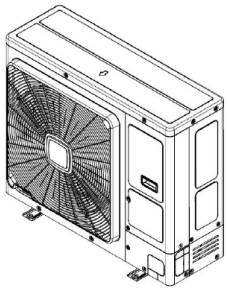
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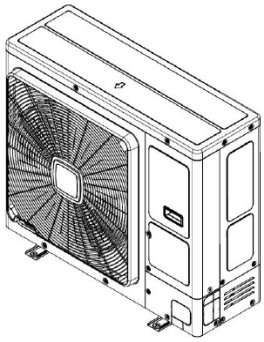
TECHNICAL CATALOGUE

HEAT PUMP AIR CONDITIONERS

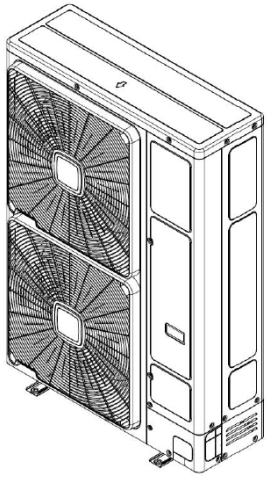
- SET FREE mini-HNSKQ SERIES VRF CONDITIONERS SYSREM -



RAS-3.0~4.0HNSKQ



RAS-4.5~6.0HNSKQ



RAS-6.5~7.0HNSKQ

Technical Catalogue

< Outdoor Units >

Power Supply	Model
220~240V/1Ph/50/60Hz	RAS-3.0HNSKQ RAS-3.5HNSKQ RAS-4.0HNSKQ RAS-4.5HNSKQ RAS-5.0HNSKQ RAS-6.0HNSKQ RAS-6.5HNSKQ RAS-7.0HNSKQ

TCY12019003A Data:19.3.29

IMPORTANT NOTICE

- The Company pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary any specifications without prior notice.
- The Company cannot anticipate every possible circumstance that might involve a potential hazard.
- This heat pump air conditioning is designed for standard air conditioning only. Do not use this heat pump air conditioning 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 such as coast regions.
  - * Places with an atmosphere of acidity or alkalinity.
- 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 of the drain pan and splashed water runs inside of 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, remote control cable or remote control 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 catches the animals and plants. It could adversely affect the animals and plants.
- The installation should be in accordance with the local laws and regulations. The following standards may be applicable, if the local regulations are not available. International Organization for Standardization, ISO5149 or European Standard, EN 378 or Japan Standard, KHKS0010.
- 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 add safety, caution and operating signs in the native language.
- This heat pump air conditioning unit has been come with a full complement of the appropriate Safety, Danger, and Caution, Warnings.
- The air conditioning cannot work in the cooling and heating operation meanwhile. Otherwise, the indoor unit which its operation is conflicted with the operation of the outdoor unit would not work.
- If you have any questions, please contact your distributor or dealer.
- This manual provides common descriptions, basic and advanced information to maintain and service this heat pump air conditioning unit which you operate as well for other models.

- 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	Stable -20°C DB

NOTE:

* : The temperature value may vary with different outdoor units.

CHECKING PRODUCT RECEIVED

- Upon receiving this product, inspect it for any shipping damages in transit. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency rating) and accessories to determine if they are in accordance with the purchase order.
- The standard utilization of the unit shall be explained in the instructions. Therefore, the utilization of the unit other than those indicated in the instructions is not recommended.
- In case of any problem, please contact the local dealer as any issues involving installation, performance, or maintenance arise. The company's liability shall not cover defects arising from the alteration performed by a customer without the company's consent in a written form.

SAFETY SUMMARY

<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 indicates a hazardous situation which, if not avoided, will result in death or serious injury.



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



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



NOTICE is used to address practices not related to personal 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 the instructions are not followed, it may result in a water leakage, electric shock or a fire.
- Use the specified non-flammable refrigerant (R410A) to the outdoor unit in the refrigerant cycle. Do not charge material other than R410A into the unit such as hydrocarbon refrigerants (propane or etc.), oxygen, flammable gases (acetylene or etc.) or poisonous gases when installing, maintaining and moving. These flammable gases are extremely dangerous and may cause an explosion, a fire and injury.
- 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 or access panel for the indoor or outdoor units without turning OFF the main power supply.
- Do not touch or adjust safety devices inside the indoor unit or outdoor units. If these devices are touched or readjusted, it may cause a serious accident.
- Refrigerant leakage can cause difficult with breathing due to insufficient air. Turn OFF the main switch, extinguish any naked flame and contact your service contractor, if refrigerant leakage occurs.
- Make sure that the refrigerant leakage test should be performed. Refrigerant (Fluorocarbon) for this unit is incombustible, non-toxic and odorless. However if the refrigerant is leaked and is contacted with fire toxic gas will generate. Also because the fluorocarbon is heavier than air, the floor surface will be filled with it, which could cause suffocation.
- The installer and system specialist shall secure safety against refrigerant leakage according to local regulations or standards.
- Use an ELB (Earth Leakage Breaker). In the event of fault, there is danger of an electric shock or a fire if it is not used.
- Do not install the outdoor unit where there is high level of oil mist, flammable gases, salty air or harmful gases such as sulfur.
- For installation, firmly connect the refrigerant pipe before the compressor starts operating. For maintenance, relocation and disposal, remove the refrigerant pipe after the compressor stops.
- Do not perform a short-circuit of the protection device such as a pressure switch when operating. It may cause a fire and explosion.

⚠ WARNING

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one meter from the system.
- If circuit breaker or fuse is often activated, stop the system and contact your service contractor.
- Check that the ground wire is securely connected. If the unit is not correctly grounded, it lead electric shock. Do not connect the ground wiring to gas piping, water piping, lightning conductor or ground wiring for telephone.
- Before performing any brazing work, check to ensure that there is no flammable material around. When using refrigerant be sure to wear leather gloves to prevent cold injuries.

- Connect a fuse of specified capacity.
- Protect the wires, electrical parts, etc. from rats or other small animals. If not protected, rats may gnaw at unprotected parts and which may lead to a fire.
- Fix the cables securely. External forces on the terminals could lead to a fire.
- Provide a sufficiently strong foundation. If not, the unit may fall down and it may lead to injuries.
- Do not install the unit in a place where oil, vapor, organic solvent and corrosive gas (ammonia, sulfur compound and acid) may be present in quantities. It may cause refrigerant leakage due to corrosion, electrical shock, deteriorated performance and breakage.
- Perform electrical work according to Installation Manual and all the relevant regulation and standards. If the instructions are not followed, an electrical shock and fire may occur due to insufficient capacity and inadequate performance.
- Use specified cables between units and choose the cables correctly. If not, an electrical shock or fire may occur.
- Ensure that the wiring terminals are tightened securely with the specified torques. If not, generating fire or electrical shock at the terminal connection part may occur.

⚠ CAUTION

- Do not step or put any material on the product.
- Do not put any foreign material on the unit or inside the unit.
- 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.

NOTICE

- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.
- Supply electrical power to the system to energize the oil heater for 12 hours before startup after a long shutdown.
- Make sure that the outdoor unit is not covered with snow or ice, before operation.
- In some cases, the packaged air conditioner may not be operated normally under the following cases.
  * In case that electrical power for the packaged air conditioner is supplied from the same power transformer as the device*.
  * In case that the power source wires for the device* and the packaged air conditioner are located close to each other.
  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.

Regarding the cases mentioned above, surge voltage may be inducted into the power supply cables for the packaged air conditioning due to a rapid change in power consumption of the device and an activation of a switch.

Check field regulations and standards before performing electrical work in order to protect the power supply for the new air conditioning unit.

NOTES:

- It is recommended that the room will be ventilated every 3 to 4 hours.
- The heating capacity of the heat pump unit is decreased according to the outdoor air temperature. Therefore, it is recommended that auxiliary heating equipment be used in the field when the units is installed in a low temperature region.

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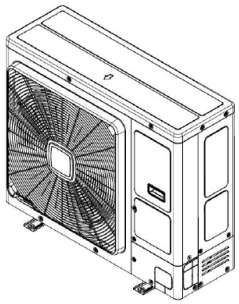
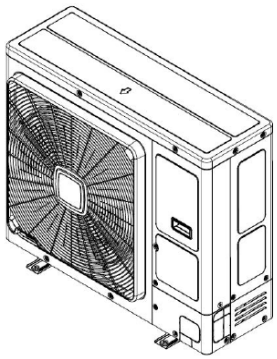
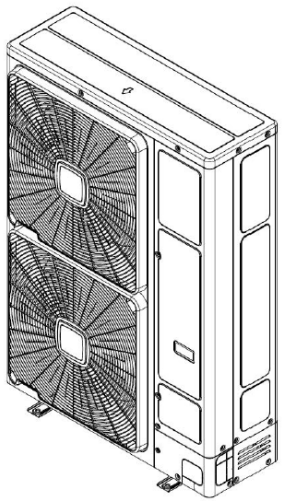
1. Product Features

1.1 Series Configuration

- Slimmer outdoor unit casing enables convenient installation and service.
- Fancy exterior design of the outdoor unit meets residential customers' requirements.

1.2 Product Line-up

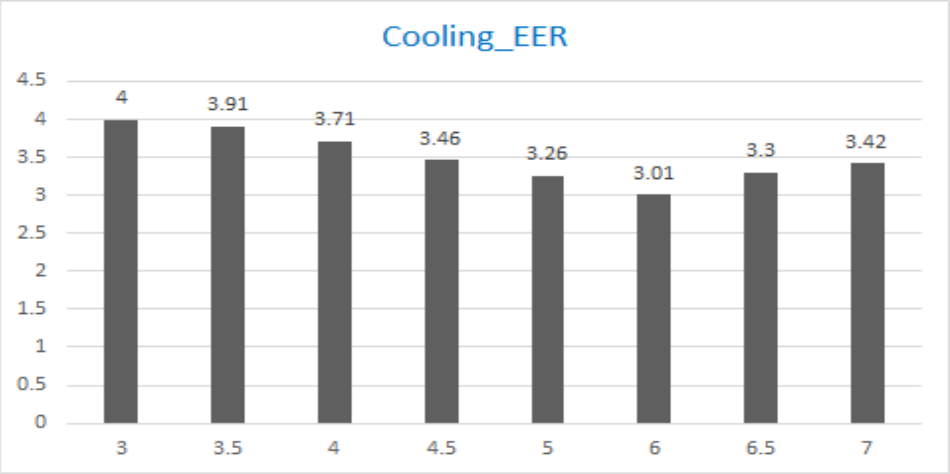
Model	Capacity
RAS-3.0HNSKQ	3.0HP
RAS-3.5HNSKQ	3.5HP
RAS-4.0HNSKQ	4.0HP
RAS-4.5HNSKQ	4.5HP
RAS-5.0HNSKQ	5.0HP
RAS-6.0HNSKQ	6.0HP
RAS-6.5HNSKQ	6.5HP
RAS-7.0HNSKQ	7.0HP

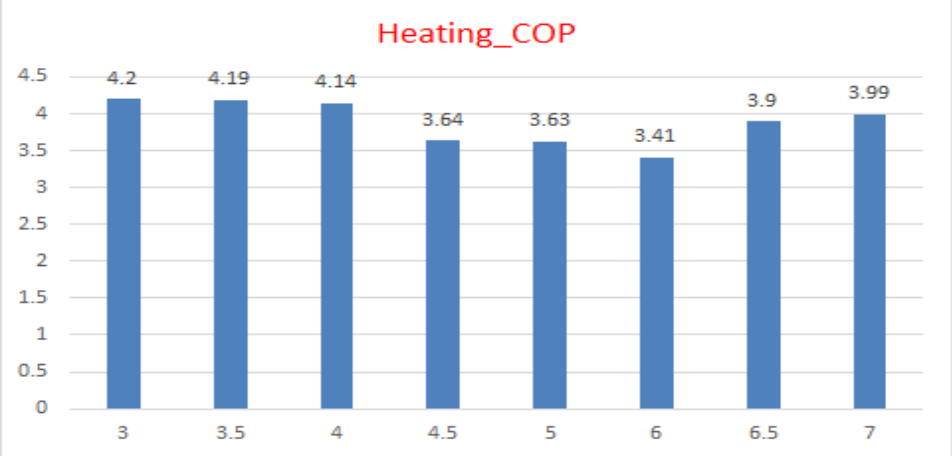
Model	RAS-3.0~4.0HNSKQ	RAS-4.5~6.0HNSKQ	RAS-6.5~7.0HNSKQ
Appearance			

- With a width of 320mm, the new 3.0~7.0 HP 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°C DB/19°C WB; Outdoor temperature: 35°C DB
- Pipe length: 10m; Pipe lift: 0m

(2)For COP:

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

1.4 Energy Saving Technology

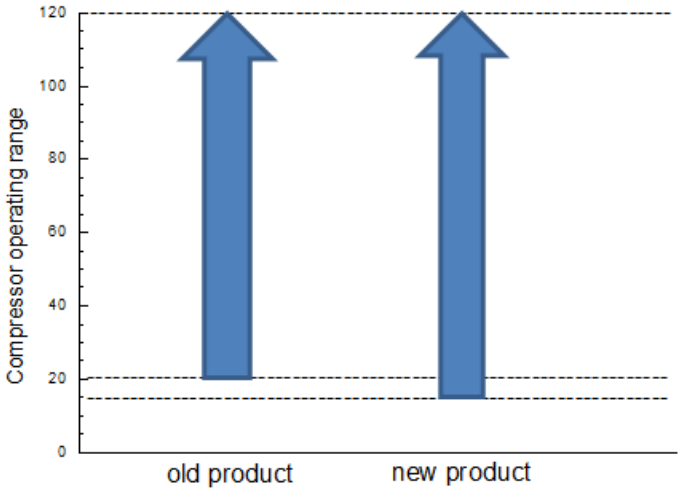
The following designs are adopted to improve the efficiency of the new product.

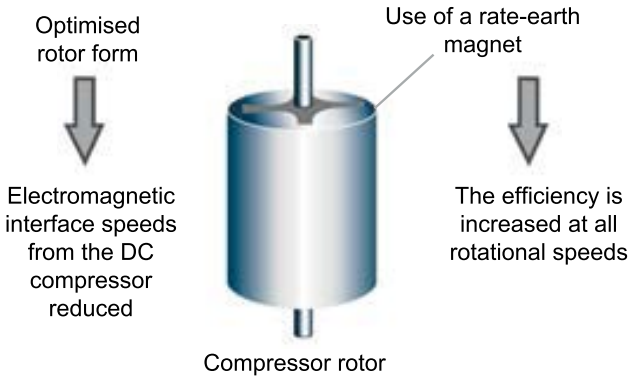
1.4.1 Optimize Compressor Frequency

(1) The high efficiency rotary (3-7.0HP) compressor is adopted here with the rare-earth magnets, which can improve the efficiency .

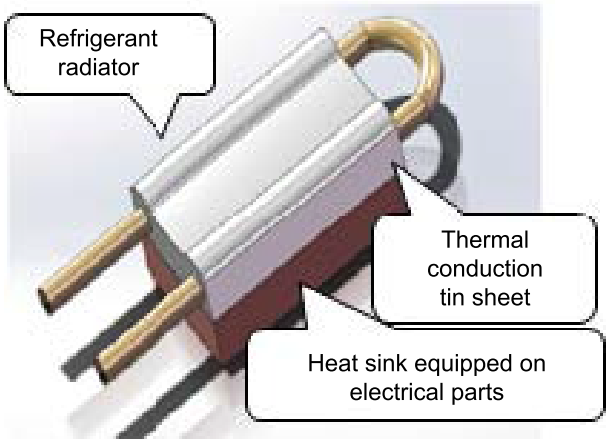
(2) The stepless frequency conversion is used. Can adapt the customer demand and keep room temperature more stability. Reduce the power consumption of system.

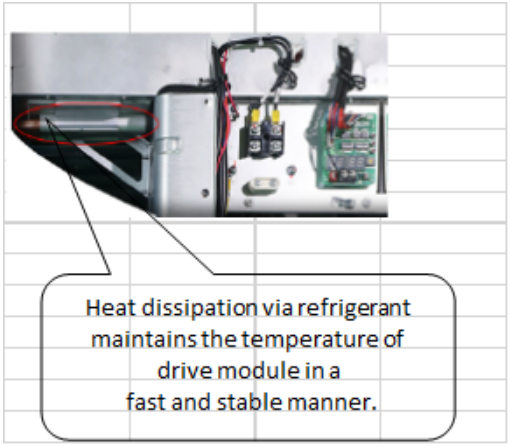
(3) With broad operation frequency of 15~120Hz, the compressor system remains stable when the load is low, which in turn eliminates frequent start-up/shutdown; the higher frequency provides faster refrigerating and heating.





1.4.2 Refrigerant cooling technology applied to all the products in this series

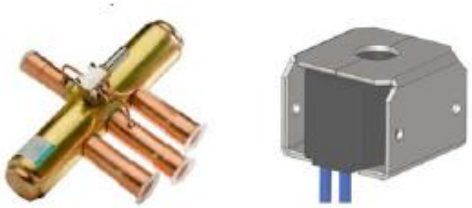




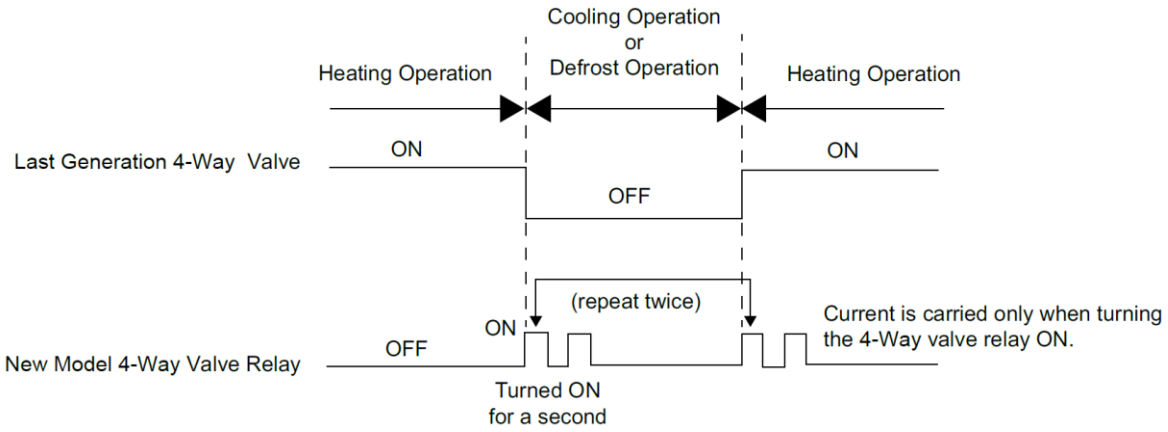
1. Heat dissipation of compressor driving module is performed via refrigerant instead of air cooling
2. 10% average temperature drop of the module
3. Improved the reliability of the units running at elevated temperature

1.4.3 Selection of Components with Lower Power Consumption

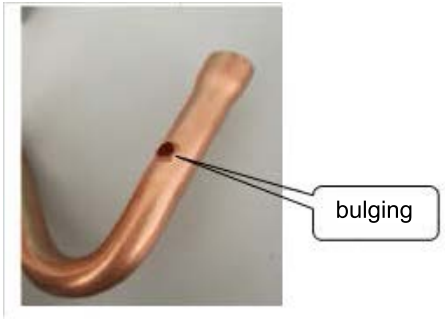
The self-holding 4-way valve operates quickly by enabling the system to save energy and enhance the reliability.



4-Way Valve Appearance



1.4.4 Low-noise piping solution



1. Most of holes in main pipes in air conditioning system require bulging process, mainly happens to suction and exhaust pipes in compressor and manifolds of heat exchanger.

2. The bulging operation effectively eliminates the whistles, which in turn improves the noise quality of the air conditioning system.

1.5 Flexible Installation Location

SET FREE mini-HNSKQ series VRF Air Conditioning system is developed to meet the customers' requirements. The system provides the customer with greater convenience for installation, which improves the air conditioners in complex facility structures.

1.5.1 30Pa ESP setting for outdoor models

30Pa ESP is available for 3~7HP 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 120meters(6.5-7HP).

(1) The distance between outdoor unit and the farthest indoor unit is 75 meters (6.5-7.0HP).

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

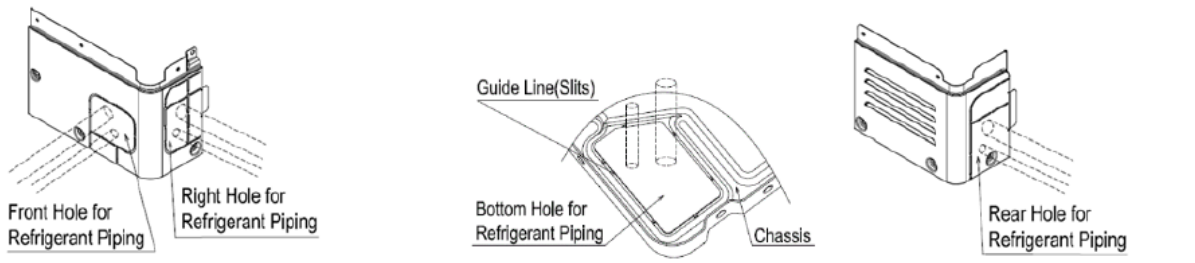
Model	The outdoor unit is higher	The outdoor unit is lower
3.0~4.0HP	20 meters	20 meters
4.5~7.0 HP	30 meters	30 meters

(3) Height difference between indoor units is 10 meters.

(4) Maximum length after branch: between the 1st branch and each indoor unit is 30 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 3~7HP.



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

Pipe Connect Direction for 3~7HP

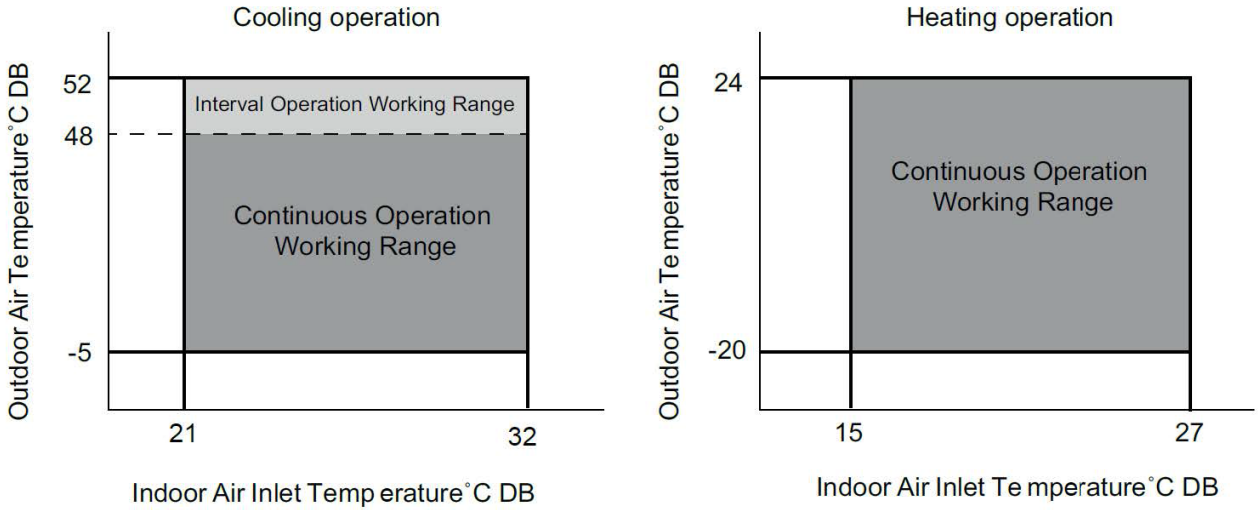
1.6 Service Convenience

There is several DIP switches in the front of the outdoor unit, which is designed for easier test and diagnostic. It has 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

1.7 Wide Operation Range

- Special 3-row coil design (4.5/5/6/6.5/7HP) and larger area of coil enhance heating capability, and enables heating as low as -20ºC 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°C or lower in a cooling operation. Besides, in the night shift mode, the noise can be reduced by 3~10dB 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. The mode reduces the noise by 1~4dB(A), depending on the level chosen.

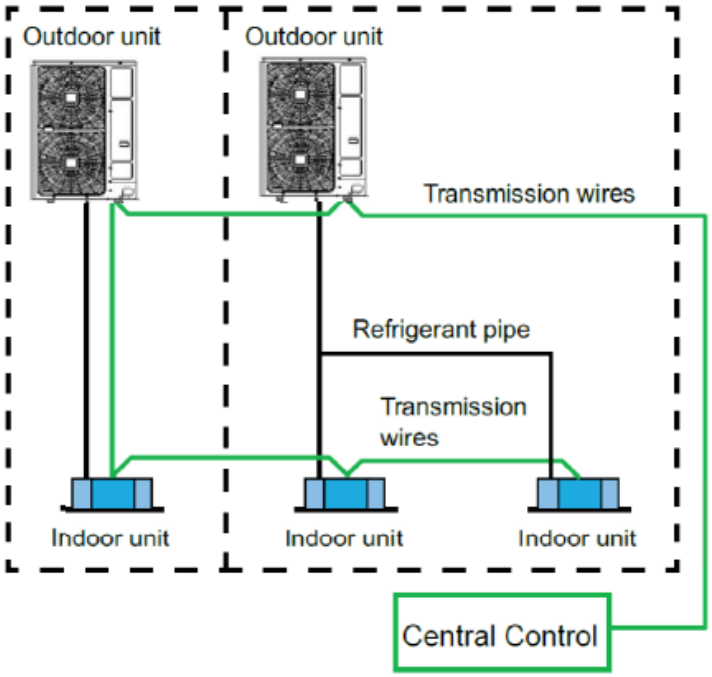
NOTE:

- The cooling and heating capacity may drop to 80%, 70% or 60% under each level in low noise setting mode.

1.9 H-LINK Ⅱ System

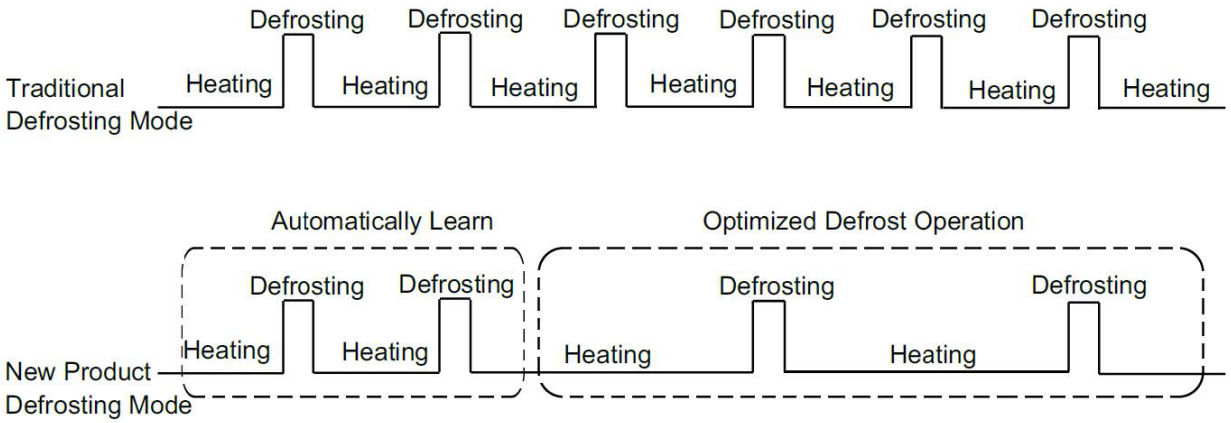
H-LINK Ⅱ system requires only two transmission wires connected with each outdoor uint.

- 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 Units

2.1 General Data

Model				RAS-3.0HNSKQ	RAS-3.5HNSKQ	RAS-4.0HNSKQ	RAS-4.5HNSKQ	RAS-5.0HNSKQ
Power Supply				220~240V/1Ph/50/60Hz				
Capacity	Cooling	Rated Capacity	W	8000	10000	11200	125000	14000
		Power Input	W	2000	2560	3020	3610	4300
	Heating	Rated Capacity	W	9500	11200	12500	14000	16000
		Power Input	W	2260	2670	3020	3850	4410
Noise		Rated	dB(A)	51/53	54/56	56/57	54/56	54/56
Outer Dimensions (Height×Width×Depth)			mm	800×950×320			990×950×320	
Package Dimensions (Height×Width×Depth)			mm	940×1070×470			1020×1070×470	
Total Indoor Unit Capacity Ratio			-	50%~130%				
No. of the indoor units can be connected			Q'ty	2~4	2~5	2~5	2~5	2~6
Weight		Net	kg	74	74	74	87	87
		Gross	kg	84	84	84	100	100
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	48	48	48	60+28	60+28
Refrigerant Oil		Type	-	α68HES-H				
		Charge Amount	L	0.88	0.88	0.88	1.65	1.65
Fan		Quantity	Q'ty	1	1	1	1	1
		Motor Output	kW	0.138	0.138	0.138	0.138	0.138
		Airflow Rate	m^3/min	60	67	71	69	71
		Drive Mode	-	Inverter	Inverter	Inverter	Inverter	Inverter
Refrigerant		Type	-	R410A	R410A	R410A	R410A	R410A
		Charge Amount	kg	2.5	3.1	3.1	4	4
Gas Side Stop Valve			mm	15.88	15.88	15.88	15.88	15.88
Liquid Side Stop Vale			mm	9.53	9.53	9.53	9.53	9.53
Connection Method			-	Flare	Flare	Flare	Flare	Flare
Min.Circuit Amps			A	20	22	25	26	28
Max.Overcurrent Protective Device			A	32	32	32	40	40
High pressure switch			Mpa	4.1	4.1	4.1	4.1	4.1
Working Temperature Range		Cooling	-	Stable work at-5℃~48℃ DB and interval work at48℃~52℃DB				
		Heating	-	Stable work at -20℃~24℃ DB				

Model				RAS-6.0HNSKQ	RAS-6.5HNSKQ	RAS-7.0HNSKQ
Power Supply				220~240V/1Ph/50/60Hz		
capacity	Cooling	Rated Capacity	W	15500	18000	20000
		Power Input	W	5150	5460	5850
	Heating	Rated Capacity	W	17000	20000	22400
		Power Input	W	4990	5130	5610
Noise		Rated	dB(A)	56/59	56/58	58/60
Outer Dimensions (Height×Width×Depth)			mm	990×950×320	1380×950×320	
Package Dimensions (Height×Width×Depth)			mm	1020×1070×470	1520×1070×470	
Total Indoor Unit Capacity Ratio			-	50%~130%		
No of the indoor units can be connected			Q'ty	2~6	2~9	2~10
Weight		Net	kg	87	118	118
		Gross	kg	100	132	132
Heat Exchanger		Type	-	Multi-Pass Cross-Finned Tube		
		material	-	Cu-Al		
Compressor		Type	-	Rotary	Rotary	Rotary
		Quantity	Q'ty	1	1	1
		Drive Mode	-	Inverter	Inverter	Inverter
		Crankcase Heater	W	60+28	60+28	60+28
Refrigerant Oil		Type	-	α68HES-H		
		Charge Amount	L	1.65	1.8	1.8
Fan		Quantity	Q'ty	1	2	2
		Motor Output	kW	0.138	0.138*2	0.138*2
		Airflow Rate	m^3/min	71	101	122
		Drive Mode	-	Inverter	Inverter	Inverter
Refrigerant		Type	-	R410A	R410A	R410A
		Charge Amount	kg	4	5.5	5.9
Gas Side Stop Valve			mm	15.88	15.88	15.88
Liquid Side Stop Vale			mm	9.53	9.53	9.53
Connection Method			-	Flare	Flare	Flare
Min.Circuit Amps			A	31	32	32
Max.Overcurrent Protective Device			A	40	40	40
High pressure switch			Mpa	4.1	4.1	4.1
Working Temperature Range		Cooling	-	Stable work at-5℃~48℃ DB and interval work at48℃~52℃DB		
		Heating	-	Stable work at -20℃~24℃ DB		

NOTES:

The test is under the following working conditions when it is combined with test indoor units.

Working condition for testing EER:
Indoor temperature: 27°C DB/19°C WB; Outdoor temperature: 35°C DB
Working condition for testing COP:
Indoor temperature: 20°C DB; Outdoor temperature: 7°C DB/6°C WB Pipe length: 10m; Pipe lift: 0m

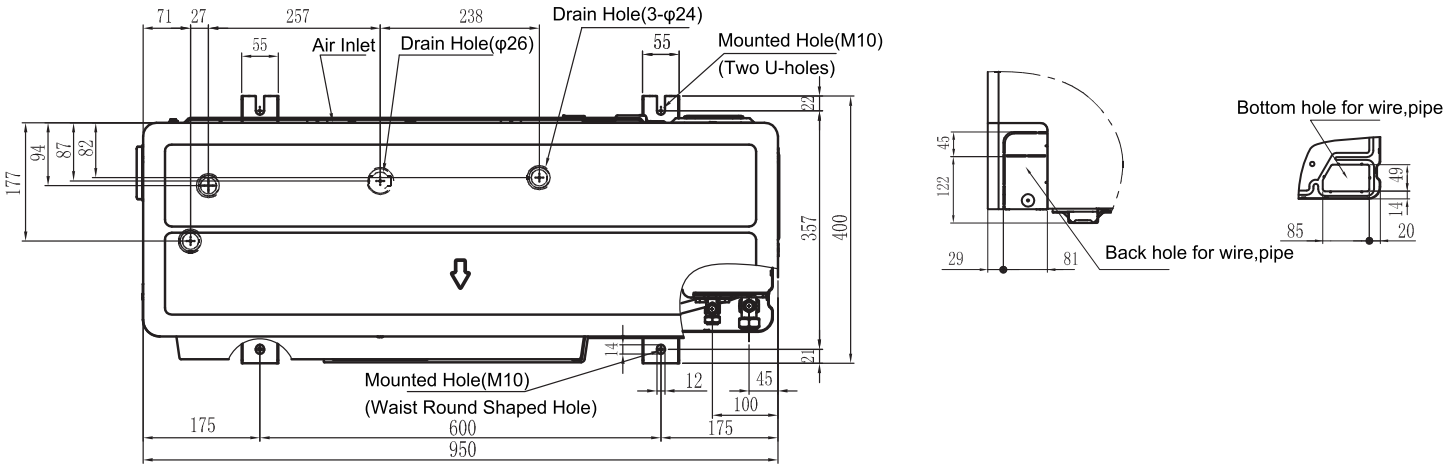
Noise test conditions are specified below:
Noise is tested 1.5m above ground level and 1m away from the surface of the external service board on the outdoor unit. Noise parameters are tested in a semi-anechoic chamber.

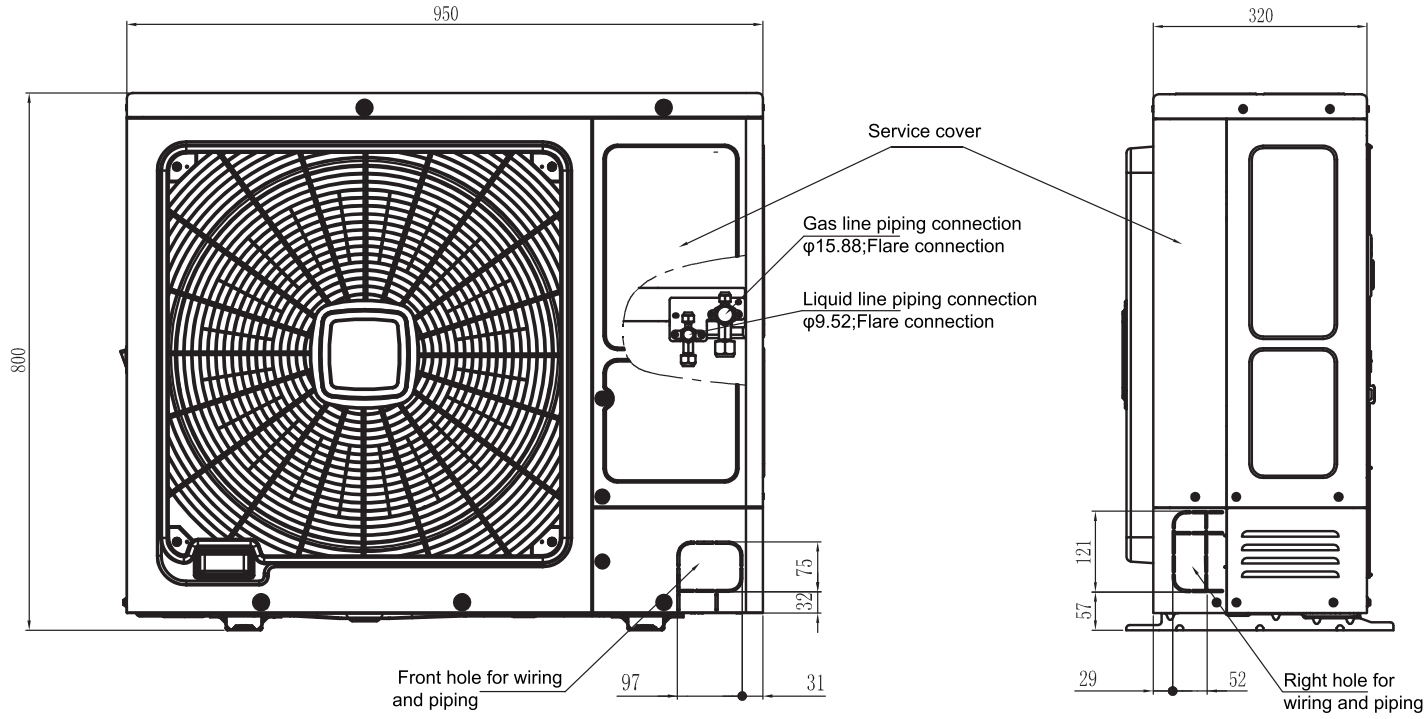
OUTDOOR UNITS

2.2 Dimensional Data

Model: RAS-3.0~4.0HNSKQ

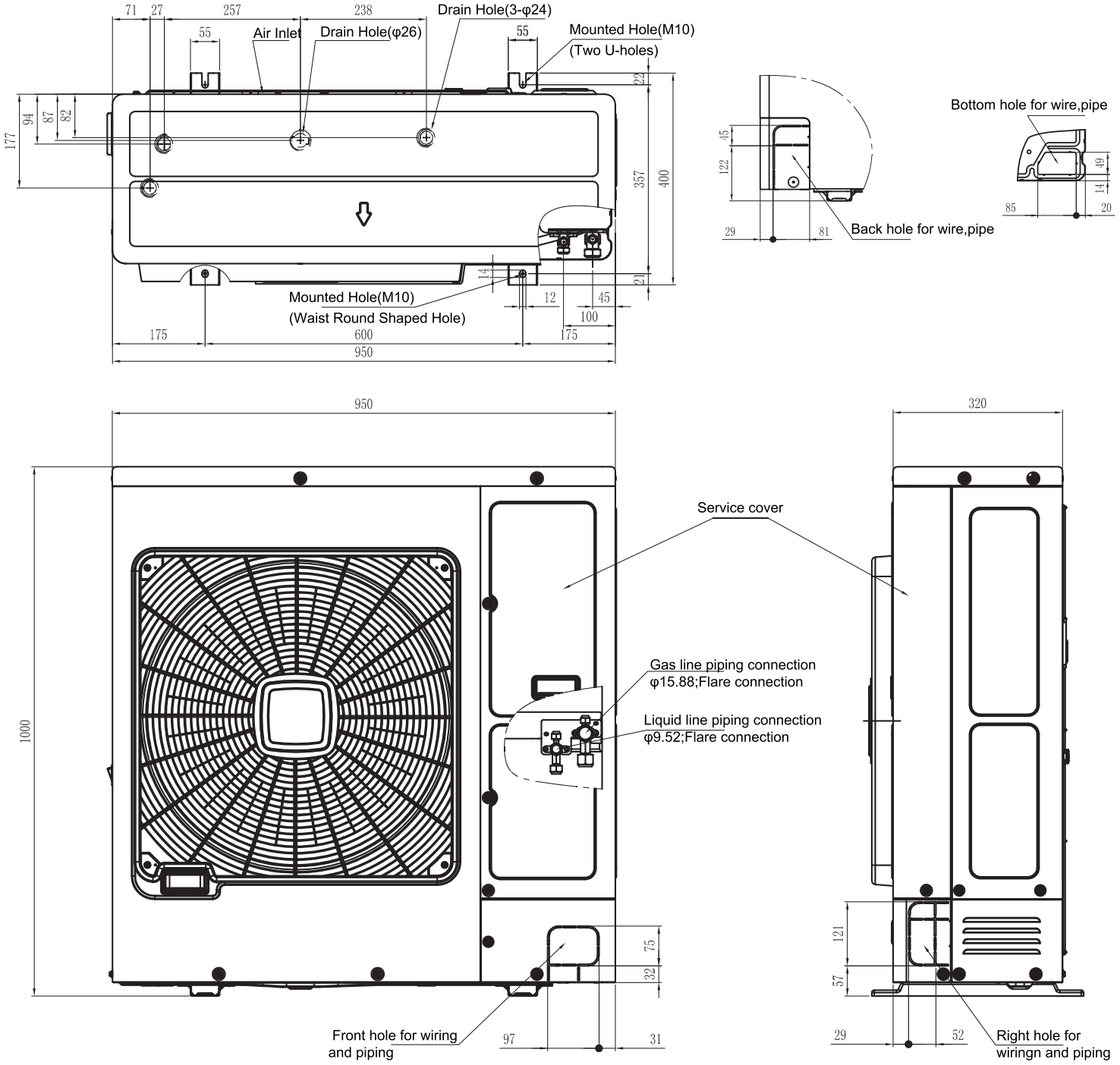
Unit: mm





Model: RAS-4.5~6.0HNSKQ

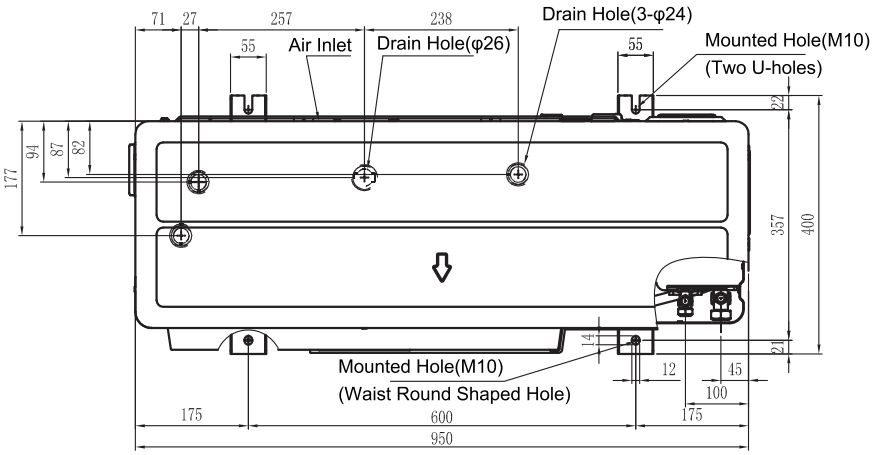
Unit: mm

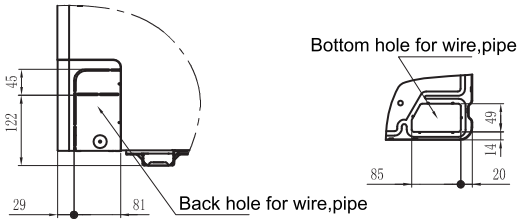


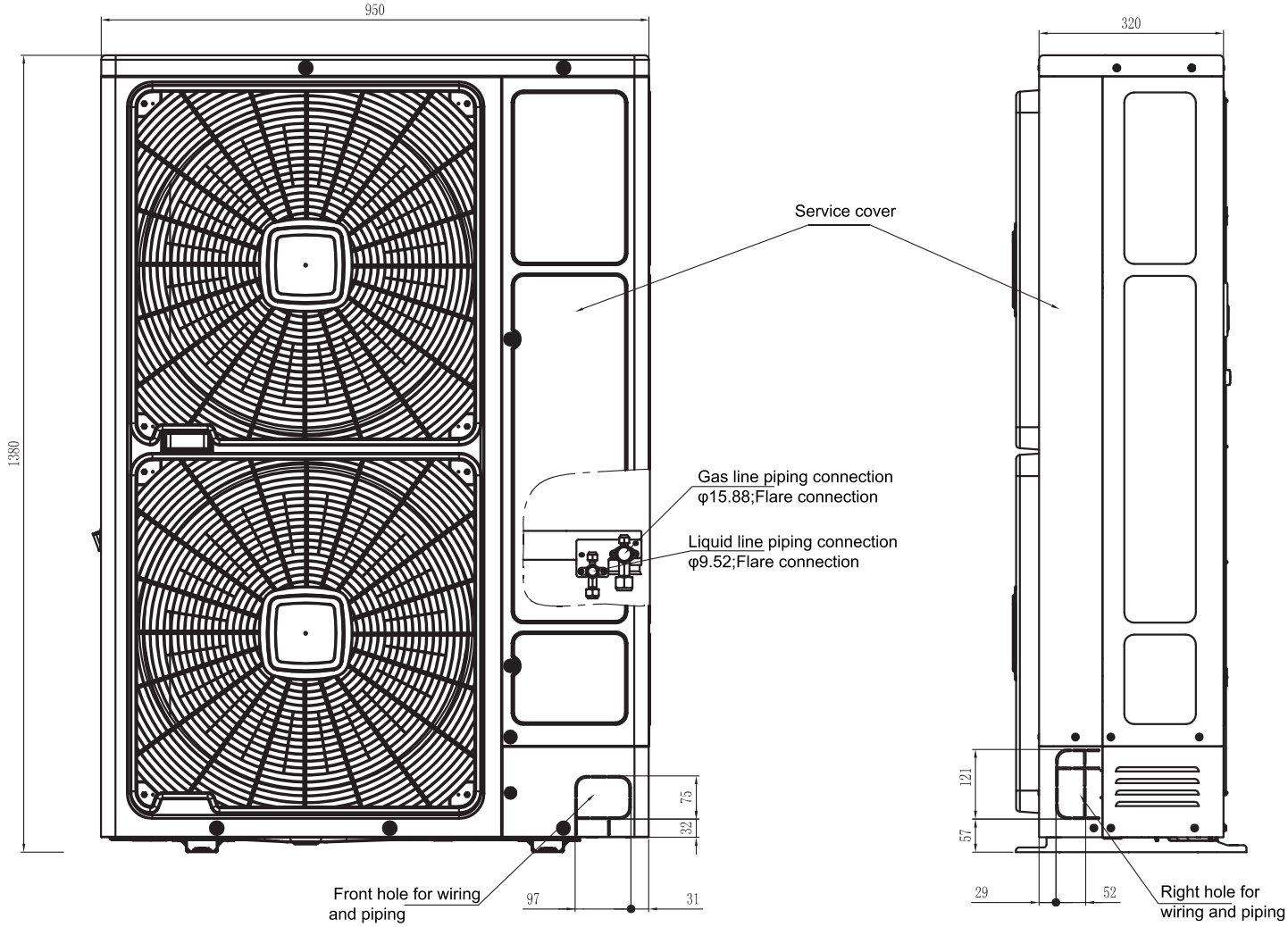
OUTDOOR UNITS

Model: RAS-6.5~7.0HNSKQ

Unit: mm

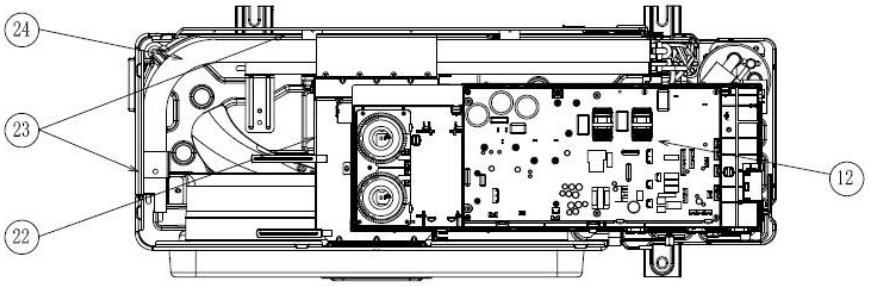


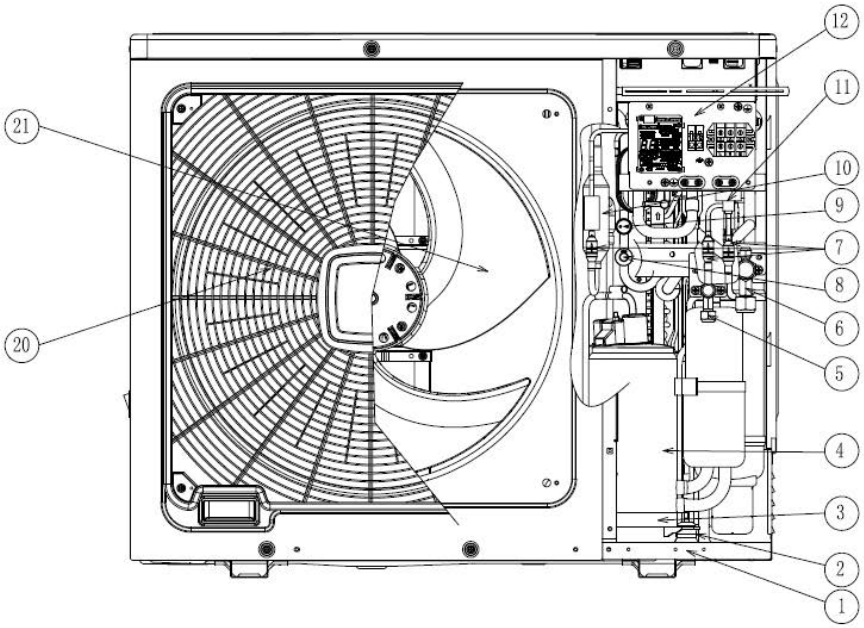


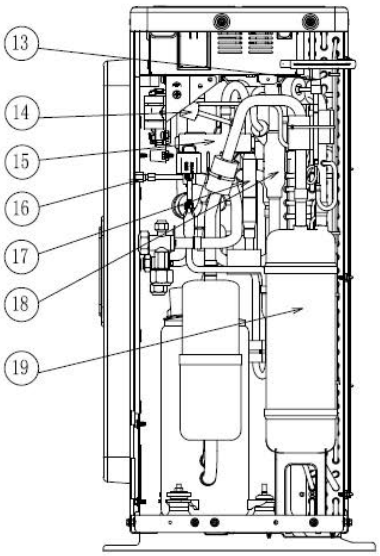


2.3 Structure

Model: RAS-3.0~4.0HNSKQ



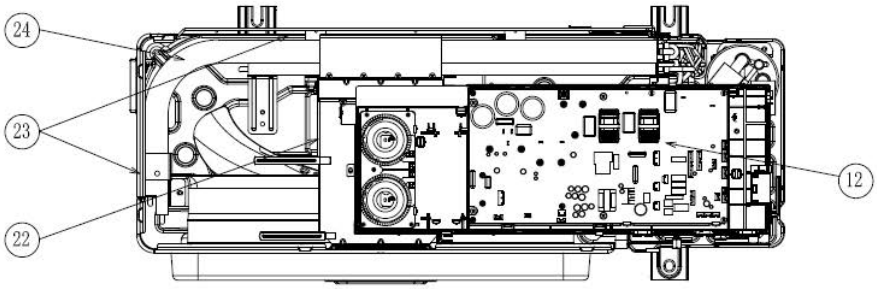


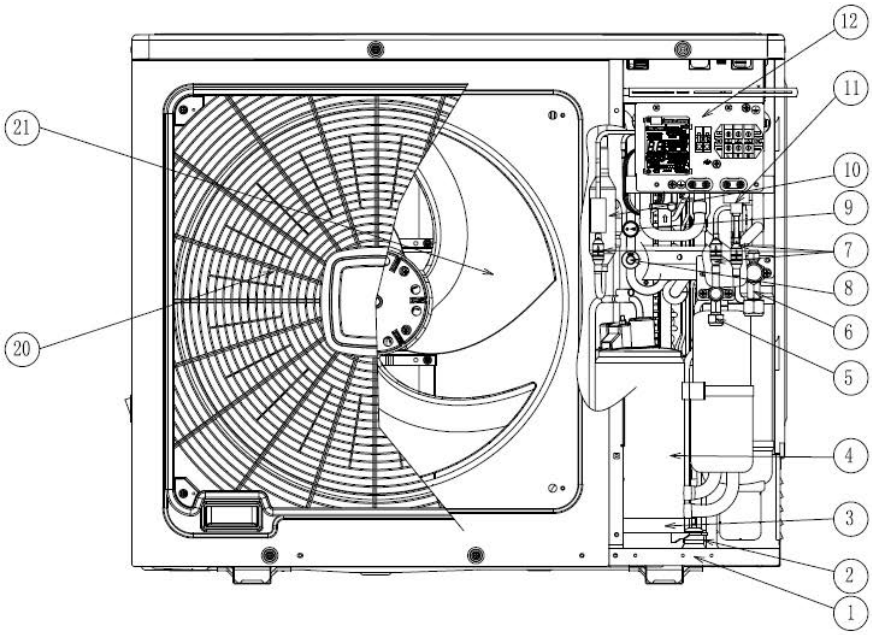


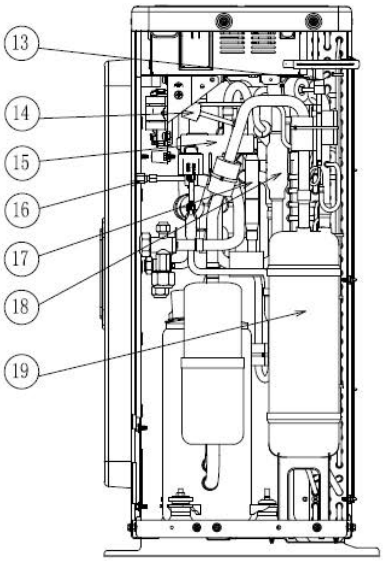
No.	Part Name	No.	Part Name	No.	Part Name	No.	Part Name
1	Chassis	7	Filter	13	Solenoid Valve	19	Accumulator
2	Vibration absorber	8	High Pressure Sensor	14	Low Pressure Switch	20	Air Outlet
3	Crankcase Heater	9	High Pressure Switch	15	4-Way Valve	21	Propeller Fan
4	Compressor	10	Oil Separator	16	Check 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

OUTDOOR UNITS

Model: RAS-4.5~6.0HNSKQ

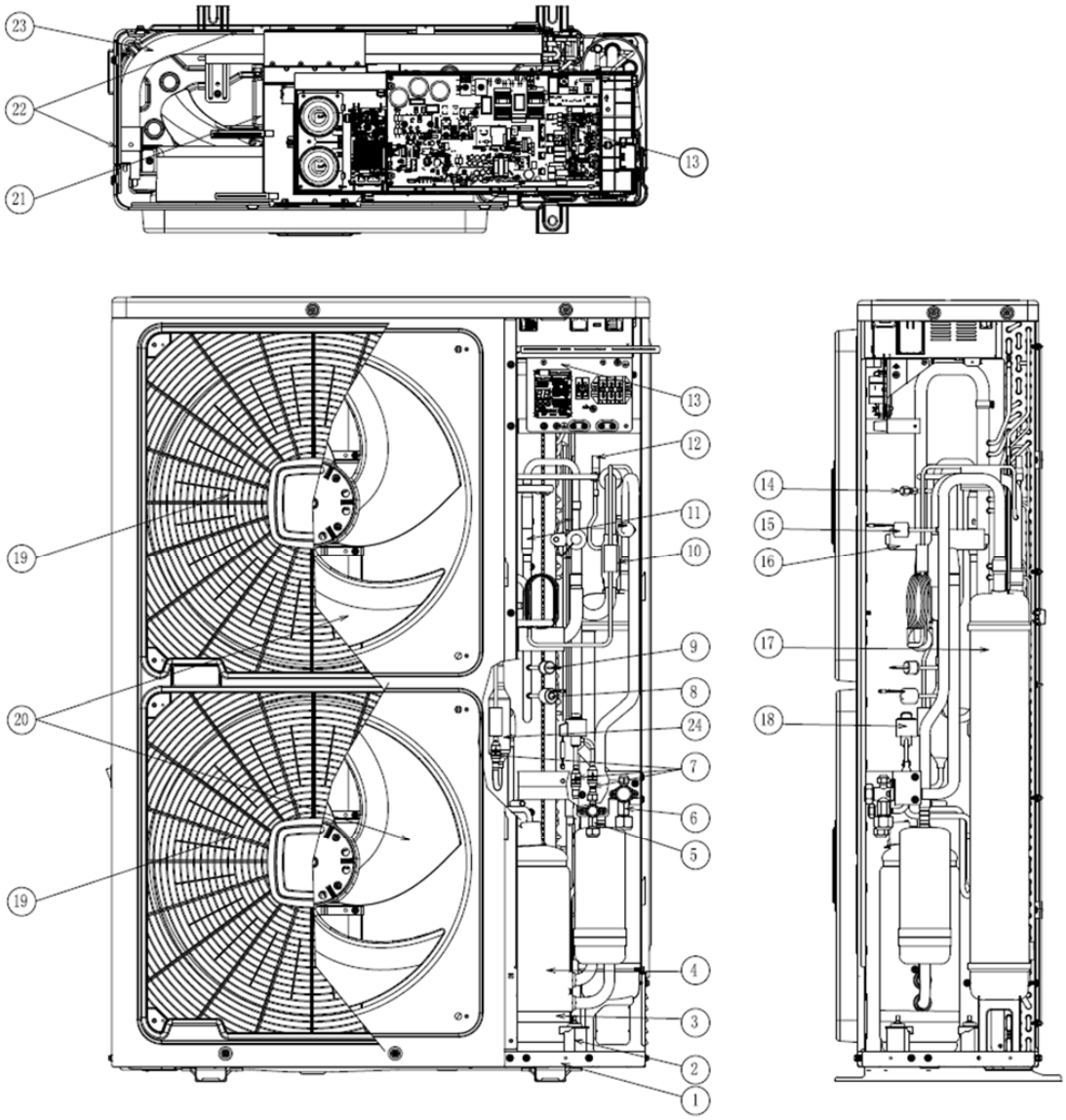






No.	Part Name	No.	Part Name	No.	Part Name	No.	Part Name
1	Chassis	7	Filter	13	Solenoid Valve	19	Accumulator
2	Vibration absorber	8	High Pressure Sensor	14	Low Pressure Switch	20	Air Outlet
3	Crankcase Heater	9	High Pressure Switch	15	4-Way Valve	21	Propeller Fan
4	Compressor	10	Oil Separator	16	Check 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-6.5~7.0HNSKQ



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 Switch	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

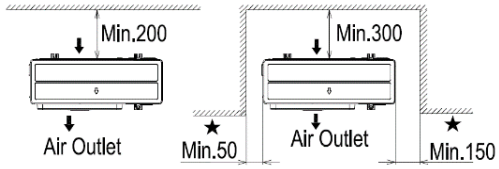
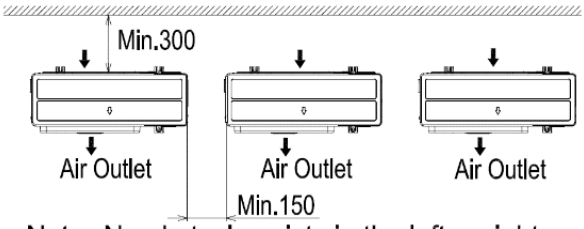
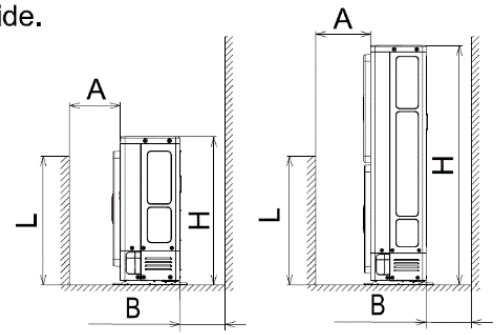
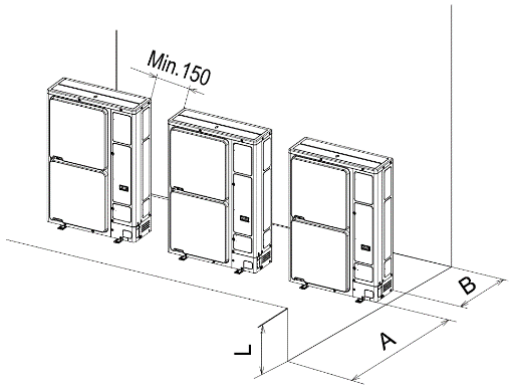
2.4 Service Space

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

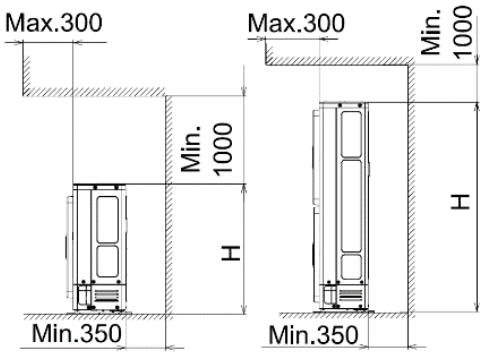
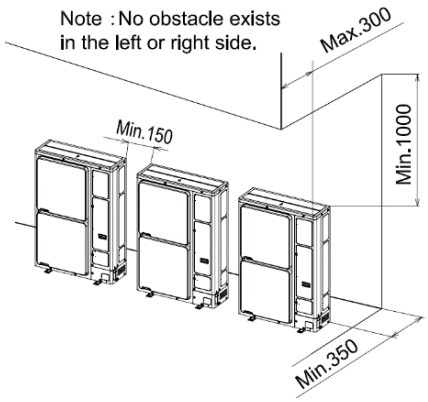
- If there is not enough service space for air inlets and outlets, it may result in a performance drop-off and mechanical issues due to insufficient air intake.
- Additionally, adequate service space is required for service maintenance access.

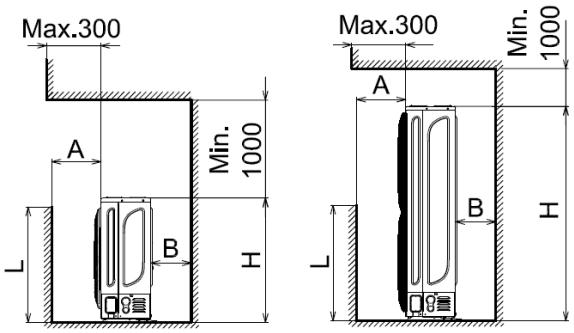
(1) Obstacles on the inlet side

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

Single Installation	Multiple Installation
* 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.	 Note :No obstacle exists in the left or right side.
Note :No obstacle exists in the left or right side. 	Note :No obstacle exists in the left or right side. 

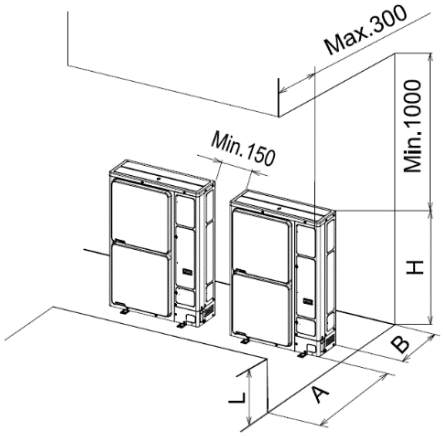
(b) There are obstacles in the upper side. Unit: mm

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

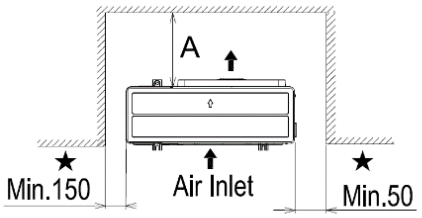
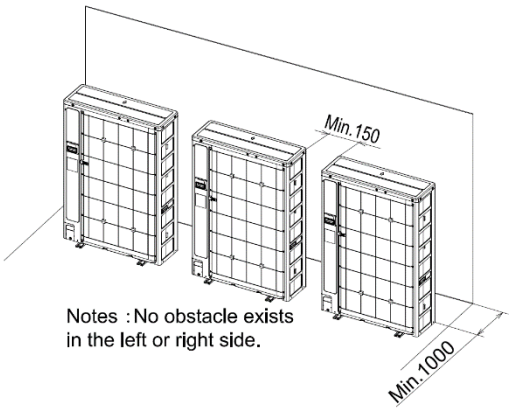
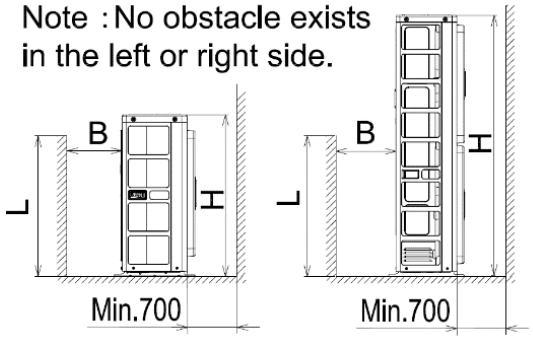
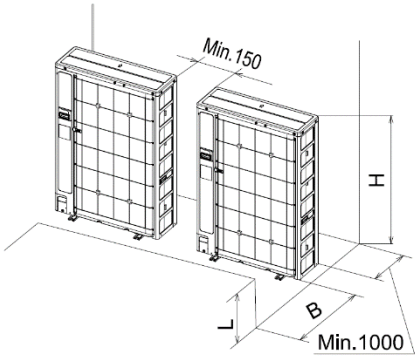


Note : No obstacle exists in the left or right side.

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

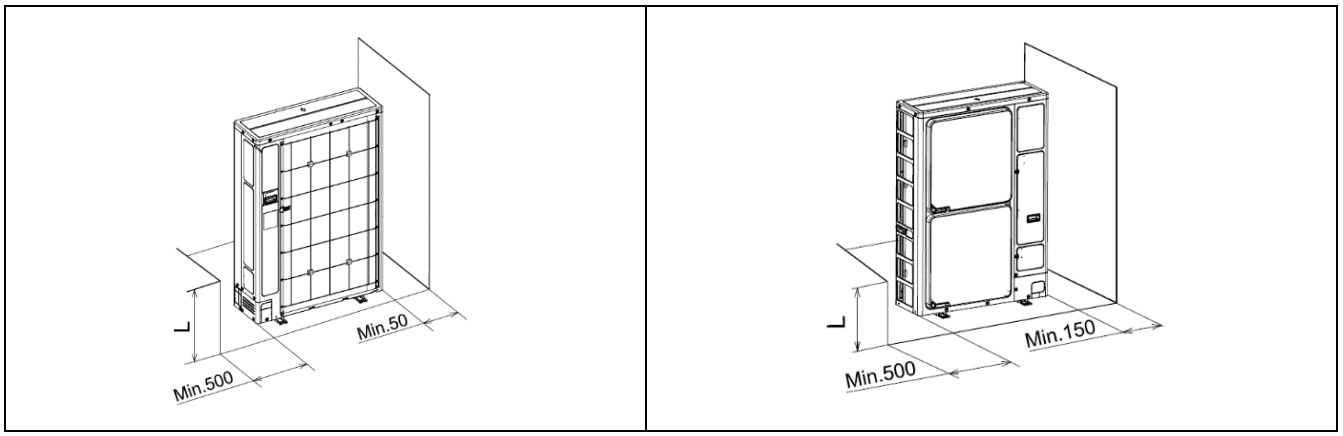
Single Installation	Multiple Installation
 ★ : It's better that the back side of unit is in a level with the obstacles. Note:Obstacles exist in the either left or right side.	 Notes : No obstacle exists in the left or right side.
Note : No obstacle exists in the left or right side. 	Notes : No obstacle exists in the left or right side. No more than two units for the installation 

(3) Obstacles on the right and left sides of single installation

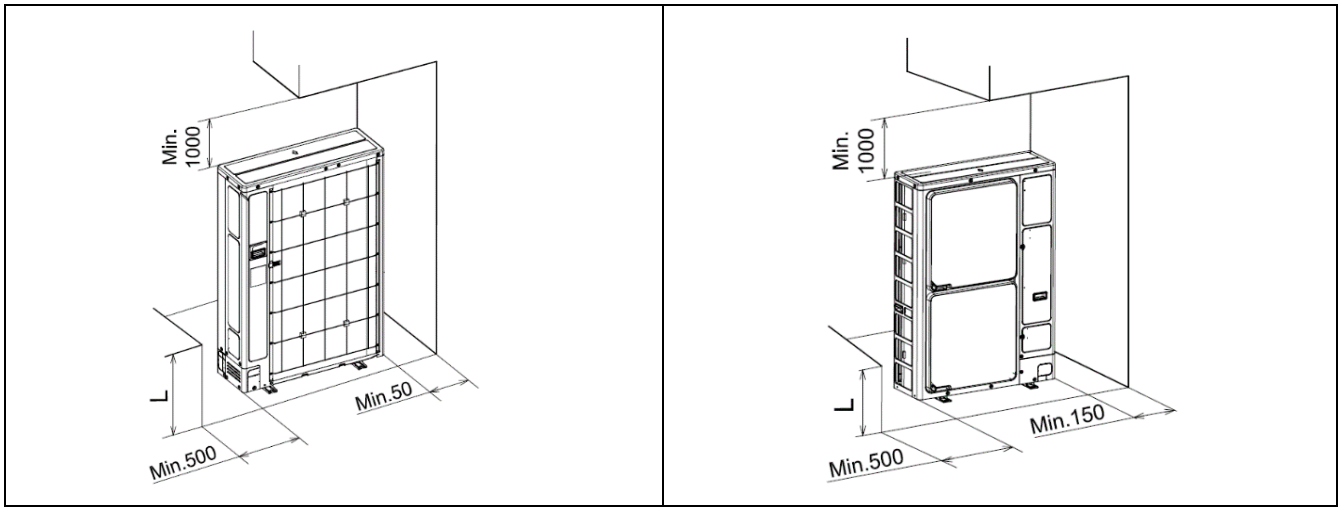
(a) There is no obstacle in the upper side.

OUTDOOR UNITS

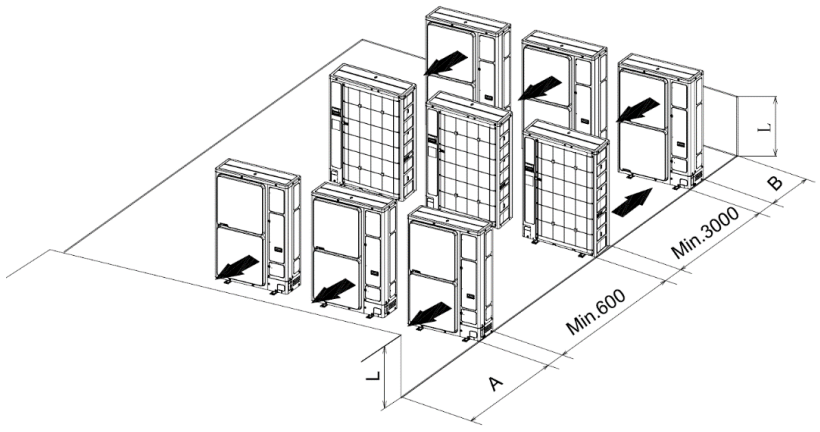
Unit: mm



(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 shortcircuit.

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)	Φ	Hz	(V)	(V)	A	A	A	A	A
RAS-3.0HNSKQ	220~240	1	50/60	264	198	1	9.18	10.38	32	25.0
RAS-3.5HNSKQ	220~240	1	50/60	264	198	1	11.75	12.26	32	25.0
RAS-4.0HNSKQ	220~240	1	50/60	264	198	1	13.87	13.87	32	25.0
RAS-4.5HNSKQ	220~240	1	50/60	264	198	1	16.42	15.31	40	30.0
RAS-5.0HNSKQ	220~240	1	50/60	264	198	1	19.25	19.94	40	31.0
RAS-6.0HNSKQ	220~240	1	50/60	264	198	1	23.79	22.40	40	33.0
RAS-6.5HNSKQ	220~240	1	50/60	264	198	1	25.07	23.55	40	32.0
RAS-7.0HNSKQ	220~240	1	50/60	264	198	1	26.86	25.76	40	32.0

NOTES:

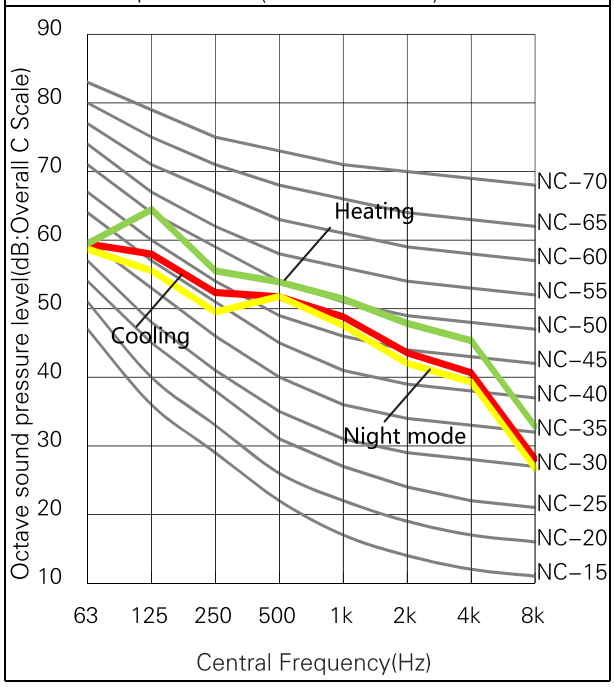
MCA: Minimum Circuit Ampacity (A);

MOP: Maximum Overcurrent Protective Device (A)

2.6 Sound Data

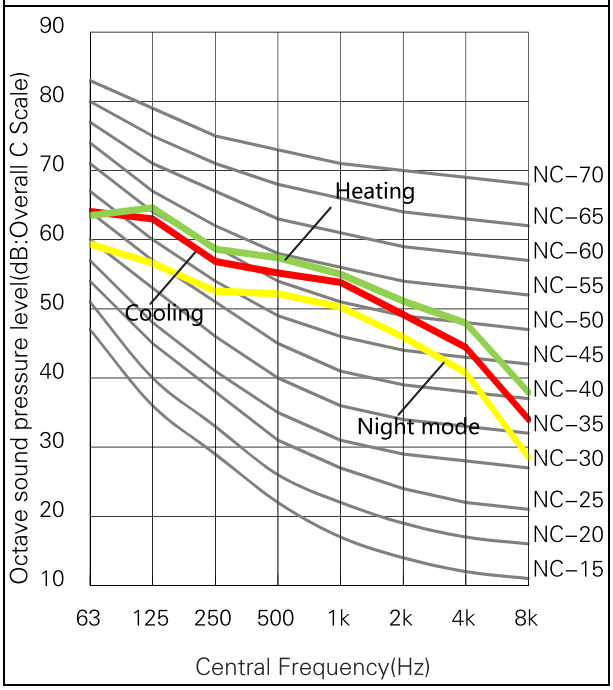
Model:RAS-3.0HNSKQ | Power Supply:220~240V/50/60Hz

Measuring point:1m distancing from the front panel of unit and 1.5m
Octave sound pressure level(dB:Overall C Scale)



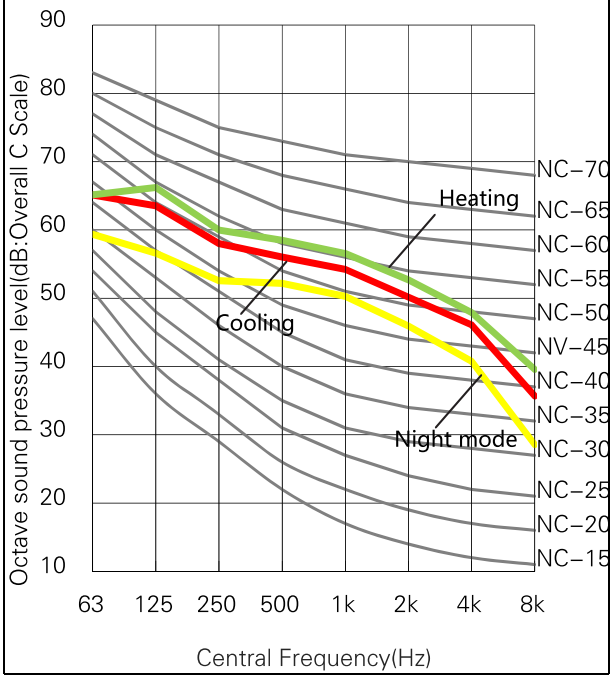
Model:RAS-3.5HNSKQ | Power Supply:220~240V/50/60Hz

Measuring point:1m distancing from the front panel of unit and 1.5m
Octave sound pressure level(dB:Overall C Scale)



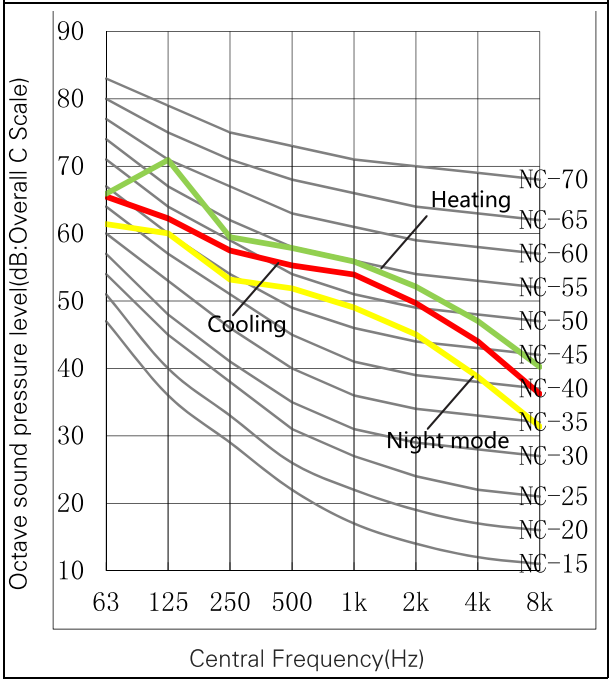
Model:RAS-4.0HNSKQ | Power Supply:220~240V/50/60Hz

Measuring point:1m distancing from the front panel of unit and 1.5m
Octave sound pressure level(dB:Overall C Scale)



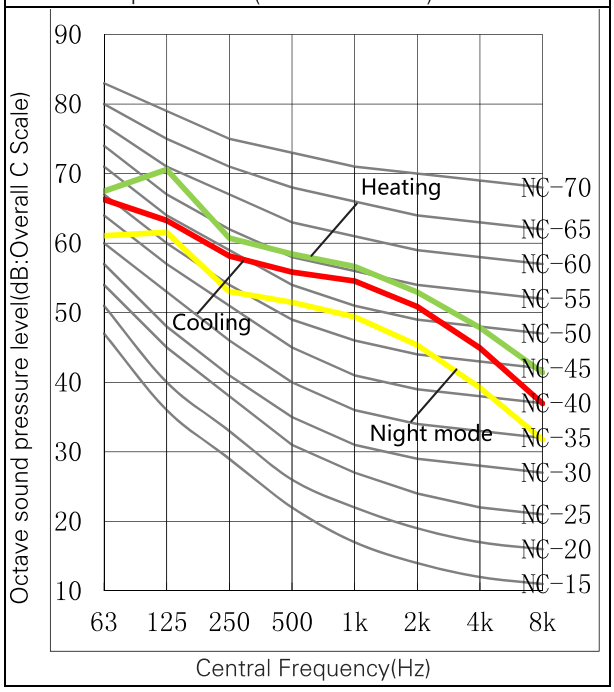
Model:RAS-4.5HNSKQ | Power Supply:220~240V/50/60Hz

Measuring point:1m distancing from the front panel of unit and 1.5m
Octave sound pressure level(dB:Overall C Scale)



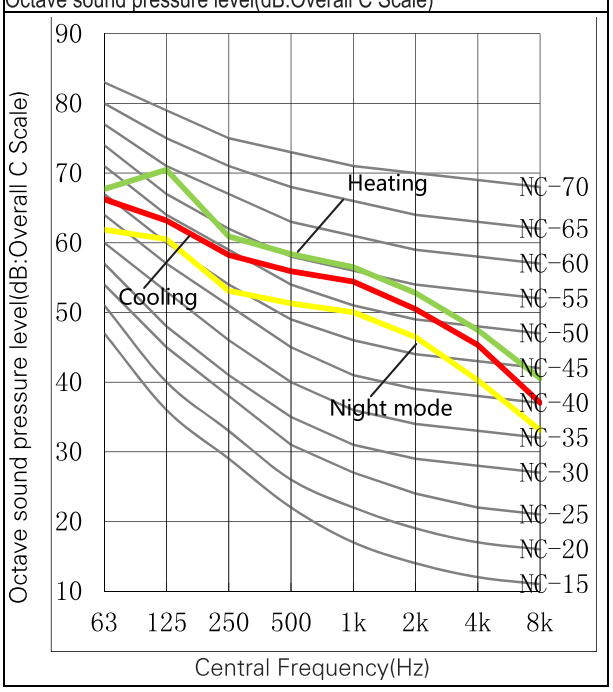
Model:RAS–5.0HNSKQ | Power Supply:220~240V/50/60Hz

Measuring point:1m distancing from the front panel of unit and 1.5m
Octave sound pressure level(dB:Overall C Scale)



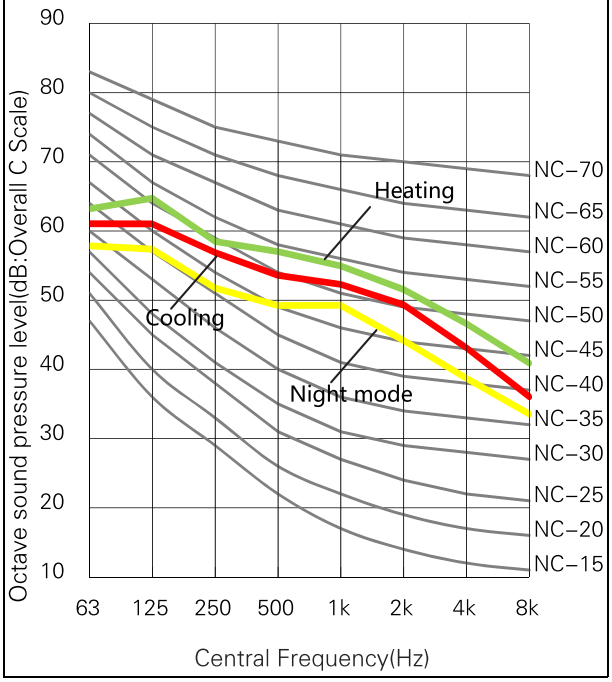
Model:RAS–6.0HNSKQ | Power Supply:220~240V/50/60Hz

Measuring point:1m distancing from the front panel of unit and 1.5m
Octave sound pressure level(dB:Overall C Scale)



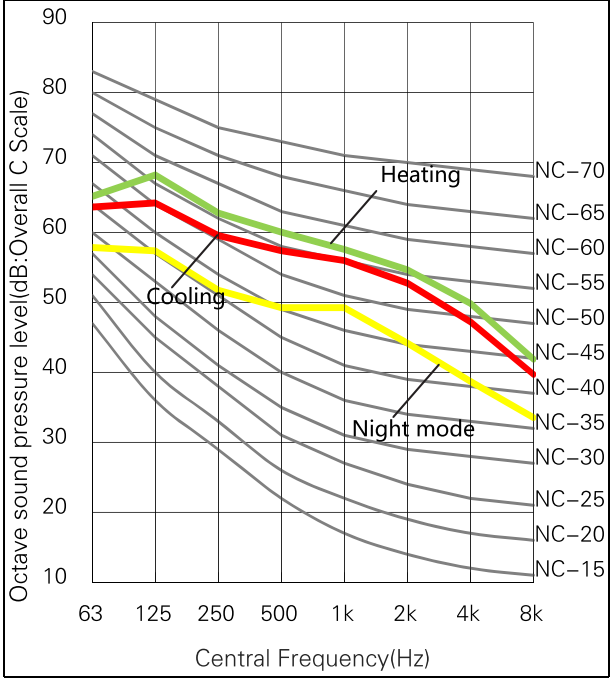
Model:RAS–6.5HNSKQ | Power Supply:220~240V/50/60Hz

Measuring point:1m distancing from the front panel of unit and 1.5m
Octave sound pressure level(dB:Overall C Scale)



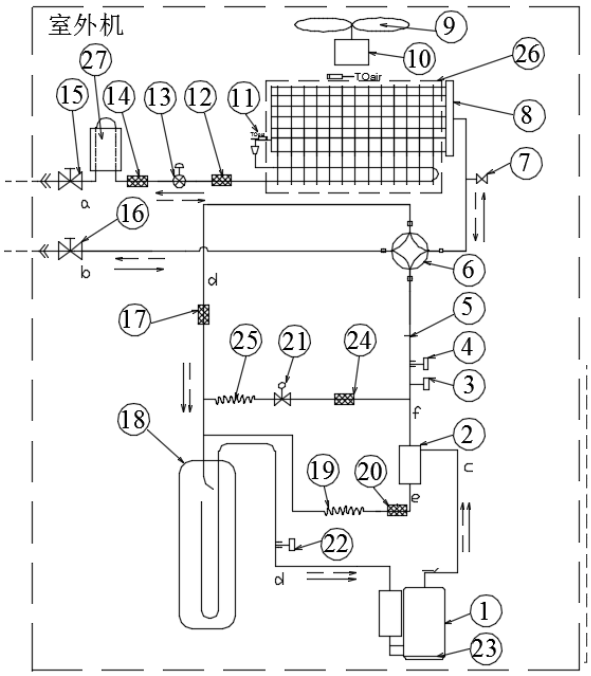
Model:RAS–7.0HNSKQ | Power Supply:220~240V/50/60Hz

Measuring point:1m distancing from the front panel of unit and 1.5m
Octave sound pressure level(dB:Overall C Scale)

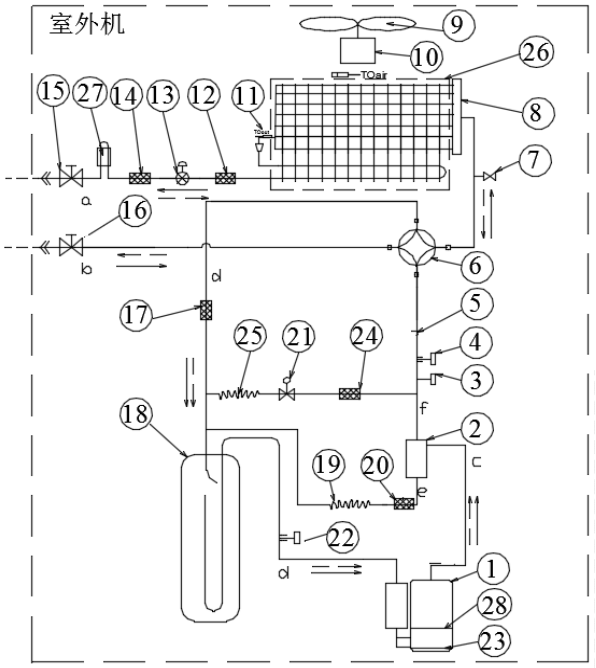


2.7 Refrigerant Cycle Diagram

Model: RAS-3.0~6.0HNSKQ



Model: RAS-6.5~7.0HNSKQ



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 Switch
5	Check Valve	14	Filter 2	23	Crankcase Heater 1
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	Refrigerant cooling
				28	Crankcase Heater 2

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 level. ◆ 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:

(a): Difference between Indoor Inlet Air Temperature and Setting Temperature;

(b): Amount of Temperature Difference Change;

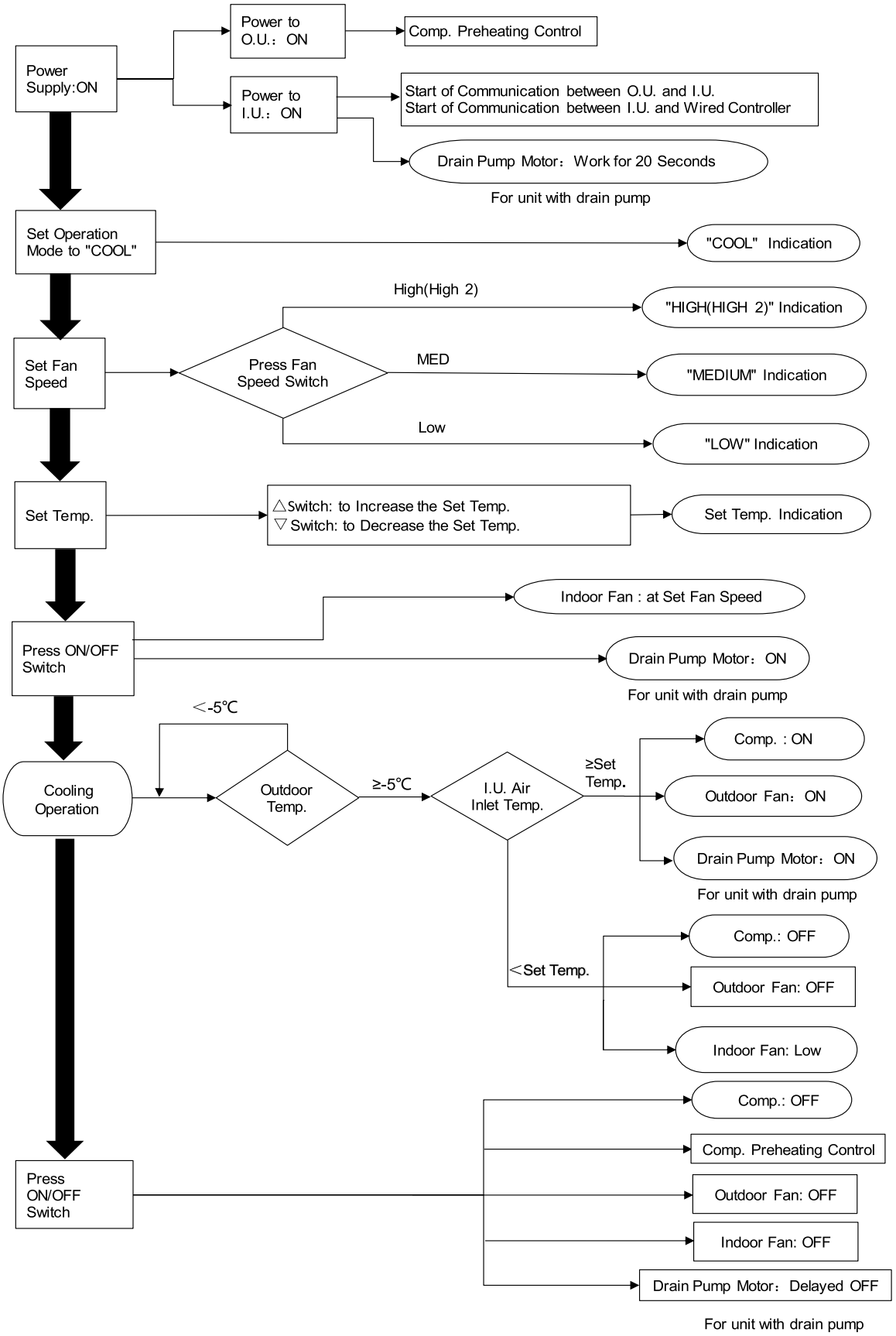
(c): Capacity Ratio between Operating Indoor Unit and Outdoor Unit;

(d): Temperature Difference between Indoor Gas Pipe and Indoor Liquid Pipe
= Indoor Gas Pipe Temperature - Indoor Liquid Pipe Temperature.

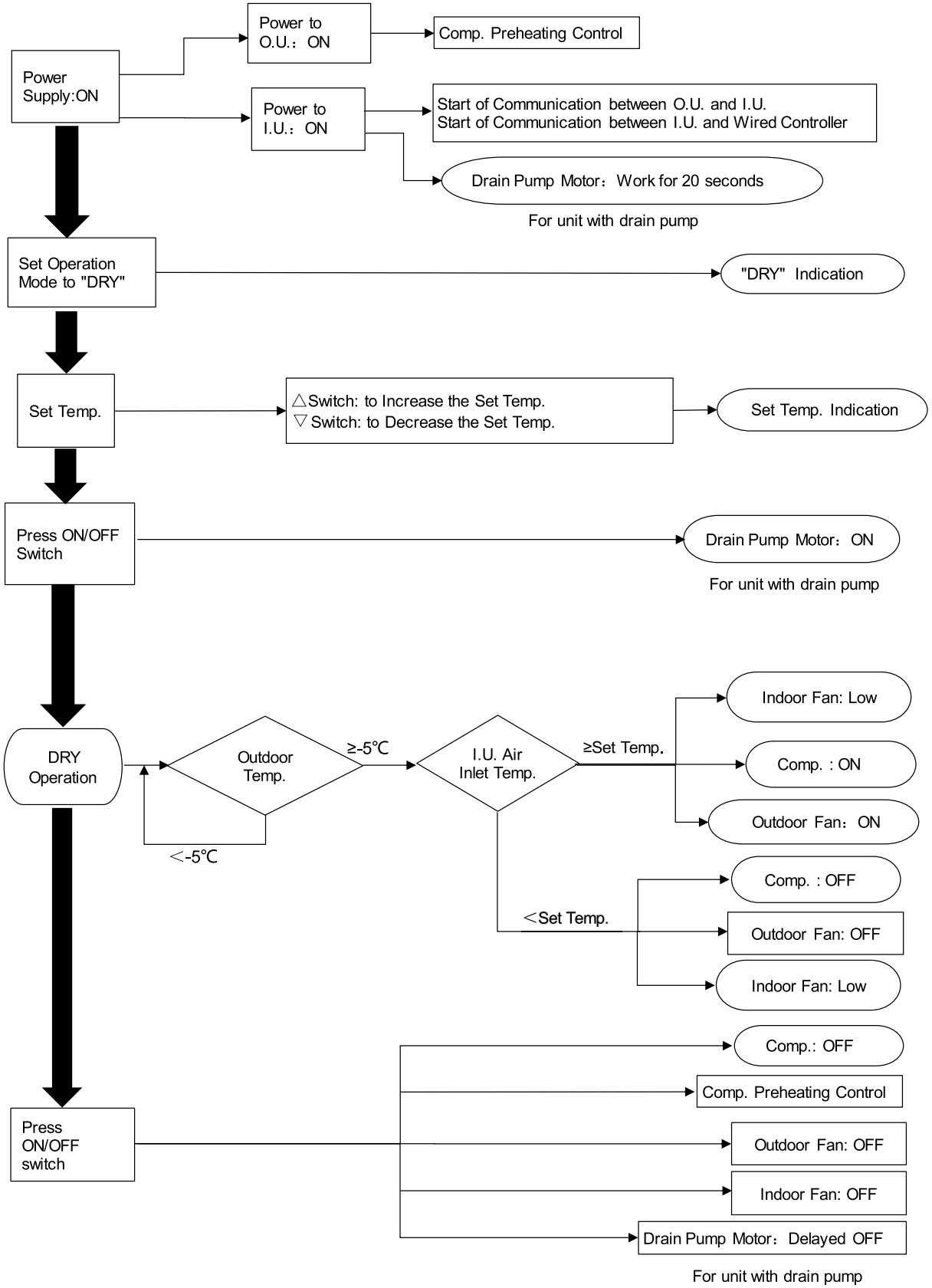
(e):I.U: Indoor Unit; O.U: Outdoor Unit

2.9 Standard Operation Sequence

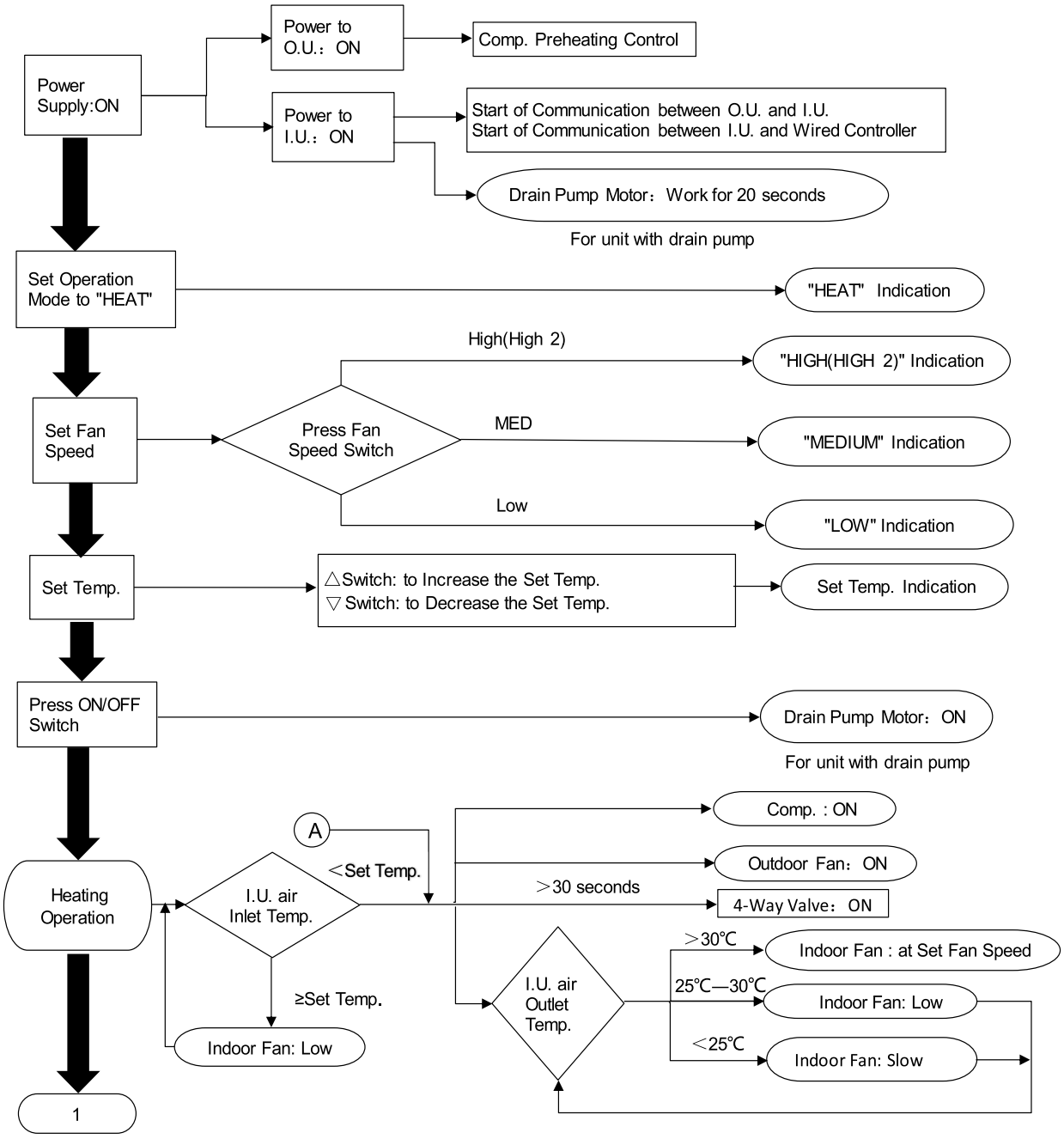
◆ Cooling Operation

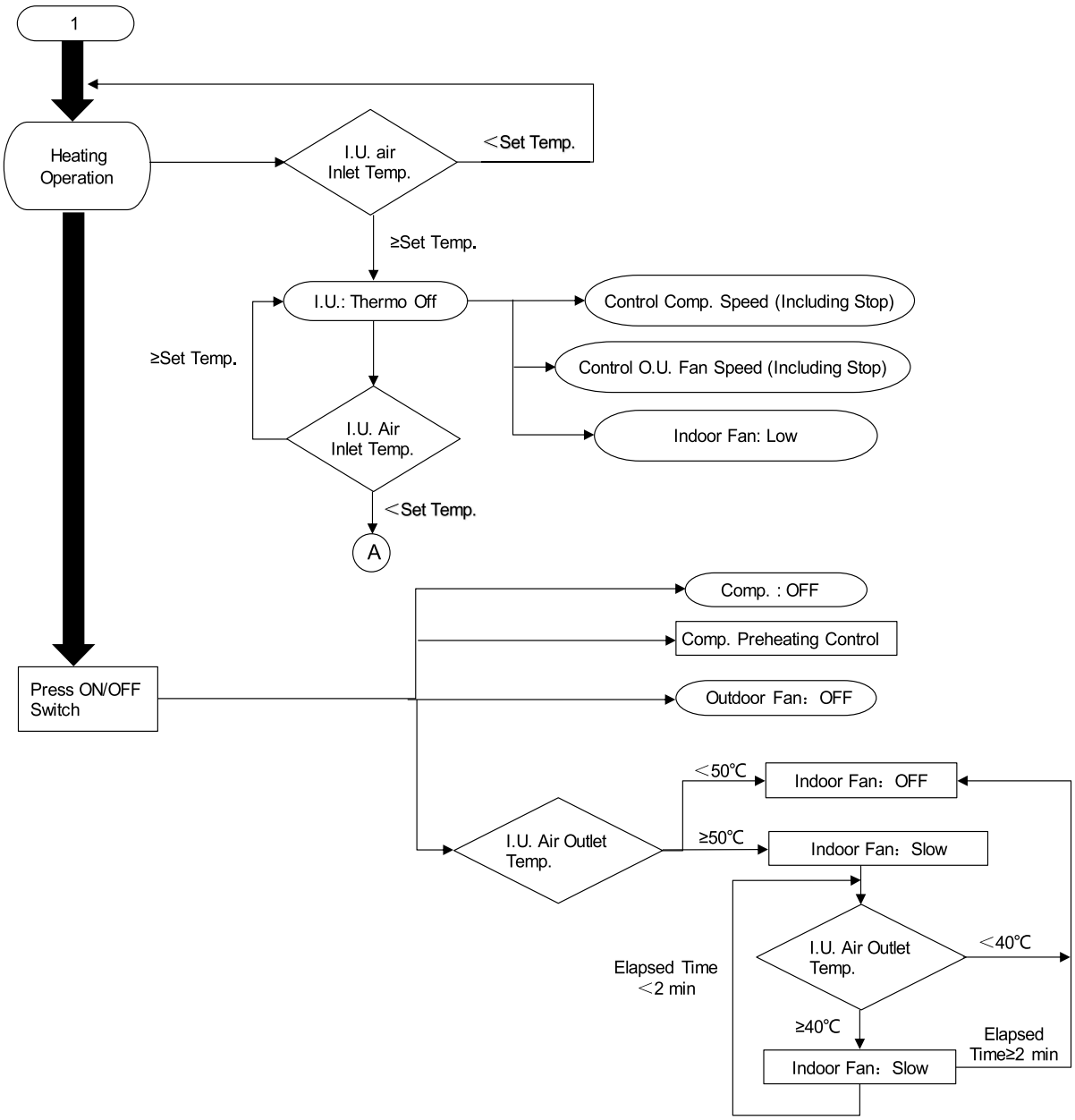


◆ Dry Operation

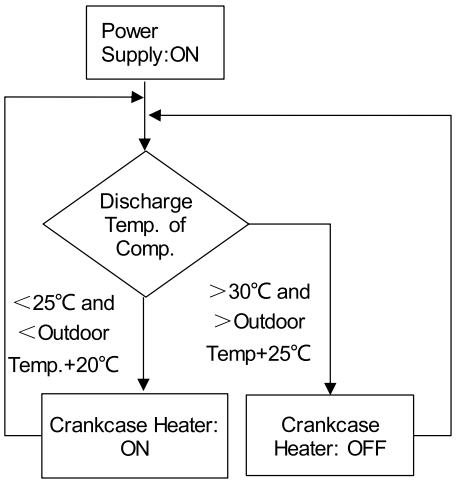


◆ Heating Operation

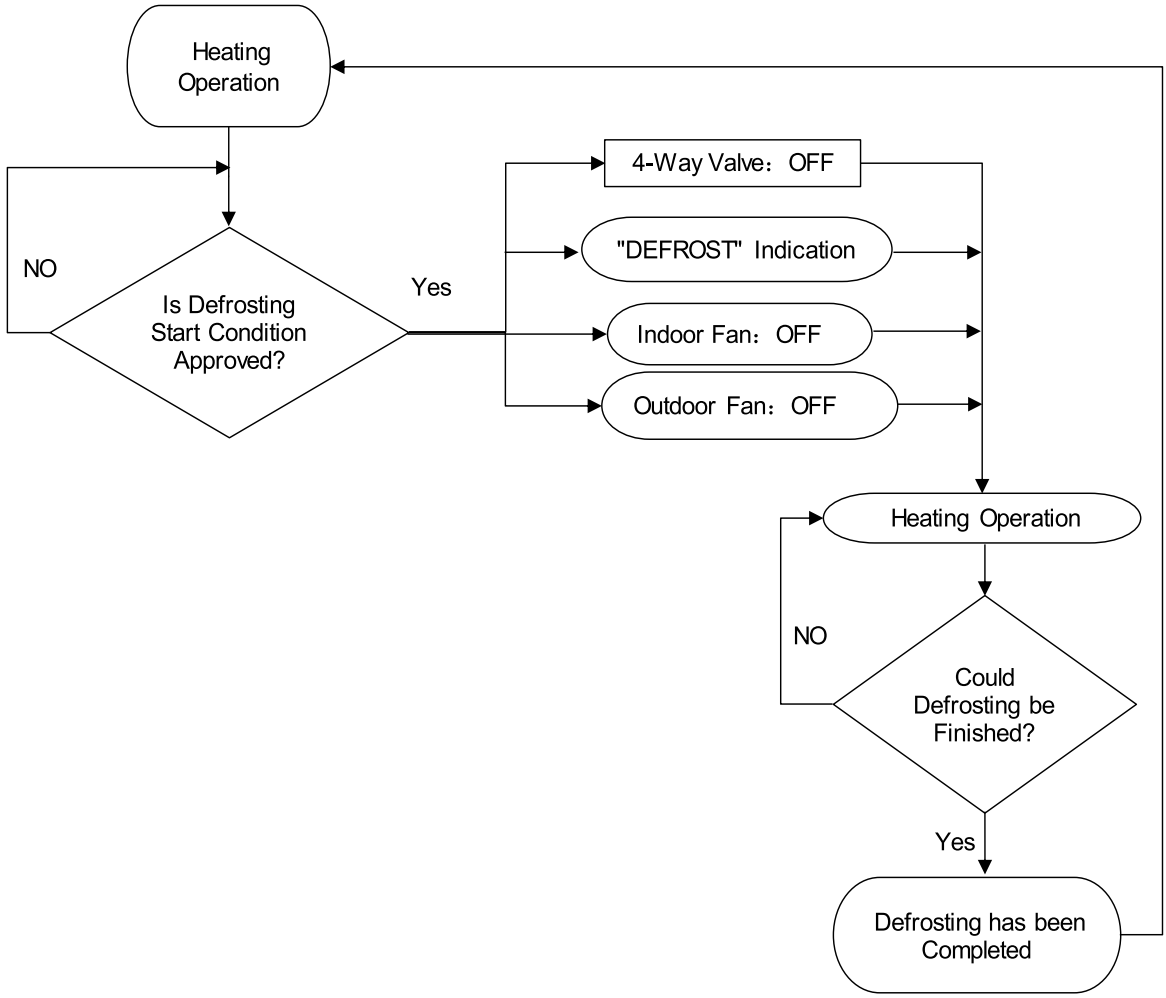




◆ Control of compressor preheat



◆ 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.

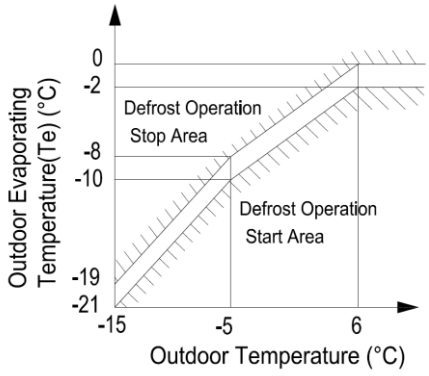
* Thermo-ON: The outdoor unit and some indoor units are running.

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°C 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°C 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°C within 2 minutes after the defrost operation starts.

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

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

(d) The discharge temperature reaches 100°C.

(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

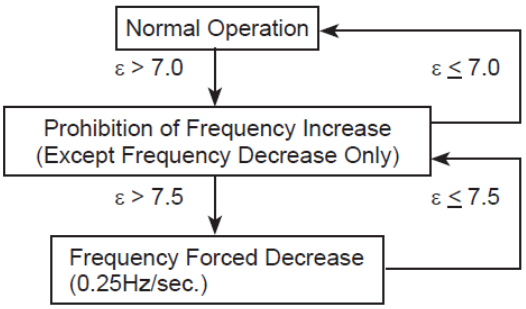
Indication	Protection Control Contents
P1	Pressure Ratio Protection Control
P2	High Pressure Increase Protection Control
P4	Inverter Fin Temperature Increase Protection Control
P5	Discharge Temperature Increase Protection Control
P6	Low Pressure Decrease Protection Control
P9	High Pressure Decrease Protection 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:

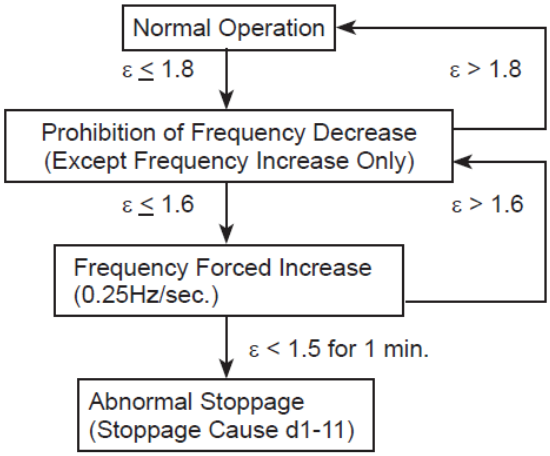


NOTE:
The pressure ratio is calculated as follows.
ε= (Pd [MPa]+0.1) / (Ps [MPa]+0.1)
Pd: Detected Value of High Pressure Sensor [MPa]
Ps: Detected Value of Low Pressure Sensor [MPa]

(b) Low Compression Ratio Protection Function

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

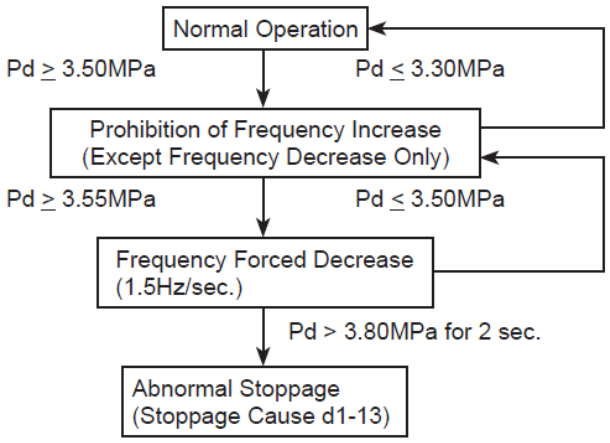
Details of Control:



(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:

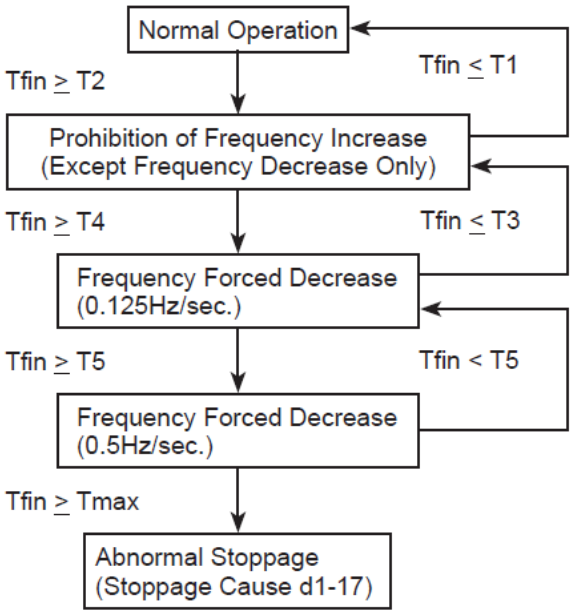


Pd: Detected Value of High Pressure Sensor [psi (MPa)]

(3) 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:



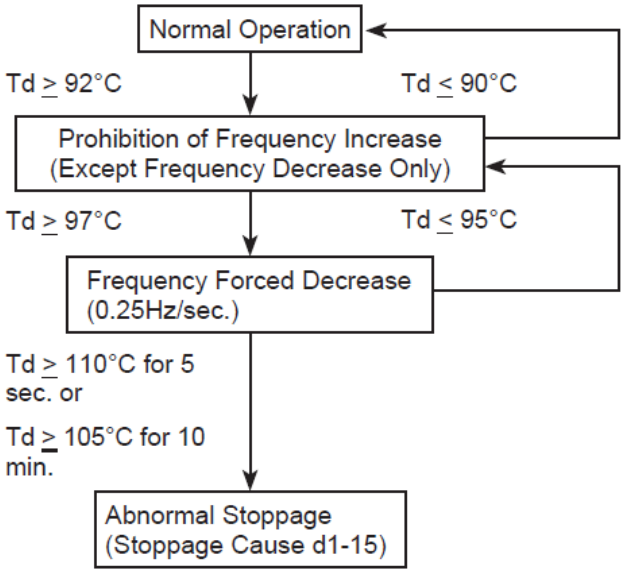
Tfin: Detected Value of Inverter Fin Thermistor (°C)

Model	T1	T2	T3	T4	T5	Tmax
RAS-3.0~7.0HNSKQ	75	81	83	84	87	92

(4) 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:

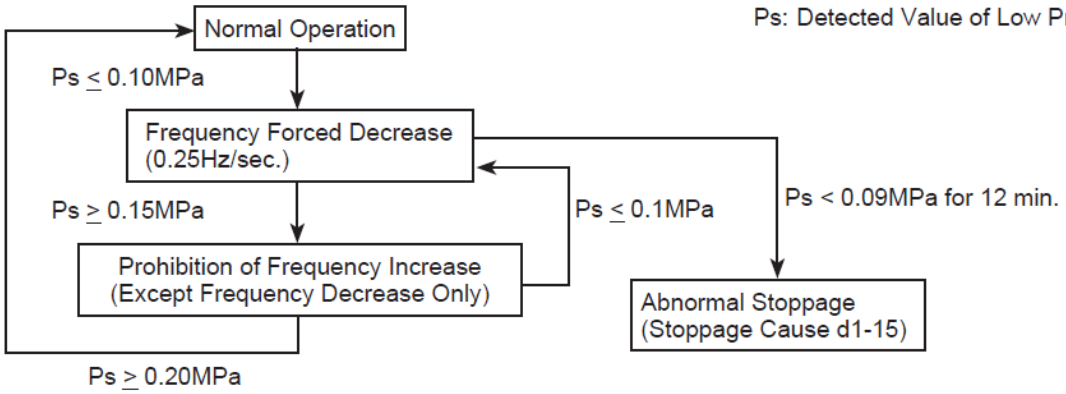


Td: Detected Value of Discharge Gas Thermistor (°C)

(5) 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.

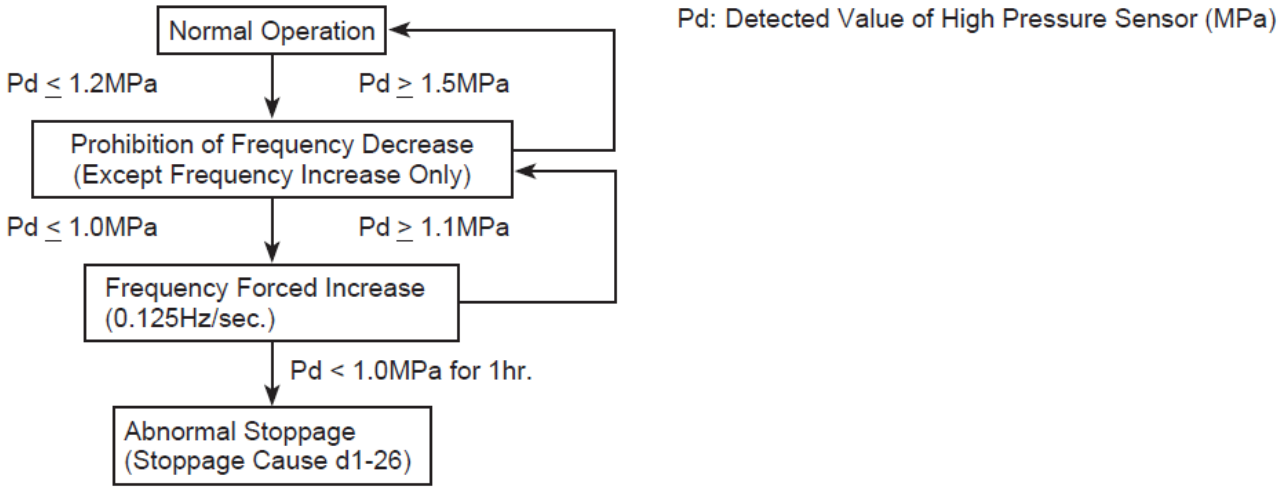
Details of Control:



(6) 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.



(7) 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.

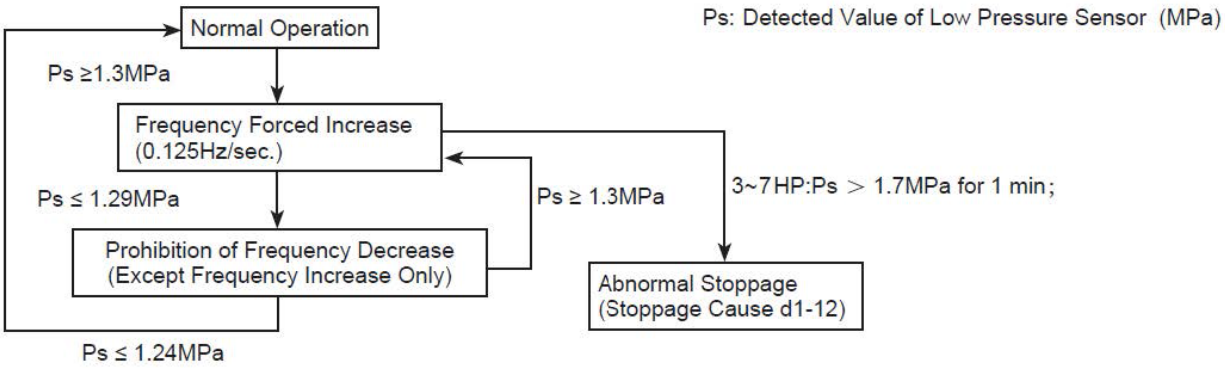
NOTE:

- 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

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

Rank Order.	Indication	Protection Control Performed
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

		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)

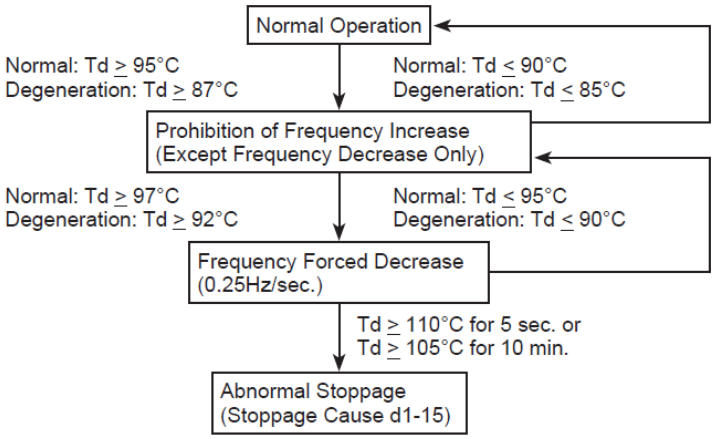
(b) High Pressure Increase Protection Control (P2)

(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.

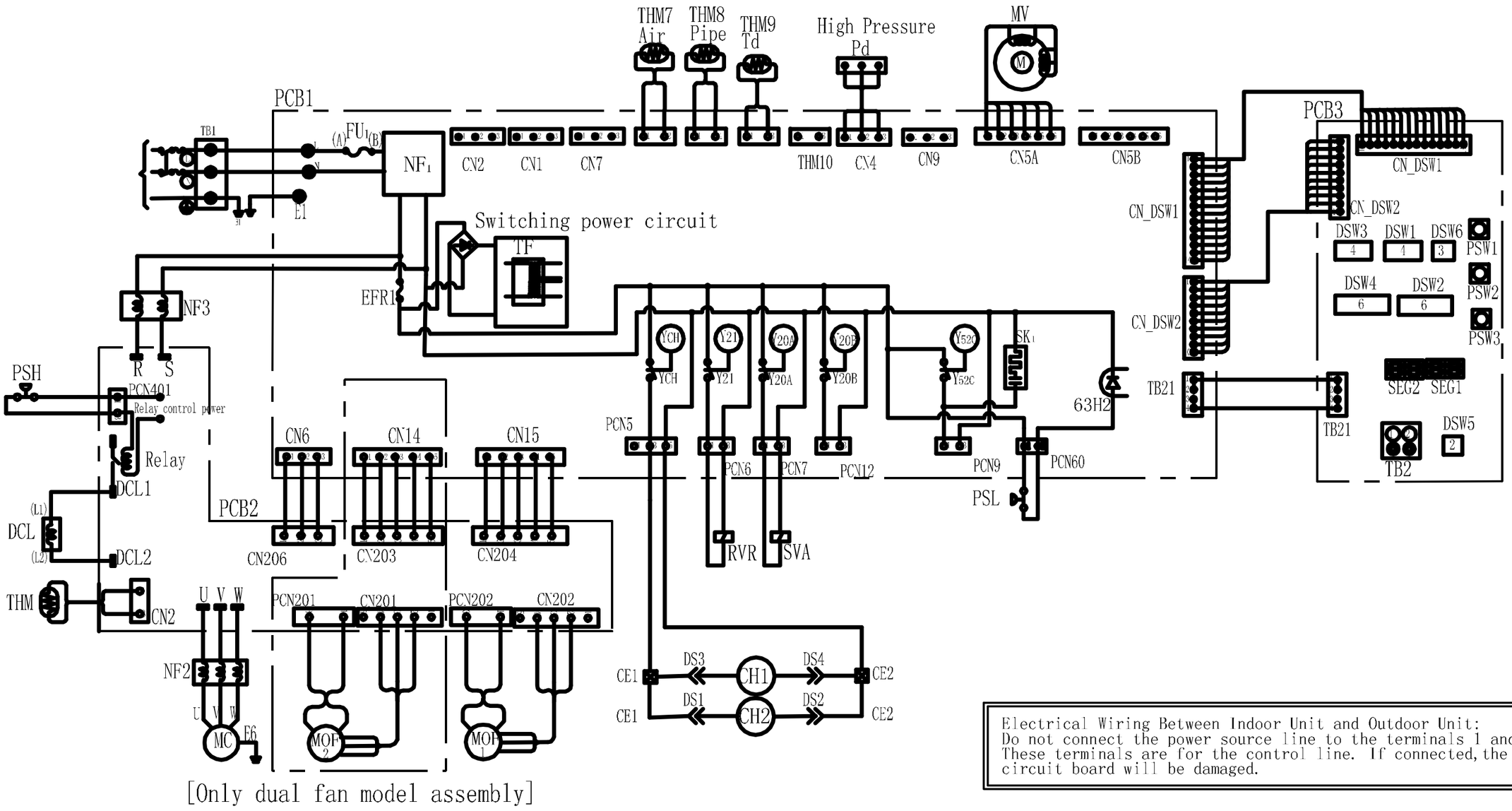
(1) High Pressure Switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

(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-3.0~4.0HNSKQ	RAS-4.5~7.0HNSKQ
High Pressure Switch		Automatic Reset, Non-Adjustable	
Cut-Out	MPa	$4.15^{-0.05}_{-0.2}$	$4.15^{-0.05}_{-0.2}$
Cut-In	MPa	$3.2^{+0.15}_{-0.2}$	$3.2^{+0.15}_{-0.2}$
Breaker	A	32	40
Crankcase Heater	W	24	28
CCP Timer Setting Time	Min	Non-Adjustable 3	Non-Adjustable 3

2.12 Electrical Wiring Diagram

Model: RAS-3.0/3.5/4.0/6.5/7.0HNSKQ

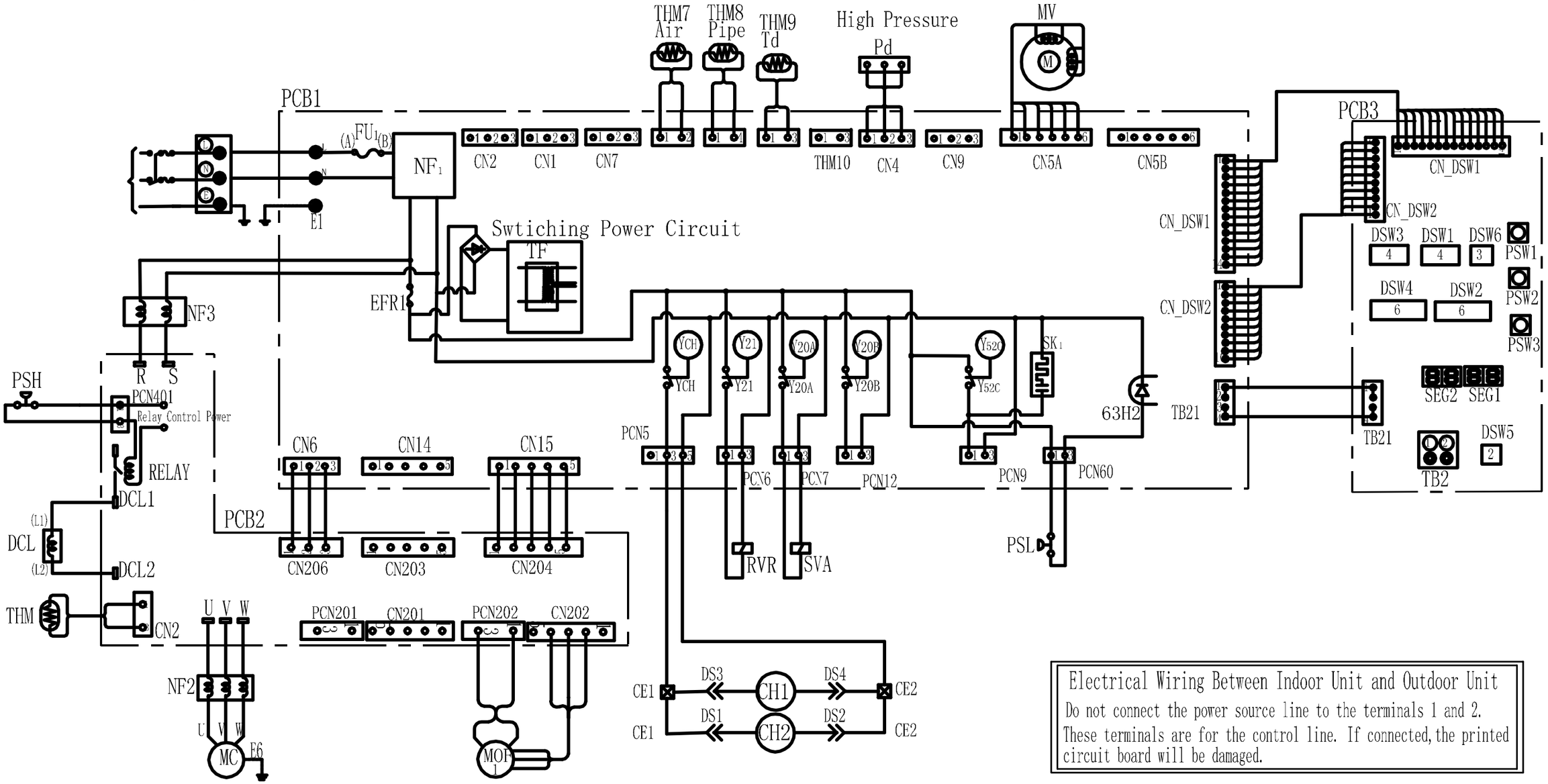


[Only dual fan model assembly]

Electrical Wiring Between Indoor Unit and Outdoor Unit:
Do not connect the power source line to the terminals 1 and 2.
These terminals are for the control line. If connected, the printed circuit board will be damaged.

[ELECTRICAL WIRING DIAGRAM]

Model: RAS-4.5/5.0/6.0HNSKQ



Electrical Wiring Between Indoor Unit and Outdoor Unit

Do not connect the power source line to the terminals 1 and 2.
These terminals are for the control line. If connected, the printed circuit board will be damaged.

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	Stable -20°C DB

NOTE:

* : The temperature value may vary with different outdoor units.

OUTDOOR UNITS

2.14 Combination of Indoor Unit and Outdoor Unit

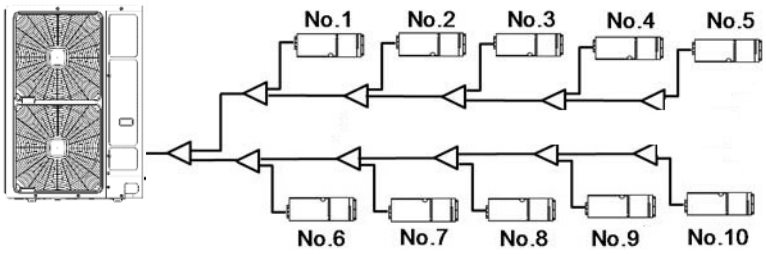
The number of indoor units that can be connected to an outdoor unit is defined in the following table:

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-3.0HNSKQ	8.0	4	10.4	2~4	1.8
RAS-3.5HNSKQ	10.0	5	13	2~5	1.8
RAS-4.0HNSKQ	11.2	5.6	14.56	2~5	1.8
RAS-4.5HNSKQ	12.5	6.25	15.6	2~5	1.8
RAS-5.0HNSKQ	14.0	7	18.2	2~6	1.8
RAS-6.0HNSKQ	15.5	8	20.8	2~6	1.8
RAS-6.5HNSKQ	18.0	9	23.4	2~9	1.8
RAS-7.0HNSKQ	20.0	10	26	2~10	1.8

NOTE:

- The connectable indoor unit capacity ratio can be calculated as follows:
  Connectable Indoor Unit Capacity Ratio = Total Indoor Unit Capacity / Total Outdoor Unit Capacity.
- For the same system, if the connectable indoor unit capacity ratio is over than 100%, and which all the indoor units operate simultaneously, the capacity of every indoor unit should be less than its rated capacity.
- Indoor unit and outdoor unit connected to the total capacity of indoor units for the outdoor unit rated capacity of 50% to 130%.

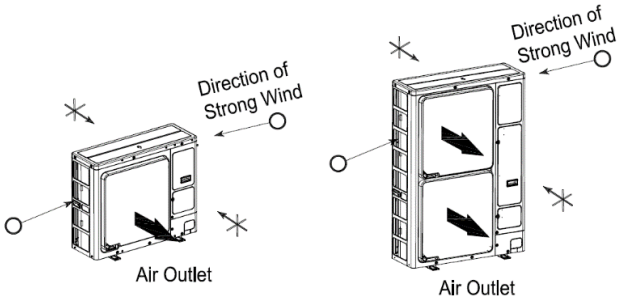


*Thermo-ON: The outdoor unit and some indoor units are running;
Thermo-OFF: The outdoor unit and some indoor units are standby, but don't run.

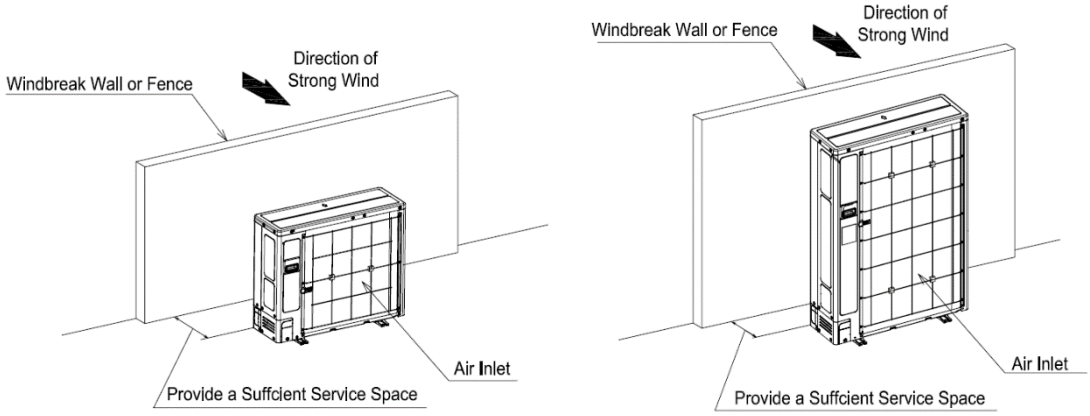
2.15 Outdoor Unit Installation

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, remembering 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. And make sure to provide sufficient space around the outdoor unit for operation and maintenance.



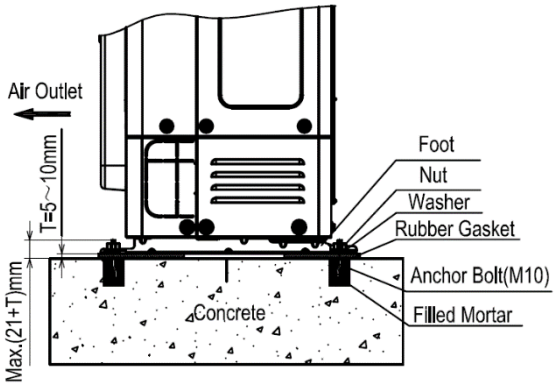
NOTES:

- 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.

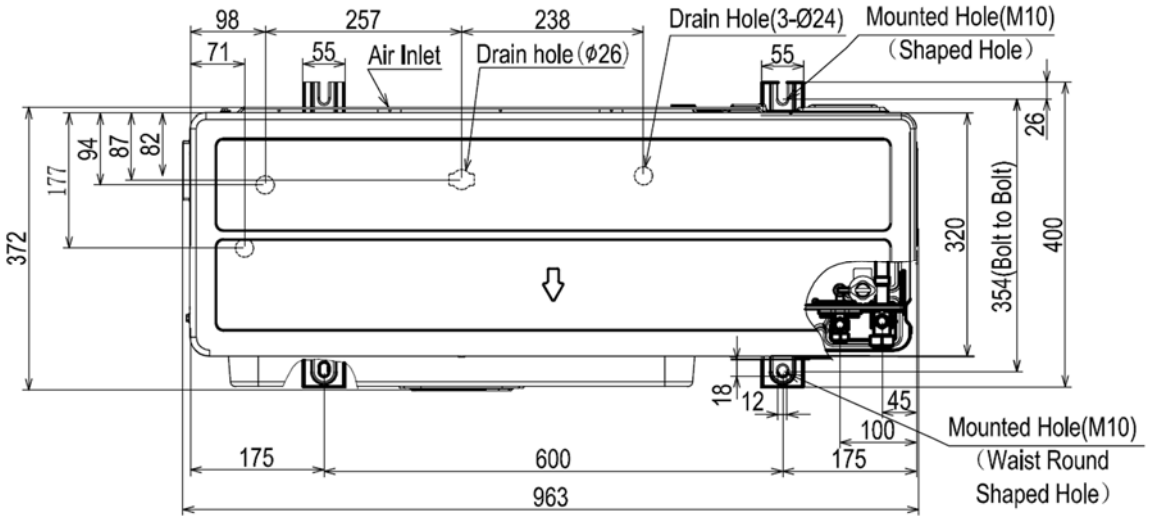


Model: RAS-3.0~7.0HNSKQ

(2)Installation positions of feet, air inlet and drain holes are shown in the following figures:

Model: RAS-3.0~7.0HNSKQ

Unit: mm

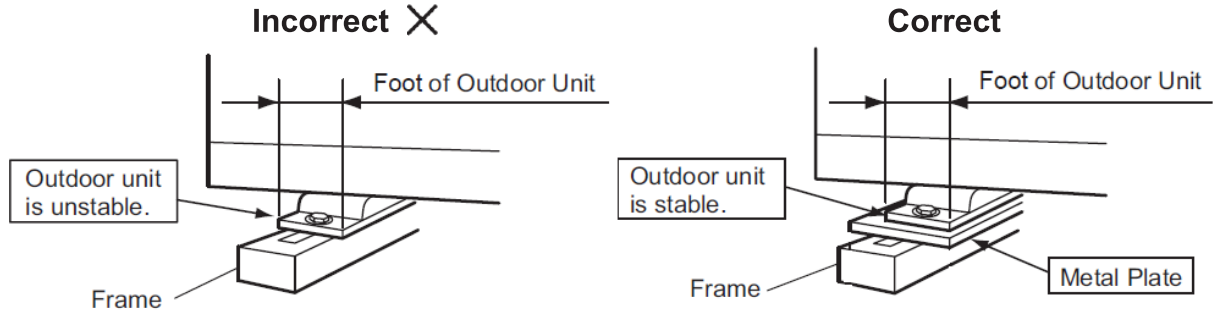


(3)The drain holes are working during the heating and defrosting operation. Choose a place where well drainage is available, or provide a groove for draining.

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

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

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



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

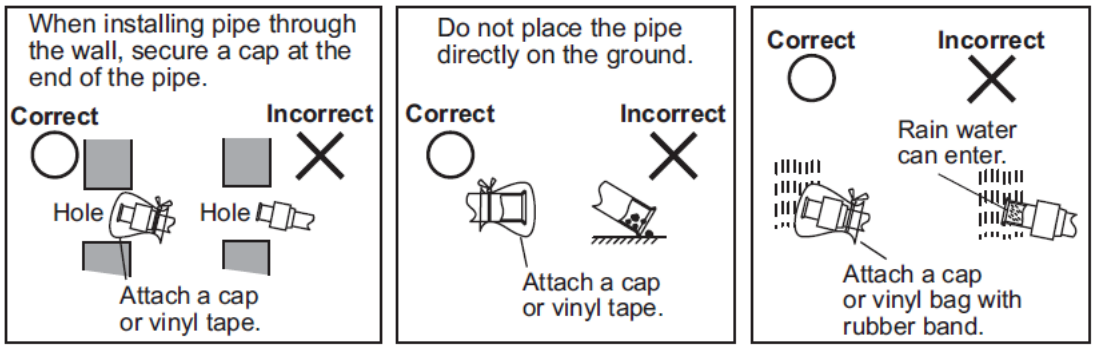
(1) Use the copper pipe for refrigerant piping.

(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) Refrigerant pipe ends



(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 (Φd)	R410A	
	Thickness	Temper
6.35 mm	0.8 mm	O
9.52 mm	0.8 mm	O
12.7 mm	0.8 mm	O
15.88 mm	1.0 mm	O
19.05 mm	1.0 mm	1/2H
22.2 mm	1.2 mm	1/2H
25.4 mm	1.2 mm	1/2H

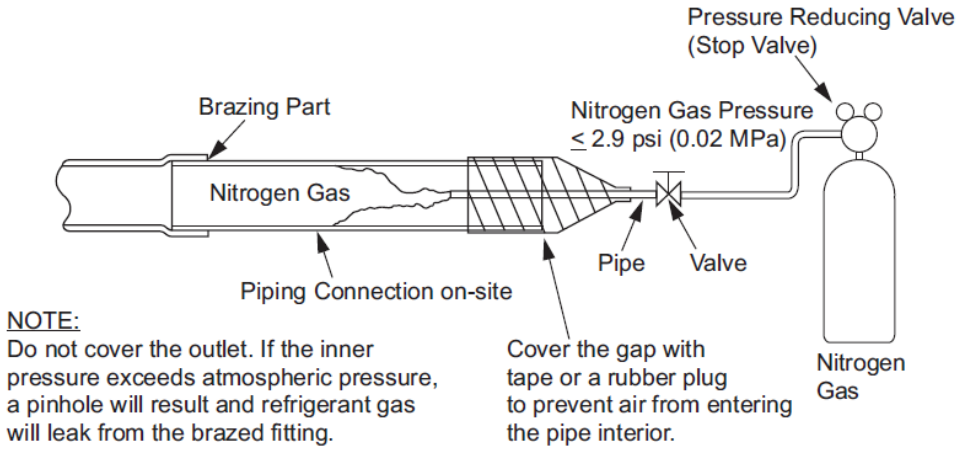
NOTES:

- Do not use the pipe with 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) Washing the weld joints to remove all flux completely after completing brazing work.

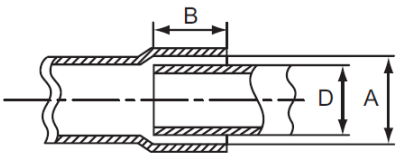
NOTE:

- 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	

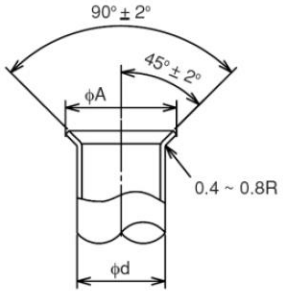


(8) Cautions for Flaring Work

(A) Perform the flaring work as shown below:

Unit: mm

Diameter (Φd)	$A^{+0}_{-0.4}$ R410A
6.35	9.1
9.52	13.2
12.7	16.6
15.88	19.7
19.05	(*)



(*): 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

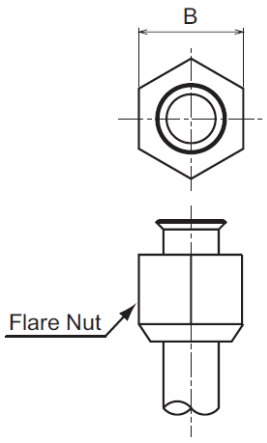
Unit: mm

Diameter(Φd)	R410A
6.35	0.5
9.52	0.6
12.7	0.7
15.88	0.8
19.05	0.8

Flare Nut Dimension B

Unit: mm

Diameter(Φd)	R410A
6.35	17
9.52	22
12.7	26
15.88	29
19.05	36

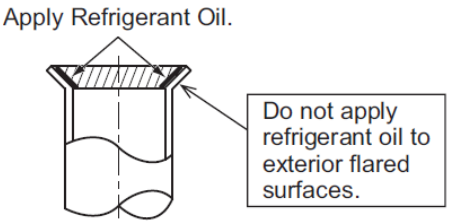


NOTE:

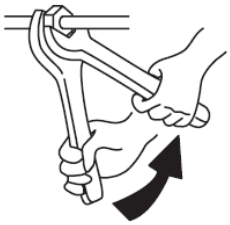
◆ Do not use a thin joint other than the ones shown in the table above.

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

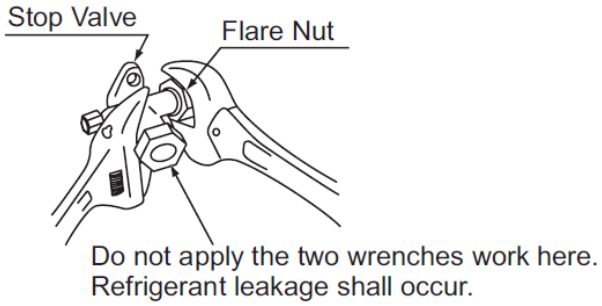
(D) Apply a little of refrigerant oil (field-supplied) on the flare surface of the pipe and flare nut before performing flaring work. Tighten the flare nut to specified torque settings using two wrenches. Perform flaring work to the liquid piping side before treating the gas piping side. Verify that 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

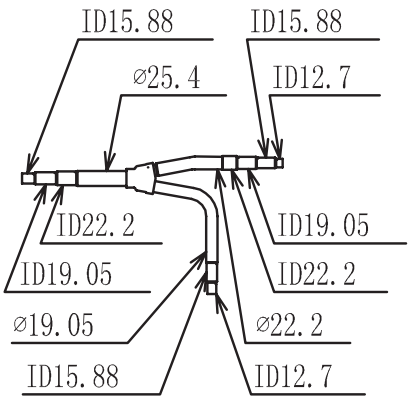
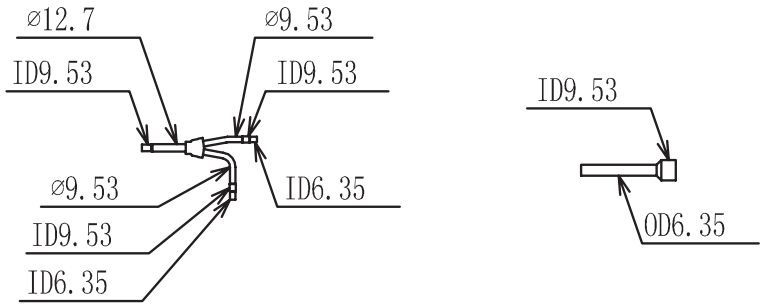
Pipe Diameter(mm)	Tightening Torque
Φ6.35mm	20 N • m
Φ9.52mm	40 N • m
Φ12.7mm	60 N • m
Φ15.88mm	80 N • m
Φ19.05mm	100 N • m

2.16.2 Model of Branch Pipe

(1) E-102SN

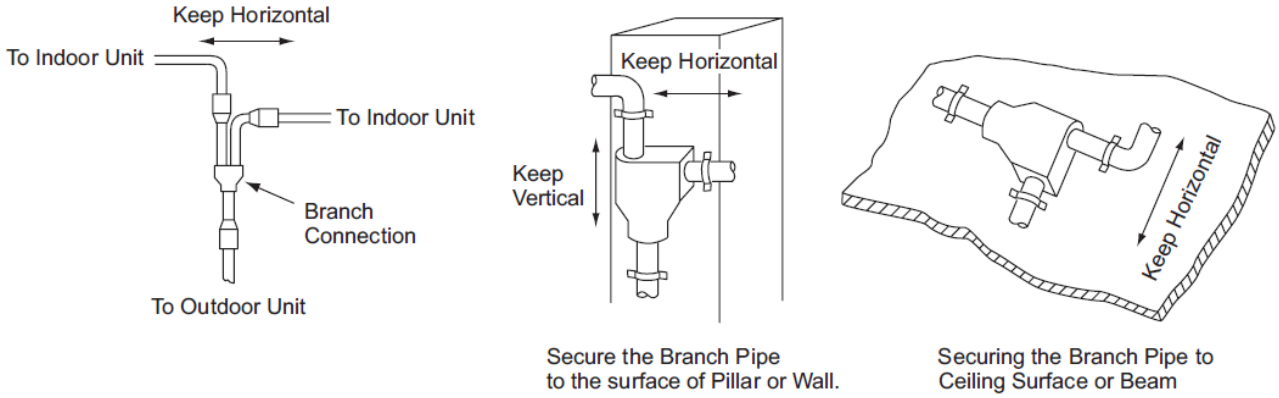
The model of E-102SN branch pipe is used for the model of RAS-3.0~7.0HNSKQ outdoor unit.

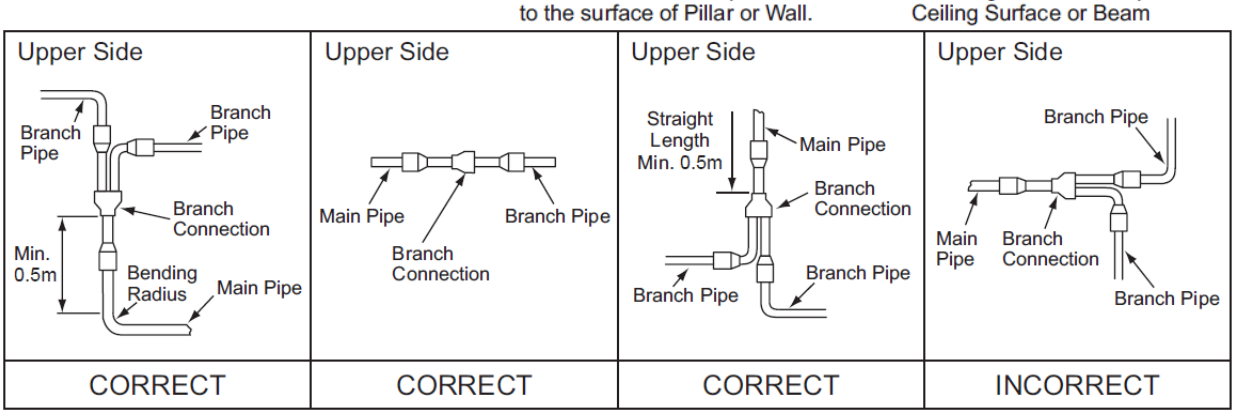
Unit: mm

Model	E-102SN for RAS-3.0~7.0HNSKQ
Gas Pipe	
Liquid Pipe	

(3) Precaution for branch pipe connection

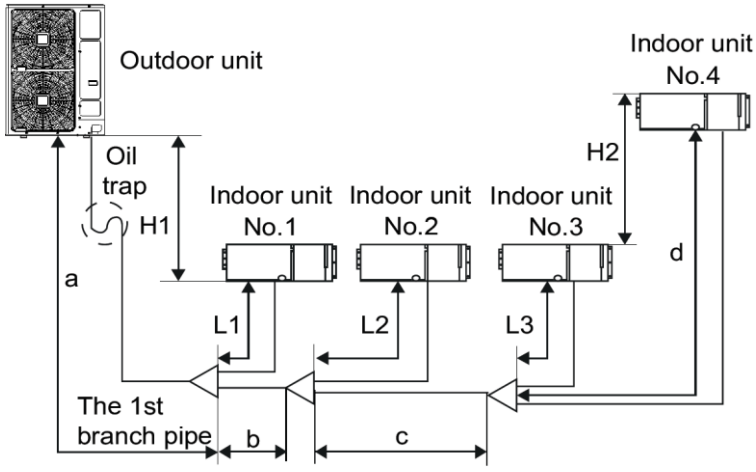
Use the branch pipe to connect the outdoor/indoor units. Mounted the branch pipes to a pillar, a wall, or a ceiling. Keep the inlet pipe of the branch pipe straight, and the length of the straight pipe is no less than 0.5 meter.





2.16.3 Refrigerant Piping Size

Example of connection: connection of 4 indoor units.



Piping Size of Main Pipe

Model	Stop Valve(mm)		Pipe between the outdoor unit and the 1st branch pipe; The pipes between the branch pipes.		
	Gas	Liquid	Gas	Liquid	Marks
RAS-3.0~7.0HNSKQ	Φ15.88	Φ9.52	Φ15.88	Φ9.52▲	a; b; c

NOTE:

◆ Mark "▲" represent that if the liquid pipe which between the outdoor unit and the 1st 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.

Table 4.2 Piping Size of Indoor Unit

Indoor Unit Type	Model	Gas Pipe(mm)	Liquid Pipe (mm)	Marks
Compact Ducted Medium ESP Ducted High ESP Ducted	18~45	Φ12.7	Φ6.35	L1; L2; L3; d
	50~56	Φ15.88	Φ6.35	L1; L2; L3; d
	63~160	Φ15.88	Φ9.52	L1; L2; L3; d
Round-way Cassette	22~63	Φ12.7	Φ6.35	L1; L2; L3; d
	71~160	Φ15.88	Φ9.52	L1; L2; L3; d

Table 4.3 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-3.0~4.0HNSKQ	≤25 meters
			RAS-4.5~6.0HNSKQ	≤60 meters
			RAS-6.5~7.0HNSKQ	≤75 meters
	Total liquid pipe length	a+b+c+d+L1+ L2+L3	RAS-3.0HNSKQ	≤30 meters
			RAS-3.5~4.0HNSKQ	≤40 meters
			RAS-4.5~6.0HNSKQ	≤70 meters
			RAS-6.5~7.0HNSKQ	≤120 meters
	Between the 1st branch pipe and the farthest indoor unit	b+c+d	RAS-3.0~4.0HNSKQ	≤20 meters
			RAS-4.5~7.0HNSKQ	≤30 meters
	Between branch pipes and connected indoor units	L1，L2，L3，d		≤10 meters
Allowable Height Difference	Outdoor unit is higher than indoor unit	H1	RAS-3.0~4.0HNSKQ	≤20 meters
			RAS-4.5~7.0HNSKQ	≤30 meters
	Outdoor unit is lower than indoor unit	H1	RAS-3.0~6.0HNSKQ	≤20 meters
			RAS-6.5~7.0HNSKQ	≤30 meters
	Height difference between indoor units	H2	RAS-3.0~4.0HNSKQ	≤3.5 meters
			RAS-4.5~7.0HNSKQ	≤10 meters
Others	The model of branch pipe▲	RAS-3.0~6.0HNSKQ		E-102SN
		RAS-6.5~7.0HNSKQ		
	Setting requirement for oil trap	When the gas pipe is lifted over than 10meters interval, one oil trap should be set.		

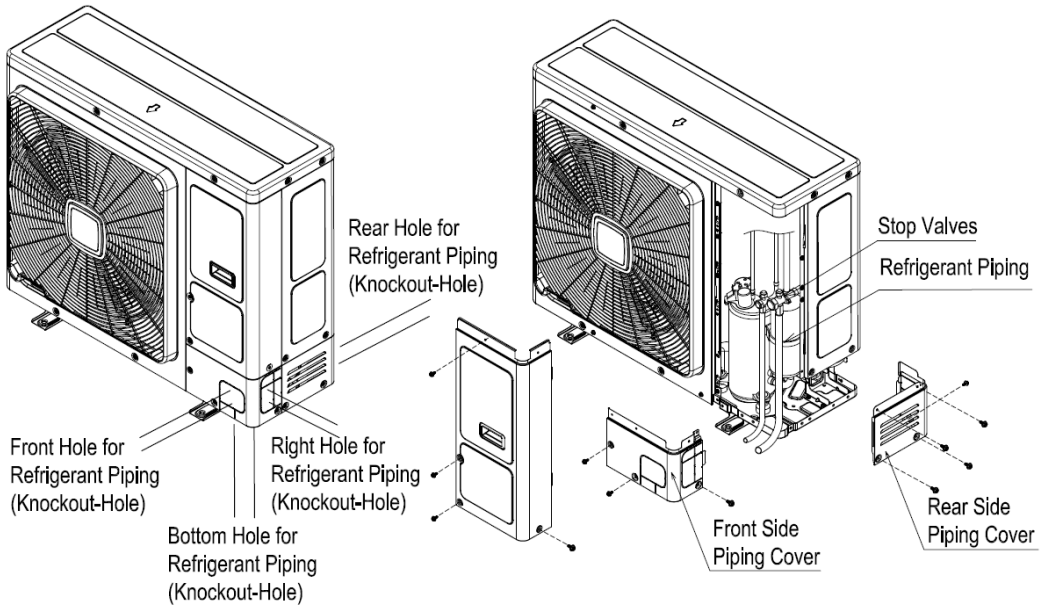
NOTE:

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

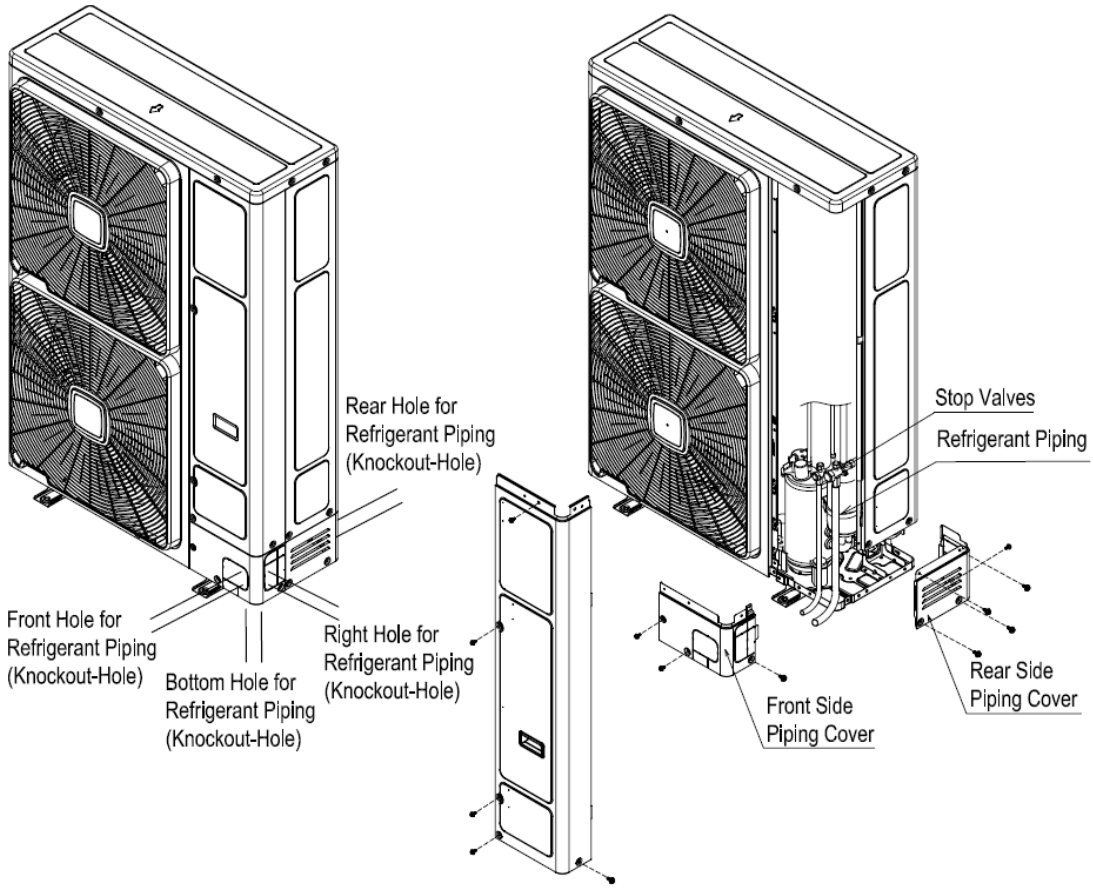
2.16.4 Refrigerant Piping Work for Outdoor Unit

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

Model: RAS-3.0~6.0HNSKQ



Model: RAS-6.5~7.0HNSKQ



NOTE:

- Mark "※" represent that there is a pipe adapter in the outdoor unit, which is used to converting the gas pipe between the outdoor unit and the first branch.

Attention for Removing Service Cover

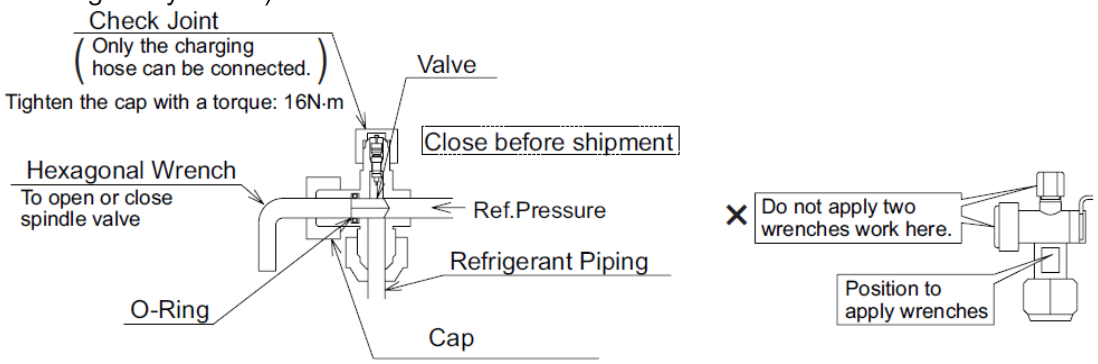
– Procedures of Removing Cover –

1) 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.

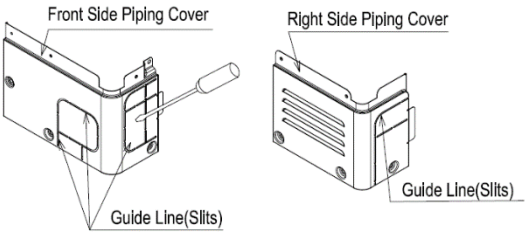
2) Slowly push the service cover downward.

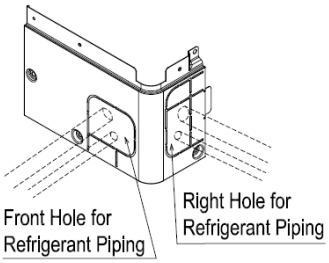
(2) Securely use two wrenches at the following position when removing or installing the pipe. (If not, refrigerant leakage may occur.)



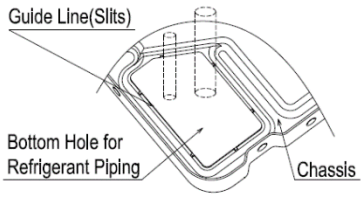
Controlling torque of hexagonal wrench		
Model	Gas side stop valve	Liquid side stop valve
RAS-3.0~7.0HNSKQ	11~14 N·m	7~9 N·m

(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.

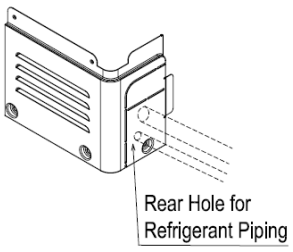




(a)Front and Right Side Piping Work



(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. (Field-supplied).
- Prevent the cables contacting with 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 entering the unit. Completely seal the penetration parts of the pipes with field-supplied insulation in order to prevent rain water entering 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 the 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

<table>
<tr><th>Model</th><th>Item</th><th colspan="5">Contents</th><th>Total Additional Charge</th></tr>
<tr><td rowspan="5">RAS-3.0~6.0 HNSKQ</td><td rowspan="4">For the refrigerant pipes</td><td>Pipe diameter</td><td>Symbol</td><td>Total length of liquid piping (meter)</td><td>Refrigerant charge per meter</td><td>Additional charge (kg)</td><td rowspan="4">W=W11+W12 +W13</td></tr>
<tr><td>Φ6.35</td><td>W11=</td><td></td><td>×0.020kg/m=</td><td></td></tr>
<tr><td>Φ9.52</td><td>W12=</td><td></td><td>×0.050kg/m=</td><td></td></tr>
<tr><td>Φ12.7</td><td>W13=</td><td></td><td>×0.085kg/m=</td><td></td></tr>
<tr><td>For the Indoor units</td><td colspan="5">0</td></tr>
<tr><td rowspan="9">RAS-6.5~7.0 HNSKQ</td><td rowspan="4">For the refrigerant pipes</td><td>Pipe diameter</td><td>Symbol</td><td>Total length of liquid piping (meter)</td><td>Refrigerant charge per meter</td><td>Additional charge (kg)</td><td rowspan="9">W=W11+W12 +W13+W21 +W22+W23</td></tr>
<tr><td>Φ6.35</td><td>W11=</td><td></td><td>×0.020kg/m=</td><td></td></tr>
<tr><td>Φ9.52</td><td>W12=</td><td></td><td>×0.059kg/m=</td><td></td></tr>
<tr><td>Φ12.7</td><td>W13=</td><td></td><td>×0.120kg/m=</td><td></td></tr>
<tr><td rowspan="4">For the round-way cassette indoor units</td><td>Model</td><td>Symbol</td><td>Numbers (Q’ty)</td><td>Refrigerant charge per unit</td><td>Additional charge (kg)</td></tr>
<tr><td>28~45</td><td>W21=</td><td></td><td>×0.23kg/pcs=</td><td></td></tr>
<tr><td>50~71</td><td>W22=</td><td></td><td>×0.29kg/pcs=</td><td></td></tr>
<tr><td>80~160</td><td>W23=</td><td></td><td>×0.47kg/pcs=</td><td></td></tr>
<tr><td>For the other indoor units</td><td colspan="5">0</td></tr>
</table>

NOTE:

◆ Ensure the total additional charge should not exceed the max. additional refrigerant charge quantity.

(2) Max. Additional Refrigerant Charge Quantity

Outdoor Unit	RAS-3.0~ 4.0HNSKQ	RAS-4.5~ 6.0HNSKQ	RAS-6.5~ 7.0HNSKQ
Max. Additional Refrigerant Charge Quantity (kg)	3.1	2.7	7.9

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

Outdoor Unit	W_0（kg）
RAS-3.0HNSKQ	2.5
RAS-3.5~4.0HNSKQ	3.1
RAS-4.5~6.0HNSKQ	4.0
RAS-6.5HNSKQ	5.5
RAS-7.0HNSKQ	5.9

NOTE:

◆ W0 is outdoor unit refrigerant charge before shipment.

(4) Record of Additional Charge

OUTDOOR UNITS

The total refrigerant charge of the system should be calculated in the following formula.

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

2.18 Electrical Wiring

⚠ WARNING

- Turn off the main power switch to 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 from rats or other small animals. If not, rats may gnaw at unprotected parts and which may lead to a fire.
- Avoid the wirings from 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 table next page. 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 cause a 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.

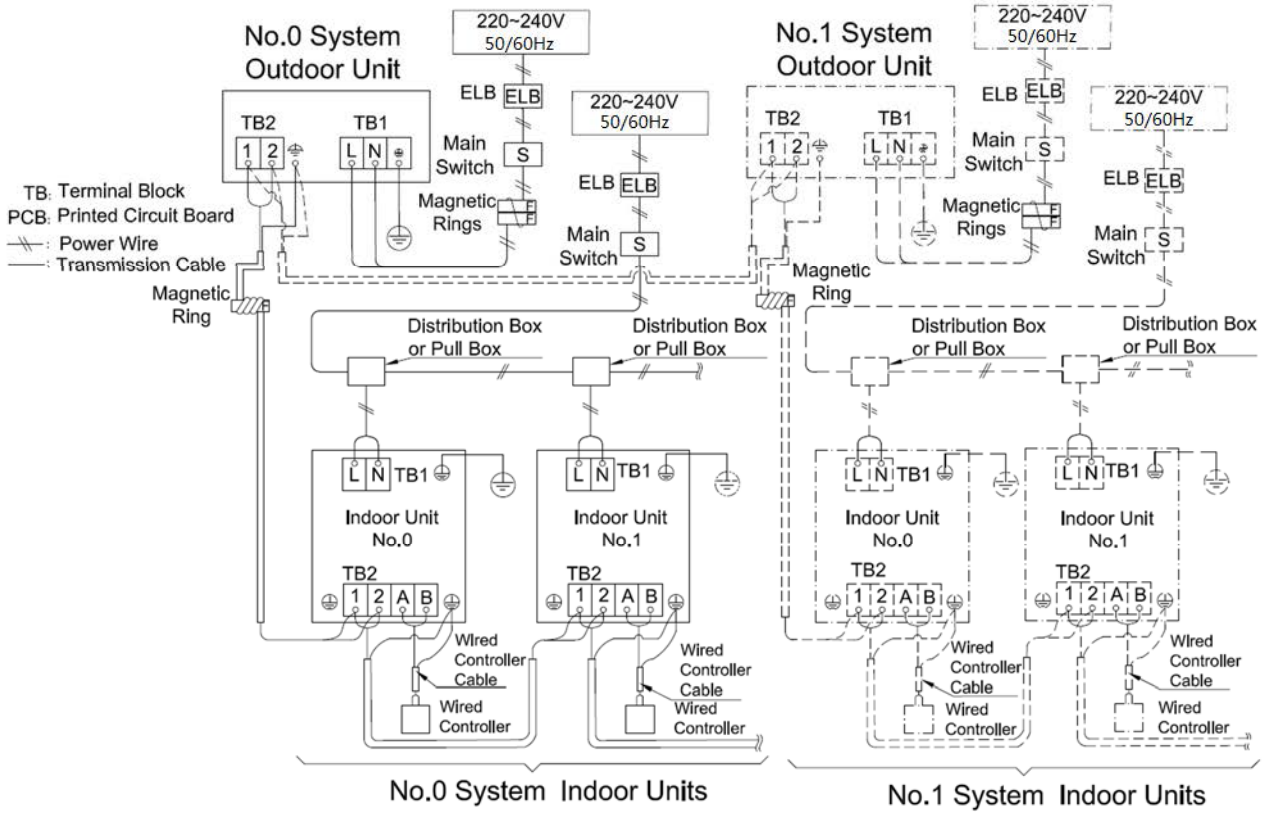
In the instances mentioned above, an induction surge of the power supply wiring for the air conditioning could occur due to a rapid change in electricity consumption of the device and activation of the switch. Therefore, check the field regulations and standards before performing electrical work in order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

Recommended Electrical Characteristics

Model	Power Supply	Rated Ampacity (A)	Power Supply Wiring (Cores×mm²)	Transmission cable (Cores×mm²)	ELB	
					Rated Ampacity (A)	Rated Sensitive Ampacity (mA)
RAS-3.0~4.0HNSKQ	220~240V 1Ph/50/60Hz	25	3×4.0	2×0.75	32	30
RAS-4.5HNSKQ	220~240V 1Ph/50/60Hz	30	3×6.0	2×0.75	40	30
RAS-5.0HNSKQ	220~240V 1Ph/50/60Hz	31	3×6.0	2×0.75	40	30
RAS-6.0HNSKQ	220~240V 1Ph/50/60Hz	33	3×10.0	2×0.75	40	30
RAS-6.5HNSKQ	220~240V 1Ph/50/60Hz	32	3×10.0	2×0.75	40	30
RAS-7.0HNSKQ	220~240V 1Ph/50/60Hz	32	3×10.0	2×0.75	40	30

2.18.2 Electrical Wiring Connection

Connect the electrical wiring according to the following figures:



Electrical Wiring Connection for RAS-3.0~7.0HNSKQ

(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-3.0~7.0HNSKQ outdoor units, the magnetic rings in the package of the outdoor unit should be used on the power supply wire、transmission cable and ground wire.

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

(5) The transmission cable should 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 devices. If it 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:

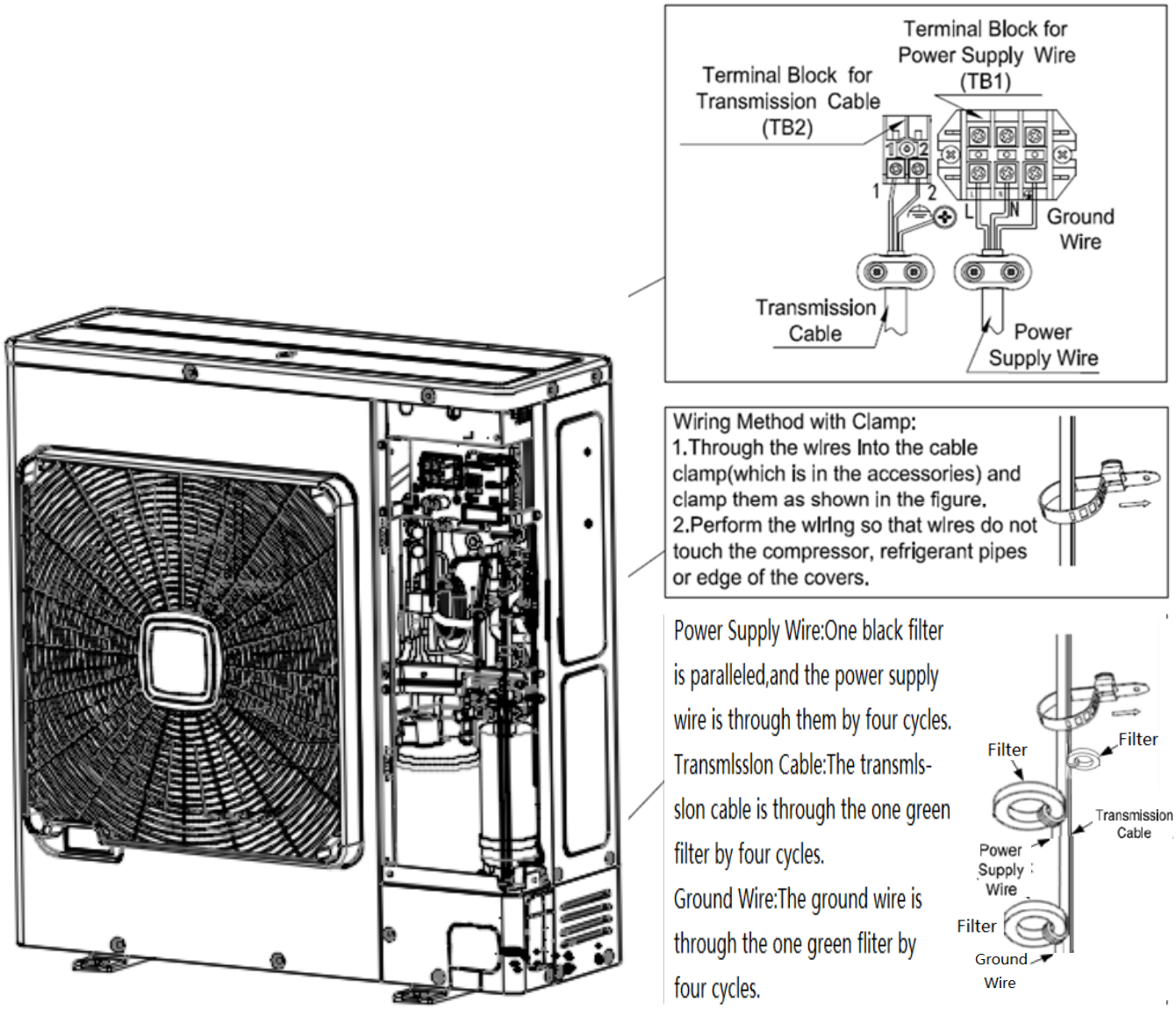
Size	Tightening Torque
M4	1.0~1.3 N·m
M5	2.0~2.5 N·m
M6	4.0~5.0 N·m
M8	9.0~11.0 N·m
M10	18.0~23.0 N·m

⚠ WARNING

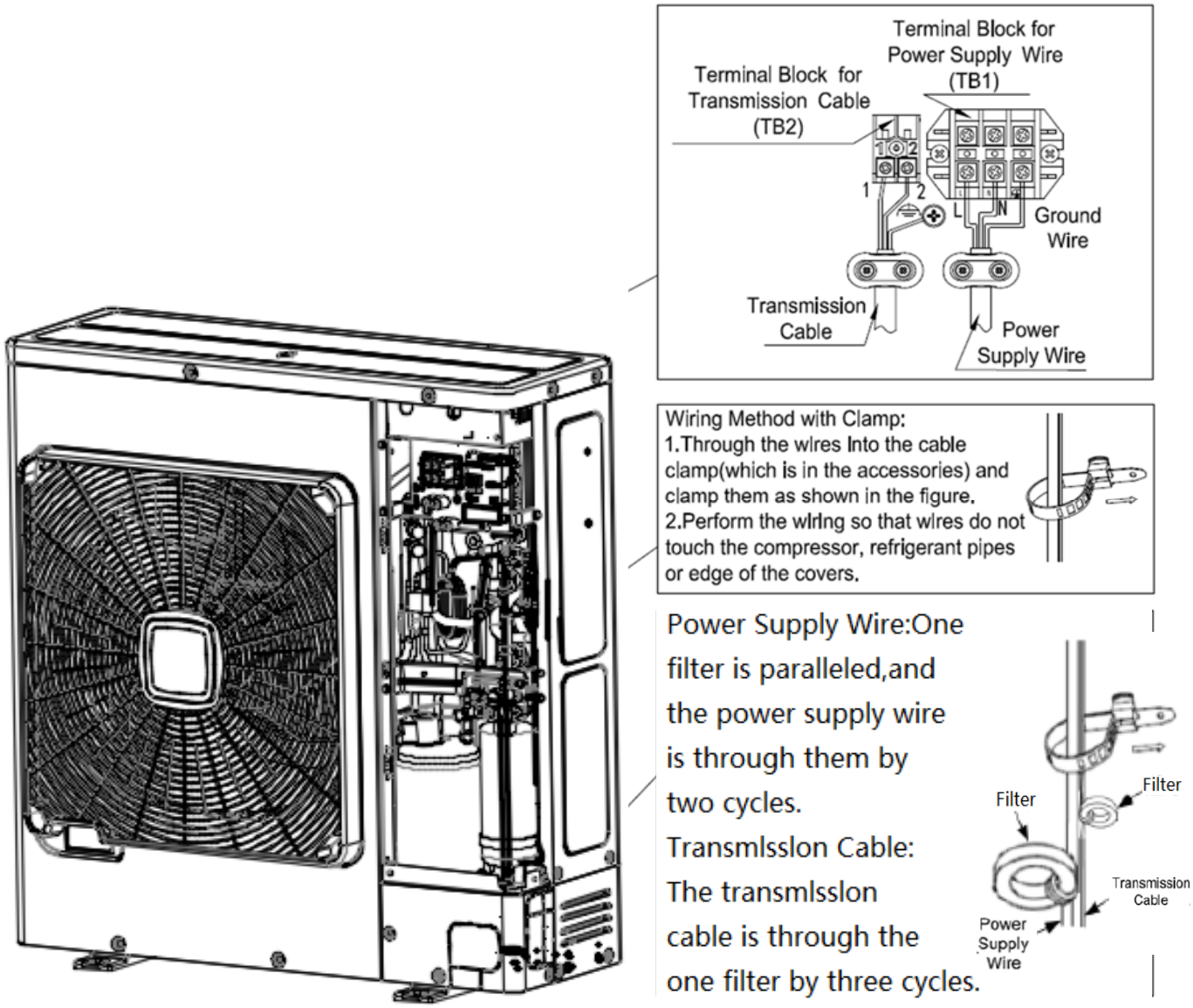
- The ELB (Earth leakage breaker), FUSE and S (Main switch) must be installed to each power source of outdoor unit and indoor units. If not, it may cause of an electrical shock or fire.
- Perform the electrical work according to the regulations of each region and this installation and maintenance manual. 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.
-

2.18.3 Electrical Wiring for Outdoor Unit

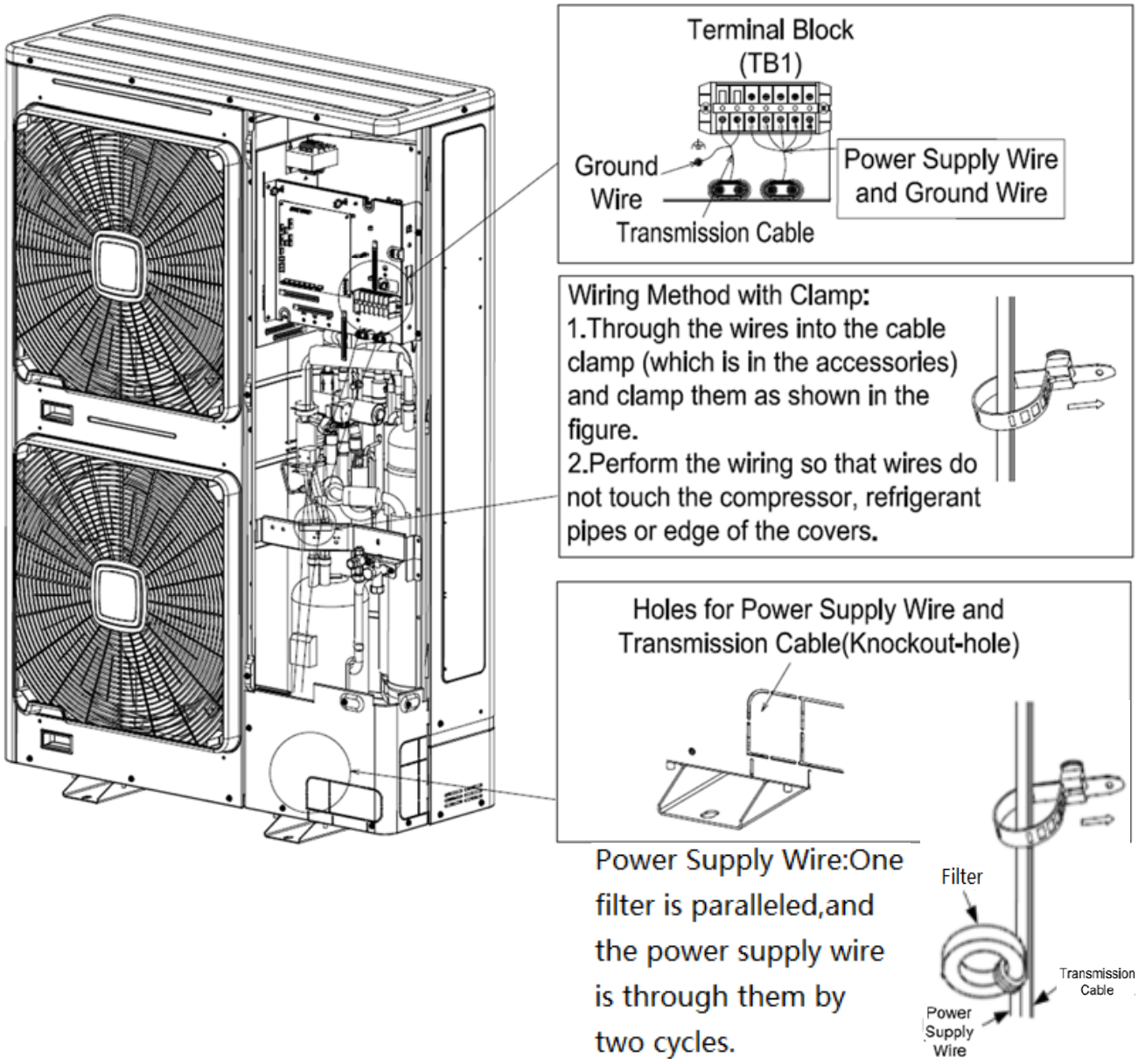
Avoid the wirings from touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not, the wirings will be damaged and a fire may be happened.



Electrical Wiring for RAS-3.0~4.0HNSKQ



Electrical Wiring for RAS-4.5~6.0HNSKQ



Electrical Wiring for RAS-6.5~7.0HNSKQ

NOTE:

(1) 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.

(2) 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.

(3) 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	
25<I≤32	6	
32<I≤40	10	
40<I≤63	16	
63<I	※1	

(4) The power supply wire should be stranded copper with shielding by neoprene.

(5) The transmission cables must be made up of the shielded twist pair cabling, and the shielded should be connected to the ground.

(6) If the power supply wiring or the transmission cable is damaged, please turn off the power supply and contact the service dealer.

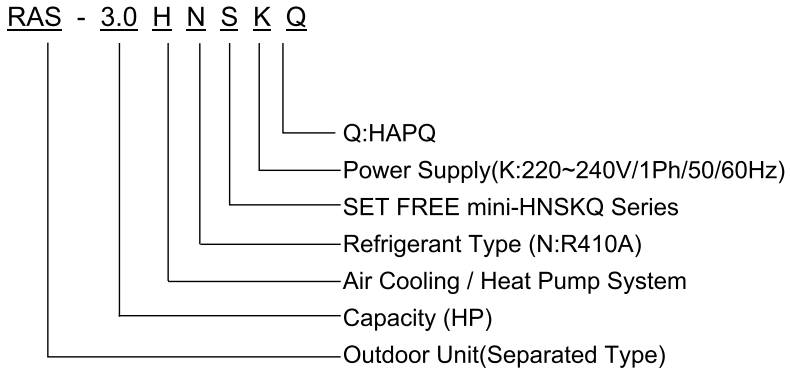
(7) A switch that can ensure all-pole disconnection shall be installed between power supply and air conditioning unit in such a manner that the contact spacing shall not be less than 3mm.

(8) When connect 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



3.2 Selection Guide

(1) Given Condition (Example)

◆ Estimated Load

Item		Room 1	Room 2	Room 3
Estimated Cooling Load	kW	3.5	3.5	4.1
Estimated Heating Load	kW	3.3	3.3	4.0

◆ 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		RPIZ-1.5FS N1Q	RPIZ-1.5FS N1Q	RPIZ-1.8FS N1Q	
Nominal Cooling Capacity	kW	4.4	4.4	5.2	14.0
Nominal Heating Capacity	kW	4.9	4.9	5.6	15.4

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

(3) Actual Capacity

In the example, the total indoor unit capacity is 14.0kW, and outdoor unit capacity is 14.0kW.

Therefore, the connected indoor unit capacity ratio is 100%.

(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	14.0kW	12.6/14	0.87	1.0	0.97
Heating	15.4kW	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 = 14×(12.6/14) ×1.0× 0.97= 12.2kW

Heating = 15.4 ×(15.5/16) ×0.96 ×0.95 ×0.97 = 13.2kW

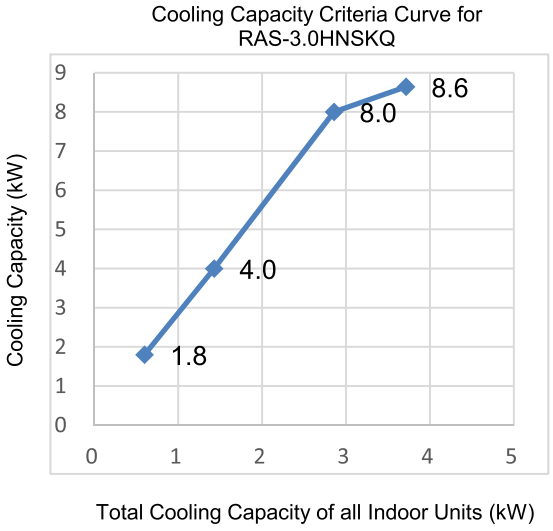
(B) Actual Capacity of Each Indoor Unit

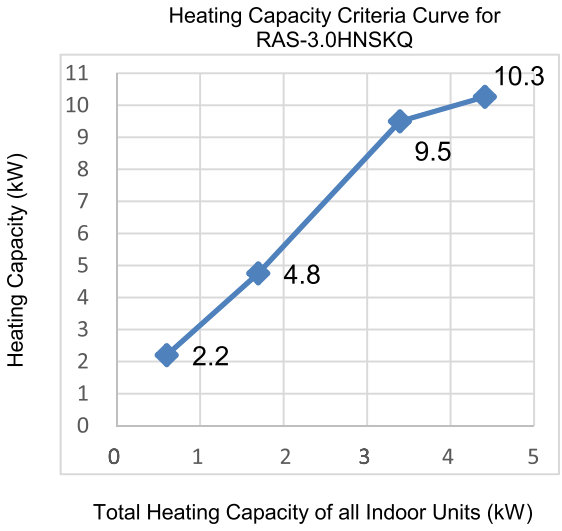
Actual Capacity of Each Indoor Unit= Actual Capacity of Outdoor Unit × Each Indoor Unit Capacity ÷ Summation of Indoor Units Capacity

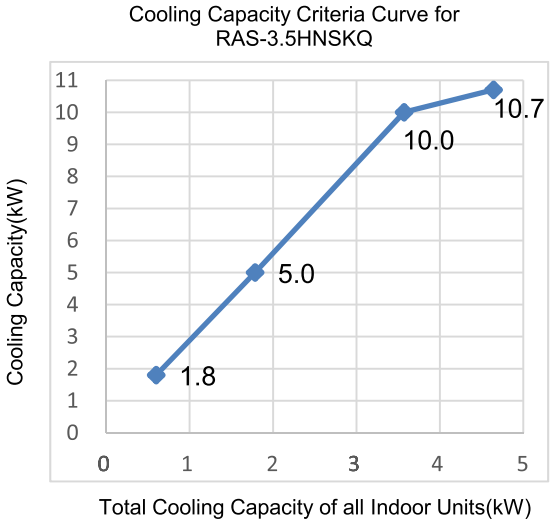
Result:

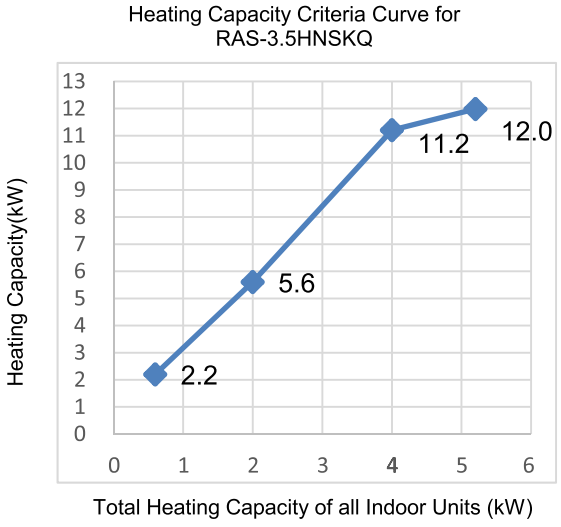
Item			Room 1	Room 2	Room 3	Total
Selected Model			RPIZ-1.6HN GUAQ	RPIZ-1.6HN GUAQ	RPIZ-1.8HN GUAQ	
Actual Capacity	Actual Maximum Cooling Capacity	kW	3.9	3.9	4.4	12.2
	Actual Maximum Heating Capacity	kW	4.2	4.2	4.7	13.1
Design Load	Estimated Cooling Load	kW	3.5	3.5	4.1	11.1
	Estimated Heating Load	kW	3.3	3.3	4.0	10.6

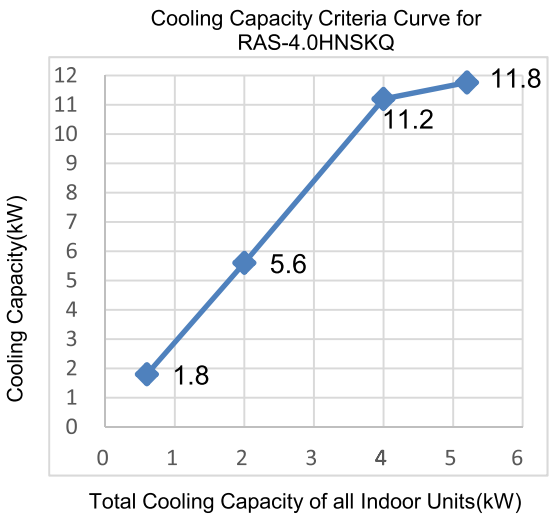
3.3 Outdoor Unit Capacity According to Connected IDU Capacity Ratio

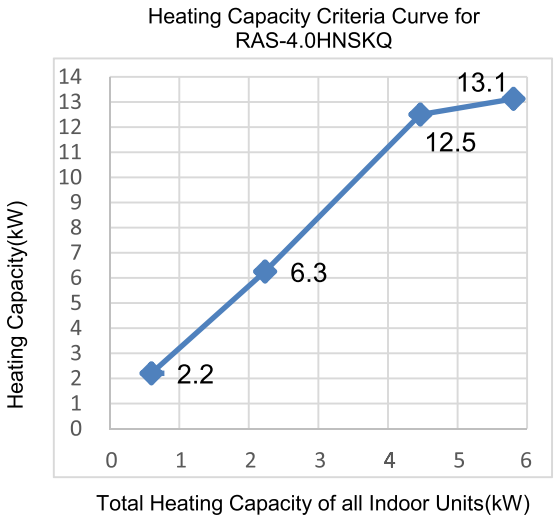




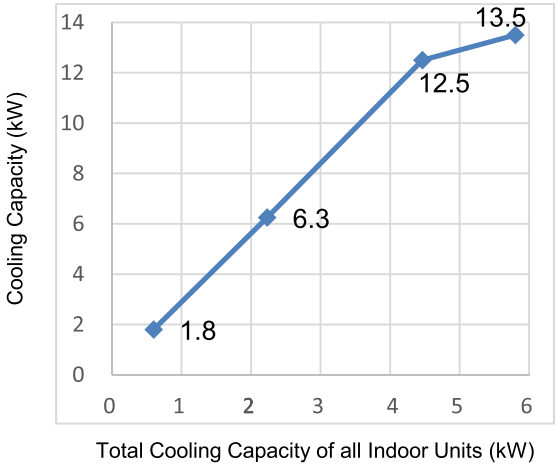




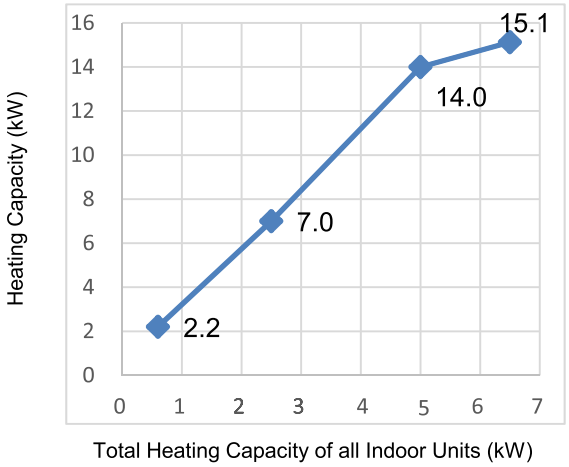




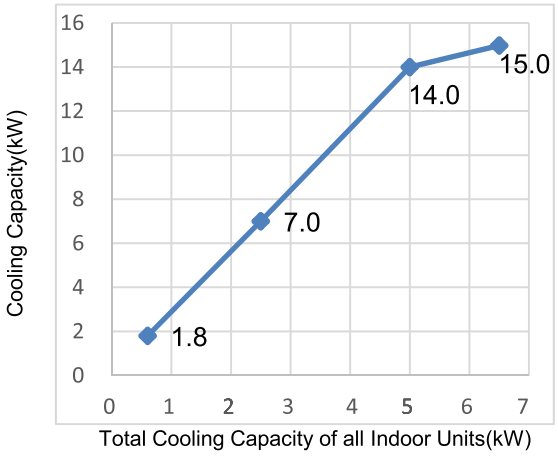
Cooling Capacity Criteria Curve for RAS-4.5HNSKQ



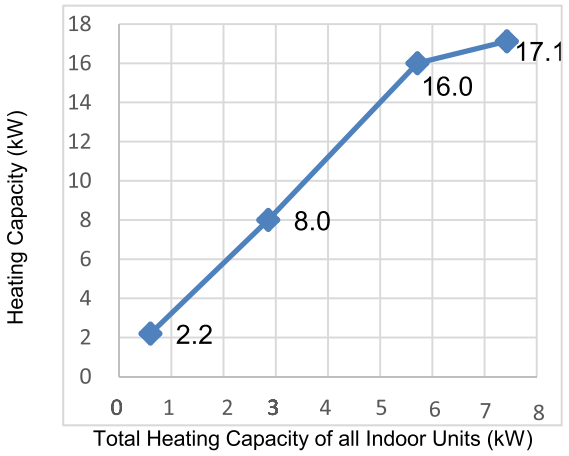
Heating Capacity Criteria Curve for RAS-4.5HNSKQ



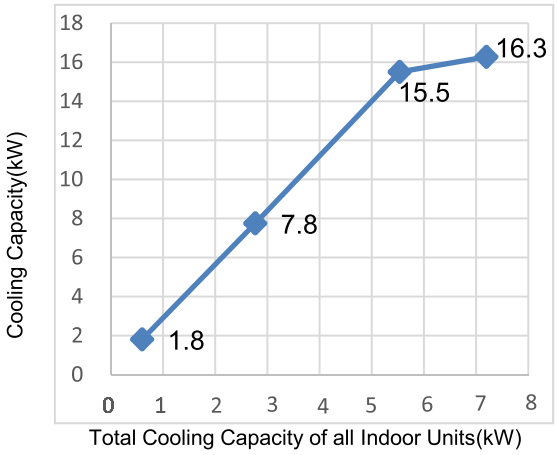
Cooling Capacity Criteria Curve for RAS-5.0HNSKQ



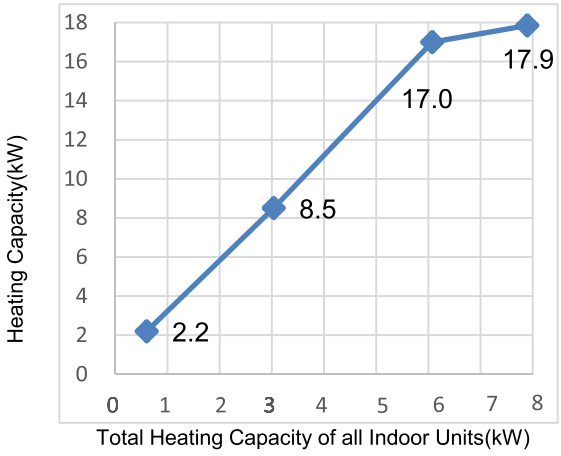
Heating Capacity Criteria Curve for RAS-5.0HNSKQ



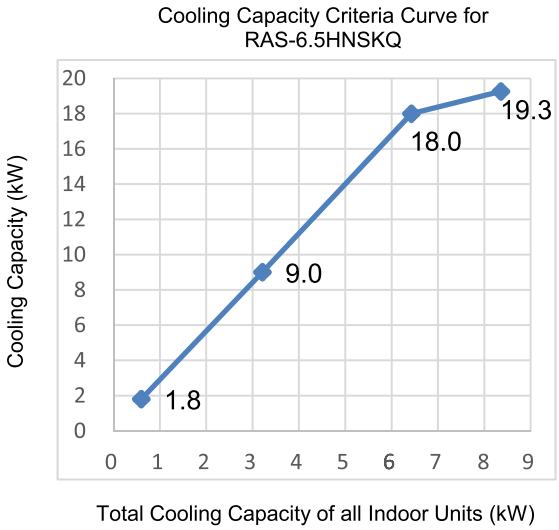
Cooling Capacity Criteria Curve for RAS-6.0HNSKQ

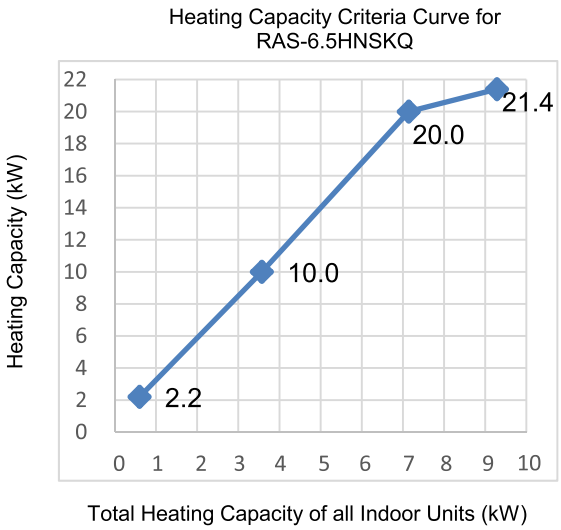


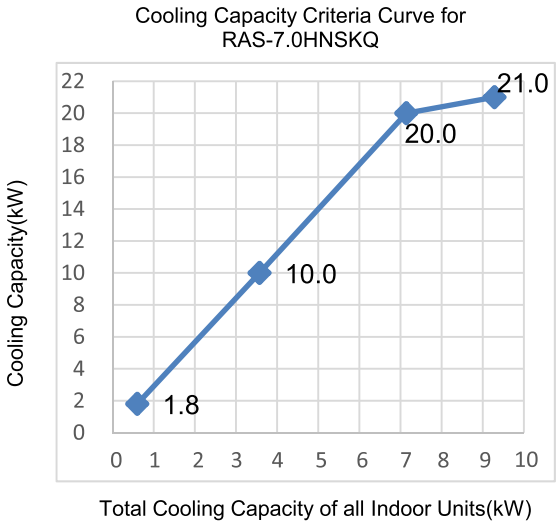
Heating Capacity Criteria Curve for RAS-6.0HNSKQ

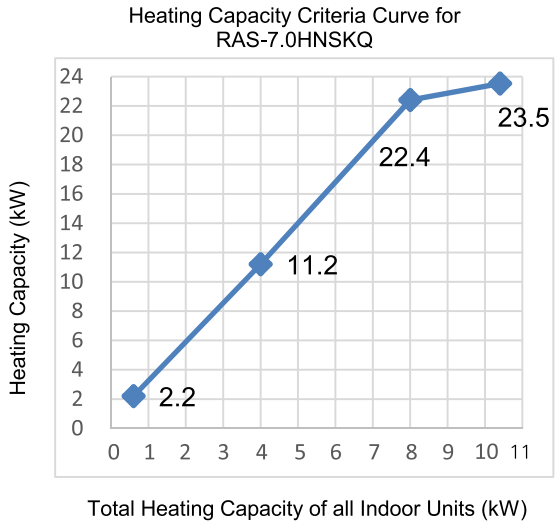


SELECTION DATA









NOTES:

(1)The capacity are tested under the following working conditions.

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

3.4 Outdoor Unit Capacity According to Temperature Condition

◆ Cooling

Table1：Cooling Capacity for RAS–3.0HNSKQ

Unit:kW

Outdoor Temperature °C DB	Indoor airlet temperature ° C WB								
	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0
25	7.1	7.6	8.1	8.7	9.2	9.6	9.9	10.3	10.7
28	7.0	7.5	8.0	8.6	9.1	9.5	9.8	10.2	10.6
30	7.0	7.5	8.0	8.5	9.0	9.4	9.8	10.2	10.6
35	6.4	6.8	7.2	7.6	8.0	8.3	8.5	8.7	8.9
40	6.0	6.3	6.5	6.9	7.2	7.4	7.5	7.7	7.8

Table2：Cooling Capacity for RAS–3.5HNSKQ

Unit:kW

Outdoor Temperature °C DB	Indoor airlet temperature ° C WB								
	15	16	17	18	19	20	21	22	23
25	8.8	9.5	10.1	10.8	11.4	11.9	12.4	12.9	13.4
28	8.8	9.4	10.0	10.7	11.3	11.8	12.3	12.8	13.3
30	8.8	9.4	10.0	10.7	11.3	11.8	12.3	12.8	13.2
35	8.0	8.5	9.0	9.5	10.0	10.3	10.6	10.9	11.2
40	7.5	7.9	8.2	8.6	8.9	9.2	9.4	9.6	9.8

Table3：Cooling Capacity for RAS–4.0HNSKQ

Unit:kW

Outdoor Temperature °C DB	Indoor airlet temperature ° C WB								
	15	16	17	18	19	20	21	22	23
25	9.4	10.1	10.8	11.5	12.2	12.9	13.5	14.2	14.8
28	9.3	10.0	10.7	11.4	12.1	12.7	13.3	14.0	14.6
30	9.3	10.0	10.6	11.3	12.0	12.6	13.2	13.9	14.5
35	8.9	9.5	10.1	10.7	11.2	11.7	12.1	12.6	13.0
40	8.3	8.8	9.3	9.8	10.3	10.6	10.8	11.0	11.2

Table4：Cooling Capacity for RAS–4.5HNSKQ

Unit:kW

Outdoor Temperature °C DB	Indoor airlet temperature ° C WB								
	15	16	17	18	19	20	21	22	23
25	11.2	11.6	12.1	12.5	13.0	13.5	13.9	14.4	14.8
28	11.1	11.5	12.0	12.4	12.9	13.4	13.8	14.3	14.7
30	11.0	11.5	12.0	12.4	12.9	13.3	13.8	14.3	14.7
35	10.7	11.1	11.6	12.0	12.5	13.0	13.4	13.9	14.3
40	10.3	10.7	11.1	11.6	12.0	12.3	12.6	12.9	13.1

Table5：Cooling Capacity for RAS–5.0HNSKQ

Unit:kW

Outdoor Temperature °C DB	Indoor airlet temperature ° C WB								
	15	16	17	18	19	20	21	22	23
25	12.8	13.3	13.8	14.3	14.8	15.3	15.8	16.4	16.9
28	12.6	13.1	13.6	14.1	14.6	15.1	15.7	16.2	16.7
30	12.4	12.9	13.4	13.9	14.4	15.0	15.5	16.0	16.5
35	12.1	12.6	13.0	13.5	14.0	14.5	15.0	15.4	15.9
40	11.5	12.0	12.5	12.9	13.4	13.9	14.4	14.8	15.3

SELECTION DATA

Table6：Cooling Capacity for RAS–6.0HNSKQ Unit:kW

Outdoor Temperature °C DB	Indoor airlet temperature ° C WB								
	15	16	17	18	19	20	21	22	23
25	13.8	14.4	15.0	15.6	16.1	16.7	17.3	17.8	18.4
28	13.7	14.3	14.9	15.5	16.0	16.6	17.2	17.7	18.3
30	13.7	14.3	14.8	15.4	16.0	16.5	17.1	17.7	18.2
35	13.2	13.8	14.4	14.9	15.5	16.1	16.6	17.2	17.8
40	12.7	13.3	13.8	14.4	14.9	15.2	15.6	15.9	16.3

Table7：Cooling Capacity for RAS–6.5HNSKQ Unit:kW

Outdoor Temperature °C DB	Indoor airlet temperature ° C WB								
	15	16	17	18	19	20	21	22	23
25	15.2	16.1	17.0	18.0	18.9	19.5	20.1	20.7	21.3
28	15.1	16.0	16.9	17.9	18.8	19.4	20.0	20.6	21.2
30	15.1	16.0	16.9	17.9	18.8	19.4	19.9	20.5	21.1
35	14.8	15.6	16.4	17.2	18.0	18.6	19.1	19.7	20.2
40	14.2	15.0	15.7	16.5	17.3	17.8	18.2	18.7	19.1

Table8：Cooling Capacity for RAS–7.0HNSKQ 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
28	19.3	19.8	20.5	21.0	21.6	22.2	22.8	23.5	24.1
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

◆ Heating

Table1： Heating Capacity for RAS–3.0HNSKQ

Unit:kW

Outdoor Temperature °C WB	Indoor airlet temperature ° C DB							
	15	16	18	20	22	24	26	28
–20	5.8	5.7	5.6	5.5	5.4	5.2	5.1	5.0
–15	6.2	6.1	5.9	5.8	5.6	5.6	5.5	5.4
–10	6.4	6.3	6.2	6.1	6.0	5.9	5.8	5.7
–5	6.7	6.6	6.6	6.5	6.4	6.3	6.2	6.1
0	7.7	7.6	7.5	7.5	7.4	7.3	7.2	7.1
5	9.0	8.9	8.8	8.7	8.6	8.5	8.5	8.4
6	9.0	9.0	9.1	9.1	9.1	8.9	8.8	8.6
10	10.6	10.5	10.4	10.2	10.1	10.0	9.8	9.8
15	12.2	12.1	12.0	11.9	11.6	11.3	11.0	10.6

Table2： Heating Capacity for RAS–3.5HNSKQ

Unit:kW

Outdoor Temperature °C WB	Indoor airlet temperature ° C DB							
	15	16	18	20	22	24	26	28
–20	6.0	5.9	5.8	5.7	5.5	5.4	5.3	5.2
–15	6.5	6.4	6. 3	6.1	5.9	5.8	5.8	5.7
–10	6.9	6.8	6.7	6.6	6.5	6.3	6.2	6.1
5	8.2	8.1	8.0	7.9	7.8	7.6	7.5	7.4
0	9.4	9.3	9.2	9.1	9.0	8.9	8.8	8.7
5	10.9	10.8	10.7	10.6	10.5	10.4	10.3	10.3
6	11.9	11.8	11.7	11.2	11.0	10.8	10.7	10.6
10	12.9	12.8	12.7	12.5	12.3	12.2	12.0	11.9
15	14.9	14.8	14.7	14.6	14.2	13.8	13.4	12.9

Table3： Heating Capacity for RAS–4.0HNSKQ

Unit:kW

Outdoor Temperature °C WB	Indoor airlet temperature ° C DB							
	15	16	18	20	22	24	26	28
–20	7.3	7.2	7.1	7.0	6.8	6.7	6.4	6.2
–15	8.0	7.9	7.7	7.5	7.4	7.2	6.9	6.6
–10	8.7	8.6	8.4	8.3	8.1	7.9	7.5	7.1
5	9.5	9.4	9.2	9.0	8.9	8.7	8.4	8.0
0	10.9	10.8	10.7	10.5	10.3	10.1	9.9	9.6
5	12.6	12.5	12.3	12.1	11.9	11.7	11.5	10.7
6	13.5	13.4	13.2	12.5	12.2	12.0	11.8	10.8
10	14.6	14.5	14.3	14.1	14.0	13.1	12.0	10.9
15	16.6	16.5	16.2	15.0	14.0	13.1	12.0	10.9

Table4： Heating Capacity for RAS–4.5HNSKQ

Unit:kW

Outdoor Temperature °C WB	Indoor airlet temperature ° C DB							
	15	16	18	20	22	24	26	28
–20	8.0	8.0	7.8	7.7	7.6	7.5	7.4	7.4
–15	8.7	8.7	8.5	8.4	8.3	8.3	8.2	8.2
–10	9.7	9.6	9.6	9.3	9.1	9.0	9.0	8.9
–5	10.6	10.6	10.5	10.5	10.5	10.5	10.5	10.5
0	12.2	12.2	12.1	12.1	12.0	11.9	11.9	11.8
5	13.9	13.9	13.8	13.7	13.6	13.5	13.4	13.2
6	14.1	14.1	14.1	14.0	13.9	13.7	13.6	13.2
10	15.4	15.4	15.3	15.2	15.0	14.8	14.1	13.2
15	16.0	16.0	15.9	15.9	15.9	15.7	14.6	13.2

SELECTION DATA

Table 5：Heating Capacity for RAS–5.0HNSKQ Unit:kW

Outdoor Temperature °C WB	Indoor airlet temperature ° C DB							
	15	16	18	20	22	24	26	28
–20	9.5	9.4	9.1	9.1	8.9	8.8	8.7	8.6
–15	10.0	9.9	9.7	9.6	9.4	9.4	9.3	9.1
–10	11.0	10.9	10.7	10.5	10.4	10.3	10.2	10.1
–5	12.2	12.1	12.1	12.0	11.9	11.9	11.9	11.8
0	14.0	13.9	13.9	13.8	13.7	13.6	13.5	13.4
5	15.9	15.9	15.8	15.7	15.5	15.3	15.2	15.1
6	16.3	16.3	16.2	16.0	15.8	15.7	15.5	15.2
10	17.8	17.7	17.5	17.4	17.3	17.0	16.1	15.1
15	18.5	18.3	18.1	18.0	17.8	17.5	16.4	15.1

Table6：Heating Capacity for RAS–6.0HNSKQ Unit:kW

Outdoor Temperature °C WB	Indoor airlet temperature ° C DB							
	15	16	18	20	22	24	26	28
–20	10.3	10.3	10.0	9.9	9.7	9.6	9.6	9.5
–15	11.2	11.2	11.0	10.8	10.7	10.6	10.6	10.5
–10	12.4	12.3	12.3	11.9	11.7	11.6	11.5	11.4
–5	13.6	13.6	13.5	13.5	13.5	13.5	13.5	13.5
0	15.7	15.7	15.6	15.5	15.4	15.3	15.3	15.2
5	17.9	17.9	17.8	17.7	17.5	17.3	17.2	17.0
6	18.2	18.2	18.2	18.0	17.8	17.6	17.5	16.9
10	19.8	19.8	19.7	19.5	19.3	19.1	18.1	17.0
15	20.5	20.5	20.5	20.4	20.4	20.2	18.8	17.0

Table7：Heating Capacity for RAS–6.5HNSKQ Unit:kW

Outdoor Temperature °C WB	Indoor airlet temperature ° C DB							
	15	16	18	20	22	24	26	28
–20	11.9	11.7	10.8	9.8	9.3	8.8	8.4	7.9
–15	12.3	12.1	11.7	11.4	11.0	10.3	9.6	8.9
–10	13.0	12.8	12.6	12.3	12.0	11.7	10.8	9.9
–5	15.4	15.2	14.9	14.6	14.3	13.9	13.2	12.4
0	17.9	17.7	17.3	17.0	16.6	16.2	15.6	15.0
5	20.4	20.2	19.8	19.4	18.9	18.5	18.1	17.7
6	21.8	21.2	20.9	20.0	19.6	19.2	19.0	18.6
10	23.2	23.0	22.8	22.5	22.3	22.0	21.8	21.3
15	26.2	25.9	25.7	25.5	25.0	24.5	23.2	22.0

Table8：Heating Capacity for RAS–7.0HNSKQ Unit:kW

Outdoor Temperature °C WB	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

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 x F

CCA: Actual Corrected Cooling Capacity

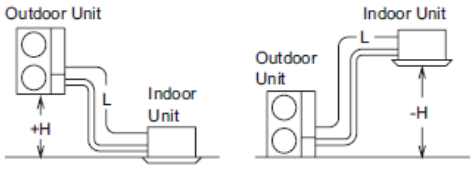
CC: Cooling Capacity in the Performance Table

F: Correction Factor Based on the Equivalent Piping Length

The correction factors are shown in the following figures.

Equivalent Piping Length for:

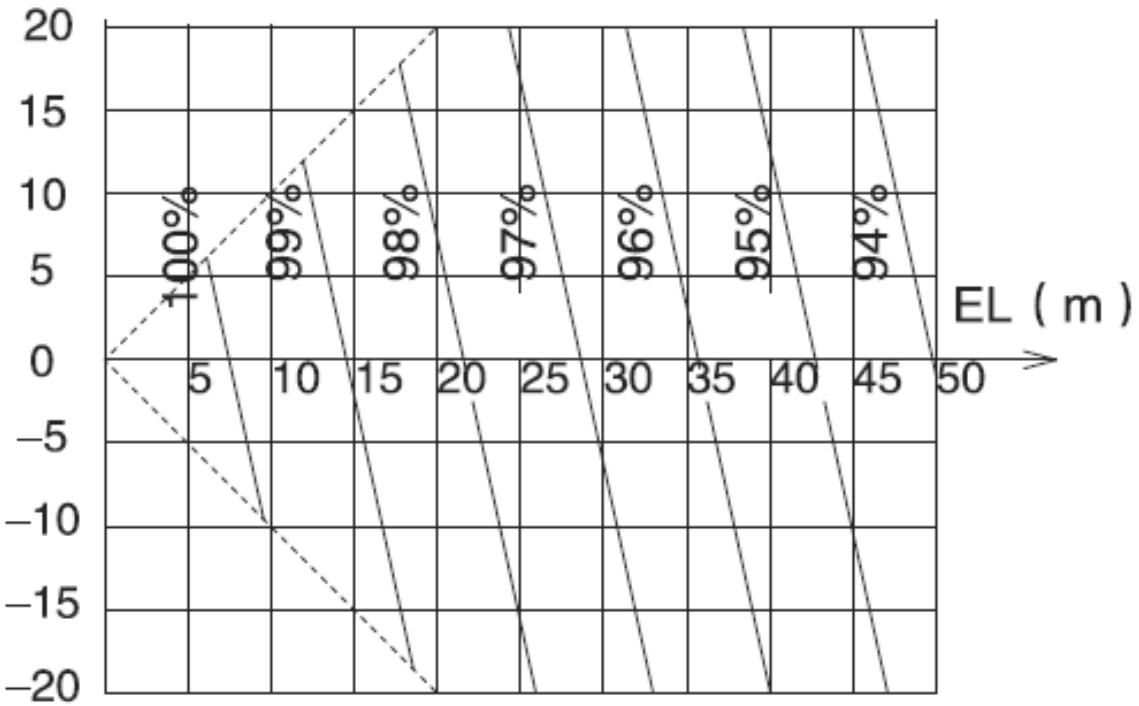
- ◆ One 90° Elbow is 0.5m.
- ◆ One 180° Bend is 1.5m.
- ◆ One branch pipe is 0.5m.



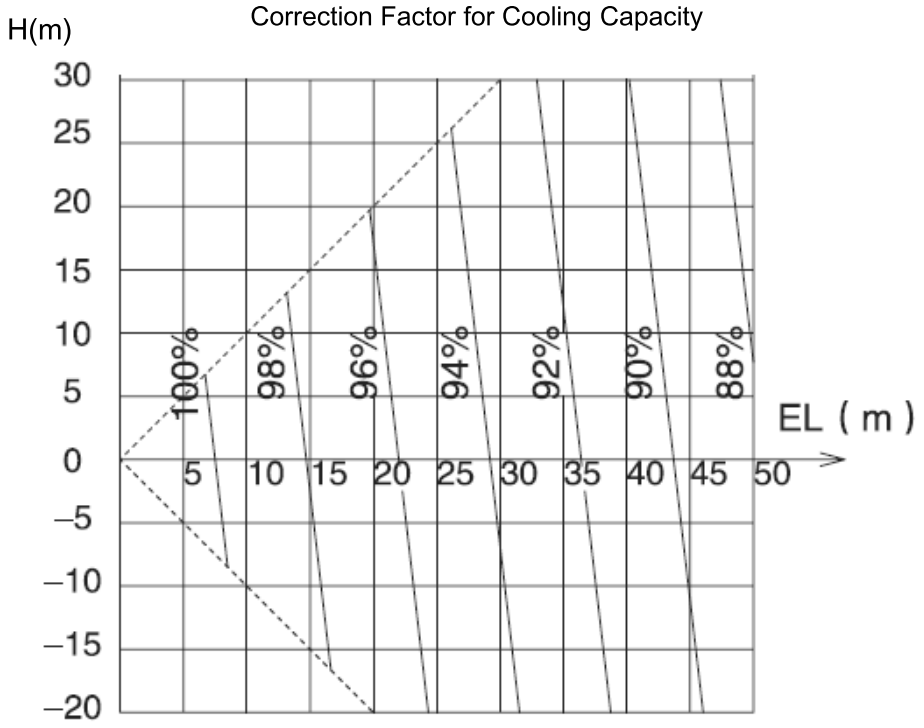
H: Vertical Distance Between Indoor Unit and Outdoor Unit
EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit (Equivalent One-Way Piping Length)
H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit
L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit

Model: RAS-3.0HNSKQ

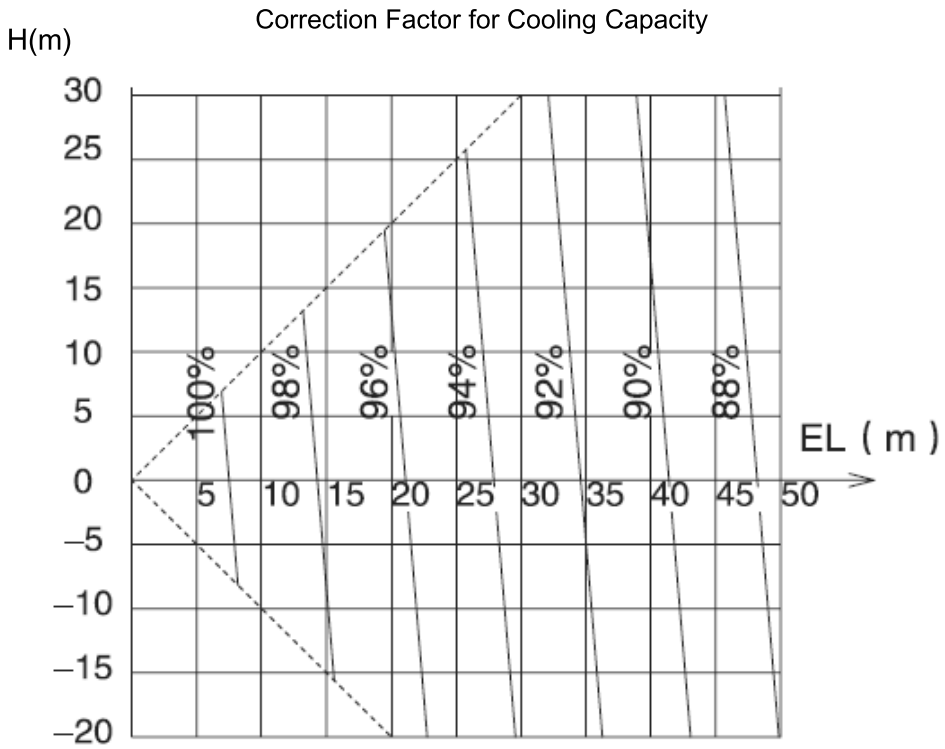
H(m) Correction Factor for Cooling Capacity



Model: RAS-3.5HNSKQ

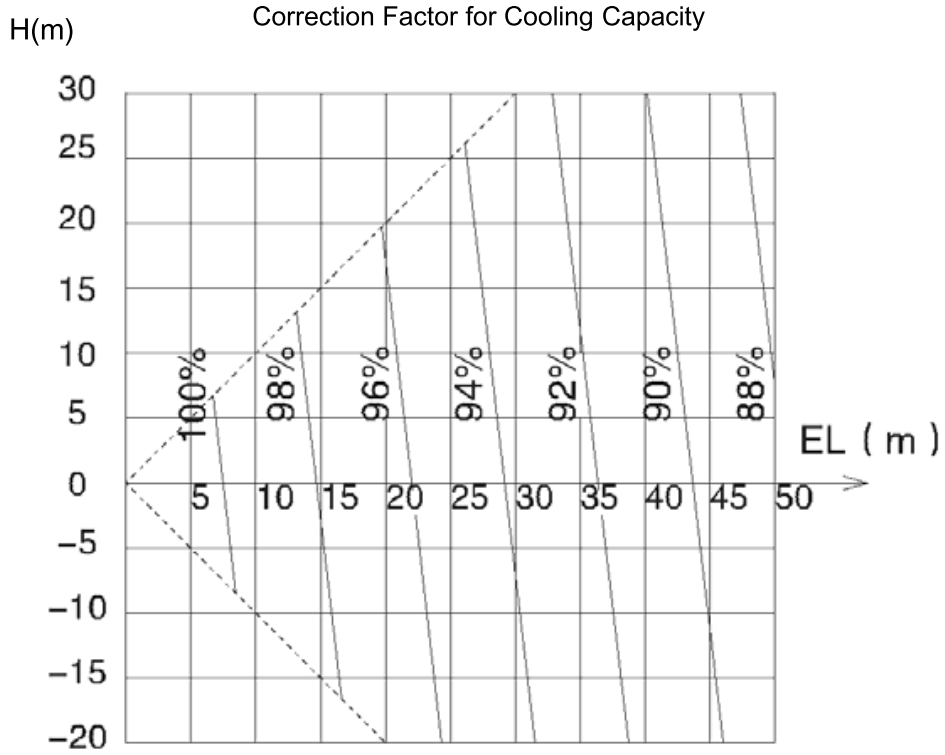


Model: RAS-4.0HNSKQ

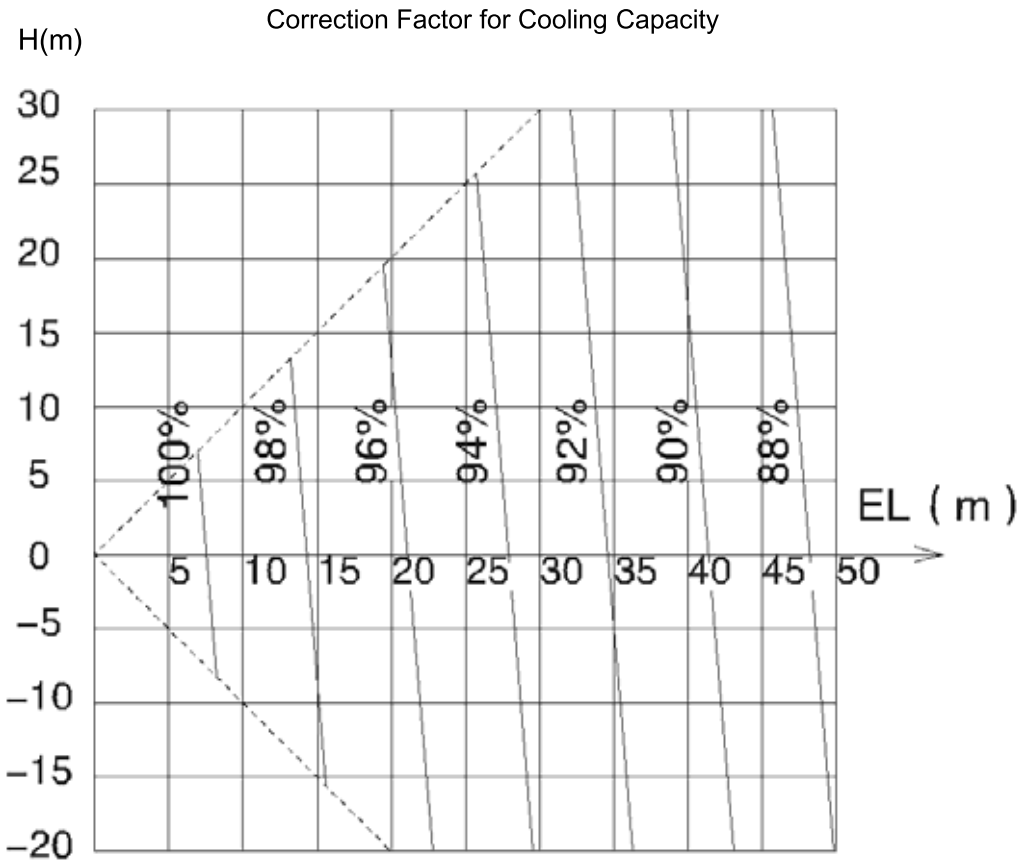


SELECTION DATA

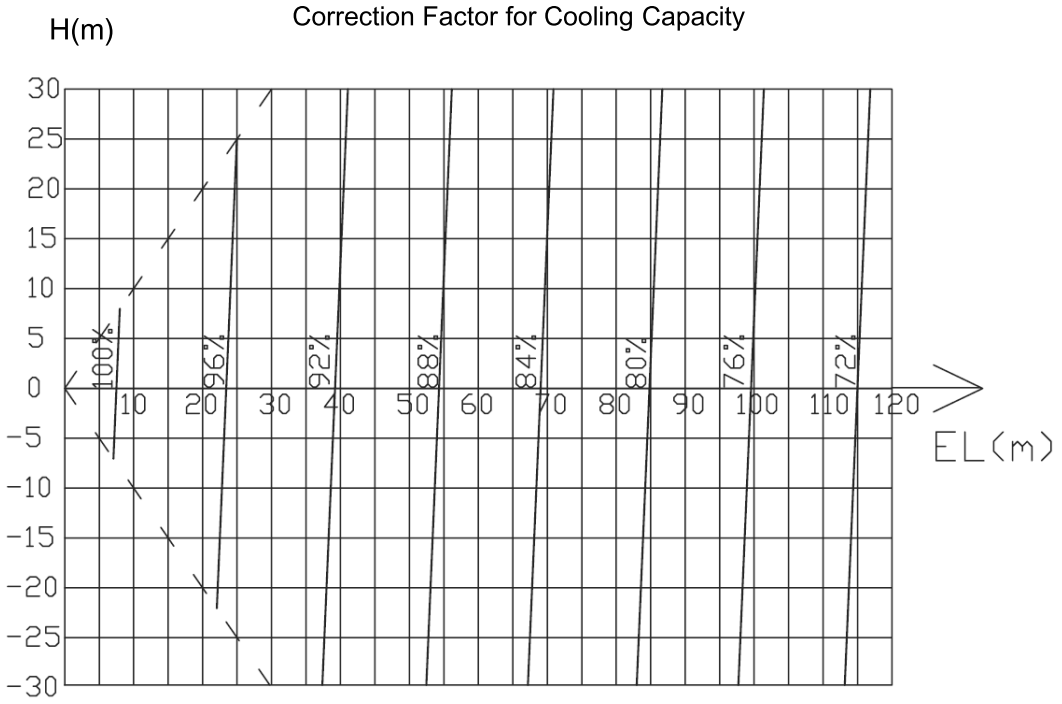
Model: RAS-4.5HNSKQ



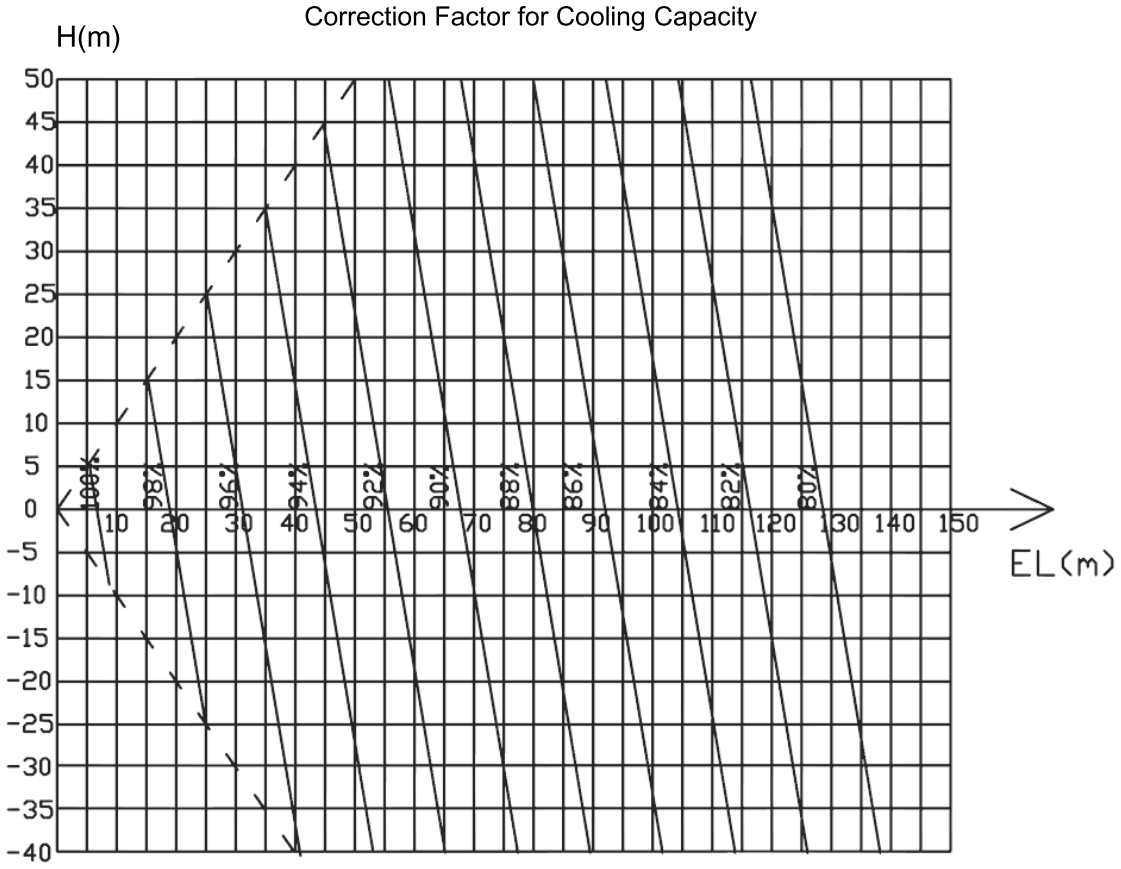
Model: RAS-5.0/6.0HNSKQ



Model: RAS-6.5HNSKQ



Model: RAS-7.0HNSKQ



SELECTION DATA

◆ Heating Capacity

Correction Factor for Heating Capacity According to Piping Length

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

HCA=HC x F

HCA: Actual Corrected Heating Capacity

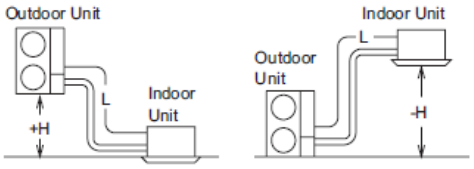
HC: Heating Capacity in the Performance Table

F: Correction Factor Based on the Equivalent Piping Length

The correction factors are shown in the following figures.

Equivalent Piping Length for:

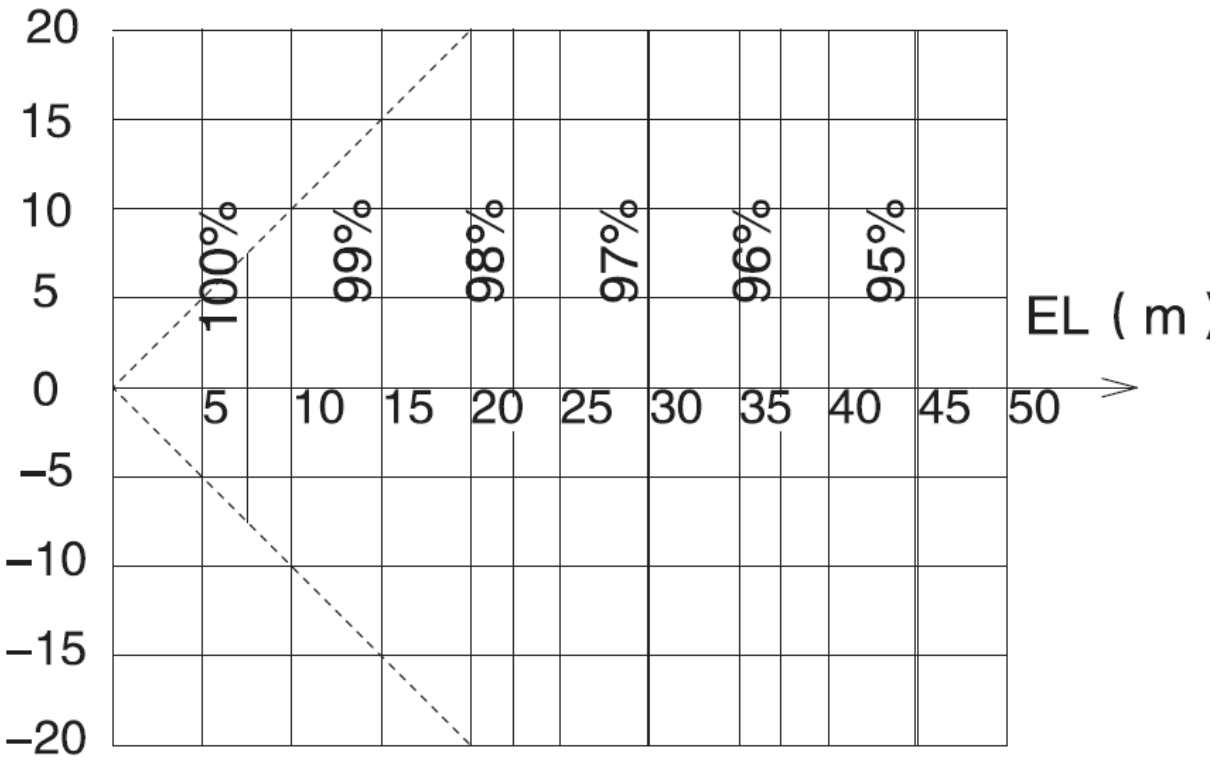
- ◆ One 90° Elbow is 0.5m.
- ◆ One 180° Bend is 1.5m.
- ◆ One branch pipe is 0.5m.



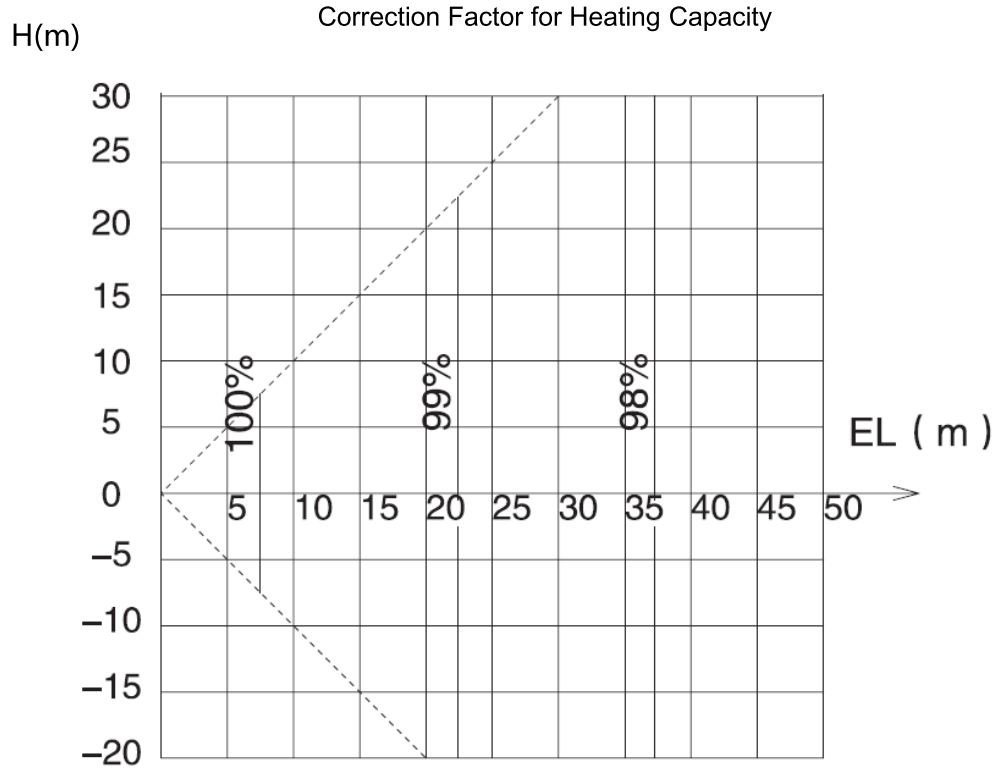
H: Vertical Distance Between Indoor Unit and Outdoor Unit
EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit (Equivalent One-Way Piping Length)
H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit
L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit

Model: RAS-3.0HNSKQ

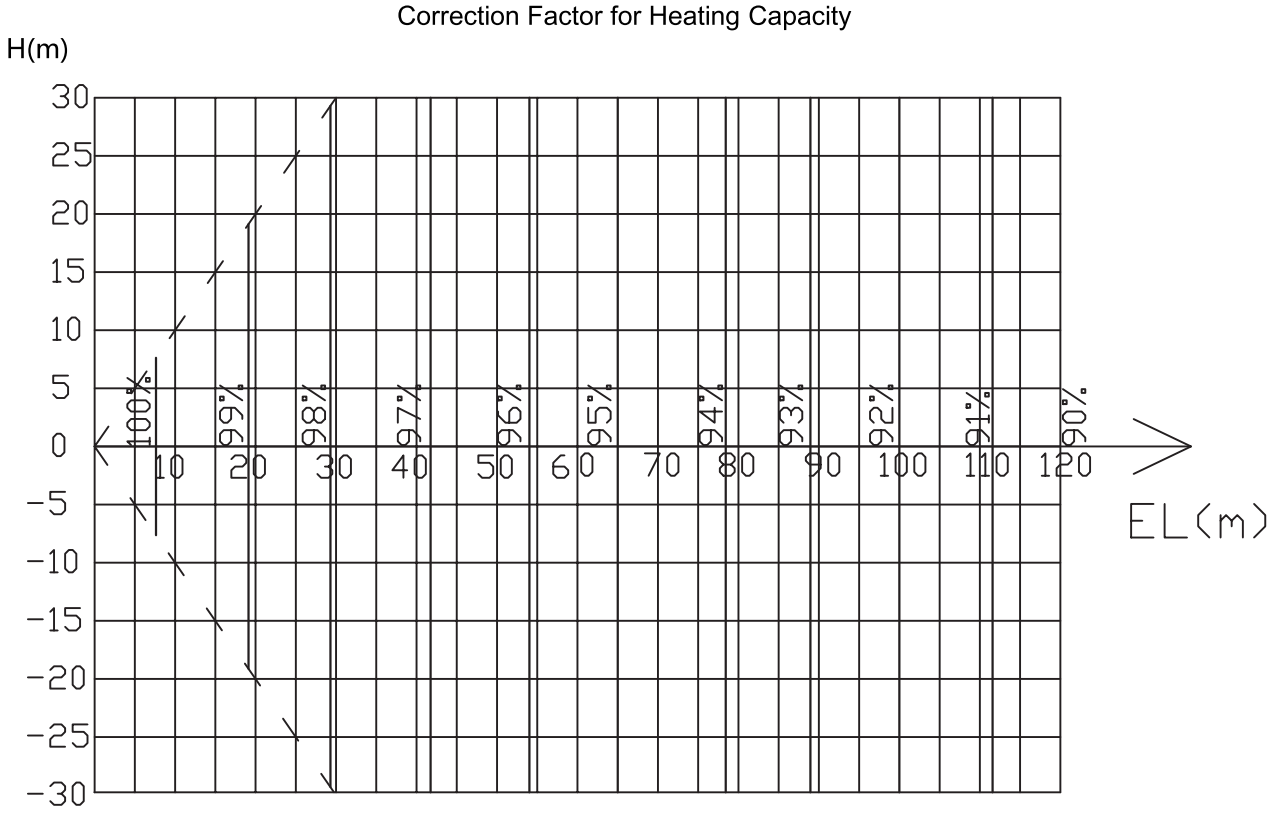
H(m) Correction Factor for Heating Capacity



Model: RAS-3.5~6.0HNSKQ



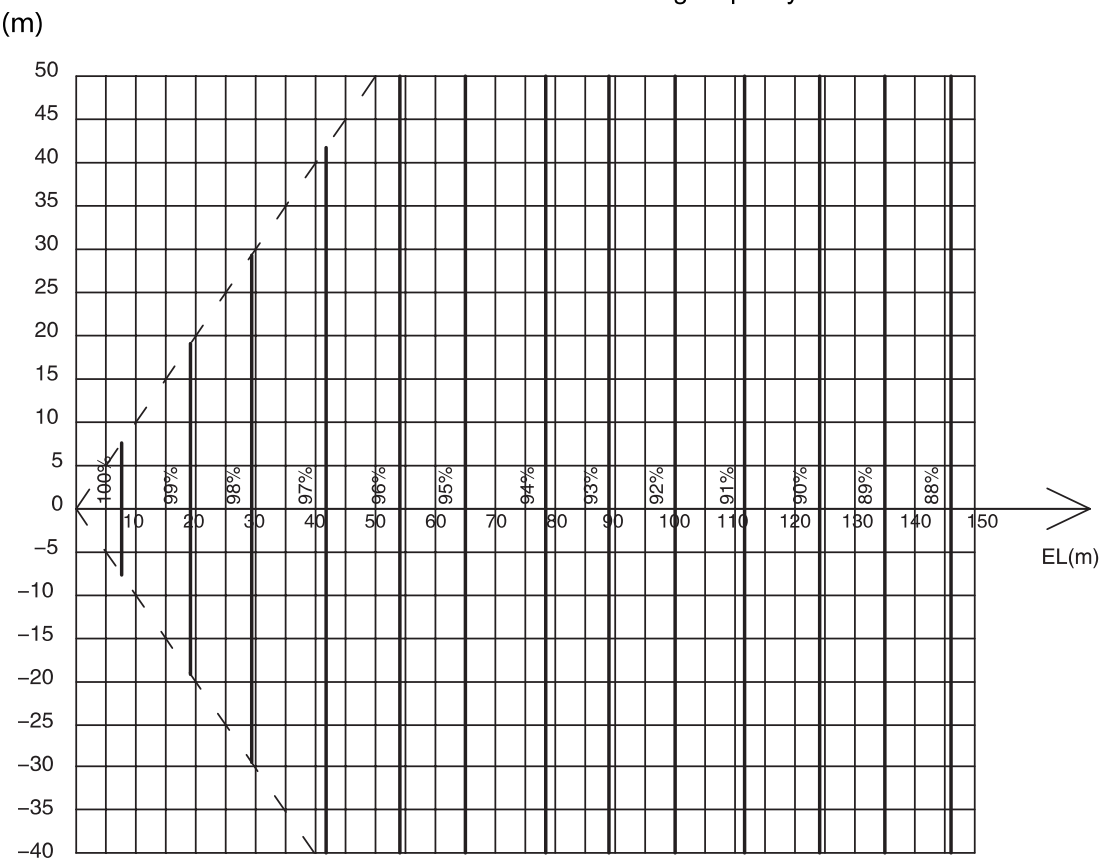
Model: RAS-6.5HNSKQ



SELECTION DATA

Model: RAS-7.0HNSKQ

Correction Factor for Heating Capacity



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 x 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 x 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