HITACHI
Inspire the Next

UTOPIA RASC-IVX SERIES
RASC-H(V)RNME

Technical Catalogue

RASC-5HVRNME
RASC-10HRNME

HITACHI
Inspire the Next

Contents

General Index

HITACHI
Inspire the Next

1. General information

Index

1.1 General information

1.1.1 General notes

No part of this publication may be reproduced, copied, filed or transmitted in any shape or form without the permission of HITACHI Air Conditioning Products Europe, S.A.

Within the policy of continuous improvement of its products, HITACHI Air Conditioning Products Europe, S.A. reserves the right to make changes at any time without prior notification and without being compelled to introducing them into products subsequently sold. This document may therefore have been subject to amendments during the life of the product.

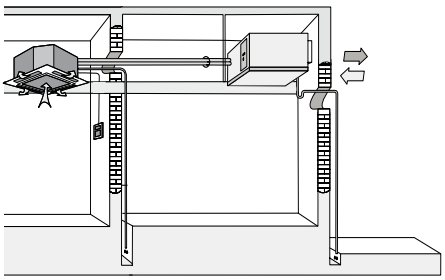
HITACHI makes every effort to offer correct, up-to-date documentation. Despite this, printing errors cannot be controlled by HITACHI and are not its responsibility.

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

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

1.1.2 Introduction

RASC units are suitable for business premises and houses where the use of a conventional outdoor unit is either prohibited or impossible.



This air conditioner is designed to offer cooling, heating, dry and fan operation. The operation mode will be controlled by the remote control switch.

These units allow the installation with up to four different indoor units (quad system).

In addition, to reduce as much as possible the energy consumption and improve the energy efficiency, RASC units include the “individual operation” mode, performing an individual control over the connected indoor units to create a zone-based control.

1.1.3 Environment-friendly units

This range of HITACHI RASC units uses environmentally-friendly R410A gas refrigerant, and the RoHS and Green Dot regulations are applied throughout the manufacturing and installation process to reflect HITACHI’s awareness of environmental respect and commitment.

R410A is totally environmentally-friendly since it does not contain any substances that damage the ozone layer:

ODP (ozone depleting product) =0.

1.2 Applied symbols

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

Situations that jeopardise the safety of those in the surrounding area or that put the unit itself at risk will be clearly indicated in this manual.

To indicate these situations, a series of special symbols will be used to clearly identify these situations.

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

DANGER

- ***The text following this symbol contains information and instructions relating directly to your safety and physical wellbeing.***
- ***Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others in the proximities of the unit.***

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

CAUTION

- ***The text following this symbol contains information and instructions relating directly to your safety and physical wellbeing.***
- ***Not taking these instructions into account could lead to minor injuries to you and others in the proximities of the unit.***
- ***Not taking these instructions into account could lead to unit damage.***

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

NOTE

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

1.3 Product guide

1.3.1 Classification of RASC unit models

Unit type (Outdoor unit - Built in horizontal)								
	Position-separating hyphen (fixed)							
		Compressor power (HP): 5, 10.						
			H = Heat pump					
				V = Single phase unit (1~ 230V 50Hz)				
				- = Three phase unit (3N~ 400V 50Hz)				
					R = Inverter system			
						N = R410A refrigerant		
							M = IVX	
								E = Made in Europe
RASC	–	XX	H	X	R	N	M	E

1.3.2 Classification of indoor unit models

Unit type (indoor unit): RCI, RCIM, RCD, RPC, RPI, RPIM, RPK, RPF, RPFI									
	Position-separating hyphen (fixed)								
		Compressor power (HP): 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10.							
			FS = SYSTEM FREE						
				N = R410A refrigerant					
					H = Hotel (RPK-(1.0/1.5) only)				
						2/3 = series			
							E = Made in Europe M = Made in Malaysia – = Made in Japan		
								DU = Drain Up (RPIM only)	
XXX	–	X.X	FS	N	(H)	(X)	(X)	(-DU)	

1.3.3 Product guide: RASC units

RASC units			
Single phase (1~)		Three phase (3N~)	
HVRNME		HRNME	
			
Unit	Code	Unit	Code
RASC-5HVRNME NEW	7E341008	RASC-10HRNME NEW	7E341111

NOTE

- ***Check the exact classification for each unit (model, type, power and series) in Classification of RASC unit models.***
- ***All references of the "Built-in-horizontal" units contained into this Technical Catalogue, have been abbreviated as "RASC" unit.***
- ***HITACHI has a range of accessories and remote control systems that can be used with the UTOPIA RASC units. Please, refer to the Controls Technical Catalogue.***

1.3.4 Product guide: Indoor units

◆ RCI, RCIM and RCD indoor units

FSN(2/3)(E) indoor units							
RCI		**RCIM**		**RCD**			
							
4-way cassette		4-way cassette (compact)		2-way cassette			
Unit	Code	Unit	Code	Unit	Code		
RCI-1.5FSN3E	7E403002	RCIM-1.5FSN2	60278013	RCD-1.5FSN2	60278030		
RCI-2.0FSN3E	7E403003	RCIM-2.0FSN2	60278014	RCD-2.0FSN2	60278031		
RCI-2.5FSN3E	7E403004			RCD-2.5FSN2	60278032		
RCI-3.0FSN3E	7E403005			RCD-3.0FSN2	60278033		
RCI-4.0FSN3E	7E403007					RCD-4.0FSN2	60278034
RCI-5.0FSN3E	7E403008					RCD-5.0FSN2	60278035
RCI-6.0FSN3E	7E403009						

Panels							
RCI		**RCIM**		**RCD**			
							
P-N23NA	70531000	P-N23WAM	60197160	P-N23DNA	60297211	P-N46DNA	60297212

NOTE

- ***Check the exact classification for each unit (model, type, power and series) in*** *Classification of indoor unit models*.
- ***The RCI, RCIM and RCD models must be used in combination with the panels indicated above.***

◆ RPC, RPI and RPIM indoor units

FSN(2/3)E indoor units							
RPC		**RPI**				**RPIM**	
							
Ceiling type		Indoor ducted unit					
Unit	Code	Unit	Code	Unit	Code	Unit	Code
		RPI-1.5FSN2E	7E420002			RPIM-1.5FSN2E	7E430002
						RPIM-1.5FSN2E-DU	7E431002
RPC-2.0FSN2E	7E440003	RPI-2.0FSN3E	7E424003				
RPC-2.5FSN2E	7E440004	RPI-2.5FSN3E	7E424004				
RPC-3.0FSN2E	7E440005	RPI-3.0FSN3E	7E424005				
RPC-4.0FSN2E	7E440007	RPI-4.0FSN3E	7E424007				
RPC-5.0FSN2E	7E440008	RPI-5.0FSN3E	7E424008				
RPC-6.0FSN2E	7E440009	RPI-6.0FSN3E	7E424009				
				RPI-8.0FSN3E	7E424010		
				RPI-10.0FSN3E	7E424011		

NOTE

Check the exact classification for each unit (model, type, power and series) in *Classification of indoor unit models*.

◆ RPK, RPF and RPFI indoor units

FSN(H)2(E/M) indoor units					
RPK		**RPF**		**RPFI**	
					
Wall type		Floor type		Floor concealed type	
Unit	Code	Unit	Code	Unit	Code
RPK-1.5FSN2M	60277942	RPF-1.5FSN2E	7E450002	RPFI-1.5FSN2E	7E460002
RPK-1.5FSNH2M	60277962				
RPK-2.0FSN2M	60277943	RPF-2.0FSN2E	7E450003	RPFI-2.0FSN2E	7E460003
RPK-2.5FSN2M	60277944	RPF-2.5FSN2E	7E450004	RPFI-2.5FSN2E	7E460004
RPK-3.0FSN2M	60277945				
RPK-4.0FSN2M	60277946				
EV-1.5N[1]	60291612				

[1] For RPK-1.5FSNH2M model only.

NOTE

Check the exact classification for each unit (model, type, power and series) in *Classification of indoor unit models*.

2. Features and benefits

Index

2.1 Selection benefits

2.1.1 Individual operation function NEW

The individual operation function brings the following advantages:

◆ Great comfort

Comfortable environment thanks to the possibility of working at different set temperature.

It might happen that in many building, because of its orientation, the heating / cooling load is not the same in all the area, so for these cases the Individual operation is very useful.

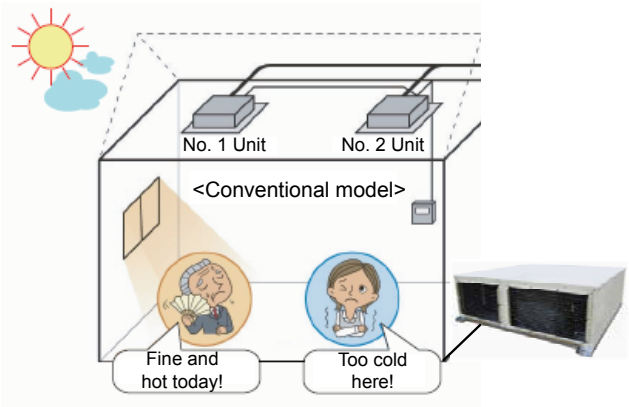
Conventional RASC series

In the situation of “Thermo OFF” , No.1 indoor unit had achieved set temperature, at this time No.1 and No.2 indoor units simultaneously stopped (even No.2 Indoor unit do not achieved its set temperature).

New RASC-IVX series

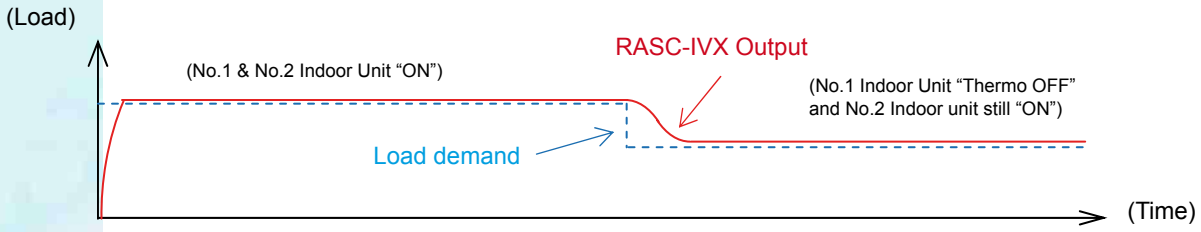
In the same situation, when “thermo OFF” is demanded by No.1 indoor unit, it will stops only this unit.

The RASC unit will adapt its control to the new load demand situation (by compressor frequency control). So No.2 Indoor unit will continue running for achieving its set temperature.



◆ Energy saving

The Individual operation adapts its energy consumption (IPT) according demanded load, so energy waste do no happens because IVX control balances the output against the current load demand.



2.1.2 Flexible system

◆ High indoor units combinability and installation flexibility

Following the UTOPIA IVX concept, the new RASC units accept the combination with a large variety of types of Hitachi Indoor units system free:

Available indoor units

RCI	RCIM	RCD	RPC	RPIM	RPI	RPK	RPF	RPFI
								
1~								
4-way cassette type		2-way cassette type	Ceiling	In the ceiling		Wall Type	Floor Type	Floor Concealed Type
RCI-1.5FSN3E	RCIM-1.5FSN2	RCD-1.5FSN2		RPIM-1.5FSN2E RPIM-1.5FSN2E-DU	RPI-1.5FSN2E	RPK-1.5FSN(H)2M	RPF-1.5FSN2E	RPFI-1.5FSN2E
RCI-2.0FSN3E	RCIM-2.0FSN2	RCD-2.0FSN2	RPC-2.0FSN2E		RPI-2.0FSN3E	RPK-2.0FSN2M	RPF-2.0FSN2E	RPFI-2.0FSN2E
RCI-2.5FSN3E		RCD-2.5FSN2	RPC-2.5FSN2E		RPI-2.5FSN3E	RPK-2.5FSN2M	RPF-2.5FSN2E	RPFI-2.5FSN2E
RCI-3.0FSN3E		RCD-3.0FSN2	RPC-3.0FSN2E		RPI-3.0FSN3E	RPK-3.0FSN2M		
RCI-4.0FSN3E		RCD-4.0FSN2	RPC-4.0FSN2E		RPI-4.0FSN3E	RPK-4.0FSN2M		
RCI-5.0FSN3E		RCD-5.0FSN2	RPC-5.0FSN2E		RPI-5.0FSN3E			
RCI-6.0FSN3E			RPC-6.0FSN2E		RPI-6.0FSN3E			
					RPI-8.0FSN3E			
					RPI-10.0FSN3E			

Expanded combinability (For RASC-10HP) NEW

New indoor units combinability of 2HP + 8HP. Specific combination for those cases of refurniture or new installations in banks or third sector business. Specially focused for ducted air installations with a main and big room with big load demand, and a seconds reduced room where its load is small.

Combination	Indoor unit capacity (HP)						
	RASC-5HVRNME			RASC-10HRNME			
Single	5.0	--	--	10.0	--	--	--
Twin	2.5	2.5	--	5.0	5.0	--	--
	3.0	(2.3)	--	6.0	4.0	--	--
	--	--	--	**8.0**	**2.0**	--	--
Triple	(1.8)	(1.8)	1.5	3.0	3.0	3.0	--
	--	--	--	4.0	3.0	3.0	--
Quad	--	--	--	2.5	2.5	2.5	2.5
	--	--	--	3.0	2.5	3.0	2.0
	--	--	--	3.0	2.5	2.5	2.5
	--	--	--	3.0	2.0	3.0	2.0
	--	--	--	3.0	2.0	2.5	2.5
	--	--	--	3.0	(2.3)	3.0	(2.3)
	--	--	--	3.0	(2.3)	3.0	2.0
	--	--	--	3.0	(2.3)	2.5	2.5

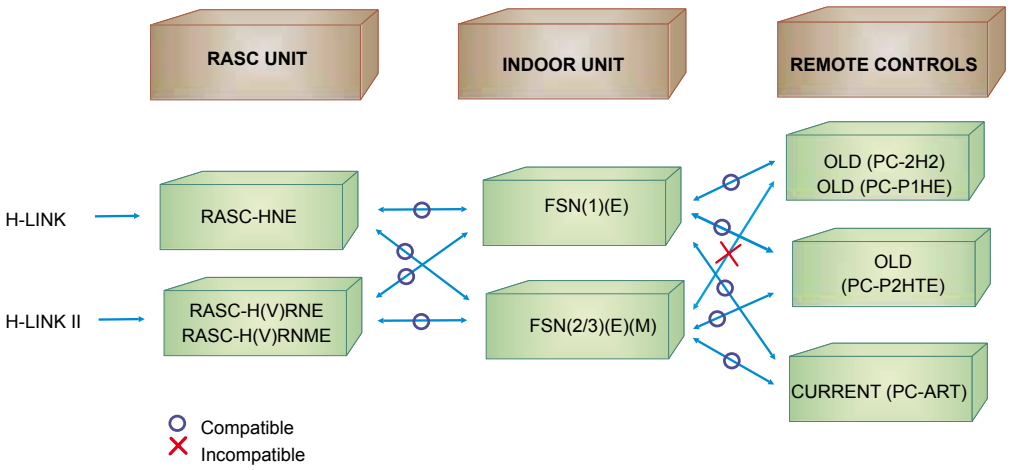
NOTE

- ***(): Adjusted capacity***
- ***For more information, please refer to the section "Combinability" in chapter*** *Capacities and selection data*.

◆ High compatibility

Units with the H-LINK system and units with the H-LINK II system and their remote controls can be combined as follows:

- The new RASC-H(V)RNME can be connected with the FSN1(E) and FSN2(E) indoor units
- The new system H-LINK II enables connection of remote controls, from type PC-ART and PC-P2HTE.



NOTE

- ***(*) In both combinations, some of the functions of the indoor unit cannot be used.***
- ***Refer to the specific controls Technical Catalogue for the details of H-LINK.***

◆ Wide variety of standard command options

The UTOPIA series have many standard commands. These options can be easily set by means of any of the wide variety of HITACHI remote controls, or through the PCBs of the indoor and RASC units. In this way the UTOPIA series adapts to each installation.

2.1.3 Assisted air conditioning installation design by Hi-Tool kit selection software

The Hi-Tool Kit selection software is a tool for designing HVAC installations and automatically generating all necessary related information to complete the planned installation.

The necessary related information includes:

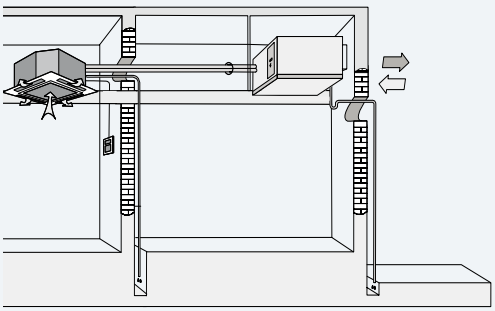
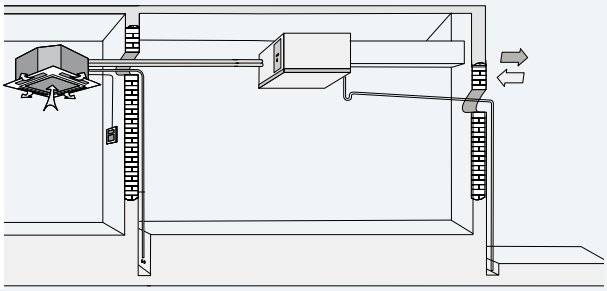
- Product selection table.
- Cooling and wiring diagram according to the installation design.
- Full list of necessary products to complete the installation.
- Installation start-up management.

2.2 Installation benefits

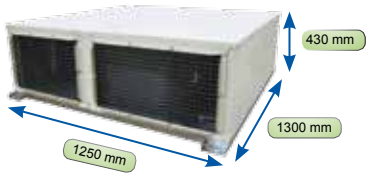
2.2.1 Easy and flexible unit installation

◆ Hidden installation & large external static pressure range availability

- Suitable application for both business and household where it is not possible to place the outdoor unit outside the building.
- To fulfil legislation and local regulations regarding air conditioning units installation.
- Ducts flexibility allows to adapt each installation depending on each particular need.

Example of NO duct installation	Example of installation WITH ducts
	

◆ Compact size & low height profile (5HP)



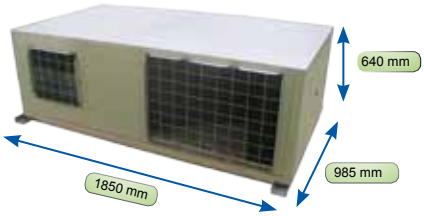
RASC-5HVRNME

W x H x D: 1250 x 1300 x 430

Foot Print: 1,6 m²

Volume: 0,7 m³

Weight: 176 kg.



RASC-10HRNME

W x H x D: 1850 x 640 x 985

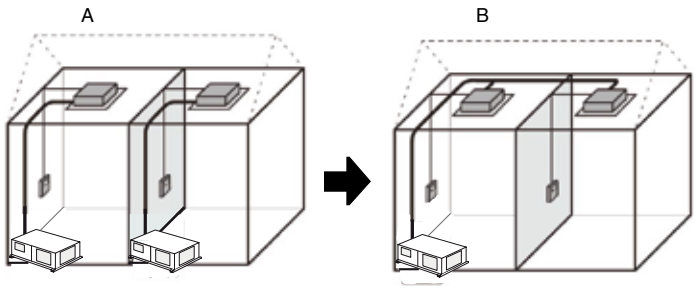
Foot Print: 1,8 m²

Volume: 1,2 m³

Weight: 262 kg.

◆ Reduced installation space by individual operation NEW

- For Indoor units installed in different rooms, the benefits are:
  - Outdoor installation space reduced to half.
  - Decrease piping installation work and cost.
  - Decrease wiring and power equipment.

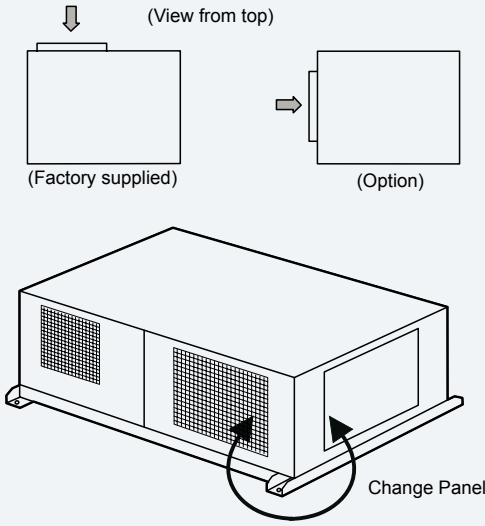
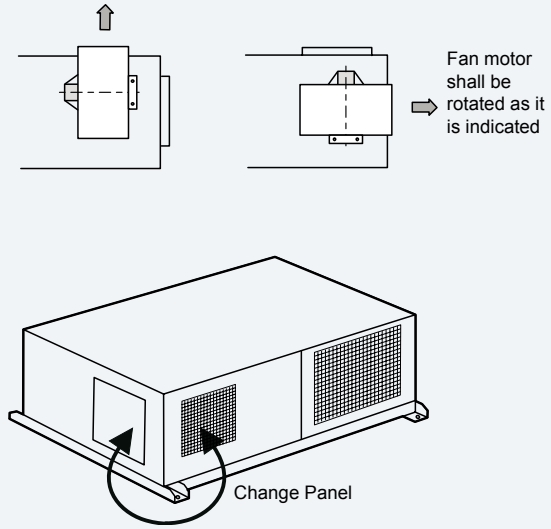


A. Conventional model.

B. IVX model.

◆ Flexible inlet and outlet air option

Side panels and grilles can be changed depending on each installation needs.

Inlet air option	Outlet air option (RASC-10HP only)
	

◆ Cycle optimization (Less refrigerant charge) (For RASC-10HP) NEW

The refrigerant charge before shipment has been reduced due to a cycle optimization from RASC DC-INVERTER series as shown in the following table:

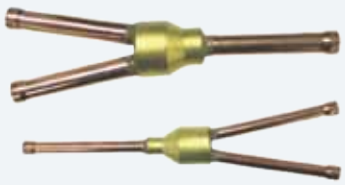
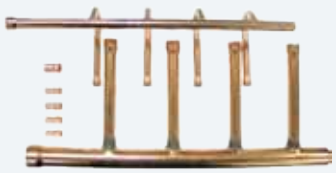
	RASC-10HRNE	-44% →	RASC-10HRNME
Refrigerant charge before shipment (kg)	**9.0**		**5.0**

◆ Insulations fire resistance class M1 NEW

All the Insulations used in new RASC-IVX for thermal and acoustic insulation are certified Fire Resistance Class M1 (UNE-23327 Spain / NF P 92-501 France, specific regulation for ducted units installed into public buildings).

◆ Different mounting accessories available

HITACHI provides all of the accessories required to connect the pipes (distributors and multikits). These accessories make the installation process more flexible and straightforward.

TE-N multikit	QE-N distributors
	

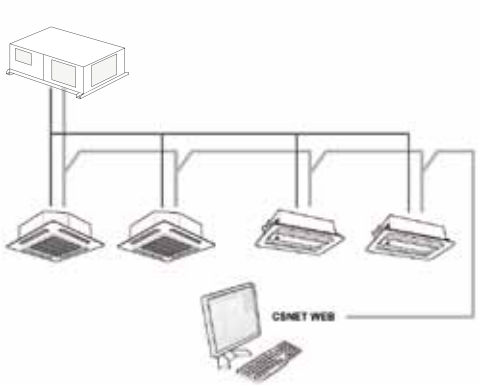
2.2.2 Easy and flexible electrical installation

◆ Interconnection of units via the new H-LINK II

The units interconnect via a bus called H-LINK II, consisting of 2 non-polarity cables and accepting lengths of up to 1,000 m. Accessories are available if required to increase this length to 5,000 m.

◆ Up to 160 indoor units connected to each circuit

Each H-LINK II bus can communicate up to 160 indoor units. Taking into account the absence of polarity and the length of line permitted, the flexibility of the interconnection between the machines is very high. This lets you, for example, connect the H-LINK II of a cooling system's indoor unit to the H-LINK II of another system's indoor unit.



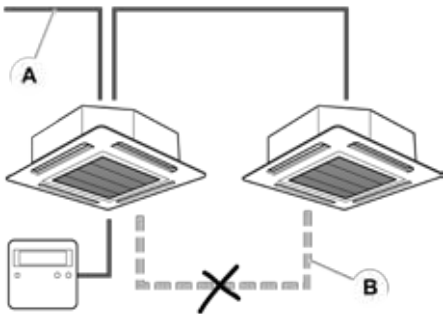
Specifications	
Transmission cable	2-wire
Polarity of transmission cable	Non-polar wire
Maximum refrigerant cycles	64 units per H-LINK II system
Maximum indoor units	160 units per H-LINK II system 64 units per refrigerant cycle.
Maximum number of equipment units	200
Maximum wiring length	Total 1.000 m (including CS-NET WEB)
Recommended cable	Shielded twisted pair cable or shielded pair cable, over 0.75 mm^2 (equivalent to KPEV-S)
Voltage	DC 5 V

◆ No operating cable for the remote control

In the case of double, triple and quad systems the indoor units can be controlled using a single remote control switch without having to join them with an operating cable for the remote control.

A. Operation wiring.

B. An operating cable is not required for using the remote control switch.



NOTE

- ***When using the H-LINK II system, DIP switches have to be adjusted. If the DIP switches are not set or set incorrectly, an alarm may occur due to transmission failure. Total wiring length for the remote control switch can be extended to up to 5,000 m. If total wiring length is less than 30 m, it is possible to use the normal wiring (0.3 mm^2).***
- ***The H-LINK II system provides maximum flexibility for system design; installation is easy, and total costs are reduced. Furthermore, it can be controlled centrally by connecting CS-NET WEB to H-LINK II wiring.***
- ***You can also control the installation by Internet via CS-NET WEB.***

2.2.3 Easy and flexible control connection (Central Station, BMS Interface, CS-NET WEB)

◆ No polarity

Thanks to the absence of polarity, any centralized control can be connected directly to the H-LINK II bus, which means that special lines are not needed.

◆ Auto-Configuration

Aside from the customized configuration, the control systems are also auto-configurable; for example, they have the capacity of interpreting the type of machine they are connected to, and detect the type of indoor unit or its power.

2.3 Start-up benefits

2.3.1 Automatic start-up test

The installation is started up automatically, therefore considerably reducing the time required for the process.

There are the following types of start-up:

- Test run and identification of the units forming the system.
- Test run from the remote control.
- Test run from the RASC unit.

◆ Test run and identification of the system units

The automatic test run can be activated through RASC unit DIP switch or indoor unit remote control switch. The RASC unit 7-segment display gives all the information needed to check the system is operating correctly.

The units forming part of the system are identified separately for the RASC and indoor units:

- RASC units: Using the remote control, the series to which each of the operational RASC unit belongs (for example, simple or multiple series) can be assigned.
- Indoor units: Using the rotary and DIP switch on each unit.

◆ Test run from the remote control

The remote control can run 3 operations.

- Auto-diagnostic: quick check of the operating conditions of the indoor units and the RASC unit.
- Data memory query: if an abnormality occurs, the LCD remote control switch shows an alarm code and saves all the operation settings of the unit at the time the fault occurs, so that a quick diagnosis can be made of the installation.
- Optional function setting: the remote control switch allows cancellation of the 4-degree offset in the heating mode and an increase in the fan speed setting, among 29 possible options.

This way, multiple indoor units can be set at the same time. Also, the configuration can easily be changed, even after the installation has been completed.

◆ Test run from the RASC unit

The RASC unit PCB is equipped with a 7-segment display, which depending on the position of the PSWs shows the following parameters in sequence.

- Outdoor temperature.
- Discharge gas temperature.
- Evaporation temperature in heating mode.
- Condensing temperature.
- Discharge pressure.
- Compressor run time.

This allows quick and accurate diagnosis of the installation during normal operation or test run.

2.3.2 Service verification

◆ System operation control

The working order of the system is continuously monitored through the control system. All operating parameters that the system uses to manage the RASC and indoor units are continuously supervised.

Assisted-management air conditioning system

The air conditioning system can be managed conveniently using the assisted management software HITACHI Service Tools.

This software enables, for example, a laptop computer to be connected to the air conditioning system by means of an interface connected to the H-LINK II bus. Using different menus, the software allows you to manage all the systems connected effectively and obtain data to optimise system performance.

Compilation of operating data

All the data obtained using HITACHI Service Tools is compiled in different formats and monitored in various ways. The user of the software can configure the data handling to monitor those parameters that are the most important in each installation.

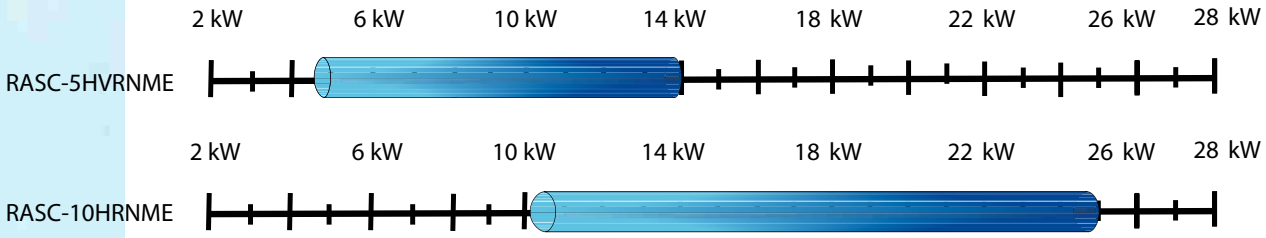
The data reports allow you to verify the system operation continuously. Any deviation in the stipulated ranges of values are detected immediately.

2.4 Functionality benefits

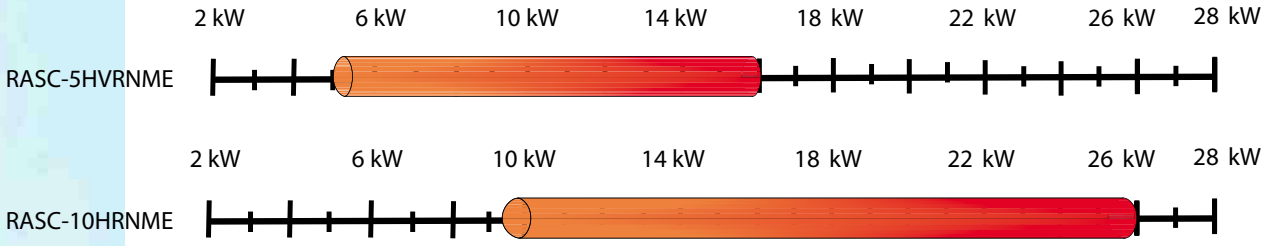
2.4.1 Wide capacity range

The control frequency system allows a wide capacity application range as shown below:

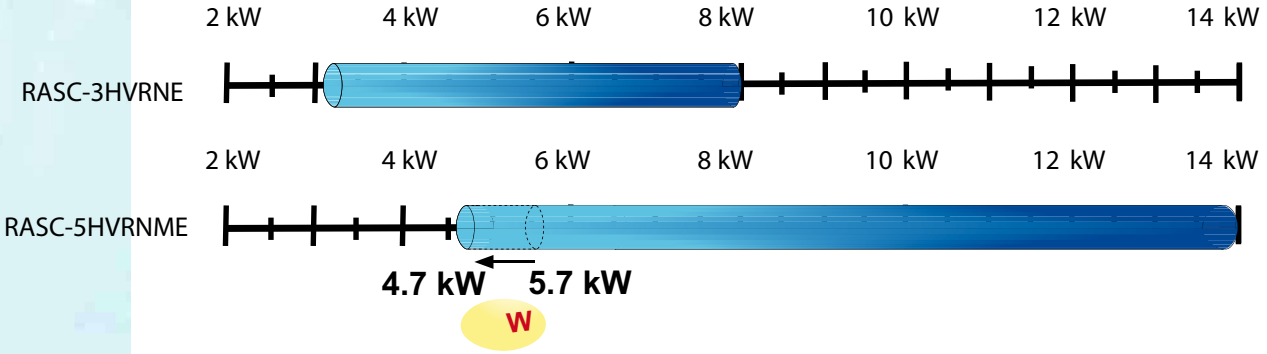
Cooling capacity range at conditions: Indoor air inlet: 27/19 ºC (DB/WB); Outdoor air inlet: 35 ºC DB.



Heating capacity range at conditions: Indoor air inlet: 20 ºC DB; Outdoor air inlet: 7/6 ºC (DB/WB).



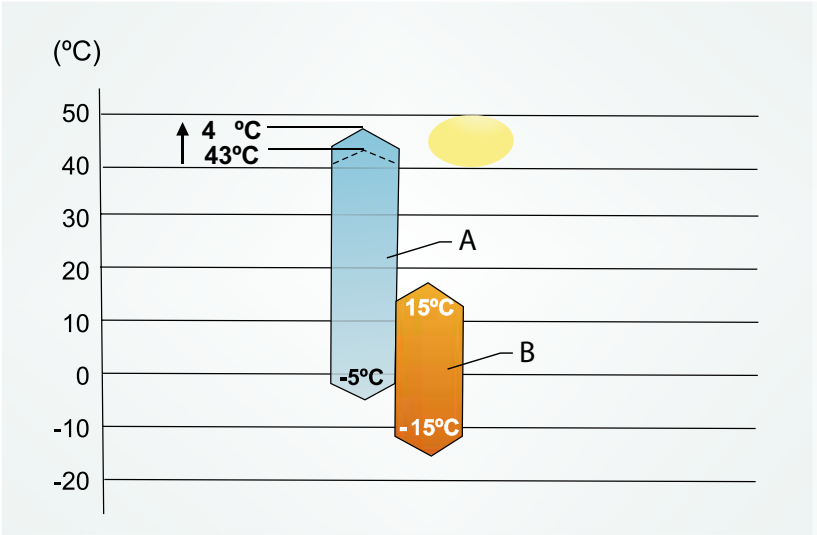
Referent to the RASC DC-INVERTER series, the minimum cooling capacity has been reduced. By this new feature, total capacity range is larger than before, so for 5HP unit case it could be covered most of the current capacity range of 3HP unit.



2.4.2 Expanded temperature range

RASC series are able to work in a wide working range (from -5 to 46 ºC (DB) in cooling mode and from -15 to 15 ºC WB in heating mode).

The cooling working range has been increased up to 46ºC in outdoor ambient temperature respect RASC DC-INVERTER series (43ºC).



A Cooling (DB)

B Heating (WB)

◆ Fan regulation at low ambient temperature

- Wide working range thanks to fan control regulation, in cooling mode, for operating at low ambient temperature (down to -5ºC DB).
- Fan control regulation enables working at low ambient ttemperature (down to -15ºC WB), in heating mode, reducing “Defrost operations” or unit “stoppages” compared with conventional units.

2.4.3 Expanded maximum refrigerant piping length NEW

The maximum refrigerant piping length has been expanded from RASC DC-INVERTER series as shown in the following table:

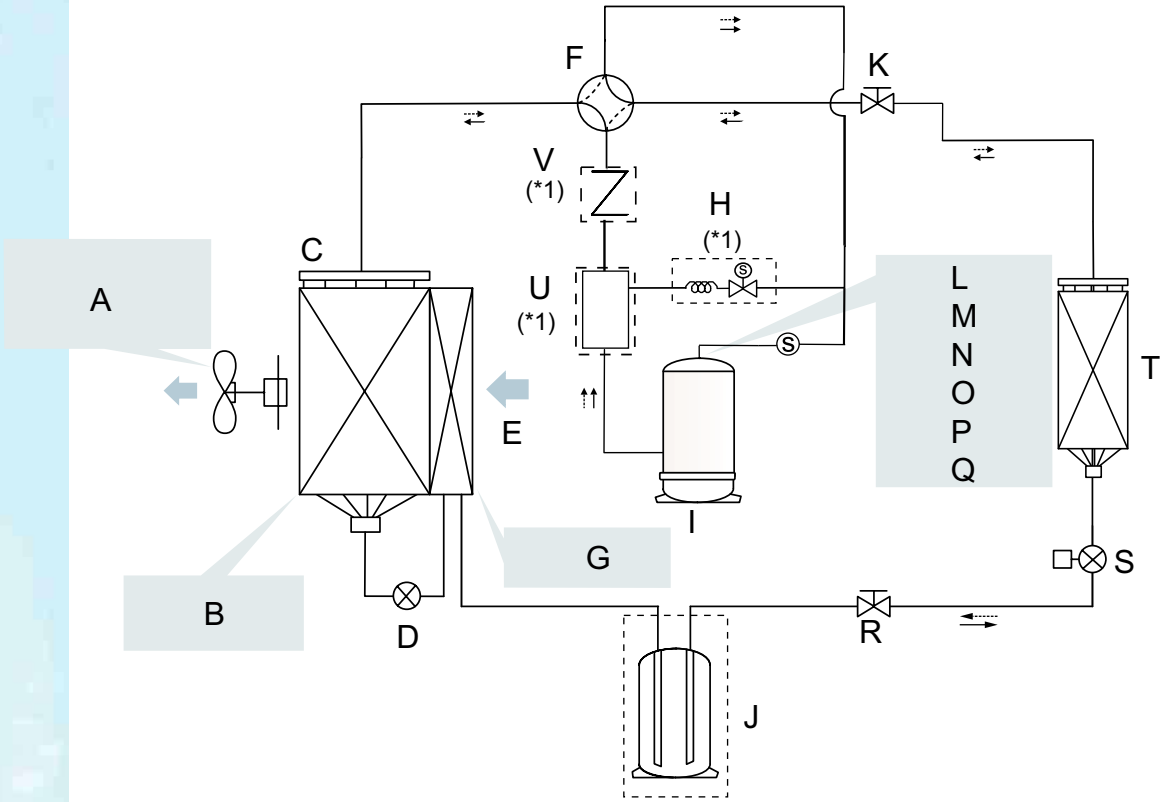
(Units: m)

Maximum piping length	RASC-5HVRNE	→	RASC-5HVRNME	RASC-10HRNE	→	RASC-10HRNME
Actual piping length	50	→	**75**	50	→	**100**
Height difference between indoor units	0.5	→	**3**	0.5	→	**3**
Total piping length	60	→	**95**	80	→	**145**

2.4.4 Advanced technology

The functionality benefits explained before (Highly efficiency system, wide capacity range and expanded working range) are direct consequence of the advanced technology applied on all the system components.

Then, the main features on different components of the system will be detailed:



Refrigerant flow for cooling	Refrigerant flow for heating

A: External static pressure range availability.
B: High-efficiency heat exchanger.
C: RASC unit heat exchanger.
D: RASC unit expansion valve.
E: Sub-cooling circuit.
F: Reversing valve.
G: Improved performance by sub-cooling circuit.
H: Gas by-pass.
I: Compressor.
J: Liquid receiver.
K: Stop valve of the gas pipe.
L: Highly efficient scroll compressor.
M: High pressure shell.
N: Lubrication.
O: New design of stator.
P: DC compressor with neodymium magnet.
Q: Low noise.
R: Stop valve of the liquid pipe.
S: Indoor unit expansion valve.
T: Indoor unit heat exchanger.
U: Oil separator
V: Check valve

NOTE

- ***(*1): Only for RASC-10HRNME.***
- ***(*2): For detailed information about gas by-pass on RASC-10HRNME, please refer to its specific refrigerant cycle.***

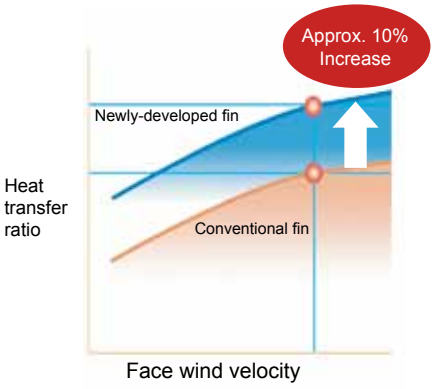
Heat exchanger

High-efficiency heat exchanger

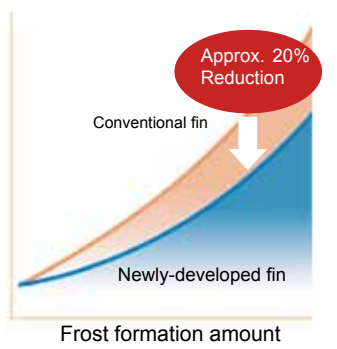
- Compact design and high-efficiency by arranging narrow heat exchanger tubes. (conventional fin Ø9.53 mm, now Ø7 mm).
- Newly-developed high-efficiency heat transfer fin. The ventilating resistance is reduced by 20% from previous models.
- Heat exchanger configuration aiming at fluid loss reduction.

High-efficiency heat transfer fin

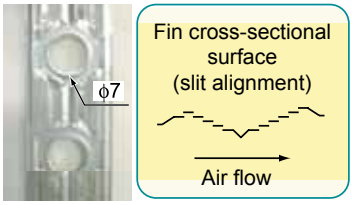
Improved heat transfer capacity



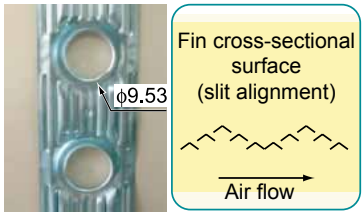
Air ventilation resistance



Newly-developped fin
(Ø7 Heat transfer tube)



Conventional fin
(Ø9.53 Heat transfer tube)



Improved performance by subcooling circuit

The system performance is improved by enlarged heat transfer area of RASC unit and subcooler heat exchanger.

A: Rear side.

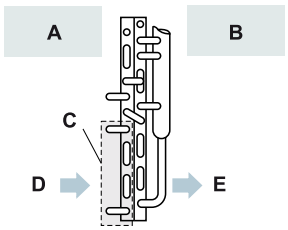
B: Front side.

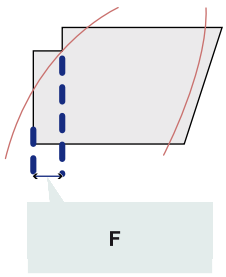
C: Sub-cooler.

D: Air inlet.

E: Air outlet.

F: Increase of enthalpy due to the use of the sub-cooling circuit.

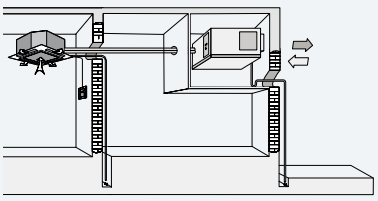
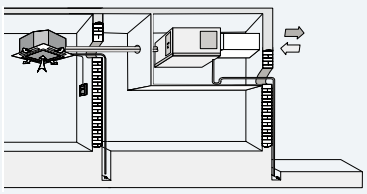
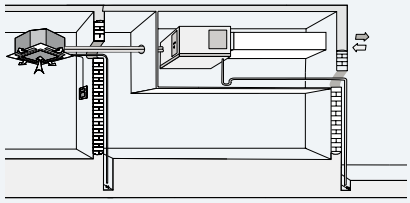




◆ Fan unit

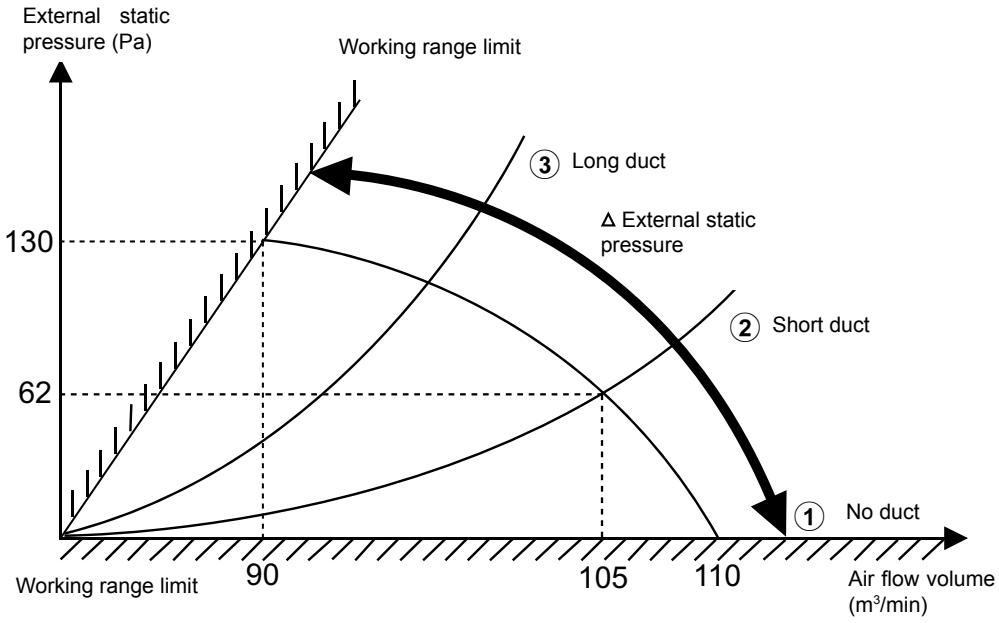
External static pressure range availability

Centrifugal fans allow working with a large external stactic pressure range, providing the possibility to duct the RASC unit keeping it hidden.

① No duct	② Short duct	③ Long duct
		

As can be seen in the following figure, the centrifugal fans adapt its performance depending on the type of installation within a working range limits:

RASC-10HRNME example:

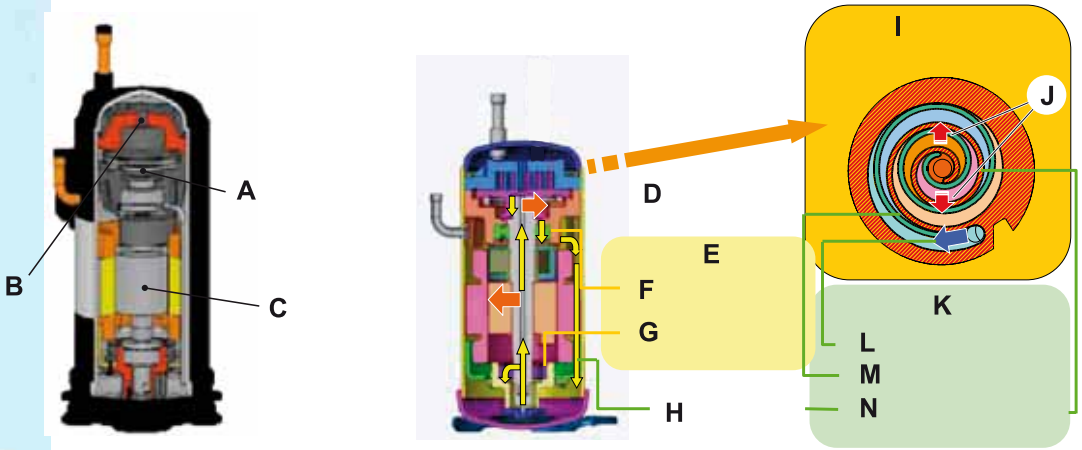


◆ HITACHI exclusive scroll compressor

Highly efficient scroll compressor

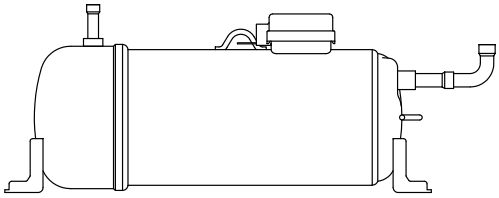
The HITACHI DC INVERTER scroll compressor has been developed to increase efficiency, reliability and to reduce power input:

- High performance at intermediate season.
- High efficiency at low speed (release valve and compacted winding of the DC-inverter motor).



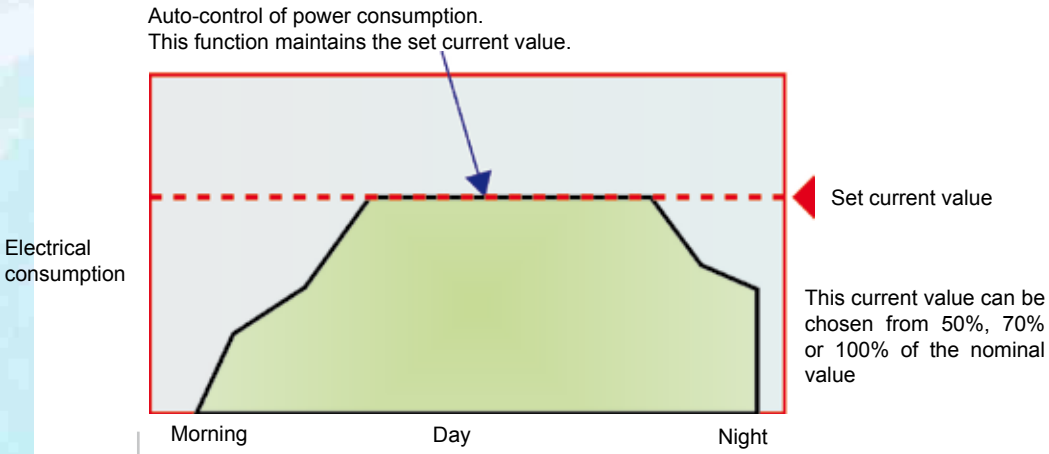
A: New drive mechanism, oil feeding mechanism etc,...
B: Newly developed scroll for R410A.
C: DC-Inverter motor (compacted winding).
D: Sub-bearing.
E: High reliability.
F: Decreased of bearing load.
G: Minimizing of shaft swing.
H: Oil return pipe.
I: Asymmetric scroll lap.
J: Shut out.
K: High performance.
L: Decrease of intake loss.
M: Decrease of leak loss.
N: Increase of superheat loss.

- Horizontal DC-inverter compressor configuration (5HP only) ⟶ as a result “low height” units.

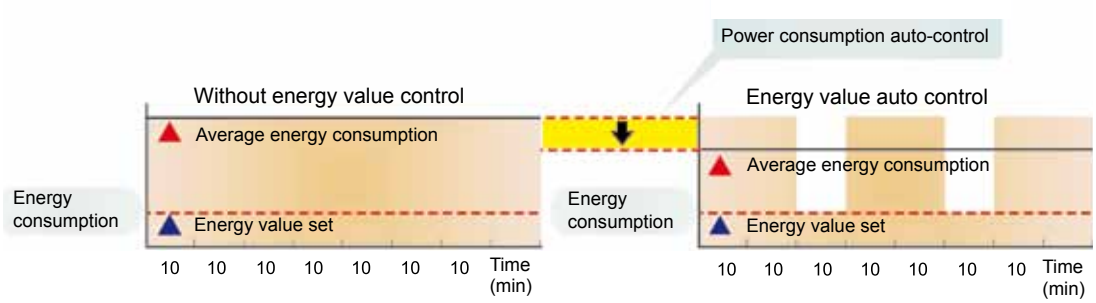


Reduced power consumption

- Highly efficient DC Scroll Compressor (use of neodymium magnets in the compressor motor rotor).
- New inverter control.
- Self demand control: Auto-control of power consumption, which can be regulated from 100%, 70% and 50% of nominal value. Avoids excess energy consumption by regulating the frequency.

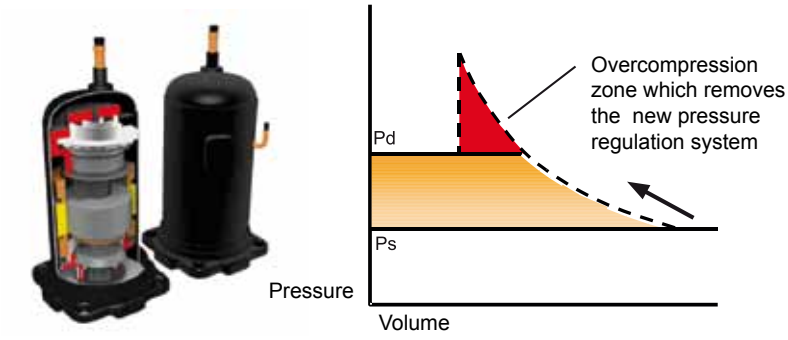


- Wave mode: Regulation of demand through wave control. The demand is regulated by controlling the wave.



High pressure shell

- It acts as an oil separator reducing the amount of oil circulating in the cooling system giving better heat exchanger efficiency.
- Motor heat is not added to the suction gas before compression, which reduces the discharge gas temperature. This is particularly important at low suction temperatures. The discharge gas cools the motor sufficiently.
- Refrigerant cannot enter the shell during the off cycle causing oil dilution and oil foaming at start up.
- New system of regulating pressure, increasing the compressor's efficiency and reliability in part load mode. This system ensures the work pressure of the compressor is always at optimum level regardless of the charge, so that the ratio between the discharge pressure (Pd) and the suction pressure (Ps) is optimum as in the following graphic:



Lubrication

Bearing in mind that lubrication is one of the most important factors in the service life of a compressor, HITACHI has developed a system based on the pressure differences between the suction and discharge using a secondary pump at the base of the compressor. As a result, all of the compressor's moving parts are lubricated evenly, ensuring high reliability in terms of its operating range, even at low frequencies.

A: Suction.

B: Discharge.

C: Roller bearing.

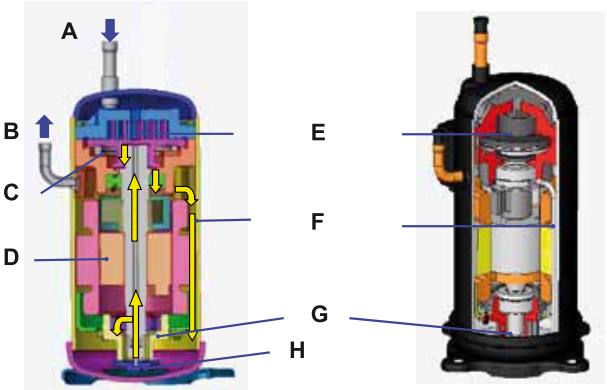
D: Synchronous motor.

E: Asymmetric scroll.

F: Oil return pipe.

G: Sub-ball-bearing structure.

H: Trochoid oil pump.



Protection against liquid return

When the compressor is at rest, the moving scroll rests on the casing. When the compressor starts to run, the pressure in the chamber under the scroll builds up through two bleed holes in the medium pressure section of the compression stroke. This pressure then forces the scroll up against the housing and seals the compression chamber. If liquid returns to the compressor, the resulting increase in pressure forces the scroll downwards, breaking the seal and allowing the liquid to pass back into the compressor body, where it will boil off due to the higher temperature.

A: Suction inlet.

B: Gas outlet.

C: Fixed scroll.

D: Moving scroll.

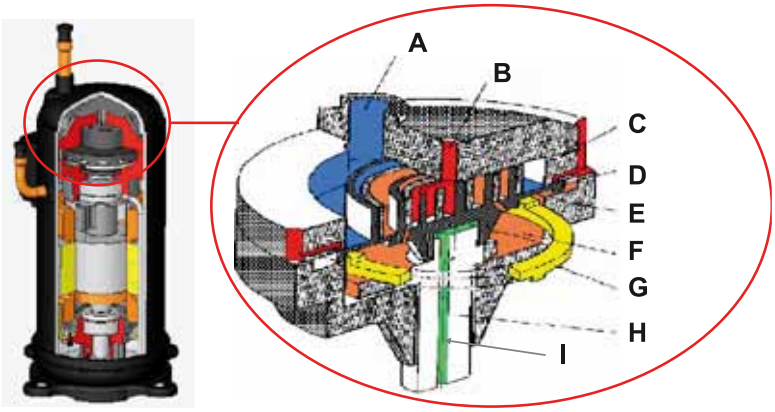
E: Housing.

F: Medium pressure chamber.

G: “Oldham ring”

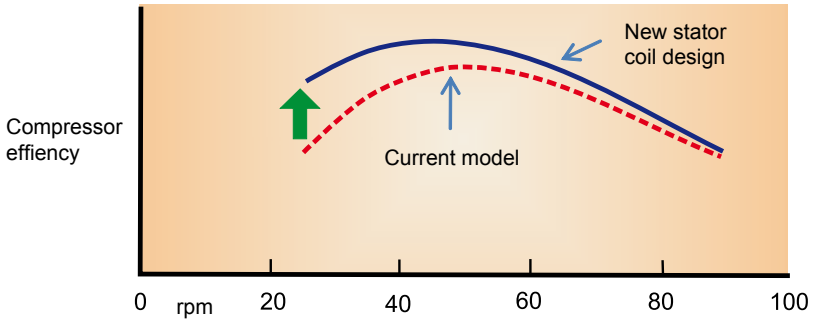
H: Shaft.

I: Oilway.



New design of stator coils

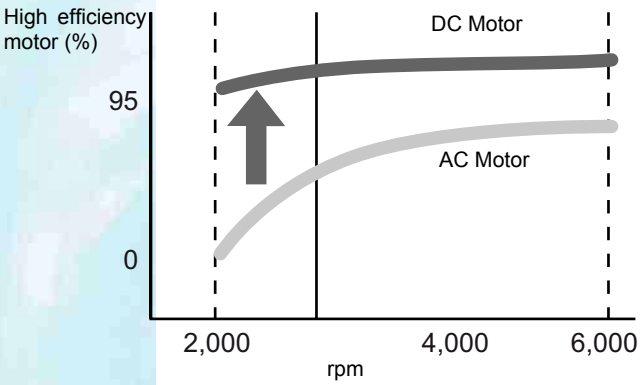
The new design of the stator coils positioned to optimize the magnetic field significantly reduce heat losses, and increase the motor’s efficiency at low speeds.

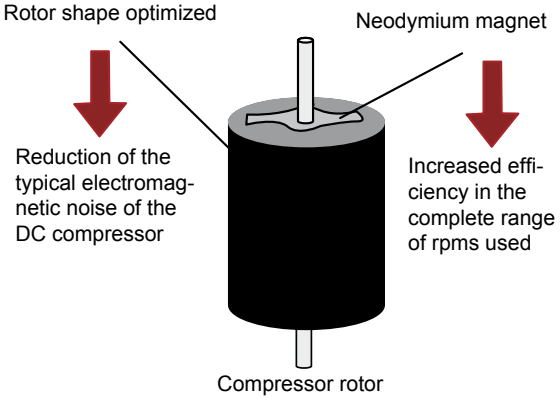


DC compressor with neodynium magnet

The use of a DC compressor with neodynium magnets in the rotor improves the performance at around the 30-40 Hz range where the operation time of the inverter compressor is longest. Additionally, to suppress electromagnetic noise interference and achieve low noise, the rotor has been divided into two parts and the electric pole displaced.

Characteristics at low speed, which affect the annual running cost, have been significantly improved.





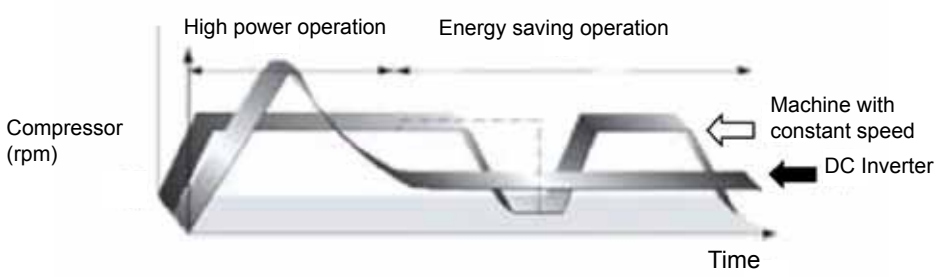
Low noise

- Inverter control: The inverter controls compressor speeds from 30 Hz to 115 Hz, quickly reaching the set temperature and maintaining a stable energy-saving operation, thus reducing the noise since the compressor is not running continuously.

Setting temperature (in heating mode)

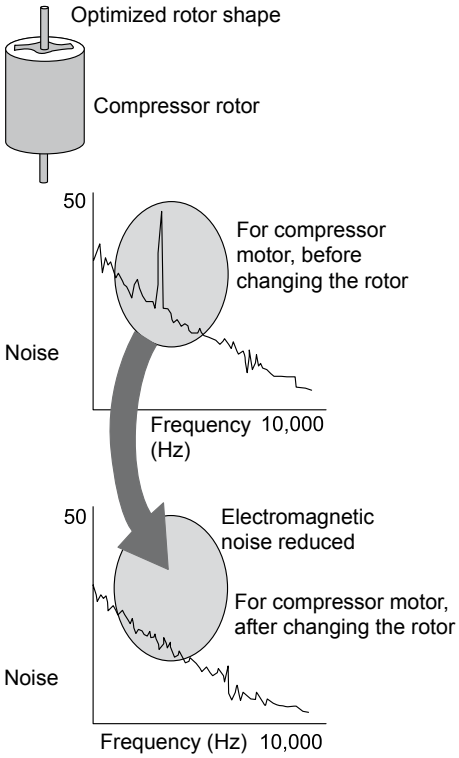
- In the case of UTOPIA series: Quickly reaches the temperature set at high power, then maintains stable energy-saving operation.
- In the case of other constant speed machines: Slowly reaches the set temperature, then turns on and off repeatedly to maintain the temperature, operating uneconomically and wasting energy.

Power consumption (in heating mode)



In case of existing machines with constant speed, repeated turning on and off wastes energy.

- Optimized rotor shape. The scroll compressor allows reduced noise and vibration levels due to:
  - The compression points are evenly distributed along the compression stroke.
  - The reduced number of components used.
  - Use of a high-pressure insulation shell.



- Acoustically insulated compressor: The scroll compressor is insulated by means of a acoustic cover, providing minimum noise levels.

◆ Large range of operating possibilities

The use of these machines together with CSNET-WEB can increase the performance of these installations even more by:

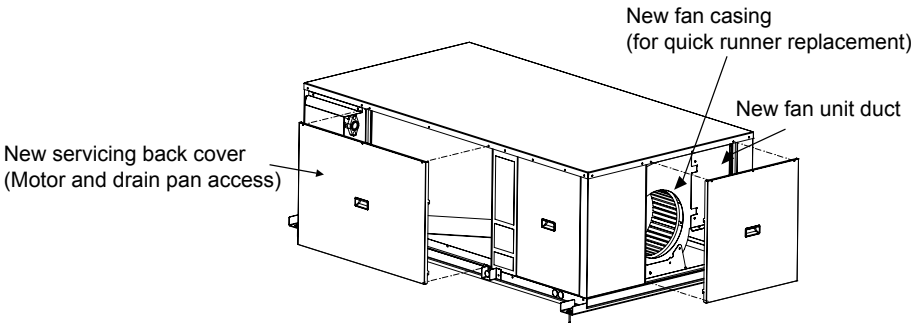
- Scheduled programming, which prevents these machines from running continuously in rooms which are not being used, and allows rooms to be preheated or pre-refrigerated just before being occupied.
- Limiting the set temperatures, which means that machines do not work at maximum capacity when comfort does not require it.
- Locking functions from the central control, thus avoiding incorrect or ineffective use of the units.

All these and many more functions mean that the use of the installation as a whole can be optimized. And it is worth remembering that because of the wide range of indoor units you can always find the unit with the power and type of installation that best suits your needs. CS-NET-WEB Ability to lock functions from the central control.

2.5 Maintenance benefits

2.5.1 Back side servicing covers (for RASC-10HP) NEW

Improvement of the back side covers getting a better fan unit servicing and drain pan maintenance.



2.5.2 Minimum maintenance

The units have been designed in line with Hitachi's philosophy, guaranteeing great reliability and robustness and reducing maintenance to a minimum.

2.5.3 Easy accessibility

The system components are easily accessible. You can access all of the unit's components to perform any necessary operations through a simple cover. The entire system is designed for maintenance operations to be easy and simple.

2.5.4 Alarm codes

The alarms are grouped by elements within the system in order to facilitate maintenance work and optimize the fitter's job.

2.5.5 SMS alarm

The alarm signals can also be received through a simple SMS specifying the cycle affected and the alarm code, allowing incidents to be detected and solved more quickly.

2.5.6 Availability of maintenance tools

All the functions of the Hitachi Service Tools for setup are applicable to unit maintenance, both preventive and corrective, so that any problem can be detected and solved immediately.

CSNET-WEB is also useful for maintenance tasks.

HITACHI
Inspire the Next

3. General data

Index

3.1 General data

Item	Units	RASC-5HVRNME	RASC-10HRNME
Minimum - Maximum indoor units connectable	-	1 - 3	1 - 4
Minimum - Maximum connected capacity	%	-	-
Nominal cooling capacity (min - max)	kW	12.5 (4.7 - 14.0)	23.0 (10.3 - 25.0)
Nominal heating capacity (min - max)	kW	14.0 (5.0 - 16.0)	25.0 (9.4 - 26.0)
Nominal cooling power input	kW	4.61	8.49
Nominal heating power input	kW	4.52	8.59
EER / COP	-	2.71 / 3.10 (1)	2.71 / 2.91 (2)
Energy class (cooling / heating)	-	-	-
Noise level cooling (sound pressure) (night mode)	dB(A)	55 (51)	68 (64)
Noise level heating (sound pressure)	dB(A)	56	68
Noise level (sound power)	dB(A)	71	83
Air flow (cooling / heating)	m3/min	65 / 65	110 / 110
Static pressure (nominal conditions / maximum)	Pa	50 / 100	62 / 130
Dimensions (H x W x D)	mm	430 x 1250 x 1300	640 x 1850 x 985
Net weight	kg	176	262
Power supply	-	1~ 230V 50Hz	3N~ 400V 50Hz
Recommended fuse size	A	50	40
Starting current	A	Less than maximum current	Less than maximum current
Maximum current	A	37	33
Running current cooling	A	22.0	20.0
Running current heating	A	21.6	20.2
Power cable size (according to EN 60335-1)	quantity x mm²	3 x 10.0	5 x 10.0
Transmitting cable size between indoor unit and outdoor unit	quantity x mm²	2 x 0.75	2 x 0.75
Piping diameter (liquid / gas)	mm (inch)	Ø9.53 (3/8) / Ø15.88 (5/8)	Ø12.7 (1/2) / Ø25.4 (1)
Refrigerant charge before shipment	kg	3.1	5.0
Minimum piping length	m	5	5
Maximum piping length chargeless	m	15	7.5
Maximum piping length (additional refrigerant charge needed)	m (g/m)	70 (need to be calculated)	50 (need to be calculated)
Height difference (O.U. higher / O.U. lower)	m	30 / 20	30 / 20
Working range (cooling // heating)	°C	-5 / +46 (DB) // -15 / +15.5 (WB)	-5 / +46 (DB) // -15 / +15.5 (WB)
Refrigerant	-	R410A	R410A
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven

(1) The ERR/COP have been calculate with RCI-5,0FSN3E

(2) The ERR/COP have been calculate with 2 x RCI-5,0FSN3E

3.2 Component data

3.2.1 Fan unit and heat exchanger

Model				RASC-5HVRNME	RASC-10HRNME
Heat exchanger	Heat exchanger type		-	Multi-pass cross-finned tube	
	Piping	Material	-	Copper	Copper piping
		Outer diameter	mm	7	7
		Row quantity	-	5	5
		Number of tubes/row	-	60	150
	Fin	Material	-	Aluminum	
		Pitch	mm	1.9	1.9
	Maximum operating pressure		MPa	4.15	4.15
	Total face area		m^2	0,54	0,83
	Number of coils/unit		-	1	1
Fan unit	Fan	Type	-	Multi-blade centrifugal fan	
		Number/unit	-	2	1
		Outer diameter	mm	240	305
		Revolutions	rpm	1480 ± 5%	950 ± 5%
		Nominal air flow	m^3/min	65	110
	Motor	Type	-	Drip-proof enclosure	
		Starting method	-	Permanent condenser	
		Power	W	950	1500
		Qty.	-	1	1
		Insulation class	-	F	F
Compressor				E-405ALD-36A2	E-656DHD-65D2

3.2.2 Compressor

Model			E405ALD-36A2	E656DHD-65D2
Compressor type			Hermetic scroll (horizontal)	Hermetic scroll
Pressure resistance	Discharge	MPa	4.15	4.15
	Suction	MPa	2.21	2.21
Motor	Starting method	-	Inverter-driven	Inverter-driven
	Poles	-	4	4
	Insulation class	-	E	E
Oil type		-	FVC68D	FVC68D
Oil quantity		L	1.2	1.9

3.3 Electrical data

3.3.1 Considerations

Keywords:

- U: Power supply
- PH: Phase
- f: Frequency
- STC: Starting current: Less than maximum current
- RNC: Running current
- IPT: Total input power
- MC: Maximum current

NOTE

- ***The compressor data shown in the table are based on a combined capacity of 100% of the power supplied.***
- ***The performance data are based on an equivalent piping length of 7.5m and 0m piping lift.***
- ***The data are measured at the following conditions:***
  Cooling conditions: Indoor air inlet: 20 ºC DB; Outdoor air inlet: 7/6 ºC (DB/WB).
  Heating conditions: Indoor air inlet: 27/19 ºC (DB/WB); Outdoor air inlet: 35 ºC DB.
- ***Specifications in these tables are subject to change without notice in order that HITACHI may bring the latest innovations to their customers.***

3.3.2 RASC series

Model	Main unit power			Applicable voltage		Compressor and fan motors						Max. IPT (kW)	MC (A)
								Cooling operation		Heating operation			
	U [V]	PH	f [Hz]	U max. (V)	U min (V)	PH	STC (A)	IPT (kW)	RNC (A)	IPT (kW)	RNC (A)		
RASC-5HVRNME	230	1	50	253	207	1	-	4.65	22.0	4.56	21.6	8.76	37.0
RASC-10HRNME	400	3	50	440	360	3	-	8.60	20.0	8.70	20.2	15.09	33.0

4. Capacity and selection data

Índice

4.1 System selection procedure

RASC units are suitable for business premises and houses where the use of a conventional RASC unit is either prohibited or impossible.

The following procedure is an example of how to select the system units and indicates how to use all the parameters indicated in this chapter.

Considering the layout of the building, the possible position of the indoor units and the air flow distribution, select the unit features that provide the greatest efficiency and comfort. Decide a position for the RASC unit that facilitates service and maintenance tasks, as well as easy refrigerant pipe installation.

4.1.1 Selection parameters

To select the RASC units, it will be necessary to consult and/or use a serie of parameters shown in tables and graphics presented in the different chapters of this catalogue. A summarized list is shown below:

Available models	Maximum cooling and heating capacities
General information of the units	COP and EER
Operation space possibilities	Different correction factors
Working range	Sound data for the different units

In case of an installation with ducts (RASC unit with RPI indoor unit) the fan performance for duct calculations should be considered. The RPI units are designed with different static pressure ranges in order to fulfil all installation necessities.

Capacity adjustment by dip switch setting of the indoor units

In some, situations, it should be useful to adjust the capacity of the indoor units in order to adapt the unit to the actual installation requirements. This function is performed by dip switch setting and it's possible in some HP indoor unit models.

Following table contains the nominal capacity and the adjusted capacity by dip switch setting of the indoor units.

- Nominal capacity of indoor units

Horsepower (HP) / Capacity		1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0
Cooling	kW	3.6	5.0	6.3	7.1	10.0	12.5	14.0	20.0	25.0
Heating	kW	4.0	5.6	7.0	8.0	11.2	14.0	16.0	22.4	28.0

NOTE

The nominal cooling and heating capacity is the combined capacity of the RASC system, and is based on EN14511.

Operation condition		Cooling	Heating
Indoor air inlet temperature	DB	27 °C	20 °C
	WB	19 °C	—
Outdoor air inlet temperature	DB	35 °C	7 °C
	WB	—	6 °C

Piping length: 7.5 meters.

Piping height: 0 meters.

DB: Dry Bulb.

WB: Wet Bulb.

- Adjusted capacities of indoor units.

Horsepower (HP)		1.8			2.3		
Variable capacity		1.8	←	2.0	2.3	←	2.5
Cooling	kW	4.5			5.6		
Heating	kW	5.0			6.3		
Applicable model		RPI, RCI, RCD, RPK, RPC			RPI, RCI, RCD, RPC		
Indoor unit dip switch setting (DSW3)		1.8 HP  Lowered	←	2.0 HP  Standard	2.3 HP  Lowered	←	2.5 HP  Standard

NOTE

The maximum indoor unit capacity combined with the capacity of the RASC unit should be carefully considered to ensure the correct distribution of the indoor units in each building.

4.1.2 Selection procedure

Cooling mode

a. Initial pre-selection

This example is based on an ambient with the following characteristics:

- Total load required for each room

Item			Room		
			1	2	Total
Estimated cooling load	Total	kW	5.0	6.6	11.6
	Sensible		4.0	5.3	9.3

- Design conditions

Outdoor air inlet	Dry bulb: 35 ºC
Indoor air inlet	Dry bulb: 25 ºC Wet bulb: 17 ºC

The example used consists of a determined ambient (commercial premises) in which the shop window area can be used to place the RASC in the false ceiling, so taking advantage of the height of the establishment.

It has been assumed that this ambient will require a cooling load of 11.6 kW, of which the client has set a minimum sensible heat load condition of 9.3 kW.

The outdoor ambient temperature (air inlet at the RASC unit) is 35 ºC DB and the air inlet temperature for the indoor unit is 25/17 ºC (DB/WB).

- Installation characteristics

Equivalent piping length (EL)	20 m
Height difference between indoor and RASC units.	0 m

Normally, given that RASC units are designed to be installed in false ceilings, the height difference between the indoor units and the RASC is 0 m. In other words, they are at the same level.

A certain height difference can also exist between the RASC unit and the indoor units.

For example, when the RASC unit is located in a garage or other room located on a lower floor. However, the calculation method for the piping length correction factor is the same in both cases.

Therefore, when necessary refer to the section *Piping length correction factor*.

b. Selecting the combination of the RASC unit and the indoor unit

The section *Maximum cooling capacities,* should be seen once the characteristics of the space to be conditioned have been studied in order to find the unit that will provide the appropriate cooling capacity for these ambient conditions. The maximum capacities are not guaranteed constantly out of the standard conditions.

As can be seen in the table, the RASC unit inmediatelly higher that covers the installation's cooling requirements is the RASC-5HVRNME (Maximum cooling capacity = 13.25 kW). Therefore, this will be the pre-selected unit.

NOTE

If the air inlet temperature for the indoor unit or RASC unit is not contained in the capacity table in section standard cooling and heating capacities, an interpolation should be carried out using the values above and below those of the air inlet temperature..

For this theoretical ambient, it is assumed that the most appropriate combination would be one indoor by room (total of 2 indoor units connected at the RASC unit), taking into account the design of the room and the possible position of the indoor units and their subsequent air distribution.

See section *Combinability,* for each indoor unit maximum cooling capacity.

Room		1	2	Total
Selected model		RPI-2.5FSN3E (Adjusted to 2.3HP)	RCI-3.0FSN3E	
Maximum cooling capacity (Q_{MC})	kW	6.08	7.92	14.0

For this example it is assumed two different indoor units (RPI-2.5FSN3E and RCI-3.0FSN3E) in order to show how the choice of indoor unit can affect the different factors presented in this chapter.

Taking into account the RASC system possibilities mentioned above, it has been adjusted the indoor unit capacity of RPI-2.5FSN3E by dip-switch.

c. Cooling capacity correction

The actual cooling capacity of the pre-selected unit must be calculated applying the necessary correction factors:

$$Q_C = Q_{MC} \times f_{LC}$$

Q_C: Actual cooling capacity of the RASC unit (kW).

Q_{MC}: Maximum cooling capacity of the RASC unit (kW).

f_{LC}: Cooling piping length correction factor.

The maximum cooling capacity (Q_{MC}) of the RASC-5HVRNME unit is 13.25 kW.

- Calculation of f_{LC}

Both the length of the refrigerant piping used and the height difference between the RASC unit and the indoor units directly affect the performance of the unit. This concept is quantified in the piping length correction factor.

To determine this value it is necessary refer to section *Piping length correction factor,* where it can be seen that for the characteristics of our example (equivalent piping length of 20 metres and a height difference between the RASC unit and the indoor units of 0 metres) the piping length correction factor for cooling mode is **0.96** aproximatelly.

- Calculation of Q_C

Once the correction factors to be applied have been determined, the formula for actual cooling capacity of the unit RASC-5HVRNME can be applied:

$$Q_C = 13.25\ kW \times 0.96 = \mathbf{12.72\ kW}$$

As can be seen, the actual cooling capacity of the RASC-5HVRNME (12.72 kW) unit is greater than the cooling load required by the ambient to be conditioned (11.6 kW). Before deciding that the unit is valid, it must be verified that the system complies with each room demand and with the requirement for the minimum sensible heat capacity set by the client.

- Actual indoor units capacity

$$Q_{CI} = Q_C \times (Q_{MCI} / Q_{MCC})$$

Q_{CI}: Actual cooling capacity of the indoor unit (kW).

Q_C: Actual cooling capacity of the RASC unit (kW).

Q_{MCI}: Maximum cooling capacity of the indoor unit (kW). See section *Combinability*.

Q_{MCC}: Maximum cooling capacity of the combination (kW). See section *Combinability*.

Applying this we obtain:

$$Q_{C\_RPI–2.5\ (Adjusted\ to\ 2.3HP)} = 12.72\ kW \times (6.08\ kW / 14.0\ kW) = \mathbf{5.52\ kW}$$
$$Q_{C\_RCI-3.0} = 12.72\ kW \times (7.92\ kW / 14.0\ kW) = \mathbf{7.20\ kW}$$

NOTE

If the actual cooling capacity calculated is less than that provided by the pre-selected unit, the calculation must be done again with the unit immediately higher.

4

d. Sensible heat capacity (SHC)

The system requirements specify a minimum sensible heat capacity of 9.3 kW. Once the real cooling capacity of the RASC-5HVRNME unit has been determined, its sensible heat capacity in combination with the two indoor units (RPI-2.5FSN3E and RCI-3.0FSN3E), can be calculated.

Once the calculation of the indoor units cooling capacity has been completed, the sensible heat capacity can be calculated using the following formula:

$$SHC = Q_{CI} \times SHF$$

SHC: Sensible heat capacity (kW).

Q_{CI}: Actual cooling capacity of the indoor unit (kW).

SHF: Sensible heat factor.

- Calculation of SHF

To determine the sensible heat factor (ratio of sensible heat relative to the total) the table in section *Sensible heat factor (SHF)* in Indoor Units Technical Catalogue has to be seen, in which the different SHF values are shown for the different indoor units for each of the three possible fan speeds (High, Medium, Low). In this case, the value used is the high fan speed factor.

Doing this we obtain:

$SHF_{RPI-2.5\ (Adjusted\ to\ 2.3\ HP)} = 0.76$

$SHF_{RCI-3.0} = 0.79$

Initially, once the sensible heat factors have been obtained, the sensible heat capacity of each indoor unit can be calculated by applying the previous formula.

$$SHC\_{}_{RPI-2.5\ (Adjusted\ to\ 2.3HP)} = 5.52\ kW \times 0.76 = \mathbf{4.20\ kW}$$
$$SHC\_{}_{RCI-3.0} = 7.20\ kW \times 0.79 = \mathbf{5.69\ kW}$$

The cooling capacity data for the RASC-5HVRNME unit taken from the table in section *Maximum cooling capacities,* is calculated on the basis of a relative humidity of 50% which means that an indoor air inlet temperature of 17 ºC WB corresponds to a temperature of 24 ºC DB.

However, the difference between the indoor air inlet dry bulb temperature required by the system (25 ºC) and the indoor air inlet dry bulb temperature recorded in the cooling capacity data (24 ºC) requires an adjustment of the sensible heat capacity for each indoor unit.

e. Sensible heat capacity correction (SHCc)

The following formula should be used to carry out the sensible heat correction for each indoor unit:

$$SHC_C = SHC + (CR \times (DB_R - DB))$$

SHC_C: Corrected sensible heat capacity (kW).

SHC: Sensible heat capacity (kW).

CR: Correction ratio due to humidity.

DB_R: Real Dry Bulb evaporator temperature (ºC).

DB: Dry Bulb evaporator temperature (ºC) for each wet bulb temperature from the table (HR = 50 %).

- Calculation of CR

The correction ratio due to humidity is shown in the table contained in section *Maximum cooling capacities*.

This coefficient corrects the sensible heat capacity of a unit according to the relative humidity of the air entering the indoor unit. The greater the relative humidity the lower will be the sensible heat capacity and vice versa.

The correction ratio CR for the RASC-5HVRNME unit is **0.53.**

Once the CR has been identified for the RASC-5HVRNME unit the corrected sensible heat capacity SHC_C of the indoor unit can be calculated:

$$SHC_{C\_RPI\text{-}2.5\ (Adjusted\ to\ 2.3HP)} = 4.20\ kW + (0.53 \times (25 - 24)) = \mathbf{4.73\ kW}$$
$$SHC_{C\_RCI\text{-}3.0} = 5.69\ kW + (0.53 \times (25 - 24)) = \mathbf{6.22\ kW}$$

- Calculation of SHC_C

The sensible heat capacity for the combination will be:

$$SHC_C = SHC_{C\_RPI\text{-}2.5\ (Adjusted\ to\ 2.3HP)} + SHC_{C\_RCI\text{-}3.0}$$
$$SHC_C = 4.73\ kW + 6.22\ kW = \mathbf{10.95\ kW}$$

As can be seen, the corrected sensible heat capacity of the system (10.95 kW) is greater than the sensible heat capacity required by the ambient to be conditioned (9.3 kW). Therefore, it can be said that the RASC-5HVRNME unit meets the minimum cooling requirements set for the system.

f. Results for cooling mode

Item			1	2	Total
			RPI-2.5FSN3E (Adjusted to 2.3HP)	RCI 3.0FSN3E	RASC-5HVRNME
Estimated load	Total	kW	5.0	6.6	11.6
	Sensible		4.0	5.3	9.3
Actual capacity	Total		5.52	7.20	12.72
	Sensible		4.73	6.22	10.95

In order to validate the pre-selection of the RASC-5HVRNME unit, its compliance with the minimum cooling requirements and the minimum heating requirements must be checked.

Heating mode

a. Initial pre-selection

The heating requirements for the previous example are shown below.

- Total load required for each room

Item		Room		
		1	2	Total
Estimated heating load Total	kW	4.8	6.3	11.1

- Desing conditions

The cooling ambient studied has the following heating characteristics:

Outdoor air inlet temperature	Dry bulb: 1 ºC Wet bulb: 0 ºC
Indoor air inlet temperature	Dry bulb: 20 ºC

It has been assumed that the required heating load for this ambient is 11.1 kW.

The outdoor ambient temperature (air inlet at the RASC unit) is 1/0 ºC (DB/WB) and temperature of the indoor air inlet is 20 ºC DB. In section *Maximum heating capacities,* should be seen once the characteristics of the space to be conditioned have been studied in order to verify that the unit pre-selected for cooling provides an appropriate heating capacity for these conditions. In this case for RASC-5HVRNME the maximum heating capacity is 13.55 kW. The maximum capacities are not guaranteed constantly out of the standard conditions.

As can be seen , the RASC-5HVRNM unit provides a theoretical heating capacity greater than the heating demand required by the environment. Therefore, the calculation process can continue.

Room		1	2	Total
Selected model		RPI-2.5FSN3E (Adjusted to 2.3HP)	RCI-3.0FSN3E	
Maximum heating capacity (Q_{MH})	kW	6.94	9.06	16.0

NOTE

If the unit pre-selected for cooling does not provide the heating load required by the environment the pre-selection should be changed and the next unit should be chosen.

b. Heating capacity correction

The actual heating capacity of the pre-selected unit must be calculated applying the necessary correction factors:

$$Q_H = Q_{MH} \times f_{LH} \times f_d$$

Q_H: Actual heating capacity of the RASC unit (kW).

Q_{MH}: Maximum heating capacity of the RASC unit (kW).

f_{LH}: Heating piping length correction factor.

f_d: Defrost correction factor.

The maximum heating capacity (Q_{MH}) of the RASC-5HVRNME unit is 13.55 kW.

- Calculation of f_{LH}

Consulting *Piping length correction factor,* it can be seen that for the characteristics of our example (equivalent piping length of 20 metres and a height difference between the RASC unit and the indoor units of 0 metres) the piping length correction factor for heating mode is **0.99** aproximatelly.

- Calculation of f_d

In situations where the ambient temperature is lower than 7 ºC DB, frost may build up on the heat exchanger. In this case, the heating capacity for the unit may be reduced because of the time spent by the unit in removing the frost up.

The defrost correction factor takes this time into account to apply the heating capacity correction.

To calculate the correction factor, please see section *Defrost correction factor,* which shows a table with different values of fd depending on the ambient temperature (ºC DB). If the correction factor at an ambient temperature of 1 ºC DB does not appear on the table, an interpolation will be needed.

Finally, the resulting defrosting correction factor is **0.86**.

- Calculation of Q_H

Once the correction factors to be applied have been determined, the formula for actual heating capacity of the unit RASC-5HVRNME can be applied:

$$Q_H = 13.55\ kW \times 0.99 \times 0.86 = \mathbf{11.54\ kW}$$

As can be seen, the actual heating capacity of the unit RASC-5HVRNME (11.54 kW) is greater than the heating load required by the ambient to be conditioned (11.1 kW).

NOTE

If the actual heating capacity calculated is less than that provided by the pre-selected unit, the calculation must be done again with the unit immediately higher.

Actual indoor units capacity

Once the real heating capacity of the RASC-5HVRNME unit has been determined, the heating capacity of the combination with the two indoor units (RPI-2.5FSN3E and RCI-3.0FSN3E), can be calculated.

$$\boldsymbol{Q_{CI} = Q_C \times (Q_{MCI} / Q_{MCC})}$$

Q_{CI}: Actual cooling capacity of the indoor unit (kW).

Q_C: Actual cooling capacity of the RASC unit (kW).

Q_{MCI}: Maximum cooling capacity of the indoor unit (kW). See section *Combinability*.

Q_{MCC}: Maximum cooling capacity of the combination (kW). See section *Combinability*.

Applying this we obtain:

$$Q_{C\_RPI–2.5\ (Adjusted\ to\ 2.3HP)} = 11.54\ kW \times (6.94\ kW / 16.0\ kW) = \mathbf{5.01\ kW}$$

$$Q_{C\_RCI-3.0} = 11.54\ kW \times (9.06\ kW / 16.0\ kW) = \mathbf{6.53\ kW}$$

c. Results of Heating mode

Item		Room		
		1	2	Total
		RPI-2.5FSN3E (Adjusted to 2.3HP)	RCI 3.0FSN3E	RASC-5HVRNME
Estimated load	kW	4.8	6.3	11.1
Actual capacity		5.01	6.54	11.54

The corrected heating capacity is greater than the estimated heating load by the different rooms to be conditioned.

Therefore, it can be said that the selection is valid for both heating and cooling.

4.2 Combinability

The following table shows the possible combinations for RASC units as well as the maximum capacity of the single unit and of the system according to the power combination (HP) of the indoor units at a nominal temperature and with a 7.5m piping length.

RASC-5HVRNME						Nominal cooling capacity: 12.50 kW Nominal heating capacity: 14.00 kW									
Combination	Indoor unit combination (HP)				Total	Maximum capacity (kW)									
						Cooling					Heating				
										Total					Total
Single	5.0	-	-	-	5.0	14.00	-	-	-	14.00	16.00	-	-	-	16.00
Twin	2.5	2.5	-	-	5.0	7.00	7.00	-	-	14.00	8.00	8.00	-	-	16.00
	3.0	(2.3)	-	-	5.3	7.92	6.08	-	-	14.00	9.06	6.94			16.00
Triple	(1.8)	(1.8)	1.5	-	5.1	4.94	4.94	4.12	-	14.00	5.65	5.65	4.71	-	16.00

RASC-10HRNE						Nominal cooling capacity: 23.00 kW Nominal heating capacity: 25.00 kW									
Combination	Indoor unit combination (HP)				Total	Maximum capacity (kW)									
						Cooling					Heating				
										Total					Total
Single	10.0	-	-	-	10.0	25.00	-	-	-	25.00	26.00	-	-	-	26.00
Twin	6.0	4.0	-	-	10.0	15.00	10.00	-	-	25.00	15.60	10.40	-	-	26.00
	5.0	5.0	-	-	10.0	12.50	12.50	-	-	25.00	13.00	13.00	-	-	26.00
	8.0	2.0	-	-	10.0	20.00	5.00	-	-	25.00	20.80	5.20	-	-	26.00
Triple	3.0	3.0	3.0	-	9.0	8.33	8.33	8.33	-	25.00	8.67	8.67	8.67	-	26.00
	4.0	3.0	3.0	-	10.0	10.00	7.50	7.50	-	25.00	10.40	7.80	7.80	-	26.00
Quad	2.5	2.5	2.5	2.5	10.0	6.25	6.25	6.25	6.25	25.00	6.50	6.50	6.50	6.50	26.00
	3.0	2.5	3.0	2.0	10.5	7.14	5.95	7.14	4.76	25.00	7.43	6.19	7.43	4.95	26.00
	3.0	2.5	2.5	2.5	10.5	7.14	5.95	5.95	5.95	25.00	7.43	6.19	6.19	6.19	26.00
	3.0	2.0	3.0	2.0	10.0	7.50	5.00	7.50	5.00	25.00	7.80	5.20	7.80	5.20	26.00
	3.0	2.0	2.5	2.5	10.0	7.50	5.00	6.25	6.25	25.00	7.80	5.20	6.50	6.50	26.00
	3.0	(2.3)	3.0	(2.3)	10.6	7.08	5.42	7.08	5.42	25.00	7.36	5.64	7.36	5.64	26.00
	3.0	(2.3)	3.0	2.0	10.3	7.28	5.58	7.28	4.85	25.00	7.57	5.81	7.57	5.05	26.00
	3.0	(2.3)	2.5	2.5	10.3	7.28	5.58	6.07	6.07	25.00	7.57	5.81	6.31	6.31	26.00

NOTE

- ***(): Adjusted capacity: In the 2.0 and 2.5HP units, the capacity can be adjusted to 1.8 and 2.3HP respectively by configuring the DSW3 in the following position:***

Horsepower (HP)	2.0	2.5
Variable capacity	1.8←2.0	2.3←2.5
Dip switch setting (DSW3)		

- ***The RPF(I) unit cannot be connected with another unit in a twin or triple combination due to lift restriction between indoor units.***

4.3 Standard cooling and heating capacities

RASC unit	Indoor unit	Cooling				Heating			
		Capacity (kW)	Power input (kW)	EER	Cooling performance	Performance capacity (kW)	Power input (kW)	COP	Heating performance
RASC-5HVRNME	RCI-5.0FSN3E	12.5	4.61	2.71	-	14.0	4.52	3.10	-
	RPC-5.0FSN2E	12.5	4.75	2.63	-	14.0	4.70	2.98	-
	RPI-5.0FSN3E	12.5	4.79	2.61	-	14.0	4.71	2.97	-
	RCD-5.0FSN2	12.5	4.65	2.69	-	14.0	4.65	3.01	-
	RCI-2.5FSN3E (x2)	12.5	4.56	2.74	-	14.0	4.70	2.98	-
	RPC-2.5FSN2E (x2)	12.5	4.79	2.61	-	14.0	4.73	2.96	-
	RPI-2.5FSN3E (x2)	12.5	4.66	2.68	-	14.0	4.73	2.96	-
	RCD-2.5FSN2 (x2)	12.5	4.61	2.71	-	14.0	4.71	2.97	-
	RPK-2.5FSN2M (x2)	12.5	4.68	2.67	-	14.0	4.79	2.92	-
	RPF-2.5FSN2E (x2)	12.5	4.77	2.62	-	14.0	4.83	2.90	-
	RPFI-2.5FSN2E (x2)	12.5	4.77	2.62	-	14.0	4.83	2.90	-
RASC-10HRNME	RPI-10.0FSN3E	23.0	9.54	2.41	-	25.0	9.47	2.64	-
	RCI-5.0FSN3E (x2)	23.0	8.49	2.71	-	25.0	8.59	2.91	-
	RPC-5.0FSN2E (x2)	23.0	9.50	2.42	-	25.0	9.33	2.65	-
	RPI-5.0FSN3E (x2)	23.0	9.43	2.44	-	25.0	9.36	2.67	-
	RCD-5.0FSN2 (x2)	23.0	9.16	2.51	-	25.0	8.68	2.88	-

4.4 Maximum cooling capacities

RASC unit	CR	Outdoor air inlet temperature (DB) (ºC)	Indoor air inlet temperature WB(ºC) / (DB(ºC))					
			15/(21)	17/(24)	19/(26)	20/(28)	21/(29)	23/(31)
			CAP max.	CAP max.	CAP max.	CAP max.	CAP max.	CAP max.
RASC-5HVRNME	0.51	25	12.80	13.75	14.50	14.78	15.00	15.35
		30	12.65	13.55	14.25	14.55	14.80	15.20
		35	12.25	13.25	14.00	14.30	14.55	14.90
		40	11.65	12.60	13.40	14.72	13.95	14.20
RASC-10HRNME	0.88	25	23.00	24.68	26.00	26.50	26.93	27.51
		30	22.75	24.43	25.75	26.25	26.68	27.26
		35	22.00	23.65	25.00	25.50	25.90	26.50
		40	20.25	21.93	23.25	23.75	24.18	24.76

NOTE

CAP max.: Capacity at compressor maximum frequency (kW).

CR: Correction ratio due to humidity.

4.5 Maximum heating capacities

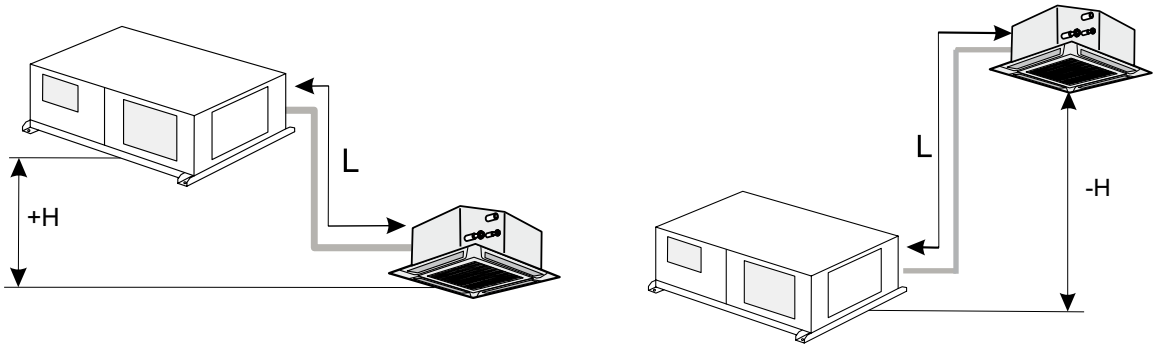
RASC unit	Outdoor air inlet temperature (WB) (ºC)	Indoor air inlet temperature (DB) (ºC)					
		16 CAP max.	18 CAP max.	20 CAP max.	22 CAP max.	24 CAP max.	26 CAP max.
RASC-5HVRNME	-10	11.10	10.90	10.65	10.40	10.10	9.80
	-5	12.30	12.10	11.85	11.50	11.20	10.93
	0	14.10	13.80	13.55	13.20	12.40	12.50
	5	16.10	15.90	15.70	15.45	15.20	14.95
	10	18.25	18.00	17.75	17.47	17.20	16.95
	15	20.70	20.50	20.27	20.00	19.75	19.50
RASC-10HRNME	-10	17.38	17.18	16.90	16.50	16.02	15.45
	-5	19.98	19.78	19.50	19.10	18.62	18.05
	0	22.50	22.30	22.02	21.62	21.14	20.57
	5	25.98	25.80	25.51	25.10	24.60	24.07
	10	28.30	28.10	27.82	27.42	26.94	26.37
	15	29.08	28.88	28.60	28.20	27.72	27.15

NOTE

CAP max.: Capacity at compressor maximum frequency (kW).

4.6 Correction factors

4.6.1 Piping length correction factor



The correction factor is based on the equivalent piping length in meters (EL) and the height between RASC and indoor units in meters (H).

H:

Height between indoor unit and RASC

unit (m).

- H>0: Position of RASC unit is higher than position of indoor unit (m).
- H<0: Position of RASC unit is lower than position of indoor unit (m).

L:

Actual one-way piping length between indoor unit and RASC unit (m).

EL:

Equivalent one-way piping length between indoor unit and RASC unit (m).

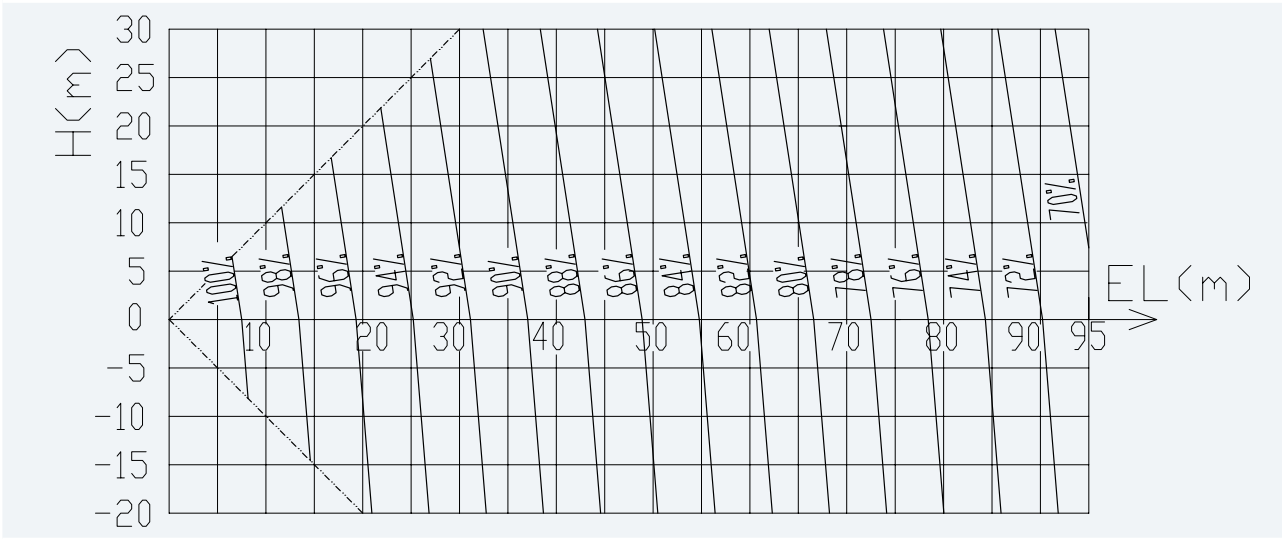
- One 90º elbow is 0.5 m.
- One 180º bend is 1.5 m.
- One Multi-kit is 0.5 m.

NOTE

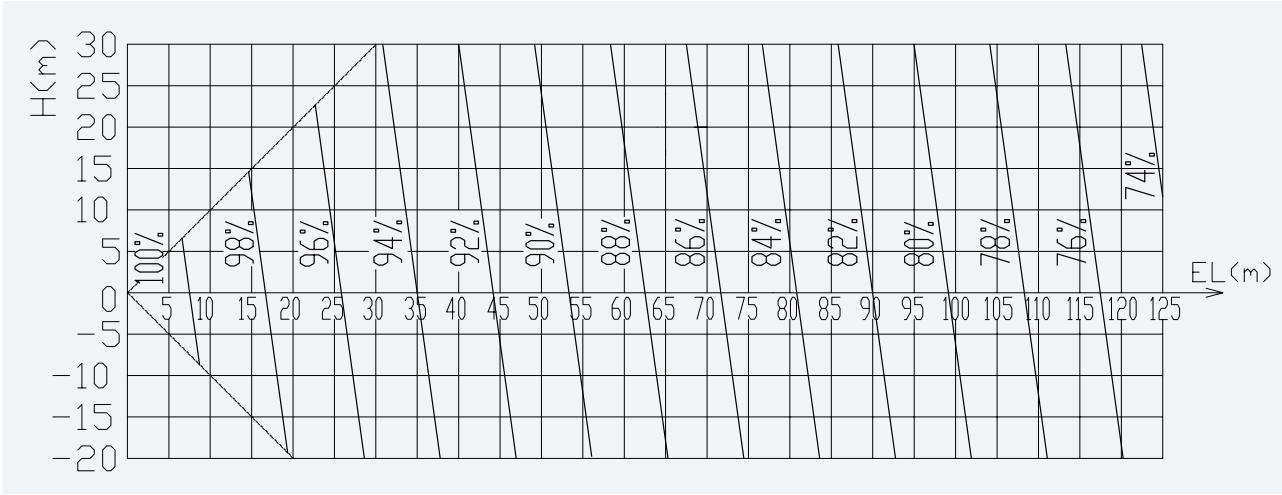
In order to ensure correct unit selection, consider the fartest indoor unit.

Cooling

RASC-5HVRNME



RASC-10HRNME



NOTE

Cooling capacity

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

CCA = CC x F

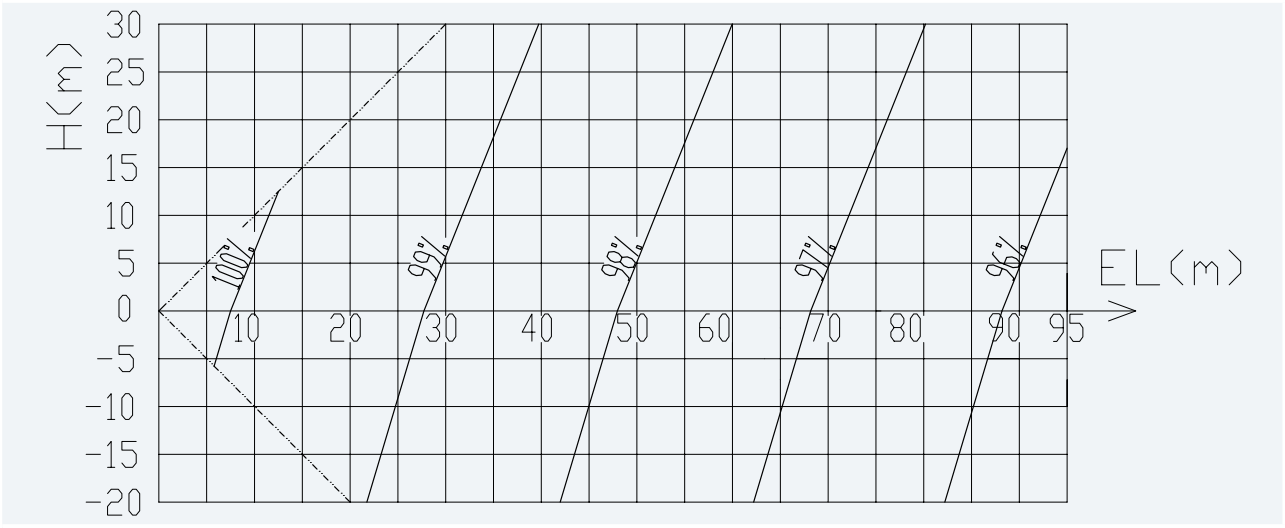
CCA: ***Actual corrected cooling capacity (kW).***

CC: Cooling capacity in the cooling capacity table (kW).

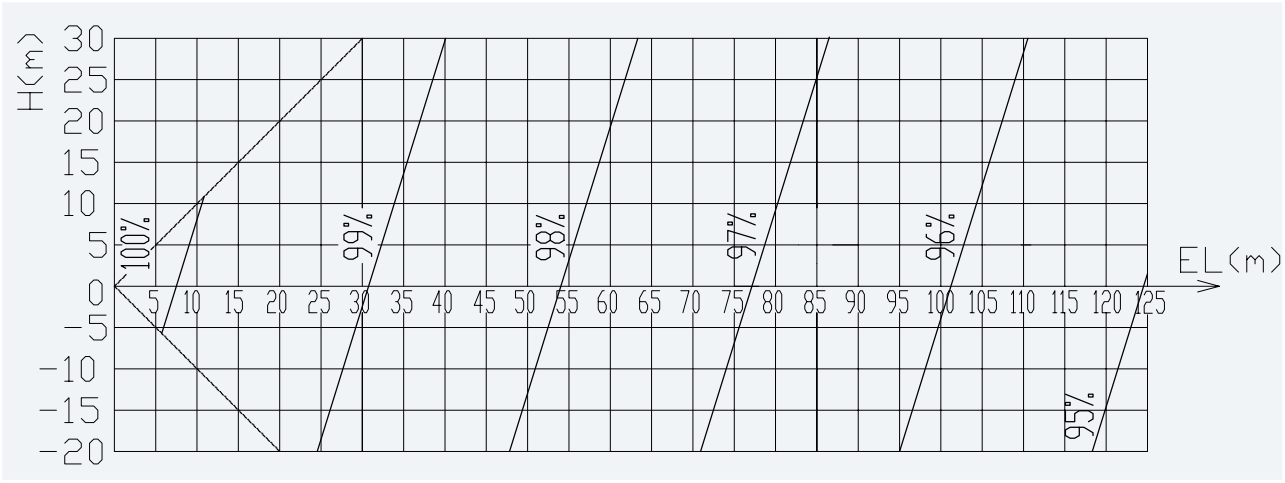
F: Correction factor based on the equivalent piping length (in %).

Heating

RASC-5HVRNME



RASC-10HRNME



NOTE

Heating capacity

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

HCA = HC x F

HCA: ***Actual corrected heating capacity (kW).***

HC: Heating capacity from heating capacity table (kW).

F: Correction factor based on the equivalent piping length (in %).

4.6.2 Defrost correction factor

The heating capacity does not include operation during frost or defrosting.

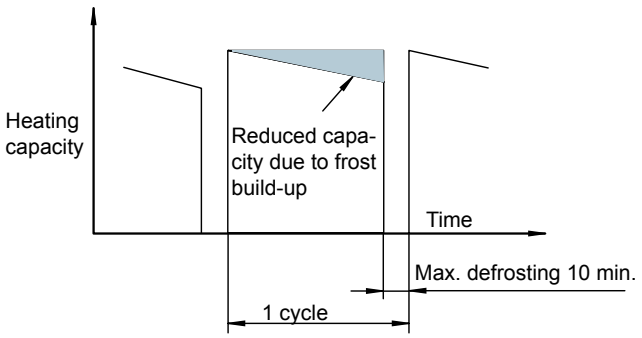
When this type of operation is taken in account, the heating capacity must be corrected according to the following equation:

Corrected heating capacity = correction factor x heating capacity

Ambient temperature (ºC DB) (HR = 85%)	-20	-7	-5	-3	0	3	5	7
Defrost correction factor f_d	0.95	0.95	0.93	0.88	0.85	0.87	0.90	1.00

NOTE

- ***Defrost correction factor corresponds to a relative humidity of 85%. If the condition changes, the correction factor will be different.***
- ***Defrost correction factor is not valid for special conditions such as during snow or operation in a transitional period.***



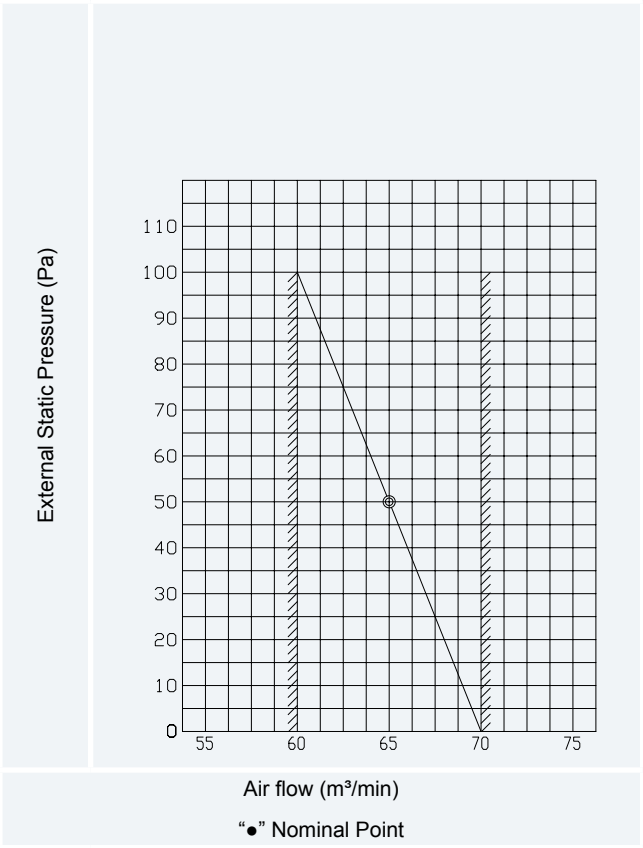
4.7 Fan performance

RASC unit can be installed with suction and/or discharge air ducts.

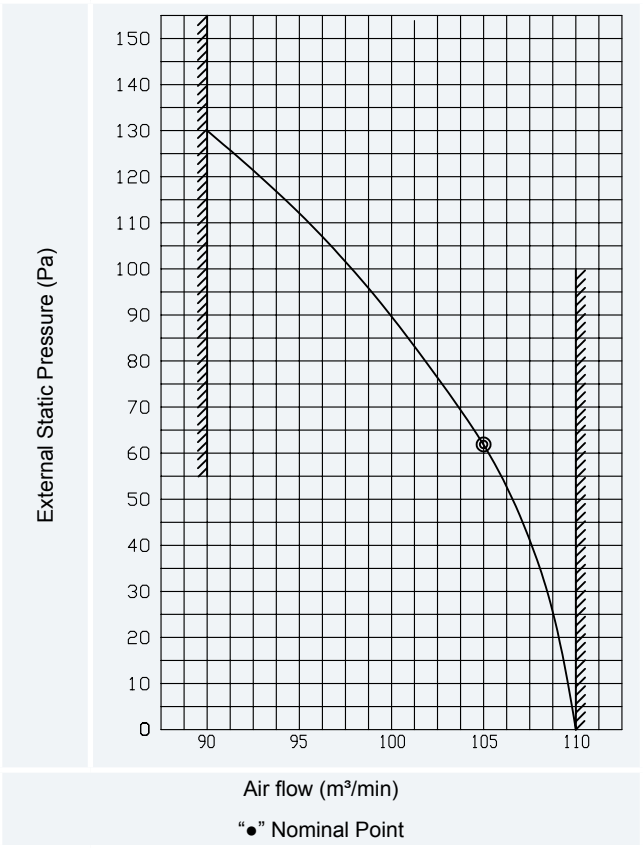
Refer to Fan performance curve in order to ensure that the air volume is within the working range.

In the case of using suction and/or discharge air ducts, check the fan performance curve and decide which ducts are suitable according to the external static pressure (Pa) / air flow volume (m^3/min.).

RASC-5HVRNME



RASC-10HRNME



NOTE

- ***When design a duct, check to ensure that the Air volume is within working range as indicate** Fan performance curve**.***
- ***If the Air volume is set outside working range, water-carry-over (drop in the ceiling or into the room), noise increases, fan motor damaged (high temperature), insufficient Cooling/Heating capacity, phenomena can occur.***

5. Acoustic characteristic curves

Index

5.1 Overall sound level

The sound pressure level is based on the following conditions:

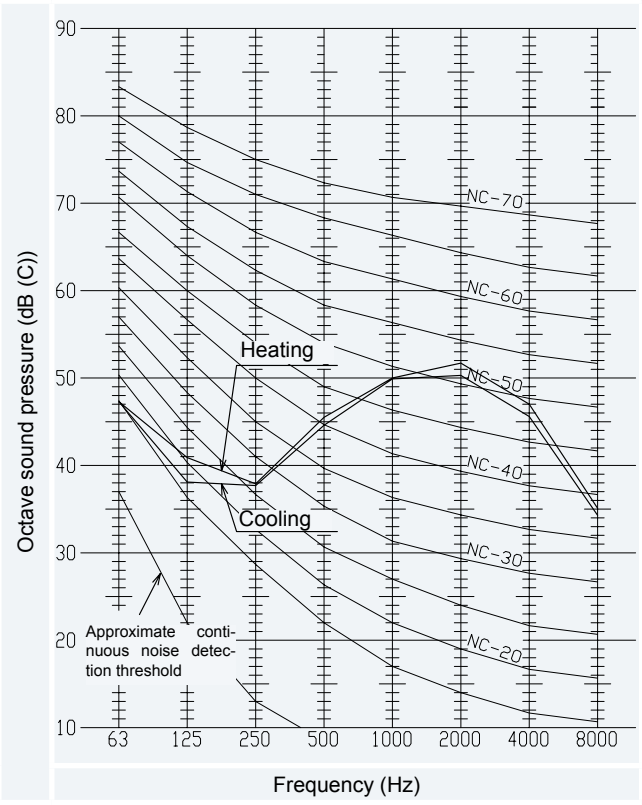
1. Distance of the unit from the measuring point: 1.5 meters beneath the unit (With duct)
2. Power supply:
   - **a.** RASC-5HVRNME: 1~ 230V 50Hz.
   - **b.** RASC-10HRNME: 3N~ 400V 50Hz.

NOTE

The sound data is measured in an anechoic chamber, so reflected sound should be taken into consideration when installing the unit.

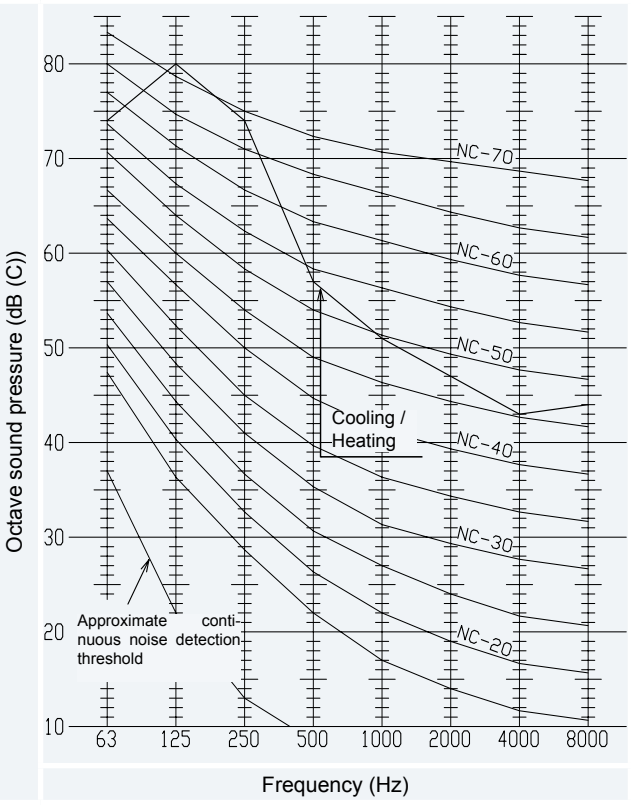
5.2 Sound data

RASC-5HVRNME



Cooling/ Heating: 55/56 dB(A)

RASC-10HRNME



Cooling/ Heating: 68/68 dB(A)

HITACHI
Inspire the Next

6. Working range

Index

6.1 Working range

6.1.1 Power supply

Operating voltage	Between 90 and 110% of the nominal voltage.
Voltage imbalance	Up to 3% of each phase, measured at the main terminal of the RASC unit.
Starting voltage	Over 85% of the nominal voltage.

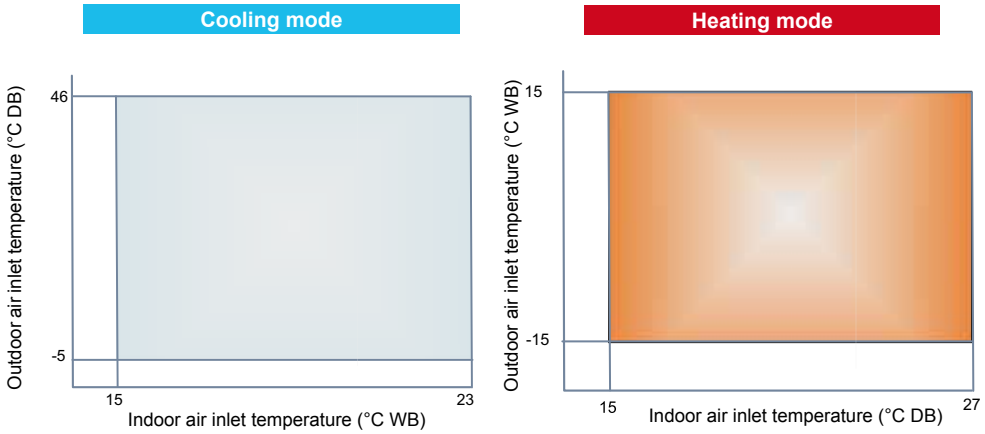
6.1.2 Temperature range

The temperature range is indicated in the following table:

		Cooling mode	Heating mode
Indoor temperature	Minimum	21°C DB/15°C WB	15°C DB
	Maximum	32°C DB/23°C WB	27°C DB
Outdoor temperature	Minimum	-5°C DB	-15°C WB
	Maximum	46°C DB	15°C WB

DB: dry bulb; WB: wet bulb

Temperature range diagram:

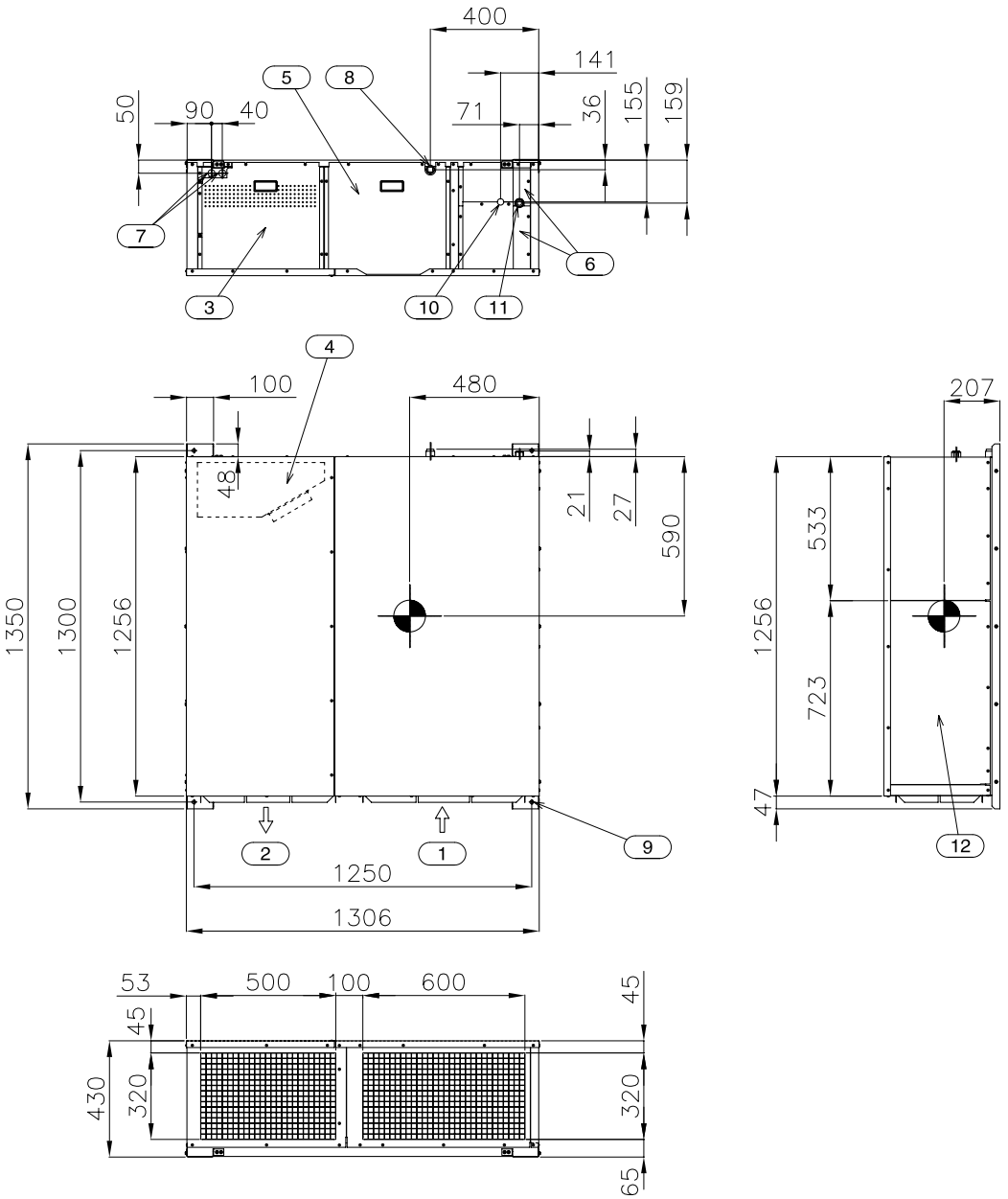


7. Dimensional data

Index

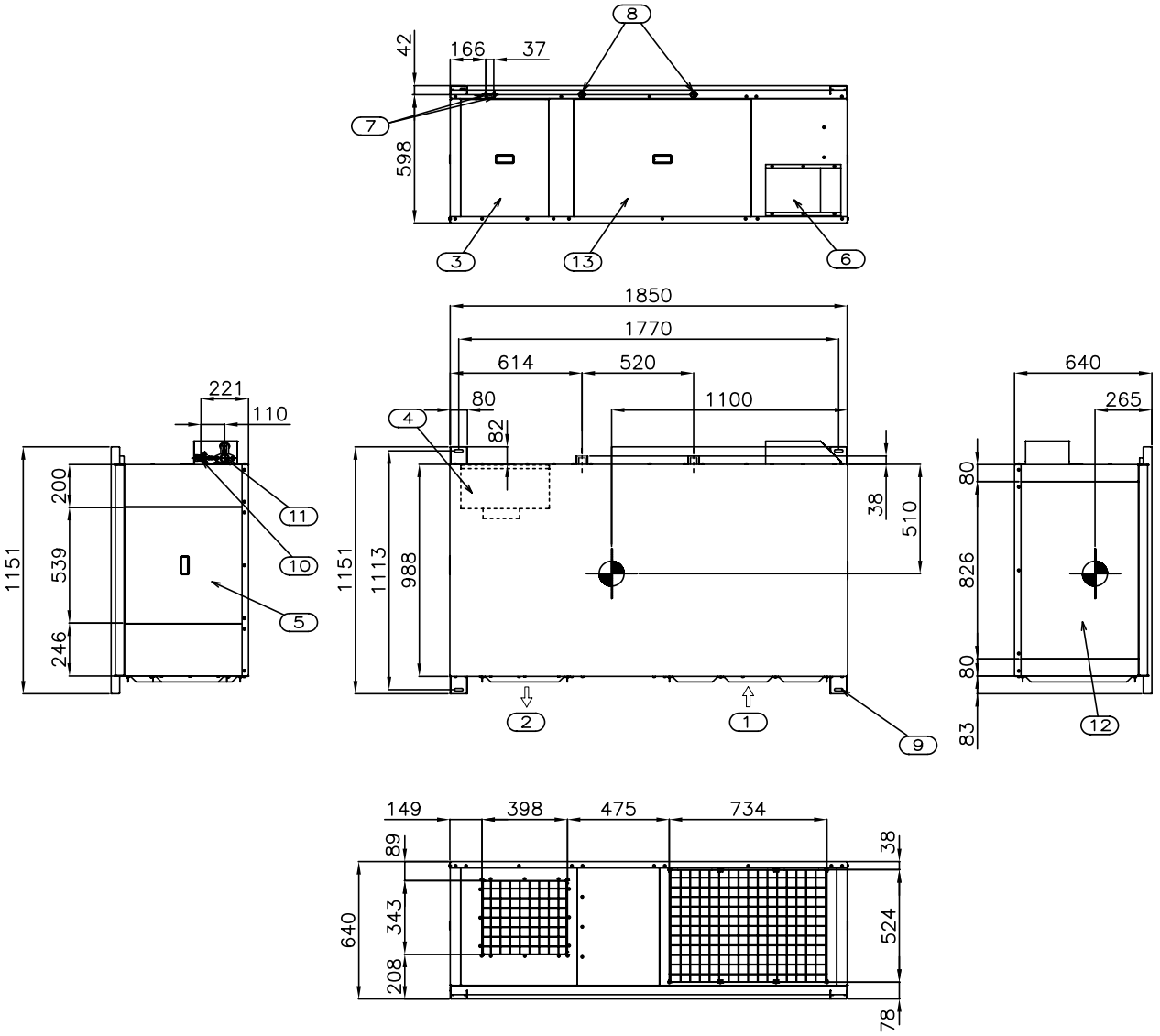
7.1 Dimensions

7.1.1 RASC-5HVRNME

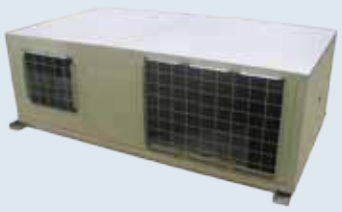


No.	Part name	Remarks
1	Air inlet	
2	Air outlet	
3	Electrical box cover	
4	Electrical box	
5	Fan service cover	
6	Stop valves cover	
7	Holes for wiring connections	2-Ø26
8	Drain pipe	Ø26
9	Holes for fixing unit	4-Ø14
10	Refrigerant liquid pipe	Flare nut: Ø9.53 (3/8”)
11	Refrigerant gas pipe	Flare nut: Ø15.88 (5/8”)
12	Optional air inlet	

7.1.2 RASC-10HRNME



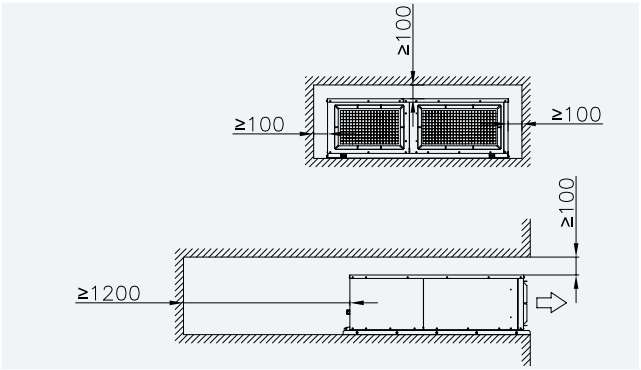
No.	Part name	Remarks
1	Air inlet	
2	Air outlet	
3	Electrical box cover	
4	Electrical box	
5	Fan service cover / Optional air outlet	
6	Stop valves protection	
7	Holes for wiring connections	2-Ø25
8	Drain pipe	2-Ø30
9	Holes for fixing unit	4-Ø12x28
10	Refrigerant liquid pipe	Flare nut: Ø12,7 (1/2”)
11	Refrigerant gas pipe	Flare nut: Ø25,4 (1”)
12	Optional air inlet	
13	Back cover	



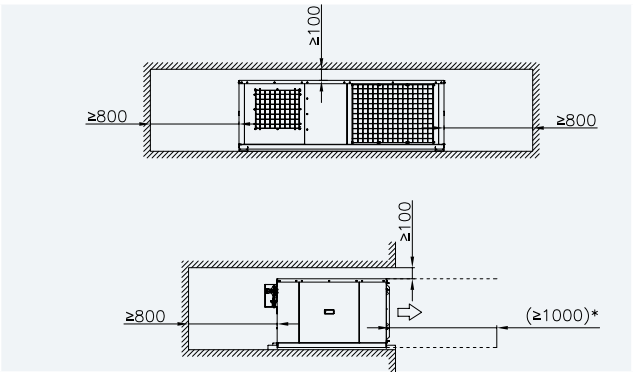
7.2 Service space

7.2.1 Service space

RASC-5HVRNME



RASC-10HRNME



NOTE

(*) Recommended servicing space for fan unit in those cases where will not be possible accessing from the unit's side.

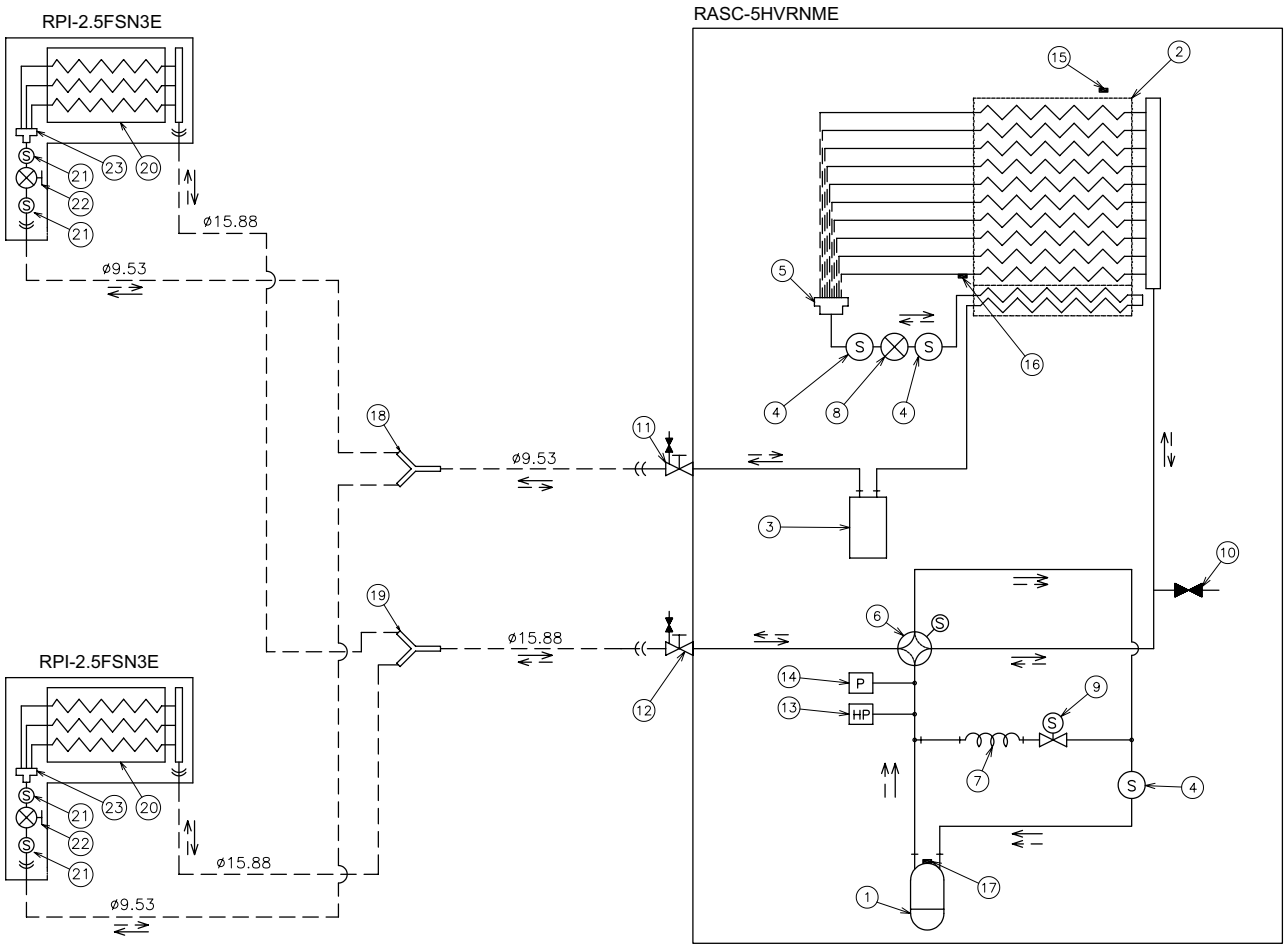
In these cases, it should be installed a "removable servicing duct" or a "removable grille" (in case of installing the unit near to a wall) for guarantee the fan unit replacement (which should be made from the unit's front side).

8. Refrigerant cycle

Index

8.1 RASC-5HVRNME

Example of twin combination:



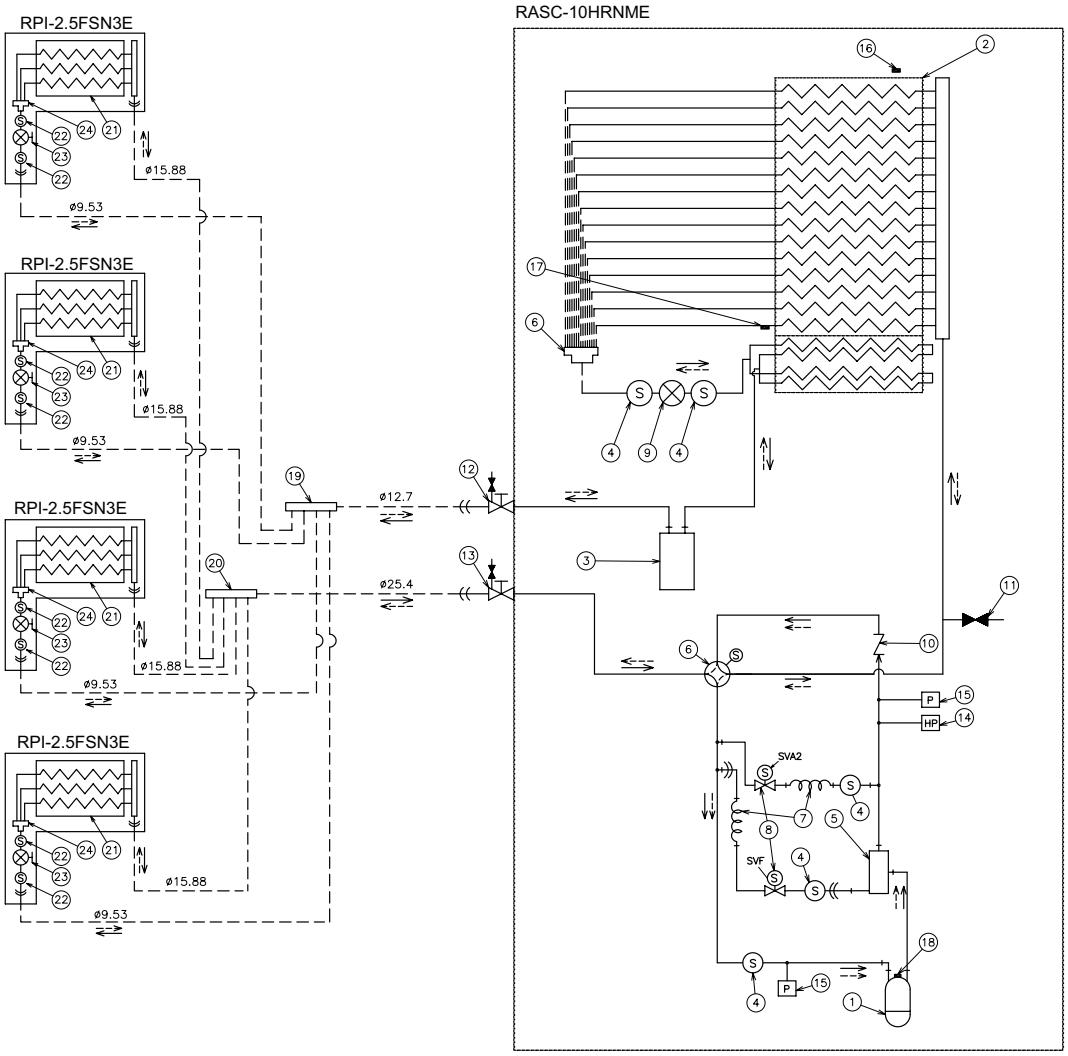
Cooling Refrigerant Flow	Heating Refrigerant Flow	Installation Refrigerant Piping Line	Flare Nut Connection	Flange Connection	Brazing Connection

Nº	Part name
1	Compressor
2	Heat exchanger
3	Liquid tank
4	Strainer
5	Distributor
6	Reversing valve
7	Capillary tube
8	Electronic expansion valve
9	Solenoid valve
10	Check joint
11	Stop valve for liquid line
12	Stop valve for gas line

Nº	Part name
13	High pressure switch for protection
14	Pressure switch for control
15	Ambient thermistor
16	Condenser pipe thermistor
17	Discharge gas thermistor
18	Multikit (Liquid line)
19	Multikit (Gas line)
20	Indoor exchanger
21	Strainer
22	Electronic expansion valve
23	Distributor

8.2 RASC-10HRNME

Example of quadruple combination:



Cooling Refrigerant Flow	Heating Refrigerant Flow	Installation Refrigerant Piping Line	Flare Nut Connection	Flange Connection	Brazing Connection

Nº	Part name
1	Compressor
2	Heat exchanger
3	Liquid tank
4	Strainer
5	Oil separator
6	Reversing valve
7	Capillary tube
8	Solenoid valve
9	Electronic expansion valve
10	Check valve
11	Check joint
12	Stop valve for liquid line

Nº	Part name
13	Stop valve for gas line
14	High pressure switch for protection
15	Pressure switch for control
16	Ambient thermistor
17	Condenser pipe thermistor
18	Discharge gas thermistor
19	Multikit (Liquid line)
20	Multikit (Gas line)
21	Indoor exchanger
22	Strainer
23	Electronic expansion valve
24	Distributor

* SVF: Oil return, SVA2: Gas by-pass

9. Piping work and refrigerant charge

Index

9.1 General notes

9.1.1 Pipe size selection

CAUTION

- ***Do not use refrigerant pipe sizes other than those indicated in this Technical Catalogue. The diameter of the refrigerant pipes depends directly on the RASC unit capacity.***
- ***If larger diameter refrigerant pipes are used, the circuit lubrication oil tends to separate from the refrigerant carrying it. The compressor will be seriously damaged due to a lack of lubrication.***
- ***If smaller diameter refrigerant pipes are used, the refrigerant will have serious difficulties in circulating. System performance will be affected. The compressor will run under more severe conditions than foreseen and will be damaged in a short space of time.***

9.1.2 Multikit or distributor selection

NOTE

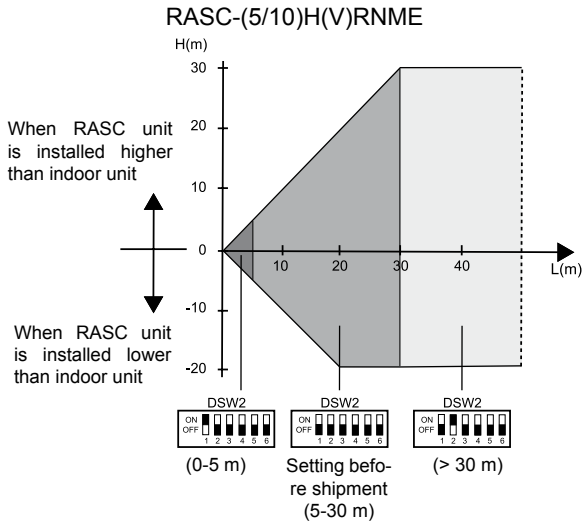
- ***Pipe connection size on RASC units, indoor units and the multikit or distributor vary according to the system. For the specific information, please refer to Service Manual (SMXX0064).***
- ***The sizes of the indoor and RASC units could be different. Adjust the flare adapter (accessory) to the indoor pipe connection in these cases.***
- ***For detailed information about multikits and distributors, please refer to the Indoor units Technical Catalogue (TCXX0063).***

9.2 Refrigerant piping range

9.2.1 Refrigerant piping length

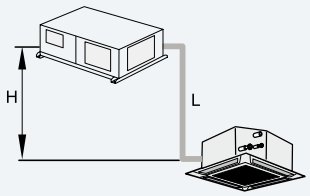
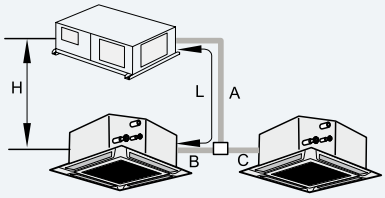
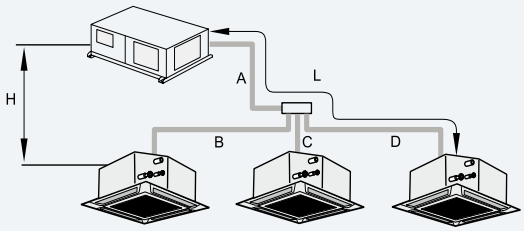
The refrigerant piping between the indoor unit and the RASC unit should be designed using the following chart.

Keep the design point within the area of the chart, which is showing the applicable height difference according to piping length.

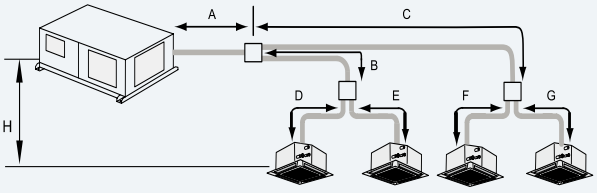
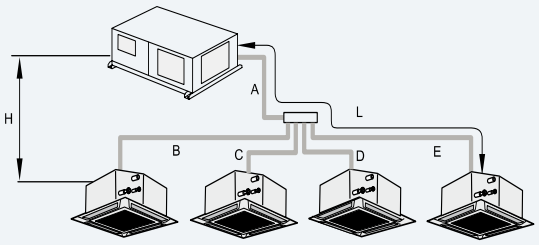


◆ **Piping system (Typical installation)**

RASC-(5/10)HP

Single system	Twin system	Triple system
		
	L= A + the longest of B & C	L=A + the longest of B, C & D

RASC-10HP only

Quad system (Only for RASC-10HRNME)	
Case a)	Case b)
	
L= A + the longest of (B + the longest of D & E) & (C + the longest of F & G)	L= A + the longest of B, C, D & E

NOTE

L and H are the length and height indicated in the above chart. For twin, triple and quad systems, the length is the distance between the RASC unit and the farthest indoor unit.

CAUTION

- ***The liquid piping and the gas piping must be of the same length and run along the same route.***
- ***Multi-kits for multiple connections (optional accessory as system parts) must be used to install the branch pipe to the indoor unit.***

Maximun refrigerant piping length (Typical installation)

(m)

Item			5HP	10HP
Maximum piping length between the RASC unit and the farthest indoor unit (L)	Actual piping length		70	50
	Equivalent piping length		90	70
Maximum height difference between RASC unit and indoor unit (H)	RASC unit higher than indoor unit		30	30
	Indoor unit higher than RASC unit		20	20
	Height difference between indoor units		3	3
Maximum piping length between multikit and indoor unit	Twin B, C		10	15
	Triple B, C, D		10	15
	Quad	Case a) B + D, B + E, C + F, C + G	-	15
		Case b) B, C, D, E	-	15
Maximum total piping length	Twin (A + B + C)		80	60
	Triple (A + B + C + D)		80	70
	Quad	Case a) (A + B + C + D + E + F + G)	-	80
		Case b) (A + B + C + D + E)	-	80

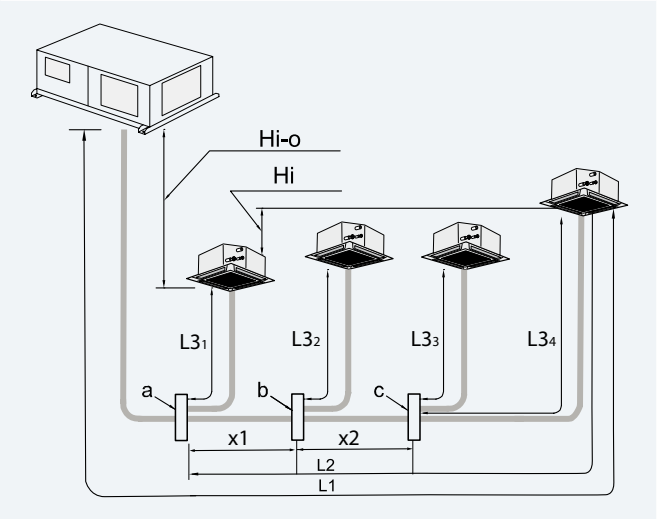
NOTE

- ***The refrigerant piping length from the RASC unit to the first branch must be higher than the piping length from the first branch to the farthest indoor unit.***
- ***All branch piping should be balanced, and the difference between these sections cannot be greater than indicated in the tables below:***

(m)

			5HP	10HP
Twin		(B-C)	8	8
Triple		(B-C, B-D, C-D)	8	8
Quad	Case a)	(B+(D/E)) - (C+(F/G))	-	8
		(D-E)		
		(F-G)		
	Case b)	(B-C, B-D, B-E, C-D, C-E, D-E)	-	8

◆ Piping system (Line branch installation) (RASC-10HP only)



Maximum refrigerant piping length (Typical installation) (RASC-10HP only)

(m)

Item		10HP
Maximum piping length between the RASC unit and the farthest indoor unit (L)	Actual piping length	50
	Equivalent piping length	70
Maximum length from the 1st multikit to the furthest indoor unit (L2)		15
Maximum piping length (L3)		10
Maximum height difference between RASC unit and indoor unit (Hi-o)	RASC unit higher than indoor unit	30
	Indoor unit higher than RASC unit	20
Maximum height difference between indoor units (Hi)		3
Total piping length (L1+ $L3_1$ + $L3_2$ + $L3_3$)		60

NOTE

All branch piping should be balanced, and the difference between these sections cannot be greater than indicated in the tables below:

(m)

	10HP
L2-$L3._1$	8
L2-(x1+$L3._2$)	8
L2-(x1+x2+$L3._3$)	8

9.2.2 Multikit selection

◆ Typical installation

RASC unit	Multikit/Distributor		
	Twin	Triple	Quad
RASC-5HVRNME	TE-56N	TRE-06N	-
RASC-10HRNME	TE-10N	TRE-810N	Case a) TE-10N + (TE-56N + TE-56N)(*1)
			Case b) QE-810N

NOTE

(*1) Condition:

Total IU capacity after second branch	Multikit
≤ 1.5HP	TE-03N
> 1.5HP	TE-56N

◆ Line branch installation (RASC-10HP only)

Mark	Multikit		
	Twin	Triple	Quad
a (First multikit)	E-102SN	E-162SN	E-162SN
b (Second multikit)	–	E-102SN	E-162SN
c (Third multikit)	–	–	E-102SN

NOTE

For more information about multikits/distributors, please refer to the indoor unit Technical Catalogue (TCXX0063).

9.2.3 Refrigerant piping size

Select the piping connection sizes according to the following procedures:

- Between RASC unit and first branch: select the same pipe connection size as the pipe size of the RASC unit.
- Between first and second branch pipe (for RASC-10HRNME quad system case a)).
- Between branch pipe and indoor unit: Select the same pipe connection size as the pipe size of the indoor unit.

◆ Piping connection size between RASC unit and first branch

(mm(in))

RASC Unit	Pipe Size (*1)	
	Liquid	Gas
RASC-5HVRNME	Ø9.53 (3/8”)	Ø15.88 (5/8”)
RASC-10HRNME	Ø12.70 (1/2”)	Ø25.40 (1”)

NOTE

(*1): The sizes of the indoor unit and RASC unit could be different. Adjust the flare adapter (accessories) to the joint part of the indoor piping.

◆ Piping connection size between first and second branch pipe (for RASC-10HRNME quad system case a))

Total indoor unit capacity after connecting second branch pipe	Pipe size (∅ mm) (First - Second branch pipe)	
	Gas	Liquid
< 2.3 HP	∅12.7	∅6.35
≥ 2.5 HP	∅15.88	∅9.53

◆ Piping connection size of indoor unit

Indoor unit	Gas piping size	Liquid piping size
1.5HP	∅12.7	∅6.35
2.0HP	∅15.88	∅6.35
(2.5-6.0)HP	∅15.88	∅9.53
8.0HP	∅19.05–> ∅25.4(*1)	∅9.53
10.0HP	∅22.2–>∅25.4(*1)	∅9.53(*2)

NOTE

If using different piping from the standard values, piping reducers will be supplied by the installer.

- ***(*1) Ø19.05 --> Ø25.4 and Ø22.2 --> Ø25.4 indoor pipe adapters are factory supplied with the indoor unit.***
- ***(*2) Change the liquid piping size to Ø12.7 when the piping length is more than 30 m. Indoor unit pipe adapter is factory supplied with the indoor unit.***

◆ Piping connection size between branch pipe and indoor unit

	Pipe size (∅ mm)	
Indoor unit	Gas	Liquid
1.5HP	∅12.7	∅6.35
2HP	∅15.88	∅6.35
(2.5-6)HP	∅15.88	∅9.53
8HP	∅19.05–> ∅25.4(*1)	∅9.53
10HP	∅22.2–>∅25.4(*1)	∅9.53(*2)

NOTE

If using different piping from the standard values, piping reducers shall be supplied by the installer.

- ***(*1) Ø19.05 --> Ø25.4 and Ø22.2 --> Ø25.4 indoor pipe adapters are factory supplied with the indoor unit.***
- ***(*2) Change the liquid piping size to Ø12.7 when the piping length is more than 30 m. Indoor unit pipe adapter is factory supplied with the indoor unit.***

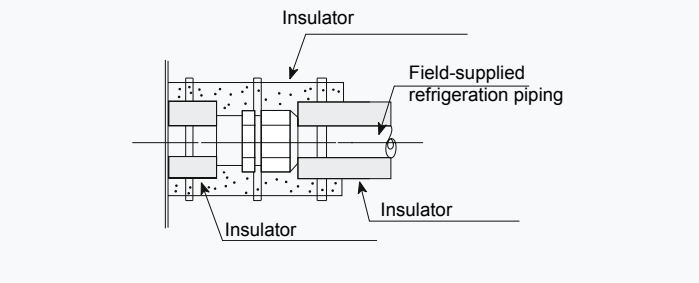
9.3 Copper pipes, sizes and connection

9.3.1 Copper pipes and sizes

1 Prepare locally-supplied copper pipes.
2 Select the correct pipe size and material. Use the table below to select the required piping.

Nominal Diameter		Thickness (mm)	Copper Type
(mm)	(in)		
6.35	1/4	0.80	Roll
9.53	3/8	0.80	Roll
12.7	1/2	0.80	Pipe/Roll
15.88	5/8	1.00	Roll
19.05	3/4	1.00	Pipe/Roll
22.2	7/8	1.00	Pipe/Roll
25.4	1	1.00	Pipe

3 Select clean copper pipes. Make sure there is no dust and moisture inside. Blow the inside of the pipes through with oxygen-free nitrogen to remove any dust and foreign materials before connecting pipes.
4 After connecting the refrigerant piping, seal the open space between the knockout hole and refrigerant pipes by using insulation material as shown below:



NOTE

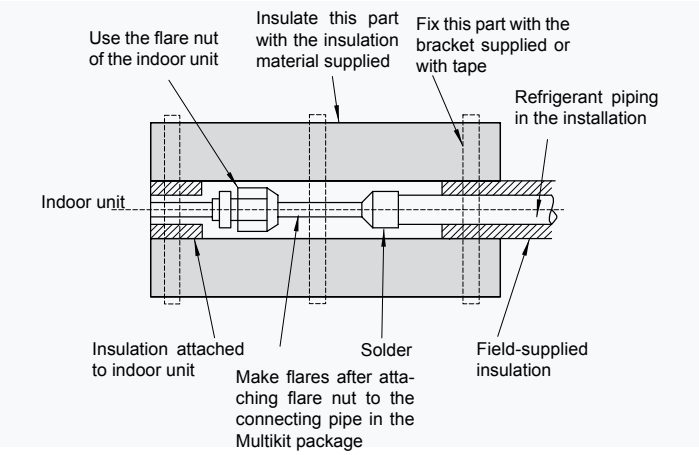
- ***If copper pipe is used for piping bigger than Ø19.05 flaring work can not be performed.***
- ***If necessary, use a joint adapter.***

CAUTION

Do not use saws. grindstones or other tools which might create copper dust.

9.3.2 Pipe connection

Fix the connecting pipe as shown in the figure below. Use the insulation attached to the indoor unit.

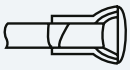


NOTE

A system with no moisture or oil contamination will give maximum performance and life-cycle as compared with a poorly prepared system.

To ensure this, blow oxygen free nitrogen through the pipes.

- Cap the end of the pipe when the pipe is to be inserted through a hole.
- Do not place pipes directly on the ground without a cap or vinyl tape covering the end.

Right	Wrong
	

- If piping installation cannot be completed until the following day or longer, solder the ends of the piping to close them and load with oxygen-free nitrogen using an access device such as a Schrader valve to avoid moisture and contamination by extraneous particles.
- Do not use insulation material containing NH3 as it can damage the copper piping material and may be a source of future leakage.

9.3.3 Insulation

Attach insulation package with the Multikit to each branch using vinyl tape. Also attach insulation to field-supplied piping to prevent capacity decrease due to ambient air conditions and dewing on pipe surface caused by low pressure.

NOTE

When polyethylene foam is applied a thickness of 10mm for the liquid piping and 15mm to 20mm for the gas piping is recommended.

CAUTION

- ***Perform insulation work when the surface temperature reaches the room temperature. Otherwise it is possible that the insulation will melt.***
- ***If the ends of the piping system are open after accomplishing piping work securely attach caps or vinyl bags to the ends of the piping avoiding the invasion of moisture and dust.***

9.4 Refrigerant charge amount

Although refrigerant has been charged into this unit, additional refrigerant charge is required according to piping length.

- The additional refrigerant quantity should be determined and charged into the system according to the following procedure.
- Record the additional refrigerant quantity in order to facilitate maintenance and servicing activities.

9.4.1 Refrigerant charge before shipment (W_0 (kg))

W_0 is the RASC unit refrigerant charge before shipment (Factory charge) and it's shown in the following table:

Model	Refrigerant charge before shipment (W0 (kg))
RASC-5HVRNME	3.1
RASC-10HRNME	5.0

CAUTION

- ***When charging refrigerant, measure the amount precisely.***
- ***Overcharging or undercharging of refrigerant may cause compressor problems.***
- ***If the actual piping length is less than 5 m, consult your dealer.***

9.4.2 Additional refrigerant charge calculation method

RASC units have been charged with refrigerant for the following of actual piping length. An additional refrigerant charged is required in systems with actual piping length longer than these values:

Model	Maximum piping length chargeless (m)
RASC-5HVRNME	15
RASC-10HRNME	7.5

◆ Step 1: Additional refrigerant charge calculation for liquid piping (W_1 (kg))

The additional refrigerant charge must be calculated by multiplying the piping length of each diameter per its Additional refrigerant charge factor according to the following table. The result is the additional refrigerant charge for liquid piping.

Use the following formula:

$$W_1 = \Sigma(Pi \times Li) - 0.9$$

P: Additional refrigerant charge factor (kg/m) (Refer to the following table)

L: Piping length of each diameter (m)

Pipe size (mm)	Additional refrigerant charge factor (P) (kg/m)
Ø15.88	x 0.19
Ø12.7	x 0.12
Ø9.53	x 0.06
Ø6.35	x 0.03

◆ Step 2: Additional refrigerant charge calculation for indoor unit (W_2 (kg))

When the RASC unit is combined with indoor units RPI-10HP, it´s necessary an additional refrigerant charge (W_2) = 1 kg/ unit. For the rest of indoor units, an additional refrigerant charge it's not needed.

Indoor unit capacity	Additional refrigerant charge (W_2 (kg))
RPI-10HP	1
Rest of indoor units	0

◆ Step 3: Calculation of total additional refrigerant charge (W (kg))

Put weight W_1 and W_2 calculated in step 1 and step 2 into the following formula:

$$W = W_1 + W_2$$

System example (W) = ____ + ____ = ____ kg

◆ Step 4: Charging work

Charge refrigerant (R410A) into the system according to the instructions in the Service Manual.

◆ Step 5: Total refrigerant charge of the system (W_{TOT} (kg))

The total refrigerant charge of this system is calculated by the following formula:

$$W_{TOT} = W_0 + W$$

System example (W_{TOT}) = ____ + ____ = ____ kg

W_0 is the RASC unit refrigerant charge before shipment explained before, and it's shown in its specific table.

Finally, record the refrigerant charge quantity in the F-Gas label in order to facilitate maintenance and servicing activities.

(EN) This equipment contains fluorinated greenhouse gases covered by the kyoto protocol.
(ES) Este equipo contiene gases fluorados de efecto invernadero contemplados en el protocolo de kyoto.
(DE) Diese anlage enthält im rahmen des kyoto protokolls genannte, fluorierte treibhausgase.
(FR) Cet appareil contient des gaz fluorés à effet de serre visés par le protocole de kyoto.
(IT) Questa apparecchiatura contiene gas fluorurati ad effetto serra che rientrano nel protocollo di kyoto.
(PT) Este equipamento contém gases fluorados que provocam efeito de estufa, segundo o protocolo de kyoto.
(DA) Dette udstyr indeholder fluorholdige drivhusgasser, der er omfattet af kyoto-protokollen.
(NL) Deze apparatuur bevat gefluorineerde broeikasgassen die vallen onder het protocol van kyoto .
(SV) Denna anläggning innehåller flourhaltiga växthusgaser som regleras av kyoto-protokollet.
(EL) *Ο παρόν εξοπλισμός περιέχει φθοριούχα αέρια θερμοκηπίου τα οποία αναφέρονται στο πρωτόκολλο του Κιότο*

Do not vent R410A into the atmosphere. / Não efectue a ventilação do R410A para a atmosfera.
No descargue el R410A en la atmósfera. / Slip ikke R410A ud i atmosfæren.
Lassen sie R410A nicht in die luft entweichen. / Laat geen R410A ontsnappen in de atmosfeer.
Ne laissez pas le R410A se répandre dans l'atmosphère. / Släpp inte ut R410A i atmosfären.
Non scaricare R410A nell'atmosfera. / Μην ελευθερώνετε το R410A στην ατμόσφαιρα.

REFRIGERANT INFORMATION - INFORMACIÓN SOBRE EL REFRIGERANTE - KÜHLMITTELINFORMATION
INFORMATION CONCERNANT LE FLUIDE FRIGORIGENE - INFORMAZIONI RELATIVE AL REFRIGERANTE
INFORMAÇÕES SOBRE O REFRIGERANTE - OPLYSNINGER OM KØLEMIDDEL - INFORMATIE OVER KOELSTOF
KYLNINGSINFORMATION - ΣΤΟΙΧΕΙΑ ΨΥΚΤΙΚΟΥ ΜΕΣΟΥ

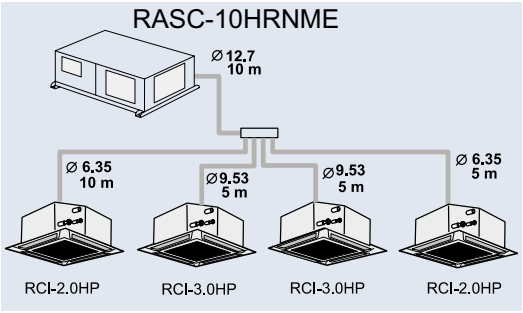
Refrigerant - Refrigerante - Kühlmittel - Fluide frigorigène - Kølemiddel - Koelstof - Kylnings - Μεσου : R410A

Factory Charge (Refer to Specification Label) - Carga de fábrica (Consulte la etiqueta de especificaciones) - Werksbefüllung (Siehe Typenschild) - Charge en usine (Reportez-vous à l'Etiquette des Spécifications)
Quantità già caricata (Fare riferimento alla piastra delle specifiche) - Carga de fábrica (Consulte a etiqueta de especificações) - Påfyldt fra fabrikken (Se specifikationsmærkat) - In fabriek gevuld (Zie specificatielabel)
Påfyllning från fabriken (Se märketikett) - Εργοστασιακή πλήρωση (Ανατρέξτε στην πινακίδα προδιαγραφών) : ____ kg

Additional Charge - Carga adicional - Zusätzliche Füllmenge - Charge supplémentaire
Carica aggiuntiva - Carga adicional - Ekstra påfyldning - Extra vulling - Tillgare påfyllning
Πρόσθετη πλήρωση : ____ kg

Total Charge - Carga Total - Gesamtfüllmenge - Charge totale - Carica totale
Carga total - Samlet påfyldning - Totale vulling - Total påfyllning - Συνολική πλήρωση : ____ kg

9.4.3 Additional refrigerant charge calculation example



◆ **Step 1: Additional refrigerant charge calculation for liquid piping (W_1 (kg))**

Calculate the additional refrigerant charge for the liquid piping as indicated below. Check the example for the RASC-10HRNME model and fill in the following table.

Pipe size (mm)	Piping length of each diameter (L) (m)	Additional refrigerant charge factor (P) (kg/m)	Subtotal (kg)
Ø15.88	0	x 0.19	0
Ø12.7	(20-15)	x 0.12	0.6
Ø9.53	(5+5)	x 0.06	0.6
Ø6.35	(10+5)	x 0.03	0.45
TOTAL			Σ(Pi x Li) = 2.25

Use the following formula:

$$W_1 = \Sigma(Pi \times Li) - 0.9 = 2.25 - 0.9 = 1.35 \text{ kg}$$

◆ **Step 2: Additional refrigerant charge calculation for indoor unit (W_2 (kg))**

The additional refrigerant charge needed for indoor units it's only for RPI-10HP, so in this case it's not needed (W_2=0 kg).

◆ **Step 3: Calculation of total additional refrigerant charge (W (kg))**

Use the formula shown below:

$$W = W' + W_2 = 1.35 + 0 = 1.35 \text{ kg}$$

◆ **Step 4: Total refrigerant charge of the system (W_{TOT} (kg))**

The total refrigerant charge of this system is calculated by the following formula:

$$W_{TOT} = + W_0 + W$$

Refrigerant charge before shipment (W_0) = 5.0 kg (Refer to its specific table)

$$W_{TOT} = 5.0 + 1.35 = 6.35 \text{ kg}$$

9.5 Caution in case of refrigerant leakage

The installers and those responsible for drafting the specifications are obliged to comply with local safety codes and regulations in the case of refrigerant leakage.

9.5.1 Maximum permitted concentration of HFCs

The refrigerant R410A, charged in the RASC series system, is an incombustible and non-toxic gas. However, if leakage occurs and gas fills a room, it may cause suffocation.

The maximum permissible concentration of HFC gas, R410A in air is 0.44 kg/m³, according to EN378-1.

Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.44 kg/ m³, in case of leakage.

9.5.2 Calculation of refrigerant concentration

1 Calculate the total quantity of refrigerant R (kg) charged in the system by connecting all the indoor units in the rooms to be air-conditioned.
2 Calculate the room volume V (m³) of each room.
3 Calculate the refrigerant concentration C (kg/m³) of the room according to the following equation:

C= R / V	R: Total quantity of refrigerant charged (kg)
	V: Room volume (m³)
	C: Refrigerant concentration (=0.44* kg/m³ for R410A)

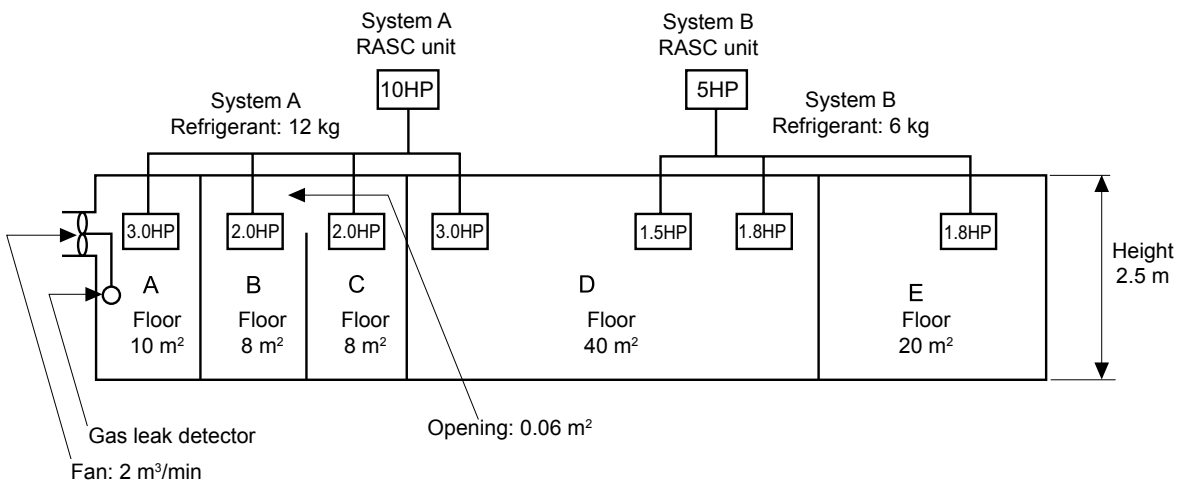
9.5.3 Countermeasure for refrigerant leakage

The facility must have the following features in case of a refrigerant leakage occurs:

1 Provide a shutterless opening which will allow fresh air to circulate into the room.
2 Provide a doorless opening of 0.15% or more size to the floor area.
3 There must be a ventilator fan connected to a gas leak detector, with a ventilator capacity of 0.4 m³/min or higher per Japanese refrigeration ton (= compressor displacement volume/5.7m³/h) of the air conditioning system using the refrigerant.

Model	Tonnes
RASC-5HVRNME	2.27
RASC-10HRNME	4.11

4 Pay a special attention to the place, such as a basement, etc., where refrigerant can stay, since refrigerant is heavier than air.
   - General example of application



Room	R (kg)	V (m^3)	C (kg/m^3)	Countermeasure
A	12	25	0.48	2 m^3/min fan linked with gas leak detector
B	12	20	0.60	0.06 m^2 aprox. opening
C	12	20	0.60	0.06 m^2 aprox. opening
B + C	12	40	0.30	-
D	18	100	0.18	-
E	6	50	0.12	-

HITACHI
Inspire the Next

10. Electrical wiring

Index

10.1 General information

10.1.1 General notes

CAUTION

- ***Before any electrical wiring work or regular inspections, switch off the main power supply switches of the indoor and RASC units. Wait three minutes before starting installation or maintenance work.***
- ***Make sure that the indoor and RASC unit are completely stopped before starting work on the electrical wiring or regular inspections.***
- ***Protect cables, drain hose, electric parts, etc. from rodents and insects; otherwise these might damage unprotected components and, in the worst case, cause a fire.***
- ***Do not allow cables to come into contact with the refrigerant pipes, metal edges, printed circuit boards (PCB) or the electric parts inside the unit; the cables may be damaged and, in the worst case, cause a fire.***
- ***Firmly secure the cables inside the indoor unit with plastic flanges.***

DANGER

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

NOTE

- ***In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the electrical box.***

10.1.2 General verifications

1 Make sure the electric components supplied by the installer (main power switches, circuit breakers, wires, connectors and connection terminals) have been selected correctly in line with the electrical data given.

   a. The electricity supply to the unit should be via an exclusive power control switch and protective circuit breaker, certified and installed in accordance with local or national safety regulations.

   b. The electricity supply for the RASC and indoor units should be separate. Connect the voltage supply wiring for each group of indoor units to the same RASC unit.

2 Check that the supply voltage is between 90 and 110% of the rated voltage. Where the voltage capacity is too low, it will not be possible to start the system due to the drop in voltage.

3 During the preliminary preparation work of the electricity supply line for the unit, the provisions in local and national legislation must never be violated.

4 Check that the earth cable is correctly connected.

Electromagnetic compatibility

Following Council Directive 89/336/EEC and amendments 92/31/EEC and 93/68/EEC, relating to electromagnetic compatibility, the following table indicates maximum permissible system impedance Z_{max} at the interface point of the user's power supply, in accordance with EN61000-3-11.

MODEL	Z_{max} (Ω)
RAS-5HVRNME	0.19
RAS-10HRNME	0.20

Harmonics

Harmonics situation of each model regarding IEC 61000-3-2 and IEC 61000-3-12 is as follows:

MODELS SITUATION REGARDING IEC 61000-3-2 and IEC 61000-3-12	MODEL	Ssc “xx” (kVA)
Equipment complying with IEC 61000-3-12	RASC-5HVRNME	—
Installation restrictions may be applied by supply authorities in relation to harmonics	RASC-10HRNME	—

DANGER

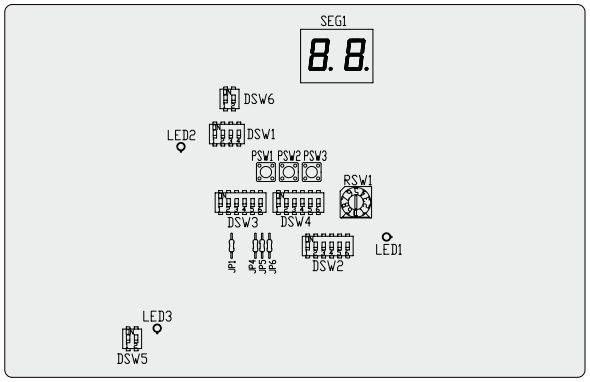
- ***Never connect the earth cable to the refrigerant pipes. The gas in the pipes could cause a fire.***
- ***Do not connect the earth cable to the lighting arrest system. The electrical potential of earth would increase abnormally.***

10.2 Setting and Function of DIP Switches for RASC units

- Number and position of DIP switches.

The PCB in the RASC unit operates with 6 types of DIP switches, 6 cut-off switches and 3 types of push-switches.

Position of DIP switches:



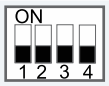
NOTE

- ***The "■" mark indicates the position of the DIP switches. The figures show the settings before shipment or after selection.***
- ***When using DSW1 the unit starts up or stops 10 to 20 seconds after the switch is operated.***

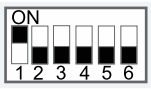
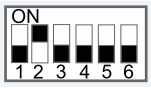
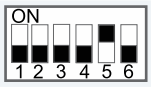
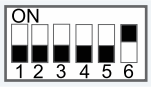
CAUTION

Turn off power source before setting DIP switches. If the switches are set without turning off the power source, the settings are invalid.

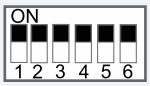
DSW1: Test run.

Before shipment		-
Test Run for cooling		Continuous operation during 2 hours is performed without thermo OFF.
Test Run for heating		The 3 minutes guard for compressor protection is not effective during the test run operation.
Enforced compressor OFF		Compressor operation is OFF during the operation.

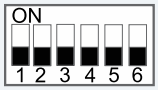
DSW2: Pipe length/ Selection of optional functions.

Before shipment (5-30m)		-
Piping Length (0~5 m)		Initial expansion valve opening is changed according to the piping.
Piping Length (More than 30 m)		External input/output selection is set.
Function selection setting		Function selection is set by PSW.
External input/output selection		External input/output selection is set by PSW.

DSW3: Setting capacity.

RASC-5HVRNME		No setting is required
RASC-10HRNME		

DSW4 and RSW1: Setting number of refrigerant cycles.

Setting for the tenth digit	
Setting for the last digit	

DSW5: Setting of end-terminal resistance.

No setting is required. However, to ensure the impedance corresponds, set the DSW5 according to the number of RASC units of the H-link system.

Setting before shipment End resistance is ON		No setting is required. In case of having 2 or more RASC units connected to the same H-LINK, set for the second unit the pin number 1 of DSW5 at OFF.

DSW6: Power supply and series setting.

No setting is required.

Single phase operation 230V (RASC-5HVRNME)		No setting is required.
Setting before shipment 400V (RASC-10HRNME)		

JP4 cut: Fixing cooling mode

JP5 cut: Alternative defrosting

10.3 Common wiring

10.3.1 Electrical wiring between Indoor and RASC units

Connect the electrical wires between the indoor unit and the RASC unit, as shown below.

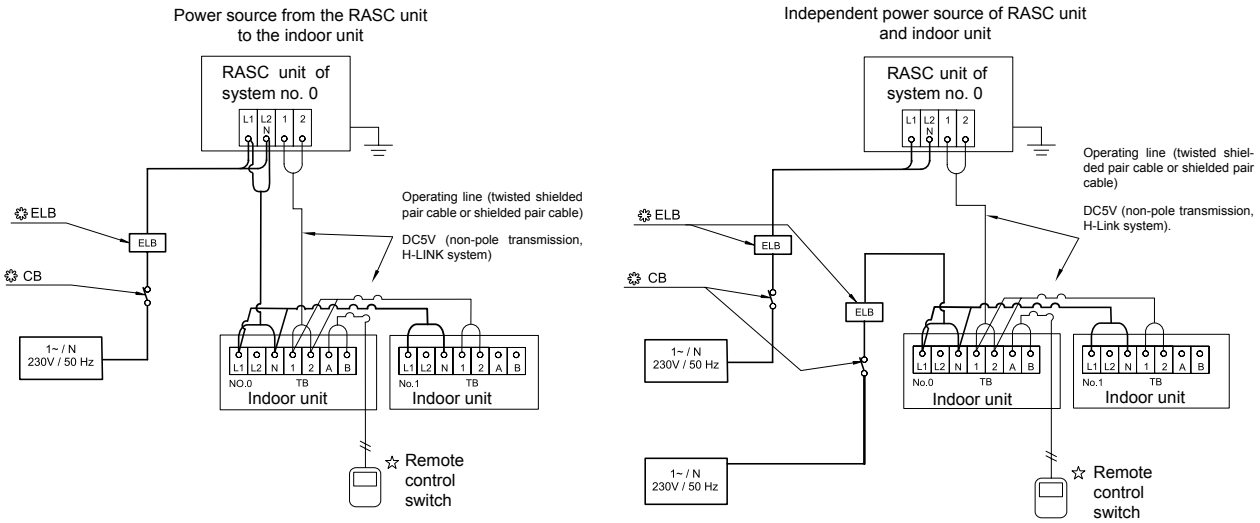
Check to ensure that the terminal for power source wiring (terminals “L1” to “L1” and “N” to “N” of each terminal board: AC230V), and intermediate wires (Operating Line: terminals “1” to “1” and “2” to “2” of each terminal board: DC5V) between the indoor unit and the RASC unit coincide correctly. If not, some component will be damaged.

- Follow local codes and regulations when performing electrical wiring.
- Connect the operation wiring to the units in the same refrigerant cycle (The refrigerant piping and the control wiring should be connected to the same indoor units). If the refrigerant piping ant the control wiring are connected to the units in the different refrigerant cycle, it may cause a abnormal operation.
- Use twist pair wire (more than 0.75 mm²) for operation wiring between RASC unit and indoor unit, and operation wiring between indoor units (H-Link connection). It can be also used shielded pair wiring. Shield shall be connected to earth only in one cable side.
- Use shielded wires for intermediate wiring to protect the units from noise obstacle at length of less than 300 m and size complied with local code.
- Do not use more than 3 cores for operation wiring (H-Link). Core sizes must be selected according to the national regulations.
- Open a hole near the connection hole of power source wiring when multiple RASC units are connected from one power source line.
- The recommended breaker sizes are shown in Table of electrical data and recommended Wiring, Breaker Size/1 RASC unit.
- In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the electrical box.
- All the field wiring and equipment must comply with local and international codes.

CAUTION

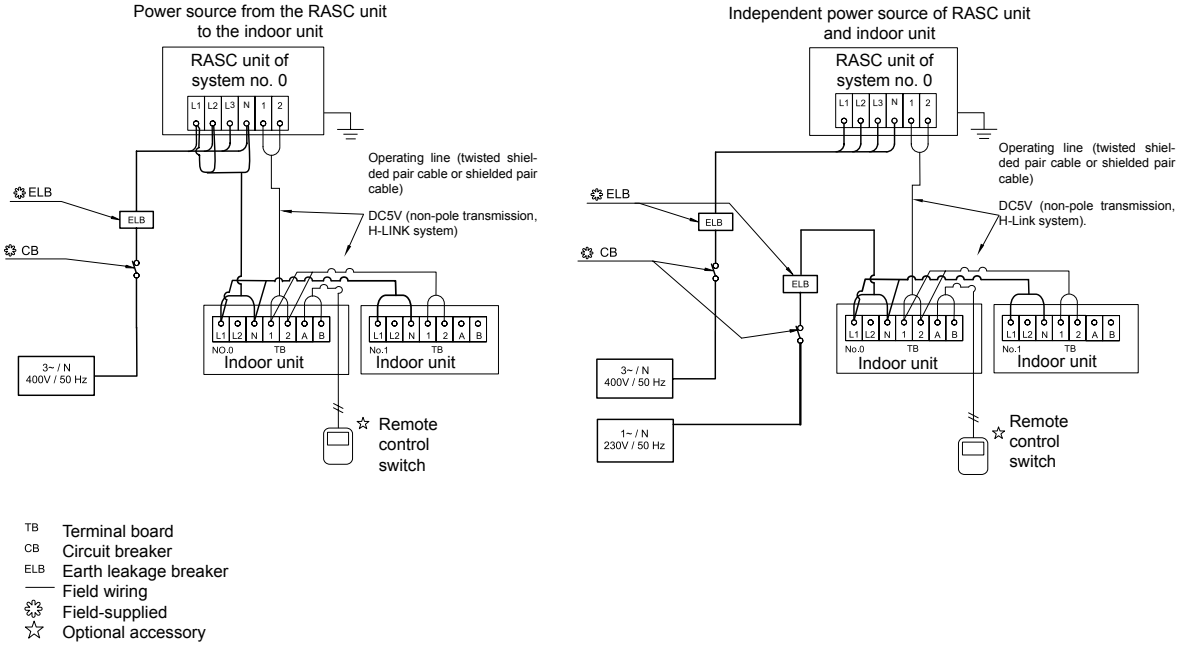
- ***All the field wiring and electrical components must comply with local codes.***
- ***Pay attention to the connection of the operating line. Incorrect connection may cause the failure of PCB.***

RASC-5HVRNME



TB Terminal board
CB Circuit breaker
ELB Earth leakage breaker
—— Field wiring
Field-supplied
☆ Optional accessory

RASC-10HRNME



TB Terminal board
CB Circuit breaker
ELB Earth leakage breaker
Field wiring
Field-supplied
Optional accessory

10.3.2 Wiring size

◆ Connection wiring

Recommended minimum sizes for field provided wires:

Model	Power supply	Maximum current (A)	Power supply cable size EN60 335-1	Transmitting cable size EN60 335-1
RASC-5HVRNME	1~ 230V 50Hz	37.0	10 mm²	0.75 mm²
RASC-10HRNME	3N~ 400V 50Hz	33.0	10 mm²	

NOTE

- ***Follow local codes and regulations when selecting field wires, Circuit breakers and Earth Leakage breakers.***
- ***Use the wires which are not lighter than the ordinary polychloroprene sheathed flexible cord (code designation H05RN-F).***
- ***The earth cable size must comply with local regulation: IEC 245, no. 571.***

◆ Main switch protection

Select the main switches according to the following tables:

Model	Power supply	Maximum current (A)	CB (A)	ELB (no. poles/A/mA)
RASC-5HVRNME	1~ 230V 50Hz	37.0	50	2/63/30
RASC-10HRNME	3N~ 400V 50Hz	33.0	40	4/40/30

ELB: Earth leakage breaker.

CB: Circuit breaker.

10.4 H-LINK II system

The H-LINK II is the wiring connection system between units.

The H-LINK II wiring system only needs:

- Two transmission wires connecting each indoor and RASC unit for a total of 64 refrigerant cycles.
- Connection wiring for all indoor and RASC units in series.

10.4.1 Application

The H-LINK II system can be applied to the following models:

Indoor unit	RASC unit
System Free	
RCI	RASC-(5/10)H(V)RNME
RCIM	
RCD	
RPI	
RPIM	
RPK	
RPF	
RPFI	
RPC	

CAUTION

The H-LINK II system cannot be applied to the models with the old cycle, nor to units with an old transmission.

10.4.2 Features

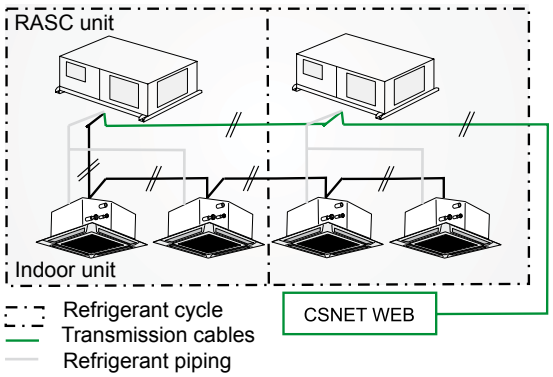
- The total wiring length is considerably reduced compared to traditional connections.
- Only one connection is required for the wiring between the indoor and RASC units.
- The wiring connection of the complementary central control devices is easy.

NOTE

CSNET WEB is centralized control system which allows the installation to be controlled remotely. It can be connected at any point of the local corporate network, or even via the Internet.

10.4.3 Specifications

- Transmission cable: 2-wire.
- Polarity of transmission cable: non-polar wire.
- Maximum number of indoor units that can be connected: 4 units per cycle and 160 units per H-LINK II system.
- Maximum wiring length: total 1000 m (including CSNET WEB).
- It is possible to increase the maximum wiring length up to 5000 m by using up to four PSC-5HR units.
- Recommended cable: shielded twisted pair cable, over 0.75 mm^2 (Equivalent to KPEV-S).
- Voltage: 5 V DC.

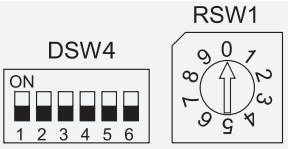
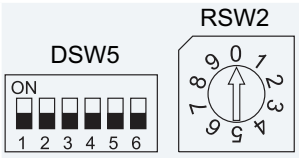
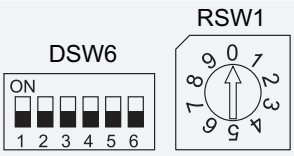


CAUTION

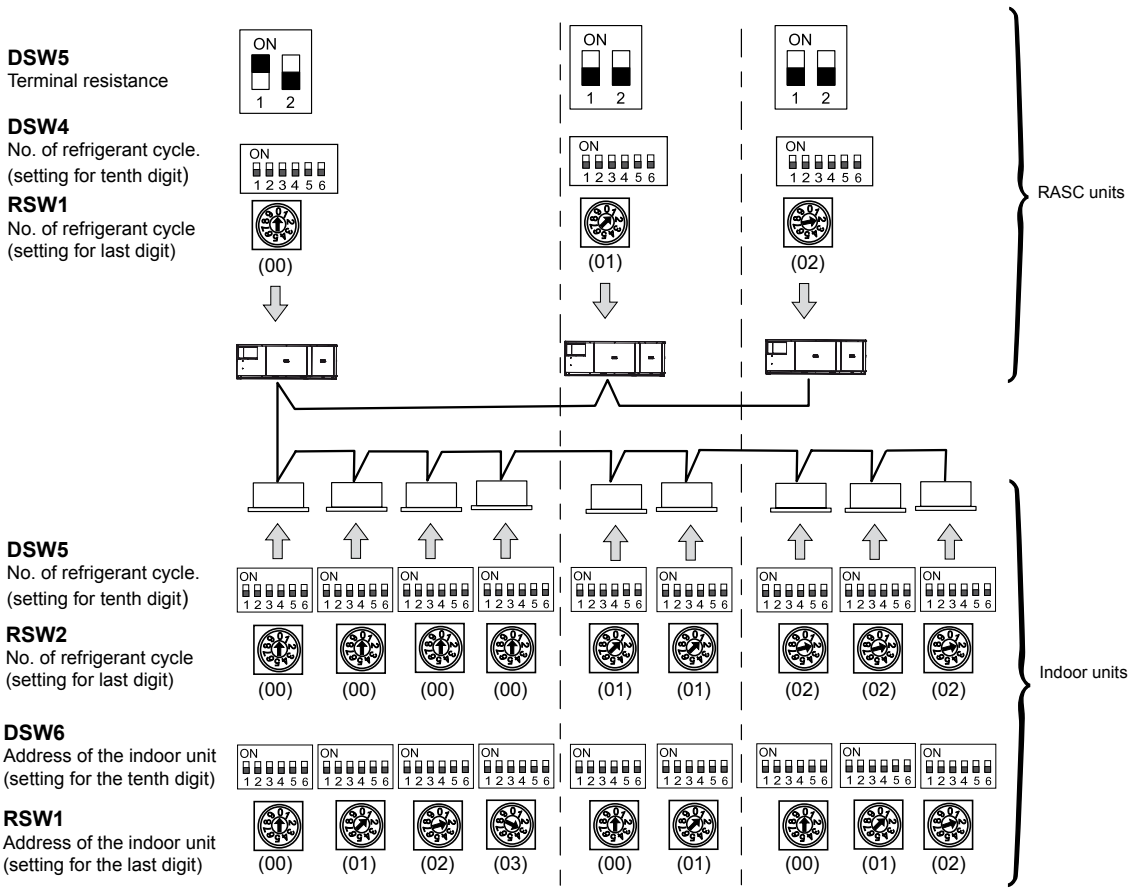
For the H-LINK II system must use twisted shielded pair cable or shielded pair cable.

10.4.4 DIP Switch setting for multiple H-LINK system

The DIP switches of all the RASC and indoor units have to be set as follows:

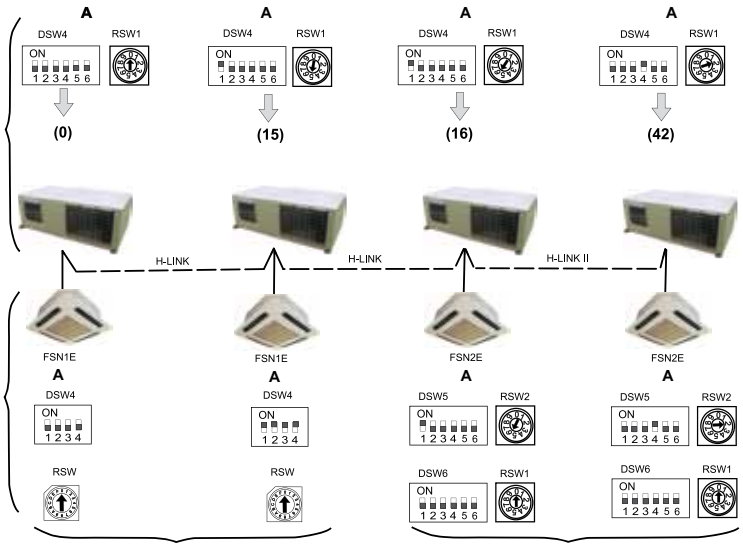
Unit	Name of DIP switch	Mark	Setting before the Shipment	Function
RASC Unit	Terminal resistance	DSW5		DSW5-1 is in “ON” position before shipment. • It is not necessary to set when H-LINK is connected with only one outdoor unit. • When H-LINK is connected with more than one outdoor unit, set as following: - First outdoor unit: keep DSW5-1 in “ON”. - Rest of outdoor units: set DSW5-1 to “OFF”.
	Refrigerant cycle	DSW4 RSW1		For setting the refrigerant cycle address of the RASC unit. Set the DSW4 and RSW1 to overlap the setting of other RASC units in the same H-LINK system.
Indoor Unit	Refrigerant cycle	DSW5 RSW2		For setting the refrigerant cycle address of the indoor unit. Set the DSW5 and RSW2 corresponding to the address of RASC unit in the same refrigerant cycle.
	Address of the indoor unit	DSW6 RSW1		Setting indoor unit address. Set the DSW6 and RSW1 not to overlap the setting of other indoor units in the same refrigerant cycle. (If no set, the automatic address function is performed.)

- Example of the setting of the DIP switches.



10.4.5 Examples of the system of connection between H-LINK and H-LINK II units

In the case of mixed systems with H-LINK and H-LINK II, set the H-LINK units in the first 16 position of the system, as in the following example where 42 systems are connected, 16 with indoor FSN1E units and 26 with indoor FSN2E units.



A. Refrigerant cycle.

B. RASC unit.

C. Indoor unit.

D. Indoor unit address.

E. Either the current remote control switch (H-LINK) or the new one (H-LINK II) can be used.

F. Only the new remote control switch (H-LINK II) can be used.

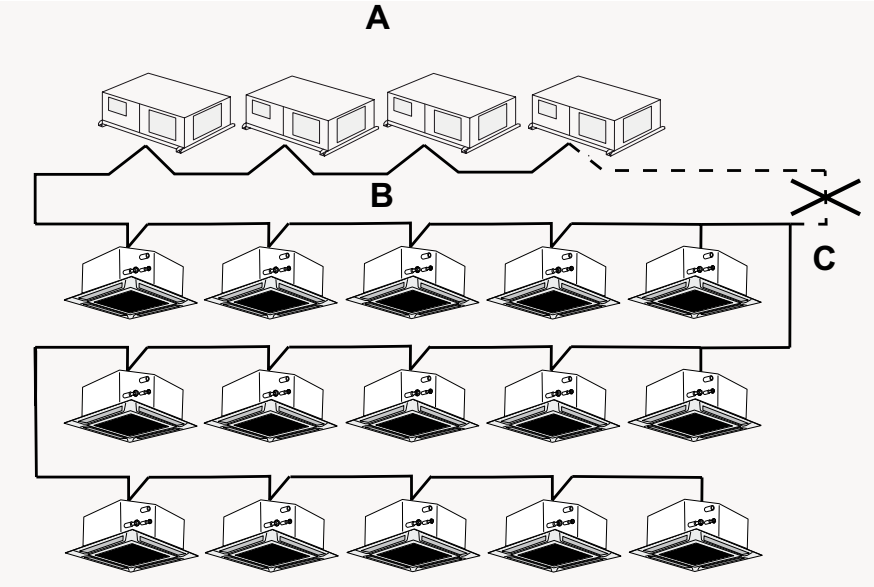
NOTE

- ***The maximum number of indoor units than an H-LINK II can control is 160.***
- ***If you use PSC-5S and the CSNET WEB 2.0 (systems only compatible with H-LINK) bear in mind that it will only recognize 16 indoor and 16 RASC units.***

10.4.6 Examples of H-LINK II system

1 Using H-LINK II system for air conditioning systems without a central control device (CSNET WEB or PSC-A64S).

- Line connection with all units.

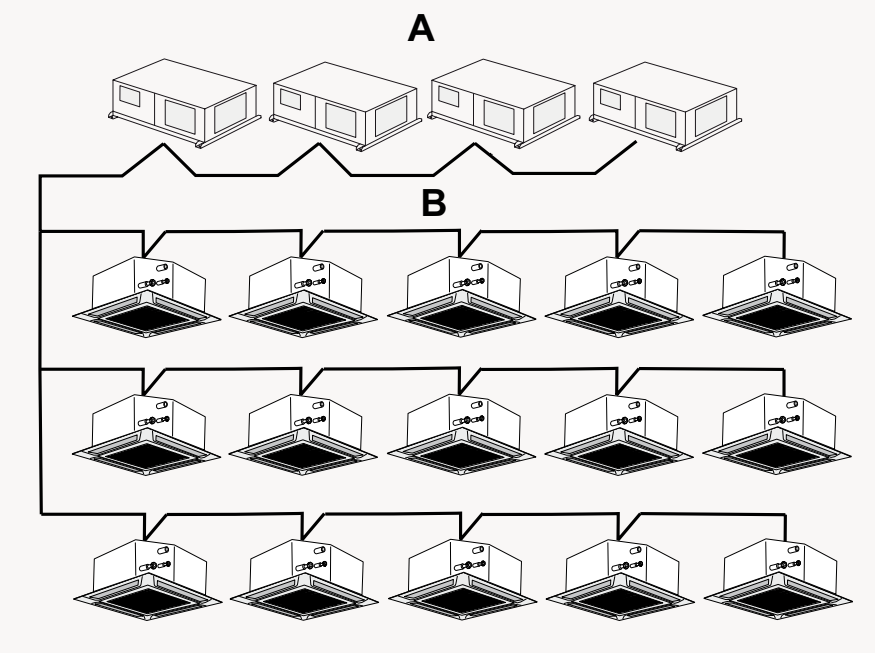


A. RASC units.

B. Indoor units.

C. Do not install wiring in a loop.

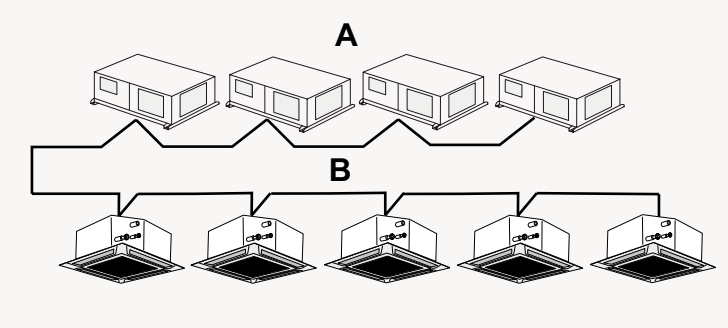
- Line connection for each floor.



A. RASC units.

B. Indoor units.

- Connection with one main line and with the branch lines for the units.



A. RASC units.

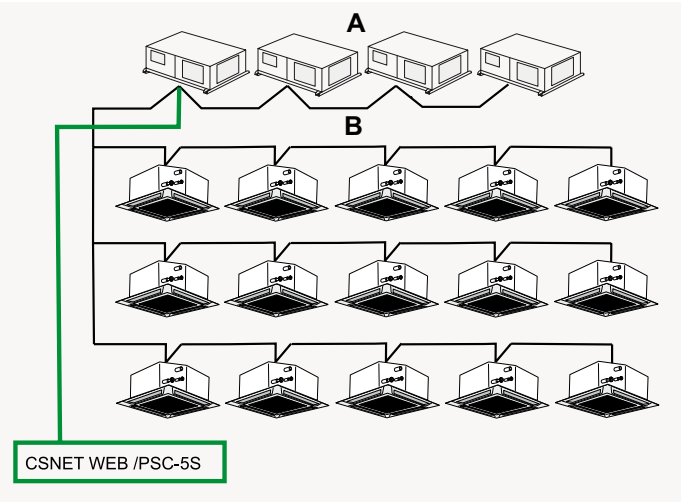
B. Indoor units.

CAUTION

- ***The maximum number of units than can be connected is 64 RASC units and 160 indoor units (including Utopia and/or Set Free, Mini Set-free).***
- ***Do not install the wiring in a loop.***
- ***If the H-LINK II system is not used when carrying out the electrical wiring as shown above, it must be used once the wiring of the instrument is completed. The DIP switches must therefore be set as specified in the DIP switches on the PCB.***

2 Using the H-LINK II system for air conditioning systems with a central control device (CSNET WEB or PSC-A64S)

- If the central control device is used when carrying out electrical wiring, the CS-NET WEB can be connected at any point of the H-LINK II wiring.



A. RASC units.

B. Indoor units.

- If the central control device is not used when electrical wiring is carried out, you must connect the H-LINK II wiring to all the systems. The easiest method is usually to connect the RASC units.

NOTE

For CSNET WEB 2.0 the limitations are those corresponding to H-LINK.

HITACHI
Inspire the Next

11. Optional functions

Index

11.1 RASC unit

Optional function	Explanation
Setting for the energy saving request function.	This function regulates the RASC unit consumption to 50%, 70% or 100%. If the required power is above the set value, the capacity of the indoor unit will be reduced proportionally to the power consumption of the RASC unit. It can even come to a thermostatic stop if necessary. This function can be configured using an external or internal signal, depending on the needs of the installation. Configuration by external signal is very useful for setting up groups of RASC units. The internal signal is useful for setting up a single RASC unit.
Wave function setting.	This function controls the RASC unit consumption in the following way: It allows a consumption of 100% for 20 minutes. The following 10 minutes it goes down to 50/75% and the alternates between 100% and 50/75%.
Saving energy operation.	If this function is activated the compressor is stopped when less than 35 Hz are requested from the indoor unit and the indoor units are on thermo OFF.
Low speed defrost adjustment.	When this function is activated the indoor fan speed at defrost mode changes to slow instead of stopping the fan.
Low noise setting.	This function decreases the sound levels from compressor by reducing the maximum working frequency of the compressor (Cooling/Heating).
Night mode (low noise) operation	This function reduces the sound level of the RASC units by decreasing the maximum working frequency of the compressor and the fan airflow according to the outside temperature (only for cooling mode).
Change of defrost operation conditions	This function changes the defrosting operation conditions. It is particularly useful for cold areas.
Protection against cold air discharge (1)	When the air discharge temperature of the indoor unit is less than or equal to 10ºC in cooling mode, the fans stop and the frequency of the RASC unit is reduced, thereby preventing any discomfort to the occupants of the room.
Protection against cold air discharge (2)	When the discharge temperature of the air in the indoor unit is less than or equal to 10ºC in cooling mode more than 3 minutes, the compressor stops and alarm nº (d1-07) appears.
Only cooling mode (JP4)	This function sets the cooling mode: the indoor unit will only start when the system is on COOL or DRY.
Alternation of the defrost mode activation (JP5)	This function is useful in an installation consisting of various RASC units placed in the same H-LINK. The defrost mode is activated alternately in each RASC unit.

11.2 For operation with CS-NET WEB

Optional function	Explanation
Historical data	CS-NET WEB generates a file with this information so the data can be consulted.
Power consumption	
Automatic COOL/HEAT operation	This function changes automatically from Cool to Heat operation.
Setting the operation mode	This function eliminates the possibility of changing the operation mode from the remote controller.
Setting set temperature	This function eliminates the possibility of changing the set temperature from the remote controller.
Setting air volume	This function eliminates the possibility of changing the fan speed from the remote controller.

12. Troubleshooting

Index

12.1 On-screen displays during abnormal operation

Abnormal operation can be produced due to the following reasons:

- Malfunction

The RUN (red) indicator flashes.

The ALARM indicator appears on the liquid crystal display.

The screen also displays the following items:

- A: indoor unit address.
- B: Refrigerant cycle number.
- C: Alarm code.
- D: Model code.
- E: If there are various indoor units connected, the above mentioned information is shown for each one of them.

Write down the indications and contact your HITACHI service supplier.

- Power supply failure.

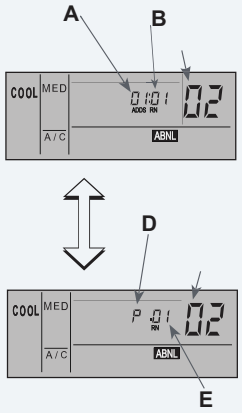
All displays disappear.

If the unit stops due to a power shortage, it will not start again, even though the power comes back on. Carry out the start-up operations again.

If the power failure lasts less than 2 seconds, the unit will start again automatically.

- Electrical noise

The displays can disappear from the screen and the unit can stop. This is because the microcomputer has been activated to protect the unit from electrical noise.



NOTE

If the wireless remote control is used for the wall-type indoor unit, remove the connectors (CN25) that are connected to the indoor PCB. Otherwise the unit will not work. The stored data cannot be erased unless the remote control is initialised.

Model code	
Indication	**Model**
H	Heat pump
P	Inverter
F	Multi (SET-FREE)
C	Cooling only
E	Other
b	IVX, individual operation
L	KPI

12.2 Alarm codes

Code No.	Category	Type of abnormality	Main cause
01	Indoor unit	Activation of protection device	Float switch activated.
02	RASC unit or Power source	Activation of protection device or Abnormality of power source wiring	Activation of: PSH, Float Switch, Magnetic Circuit Breaker (Fan line 10 HP only), Locked Motor or Incorrect wiring (wrong phase connection).
03	Transmission	Abnormality between indoor (or RASC unit) and RASC unit (or indoor) units	Incorrect wiring. Failure of PCB. Tripping of fuse. Power supply OFF.
04		Abnormal operation between inverter and control PCB	Transmission failure between inverter PCBs.
05	Transmission	Abnormality between power source wiring	Reverse phase incorrect wiring (10 HP only)
06	Voltage drop	Voltage drop due to excessively low or high voltage in RASC unit	Voltage drop in power supply. Incorrect wiring or insufficient capacity of power supply wiring.
07	Cycle	Drop in discharge gas overheating	Excessive refrigerant charge. Expansion valve lock open.
08		Increase in discharge gas temperature	Insufficient refrigerant charge, refrigerant leakage. Expansion valve closed or clogged.
11	Sensor in indoor unit	Inlet air thermistor	Failure of thermistor, sensor, connection
12		Outlet air thermistor	
13		Anti-freeze thermistor	
14		Gas pipe thermistor	
19		Protection device for fan motor is triggered	Failure of fan motor.
20	Sensor on RASC unit	Compressor thermistor	Failure of thermistor, sensor, connection.
22		Outside air thermistor	
24		Evaporation thermistor	
31	System	Incorrect setting of RASC unit and indoor units	Incorrect setting of capacity code
35		Incorrect setting of indoor unit number	Duplication of indoor unit number.
38		Abnormality of protective circuit in RASC unit	Failure of indoor unit PCB; incorrect wiring connection to indoor unit PCB.
41	Pressure	Overload cooling (possible activation of high pressure device)	If the RASC unit pipe thermistor temp. is higher than 55ºC and the compressor top temp. is higher than 95ºC, RASC unit protection device is activated.
42		Heating overload (high-pressure device may be activated)	If I.U. freeze protection thermistor temp. is higher than 55ºC and compressor top temp. is higher than 95ºC, RASC unit protection device is activated.
47		Enabling of protection device for low pressure drop	Stoppage due to excessive decrease of evaporating temperature (Tem < -35ºC) is activated 3 times in one hour, motor locked in heating operation.
48	Inverter	Activation of overcurrent protection	Clogging of heat exchanger. Locked compressor. Excessive refrigerant charge, Failure of Inverter PCB.
51		Abnormality in inverter current sensor	Failure of Control PCB or Inverter PCB.
53		Activation for protection of Inverter	Inverter PCB Abnormality Compressor failure, heat exchanger clogged.
54		Inverter fin temperature increase	Abnormal inverter fin thermistor Heat exchanger clogged. Abnormal RASC unit fan. Failure of Fan Motor.
55		Inverter Abnormality	Failure of Inverter PCB.
59		Inverter fin temperature increase	Loose disconnected, broken or short-circuit connector.
b1	Indoor unit No. setting	Incorrect unit No. setting	Over 64 indoor units, setting by refrigerant cycle No. or indoor unit address.
EE	Compressor	Compressor protection alarm	Compressor failure.

HITACHI
Inspire the Next

Hitachi Air Conditioning Products Europe, S.A.
Ronda Shimizu, 1 - Políg. Ind. Can Torrella
08233 Vacarisses (Barcelona) España

Hitachi certifies that our products have met EU consumer safety, health and environmental requirements.

Hitachi Air Conditioning Products Europe, S.A. is certified with:
ISO 9001 of AENOR, Spain for its Quality Management accordance with the standard
ISO 14001 of AENOR Spain for its Environmental Management systems accordance with the standard.

Hitachi air conditioning products are manufactured according to:
ISO 9001 of JQA, Japan for its Quality Management accordance with the standard
ISO 14001 of JACO, Japan for its Environmental Management accordance with the standard.

HITACHI participates in the Eurovent Certification Programme; the certified data of certified models are listed in the Eurovent Certification Online Directory (www.eurovent-certification.com).

TCGB0058 rev.0 - 12/2011 Printed in Spain