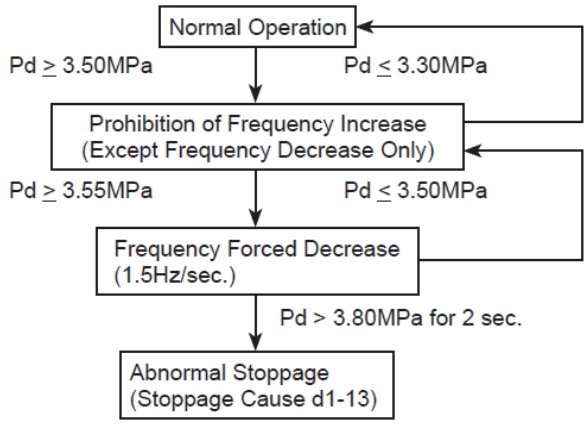
Details of Control:



(2) P2: High Pressure Increase Protection Control

High Pressure Protection Control is performed in order to prevent activation of a protection device caused by a high pressure increase during an abnormality and to protect the compressor from an excessive increase of discharge pressure.

Details of Control:

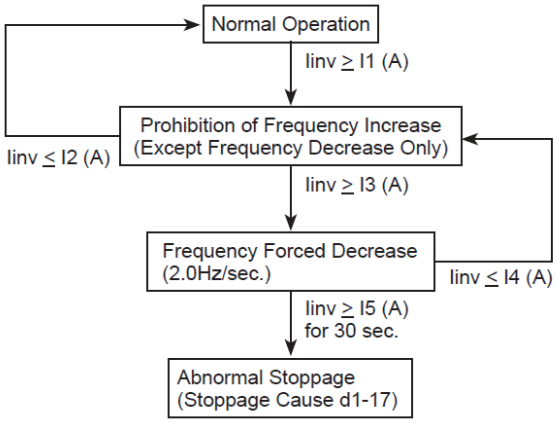


Pd: Detected Value of High Pressure Sensor [psi (MPa)]

(3) P3: Inverter Current Protection Control

Inverter Current Protection Control is performed in order to prevent an inverter trip caused by an increase of inverter secondary current value.

Details of Control:



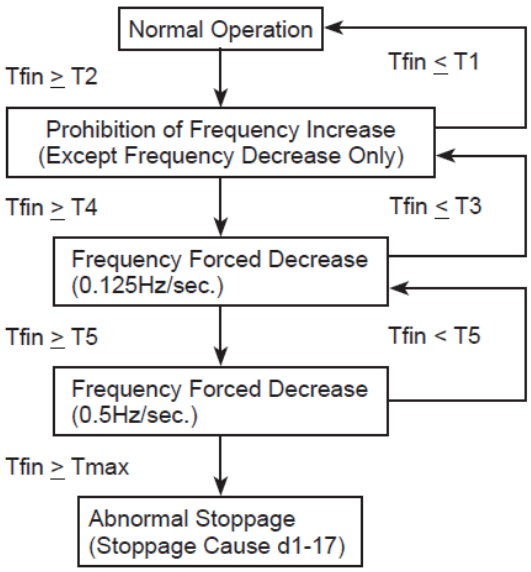
Iinv: Detected Value of Inverter Secondary Current Sensor [A]

Model	I1	I2	I3	I4	I5
RAS-3.0~3.5HNBRKQ1	14.5	13.5	16	15	24
RAS-4.0~6.5HNBRKQ1	18.5	17.5	20	19	28
RAS-7.0~8.0HNBRMQ1	23	22.5	24	23.5	35
RAS-10~12HNBRMQ1	29	28.5	30	29.5	49

(4) P4: Inverter Fin Temperature Increase Protection Control

Inverter Fin Temperature Increase Protection Control is performed in order to prevent an inverter trip caused by a temperature increase of the inverter fin.

Details of Control:



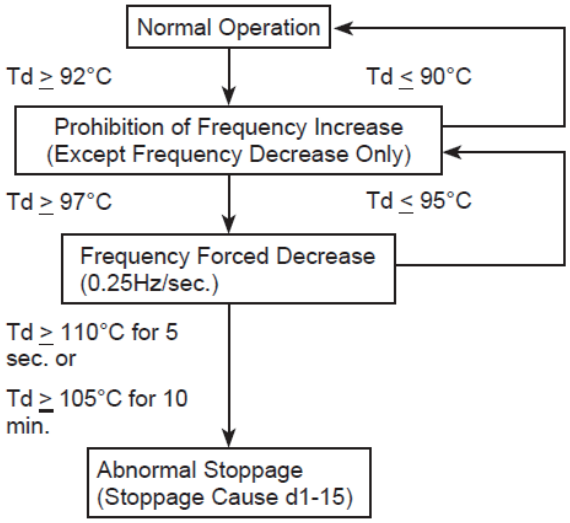
Tfin: Detected Value of Inverter Fin Thermistor (°C)

Model	T1	T2	T3	T4	T5	T_{max}
RAS-3.0~6.5HNBRKQ1	75	81	83	84	87	92
RAS-7.0~12HNBRMQ1	89	90	91	92	95	100

(5) P5: Discharge Temperature Increase Protection Control

Discharge Temperature Increase Protection Control is performed in order to protect the compressor motor coil from an increase of discharge temperature during an abnormality.

Details of Control:

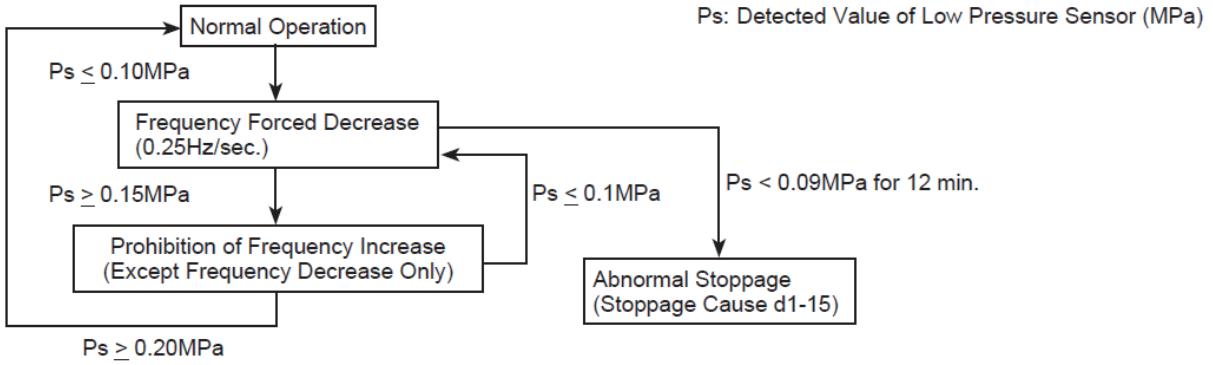


Td: Detected Value of Discharge Gas Thermistor (°C)

(6) P6: Low Pressure Decrease Protection Control

Low Pressure Decrease Protection Control is performed in order to protect the compressor from a transitional decrease of suction pressure.

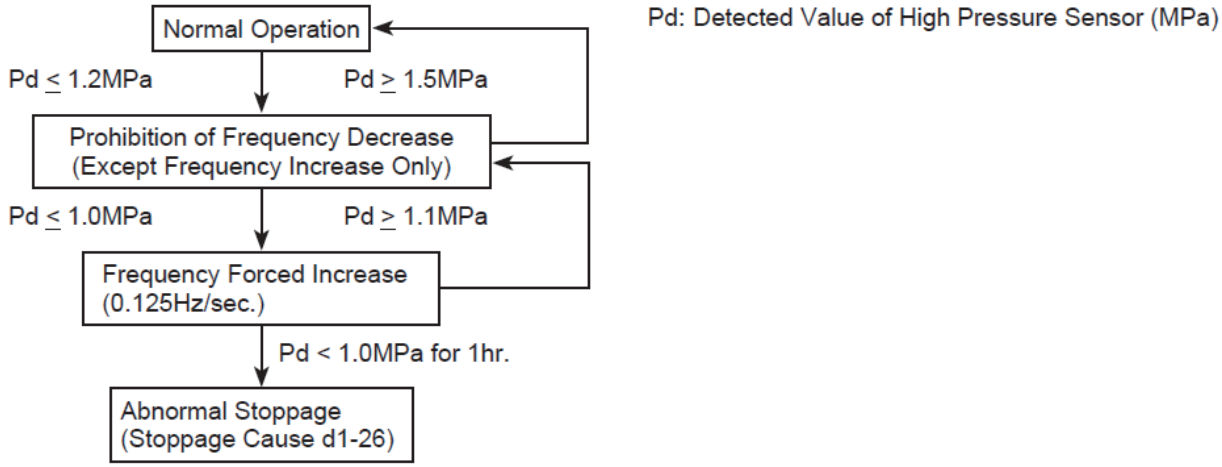
Details of Control:



(7) P9: High Pressure Decrease Protection Control

When decreasing high pressure, the compressor operation frequency is controlled by this protection control for the following purposes.

- To prevent insufficient refrigerant supply to indoor units installed at different height locations.
- To keep the refrigerant oil supply in the compressor.



(8) PA: Demand Current Control

The compressor operation frequency is controlled to set at the setting value of the outdoor unit inverter primary current (40% to 100% of rated current of cooling operation). This function is detailed in the “External Input and Output Setting”. Refer to the Service Manual for details.

If the operation current exceeds each setting function value, the compressor operation frequency is controlled.

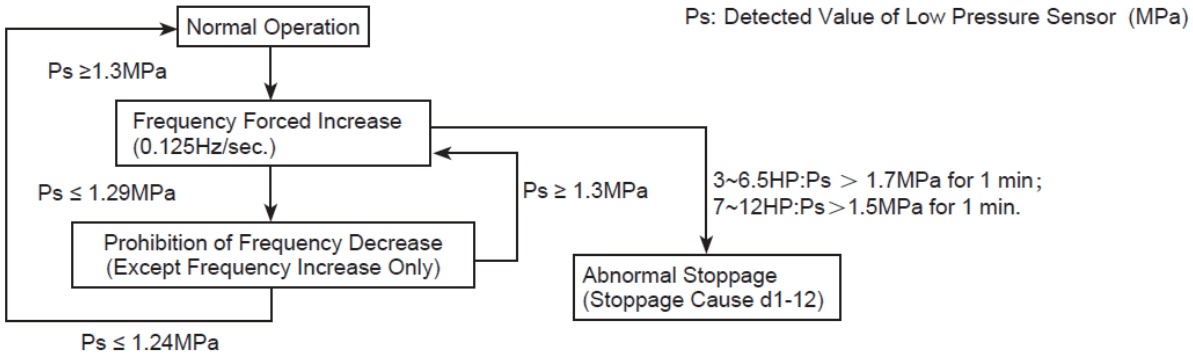
NOTE:

- This function is not available when the compressor starts or during a defrost operation.

(9) Pd: Low Pressure Increase Protection Control

The compressor operation frequency is controlled to protect the compressor from suction pressure transitional increasing.

Details of Control:



(10) Priority of Protection Control

Rank Order.	Indication	Protection Control Contents
1	P1	Pressure Ratio Protection Control
2	P2	High Pressure Increase Protection Control
3	P3	Inverter Current Protection Control
4	P4	Inverter Fin Temperature Increase Protection Control
5	P5	Discharge Temperature Increase Protection Control
6	P6	Low Pressure Decrease Protection Control
7	PA	Demand Current Control
8	Pd	Low Pressure Increase Protection Control
9	P9	High Pressure Decrease Protection Control

If two or more protection controls meet a condition, the protection controls perform according to the following.

		② Lower Rank Order of Protection Control Function			
		Forced Decrease	Forced Increase	Prohibition of Increase	Prohibition of Decrease
① Higher Rank Order of Protection Control Function	Forced Decrease	①	①	①	①
	Forced Increase	①	①	①	①
	Prohibited Increase	②	①	②*1	①
	Prohibited Decrease	②	②	②	②

*1: Discharge Temperature Increase Protection Control (P5) is higher than the following protection controls.

a) Low Pressure Decrease Protection Control (P6)

b) Demand Current Control (PA)

(11) Degeneration Control

Degeneration Control is performed to change the protection control range. This control sequence will suppress re-occurring alarms in response to repeated equipment restarts during protection control conditions listed below. Related Protection Control:

(a) Pressure Ratio Decrease Protection Control (P1)

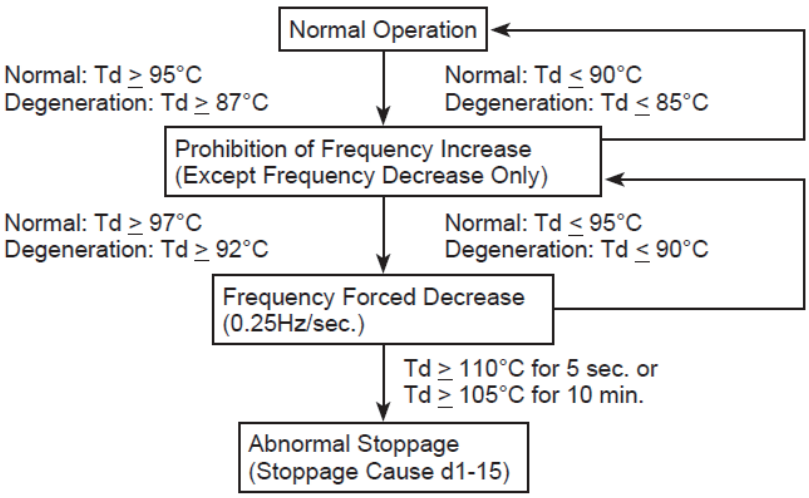
(b) High Pressure Increase Protection Control (P2)

(c) Inverter Current Protection Control (P3)

(d) Inverter Fin Temperature Increase Protection Control (P4)

(e) Discharge Temperature Increase Protection Control (P5)

Example of Discharge Temperature Increase Protection Control



2.11 Safety and Control Device Setting

The compressor is protected by the following devices and their combinations:

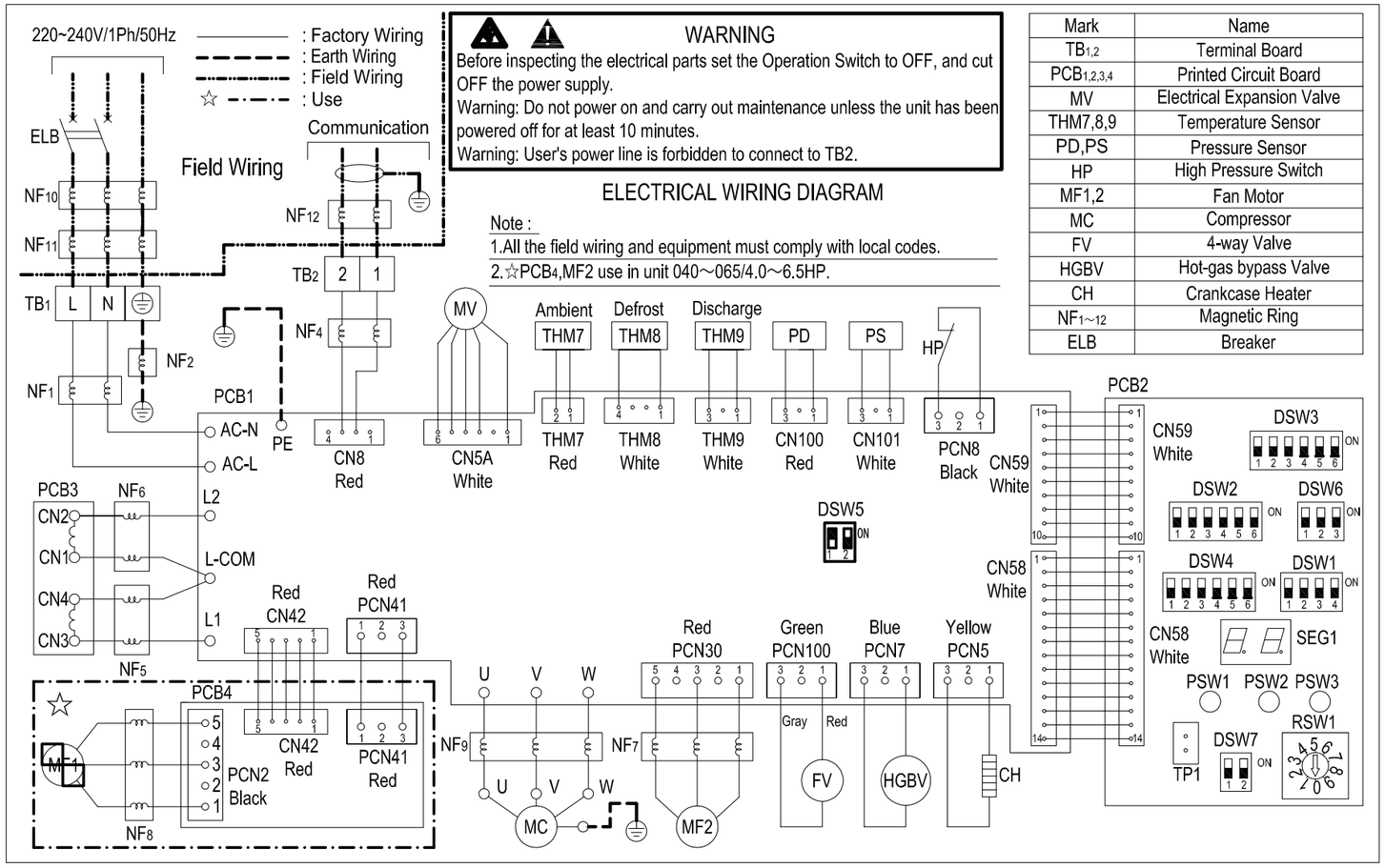
(1) High Pressure Switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

(2) Crankcase Heater:This band type heater protects against oil foaming during cold starting, as it is energized while the compressor is stopped.

Model		RAS-3.0~ 3.5HNBRKQ1	RAS-4.0~ 6.5HNBRKQ1	RAS-7.0~ 8.0HNBRMQ1	RAS-10~ 12HNBRMQ1
High Pressure Switch		Automatic Reset, Non-Adjustable		Automatic Reset, Non-Adjustable	
Cut-Out	MPa	$4.15^{-0.05}_{-0.2}$	$4.15^{-0.05}_{-0.2}$	$4.15^{-0.05}_{-0.2}$	$4.15^{-0.05}_{-0.2}$
Cut-In	MPa	$3.2^{+0.15}_{-0.2}$	$3.2^{+0.15}_{-0.2}$	$3.2^{+0.15}_{-0.2}$	$3.2^{+0.15}_{-0.2}$
Breaker	A	32	40	25	40
Crankcase Heater	W	24	28	80	80
CCP Timer Setting Time	Min	Non-Adjustable 3	Non-Adjustable 3	Non-Adjustable 3	Non-Adjustable 3

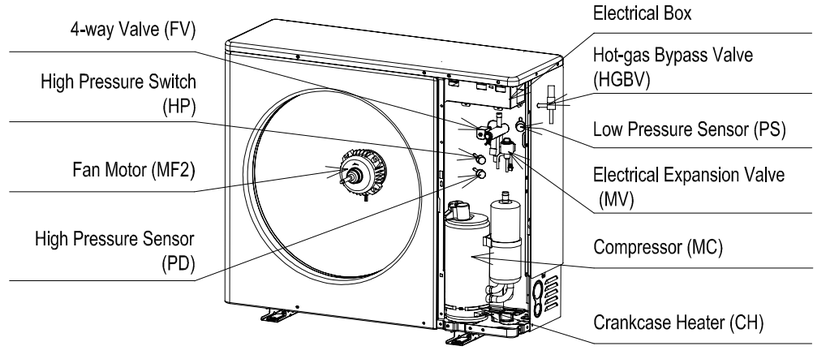
2.12 Electrical Wiring Diagram

Model: RAS-3.0~6.5HNBRKQ1

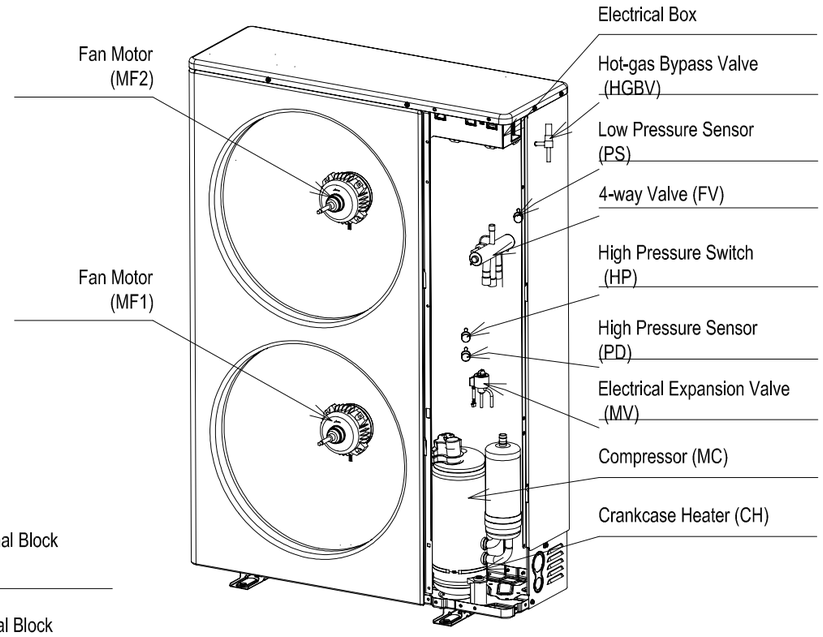


Mark	Name
$TB_{1,2}$	Terminal Board
$PCB_{1,2,3,4}$	Printed Circuit Board
MV	Electrical Expansion Valve
THM7,8,9	Temperature Sensor
PD,PS	Pressure Sensor
HP	High Pressure Switch
MF1,2	Fan Motor
MC	Compressor
FV	4-way Valve
HGBV	Hot-gas bypass Valve
CH	Crankcase Heater
$NF_{1\sim12}$	Magnetic Ring
ELB	Breaker

LOCATION OF MAIN PARTS

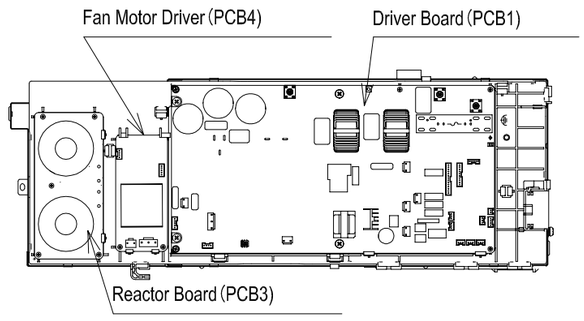


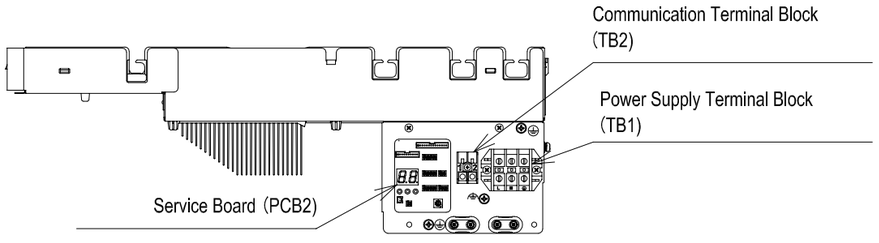
3~3.5HP



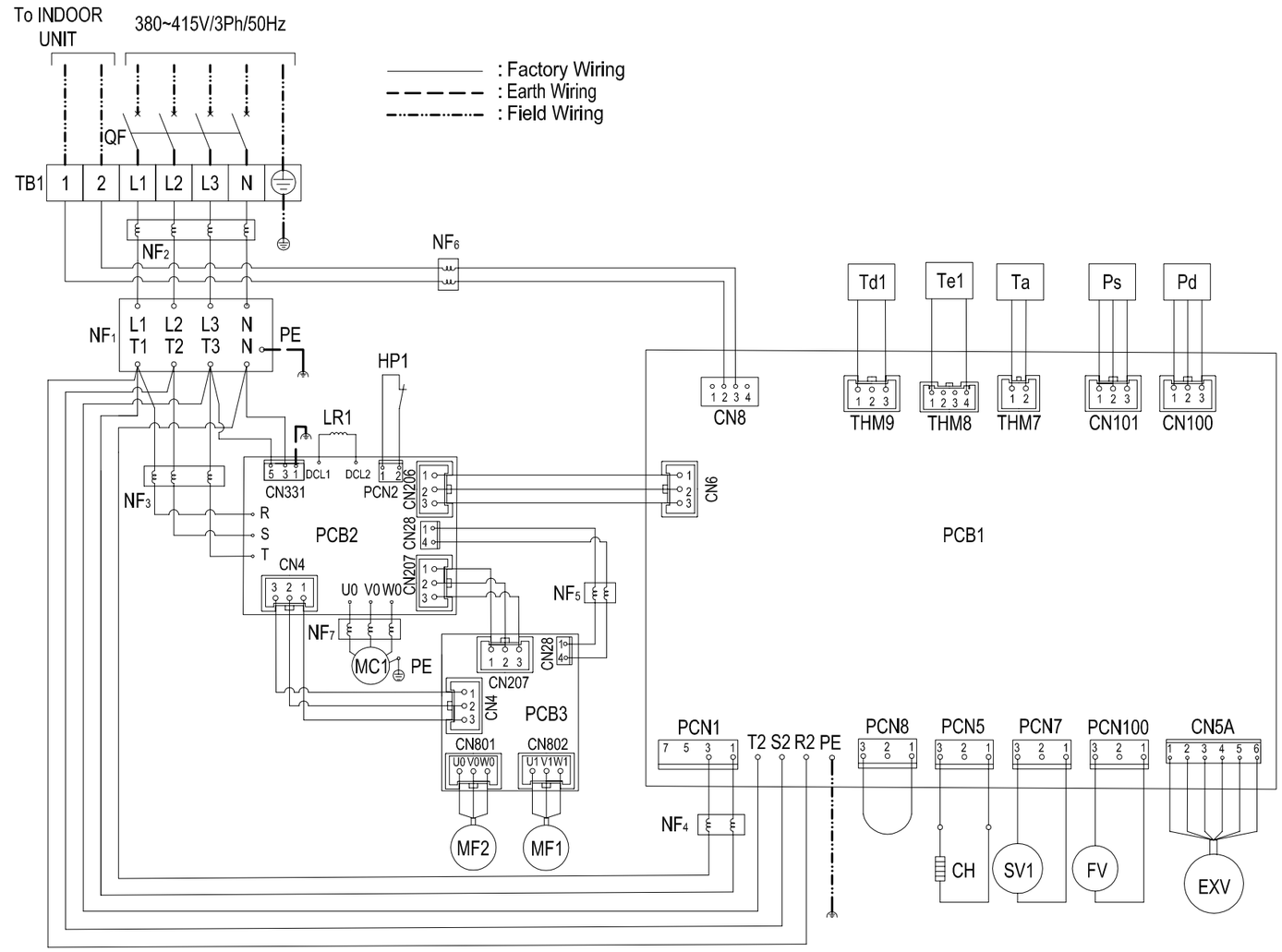
4~6.5HP

Electrical Box

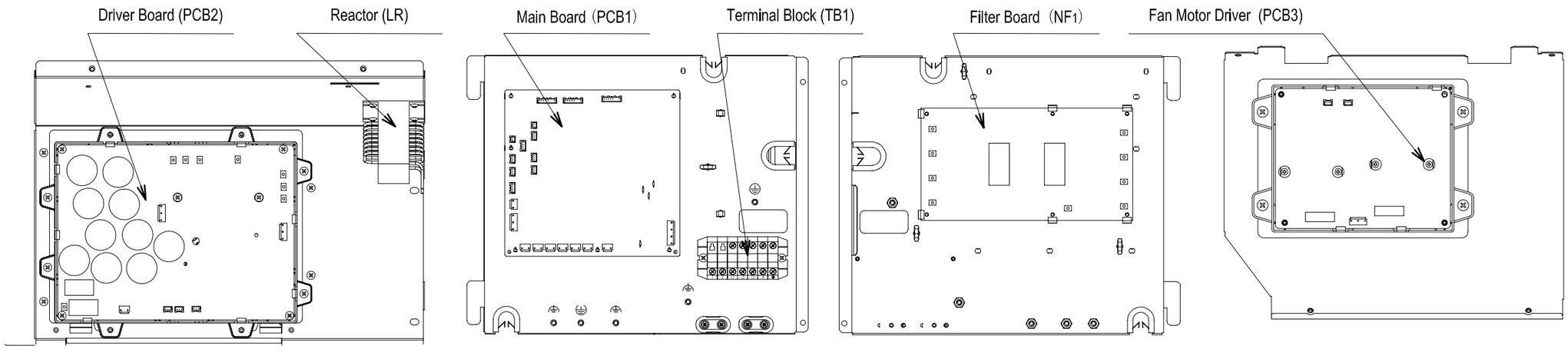




Model: RAS-7.0~12HNBRKQ1



CODE	DESCRIPTION
QF	Breaker
TB1	Terminal Block
NF_1	Noise Filter Board
NF_2~NF_7	Magnetic Ring
PCB2	Driver Board
LR	Reactor
MC1	Compressor
FV	4-Way Valve
PCB1	Main Board
HP	High Pressure Switch
Pd	High Pressure Sensor
Ps	Low Pressure Sensor
MF1/MF2	Fan Motor
EXV	Electronic Expansion Valve
CH	Crankcase Heater
Td1	Discharge Temperature Sensor
Ta	Ambient Temperature Sensor
Te1	Coil Outlet Temperature Sensor
SV1	Solenoid Valve



2.13 Operation Range

This heat pump air conditioning has been designed for the following temperatures range. Operate the heat pump air conditioning within this range according to the table below.

Temperature DB: Dry Bulb, WB: Wet Bulb

		Maximum	Minimum
Cooling Operation	Indoor	32°C DB/23°C WB	21°C DB/15°C WB
	Outdoor	Stable 48°C DB Interval 48~52°C DB	-5°C DB *
Heating Operation	Indoor	27°C DB	15°C DB
	Outdoor	24°C DB/15°C WB	Stable -15°C WB Interval -20~-15°C WB

NOTE:

*: When RAS-7.0~12HNBRMQ1 outdoor units are connected with the RCIM-0.8FSN4 or RCD-0.8~1.0FSN3 or RCS-0.8~1.0FSN, if only one of these indoor unit is operating in cooling mode, the minimum outdoor temperature is limited to 5°C DB.

2.14 Combination of Indoor Unit and Outdoor Unit

The number of indoor units that can be connected to an outdoor unit is defined in the following table:

System Combination

Outdoor Unit Type	Rated Capacity (kW)	Min. Total Capacity of the indoor units can be connected (kW)	Max. Total Capacity of the indoor units can be connected (kW)	Numbers of the indoor units can be connected (Q'ty)	Min. Capacity at Individual Operation (kW)
RAS-3.0HNBRKQ1	8.0	4.0	10.4	2~4	2.2
RAS-3.5HNBRKQ1	10.0	5.0	13.0	2~5	2.2
RAS-4.0HNBRKQ1	11.2	5.6	14.6	2~6	2.2
RAS-4.5HNBRKQ1	12.0	6.0	15.6	2~6	2.2
RAS-5.0HNBRKQ1	14.0	7.0	18.2	2~7	2.2
RAS-6.0HNBRKQ1	16.0	8.0	20.8	2~8	2.2
RAS-6.5HNBRKQ1	18.0	9.0	23.4	2~9	2.2
RAS-7.0HNBRMQ1	20.0	10.0	26.0	2~10	2.2
RAS-8.0HNBRMQ1	22.4	11.2	29.1	2~10	2.2
RAS-10HNBRMQ1	28.1	14.1	36.5	2~10(13) △	2.2
RAS-11HNBRMQ1	31.0	15.5	40.3	2~10(14) △	2.2
RAS-12HNBRMQ1	33.5	16.8	43.6	2~10(15) △	2.2

NOTES:

(1) The connectable indoor unit capacity ratio can be calculated as follows: Connectable Indoor Unit Capacity Ratio = Total Indoor Unit Capacity / Total Outdoor Unit Capacity.

(2) It is suggested that the total capacity of indoor units which are operated simultaneously should not exceed the capacity of outdoor units under the following conditions. Otherwise, there is a decrease in operating performance.

- When there are some 4-way cassette indoor units and high wall indoor units in the system;
- When the outdoor air temperature is 43°C or more during the outdoor unit cooling operation;
- When the outdoor air temperature is lower than -10°C during the outdoor unit heating operation.

(3) When operating the outdoor unit under low heating load conditions and the outdoor temperature is 15°C WB or more, only one indoor unit is in the operation, the outdoor unit will be Thermo-OFF* to protect the compressor from failure.

(4) *: When RAS-7.0~12HNBRMQ1 outdoor units are connected with the RCIM-0.8FSN4 or RCD-0.8~1.0FSN3 or RCS-0.8~1.0FSN, if only one of these indoor unit is operating in cooling mode, the minimum outdoor temperature is limited to 5°C DB.

(5) For the same system, if the connectable indoor unit capacity ratio is over than 100%, and which all the indoor units operate simultaneously, capacity of every indoor unit should be less than its rated capacity.

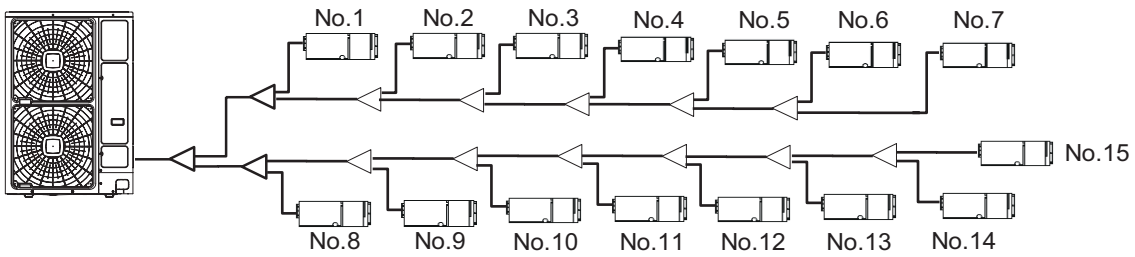
(6) △: When the number of indoor units which are connected to the model of RAS-10~12HNBRMQ1 outdoor unit is over than 10 units, the following restrictions are also required to meet.

(a) The piping system must be divided into two main pipes, the total capacity and the number of the units connected to each main pipe should be as equal as possible.

(b) The maximum height difference between outdoor and indoor units is 30 meters and the maximum height difference between indoor units is 10 meters, the longest piping length between the branch pipe to the connected indoor unit is 10 meters.

(c) The connectable indoor unit capacity ratio should not be more than 105%.

(d) Only 0.8~4.0HP of ducted indoor units can be selected.

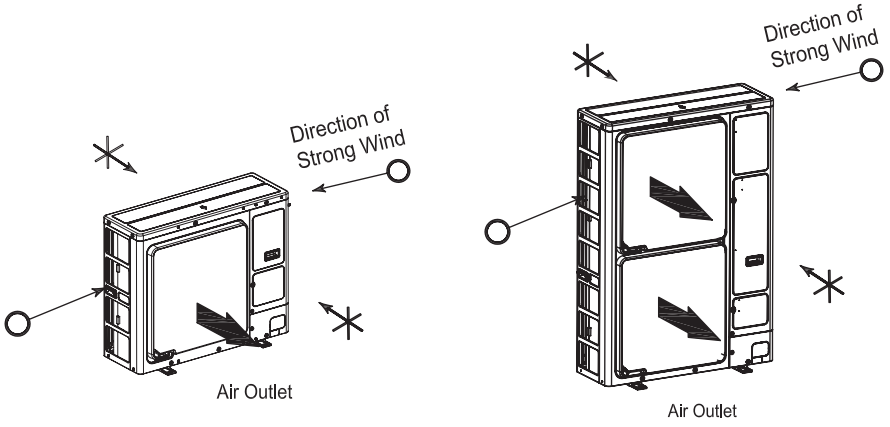


*Thermo-ON: The outdoor unit and some indoor units are running;
Thermo-OFF: The outdoor unit and some indoor units are standby, but don't run.

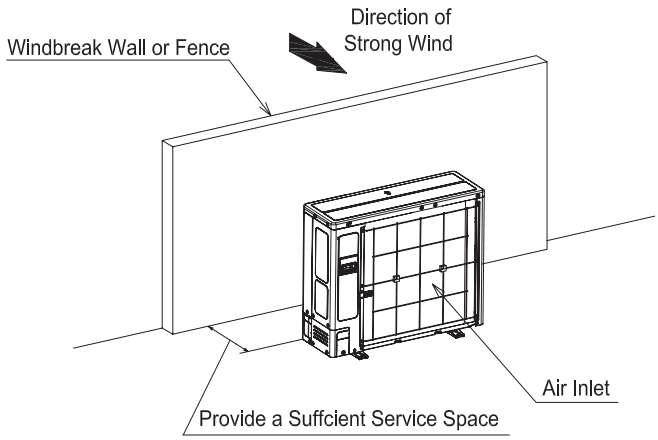
2.15 Outdoor Unit Installation

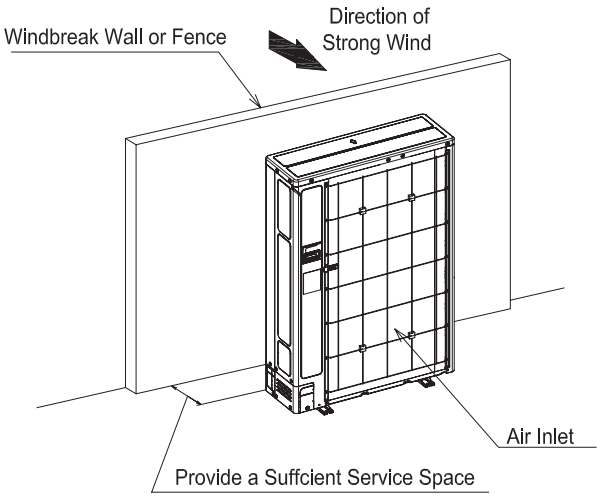
2.15.1 Installation Location and Precautions

- When installing the unit into:
  - A wall: Make sure the wall is strong enough to hold the weight of the unit. It may be necessary to construct a strong wood or metal frame to provide added support.
  - A room: Properly insulate any refrigerant tubing run inside a room to prevent “sweating” that can cause dripping and water damage to wall and floors.
  - Damp or uneven areas: Use a raised concrete pad or concrete blocks to provide a solid and level foundation for the unit to prevent water damage and abnormal vibration.
  - An area with high winds: Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable wall for wind prevention (field-supplied).
  - A snowy area: Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow roof for snow prevention (field-supplied).
- Do not install the unit in the following places. Otherwise, it can result in an explosion, fire, deformation, corrosion, or product failure.
  - Explosive or flammable atmosphere.
  - Where a fire, oil, steam, or powder can directly enter the unit, such as in close proximity or directly above a kitchen stove.
  - Where oil (including machinery oil) may be present.
  - Where corrosive gases such as chlorine, bromine, or sulphide can accumulate, such as near a hot tub or hot spring.
  - Where dense, salt-laden airflow is heavy, such as in coastal regions.
  - Where the air quality is of high acidity.
  - Where harmful gases can be generated from decomposition.
- Do not install the indoor unit where such dripping can cause moisture damage or uneven locations: Use a raised concrete pad or concrete blocks to provide a solid and level foundation for the unit to prevent water damage and abnormal vibration. Do not position the drain pipe for the indoor unit near any sanitary sewers where corrosive gases may be present.
- Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remember to check that no metal scraps or bits of wiring have been left behind inside the unit being installed.
- After installation work for the system has been completed, explain the “Safety Precautions”, the proper use and maintenance of the unit to the customer according to the information in all manuals that came with the system. All manuals and warranty information must be given to the user or be left near the Indoor Unit.
- Select a direction where a strong wind does not blow to the air outlet surface or the air inlet surface.



- If a suitable location cannot be found, the windbreak wall or fence should be installation to prevent a strong wind blows to air inlet or outlet of the outdoor unit. Make sure to provide sufficient space around the outdoor unit for operation and maintenance.



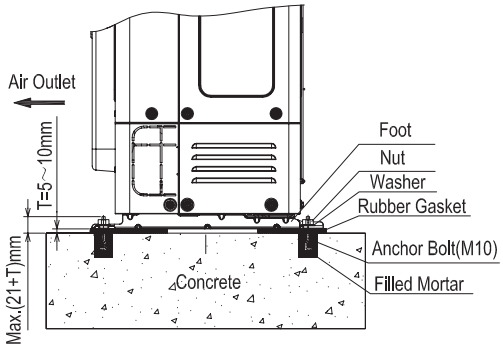


NOTES:

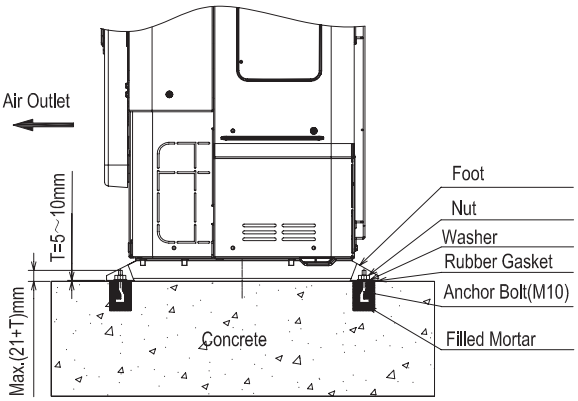
- If strong wind blows to the air outlet directly, the needed airflow volume cannot be maintained and the outdoor unit may be difficult to operate normally.
- If excessively strong wind blows to the air outlet consecutively, it may cause the propeller fan or the fan motor breakage by high speed rotation or overload.

2.15.2 Installation Work

(1) Secure the outdoor unit with the anchor bolts.
In order to avoid the vibration from transmitting to the indoor by the base of the unit, the 5～10mm thickness of rubber gaskets (field supplied) should be placed under the feet of the outdoor unit, which could decrease the vibration into the room.



a) Model:RAS-3.0~6.5HNBRKQ1



b) Model: RAS-7.0~12HNBRMQ1

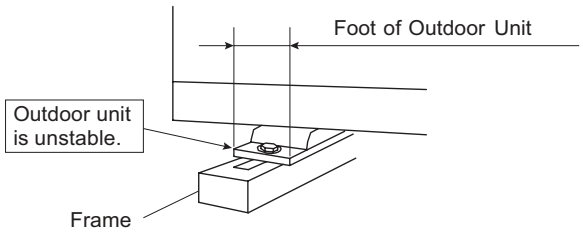
(2) The drain holes are working during the heating and defrosting operation. Choose a place where well drainage is available or provide a groove for draining.

(3) The unit will condensate in heating mode, and the condensate will freeze in colder climates, which may cause the road slippery, if not properly managed.

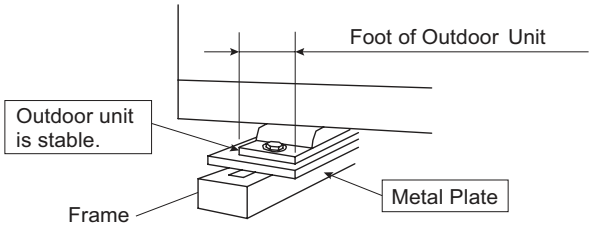
(4) The base of the outdoor unit should be installed on a foundation, which is made up of concrete or metal frame. When the rubber gaskets have been adopted, they should also be positioned under the feet of the outdoor unit.

(5) When the outdoor unit is installed on a metal frame, the metal plates should be used to adjust the frame width for stable installation.

Incorrect



Correct



Recommended Metal Plate Size (Field-Supplied):

Material: Hot-Rolled Mild Steel Plate (SPHC);

Plate Thickness: 4.5mm.

⚠ CAUTION

- Aluminum fins have very sharp edges, handle them carefully to avoid injuries.

NOTE:

- Install the outdoor unit on a roof or in an area where only service engineers come in contact with the outdoor unit.

2.16 Refrigerant Piping Work

WARNING

- The design pressure for this product is 4.15MPa. The pressure required for refrigerant R410A is 1.4 times higher than that of the refrigerant R22. That means that the refrigerant piping for R410A must be thicker than that for R22. Make sure to use specified refrigerant piping. Otherwise, the refrigerant piping may rupture due to an excessive refrigerant pressure. Pay close attention to the piping thickness when using copper refrigerant piping.
- Ensure that the stop valves are closed before removing the flare nut of the stop valves.

CAUTION

- When handling the refrigerant, be sure to wear leather gloves to prevent injuries.

2.16.1 Precaution for Refrigerant Piping

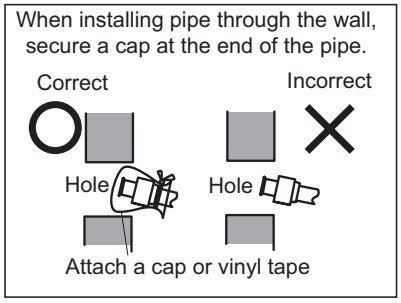
(1) Use the copper pipe for refrigerant piping.

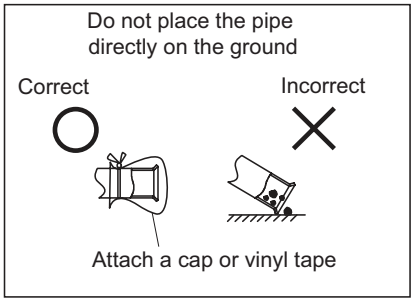
(2) Keep the copper pipes clean. Make sure there is no dust or moisture inside the pipes. Blow nitrogen or dry, compressed air into the pipes to remove any dust or foreign materials before connecting them. Do not use any cutting tools such as a grinder or saw which could produce metal particles.

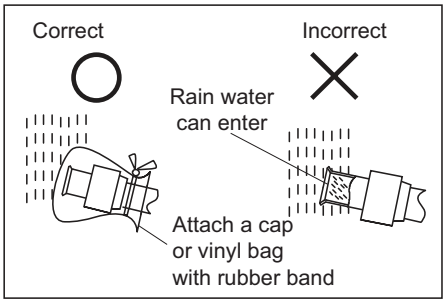
(3) Take special care to prevent pollution or moisture settling from going into the interior pipe during piping work.

(4) Avoid performing the piping connection work for outdoor unit in the rain.

(5) Take care of the refrigerant pipe ends, as the following pictures:







(6) Piping Thickness and Material

The thickness of refrigerant pipe differs depending on design pressure. For copper tube, pay attention to pipe selection, because the piping thickness differs depending on its material.

Diameter (mm)	R410A	
	Thickness (mm)	Temper
Φ6.35	0.8	O
Φ9.52	0.8	O
Φ12.7	0.8	O
Φ15.88	1.0	O
Φ19.05	1.0	1/2H
Φ22.2	1.2	1/2H
Φ25.4	1.2	1/2H

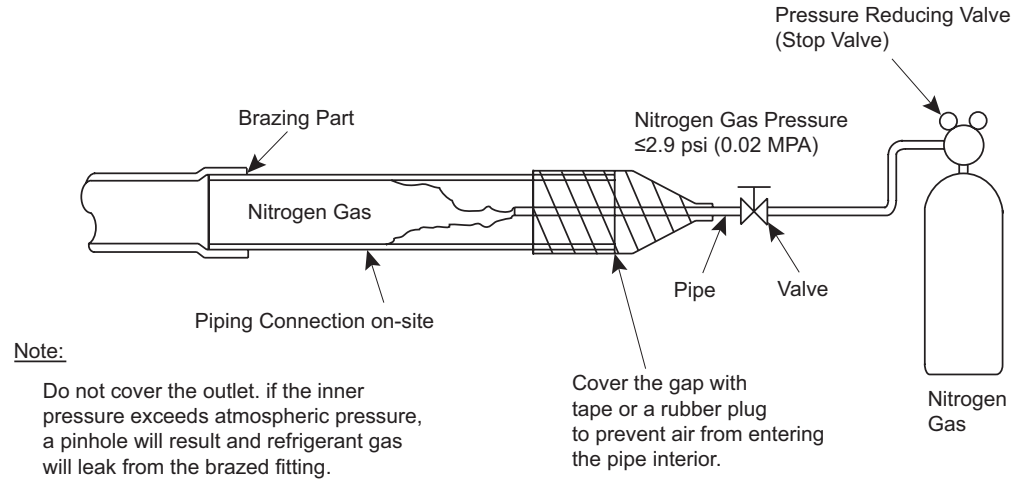
NOTES:

- Do not use the pipe that allowable pressure is less than 4.15MPa.
- The reference value of the refrigerant piping thickness is indicated in the table above.
- Do not use the pipe which is considerably different from the reference value.

(7) Cautions for Brazing Work

(A) For piping connections, complete non-oxidation brazing with a nitrogen charge. If brazing the pipes without the nitrogen substitution, a large amount of oxidized scaling will be generated in the piping. This oxidized scaling can cause clogging inside the expansion valve, solenoid valve, accumulator, and compressor, which can damage the unit.

Do not use field-supplied antioxidant which can corrode pipes and degrade the refrigerant oil.



NOTES:

- Make sure to use nitrogen. Nitrogen gas pressure shall be 0.02 MPa or less.
- Make sure to use the pressure-reducing valve.
- Do not use field-supplied antioxidant.

(B) Use a type of flux with a low chlorine concentration.

(C) Wash the weld joints to remove all flux completely after completing brazing work.

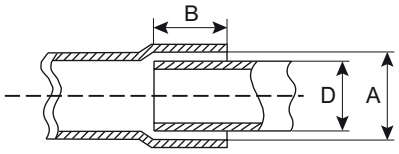
NOTE:

- To avoid oxidation and scaling, perform brazing at the appropriate temperature.

(D) To prevent gas leakage at the brazing connection, refer to the table for the insertion depth and the gap for joint pipe.

Unit: mm

Diameter (ΦD)	Min. Insertion Depth (B)	Gap (A - D)
5≤ D <8	6	0.05 - 0.35
8≤ D <12	7	
12≤ D <16	8	0.05 - 0.45
16≤ D <25	10	

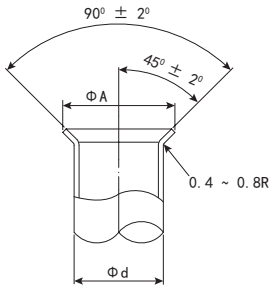


(8) Cautions for Flaring Work

(A) Perform the flaring work as shown below:

Unit: mm

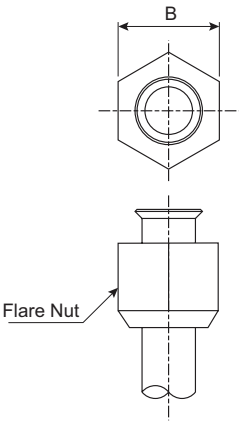
Diameter	$A^{+0}_{-0.4}$
	R410A
Φ6.35	9.1
Φ9.52	13.2
Φ12.7	16.6
Φ15.88	19.7
Φ19.05	(*)



(*): It is impossible to perform flaring work with hard temper pipe. Use an accessory pipe with a flare.

(B) Joint Selection

The minimum thickness of joint and flare nut dimension are selected from the table below:



Minimum Thickness of Joint

Unit: mm

Diameter	R410A
Φ6.35	0.5
Φ9.52	0.6
Φ12.7	0.7
Φ15.88	0.8
Φ19.05	0.8

Flare Nut Dimension B

Unit: mm

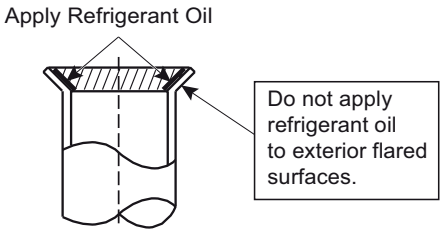
Diameter	R410A
Φ6.35	17
Φ9.52	22
Φ12.7	26
Φ15.88	29
Φ19.05	36

NOTE:

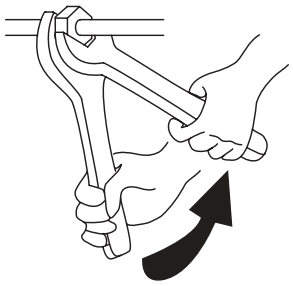
- Do not use a thin joint other than the ones shown in the table above.

(C) Verify that there are no scratches, metal particles, gaps, or deformations at the flared end before making connections to the system.

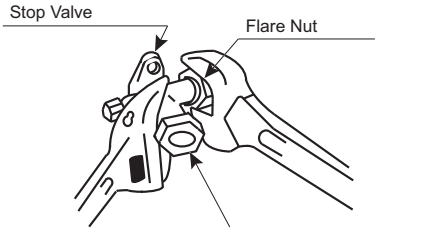
(D) Apply refrigerant oil (field-supplied) slightly on the flare surface of the pipe and flare nut before performing flaring work. Tighten the flare nut with the specified torque settings using two wrenches. Perform flaring work to the liquid piping side before treating the gas piping side. Verify that no gas leakage has occurred after completing flaring work.



(E) Be sure to use two wrenches as shown.



Use two wrenches as shown



Tightening Work for Stop Valve

Required Tightening Torque for Flare Nut

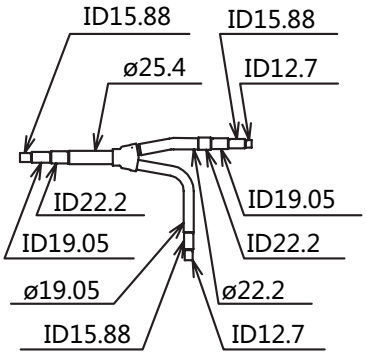
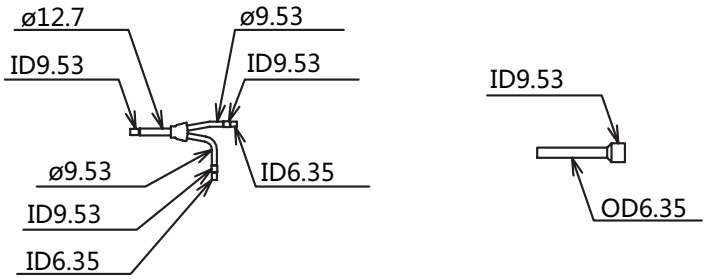
Pipe Diameter (mm)	**Tightening Torque (N·m)**
Φ6.35	20
Φ9.52	40
Φ12.7	60
Φ15.88	80
Φ19.05	100

2.16.2 Model of Branch Pipe

(1) E-102SN

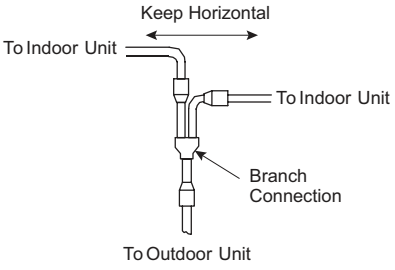
The model of E-102SN branch pipe is used for the model of RAS-3.0~6.5HNBRKQ1 and RAS-7.0~12HNBRMQ1 outdoor unit.

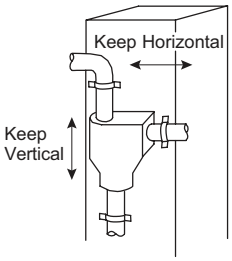
Unit: mm

Model	E-102SN for RAS-3.0~6.5HNBRKQ1 and RAS-7.0~12HNBRMQ1
Gas Pipe	
Liquid Pipe	

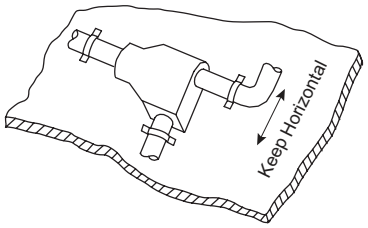
(2) Precaution for branch pipe connection

Use the branch pipe to connect the outdoor/indoor units. Mounted the branch pipes to a pillar, a wall, or a ceiling. Keep the inlet pipe of the branch pipe straight, and the length of the straight pipe is no less than 0.5 meter.

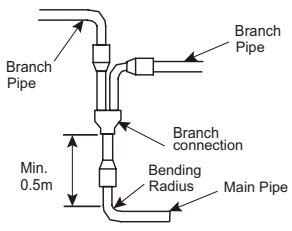
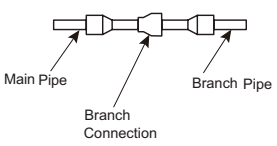
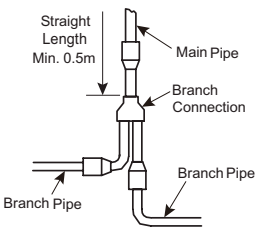
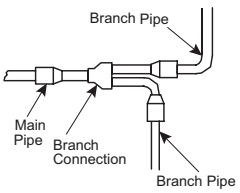




Secure the Branch Pipe
to the surface of Pillar or Wall.

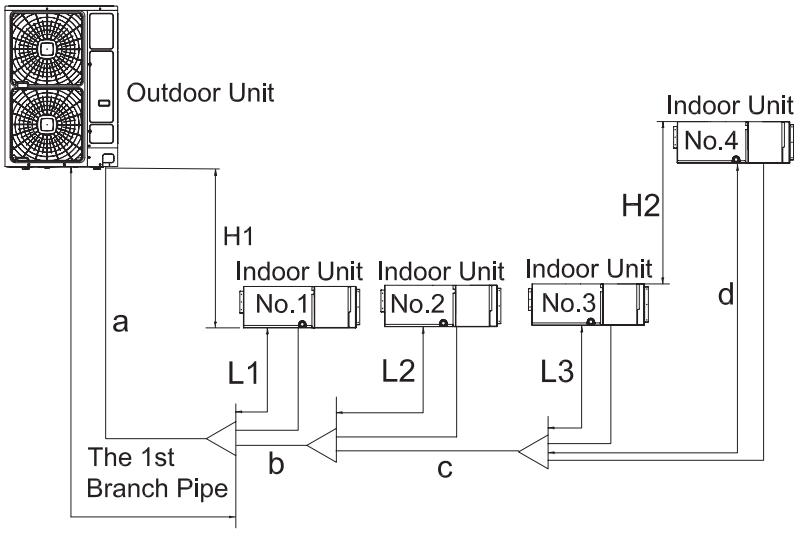


Secure the Branch Pipe
to Ceiling surface or Beam

Upper side	Upper side	Upper side	Upper side
			
CORRECT	CORRECT	CORRECT	INCORRECT

2.16.3 Refrigerant Piping Size

Example: connection of 4 indoor units.



Piping Size of Main Pipe

Model	Stop Valve (mm)		Pipe between the outdoor unit and the first branch pipe; The pipes between the branch pipes		
	Gas	Liquid	Gas	Liquid	Marks
RAS-3.0~6.5HNBRKQ1	Φ15.88	Φ9.52	Φ15.88	Φ9.52▲	a; b; c
RAS-7.0~8.0HNBRMQ1	Φ19.05	Φ9.52	Φ19.05	Φ9.52▲	a; b; c
RAS-10HNBRMQ1	Φ19.05	Φ12.7	Φ22.2*	Φ12.7	a; b; c
RAS-11~12HNBRMQ1	Φ19.05	Φ12.7	Φ25.4*	Φ12.7	a; b; c

NOTES:

- Mark "▲" represent that if the liquid pipe which between the outdoor unit and the first branch is over than 70 meters, its diameter should be up size. Thus the Φ9.52 diameter pipe is converted to Φ12.7 diameter pipe.
- Mark " * " represent that there are pipe adapters in the outdoor unit, which is used to adjust the gas pipe between the outdoor unit and the first branch. Thus the Φ19.05 diameter pipe is converted to Φ22.2 diameter pipe in the model of RAS-10HNBRMQ1, and the Φ19.05 diameter pipe is converted to Φ25.4 diameter pipe in the model of RAS-11~12HNBRMQ1.
- The piping size (L1,L2,L3,d) of indoor unit differ with indoor units model, please refer to the technical literature of indoor units.

Piping Work Conditions

Item		Marks	Allowable Piping Length	
Maximum Piping Length (Liquid Pipe)	Between the outdoor unit and the farthest indoor unit	a+b+c+d	RAS-3.0~3.5HNBRKQ1	≤65 meters
			RAS-4.0~5.0HNBRKQ1	≤70 meters
			RAS-6.0~6.5HNBRKQ1	≤85 meters
			RAS-7.0~12HNBRMQ1	≤100 meters
	Total liquid pipe length	a+b+c+d+ L1+L2+L3	RAS-3.0~3.5HNBRKQ1	≤100 meters
			RAS-4.0~5.0HNBRKQ1	≤120 meters
			RAS-6.0~6.5HNBRKQ1	≤150 meters
			RAS-7.0~12HNBRMQ1	≤180 meters
	Between the first branch pipe and the farthest indoor unit	b+c+d		≤40 meters
	Between branch pipes and connected indoor units	L1,L2,L3,d		≤15 meters
Allowable Height Difference	Outdoor unit is higher than indoor unit	H1	RAS-3.0~6.5HNBRKQ1	≤30 meters
			RAS-7.0~12HNBRMQ1	≤50 meters
	Outdoor unit is lower than indoor unit	H1	RAS-3.0~6.5HNBRKQ1	≤30 meters
			RAS-7.0~12HNBRMQ1	≤40 meters
	Height difference between indoor units	H2		≤15 meters
Others	The model of branch pipe▲	RAS-3.0~6.5HNBRKQ1 RAS-7.0~12HNBRMQ1		E-102SN

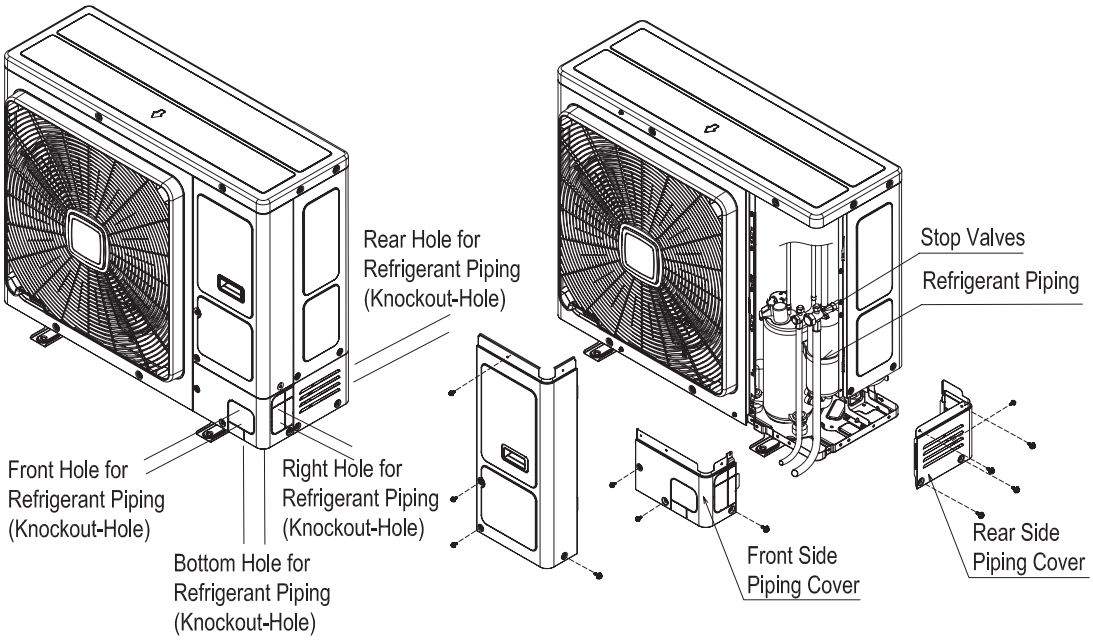
NOTE:

- Mark "▲" represent that the model of branch pipe should be same as the requirement of the table above.

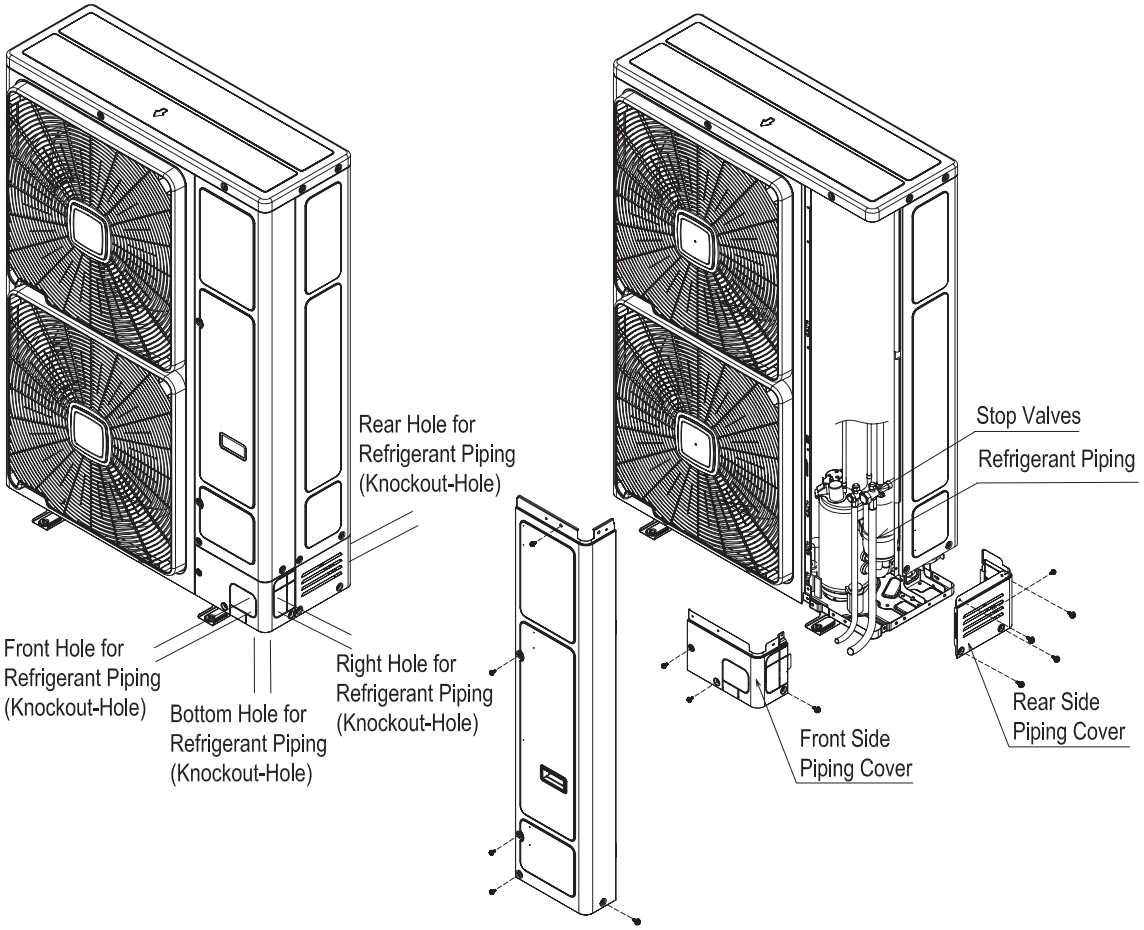
2.16.4 Refrigerant Piping Work for Outdoor Unit

(1) The refrigerant piping can be installed in four directions (front, right, bottom or rear side) as shown in the following figures.

Model: RAS-3.0~3.5HNBRKQ1



Model: RAS-4.0~6.5HNBRKQ1; RAS-7.0~12HNBRMQ1



Attention for Removing Service Cover

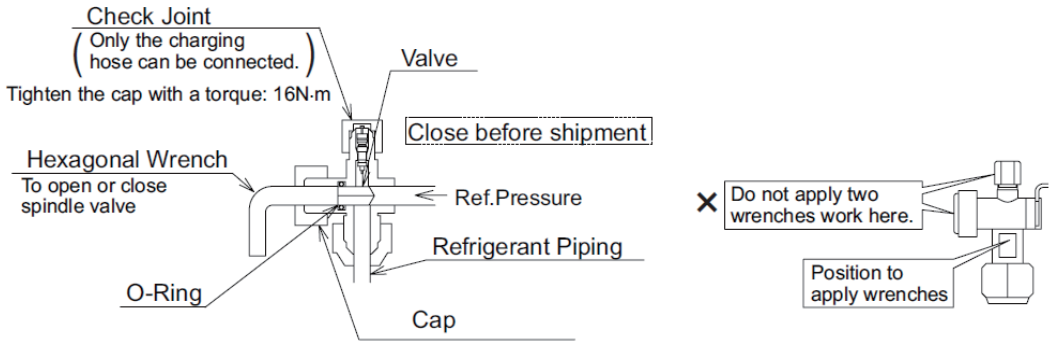
– Procedures of Removing Cover –

- Remove the screws according to the figure above.

NOTE:
Remove the screws and hold the service cover with your hands. If not,the service cover may fall down.

- Slowly push the service cover downward.

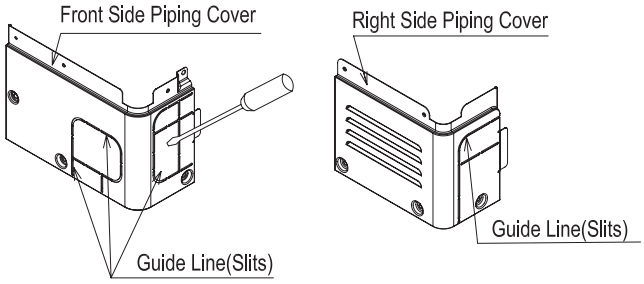
(2) Securely use two wrenches at the following position when removing or installing the pipe. (If not, refrigerant leakage may occur.)

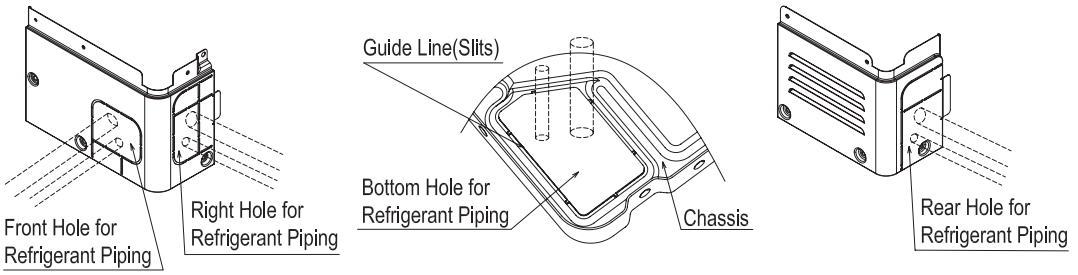


Controlling torque of hexagonal wrench

Model	Gas side stop valve	Liquid side stop valve
RAS-3.0~6.5HNBRKQ1	11~14 N·m	7~9 N·m
RAS-7.0~8.0HNBRMQ1	12~15 N·m	7~9 N·m
RAS-10~12HNBRMQ1	12~15 N·m	8~12 N·m

(3) If the direction of the refrigerant piping has been chosen, please remove the piping cover from the unit, punch out the holes following the guide line with a screwdriver and a hammer. Then, deburr the holes and attach insulation (field-supplied) for protection of cables and pipes.





(a)Front and Right Side Piping Work (b) Bottom Side Piping Work (c) Rear Side Piping Work

NOTICE

- Protect cables and refrigerant pipes from the edges of the holes with insulations, and so on. (Fieldsupplied)
- Prevent the cables from contacting the refrigerant piping and the hot components of the unit directly.
- For the right side and rear side piping work, secure enough space for the piping.

(4) Be sure to attach the piping cover to prevent rain water from going into the unit. Completely seal the penetration parts of the pipes with field-supplied insulation in order to prevent rain water from going into the unit.

(5) Use a pipe bender or an elbow (field-supplied) for bending work while connecting pipes.

2.17 Additional Refrigerant Charge Calculation

Although this unit has been charged with refrigerant, additional refrigerant charge is required on the site. Determine additional quantity of refrigerant required according to the following table, and charge it into the system.

(1) Calculating the method of Additional Refrigerant Charge

Model	Item	Contents					Total Additional Charge
RAS-3.0~6.5 HNBRKQ1	For the refrigerant pipes	Liquid Pipe diameter	Symbol	Total length of liquid piping (meter)	Refrigerant charge per meter	Additional charge (kg)	W=W11+W12 +W13
		Φ6.35	W11=		×0.020kg/m=		
		Φ9.52	W12=		×0.050kg/m=		
		Φ12.7	W13=		×0.085kg/m=		
	For the Indoor units	0					
RAS-7.0~12 HNBRMQ1	For the refrigerant pipes	Liquid Pipe diameter	Symbol	Total length of liquid piping (meter)	Refrigerant charge per meter	Additional charge (kg)	W=W11+W12 +W13+W21 +W22+W23
		Φ6.35	W11=		×0.020kg/m=		
		Φ9.52	W12=		×0.059kg/m=		
		Φ12.7	W13=		×0.120kg/m=		
	For the 4-way cassette indoor units	Model	Symbol	Numbers (Q'ty)	Refrigerant charge per unit	Additional charge (kg)	
		28~45	W21=		×0.23kg/pcs=		
		50~71	W22=		×0.29kg/pcs=		
		80~160	W23=		×0.47kg/pcs=		
	For the other indoor units	0					

NOTE:

- Ensure the total additional charge should not be exceeded the max. additional refrigerant charge quantity.

(2) Max. Additional Refrigerant Charge Quantity

Outdoor Unit	RAS-3.0~ 3.5HNBRKQ1	RAS-4.0~ 5.0HNBRKQ1	RAS-6.0~ 6.5HNBRKQ1	RAS-7.0~ 8.0HNBRMQ1	RAS-10~ 12HNBRMQ1
Max. Additional Refrigerant Charge Quantity (kg)	3.9	7.9	8.6	12.9	12.9

(3) Refrigerant Charge Amount of Outdoor Unit before Shipment.

Outdoor Unit	W_0(kg)
RAS-3.0~3.5HNBRKQ1	3.0
RAS-4.0~5.0HNBRKQ1	4.1
RAS-6.0~6.5HNBRKQ1	4.4
RAS-7.0~8.0HNBRMQ1	5.5
RAS-10~12HNBRMQ1	6.5

NOTE:

- W_0 is outdoor unit refrigerant charge before shipment.

(4) Record of Additional Charge

The total refrigerant charge of the system should be calculated by the following formula:

Total of Refrigerant Charge	=	W	+	W_0				
The system	=		+		=		kg	Total Additional Charge: W ☐ kg Total Ref. Charge: ☐ kg Date of Ref. Charge Work: ☐ / ☐ / ☐

2.18 Electrical Wiring

⚠ WARNING

- Turn off the main power switch of the indoor unit and the outdoor unit, then wait for more than 10 minutes before electrical wiring work or a periodical check is performed.
- Ensure that the indoor fan and the outdoor fan have been stopped before electrical wiring work or a periodical check is performed.
- Protect the wirings, electrical parts, and so on. from rats or other small animals. If not, rats may gnaw at unprotected parts which may lead to a fire.
- Avoid the wirings touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not, the wirings will be damaged and a fire may be happened.
- Secure the cables. External forces on the terminals can lead to a fire.

NOTICE

- The indoor unit fan may continue to operate for up to five minutes following the heating cycle to dissipate residual heat from the indoor unit.

2.18.1 General Check

(1) Make sure that the field-supplied electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical characteristics indicated in the following table. Make sure that the components comply with the local national standards and rules.

- Supply electrical power to each outdoor unit. An ELB (Earth Leakage Breaker), fuse and main switch should be used for each outdoor unit. If not, it will be cause of fire or electrical shock.

(2) Ensure that the power supply voltage is within ±10% of the rated voltage. If the power supply voltage is too low, the system cannot start due to the voltage drop.

(3) Check the size of the electrical wires.

(4) Ensure that the ground wiring for the outdoor unit and indoor unit are connected. If not, it will be cause of fire or an electrical shock.

(5) Communication cabling shall be a minimum of 0.75mm^2, 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per guidelines. Plenum and riser ratings for transmission cables must be considered per application and local code requirements.

- In case of where the power source for the air conditioning is supplied from the same power transformer as the device with high electricity consumption*.
- In case of where the power supply wiring for the device* and for the air conditioning are located close to each other.

* Example: Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor, and large-sized switch.

In the instances mentioned above, an induction surge of the power supply wiring for the air conditioning cloud occur due to a rapid change in electricity consumption of the device and activation of the switch. Therefore, check the field regulations and standards before performing electrical work in order to protect the power supply wiring for the air conditioning.

Recommended Electrical Characteristics

Model	Power Supply	Maximum Running Ampacity (A)	Power Supply Wiring (Cores×mm^2)	Transmission Cable (Cores×mm^2)	ELB	
					Rated Ampacity (A)	Rated Sensitive Ampacity (mA)
RAS-3.0~3.5 HNBRKQ1	220-240V/1Ph/50Hz	21	3×4.0	2×0.75	32	30
RAS-4.0~6.5 HNBRKQ1	220-240V/1Ph/50Hz	31	3×6.0	2×0.75	40	30
RAS-7.0~8.0 HNBRMQ1	380-415V/3Ph/50Hz	20	5×6.0	2×0.75	25	30
RAS-10~12 HNBRMQ1	380-415V/3Ph/50Hz	28	5×6.0	2×0.75	40	30

2.18.2 Electrical Wiring Connection

Connect the electrical wiring according to the following figures:

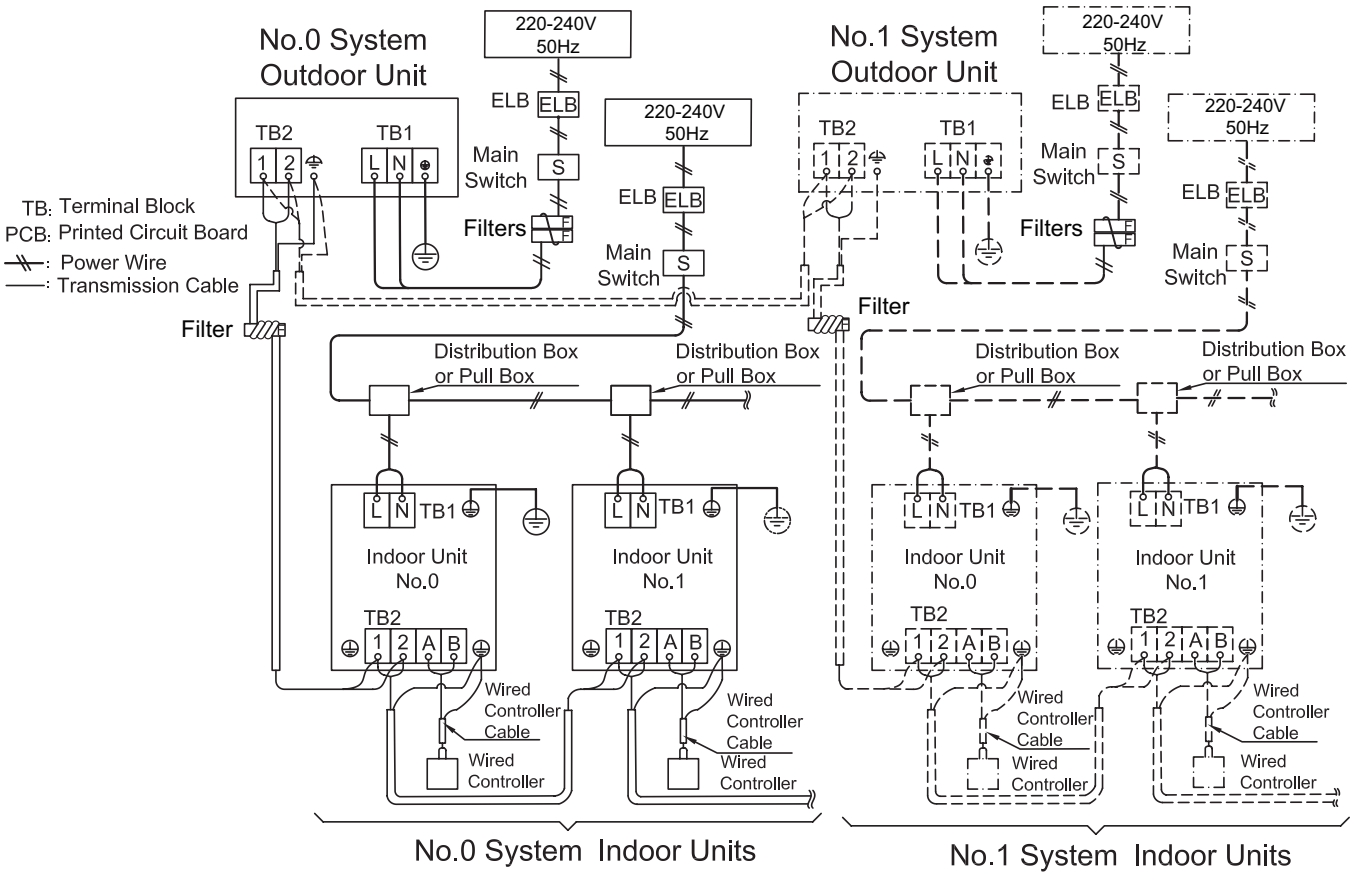


Figure 5.1 Electrical Wiring Connection for RAS-3.0~6.5HNBRKQ1

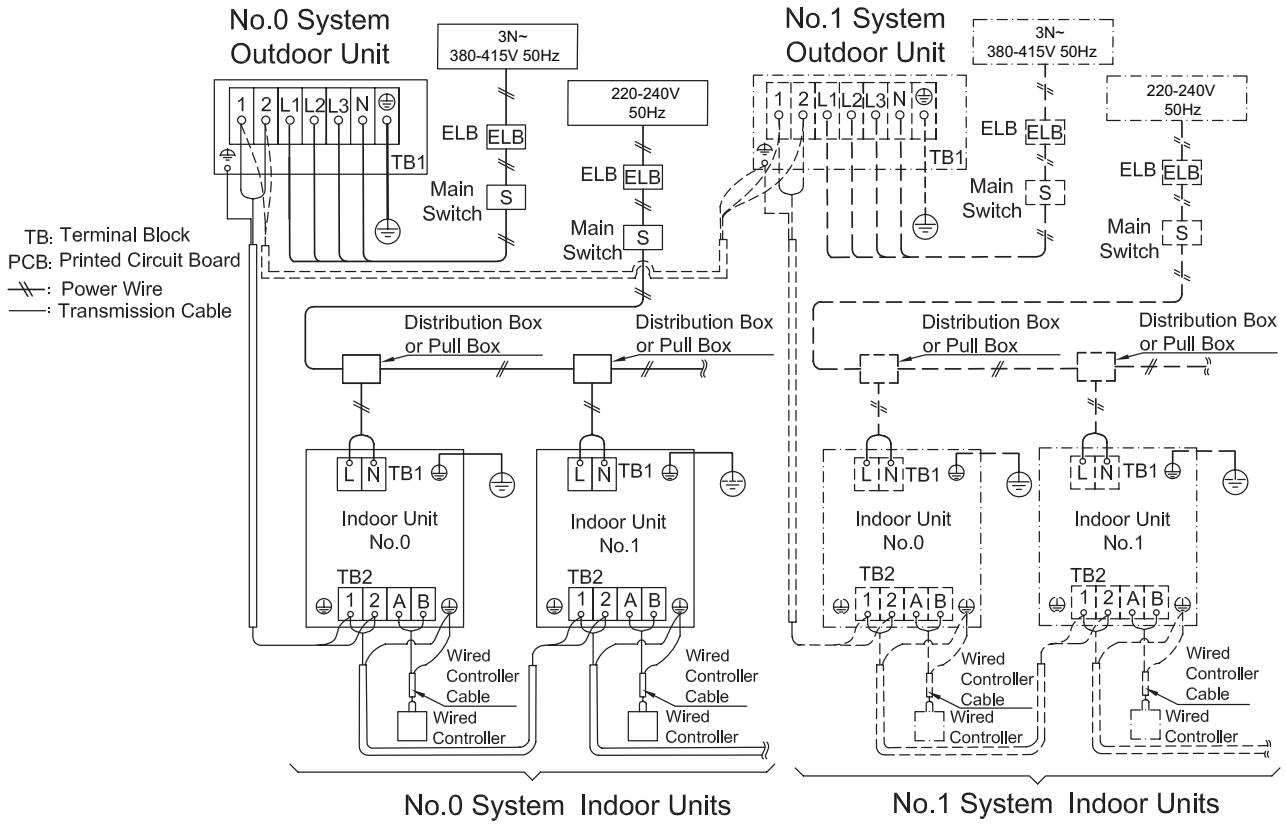


Figure 5.2 Electrical Wiring Connection for RAS-7.0~12HNBRMQ1

(1) Connect the power supply wirings to the terminal block TB1 and ground wiring to the terminal in the electrical control box. The ELB (Earth leakage breaker), FUSE and S (Main switch) must be installed to each power source of outdoor unit.

(2) Connect the transmission cables between the outdoor unit and indoor units to the terminals 1 and 2 on the terminal block. The transmission cables must be made from the shielded twist pair cabling. Proper bonding and termination of the cable shield is required as per guidelines. The installation must be considered per application and local code requirements. Transmission cable shall be a minimum of 0.75mm^2, 2-Conductor, Stranded Copper.

(3) For the model of RAS-3.0~6.5HNBRKQ1 outdoor units, the magnetic rings in the package of the outdoor unit should be used on the power supply wire and transmission cable. For the power supply wire, two magnetic rings should be paralleled and the wire should through them by one cycle. For the transmission cable between the outdoor unit and indoor units, the cable should be through the magnetic ring by 3 cycles.

(4) Connect the transmission cables between the indoor unit and wireless controller to the terminals A and B on the terminal block.

(5) The transmission cable is required to be separated from the power supply wiring.
Keep at least 5cm distance between the transmission cable and the power supply wiring, and also min. 1.5m distance between the transmission cable and power supply wiring for other electrical device. If the above is not secured, put the power supply wiring into the metal conduit tube to separate from other wirings.

(6) Do not connect the power supply wiring to the terminals 1 and 2 on the terminal block for transmission wiring. Otherwise, printed circuit board may be damaged.

(7) Connect the ground wire for the outdoor/indoor units. The ground wiring work under the condition of 100Ω (max.) ground resistance should be performed by the qualified person.

(8) Tighten screws for the terminal block according to the following table:

Size	Tightening Torque
M4	1.0~1.3 N·m
M5	2.0~2.5 N·m
M6	4.0~5.0 N·m
M8	9.0~11.0 N·m
M10	18.0~23.0 N·m

⚠ WARNING

- The ELB (Earth leakage breaker), FUSE and S (Main switch) must be installed to each power source of outdoor unit and indoor units. If not, it may cause an electrical shock or fire.
- Perform the electrical work according to the regulations of each region and this installation and maintenance manual. A separate, dedicated electrical circuit must be used. If the electrical wiring work is performed incorrectly or there is a capacity shortage of the power circuit, it will cause an electric shock or fire.
- Check that the ground wire is securely connected. Otherwise, it may lead to an electrical shock. Do not connect the ground wiring to gas piping, water piping, lightning conductor, or telephone ground wirings.
- In the electrical wiring connection for RAS-7.0~12HNBRMQ1, do not connect the live wires (L1/L2/L3) to the terminals N of the terminal block TB1. Otherwise, printed circuit board may be damaged.

2.18.3 Electrical Wiring for Outdoor Unit

Avoid the wirings touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not, the wires will be damaged and at the worst, a fire will occur.

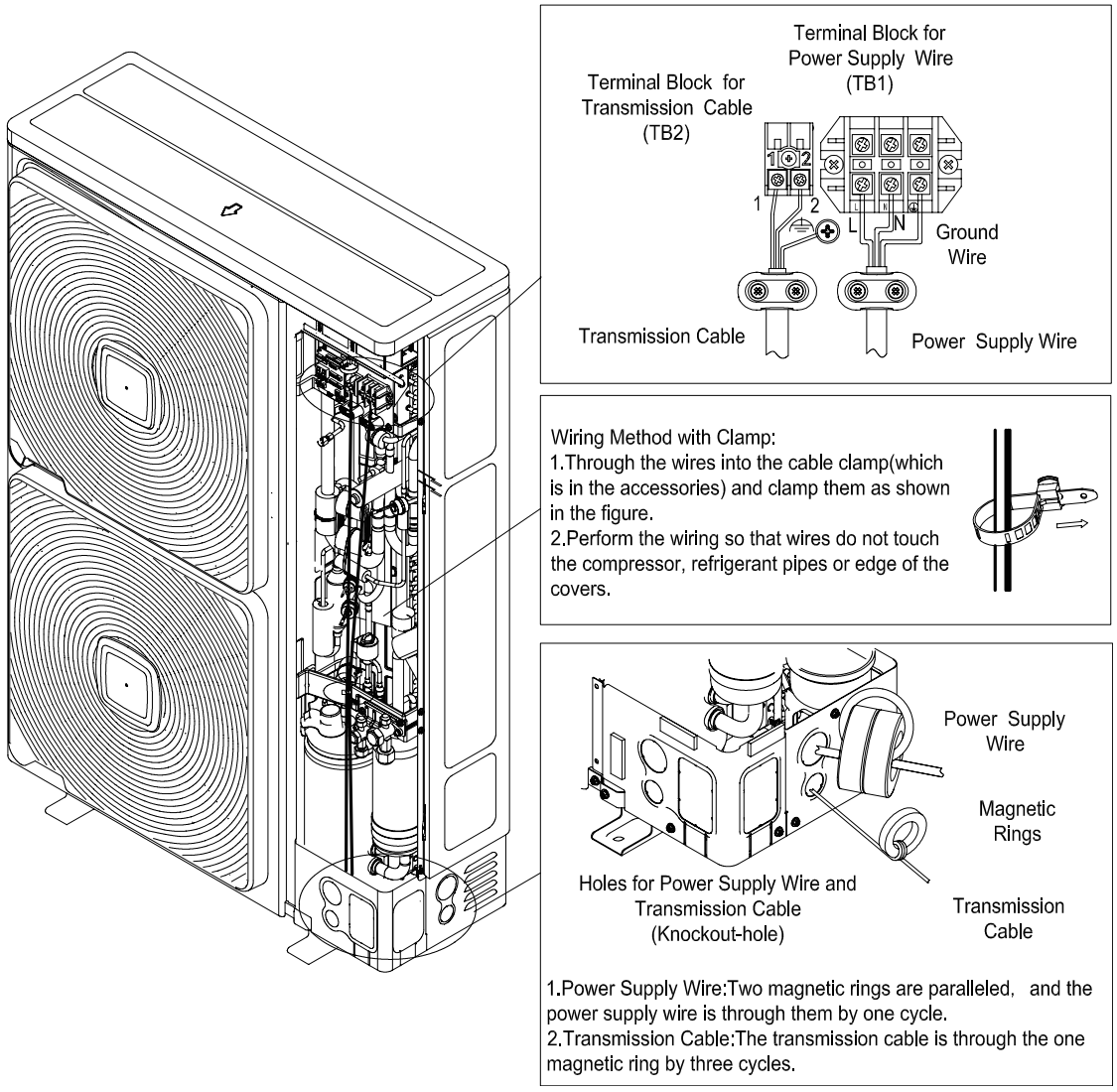


Figure 5.3 Electrical Wiring for RAS-3.0~6.5HNBRKQ1

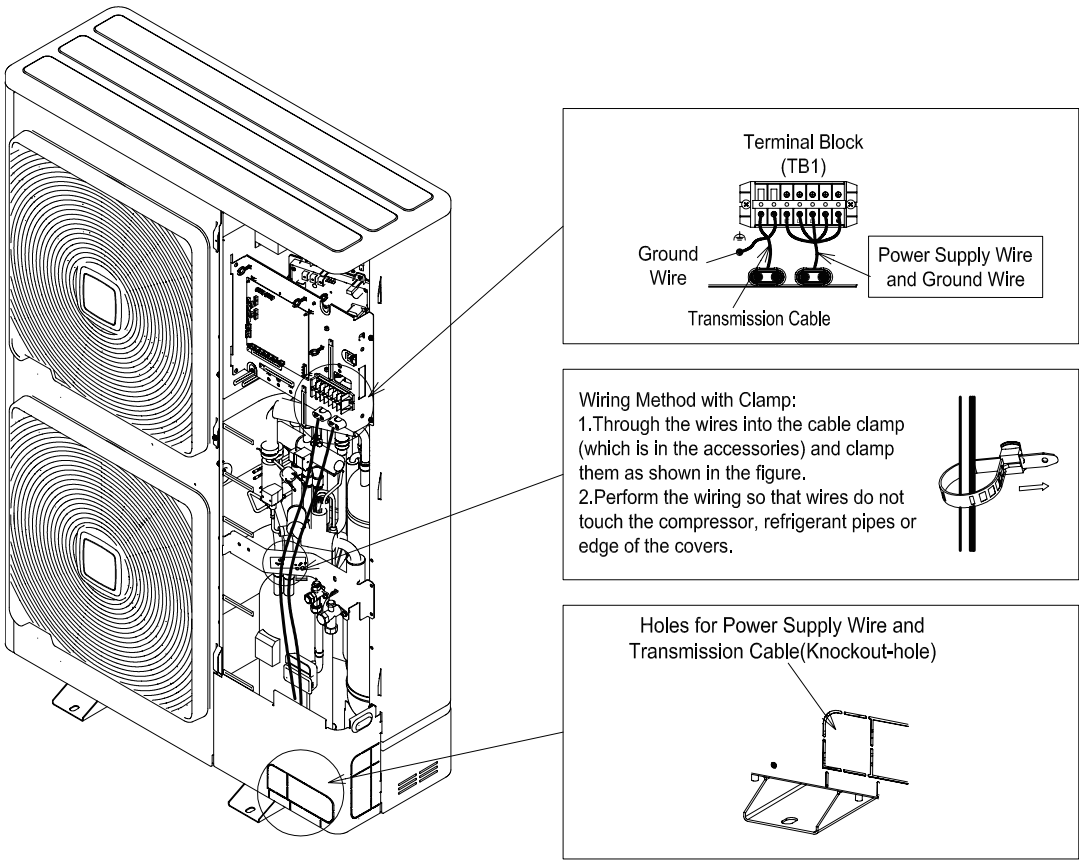


Figure 5.4 Electrical Wiring for RAS-7.0~12HNBRMQ1

NOTES:

- Perform all the electrical work in accordance with the manual and in compliance with the local regulations and safety standards. The electrical wiring should be applied by the qualified person.
- The recommended electrical characteristics are calculated by the related safety standards. The environment temperature is less than 40°C, the length of the power supply wire is no more than 15 meters. If the air conditioning is in an extreme environment, please calculate the electrical characteristics again.
- If the distribution box or pull box is adopted to the power supply for air conditioning, the size of the power supply wire should be chosen according to the following table.

Total Ampacity (A)	Power Supply Wiring (mm^2)	
I≤6	2.5	※1: If the total ampacity is over than 63A, the power supply wires must not be connected in series.
6<I≤10	2.5	
10<I≤16	2.5	
16<I≤25	4.0	
25<I≤32	6.0	
32<I≤40	10.0	
40<I≤63	16.0	
63<I	※1	

- The power supply wire should be stranded copper with shielding by neoprene.
- The transmission cables must be made up of the shielded twist pair cabling, and the shielded should be connected to the ground.
- If the power supply wiring or the transmission cable is damaged, please turn off the power supply and contact the service dealer.
- The ELB (Earth leakage breaker) must be installed to each power source of outdoor unit and indoor units. The distance between the terminals of the ELB should be more than 3 mm.
- When connecting the power supply wirings, it is better that the ground wire should be longer than the live and neutral wires.

3. Selection Data

3.1 Unit Nomenclature

Unit Nomenclature for Outdoor Unit.

Digit	Example	Description
1~3	RAS	Outdoor Unit (Separated Type)
4	3.0	Capacity (HP)
5	H	Air Cooling/Heat Pump System
6	N	Refrigerant Type (N: R410A)
7	B	Generation
8	R	SET FREE mini *R* Series
9	K	Power Supply (K: 220-240V/1Ph/50Hz, M: 380~415V/3Ph/50Hz)
10	Q	HAPQ
11	1	Version (Code "0" can be omitted)

3.2 Selection Guide

(1) Given Condition

- Estimated Load

Item		Room 1	Room 2	Room 3
Estimated Cooling Load	kW	2.5	2.5	3.6
Estimated Heating Load	kW	3.5	3.5	4.7

- Temperature Condition

Cooling	Heating
Outdoor Coil Air Inlet: Dry Bulb: 35˚C Indoor Coil Air Inlet: Dry Bulb: 24˚C Wet Bulb: 17˚C	Outdoor Coil Air Inlet: Dry Bulb: 6˚C Wet Bulb: 5˚C Indoor Coil Air Inlet: Dry Bulb: 20˚C

- Altitude Condition: 305m
  Equivalent Piping Length between Indoor Units and Outdoor Unit: 60m
  Piping Lift: 8m
  Power Supply: 50Hz

(2) Selecting Matching Indoor Units and Nominal Capacity

Select Compact Ducted Type Indoor Units (Example)

Item		Room 1	Room 2	Room 3	Total
Selected Model		RCI-1.5***	RCI-1.5***	RCI-2.0***	
Nominal Cooling Capacity	**kW**	4.0	4.0	5.6	13.6
Nominal Heating Capacity	**kW**	4.8	4.8	6.3	15.9

Item		Outdoor Unit
Selected Model		RAS-5.0HNBRKQ1
Nominal Cooling Load	**kW**	14.0
Nominal Heating Load	**kW**	16.0

(3) Actual Capacity

In the example, the total indoor unit capacity is 13.6kW, and outdoor unit capacity is 14.0kW. Therefore, the connected indoor unit capacity ratio is 97%.

(A) Actual Capacity of Outdoor Unit

Maximum Actual Capacity of Outdoor Unit
= ① Outdoor Unit Capacity According to Connected IDU Capacity Ratio × ② Outdoor Unit Capacity According to Temperature Condition × ③ Correction Factor According to Piping Length and Lift × ④ Correction Factor According to Defrosting Operation (only heating) × ⑤ Correction Factor According to

Altitude.

Item	①	②	③	④	⑤
Cooling	13.6kW	12.6/14	0.87	1	0.97
Heating	15.9kW	15.5/16	0.96	0.95	0.97
Note	Section 3.3	Section 3.4	Section 3.5	Section 3.6	Section 3.7

Maximum Actual Capacity of Outdoor Unit:

Cooling = 13.6 × (12.6/14) × 0.87 ×1 × 0.97=10.33kW

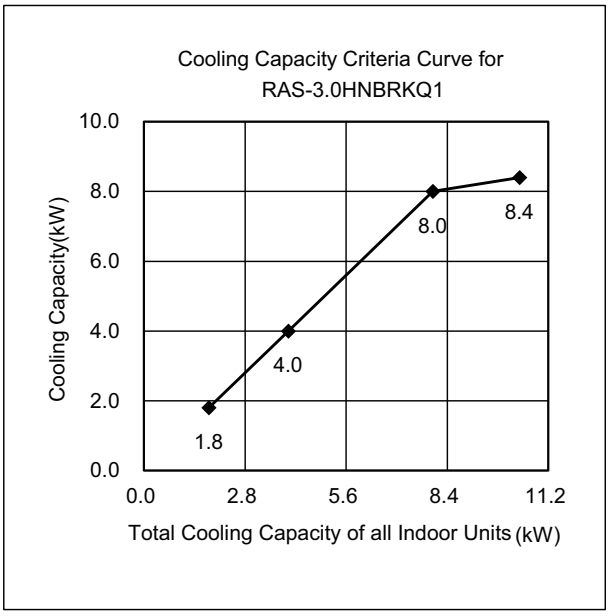
Heating = 15.9 × (15.5/16) × 0.96 ×0.95 × 0.97=13.62kW

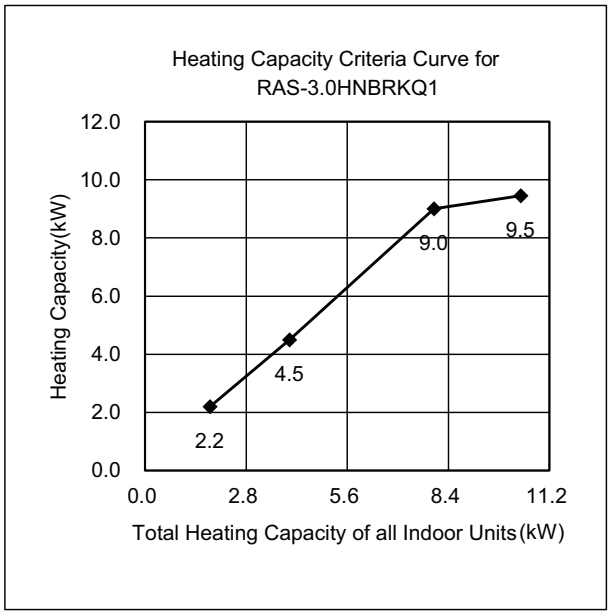
(A) Actual Capacity of Each Indoor Unit

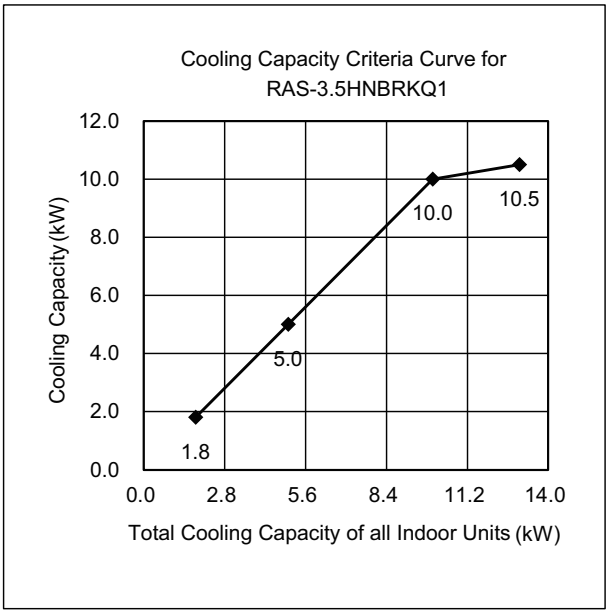
Actual Capacity of Each Indoor Unit = Actual Capacity of Outdoor Unit × Each Indoor Unit Capacity ÷ Summation of Indoor Units Capacity Result:

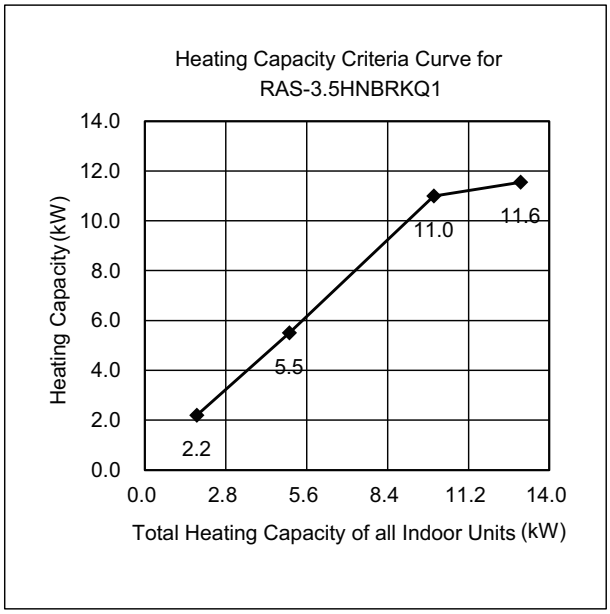
Item			Room 1	Room 2	Room 3	Total
Selected Model			RCI-1.5FSKDNQ	RCI-1.5FSKDNQ	RCI-2.0FSKDNQ	
Actual Capacity	**Actual Maximum Cooling Capacity**	**kW**	3.04	3.04	4.25	10.33
	Actual Maximum Heating Capacity	**kW**	4.11	4.11	5.4	13.62
Design Load	**Estimated Cooling Load**	**kW**	2.5	2.5	3.6	8.6
	Estimated Heating Load	**kW**	3.5	3.5	4.7	11.7

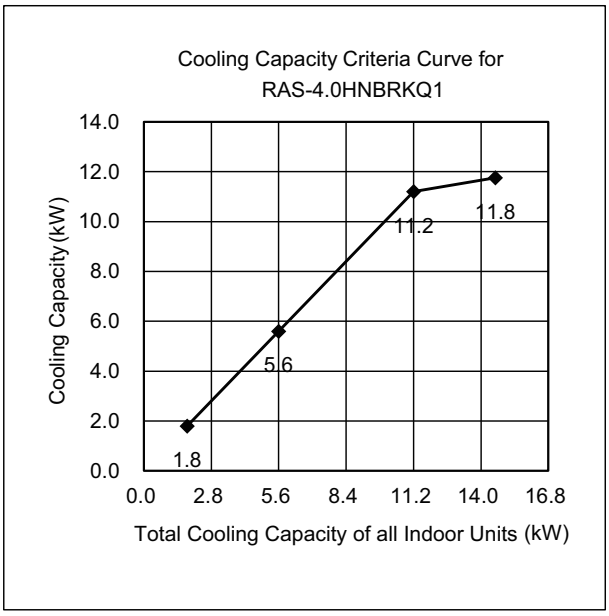
3.3 Outdoor Unit Capacity According to Connected IDU Capacity Ratio

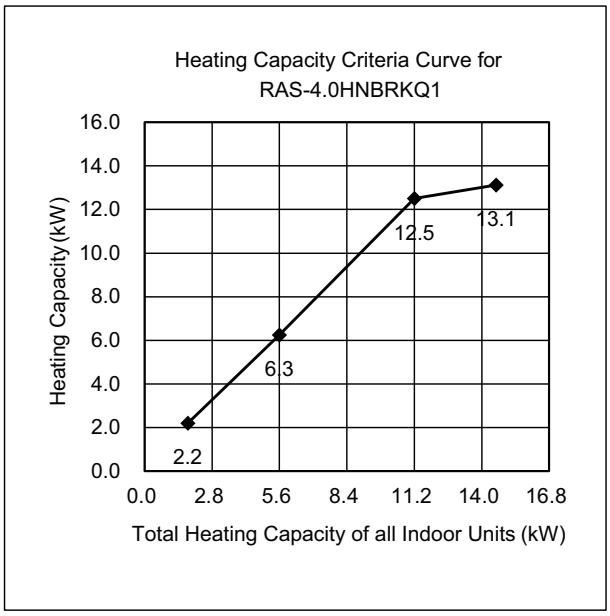


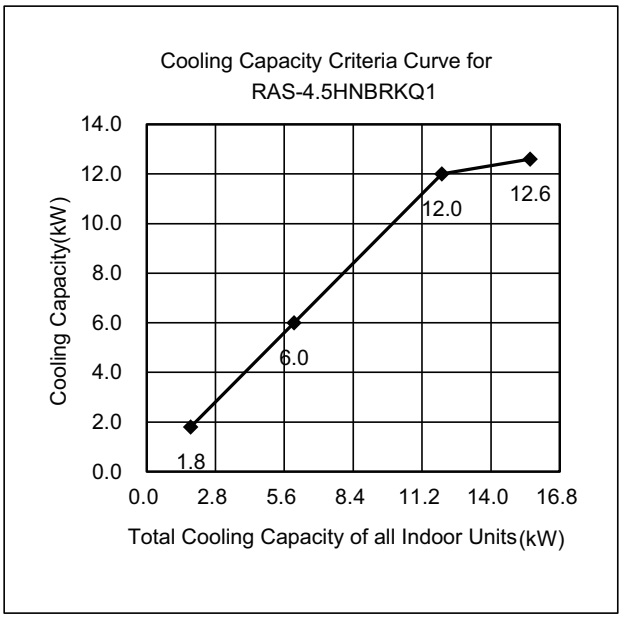


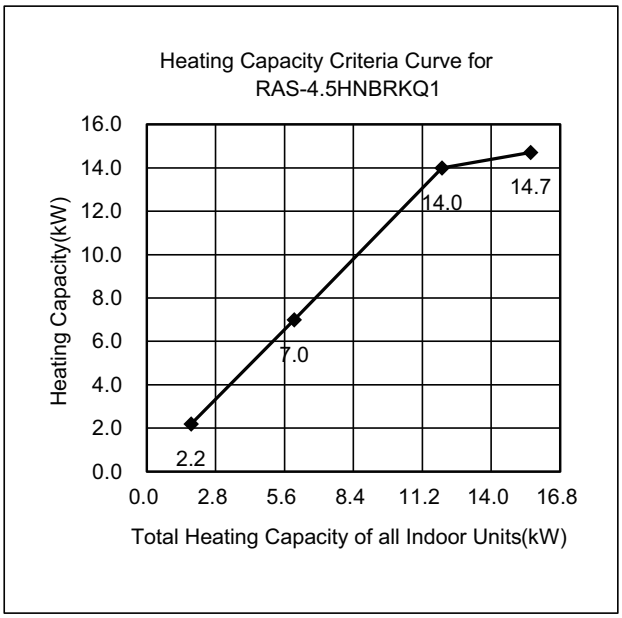


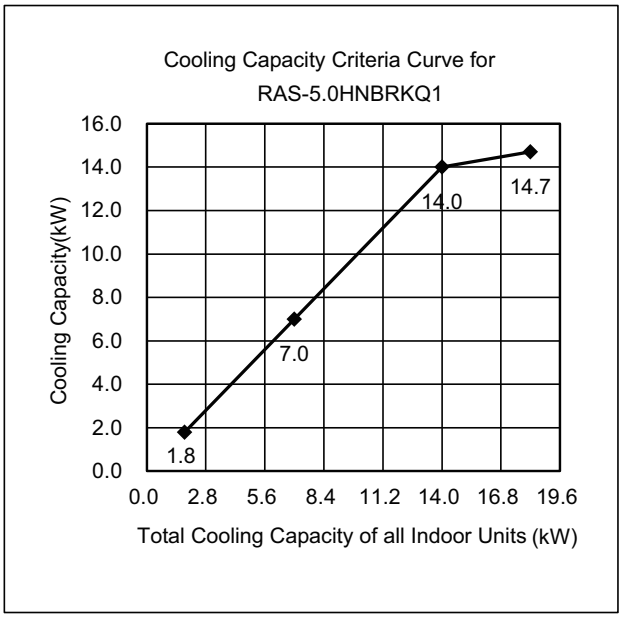


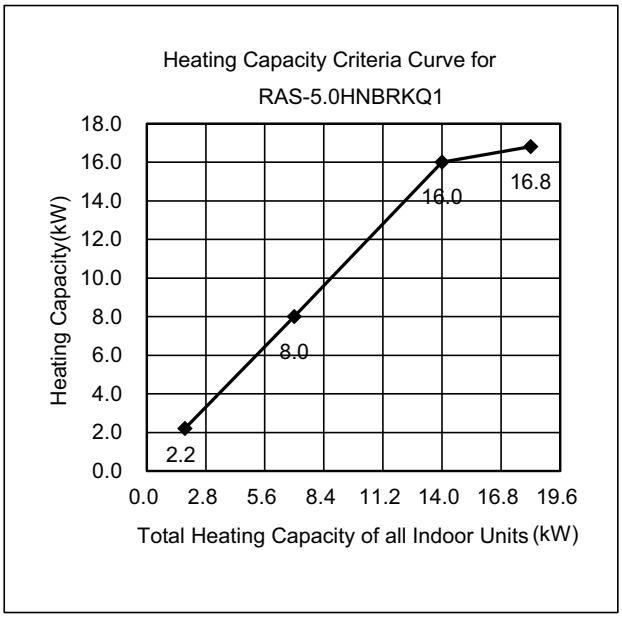


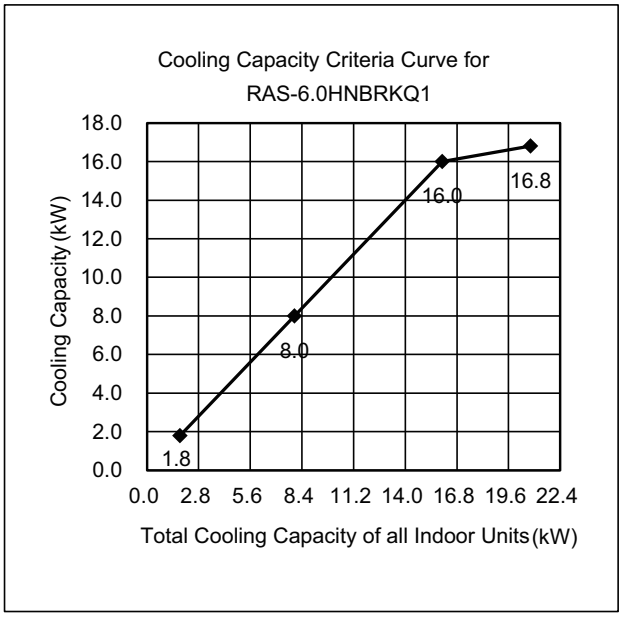


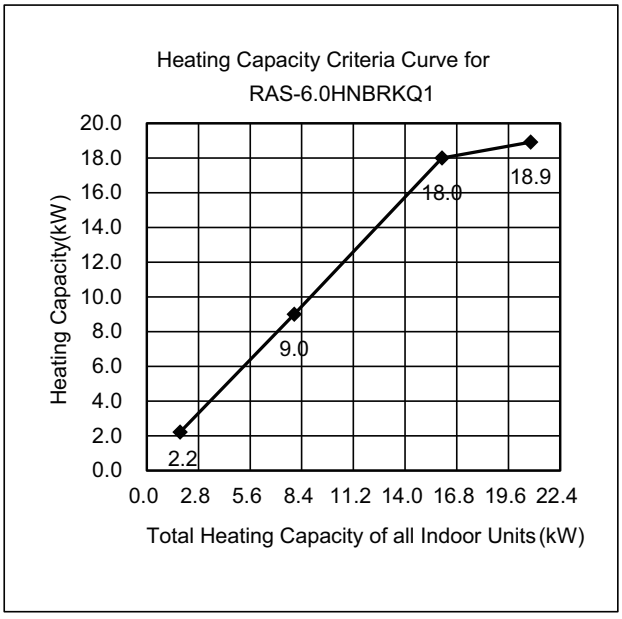

Cooling Capacity Criteria Curve for
RAS-4.5HNBRKQ1
Cooling Capacity(kW)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1.8
6.0
12.0
12.6
0.0 2.8 5.6 8.4 11.2 14.0 16.8
Total Cooling Capacity of all Indoor Units (kW)


Heating Capacity Criteria Curve for
RAS-4.5HNBRKQ1
Heating Capacity(kW)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2.2
7.0
14.0
14.7
0.0 2.8 5.6 8.4 11.2 14.0 16.8
Total Heating Capacity of all Indoor Units(kW)

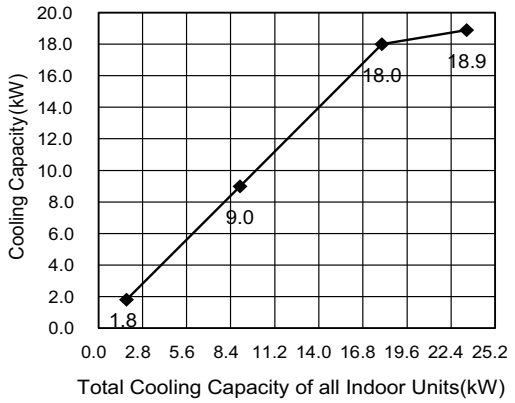

Cooling Capacity Criteria Curve for
RAS-5.0HNBRKQ1
Cooling Capacity(kW)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1.8
7.0
14.0
14.7
0.0 2.8 5.6 8.4 11.2 14.0 16.8 19.6
Total Cooling Capacity of all Indoor Units (kW)


Heating Capacity Criteria Curve for
RAS-5.0HNBRKQ1
Heating Capacity(kW)
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2.2
8.0
16.0
16.8
0.0 2.8 5.6 8.4 11.2 14.0 16.8 19.6
Total Heating Capacity of all Indoor Units (kW)

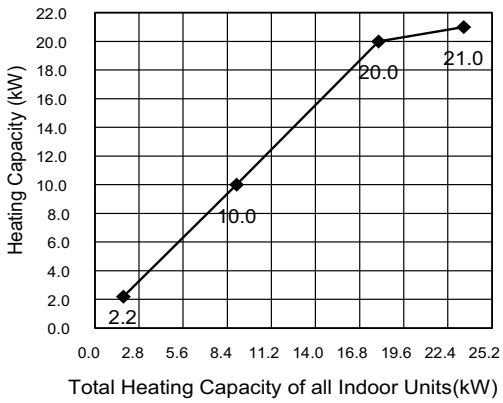

Cooling Capacity Criteria Curve for
RAS-6.0HNBRKQ1
Cooling Capacity (kW)
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1.8
8.0
16.0
16.8
0.0 2.8 5.6 8.4 11.2 14.0 16.8 19.6 22.4
Total Cooling Capacity of all Indoor Units (kW)


Heating Capacity Criteria Curve for
RAS-6.0HNBRKQ1
Heating Capacity(kW)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2.2
9.0
18.0
18.9
0.0 2.8 5.6 8.4 11.2 14.0 16.8 19.6 22.4
Total Heating Capacity of all Indoor Units (kW)

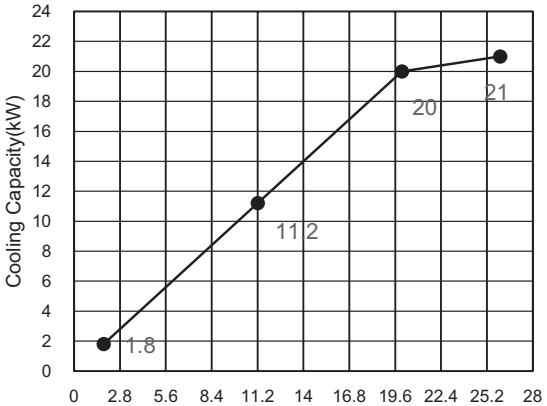
Cooling Capacity Criteria Curve for
RAS-6.5HNBRKQ1



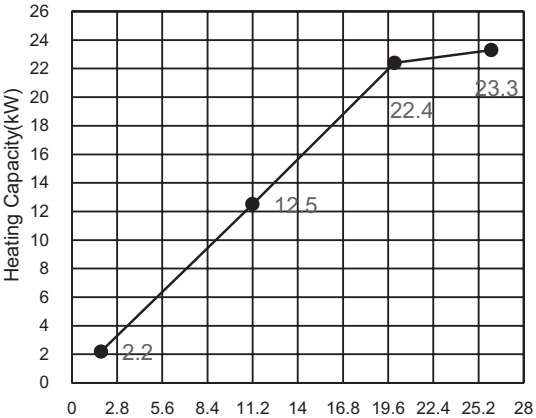
Heating Capacity Criteria Curve for
RAS-6.5HNBRKQ1



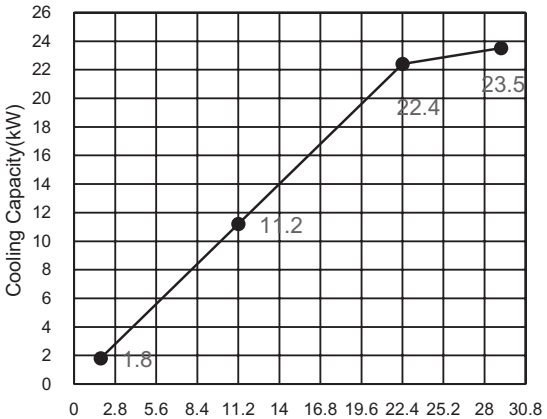
Cooling Capacity Criteria Curve for
RAS-7.0HNBRMQ1



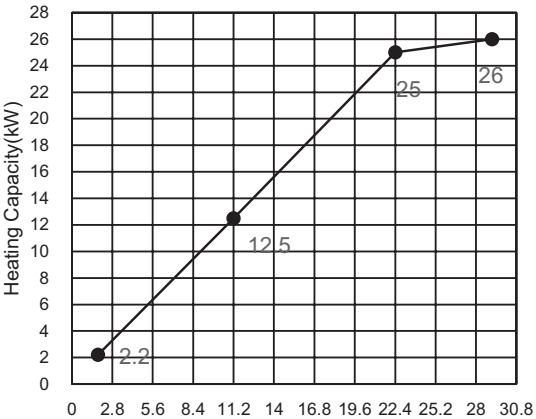
Heating Capacity Criteria Curve for
RAS-7.0HNBRMQ1

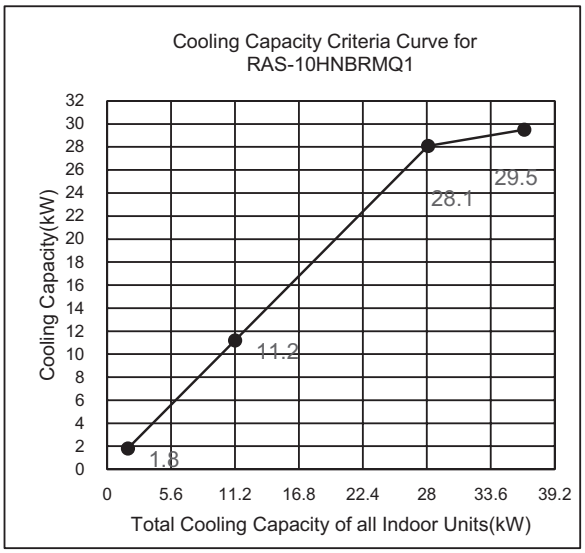


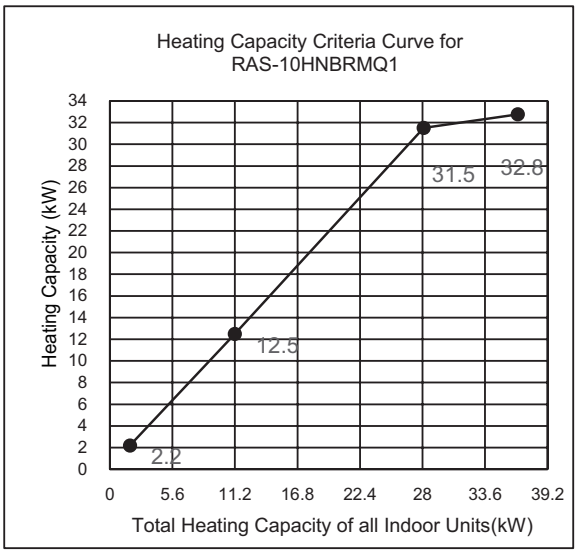
Cooling Capacity Criteria Curve for
RAS-8.0HNBRMQ1

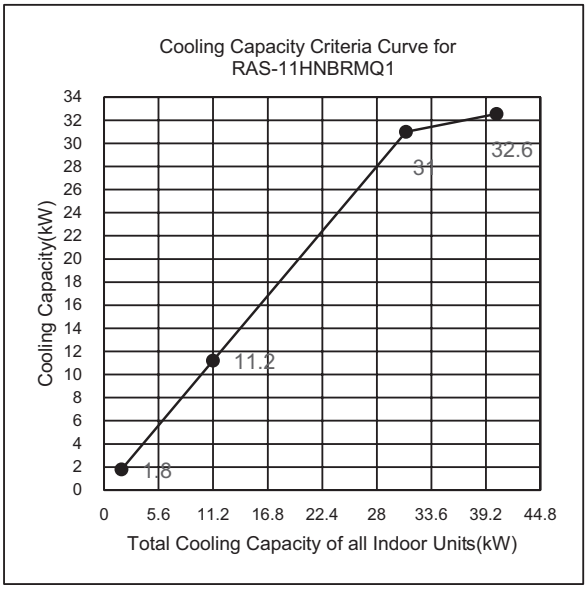


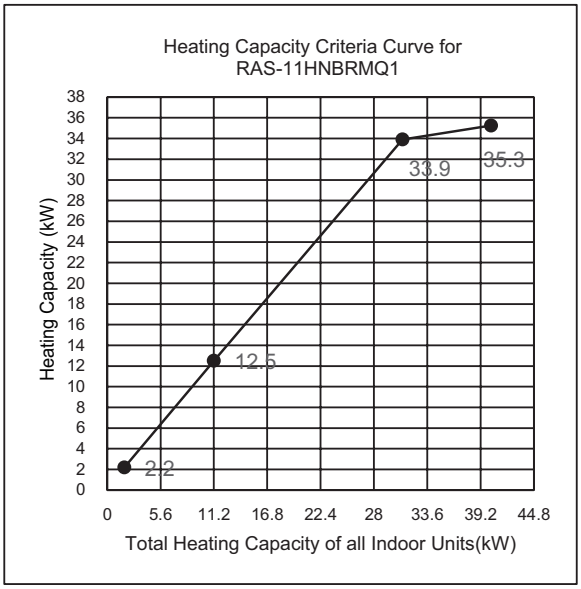
Heating Capacity Criteria Curve for
RAS-8.0HNBRMQ1

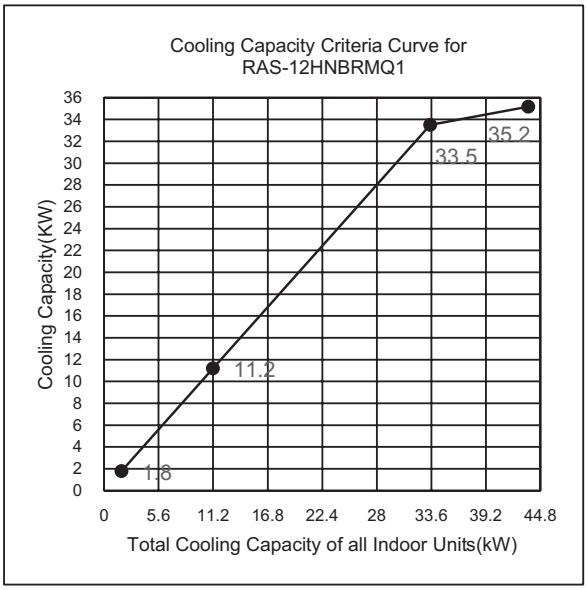


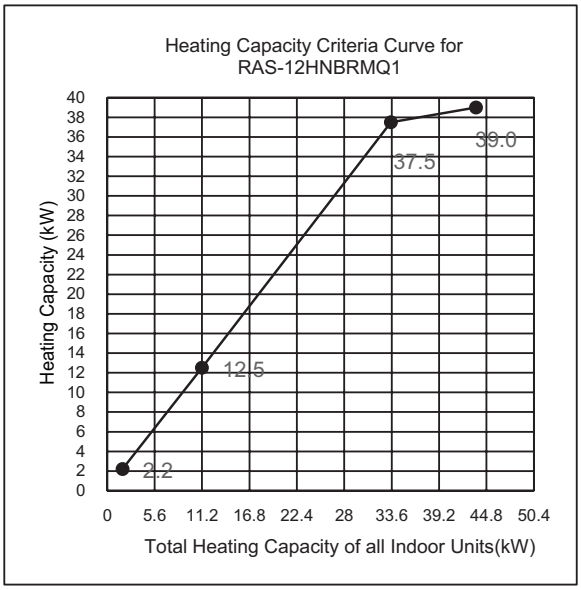












NOTES:

(1) Capacity test working conditions：Pipe length: 10m; Pipe Lift: 0m

Working condition for cooling:	Working condition for heating:
Indoor temperature: 27˚C DB/19˚C WB;	Indoor temperature: 20˚CDB;
Outdoor temperature: 35˚C DB	Outdoor temperature: 7˚C DB/6˚C WB

(2) In some cases, the value may change due to the compressor protection control.

(3) The heating capacity on the table indicates the peak value, which does not include the capacity decrease caused by frost.

3.4 Outdoor Unit Capacity According to Temperature Condition

● Cooling

Cooling Capacity for RAS-3.0HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB				
	15	17	19	21	23
25	7.1	8.1	9.2	9.9	10.7
30	7.0	8.0	9.0	9.8	10.6
35	6.4	7.2	8.0	8.5	8.9
40	6.0	6.5	7.2	7.5	7.8

Cooling Capacity for RAS-3.5HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB				
	15	17	19	21	23
25	8.8	10.1	11.4	12.4	13.4
30	8.8	10.0	11.3	12.3	13.2
35	8.0	9.0	10.0	10.6	11.2
40	7.5	8.2	8.9	9.4	9.8

Cooling Capacity for RAS-4.0HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB				
	15	17	19	21	23
25	9.4	10.8	12.2	13.5	14.8
30	9.3	10.6	12.0	13.2	14.5
35	8.9	10.1	11.2	12.1	13.0
40	8.3	9.3	10.3	10.8	11.2

Cooling Capacity for RAS-4.5HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB				
	15	17	19	21	23
25	10.0	11.6	13.1	14.5	15.9
30	9.9	11.4	12.9	14.2	15.5
35	9.6	10.8	12.0	13.0	13.9
40	8.9	9.9	11.0	11.5	12.0

Cooling Capacity for RAS-5.0HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB				
	15	17	19	21	23
25	11.7	13.5	15.3	16.9	18.9
30	11.6	13.3	15.0	16.6	18.1
35	11.2	12.6	14.0	15.2	16.3
40	10.4	11.6	12.9	13.5	14.0

Cooling Capacity for RAS-6.0HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB				
	15	17	19	21	23
25	13.5	15.2	16.8	17.9	18.9
30	13.5	15.0	16.7	17.7	18.7
35	13.1	14.6	16.0	17.0	17.9
40	12.6	14.0	15.4	16.2	17.0

Cooling Capacity for RAS-6.5HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB				
	15	17	19	21	23
25	15.2	17.0	18.9	20.1	21.3
30	15.1	16.9	18.8	19.9	21.1
35	14.8	16.4	18.0	19.1	20.2
40	14.2	15.7	17.3	18.2	19.1

Cooling Capacity for RAS-7.0HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB								
	15	16	17	18	19	20	21	22	23
25	19.8	20.3	21.0	21.5	22.2	22.8	23.4	24.0	24.6
30	18.9	19.4	20.0	20.6	21.1	21.7	22.2	22.9	23.5
35	17.9	18.4	19.0	19.4	20.0	20.6	21.1	21.7	22.3
40	17.0	17.4	17.8	18.3	18.9	19.4	19.9	20.5	21.0

Cooling Capacity for RAS-8.0HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB								
	15	16	17	18	19	20	21	22	23
25	22.1	22.8	23.5	24.1	24.8	25.5	26.2	26.9	27.6
30	21.1	21.8	22.4	23.0	23.7	24.3	24.9	25.6	26.3
35	20.1	20.6	21.2	21.8	22.4	23.0	23.7	24.3	25.0
40	19.0	19.5	20.0	20.5	21.1	21.7	22.3	22.9	23.6

Cooling Capacity for RAS-10HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB								
	15	16	17	18	19	20	21	22	23
25	25.7	26.5	27.3	28.2	29.1	30.0	31.0	32.0	33.0
30	25.3	26.2	27.1	27.9	28.9	29.7	30.7	31.7	32.7
35	24.6	25.4	26.3	27.2	28.1	29.0	30.0	31.0	32.0
40	23.5	24.3	25.2	26.1	26.8	27.5	28.0	28.6	29.3

Cooling Capacity for RAS-11HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB								
	15	16	17	18	19	20	21	22	23
25	28.3	29.2	30.2	31.1	32.1	33.1	34.1	35.3	36.4
30	27.9	28.9	29.9	30.8	31.8	32.8	33.9	35.0	36.1
35	27.1	28.0	29.1	30.0	31.0	32.0	33.1	34.2	35.3
40	25.9	26.8	27.8	28.8	29.6	30.4	30.9	31.6	32.3

Cooling Capacity for RAS-12HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C WB								
	15	16	17	18	19	20	21	22	23
25	30.6	31.6	32.6	33.6	34.7	35.8	36.9	38.1	39.3
30	30.2	31.2	32.3	33.3	34.4	35.4	36.6	37.8	39.0
35	29.3	30.3	31.4	32.4	33.5	34.6	35.8	37.0	38.2
40	28.0	29.0	30.0	31.1	32.0	32.8	33.4	34.1	34.9

SELECTION DATA

- Heating

Heating Capacity for RAS-3.0HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB						
	16	18	20	22	24	26	28
-20	5.7	5.6	5.5	5.4	5.2	5.1	5.0
-15	6.1	5.9	5.8	5.6	5.6	5.5	5.4
-10	6.3	6.2	6.1	6.0	5.9	5.8	5.7
-5	6.6	6.6	6.5	6.4	6.3	6.2	6.1
0	7.6	7.5	7.5	7.4	7.3	7.2	7.1
5	8.9	8.8	8.7	8.6	8.5	8.5	8.4
10	10.5	10.4	10.2	10.1	10.0	9.8	9.8
15	12.1	12.0	11.9	11.6	11.3	11.0	10.6

Heating Capacity for RAS-3.5HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB						
	16	18	20	22	24	26	28
-20	5.9	5.8	5.7	5.5	5.4	5.3	5.2
-15	6.4	6.3	6.1	5.9	5.8	5.8	5.7
-10	6.8	6.7	6.6	6.5	6.3	6.2	6.1
-5	8.1	8.0	7.9	7.8	7.6	7.5	7.4
0	9.3	9.2	9.1	9.0	8.9	8.8	8.7
5	10.8	10.7	10.6	10.5	10.4	10.3	10.3
10	12.8	12.7	12.5	12.3	12.2	12.0	11.9
15	14.8	14.7	14.6	14.2	13.8	13.4	12.9

Heating Capacity for RAS-4.0HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB						
	16	18	20	22	24	26	28
-20	7.2	7.1	7.0	6.8	6.7	6.4	6.2
-15	7.9	7.7	7.5	7.4	7.2	6.9	6.6
-10	8.6	8.4	8.3	8.1	7.9	7.5	7.1
-5	9.4	9.2	9.0	8.9	8.7	8.4	8.0
0	10.8	10.7	10.5	10.3	10.1	9.9	9.6
5	12.5	12.3	12.1	11.9	11.7	11.5	10.7
10	14.5	14.3	14.1	14.0	13.1	12.0	10.9
15	16.5	16.2	15.0	14.0	13.1	12.0	10.9

Heating Capacity for RAS-4.5HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB						
	16	18	20	22	24	26	28
-20	7.9	7.8	7.6	7.5	7.3	7.0	6.7
-15	8.8	8.6	8.5	8.3	7.9	7.5	7.1
-10	9.5	9.4	9.2	9.0	8.7	8.2	7.7
-5	10.6	10.4	10.2	10.0	9.7	9.3	8.9
0	12.2	12.0	11.8	11.6	11.3	11.1	10.7
5	14.0	13.8	13.5	13.5	13.0	12.8	12.0
10	16.2	16.0	15.8	15.8	14.7	13.4	12.2
15	18.3	18.1	16.9	16.9	14.7	13.4	12.2

Heating Capacity for RAS-5.0HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB						
	16	18	20	22	24	26	28
-20	8.6	8.5	8.3	7.9	7.6	7.3	7.0
-15	9.6	9.3	9.0	8.8	8.3	7.9	7.4
-10	10.1	9.9	9.8	9.5	9.3	8.7	8.2
-5	12.1	11.9	11.6	11.4	11.1	10.7	10.2
0	14.0	13.7	13.5	13.2	12.9	12.6	12.2
5	16.0	15.8	15.5	15.2	14.9	14.7	13.7
10	18.5	18.3	18.1	17.9	16.8	15.3	13.9
15	20.9	20.7	19.3	18.0	16.8	15.3	13.9

Heating Capacity for RAS-6.0HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB						
	16	18	20	22	24	26	28
-20	11.3	10.4	9.4	9.0	8.5	8.1	7.6
-15	11.6	11.2	10.9	10.6	9.9	9.2	8.5
-10	12.1	11.9	11.6	11.3	11.0	10.2	9.3
-5	13.7	13.5	13.2	12.9	12.5	11.8	11.2
0	15.9	15.6	15.3	14.9	14.6	14.0	13.5
5	18.2	17.8	17.4	17.0	16.7	16.3	15.9
10	20.7	20.5	20.3	20.0	19.8	19.6	19.2
15	23.3	23.1	22.9	22.5	22.1	20.9	19.8

Heating Capacity for RAS-6.5HNBRKQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB						
	16	18	20	22	24	26	28
-20	11.7	10.8	9.8	9.3	8.8	8.4	7.9
-15	12.1	11.7	11.4	11.0	10.3	9.6	8.9
-10	12.8	12.6	12.3	12.0	11.7	10.8	9.9
-5	15.2	14.9	14.6	14.3	13.9	13.2	12.4
0	17.7	17.3	17.0	16.6	16.2	15.6	15.0
5	20.2	19.8	19.4	18.9	18.5	18.1	17.7
10	23.0	22.8	22.5	22.3	22.0	21.8	21.3
15	25.9	25.7	25.5	25.0	24.5	23.2	22.0

Heating Capacity for RAS-7.0HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB							
	15	16	18	20	22	24	26	28
-20	12.2	12.2	12.1	12.1	12.1	12.1	12.0	12.0
-15	13.5	13.5	13.4	13.4	13.3	13.3	13.2	13.2
-10	15.6	15.5	15.4	15.2	15.1	15.0	14.9	14.8
-5	17.9	17.8	17.6	17.5	17.4	17.3	17.2	17.1
0	20.9	20.9	20.7	20.5	20.4	20.3	20.1	20.0
5	22.8	22.6	22.5	22.2	22.0	21.7	21.6	21.3
6	23.0	22.9	22.6	22.4	22.2	22.0	21.7	21.5
10	23.5	23.3	23.1	22.9	22.6	22.5	22.2	22.0
15	24.0	23.9	23.8	23.5	23.3	23.1	22.9	22.6

Heating Capacity for RAS-8.0HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB							
	15	16	18	20	22	24	26	28
-20	13.6	13.6	13.5	13.5	13.5	13.5	13.4	13.4
-15	15.1	15.1	15.0	15.0	14.9	14.9	14.7	14.7
-10	17.4	17.3	17.2	17.0	16.9	16.8	16.6	16.5
-5	19.9	19.8	19.7	19.6	19.4	19.3	19.2	19.1
0	23.4	23.3	23.1	22.9	22.8	22.6	22.4	22.3
5	25.5	25.3	25.1	24.8	24.5	24.3	24.1	23.8
6	25.6	25.5	25.2	25.8	24.7	24.5	24.3	24.0
10	26.2	26.0	25.8	25.5	25.3	25.1	24.8	24.5
15	26.8	26.7	26.5	26.3	26.0	25.8	25.5	26.3

Heating Capacity for RAS-10HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB							
	15	16	18	20	22	24	26	28
-20	18.4	18.2	17.8	17.5	17.3	17.2	17.0	16.7
-15	20.3	20.1	19.8	19.5	19.3	19.3	19.1	19.0
-10	22.7	22.4	22.1	21.6	21.4	21.2	21.0	20.8
-5	24.9	24.9	24.8	24.7	24.6	24.5	24.5	24.5
0	28.7	28.5	28.4	28.2	28.0	27.9	27.8	27.7
5	31.4	31.2	31.0	30.8	30.5	30.2	30.1	29.7
6	32.3	32.2	31.9	31.5	31.3	31.1	30.3	29.7
10	34.8	34.6	34.4	34.1	33.9	33.4	31.6	29.7
15	36.0	35.9	35.8	35.6	35.4	34.9	32.8	29.7

Heating Capacity for RAS-11HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB							
	15	16	18	20	22	24	26	28
-20	20.3	20.1	19.6	19.3	19.1	18.9	18.7	18.4
-15	22.4	22.2	21.8	21.5	21.3	21.2	21.0	20.9
-10	25.0	24.7	24.3	23.8	23.5	23.4	23.2	23.0
-5	27.5	27.4	27.3	27.2	27.1	27.0	27.0	27.0
0	31.7	31.5	31.3	31.1	30.9	30.8	30.7	30.5
5	33.8	33.6	33.4	33.2	32.8	32.5	32.4	32.0
6	34.8	34.6	34.4	33.9	33.7	33.4	32.6	32.0
10	37.4	37.2	37.1	36.7	36.4	36.0	34.0	32.0
15	38.7	38.6	38.5	28.3	38.1	37.6	35.3	32.0

Heating Capacity for RAS-12HNBRMQ1 Unit:kW

Outdoor temperature ˚C DB	Indoor airlet temperature ˚C DB							
	15	16	18	20	22	24	26	28
-20	21.0	20.8	20.3	20.0	19.8	19.6	19.4	19.1
-15	23.2	23.0	22.6	22.3	22.1	22.0	21.8	21.7
-10	25.9	25.6	25.2	24.7	24.4	24.2	24.0	23.8
-5	28.5	28.4	28.3	28.2	28.1	28.0	28.0	28.0
0	32.8	32.6	32.4	32.2	32.0	31.9	31.8	31.6
5	37.4	37.2	36.9	36.7	36.3	36.0	35.8	35.4
6	38.5	38.3	38.0	37.5	37.3	37.0	36.1	35.4
10	41.4	41.2	41.0	40.6	40.3	39.8	37.6	35.4
15	42..8	42.7	42.6	42.4	42.2	41.6	39.0	35.4

NOTES:

(1) The capacity are tested under the following working conditions. Pipe length: 10m; Pipe Lift: 0m

(2) In some cases, the value may change due to the compressor protection control.

(3) The heating capacity on the table indicates the peak value, which does not include the capacity decrease caused by frost.

3.5 Correction Factor According to Piping Length

- Cooling Capacity

  Correction Factor for Cooling Capacity According to Piping Length

  The cooling capacity should be corrected according to the following formula:

  CCA = CC × F

  CCA: Actual Corrected Cooling Capacity

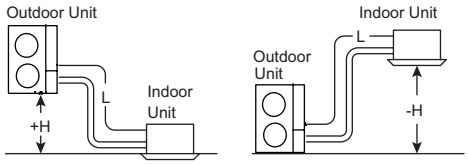
  CC: Cooling Capacity in the Performance Table

  F: Correction Factor Based on the Equivalent Piping Length

  The correction factors are shown in the following figures.

  Equivalent Piping Length for:

  - One 90° Elbow is 0.5m.
  - One 180° Bend is 1.5m.
  - One branch pipe is 0.5m.



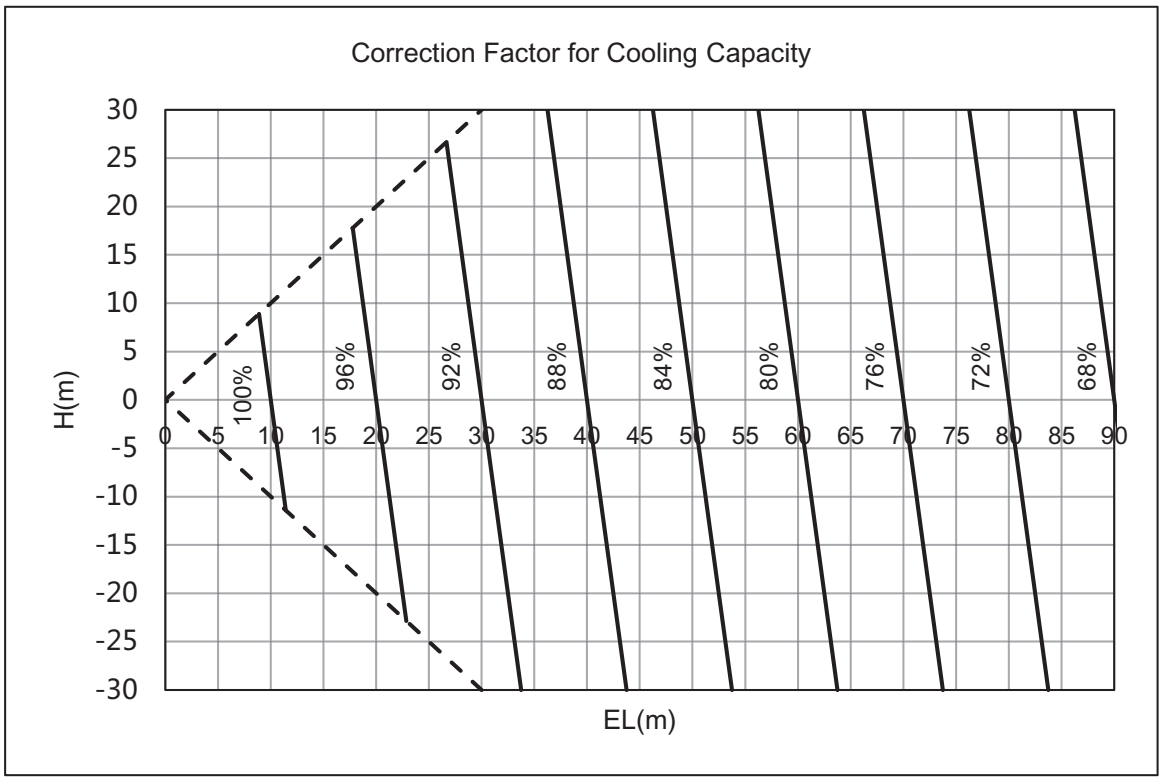
H: Vertical Distance Between Indoor Unit and Outdoor Unit in Meters

EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit in Meters (Equivalent One-Way Piping Length)

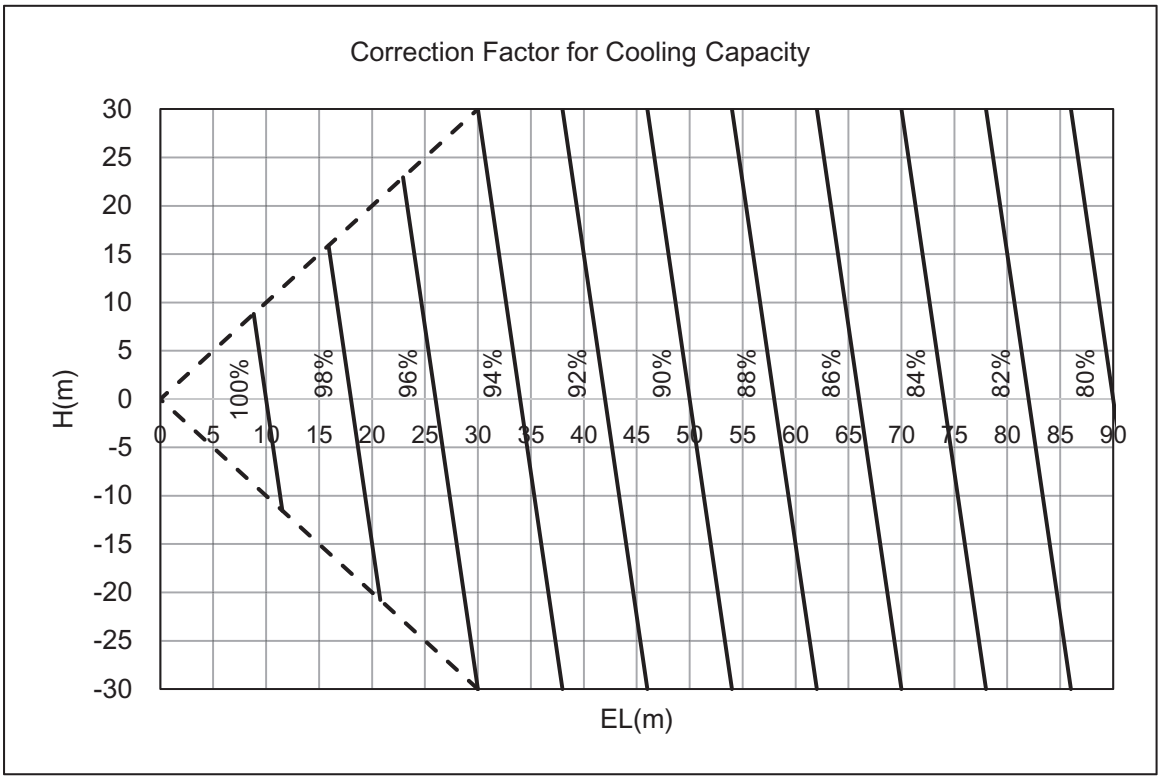
H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit

L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit in Meters

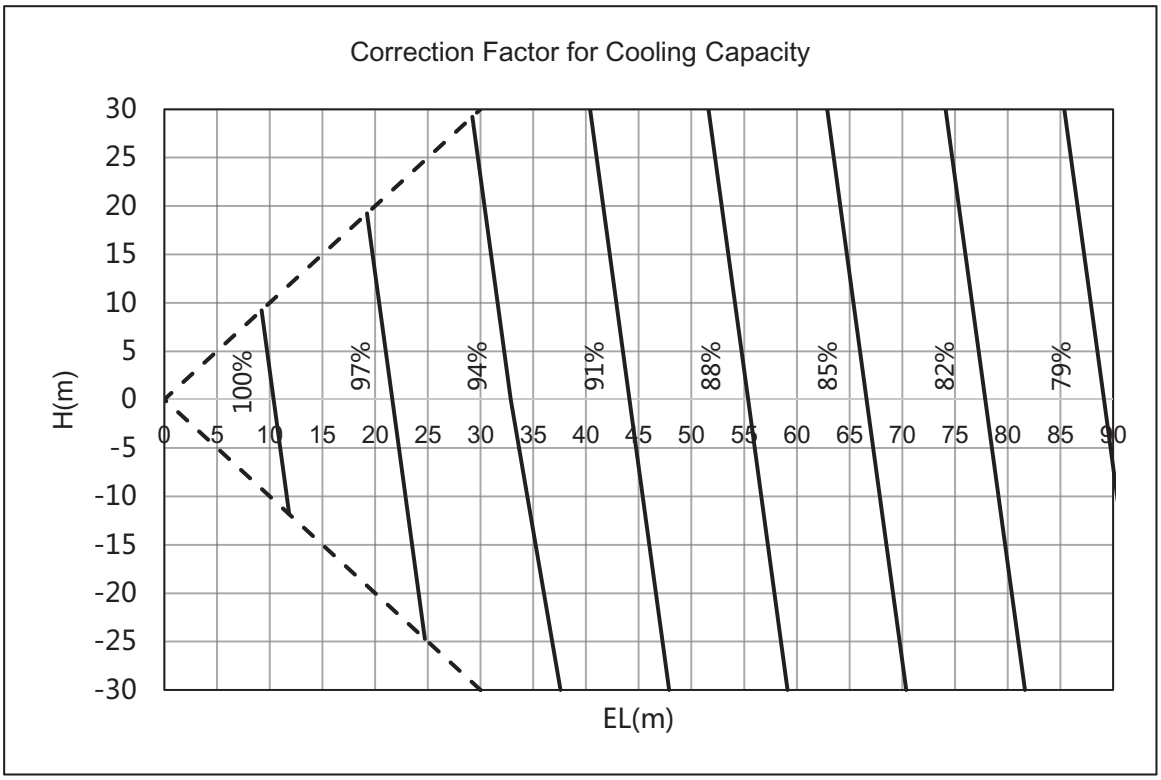
Model: RAS-3.0~3.5HNBRKQ1



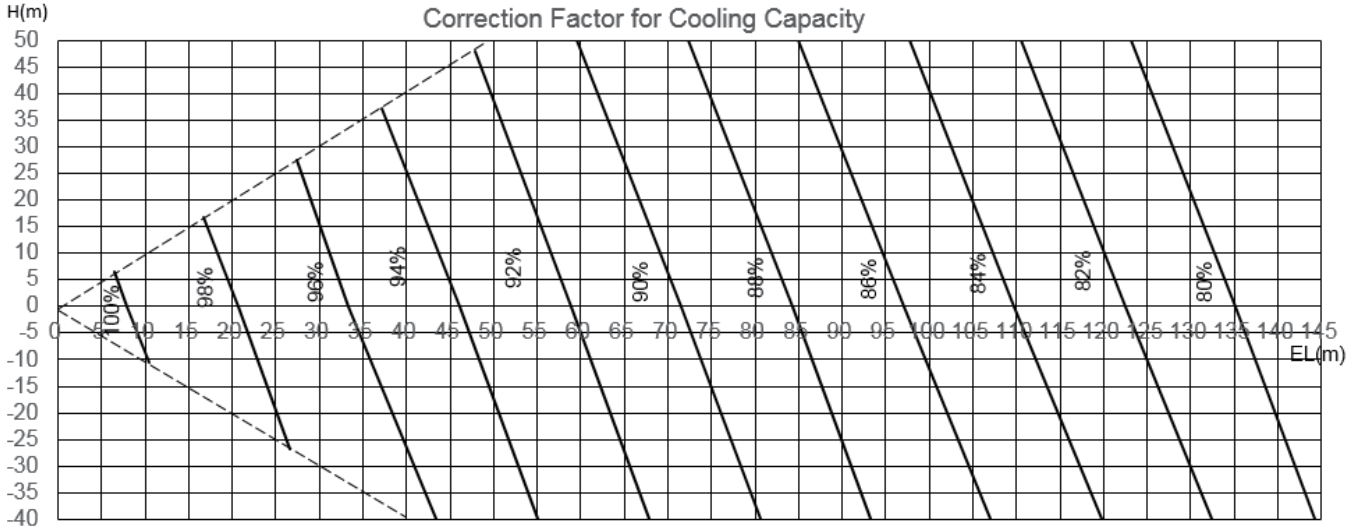
Model: RAS-4.0~5.0HNBRKQ1



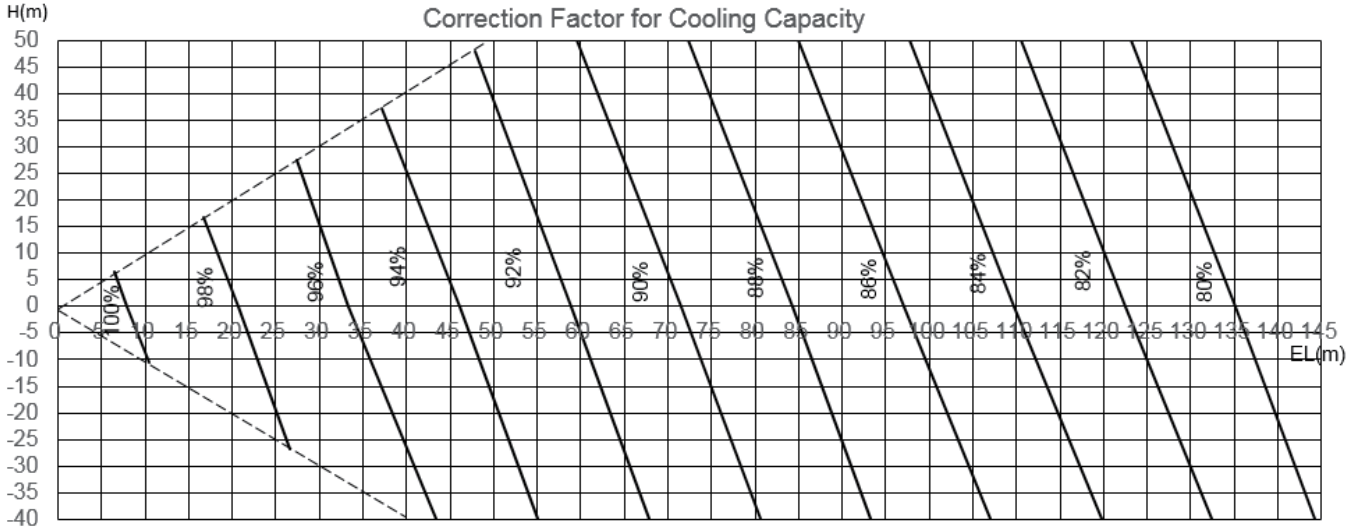
Model: RAS-6.0~6.5HNBRKQ1



Model: RAS-7.0~8.0HNBRMQ1



Model: RAS-10~12HNBRMQ1



- Heating Capacity

  Correction Factor for Heating Capacity According to Piping Length

  The heating capacity should be corrected according to the following formula:

  HCA = HC × F

  HCA: Actual Corrected Heating Capacity

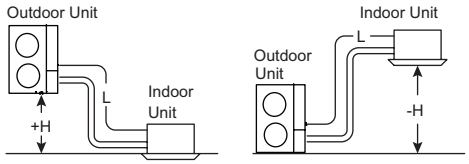
  HC: Heating Capacity in the Performance Table

  F: Correction Factor Based on the Equivalent Piping Length

  The correction factors are shown in the following figures.

  Equivalent Piping Length for:

  - One 90° Elbow is 0.5m.
  - One 180° Bend is 1.5m.
  - One branch pipe is 0.5m.



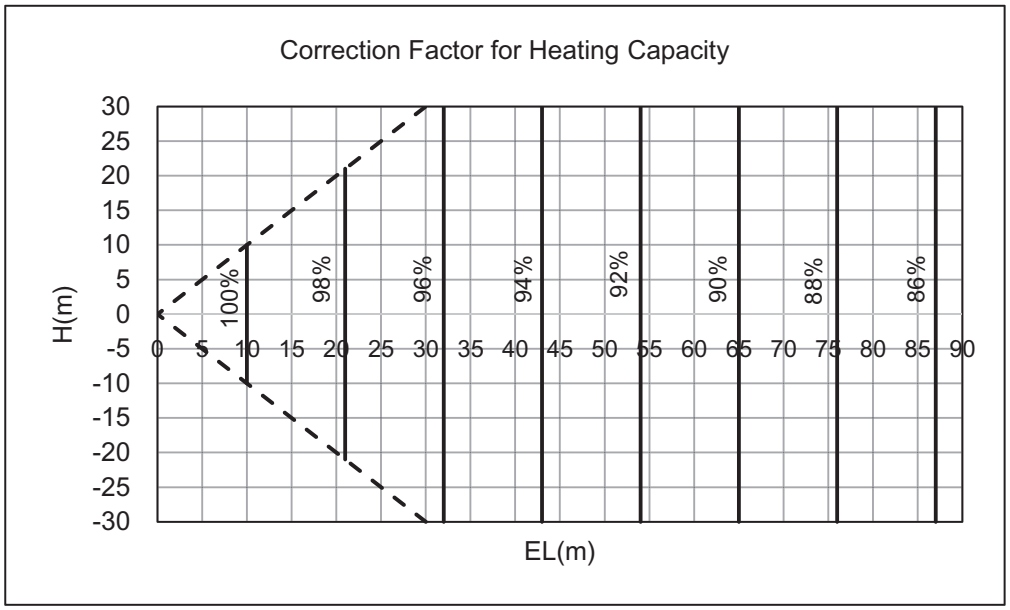
H: Vertical Distance Between Indoor Unit and Outdoor Unit in Meters

EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit in Meters (Equivalent One-Way Piping Length)

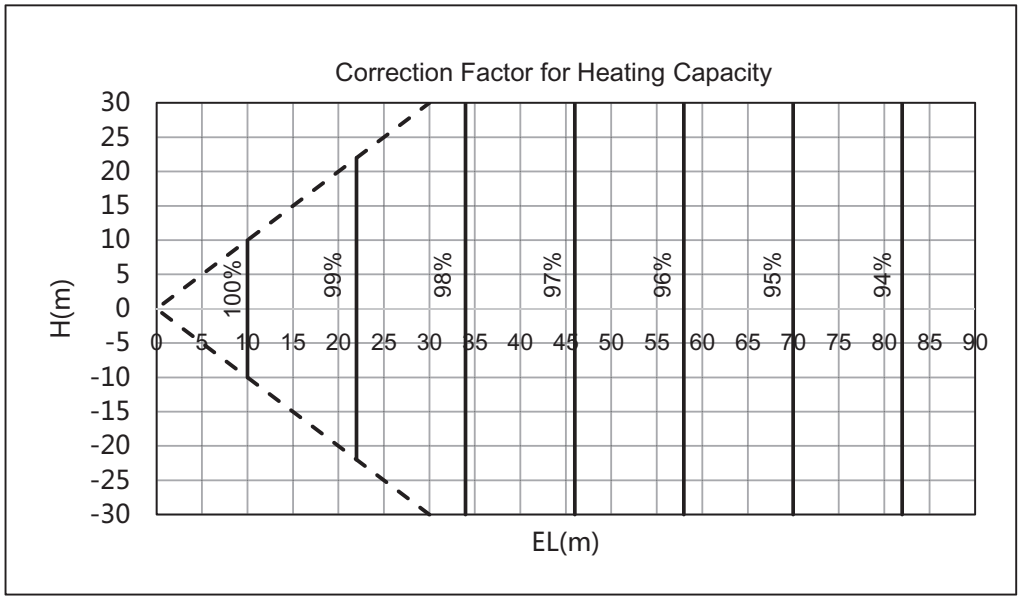
H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit

L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit in Meters

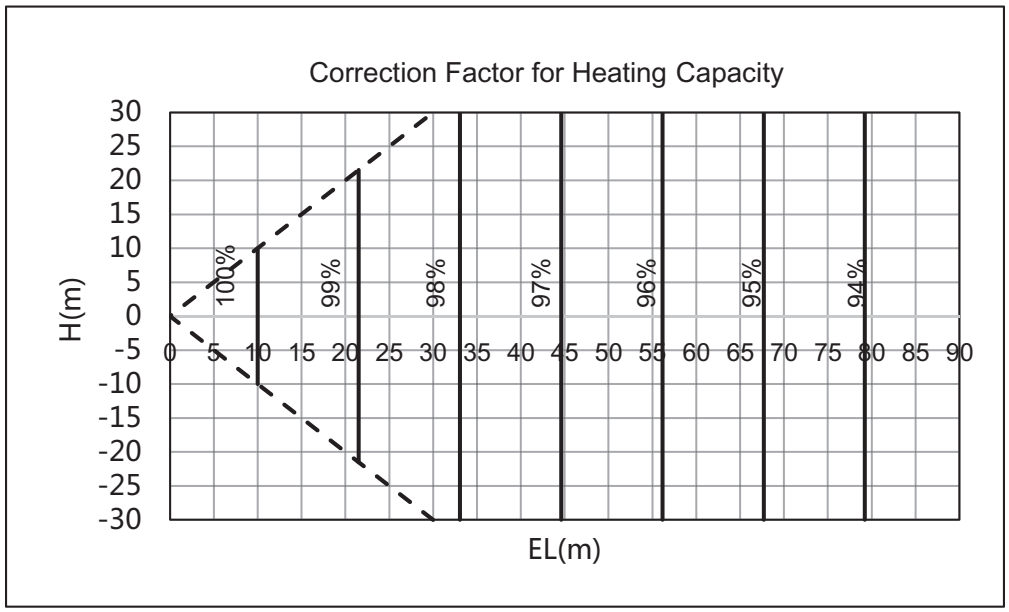
Model: RAS-3.0~3.5HNBRKQ1



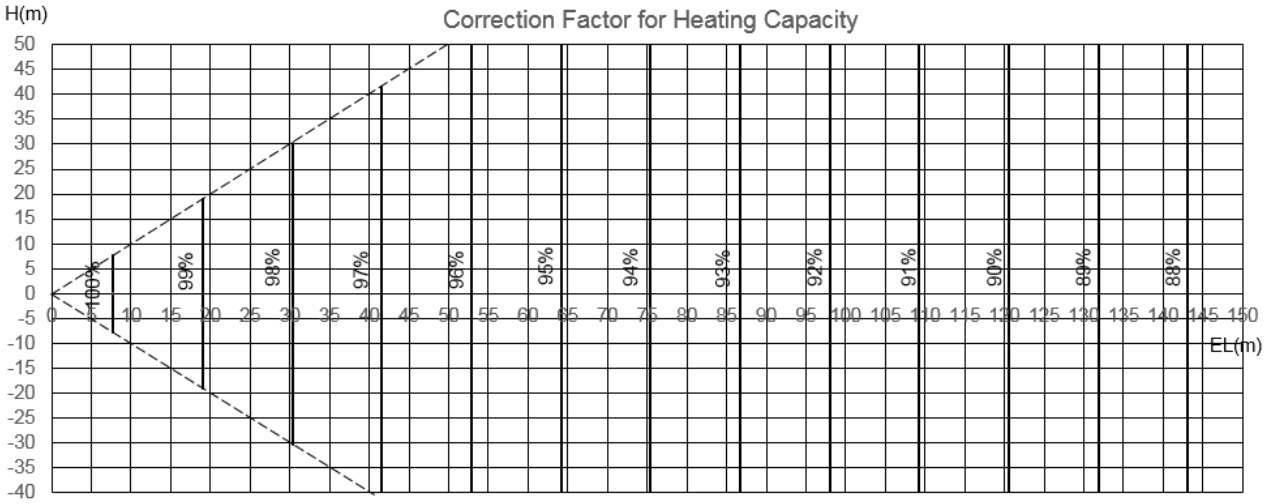
Model: RAS-4.0~5.0HNBRKQ1



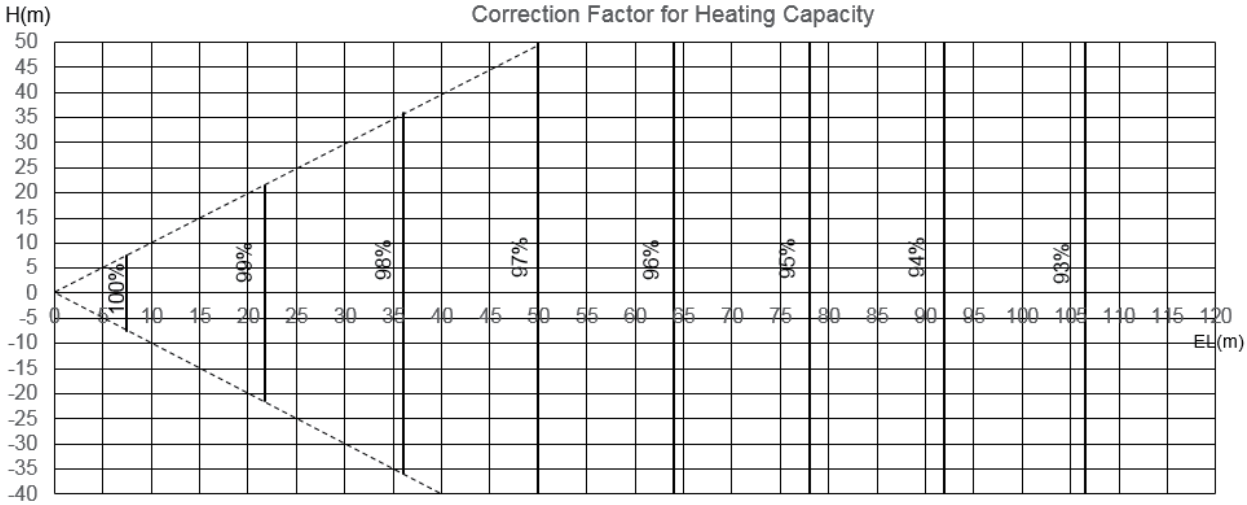
Model: RAS-6.0~6.5HNBRKQ1



Model: RAS-7.0~8.0HNBRMQ1



Model: RAS-10~12HNBRMQ1



3.6 Correction Factor According to Defrost Operation

The heating capacity in the preceding paragraph does not include defrost operation periods. Therefore, capacity should be corrected as follows:

Corrected Heating Capacity = Correction Factor × Heating Capacity

Outdoor Air Temp. (˚C DB) (Humidity=85% RH)	-7	-5	-3	0	3	5	7
Correction Factor	0.95	0.93	0.88	0.85	0.87	0.90	1.00

NOTE:

- The correction factor is not available for special conditions like snowfall or operation in a transitional period.

3.7 Correction Factor According to Altitude

The capacity is affected by the altitude.

Corrected Capacity = Correction Factor × Capacity

Altitude	m	0	305	610	914	1219	1524	1829	2133	2438	2743	3048
Correction Factor		1.00	0.97	0.93	0.90	0.87	0.83	0.80	0.77	0.75	0.72	0.69

4. Standard Specifications

UNIT - The unit shall be a multi-split system inverter-driven heat pump air conditioner for application with R410A refrigerants, and shall be connectable to:

- 4-way cassette type indoor units
- High external static pressure type indoor units
- Medium external static pressure type indoor units
- Low external static pressure type indoor units
- 2-way cassette type indoor units
- Single discharge cassette type indoor units
- Under Ceiling type indoor units
- Wall mounted type indoor units,
- Exposed floor type indoor units
- Concealed floor type indoor units

The indoor fan coil units shall be connected to the outdoor units via refrigerant piping and manufacturer supplied branch piping kits conforming to relevant Australian standards. The outdoor unit shall be completely weather-proofed for outdoor installation. Both indoor unit and the outdoor unit shall be properly assembled, internally piped and wired, thoroughly tested, and charged with R410A refrigerant at the factory and shall comply with local standards.

CAPACITY - The total capacity of the multi-split system inverter-driven heat pump air conditioner shall be ____ kW or greater with ____°C air inlet dry bulb, ____°C air inlet wet bulb, ____°C outdoor air inlet temperature and ____m^3/min. indoor air flow. The total compressor power inputs shall not exceed ____kW. The total heating capacity of the split-type air conditioners shall be ____kW or greater, with ____°C indoor heat exchanger air inlet dry bulb, ____°C outdoor heat exchanger air inlet dry bulb, ____°C outdoor heat exchanger air inlet wet bulb, and ____m^3/min. indoor air flow. The total compressor power input shall not exceed ____kW.

OUTDOOR UNIT

CABINET - The cabinet shall be constructed of galvanized steel sheet, baked with synthetic resin paint. The service panel shall be easily removable for service access to the electrical components and the compressor section.

REFRIGERATION CYCLE - Each refrigeration cycle shall be equipped with a rotary (or scroll) compressor, a solenoid valve, a heat exchanger, an accumulator, a 4-Way valve and flare connection parts.

COMPRESSOR PROTECTION - The compressor shall be protected against breakdown by a quick response overcurrent relay, a high pressure switch, (a) crankcase heater(s) and a discharge gas thermistor.

FAN AND FAN MOTOR - The outdoor fan(s) shall be the plastic propeller type, dynamically balanced, and the fan shall be directly driven by (a) motor for horizontal -flow air discharge. The fan motor shall be permanently lubricated and be protected from ingress of water.

HEAT EXCHANGER - The heat exchanger shall be the multi-pass, cross-finned tube type, equipped with highly-efficient aluminum fins, mechanically bonded to oxygen-free copper tubes. The coil shall be cleaned, dehydrated and tested for leakage at the factory. The coil fins shall have a factory applied corrosion resistant blue-fin finish.

CONTROL - All electrical control devices, shall be enclosed in the indoor and outdoor units.

PRODUCT FEATURES

HIGH ESP CONDENSER FANS – The outdoor unit fans shall be capable of operating under external resistance of up to 30Pa for main models.

INTELLIGENT DEFROSTING – The system shall be capable of learning the conditions and duration of previous defrost cycles in order to optimize subsequent defrost intervals.

NIGHT SHIFT MODE – The system shall be capable of operating in a night mode whereby the rotation speed of the compressor and the outdoor fan are automatically lowered, if the ambient temperature is 30°C or lower in a cooling operation, lowering the operation noise by 3 to 10dB(A).

LOW NOISE SETTING – The outdoor unit shall be capable of operating in a low noise setting thereby forcing the compressor to operate in a low frequency mode regardless of the ambient temperature. There shall be a choice of three levels of low noise operation and shall be set at commissioning.

WIDE OPERATION RANGE – The system shall be capable of operating in ambient temperatures between -5°C and 52°C in cooling and -20°C and 24°C in heating. Additionally, the inverter driver shall be adequately ventilated in order to ensure stable operation at high ambient conditions.