

CENTRIFUGAL VRF SERIES RASC-HNPE

Technical Catalogue

RASC-4HNPE
RASC-5HNPE
RASC-6HNPE
RASC-8HNPE
RASC-10HNPE



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1. General information

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1.1 General information

1.1.1 General notes

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

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



NOTE

This air conditioner has been designed for standard air conditioning for human beings. For use in other applications, please contact your HITACHI dealer or service contractor.



CAUTION

This unit is designed for commercial and light industrial application. If installed in house hold appliance, it could cause electromagnetic interference.

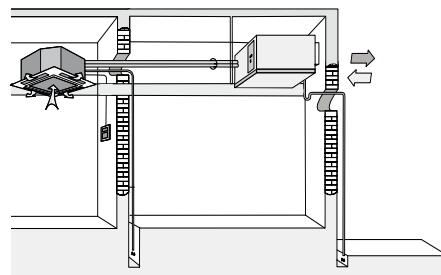
1.1.2 Introduction

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 5 different indoor units for RASC-(4-6)HNPE or 6 indoor units for RASC-(8/10)HNPE.

Additionally, 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.



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 pose a risk to the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.

A series of special symbols is 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.*
- *Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others.*

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



CAUTION

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

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



NOTE

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

1.3 Product guide

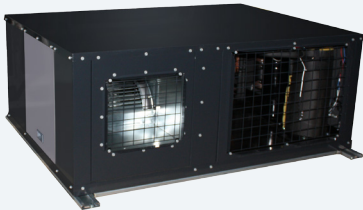
1.3.1 Classification of RASC unit models

Unit type (RASC unit - Built in horizontal)							
Position-separating hyphen (fixed)							
Compressor power (HP): 4, 5, 6, 8, 10.							
H = Heat pump							
N = R410A refrigerant							
P = Premium series							
E = Made in Europe							
RASC	-	XX	H	N	P	E	

1.3.2 Classification of indoor unit models

Unit type (indoor unit): RCI, RCIM, RCD, RPC, RPI, RPIM, RPK, RPF, RPII									
Position-separating hyphen (fixed)									
Capacity (HP): 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 8.0, 10.0.									
FS = SYSTEM FREE									
N = R410A refrigerant									
H = Hotel (RPK-1.5HP only)									
2/3/4 = series									
E = Made in Europe									
M = Made in Malaysia									
- = Made in Japan									
i = Version up (RCI only)									
k = Version up RCI for P-AP160NA(1/E) panel only									
(-DU) = Drain Up (RPIM only)									
(-f) = Non-flammable insulation (RPI-(8.0-20.0)FSN3E-f only)									
XXX	-	X.X	FS	N	(H)	X	(X)	(i)	(-xx)

1.3.3 Product guide: RASC units

RASC			
			
Unit	Code	Unit	Code
RASC-4HNPE	7E343107		
RASC-5HNPE	7E343108		
RASC-6HNPE	7E343109		
		RASC-8HNPE	7E343110
		RASC-10HNPE	7E343111



NOTE

- Check the exact classification for each unit (model, type, power and series) in "1.3.1 Classification of RASC unit models".
- All references of the "Built-in-horizontal" units contained into this document, have been abbreviated as "RASC" unit.
- HITACHI has a range of remote control systems that can be used with the UTOPIA RASC units. Please, refer to the Controls Technical Catalogue.

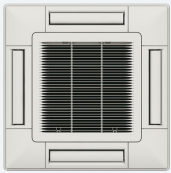
1.3.4 Product guide: Indoor units



NOTE

- The indoor unit models and codes are the last updated at time of publication; other previous models and coming developments could be available for combination with RASC series.
- Check the exact classification for each unit (model, type, power and series) in "1.3.2 Classification of indoor unit models".

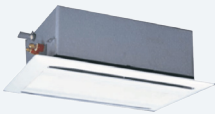
RCI						RCIM	
							
							
4-way cassette				4-way cassette (high efficiency)		4-way cassette (compact)	
Unit	Code	Unit	Code	Unit	Code	Unit	Code
						RCIM-0.8FSN4	60278216
RCI-1.0FSN3Ei	7E403014	RCI-1.0FSN3Ek	7E404001	RCI-1.0FSN3	60278119	RCIM-1.0FSN4	60278217
RCI-1.5FSN3Ei	7E403015	RCI-1.5FSN3Ek	7E404002	RCI-1.5FSN3	60278120	RCIM-1.5FSN4	60278218
RCI-2.0FSN3Ei	7E403016	RCI-2.0FSN3Ek	7E404003	RCI-2.0FSN3	60278121	RCIM-2.0FSN4	60278219
RCI-2.5FSN3Ei	7E403017	RCI-2.5FSN3Ek	7E404004	RCI-2.5FSN3	60278122	RCIM-2.5FSN4	60278220
RCI-3.0FSN3Ei	7E403018	RCI-3.0FSN3Ek	7E404005	RCI-3.0FSN3	60278123		
RCI-4.0FSN3Ei	7E403020	RCI-4.0FSN3Ek	7E404007	RCI-4.0FSN3	60278124		
RCI-5.0FSN3Ei	7E403021	RCI-5.0FSN3Ek	7E404008	RCI-5.0FSN3	60278125		
RCI-6.0FSN3Ei	7E403022	RCI-6.0FSN3Ek	7E404009	RCI-6.0FSN3	60278126		

Panels					
RCI				RCIM	
					
P-N23NA	70531000	P-AP160NA1	60297215	P-AP56NAM	60297297
		P-AP160NAE (With motion sensor)	60297217	(Without motion sensor)	



NOTE

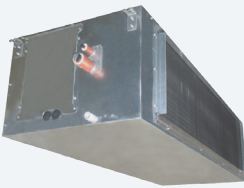
The RCI and RCIM models must be used in combination with the panels indicated above.

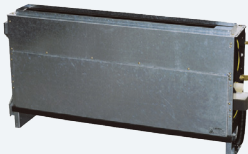
RCD				RPC			
							
							
2-way cassette				Ceiling type		Ceiling type (high efficiency)	
Unit	Code			Unit	Code	Unit	Code
RCD-1.0FSN2	60278029						
RCD-1.5FSN2	60278030					RPC-1.5FSN3	60278164
RCD-2.0FSN2	60278031					RPC-2.0FSN3	60278165
RCD-2.5FSN2	60278032					RPC-2.5FSN3	60278166
RCD-3.0FSN2	60278033			RPC-3.0FSN3E	7E443005	RPC-3.0FSN3	60278167
		RCD-4.0FSN2	60278034	RPC-4.0FSN3E	7E443007	RPC-4.0FSN3	60278168
		RCD-5.0FSN2	60278035	RPC-5.0FSN3E	7E443008	RPC-5.0FSN3	60278169
				RPC-6.0FSN3E	7E443009	RPC-6.0FSN3	60278170

Panels			
RCD			
			
P-N23DNA	60297211	P-N46DNA	60297212

**NOTE**

The RCD models must be used in combination with the panels indicated above.

RPI				RPIM			
							
							
Indoor ducted unit							
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RPI-0.8FSN4E	7E424013					RPIM-0.8FSN4E	7E430013
						RPIM-0.8FSN4E-DU	7E431013
RPI-1.0FSN4E	7E424014					RPIM-1.0FSN4E	7E430014
						RPIM-1.0FSN4E-DU	7E431014
RPI-1.5FSN4E	7E424015					RPIM-1.5FSN4E	7E430015
						RPIM-1.5FSN4E-DU	7E431015
		RPI-2.0FSN4E	7E424016				
		RPI-2.5FSN4E	7E424017				
		RPI-3.0FSN4E	7E424018				
		RPI-4.0FSN4E	7E424020				
		RPI-5.0FSN4E	7E424021				
		RPI-6.0FSN4E	7E424022				
				RPI-8.0FSN3E	7E424010		
				RPI-8.0FSN3E-f	7E424410		
				RPI-10.0FSN3E	7E424011		
				RPI-10.0FSN3E-f	7E424411		

RPK		RPF		RPFI	
					
					
Wall type		Floor type		Floor concealed type	
Unit	Code	Unit	Code	Unit	Code
RPK-0.8FSN3M	60278146				
RPK-0.8FSNH3M	60278154				
RPK-1.0FSN3M	60278147	RPF-1.0FSN2E	7E450001	RPFI-1.0FSN2E	7E460001
RPK-1.0FSNH3M	60278155				
RPK-1.5FSN3M	60278148	RPF-1.5FSN2E	7E450002	RPFI-1.5FSN2E	7E460002
RPK-1.5FSNH3M	60278156				
RPK-2.0FSN3M	60278149	RPF-2.0FSN2E	7E450003	RPFI-2.0FSN2E	7E460003
RPK-2.5FSN3M	60278150	RPF-2.5FSN2E	7E450004	RPFI-2.5FSN2E	7E460004
RPK-3.0FSN3M	60278151				
RPK-4.0FSN3M	60278152				
EV-1.5N (*)	60921791				

 NOTE

(*): For RPK-1.5FSNH3M model only.

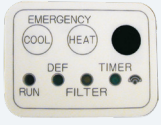
1.3.5 List of accessories

◆ Remote control systems

Individual remote controls

Name	Description	Code	Figure
PC-ARF	Remote control with timer	70510001	
PC-ART	Remote control with timer	70510000	
PC-ARH	Simplified remote control	60291486	
PC-LH3A	Wireless remote control	60291056	
PC-LH3B		60291770	

Receiver kit for combination with wireless remote control switch

Name	Description	Code	Figure
PC-ALH	Receiver kit (For RCI-FSN3Ei -on the panel-) (Compatible with PC-LH3A)	60291464	
PC-ALHN		60291627	
PC-ALHD	Receiver kit (For RCD-FSN2 -on the panel-) (Compatible with PC-LH3A)	60291467	
PC-ALH3	Receiver kit (For RCI-FSN3 and RCI-FSN3Ek -on the panel-) (Compatible with PC-LH3B)	60291767	
PC-ALHP1	Receiver kit (For RPC-FSN3 -on the panel-) (Compatible with PC-LH3B)	60291823	
PC-ALHC1	Receiver kit (For RCIM-FSN4 -on the panel-) (Compatible with PC-LH3B)	60292003	
PC-ALHZ	Receiver kit (For RCI-FSN3Ei, RCIM-FSN3E, RCD-FSN2, RPC-FSN2, RPI-FSN(3/4)(P)E, RPIM-FSN4E(-DU), RPK-FSN(H)2M, RPF(I)-FSN2E -on the wall-) (Compatible with PC-LH3A)	60291473	
PC-ALHZF	Receiver kit (For RCI-FSN3, RCI-FSN3Ek, RPK-FSN(H)3M and RPC-FSN3 -on the wall-) (Compatible with PC-LH3B)	60291789	

Centralised remote controls

Name	Description	Code	Figure
PSC-A64GT	Touch screen central station	60291730	
PSC-A32MN	Touch screen central station mini	60291966	
PSC-A64S	Centralised remote control	60291479	
PSC-A16RS	Centralised ON/OFF control	60291484	

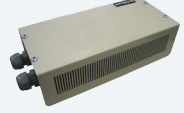
Building air conditioning controls

Name	Description	Code	Figure
CSNET WEB (PSC-A160WEB1)	Centralised control system which runs CSNET WEB software to control the indoor units	7E512000	
CSNET Manager LT	Centralised control with a touch interface of 12 inches which runs CSNET MANAGER software to control the indoor units.	7E512201	
CSNET Manager XT	Centralised control with a touch interface of 17 inches which runs CSNET MANAGER software to control the indoor units.	7E512202	
HC-A64NET	H-LINK gateway used by CSNET MANAGER Screens to communicate with indoor units (Max. 64 indoor units)	7E512200	

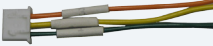
Gateways for building management systems (BMS)

Name	Description	Code	Figure
HC-A8MB	Integration with installation with intelligent control (Building Management System) Gateway Interface to MODBUS systems (Max. 8 indoor units).	7E513204	
HC-A64MB	Integration with installation with intelligent control (Building Management System) Gateway Interface to MODBUS systems (Max. 64 indoor units).	7E513205	
HC-A16KNX	Integration with installations with intelligent control (BMS). Gateway Interface to KNX systems.	7E513300	
KNX001	Integration with installations with intelligent control (BMS) through CSNET WEB. Gateway Interface to KNX systems.	7E512100	
HARC-BX E (A)	Integration with installation with intelligent control (Building Management System) Gateway Interface to LONWORKS systems. (H-LINK I communication) (Max. 64 units with 8 parameters)	60290874	
HARC-BX E (B)	Integration with installation with intelligent control (Building Management System) Gateway Interface to LONWORKS systems. (H-LINK I communication) (Max. 32 units with 16 parameters)	60290875	

Control support devices

Name	Description	Code	Figure
PSC-A1T	Programmable timer	60291482	
PSC-6RAD	H-LINK RAC Adapter	60063017	
PC-A1IO	Integration of external equipment into H-LINK	7E519000	
PSC-5HR	H-LINK Relay	60291105	
PC-AMTB	Connection board for multitenant buildings	7E519200	
THM-R2AE	Remote temperature sensor (THM4)	7E299907	

Control accessories

Name	Description	Code	Figure
Wall support	Wall mounted support (for both CSNET MANAGER LT/XT)	7E512300	
Stand support	Stand mounted support (for both CSNET MANAGER LT/XT)	7E512301	
PCC-1A	Optional function connector	70590901	
PRC-10E1	2P-Extension cord (10 metres)	7E790211	
PRC-15E1	2P-Extension cord (15 metres)	7E790212	
PRC-20E1	2P-Extension cord (20 metres)	7E790213	
PRC-30E1	2P-Extension cord (30 metres)	7E790214	
Net Config. Kit	Net configuration kit for HC-A(8/64)MB and HC-A64NET	7E512306	

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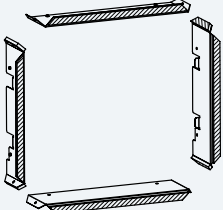
**NOTE**

In addition to all the aforementioned HITACHI controls, there are some non-HITACHI devices for combination with HITACHI Air Conditioning systems. Please refer to the Technical Catalogue of Controllers for Package for more information.

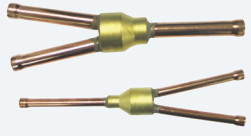
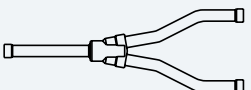
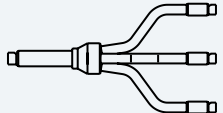
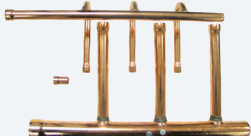
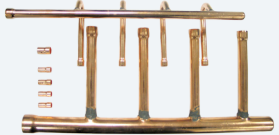
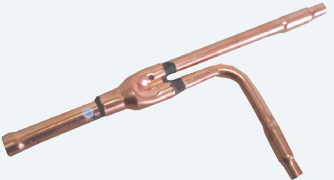
◆ Complementary systems (DX-Interface)

DX-Interface		
 Control box  Expansion valve box	Unit	Code
	EXV-2.0E1	7E610900
	EXV-2.5E1	7E610901
	EXV-3.0E1	7E610902
	EXV-4.0E1	7E610903
	EXV-5.0E1	7E610904
	EXV-6.0E1	7E610905
	EXV-8.0E1	7E610906
	EXV-10.0E1	7E610907

◆ Fan duct accessory

Name	Description	Code	Figure
FD-RASC46	Fan duct accessory for the optional air outlet position (For RASC-(4-6)HP)	7E590904	
FD-RASC810	Fan duct accessory for the optional air outlet position (For RASC-(8/10)HP)	7E590905	

Multikits

Name	Description	Code	Figure
TE-03N1	Branch pipe UTOPIA (pipe kit)	70527012	
TE-04N1		70527013	
TE-56N1		70527014	
TE-08N		70800003	
TE-10N		70800004	
TW-52AN		60291816	
TW-102AN		60291817	
TG-53AN		60291818	
TG-103AN		60291819	
TRE-46N1	Distributor UTOPIA	70527015	
TRE-812N1		70527016	
QE-812N1	Distributor UTOPIA	70527017	
E-102SN3	Branch pipe (multikit)	70524101	
E-162SN3		70524102	

2. Features and benefits

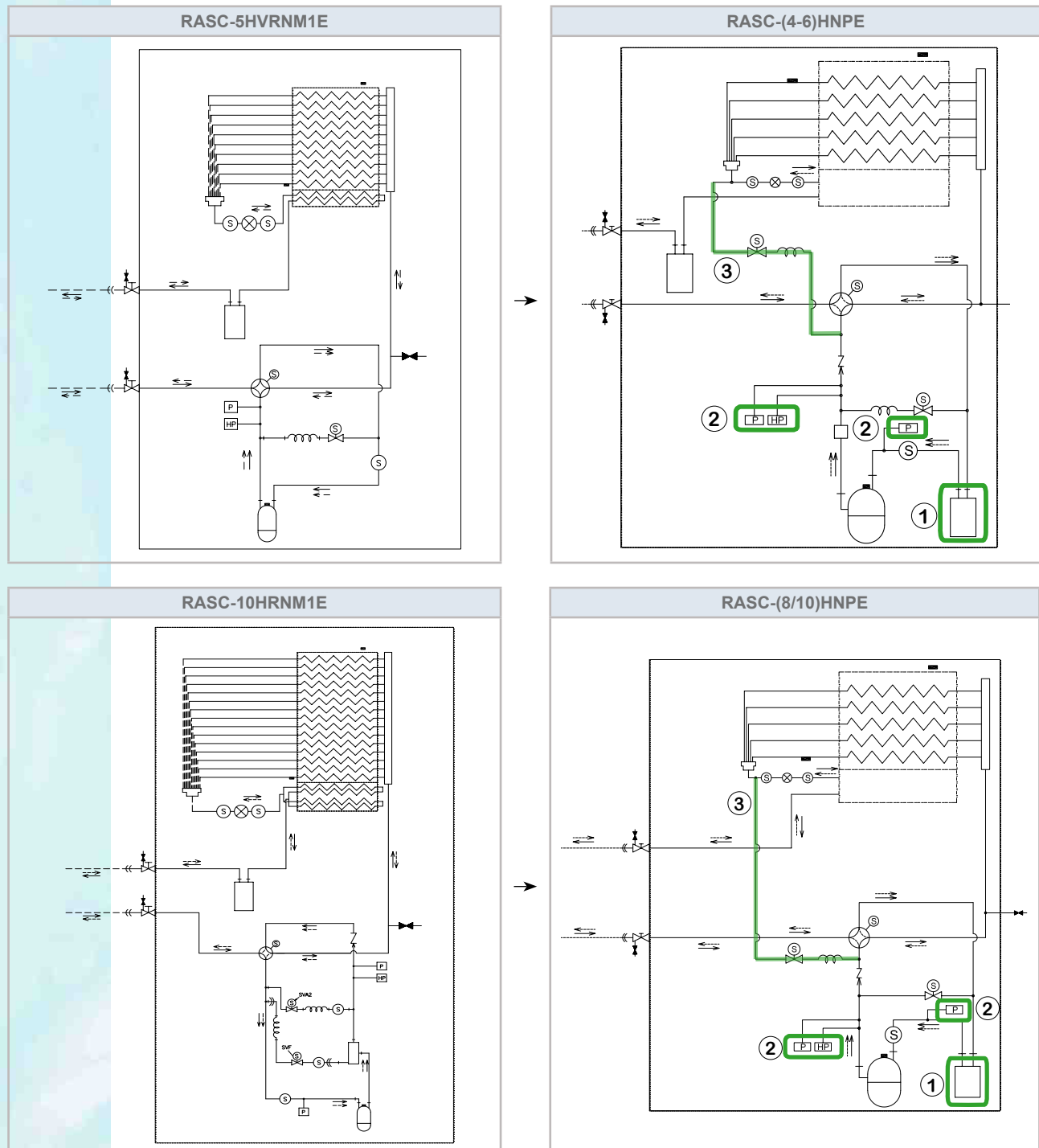
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2.1 NEW design concept

2.1.1 Optimised refrigerant cycle

The new cycle for RASC-HNPE series has been designed in order to bring the VRF concept one step further.



① New accumulator

The new accumulator used allows to optimise the amount of oil and refrigerant in each condition. As a result, the flexibility of combination has improved greatly.

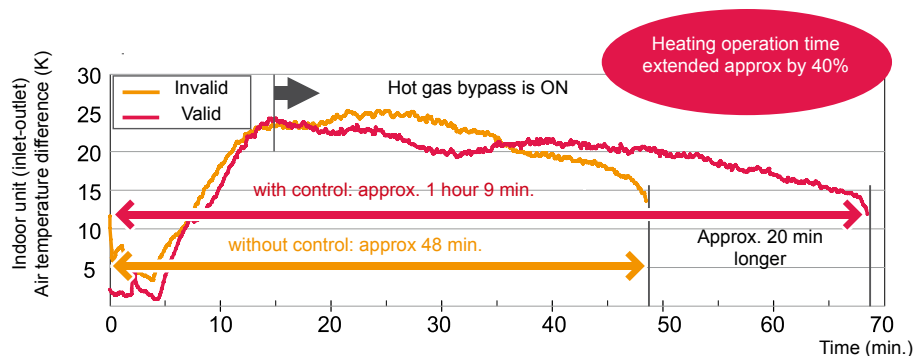
② Improved pressure control

A new pressure switch for control has been attached to the suction side of the compressor. Additionally, the high pressure switch has been replaced with a pressure sensor to ensure a more accurate compressor control.

③ Hot gas bypass to the heat exchanger

Part of the discharge gas is bypassed to the heat exchanger, making use of the surplus capacity of the RASC unit when the thermal load of the indoor units is decreased. As a result, the temperature increase of the heat exchanger prevents the appearance of frost and the heating operation can be maintained for a longer time.

General example comparison of heating operation:



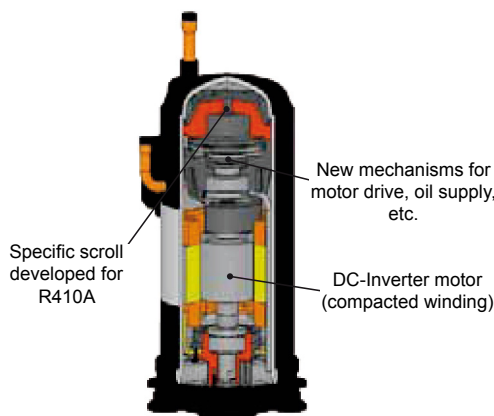
i NOTE

The diagram is valid for typical winter conditions like an outdoor air inlet temperature of 2/1°C (DB/WB), and an indoor air inlet temperature of 20°C (DB) and for an installation with the maximum allowed total refrigerant piping length (145 m).

2.1.2 New HITACHI scroll compressor

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

- **High performance in intermediate season.**
- **High efficiency at low speed (release valve and compacted winding of the DC-inverter motor).**
- **Compressor orientation has been changed from horizontal to vertical in RASC-5HP.**

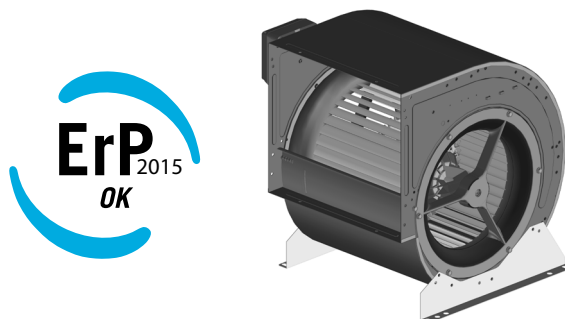


2.1.3 Improved efficiency and control of the fan unit

◆ High efficiency fan unit (Compliant with the ErP ENER Lot.11 regulation)

European Energy Regulation ErP ENER Lot.11 (covering fan motors with an input power between 125 W and 500 kW) establishes that fan motor units must satisfy a minimum level of efficiency (ErP-2015 OK), depending on the type of fan and its application.

The fan unit of the whole RASC series fulfils the requirements of ErP ENER Lot.11.



◆ AC fan motor with centrifugal structure and VFD (Variable frequency driver) control

The fan control is driven by a VFD (Variable frequency driver) which allows smooth fan speed control and better behaviour than previous models, driven by thyristors control. As a result, the input power when the fan is regulated has been greatly reduced (New for 5HP).

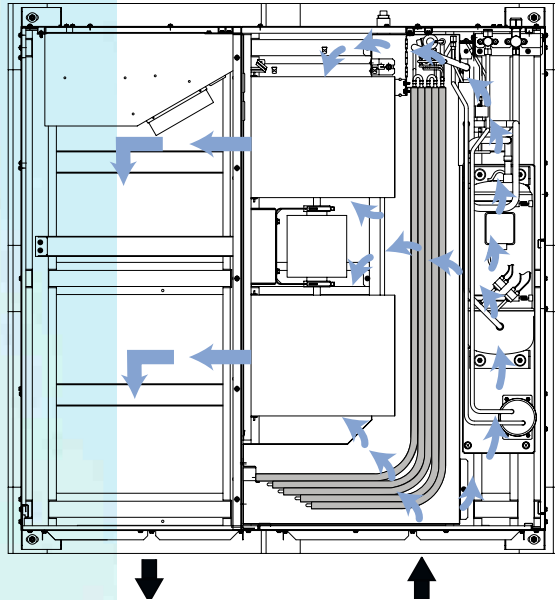
Furthermore, the communication between the main control printed circuit board and the VFD uses the RS485 protocol, which guarantees the best reliability.

2.1.4 Redesigned heat exchanger

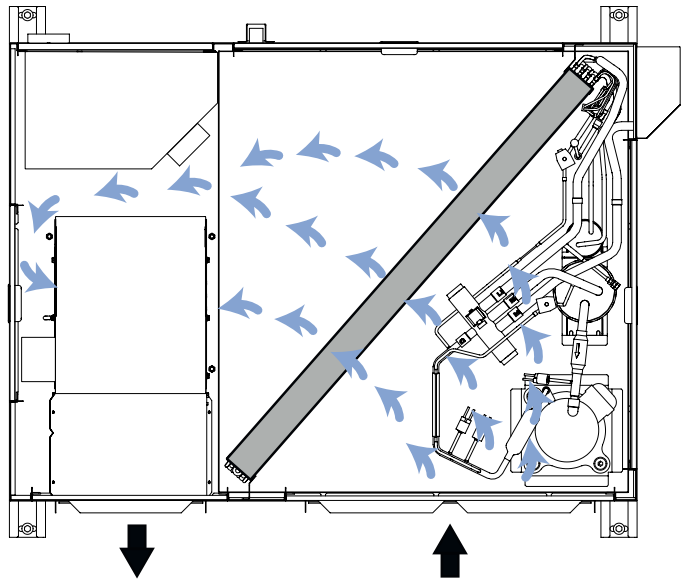
The change of the heat exchanger shape (from bent in the current 5 HP models to straight) together with the redesign of the internal layout of the unit result in an overall improvement in performance (a better use of the air inlet flow rate is made now).

Example of air distribution for RASC-5HP

◆ BEFORE



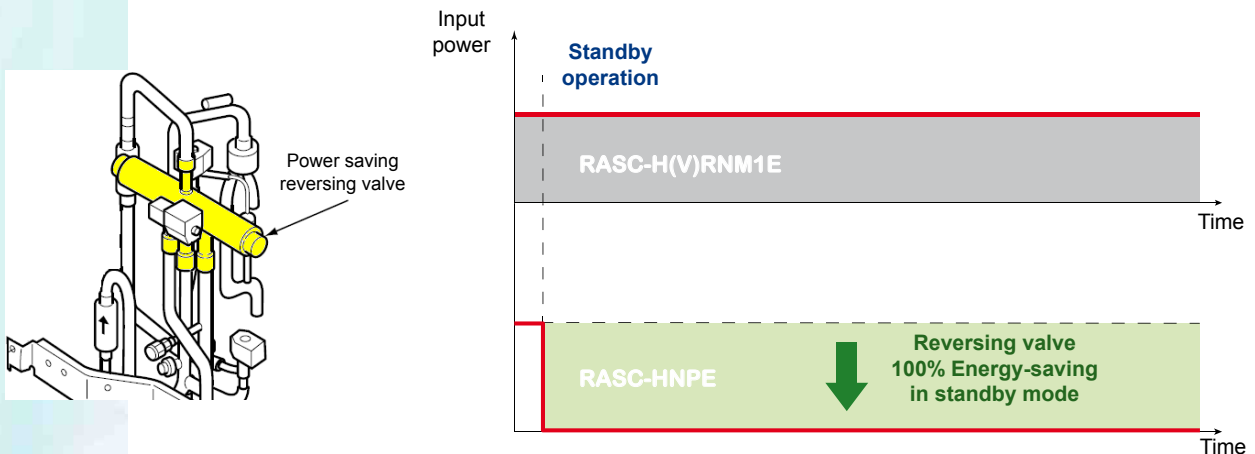
◆ AFTER



2

2.1.5 New electrical energy-saving reversing valve

The new reversing valve achieves an important reduction in power consumption, which is specially remarkable when the unit is not in operation (in standby mode). Thus, annual electricity costs are greatly improved.

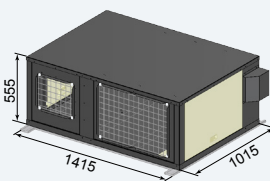
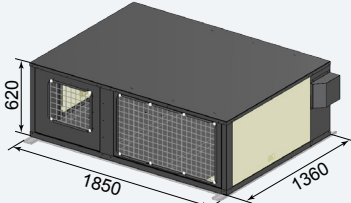


2.2 Selection benefits

2.2.1 Complete product line-up

The range of units has been expanded with the addition of 4 HP, 6 HP and 8 HP models. Furthermore, the whole range of RASC units has been designed for use in 3-phase installations, fulfilling the typical requirements of installations where these units are usually installed.

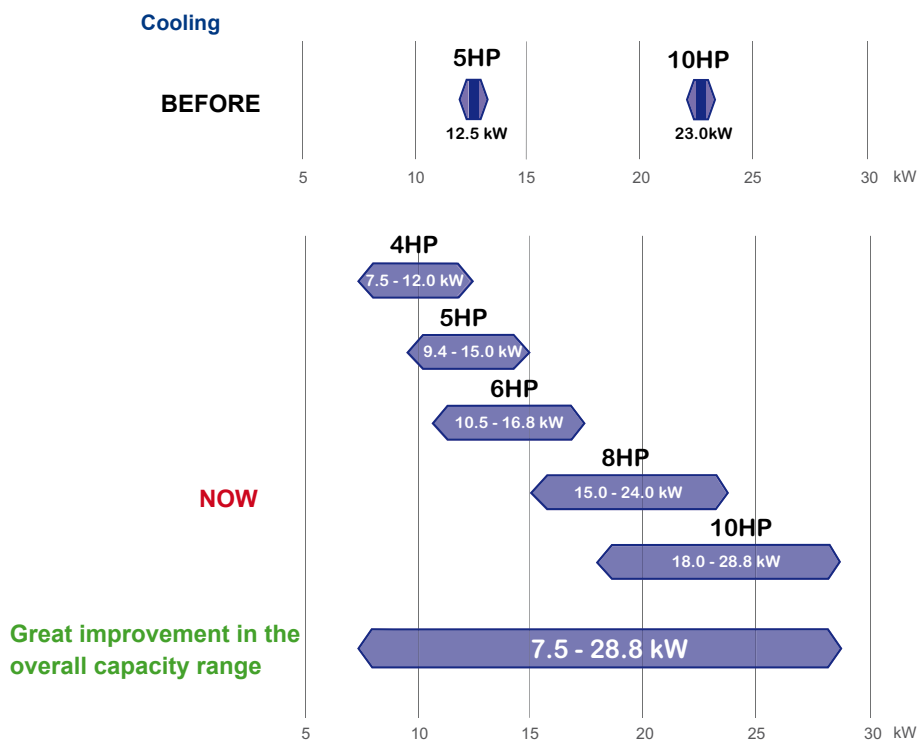
The wide range of units that can be selected in three phase combinations (4/5/6/8/10 HP) results in a much richer line-up than that of competitors for equivalent units.

RASC unit  				
Three phase (3N~ 400V 50Hz)				
4 HP	5 HP	6 HP	8 HP	10 HP
 NEW		 NEW	 NEW	
				

◆ Comparison of the combined capacity range between current RASC-H(V)RNM1E and new RASC-HNPE

Capacity range has been extended as shown below, as a result of the improvement in product line-up as well as of the enhancement of combinability (connected capacity ratio of indoor units from 75% up to 120%).

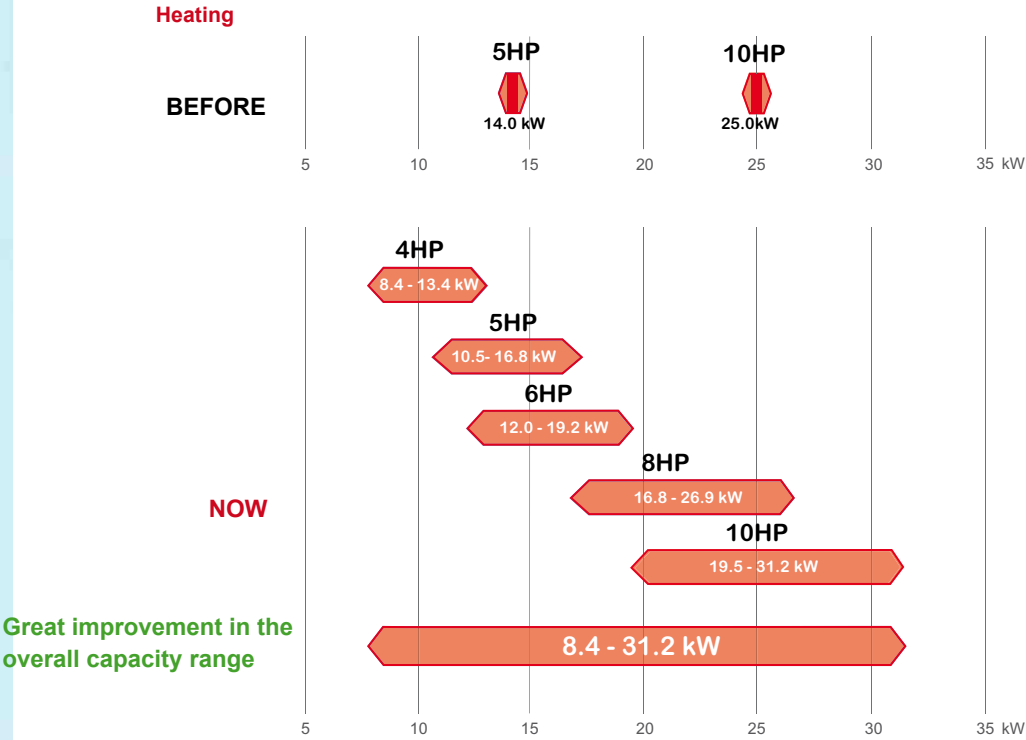
Cooling mode



NOTE

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

Heating mode



 NOTE

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

2.2.2 Flexible system

◆ Enhanced combinability

The combinability with indoor units has been significantly improved for RASC units in comparison with previous models.

Current RASC-H(V)RNM1E	RASC unit 	
	5 HP	10 HP
Maximum number of connected indoor units	3	4
Connected capacity ratio of indoor unit %	100% (based on the specific combinability table)	
Minimum capacity of indoor units (HP)	1.5 (with restrictions)	2.0 (with restrictions)

↓

↓

New RASC-HNPE	RASC unit 				
	4 HP	5 HP	6 HP	8 HP	10 HP
Maximum number of connected indoor units	5			6	
Connected capacity ratio of indoor unit % (number of connected indoor units)	75-120% (≤ 4 units)			75-120% (≤ 4 units)	
	75-100% (5 units)			75-100% (5 or 6 units)	
Minimum capacity of indoor units (HP)	0.8 (≤ 4 units: without restrictions)			0.8 (≤ 4 units: without restrictions)	
	0.8 (5 units: with restrictions) (*)			0.8 (5 or 6 units: with restrictions) (*)	



NOTE

- (*): Refer to the “4.1 Combinability” section for the specific restrictions.
- Additionally, RASC-HNPE series allows a broad range of special combinations which are requested in some typical field installations, as detailed in the “4.1 Combinability” section.

◆ Wide variety of combinable indoor units

Following the VRF concept, the RASC-HNPE series has been designed with adaptability on mind, allowing connection with many types of HITACHI indoor units.

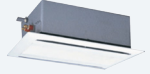
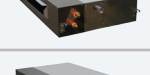
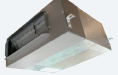
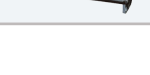
HITACHI indoor units have a wide range of capacities from 0.8 to 10.0 HP and the capacity of some indoor unit models is flexible; it is set to the maximum possible capacity by default, and it can be easily adjusted to precise lower values in line with installation requirements (depending on the model).



Constant capacity unit.



Unit whose capacity can be set one step lower, marked with , using the DIP switch.

		System Free													
Model (HP)		0.8	1.0	1.3	1.5	1.8	2.0	2.3	2.5	3.0	4.0	5.0	6.0	8.0	10.0
RCI-FSN3Ei (4-way cassette)															
RCI-FSN3Ek (4-way cassette)															
RCI-FSN3 (4-way cassette; high efficiency)															
RCIM-FSN4 (4-way cassette; compact)															
RCD-FSN2 (2-way cassette)															
RPC-FSN3E (Ceiling type)															
RPC-FSN3 (Ceiling type; high efficiency)															
RPI-FSN4E (Indoor ducted unit; Low profile)															
RPI-FSN4E (Indoor ducted unit)															
RPI-FSN3E (Indoor ducted unit)															
RPIM-FSN4E (Indoor ducted unit mini)															
RPIM-FSN4E-DU (Indoor ducted unit mini; Drain up)															
RPK-FNS3M (Wall type)															
RPK-FNSH3M (Wall type; For Hotel)															
RPF-FSN2E (Floor type)															
RPI-FSN2E (Floor concealed type)															

◆ **Complementary systems (DX-Interface)**

As well as being combinable with a wide variety of indoor unit types, the RASC series can be operated with DX-Interface complementary system:

		Capacity (HP)							
Model		2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0
DX-Interface (EXV-E1)									
									

 NOTE

Make sure that the total capacity of DX-Interfaces on the system does not exceed the capacity percentage of the RASC unit to which they are connected, according to the selected demand control mode:

- Demand control by inlet temperature: Maximum 100% of the RASC unit capacity.
- Demand control by outlet temperature or duty signal: Maximum 30% of the RASC unit capacity.

2.2.3 EcoDesign and Seasonal Efficiency

To respond to the European Environmental Objectives of the 3 x 20 (-20% energy consumption, -20% CO₂ emission, +20% renewable energy) within 2020, Europe revised the original EcoDesign Directive (Directive 2005/32/CE) and increased the covered applications. Now, the scope of EcoDesign covers all products which play a role in energy reduction (ex: air conditioning, windows...) and the directive has been renamed ErP (Energy related Products).

◆ EcoDesign

3 Key issues in terms of compliance are described in Directive 2010/30/UE No. 626/2011 dated from 4th May 2011 and Directive 2009/125/EC N°206/2012 dated from 6th March 2012. The achievement of these points grants the access of products to the European market

- Fixing a minimum level of performance in heating and cooling mode.
- Fixing a maximum sound power level for indoor and RASC units.
- Fixing communication of above characteristics to end users through labelling.

Seasonal Efficiency

Seasonal Energy Efficiency Ratio (SEER) in cooling and **Seasonal Coefficient of Performance (SCOP)** in heating give a more accurate estimation of the real performance of the equipment during the whole period of usage, all while considering:

- Several points of measure (In cooling mode: an outside temperature of 20°C, 25°C, 30°C and 35°C; in heating mode: an outside temperature of +12°C, +7°C, +2°C, and -7°C).
- Different compressor speeds (full load and partial load), auxiliary consumption (crankcase heaters, thermostat off mode, OFF mode...).
- Temperature conditions (number of hours per outdoor temperature) for an identified average climate for ErP compliance.
- Building heat load (called Pdesign).

◆ Energy classes and energy label

The **energy efficiency** classes are introduced based on SCOP and SEER values: The scale for energy labelling is:

A+++	SEER ≥ 8,50	SCOP ≥ 5,10
A++	6,10 ≤ SEER < 8,50	4,60 ≤ SCOP < 5,10
A+	5,60 ≤ SEER < 6,10	4,00 ≤ SCOP < 4,60
A	5,10 ≤ SEER < 5,60	3,40 ≤ SCOP < 4,00
B	4,60 ≤ SEER < 5,10	3,10 ≤ SCOP < 3,40
C	4,10 ≤ SEER < 4,60	2,80 ≤ SCOP < 3,10
D	3,60 ≤ SEER < 4,10	2,50 ≤ SCOP < 2,80
E	3,10 ≤ SEER < 3,60	2,20 ≤ SCOP < 2,50
F	2,60 ≤ SEER < 3,10	1,90 ≤ SCOP < 2,20
G	SEER < 2,60	SCOP < 1,90

EcoDesign requirements for Air Conditioning products entered into force in two tiers (From 1st January 2013 and 1st January 2014) for products with a rated capacity of less than 12 kW in cooling mode. These EcoDesign requirements are satisfied in ErP Lot10. **The new RASC-4HNPE**, which is within the scope of such regulation, **complies with all the Ecodesign requirements established by the ErP Lot10 directive**.

On the other hand, for those products with a rated cooling capacity higher than 12 kW, Eco-design requirements are planned to come into force from January 1st 2017. **New RASC series line-up**, whose range of units is found in its majority within the scope of this regulation, **has been designed following the seasonal efficiency concept with the target to be already prepared to fulfil the 2017 requirements**.

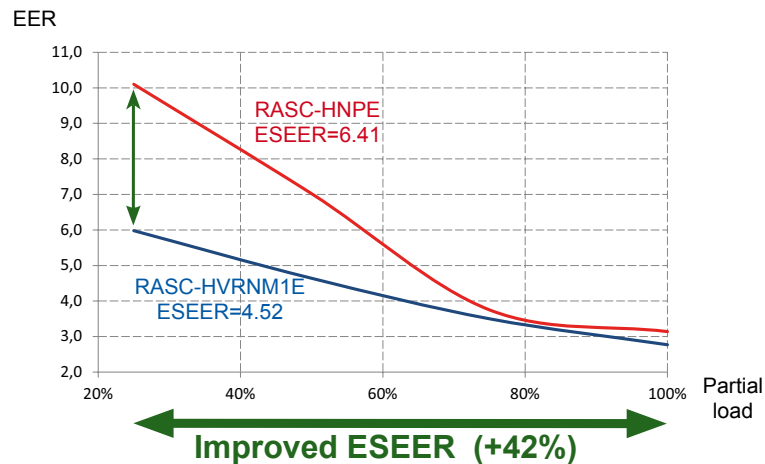
2.2.4 Improved seasonal efficiency

The annual energy cost has been highly reduced, thanks to the new high-efficiency compressor, the reduction of the input power of the fan motor unit and its fan control regulation, the new concept for refrigerant cycle and the rest of aforementioned features.

As a result, the performance has increased vastly at partial loads (ESEER improvement), as shown in the figures below:

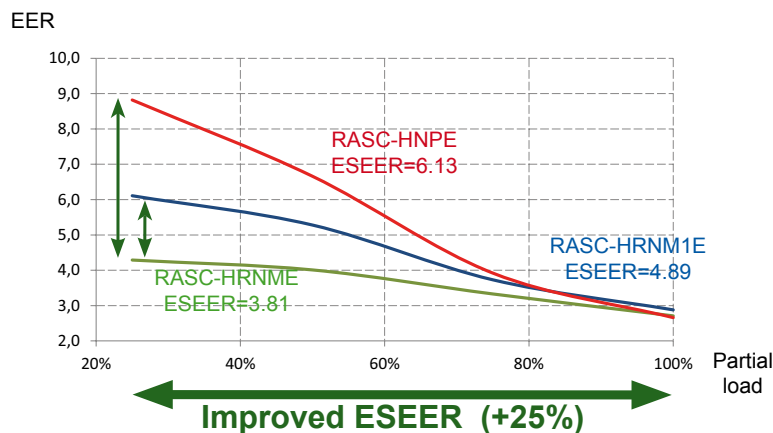
◆ 5HP

The ESEER of RASC-5HNPE has been significantly improved (42% in comparison with the current model).



◆ 10HP

In case of RASC-10HNPE, the incorporation of the variable frequency driver (VFD) technology was already undertaken in RASC-HVRNM1E models. Now, the use of the new high efficiency compressor together with the new design concept allows to achieve a further improvement of 25% with respect to the current model.



NOTE

ESEER value based on the following conditions:

- 100% of load at an ambient temperature of 35°C
- 75% of load at an ambient temperature of 30°C
- 50% of load at an ambient temperature of 25°C
- 25% of load at an ambient temperature of 20°C

2.2.5 All units certified in Eurovent as VRF

New HITACHI RASC series line-up are going to be fully certified within the framework of new Eurovent certification program for units of the VRF type. The models in the new HITACHI RASC series are thus the only centrifugal units to be Eurovent certified as VRF.



Eurovent certification program for VRF units is based on the certification of the RASC unit performance, taking into consideration the cooling and heating capacities and efficiencies (EER/COP), as well as the sound power.

2.2.6 Advanced technology

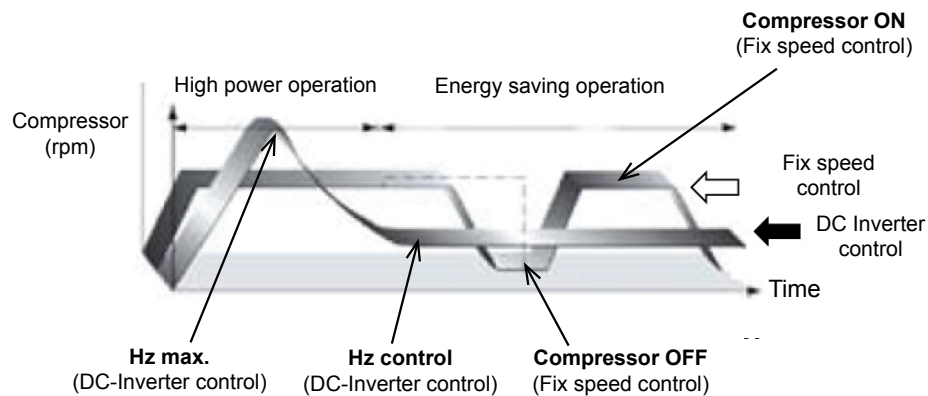
◆ Highly efficient HITACHI DC-Inverter scroll compressor

The HITACHI DC INVERTER scroll compressor has been developed with efficiency on mind.

Energy saving by DC-Inverter control

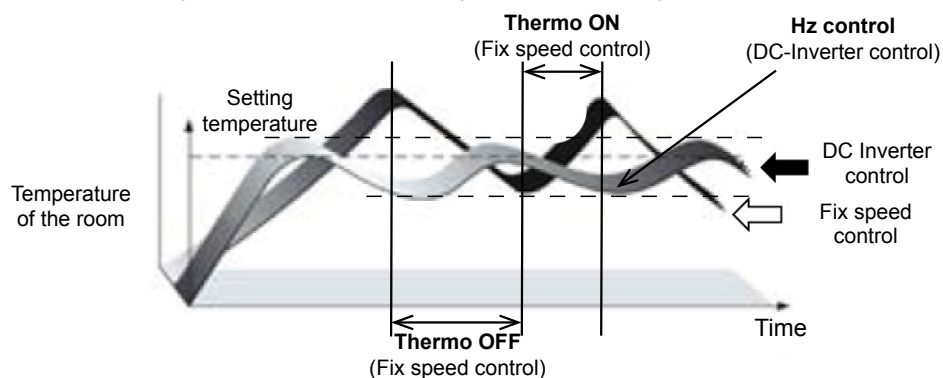
Electrical power input is reduced by means of compressor's frequency control (RASC-HNPE series instead of ON-OFF fix-speed compressor).

DC-Inverter control allows reducing the annual electricity consumption with a saving of approx. 25% (depending on each climate conditions) compared to conventional "ON-OFF" fix-speed compressors.



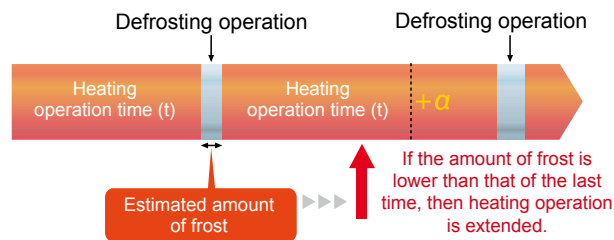
Confort by DC-Inverter control

The setting temperature is rapidly reached and stabilised by smooth frequency control.



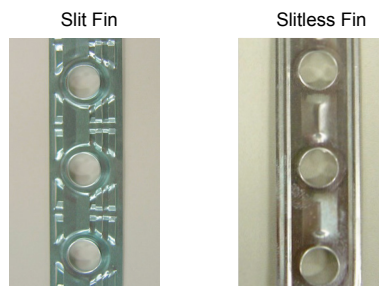
◆ Smart defrost control (Shortened defrost operation time)

The amount of frost can be estimated from the last defrosting time. If the amount of frost is deemed to be lower than that of the previous time, heating operation is automatically extended and the next defrosting operation is delayed. This results in a reduction of unnecessary defrosting operation time, and longer heating operation periods.



◆ High-efficiency heat exchanger

- Slitless fins are used in the heat exchanger; their surface design provides better resistance against frosting and improved heating performance under low temperature conditions.
- Compact design and higher efficiency thanks to the arrangement of narrow heat exchanger tubes in 3 rows.
- Heat exchanger configuration intended for reducing the fluid loss.



2.2.7 Indoor unit Individual operation control (Factory setting)

RASC units are supplied with the individual operation function enabled by factory setting. This function brings the following advantages:

◆ Great comfort

Comfortable environment thanks to the possibility of working at different set temperatures. It might happen in many buildings that because of their orientation, the heating / cooling load is not the same in every area, so individual operation is very useful in such cases.

Conventional systems (Without Individual control operation)

When number 1 indoor unit achieves its set temperature, "Thermo OFF" stops indoor units number 1 and number 2 simultaneously (even if indoor unit number 2 has not achieved its set temperature).

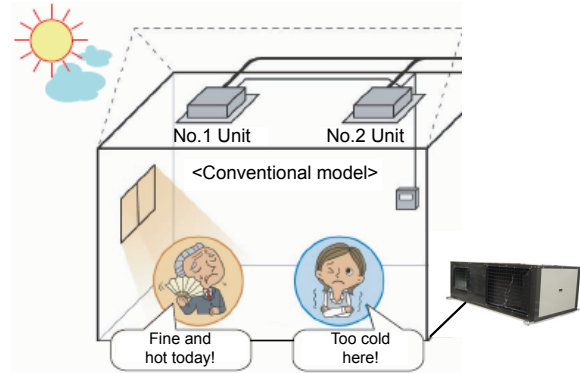
"Thermo ON" condition will be activated when both indoor units request it.

RASC-HNPE series (Individual control operation)

In the same situation, in case that indoor unit number 1 demands "Thermo OFF", only this indoor unit stops.

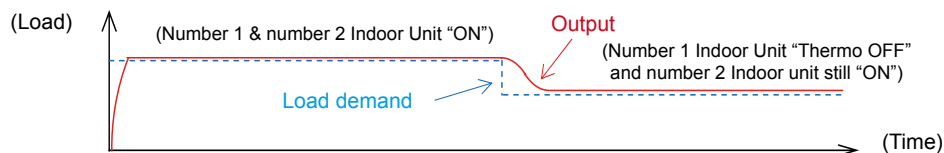
The RASC unit adapts its control to cope with the new load demand for indoor unit number 2, which continues in operation until achieving its set temperature.

"Thermo ON" condition of each indoor unit will be activated independently.



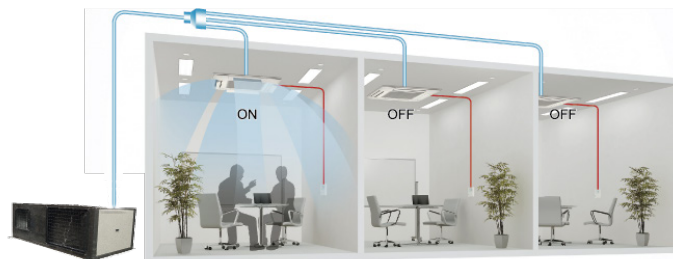
◆ Energy saving

Individual operation adapts its energy consumption (IPT) in function of load demand; energy is not wasted, because the inverter control balances the output against current load demand.



◆ Easy rearrangement

In the case of partitioned rooms, it is possible to install and operate multiple indoor units individually. The individual operation for each partition can be controlled by connecting the remote control switch to each indoor unit. This flexibility in rearrangement of operation in partitioned spaces results in improved energy saving.



2.2.8 Hi-Tool kit selection software (Assistant for air conditioning installation design and Seasonal Efficiency calculation)

◆ New RASC-HNPE series included in the selection software

The tool for seasonal efficiency calculation (SEER/SCOP according to each real system requirement) has been released as a first step. Further during 2014, the updated Hi-ToolKit selection software is expected to calculate not only seasonal efficiency, but also the necessary information to ensure that the installation design can be carried out properly in terms of unit selection, efficiency, installation data, sizes, etc.

The new RASC-HNPE series is scheduled for availability in the selection software.

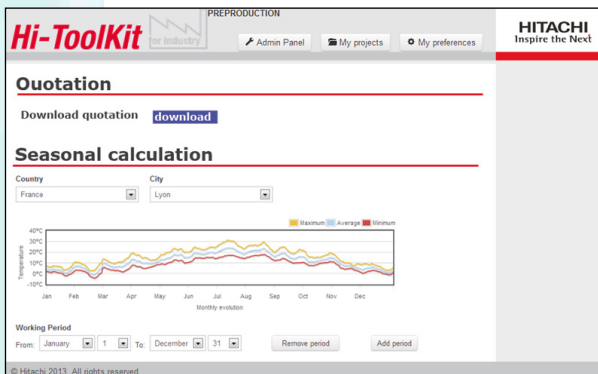
Follow a short description of the main steps of the new Hi-ToolKit 2014:

A summarized description of the functions of the new Hi-ToolKit 2014 follows:

- After completing the “Register process”, each user has a project list which can be managed with the different options shown on the screen.

Project name	Revision	Client	City	Last update
999	01			02/09/2013
aa	02			30/08/2013
Test Heating				30/08/2013
Prova oscar - Cooling & Heating - N		Client name	El Vendrell	29/08/2013
dddd				28/08/2013

- After having completed the input of project data, results appear divided in two main blocks:



Quotation

A preliminary quotation can be obtained for a quick and first evaluation.

By proceeding with design conditions, the user is requested to fill in the following data:

- Country/city
- Working period (cooling)
- Working period (heating)
- Working conditions of the indoor units

- Once all the data has been filled in, the new Hi-ToolKit software proceeds to generate a report with the following information.

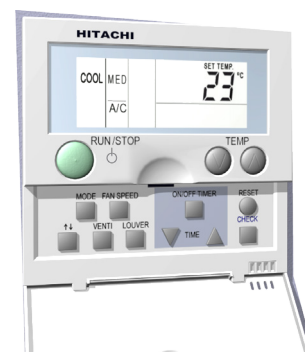
Collection of charts and calculations:	
• For the entire installation	
- CAP (cool/heat, year-round)	
- IPT (cool/heat, year-round)	
- SEER	
- SCOP	
- Cost (cool/heat, year-round)	
• For each system	
- Comparison table of outdoor units	
♦ Seasonal CAP	
♦ Seasonal IPT	
♦ Seasonal EER	
♦ Seasonal COP	
♦ Seasonal Cost	
- Data:	
♦ Dimensional drawing	
♦ Technical catalogue	
• For each indoor Unit	
- Data:	
♦ Dimensional drawing	
♦ Technical catalogue	
General:	
• Temperature charts	

2.2.9 Wide range of operation possibilities

Combined use with Building Air Conditioning controls (CSNET WEB and CSNET Manager) can increase the performance of these installations, thanks to the following features:

- Scheduled programming, which prevents continuous operation of indoor units in rooms which are not being used, while also allowing rooms to be preheated or precooled beforehand.
- Limitation of set temperatures, which means that units do not work at maximum capacity when comfort does not require it.
- Locking functions from the central control, useful to prevent incorrect or ineffective operation of the units.

These functions, among many others, allow a great degree of system optimization. The possibility of choosing among a wide range of indoor units with different power capacities and form factors is also noteworthy.



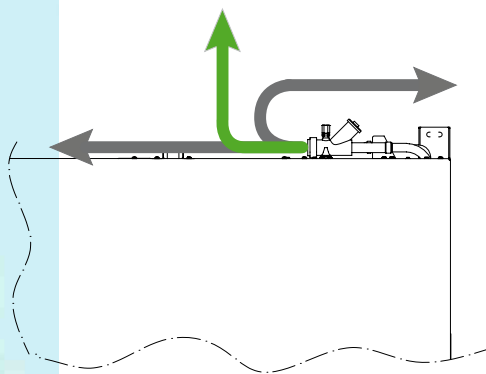
2.3 Installation benefits

2.3.1 New position for refrigerant liquid and gas stop valves NEW

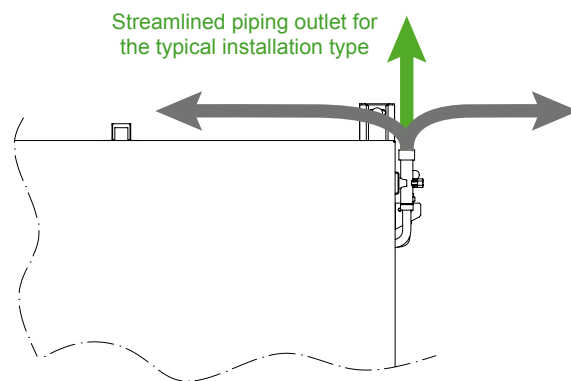
The position of the stop valves for liquid and gas has been modified. This new arrangement results in improved installation flexibility. Moreover, the back service covers can be now removed without any hassle, since the refrigerant piping outlet is not a hindrance anymore (this could have been a problem in the current RASC-10HP models)

Example for RASC-10HP

◆ BEFORE



◆ AFTER



2

2.3.2 Compatibility with the piping of current installations where R22/R407C are used NEW

The new RASC series are compatible with those installations that are currently operating with R22 or R407C. This allows to install the RASC units, which operate with R410A, without the need to change piping installation, even when the thickness is less than the R410A piping specifications.

This option is easily configured with DSW2, by setting pin 4 ON. With this setting, the control system adjusts the pressure in order to avoid damage to the existing pipe for R22/R407C, should its thickness be lower than the R410A piping specifications. Otherwise, no settings are necessary (factory setting DSW2 pin 4 OFF).

Before applying this option, it is important to take special care with preliminary operations that need to be performed on the installation (cleaning pipes, changing filters, vacuum, etc.) and restrictions (pipe lengths, etc.).

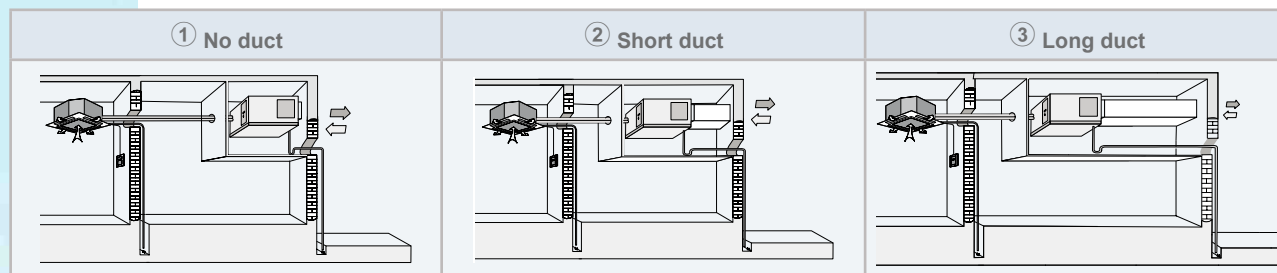
It is important not to disregard the previous operations and the established restrictions; otherwise, serious damage can be caused to the equipment and installation.

2.3.3 Easy and flexible unit installation

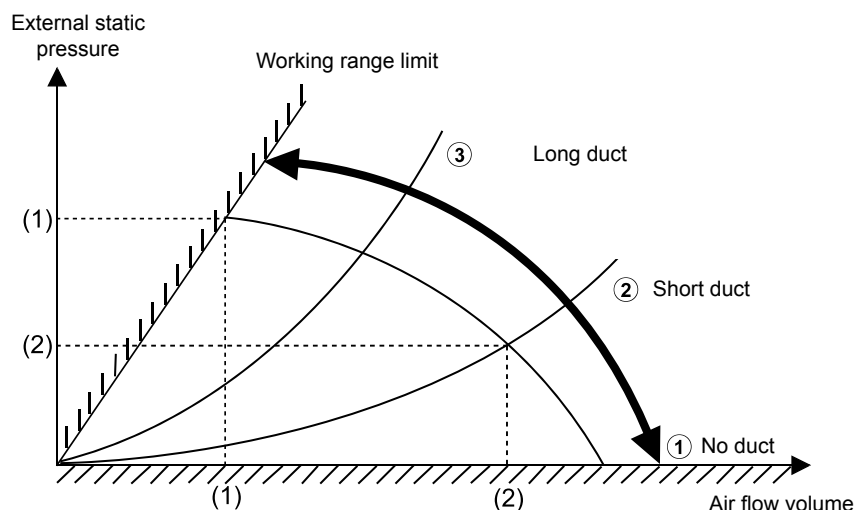
◆ Large external static pressure range availability

Centrifugal fans allow working with a wide range of external static pressures, providing the possibility to duct the RASC unit in order to keep it hidden.

The possibility to conceal the RASC unit can be very appealing for both businesses and households where it is not possible to place the outdoor unit outside the building, or when it is necessary to satisfy legislation and local regulations regarding the installation of air conditioning units.



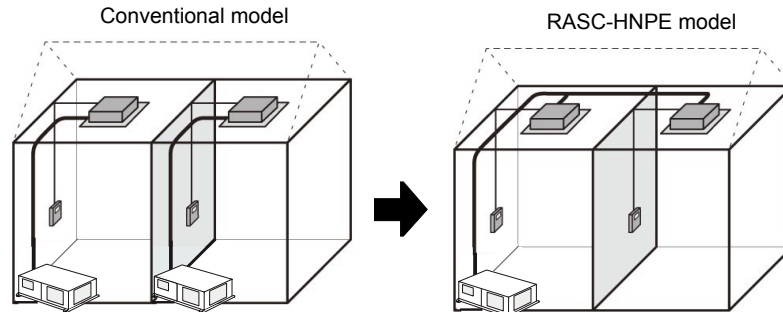
As shown in the following figure, the centrifugal fans adapt its performance within working range limits, depending on the type of installation. Setting on the field might be necessary in order to optimise the input of the fan motor. For further information about the air flow specification and the required settings, please refer to the section [“4.6 Fan performance curves”](#).



◆ Reduction of installation space thanks to individual operation

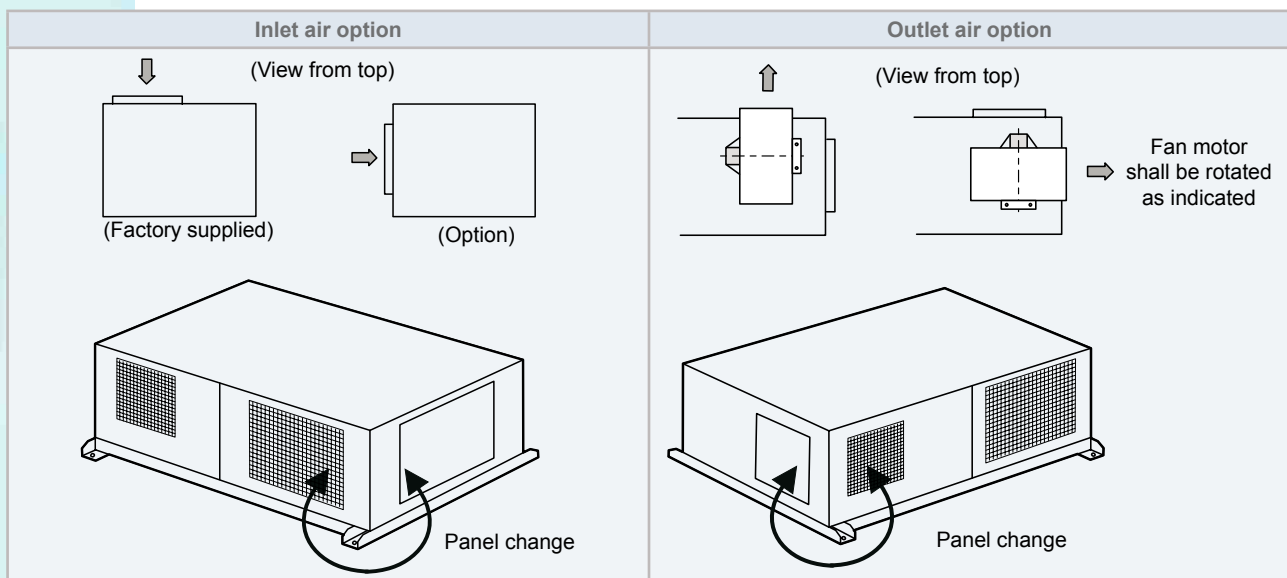
The benefits when installing indoor units in different rooms are:

- Reduction of installation space required for RASC units (down to half).
- Reduction of piping installation works and cost.
- Reduction of wiring and power equipment.



◆ Interchangeability of air inlet and outlet panels

RASC units can be used in different configurations, just by switching the air inlet and outlet panels (with respect to the air outlet panel, the change of position entails the rotation of the fan motor as well)



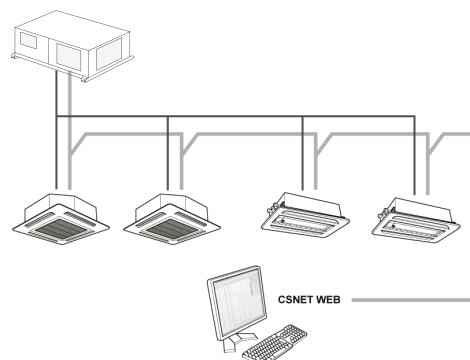
◆ Insulations with fire resistance class M1

All the Insulations used in the RASC-HNPE models 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).

2.3.4 Easy and flexible electrical installation

◆ H-LINK II system combinability

Each H-LINK II bus can communicate with up to 160 indoor units. Taking into account the absence of polarity and the permitted line length, the flexibility of the interconnection between the machines is very high. This enables, for example, connecting 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 Building AC controls)
Recommended cable	Shielded twisted pair cable or shielded pair cable, over 0.75 mm ² (equivalent to KPEV-S)
Voltage	DC 5 V

NOTE

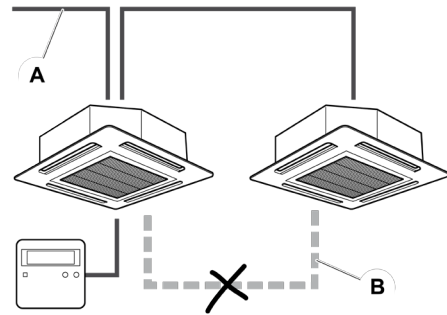
- The use of the H-LINK II system requires the setting of DIP switches. If the DIP switches are not set correctly, an alarm may occur due to transmission failure.
- Total wiring length for individual and central controllers can be extended up to 500 m. Use the 2P extension cable PRC-(10/15/20/30) E1 when these cables need to be extended up to more than 30 m. If total wiring length is less than 30 m, then normal wires (0.3 mm² section) can be used.
- The maximum H-LINK II electrical wiring length can be extended from 1,000 meters up to 5,000 meters by using four PSC-5HR devices as a maximum. Each PSC-5HR device allows an extra H-LINK wiring length of 1,000 meters.
- The H-LINK II system provides outstanding flexibility for system design; installation is easy, and total costs are reduced. Furthermore, it can be centrally controlled by connecting Building AC control systems (CSNET WEB or CSNET Manager) which can control installations with a high number of indoor units distributed through several floors which need to be separately controlled:
 - CSNET WEB is a good option when there is a computer in the installation with centralised control. In this case, connecting the PSC-A160WEB1 hardware only, it is possible to have access to all the installation parameters from the computer.
 - CSNET Manager is a good solution when there is no a computer in the installation with centralised control. In this case, with the use of its H-LINK gateway (HC-A64NET), all the installation parameters can be easily accessible through the touch screen.
- The installation can also be controlled via Internet by CSNET WEB or CSNET Manager.

◆ No need of operation cable for the remote control (when in simultaneous operation setting)

In the case of systems with multiple indoor units, they can be controlled using a single remote control switch when they are set to simultaneous operation, and thus there is no need to link them with an operation cable for the remote control.

A. Operation wiring.

B. An interconnection cable is not required when using the remote control switch.

**2.3.5 Easy and flexible control connection (Centralised remote controls, Building air conditioning controls and BMS gateways)****◆ No polarity**

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

◆ Auto-Configuration

Besides 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 to detect the type of indoor unit or its power.

2.4 Start-up benefits

2.4.1 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:

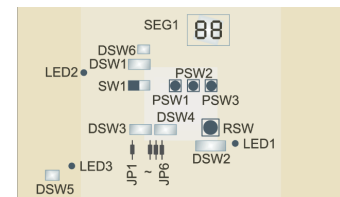
- Test run and identification of the units forming the system.
- Test run from the remote control.
- Test run from the RASC unit.

◆ Test run and identification of the system units

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

The process to identify the units which make up the system is different in the case of RASC and indoor units.

- RASC units: Setting with the remote control, where it is possible to assign the series (such as simple or multiple) to which the RASC units in operation belong.
- Indoor units: Setting with the rotary and DIP switches 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 be easily 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 shows the following parameters in order, depending on the operation of PSWs.

- 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.

2.4.2 Service verification

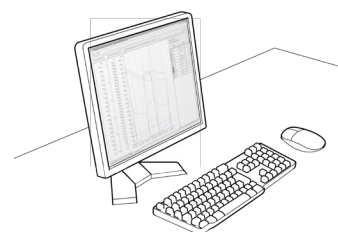
◆ System operation control

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, the connection of a laptop computer to the air conditioning system by means of an interface attached to the H-LINK II bus. The different menus in this software allow an effective management of all the connected systems and obtaining relevant data for optimisation of 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.

Data reports allow continuous verification of the system operation; any deviation from the stipulated range of values is detected immediately.

2.5 Maintenance benefits

2.5.1 Minimum maintenance

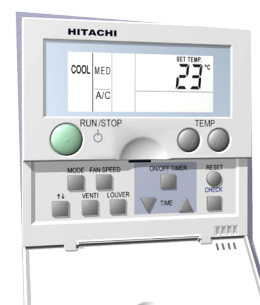
The units have been designed in line with Hitachi's philosophy, guaranteeing great reliability and robustness and reducing maintenance to a minimum.

2.5.2 Easy accessibility

The system components are easily accessible. All of the components in the unit are easily reachable for maintenance operations by just removing a cover. The entire system is designed for maintenance operations to be easy and simple.

2.5.3 Alarm codes

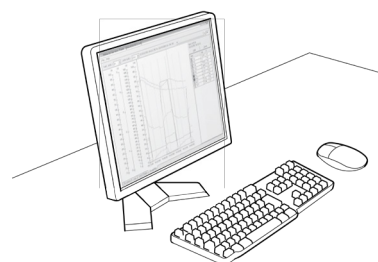
Alarms are grouped by system element in order to simplify maintenance work and the tasks of maintenance persons.



2.5.4 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.

The Building air conditioning controls CSNET WEB and CSNET Manager are also useful for maintenance tasks.



3 . General data

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3.1 General information

3.1.1 Combination with indoor units

All the RASC-HNPE units described in this manual are compatible with indoor units and complementary systems as indicated in the following table:

RASC units	Indoor units	Complementary systems
RASC-HNPE	RCI / RCIM / RCD / RPC / RPI / RPIM / RPK / RPF / RPIFI	DX-Interface

3.1.2 General conditions

- 1 The nominal cooling and heating capacities indicated refer to the RASC unit operating with the indoor units at 100% of their capacity, and are based on the EN14511 standard.

Operating conditions		Cooling	Heating
Indoor air inlet temperature	DB	27.0°C	20.0°C
	WB	19.0°C	—
Outdoor air inlet temperature	DB	35.0°C	7.0°C
	WB	—	6.0°C
DB: dry bulb; WB: wet bulb. Pipe length: 7.5 m; pipe height: 0 m			

- 2 Capacity, EER/COP and sound power level are values certified by Eurovent, following Eurovent standards for VRF certification program.
- 3 The input power of the indoor unit is not considered for the calculation of cooling and heating efficiencies.
- 4 The ESEER value represents the seasonal cooling efficiency. Only 4HP unit is within EcoDesign ErP Lot10 scope.
- 5 The sound pressure level was measured in an anechoic chamber, so reflected sound should be taken into consideration when installing the unit. Tests were carried out under the following conditions.
 - a. Distance of the unit from the measuring point: 1.5 meters beneath the unit (ducted air inlet and outlet).
 - b. Units working with their nominal supply voltage.
- 6 Sound power level was measured in a reverberant room, in accordance with the EN12102 standard. Used environment conditions are the same as specified in EN14511 for performance test.
- 7 Dimensional data shown in brackets refers to the dimensions taking into account the unit feet.

3.2 General data

3.2.1 RASC-(4-6)HNPE

Item	Units	RASC-4HNPE	RASC-5HNPE	RASC-6HNPE
Power supply	-	3N~ 400V 50Hz		
Nominal cooling capacity	kW	10.0	12.5	14.0
Nominal heating capacity	kW	11.2	14.0	15.5
EER	-	3.35	3.14	2.75
COP	-	3.80	3.40	2.70
ESEER NEW	-	6.65	6.41	6.19
Minimum - Maximum indoor units connectable	-	1 - 5		
Minimum - Maximum connected capacity	%	75 - 120 (*1)		
Noise level cooling (sound pressure) (night mode)	dB(A)	52 (48)	52 (48)	53 (49)
Noise level heating (sound pressure)	dB(A)	53	53	54
Noise level (sound power)	dB(A)	70	71	72
Rated air flow volume	m³/min	55	60	60
Rated static pressure (nominal conditions / maximum)	Pa	56 / 90	72 / 100	100 / 100
Dimensions (H x W x D)	mm	555 x 1415 x 1015 (575 x 1415 x 1175)		
Net weight	kg	192	192	192
Recommended circuit breaker	A	20	20	20
Starting current	A	Less than maximum current		
Maximum current	A	14.1	14.1	16.0
Running current cooling	A	4.8	6.4	8.2
Running current heating	A	4.7	6.6	9.2
Recommended power cable size	quantity x mm²	5 x 4.0	5 x 4.0	5 x 4.0
Transmitting cable size between indoor unit and RASC unit	quantity x mm²	2 x 0.75	2 x 0.75	2 x 0.75
Piping diameter (liquid / gas)	mm (inch)	Ø9.52 (3/8) / Ø15.88 (5/8)		
Drain pipe connection	mm	30 (*2)		
Minimum refrigerant piping length	m	5		
Maximum refrigerant piping length (chargeless)	m	30	30	30
Maximum refrigerant piping length between RASC and indoor unit (additional refrigerant charge needed)	m (g/m)	75 (60)	75 (60)	75 (60)
Height difference (RASC unit higher / RASC unit lower)	m	30 / 20		
Working range (cooling // heating)	°C	-5 / +46 (DB) // -15 / +15.5 (WB)		
Refrigerant	-	R410A		
Refrigerant charge before shipment	kg	4.1	4.2	4.2
Compressor type	-	Scroll DC Inverter driven		
Colour	-	Dark grey / Light grey		
Remote control model (Optional)	-	PC-ART / PC-ARF		



NOTE

- RASC-4HNPE is within EcoDesign ErP Lot10 scope. Its seasonal efficiencies according EN14825(2013) are: SEER= 5.15; SCOP= 4.00
- (*1): Maximum connected capacity of 100% in case of combination with more than 4 indoor units.
- (*2): Outer diameter.

3.2.2 RASC-(8/10)HNPE

Item	Units	RASC-8HNPE	RASC-10HNPE
Power supply	-	3N~ 400V 50Hz	
Nominal cooling capacity	kW	20.0	24.0
Nominal heating capacity	kW	22.4	26.0
EER	-	2.70	2.66
COP	-	3.20	3.05
ESEER NEW		6.15	6.13
Minimum - Maximum indoor units connectable	-	1 - 6	1 - 6
Minimum - Maximum connected capacity	%	75 - 120 (*1)	
Noise level cooling (sound pressure) (night mode)	dB(A)	55 (51)	56 (52)
Noise level heating (sound pressure)	dB(A)	56	57
Noise level (sound power)	dB(A)	74	75
Rated air flow volume	m³/min	115	115
Rated static pressure (nominal conditions / maximum)	Pa	84 / 120	102 / 120
Dimensions (H x W x D)	mm	620 x 1850 x 1360 (640 x 1850 x 1525)	
Net weight	kg	300	303
Recommended circuit breaker	A	30	30
Starting current	A	Less than maximum current	
Maximum current	A	24.7	24.7
Running current cooling	A	11.9	14.5
Running current heating	A	11.2	13.7
Recommended power cable size	quantity x mm²	5 x 6.0	5 x 6.0
Transmitting cable size between indoor unit and RASC unit	quantity x mm²	2 x 0.75	2 x 0.75
Piping diameter (liquid / gas)	mm (inch)	Ø9.52 (3/8) / Ø25.4 (1)	Ø12.7 (1/2) / Ø25.4 (1)
Drain pipe connection	mm	30 (*2)	
Minimum refrigerant piping length	m	5	
Maximum refrigerant piping length (chargeless)	m	30	30
Maximum refrigerant piping length between RASC and indoor unit (additional refrigerant charge needed)	m (g/m)	100 (needs to be calculated)	100 (needs to be calculated)
Height difference (RASC unit higher / RASC unit lower)	m	30 / 20	
Working range (cooling // heating)	°C	-5 / +46 (DB) // -15 / +15.5 (WB)	
Refrigerant	-	R410A	
Refrigerant charge before shipment	kg	5.7	6.2
Compressor type	-	Scroll DC Inverter driven	
Colour	-	Dark grey / Light grey	
Remote control model (Optional)	-	PC-ART / PC-ARF	

**NOTE**

- (*1): Maximum connected capacity of 100% in case of combination with more than 4 indoor units.
- (*2): Outer diameter.

3.3 Component data

3.3.1 RASC-(4-6)HNPE

Model				RASC-4HNPE	RASC-5HNPE	RASC-6HNPE	
Heat exchanger	Heat exchanger type			-	Multi-pass cross finned tube		
	Piping	Material		-	Copper		
		Outer diameter		Ømm	7		
		Rows		-	4		
		Number of tubes/coil		-	108		
	Fin	Material		-	Aluminium with anti-corrosive coating treatment		
		Pitch		mm	1.4		
	Maximum operating pressure			MPa	4.15		
	Total face area			m²	0.62		
	Number of coils/unit			-	1		
Fan unit	Fan	Type		-	Multi-blade centrifugal fan		
		Number/unit		-	1		
		Outer diameter		mm	265		
		Revolutions		rpm	860	950	1030
		Nominal air flow/fan		m³/min	55	60	60
	Motor	Type		-	Drip-proof enclosure		
		Starting method		-	Inverter-driven		
		Power		W	350		
		Quantity		-	1		
		Insulation class		-	F		
Compressor	Model		-	E402HHD-36D2			
	Type		-	Hermetic scroll			
	Pressure resistance	Discharge		MPa	4.15		
		Suction		MPa	2.21		
	Motor type	Starting method		-	Inverter-driven (I.D.)		
		Poles		-	4		
		Insulation class		-	E		
	Oil type			-	FVC68D		
	Oil quantity			l	0.9		

3.3.2 RASC-(8/10)HNPE

Model				RASC-8HNPE		RASC-10HNPE	
Heat exchanger	Heat exchanger type			-	Multi-pass cross finned tube		
	Piping	Material		-	Copper		
		Outer diameter		Ømm	7		
		Rows		-	4		
		Number of tubes/coil		-	120		
	Fin	Material		-	Aluminium with anti-corrosive coating treatment		
		Pitch		mm	1.4		
	Maximum operating pressure			MPa	4.15		
	Total face area			m²	0.96		
	Number of coils/unit			-	1		
Fan unit	Fan	Type		-	Multi-blade centrifugal fan		
		Number/unit		-	1		
		Outer diameter		mm	320		
		Revolutions		rpm	870	900	
		Nominal air flow/fan		m³/min	115	115	
	Motor	Type		-	Drip-proof enclosure		
		Starting method		-	Inverter-driven		
		Power		W	550		
		Quantity		-	1		
		Insulation class		-	F		
Compressor	Model			-	DA50PHD-D1SE2		DA65PHD-D1SE2
	Type			-	Hermetic scroll		
	Pressure resistance	Discharge		MPa	4.15		
		Suction		MPa	2.21		
	Motor type	Starting method		-	Inverter-driven (I.D.)		
		Poles		-	6		
		Insulation class		-	E		
	Oil type			-	FVC68D		
	Oil quantity			l	1.9		

3.4 Electrical data

3.4.1 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 5 m and 0 m piping lift.
- The data are measured at the following conditions:
 - Cooling conditions: Indoor air inlet: 27/19°C (DB/WB); Outdoor air inlet: 35°C DB.
 - Heating conditions: Indoor air inlet: 20°C DB; Outdoor air inlet: 7/6°C (DB/WB).
- Specifications in these tables are subject to change without notice so HITACHI may bring the latest innovations to its customers.
- Please refer to the general information, cautions and notes regarding protective devices (CB, ELB) throughout the “10. Electrical and control settings” chapter.

3.4.2 RASC series

Model	Power supply	Applicable voltage		Compressor and fan motors					Max IPT (kW)	MC (A)
		U max (V)	U min (V)	STC (A)	Cooling operation		Heating operation			
					IPT (kW)	RNC (A)	IPT (kW)	RNC (A)		
RASC-4HNPE	3N~ 400V 50Hz	440	360	-	2.99	4.8	2.95	4.7	8.76	14.1
RASC-5HNPE					3.98	6.4	4.12	6.6	8.76	14.1
RASC-6HNPE					5.09	8.2	5.74	9.2	10.01	16.0
RASC-8HNPE					7.41	11.9	7.00	11.2	15.43	24.7
RASC-10HNPE					9.02	14.5	8.52	13.7	15.43	24.7

4 . Capacity and selection data

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4.1 Combinability

RASC unit	Combinability ratio	Minimum combination capacity (HP)	Maximum combination capacity (HP)	Maximum number of indoor units	Minimum indoor unit capacity (HP)
RASC-4HNPE	75-120% (*)	3.0	4.8 (*)	5 (*)	0.8 (**)
RASC-5HNPE		3.75	6.0 (*)		
RASC-6HNPE		4.5	7.2 (*)		
RASC-8HNPE		6.0	9.6 (*)	6 (*)	
RASC-10HNPE		7.5	12.0 (*)		



NOTE

- (*): If more than 4 indoor units are connected, the following adjustments must be taken into consideration:

RASC unit	Combinability ratio	Maximum combination capacity (HP)
RASC-4HNPE	75-100	4.0
RASC-5HNPE		5.0
RASC-6HNPE		6.0
RASC-8HNPE		8.0
RASC-10HNPE		10.0

- (**): If more than 4 indoor units are connected, it is recommended to optimise the balance of indoor units by following the instructions shown in the next table regarding the minimum and maximum capacity of indoor units to be installed.

Minimum indoor unit capacity (HP)												
Indoor unit with the highest capacity (HP)	0.8	1.0	1.3	1.5	1.8	2.0	2.3	2.5	3.0	4.0	5.0	6.0
Indoor unit with the lowest capacity (HP)	0.8				1.0			1.3		1.5	1.8	2.0

- Where the parameters of installation are close to their limit values (long indoor-to-indoor pipe distances, high outdoor-to-indoor height difference, long pipes in general, etc) it is recommended to follow the previous instructions regarding the minimum capacity of indoor unit to be installed so as to guarantee best comfort.
- In systems where all the units belong to the 4-Way RCI-FSN3 model, the maximum allowed capacity ratio of connected indoor units is 100%, and the maximum number of connectable indoor units is 4.
- Make sure that the total capacity of DX-Interfaces on the system does not exceed the capacity percentage of the RASC unit to which they are connected, according to the selected demand control mode:
 - Demand control by inlet temperature: Maximum 100% of the RASC unit capacity.
 - Demand control by outlet temperature or duty signal: Maximum 30% of the RASC unit capacity.
- 8 and 10 HP indoor units are basically allowed in systems with 1 indoor unit only; however, the following special combinations, which are requested in some typical field installations, have been additionally allowed for RASC-10HNPE series.

Special combinations allowed	
2 indoor units system	3 indoor units system
8.0 + 3.0	8.0 + 2.0 + 2.0
8.0 + 2.0	8.0 + 1.5 + 1.5
10.0 + 3.0	8.0 + 1.0 + 1.0
10.0 + 2.0	10.0 + 1.5 + 1.5
	10.0 + 1.0 + 1.0

- For systems in which all indoor units operate simultaneously, the total indoor capacity must be less or equal to the RASC unit capacity. Otherwise, poor performance or narrow operation range at overload could occur.

4.2 System selection procedure

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.

4.2.1 CENTRIFUGAL VRF system possibilities

Before selecting the RASC unit, it is necessary to take into account some important possibilities that offers the CENTRIFUGAL VRF system.

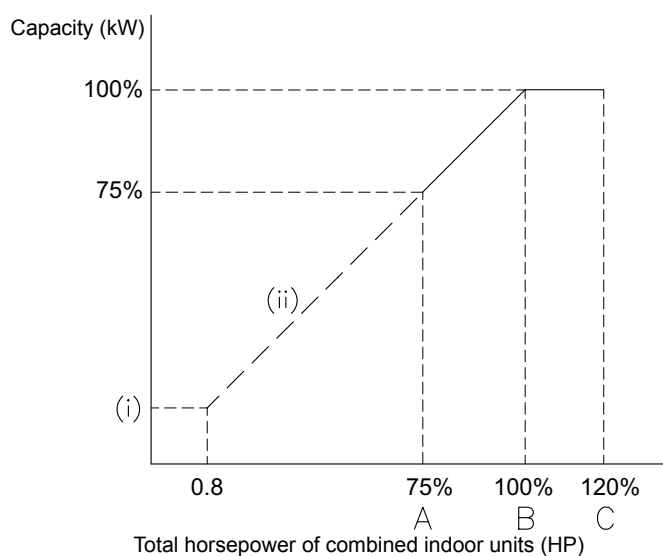
◆ Reduced RASC unit capacity

First of all, the possibility of the “Reduced total RASC unit capacity as a result of the wide range of operation capacity control available” in the CENTRIFUGAL VRF systems is considered, which enables to the RASC unit to choose a maximum total combination horsepower of 120% and a minimum total combination horsepower of 75% by combination of the indoor units when compared with the nominal RASC unit capacity.

NOTE

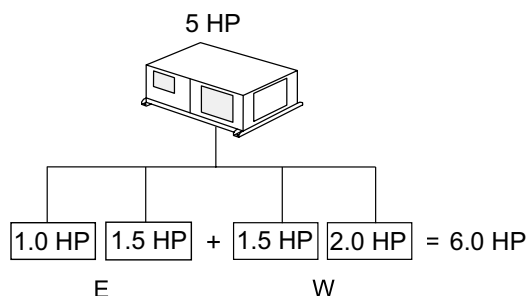
Please, refer to the previous section “4.1 Combinability” for the specific considerations.

The following figure shows the capacity curve depending on the combined indoor units (A, B and C refers to the table).



- (A): Minimum nominal combination capacity.
- (B): Nominal combination capacity.
- (C): Maximum nominal combination capacity.
- (i): Minimum nominal cooling or heating capacity.
- (ii): Capacity when some indoor units are off.

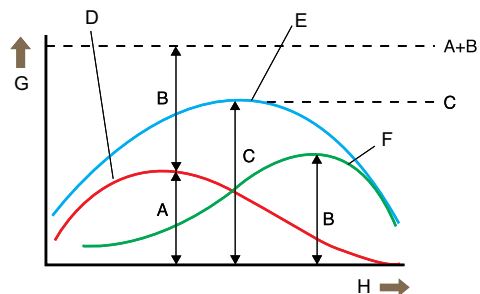
This concept allows the RASC unit to be smaller capacity when compared with other air conditioning systems, in case of the total combination horsepower, but considering that maximum load demands can not be simultaneous. This possibility is shown in the following example:



Indoor unit capacity

E: East zone (2.5 HP)

W: West zone (3.5 HP)



A: morning peak heat load in the eastern area

B: evening peak heat load in the western area

C: maximum simultaneous load for the entire building

D: eastern area load

E: total load

F: western area load

G: load

H: time

The diagram shows a typical building with a morning peak heat load on the east zone equivalent to a 2.5 HP unit. In the afternoon a peak occurs on the west zone equivalent to a 3.5 HP unit.

Therefore, a conventional system would require total installed plant of 2.5 HP + 3.5 HP = 6.0 HP. The maximum simultaneous load on the whole building occurs at noon and is equal to 5 HP of unit capacity. A RASC-HNPE system of 5 HP can be selected, and this capacity can be directed either to the east or west zone as dictated by the system controls.

i NOTE

- The maximum required loads of east and west zone must not be simultaneous.
- For systems in which all indoor units operate simultaneously, the total indoor capacity must be less or equal to the RASC unit capacity. Otherwise, poor performance or narrow operation range at overload could occur.

The total combination horsepower is calculated with the following formula:

$$\text{Total combination horsepower} = (\text{Total indoor unit horsepower} / \text{RASC unit horsepower}) \times 100 = (6.0 \text{ HP} / 5 \text{ HP}) \times 100 = 120\%$$

◆ 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 is available in some HP indoor unit models.

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

Nominal capacity of indoor units

Indoor units (HP)	0.8	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0
Cooling (kW)	2.0	2.5	3.6	5.0	6.3	7.1	10.0	12.5	14.0	20.0	25.0
Heating (kW)	2.2	2.8	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-HNPE 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: 5 meters.

Piping height: 0 meters.

DB: Dry Bulb.

WB: Wet Bulb.

Normal adjusted capacities of indoor units

Horsepower (HP)	1.3		1.8		2.3	
Variable capacity (HP)	1.5	→	1.3	→	1.8	→
Cooling (kW)	3.6	→	3.2	→	4.5	→
Heating (kW)	4.0	→	3.6	→	5.0	→
Applicable model	RPI(M), RCI(M), RCD, RPK, RPF, RPI		RPI, RCI, RCD, RPK, RPC		RPI, RCI, RCD, RPC	
Indoor unit dip switch setting (DSW3)		→		→		→
	Factory setting	→	Adjusted power	→	Adjusted power	→



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.

4.2.2 Selection procedure

◆ Selection parameters

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

Available models	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 has to be considered. The RPI units are designed with different static pressure ranges in order to fulfil all installation necessities.

Once considered the CENTRIFUGAL VRF system possibilities, it is the moment to start with the selection procedure. In order to do so, an installation consisting of several rooms with different required cooling loads and temperature conditions has been assumed, which are shown below:

◆ Design conditions

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.

Temperature condition

Cooling	Heating
Outdoor air inlet temperature: 35°C DB	Outdoor air inlet temperature: 4/0°C (DB/WB)
Indoor air inlet temperature: 25/17°C (DB/WB)	Indoor air inlet temperature: 18°C DB



NOTE

When heating, the outdoor temperature should be higher than -5°C.

Installation required loads (*)

Item			East zone		West zone	Total
			Room 1	Room 2	Room 3	1+2+3
Estimated cooling load	Total	kW	2.60	3.80	4.60	11.00
	Sensible		1.90	2.70	3.40	8.00
Estimated heating load	Total	kW	2.50	3.60	4.40	10.50



NOTE

(*): In this example, the maximum required loads are not simultaneous.

- The maximum required loads of rooms 1 and 2 (east zone) occurs at the morning
- The maximum required load of room 3 (west zone) occurs at the afternoon.

Installation characteristics

Power supply	3N ~400V 50Hz
Equivalent piping length (EL)	20 m
Height difference between RASC unit and indoor units (H)	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 [“4.5.2 Piping length correction factor”](#).

◆ Step 1: Initial pre-selection

Taking into account the CENTRIFUGAL VRF system possibilities mentioned above, the indoor unit capacities have been set by dip-switch (DSW3).

Item		Room 1	Room 2	Room 3	1+2+3	RASC unit
Selected model		RPIM-1.5 (Adjusted to 1.3)	RCD-2.0	RCI-2.5 (Adjusted to 2.3)	5.6 HP	RASC-5HNPE (112%)
Nominal cooling capacity	kW	3.8	5.6	6.7	16.1	13.20
Nominal heating capacity		4.2	6.3	7.5	18.0	13.33

The pre-selected capacity of the different indoor units has not been the immediately higher in order to apply a safety factor considering the different correction factors existing, which will reduce the capacity.

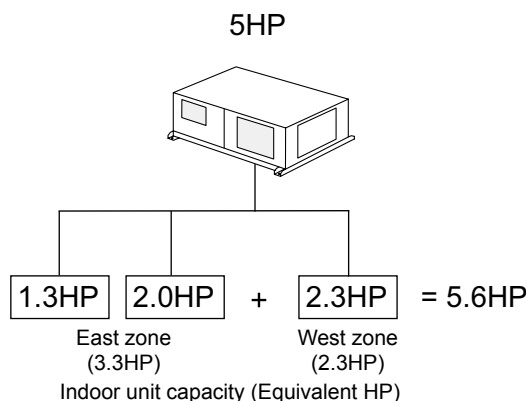
To determinate the nominal cooling and heating capacity, it is necessary refer to sections [“4.3 Maximum cooling capacities”](#) and [“4.4 Maximum heating capacities”](#) respectively, taking into account the temperature conditions.



NOTE

- When the total power of combined indoor units is 100% or higher, the Maximum capacity value obtained from the tables does not need any extra operation. However, when this value is less than 100%, the Maximum capacity value needs to be multiplied by the corresponding factor.
- If the air inlet temperature for the indoor unit or RASC unit is not contained in the capacity tables, an interpolation should be carried out using the values above and below those of the air inlet temperature.

A diagram of the resulting installation is shown below:



For this example, three different indoor units (RPK-1.5FSN3M, RCD-2.0FSN2 and RCI-2.5FSN3Ek) have been assumed in order to show how the choice of indoor unit can affect the different factors presented in this chapter.

The resulting total indoor unit horsepower is 5.6 HP. The RASC unit with the horsepower immediately higher is the 6 HP model, but the possibility “Reduced total RASC unit capacity” allows the 5 HP model selection. Thus, the RASC unit can be up to 12% smaller capacity when compared with other air conditioning systems.

The total combination horsepower is the following:

Total combination horsepower =	$\frac{\text{Total indoor unit horsepower}}{\text{RASC unit horsepower}} \times 100$	=	$\frac{5.6 \text{ HP}}{5.0 \text{ HP}} \times 100$	=	112 %
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The next step is the capacity correction using the different correction factors shown in this chapter.

This procedure is divided in two parts: cooling and heating.

Cooling mode

◆ Step 2: Cooling capacity correction

The actual cooling capacity of the pre-selected RASC 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-5HNPE unit is 13.20 kW.

Calculation of f_{LC} :

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

To determine this value, refer to section [“4.5.2 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 **0.97** approximately.

Calculation of Q_C :

Once the correction factors to be applied have been determined, the formula for the corrected cooling capacity by piping length of the unit RASC-5HNPE can be applied:

$$Q_C = 13.20 \text{ kW} \times 0.97 = \mathbf{12.80 \text{ kW}}$$

Actual cooling capacity of the RASC unit (Q_{AC}):

The cooling capacity data for the RASC-5HNPE unit taken from the table in section [“4.3 Maximum cooling capacities”](#) is calculated on the basis of a relative humidity of 50% which means that an indoor air inlet temperature of 17 °C WB corresponds to a temperature of 24°C DB.

However, the difference between the indoor air inlet dry bulb temperature required by the system (25°C) and the indoor air inlet dry bulb temperature recorded in the cooling capacity data (24°C) requires an adjustment of the capacity.

The following formula is used to apply this adjustment.

$$Q_{AC} = Q_C + (CR \times (DB_R - DB))$$

Q_{AC} : Actual cooling capacity of the RASC unit (kW).

Q_C : Corrected cooling capacity of the RASC unit by piping length (kW)

CR: Correction ratio due to humidity.

DB_R : Real Dry Bulb evaporator temperature (°C).

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

Calculation of CR:

The correction ratio due to humidity is shown in a table contained in section [“4.5.4 Correction ratio due to humidity \(CR\)”](#).

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 the sensible heat capacity and vice versa.

The correction ratio CR for the RASC-5HNPE unit is **0.51**.

Calculation of Q_{AC}

Once the CR has been identified for the RASC-5HNPE unit, its actual cooling capacity can be calculated:

$$Q_{AC} = 12.80 \text{ kW} + 0.51 \times (25-24) = \mathbf{13.31 \text{ kW}}$$

◆ Step 3: Cooling capacity of each indoor unit

Once the actual cooling capacity of the RASC unit is known, the actual cooling capacity of each indoor unit must be calculated according to the following formula:

$$Q_{Ci} = Q_{AC} \times (Q_{MCI} / Q_{MCC})$$

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

Q_{AC} : Actual cooling capacity of the RASC unit (kW).

Q_{MCI} : Nominal cooling capacity of the indoor unit (kW).

Q_{MCC} : Nominal cooling capacity of the combination (kW).

Applying this we obtain:

n° 1	RPIM-1.5 (Adjusted to 1.3)	Cooling capacity = $13.31 \times (3.80 / 16.10) = 3.14$ kW
n° 2	RCD-2.0	Cooling capacity = $13.31 \times (5.60 / 16.10) = 4.63$ kW
n° 3	RCI-2.5 (Adjusted to 2.3)	Cooling capacity = $13.31 \times (6.70 / 16.10) = 5.54$ kW

4

◆ Step 4: Sensible heat capacity (SHC)

The system requirements specify a sensible heat load for each indoor unit.

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.

$$SHF_{RPIM-1.5} = 0.71$$

$$SHF_{RCD-2.0} = 0.75$$

$$SHF_{RCI-2.5} = 0.73$$

Calculation of SHC

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.

$SHF_{RPIM-1.5} = 3.14 \text{ kW} \times 0.71 = 2.23 \text{ kW}$
$SHF_{RCD-2.0} = 4.63 \text{ kW} \times 0.75 = 3.47 \text{ kW}$
$SHF_{RCI-2.5} = 5.54 \text{ kW} \times 0.73 = 4.04 \text{ kW}$

The results of cooling mode are the following:

Item			Room 1	Room 2	Room 3	1+2+3	RASC unit
Selected model			RPIM-1.5 (Adjusted to 1.3)	RCD-2.0	RCI-2.5 (Adjusted to 2.3)	5.6 HP	RASC-5HNPE (112%)
Estimated cooling load	Total	kW	2.60	3.80	4.60	11.00	
	Sensible		1.90	2.70	3.40	8.00	
Corrected cooling capacity	Total	kW	3.14	4.63	5.54	13.57	
	Sensible		2.23	3.47	4.04	9.74	

As can be seen, the total and sensible corrected cooling capacity are greater than the estimated cooling load by the different rooms to be conditioned. Therefore, it can be said that the RASC-5HNPE unit meets the minimum cooling requirements set for the system.

In order to validate the pre-selection of the RASC-5HNPE unit, its compliance with the minimum heating requirements must be checked as well.

Heating mode

Referring to the step 1 (Initial pre-selection), the nominal heating capacities selected for each room and the RASC unit capacity at the 112% total combination horsepower can be seen. The resulting total indoor unit horsepower is 5.6 HP.

Item		Room 1	Room 2	Room 3	1+2+3	RASC unit
Selected model		RPIM-1.5 (Adjusted to 1.3)	RCD-2.0	RCI-2.5 (Adjusted to 2.3)	5.6 HP	RASC-5HNPE (112%)
Nominal heating capacity	kW	4.2	6.3	7.5	18.00	13.33



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.

◆ Step 5: Heating capacity correction

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

$$Q_{AH} = Q_{MH} \times f_{LH} \times f_D$$

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

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

f_{LC} : Heating piping length correction factor.

f_D : Defrost correction factor.

The maximum heating capacity (Q_{MH}) of the RASC-5HNPE unit is 13.33 kW.

Calculation of f_{LH}

Referring to the section “4.5.2 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 0.987 approximately.

Calculation of f_D

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

The defrosting correction factor takes this time into account and applies the heating capacity correction.

To calculate the correction factor, please see section “4.5.3 Defrost correction factor” which shows a table with different values of f_D depending on the ambient temperature (°C DB). If the correction factor at an ambient temperature specified does not appear on the table, an interpolation is needed.

Finally, the resulting defrosting correction factor is 0.90.

Calculation of Q_{AH}

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

$$Q_H = 13.33 \text{ kW} \times 0.987 \times 0.90 = 11.84 \text{ kW}$$

◆ Step 6: Heating capacity of each indoor unit

Once the actual heating capacity of the RASC unit has been determined, the actual heating capacity of each indoor unit must be calculated according to the following formula:

$$Q_{HI} = Q_H \times (Q_{MHI} / Q_{MHC})$$

Q_{HI} : Actual heating capacity of the indoor unit (kW).

Q_{AH} : Actual heating capacity of the RASC unit (kW)

Q_{MHI} : Nominal heating capacity of the indoor unit (kW).

Q_{MHC} : Nominal heating capacity of the combination (kW).

Applying this we obtain:

n° 1	RPIM-1.5 (Adjusted to 1.3)	Heating capacity = $11.84 \times (4.20 / 18.00) = 2.76 \text{ kW}$
n° 2	RCD-2.0	Heating capacity = $11.84 \times (6.30 / 18.00) = 4.14 \text{ kW}$
n° 3	RCI-2.5 (Adjusted to 2.3)	Heating capacity = $11.84 \times (7.50 / 18.00) = 4.93 \text{ kW}$

The results of heating mode are the following:

Item		Room 1	Room 2	Room 3	1+2+3	RASC unit
Selected model		RPIM-1.5 (Adjusted to 1.3)	RCD-2.0	RCI-2.5 (Adjusted to 2.3)	5.6 HP	RASC-5HNPE (112%)
Estimated heating load	kW	2.50	3.60	4.40	10.50	
Corrected heating capacity		2.76	4.14	4.93	11.83	

As can be seen, 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 RASC-5HNPE unit is valid for both heating and cooling.

** 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.

4.3 Maximum cooling capacities

Tables are based on the following conditions:

- Piping length / Height difference: 5 m / 0 m
- The tables are based on high speed indoor fan. To calculate the cooling capacity of medium or low speed of indoor fan, multiply cooling capacity of high speed by its correction factor (Section [“4.5.1 Correction indoor fan speed factor”](#)).

RASC unit	Outdoor air inlet temperature (DB) (°C)	Indoor air inlet temperature WB(°C) / (DB(°C))					
		15/(22)	17/(24)	18/(25)	19/(27)	21/(29)	23/(31)
		CAP max.	CAP max.	CAP max.	CAP max.	CAP max.	CAP max.
RASC-4HNPE	25	10.60	11.20	11.50	11.80	12.40	13.07
	30	10.30	10.90	11.20	11.50	12.13	12.79
	35	9.91	10.60	10.91	11.20	11.80	12.37
	40	9.60	10.30	10.62	10.90	11.40	11.90
RASC-5HNPE	25	13.40	14.30	14.71	15.10	15.90	16.74
	30	12.77	13.61	14.10	14.60	15.50	16.41
	35	12.40	13.20	13.59	14.00	14.96	15.83
	40	11.79	12.53	12.92	13.31	14.11	14.92
RASC-6HNPE	25	15.60	16.50	16.91	17.30	18.10	19.07
	30	15.30	16.10	16.45	16.80	17.68	18.66
	35	14.40	15.30	15.65	16.00	16.93	18.00
	40	13.70	14.50	14.91	15.30	16.03	17.94
RASC-8HNPE	25	20.76	22.07	22.77	23.47	24.90	26.49
	30	20.46	21.76	22.48	23.22	24.71	26.31
	35	19.71	20.99	21.68	22.40	23.87	25.38
	40	19.32	20.60	21.32	22.03	23.30	24.50
RASC-10HNPE	25	24.23	25.84	26.62	27.43	29.26	31.11
	30	23.47	25.02	25.83	26.69	28.49	30.34
	35	22.83	24.38	25.17	26.00	27.76	29.60
	40	21.86	23.37	24.15	24.96	26.66	28.26



NOTE

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

4.4 Maximum heating capacities

Tables are based on the following conditions:

- Piping length / Height difference: 5 m / 0 m
- The tables are based on high speed indoor fan. To calculate the heating capacity of medium or low speed of indoor fan, multiply heating capacity of high speed by its correction factor (Section "4.5.1 Correction indoor fan speed factor").
- The table shows the capacity data in peak values (without considering the defrost value). To calculate the integrated values it is necessary to apply the defrost correction factor referring to the section "4.5.3 Defrost correction factor".

RASC unit	Outdoor air inlet temperature (WB) (°C)	Indoor air inlet temperature (DB) (°C)							
		15 CAP max.	16 CAP max.	18 CAP max.	20 CAP max.	22 CAP max.	24 CAP max.	26 CAP max.	28 CAP max.
RASC-4HNPE	-20	8.27	8.16	7.96	7.74	7.52	7.30	7.08	6.84
	-15	9.34	9.25	9.08	8.89	8.67	8.46	8.25	8.03
	-10	10.40	10.32	10.16	10.00	9.81	9.60	9.40	9.20
	-5	11.45	11.38	11.26	11.10	10.93	10.75	10.55	10.36
	0	12.50	12.45	12.34	12.22	12.06	11.88	11.69	11.52
	5	13.55	13.51	13.44	13.33	13.18	13.02	12.85	12.68
	10	14.99	14.98	14.96	14.87	14.75	14.60	14.44	14.30
	15	16.54	16.54	16.52	16.51	16.41	16.24	16.10	15.94
RASC-5HNPE	-20	9.05	9.03	8.98	8.82	8.65	8.48	8.30	8.14
	-15	10.15	10.12	10.05	9.90	9.74	9.57	9.40	9.23
	-10	11.27	11.23	11.15	11.00	10.84	10.68	10.50	10.33
	-5	12.53	11.65	12.38	12.24	12.08	11.92	11.76	11.59
	0	13.50	13.44	13.33	13.19	13.03	12.87	12.71	12.55
	5	14.84	14.79	14.65	14.52	14.37	14.21	14.05	13.89
	10	16.79	16.72	16.58	16.43	16.27	16.09	15.91	15.73
	15	18.68	18.60	18.42	18.24	18.05	17.84	17.63	17.43
RASC-6HNPE	-20	9.74	9.70	9.57	9.40	9.22	9.08	8.93	8.77
	-15	10.99	10.94	10.82	10.68	10.52	10.39	10.27	10.14
	-10	12.27	12.22	12.12	12.00	11.87	11.76	11.66	11.55
	-5	13.74	13.70	13.61	13.51	13.41	13.32	13.24	13.15
	0	14.92	14.89	14.81	14.73	14.65	14.59	14.53	14.46
	5	16.58	16.54	16.48	16.42	16.37	16.32	16.29	16.25
	10	18.58	18.49	18.29	18.10	17.89	17.55	17.21	16.88
	15	20.08	19.96	19.73	19.49	18.54	17.55	17.21	16.88
RASC-8HNPE	-20	13.97	13.92	13.58	13.33	13.12	12.94	12.83	12.75
	-15	15.26	15.12	14.83	14.60	14.40	14.24	14.14	14.07
	-10	17.14	17.03	16.80	16.60	16.43	16.33	16.27	16.24
	-5	19.17	19.17	19.16	19.09	19.01	18.94	18.85	18.76
	0	21.93	21.91	21.89	21.89	21.79	21.64	21.49	21.34
	5	24.97	24.93	24.84	24.76	24.67	24.55	24.37	24.14
	10	28.06	28.00	27.86	27.68	27.52	27.25	25.75	24.14
	15	29.15	29.04	28.81	28.57	28.30	27.95	26.09	24.14
RASC-10HNPE	-20	16.11	15.95	15.61	15.33	15.17	15.02	14.87	14.70
	-15	16.97	16.78	16.50	16.25	16.10	15.96	15.83	15.68
	-10	18.86	18.67	18.31	18.00	17.78	17.61	17.42	17.22
	-5	20.83	20.79	20.70	20.61	20.54	20.46	20.37	20.28
	0	23.94	23.87	23.74	23.60	23.44	23.28	23.13	22.96
	5	27.28	27.18	27.00	26.79	26.49	26.24	26.05	25.88
	10	30.46	30.35	30.12	29.88	29.62	29.17	27.62	25.88
	15	31.55	31.41	31.13	30.84	30.53	29.99	28.05	25.88



NOTE

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

4.5 Correction factors

4.5.1 Correction indoor fan speed factor

The maximum capacity tables of previous sections are based on High speed of indoor fan. To calculate the maximum cooling/heating capacities at medium or low speed of indoor fan, multiply the maximum cooling/heating capacity at high speed by correction indoor fan speed factor.

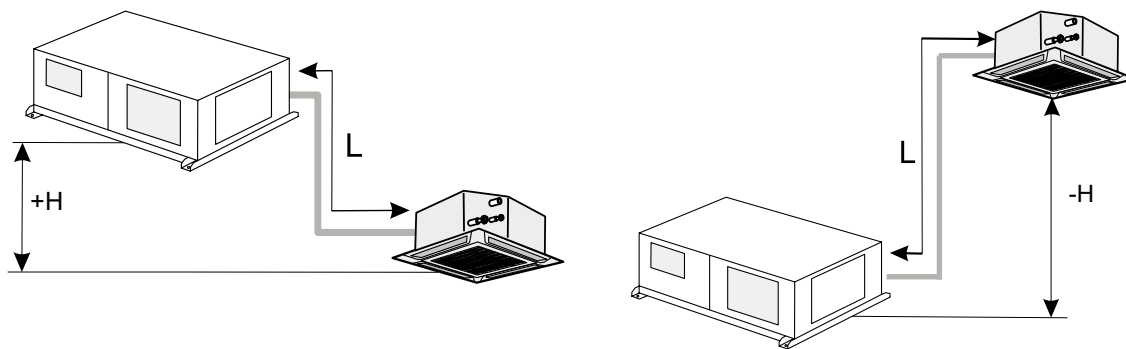
◆ Cooling

Indoor unit fan speed	RASC unit		
	4-6 HP	8 HP	10 HP
High	1.00	1.00	1.00
Medium	0.98	0.94	0.94
Low	0.95	0.86	0.87

◆ Heating

Indoor unit fan speed	RASC unit		
	4-6 HP	8 HP	10 HP
High	1.00	1.00	1.00
Medium	0.98	0.86	0.86
Low	0.97	0.77	0.76

4.5.2 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).

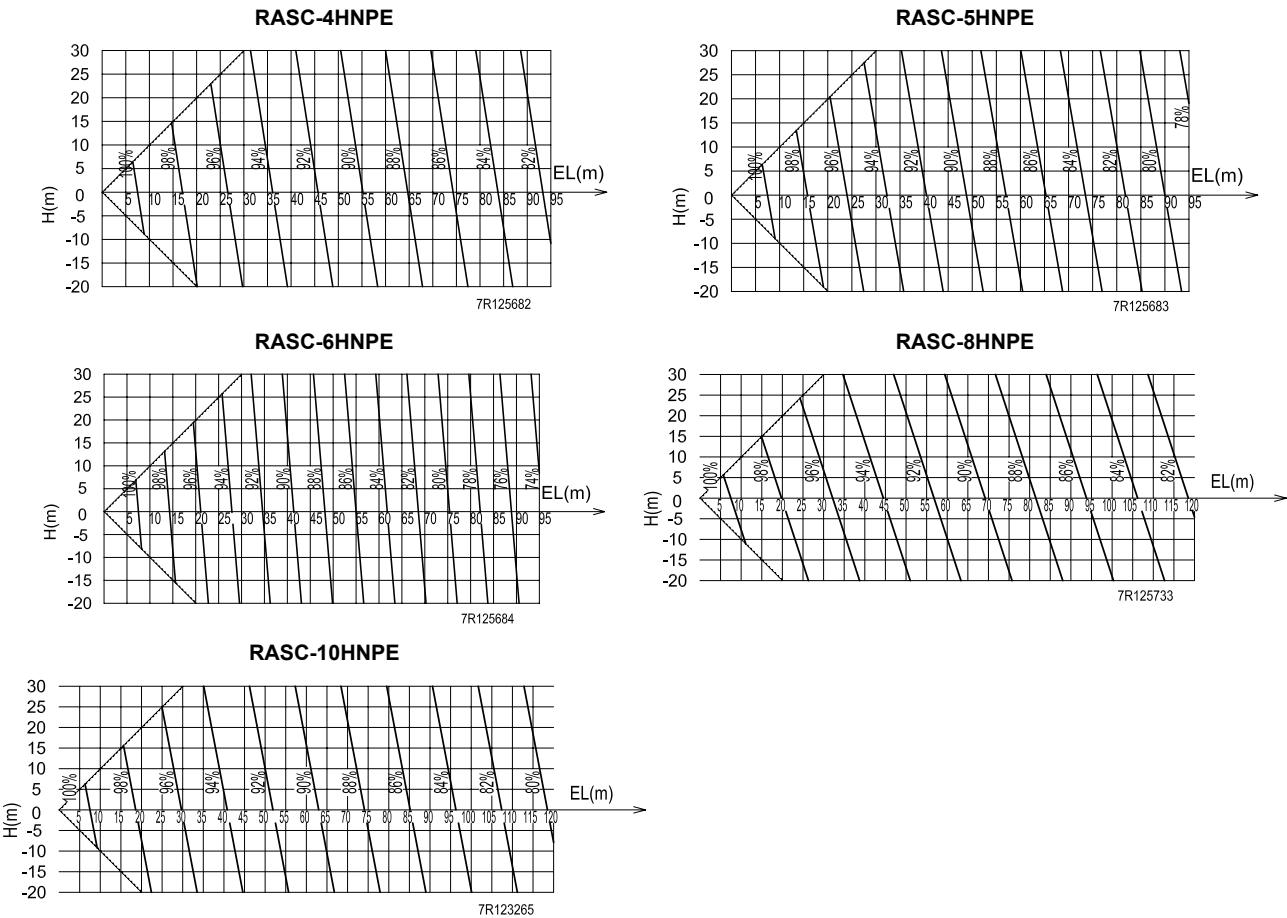
- One 90° elbow is 0.5 m.
- One 180° bend is 1.5 m.
- One Multi-kit is 0.5 m.



NOTE

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

Cooling



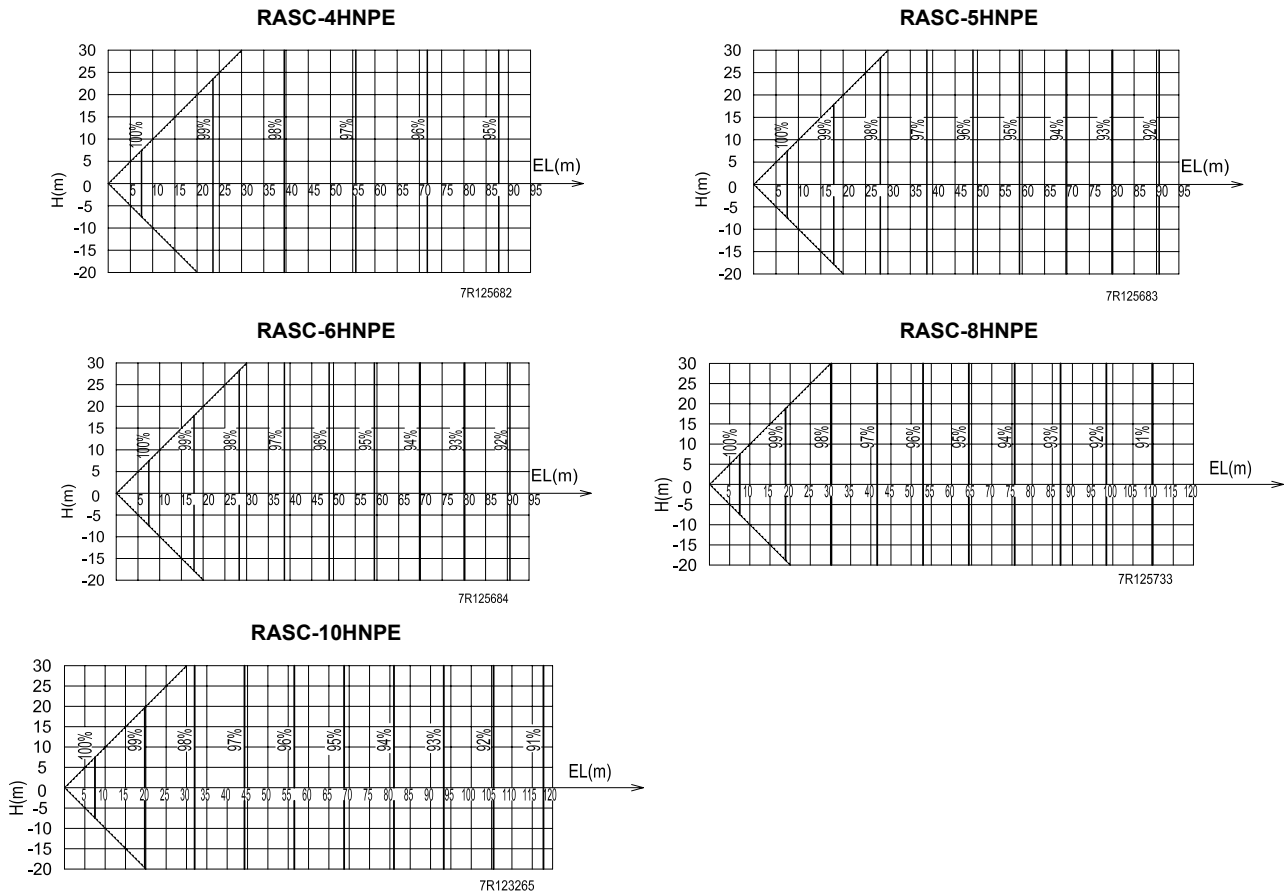
NOTE

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



i NOTE

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

$$HCA = HC \times F$$

- *HCA*: Actual corrected heating capacity (kW).
- *HC*: Heating capacity from heating capacity table (kW).
- *F*: Correction factor based on the equivalent piping length (in %).

4.5.3 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:

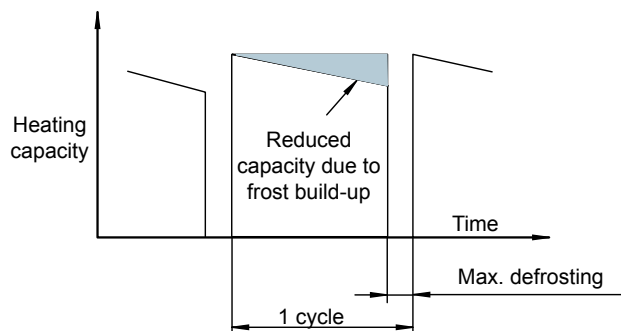
$$\text{Corrected heating capacity} = \text{correction factor} \times \text{heating capacity}$$

Outdoor inlet air temperature (°C DB) (HR = 85%)	-15	-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.



4.5.4 Correction ratio due to humidity (CR)

The cooling capacity data for the RASC units is taken from the cooling capacity tables. The tables are calculated on the basis of a relative humidity of 50%.

In some situations, it is possible that the temperature condition of the ambient to be conditioned, specifies other different relative humidity, which affects at the Dry Bulb temperature. In these cases, it is necessary to calculate the difference between the indoor air inlet dry bulb temperature required by the system and the indoor air inlet dry bulb temperature shown in the cooling capacity data.

This temperature difference requires an adjustment of the cooling capacity of the system.

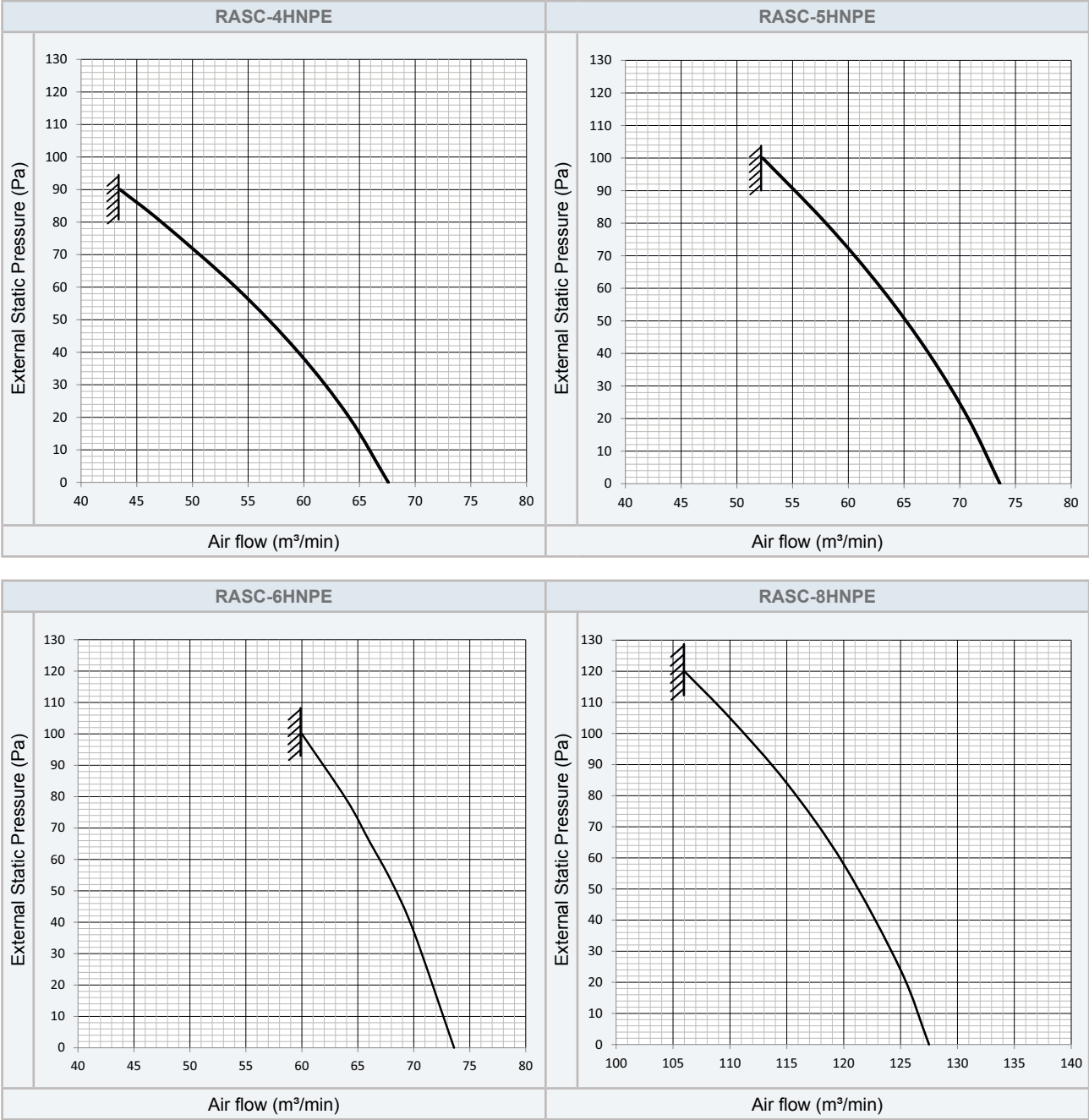
$$Q_{AC} = Q_c + (CR \times (DB_R - DB))$$

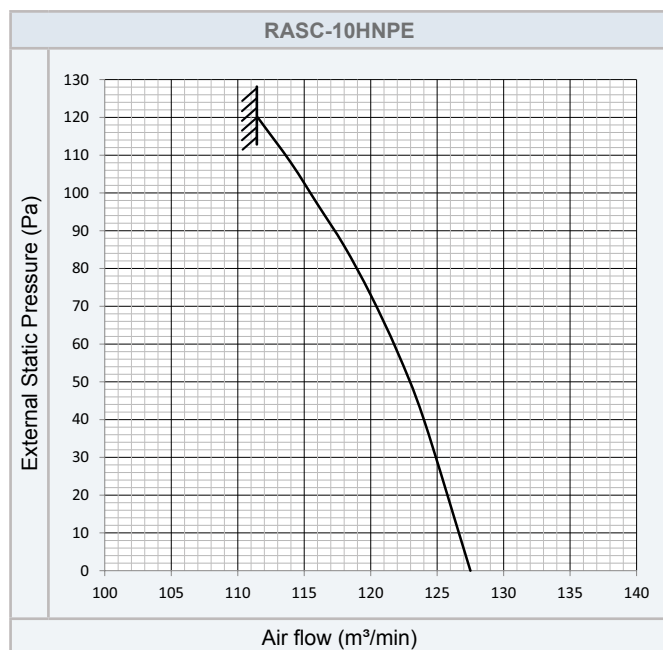
Model	CR
RASC-4HNPE	0.43
RASC-5HNPE	0.51
RASC-6HNPE	0.59
RASC-8HNPE	0.74
RASC-10HNPE	0.89

4.6 Fan performance curves

RASC unit can be installed with suction and/or discharge air ducts. Refer to the fan performance curves in order to ensure that the air volume is within the working range.

In 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 (m³/min.).



**NOTE**

- When designing a duct, check to ensure that the Air volume is within working range as indicated in the fan performance curves.
- If the Air volume is set outside working range, water carry-over (drop in the ceiling or into the room), noise increase, damage to fan motor (high temperature) or insufficient Cooling/Heating capacity phenomena can occur.

◆ Setting of the fan performance curves

In some installations, it may be necessary to adjust the fan operation settings of RASC-(6/8/10)NPE units in order to achieve an optimal performance of the fan unit. The correct static pressure setting (Low / Medium / High) has to be selected using the PSW and 7-segment display on the RASC PCB, according to the pressure values below:

- RASC-(4/5)HP: No setting is required.
- RASC-(6/8)HP: Select the “Medium pressure setting ($F\overline{2} : l$)” for external static pressures higher than 50 Pa.
- RASC-10HP: Select the most suitable static pressure setting, depending on the installation conditions:
 - “Medium pressure setting ($F\overline{2} : l$)”: For external static pressures between 50 and 80 Pa.
 - “High pressure setting ($F\overline{2} : 2$)”: For external static pressures higher than 80 Pa.

Default value: “Low pressure setting ($F\overline{2} : \overline{0}$)”.

5. Acoustic characteristic curves

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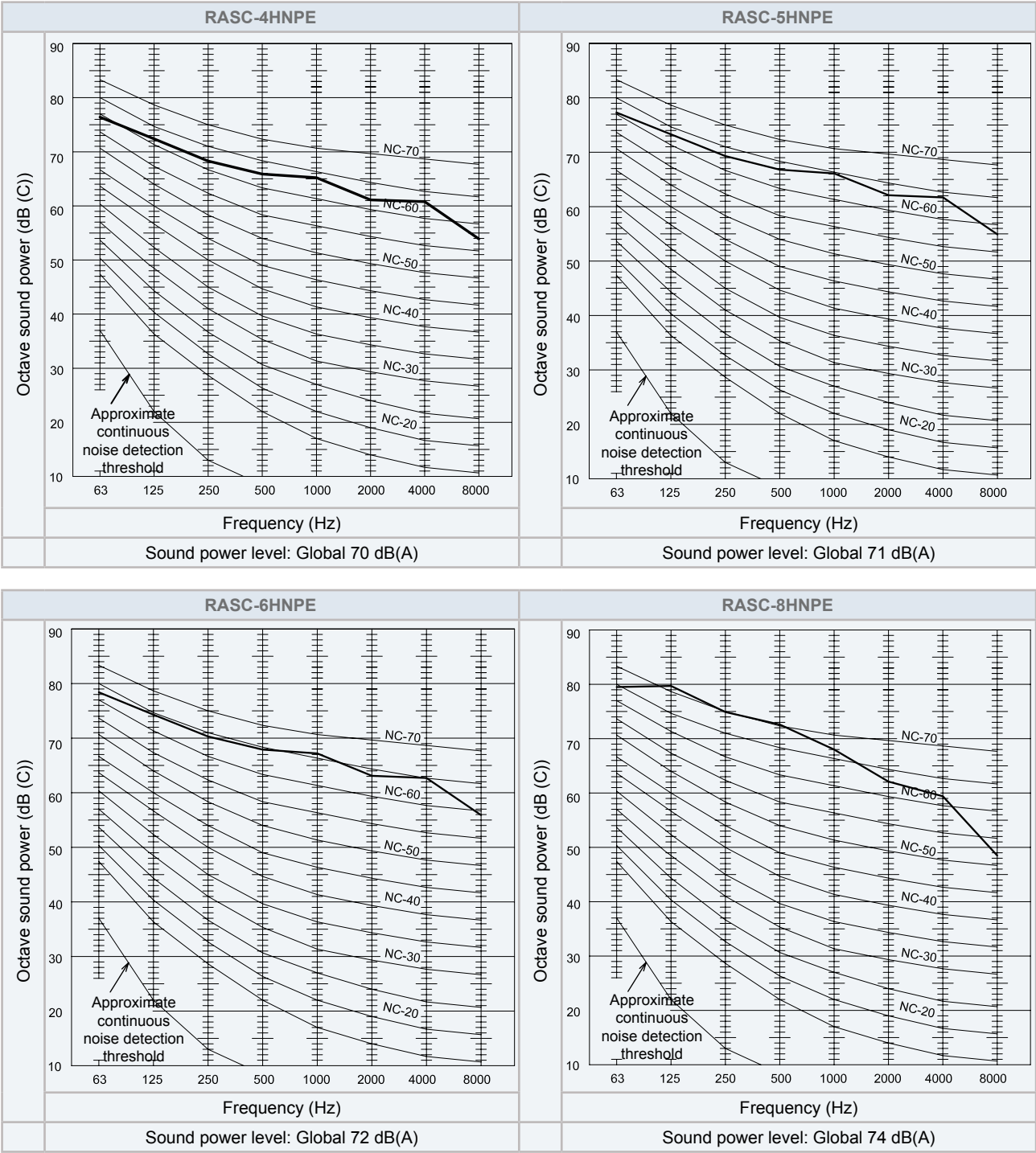
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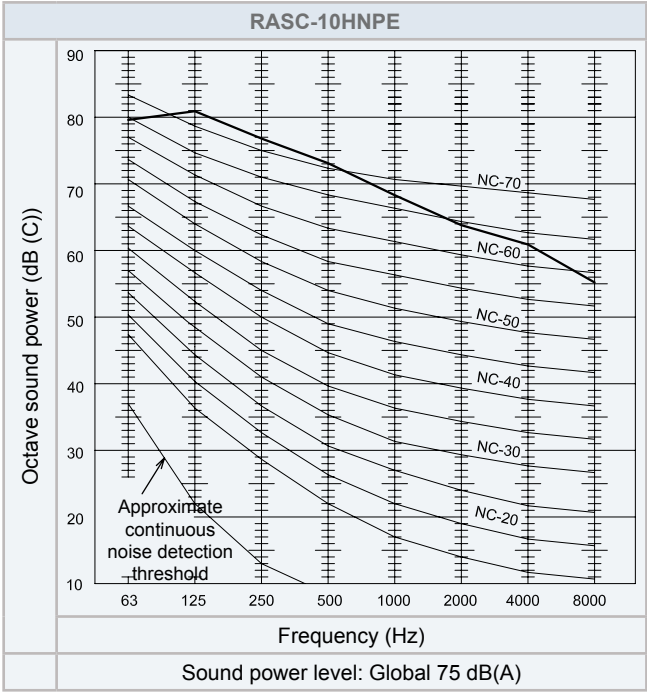
5.1 Considerations

- 1 Sound power level was measured in a reverberant room, in accordance with the EN12102 standard. Used environment conditions are the same as specified in EN14511 for performance test. This value is measured in the discharge duct, not around the unit.
- 2 Units working with their nominal power supply.
- 3 The sound measured with the curve A shown in dB(A) represents the attenuation in function of frequency as perceived by the human ear.

5.2 Sound power curves



5



6 . Working range

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6.1 Power supply range

◆ Nominal power supply

Three phase: 3N~ 400V 50Hz

◆ Operating voltage

Between 90 and 110% of the nominal voltage.

◆ Voltage imbalance for nominal power supply 3N~ 400V 50Hz

Up to 3% of each phase, measured at the main terminal of the RASC unit.

◆ Starting voltage

Always higher than 85% of the nominal voltage.

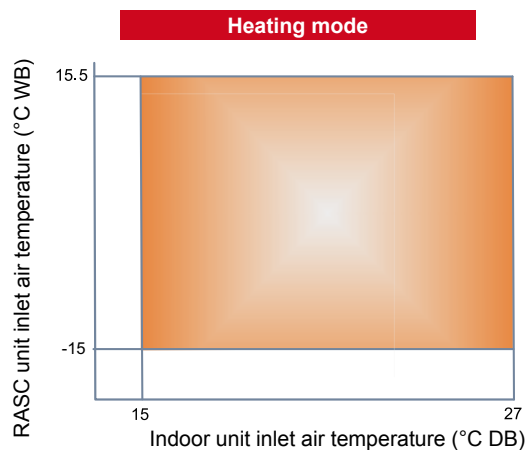
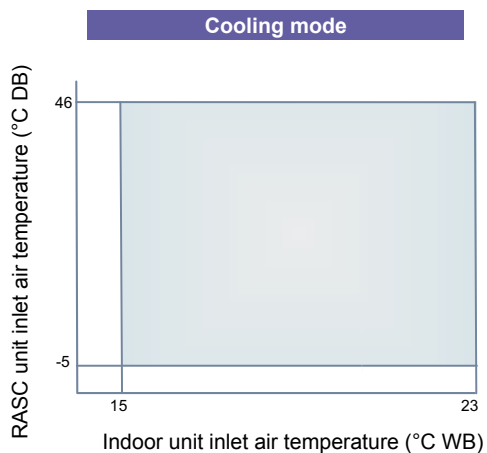
6.2 Temperature range

The temperature range is indicated in the following table:

		Cooling mode	Heating mode
Indoor unit inlet air temperature	Minimum	21°C DB / 15°C WB	15°C DB
	Maximum	32°C DB / 23°C WB	27°C DB
RASC unit inlet air temperature	Minimum	-5°C DB	-15°C WB
	Maximum	46°C DB	15.5°C WB

DB: dry bulb; WB: wet bulb

Temperature range diagram:



⚠ CAUTION

Where operation in heating mode is expected below -10 °C or in cooling mode below 0 °C, the following conditions must be complied:

- Install a number of indoor units not higher than 4 indoor units.
- Ensure that the connected capacity ratio of indoor units is not higher than 100%.
- Do not operate the RASC unit over the 80% of its maximum static pressure.

7. Dimensional data

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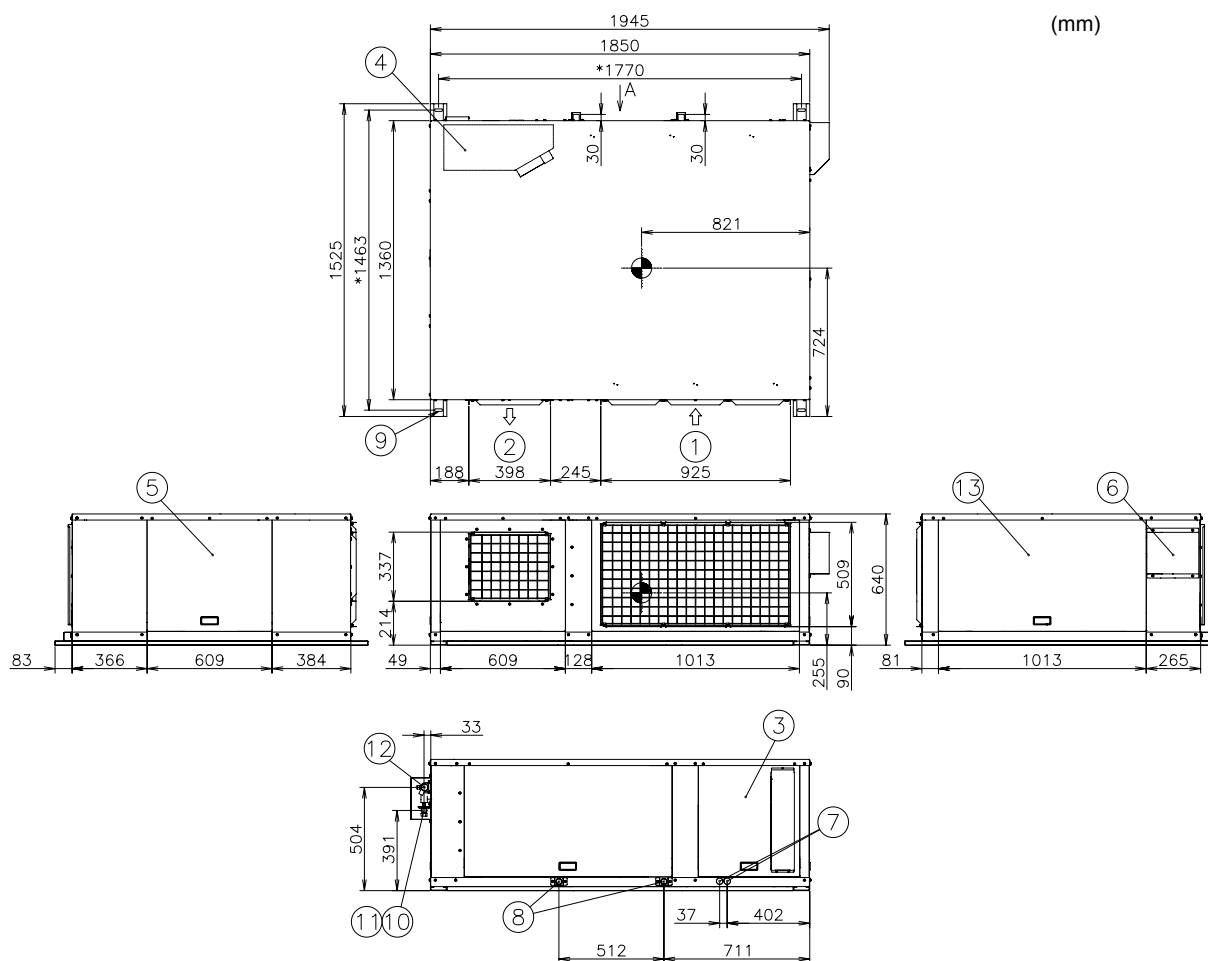
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7.1.1 RASC-(4-6)HNPE



*The dimension marked with * indicates the mounting pitch dimension for anchor bolts.*

7.1.2 RASC-(8/10)HNPE



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 valve protection	-
7	Holes for wiring connections	Ø25x2
8	Drain pipe connection	Ø30x2 (Outer diameter)
9	Holes for fixing unit	4-Ø12x28
10	Refrigerant liquid pipe	Flare nut: Ø9.52 (3/8") (RASC-8HP)
11	Refrigerant liquid pipe	Flare nut: Ø12.7 (1/2") (RASC-10HP)
12	Refrigerant gas pipe	Flare nut: Ø25.4 (1")
13	Optional air inlet	-



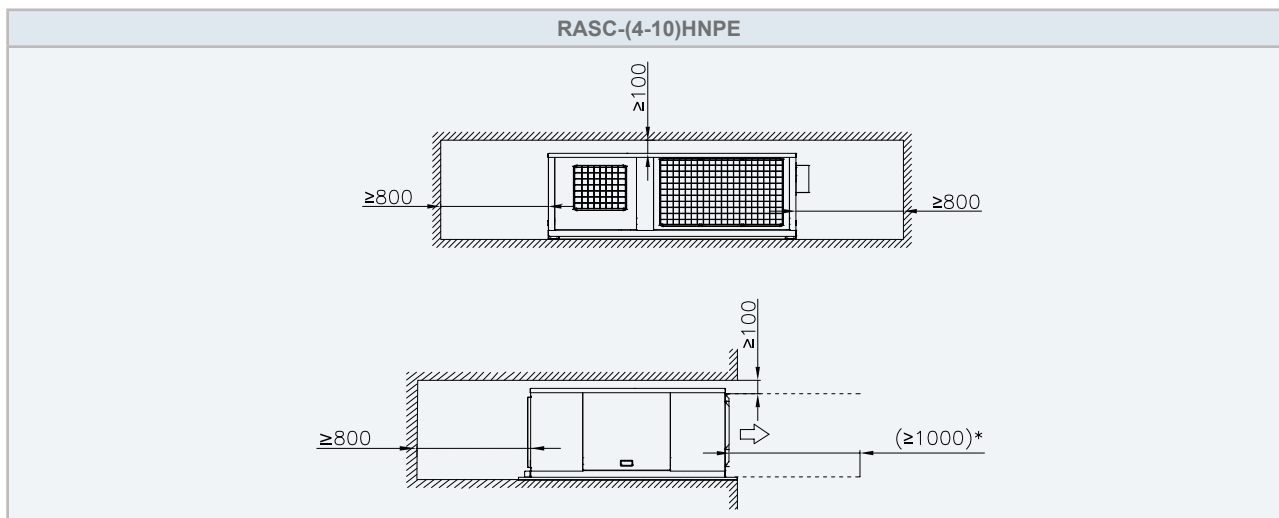
NOTE

The dimension marked with * indicates the mounting pitch dimension for anchor bolts



7.2 Service space

Units in mm.



NOTES

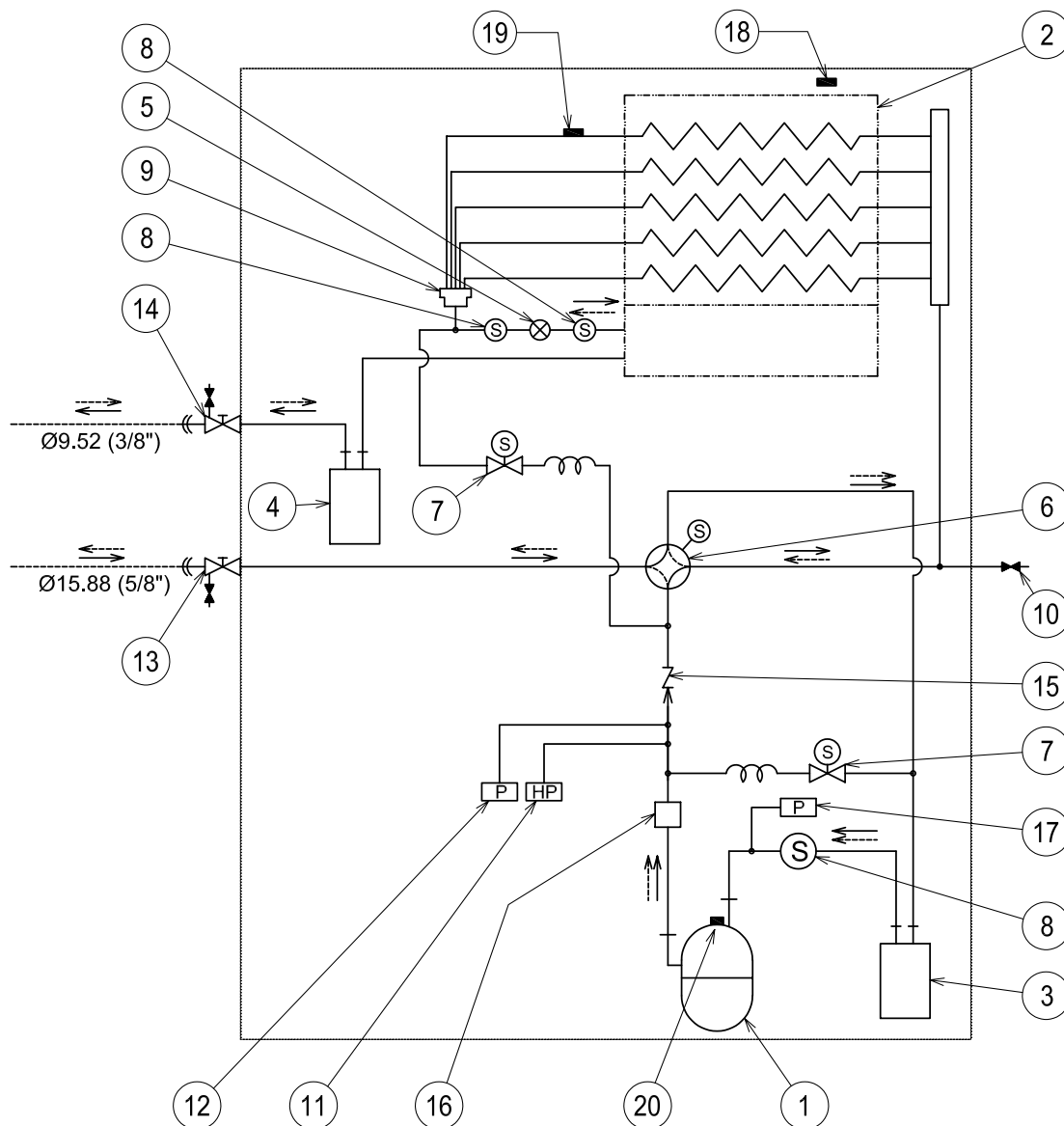
- (*): Recommended servicing space for fan unit in those cases where it is not possible to access from the unit's side. In these cases, a "removable servicing duct" or a "removable grille" (in case of installing the unit next to a wall) shall be installed to allow replacement of the fan unit whenever necessary (which should be made from the unit's front side).
- Install the RASC unit in a restricted area not accessible by the general public.
- Do not install the unit outdoors. Only indoor installation is allowed, and air for both suction and discharge must come from outside the building.
- Ensure that the installation area has a proper ventilation so that ambient temperature around the unit does never exceed 46°C.

8 . Refrigerant cycle

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8.1 RASC-(4-6)HNPE

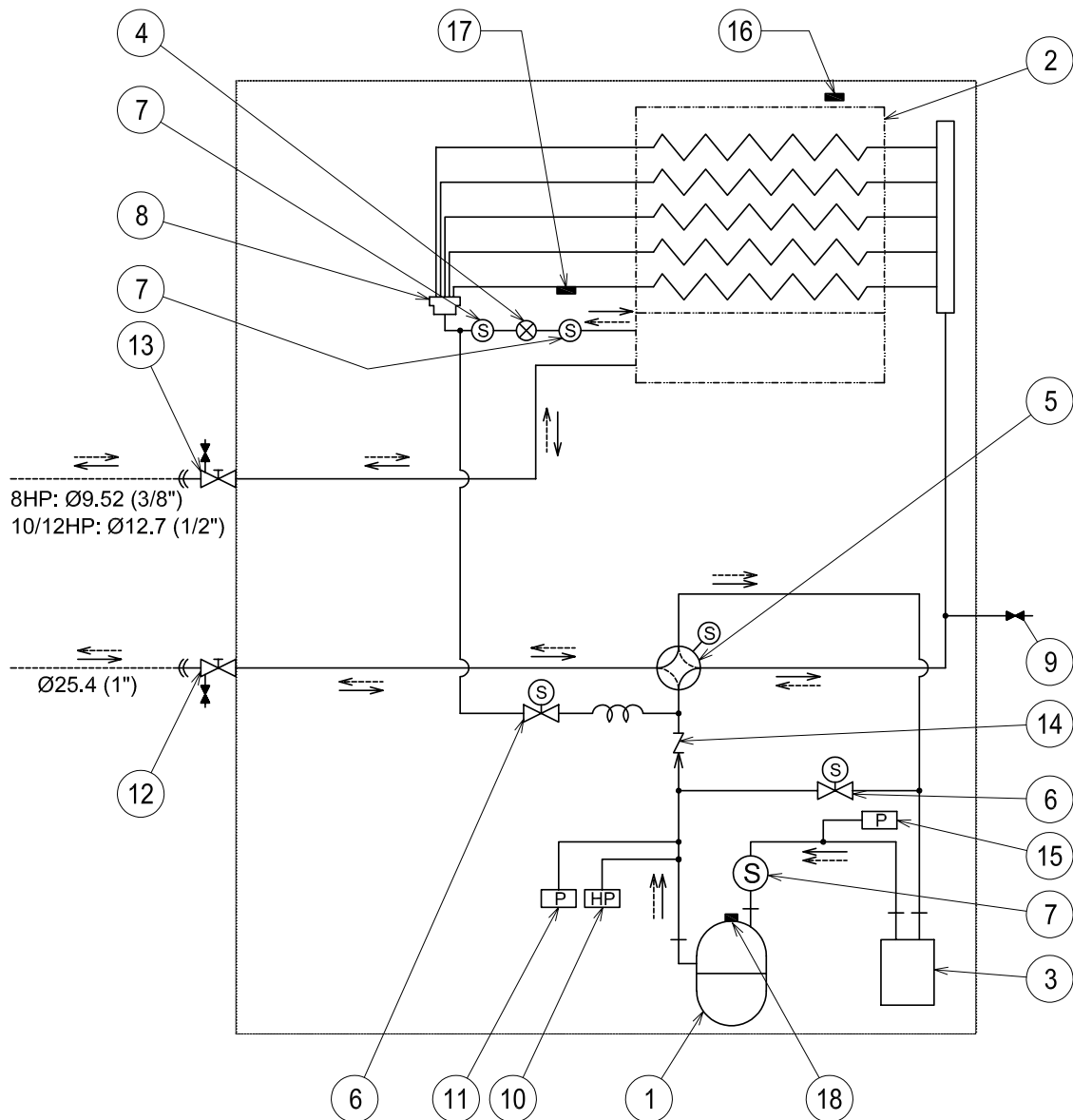


Cooling refrigerant flow or defrost	Heating refrigerant flow	Field refrigerant piping	Flare nut connection	Brazing connection

Nº	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Liquid tank
5	Electronic expansion valve
6	Reversing valve
7	Solenoid valve for gas by-pass
8	Strainer
9	Distributor
10	Check joint

Nº	Part name
11	High pressure switch for protection
12	High pressure sensor for refrigerant
13	Stop valve for gas line
14	Stop valve for liquid line
15	Check valve
16	Silencer
17	Pressure switch for control
18	Ambient thermistor
19	Evaporator pipe thermistor
20	Discharge gas thermistor

8.2 RASC-(8/10)HNPE



Cooling refrigerant flow or defrost	Heating refrigerant flow	Field refrigerant piping	Flare nut connection	Brazing connection

Nº	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Electronic expansion valve
5	Reversing valve
6	Solenoid valve for gas by-pass
7	Strainer
8	Distributor
9	Check joint

Nº	Part name
10	High pressure switch for protection
11	High pressure sensor for refrigerant
12	Stop valve for gas line
13	Stop valve for liquid line
14	Check valve
15	Pressure switch for control
16	Ambient thermistor
17	Evaporator pipe thermistor
18	Discharge gas thermistor

9. Piping work and refrigerant charge

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9.1 General notes

9.1.1 Pipe size selection

Select the pipe size in line with the following instructions:

- 1 Between the RASC unit and the branch pipe (multikit): select the same pipe connection size as for the RASC unit.
- 2 Between the branch pipe (multikit) and the indoor unit: select the same pipe connection size as for the indoor unit.
- 3 Between branch pipes (multikits): select the pipe connection size according the equivalent indoor unit size if adding up the units after the branch pipe

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

Pipe connection size on RASC units, indoor units and the multikit or distributor vary according to the system.

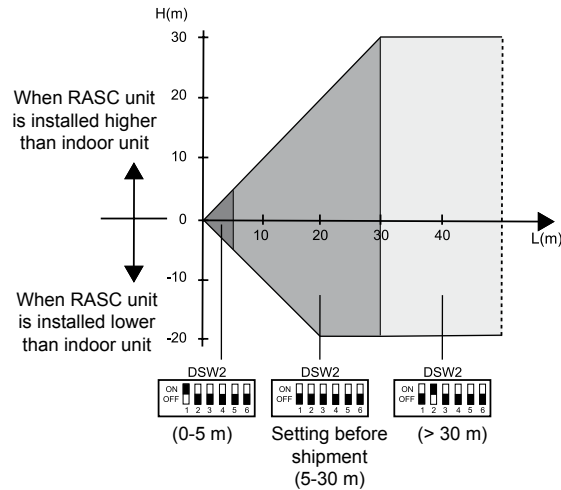
The sizes of the indoor and RASC units could be different. Adjust the flare adapter (accessory) to the indoor pipe connection in these cases.

For detailed information about multikits and distributors, please refer to the Indoor units Technical Catalogue.

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



9.2.2 Piping system (Header branch installation)

1 indoor unit system	2 indoor units system	3 indoor units system
-	$L = A + \text{the longest of B \& C}$	$L = A + \text{the longest of B, C \& D}$

4 indoor units system	
Case a)	Case b) Only for (8/10)HP
$L = A + \text{the longest of (B + the longest of D \& E) \& (C + the longest of F \& G)}$	$L = A + \text{the longest of B, C, D \& E}$



NOTE

- L and H are the length and height indicated in the above chart. For 1, 2 or 3 indoor unit systems, the length is the distance between the RASC unit and the farthest indoor unit.*
- 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. Install them at the same horizontal level.*
- Install the branch piping as close as possible to the indoor units.*

◆ Maximum refrigerant piping length (Header branch installation)

Item				4HP	5HP	6HP	8HP	10HP	(m)
Maximum piping length between the RASC unit and the farthest indoor unit	Actual piping length (L)			75			100		
	Equivalent piping length (EL)			95			125		
Maximum total piping length	2 indoor units (A + B + C)			85			100	115	
	3 indoor units (A + B + C + D)			95			100	130	
	4 indoor units	Case a) (A + B + C + D + E + F + G)		95			100	145	
		Case b) (A + B + C + D + E)		-			100	145	
	Maximum piping length between multikit and indoor unit	2 indoor units (B, C)			10			15	
3 indoor units (B, C, D)			10			15			
4 indoor units		Case a) B + D, B + E, C + F, C + G		10			15		
		Case b) B, C, D, E		-			15		
Maximum height difference between RASC unit and indoor unit (H)	RASC unit higher than indoor unit			30					
	Indoor unit higher than RASC unit			20					
Maximum height difference between indoor units				10					
Maximum height difference between multikits and between multikit and indoor unit				3					



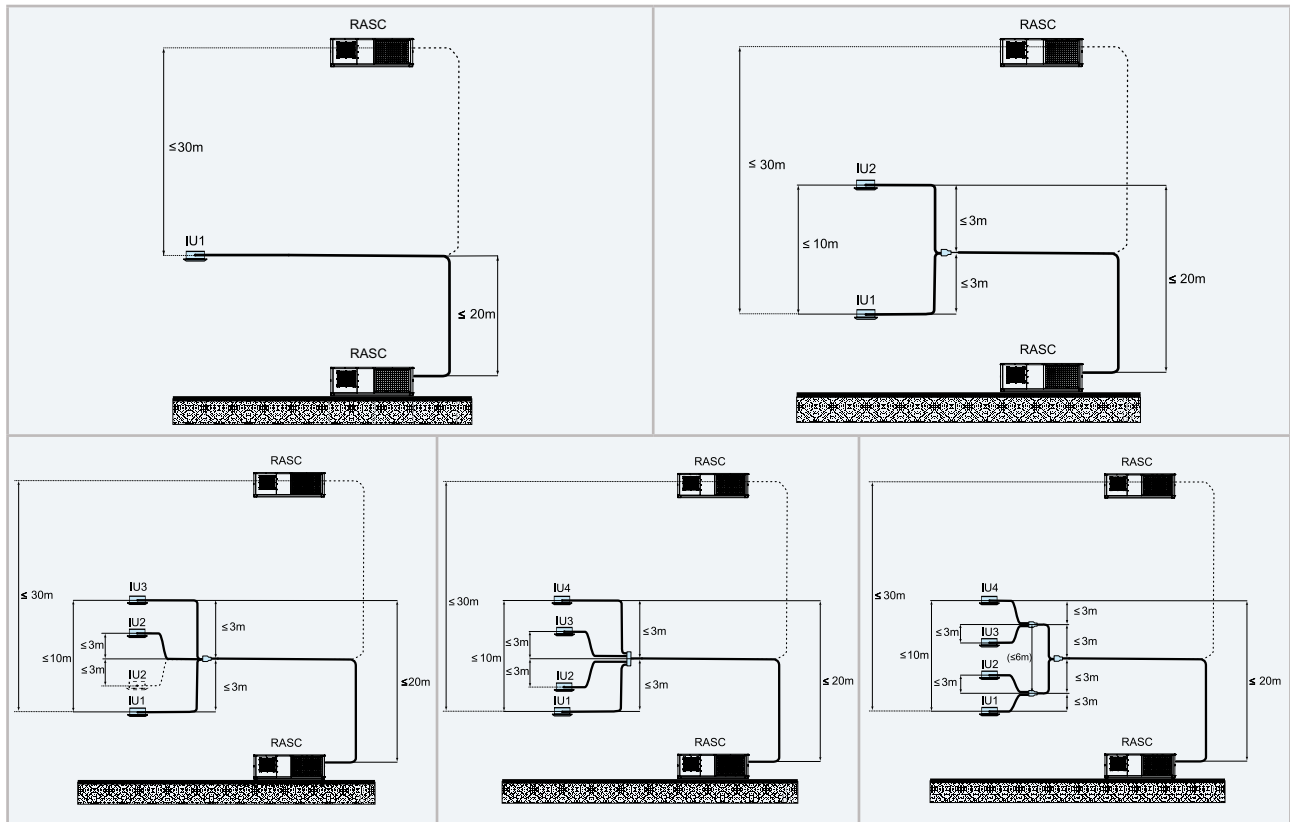
NOTE

- It is recommended that the refrigerant piping length from the RASC unit to the first branch (A) is greater 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)
			(4-10)HP
2 indoor units		(B-C)	8
3 indoor units		(B-C, B-D, C-D)	
4 indoor units	Case a)	(B+(D or E)) - (C+(F or G))	
		(D-E)	
		(F-G)	
	Case b) Only for (8/10)HP	(B-C, B-D, B-E, C-D, C-E, D-E)	

◆ Maximum height difference (clarification)

It is recommended to install all indoor units at the same height. Nevertheless, when the height difference between the indoor units due to building construction is necessary, this should be less than the value indicated in the figure:



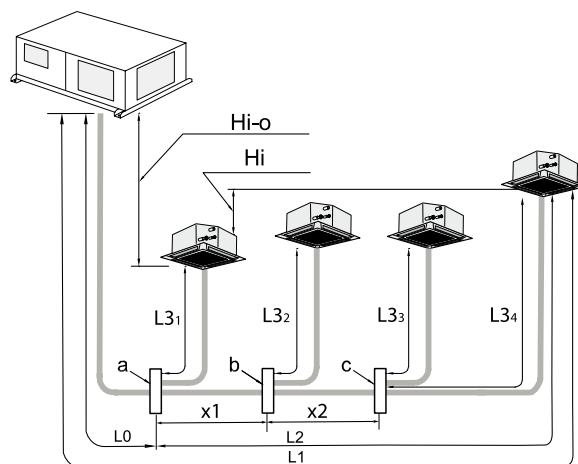
NOTE

All pictures are shown as an example.

9.2.3 Piping system (Line branch installation)

RASC unit	4 HP	5 HP	6 HP	8 HP	10 HP
Allowed quantity of indoor units	2 - 5 (*)			2 - 6 (*)	

(*): In case of more than 4 indoor units, please respect the restrictions shown in chapter "4.1 Combinability".



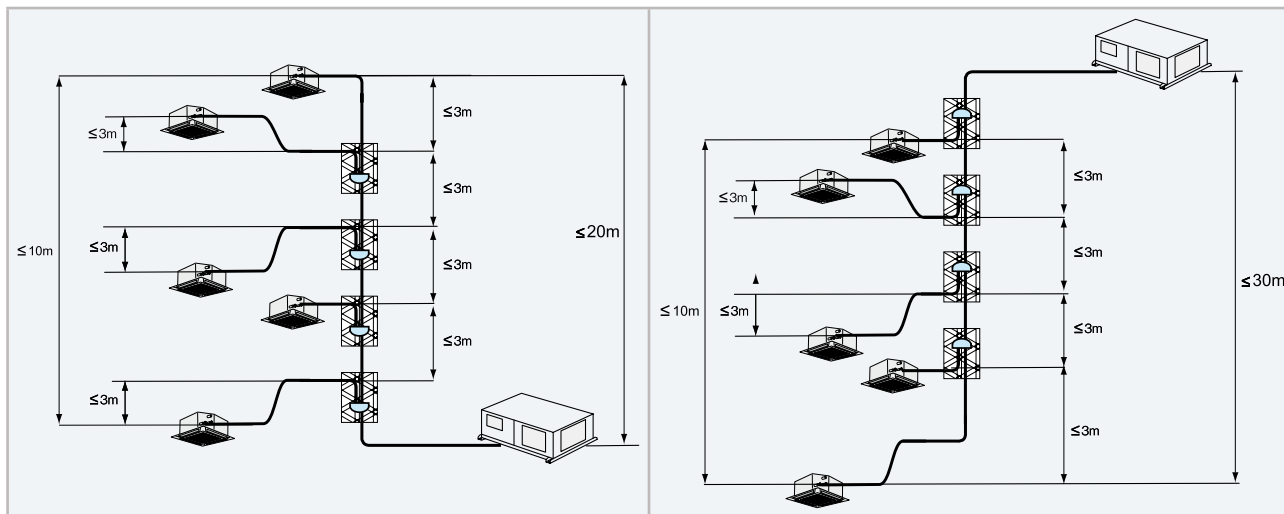
◆ Maximum refrigerant piping length (Line branch installation)

(m)

Item		4HP	5HP	6HP	8HP	10HP
Maximum piping length between the RASC unit and the farthest indoor unit	Actual piping length (L1)	75			100	
	Equivalent piping length (EL)	95			125	
Maximum total piping length (L1+ L3 ₁ + L3 ₂ + ... + L3 _{n-1})		95			100	145
Maximum piping length from the 1st multikit to the furthest indoor unit (L2)		30			40	
Maximum piping length between multikit and indoor unit (L3 ₁ , L3 ₂ , L3 ₃ , ..., L3 _n)		10			15	
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)		10				
Maximum height difference between multikits and between multikit and indoor unit		3				

◆ Maximum height difference (clarification)

It is recommended to install all indoor units at the same height. Nevertheless, when the height difference between the indoor units due to building construction is necessary, this should be less than the value indicated in the figure:



NOTE

All pictures are shown as an example.

9.2.4 Combinations of piping size and piping length

Liquid	Refrigerant piping length between RASC unit and the farthest indoor unit (m)														
	Ø6.35		Ø9.52					Ø12.70				Ø15.88			
Gas	Ø15.88	Ø19.05	Ø12.70	Ø15.88	Ø19.05	Ø22.20	Ø25.40	Ø15.88	Ø19.05	Ø22.20	Ø25.40	Ø28.58	Ø22.20	Ø25.40	Ø28.58
(4-6) HP	5 ⁽²⁾	5 ⁽²⁾	40 ⁽¹⁾	75	5 ⁽⁴⁾	-	-	30 ⁽³⁾	30 ⁽³⁾⁽⁴⁾	-	-	-	-	-	-
8 HP	-	-	-	-	50 ⁽¹⁾⁽⁴⁾⁽⁶⁾	50 ⁽¹⁾⁽⁶⁾	70 ⁽⁵⁾⁽⁶⁾	-	50 ⁽¹⁾⁽³⁾⁽⁴⁾	50 ⁽¹⁾⁽³⁾	100	-	50 ⁽¹⁾⁽³⁾	50 ⁽³⁾	-
10 HP	-	-	-	-	-	-	-	-	-	50 ⁽¹⁾	100	50	50 ⁽¹⁾⁽³⁾	50 ⁽³⁾	50 ⁽³⁾

(1). Reducing gas pipe size will reduce cooling capacity due to larger pressure loss in gas piping and narrow operation range.

(2). Reducing liquid pipe size will narrow operation range due to the indoor unit relation with expansion valve capacity. In these cases, set the DSW2-1 to ON position.

(3). Increasing liquid pipe size will require additional refrigerant charge.

(4). When using Ø19.05 gas pipe (soft-annealed), please switch ON DSW2-4# in the RASC Unit PCB.

(5). In case that pipe length exceeds 70m in 8HP, please use a Ø12.7 pipe as a liquid pipe.

(6). In case of exceeding the recommended number of connected indoor (more than 4 units), please use a Ø12.7 pipe as liquid pipe.

Standard

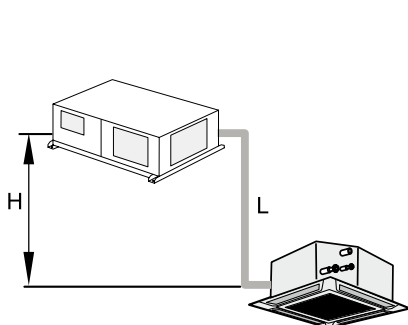
9.2.5 Refrigerant piping size and multikit/distributor selection

Select the piping connection sizes according to the following procedures:

- Between RASC unit and branch pipe: Select the same pipe connection size as the pipe size of the RASC unit.
- Between branch pipe and indoor unit: Select the same pipe connection size as the pipe size of the indoor unit.

◆ Header branch installation

1 indoor unit system



(mm)

RASC unit	Pipe size (L)	
	Gas	Liquid
(4-6) HP	Ø15.88	Ø9.52
8 HP (*)	Ø25.4	Ø9.52
10 HP (**)	Ø25.4	Ø12.7

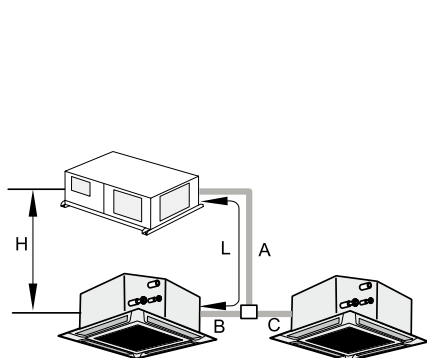
(*) Indoor unit RPI-8.0HP supplied with one adapter:

- Gas pipe adapter: Ø19.05 to Ø25.4

(**) Indoor unit RPI-10.0HP supplied with two adapters:

- Gas pipe adapter: Ø22.2 to Ø25.4
- Liquid pipe adapter: Ø9.52 to Ø12.7

2 indoor units system



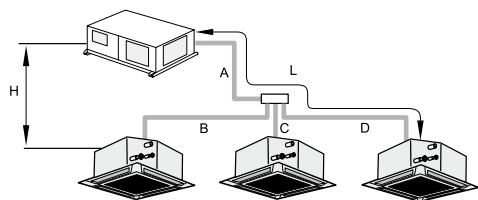
(mm)

RASC unit	Pipe size (A)		Multi-kit (**)	
	Gas	Liquid	TE option	TW option
4 HP	Ø15.88	Ø9.52	TE-04N1	TW-52AN
(5/6) HP	Ø15.88	Ø9.52	TE-56N1	TW-52AN
8 HP	Ø25.4	Ø9.52 (*)	TE-08N (***)	TW-102AN (***)
10 HP	Ø25.4	Ø12.7	TE-10N	TW-102AN

- (*): In case that pipe length exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe, with its respective multi-kit.
- (**): In case of combinations with 8.0HP or 10.0HP indoor units, install a line branch system with multi-kit E-162SN3.
- (***): In combinations with indoor units of 2.0HP or less, use the multi-kits E-162SN3.
- The dimensions for TE and TW multi-kits are different. Refer to the Indoor units' Technical Catalogue in order to check the dimensions.

(mm)

Indoor unit capacity after branch	Pipe size (B, C)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
(2.3-6.0) HP	Ø15.88	Ø9.52
8.0 HP	Ø19.05	Ø9.52
10.0 HP	Ø22.20	Ø9.52

3 indoor units system

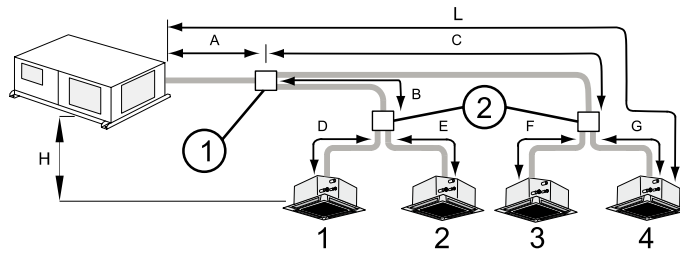
RASC unit	(mm)		Multi-kit (**)	
	Pipe Size (A)		TRE option	TG option
	Gas	Liquid		
(4-6) HP	Ø15.88	Ø9.52	TRE-46N1	TG-53AN
8 HP	Ø25.4	Ø9.52 (*)	TRE-812N1	TG-103AN
10 HP	Ø25.4	Ø12.7	TRE-812N1 (**)	TG-103AN (**)

- (*): In case that pipe length (A+B or A+C or A+D) exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.
- (**): In case of combinations with 8.0HP or 10.0HP indoor units, install a line branch system with multi-kits E-162SN3 and E-102SN3.
- The dimensions for TRE and TG multi-kits are different. Refer to the Indoor units' Technical Catalogue in order to check the dimensions.

Indoor unit capacity after branch	(mm)	
	Pipe size (B, C)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
(2.3-6.0) HP	Ø15.88	Ø9.52
8.0 HP	Ø19.05	Ø9.52
10.0 HP	Ø22.20	Ø9.52

4 indoor units system

• Case a)



i NOTE

If the capacity ratio between IU group 1+2 and 3+4 is higher than 60/40%, install a line branch system or contact with your Hitachi dealer.

RASC unit	(mm) Pipe Size (A)		Multi-kit ①	
	Gas	Liquid	TE option	TW option
4 HP	Ø15.88	Ø9.52	TE-04N1	TW-52AN
(5/6) HP	Ø15.88	Ø9.52	TE-56N1	TW-52AN
8 HP	Ø25.4	Ø9.52 (*)	TE-08N	TW-102AN
10 HP	Ø25.4	Ø12.7	TE-10N	TW-102AN

(*) : In case that pipe length (A+B+(C or D) or A+C+(F or G)) exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.

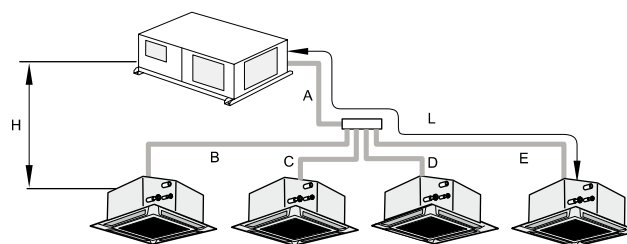
The dimensions for TRE and TW multi-kits are different. Refer to the Indoor units' Technical Catalogue in order to check the dimensions.

Total indoor unit capacity after first branch (1+2) or (3+4)	(mm) Pipe Size (B,C)		Multi-kit ②	
	Gas	Liquid	TE option	TW option
(0.8-1.5) HP	Ø12.7	Ø6.35	TE-03N1	TW-22AN
(1.8/2.0) HP	Ø15.88	Ø6.35	TE-03N1	TW-52AN
≥ 2.3 HP	Ø15.88	Ø9.52	<4HP: TE-03N1 =4HP: TE-04N1 ≥5HP: TE-56N1	TW-52AN

Indoor unit capacity	(mm) Pipe Size (D,E,F,G)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
≥ 2.3HP	Ø9.52	Ø6.35

Connections including 8.0HP or 10.0HP indoor units are not possible.

• Case b)



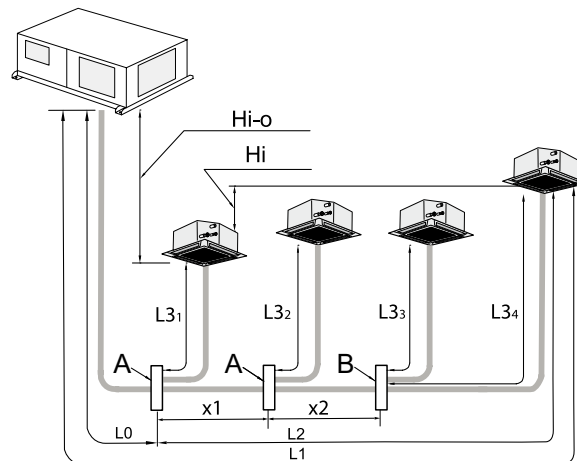
RASC unit	(mm) Pipe Size (A)		Multi-kit
	Gas	Liquid	
8 HP	Ø25.4	Ø9.52 (*)	QE-812N1
10 HP	Ø25.4	Ø12.7	

(*) : In case that pipe length (A+B or A+C or A+D or A+E) exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.

Indoor unit capacity	(mm) Pipe Size (B,C,D,E)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
≥ 2.3HP	Ø15.88	Ø9.52

Connections including 8.0HP or 10.0HP indoor units are not possible.

◆ Line branch installation



RASC unit	Pipe Size (L0,x1,x2) (mm)		Multi-kit model A	Multi-kit model B
	Gas	Liquid		
(4-6) HP	Ø15.88	Ø9.52	E-102SN3	E-102SN3
8 HP	Ø25.4	Ø9.52 (*)	E-162SN3	E-102SN3
10 HP	Ø25.4	Ø12.7	E-162SN3	E-102SN3

(*): In case that pipe length between RASC unit and the farthest indoor unit exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.

Indoor unit capacity	Pipe Size (L3) (mm)	
	Gas	Liquid
(0.8-1.5) HP	Ø12.7	Ø6.35
(1.8/2.0) HP	Ø15.88	Ø6.35
(2.3-6.0) HP	Ø15.88	Ø9.52
8.0 HP	Ø19.05	Ø9.52
10.0 HP (*)	Ø22.20	Ø9.52



NOTE

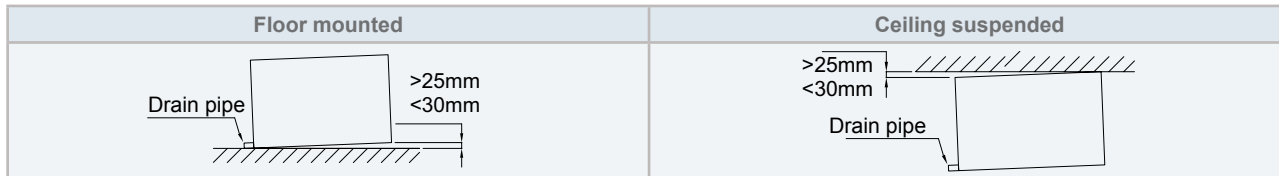
(*): In combinations with 10.0HP indoor units, only one of the two connections of the E-102SN3 multi-kit admits the Ø22.20 mm diameter corresponding to the gas pipe of the 10.0HP indoor unit. Please take this restriction into account in case that the installation requires the connection of gas piping of 10.0HP indoor units.

9.3 Drainage and drain pipe installation

◆ Provision regarding installation place

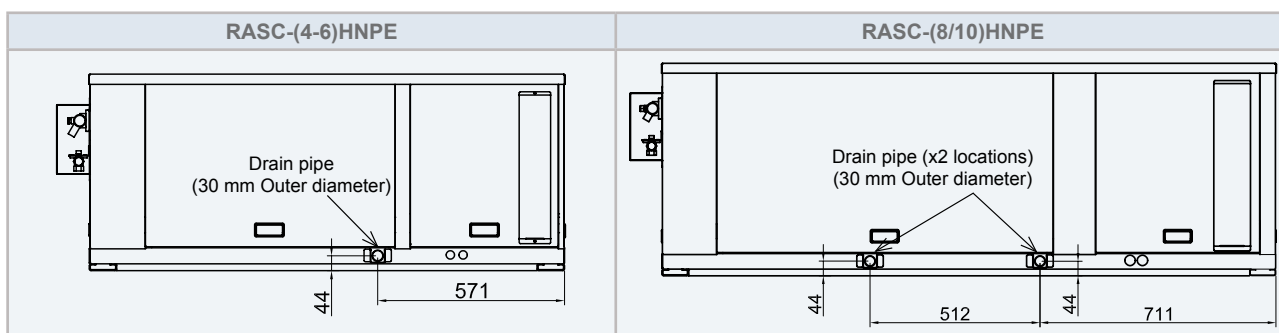
Drain water sometimes turns to ice. Therefore, avoid draining in a transited area, since it may become slippery.

Install the unit making sure that the drain outlet part is lower ($>25\text{mm}$ / $<30\text{mm}$) than the opposite side in order to avoid incorrect drain discharge.



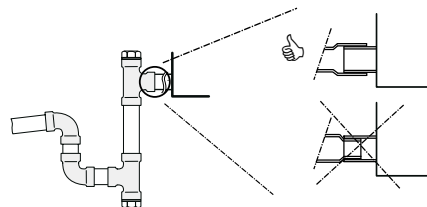
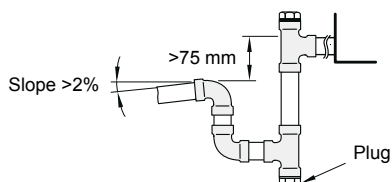
◆ Drain pipe location

Drain pipe location is indicated in the figures below:



◆ Drain pipe connection

- It is mandatory to connect a siphon as shown in the figure below. Pay special attention when connecting it to the unit (proper installation work is needed in order to guarantee matching of connection pipes).



- Fasten the siphon to the drain hose with an adhesive and a field-supplied clamp.
- Prepare a draining pipe with an internal diameter higher than 30 mm for the draining line which shall be bent with a down slope $> 2\%$.
- Check to ensure that the water drains smoothly by pouring some water into the drain pan.
- Check to ensure that the water does not remain in the drain pan.
- Check the drain connections periodically (once a year), to avoid occurrence of water leakage.

⚠ CAUTION

- If the unit is installed in a cold area, the drain water may freeze. Install an electric heater (field-supplied) at the drain connection.
- Do not install the unit using vibration-proof springs or mounting springs.

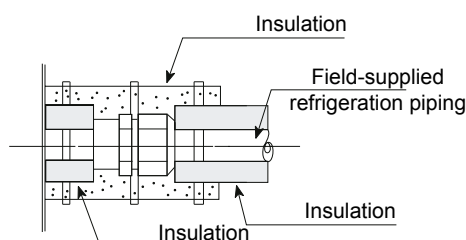
9.4 Copper pipes, sizes and connection

9.4.1 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)		
Ø6.35	1/4	0.80	Roll
Ø9.52	3/8	0.80	Roll
Ø12.7	1/2	0.80	Pipe/Roll
Ø15.88	5/8	1.00	Roll
Ø19.05	3/4	1.00	Pipe/Roll
Ø22.23	7/8	1.00	Pipe/Roll
Ø25.4	1	1.00	Pipe
Ø28.58	1 1/8	1.25	Coil

- 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.

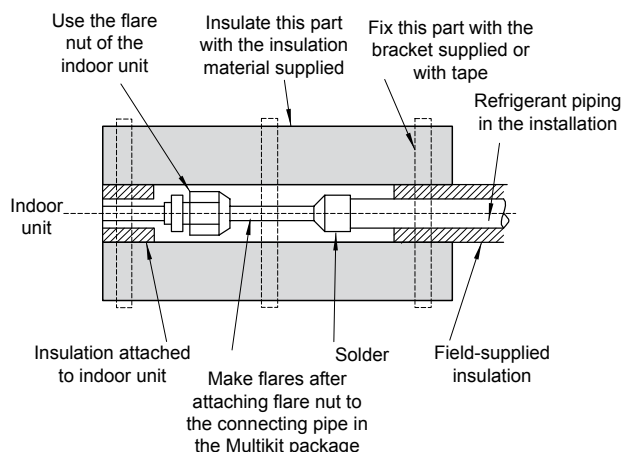


CAUTION

- Do not use saws, grindstone or other tools which might create copper dust.
- When cutting pipes, secure the part to be soldered as shown in the Service Manual.
- Strictly follow national or local regulations regarding occupational health and safety.
- Wear appropriate means of protection during cutting or brazing operations and installation (gloves, eye protection, etc).

9.4.2 Pipe connection

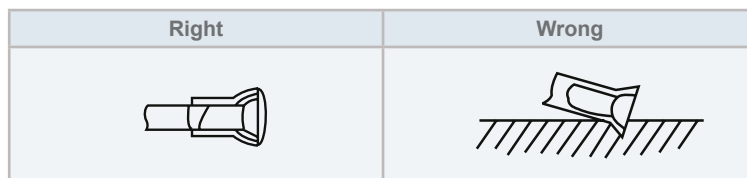
Fix the connecting pipe as shown in the figure below. Use the insulation attached to the indoor unit.



NOTE

A system with no moisture or oil contamination will give maximum performance and life-cycle as compared with a poorly prepared system. Take particular care to ensure that all copper piping is clean and dry internally. 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.



- 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.

9.4.3 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.

9.5 Refrigerant charge amount

Although refrigerant has been charged into this unit, the adequate refrigerant charge depends on the piping length.

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

CAUTION

- When charging or removing refrigerant, measure the amount precisely. Overcharging or undercharging of refrigerant may cause compressor problems.
- In case of actual piping length less than 5 m, consult your distributor.

9.5.1 Refrigerant charge before shipment (W_0 (kg))

W_0 is the RASC unit refrigerant charge before shipment explained before, and it's shown in the following table:

Model	Refrigerant charge before shipment (W_0 (kg))	Additional refrigerant charge (P (g/m))	Maximum additional charge (kg)
RASC-4HNPE	4.1	60	3.9
RASC-5HNPE	4.2	60	3.9
RASC-6HNPE	4.2	60	3.9
RASC-8HNPE	5.7	(1)	6.3
RASC-10HNPE	6.2	(1)	8.1

(1): Needs to be calculated.

9.5.2 Calculation method for the additional refrigerant charge

Calculate the additional refrigerant charge amount according to the following steps:

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

RASC units have been charged with refrigerant for 30 m of actual piping length. In systems with longer actual piping length, an additional refrigerant charged is required.

For RASC-(4-6)HNPE units

Use the following formula:

$$W_1 = (L-30) \times P$$

L: Total piping length (m)

P: Additional refrigerant charge (kg/m) (Refer to the "9.5.1 Refrigerant charge before shipment (W_0 (kg))" section)

For RASC-(8/10)HNPE units

The additional refrigerant charge for RASC-(8/10)HNPE units must be calculated by multiplying the total piping length of each diameter per its calculation factor according to the following table. The result is the additional refrigerant charge for liquid piping W_1 .

Pipe size (mm)	Additional refrigerant charge factor (kg/m)
Ø15.88	x 0.19
Ø12.7	x 0.12
Ø9.52	x 0.065
Ø6.35	x 0.065 (*)

(*): For RASC-(8/10)HNPE units ,add 0.030 kg/m (instead of 0.065 kg/m) when there are 5 or more indoor units connected to the RASC unit.

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

When the RASC unit is combined with indoor units RPI-(8/10)HP, an additional refrigerant charge is required (W_2) = 1 kg/unit. For indoor units lower than 8 HP, an additional refrigerant charge is not needed.

Indoor unit capacity	Additional refrigerant charge (W_2 (kg))
≥ 8 HP	1
< 8 HP	0

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

For RASC-(4-6)HNPE units

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

For RASC-(8/10)HNPE units

In case of RASC-(8/10)HNPE units, the following formula must be used:

$W = W_1 + W_2 - C$					
System example (W) =		+		-	kg

C: Compensation value (kg) (Refer to the following table)

Model	Compensation value (C (kg))
RASC-8HNPE	1.6
RASC-10HNPE	2.0

⚠ CAUTION

Do not exceed the allowed maximum additional charge.

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

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

$W_{TOT} = W + W_0$					
System example (W_{TOT}) =		+		=	kg

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) Questo apparecchio contiene gas fluorati 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 gefluoreerde broeikasgassen die vallen onder het protocol van Kyoto. (SV) Denna anläggning innehåller fluorhaltiga växthusgaser som regleras av Kyoto-protokollet. (EL) Ο παρών εξοπλισμός περιέχει ρευστά αερίδια που εμπεριλαμβάνονται στο πρωτόκολλο του Κιότο.			
Do not vent R410A into the atmosphere. No descargue el R410A en la atmósfera. Lassen sie R410A nicht in die Luft entweichen. Ne laissez pas le R410A se répandre dans l'atmosphère. Non scaricare R410A nell'atmosfera.		Não efectue a ventilação do R410A para a atmosfera. Slip ikke R410A ud i atmosfæren. Laat geen R410A ontsnappen in de atmosfeer. Släpp inte ut R410A i atmosfären. Μην αεριοθετείτε το R410A στην ατμόσφαιρα.	
REFRIGERANT INFORMATION - INFORMACIÓN SOBRE EL REFRIGERANTE - KÜHLMITTELINFORMATION INFORMATION CONCERNANT LE FLUIDE FRIGORIGÈNE - INFORMAZIONI RELATIVE AL REFRIGERANTE INFORMAÇÕES SOBRE O REFRIGERANTE - OPLYSNINGER OM KØLEMIDDEL - INFORMATIE OVER KOELSTOF KYLNINGSGASINFORMATION - ΣΤΟΙΧΕΙΑ ΨΥΚΤΙΚΟΥ ΜΕΣΟΥ			
Refrigerant - Refrigérant - Kühlmittel - Fluide frigorigène - Kältemittel - Koelstof - Kylnings - Μέσο [R410A]			
Factory Charge - Carga de fábrica - Werksabfüllung - Charge en usine (Refer to Specification Label) (Consulte l'étiquette de spécifications) (Siehe Typenschild) (Riferiscasi all'etichetta delle specifiche) Quantity of gas charged - Carga de fábrica - Påfyldt fra fabrikken - In fabbrica, gasuldi (In fábrica, el gas de carga) (Consulte l'étiquette de spécifications) (In fabbrica, gasuldi) Pályfült mennyiség - Εμπροσθομετρική μπίλπουση (Σε μπίλπουση)		W_0 $W_{TOT} - W_0$ kg	
Additional Charge - Carga adicional - Zusätzliche Füllmenge - Charge supplémentaire Carga adicional - Carga adicional - Extra påfyllning - Extra vulling - Irtigáire påfyllning (Πρόσθετη μπίλπουση)		W_{TOT} kg	
Total Charge - Carga Total - Gesamtfüllmenge - Charge totale - Carga total Carga total - Samlet påfyllning - Totale vulling - Total påfyllning - Συνολική μπίλπουση		kg	

9.6 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.

9.6.1 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.

9.6.2 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 (m ³)
	C: Refrigerant concentration (=0.44* kg/m ³ for R410A)

9.6.3 Countermeasure for refrigerant leakage

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

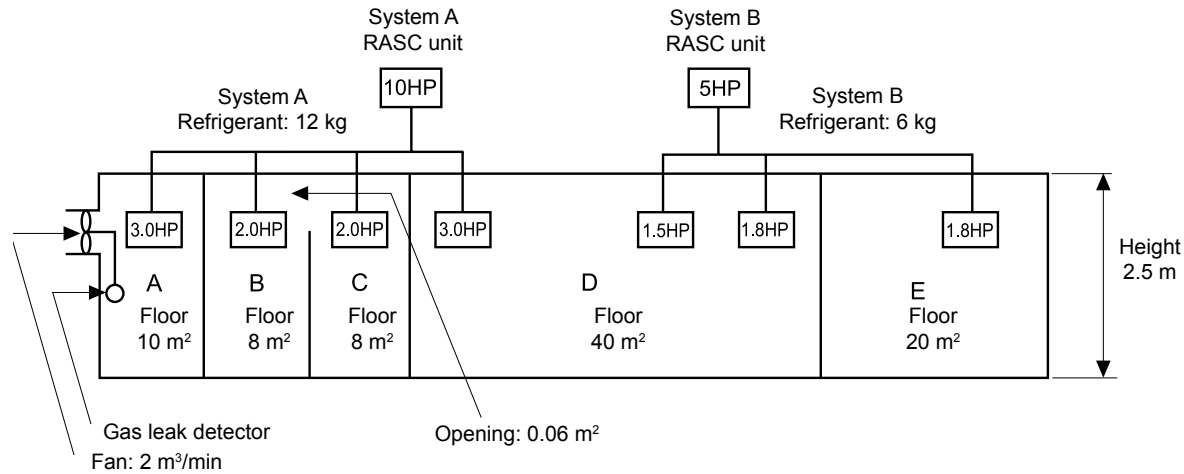
- 1 Provide a shutterless opening which will allow fresh air to circulate into the room.
- 2 Provide a doorless opening of 0.15% or more size to the floor area.
- 3 There must be a ventilator fan connected to a gas leak detector, with a ventilator capacity of 0.4 m³/min or higher per Japanese refrigeration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

Model	Tonnes
RASC-(4-6)HNPE	2.27
RASC-8HNPE	3.16
RASC-10HNPE	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.

(See the example of the following page)

- General example of application



Room	R (kg)	V (m³)	C (kg/m³)	Countermeasure
A	12	25	0.48	2 m³/min fan linked with gas leak detector
B	12	20	0.60	0.06 m² aprox. opening
C	12	20	0.60	0.06 m² aprox. opening
B + C	12	40	0.30	-
D	18	100	0.18	-
E	6	50	0.12	-

9.7 Compatibility with the piping of current installations where R22 or R407C is used

This chapter describes the works in piping for compatibility with the piping of current installations where R22 or R407C is used. (Contact your Hitachi dealer for specific support on your installation).

The new RASC-HNPE series is compatible with those installations that have been operating with R22 or R407C. This allows installing the RASC units, which operate with R410A, without having to change piping installation.

9.7.1 Installation procedure for existing pipes



NOTE

- For systems with several indoor units, branch pipes shall be changed to Hitachi-specified model for RASC-HNPE series (R410A).
- Existing RASC and indoor units for R22 or R407C can not be used.

1 Recover refrigerant (R22 or R407C):

- a. Compressor of the existing unit is working
Pump down. Perform refrigerant recovery operation of existing air conditioner without stopping during 30 minutes in cooling mode.
- b. Compressor of the existing unit is not working
Recover refrigerant with a refrigerant recovery device.

2 Remove existing air conditioning system (RASC and indoor unit).

3 For the existing pipes, proceed with one of the following operations:

- a. Clean the existing piping.
- b. Install renewal kit (optional accessory).

4 Install the new unit of the RASC series.

5 Vacuum process.

6 Refrigerant charge (R410A)

Follow the normal process described in order to determine whether additional refrigerant charge is necessary.



CAUTION

Recovering R22 and R407C is mandatory to remove an existing air conditioner and piping. Do not vent into the atmosphere.

◆ Conditions to use existing pipes with cleaning process

After the piping cleaning process, follow the normal installation process as if they corresponded to a new installation, considering all the restrictions and limitations. Special attention is required with regard to the piping thickness for R410A.

◆ Conditions to use existing pipes without cleaning process

A Renewal Kit (sold separately) can be used even in cases where there is a history of compressor failure, allowing diversion to existing piping without cleaning. Thus, the burden of installation works at renewal can be reduced.

Existing pipes can be used without cleaning if the following conditions are satisfied:

- 1 The renewal kit shall be installed. (mandatory)
- 2 Maximum piping length shall be 50 m (If the pipe is longer than 50m, existing pipes can be used if cleaning is performed).
- 3 The capacity of the new unit must be equivalent to the one previously installed.
- 4 Existing pipes shall be free of corrosion, cracks, scratches or deformations.
- 5 Dirt inside the pipes shall not be noticeable.
- 6 The specifications of piping, flare nuts, gaskets, etc. shall be compliant.
- 7 Flare shall be reprocessed.
- 8 Piping airtightness and vacuuming shall be ensured in the same way as with new piping.

9.7.2 When the existing air conditioner is a product of another manufacturer

Existing pipes made by other manufacturer can also be used if the following conditions are satisfied:

- 1 For systems with several indoor units, branch pipes shall be changed to the model specified by Hitachi.
- 2 Pipes shall be cleaned.

9.7.3 Permissible range for existing air-conditioning pipes

◆ Pipe length in the case of “without cleaning process”

Liquid (mm)	Ø6.35		Ø9.52					Ø12.70					Ø15.88		
Thickness (mm)	0.8		0.8					0.8					1.0		
Gas (mm)	Ø15.88	Ø19.05	Ø12.70	Ø15.88	Ø19.05	Ø22.20	Ø25.40	Ø15.88	Ø19.05	Ø22.20	Ø25.40	Ø28.58	Ø22.20	Ø25.40	Ø28.58
Thickness (mm)	1.0	1.0	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Material soft-annealed	x	x	x	x	x			x	x						
Material drawn		x			x	x	x		x	x	x	x	x	x	x
Performance capacity	(m)														
(4-6) HP	5 ⁽²⁾	5 ⁽²⁾	40 ⁽¹⁾	50	50 ⁽⁴⁾	-	-	30 ⁽³⁾	30 ⁽³⁾⁽⁴⁾	-	-	-	-	-	-
8 HP	-	-	-	-	50 ⁽¹⁾⁽⁴⁾	50 ⁽¹⁾	50	-	50 ⁽¹⁾⁽³⁾⁽⁴⁾	50 ⁽¹⁾⁽³⁾	50 ⁽³⁾	-	50 ⁽¹⁾⁽³⁾	50 ⁽³⁾	-
10 HP	-	-	-	-	-	-	-	-	-	50 ⁽¹⁾	50	50	50 ⁽¹⁾⁽³⁾	50 ⁽³⁾	50 ⁽³⁾

(1). Reducing gas pipe size will reduce cooling capacity due to larger pressure loss in gas piping and narrow operation range.

(2). Reducing liquid pipe size will narrow operation range due to the indoor unit relation with expansion valve capacity. In these cases, set the DSW2-1 to ON position.

(3). Increasing liquid pipe size will require additional refrigerant charge.

(4). When using Ø19.05 gas pipe (soft-annealed), please switch ON DSW2-4# in the RASC Unit PCB.

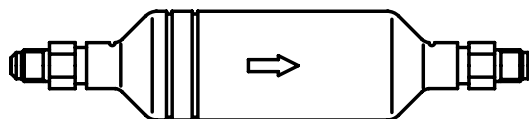
Standard

⚠ CAUTION

In case that its thickness is less than the R410A piping specifications, set DSW2, pin 4 ON. With this setting the control system adjusts the pressure in order to avoid damage to the existing pipe for R22.

9.7.4 Selection of the renewal kit model

Hitachi offers a renewal kit as an accessory.



◆ Recommended renewal kit

RASC unit	Renewal kit
	External attachment to RASC unit [Short pipe (local) + Kit + existing piping]
RASC-(4-6)HNPE	TRF-NP160S
RASC-8HNPE	(*)
RASC-10HNPE	(*)

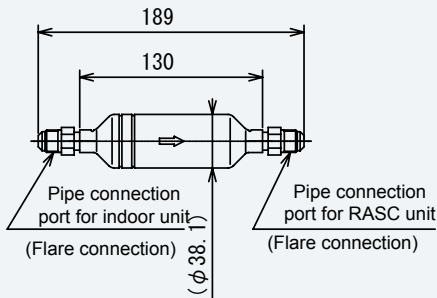
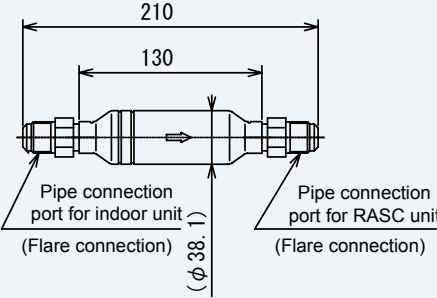
i NOTE

(*): The availability of the renewal kit for RASC-(8/10)HNPE is to be confirmed.

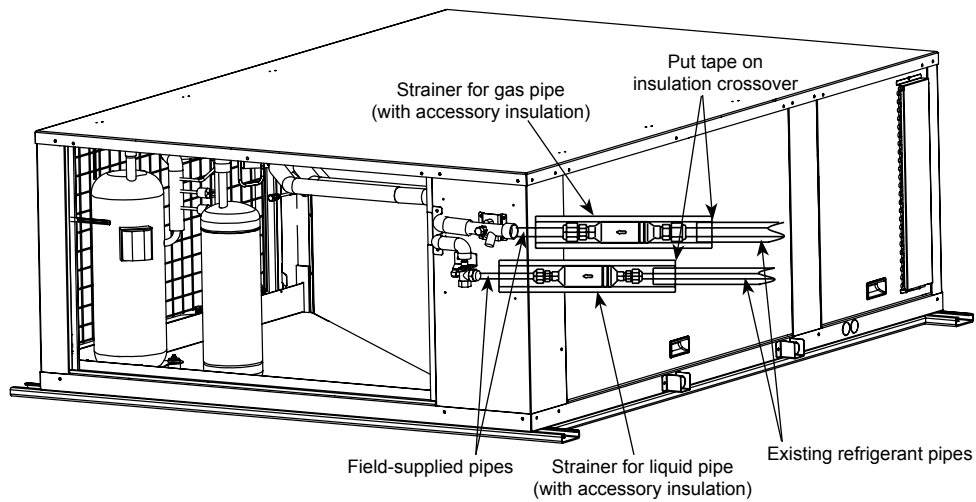
⚠ CAUTION

In case that its thickness is less than the R410A piping specifications, set DSW2, pin 4 ON. With this setting the control system adjusts the pressure in order to avoid damage to the existing pipe for R22.

◆ Details of renewal kit

Pipe	Model	TRF-NP160S
For liquid pipe		
For gas pipe		

◆ Renewal kit installation (Example)



10. Electrical and control settings

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10.1 General check

- 1 Ensure that the field-supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated. Make sure that they comply with national and regional electrical codes.

- 2 Following the Council Directive 2004/108/EC(89/336/EEC), relating to electromagnetic compatibility, next table indicates:

Maximum permissible system impedance $Z_{\max}$ at the interface point of the user's supply, in accordance with EN61000-3-11.

MODEL	$Z_{\max}$ (Ω)
RASC-4HNPE	-
RASC-5HNPE	-
RASC-6HNPE	-
RASC-8HNPE	-
RASC-10HNPE	-

- 3 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 Ssc "xx"	MODELS	Ssc "xx" (kVA)
Equipment complying with IEC 61000-3-12 (professional use)	RASC-4HNPE RASC-5HNPE RASC-6HNPE	-
This equipment complies with IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to xx (see Ssc column) at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power Ssc greater than or equal to xx (see Ssc column)	RASC-8HNPE RASC-10HNPE	3138

- 4 Check to ensure that the power supply voltage is within +/-10% of the rated voltage.
- 5 Check to ensure that power supply has an impedance low enough to warranty not reduce the starting voltage more than 85% of the rated voltage.
- 6 Check to ensure that the ground wire is connected.
- 7 Connect a fuse of specified capacity.

CAUTION

- Check to ensure that screws for terminal block are tightly tightened.
- Check to ensure that the indoor unit fan and the RASC fan have stopped before electrical wiring work or periodical check is performed.
- Protect the wires, drain pipe, electrical parts, from rats or other small animals. If not protected, rats may damage unprotected parts, and at the worst, a fire will occur.
- Wrap the accessory packing around the wires, and plug the wiring connection hole with the seal material to protect the product from any condensed water and insects.
- Tightly secure the wires with the cord clamp inside the indoor unit.
- Lead the wires through the knockout hole in the side cover when using conduit.
- Secure the cable of the remote control switch with the cord clamp inside the electrical box.
- Electrical wiring must comply with national and local codes. Contact your local authority in regards to standards, rules, regulations, etc.
- Check that the ground wire is securely connected.
- Connect a fuse of specified capacity.

DANGER

- Do not connect or adjust any wiring or connections unless the main power switch is OFF.
- Check that the earth wire is securely connected, tagged and locked in accordance with national and local codes.

NOTE

Check and test to ensure that if there is more than one source of power supply, that all are turned OFF.

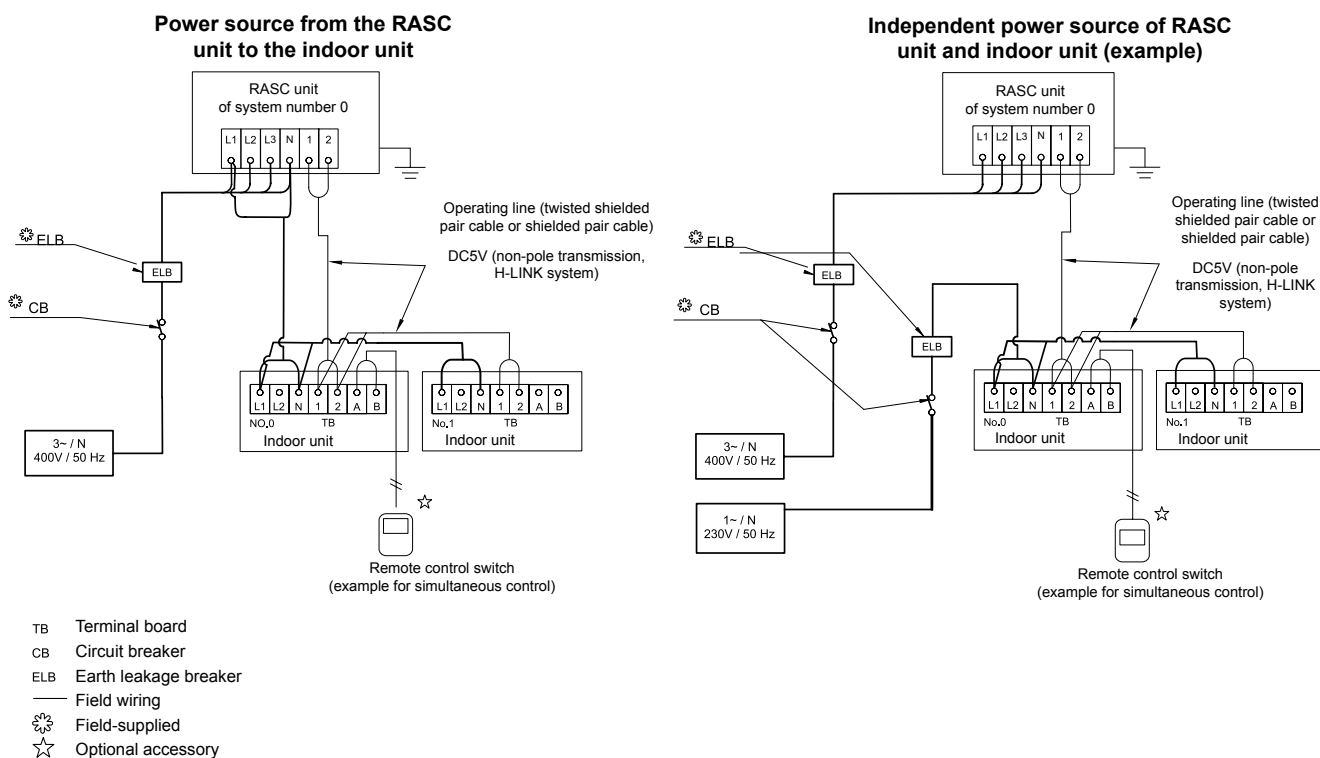
10.2 System wiring diagram

Connect the units (RASC and indoor unit) according to the following electric diagram:

- 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 and 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 panel.

⚠ 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.



10.3 Electrical connection of the RASC unit

CAUTION

Check to ensure that the field supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated on this chapter and they comply with national and local codes. If it is necessary, contact with your local authority in regards to standards, rules, regulations, etc.

10.3.1 Wiring size

Recommended minimum sizes for field provided wires:

Model	Power supply	Max. current (A)	Power supply cable size	Transmitting cable size
			EN60 335-1	EN60 335-1
RASC-4HNPE	3N~ 400V 50Hz	14.1	4 x 4.0mm ² + GND	2 x 0.75mm ²
RASC-5HNPE		14.1	4 x 4.0mm ² + GND	
RASC-6HNPE		16.0	4 x 4.0mm ² + GND	
RASC-8HNPE		24.7	4 x 6.0mm ² + GND	
RASC-10HNPE		24.7	4 x 6.0mm ² + GND	

NOTE

Use wires which are not lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).

10.3.2 Minimum requirements of the protection devices

CAUTION

- Ensure specifically that there is an Earth Leakage Breaker (ELB) installed for the units (RASC and indoor unit).
- If the installation is already equipped with an Earth Leakage Breaker (ELB), ensure that its rated current is large enough to hold the current of the units (RASC and indoor).

NOTE

- Electric fuses can be used instead of magnetic Circuit Breakers (CB). In that case, select fuses with similar rated values as the CB.
- The Earth Leakage Breaker (ELB) mentioned on this manual is also commonly known as Residual Current Device (RCD) or Residual Current Circuit Breaker (RCCB).
- The Circuit Breakers (CB) are also known as Thermal-Magnetic Circuit Breakers or just Magnetic Circuit Breakers (MCB).

◆ Main switch protection

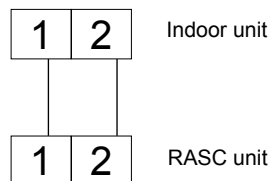
Select the main switches in according to the next table:

Model	Power source	Max. current (A)	CB (A)	ELB (no. poles/A/mA)
RASC-4HNPE	3N~ 400V 50Hz	14.1	20	4/40/30
RASC-5HNPE		14.1	20	
RASC-6HNPE		16.0	20	
RASC-8HNPE		24.7	30	
RASC-10HNPE		24.7	30	

ELB: Earth leakage breaker; CB: Circuit breaker

10.4 Transmission wiring between RASC and indoor unit

- The transmission is wired to terminals 1-2.
- The H-LINK II wiring system requires only two transmission cables that connect the indoor unit and the RASC unit.



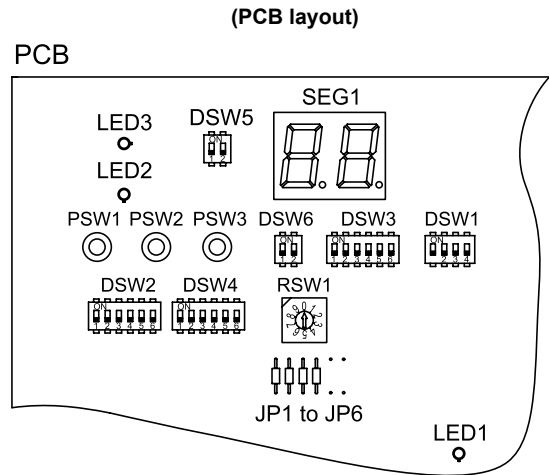
- Use twist pair wires (0.75 mm²) for operation wiring between RASC unit and indoor unit.
- The wiring must consist of 2-core wires (Do not use wire with more than 3 cores).
- Use shielded wires for intermediate wiring to protect the units from noise interference, with a length of less than 300m and a size in compliance with local codes.
- In the event that a conduit tube for field-wiring is not used, fix rubber bushes to the panel with adhesive.

CAUTION

Ensure that the transmission wiring is not wrongly connected to any live part that could be damaged the PCB.

10.5 Setting and function of DIP and RSW switches for RASC units

10.5.1 Location of DIP switches and RSW switches



10.5.2 Functions of dip switches and rotary switches

- NOTE**
- The mark “■” indicates the dip switches positions.
 - No mark “■” indicates pin position is not affected.
 - The figures show the settings before shipment or after selection.

CAUTION

Before setting dips switches, firstly turn off power source and set the position of the dips switches. If the switches are set without turning off the power source, the contents of the setting are invalid.

DSW1: Test run

Setting 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.

- NOTE**
- This operation is reset once the compressor is in Thermo-ON mode.
 - During the test run operation the units will operate continuously during 2 hours without Thermo-OFF and the 3-minute guard for compressor protection will be effective.
 - Test run will start within 20 seconds after setting DSW1 pin 1 to ON position.

DSW2: Pipe length setting (Setting is required) / Optional function setting

Setting 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)		Initial expansion valve opening is changed according to the piping.
Piping pressure setting		Control to support existing pipes or when using Ø19,05 gas pipe (soft-annealed).
Function selection setting		Function selection is set by PSW.
External input/output selection		External input/output selection is set by PSW.

DSW3: Capacity setting (No setting is required)

RASC-4HNPE		Setting before shipment.
RASC-5HNPE		
RASC-6HNPE		
RASC-8HNPE		
RASC-10HNPE		

DSW4 and RSW1: Setting number of refrigerant cycles (Setting is required)

Setting for the tens digit		Setting before shipment.
Setting for the last digit		

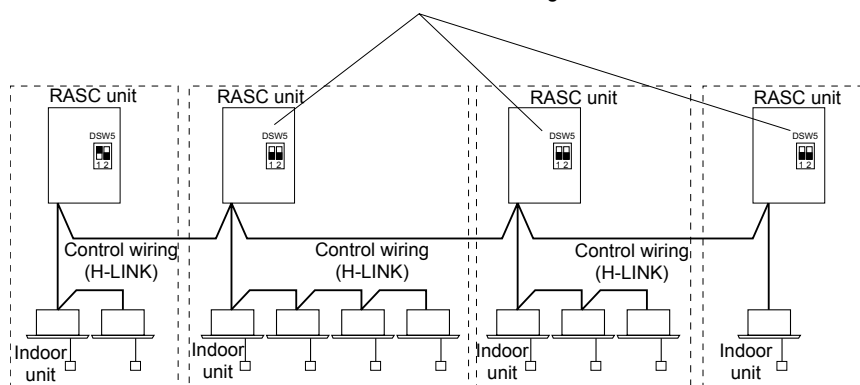
DSW5: Setting of end-terminal resistance

It is not necessary to set when the number of RASC units in the same H-LINK line is one. In case of more than one RASC unit in the same H-LINK line, set as follows:

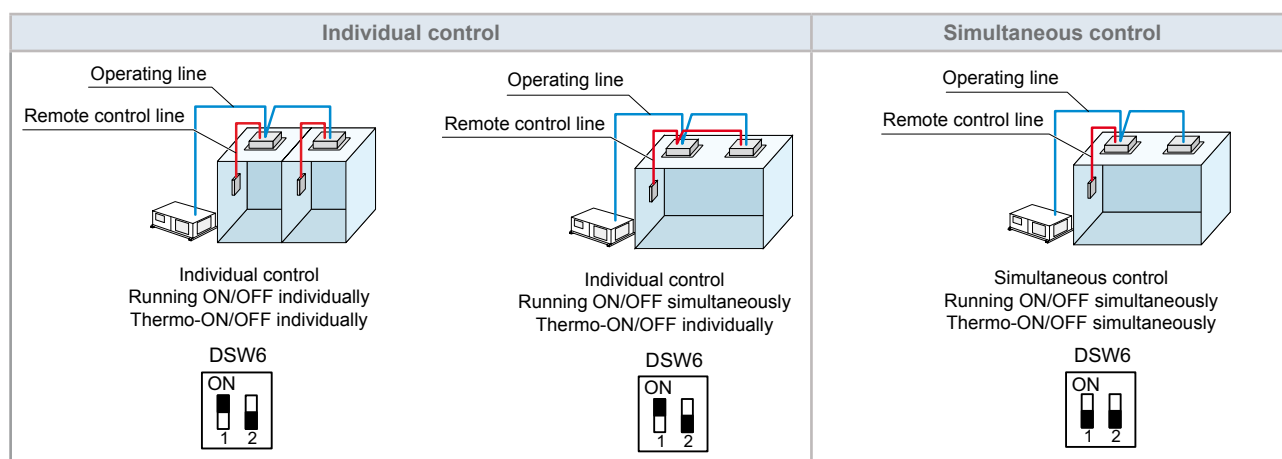
- First RASC unit: keep DSW5-1 in "ON".
- Rest of RASC units: set DSW5-1 to "OFF".

Setting before shipment	
Cancellation (Setting of end terminal resistance)	

Turn OFF DSW5 number 1 pin for cancel of end terminal resistance setting

**DSW6: Setting of indoor unit control operation**

Individual control operation (Setting before shipment)	
Simultaneous control operation	



10.5.3 Jumper lead setting (JP1~6)

Setting before shipment:

System	JP1	JP2	JP3	JP4	JP5	JP6
Three-phase (3N~)	1	1	0	1	0	0



NOTE

- 0: Open
- 1: Short circuit

The function selection using the jumper lead setting is shown in the tables below:

Setting	Function	Details
JP1	Not used	-
JP2	Not used	-
JP3	400V power source voltage	When JP3 is set to "open", current protection parameters are set for a 400 V power source voltage.
JP4	Fixing for cooling only	When JP4 is set to "open", operation mode is fixed for cooling. Thermo-ON is available only by "COOL" or "DRY" mode at indoor unit.
JP5	Self diagnosis	For function test of the RASC unit control PCB. Factory default setting is open. When power ON in short condition it enters self diagnosis.
JP6	Phase detection release	Phase detection abnormality not detected. When short, doesn't affect phase detection.

10.5.4 LED's indication

LED Indication		
LED1	Red	This LED indicates the transmission status between the indoor unit and the RCS
LED2	Yellow	This LED indicates the transmission status between the indoor unit and the RASC unit
LED3	Green	Power source for the PCB

10.6 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.

10.6.1 Application

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

Indoor unit	RASC unit
System Free	
RCI	RASC-(4-10)HNPE
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.

10.6.2 Features

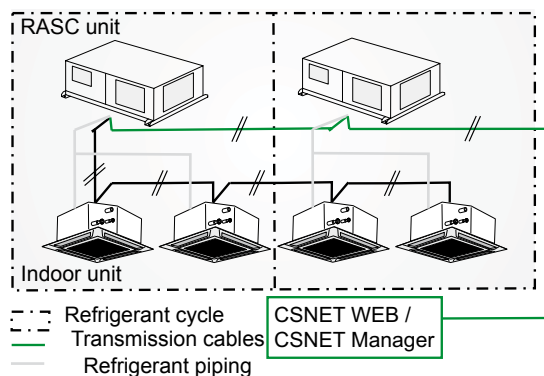
- The total wiring length is considerably reduced compared to traditional connections.
- Only one connection is required for the wiring between the indoor and RASC units.
- The wiring connection of the complementary central control devices is easy.

NOTE

CSNET WEB or CSNET Manager are centralized control systems which allow the installation to be controlled remotely. They can be connected at any point of the local corporate network, or even via the Internet.

10.6.3 Specifications

- Transmission cable: 2-wire.
- Polarity of transmission cable: non-polar wire.
- Maximum number of units that can be connected: 64 RASC units and 160 indoor units per H-LINK II system.
- Maximum wiring length: total 1000 m (including CSNET WEB or CSNET Manager).
- 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 mm² (Equivalent to KPEV-S).
- Voltage: 5 V DC.

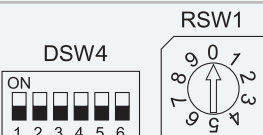
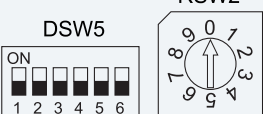


CAUTION

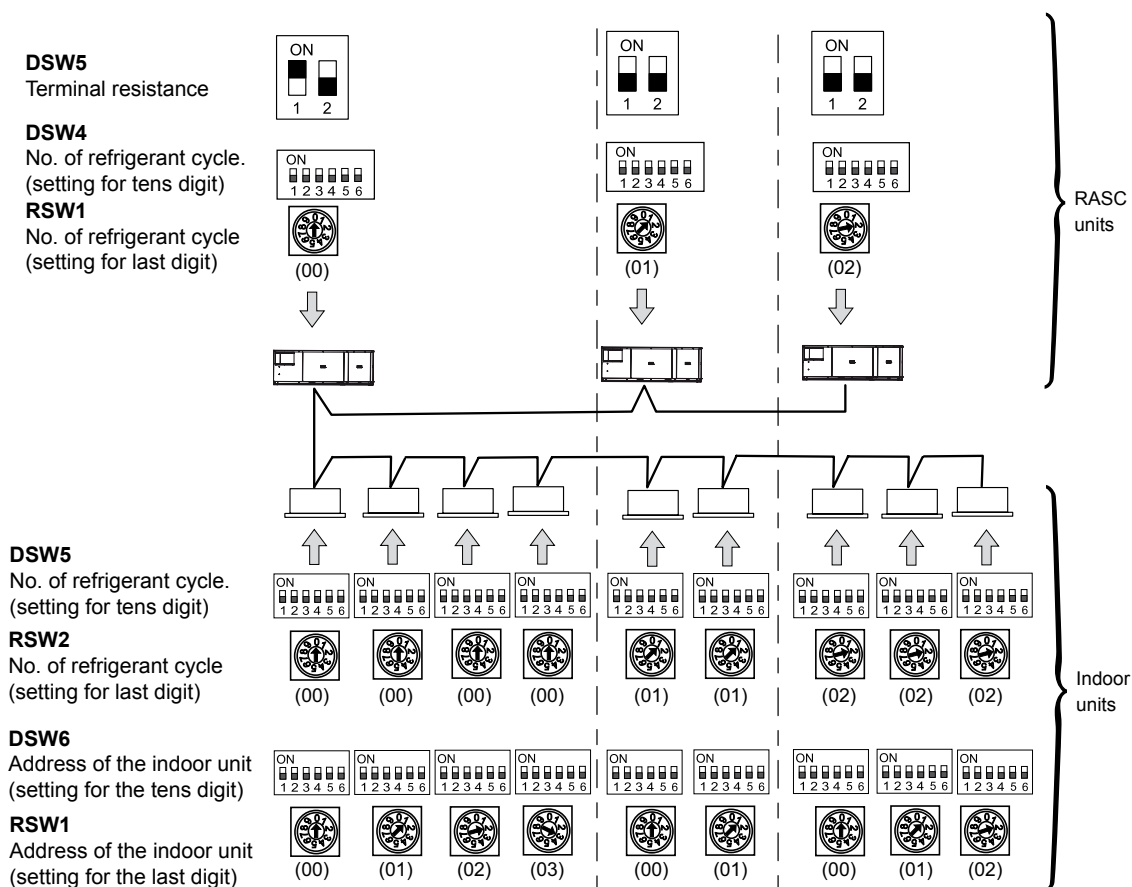
For the H-LINK II system must use twisted shielded pair cable or shielded pair cable.

10.6.4 DIP Switch setting for multiple H-LINK system

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

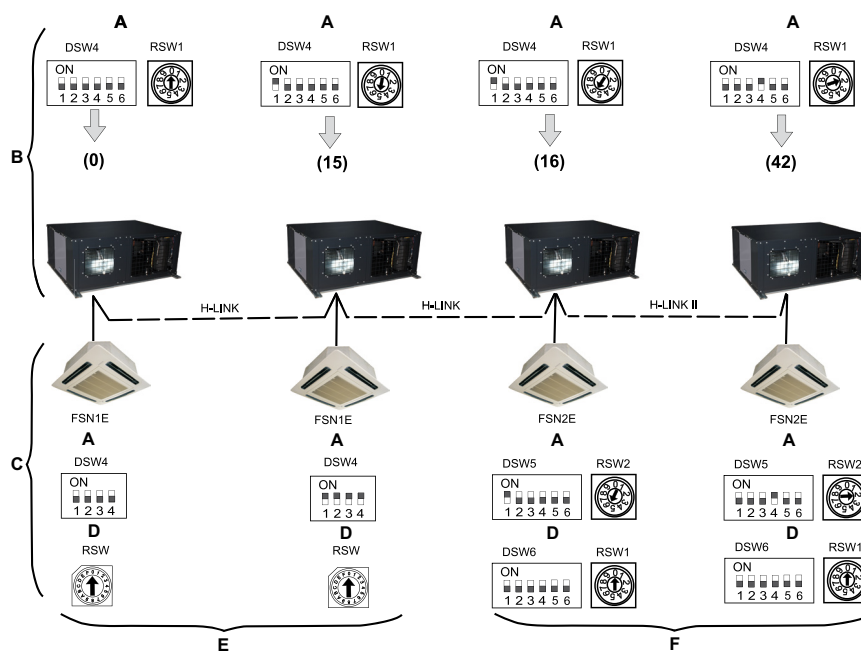
Unit	Name of DIP switch	Mark	Setting before the Shipment	Function
RASC unit	Terminal resistance	DSW5		It is not necessary to set when the number of RASC units in the same H-LINK line is one. In case of more than one RASC unit in the same H-LINK line, set as follows: - First RASC unit: keep DSW5-1 in "ON". - Rest of RASC 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.



10.6.5 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 FSN(H)(2/3/4)(E)(M)(i)(-DU) units.



A. Refrigerant cycle.

B. RASC unit.

C. Indoor unit.

D. Indoor unit address.

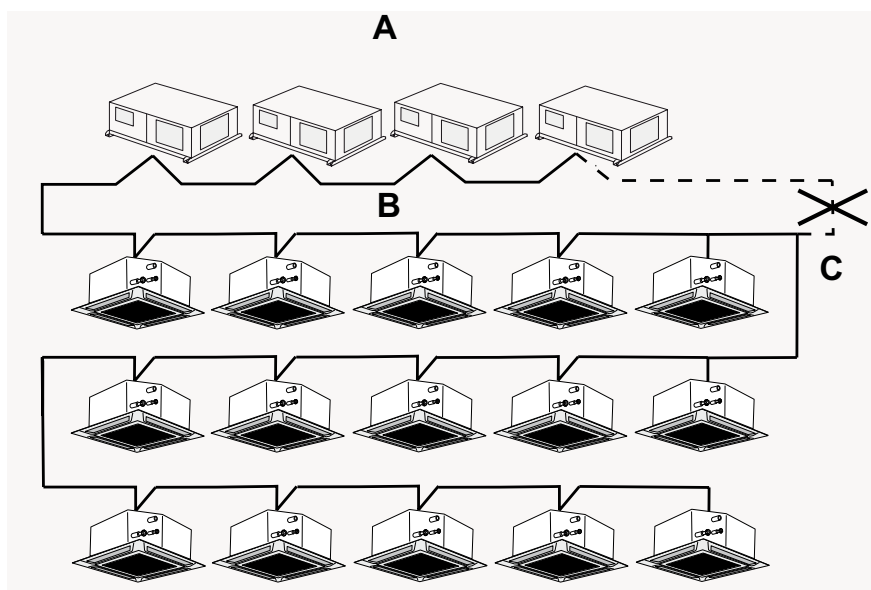
E. Either the current remote control switch (H-LINK) or the new one (H-LINK II) can be used.

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

10.6.6 Examples of H-LINK II system

1 Using the H-LINK II system for air conditioning systems without a central control device (Neither centralised remote controls nor Building air conditioning controls)

- Line connection with all units.

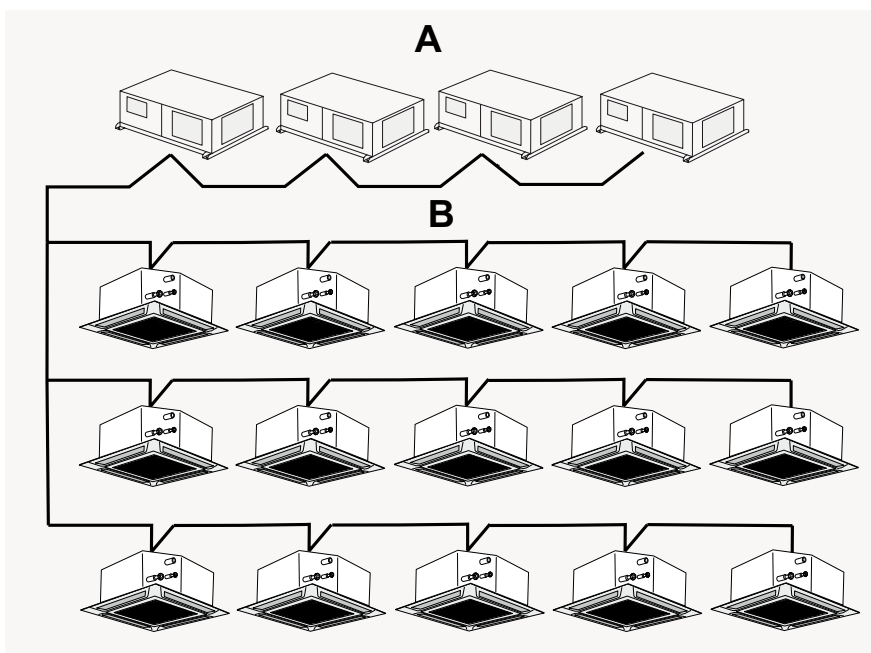


A. RASC units.

B. Indoor units.

C. Do not install wiring in a loop.

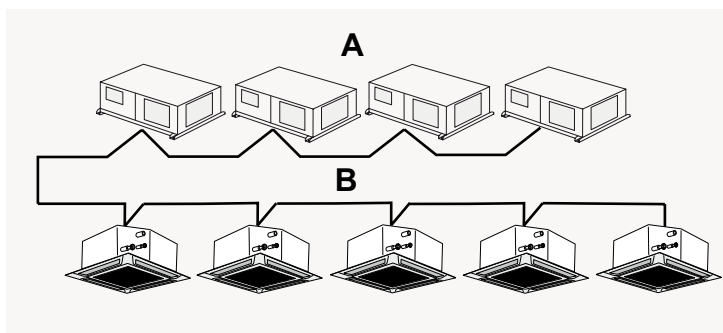
- Line connection for each floor.



A. RASC units.

B. Indoor units.

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



A. RASC units.

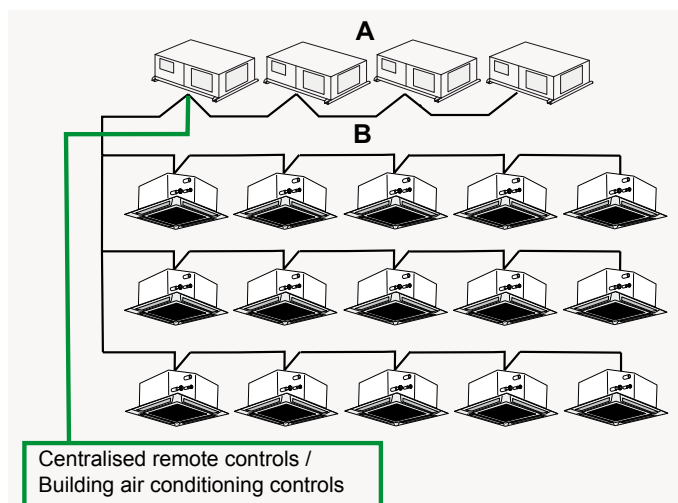
B. Indoor units.

⚠ CAUTION

- 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 (Either centralised remote controls or Building air conditioning controls)

- If the central control device is used when carrying out electrical wiring, it 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.

11. Optional functions

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11.1 Optional external input and output signals

11.1.1 Input and output signals through 7-segment display on the RASC unit PCB

The system has several input and output signals, which can be selected using the following connectors of the RASC PCB:

- Input connectors CN1 and CN2, which have two and one ports respectively to configure three optional input signals.
- Output connector CN7, which has two ports to configure two optional output signals.

The selection of these input and output signals represents the selection of some optional functions programmed in the PCB of the RASC unit through the 7-segment display.



NOTE

- Do not set same function to multiple input/output ports. If set, the setting of the higher input/output number is cleared to 00.
- Please refer to the Service Manual for detailed information of optional external input and output signals.

◆ Input signals (CN1 and CN2)

Indication	Input signal	Application
0	No setting application	No setting.
1	Fixing the heating mode	This signal allows to pre-fix the heating operation mode independently of what the indoor unit requests. If the indoor units request the opposite mode than the RASC unit, the compressor does not start.
2	Fixing the cooling mode	This signal allows to pre-fix the cooling operation mode independently of what the indoor unit requests. If the indoor units request the opposite mode than the RASC unit, the compressor does not start. This function is intended for those applications such as computer rooms, where the cooling mode is fixed throughout the year.
3	Demand thermo OFF	This signal allows to stop the compressor as well as to put the indoor unit in Thermo-OFF condition. When the compressor is stopped, this function allows the operation of the indoor unit fans to prevent from air stratification.
4	No setting application	No setting.
5	Forced stoppage	This signal allows to control the stoppage of the compressor and the fans of the indoor as well as RASC units. This function can be useful when used with the alarm signals of the fire prevention systems.
6	Current control demand (60%)	These signals allow to regulate the input current around the selected percentage (60%, 70%, 80% or 100%) of the maximum compressor current. This function provides energy-saving by limiting the installation power consumption.
7	Current control demand (70%)	
8	Current control demand (80%)	
9	Current control demand (100%)	
10	No setting application	No setting.

◆ Output signals (CN7)

Indication	Output signal	Application
0	No setting application	No setting.
1	Operation signal	This signal allows to notify that the unit is operating. It enables to start up additional systems such as humidifiers, fans and other additional air-conditioning systems.
2	Alarm signal	This signal allows to notify that protection devices have been activated and to transfer it to additional systems.
3	Compressor ON signal	This signal allows to notify that the compressor is activated. This function can be applied for situations such as checking signals during remote-control operation and for the interlock of the RASC unit.
4	Defrost operation signal	This signal allows to notify that the unit is under defrosting operation.

11.1.2 Input and output signals through remote control switch

In addition to the external signals that can be selected through the 7-segment display on the RASC unit PCB, the remote control switches provide extra input/output signals.

An example of the available external input and output signals through the HITACHI individual remote controls (PC-ARF/PC-ART) is shown below:

Input and output number display and connectors

Input number display	Port	Factory setting	
Input/Output indication		Setting item	Indication
Input 1	CN3 1-2	Remote ON/OFF 1 (Level)	03
Input 2	CN3 2-3	Prohibiting Remote Control after Manual Stoppage	06
Output 1	CN7 1-2	Operation	01
Output 2	CN7 1-3	Alarm	02
Output 3	CN8 1-2	Thermo-ON for Heating	06

Input and output settings and display codes

Indication	Input	Output
00	Not set	Not set
01	Room Thermostat (for Cooling)	Operation
02	Room Thermostat (for Heating)	Alarm
03	Remote ON/OFF 1 (Level)	Cooling
04	Remote ON/OFF 2 (Operation)	Thermo-ON for Cooling
05	Remote ON/OFF 2 (Stoppage)	Heating
06	Forbidding Remote Control after Manual Stoppage	Thermo-ON for Heating
07	Remote Cooling / Heating Change	Total Heat Exchanger
08	Elevating Grille Input (not available for PC-ART)	Elevating Grille Output



NOTE

- After at least 3 minutes from the power ON, change the optional setting.
- The elevating grille input can be set to "Input 2" only. It cannot be set to "Input 1".
- The elevating grille output can be set to "Output 1" or "Output 2" only. It cannot be set to "Output 3".
- Do not set the elevating grille for the total heat exchanger.
- Record the setting conditions for each input and output in the "Setting" column of the table.

11.2 Optional functions

HITACHI units provide a large number of optional functions to adapt the system to the requirements of the customer. Each function is selected from different sources:

- Optional functions through 7-segment display on the RASC unit PCB.
- Optional functions through remote controllers.

11.2.1 Optional functions through 7-segment display on the RASC unit PCB

The following optional functions are available for being selected using the PSW switches and 7-segment on the RASC unit PCB:

Indication	Input signal	Application
<i>FR</i>	Control of the indoor unit fan during Thermo-OFF in heating mode	The fan of the indoor units stops when the unit is in defrost operation. This function forces a start-and-stop cycle of the indoor unit fan to prevent air stratification.
<i>n i</i>	Night mode (Low noise)	This function reduces the outdoor fan speed and the maximum compressor frequency value in cooling operation according to the outdoor air temperature in order to reduce sound in low load conditions.
<i>CS</i>	Cancellation of outdoor ambient temperature limit	This function allows the operation of the units under unfavourable outdoor ambient temperature conditions compared to normal conditions (higher outdoor air temperatures in heating operation and lower outdoor air temperatures in cooling operation). This function can be applied for heating operation, cooling operation or for both.
<i>do</i>	Change of defrost condition	This function allows to shift the temperature conditions in order to cause an earlier defrosting. It is useful in installations placed in very cold regions, where frost generates continuously; enabling an earlier defrosting operation results in a lower amount of accumulated frost, therefore keeping higher heating capacity values.
<i>bd</i>	"Slow" fan speed during defrost operation	The fan of the indoor units stops at low discharge pressures during and after defrost operation. This function allows to set the fan speed of the indoor unit fan to "Slow". It helps to prevent air stratification and to avoid cold draft after defrosting. i NOTE <i>For indoor units without "Slow" fan speed setting, the fan speed is adjusted to "Low".</i>
<i>nd</i>	Capacity adjustment for long piping	This function modifies the parameters for compressor frequency calculation to achieve a faster compressor response. It is convenient for installations with long refrigerant piping length.
<i>Hc</i>	Target value of compressor frequency control in cooling operation (Control function)	This function allows to modify the compressor frequency range in cooling mode.
<i>Hh</i>	Target value of compressor frequency control in heating operation (Control function)	This function allows to modify the compressor frequency range in heating mode. i NOTE <i>This function has no effect on RASC-(5/6/8)HNPE.</i>
<i>Si</i>	Opening of the indoor expansion valve during heating operation stoppage (Control function)	This function allows to modify the opening of the indoor unit expansion valves during heating operation stoppage to opening values higher than the standard opening value in heating operation stoppage.
<i>So</i>	Opening of the indoor expansion valve during heating thermo-OFF operation (Control function)	This function allows to modify the opening of the indoor unit expansion valves during heating thermo-OFF operation to opening values higher than the standard opening value in heating thermo-OFF operation.
<i>ci</i>	Initial opening of the indoor expansion valve at starting in heating operation (Control function)	This function allows to modify the opening of the indoor unit expansion valves when the unit is starting in heating operation. It is practical as a support of the optional function "Slow fan speed during defrost operation (<i>bd</i>)".

Indication	Input signal	Application
<i>dB</i>	Low noise setting (Control function)	This function allows to set the maximum compressor frequency and the maximum outdoor fan speed to a value slightly lower than the standard maximum value. Unlike optional function "Night mode (㇏)", this setting can be enabled regardless of outdoor air temperature. It is conceived for installations where sound level needs to be reduced.
<i>dE</i>	Fixing of current control demand function	This function allows to regulate the input current around the percentage of the maximum compressor current which has been selected through external input signals on the 7-segment display (60%, 70%, 80% or 100%), without the need to short-circuit the input terminals (CN1 or CN2).
<i>UE</i>	Wave function setting	This function activates a continuous wave cycle for the control of input current (20 minutes at 100% of maximum compressor current, and 10 minutes at the percentage which has been selected through external input signals on the 7-segment display (60%, 70%, 80% or 100%)) (CN1 or CN2).
<i>Fb</i>	Cold draft protection	This function allows to reduce the compressor frequency when the discharge air temperature in the indoor unit falls below 12°C in cooling operation. This is done in order to avoid the direct discharge of cold air. Depending on the setting of "Cold draft protection" function, the SVA (Solenoid valve for high pressure bypass) is turned ON.
<i>E</i>	Cancellation of hot gas bypass control	When this function is selected, the activation of hot gas bypass circuit between compressor discharge and heat exchanger inlet is not performed. The hot gas bypass circuit is intended to reduce the amount of frost at the heat exchanger. Enabling this function, the number of defrost cycles is reduced while slightly reducing the heating capacity.
<i>dS</i>	Forced stoppage after defrost operation	This function allows to stop the indoor unit fans after defrost operation is finished. The indoor unit fan operation is started again once 3-minute ON guard for indoor units has finished. Then, the heating operation is restarted. It is helpful to avoid the direct discharge of cold air after defrost operation.
<i>F1</i>	Defrost control in current control demand mode	This function allows to reduce the accumulated heating operation time and to force an earlier defrosting operation. It is practical as a support of optional function "Fixing of current control demand function (<i>dE</i>)".
<i>F2</i>	Setting of the fan performance curves	This function allows to adjust the fan operation settings of RASC-(6/8/10)NPE units in order to achieve an optimal performance of the fan unit in some specific installations.
<i>F3</i>	Compressor heater control mode (Only for 4-6HP)	When the system is in stand-by mode, the crankcase heater is ON to ensure an optimum temperature of the compressor's oil when the unit is required to start operation. This causes an additional heater input while the system is not expected to start. This function switches the crankcase heater OFF in stand-by mode; therefore saving energy while the unit is not running.

**NOTE**

Please refer to the Service Manual for detailed information of optional functions through 7-segment display.

11.2.2 Optional functions through remote control switch

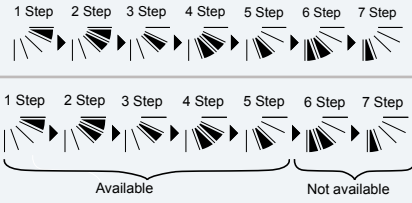
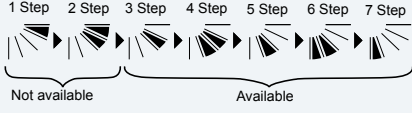
In addition to the possible optional functions through the 7-segment display of the RASC unit's PCB and through DIP switch setting, there are available a large quantity of optional functions for each remote control switch connected to the system.

An example of the available optional functions through the HITACHI individual remote controls (PC-ARF/PC-ART) is shown below:

NOTE

For the detailed information about optional functions through remote controls, please refer to the *Technical catalogue of Packaged controllers*.

Element	Optional function	Description
b1	Removal of heating temperature compensation	This function is used when the temperature setting displayed on the remote control switch and the inlet air temperature of the indoor unit must be the same.
b2	Circulator function at heating Thermo-OFF	This function means that the fan unit remains running at the same speed during Thermo-OFF condition to prevent the air in the room from stratifying.
b3	Forced compressor operation for at least 3 minutes	This function is used to protect the compressor, preventing it from being started or stopped for periods of less than three minutes.
b4	Pre-determined filter cleaning period change	This function is used to modify the period until the next display of filter cleaning sign.
b5	Fixing of operation mode	Once the unit operating mode has been selected, this function prevents it from being modified from the remote control.
b6	Fixing of setting temperature	Once the unit temperature has been selected, this function prevents it from being modified from the remote control.
b7	Fixing of cooling operation	This function is available to use cooling mode only and to prevent heating mode from being enabled.
b8	Automatic COOL/HEAT operation	This function allows the automatic change from the cooling to the heating mode for the units with the same refrigerant cycle.
b9	Fixing of indoor unit fan speed	Once the indoor unit fan speed has been selected, this function prevents it from being modified from the remote control.
bb	Cooling temperature compensation	This function is used to obtain longer cooling periods. When this function is enabled, Thermo-ON/OFF is controlled under lower temperature conditions than the setting temperature by the remote control switch.
C4	Drain pump in heating mode	This function is used to activate the drain pump in heating mode.
C5	Static pressure selection (RPI)	This function is used to change the static pressure of the RPI units from the remote control.
	Increasing fan speed	This function is used to change the indoor units fan speed installed in high ceilings.
C6	High speed at heating Thermo-OFF	This function is used to increase the fan speed when the thermostat reaches the set temperature in heating using function C5.
C7	Cancellation of the forced compressor operation for at least 3 minutes	This function is used to cancel the function b3 (Forced compressor operation for at least 3 minutes).
C8	Thermistor of remote control switch	This function determines the thermistor to control the air temperature.  NOTE <i>If THM-R2AE accessory is installed, these setting have different meaning.</i>
Cb	Selection of forced stoppage logic	This function determines the logic operation for the forced stoppage contacts.

Element	Optional function	Description
CF	Change of louver swing angle	This function adjusts the angle of the air outlet louver.
		
		
d1	Power supply ON/OFF 1	This function stores the unit settings in the event of a power cut. The unit is restarted when the power is re-established.
d3	Power supply ON/OFF 2	This function is used to restart the unit automatically after a power failure lasting more than 2 seconds. (3-minute compressor OFF guard applies).
d4	Prevention of discharge air temperature drop in cooling operation	This function changes the cooling operating conditions to avoid cold drafts.
d5	Prevention of discharge air temperature drop in heating operation	This function prevents a drop in the air temperature by decreasing the fan speed, regardless fan speed setting on the remote control.
d6	Room temperature control for energy saving	This function saves energy when the outdoor air temperature thermistor detects from the outdoor temperature that the air-conditioning load is low
E1	KPI: ventilation mode	This function is used to set the unit ventilation mode with energy / heat recovery.
(*1)	Econofresh: All fresh mode	This function allows to open the damper totally to activate the all fresh mode.
E2	KPI: Increasing air supply volume	This function is used to increase the air supply pressure in the room.
(*1)	Econofresh: Enthalpy sensor	This function selects the enthalpy sensor input.
E4	KPI: Pre-cooling / pre-heating period	This function delays the unit start-up with energy / heat recovery.
(*1)	Econofresh: gas sensor	This function selects the gas sensor input.
E6	Indoor fan operation time after cooling operation stoppage	This function prevents the condensation accumulation in the unit by keeping the fan running after it is switched off, as well as to prevent mildew or abnormal odours.
E8	Fan operation control at heating Thermo-OFF	This function reduces the indoor unit fan speed during heating thermo-OFF to prevent cold drafts.
Eb	Fan operation control at cooling Thermo-OFF	This function decreases the indoor unit fan speed during cooling thermo-OFF to reduce the spreading of odours and humidity.
EC	Forced Thermo-ON stoppage at cooling operation	This function is used to stop the operation by forced thermo-ON operation when cooling is complete.
EE	Automatic fan speed control	This function limits the unit operation by automatically controlling the fan speed when the room temperature is close to the set temperature.
F1	Automatic OFF timer setting	This function is used to set the automatic timer to switch off when the unit has been started by remote control. Do not set the functions "0C"."0F" when two remote control switches are used in the same remote control group. (Settings 0C, 0D, 0E and 0F are not available for PC-ART).
F2	Remote control Master-Slave setting	This function is used when two remote controls are installed in a system. One of them has to be set as "Master" and the other one as "Slave".

Element	Optional function	Description
F3 (*6)	Automatic reset of setting temperature	When this function is activated, once a defined time (F4) has passed after the last change in the setting temperature by using the remote control switch, the setting temperature returns to the selected cooling (F5) or heating (F6) temperature values. This function provides energy-saving.
F4	Automatic reset time	This function is used to set the automatic reset time with the temperature setting.
F5	Automatic reset temperature for cooling	This function is used to set the automatic temperature reset in FAN/COOL/DRY modes.
F6	Automatic reset temperature for heating	This function is used to set the automatic temperature reset in HEAT mode.
F7	Operation stoppage prevention by remote control switch operational error	This function is used to prevent the careless operational stoppage caused by remote control switch operational error.
F8	Lock function for operation mode selection	This function is used to prevent changes to the operating mode.
F9	Lock function for temperature setting	This function is used to prevent changes to the temperature setting.
FA	Lock function for fan speed selection	This function is used to prevent changes to the fan speed.
Fb	Lock function for swing louvre operation	This function is used to prevent changes to automatic louvre operations.
FC	Lower limit of setting temperature for cooling operation	This function is used to limit the lowest setting temperature for FAN/COOL/DRY modes.
Fd	Upper limit of setting temperature for heating operation	This function is used to limit the highest setting temperature for HEAT mode. (Settings 11 and 12 are not available for PC-ART).
FF	PC-ART: Lock function for timer	This function is used to lock timer activation.
	PC-ARF: Not available	—
H1	PC-ART: Maintenance alarms	This function is used to display or hide maintenance alarms.
	PC-ARF: Not available	—
H2	PC-ART: Automatic control indication	This function is used to display or hide the automatic control indication.
	PC-ARF: Indication of hot start	This function is used to display or hide the Hot start "HOT-ST" control indication.
H3	PC-ART: Operating mode change restriction	This function is used to configure restrictions to the operation mode.
	PC-ARF: Not available	—
H4	PC-ART: Operating modes for the ventilation unit with energy / heat recovery	This function allows to select the operation mode for KPI units. (Only available for KPI units)
	PC-ARF: Not available	—
H5	PC-ART: Central control available after forced stoppage	This function allows the central control after the forced stoppage of the unit.
	PC-ARF: Not available	—
J1	Temperature indication	This function is used to display the sensor temperature on the remote control switch. This temperature depends on the setting value of optional function (C8) and on the use of remote sensor (THM4) (Displayed on PC-ARF only)

Element	Optional function	Description
J3	Run indicator colour	This function allows to select the colour of run indicator between green and red. (Displayed on PC-ARF only)
J8	Eco-operation	When this function is activated, the setting temperature returns to the selected cooling (F5) or heating (F6) temperature values by restarting the operation using the RUN/STOP button on the remote control switch. This function provides energy-saving. (Displayed on PC-ARF only)
K5	Human sensor detection level	This function allows to modify the conditions for the detection of human activity. (Displayed on PC-ARF only)

(*1): E1 to E4: Setting for the total heat exchanger KPI and Econofresh.

(*2): This function is for air panel with motion sensor. If the air panel don't have available the motion sensor, setting condition is displayed as "--".



NOTE

The optional function settings are different depending on the indoor or RASC units. Check that the unit has or not the optional setting.

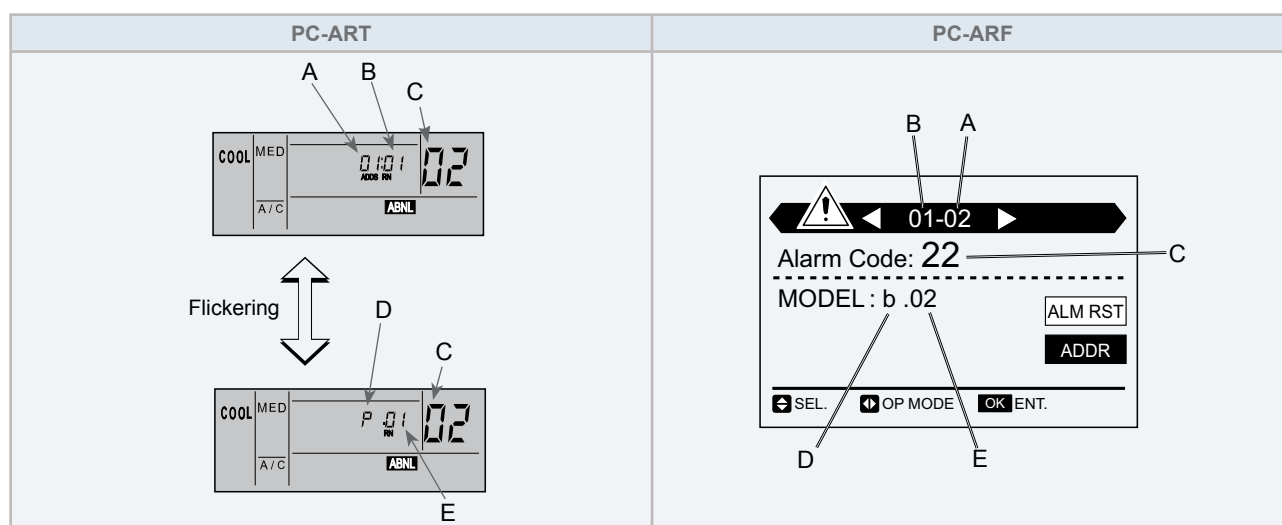
12. Troubleshooting

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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.

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

- E: If there are various indoor units connected, the above mentioned information is shown for each one of them.

◆ 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.

12.2 Alarm codes

Code number	Category	Type of abnormality	Main cause
1	Indoor unit	Activation of protection device (float switch)	Failure of fan motor, drain discharge, PCB, relay, float switch activated (High Water Level in Drain Pan, Abnormality of Drain Pipe, Float Switch or Drain Pan).
2	Protection device	Activation of protection device	Activation of the float switch (FS). Activation of the internal thermostat protection of the motor (ITO). Activation of the high pressure switch (PSH). Variable frequency driver failure (VFD).
3	Transmission	Abnormal transmission between outdoor and indoor units	Incorrect wiring. Loose terminals, Failure of PCB. Tripping of fuse. Power supply OFF.
4		Abnormal transmission between inverter PCB and RASC unit PCB	Transmission failure between inverter PCBs. (Loose Connector, Wire Breaking, Blowout of Fuse).
5	Power supply	Reception of abnormal operation code for detection of power source phase	Power source with abnormal wave pattern. Main power supply phase is reversely connected or one phase is not connected.
6	Voltage	Excessively low voltage or excessively high voltage for the inverter	Voltage drop in power supply. Incorrect wiring or insufficient capacity of power supply wiring.
7	Cycle	Decrease in discharge gas superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnected Connector).
8		Excessively high discharge gas temperature at the top of compressor	Insufficient refrigerant charge, refrigerant leakage. Expansion valve closed or clogged.
11	Indoor unit sensor	Air inlet thermistor	Failure of thermistor, sensor, connection. (Incorrect Wiring, Disconnected Wiring, Wire Breaking, Short Circuit).
12		Air outlet thermistor	
13		Freeze protection thermistor	
14		Gas piping thermistor	
15	Econofresh	Thermistor of fresh outdoor air	
16	Indoor unit sensor	Remote thermistor	
17		Thermistor of remote control switch	
19	Fan motor	Activation of the protection device for the indoor fan motor	Failure of fan motor.
20	RASC unit sensor	Thermistor for discharge gas temperature (THM9)	Incorrect wiring, disconnected wiring, broken cable, short circuit.
21		High pressure sensor	
22		Thermistor for outdoor ambient temperature (THM7)	
24		Thermistor for evaporating temperature (THM8)	Incorrect Wiring, Disconnected Wiring, Wire Breaking, Short Circuit, Fan Motor Locking at Heating Operation.
31	System	Incorrect capacity setting or combined capacity between outdoor and indoor units	Incorrect Capacity Code Setting, Excessive or Insufficient Indoor Unit Total Capacity Code.
32		Incorrect setting signal from another Indoor Unit in same system (RPK only)	Abnormality of another Indoor Unit in the same Refrigerant Cycle (Failure of Power Source, Abnormality of PCB).
35		Incorrect indoor unit number setting	Duplication of indoor unit number, number of indoor units over specifications.
36		Incorrect of Indoor Unit Combination.	"Indoor Unit is Designed for Other Refrigerant (R22 or R407C)".
38		Abnormality of picking up circuit for protection (RASC unit)	Failure of indoor unit PCB, incorrect wiring, connection to PCB in indoor unit.

Code number	Category	Type of abnormality	Main cause
45	Protection device	Activation of the safety device from excessively high discharge pressure	Overload (obstruction of HEX, short circuit) mixture of inert gas, Excessive Refrigerant.
47		Activation of the safety device from excessively low suction pressure (protection from vacuum operation)	Shortage or leakage of refrigerant, piping clogging, expansion valve close-locked, fan motor locked.
48		Activation of overcurrent protection	Overload, overcurrent. Failure of Inverter PCB, heat exchanger clogged, locked compressor. EVI/EVO failure.
51	Inverter	Abnormal operation of the current sensor	Incorrect wiring of current sensor. Failure of control PCB or Inverter PCB.
53		Inverter fin temperature increase	Inverter module (IPM, DIP-IPM) and Inverter PCB abnormality. Failure of compressor, clogging of heat exchanger.
54		Abnormality of inverter fin temperature	Heat Exchanger Clogging. Fan Motor Failure.
55		Abnormality of inverter module	Failure of DIP-IPM, IPM or Inverter PCB.
EE	Compressor	Compressor protection	"Compressor failure. This alarm code appears when the following alarms 02, 07, 08, 45, 47 occur three times within 6 hours."
b0	Indoor unit model setting	Incorrect setting of unit model	No setting of unit capacity or incorrect setting of unit capacity.
b1	Number setting	Incorrect setting address or refrigerant cycle	Over 64 indoor units setting by number or indoor unit address.
b5		Incorrect setting of indoor unit number for H-LINK type	The number of indoor units connected to the H-LINK II of one system is 17 or higher.

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



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