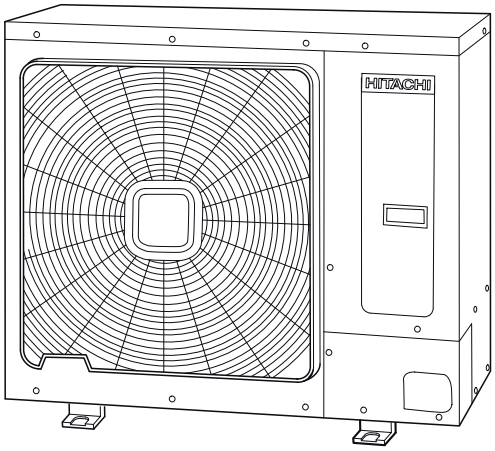
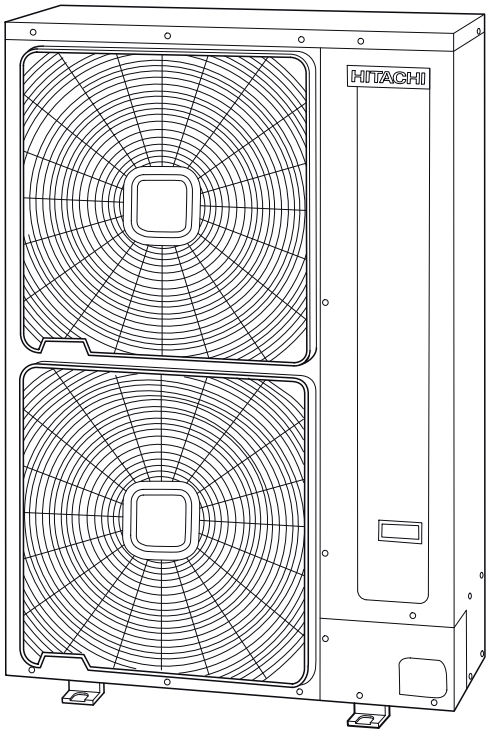
HITACHI

UTOPIA IVX PREMIUM/STANDARD SERIES
(X)H(V)N(P/C)(1)(E)





Technical Catalogue

RAS-(2-6)HVNP1(E)
RAS-(4-12)HNP(1)(E)

RAS-(3-6)HVNC1(E)
RAS-(4-12)HNC(1)(E)

RAS-(3-6)XHVNP1E
RAS-(4-10)XHNP(1)E

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1. General Information

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1.1 General information

1.1.1 General notes

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

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1.1.2 Introduction

HITACHI UTOPIA series is an outdoor unit series designed with the goal to cover the requirements of the split and multisplit systems, for installations where from one indoor unit (single system) to up to 8 indoor units, are connected to the same IVX outdoor unit (depending on model).

New UTOPIA series consists in two different outdoor unit series: IVX Premium and IVX Standard, which compliant with the Seasonal Efficiency driven by the EU's Energy Product Directive (Eco Design Directive (EuP Lot 10)) and Seasonal Efficiency design concept in order to meet the European Directive on seasonal efficiency (Lot 6/21 coming in 2015) (depending on the model). The Seasonal Energy Efficiency Ratio (SEER) in cooling and the Seasonal Coefficient of Performance (SCOP) in heating, show an approach values to the real energy consumption.

UTOPIA series incorporate the HITACHI inverter technology, which makes possible to adapt automatically and without the user operation the capacity of the unit, so the power input, to the real demand of the installation, increasing the system efficiency to unattainable levels with other technologies. All UTOPIA units are equipped with a heat pump, resulting in an air conditioning system valid for the whole year, in which the installation of additional and specific systems a not necessary.

IVX Premium

Nominal capacity from 5 kW to 30 kW (cooling mode). Connectable indoor units up to 8 units (depending on model) and total combination power from 50% up to 120%, outdoor units from 3 to 12HP, or 90% up to 110% for 2 and 2.5 HP outdoor units.

IVX Standard

Nominal capacity from 7.1 kW to 30 kW (cooling mode). Connectable indoor units up to 4 units (2 units for 3HP model) and total combination power from 90% up to 115%, outdoor units from 4 to 12HP, or 90% up to 110% for 3HP outdoor units.

Specific IVX Premium for DX-Interface

For the DX-Interface (EXV-0E2) enhanced functions, HITACHI offers the special series: IVX Premium RAS-XH(V)NP(1) E. This series have a specific control software for duct or air handling unit systems where a DX-Interface series 2 is combined. These outdoor units range can only be used in combination with DX-Interface series 2 and duct or air handling unit systems.

Indoor Units

One of the main merits of HITACHI units range is the combinability and flexibility of its indoor units SYSTEM FREE. This outstanding technology makes possible to use the same indoor units with both UTOPIA and SET FREE outdoor units, making easier the design, installation and control of the air conditioning installations.

1.2 Safety

1.2.1 Applied symbols

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

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

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

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

⚠ DANGER

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

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

⚠ CAUTION

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

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

NOTE

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

1.2.2 Norms and Regulations

Following Regulation EU No. 517/2014 on Certain Fluorinated Greenhouse gases, it is mandatory to fill in the label attached to the unit with the total amount of refrigerant charged on the installation.

Do not vent R410A into the atmosphere: R410A are fluorinated greenhouse gases covered by the Kyoto protocol global warming potential (GWP) R410A: = 2088.

Tn of CO2 equivalent of fluorinated greenhouse gases contained is calculated by indicated GWP * Total Charge (in kg) indicated in the product label and divided by 1000.

Appropriate refrigerant

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

Consequences of charging non-specified refrigerant

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

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

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

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

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

1.3 Product guide

1.3.1 Classification of outdoor unit models

◆ IVX series

Unit type (Outdoor unit): RAS									
	Position-separating hyphen (fixed)								
		Capacity (HP): 2, 2.5, 3, 4, 5, 6, 8, 10, 12							
			X = specific combinability with the DX-Interface series 2						
				H = Heat pump					
					V = Single phase unit (1~ 230V 50Hz)				
					- = Three phase unit (3N~ 400V 50Hz)				
						N = R410A refrigerant			
							P: Premium series		
							C: Standard series		
								- = series 0	
								1 = series 1	
									E = Made in Europe
									- = Made in Japan
RAS	–	XX	(X)	H	(X)	N	X	(X)	(X)

1.3.2 Classification of indoor unit models

Unit type (indoor unit): RCI, RCIM, RCD, RPC, RPI, RPIM, RPK, RPF, RPFI										
	Position-separating hyphen (fixed)									
		Capacity (HP): 0.8, 1.0, 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-(0.8-1.5) only)					
						2/3/4 = series				
							E = Made in Europe			
							M = Made in Malaysia			
							- = Made in Japan			
								i = Version up (RCI for P-N23NA panel only)		
								k = Version up RCI for P-AP160NA(1/E) panel only		
									(-DU) = Drain Up (RPIM only)	
XXX	–	X.X	FS	N	(H)	X	(X)	(x)	(-DU)	

1.3.3 Product line-up: Outdoor units

◆ IVX Premium

1~ 230V 50Hz						3N~ 400V 50Hz			
									
Unit	Code	Unit	Code	Unit	Code	Unit	Code	Unit	Code
RAS-2HVNP1	60288615								
RAS-2.5HVNP1	60288616								
		RAS-3HVNP1E	7E304018						
				RAS-4HVNP1E	7E304020	RAS-4HNP1E	7E304120		
				RAS-5HVNP1E	7E304021	RAS-5HNP1E	7E304121		
				RAS-6HVNP1E	7E304022	RAS-6HNP1E	7E304122		
						RAS-8HNPE	7E310110		
						RAS-10HNPE	7E310111		
								RAS-12HNP	60288563

◆ IVX Standard

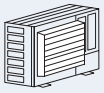
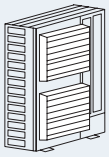
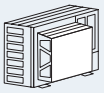
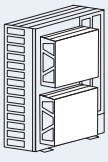
1~ 230V 50Hz				3N~ 400V 50Hz					
									
Unit	Code	Unit	Code	Unit	Code	Unit	Code	Unit	Code
RAS-3HVNC1	60288617								
		RAS-4HVNC1E	7E305034	RAS-4HNC1E	7E305134				
		RAS-5HVNC1E	7E305035	RAS-5HNC1E	7E305135				
		RAS-6HVNC1E	7E305036	RAS-6HNC1E	7E305136				
						RAS-8HNCE	7E311110		
						RAS-10HNCE	7E311111		
								RAS-12HNC	60288572

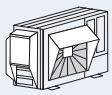
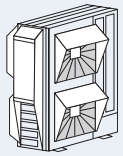
◆ Specific IVX Premium for DX-Interface

1~ 230V 50Hz				3N~ 400V 50Hz	
					
Unit	Code	Unit	Code	Unit	Code
RAS-3XHVNP1E	7E304218				
		RAS-4XHVNP1E	7E304220	RAS-4XHNP1E	7E304320
		RAS-5XHVNP1E	7E304221	RAS-5XHNP1E	7E304321
		RAS-6XHVNP1E	7E304222	RAS-6XHNP1E	7E304322
				RAS-8XHNPE	7E310210
				RAS-10XHNPE	7E310211

For further information about the combinability of the specific outdoor units with the DX-Interface series 2 (EXV-E2) please refer to the DX-Interface information in the Indoor Units Technical Catalogue.

1.3.4 Outdoor unit accessory code list

Name	OU Ref.	Description	Code	Figure
DBS-26	a	Drain discharge connection	60299192	
AG-264	b	Air flow guide	60209100	
AG-335A	d, c, f, g	Air flow guide	60291432	
WSP-264	b	Wind guard	60291831	
WSP-160F	f	Wind guard	60291753	
WSP-335A	d, c, g		60291432	

Snow protection hood					
Name	OU Ref.	Description		Code	Figure
ASG-NP80F	b	Air outlet	(Zinc plate)	60291377	
ASG-NP335F	c, f, g		(Zinc plate)	60291433	
ASG-NP335FS2	c, f, g		(Stainless plate)	60291519	
ASG-NP335F1	d		(Steel plate)	60291703	
ASG-NP335FS3	d		(Stainless plate)	60291704	
ASG-SP11FB	d		(Steel plate)	60299392	
ASG-SP11FBS	d		(Stainless plate)	60299398	
ASG-NP56B	b	Air inlet of rear side	(Zinc plate)	60291458	
ASG-NP63BS2	b		(Stainless plate)	60291526	
ASG-NP80B	c		(Zinc plate)	60291773	
ASG-NP160BS2	c		(Stainless plate)	60291774	
ASG-NP280BS2	f		(Stainless plate)	60291778	
ASG-NP335B	g		(Zinc plate)	60291434	
ASG-NP335BS2	g		(Stainless plate)	60291520	
ASG-SP10BE	d		(Steel plate)	90291924	
ASG-SP10BES	d		(Stainless plate)	90291926	
ASG-NP56L	b	Air inlet of left side	(Zinc plate)	60291459	
ASG-NP63LS2	b		(Stainless plate)	60291527	
ASG-NP80L	c		(Zinc plate)	60291775	
ASG-NP160LS2	c		(Stainless plate)	60291776	
ASG-NP280LS2	f		(Stainless plate)	60291780	
ASG-NP335L	g		(Zinc plate)	60291435	
ASG-NP335LS2	g		(Stainless plate)	60291521	
ASG-SP10LE	d		(Steel plate)	60291925	
ASG-SP10LES	d		(Stainless plate)	60291927	

Name	Description	Code	Figure
TRF-NP63S	Renewal kit	60291826	
TRF-NP160S		60291827	
TRF-NP160U		60291828	
TRF-NP280U		60291829	
TRF-NP335U1		60291830	

◆ OU Reference

Model	Ref.
All models	a
RAS-(2.0/2.5)HVNP1 / RAS-3HVNC1	b
RAS--3HVNP1E	c
RAS-(4-6)HVNC1E	d
RAS-(4-6)H(V)NPE / RAS-(8-10)HN(P/C)E	f
RAS-12HN(P/C)	g

NOTE

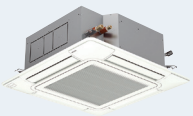
HITACHI has a range of accessories and remote control systems that can be used with the UTOPIA outdoor units. Please, refer to the Controls Technical Catalogue.

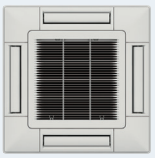
1.3.5 Product line-up: indoor units

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 the outdoor unit series.*
- *Check the exact classification for each unit (model, type, power and series) in "1.3.1 Classification of indoor unit models".*

◆ RCI and RCIM indoor units

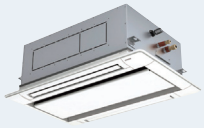
RCI						RCIM	
❄ ☀							
							
4-way cassette						4-way cassette (compact)	
Unit	Code	Unit	Code	Unit	Code	Unit	Code
						RCIM-0.8FSN4	60278216
RCI-1.0FSN3Ei	7E403014	RCI-1.0FSN3Ek	7E404001	RCI-1.0FSN3	60278119	RCIM-1.0FSN4	60278217
RCI-1.5FSN3Ei	7E403015	RCI-1.5FSN3Ek	7E404002	RCI-1.5FSN3	60278120	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		

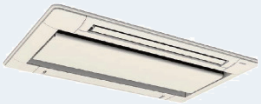
Panels					
RCI				RCIM	
					
P-N23NA	70531000	P-AP160NA1	60297215	P-AP56NAM (without Motion Sensor)	60297297
		P-AP160NAE (With motion sensor)	60297217		

NOTE

- *The RCI and RCIM models must be used in combination with the panels indicated above.*
- *(**): 1 indoor unit combinations with IVX Premium / Standard series not allowed.*

◆ RCD and RPC indoor units

RCD				RPC			
❄ ☀							
							
2-way cassette				Ceiling type			
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RCD-0.8FSN3 (*)	60278242						
RCD-1.0FSN3 (*)	60278243						
RCD-1.5FSN3 (*)	60278244					RPC-1.5FSN3	60278164
RCD-2.0FSN3 (*)	60278245					RPC-2.0FSN3	60278165
RCD-2.5FSN3 (*)	60278246					RPC-2.5FSN3	60278166
RCD-3.0FSN3 (*)	60278247			RPC-3.0FSN3E	7E443005	RPC-3.0FSN3	60278167
		RCD-4.0FSN3 (*)	60278248	RPC-4.0FSN3E	7E443007	RPC-4.0FSN3	60278168
		RCD-5.0FSN3 (*)	60278249	RPC-5.0FSN3E	7E443008	RPC-5.0FSN3	60278169
		RCD-6.0FSN3 (*)	60278250	RPC-6.0FSN3E	7E443009	RPC-6.0FSN3	60278170

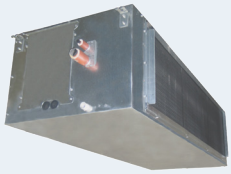
Panels			
RCD			
			
P-AP90DNA	60297300	P-AP160DNA	60297301

NOTE

- *The RCD models must be used in combination with the panels indicated above.*
- *(*): 1 indoor unit combinations with IVX Premium / Standard series not allowed.*

◆ RPI and RPIM indoor units

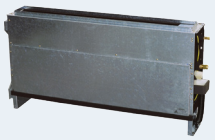
RPI				RPIM	
❄ ☀					
					
Indoor ducted unit				Indoor ducted unit (compact)	
Unit	Code	Unit	Code	Unit	Code
RPI-0.8FSN4E	7E424013			RPIM-0.8FSN4E	7E430013
				RPIM-0.8FSN4E -DU	7E431013
RPI-1.0FSN4E	7E424014			RPIM-1.0FSN4E	7E430014
				RPIM-1.0FSN4E -DU	7E431014
RPI-1.5FSN4E	7E424015			RPIM-1.5FSN4E	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			
❄ ☀			
			
Indoor ducted unit			
Unit	Code	Unit	Code
RPI-8.0FSN3E	7E424010 (**)	RPI-8.0FSN3E-f	7E424410 (**)
RPI-10.0FSN3E	7E424011 (**)	RPI-10.0FSN3E-f	7E424411 (**)

NOTE

- *(**): In combination with UTOPIA IVX Premium/Standard series: 1 indoor unit system only.*

◆ RPK, RPF and RPFI indoor units

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				
RPK-1.0FSNH3M	60278155	RPF-1.0FSN2E	7E450001	RPFI-1.0FSN2E	7E460001
RPK-1.5FSN3M	60278148				
RPK-1.5FSNH3M	60278156	RPF-1.5FSN2E	7E450002	RPFI-1.5FSN2E	7E460002
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				

Expansion valve kit [1]	
EV-1.5N1[1]	60921791

NOTE

- *(**) 1 indoor unit combinations with IVX Premium / Standard series not allowed.*
- *[1] For RPK-(0.6-1.5)FSNH3M models only.*

1.3.6 Product line-up: KPI energy recovery unit

KPI			
			
Energy recovery		Active (Energy Recovery+DX section)	
Unit	Code	Unit	Code
KPI-252E4E	70603000		
KPI-502E4E	70603001	KPI-502X4E	70603201
KPI-802E4E	70603002	KPI-802X4E	70603202
KPI-1002E4E	70603003	KPI-1002X4E	70603203
KPI-1502E4E	70603004		
KPI-2002E4E	70603005		

1.3.7 Product line-up: DX-Interface

DX-Interface		
 Control box  Expansion valve box	Unit	Code
	EXV-2.0E2	7E611000
	EXV-2.5E2	7E611001
	EXV-3.0E2	7E611002
	EXV-4.0E2	7E611003
	EXV-5.0E2	7E611004
	EXV-6.0E2	7E611005
	EXV-8.0E2	7E611006
	EXV-10.0E2	7E611007

1.3.8 Product line-up: Econofresh

Econofresh	
	
Unit	Code
EF-456NE	7E560000

NOTE

The EF-456NE unit can only be installed in combination with the following units (Sales from April 2014):

- *RPI-4.0FSN4E (7E424020)*
- *RPI-5.0FSN4E (7E424021)*
- *RPI-6.0FSN4E (7E424022)*

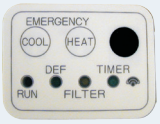
1.3.9 Remote control systems

◆ Individual remote controls

Name	Description	Code	Figure
PC-ARFPE	Remote control with timer	70510002	
PC-ARH	Simplified remote control	60291486	
PC-LH3A	Wireless remote control	60291056	
PC-LH3B		60291770	
PC-AWR (*)		60291056	

(*) Date of availability will be confirmed

◆ Receiver kit for combination with wireless remote control switch

Receiver kit Name	Indoor Unit application	Compatible Wireless remote control	Code	Figure
PC-ALH	RCI-FSN3Ei	PC-LH3A	60291464	on the panel 
PC-ALHN			60291627	
PC-ALH3	RCI-FSN3 and RCI-FSN3Ek	PC-LH3B / PC-AWR	60291767	
PC-ALHC1	RCIM-FSN4	PC-LH3B / PC-AWR	60292003	
PC-ALHD1	RCD-FSN3	PC-LH3B / PC-AWR	60292053	
PC-ALHP1	RPC-FSN3	PC-LH3B / PC-AWR	60291823	
PC-ALHZ	RCI-FSN3Ei, RPI-FSN(3/4)(P)E, RPIM-FSN4E(-DU), RPF(I)-FSN2E	PC-LH3A	60291473	on the wall 
PC-ALHZF	RCI-FSN3, RCI-FSN3Ek, RCIM-FSN4, RCD-FSN3, RPK-FSN(H)3M and RPC-FSN3	PC-LH3B / PC-AWR	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	

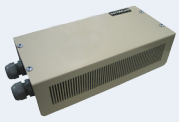
◆ Building air conditioning controls

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	

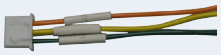
◆ Gateways for building management systems (BMS)

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.	7E5121000	
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	
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 Configuration Kit	Net configuration kit for HC-A(8/64)MB and HC-A64NET	7E512306	

◆ Other devices compatible with HITACHI Air Conditioning systems

In addition to all the aforementioned HITACHI controls, there are some non-HITACHI devices for combination with HITACHI Air Conditioning systems. These are the following:

- HITACHI-AIRZONE gateway (HTI11001): Applicable to HITACHI RPI(M) units providing compatibility with the AIRZONE systems, zone-based climate-control systems.
- Power meter: Siemens power meter for CSNET WEB and CSNET Manager.
- MODBUS-BACNET gateway: Solution offered by Intesis Software company which transfers MODBUS data into BACNET data.
- MODBUS-FIDELIO gateway: Solution offered by Intesis Software company which transfers MODBUS data into FIDELIO data

Please refer to the Technical Catalogue of Controllers for Package for more information.

2. Features and benefits

Index

2.1 Features and benefits

◆ Improvements of UTOPIA IVX Series 1

UTOPIA IVX Premium and Standard series 1 provides the following improvements to air conditioning installations:

1 Improvement of Seasonal Efficiency.

2 Improvement of Heating Capacity at low ambient temperature, in 5 and 6HP IVX Standard series 1 models.

2.1.1 Improvement of Seasonal Efficiency

The entire IVX series 1 has been optimised in order to achieve greater Seasonal Efficiency at partial loads (no variation at full load).

NOTE

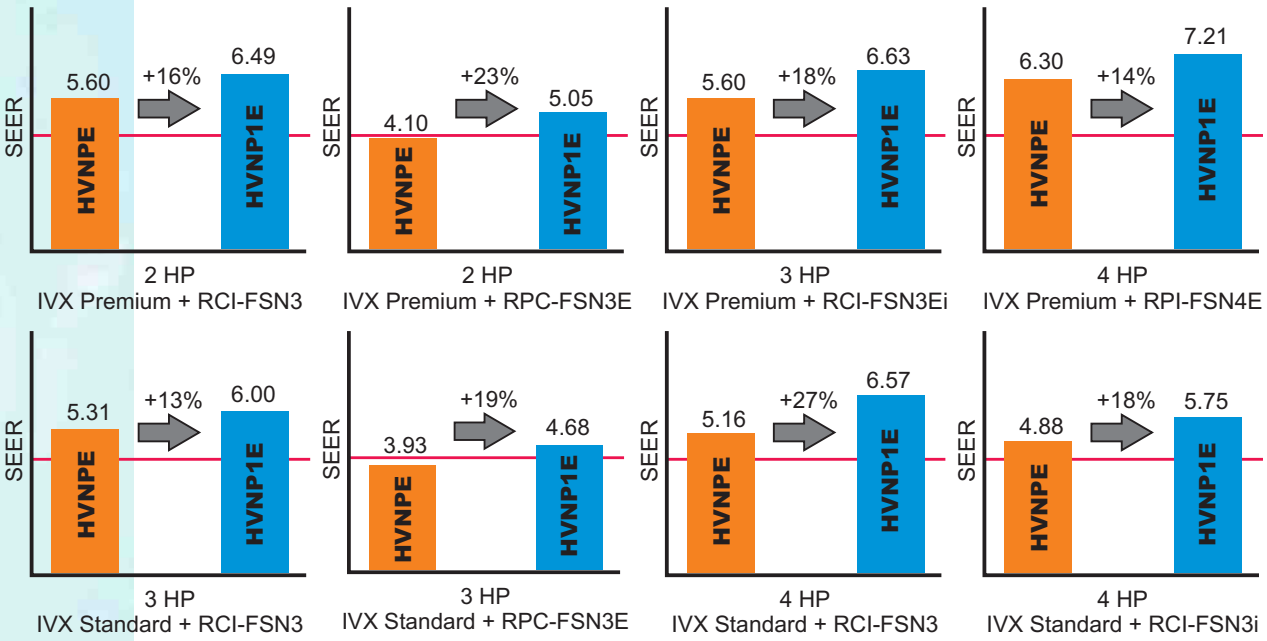
New series 1

Current series 0

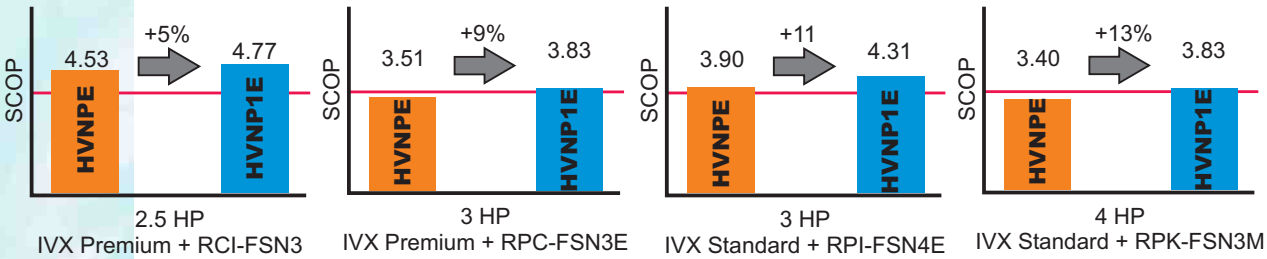
Tier

Examples:

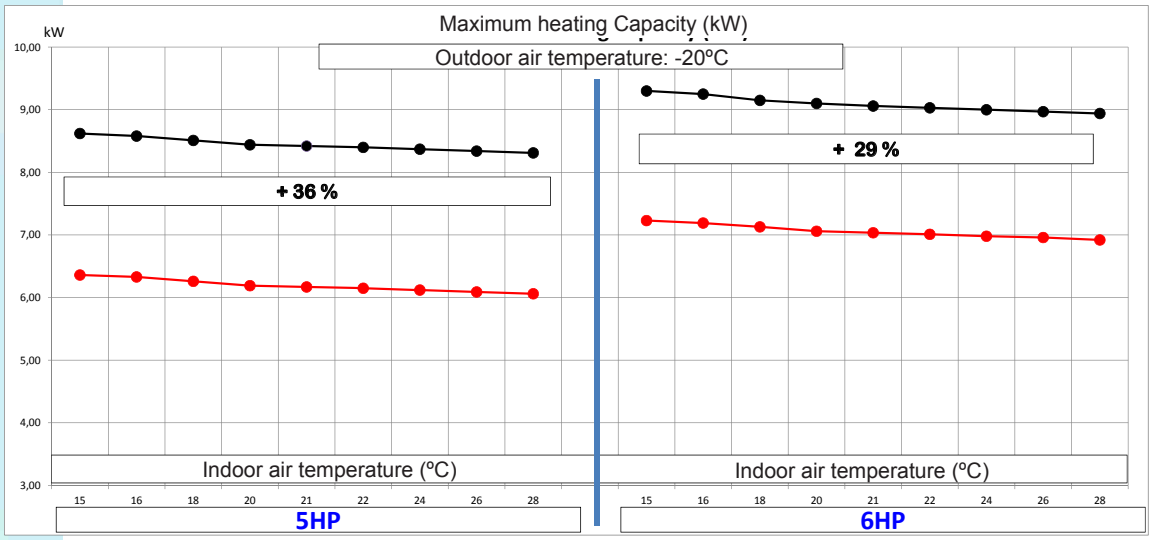
SEER



SCOP



2.1.2 Improved Heating capacity at low ambient temperature (5 and 6 HP IVX Standard series 1)



New series 1

Current series 0

◆ **Increased cabinet size for 4, 5 and 6 HP IVX Standard series 1**

- Increased heat exchanger area.
- New design
- New fan motor
- New compressors

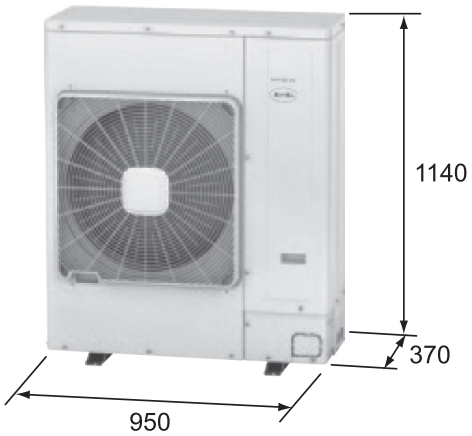
→

- Better Seasonal Efficiency
- Improved Heating Capacity at low ambient temperature

Cabinet sizes

Unit: (mm)

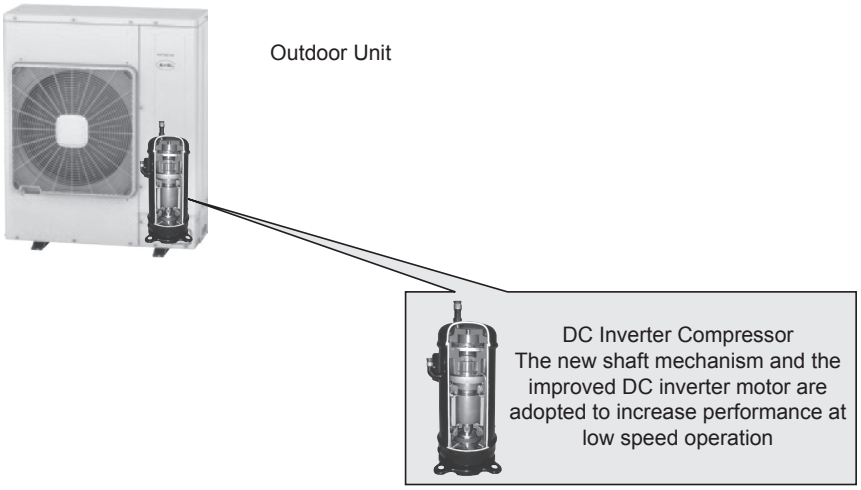
Net Weight: 89kg



◆ Improved compressor

• Improvement of intermediate capacity for the compressors	• High energy-saving

High energy-saving is realized by the improvement of intermediate capacity for the new compressors.



2.1.3 Indoor Units adopting Motion Sensor function

The air conditioning capacity is regulated automatically depending on the situation and detecting the amount of human activity through the motion sensor located on the corner of the air panel.

Energy-saving can be improved even more with the individual operation function. In addition, the operation can be stopped automatically if absence continues for more than 30 minutes.

The motion sensor allows maintaining the comfortable indoor environment and suppressing the unnecessary operation.

NOTE

- *The default setting is “30 minutes”. However, the setting is changeable.*
- *The default setting is “Running Operation”. However, “Automatic Stop” can be selected by setting from the remote control switch.*

The motion sensor control adjusts automatically the following items depending on the situation:

- Setting temperature: is adjusted by 1ºC or 2ºC for energy saving
- Air flow volume: is adjusted to one volume lower or to “Slo” (except during the dry operation).
- Air flow direction: is adjusted to horizontal.

Look the the indoor units that can adopt the Motion Sensor function in the Technical Catalogue Indoor units & complementary systems.

The energy-saving is improved by combining the motion sensor function and the individual operating function.

2.2 Eco-Desing 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 enlarged the applications covered. Initially the scope of Eco-Design was products using energy (E.u.P.). From now on, the scope of Eco-Design will be all products related to energy reduction (ex: air conditioning, windows…) and is called ErP (Energy related Products).

2.2.1 Eco-Design

The Eco-Design of Energy-related products (ErP) Directive provides consistent EU-wide rules for improving the environmental performance of energy related products (ErP) by requiring integration of eco considerations at the outset of product design – ensuring reduced energy consumption to benefit both businesses and consumers. It implies a consideration of the environmental aspect of any products or services developed. This approach consists of qualifying 'CO2 emission' and 'energy consumption' during the whole life of the product (from design to the end life, including transport).

Eco-Design analyses highlighted the fact that the major environmental impact is related to the "usage period" of the above products. For this reason, ErP fixes minimum performance levels to allow products coming in the European market. Simultaneously, ErP fixes technical communication contents to end user through a label (data on performance, sound level) in order to help them to make their choice.

ErP is applied to all air conditioning and heating equipments, whatever the type (air/air, air/water, water/water, boilers…), the capacity, the usage (heating, cooling, SHW) is, through different "Lots" and at different application frameworks. The first one, coming into application on 1rst January 2013, was "Lot 10". It does concern all air conditioning systems (air/air), with a capacity lower than 12kw, operating in heating and/or cooling mode.

These regulations include air conditioning products, which are a key source of energy consumption in buildings, and require all manufacturers to calculate energy usage in a more realistic way, moving from nominal to seasonal, creating a more accurate calculation and representation of products in the market.

Key issues in terms of compliance are:

(a) Fixing a minimum level of performance in heating and cooling mode

(b) Fixing a maximum sound power level for indoor and outdoor units

(c) Fixing communication of above characteristics to end users through labelling

HITACHI has always engineered the most environmentally-friendly heating and cooling products from its factories, and is proud to launch a complete range of fully ErP-compliant air conditioning products. Where product ranges and models fall outside the scope of the ErP directive (<12kW), there are a series of enhancements for RAC; in particular IVX Premium and IVX Standard Series, which already are market leaders in Japan's Annual Performance Factor (APF) for seasonal efficiency.

2.2.2 Seasonal Efficiency

Seasonal Efficiency has been developed in the Eco Design Directive (EU's Energy Related Products Directive), which specifies the minimum requirements that manufacturers must integrate into their energy using products.

Target relies on a seasonal performance of the equipment called SCOP (heating mode) and SEER (cooling mode) for an average European climate. This performance value will replace historical nominal values of COP and EER.

The new calculation uses several rating temperatures for cooling and heating, and integrates partial capacity operation in the calculation. Since most systems operate most of the time under a partial load, the new methodology gives a better indication of expected real-life performance. The new seasonal efficiency calculation will also take into consideration the power consumed by devices in auxiliary modes like standby mode.

Seasonal Energy Efficiency Ratio (SEER) in cooling and the **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 20ºC, 25ºC, 30ºC and 35ºC; in heating mode: an outside temperature of +12ºC, +7ºC, +2ºC, and -7ºC.
- Different compressor speeds (full load and partial load), auxiliary consumption (crankcase heaters, thermostat off mode, OFF mode…).
- Conditions of temperature (number of hours per outdoor temperature) for an identified climate (average climate for ErP compliance)
- Building heat load (called Pdesign)

HITACHI, in compliance with the Eco Design Directive, has developed the new outdoor units: UTOPIA IVX Premium and IVX Standard series, whose high efficiency level (including SEER and SCOP values) is properly informed to our customers to allow for an easy selection.

IVX Premium and IVX Standard Series offer high seasonal efficiencies, as well as complete flexibility, with all outdoor units from both ranges being fully compatible with the System Free range of indoor units. HITACHI's IVX technology has all the benefits of VRF, including individual control of each indoor unit with an increased number of indoor unit combinations in addition to delivering excellent part-load efficiency.

With cooling capacities and heating capacities from 2HP to 12HP, a maximum of 8 indoor units are connectable to a single outdoor unit, with individual control and efficiencies achieved as high as A++/A+ (depending on model/ combinations).

2.2.3 Energy classes and energy label (Lot 10)

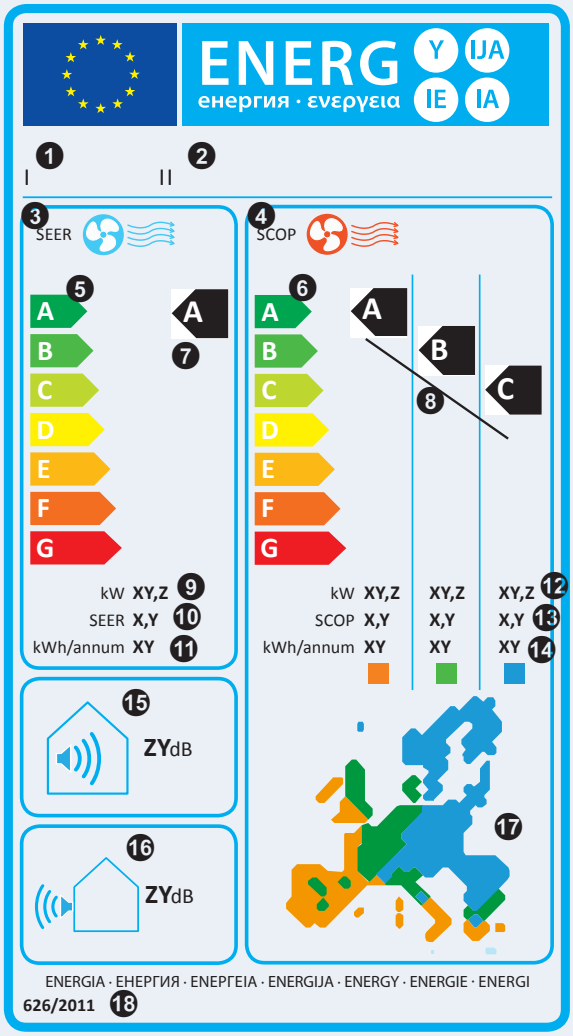
The **energy efficiency** classes from A+++ to D are introduced based on SCOP and SEER values: The scale for energy labelling is:

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

The **Energy label** is the regulation compliant way of displaying product efficiency and sound level to any point of sales. This label displays 3 European climates: average climate (green), cold climate (blue), hot climate (orange). Regulation requirement is to display any information related to performances on average climate.

Climate used on ErP	Temperature used for product selection
Average	-10°C
Cold	-22°C
Hot	+2

Energy efficiency label for air conditioners up to 12 kW is supplied together with HITACHI IVX Premium and IVX Standard units in order to facilitate our customers their decision when purchasing. Below there is a description of each information that will be found in the energy label.



❶	Manufacturer
❷	Unit name
❸	SEER (Seasonal Energy Efficiency) value in cooling mode
❹	SCOP (Seasonal Coefficient of performance) value in heating mode
❺	Energy efficiency classes SEER in cooling mode
❻	Energy efficiency classes SCOP in heating mode
❼	Energy efficiency class in cooling of the unit
❽	Energy efficiency class in heating of the unit (the indication for the unit model is made for all three climate zones)
❾	Nominal capacity in cooling mode
❿	SEER value
⓫	Annual power consumption for cooling
⓬	Nominal capacity in the heating mode
⓭	SCOP value
⓮	Annual power consumption for heating
⓯	Operating noise for indoors (1)
⓰	Operating noise for outdoors (1)
⓱	Climate zones: Warm zone (Athens) (Orange) Moderate zone (Strasbourg) (Green) Cold zone (Helsinki) (Blue)
⓲	Time reference

(1) Maximally admissible			
Cooling capacity ≤ 6 kW		Cooling capacity > 6 kW ≤ 12 kW	
Indoor unit	Outdoor unit	Indoor unit	Outdoor unit
60 dB(A)	65 dB(A)	65 dB(A)	70 dB(A)

2.3 General features and benefits of the UTOPIA IVX Premium/Standard series 1

IVX Premium	IVX Standard
Connected capacity ratio of Indoor Units from 50 % up to 120% of Outdoor Unit capacity (depending on the models). Connection of up to 8 Indoor Units (depending on the models). Compact sizes in 3HP. Compliance with new Eco Design Directive (EuP Lot 10) and Seasonal Efficiency design concept in order to meet the European Directive on seasonal efficiency (Lot 6/21 coming in 2015) (depending on the models) Individual operation of Indoor Units (factory setting). Minimum connectable capacity of Indoor Unit as low as 0.8 HP. Optimization in energy performance, achieved with high efficiency compressor and new cycle design. Specific IVX Premium for DX-Interface (EXV-E2) for enhanced control of system capacity and faster response. Compatibility with the piping of current installations where R22 or R407C are used (see Technical Catalogue)	Connected capacity ratio of Indoor Units from 90 % up to 115%. Connection of up to 4 Indoor Units (depending on the models). Compliance with new Eco Design Directive (EuP Lot 10) and Seasonal Efficiency design concept in order to meet the European Directive on seasonal efficiency (Lot 6/21 coming in 2015) (depending on the models) Individual operation of Indoor Units (factory setting). Minimum connectable capacity of Indoor Unit as low as 0.8 HP (depending on the models). Improvement in energy performance, achieved with new compressor and new cycle design. Compatibility with the piping of current installations where R22 or R407C are used.

2.3.1 Main features

IVX Premium RAS-(2-12)H(V)NP(1)(E) and Standard RAS-(3-12)H(V)NC(1)(E) series allow:

◆ Comfortability and installability

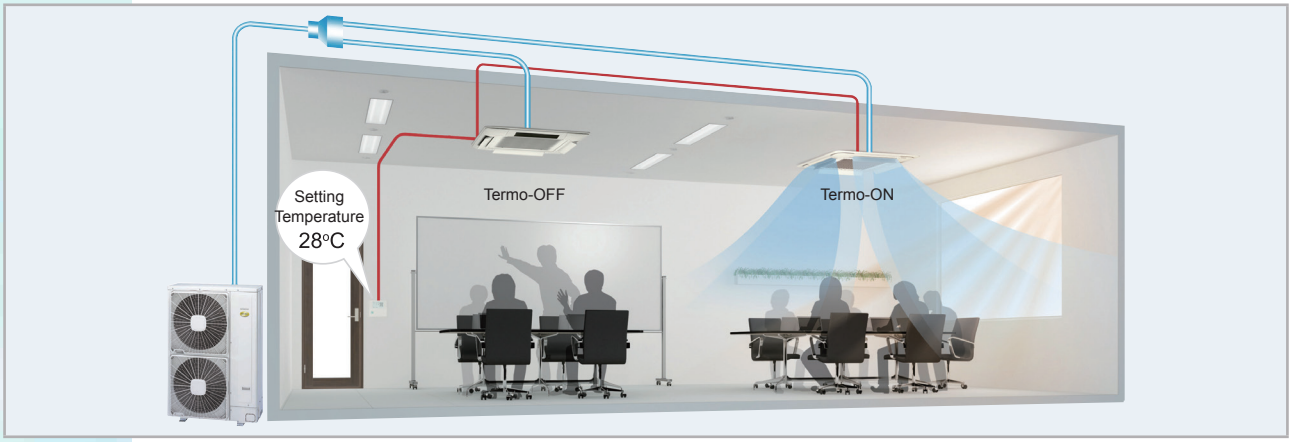
The individual operation function is adopted, which makes it possible to keep either one or multiple rooms comfortably and efficiently air-conditioned. In addition, the number of connectable indoor units is being increased.

◆ Reduction of local temperature irregularity and achievement of optimal room conditions

The individual thermo-ON/OFF control enables control of multiple indoor units by one remote control switch. The air conditioning operation is adjusted to control the room temperature as appropriate, according to the different air-conditioning loads required for the interior zone and the perimeter zone of each room. As a result, this function provides comfortable air conditioning (achieving uniform temperatures) and energy-saving.

- Interior Zone: a zone where temperature is not affected by direct sunlight or outdoor air inflow
- Perimeter Zone: a zone where temperature is affected by direct sunlight or outdoor air inflow

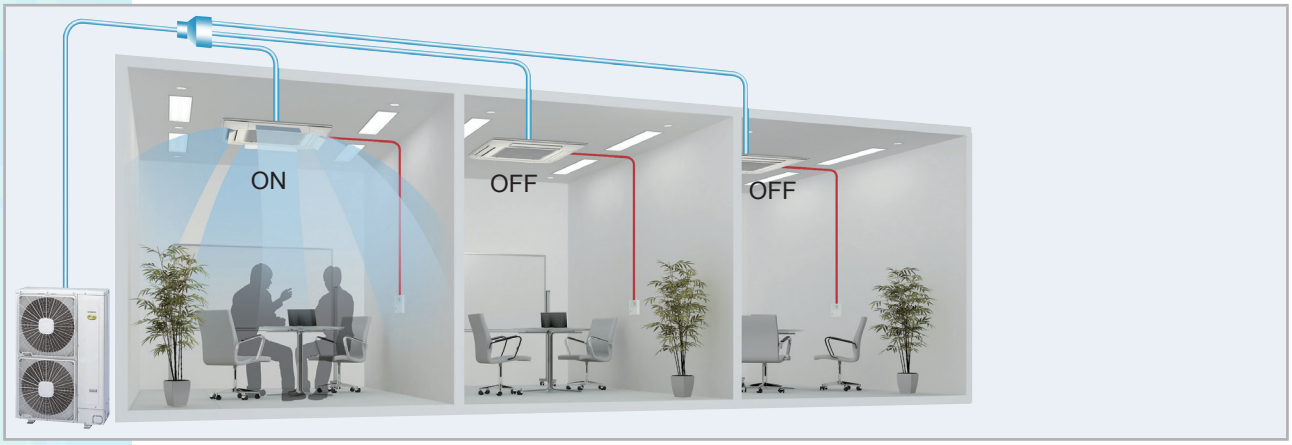
Example for one room:



◆ Easy rearrangement

Multiple indoor units can be installed and operated individually even if rooms are partitioned. Individual operation can be controlled for each room by connecting the remote control switch to each indoor unit. It is possible to operate the indoor units of occupied rooms only, resulting in energy saving and flexibility for rearrangement of partitions.

Example for multiple rooms.

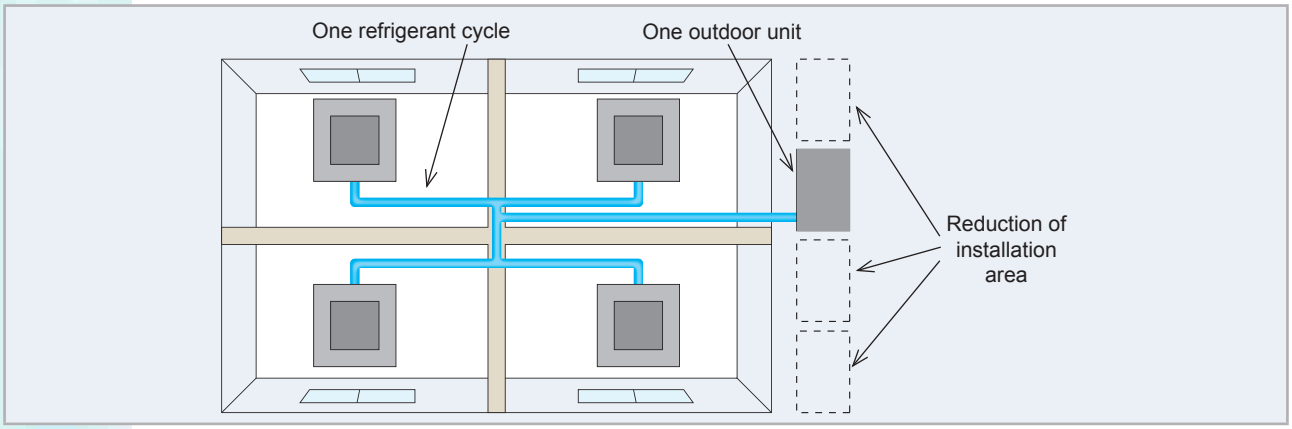


◆ Easy installation work

Multiple indoor units can be connected to one outdoor unit. As a result, piping and wiring work becomes as easy as when arranging just one refrigerant system. The installation work is made easier and with a shorter schedule, in comparison with the single type where an outdoor unit is required for each indoor unit.

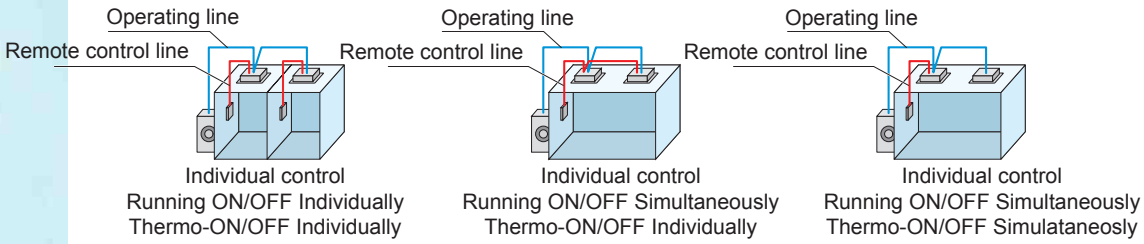
Easy and shortened installation schedule become possible because four indoor units can be connected to one refrigerant system.

This helps to save more installation space and so increases flexibility in installation location.

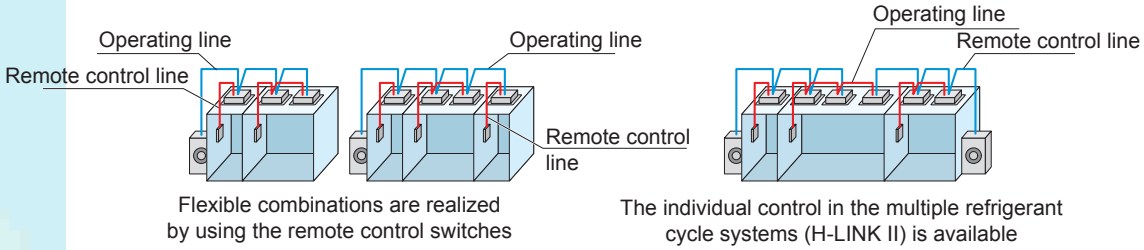


Wiring Example (DSW6 needs to be set according to each system configuration)

◆ Basic combinations (In the case of Twin Combination)

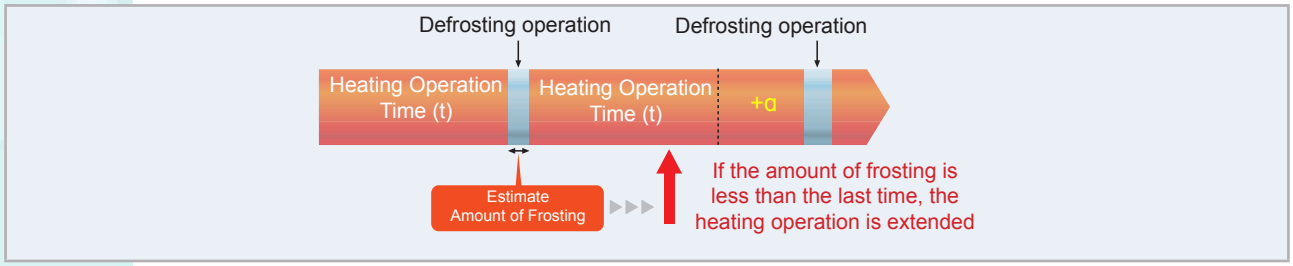


◆ Flexible combinations for Individual Operation (Combination example by using Individual Operation Function)



◆ Decreased defrosting operation time and extended heating operation time by control depending on amount of frost

The amount of frost can be estimated from the length of last defrosting. If the amount of frost is less than the last time, then heating operation until next defrosting operation is extended automatically. As a result, unnecessary defrosting operation is avoided, increasing availability of continuous heating operation.



◆ Enhanced combination of outdoor units and indoor units

The number of the indoor units connectable to one outdoor units is increased

Maximum number of connectable indoor units		
HP	Premium	Standard
2	2	--
2,5	2	--
3	3	2
4	5	4
5	6	4
6	6	4
8	8	4
10	8	4
12	8	4

NOTE

Please check the chapter about combinability restrictions.
Outdoor units RAS-XH(V)NP(1)E range can only be used in combination 1 to 1 with DX-Interface series 2 and duct or air handling unit systems.

◆ Compatibility with the piping of current installations where R22 or R407C are used

The IVX Premium RAS-(2-12)H(V)NP(1)(E) and Standard RAS-(3-12)H(V)NC(1)(E) series are compatible with those installations that have been operating with R22 or R407C. This allows the installation of the IVX Premium/Standard Outdoor Units, which operate with R410A, without having to change piping installation.

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

Before applying this option, it is important to have special care with preliminary operations that need to be performed during installation (cleaning, changing filters, vacuum, etc.) and restrictions (lengths of pipe, etc.). See Technical Catalogue and Installation and Operation Manual for proper installation procedure.

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

2.4 Selection benefits

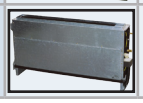
2.4.1 Wide range of UTOPIA outdoor units

		2	2.5	3	4	5	6	8	10	12
IVX Premium RAS-H(V)NP(1)(E)	1~ 230V 50Hz	●	●	●	●	●	●			
	3N~ 400V 50Hz				●	●	●	●	●	●
IVX Premium RAS-XH(V)NP(1)(E)	1~ 230V 50Hz			●	●	●	●			
	3N~ 400V 50Hz				●	●	●	●	●	
IVX Standard RAS-H(V)NC(1)(E)	1~ 230V 50Hz			●	●	●	●			
	3N~ 400V 50Hz				●	●	●	●	●	●

2.4.2 Wide range of indoor units

HITACHI indoor units have a wide range of capacities from 0.8 to 10.0 HP.

The capacity of each indoor unit is flexible; they are set to the maximum possible capacity by default, and can be easily adjusted to precise lower values in line with installation requirements (depending on the model).

System Free														
Model		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	8.0	10.0
RCI 4-way cassette			●	○	◐	○	◐	○	◐	●	●	●	●		
RCIM 4-way cassette (compact)		◐	●	○	◐	○	◐	○	◐						
RCD 2-way cassette		●	●	○	◐	○	◐	○	◐	●	●	●	●		
RPC ceiling type				○	◐ (*)	○	◐ (*)	○	◐ (*)	●	●	●	●		
RPI Indoor ducted unit (low profile)		◐	●	○	◐										
RPI Indoor ducted unit						○	◐	○	◐	●	●	●	●		
RPI Indoor ducted unit														●	●
RPIM Indoor ducted unit		◐	●	○	◐										
RPK wall type		◐	●	○	◐	○	◐	○	◐	●	●				
RPF floor type			●	○	◐	○	◐	○	◐						
RPFI floor concealed type			●	○	◐	○	◐	○	◐						

● Constant capacity unit. ◐ Unit whose capacity can be set one step lower, marked with ○, using the DIP switch.

NOTE

Not applicable for Outdoor Unit series UTOPIA IVX Premium RAS-XH(V)NP(1)E.

2.4.3 Hi-ToolKit Selection Software

Assistant for air conditioning installation design and Seasonal Efficiency calculation

◆ Current Hi-ToolKit Selection Software for design assistance

The Hi-Tool Kit selection software is a tool for HVAC installations design, generating automatically all necessary information to complete the installation specifications.

Available installation information:

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

◆ New selection software for Seasonal Efficiency calculation

Hi-ToolKit for Business is HITACHI software that has been specifically developed to assist professionals involved in planning the installation of air conditioning systems in non-residential buildings.

In just a few clicks, this new software allows you to quickly and confidently select a HITACHI system from the UTOPIA or SET FREE range. Hi-ToolKit for Business is a genuine consultation tool that can be used to carry out system simulation, aiming to evaluate their efficiency under particular conditions.

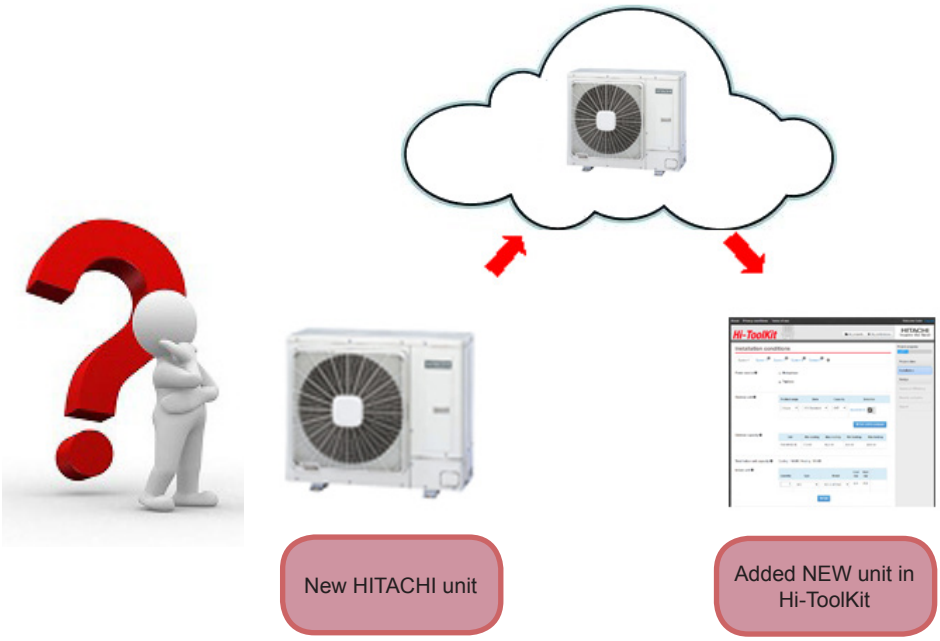
With Hi-ToolKit for Business, you can be safe in the knowledge you will select the correct commercial equipment.

Access to HI-Toolkit for Business

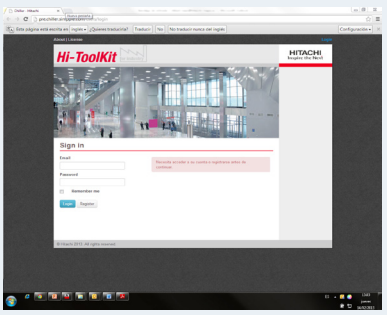
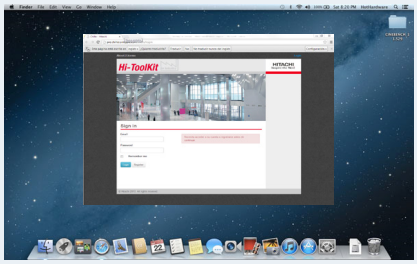
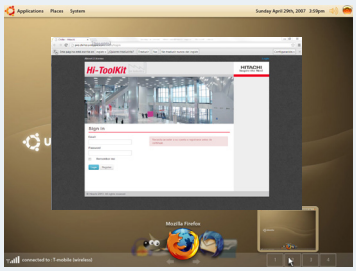
1 Online web version

Being web-based, the online version web tool provides the user a lot of benefits thanks to its flexible and simple structure:

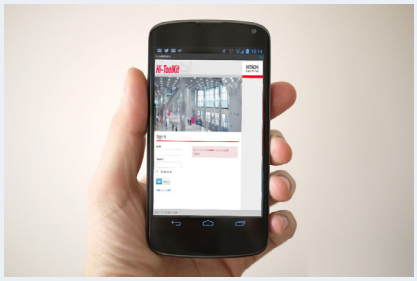
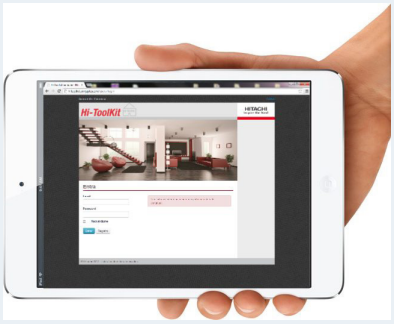
- The user always uses the latest version of selection software



- Accessible from all operating systems (Win, MacOS, Linux) at the beginning.

		
Windows	MacOS	Linux

- Accessible from all hardware platforms (PC, Smartphone, Tablets) at once (*)

		
PC (Windows, MAC, Linux)	Smartphone	Tablets

- All projects from the user are available in the cloud (*)

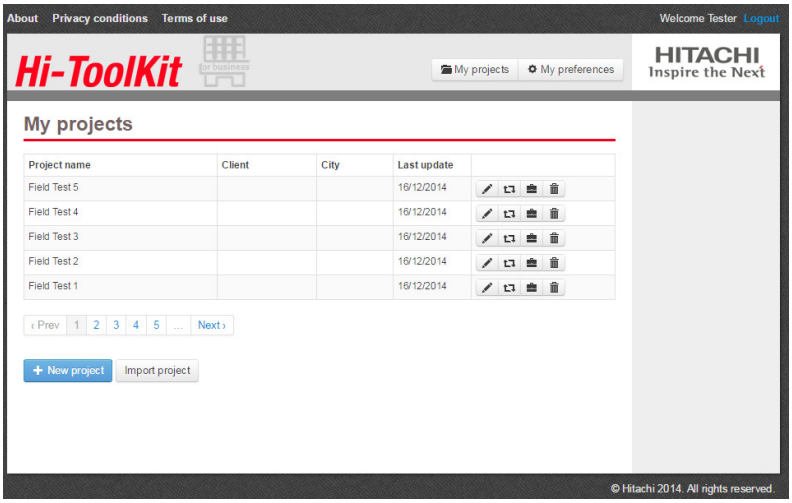
At the workplace | Anywhere | At home

All projects in your user account

With the new Hi-ToolKit for Business, the user has all their projects in their account, accessible from anywhere.

The user has the ability to:

- Create new project
- Edit project
- Copy project
- Export project
- Import project
- Delete project
- See selected units in project
- Print a report of project

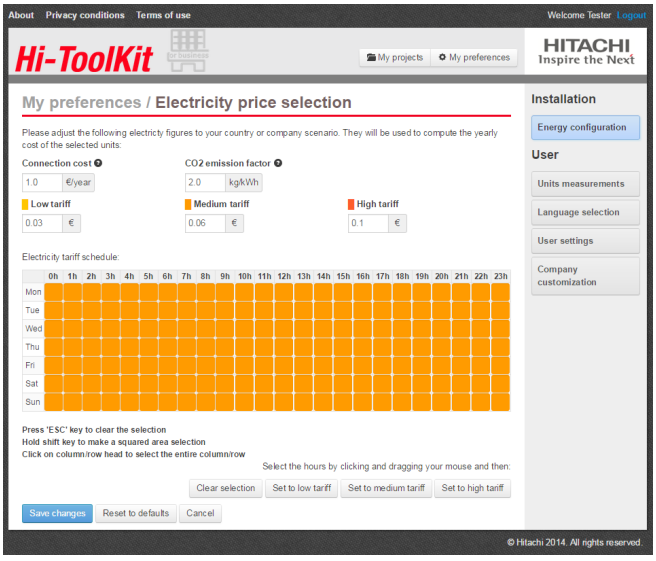


Easy and friendly user configuration

The “My Preferences” screen consists of several options, to define several settings that apply to all Hi-ToolKit for Business projects.

“My Preferences” is divided in two parts:

- Installation Preferences: All options related with installation issues like energy configuration.
- User Preferences: All options related with user settings, such as the change of units of measurement, software language, etc…



Easy, faster and friendly project creation

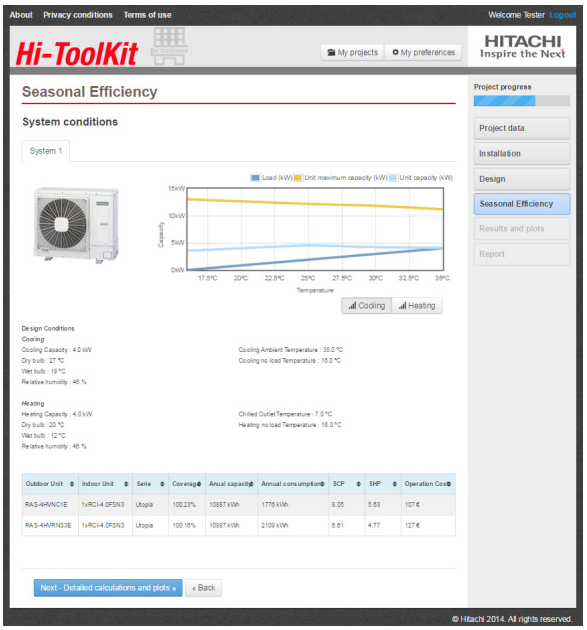
In only 6 steps, the user can create the report of the selected units for the installation. The user can always see the progress of the project on the menu at the side of the screen.

Project progress		
Project data	**Step 1**	Define information of the new project and customer details.
Installation	**Step 2**	Define installation criteria: systems composition, installation parameters, etc.
Design	**Step 3**	Define design criteria: installation location, outdoor and indoor design conditions, ON/OFF usage, etc.
Seasonal efficiency	**Step 4**	After installation and design configuration, Hi-toolkit calculates the seasonal efficiency for the selected systems.
Results and plots	**Step 5**	Hi-toolkit produces extra information by means of different types of graphs.
Report	**Step 6**	The user can print a professional report.

Exhaustive comparison and selection

Hi-ToolKit can compare between different outdoors for a specified group of indoors, making great comparison between the outdoors, making easy to select the suitable one.

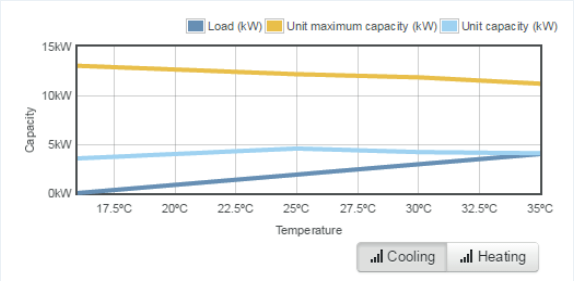
Hi-ToolKit calculates for each system the seasonal performance for cooling and heating with the related operating costs.



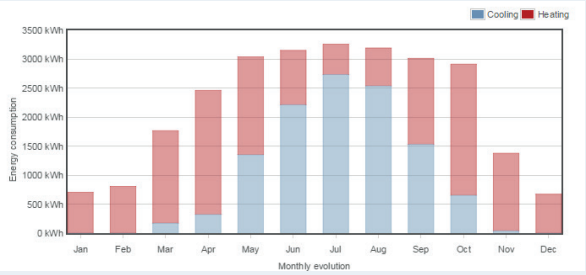
Detailed information with graphs

When the user selects the system, Hi-ToolKit produces extra information with different kinds of graphs and explanations:

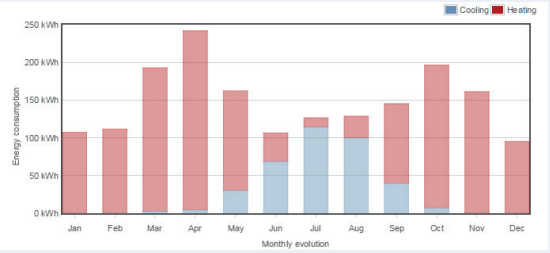
Part load unit regulation (kWh)



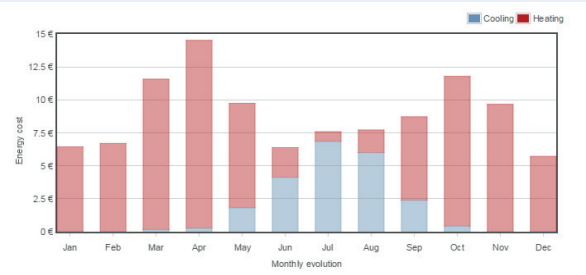
Annual Capacity (kWh)



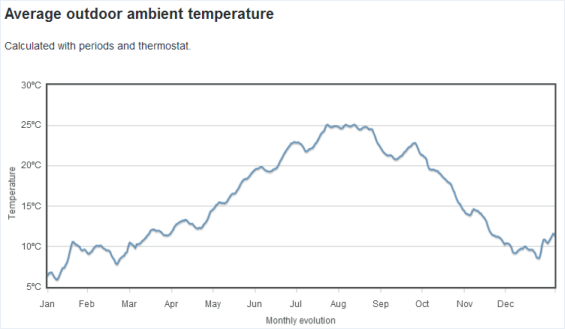
Annual Power consumption (kWh)



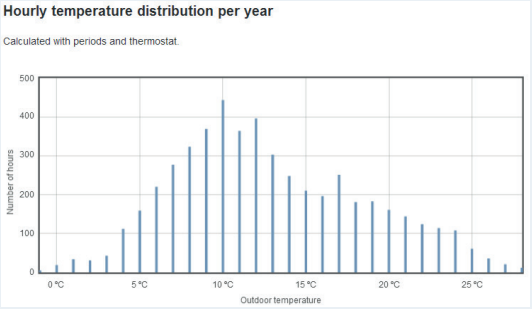
Monthly Energy Cost (€)



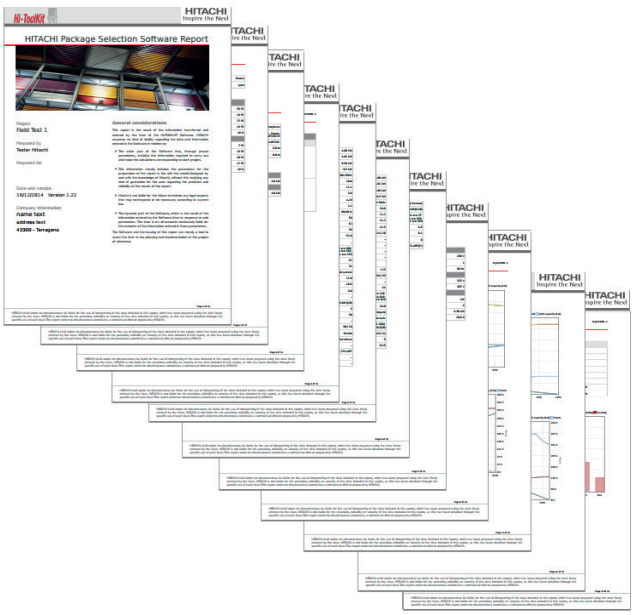
Average outdoor ambient temperature (ºC)



Hourly temperature distribution per year (hours)



Professional report



2.5 Installation benefits

◆ Adoption of H-Link II transmission system

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

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 (address 0 to 63)
Maximum number of equipment units	200
Maximum wiring length	Total 1000 m (including CS-NET WEB) (5000m in case of using 4 H-LINK relays)
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 mm^2 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.*

2.6 Start-up benefits

2.6.1 Automatic start-up test

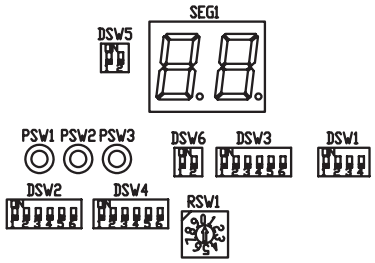
The installation is started up automatically, therefore considerably reducing the time required for the process.

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 outdoor unit.

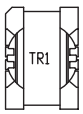
◆ Test run and identification of the system units

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



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

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



◆ Test run from the remote control

The remote control can run 3 operations.

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

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

◆ Test run from the outdoor unit

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

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

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

2.6.2 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 outdoor and indoor units are continuously supervised.

◆ Assisted-management air conditioning system

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

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

◆ Compilation of operating data

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

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

2.7 Maintenance benefits

2.7.1 Minimum maintenance

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

2.7.2 Easy accessibility

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

2.7.3 Alarm codes

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

Availability of maintenance tools

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

CSNET-WEB / CSNET Manager is also useful for maintenance tasks.

3. General data

Index

3.1 General information

3.1.1 Combination with indoor units and complementary systems

All the outdoor units described in this manual can be combined with the indoor units indicated in the following table:

Outdoor units	Indoor units	Complementary systems
IVX Premium / IVX Standard	RCI	KPI KPI Active Econofresh DX-Interface (EXV-0E2)
	RCIM	
	RCD	
	RPC	
	RPI	
	RPIM	
	RPK	
	RPF	
	RPFI	
IVX Premium RAS-XH(V)NP(1)E series	--	DX-Interface (EXV-0E2)

3.1.2 Considerations

1 Data for 8,10 and 12 HP are in accordance with the Eurovent VRF standards:

- The nominal cooling and heating capacities indicated refer to the outdoor units operating with the indoor units at 100% of their capacity and are based on the EN14511 standard.
- Capacity, EER/COP and sound power level are values certified by EUROVENT, following EUROVENT standards for VRF certification program
- The input power of the indoor unit is not considered for the calculation of cooling and heating efficiencies.

2 Data for 2 to 6 HP are in accordance with the following conditions:

- The nominal cooling and heating capacity is the combined capacity of the system comprising outdoor and indoor units, and is based on the EN14511 standard, with the operating conditions indicated in the table:

Operating conditions		Cooling	Heating
Indoor air inlet temperature	DB	27.0ºC	20.0ºC
	WB	19.0ºC	—
Outdoor air inlet temperature	DB	35.0ºC	7.0ºC
	WB	—	6.0ºC
DB: Dry Bulb; WB: Wet Bulb Piping length: 7.5 metres; Piping lift: 0 meters			

  - The data corresponds to a system with a 1-to-1 indoor 4-way cassette (RCI-FSN3) at 100% of its capacity.
  - The SEER, SCOP, EER and COP are specified in the outdoor unit in combination with the referred indoor unit.
  - SEER and SCOP are based on EN14825.

3 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.

- Measurement point located at a height of 1.5 m from floor level and a distance of 1 m from the front surface of the unit.
- Units working with their nominal supply voltage.

4 Sound power levels were measured in a reverberant room, in accordance with the EN12102 standard. Used environment conditions are the same as those specified in EN14511 for performance test.

5 Nominal electrical data is in accordance with the nominal working conditions described in items 1 and 2.

6 The outdoor units of the “RAS-XH(V)NP(1)E” UTOPIA IVX Premium series have been designed for specific applications requiring the combination of a DX-Interface series 2. The EER and COP data are exclusively for reference purposes, and are not Eurovent certified. This data may vary depending on each particular application.

3.2 IVX Premium

3.2.1 General specifications

OUTDOOR UNITS		RAS-2HVNP1	RAS-2.5HVNP1	RAS-3HVNP1E	RAS-4HVNP1E
Power supply	-	1~ 230V 50Hz	1~ 230V 50Hz	1~ 230V 50Hz	1~ 230V 50Hz
Nominal cooling capacity (min-max)	kW	5.0 (2.2-5.6)	5.6 (2.2-6.3)	7.1 (3.2-8.0)	10.0 (4.5-11.2)
Nominal heating capacity (min-max)	kW	5.6 (2.2-7.1)	6.3 (2.2-8.0)	8.0 (3.5-10.6)	11.2 (5.0-14.0)
EER (*)		4.03	4.18	4.49	4.68
COP (*)		4.68	4.92	4.88	5.16
Minimum - Maximum connectable indoor units	-	1 - 2	1 - 2	1 - 3	1 - 5
Minimum - Maximum connected capacity	%	90% - 110%	90% - 110%	50% -120%	50% -120%
Noise level cooling (sound pressure) (night mode)	dB(A)	44 (42)	45 (43)	46 (42)	47 (43)
Noise level heating (sound pressure)	dB(A)	46	47	48	49
Noise level (sound power)	dB(A)	62	63	63	63
Air flow	m^3/min	40.6	40.6	45	80
Dimensions (H x W x D)	mm	600 x 792 x 300	600 x 792 x 300	800 x 950 x 370	1380 x 950 x 370
Net weight	kg	43	43	66	103
Recommended circuit breaker	A	16	20	20	32
Starting current	A	Less than maximum current	Less than maximum current	Less than maximum current	Less than maximum current
Maximum current	A	13.8	15.8	21.5	30.5
Running current cooling	A	5.1	5.4	6.4	8.7
Running current heating	A	4.9	5.7	6.7	8.9
Size of power cable (according to EN 60335-1)	quantity x mm^2	3 x 2.5	3 x 4.0	3 x 4.0	3 x 6.0
Size of transmission cable between indoor unit and outdoor unit	quantity x mm^2	2 x 0.75	2 x 0.75	2 x 0.75	2 x 0.75
Piping diameter (liquid / gas)	mm (inch)	Ø6.35 (1/4) / Ø12.7 (1/2)	Ø6.35 (1/4) / Ø12.7 (1/2)	Ø9.52 (3/8) / Ø15.88 (5/8)	Ø9.52 (3/8) / Ø15.88 (5/8)
Minimum piping length	m	5	5	5	5
Maximum chargeless piping length	m	30 (0 m for 2 indoor units system)	30 (0 m for 2 indoor units system)	30	30
Maximum piping length (additional refrigerant charge needed)	m (g/m)	50 (30)	50 (30(**))	50 (40)	75 (60)
Height difference (higher OU / lower OU)	m	30 / 20	30 / 20	30 / 20	30 / 20
Working range (cooling // heating)	°C	-5 / +46 (DB) // -20 / +15 (WB)	-5 / +46 (DB) // -20 / +15 (WB)	-5 / +46 (DB) // -20 / +15 (WB)	-5 / +46 (DB) // -20 / +15 (WB)
Refrigerant	-	R410A	R410A	R410A	R410A
Refrigerant charge before shipment	kg	1.6	1.6	2.3	4.1
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven	Rotary DC Inverter driven	Scroll DC Inverter driven
Wired Remote control model (Optional)		PC-ARFPE	PC-ARFPE	PC-ARFPE	PC-ARFPE

(*) COP and EER data are specified for RCI-FSN3 indoor unit combinations.

(**) For 2 indoor unit systems, the additional refrigerant charge needed is 24 g/m.

OUTDOOR UNITS		RAS-5HVNP1E	RAS-6HVNP1E
Power supply	-	1~ 230V 50Hz	1~ 230V 50Hz
Nominal cooling capacity (min-max)	kW	12.5 (5.7-14.0)	14.0 (6.0-16.0)
Nominal heating capacity (min-max)	kW	14.0 (5.0-18.0)	16.0 (5.0-20.0)
EER (*)		3.81	3.41
COP (*)		4.55	4.23
Minimum - Maximum connectable indoor units	-	1 - 6	1 - 6
Minimum - Maximum connected capacity	%	50% -120%	50% -120%
Noise level cooling (sound pressure) (night mode)	dB(A)	48 (44)	48 (45)
Noise level heating (sound pressure)	dB(A)	50	50
Noise level (sound power)	dB(A)	64	65
Air flow	m^3/min	90	100
Dimensions (H x W x D)	mm	1380 x 950 x 370	1380 x 950 x 370
Net weight	kg	103	103
Recommended circuit breaker	A	32	32
Starting current	A	Less than maximum current	Less than maximum current
Maximum current	A	30.5	30.5
Running current cooling	A	13.7	17.3
Running current heating	A	12.8	15.9
Size of power cable (according to EN 60335-1)	quantity x mm^2	3 x 6.0	3 x 6.0
Size of transmission cable between indoor unit and outdoor unit	quantity x mm^2	2 x 0.75	2 x 0.75
Piping diameter (liquid / gas)	mm (inch)	Ø9.52 (3/8) / Ø15.88 (5/8)	Ø9.52 (3/8) / Ø15.88 (5/8)
Minimum piping length	m	5	5
Maximum chargeless piping length	m	30	30
Maximum piping length (additional refrigerant charge needed)	m (g/m)	75 (60)	75 (60)
Height difference (higher OU / lower OU)	m	30 / 20	30 / 20
Working range (cooling // heating)	°C	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)
Refrigerant	-	R410A	R410A
Refrigerant charge before shipment	kg	4.2	4.2
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven
Wired Remote control model (Optional)		PC-ARFPE	PC-ARFPE

(*) COP and EER data are specified for RCI-FSN3 indoor unit combinations

OUTDOOR UNITS		RAS-4HNP1E	RAS-5HNP1E	RAS-6HNP1E
Power supply	-	3N~ 400V 50Hz	3N~ 400V 50Hz	3N~ 400V 50Hz
Nominal cooling capacity (min-max)	kW	10.0 (4.5-11.2)	12.5 (5.7-14.0)	14.0 (6.0-16.0)
Nominal heating capacity (min-max)	kW	11.2 (5.0-14.0)	14.0 (5.0-18.0)	16.0 (5.0-20.0)
EER (*)		4.68	3.81	3.41
COP (*)		5.16	4.55	4.23
Minimum - Maximum connectable indoor units	-	1 - 5	1 - 6	1 - 6
Minimum - Maximum connected capacity	%	50% -120%	50% -120%	50% -120%
Noise level cooling (sound pressure) (night mode)	dB(A)	47 (43)	48 (44)	48 (45)
Noise level heating (sound pressure)	dB(A)	49	50	50
Noise level (sound power)	dB(A)	63	64	65
Air flow	m^3/min	80	90	100
Dimensions (H x W x D)	mm	1380 x 950 x 370	1380 x 950 x 370	1380 x 950 x 370
Net weight	kg	103	103	103
Recommended circuit breaker	A	15	15	15
Starting current	A	Less than maximum current	Less than maximum current	Less than maximum current
Maximum current	A	14.0	14.0	16.0
Running current cooling	A	3.2	5.0	6.3
Running current heating	A	3.2	4.7	5.8
Size of power cable (according to EN 60335-1)	quantity x mm^2	5 x 2.5	5 x 2.5	5 x 2.5
Size of transmission cable between indoor unit and outdoor unit	quantity x mm^2	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)	Ø9.52 (3/8) / Ø15.88 (5/8)	Ø9.52 (3/8) / Ø15.88 (5/8)
Minimum piping length	m	5	5	5
Maximum chargeless piping length	m	30	30	30
Maximum piping length (additional refrigerant charge needed)	m (g/m)	75 (60)	75 (60)	75 (60)
Height difference (higher OU / lower OU)	m	30 / 20	30 / 20	30 / 20
Working range (cooling // heating)	°C	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)
Refrigerant	-	R410A	R410A	R410A
Refrigerant charge before shipment	kg	4.1	4.2	4.2
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven	Scroll DC Inverter driven
Wired Remote control model (Optional)		PC-ARFPE	PC-ARFPE	PC-ARFPE

(*) COP and EER data are specified for RCI-FSN3 indoor unit combinations

OUTDOOR UNITS		RAS-8HNPE	RAS-10HNPE	RAS-12HNP
Power supply	-	3N~ 400V 50Hz	3N~ 400V 50Hz	3N~ 400V 50Hz
Nominal cooling capacity (min-max)	kW	20.0 (8.0-22.4)	25.0 (10.0-28.0)	30.0 (11.2-33.5)
Nominal heating capacity (min-max)	kW	22.4 (6.3-28.0)	28.0 (8.0-35.0)	33.5 (9.0-37.5)
EER		3.56	3.07	2.65
COP		4.21	3.84	3.64
Minimum - Maximum indoor units connectable	-	1 - 8	1 - 8	1 - 8
Minimum - Maximum connected capacity	%	50% -120%	50% -120%	50% -120%
Noise level cooling (sound pressure) (night mode)	dB(A)	57 (55)	58 (56)	59 (57)
Noise level heating (sound pressure)	dB(A)	59	60	61
Noise level (sound power)	dB(A)	76	76	77
Air flow (cooling / heating)	m^3/min	127	134	163
Dimensions (H x W x D)	mm	1380 x 950 x 370	1380 x 950 x 370	1650 x 1100 x 390
Net weight	kg	136	138	168
Recommended circuit breaker	A	30	30	30
Starting current	A	Less than maximum current	Less than maximum current	Less than maximum current
Maximum current	A	24.0	24.0	24.3
Running current cooling	A	8.6	12.6	17.5
Running current heating	A	8.1	11.3	14.2
Power cable size (according to EN 60335-1)	quantity x mm^2	5 x 6.0	5 x 6.0	5 x 6.0
Transmitting cable size between indoor unit and outdoor unit	quantity x mm^2	2 x 0.75	2 x 0.75	2 x 0.75
Piping diameter (liquid / gas)	mm (inch)	Ø9.52 (3/8) / Ø25.4	Ø12.70 (1/2) / Ø25.4	Ø12.70 (1/2) / Ø25.4
Minimum piping length	m	5	5	5
Maximum chargeless piping length	m	30	30	30
Maximum piping length (additional refrigerant charge needed)	m (g/m)	100 (need to be calculate)	100 (need to be calculate)	100 (need to be calculate)
Height difference (OU higher / OU lower)	m	30 / 20	30 / 20	30 / 20
Working range (cooling // heating)	°C	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)
Refrigerant	-	R410A	R410A	R410A
Refrigerant charge before shipment	kg	5.7	6.2	6.7
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven	Scroll DC Inverter driven
Remote control model (Optional)		PC-ARFPE	PC-ARFPE	PC-ARFPE

3.2.2 Cooling and heating performance IVX Premium series

System combination		Cooling				Heating			
Outdoor unit	Indoor unit	EER	SEER	Energy Class	P Design (35°C)	COP	SCOP	Energy Class	P Design (-10°C)
			-	-	kW		-	-	kW
RAS-2HVNP1	RCI-2.0FSN3	4.03	6.49	A++	5.0	4.68	4.67	A++	5.0
	RCI-2.0FSN3Ei	3.60	5.82	A+	5.0	4.06	4.01	A+	5.0
	RCI-2.0FSN3Ek	3.60	5.82	A+	5.0	4.06	4.01	A+	5.0
	RPC-2.0FSN3	3.72	5.63	A+	5.0	4.06	4.44	A+	5.0
	RPI-2.0FSN4E	3.54	5.60	A+	5.0	3.73	4.01	A+	5.0
	RPK-2.0FSN3M	3.23	5.47	A	5.0	3.70	4.01	A+	5.0
RAS-2.5HVNP1	RCI-2.5FSN3	4.18	6.05	A+	5.6	4.92	4.77	A++	5.2
	RCI-2.5FSN3Ei	3.46	5.64	A+	5.6	4.00	4.36	A+	5.2
	RCI-2.5FSN3Ek	3.46	5.64	A+	5.6	4.00	4.36	A+	5.2
	RPC-2.5FSN3	4.00	5.49	A	5.6	4.12	4.49	A+	5.2
	RPI-2.5FSN4E	3.49	5.51	A	5.6	3.81	4.33	A+	5.2
	RPK-2.5FSN3M	3.31	5.24	A	5.6	3.75	4.14	A+	5.2
RAS-3HVNP1E	RCI-3.0FSN3	4.49	7.42	A++	7.1	4.88	4.37	A+	6.4
	RCI-3.0FSN3Ei	3.97	6.63	A++	7.1	4.40	4.00	A+	6.0
	RCI-3.0FSN3Ek	3.97	6.63	A++	7.1	4.40	4.00	A+	6.0
	RPC-3.0FSN3	3.68	5.87	A+	7.1	4.15	4.00	A+	6.0
	RPC-3.0FSN3E	3.38	5.33	A	7.1	3.40	3.80	A	6.0
	RPI-3.0FSN4E	3.50	6.05	A+	7.1	3.95	4.00	A+	6.0
	RPK-3.0FSN3M	3.32	6.40	A++	7.1	3.37	3.91	A	6.0
RAS-4HVNP1E	RCI-4.0FSN3	4.68	7.88	A++	10.0	5.16	4.68	A++	11.5
	RCI-4.0FSN3Ei	4.02	7.16	A++	10.0	4.50	4.25	A+	11.5
	RCI-4.0FSN3Ek	4.02	7.16	A++	10.0	4.50	4.25	A+	11.5
	RPC-4.0FSN3	4.48	6.53	A++	10.0	4.44	4.23	A+	11.5
	RPC-4.0FSN3E	3.60	5.92	A+	10.0	3.60	3.81	A	11.2
	RPI-4.0FSN4E	3.92	6.45	A++	10.0	4.23	4.23	A+	11.5
	RPK-4.0FSN3M	3.64	6.81	A++	10.0	3.44	3.81	A	9.0
RAS-4HNP1E	RCI-4.0FSN3	4.68	7.66	A++	10.0	5.16	4.68	A++	11.5
	RCI-4.0FSN3Ei	4.02	6.98	A++	10.0	4.50	4.25	A+	11.5
	RCI-4.0FSN3Ek	4.02	6.98	A++	10.0	4.50	4.25	A+	11.5
	RPC-4.0FSN3	4.48	6.38	A++	10.0	4.44	4.23	A+	11.5
	RPC-4.0FSN3E	3.60	5.80	A+	10.0	3.60	3.81	A	11.2
	RPI-4.0FSN4E	3.92	6.30	A++	10.0	4.23	4.23	A+	11.5
	RPK-4.0FSN3M	3.64	6.64	A++	10.0	3.44	3.81	A	9.0

System combination		Cooling		Heating	
Outdoor unit	Indoor unit	EER	Energy Class	COP	Energy Class
RAS-5H(V)NP1E	RCI-5.0FSN3	3.81	A	4.55	A
	RCI-5.0FSN3Ei	3.47	A	3.90	A
	RCI-5.0FSN3Ek	3.47	A	3.90	A
	RPC-5.0FSN3	3.38	A	4.09	A
	RPC-5.0FSN3E	3.09	B	3.48	B
	RPI-5.0FSN4E	3.42	A	3.92	A
RAS-6H(V)NP1E	RCI-6.0FSN3	3.41	A	4.23	A
	RCI-6.0FSN3Ei	3.29	A	3.72	A
	RCI-6.0FSN3Ek	3.29	A	3.72	A
	RPC-6.0FSN3	3.11	B	3.86	A
	RPC-6.0FSN3E	2.79	D	3.34	C
	RPI-6.0FSN4E	3.07	B	3.64	A

3.3 IVX Standard series

3.3.1 General specifications

OUTDOOR UNITS		RAS-3HVNC1	RAS-4HVNC1E	RAS-5HVNC1E	RAS-6HVNC1E
Power supply	-	1~ 230V 50Hz	1~ 230V 50Hz	1~ 230V 50Hz	1~ 230V 50Hz
Nominal cooling capacity (min-max)	kW	7.1 (3.2-8.0)	10.0 (4.5-11.2)	12.5 (5.7-14.0)	14.0 (6.0-16.0)
Nominal heating capacity (min-max)	kW	8.0 (3.5-10.6)	11.2 (5.0-14.0)	14.0 (5.0-18.0)	16.0 (5.0-20.0)
EER (*)		3.14	3.70	3.37	3.26
COP (*)		4.00	4.57	3.89	3.56
Minimum - Maximum connectable indoor units	-	1 - 2	1 - 4	1 - 4	1 - 4
Minimum - Maximum connected capacity	%	90% - 110%	90% - 115%	90% - 115%	90% - 115%
Noise level cooling (sound pressure) (night mode)	dB(A)	48(46)	52(50)	52(50)	55(53)
Noise level heating (sound pressure)	dB(A)	50	54	54	57
Noise level (sound power)	dB(A)	66	68	69	71
Air flow	m^3/min	44.7	62	68	80
Dimensions (H x W x D)	mm	600 x 792 x 300	1140 x 950 x 370	1140 x 950 x 370	1140 x 950 x 370
Net weight	kg	44	79	89	89
Recommended circuit breaker	A	20	32	32	32
Starting current	A	Less than maximum current	Less than maximum current	Less than maximum current	Less than maximum current
Maximum current	A	17.8	28.5	28.5	28.5
Running current cooling	A	9.4	11.2	15.5	18.1
Running current heating	A	8.3	10.1	15.1	19.0
Size of power cable (according to EN 60335-1)	quantity x mm^2	3 x 4.0	3 x 6.0	3 x 6.0	3 x 6.0
Size of transmission cable between indoor unit and outdoor unit	quantity x mm^2	2 x 0.75	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)	Ø9.52 (3/8) / Ø15.88 (5/8)	Ø9.52 (3/8) / Ø15.88 (5/8)	Ø9.52 (3/8) / Ø15.88 (5/8)
Minimum piping length	m	5	5	5	5
Maximum chargeless piping length	m	20	30	30	30
Maximum piping length (additional refrigerant charge needed)	m (g/m)	50 (40)	70 (40)	75 (60)	75 (60)
Height difference (higher OU / lower OU)	m	30 / 20	30 / 20	30 / 20	30 / 20
Working range (cooling // heating)	°C	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)
Refrigerant	-	R410A	R410A	R410A	R410A
Refrigerant charge before shipment	kg	1.9	3.2	3.2	3.2
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven	Scroll DC Inverter driven	Scroll DC Inverter driven
Wired Remote control model (Optional)		PC-ARFPE	PC-ARFPE	PC-ARFPE	PC-ARFPE

(*) COP and EER data are specified for RCI-FSN3 indoor unit combinations.

OUTDOOR UNITS		RAS-4HNC1E	RAS-5HNC1E	RAS-6HNC1E
Power supply	-	3N~ 400V 50Hz	3N~ 400V 50Hz	3N~ 400V 50Hz
Nominal cooling capacity (min-max)	kW	10.0 (4.5-11.2)	12.5 (5.7-14.0)	14.0 (6.0-16.0)
Nominal heating capacity (min-max)	kW	11.2 (5.0-14.0)	14.0 (5.0-18.0)	16.0 (5.0-20.0)
EER (*)		3.70	3.37	3.26
COP (*)		4.57	3.89	3.56
Minimum - Maximum connectable indoor units	-	1 - 4	1 - 4	1 - 4
Minimum - Maximum connected capacity	%	90% - 115%	90% - 115%	90% - 115%
Noise level cooling (sound pressure) (night mode)	dB(A)	52(50)	52(50)	55(53)
Noise level heating (sound pressure)	dB(A)	54	54	57
Noise level (sound power)	dB(A)	68	69	71
Air flow (cooling / heating)	m^3/min	75	75	80
Dimensions (H x W x D)	mm	1140 x 950 x 370	1140 x 950 x 370	1140 x 950 x 370
Net weight	kg	79	89	89
Recommended circuit breaker	A	20	20	20
Starting current	A	Less than maximum current	Less than maximum current	Less than maximum current
Maximum current	A	15.5	15.5	15.5
Running current cooling	A	4.1	5.7	6.6
Running current heating	A	3.7	5.5	6.9
Size of power cable (according to EN 60335-1)	quantity x mm^2	5 x 4.0	5 x 4.0	5 x 4.0
Size of transmission cable between indoor unit and outdoor unit	quantity x mm^2	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)	Ø9.52 (3/8) / Ø15.88 (5/8)	Ø9.52 (3/8) / Ø15.88 (5/8)
Minimum piping length	m	5	5	5
Maximum chargeless piping length	m	30	30	30
Maximum piping length (additional refrigerant charge needed)	m (g/m)	70 (40)	75 (60)	75 (60)
Height difference (higher OU / lower OU)	m	30 / 20	30 / 20	30 / 20
Working range (cooling // heating)	°C	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)
Refrigerant	-	R410A	R410A	R410A
Refrigerant charge before shipment	kg	3.2	3.2	3.2
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven	Scroll DC Inverter driven
Remote control model (Optional)		PC-ARFPE	PC-ARFPE	PC-ARFPE

(*) COP and EER data are specified for RCI-FSN3 indoor unit combinations.

OUTDOOR UNITS		RAS-8HNCE	RAS-10HNCE	RAS-12HNC
Power supply	-	3N~ 400V 50Hz	3N~ 400V 50Hz	3N~ 400V 50Hz
Nominal cooling capacity (min-max)	kW	20.0 (8.0-22.4)	25.0 (10.0-28.0)	30.0 (11.2-33.5)
Nominal heating capacity (min-max)	kW	22.4 (6.3-28.0)	28.0 (8.0-35.0)	33.5 (9.0-37.5)
EER		3.36	3.02	2.57
COP		3.81	3.63	3.54
Minimum - Maximum indoor units connectable	-	1 - 4	1 - 4	1 - 4
Minimum - Maximum connected capacity	%	90% - 115%	90% - 115%	90% - 115%
Noise level cooling (sound pressure) (night mode)	dB(A)	57(55)	58(56)	59(56)
Noise level heating (sound pressure)	dB(A)	59	60	61
Noise level (sound power)	dB(A)	76	76	77
Air flow (cooling / heating)	m^3/min	127	134	163
Dimensions (H x W x D)	mm	1380 x 950 x 370	1380 x 950 x 370	1650 x 1100 x 390
Net weight	kg	136	138	168
Recommended circuit breaker	A	30	30	30
Starting current	A	Less than maximum current	Less than maximum current	Less than maximum current
Maximum current	A	24.0	24.0	24.3
Running current cooling	A	9.1	12.9	18.1
Running current heating	A	9.0	12.0	14.6
Power cable size (according to EN 60335-1)	quantity x mm^2	5 x 6.0	5 x 6.0	5 x 6.0
Transmitting cable size between indoor unit and outdoor unit	quantity x mm^2	2 x 0.75	2 x 0.75	2 x 0.75
Piping diameter (liquid / gas)	mm (inch)	Ø9.52 (3/8) / Ø25.4	Ø12.70 (1/2) / Ø25.4	Ø12.70 (1/2) / Ø25.4
Minimum piping length	m	5	5	5
Maximum chargeless piping length	m	30	30	30
Maximum piping length (additional refrigerant charge needed)	m (g/m)	100 (need to be calculate)	100 (need to be calculate)	100 (need to be calculate)
Height difference (OU higher / OU lower)	m	30 / 20	30 / 20	30 / 20
Working range (cooling // heating)	°C	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)	-5 / +46 (DB) // -20 / +15(WB)
Refrigerant	-	R410A	R410A	R410A
Refrigerant charge before shipment	kg	5.7	6.2	6.7
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven	Scroll DC Inverter driven
Remote control model (Optinal)		PC-ARFPE	PC-ARFPE	PC-ARFPE

3.3.2 Cooling and heating performance IVX Standard series

System combination		Cooling				Heating			
Outdoor unit	Indoor unit	EER	SEER	Energy Class	P Design (35ºC)	COP	SCOP	Energy Class	P Design (-10ºC)
			-	-	kW				kW
RAS-3HVNC1	RCI-3.0FSN3	3.14	6.00	A+	7.1	4.00	4.21	A+	5,6
	RCI-3.0FSN3Ei	3.01	5.48	A	7.1	3.83	3.95	A	5,6
	RCI-3.0FSN3Ek	3.01	5.48	A	7.1	3.83	3.95	A	5,6
	RPC-3.0FSN3	3.10	5.29	A	7.1	3.43	4.13	A+	5,6
	RPC-3.0FSN3E	2.65	4.68	B	7.1	3.07	3.80	A	5,6
	RPI-3.0FSN4E	2.81	4.97	B	7.1	3.54	3.80	A	5,6
	RPK-3.0FSN3M	2.69	5.35	A	7.1	2.93	3.80	A	5,6
RAS-4HVNC1E	RCI-4.0FSN3	3.70	6.57	A++	10.0	4.57	4.47	A+	8,7
	RCI-4.0FSN3Ei	3.28	5.75	A+	10.0	4.13	4.21	A+	8,7
	RCI-4.0FSN3Ek	3.28	5.75	A+	10.0	4.13	4.21	A+	8,7
	RPC-4.0FSN3	3.08	5.02	B	10.0	3.85	3.90	A	8,7
	RPC-4.0FSN3E	2.80	4.61	B	10.0	3.33	3.80	A	7,4
	RPI-4.0FSN4E	3.23	5.38	A	10.0	4.03	4.01	A+	8,7
	RPK-4.0FSN3M	2.15	5.56	A	10.0	3.15	3.83	A	7,4
RAS-4HNC1E	RCI-4.0FSN3	3.70	6.41	A++	10.0	4.57	4.47	A+	8,7
	RCI-4.0FSN3Ei	3.28	5.63	A+	10.0	4.13	4.21	A+	8,7
	RCI-4.0FSN3Ek	3.28	5.63	A+	10.0	4.13	4.21	A+	8,7
	RPC-4.0FSN3	3.08	4.93	B	10.0	3.85	3.90	A	8,7
	RPC-4.0FSN3E	2.80	4.53	C	10.0	3.33	3.80	A	7,4
	RPI-4.0FSN4E	3.23	5.27	A	10.0	4.03	4.01	A+	8,7
	RPK-4.0FSN3M	2.15	5.45	A	10.0	3.15	3.83	A	7,4

System combination		Cooling		Heating	
Outdoor unit	Indoor unit	EER	Energy Class	COP	Energy Class
RAS-5H(V)NC1E	RCI-5.0FSN3	3.37	A	3.89	A
	RCI-5.0FSN3Ei	3.30	A	3.73	A
	RCI-5.0FSN3Ek	3.30	A	3.73	A
	RPC-5.0FSN3	2.72	D	3.55	B
	RPC-5.0FSN3E	2.52	E	3.10	D
	RPI-5.0FSN4E	3.18	A	3.54	B
RAS-6H(V)NC1E	RCI-6.0FSN3	3.26	A	3.56	B
	RCI-6.0FSN3Ei	3.07	B	3.38	C
	RCI-6.0FSN3Ek	3.07	B	3.38	C
	RPC-6.0FSN3	2.55	E	3.64	A
	RPC-6.0FSN3E	2.41	E	3.04	D
	RPI-6.0FSN4E	3.08	B	3.37	C

3.4 IVX Premium for DX-Interface

3.4.1 General specifications

OUTDOOR UNITS		RAS-3XHVNP1E	RAS-4XHVNP1E	RAS-5XHVNP1E	RAS-6XHVNP1E
Power supply	-	1~ 230V 50Hz	1~ 230V 50Hz	1~ 230V 50Hz	1~ 230V 50Hz
Nominal cooling capacity (min-max)	kW	7.1 (3.2-8.0)	10.0 (4.5-11.2)	12.5 (5.7-14.0)	14.0 (6.0-16.0)
Nominal heating capacity (min-max)	kW	8.0 (3.5-10.6)	11.2 (5.0-14.0)	14.0 (5.0-18.0)	16.0 (5.0-20.0)
EER		4.49	4.68	3.81	3.41
COP		4.88	5.16	4.55	4.23
Noise level cooling (sound pressure) (night mode)	dB(A)	46 (42)	47 (43)	48 (44)	48 (45)
Noise level heating (sound pressure)	dB(A)	48	49	50	50
Noise level (sound power)	dB(A)	63	63	64	65
Air flow	m^3/min	45	80	90	100
Dimensions (H x W x D)	mm	800 x 950 x 370	1380 x 950 x 370	1380 x 950 x 370	1380 x 950 x 370
Net weight	kg	66	103	103	103
Recommended circuit breaker	A	20	32	32	32
Starting current	A	Less than maximum current	Less than maximum current	Less than maximum current	Less than maximum current
Maximum current	A	21.5	30.5	30.5	30.5
Running current cooling	A	6.4	8.7	13.7	17.3
Running current heating	A	6.7	8.9	12.8	15.9
Size of power cable (according to EN 60335-1)	quantity x mm^2	3 x 4.0	3 x 6.0	3 x 6.0	3 x 6.0
Size of transmission cable between indoor unit and outdoor unit	quantity x mm^2	2 x 0.75	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)	Ø9.52 (3/8) / Ø15.88 (5/8)	Ø9.52 (3/8) / Ø15.88 (5/8)	Ø9.52 (3/8) / Ø15.88 (5/8)
Minimum piping length	m	5	5	5	5
Maximum chargeless piping length	m	30	30	30	30
Maximum piping length Additional refrigerant charge needed)	m	50	75	75	75
Additional refrigerant charge needed	g/m	(1)			
Height difference (higher OU / lower OU)	m	30 / 20	30 / 20	30 / 20	30 / 20
Working range (cooling // heating)	°C	(1)			
Refrigerant	-	R410A	R410A	R410A	R410A
Refrigerant charge before shipment	kg	2.3	4.1	4.2	4.2
Compressor type	-	Rotary DC Inverter driven	Scroll DC Inverter driven	Scroll DC Inverter driven	Scroll DC Inverter driven
Wired Remote control model (required; sold separately)		PC-ARFPE	PC-ARFPE	PC-ARFPE	PC-ARFPE

(1) The values for "Additional refrigerant charge needed" and "Working range" are determined depending on the specific application, and can be found in the "Working range " and "DX-Interface refrigerant charge and piping length limits" chapters in the "Indoor Unit Technical Catalogue". It is also essential to check the allowed applications in the "DX-Interface series 2 applications and control mode" chapter in the aforementioned technical catalogue.

OUTDOOR UNITS		RAS-4XHNP1E	RAS-5XHNP1E	RAS-6XHNP1E
Power supply	-	3N~ 400V 50Hz	3N~ 400V 50Hz	3N~ 400V 50Hz
Nominal cooling capacity (min-max)	kW	10.0 (4.5-11.2)	12.5 (5.7-14.0)	14.0 (6.0-16.0)
Nominal heating capacity (min-max)	kW	11.2 (5.0-14.0)	14.0 (5.0-18.0)	16.0 (5.0-20.0)
EER (*)		4.68	3.81	3.41
COP (*)		5.16	4.55	4.23
Noise level cooling (sound pressure) (night mode)	dB(A)	47 (43)	48 (44)	48 (45)
Noise level heating (sound pressure)	dB(A)	49	50	50
Noise level (sound power)	dB(A)	63	64	65
Air flow	m^3/min	80	90	100
Dimensions (H x W x D)	mm	1380 x 950 x 370	1380 x 950 x 370	1380 x 950 x 370
Net weight	kg	103	103	103
Recommended circuit breaker	A	15	15	15
Starting current	A	Less than maximum current	Less than maximum current	Less than maximum current
Maximum current	A	14.0	14.0	16.0
Running current cooling	A	3.2	5.0	6.3
Running current heating	A	3.2	4.7	5.8
Size of power cable (according to EN 60335-1)	quantity x mm^2	5 x 2.5	5 x 2.5	5 x 2.5
Size of transmission cable between indoor unit and outdoor unit	quantity x mm^2	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)	Ø9.52 (3/8) / Ø15.88 (5/8)	Ø9.52 (3/8) / Ø15.88 (5/8)
Minimum piping length	m	5	5	5
Maximum chargeless piping length	m	30	30	30
Maximum piping length	m	75	75	75
Additional refrigerant charge needed	g/m	(1)		
Height difference (higher OU / lower OU)	m	30 / 20	30 / 20	30 / 20
Working range (cooling // heating)	°C	(1)		
Refrigerant	-	R410A	R410A	R410A
Refrigerant charge before shipment	kg	4.1	4.2	4.2
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven	Scroll DC Inverter driven
Wired Remote control model (required; sold separately)		PC-ARFPE	PC-ARFPE	PC-ARFPE

(1) The values for "Additional refrigerant charge needed" and "Working range" are determined depending on the specific application, and can be found in the "Working range " and "DX-Interface refrigerant charge and piping length limits" chapters in the "Indoor Unit Technical Catalogue". It is also essential to check the allowed applications in the "DX-Interface series 2 applications and control mode" chapter in the aforementioned technical catalogue.

OUTDOOR UNITS		RAS-8XHNPE	RAS-10XHNPE
Power supply	-	3N~ 400V 50Hz	3N~ 400V 50Hz
Nominal cooling capacity (min-max)	kW	20.0 (8.0-22.4)	25.0 (10.0-28.0)
Nominal heating capacity (min-max)	kW	22.4 (6.3-28.0)	28.0 (8.0-35.0)
EER		3.56	3.07
COP		4.21	3.84
Noise level cooling (sound pressure) (night mode)	dB(A)	57 (55)	58 (56)
Noise level heating (sound pressure)	dB(A)	59	60
Noise level (sound power)	dB(A)	76	76
Air flow (cooling / heating)	m^3/min	127	134
Dimensions (H x W x D)	mm	1380 x 950 x 370	1380 x 950 x 370
Net weight	kg	136	138
Recommended circuit breaker	A	30	30
Starting current	A	Less than maximum current	Less than maximum current
Maximum current	A	24.0	24.0
Running current cooling	A	8.6	12.6
Running current heating	A	8.1	11.3
Power cable size (according to EN 60335-1)	quantity x mm^2	5 x 6.0	5 x 6.0
Transmitting cable size between indoor unit and outdoor unit	quantity x mm^2	2 x 0.75	2 x 0.75
Piping diameter (liquid / gas)	mm (inch)	Ø9.52 (3/8) / Ø25.4	Ø12.70 (1/2) / Ø25.4
Minimum piping length	m	5	5
Maximum chargeless piping length	m	30	30
Maximum piping length	m	100	100
Additional refrigerant charge needed	g/m	(1)	
Height difference (OU higher / OU lower)	m	30 / 20	30 / 20
Working range (cooling // heating)	°C	(1)	
Refrigerant	-	R410A	R410A
Refrigerant charge before shipment	kg	5.7	6.2
Compressor type	-	Scroll DC Inverter driven	Scroll DC Inverter driven
Wired Remote control model (required; sold separately)		PC-ARFPE	PC-ARFPE

(1) The values for "Additional refrigerant charge needed" and "Working range" are determined depending on the specific application, and can be found in the "Working range " and "DX-Interface refrigerant charge and piping length limits" chapters in the "Indoor Unit Technical Catalogue". It is also essential to check the allowed applications in the "DX-Interface series 2 applications and control mode" chapter in the aforementioned technical catalogue.

3.5 Component data

3.5.1 IVX Premium series

◆ RAS-(2-3)HVNP1(E)

MODEL			RAS-2HVNP1	RAS-2.5HVNP1	RAS-3(X)HVNP1E
Heat exchanger	Type		Multi-pass cross-finned tube		
	Pipe material		Copper		
	Outer diameter	mm	8		7
	Rows		2		2
	Number of tubes in the heat exchanger		44		76
	Fin material		Aluminium		
	Fin pitch		1.45		1.4
	Maximum operating pressure	MPa	4.15		
	Total front area	m^2	0.47		0.77
	Number of heat exchanger per unit		1		
Fan	Fan type		Direct drive propeller fan		
	Fans per unit		1		
	Outer diameter	mm	449		544
	Revolutions	rpm	770		465
	Nominal air flow	m^3/min	41		45
Motor	Shell		Drip-proof type enclosure		
	Starting		Direct current control		
	Power	W	40		100
	Quantity		1		1
	Insulation class		E		E
Compressor	Model		EU1114D9	EU140XA2	2YC45KXD
	Oil Type		HAF68D1 or 68HES-H		FVC50K
	Quantity (l)		0.75	0.75	0.8

◆ RAS-S(4-6)HVNP1E

MODEL			RAS-4(X)H(V)NP1E	RAS-5(X)H(V)NP1E	RAS-6(X)H(V)NP1E
Heat exchanger	Type		Multi-pass Cross finned tube		
	Pipe material		Copper		
	Outer diameter	mm	7		
	Rows		2		
	Number of tubes in the heat exchanger		132		
	Fin material		Aluminium		
	Fin pitch		1.4		
	Maximum operating pressure	MPa	4.15		
	Total front area	m^2	1.35		
	Number of heat exchanger per unit		1		
Fan	Fan type		Direct drive propeller fan		
	Fans per unit		2		
	Outer diameter	mm	544		
	Revolutions	rpm	459/376	516/422	573/469
	Nominal air flow	m^3/min	80	90	100
Motor	Shell		Drip-proof type enclosure		
	Starting		Direct current control		
	Power	W	100 + 100		
	Quantity		2		
	Insulation class		E		
Compressor	Model		E402HHD-36A2 (1~) / E402HHD-36D2 (3N~)		
	Oil type		FVC68D		
	Quantity		0,9	0,9	0,9

◆ RAS-(8-12)HNP(E)

MODEL			RAS-8(X)HNPE	RAS-10(X)HNPE	RAS-12HNP
Heat exchanger	Type		Multi-pass cross-finned tube		
	Pipe material		Copper		
	Outer diameter	mm	7		
	Rows		3		2
	Number of tubes in the heat exchanger		198		160
	Fin material		Aluminium		
	Fin pitch		1.4		
	Maximum heat exchanger pressure	MPa	4.15		
	Total front area	m^2	1.35		1.86
	Number of evaporators per unit		1		
Fan	Fan type		Direct drive propeller fan		
	Fans per unit		2		
	Outer diameter	mm	544		
	Revolutions	rpm	586/717	644/787	630/880
	Nominal air flow	m^3/min	127	134	163
Motor	Shell		Drip-proof type enclosure		
	Starting		Direct current control		
	Power	W	138 + 138		138 + 200
	Quantity		2		
	Insulation class		E		
Compressor	Model		DA50PHD-D1SE2	DA65PHD-D1SE2	
	Oil type		FVC68D		
	Quantity		1.9	1.9	1.9

3.5.2 IVX Standard series

◆ RAS-(3-6)HVNC1(E)

MODEL			RAS-3HVNC1	RAS-4H(V)NC1E	RAS-5H(V)NC1E	RAS-6H(V)NC1E
Heat exchanger	Type		Multi-pass cross-finned tube			
	Pipe material		Copper			
	Outer diameter	mm	8	7		
	Rows		2	2	2	
	Number of tubes in the heat exchanger		44	108		
	Fin material		Aluminium			
	Fin pitch		1.45	1.4		
	Maximum operating pressure	MPa	4.15			
	Total front area	m^2	0.47	1.11		
	Number of heat exchanger per unit		1			
Fan	Fan type		Direct drive propeller fan			
	Fans per unit		1	1		
	Outer diameter	mm	449	544		
	Revolutions	rpm	850	730	730	820
	Nominal air flow	m^3/min	45	62	68	80
Motor	Shell		Drip-proof type enclosure			
	Starting					
	Power	W	40	190		
	Quantity		1	1		
	Insulation class		E	E		
Compressor	Model		EU180XA1	EU260XC1(1~) EU260XD2(3N~)	HB36PHD-A1S2(1~) HB36PHD-D1S2(3N~)	
	Oil type		HAF68D1 or 68HES-H		FVC68D	
	Quantity		0.75	0.9	0.9	

◆ RAS-(8-12)HNC(E)

MODEL			RAS-8HNCE	RAS-10HNCE	RAS-12HNC
Heat exchanger	Type		Multi-pass cross-finned tube		
	Pipe material		Copper		
	Outer diameter	mm	7		
	Rows		3		2
	Number of tubes in the heat exchanger		198		160
	Fin material		Aluminium		
	Fin pitch		1.4		
	Maximum operating pressure	MPa	4.15		
	Total front area	m^2	1.35		1.86
	Number of heat exchanger per unit		1		
Fan	Fan type		Direct drive propeller fan		
	Fans per unit		2		
	Outer diameter	mm	544		
	Revolutions	rpm	586/717	640/787	630/880
	Nominal air flow	m^3/min	127	134	163
Motor	Shell		Drip-proof type enclosure		
	Starting		Direct current control		
	Power	W	138 + 138		138 + 200
	Quantity		2		
	Insulation class		E		
Compressor	Model		DA50PHD-D1SE2	DA65PHD-D1SE2	
	Oil type		FVC68D		
	Quantity		1,9	1,9	1,9

3.6 Electrical data

3.6.1 Considerations

Keywords:

- U: Power supply.
- PH: Phase.
- f: Frequency.
- STC: Starting current: Less than maximum current.
- IPT: Total input power.
- RNC: Running current.
- MC: Maximum current.
- CB: Circuit breaker (A)
- ELB: Earth leakage breaker (Number of poles/A/mA)

NOTE

- *Specifications in these tables are subject to change without notice in order that HITACHI may bring the latest innovations to their customers.*
- *Cooling conditions: Indoor air inlet: 20ºC DB; Outdoor air inlet: 7/6ºC (DB/WB).*
- *Heating conditions: Indoor air inlet: 27/19ºC (DB/WB); Outdoor air inlet: 35ºC DB.*

3.6.2 Minimum requirements of the protection devices

CAUTION

- *Ensure specifically that there is an Earth Leakage Breaker (ELB) installed for the units (outdoor 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 (outdoor and indoor unit).*

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).*

3.6.3 IVX Premium series

Outdoor unit	Main unit power			Applicable voltage		Compressor and fan motor						CB (A)	ELB
							Cooling		Heating				
	U (V)	PH	f (Hz)	U max (V)	U min (V)	STC (A)	RNC (A)	IPT (kW)	RNC (A)	IPT (kW)	MC (A)	Max. IPT (kW)	
RAS-2HVNP1	230	1	50	253	207	-	5.1	1.17	4.9	1.13	13.8	3.1	16	2/40/30
RAS-2.5HVNP1							5.4	1.22	5.7	1.30	15.8	3.6	20	
RAS-3(X)HVNP1E							6.4	1.46	6.7	1.52	21.5	4.9	25	
RAS-4(X)HVNP1E							8.7	1.99	8.9	2.02	30.5	6.9	40	
RAS-5(X)HVNP1E							13.7	3.11	12.8	2.91	30.5	6.9	40	
RAS-6(X)HVNP1E							17.3	3.94	15.9	3.61	30.5	6.9	40	
RAS-4(X)HNP1E	400	3	50	440	360	-	3.2	1.99	3.2	2.02	14.0	8.7	20	4/40/30
RAS-5(X)HNP1E							5.0	3.11	4.7	2.91	14.0	8.7	20	
RAS-6(X)HNP1E							6.3	3.94	5.8	3.61	16.0	9.9	20	
RAS-8(X)HNPE							8.6	5.36	8.1	5.06	24.0	15.0	30	
RAS-10(X)HNPE							12.6	7.88	11.3	7.03	24.0	15.0	30	
RAS-12HNP							17.5	11.05	14.2	8.96	24.3	15.3	30	

IVX Standard series

Outdoor unit	Main unit power			Applicable voltage		Compressor and fan motor						CB (A)	ELB
							Cooling		Heating				
	U (V)	PH	f (Hz)	U max (V)	U min (V)	STC (A)	RNC (A)	IPT (kW)	RNC (A)	IPT (kW)	MC (A)	Max. IPT (kW)	
RAS-3HVNC1	230	1	50	253	207	-	9.4	2.14	8.3	1.88	17.8	4.0	20	2/40/30
RAS-4HVNC1E							11.2	2.55	10.1	2.30	28.5	6.5	32	
RAS-5HVNC1E							15.5	3.54	15.1	3.43	28.5	6.5	32	
RAS-6HVNC1E							18.1	4.12	19.0	4.32	28.5	6.5	32	
RAS-4HNC1E	400	3	50	440	360	-	4.1	2.55	3.7	2.30	15.5	9.6	20	4/40/30
RAS-5HNC1E							5.7	3.54	5.5	3.43	15.5	9.6	20	
RAS-6HNC1E							6.6	4.12	6.9	4.32	15.5	9.6	20	
RAS-8HNCE							9.1	5.69	9.0	5.62	24.0	15.0	30	
RAS-10HNCE							12.9	8.02	12.0	7.45	24.0	15.0	30	
RAS-12HNC							17.5	11.05	14.2	8.96	24.3	15.3	30	

4. Capacities and selection data

Index

4.1 Combinability range

4.1.1 Connected number of indoor units

◆ IVX Premium series

Range of operation capacity control from 50% up to 120% (from 90 up to 110% for 2 and 2.5HP outdoor units).

Outdoor unit	Minimum combination capacity (HP)	Maximum combination capacity (HP)	Maximum Combination quantity	Minimum indoor unit capacity (HP)
RAS-2HVNP1	1.8	2.2	2	0.8 (*)
RAS-2.5HVNP1	2.25	2.75	2	0.8 (**)
RAS-3HVNP1E	1.5	3.6	3	0.8
RAS-4H(V)NP1E	2.0	4.8	5	0.8
RAS-5H(V)NP1E	2.5	6.0	6	0.8
RAS-6H(V)NP1E	3.0	7.2	6	0.8
RAS-8HNPE	4.0	9.6	8	0.8
RAS-10HNPE	5.0	12.0	8	0.8
RAS-12HNP	6.0	14.4	8	0.8

NOTE

- *(*) When installing Indoor Units RCI-FSN3, only 1 indoor unit system combination is allowed.*
- *(**) When installing several Indoor Units and either RCI-FSN3 are present, the minimum allowed capacity for these series is 1.5 HP.*

◆ IVX Standard series

Range of operation capacity control from 90% up to 115% (from 90 up to 110% for 3HP outdoor unit).

Outdoor unit	Minimum combination capacity (HP)	Maximum combination capacity (HP)	Maximum Combination quantity	Minimum indoor unit capacity (HP)
RAS-3HVNC1	2.7	3.5	2	0.8
RAS-4H(V)NC1E	3.6	4.6	4	0.8
RAS-5H(V)NC1E	4.5	5.8	4	0.8
RAS-6H(V)NC1E	5.4	6.9	4	0.8
RAS-8HNCE	7.2	9.2	4	1.8
RAS-10HNCE	9.0	11.5	4	1.8
RAS-12HNC	10.8	13.8	4	1.8

NOTE

- *When installing RCIM-2.0FSN2, RPF(I)-2.0FSN2E or RPF(I)-2.5FSN2E, 1 indoor unit system combination with IVX Premium/ Standard series not allowed.*
- *In case of installation in cold territories (where Outdoor Temperature may fall below -10ºC for Utopia IVX Premium and -5ºC for Utopia IVX Standard) or in places where Heating load is large, install a number of units not bigger than suggested number of connected units, with a connected capacity ratio under 100%.*
- *Please check the piping chapter for other restrictions and limitations to adequate the combinability and the number of indoor units installed.*
- *See "9. Piping work and refrigerant charge" for detailed information and additional remarks about combinability.*
- *8 and 10 HP indoor units only 1 indoor unit system is allowed.*

◆ Specific IVX Premium for DX-Interface

Outdoor unit	DX-Code
RAS-3XHVNP1E	EXV-3.0E2
RAS-4XH(V)NP1E	EXV-4.0E2
RAS-5XH(V)NP1E	EXV-5.0E2
RAS-6XH(V)NP1E	EXV-6.0E2
RAS-8XHNPE	EXV-8.0E2
RAS-10XHNPE	EXV-10.0E2

NOTE

only 1 to 1 combination system is allowed

ATTENTION

It is essential to check the allowed applications and the requirements that must be satisfied for each of them in the "Selection procedure for DX-interface" chapter of the "Indoor Unit Technical Catalogue, as well as the working range and the piping length limits for the DX-Interface in the relevant chapters of the aforesaid technical catalogue.

4.1.2 Connected capacity ratio

◆ IVX Premium series

	❄ ☀					
	Outdoor unit model					
	2 HP (**)	2.5 HP (***)	3 HP	4 HP	5 HP	6 HP
Maximum number of connected indoor units	2		3	5	6	
Connected capacity ratio of indoor unit % (number of connected indoor units)	90-110% (1 unit)		50-120% (≤ 2 units)	50-120% (≤ 4 units)		
	90-100% (2 units) (*)		50-100% (3 units) (*)	50-100% (5 units) (*)	50-100% (5 or 6 units) (*)	
Minimum capacity of indoor units (HP)	0.8					

	❄ ☀		
	Outdoor unit model		
	8 HP	10 HP	12 HP
Maximum number of connected indoor units	8		
Connected capacity ratio of indoor unit % (number of connected indoor units)	50-120% (≤ 4 units)		
	50-100% (5, 6, 7 or 8 units) (*)		
Minimum capacity of indoor units (HP)	0.8		

NOTE

- *(*) Follow Table 1 (see remarks) in order to optimise the balance of indoor units.*
- *(**) When installing indoor units RCI-FSN3, only single combination is allowed.*
- *(***) When installing several indoor units and either RCI-FSN3 are present, the minimum allowed capacity for these series is 1.5 HP.*

◆ IVX Standard series

	❄ ☀			
	Outdoor unit model			
	3 HP	4 HP	5 HP	6 HP
Maximum number of connected indoor units	2	4		
Connected capacity ratio of indoor unit % (number of connected Indoor Units)	90-110% (1 unit)	90-115% (≤ 2 units)		
	90-100% (2 units)	90-100% (3 or 4 units)		
Minimum capacity of indoor units (HP)	0.8			

	❄ ☀		
	Outdoor unit model		
	8 HP	10 HP	12 HP
Maximum number of connected indoor units	4		
Connected capacity ratio of indoor unit % (number of connected indoor units)	90-115%		
Minimum capacity of indoor units (HP)	1.8		

NOTE

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 Table 1 (see remarks) for best comfort.

◆ Remarks

1 Table 1

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

2 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 are:

OU model	2 HP	2.5 HP	3 HP	4 HP	5 HP	6 HP	8HP	10HP	12HP
OU Premium Series Maximum number of IU	1		2	4					
OU Standard Series Maximum number of IU	--		1	2			4		

3 When installing RCIM-2.0FSN2, RPF(I)-2.0FSN2E or RPF(I)-2.5FSN2E, single combination with IVX Premium/ Standard series is not allowed.

4 In case of installation in cold territories (where outdoor temperature may fall below -10ºC for Utopia IVX Premium and -5ºC for Utopia IVX Standard) or in places where heating load is large, install a number of units not bigger than suggested number of connected units, with a connected capacity ratio under 100%.

5 Please check the piping chapter for other restrictions and limitations to adequate the combinability and the number of indoor units installed.

6 8 and 10 HP Indoor Units allowed for 1 indoor unit combination system only.

4.2 System selection procedure

This combinability allows the outdoor 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.

A: morning peak heat load in the eastern area. (example: 3 HP)

B: evening peak heat load in the western area. (example: 3.5 HP)

C: maximum simultaneous load for the entire building.

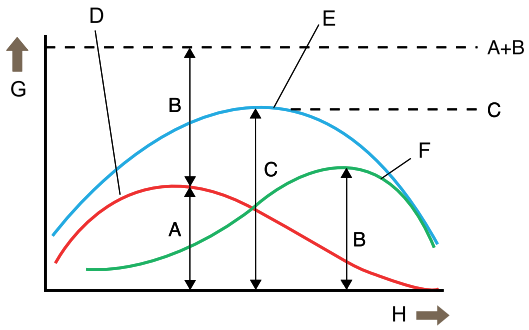
D: eastern area load.

E: total load.

F: western area load.

G: load.

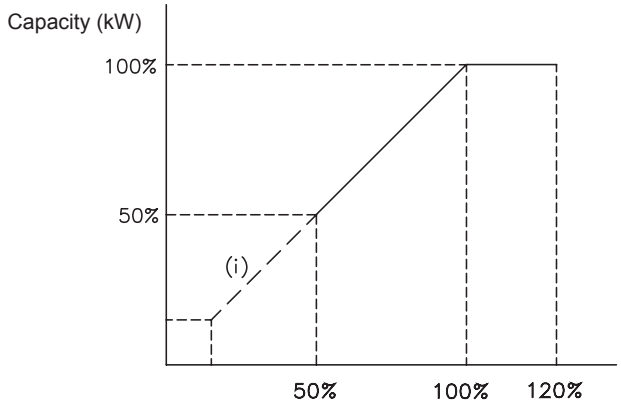
H: time.



The diagram shows a typical building with a morning peak heat load on the east zone equivalent to a 3 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 A+B : 3 HP + 3.5 HP = 6.5 HP (next capacity available is 8 HP). The maximum simultaneous load on the whole building occurs at noon and is equivalent to a 6 HP capacity (as example). A RAS-6H(V)NPE unit can be selected, and this capacity can be directed either to the east or west zone as dictated by the systems controls. Then the IVX Premium series 6 HP outdoor unit can be selected, against the 8 HP required in a typical system (25% reduction).

The following figure shows the capacity curve depending on the combined indoor units.



Total horsepower of combined indoor units (HP) (*)

NOTE

- *(*) This range can be different depending the outdoor and indoor unit model.*
- *(i) Capacity when some indoor units are off*

4.2.1 Selection procedure (step 1)

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 outdoor unit that facilitates service and maintenance tasks.

1 **Determine the total load required for each room.**

2 **Select, per each room, the appropriate Indoor Unit according to the required load and the installation characteristics.**

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

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

3 Pre-select the outdoor units that covers the installation's cooling load requirements

If the required loads will not be simultaneous (for example: the maximum required loads of room 1 (east zone) occurs at the morning and the maximum required loads of room 2 (west zone) occurs at the afternoon.), select the outdoor unit that cover the maximum simultaneous load on the installation and check that the total combination horsepower must not be higher than the limits, using the following:

Total combination horsepower = (Total indoor unit horsepower / Outdoor unit horsepower) x 100

4 Calculation of f_{LC} (Cooling piping length correction factor)

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

To determine this value it is necessary refer to the piping length correction factor tables that are based on the equivalent piping length in meter and height between outdoor and indoor units. For the equivalent one-way piping length between indoor unit and outdoor unit (m) consider the following:

One 90º elbow is 0.5 m.

One 180º bend is 1.5 m.

One Multi-kit is 0.5 m.

5 Calculation of f_{AL} (Correction factor according to altitude

The capacity is affected by the altitude of the installation location. When the altitude is above sea level, capacity must be corrected with the altitude correction factor according to according to the table of "Correction factor according to altitude"

6 Cooling capacity correction (Q_C) due to the piping length and altitude factor

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

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

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

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

f_{LC}: Cooling piping length correction factor.

f_{AL}: Corrections factor according to altitude.

7 Cooling capacity correction of the outdoor unit (Q_{AC}) depending of the humidity of the indoor unit

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

The following formula is used to apply an adjustment to the cooling capacity showed in the tables due to the difference between the real indoor air inlet dry bulb temperature vs the one used for calculate the nominal cooling capacity data.

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

Q_{AC}: Actual cooling capacity of the outdoor unit (kW) (at given real % humidity)

Q_C: Corrected cooling capacity of the outdoor unit by piping length (kW) (at given 50 % humidity)

CR: Correction ratio due to humidity.

DB_R: Real Dry Bulb evaporator temperature (ºC).

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

8 Actual indoor units capacity

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

$$Q_{CI} = Q_{AC} \times (Q_{NCI} / Q_{NCC})$$

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

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

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

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

9 Sensible heat capacity (*SHC*)

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.

10 Cheks

Check that the total capacity and sensible heat capacity (SHC) are greater than the estimated cooling load by the different rooms to be conditioned. Therefore, it can be said that the selected outdoor unit meets the minimum cooling requirements set for the system.

Corrected total cooling capacity $(kW)_{TOTAL}$	≥	Estimated total cooling load $(kW)_{TOTAL}$
Corrected sensible heat capacity $(kW)_{TOTAL}$	≥	Estimated sensible heat capacity $(kW)_{TOTAL}$
Corrected total cooling capacity $(kW)_{ROOMn}$	≥	Estimated total cooling load $(kW)_{ROOMn}$
Corrected sensible heat capacity $(kW)_{ROOMn}$	≥	Estimated sensible heat capacity $(kW)_{ROOMn}$

4.2.2 Selection procedure (step 2)

1 Calculate the heating requirements for each room

See if the pre-selected indoor units and outdoor units have the necessary nominal heating capacity for each room.

2 Heating capacity correction (Q_H)

The actual heating capacity of the pre-selected outdoor unit (in cooling mode (step 1)) must be calculated applying the necessary correction factors:

$Q_H = Q_{MH} \times f_{LH} \times f_D \times f_{AL}$

Q_H: Actual heating capacity of the outdoor unit (kW)

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

f_{LH}: Heating piping length correction factor

f_D: Defrost correction factor

f_{AL}: Corrections factor according to altitude.

Calculation of f_{LH}

Referring to the diagrams for *"4.6 Piping length correction factor".*

Calculation of f_D

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

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

3 Heating capacity of each indoor unit (Q_H)

Once the real heating capacity of the outdoor unit has been determined, its heating capacity in combination with the indoor units, can be calculated.

$Q_{HI} = Q_H \times (Q_{NHI} / Q_{NHC})$

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

Q_H: Actual heating capacity of the outdoor unit (kW)

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

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

If the corrected heating capacity is greater than the estimated heating load by the different rooms to be conditioned, it can be said that the selection is valid for both cooling and heating.

Actual heating capacity $(kW)_{TOTAL}$	≥	Estimated heating capacity $(kW)_{TOTAL}$
Actual heating capacity $(kW)_{ROOMn}$	≥	Estimated heating capacity $(kW)_{ROOMn}$

4.3 Maximum cooling capacity

Tables are based on the following conditions:

Piping Length/Height difference: 7.5 m / 0 m.

The tables are based on High speed of indoor fan. To calculate the cooling capacity of medium or low speed of indoor fan, multiply cooling capacity of high speed by Correction Curve Factor (Chapter *"4.5 Correction indoor fan speed factor"*).

All temperatures in ºC.

4.3.1 IVX Premium series

Outdoor unit	Outdoor air inlet temperature (DB)	Indoor air inlet temperature WB (ºC) (DB (ºC))					
		15/(22)	17/(24)	18/(25)	19/(27)	21/(29)	23/(31)
		CAP max	CAP max	CAP max	CAP max	CAP max	CAP max
RAS-2HVNP1	25	5,29	5,60	5,75	5,89	6,17	6,44
	30	5,18	5,50	5,64	5,78	6,06	6,33
	35	5,00	5,31	5,46	5,60	5,88	6,15
	40	4,77	5,08	5,23	5,37	5,65	5,92
RAS-2.5HVNP1	25	5,91	6,22	6,37	6,52	6,80	7,10
	30	5,76	6,07	6,23	6,39	6,71	6,99
	35	5,67	5,98	6,14	6,30	6,60	6,90
	40	5,33	5,61	5,75	5,88	6,15	6,38
RAS-3(X)HVNP1E	25	7,73	8,16	8,39	8,62	9,06	9,45
	30	7,52	7,95	8,17	8,39	8,79	9,22
	35	7,08	7,61	7,80	8,00	8,49	8,92
	40	6,81	7,30	7,51	7,70	8,10	8,50
RAS-4(X)H(V)NP1E	25	10,60	11,20	11,50	11,80	12,40	13,07
	30	10,30	10,9	11,20	11,50	12,13	12,79
	35	9,91	10,6	10,91	11,20	11,80	12,37
	40	9,60	10,30	10,62	10,90	11,40	11,90
RAS-5(X)H(V)NP1E	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
RAS-6(X)H(V)NP1E	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
RAS-8(X)HNPE	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
RAS-10(X)HNPE	25	26,09	27,83	28,67	29,54	31,51	33,50
	30	25,27	26,94	27,82	28,74	30,68	32,67
	35	24,59	26,26	27,11	28,00	29,90	31,88
	40	23,54	25,17	26,01	26,88	28,71	30,43
RAS-12HNP	25	30,53	32,55	33,59	34,66	36,91	39,30
	30	30,13	32,21	33,26	34,34	36,65	39,01
	35	29,23	31,35	32,41	33,50	35,79	38,18
	40	28,01	30,01	31,09	32,05	33,38	34,82

4.3.2 IVX Standard series

Outdoor unit	Outdoor air inlet temperature (DB)	Indoor air inlet temperature WB (ºC) (DB (ºC))					
		15/(22)	17/(24)	18/(25)	19/(27)	21/(29)	23/(31)
		CAP max	CAP max	CAP max	CAP max	CAP max	CAP max
RAS-3HVNC1	25	7,70	8,10	8,31	8,50	8,80	9,10
	30	7,42	7,84	8,04	8,23	8,55	8,80
	35	7,26	7,63	7,82	8,00	8,32	8,60
	40	6,78	7,00	7,16	7,32	7,64	7,95
RAS-4H(V)NC1E	25	10,60	11,20	11,50	11,80	12,40	13,10
	30	10,30	10,90	11,20	11,50	12,15	12,80
	35	10,00	10,60	10,90	11,20	11,80	12,40
	40	9,70	10,30	10,60	10,90	11,45	11,90
RAS-5H(V)NC1E	25	13,20	14,00	14,40	14,70	15,30	15,80
	30	12,70	13,50	13,90	14,30	14,90	15,40
	35	12,10	13,10	13,60	14,00	14,50	14,80
	40	11,50	12,30	12,70	13,00	13,55	14,00
RAS-6H(V)NC1E	25	15,50	16,30	16,70	17,00	17,60	18,10
	30	15,10	15,90	16,30	16,60	17,25	17,70
	35	14,25	15,15	15,60	16,00	16,55	16,90
	40	13,50	14,30	14,70	15,10	15,75	16,20
RAS-8HNCE	25	20,76	22,07	22,77	23,47	24,89	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
RAS-10HNCE	25	26,09	27,83	28,67	29,54	31,51	33,50
	30	25,27	26,94	27,82	28,74	30,68	32,67
	35	24,59	26,26	27,11	28,00	29,90	31,88
	40	23,54	25,17	26,01	26,88	28,71	30,43
RAS-12HNC	25	30,53	32,55	33,59	34,66	36,91	39,30
	30	30,13	32,21	33,26	34,34	36,65	39,01
	35	29,23	31,35	32,41	33,50	35,79	38,18
	40	28,01	30,01	31,09	32,05	33,38	34,92

4.4 Maximum heating capacity

Tables are based on the following conditions:

Piping Length/Height difference: 7.5 m / 0 m.

The tables are based on High speed of indoor fan. To calculate the cooling capacity of medium or low speed of indoor fan, multiply cooling capacity of high speed by Correction Curve Factor (Chapter *"4.5 Correction indoor fan speed factor"*).

The Tables does not include decreasing capacity by defrosting operation.

All temperatures in ºC.

4.4.1 IVX Premium series

Outdoor unit	Outdoor air inlet temperature (WB)	Indoor air inlet temperature WB (ºC) (DB (ºC))							
		15	16	18	20	22	24	26	28
		CAP max	CAP max	CAP max	CAP max	CAP max	CAP max	CAP max	CAP max
RAS-2HVNP1	-20	3,84	3,82	3,79	3,75	3,71	3,68	3,64	3,61
	-15	4,49	4,47	4,44	4,39	4,35	4,32	4,28	4,24
	-10	5,14	5,12	5,08	5,04	4,99	4,95	4,91	4,87
	-5	5,80	5,78	5,73	5,68	5,63	5,59	5,55	5,00
	0	6,45	6,43	6,38	6,33	6,27	6,23	6,18	6,13
	5	7,10	7,08	7,03	6,97	6,92	6,86	6,81	6,76
	10	7,94	7,91	7,85	7,79	7,73	7,66	7,59	7,53
	15	8,82	8,79	8,72	8,65	8,57	8,49	8,42	8,34
RAS-2,5HVNP1	-20	4,27	4,25	4,19	4,15	4,10	4,06	4,02	3,98
	-15	5,03	5,00	4,94	4,90	4,85	4,80	4,75	4,71
	-10	5,73	5,70	5,64	5,60	5,55	5,51	5,48	5,44
	-5	6,48	6,45	6,40	6,35	6,30	6,25	6,21	6,16
	0	7,23	7,21	7,15	7,10	7,05	6,99	6,94	6,89
	5	7,99	7,96	7,91	7,85	7,79	7,74	7,68	7,62
	10	8,85	8,81	8,75	8,69	8,63	8,56	8,50	8,43
	15	9,73	9,70	9,62	9,55	9,47	9,39	9,31	9,23
RAS-3(X)HVNP1E	-20	5,45	5,43	5,40	5,36	5,33	5,30	5,27	5,24
	-15	6,49	6,46	6,41	6,37	6,33	6,28	6,24	6,19
	-10	7,52	7,49	7,43	7,38	7,32	7,26	7,20	7,15
	-5	8,55	8,52	8,45	8,38	8,32	8,25	8,17	8,10
	0	9,59	9,55	9,47	9,39	9,31	9,23	9,14	9,06
	5	10,62	10,58	10,49	10,40	10,31	10,21	10,11	10,01
	10	11,88	11,83	11,73	11,63	11,51	11,39	11,26	11,14
	15	13,24	13,18	13,04	12,91	12,77	12,62	12,47	12,32
RAS-4(X)H(V)NP1E	-20	8,54	8,43	8,22	8,00	7,77	7,54	7,31	7,07
	-15	9,65	9,56	9,38	9,18	8,96	8,74	8,52	8,30
	-10	10,74	10,66	10,50	10,33	10,13	9,92	9,71	9,50
	-5	11,83	11,76	11,63	11,47	11,29	11,10	10,90	10,70
	0	12,91	12,86	12,75	12,62	12,46	12,27	12,08	11,90
	5	14,00	13,96	13,88	13,77	13,62	13,45	13,27	13,10
	10	15,48	15,47	15,45	15,36	15,24	15,08	14,92	14,77
	15	17,09	17,09	17,07	17,05	16,95	16,78	16,63	16,47

Outdoor unit	Outdoor air inlet temperature (WB)	Indoor air inlet temperature WB (ºC) (DB (ºC))							
		15	16	18	20	22	24	26	28
		CAP max	CAP max	CAP max	CAP max	CAP max	CAP max	CAP max	CAP max
RAS-5(X)H(V)NP1E	-20	10,88	10,85	10,79	10,60	10,40	10,19	9,98	9,78
	-15	12,20	12,16	12,08	11,90	11,70	11,50	11,30	11,09
	-10	13,54	13,50	13,40	13,22	13,03	12,83	12,62	12,42
	-5	15,06	14,00	14,88	14,71	14,52	14,32	14,13	13,93
	0	16,22	16,15	16,02	15,85	15,66	15,47	15,27	15,08
	5	17,84	17,77	17,61	17,45	17,27	17,08	16,88	16,69
	10	20,18	20,10	19,93	19,74	19,55	19,34	19,12	18,90
	15	22,45	22,35	22,14	21,92	21,69	21,44	21,19	20,95
RAS-6(X)H(V)NP1E	-20	11,47	11,42	11,27	11,07	10,86	10,69	10,51	10,33
	-15	12,94	12,88	12,74	12,57	12,39	12,24	12,09	11,94
	-10	14,45	14,39	14,27	14,13	13,98	13,85	13,73	13,60
	-5	16,18	16,13	16,02	15,91	15,79	15,69	15,59	15,49
	0	17,57	17,53	17,44	17,35	17,25	17,18	17,11	17,03
	5	19,52	19,48	19,40	19,34	19,27	19,22	19,18	19,13
	10	21,88	21,77	21,54	21,31	21,06	20,67	20,27	19,88
	15	23,64	23,50	23,23	22,95	21,83	20,67	20,27	19,88
RAS-8(X)HNPE	-20	15,43	15,38	15,00	14,73	14,49	14,30	14,17	14,09
	-15	16,86	16,70	16,38	16,13	15,91	15,73	15,62	15,55
	-10	18,94	18,81	18,56	18,34	18,15	18,04	17,97	17,94
	-5	21,18	21,18	21,17	21,09	21,00	20,92	20,83	20,73
	0	24,23	24,21	24,18	24,19	24,07	23,91	23,74	23,58
	5	27,59	27,54	27,44	27,36	27,26	27,12	26,92	26,67
	10	31,00	30,93	30,78	30,58	30,40	30,11	28,45	26,67
	15	32,20	32,08	31,83	31,57	31,27	30,88	28,83	26,67
RAS-10(X)HNPE	-20	20,58	20,37	19,94	19,58	19,37	19,19	18,99	18,78
	-15	21,67	21,43	21,08	20,75	20,56	20,39	20,22	20,03
	-10	24,09	23,85	23,39	22,99	22,71	22,49	22,25	21,99
	-5	26,61	26,55	26,44	26,32	26,23	26,13	26,02	25,90
	0	30,58	30,49	30,32	30,14	29,94	29,74	29,54	29,32
	5	34,84	34,72	34,48	34,22	33,83	33,52	33,27	33,05
	10	38,90	38,76	38,47	38,16	37,83	37,26	35,28	33,05
	15	40,30	40,12	39,76	39,39	38,99	38,31	35,82	33,05
RAS-12HNP	-20	21,00	20,79	20,37	20,01	19,80	19,62	19,43	19,22
	-15	23,18	22,99	22,60	22,28	22,10	21,94	21,77	21,59
	-10	25,82	25,55	25,12	24,71	24,43	24,22	23,98	23,71
	-5	28,48	28,43	28,33	28,24	28,17	28,12	28,09	28,08
	0	32,73	32,65	32,48	32,30	32,11	31,93	31,75	31,58
	5	37,31	37,18	36,92	36,66	36,39	36,09	35,77	35,43
	10	41,40	41,25	40,95	40,64	40,32	39,77	37,71	35,43
	15	42,80	42,82	42,75	42,52	42,30	41,50	39,07	35,43

4.4.2 IVX Standard series

Outdoor unit	Outdoor air inlet temperature (WB)	Indoor air inlet temperature WB (ºC) (DB (ºC))							
		15	16	18	20	22	24	26	28
		CAP max	CAP max	CAP max	CAP max	CAP max	CAP max	CAP max	CAP max
RAS-3HVNC1	-20	4,71	4,68	4,62	4,56	4,51	4,46	4,41	4,36
	-15	5,38	5,35	5,29	5,23	5,18	5,13	5,08	5,03
	-10	6,05	6,02	5,96	5,95	5,85	5,80	5,75	5,70
	-5	6,85	6,82	6,75	6,69	6,63	6,57	6,52	6,46
	0	7,93	7,88	7,81	7,74	7,68	7,61	7,55	7,49
	5	8,99	8,95	8,87	8,79	8,72	8,65	8,58	8,51
	10	10,09	10,04	9,95	9,87	9,80	9,72	9,64	9,56
	15	11,21	11,16	11,07	10,96	10,88	10,78	10,68	10,59
RAS-4H(V)NC1E	-20	8,20	8,09	7,88	7,66	7,42	7,19	6,96	6,73
	-15	9,39	9,29	9,09	8,89	8,68	8,46	8,24	8,02
	-10	10,55	10,47	10,31	10,14	9,94	9,73	9,52	9,31
	-5	11,74	11,67	11,53	11,38	11,19	11,00	10,81	10,62
	0	12,92	12,86	12,74	12,62	12,45	12,26	12,07	11,88
	5	14,01	13,97	13,89	13,77	13,62	13,45	13,28	13,11
	10	15,48	15,47	15,45	15,35	15,23	15,07	14,91	14,75
	15	17,12	17,10	17,07	17,05	16,94	16,78	16,62	16,46
RAS-5H(V)NC1E	-20	8,62	8,58	8,51	8,44	8,40	8,37	8,34	8,31
	-15	10,26	10,22	10,15	10,12	10,03	10,00	9,97	9,94
	-10	11,95	11,92	11,87	11,79	11,74	11,72	11,70	11,68
	-5	13,65	13,61	13,53	13,46	13,37	13,31	13,25	13,19
	0	15,84	15,79	15,69	15,60	15,49	15,40	15,31	15,22
	5	18,04	18,00	17,92	17,81	17,67	17,54	17,41	17,28
	10	19,04	19,00	18,92	18,79	18,65	18,47	18,29	18,11
	15	19,74	19,69	19,60	19,49	19,35	19,13	18,91	18,69
RAS-6H(V)NC1E	-20	9,30	9,25	9,15	9,10	9,03	9,00	8,97	8,94
	-15	11,04	11,01	10,96	10,89	10,85	10,82	10,79	10,76
	-10	12,80	12,76	12,96	12,64	12,59	12,55	12,51	12,47
	-5	14,87	14,82	14,73	14,64	14,55	14,48	14,41	14,34
	0	17,46	17,41	17,31	17,20	17,08	16,97	16,86	16,75
	5	20,11	20,04	19,90	19,75	19,61	19,45	19,29	19,13
	10	21,15	21,10	21,00	20,89	20,80	20,66	20,52	20,38
	15	22,31	22,22	22,04	21,90	21,76	21,64	21,52	21,40
RAS-8HNCE	-20	15,43	15,35	15,00	14,73	14,49	14,30	14,17	14,09
	-15	16,86	16,70	16,38	16,13	15,91	15,73	15,62	15,55
	-10	18,94	18,81	18,56	18,34	18,15	18,04	17,97	17,94
	-5	21,18	21,18	21,17	21,09	21,00	20,92	20,83	20,73
	0	24,23	24,21	24,18	24,19	24,07	23,91	23,75	23,58
	5	27,59	27,54	27,44	27,36	27,26	27,12	26,92	26,67
	10	31,00	30,93	30,78	30,58	30,40	30,11	28,45	26,67
	15	32,20	32,08	31,83	31,57	31,28	30,88	28,83	26,67

Maximum heating capacity

Outdoor unit	Outdoor air inlet temperature (WB)	Indoor air inlet temperature WB (ºC) (DB (ºC))							
		15	16	18	20	22	24	26	28
		CAP max	CAP max	CAP max	CAP max	CAP max	CAP max	CAP max	CAP max
RAS-10HNCE	-20	20,58	20,37	19,94	19,58	19,37	19,19	18,99	18,78
	-15	21,67	21,47	21,08	20,75	20,56	20,39	20,22	20,03
	-10	24,09	23,85	23,39	22,99	22,71	22,49	22,25	21,99
	-5	26,61	26,55	26,44	26,32	26,23	26,13	26,02	25,90
	0	30,58	30,49	30,32	30,14	29,94	29,74	29,54	29,32
	5	34,84	34,72	34,48	34,22	33,83	33,52	33,27	33,05
	10	38,90	38,76	38,47	38,16	37,83	37,26	35,28	33,05
	15	40,30	40,12	39,76	39,39	38,99	38,31	35,82	33,05
RAS-12HNC	-20	21,00	20,79	20,37	20,01	19,80	19,62	19,43	19,22
	-15	23,18	22,99	22,60	22,28	22,10	21,94	21,77	21,59
	-10	25,82	25,55	25,12	24,71	24,43	24,22	23,98	23,71
	-5	28,48	28,43	28,33	28,24	28,17	28,12	28,09	28,08
	0	32,73	32,65	32,48	32,30	32,11	31,93	31,75	31,58
	5	37,31	37,18	36,92	36,66	36,39	39,09	35,77	35,43
	10	41,40	41,25	40,95	40,64	40,32	39,77	37,71	35,43
	15	42,80	42,82	42,75	42,52	42,30	41,50	39,07	35,43

4.5 Correction indoor fan speed factor

4.5.1 Cooling

The tables are based on High speed of indoor fan. To calculate the cooling capacity of medium or low speed of indoor fan, multiply cooling capacity of high speed by correction indoor fan speed factor.

	Outdoor unit HP		
Indoor unit fan speed	2 - 6	8	10/12
High	1.00	1.00	1.00
Medium	0.98	0.94	0.94
Low	0.95	0.86	0.87

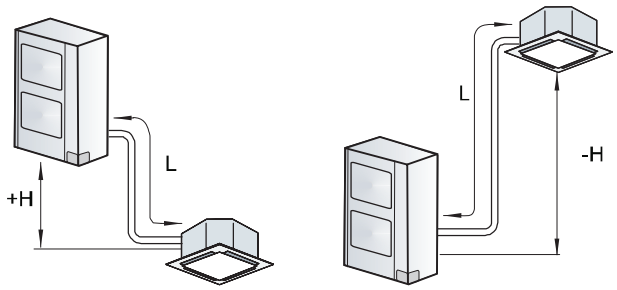
4.5.2 Heating

The tables are based on High speed of indoor fan. To calculate the cooling capacity of medium or low speed of indoor fan, multiply cooling capacity of high speed by correction indoor fan speed factor.

The tables does not include decreasing capacity by defrosting operation.

	Outdoor unit HP		
Indoor unit fan speed	2 - 6	8	10/12
High	1.00	1.00	1.00
Medium	0.98	0.86	0.86
Low	0.97	0.77	0.76

4.6 Piping length correction factor (f_{LC}, f_{LH})



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

H: Height between indoor unit and outdoor unit (m).

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

L: Actual one-way piping length between indoor unit and outdoor unit (m).

EL: Equivalent one-way piping length between indoor unit and outdoor unit (m).

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

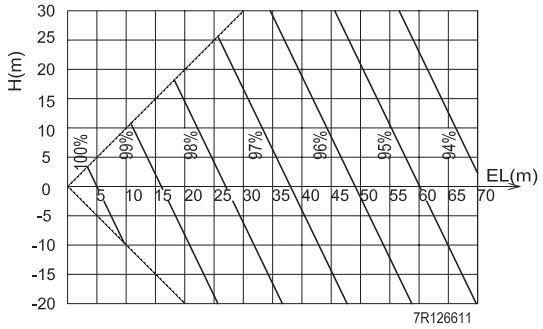
NOTE

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

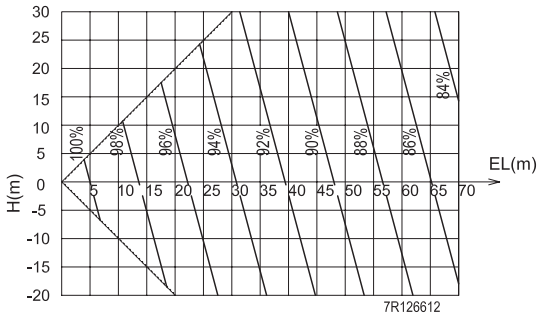
4.6.1 IVX Premium series

Cooling

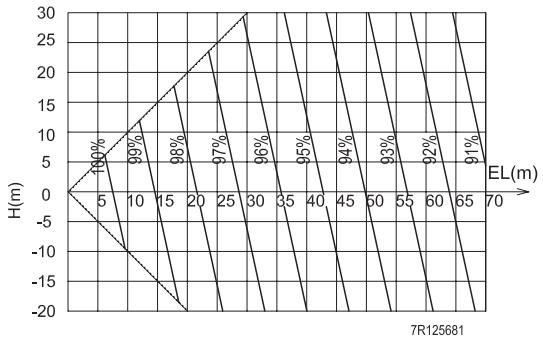
RAS-2HVNP1



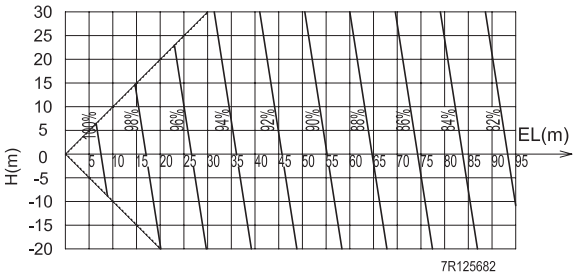
RAS-2.5HVNP1



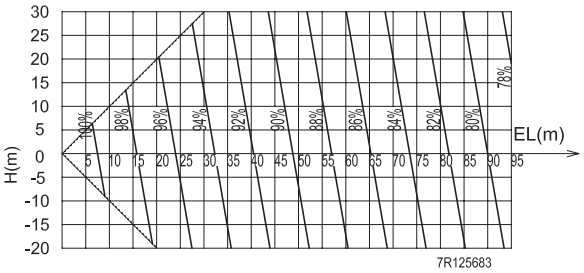
RAS-3(X)HVNP1E



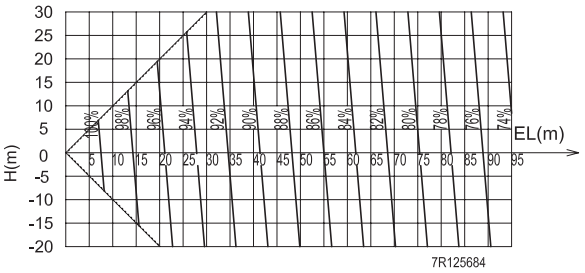
RAS-4(X)H(V)NP1E



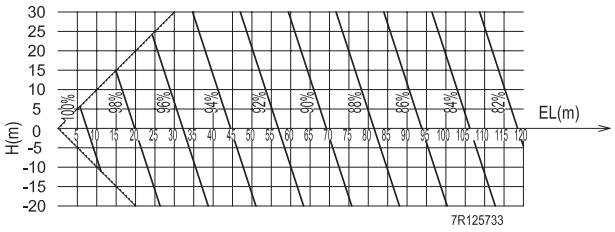
RAS-5(X)H(V)NP1E



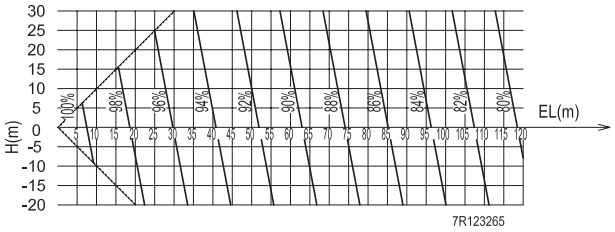
RAS-6(X)H(V)NP1E



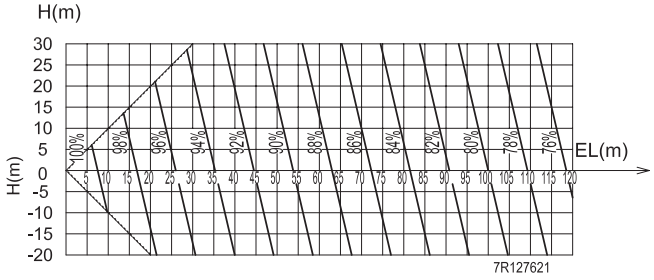
RAS-8(X)HNPE



RAS-10(X)HNPE

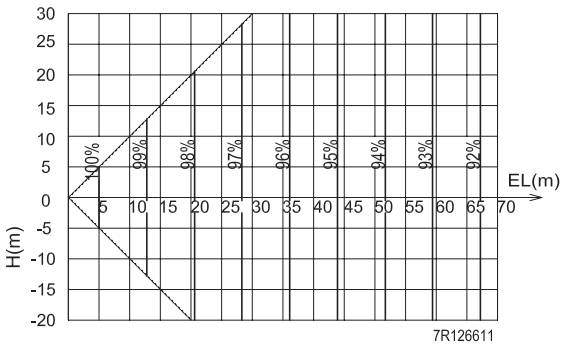


RAS-12HNP

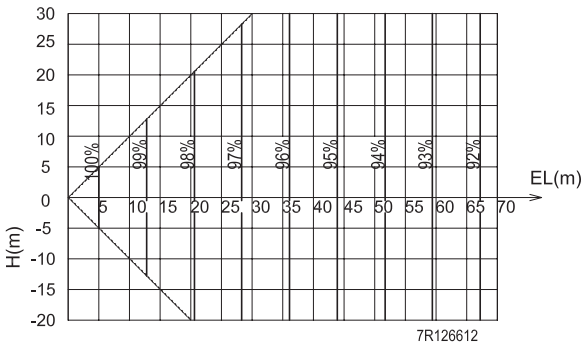


Heating

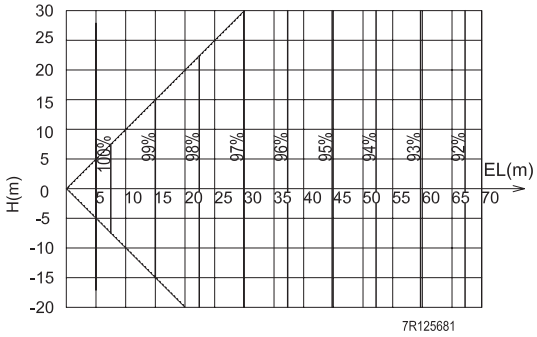
RAS-2HVNP1



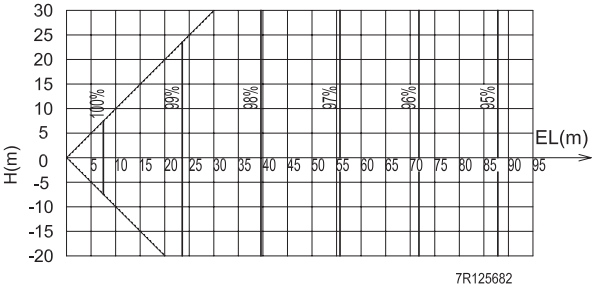
RAS-2.5HVNP1



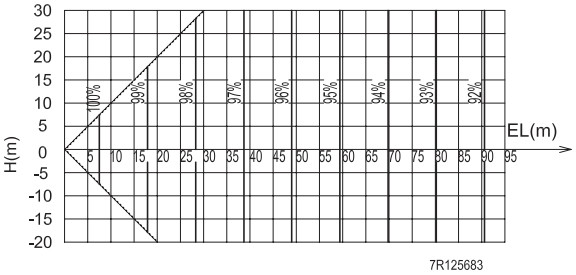
RAS-3(X)HVNP1E



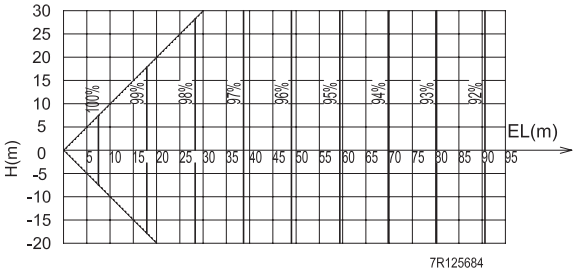
RAS-4(X)H(V)NP1E



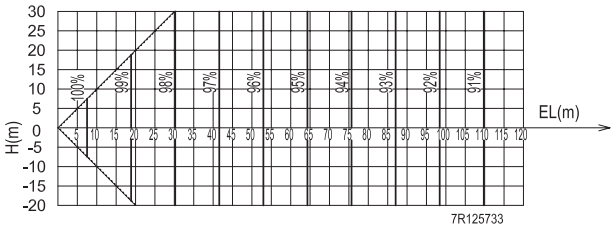
RAS-5(X)H(V)NP1



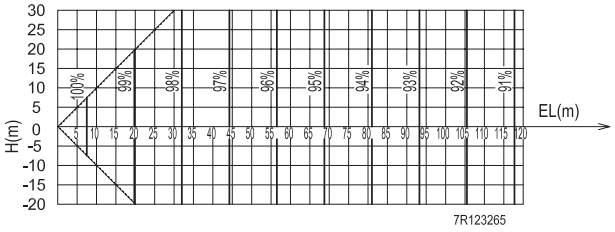
RAS-6(X)H(V)NP1E



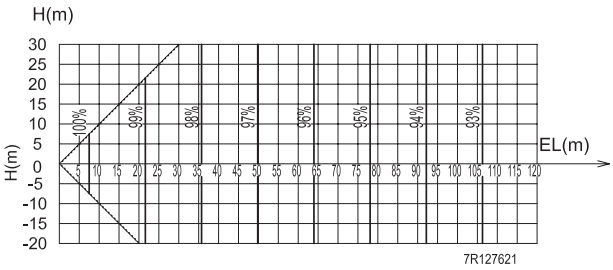
RAS-8(X)HNPE



RAS-10(X)HNPE



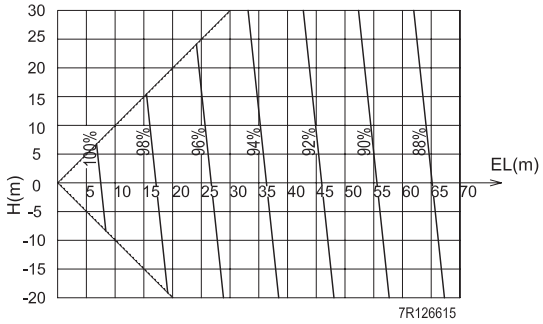
RAS-12HNP



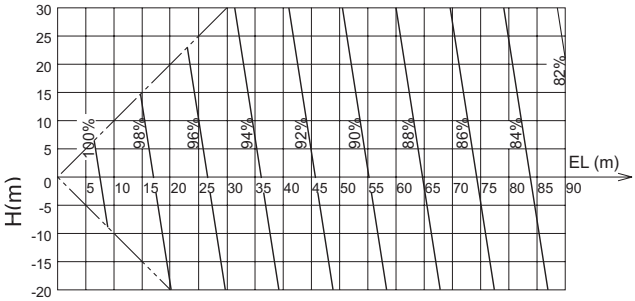
4.6.2 IVX Standard series

Cooling

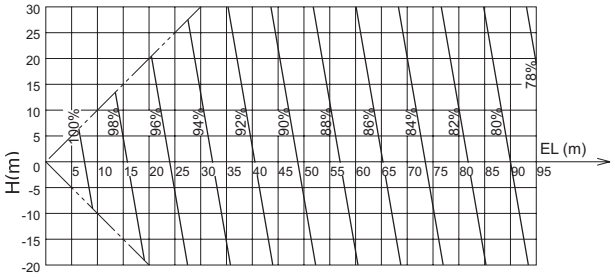
RAS-3HVNC1



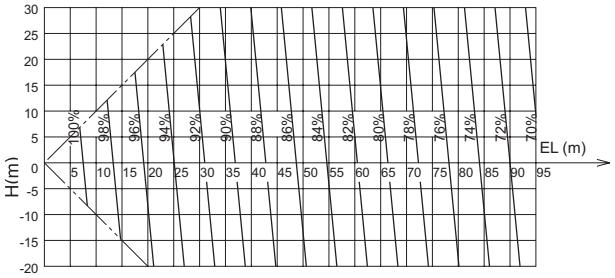
RAS-4H(V)NC1E



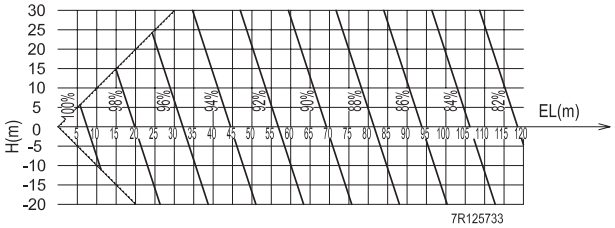
RAS-5H(V)NC1E



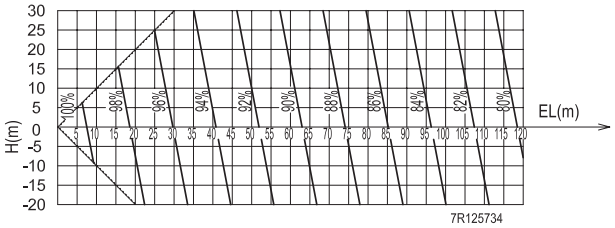
RAS-6H(V)NC1E



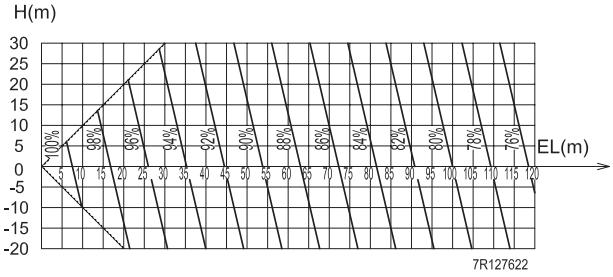
RAS-8HNCE



RAS-10HNCE

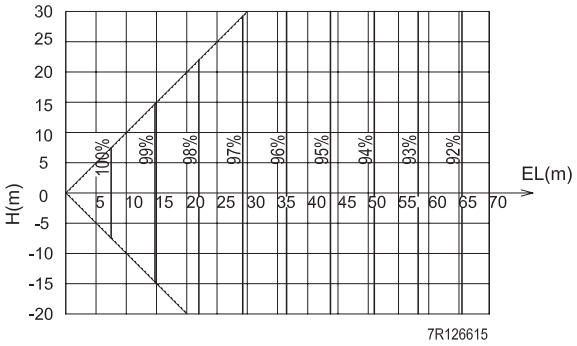


RAS-12HNC

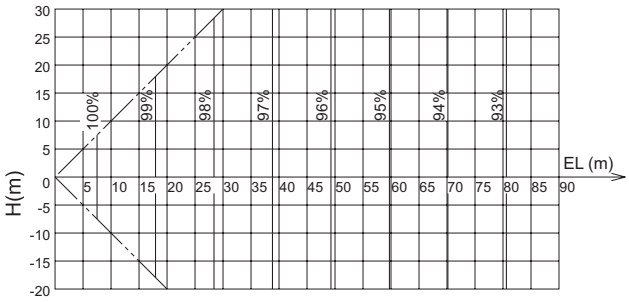


Heating

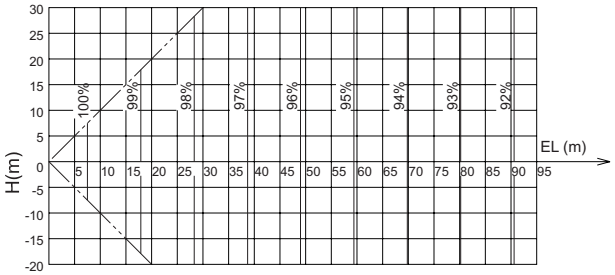
RAS-3HVNC1



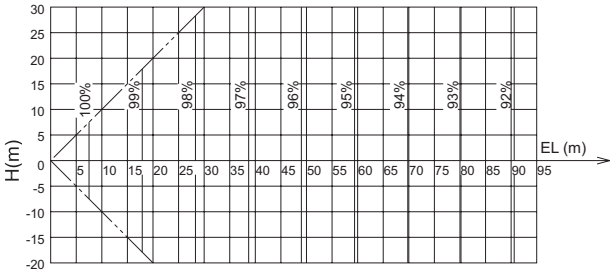
RAS-4H(V)C1E



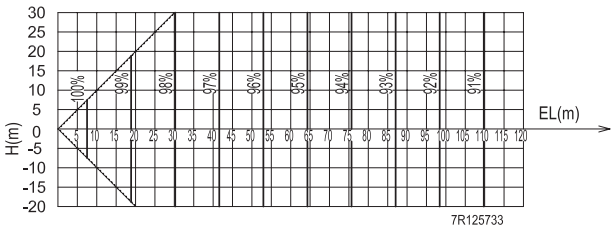
RAS-5H(V)NC1E



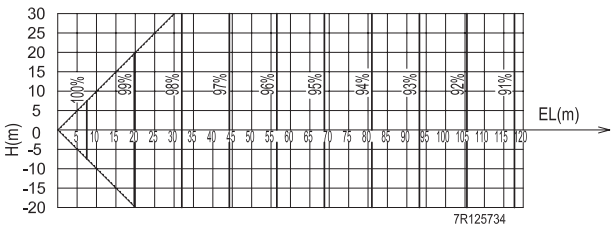
RAS-6H(V)NC1E



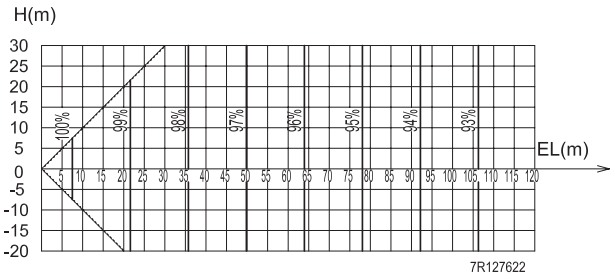
RAS-8HNCE



RAS-10HNCE



RAS-12HNC



4.7 Defrost Operation correction factor (f_D)

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

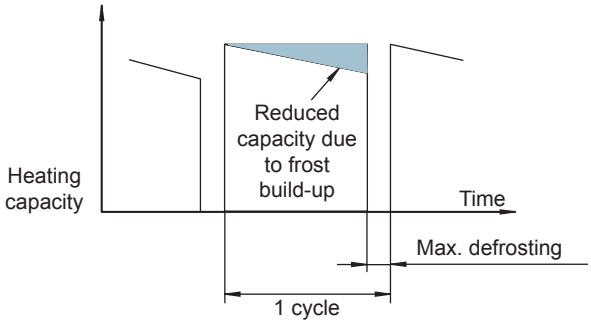
When this type of operation is taken in account, the heating capacity must be corrected according to the following equation:

Correction heating capacity = Correction factor x heating capacity

Outdoor inlet air temperature (ºC DB)	-7	-5	-3	0	3	5	7
Correction factor	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.*



4.8 Correction ratio due to humidity (CR)

The cooling capacity data for the outdoor 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's possible that the temperature condition of the ambient to be conditioned, specifies other different relative humidity, which affect at the Dry Bulb temperature. In this cases, it's 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
RAS-2HVNP1	0.25
RAS-2.5HVNP1	0.30
RAS-3H(V)N(P/C)1E	0.34
RAS-4H(V)N(P/C)1E	0.43
RAS-5H(V)N(P/C)1E	0.51
RAS-6H(V)N(P/C)1E	0.59
RAS-8HN(P/C)E	0.74
RAS-10HN(P/C)E	0.89
RAS-12HN(P/C)	1.01

4.9 Correction factor according to altitude (f_{AL})

The capacity is affected by the altitude of the installation location. When the altitude is above sea level, capacity must be corrected with the altitude correction factor according to the following equation:

Correction capacity = Altitude Correction factor x Capacity

Altitude (m)	0	300	600	900	1200	1500	1800	2100	2400	2700	3000
Correction factor	1	0.97	0.94	0.90	0.88	0.84	0.81	0.78	0.75	0.72	0.69

5. Acoustic characteristic curves

Index

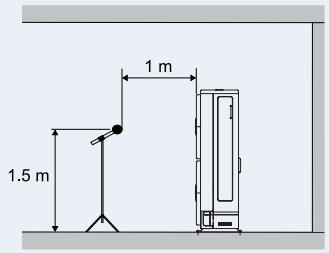
5.1 Overall sound level

The overall sound level has been measured in an anechoic chamber so reflected sound should be taken into consideration when installing the unit.

Test Conditions:

1 Distance of the unit from the measuring point: 1 meter from the unit's front surface; 1.5 meter from floor level:

Overall sound level measuring position



2 Power supply:

a. Single phase units: 1~ 230V 50Hz.

b. Three phase units: 3N~ 400V 50Hz.

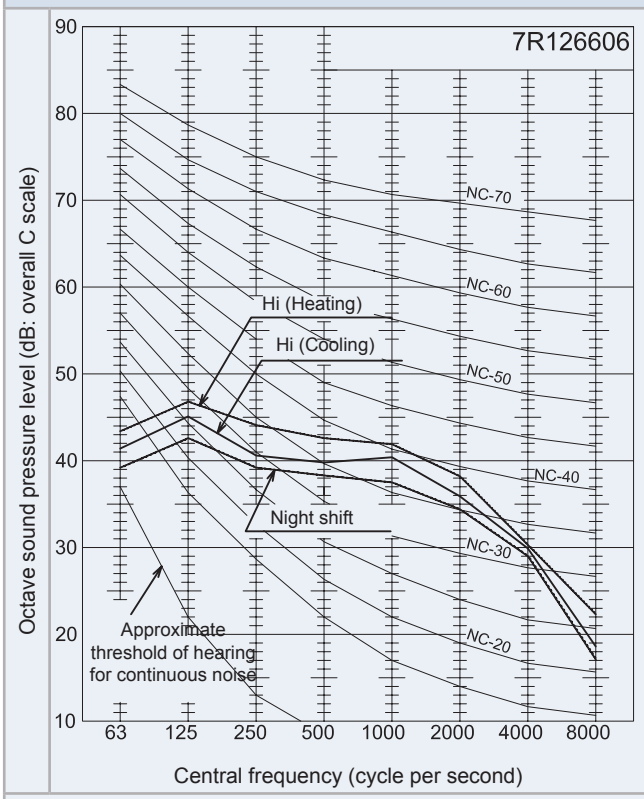
NOTE

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

5.2 Sound pressure curves

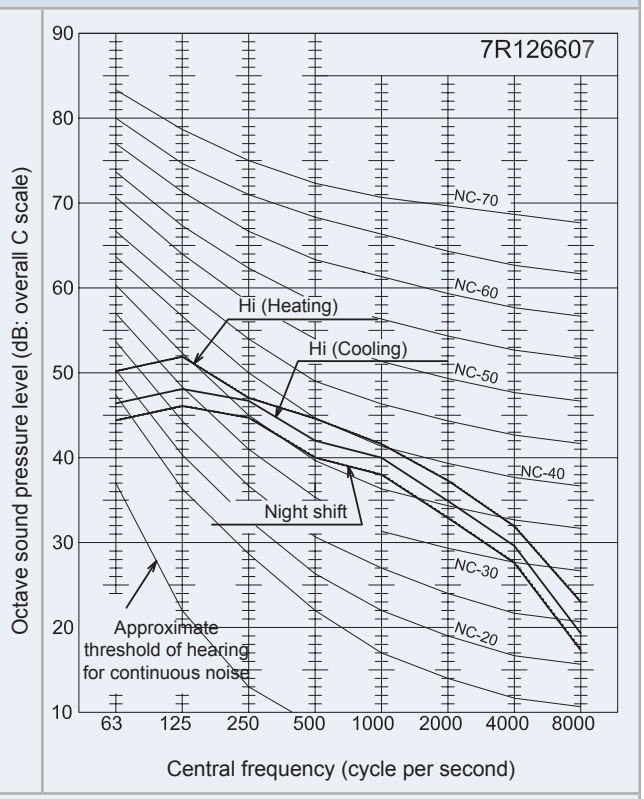
5.2.1 IVX Premium series

RAS-2HVNP1



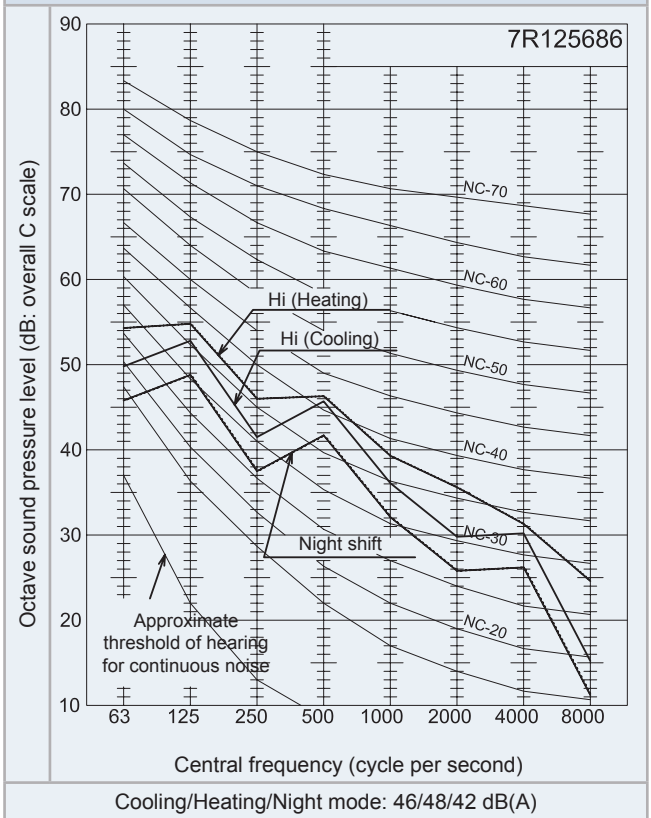
Cooling/Heating/Night mode: 44/46/42 dB(A)

RAS-2.5HVNP1



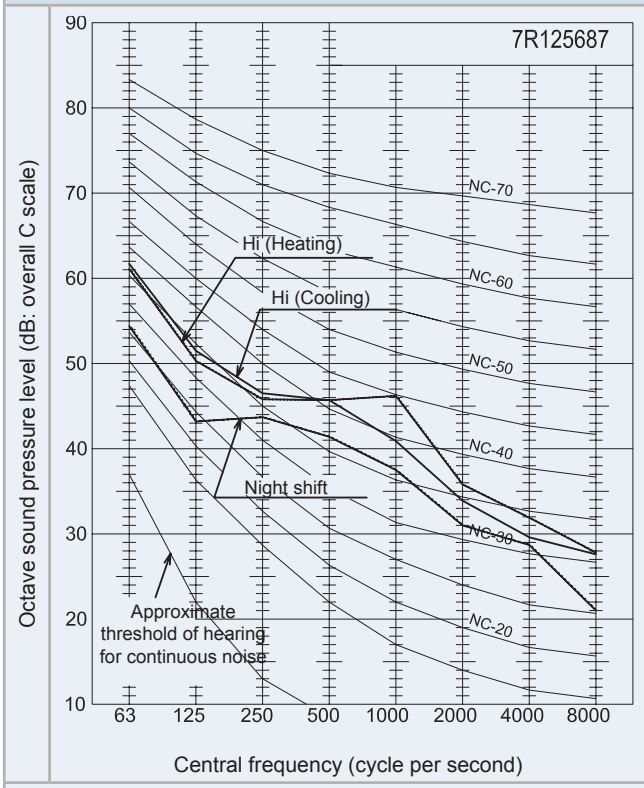
Cooling/Heating/Night mode: 45/47/43 dB(A)

RAS-3(X)HVNP1E



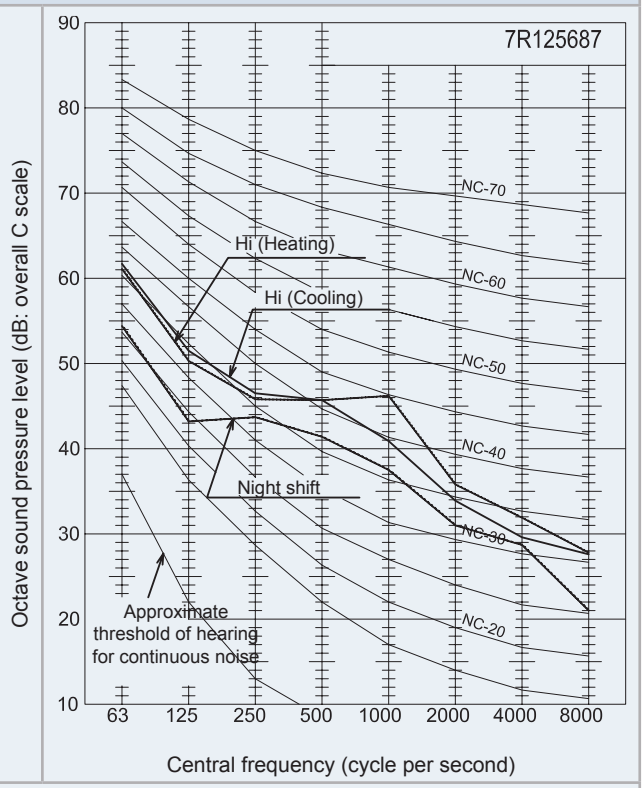
Cooling/Heating/Night mode: 46/48/42 dB(A)

RAS-4(X)HVNP1E



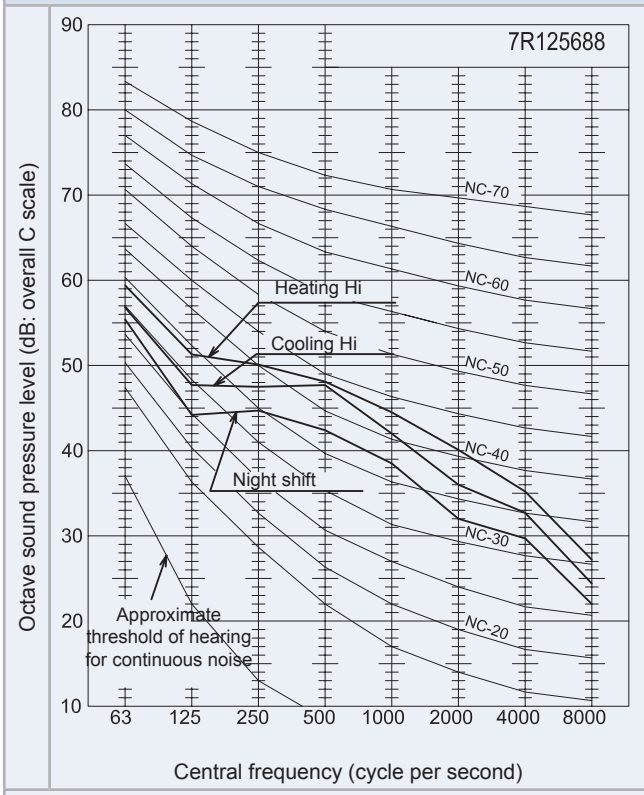
Cooling/Heating/Night mode: 47/49/43 dB(A)

RAS-4(X)HNP1E



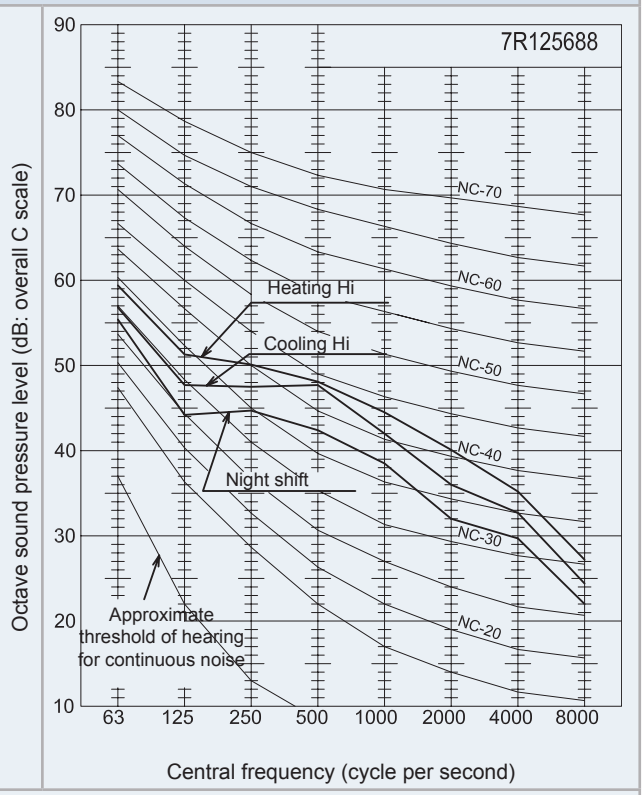
Cooling/Heating/Night mode: 47/49/43 dB(A)

RAS-5(X)HVNP1E



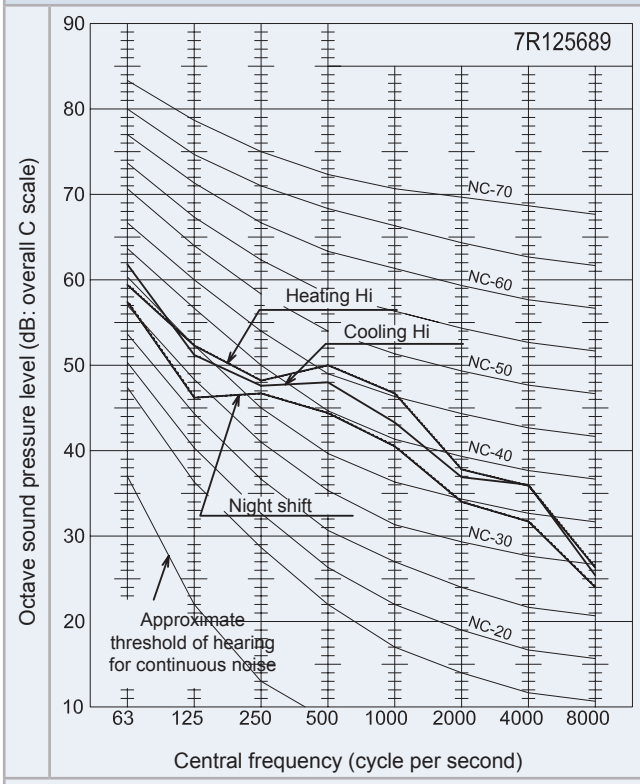
Cooling/Heating/Night mode: 48/50/44 dB(A)

RAS-5(X)HNP1E



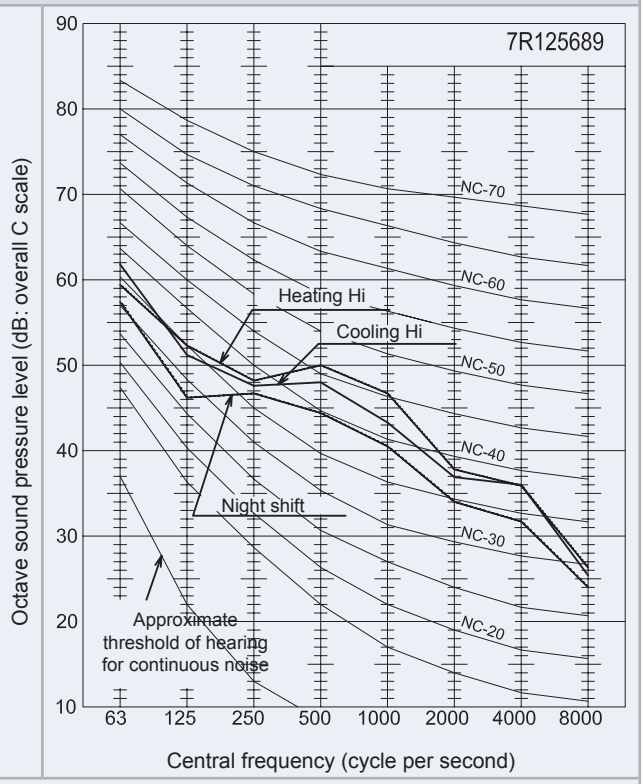
Cooling/Heating/Night mode: 48/50/44 dB(A)

RAS-6(X)HVNP1E



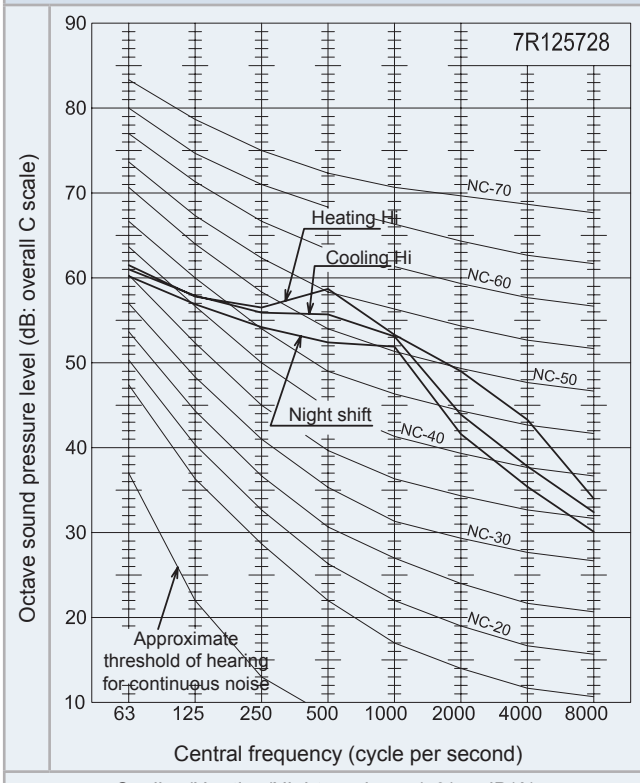
Cooling/Heating/Night mode: 48/50/45 dB(A)

RAS-6(X)HNP1E



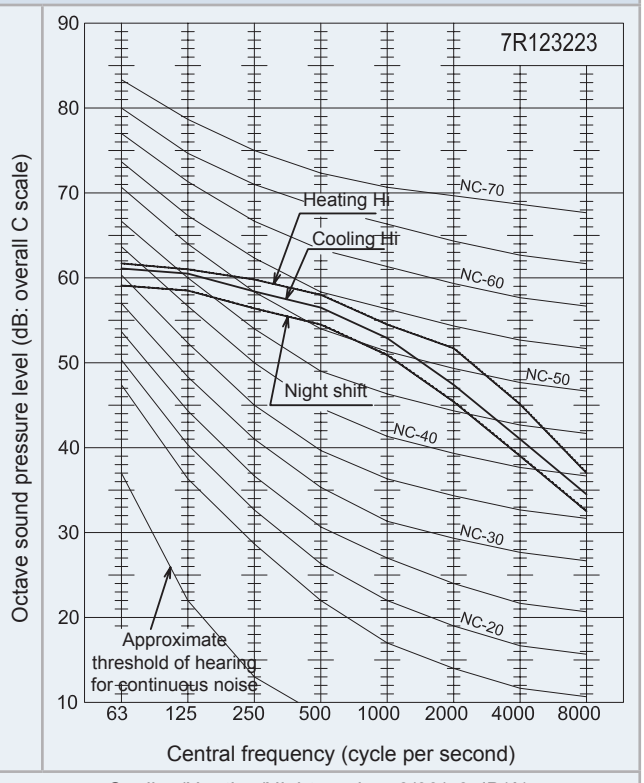
Cooling/Heating/Night mode: 48/50/45 dB(A)

RAS-8(X)HNPE



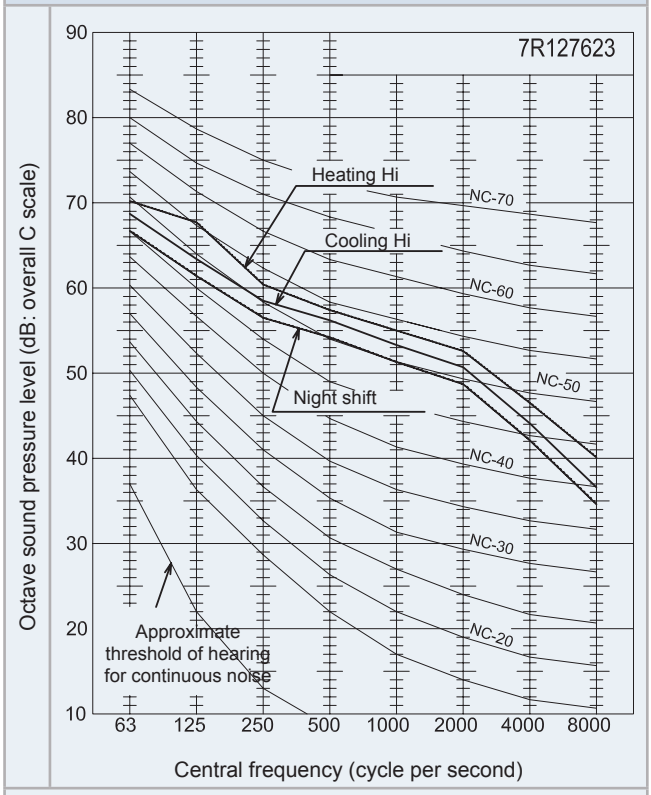
Cooling/Heating/Night mode: 57/59/55 dB(A)

RAS-10(X)HNPE



Cooling/Heating/Night mode: 58/60/56 dB(A)

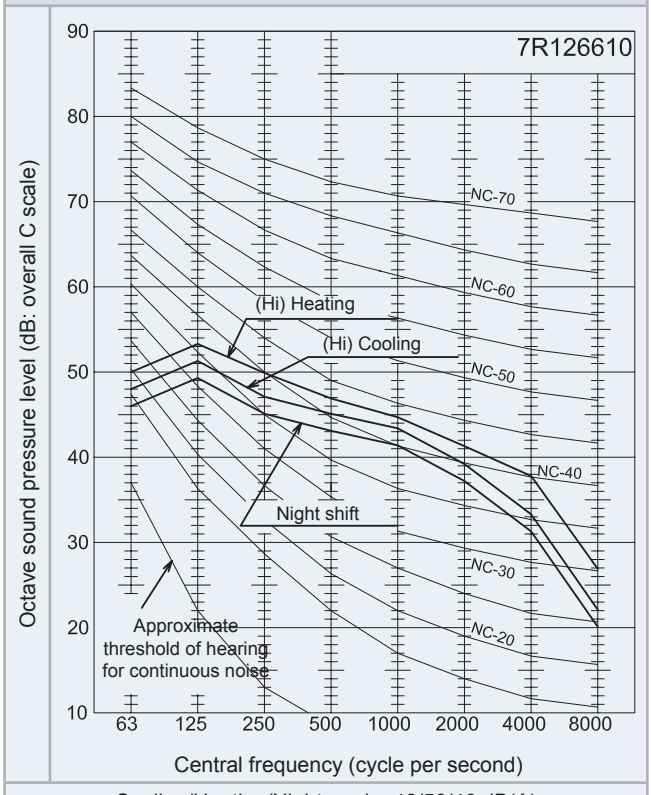
RAS-12HNP



Cooling/Heating/Night mode: 59/61/57 dB(A)

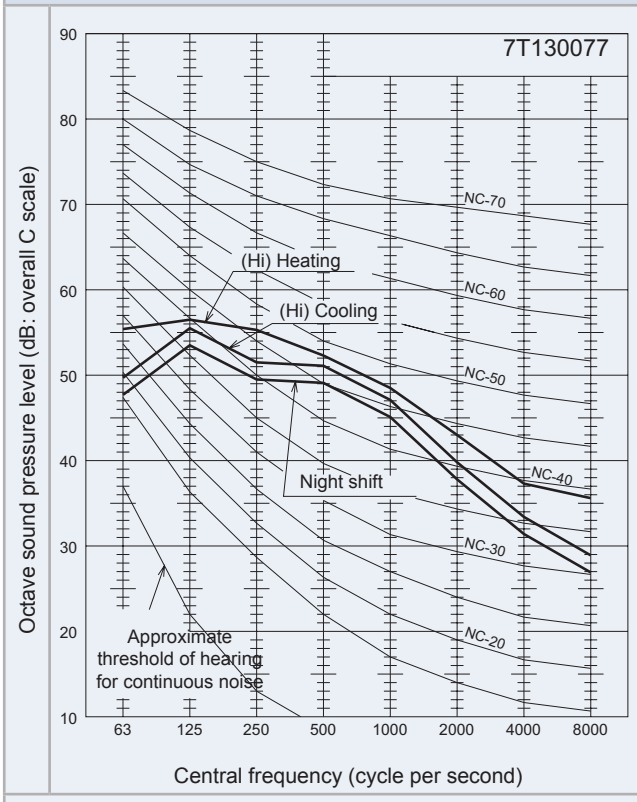
5.2.2 IVX Standard series

RAS-3HVNC1



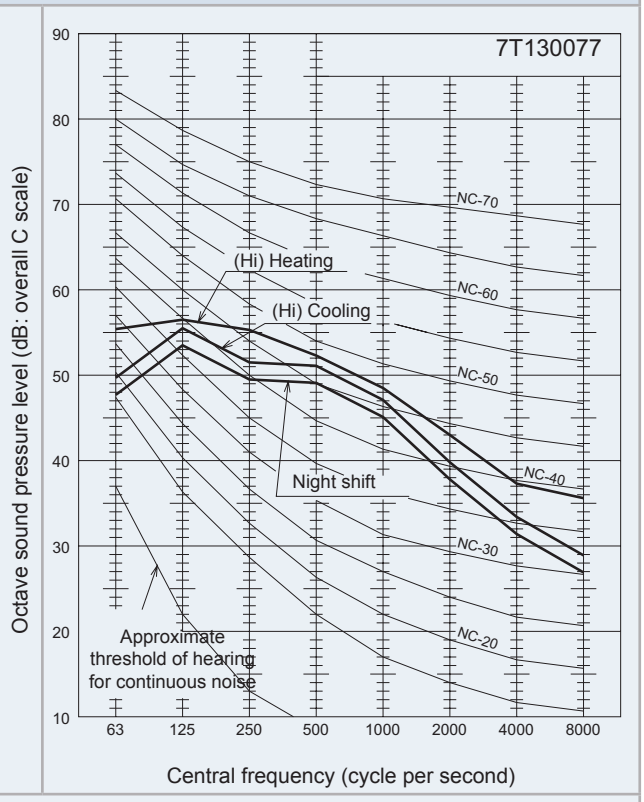
Cooling/Heating/Night mode: 48/50/46 dB(A)

RAS-4HVNC1E



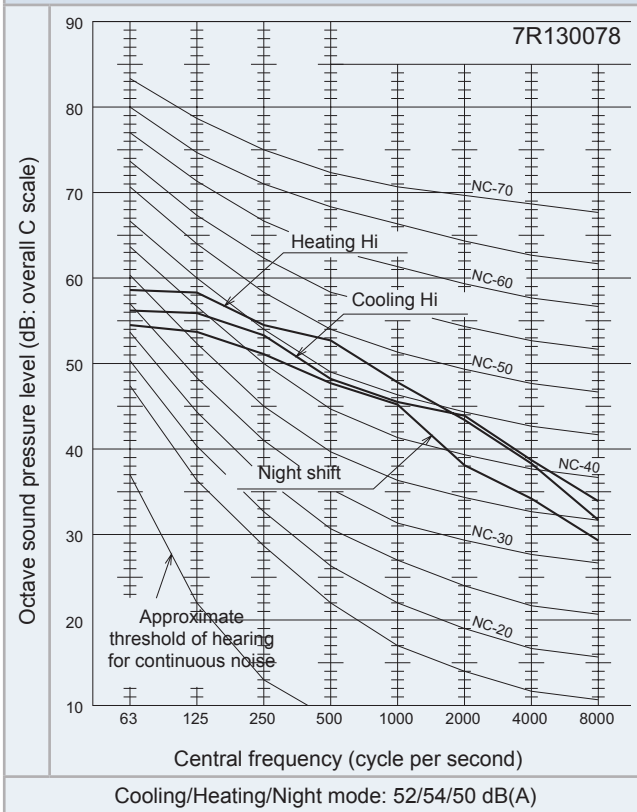
Cooling/Heating/Night mode: 52/54/50 dB(A)

RAS-4HNC1E



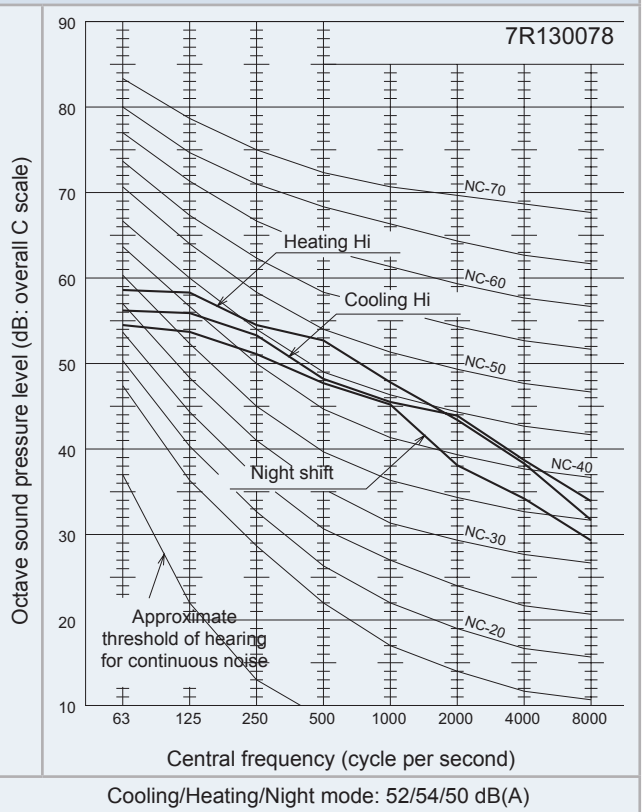
Cooling/Heating/Night mode: 52/54/50 dB(A)

RAS-5HVNC1E



Cooling/Heating/Night mode: 52/54/50 dB(A)

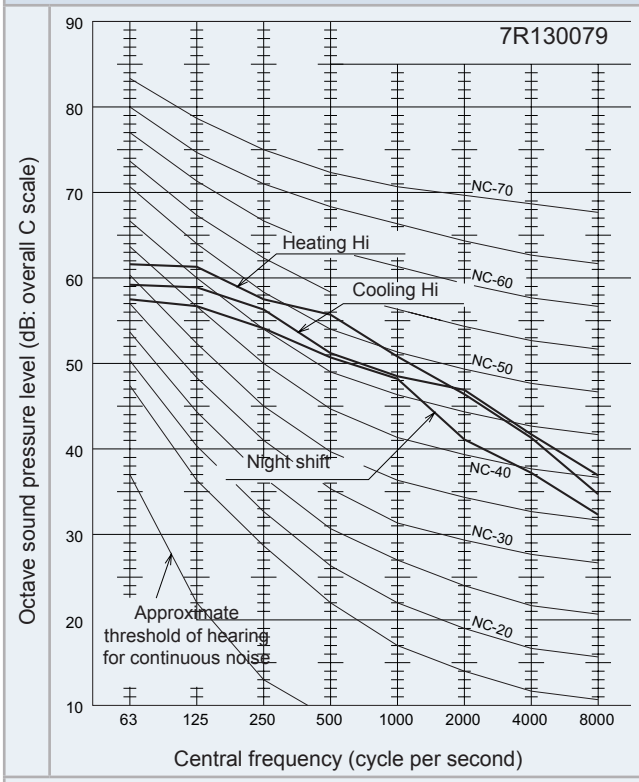
RAS-5HNC1E



Cooling/Heating/Night mode: 52/54/50 dB(A)

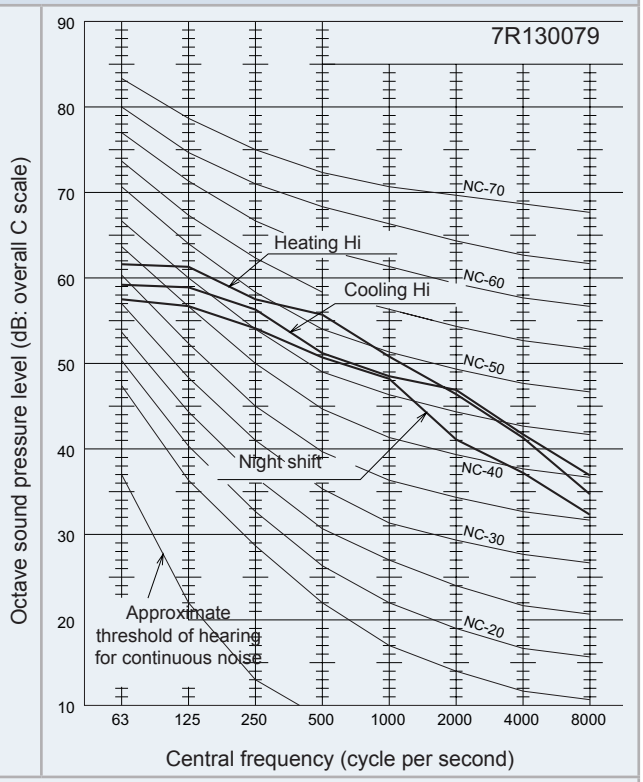
5

RAS-6HVNC1E



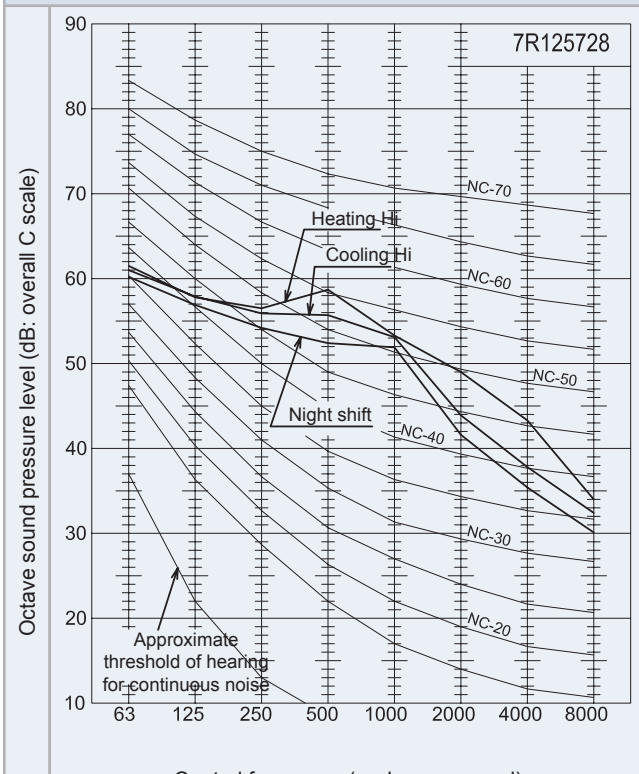
Cooling/Heating/Night mode: 55/57/53 dB(A)

RAS-6HNC1E



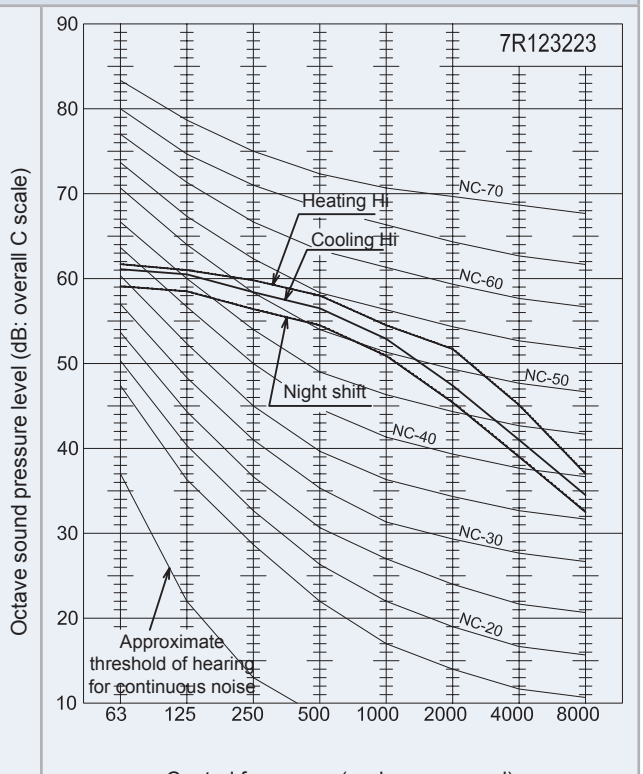
Cooling/Heating/Night mode: 55/57/53 dB(A)

RAS-8HNCE



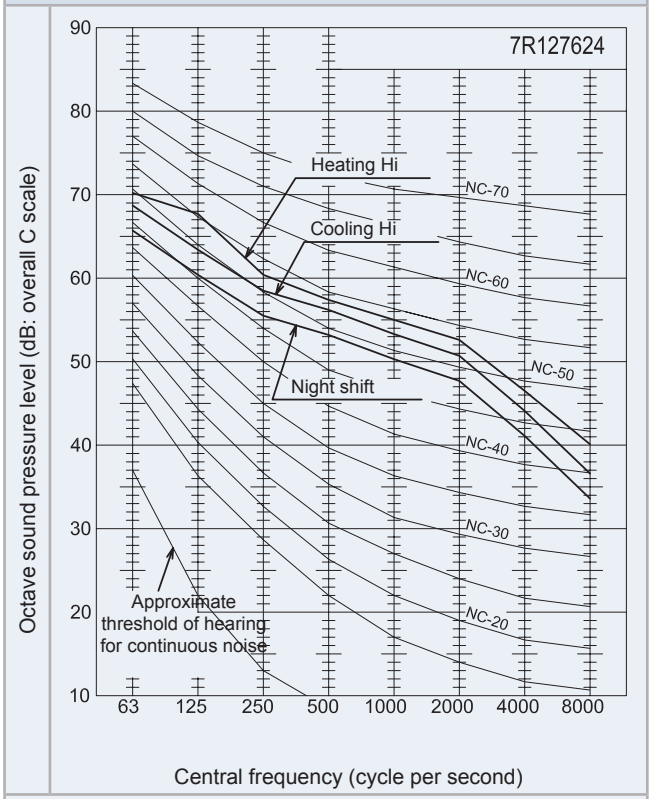
Cooling/Heating/Night mode: 57/59/55 dB(A)

RAS-10HNCE



Cooling/Heating/Night mode: 58/60/56 dB(A)

RAS-12HNC

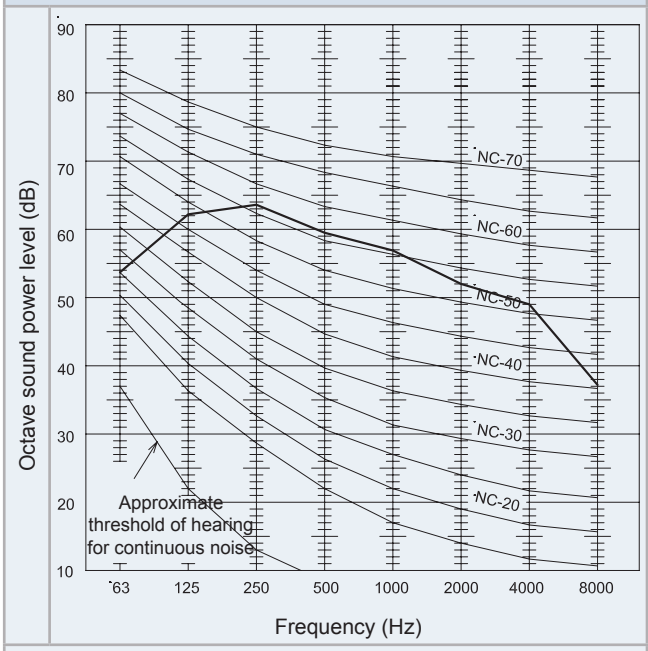


Cooling/Heating/Night mode: 59/61/56 dB(A)

5.3 Sound power curves

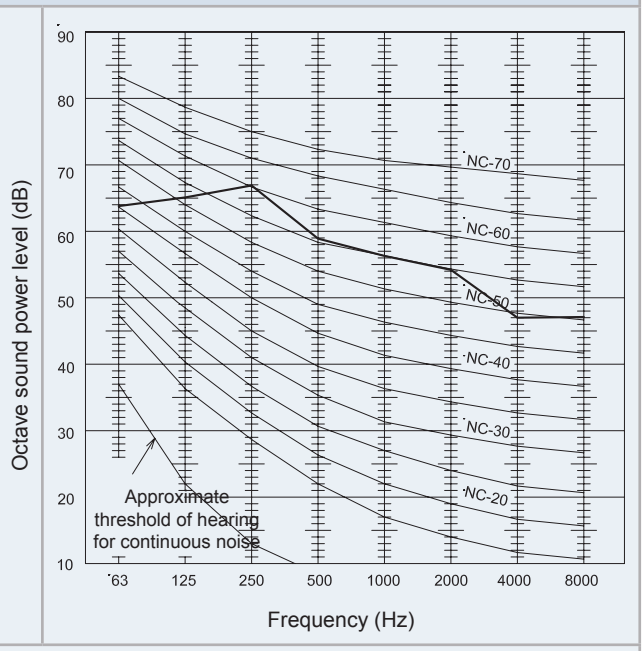
5.3.1 IVX Premium series

RAS-2HVNP1



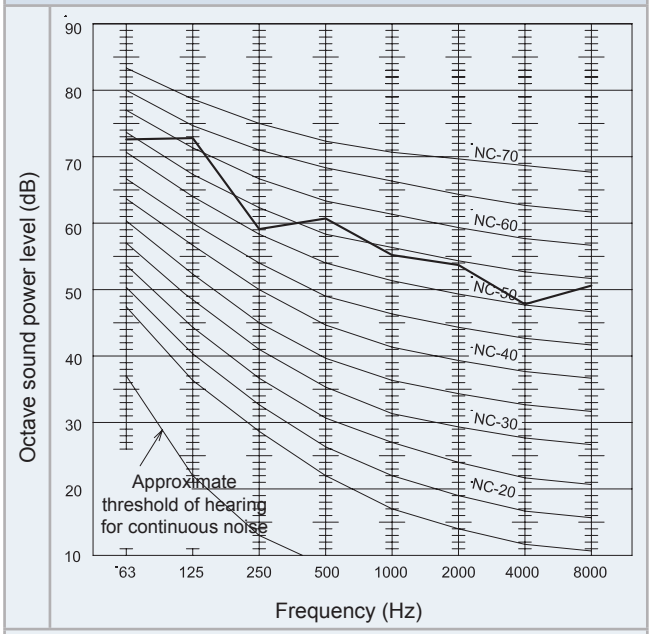
Sound power level: Global 62 dB(A)

RAS-2.5HVNP1



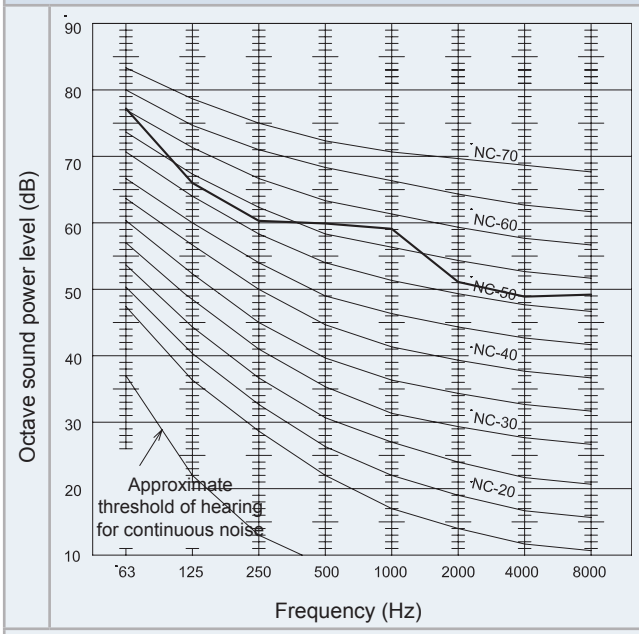
Sound power level: Global 63 dB(A)

RAS-3(X)HVNP1E



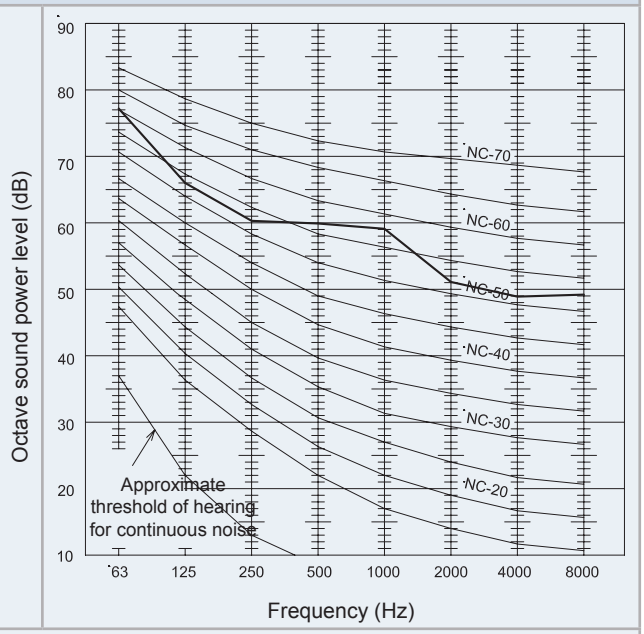
Sound power level: Global 63 dB(A)

RAS-4(X)HVNP1E



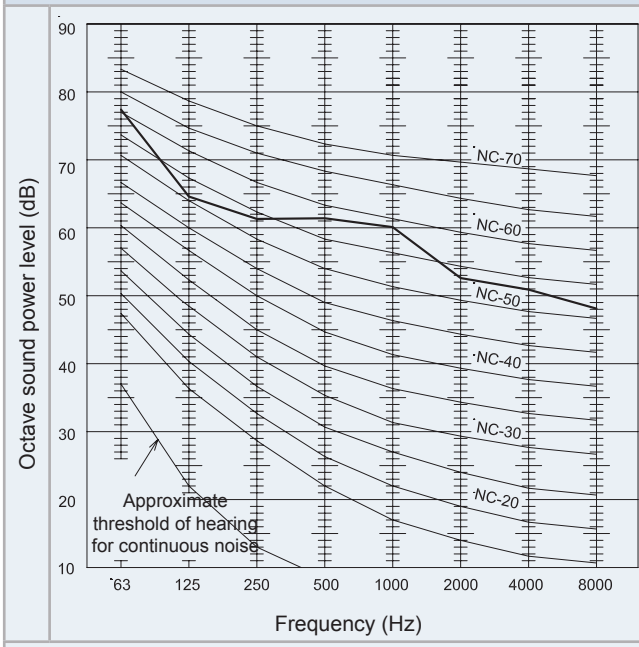
Sound power level: Global 63 dB(A)

RAS-4(X)HNP1E



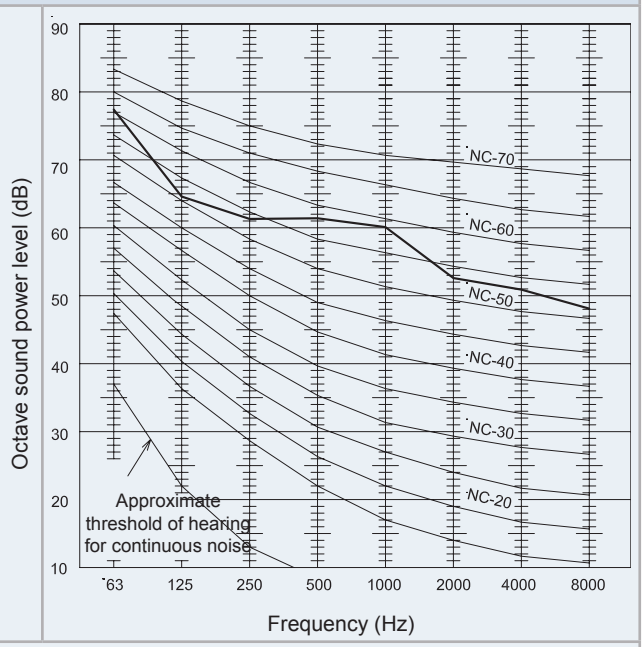
Sound power level: Global 63 dB(A)

RAS-5(X)HVNP1E



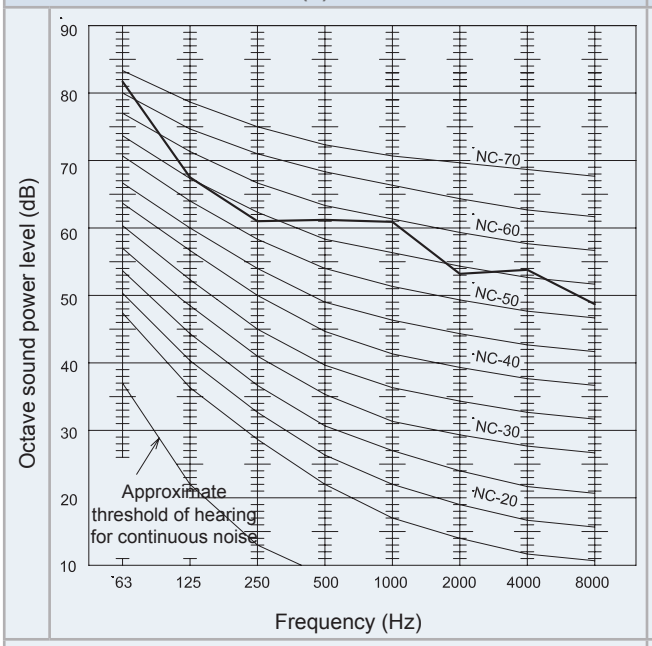
Sound power level: Global 64 dB(A)

RAS-5(X)HNP1E



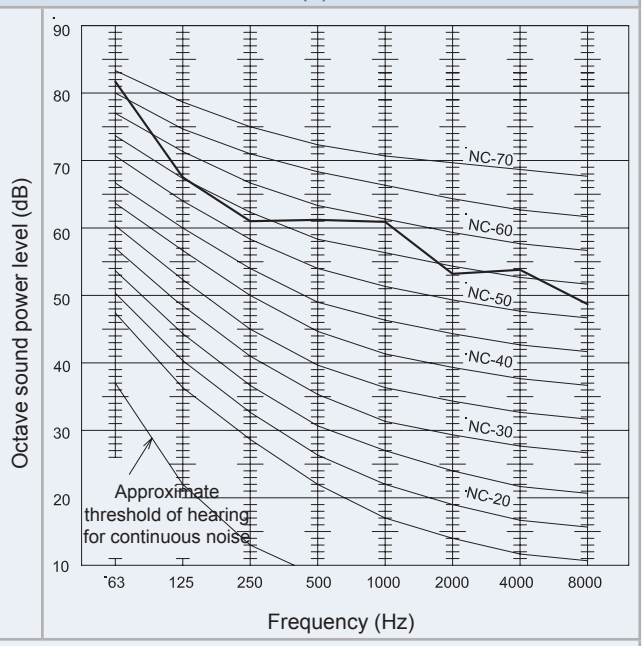
Sound power level: Global 64 dB(A)

RAS-6(X)HVNP1E



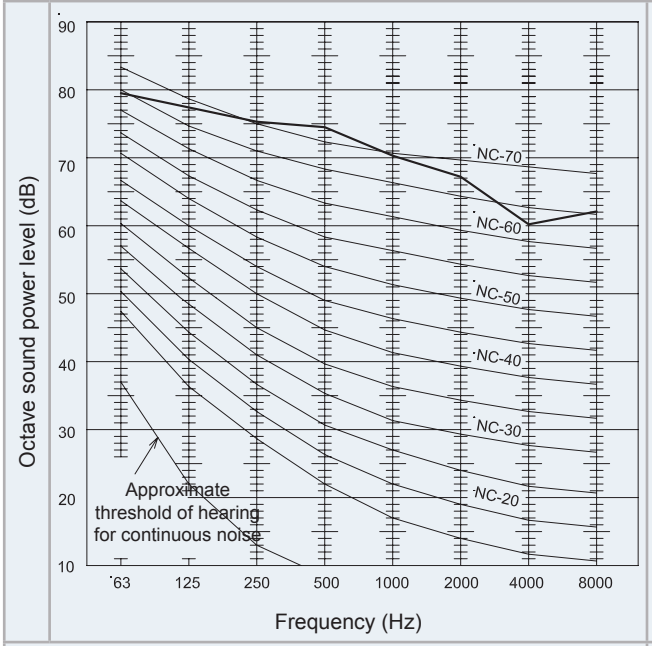
Sound power level: Global 65 dB(A)

RAS-6(X)HNP1E



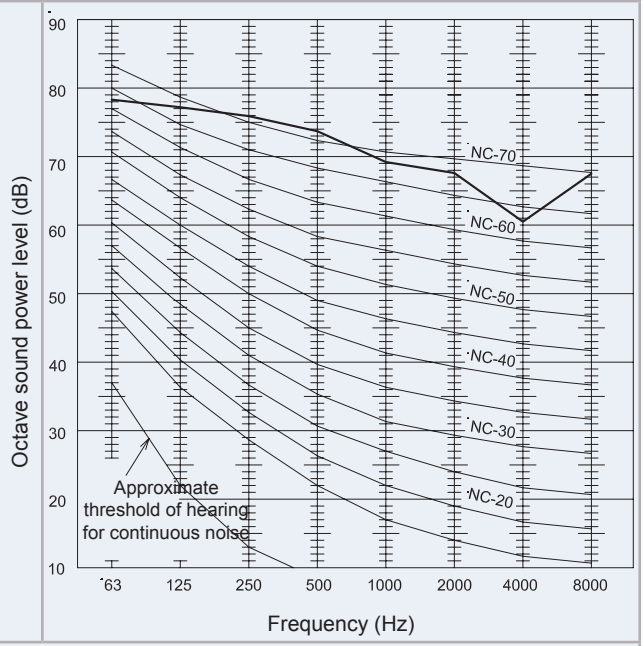
Sound power level: Global 65 dB(A)

RAS-8(X)HNPE



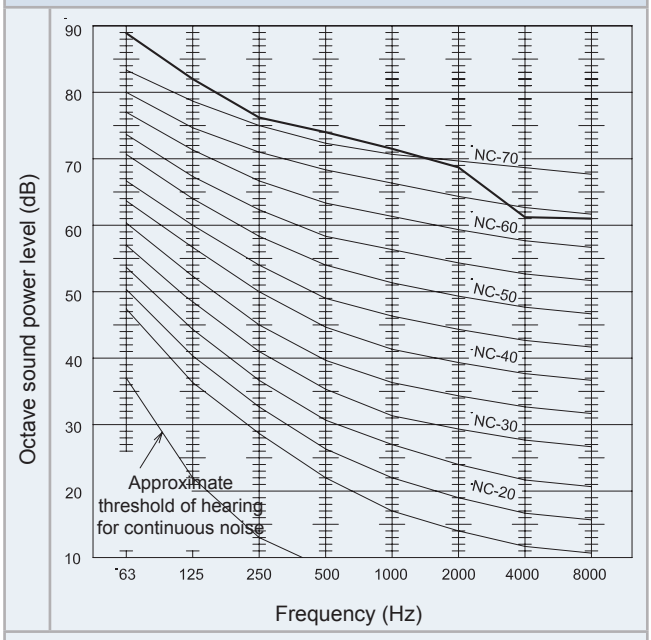
Sound power level: Global 76 dB(A)

RAS-10(X)HNPE



Sound power level: Global 76 dB(A)

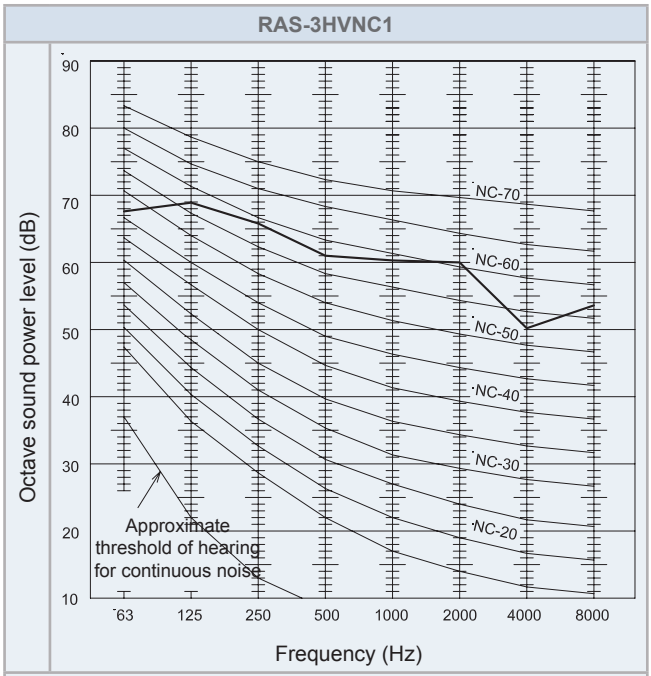
RAS-12HNP



Sound power level: Global 77 dB(A)

5.3.2 IVX Standard series

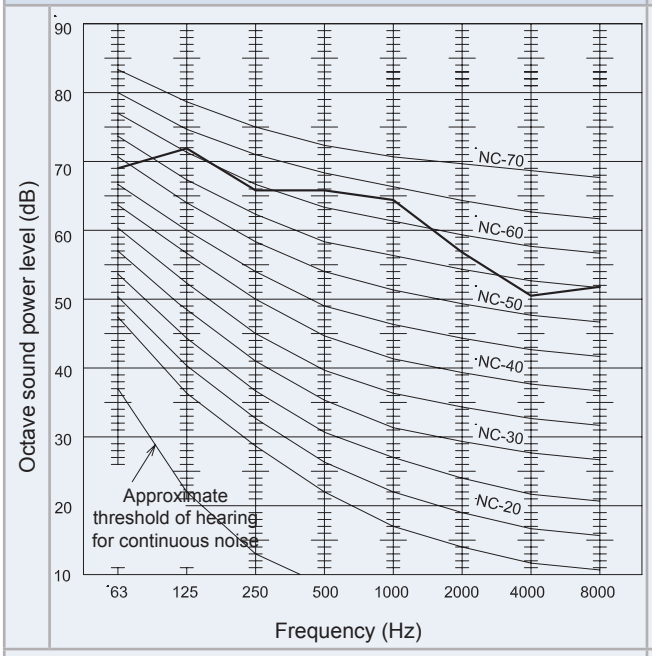
RAS-3HVNC1



Sound power level: Global 66 dB(A)

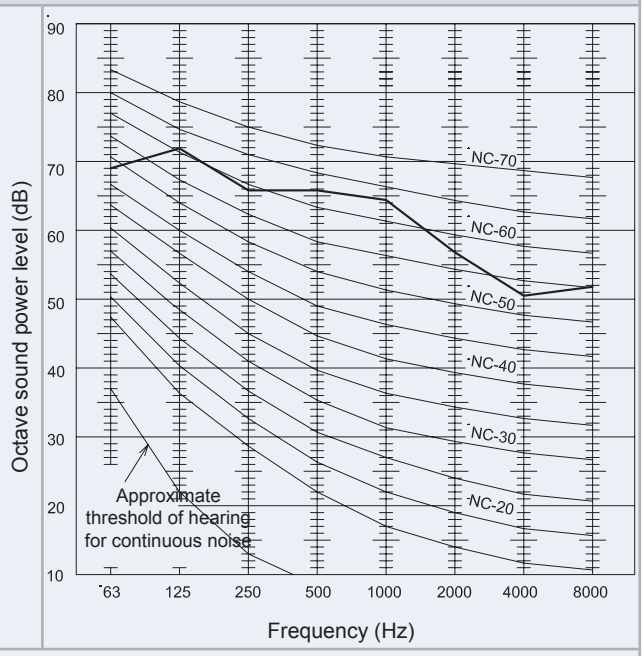
5

RAS-4HVNC1E



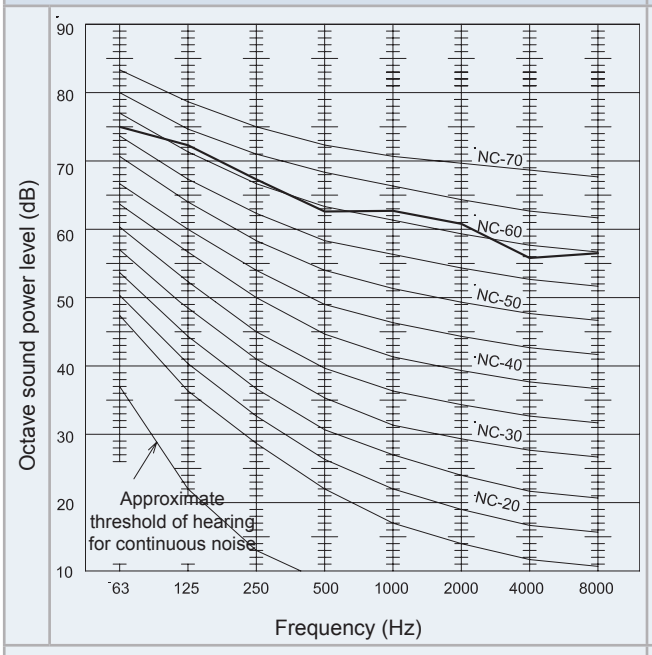
Sound power level: Global 68 dB(A)

RAS-4HNC1E



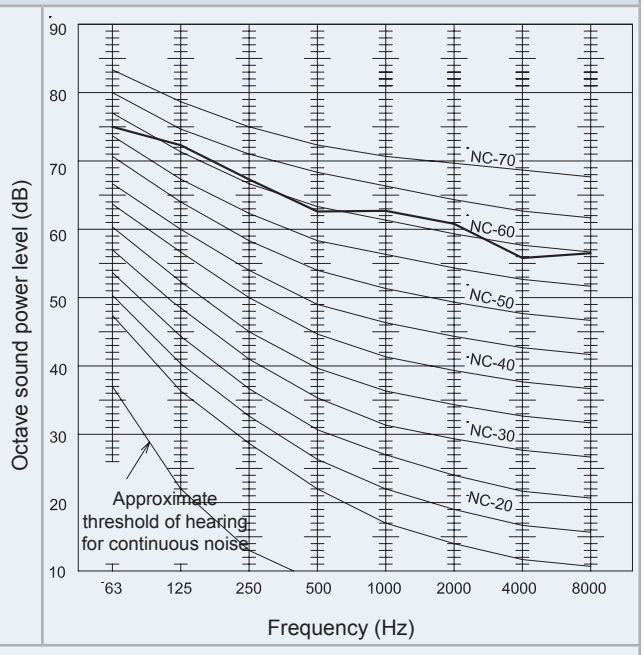
Sound power level: Global 68 dB(A)

RAS-5HVNC1E



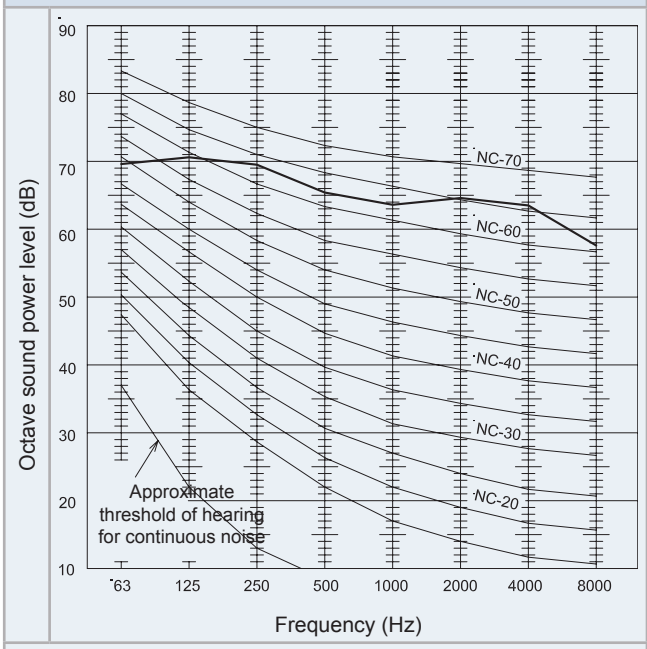
Sound power level: Global 68 dB(A)

RAS-5HNC1E



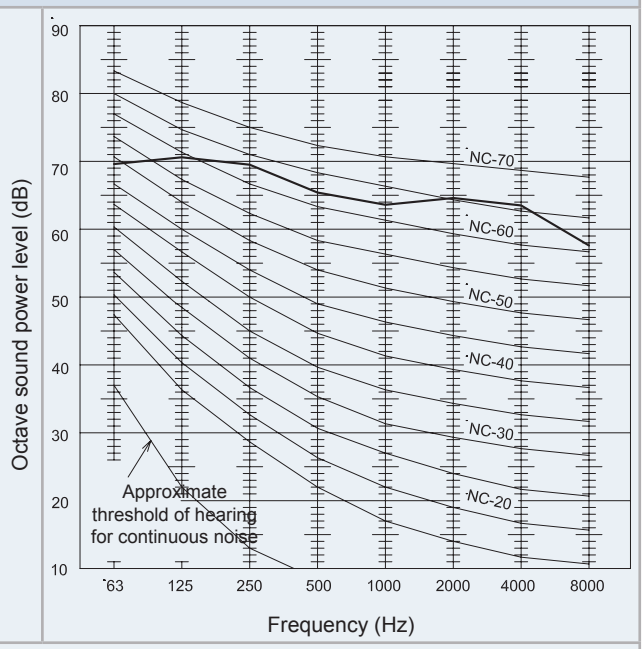
Sound power level: Global 68 dB(A)

RAS-6HVNC1E



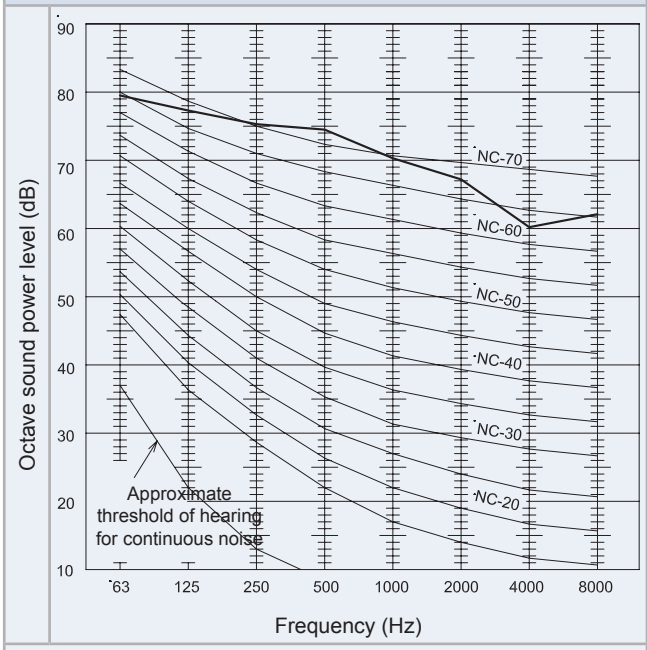
Sound power level: Global 71 dB(A)

RAS-6HNC1E



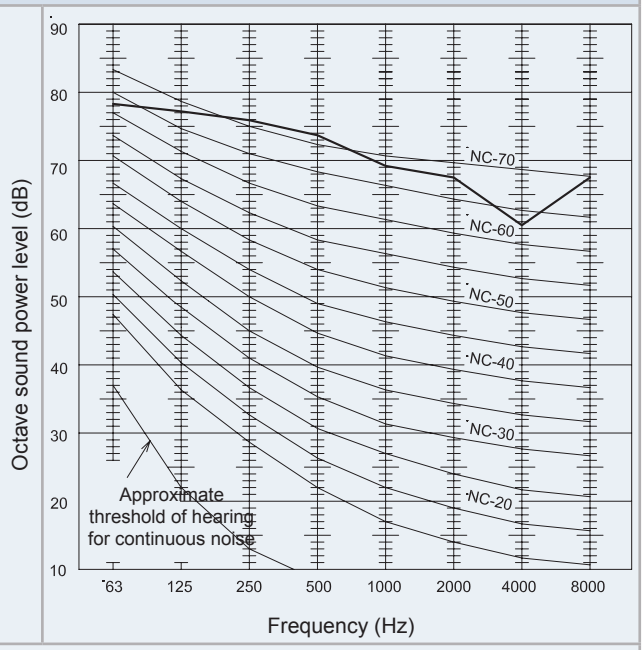
Sound power level: Global 71 dB(A)

RAS-8HNCE



Sound power level: Global 76 dB(A)

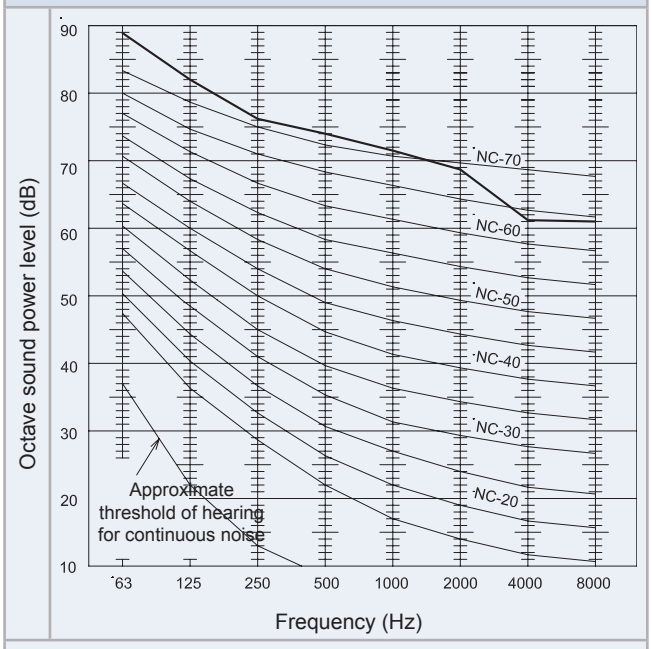
RAS-10HNCE



Sound power level: Global 76 dB(A)

5

RAS-12HNC



Sound power level: Global 77 dB(A)

6. Working range

Index

6.1 Working range

6.1.1 Power supply

Nominal power supply:

- Single phase: 1~ 230V 50Hz
- 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 outdoor unit.

Starting voltage

Always higher than 85% of the nominal voltage.

Relative Humidity limit

Lower that 80%

6.1.2 Temperature working range

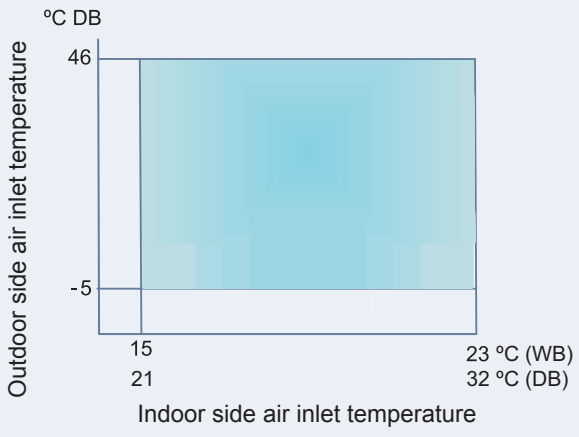
The temperature range is indicated in the following table:

		Cooling mode	Heating mode
Indoor side air inlet temperature	Minimum	21 ºC DB / 15 ºC WB	15 ºC DB
	Maximum	32 ºC DB / 23 ºC WB	27 ºC DB
Outdoor side air inlet temperature	Minimum	-5 ºC DB	-20 ºC WB
	Maximum	46ºC DB	15 ºC WB

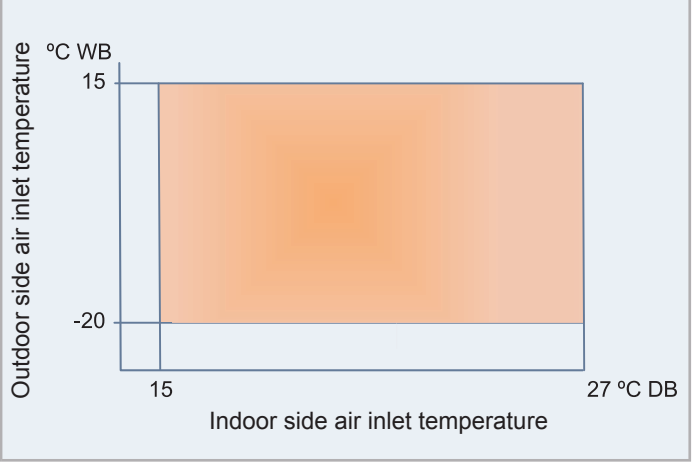
NOTE

DB: Dry Bulb; WB: Wet Bulb.

Cooling mode



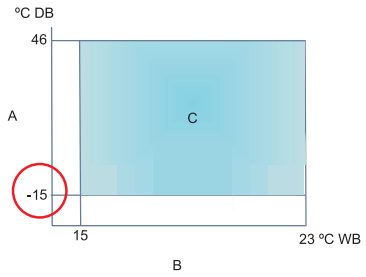
Heating mode



6.1.3 Special configuration for low ambient temperature (-15ºC)

Only when		Mandatory setting (OU)
Cooling mode operation and Simultaneous operation (individual operation not allowed)	→	DSW2 PIN 3 = ON and DSW6 PIN1 = OFF

The outdoor ambient temperature limit is extended down to -15ºC under this configuration.



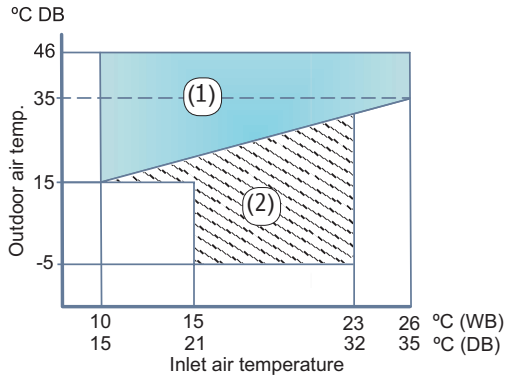
NOTE

Capacity and efficiency can vary depending on ambient conditions, working settings, control and protections, etc.

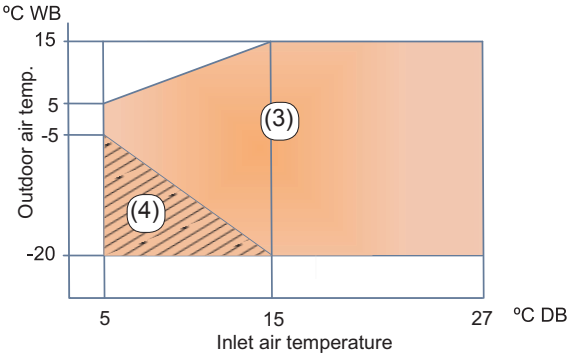
6.1.4 Special working range for combination of outdoor units of the RAS-XH(V)NP(1)E series and DX-Interface Series 2 in applications with Air Handling Units (AHU)

The general working range has been extended in applications with Air Handling Units (AHU) as shown below, for the combination of DX-Interface Series 2 with the outdoor units of the RAS-XH(V)NP(1)E series, focused on application in Air Handling Units (AHU).

Cooling



Heating



NOTE

- *(1) Air Handling unit in cooling mode in Toutdoor air ≥ Tinlet air working condition only.*
- *(2) Standard working range operation is allowed.*
- *(3) Air Handling unit in heating mode in Toutdoor air ≤ Tinlet air working condition only.*
- *(4) Minimum setting temperature (19 ºC) is not guaranteed in extreme working conditions. Outlet air might require additional treatment with a heating stage after DX-Coil in order to achieve comfort conditions.*
- *The working ranges shown apply under the conditions and restrictions of use described for this product. For any item not covered in this documentation, please refer to the Air Handling Unit Technical Documentations.*

CAUTION

This temperature working range do not apply when the outdoor units RAS-XH(V)NP(1)E series are combined with DX-Interface Series 2 in applications with Duct systems. For this application refer the chapter "6.1.2 Temperature working range" as the working range of the Duct Unit.

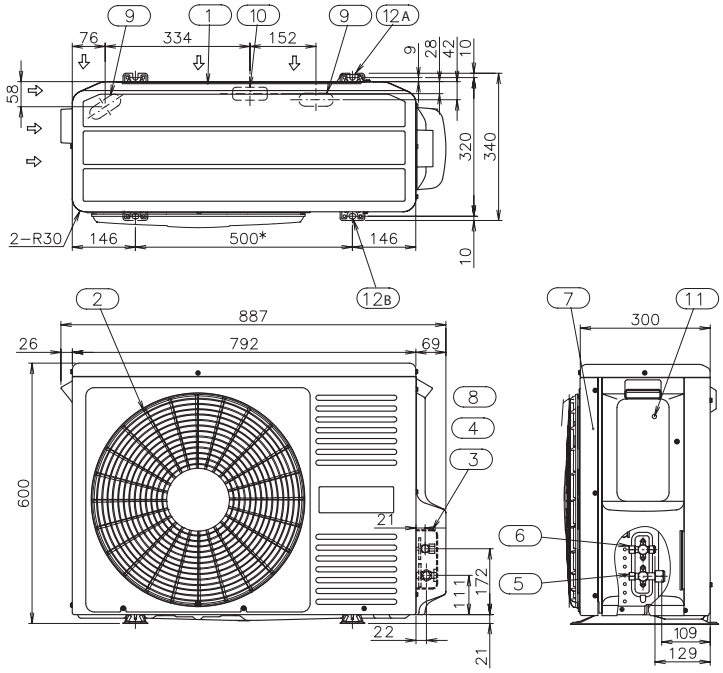
7. General dimensions

Index

7.1 Dimensions

7.1.1 IVX Premium series

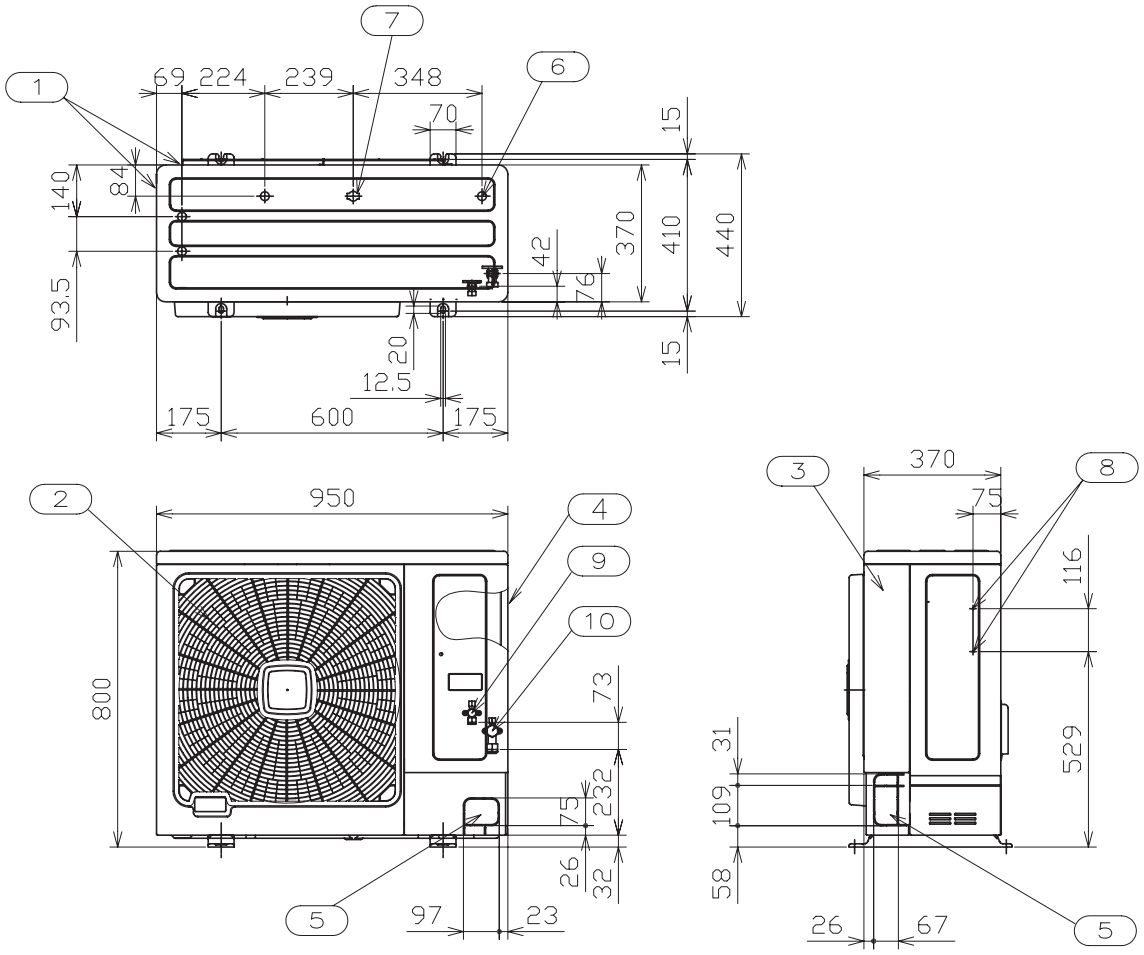
◆ RAS-(2/2.5)HVNP1



Units in mm.

Number	Description	Remarks
1	Air inlet	—
2	Air outlet	—
3	Holes for power supply wiring	—
4	Holes for control line wiring	—
5	Gas piping connection	—
6	Liquid piping connection	—
7	Service panel	—
8	Refrigerant piping hole	—
9	Drain hole	—
10	Drain hole	—
11	Earth terminal wiring	(M5)
12	Holes for fixing machine to wall	A: 2-U cut holes / B: 2 - holes

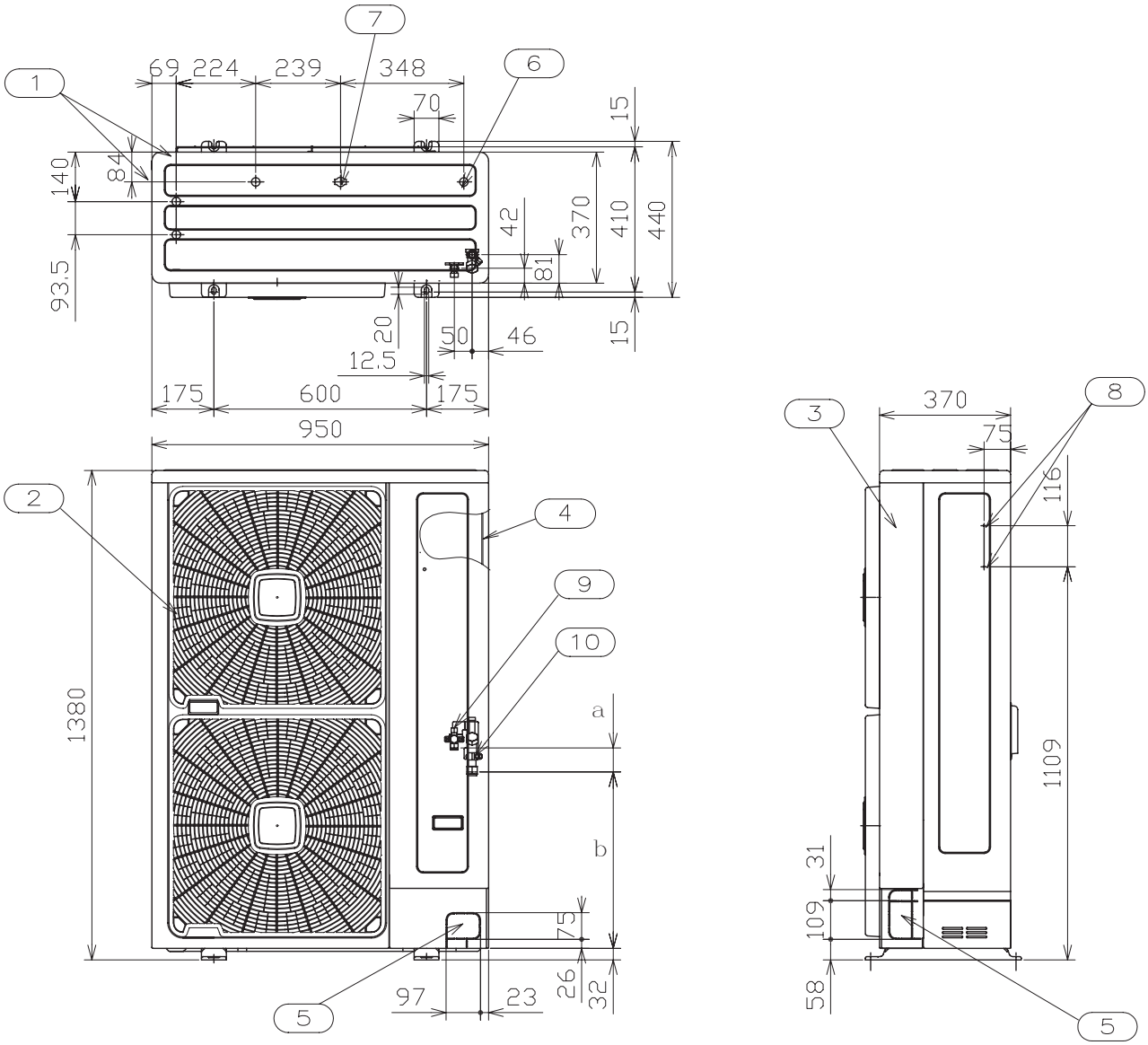
◆ RAS-3(X)HVNP1E



Units in mm.

Number	Description	Remarks
1	Air inlet	—
2	Air outlet	—
3	Service cover	—
4	Electrical switch box	—
5	Holes for refrigerant piping and electrical wiring piping	—
6	Drain holes	4-Ø24
7	Drain holes	1-Ø26
8	Holes for fixing machine to wall	4-(M5)
9	Refrigerant liquid pipe	—
10	Refrigerant gas pipe	—

◆ RAS-(4-6)(X)H(V)NP1E / RAS-(8/10)(X)HNPE

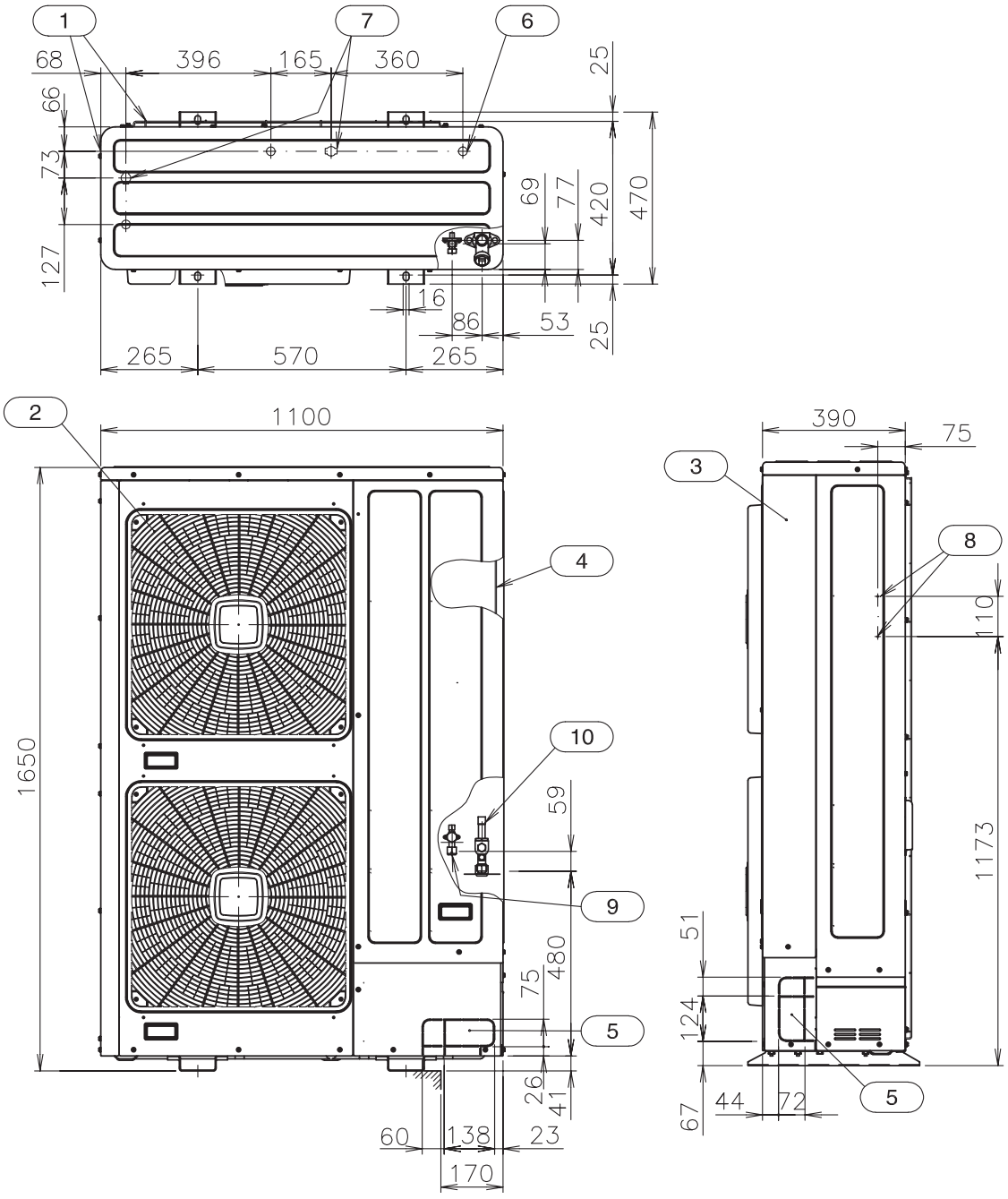


Units in mm.

Number	Description	Remarks
1	Air inlet	—
2	Air outlet	—
3	Service cover	—
4	Electrical switch box	—
5	Holes for refrigerant piping and electrical wiring piping	—
6	Drain holes	3-Ø24
7	Drain holes	2-Ø26
8	Holes for fixing machine to wall	4-(M5)
9	Refrigerant liquid pipe	—
10	Refrigerant gas pipe	—

	4-6 HP	8 HP	10 HP
a	90	81	99
b	459	465	465

◆ RAS-12HNP

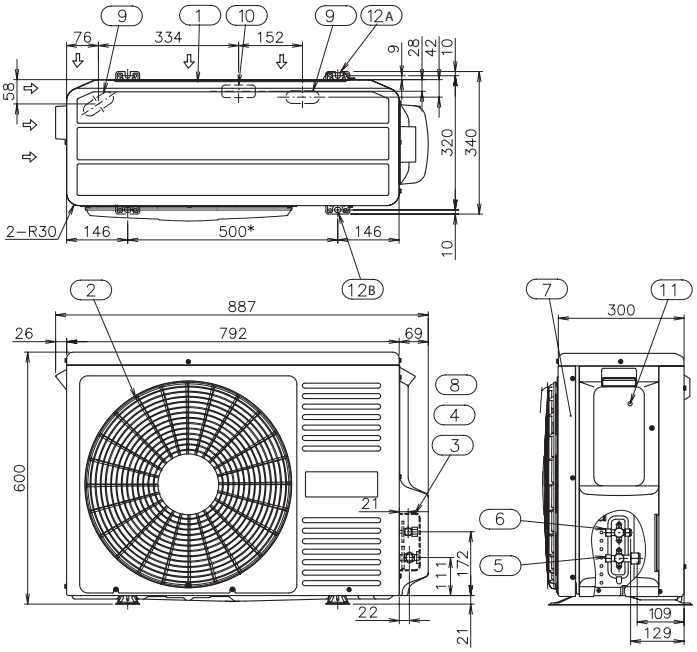


Units in mm.

Number	Description	Remarks
1	Air inlet	—
2	Air outlet	—
3	Service cover	—
4	Electrical switch box	—
5	Holes for refrigerant piping and electrical wiring piping	—
6	Drain holes	3-Ø24
7	Drain holes	2-Ø26
8	Holes for fixing machine to wall	4-(M5)
9	Refrigerant liquid pipe	—
10	Refrigerant gas pipe	—

7.1.2 IVX Standard series

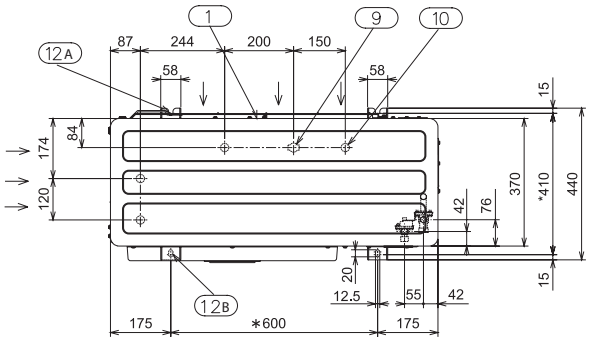
◆ RAS-3HVNC1

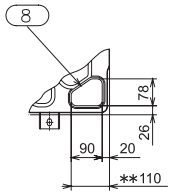


Units in mm.

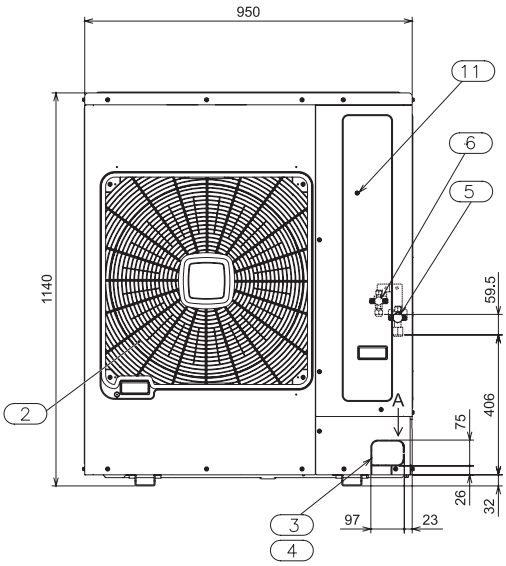
Number	Description	Remarks
1	Air inlet	—
2	Air outlet	—
3	Holes for power supply wiring	—
4	Holes for control line wiring	—
5	Gas piping connection	—
6	Liquid piping connection	—
7	Service panel	—
8	Refrigerant piping hole	—
9	Drain hole	—
10	Drain hole	—
11	Earth terminal wiring	(M5)
12	Holes for fixing machine to wall	A: 2-U cut holes / B: 2 - holes

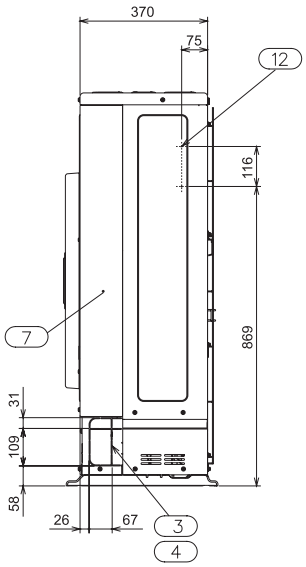
◆ RAS-(4-6)H(V)NC1E

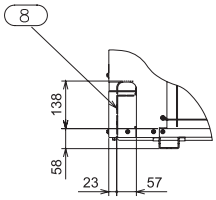




Viewed from A



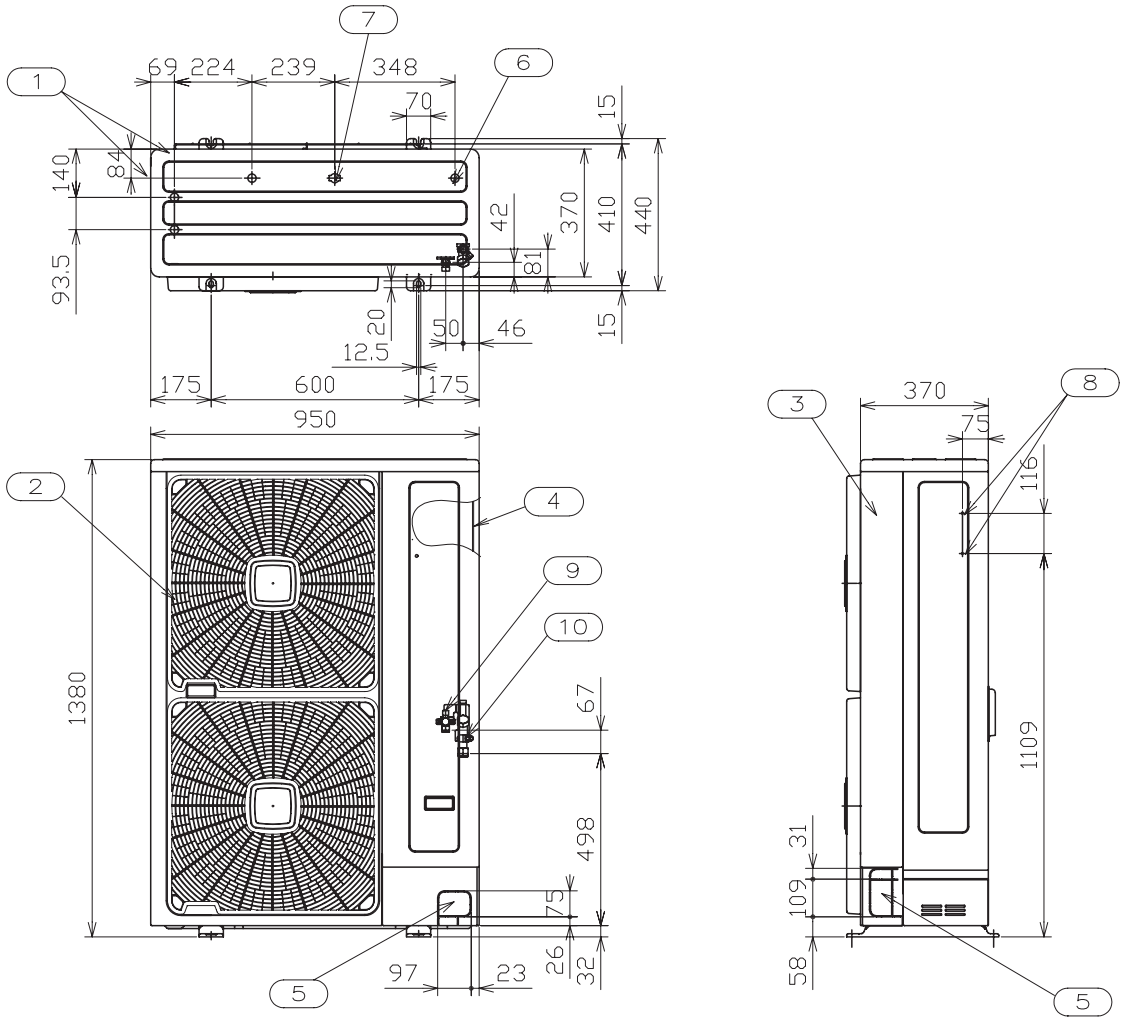




Units in mm.

Number	Description	Remarks
1	Air inlet	—
2	Air outlet	—
3	Holes for power supply wiring	—
4	Holes for control line wiring	—
5	Gas piping connection	—
6	Liquid piping connection	—
7	Service panel	—
8	Refrigerant piping hole	—
9	Drain hole	—
10	Drain hole	—
11	Earth terminal wiring	(M5)
12	Holes for fixing machine to wall	A: 2-U cut holes / B: 2 - holes

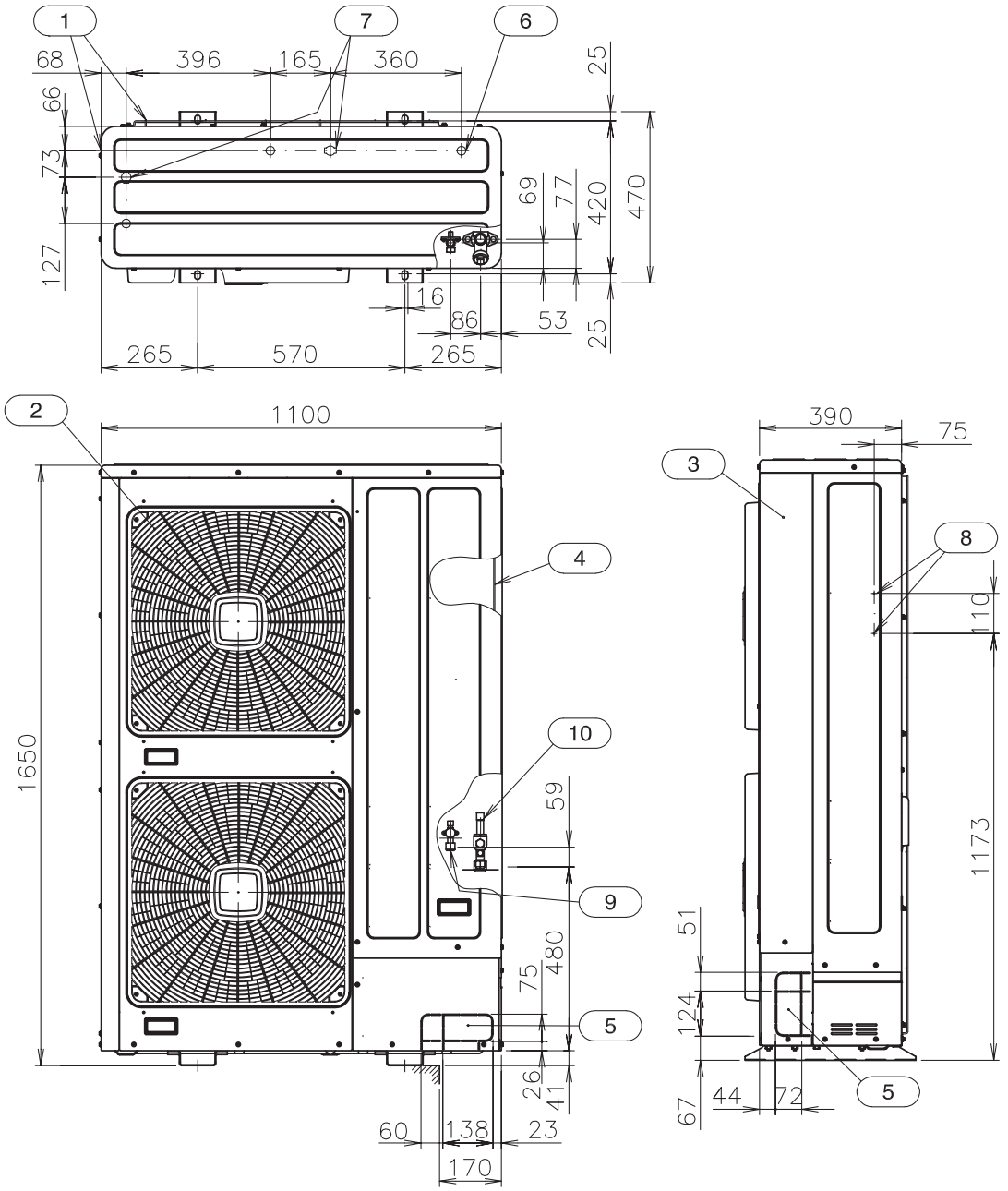
◆ RAS-(8/10)HNCE



Units in mm.

Number	Description	Remarks
1	Air inlet	—
2	Air outlet	—
3	Service cover	—
4	Electrical switch box	—
5	Holes for refrigerant piping and electrical wiring piping	—
6	Drain holes	3-Ø24
7	Drain holes	2-Ø26
8	Holes for fixing machine to wall	4-(M5)
9	Refrigerant liquid pipe	—
10	Refrigerant gas pipe	—

◆ RAS-12HNC



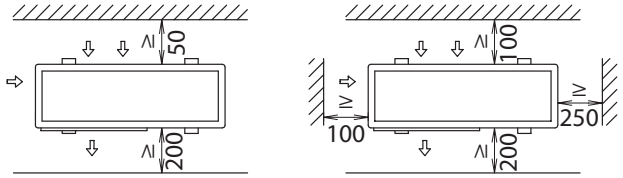
Units in mm.

Number	Description	Remarks
1	Air inlet	—
2	Air outlet	—
3	Service cover	—
4	Electrical switch box	—
5	Holes for refrigerant piping and electrical wiring piping	—
6	Drain holes	3-Ø24
7	Drain holes	2-Ø26
8	Holes for fixing machine to wall	4-(M5)
9	Refrigerant liquid pipe	—
10	Refrigerant gas pipe	—

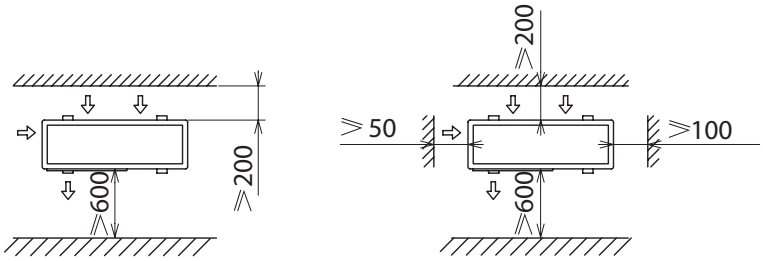
7.2 Service space

7.2.1 Basic sizes

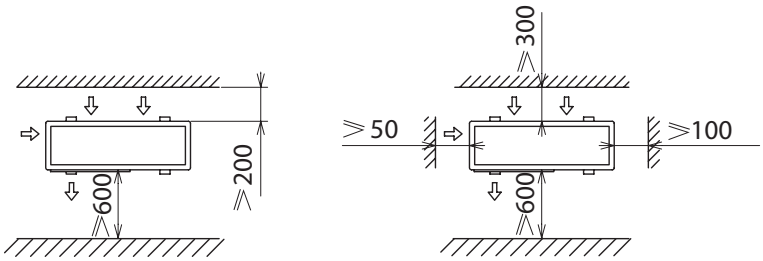
◆ **RAS-2HVNP1 - RAS-2.5HVNP1 - RAS-3HVNC1**



◆ **RAS-(4-6)H(V)NC1E)**



◆ **All models (except RAS-2HVNP1 - RAS-2.5HVNP1 - RAS-3HVNC1 - RAS-(4-6)H(V)NC1E))**



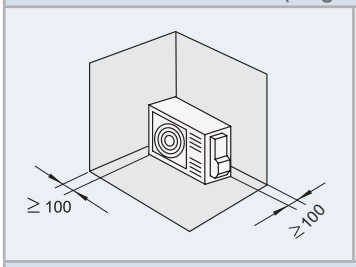
Units in mm.

NOTE

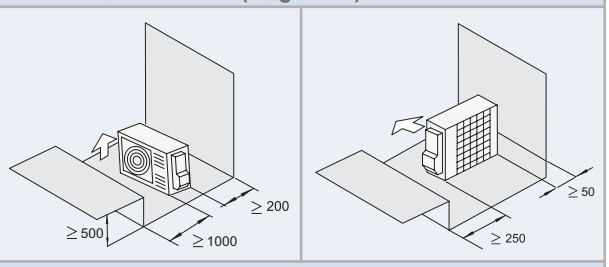
Please refer to the Service Manual for specific information.

7.2.2 RAS-(2-2.5)HVNP1 / RAS-3HVNC1

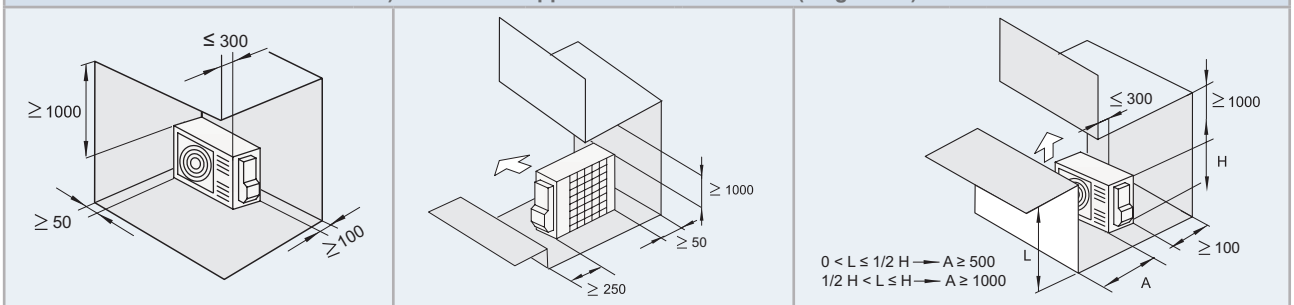
a) In case of front side and either of the sides are open (single unit)



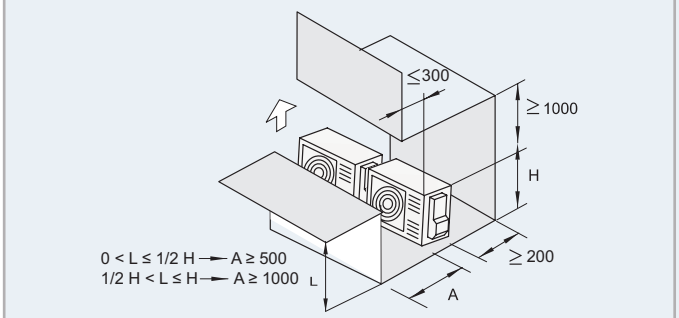
b) In case that surrounding wall exist (single unit)



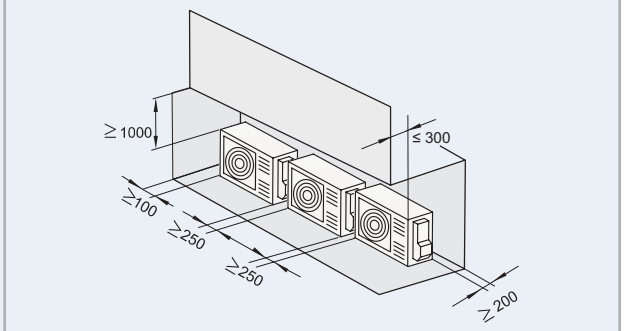
c) In case that upper side obstacles exist (single unit)



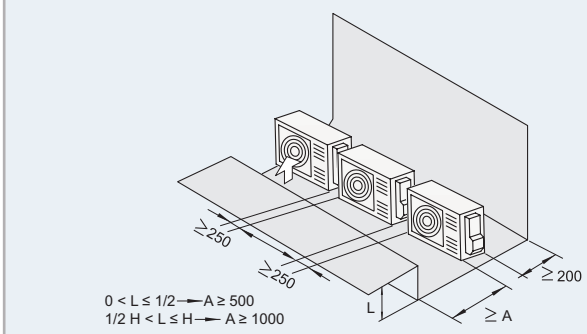
d) In case that upper side obstacles exist (serial units)

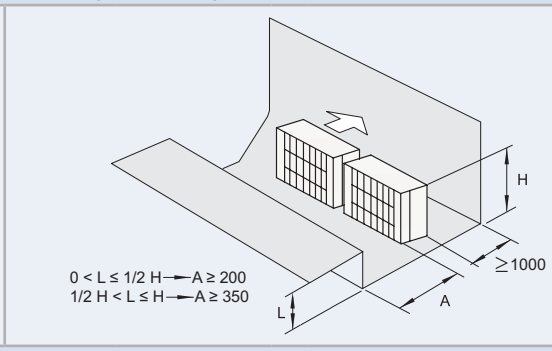


e) In case of front side and either of the sides are open (serial units)

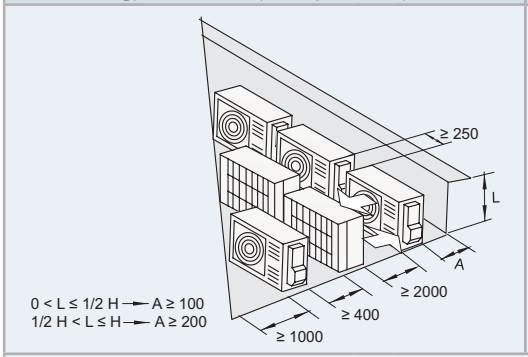


f) In case that surrounding wall exist (serial units)

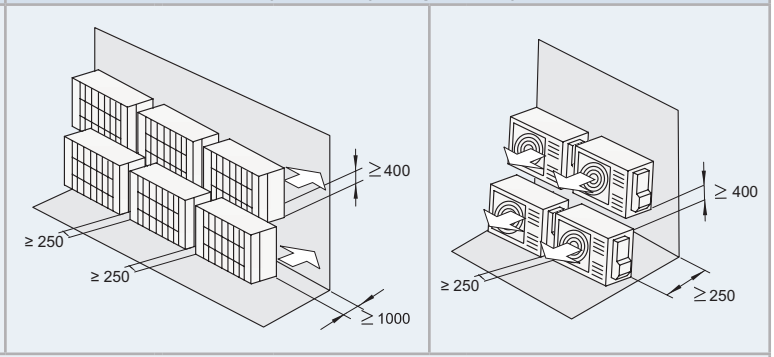




g) Horizontal (multiple units)



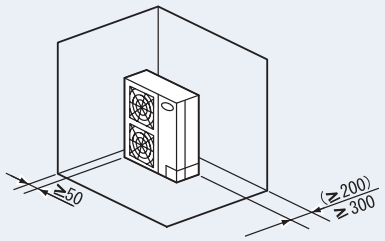
h) Vertical (multiple units)

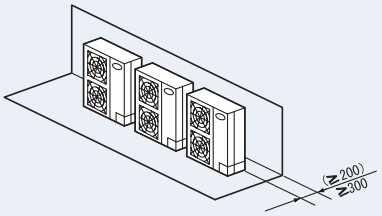


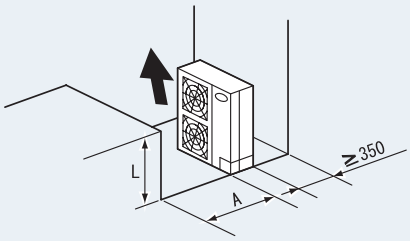
Do not stack more than two units in height.
Close gap (*) to avoid recirculating discharge air flow.

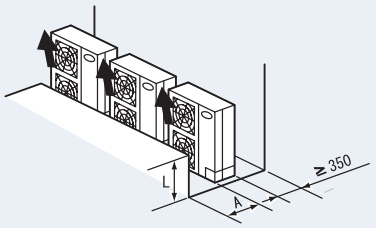
7.2.3 RAS-(3-12)(X)H(V)NP(1)(E) / RAS-12HNC

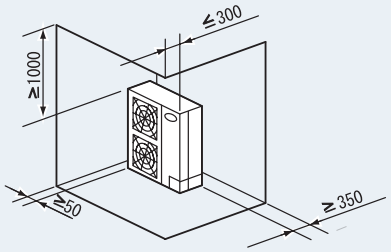
(Unit: mm)

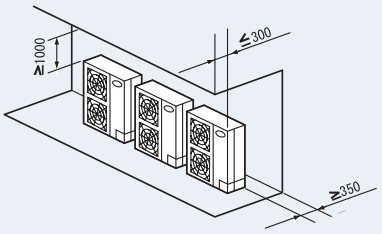
<table>
<tr><th colspan="2">Blocked in inlet side</th></tr>
<tr><th colspan="2">Upper side open</th></tr>
<tr><td>Single installation</td><td>Multiple installation (Two units or more)</td></tr>
<tr><td> 

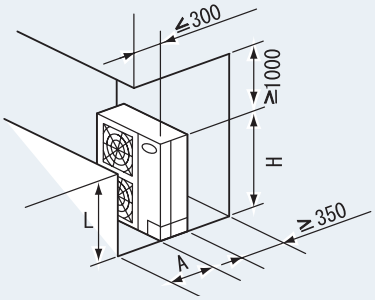
200 or more of the back space is acceptable when the right and left sides are open.
Dimensions in ( ) shows numbers especially for RAS-3HVNPE.</td><td> 

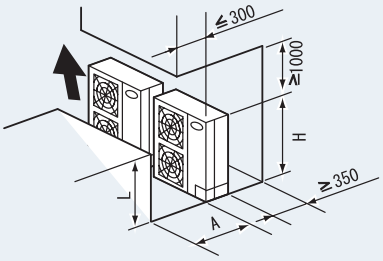
Allow 100 mm of space between units. Leave open both right and left sides.
Dimensions in ( ) shows numbers especially for RAS-3HVNPE.</td></tr>
<tr><td> 

Be sure to use the fan direction guide. Leave open both right and left sides.</td><td> 

Be sure to use the fan direction guide. Allow 100 mm of space between units. Leave open both right and left sides.</td></tr>
<tr><th colspan="2">Upper side blocked</th></tr>
<tr><td>Single installation</td><td>Multiple installation (Two units or more)</td></tr>
<tr><td> 

100 mm or more of the side space is acceptable on the service cover side.</td><td> 

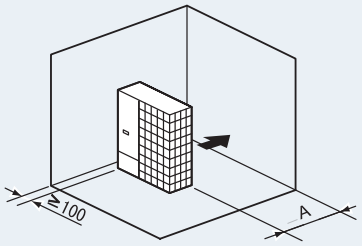
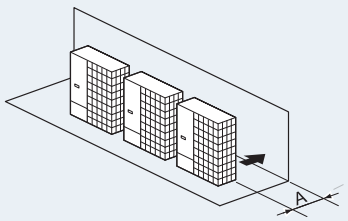
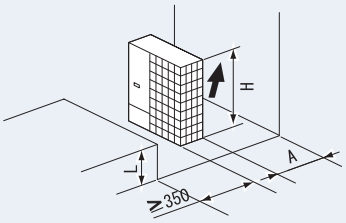
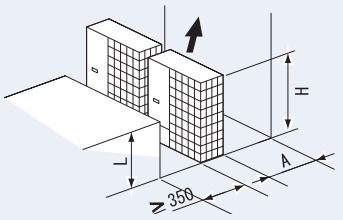
Allow 100 mm of space between units. Leave open both right and left sides.</td></tr>
<tr><td> 

Leave open both right and left sides.</td><td> 

Be sure to use the fan direction guide. Allow 100 mm of space between units. Leave open both right and left sides.
No more than 2 units for multiple installation.</td></tr>
<tr><td>The length A is as shown in the following table:
<table><tr><th>L</th><th>A</th></tr><tr><td>0 < L ≤ 1/2H</td><td>600 or greater</td></tr><tr><td>1/2H < L≤ H</td><td>1400 or greater</td></tr></table></td><td>When L > H use a base for outdoor unit to make L ≤ H.
Close the base not to allow the bypassed outlet air in.</td></tr>
</table>

Outlet side blocked

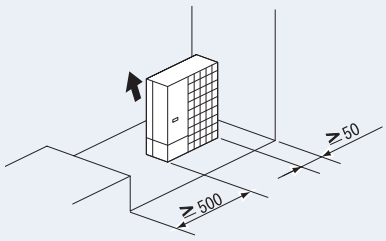
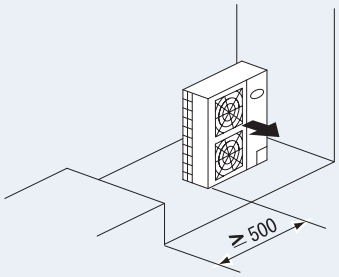
Upper side open

Single installation	Multiple installation (Two units or more)
	 Allow 100 mm of space between units. Both right and left sides shall be open.
 Be sure to use the fan direction guide. Leave open both right and left sides.	 Be sure to use the fan direction guide. Allow 100 mm of space between units. Leave open both right and left sides. No more than 2 units for multiple installation.
The length A is as shown in the following table: L ≤ A 0 < L ≤ 1/2H ≤ 600 or greater 1/2H < L≤ H ≤ 1400 or greater	When L > H use a base for outdoor unit to make L ≤ H. Close the base not to allow the bypassed outlet air in.

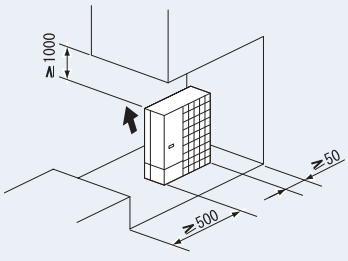
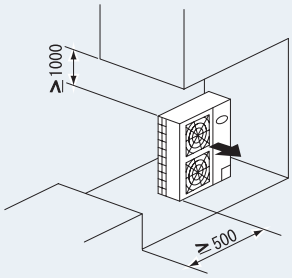
Lateral side blocked

Upper side open

Single installation

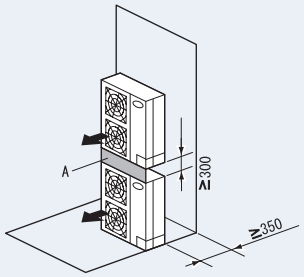
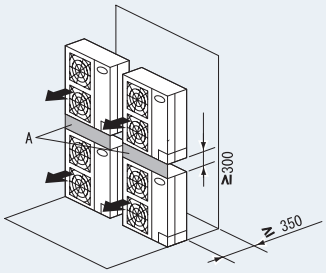
Upper side blocked

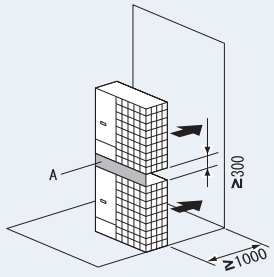
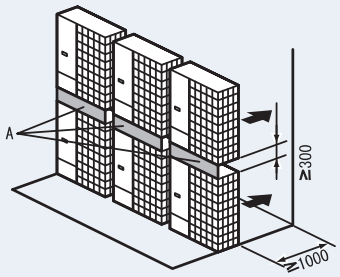
7

Stack installation (allowed up to 2 Units)

Upper side open

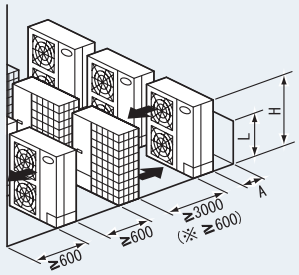
Single installation	Multiple installation
	
Close the part A not to allow the bypassed outlet air in. Install to avoid the drain water from upper unit falling on the lower unit.	Allow 100 mm of space between units. Serial sideways installation allowed up to two units. Leave open both right and left sides. Close the part A not to allow the bypassed outlet air in. Install to avoid the drain water from upper unit falling on the lower unit.

Upper side blocked

Single installation	Multiple installation
	
Be sure to use the fan direction guide. Close the part A not to allow the bypassed outlet air in. Install to avoid the drain water from upper unit falling on the lower unit.	Be sure to use the fan direction guide. Allow 100 mm of space between units. Serial side way installation allowed. but leave open both right and left sides. Close the part A not to allow the bypassed outlet air in. Install to avoid the drain water from upper unit falling on the lower unit.

Multiple installation in multiple rows

Serial installation in multiple rows (E.g. Rooftop)



Allow approx. 100 mm of space from the side unit. Leave open both right and left sides.

The length A is as shown in the following table:

L	A
0 < L ≤ 1/2H	≤ 300
1/2H < L≤ H	≤ 350

NOTE

When L > H use a base for outdoor unit to make L = H. Close the base not to allow the bypassed outlet air in. *Be sure to use the fan direction guide in order to ensure the length marked with ※.*

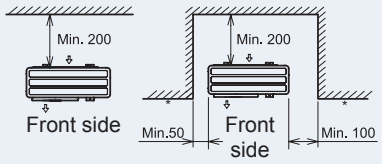
7.2.4 RAS-(4-6)H(V)NC1E

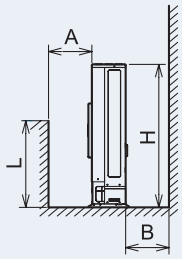
(Unit: mm)

Blocked in inlet side

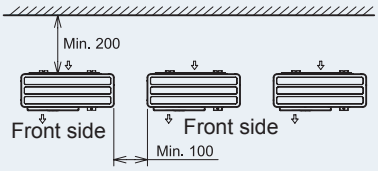
Upper side open

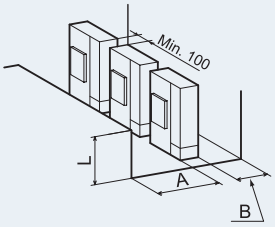
Single installation





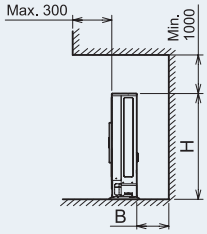
Multiple installation (Two units or more)

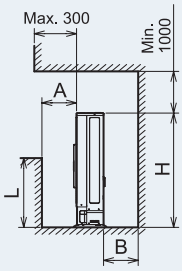




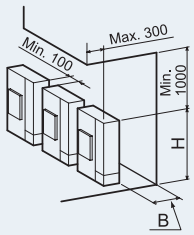
Upper side blocked

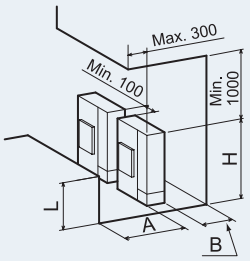
Single installation





Multiple installation (Two units or more)

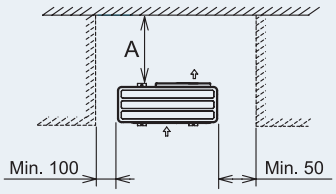


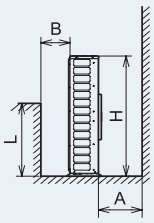


Outlet side blocked

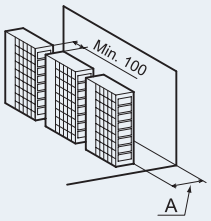
Upper side open

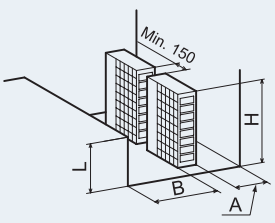
Single installation



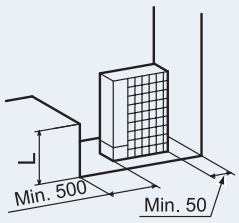
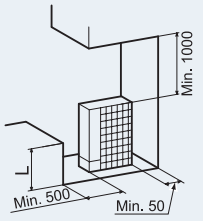
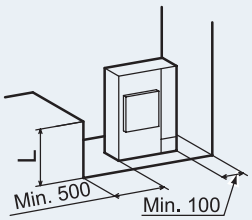
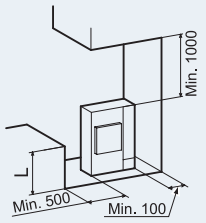


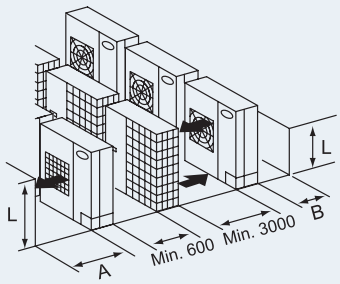
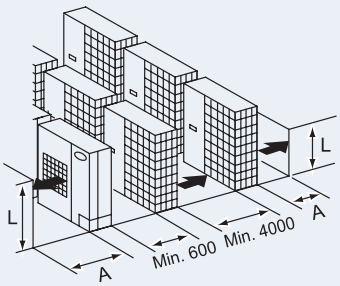
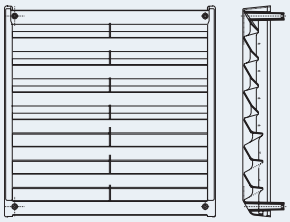
Multiple installation (Two units or more)





7

Right and left blocked	
Upper side open	**Upper side blocked**
Single installation	
	
	

Multi-Row and multiple installations		
		
Mount the airflow guide and provide sufficient space on both right and left sides		When using airflow guide (AG-335A, optional), check that the discharged air is not short-circuited to the air inlet side
<table><tr><th colspan="2">A</th><th colspan="2">B</th></tr><tr><td>0 < L ≤ 1/2H</td><td>1/2H < L≤ H</td><td>0 < L ≤ 1/2H</td><td>1/2H < L≤ H</td></tr><tr><td>Min. 600</td><td>Min. 1400</td><td>Min. 300</td><td>Min.350</td></tr></table>		When L > H use a base for outdoor unit to make L ≤ H. Close the base not to allow the bypassed outlet air in.

8. Refrigerant cycle

Index

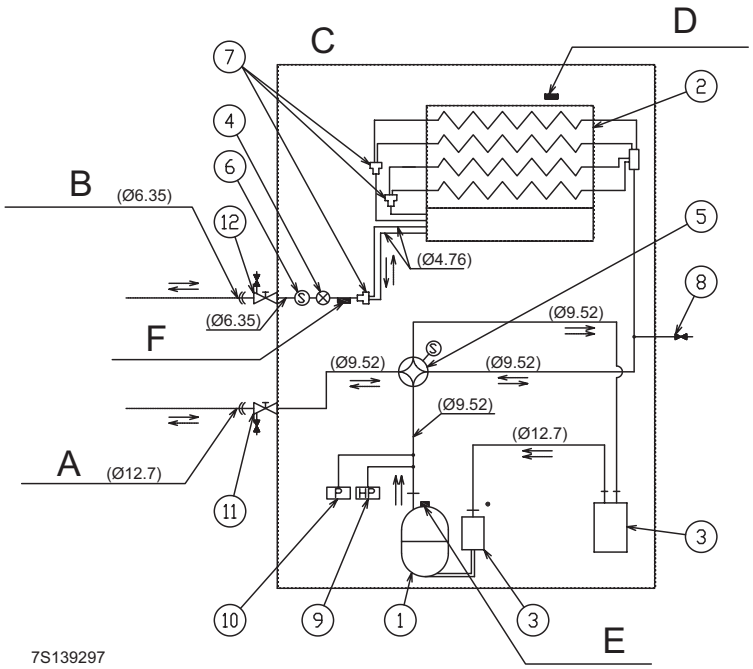
8.1 General notes

Mark	Part name
A	Gas line refrigerant piping connection
B	Liquid line refrigerant piping connection
C	Outdoor unit
D	Ambient thermistor
E	Discharge gas thermistor
F	Pipe thermistor

				R410A	4.15 MPa
Refrigerant flow for cooling	Refrigerant flow for heating	Connection by flare nut	Connection by welding	Gas refrigerant	Leakage test pressure

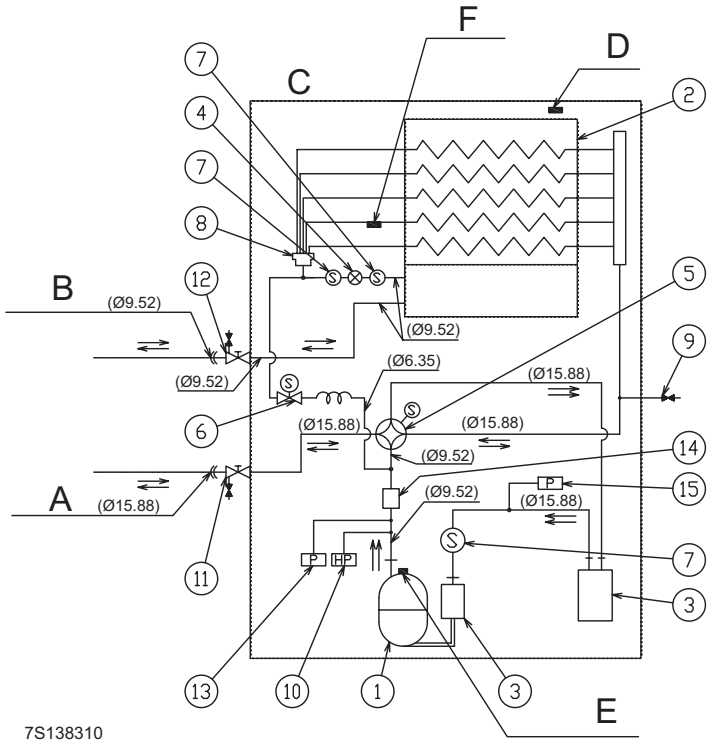
8.2 IVX Premium series

◆ RAS-(2/2.5)HVNP1



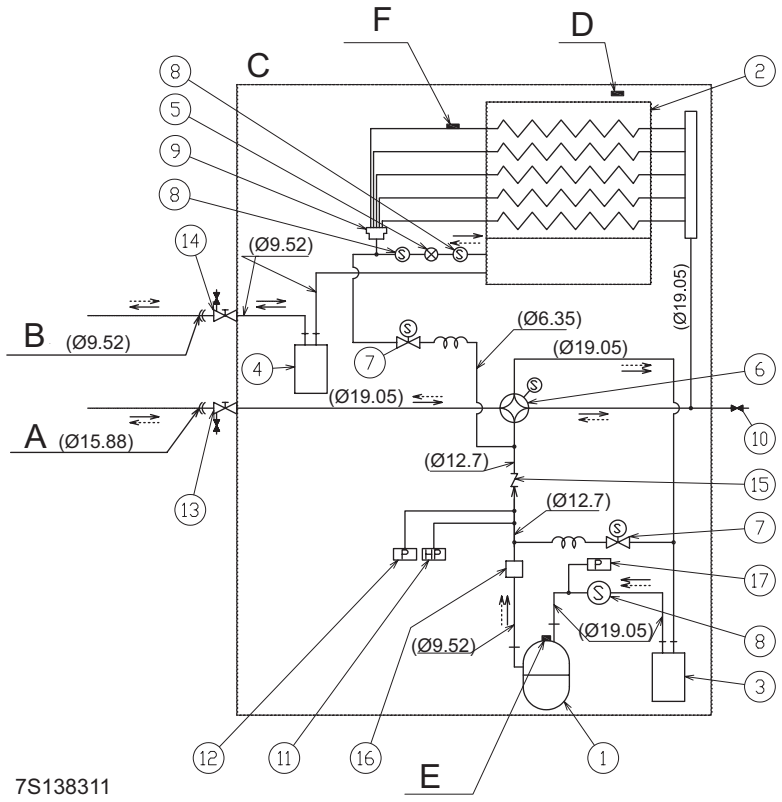
N.	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Micro-computer control expansion valve
5	Reversing valve
6	Strainer
7	Distributor
8	Check joint
9	High pressure switch for protection
10	Pressure switch for control
11	Stop valve for gas line
12	Stop valve for liquid line

◆ RAS-3(X)HVNP1E



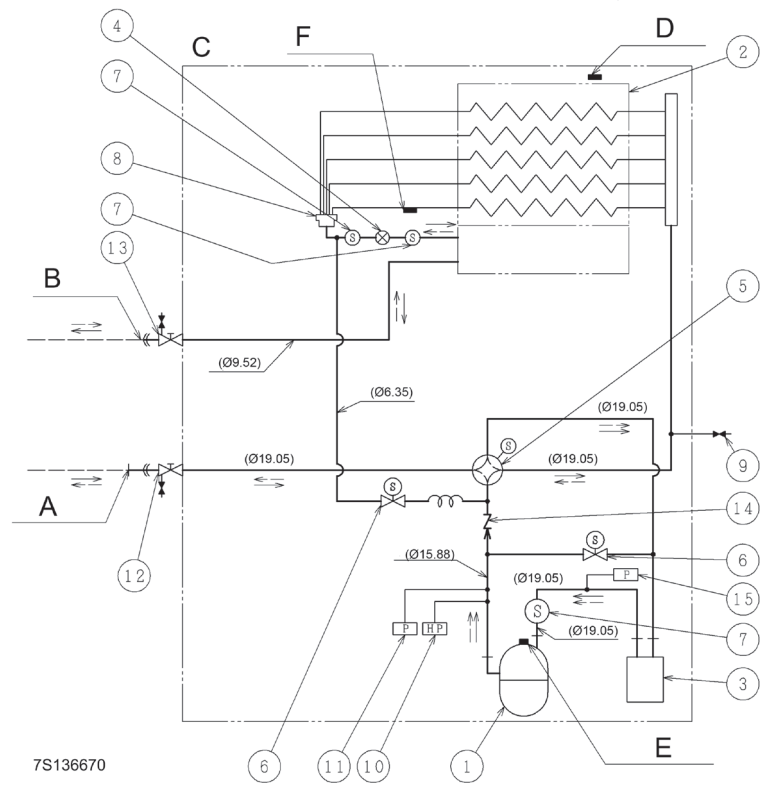
N.	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Micro-computer control expansion valve
5	Reversing valve
6	Solenoid valve for gas bypass
7	Strainer
8	Distributor
9	Check joint
10	High pressure switch for protection
11	Stop valve for gas line
12	Stop valve for liquid line
13	Sensor for refrigerant pressure
14	Silencer
15	Pressure switch for control

◆ RAS-(4-6)(X)H(V)NP1E



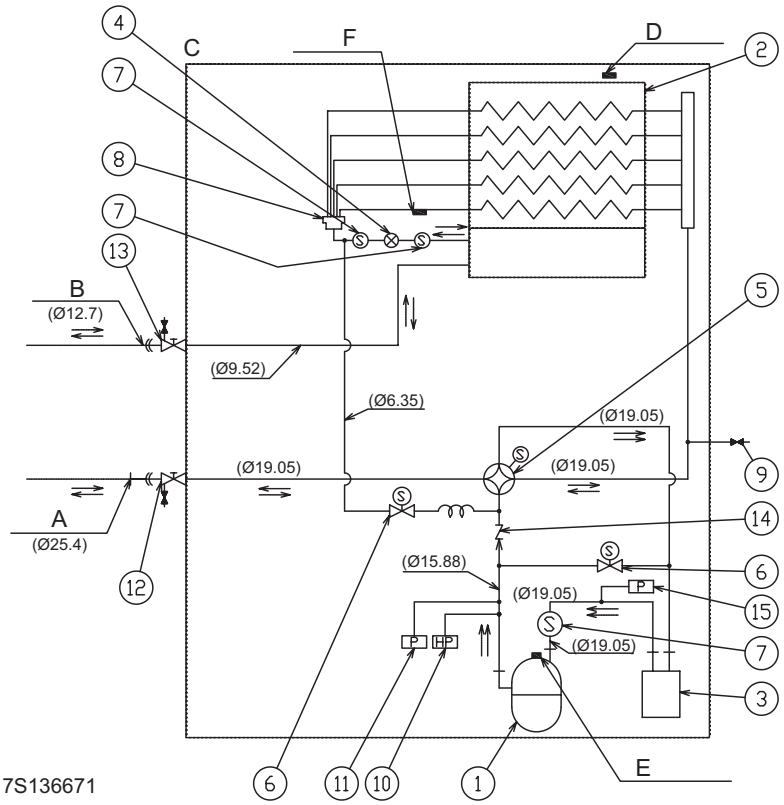
N.	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Receiver
5	Micro-computer control expansion valve
6	Reversing valve
7	Solenoid valve for gas bypass
8	Strainer
9	Distributor
10	Check joint
11	High pressure switch for protection
12	Sensor for refrigerant pressure
13	Stop valve for gas line
14	Stop valve for liquid line
15	Check valve
16	Silencer
17	Pressure switch for control

◆ RAS-8(X)HNPE



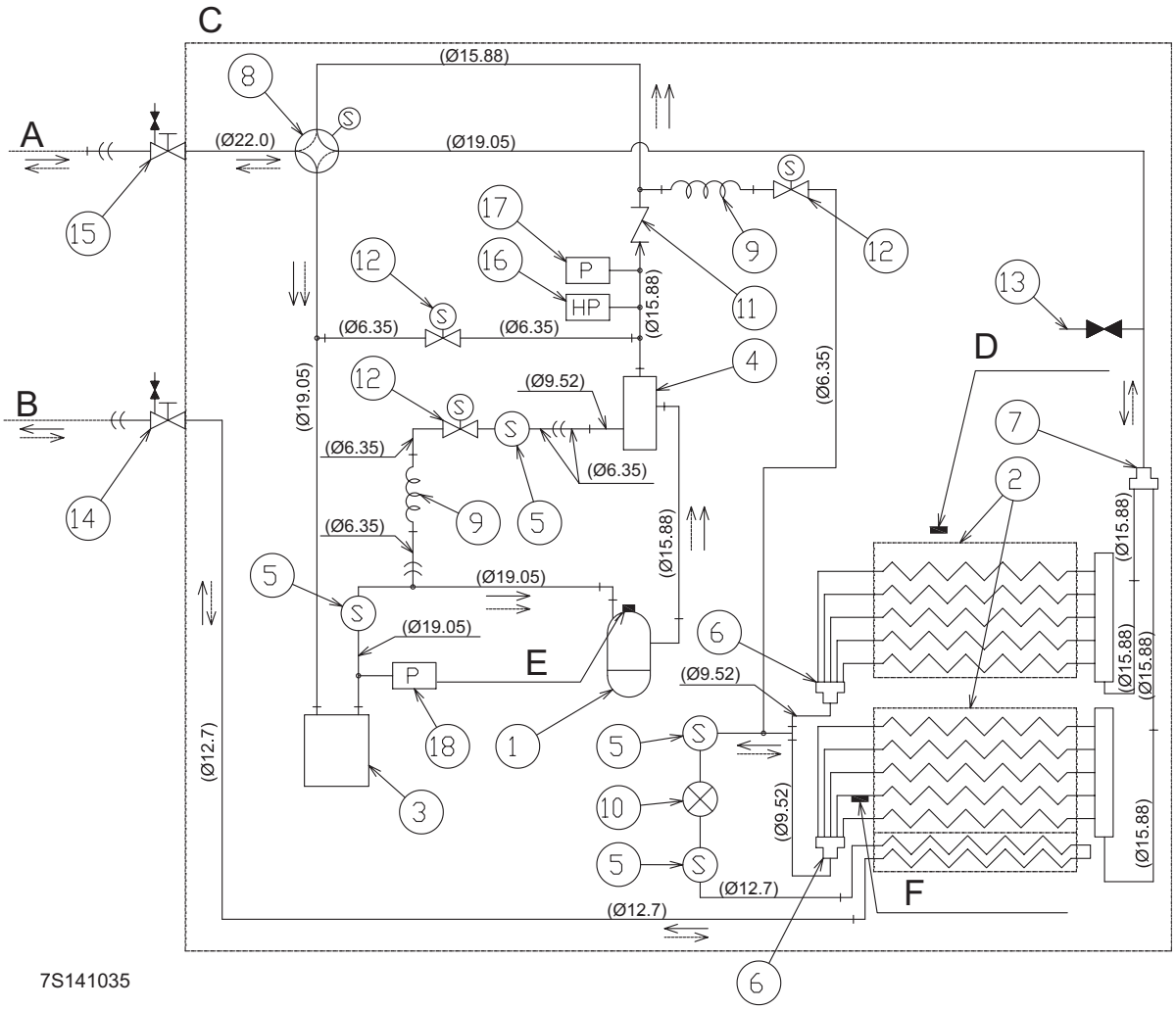
N.	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Micro-computer control expansion valve
5	Reversing valve
6	Solenoid valve for gas bypass
7	Strainer
8	Distributor
9	Check joint
10	High pressure switch for protection
11	Sensor for refrigerant pressure
12	Stop valve for gas line
13	Stop valve for liquid line
14	Check valve
15	Pressure switch for control

◆ RAS-10(X)HNPE



N.	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Micro-computer control expansion valve
5	Reversing valve
6	Solenoid valve for gas bypass
7	Strainer
8	Distributor
9	Check joint
10	High pressure switch for protection
11	Sensor for refrigerant pressure
12	Stop valve for gas line
13	Stop valve for liquid line
14	Check valve
15	Pressure switch for control

◆ RAS-12HNP

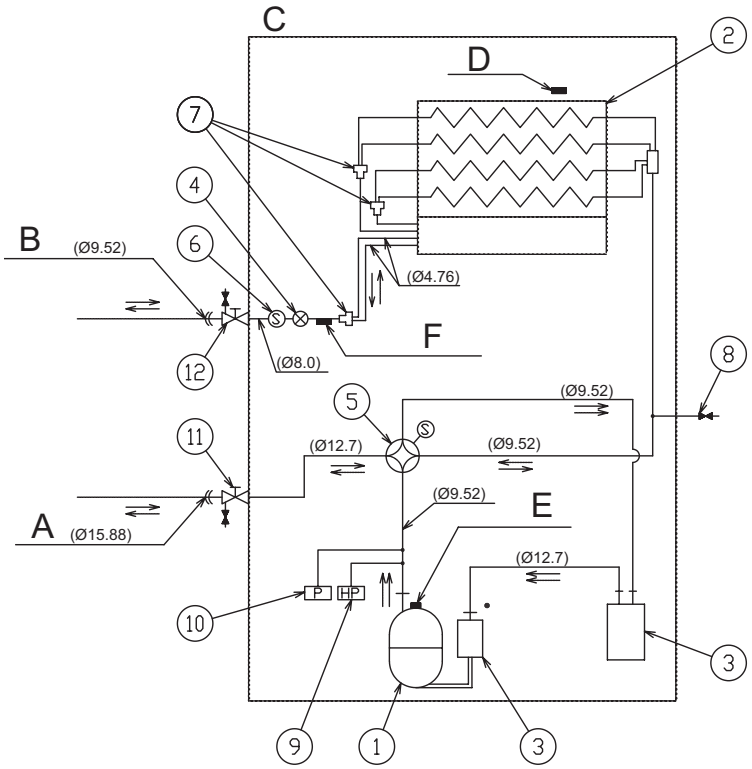


7S141035

N.	Part name	N.	Part name
1	Compressor	10	Expansion valve
2	Heat exchanger	11	Check valve
3	Accumulator	12	Solenoid valve for gas bypass
4	Oil separator	13	Check joint
5	Strainer	14	Stop valve for liquid line
6	Distributor	15	Stop valve for gas line
7	Distributor	16	High pressure switch for protection
8	Reversing valve	17	Sensor for refrigerant pressure
9	Capillary tube	18	Pressure switch for control

8.3 IVX Standard series

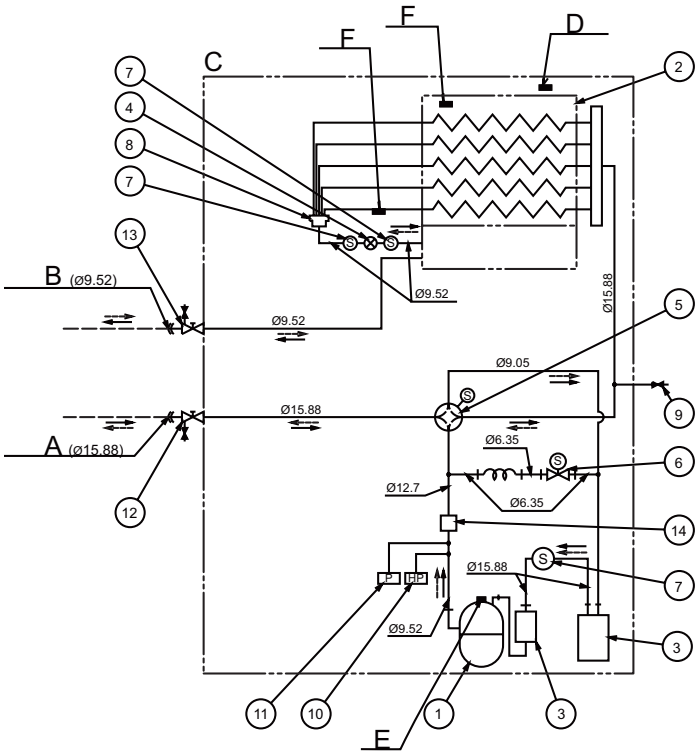
◆ RAS-3HVNC1



3139296

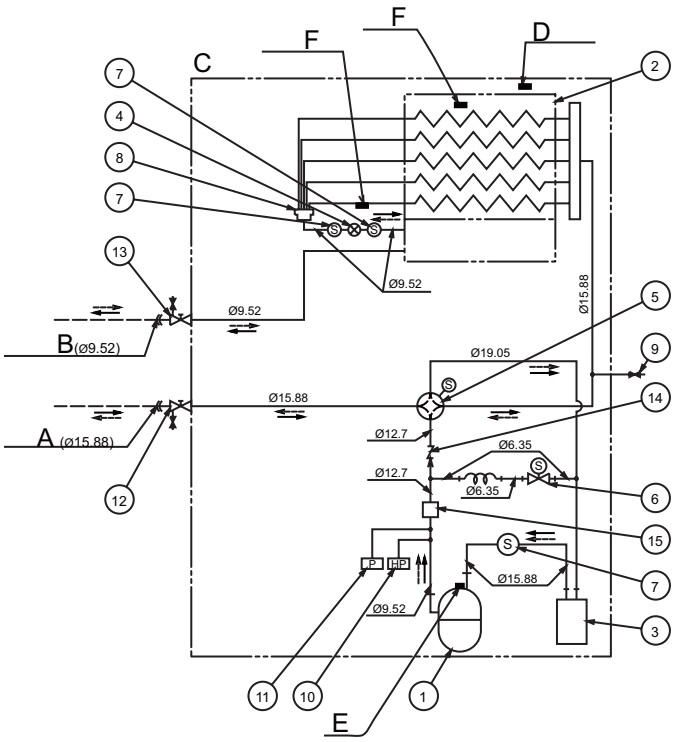
N.	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Micro-computer control expansion valve
5	Reversing valve
6	Strainer
7	Distributor
8	Check joint
9	High pressure switch for protection
10	Pressure switch for control
11	Stop valve for gas line
12	Stop valve for liquid line

◆ RAS-4H(V)NC1E



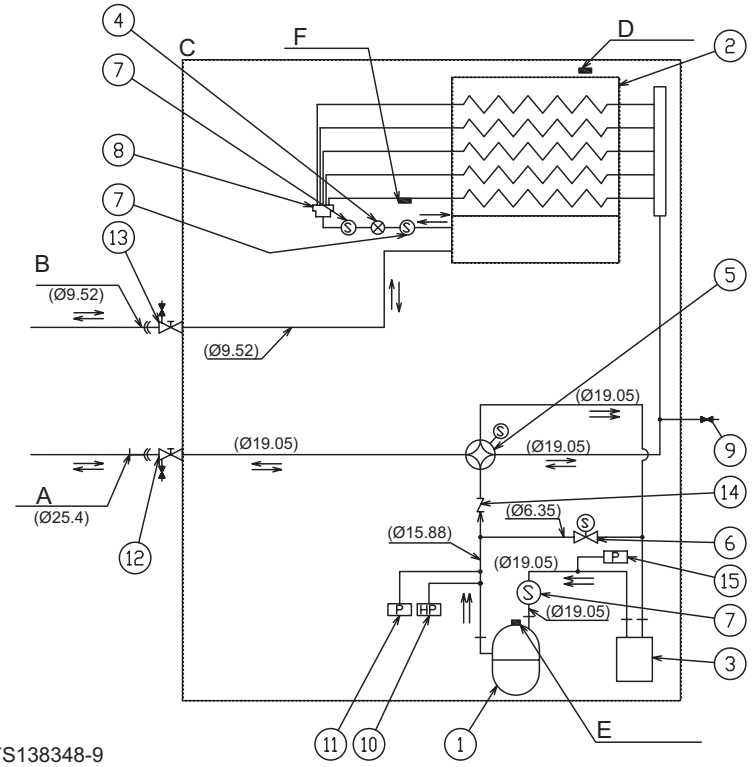
N.	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Micro-Computer controlled expansion valve
5	Reversing valve
6	Solenoid valve for gas bypass
7	Strainer
8	Distributor
9	Check joint
10	High pressure switch for protection
11	Pressure switch for control
12	Stop valve for gas line
13	Stop valve for liquid line
14	Silencer

◆ RAS-(5/6)H(V)NC1E



N.	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Micro-Computer controlled expansion valve
5	Reversing valve
6	Solenoid valve for gas bypass
7	Strainer
8	Distributor
9	Check Joint
10	High pressure switch for protection
11	Pressure switch for control
12	Stop valve for gas line
13	Stop valve for liquid line
14	Check valve
15	Silencer

◆ RAS-(8/10)HNCE



N.	Part name
1	Compressor
2	Heat exchanger
3	Accumulator
4	Micro-computer control expansion valve
5	Reversing valve
6	Solenoid valve for gas bypass
7	Strainer
8	Distributor
9	Check joint
10	High pressure switch for protection
11	Pressure switch for control
12	Stop valve for gas line
13	Stop valve for liquid line
14	Check valve
15	Pressure switch for control

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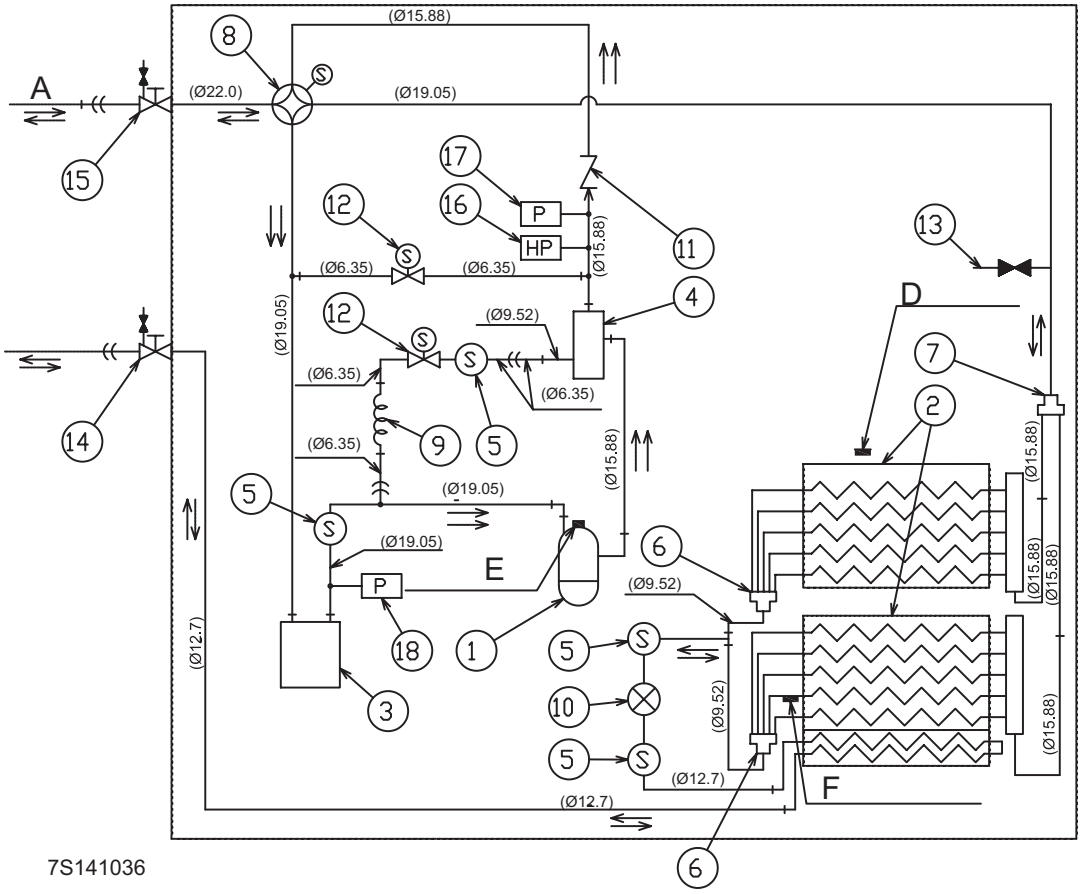
◆ RAS-12HNC



N.	Part name	N.	Part name
1	Compressor	10	Expansion valve
2	Heat exchanger	11	Check valve
3	Accumulator	12	Solenoid valve for gas bypass
4	Oil separator	13	Check joint
5	Strainer	14	Stop valve for liquid line
6	Distributor	15	Stop valve for gas line
7	Distributor	16	High pressure switch for protection
8	Reversing valve	17	Sensor for refrigerant pressure
9	Capillary tube	18	Pressure switch for control

9. Piping work and refrigerant charge

Index

9.1 Refrigerant pipe selection

9.1.1 Pipe size selection

Select the pipe size in line with the following instructions:

1 Between the outdoor unit and the branch pipe (multikit): select the same pipe connection size as for the outdoor 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 outdoor unit capacity.*
- *If larger diameter gas refrigerant pipes are used, the circuit lubrication oil tends to separate from the gas carrying it. The compressor will be seriously damaged due to a lack of lubrication.*
- *If smaller diameter gas refrigerant pipes are used, the gas or liquid refrigerant will have serious difficulties in circulating. System performance will be affected. The compressor will run under more severe conditions than foreseen and will be damaged in a short space of time.*

9.1.2 Gas pipe accessory (only for 8, 10 and 12 HP)

For RAS-(8-12)(X)HN(P/C)E, the gas pipe accessory with a flare nut (factory-supplied silencer) shall be brazed to the field supplied gas line, and connected to the gas valve.

9.1.3 Multikit or distributor selection

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

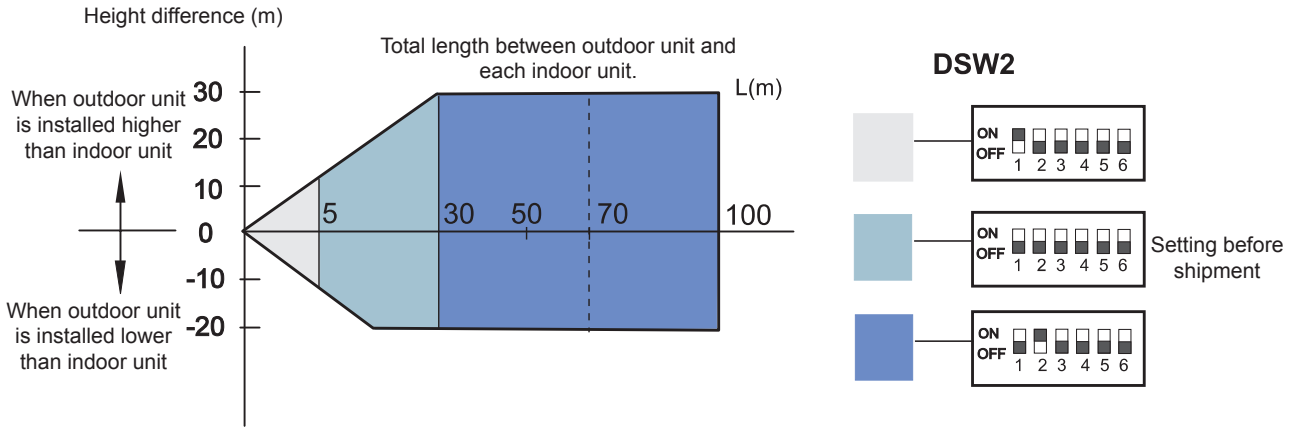
The sizes of the indoor and outdoor units could be different. Adjust the flare adapter (accessory) to the indoor pipe connection in these cases.

9.2 Refrigerant piping range

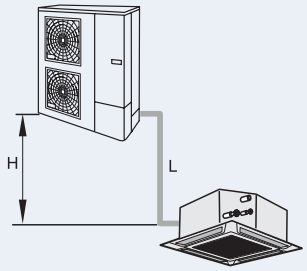
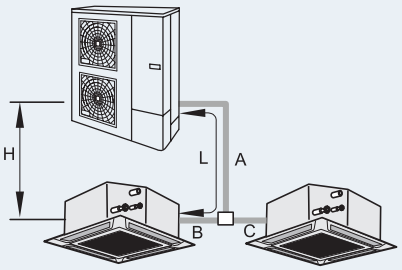
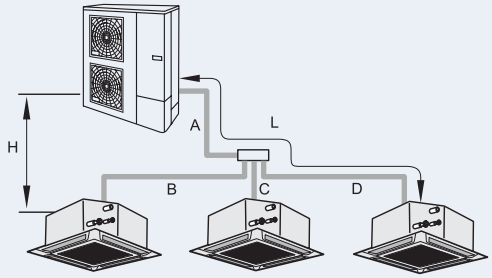
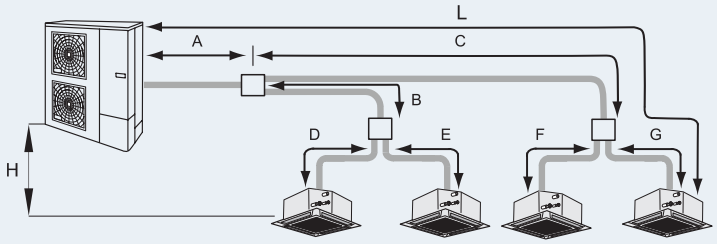
9.2.1 Refrigerant piping length

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

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



9.2.2 Piping system for header branch (except RAS-XH(V)NP(1)E series)

1 indoor unit system (OU from 2 to 10 HP)	2 indoor units system (OU from 2 to 12 HP)
	
3 indoor units system (OU from 4 to 12 HP)	**4 indoor units system (OU from 4 to 12 HP)**
	

(pictures are as example)

◆ Maximum refrigerant piping length

IVX Premium series (except RAS-XH(V)NP(1)E series)

(m)

Outdoor unit		2 HP	2.5 HP	3HP	4HP	5HP	6HP	8HP	10HP	12HP
Maximum piping length between the outdoor unit and the farthest indoor unit	Actual length (L)	50			75			100		
	Equivalent length (EL)	70			95			125		
Total piping length	2 units (A+B+C)	50		60	85			100	115	
	3 units (A+B+C+D)	--			95			100	130	
	4 units (A+B+C+D+E+F+G+)	--			95			100	145	
Maximum piping line after first branch	2 and 3 units (B, C, D)	10						15		
	4 units (B+D, B+E, C+F, C+G)	--			10			15		
Main piping length A		A > B, C, D, E, F, G								
Maximum height difference, Outdoor / Indoor (H) (Outdoor unit is higher / lower)		30 / 20								
Maximum height difference Indoor / Indoor		3		10						
Maximum height difference: branch pipe/indoor (2,3 and 4 indoor units system) branch pipe/branch pipe (4 indoor units system)		3								
Maximum length difference of the several branches: (B-C) (2 and 3 unit system) (B-D) (3 unit system) (C-D) (3 unit system) (C+G)-(C+F) (4 unit system) (B+E)-(B+D) (4 unit system) (C+G)-(B+E) (4 unit system) (C+G)-(B+D) (4 unit system) (C+F)-(B+E) (4 unit system) (C+F)-(B+D) (4 unit system)		< 8								

IVX Standard series

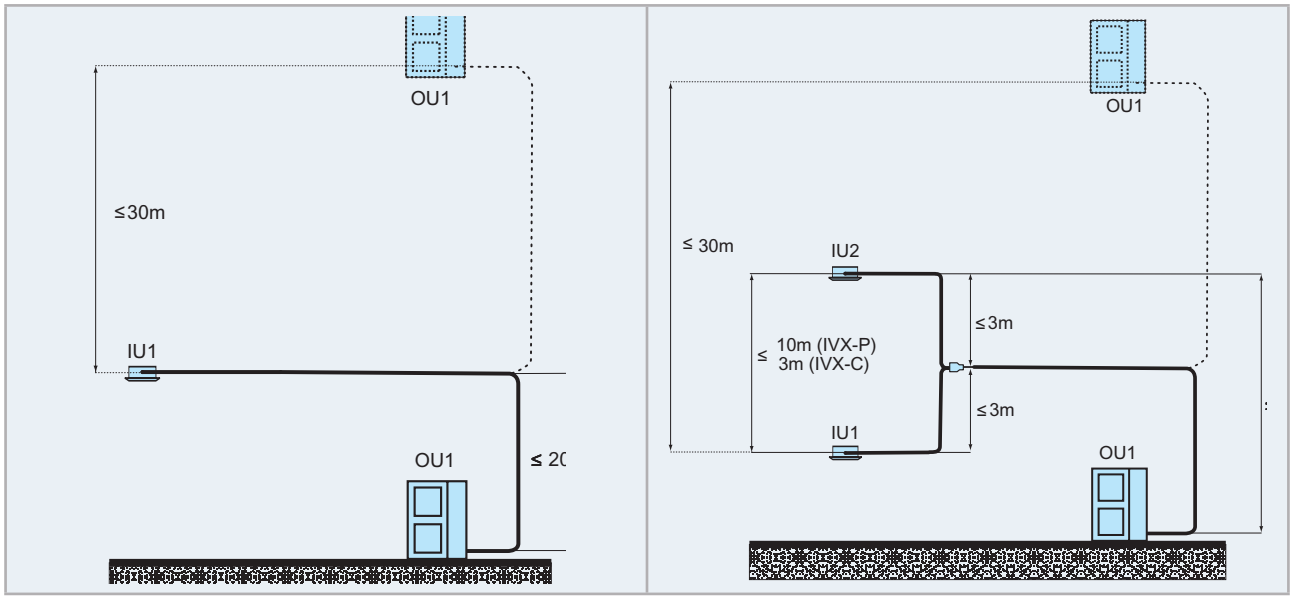
(m)

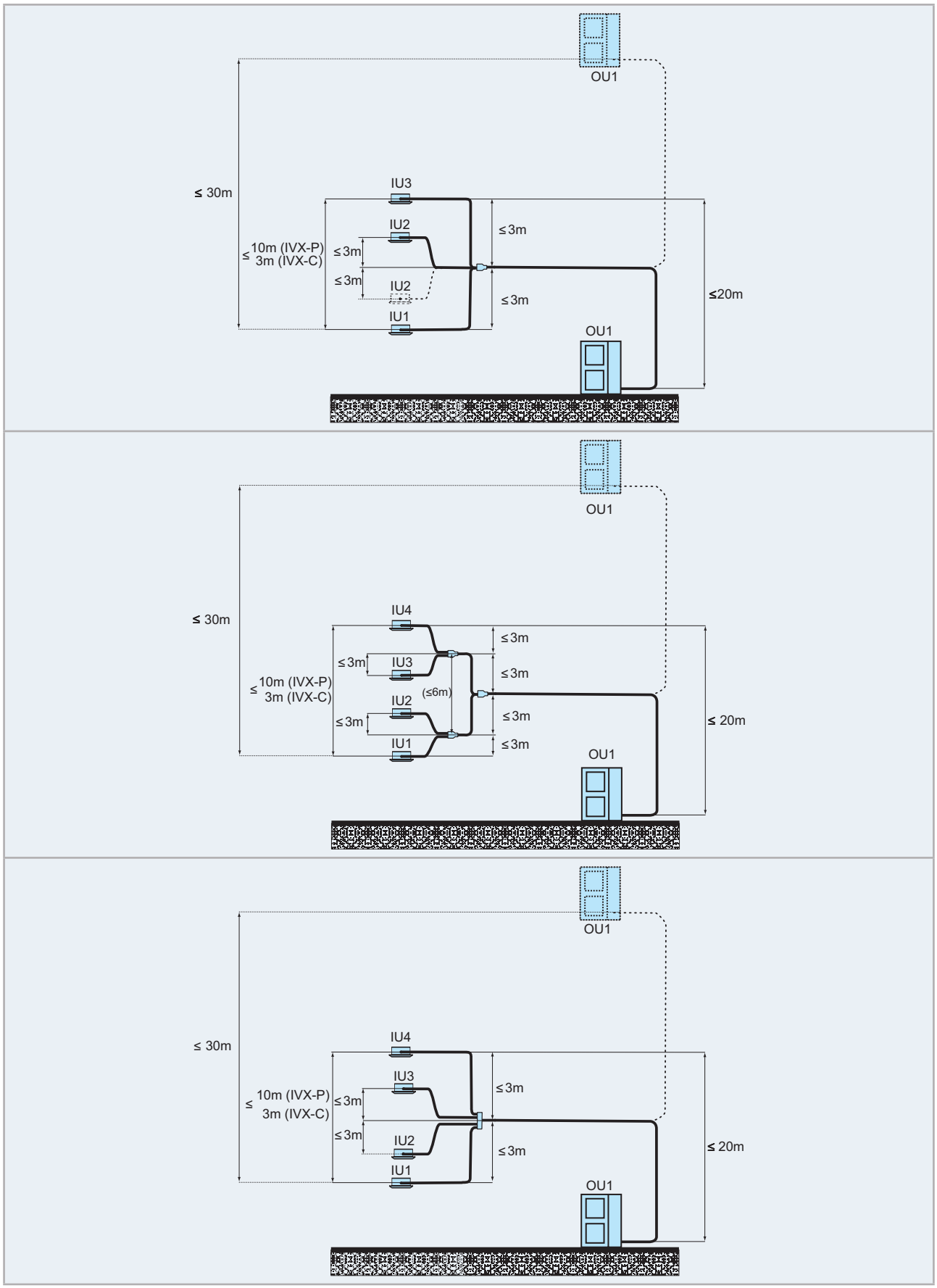
Outdoor Unit		3HP	4HP	5HP	6HP	8HP	10HP	12HP
Maximum piping length between the outdoor unit and the farthest indoor unit	Actual length (L)	50	70	75		100		
	Equivalent length (EL)	70	90	95		125		
Total piping length	2 units (A+B+C)	60	80	85		100	115	
	3 units (A+B+C+D)	--	90	95		100	130	
	4 units (A+B+C+D+E+F+G+)	--	90	95		100	145	
Maximum piping line after first branch	2 and 3 units (B, C, D)	10				15		
	4 units (B+D, B+E, C+F, C+G)	--	10			15		
Main piping length A		A > B, C, D, E, F, G						
Maximum height difference, Outdoor / Indoor (H) (Outdoor Unit is higher / lower)		30 / 20						
Maximum height difference Indoor / Indoor		3						
Maximum height difference: branch pipe/indoor (2,3 and 4 indoor units system) branch pipe/branch pipe (4 indoor units system)		3						
Maximum length difference of the several branches: (B-C) (2 and 3 unit system) (B-D) (3 unit system) (C-D) (3 unit system) (C+G)-(C+F) (4 unit system) (B+E)-(B+D) (4 unit system) (C+G)-(B+E) (4 unit system) (C+G)-(B+D) (4 unit system) (C+F)-(B+E) (4 unit system) (C+F)-(B+D) (4 unit system)		< 8						

NOTE

- *The liquid piping and the gas piping must be of the same piping length and run along the same route.*
- *Install the branch piping as much as possible near the indoor units.*
- *Install Multikits at the same horizontal level.*

◆ Maximum height difference (clarification)



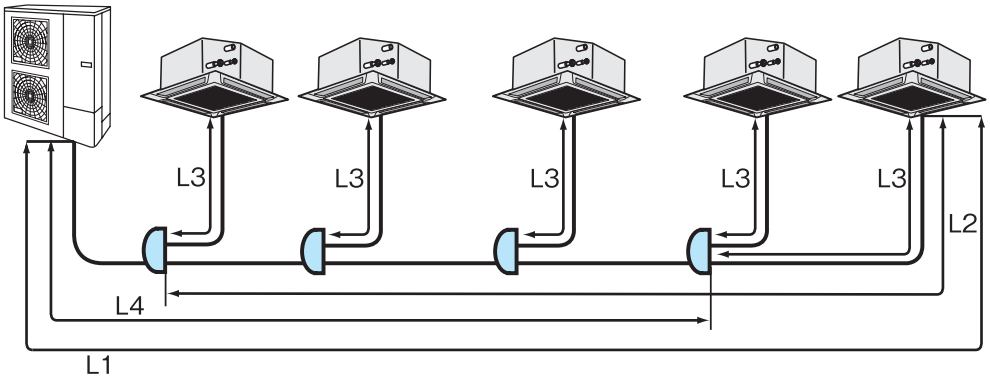


NOTE

All pictures are as example. Branch and headers are not showed as real sizes or real picture, for the installation of this components follow the technical documentation.

9.2.3 Piping system for line branch (except RAS-XH(V)NP(1)E series)

Outdoor unit		3 HP	4 HP	5 HP	6 HP	8 HP	10 HP	12 HP
IU quantity allowed	IVX Premium	2 -3	2 - 5	2 - 6		2 - 8		
	IVX Standard	--	2 - 4					



(picture is as example)

◆ Maximum refrigerant piping length (Line branch system)

IVX Premium series

(m)

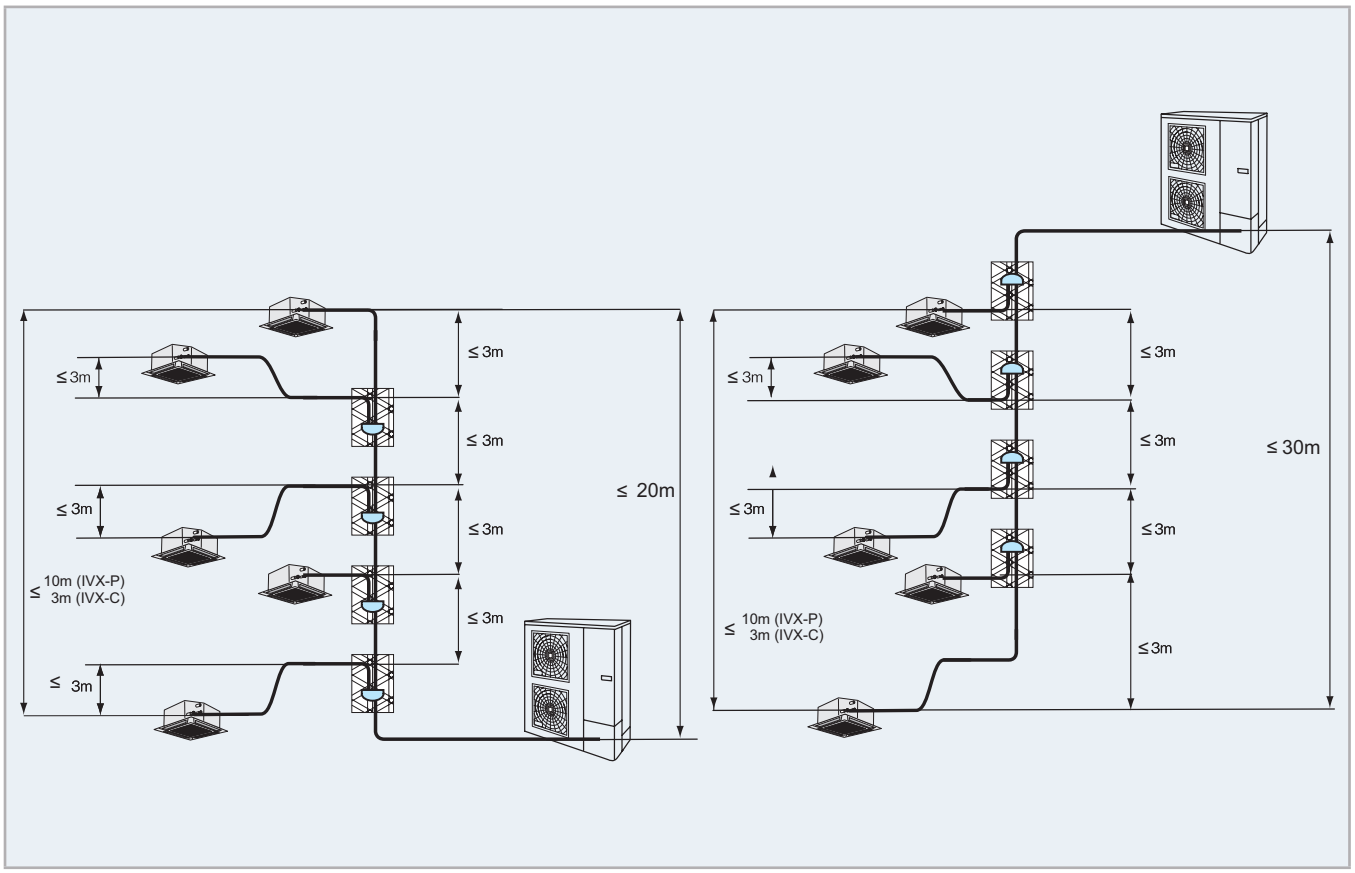
Outdoor Unit		3HP	4HP	5HP	6HP	8HP	10HP	12HP
Maximum piping length between the outdoor unit and the farthest indoor unit	Actual Length (L1)	50	75			100		
	Equivalent Length (EL)	70	95			125		
Maximum piping length from first branch to each indoor unit (L2)		20	30			40		
Maximum piping length from branch to indoor unit (L3)		10				15		
Total piping length L4 + (L31+L32+L33....)		60	95			100	145	
Maximum height difference, Outdoor / Indoor (H) (Outdoor unit is higher / lower)		30 / 20						
Maximum height Difference Indoor / Indoor		10						
Maximum height difference: Branch pipe/Indoor Branch pipe/branch pipe		3						

IVX Standard series

(m)

Outdoor Unit		4HP	5HP	6HP	8HP	10HP	12HP
Maximum piping length between the outdoor unit and the farthest indoor unit	Actual Length (L1)	70	75		100		
	Equivalent Length (EL)	90	95		125		
Maximum piping length from first branch to each indoor unit (L2)		20			25		
Maximum piping length from branch to indoor unit (L3)		10			15		
Total piping length L4 + (L31+L32+L33....)		70	75		100	145	
Maximum height difference, outdoor / indoor (H) (Outdoor unit is higher / lower)		30 / 20					
Maximum height Difference Indoor / Indoor		3					
Maximum height difference: Branch pipe/Indoor Branch pipe/branch pipe		3					

◆ Maximum height difference



NOTE

All pictures are as example. Branch and headers are not showed as real sizes or real picture, for the installation of this components follow the technical documentation.

9.2.4 Combinations of piping size and piping length

IVX Premium series

Liquid	Ø6.35				Ø9.52					Ø12.70					Ø15.88		
Gas	Ø9.52	Ø12.70	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
Performance capacity																	(m)
2 HP	15 (1)	50	30	-	15 (3)	15 (3)	-	-	-	-	-	-	-	-	-	-	-
2.5 HP	-	50	30	-	20 (3)	20 (3)	-	-	-	-	-	-	-	-	-	-	-
3 HP	-	30 (1) (2)	30 (2)	-	30 (1)	50	-	-	-	-	-	-	-	-	-	-	-
4 - 5 - 6 HP	-	-	5 (2)	5 (2)	40 (1)	75	50(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 - 12 HP	-	-	-	-	-	-	-	-	-	-	-	50(1)	100	50	50 (1) (3)	50 (3)	50 (3)

(1).Reducing gas pipe size will lower 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 indoor unit relation with expansion valve capacity.

(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 Outdoor Unit PCB.

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

(6).In case of exceeding the recommended number of connected Indoor Units of 8 HP (more than 5 Units), please use a Ø12.7 pipe as a liquid

	Standard

IVX Standard series

Liquid	Ø6.35				Ø9.52					Ø12.70					Ø15.88		
Gas	Ø9.52	Ø12.70	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
Performance capacity	(m)																
3 HP	-	30 (1) (2)	30 (2)	-	30 (1)	50	-	-	-	-	-	-	-	-	-	-	-
4 HP	-	-	5 (2)	5 (2)	40 (1)	70	50 (4)	-	-	30 (3)	30 (3) (4)	-	-	-	-	-	-
5 - 6 HP	-	-	5 (2)	5 (2)	40 (1)	75	50 (4)	-	-	30 (3)	30 (3) (4)	-	-	-	-	-	-
8 HP	-	-	-	-	-	-	50 (1) (4)	50 (1)	70 (5) (6)	-	50 (1) (3) (4)	50 (1) (3)	100		50 (1) (3)	50 (3)	
10 - 12 HP	-	-	-	-	-	-	-	-	-	-	-	50 (1)	100	50	50 (1) (3)	50 (3)	50 (3)

(1).Reducing gas pipe size will lower 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 indoor unit relation with expansion valve capacity.

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

(4).When using Ø 19.05 gas pipe (soft-annealed), please switch ON DSW2-4# in the Outdoor Unit PCB.

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

(6) In case of exceeding the recommended number of connected Indoor Units of 8 HP (more than 5 Units), please use a Ø12.7 pipe as a liquid

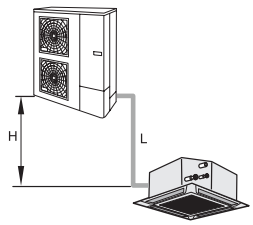
Standard

9.2.5 Refrigerant piping size and multikit/distributor (except RAS-XH(V)NP(1)E series)

Select the piping connection sizes according to the following procedures

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

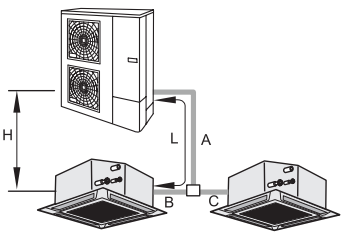
1 indoor unit system



(mm)

Outdoor Unit HP	Pipe Size (L)	
	Gas	Liquid
2 / 2.5	Ø12.70	Ø6.35
3 - 6	Ø15.88	Ø9.52
8	Ø25.40	Ø9.52
10/12	Ø25.40	Ø12.70

2 indoor units system



(mm)

Outdoor Unit HP	Pipe Size (A)		Branch pipe
	Gas	Liquid	
2 / 2.5	Ø12.70	Ø6.35	E-102SN4
3 / 4	Ø15.88	Ø9.52	E-102SN4
5 / 6	Ø15.88	Ø9.52	E-102SN4
8	Ø25.40	Ø9.52 (1)	E-162SN4
10 /12	Ø25.40	Ø12.70	E-162SN4

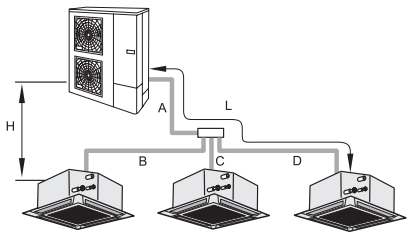
(1) In case that pipe length exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.

(mm)

Indoor unit capacity	Pipe Size (B, C)	
	Gas	Liquid
≤ 1.5 HP	Ø12.70	Ø6.35
1.8/2.0HP	Ø15.88	Ø6.35
≥ 2.3 HP	Ø15.88	Ø9.52

Connections including Indoor Units 8 and 10 HP are not possible

3 indoor units system



(mm)

Outdoor Unit HP	Pipe Size (A)		Header Branch
	Gas	Liquid	
4 / 5 / 6	Ø15.88	Ø9.52	MH-84AN1
8	Ø25.40	Ø9.52(1)	MH-84AN1
10 /12	Ø25.40	Ø12.70	MH-84AN1

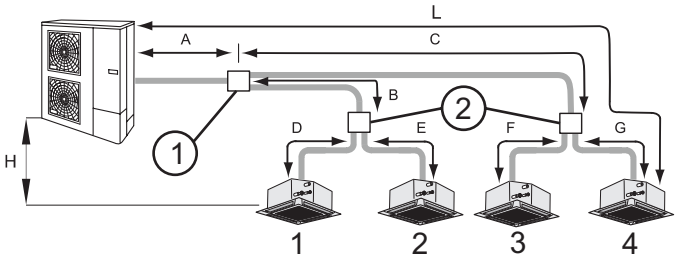
(1) In case that pipe length (A+B orA+C or A+D) exceeds 70m in 8 HP, please use a Ø12.7 pipe as a liquid pipe.

(mm)

Indoor unit capacity	Pipe Size (B, C, D)	
	Gas	Liquid
≤ 1.5 HP	Ø12.70	Ø6.35
1.8/2.0HP	Ø15.88	Ø6.35
≥ 2.3 HP	Ø15.88	Ø9.52

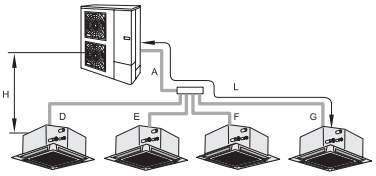
Connections including Indoor Units 8 and 10 HP are not possible

4 indoor units system



NOTE

- *(1) In case that total pipe length (A+B+D or A+B+E or A+C+F or A+C+G) exceeds of 70m in 8 HP unit, please use a Ø12.7 pipe as a liquid pipe.*
- *(2) When is used Multi-kit model QE-812N1 it is not necesary the multi.kit 2.*



(mm)

Outdoor Unit HP	Pipe Size (A)		Branch line ①
	Gas	Liquid	
4 / 5 / 6	Ø15.88	Ø9.52	E-102SN4
8	Ø25.40	Ø9.52(1)	E-162SN4 MH-84AN1(2)
10 /12	Ø25.40	Ø12.70	E-162SN4 MH-84AN1(2)

(mm)

Total Indoor Unit capacity after branch pipe 1+2 or 3+4	Pipe Size (B, C)		Branch line ②
	Gas	Liquid	
≤ 1.5 HP	Ø12.70	Ø6.35	E-102SN4
from 1.8 to 2.0 HP	Ø15.88	Ø6.35	E-102SN4
≥ 2.3 HP	Ø15.88	Ø9.52	E-102SN4

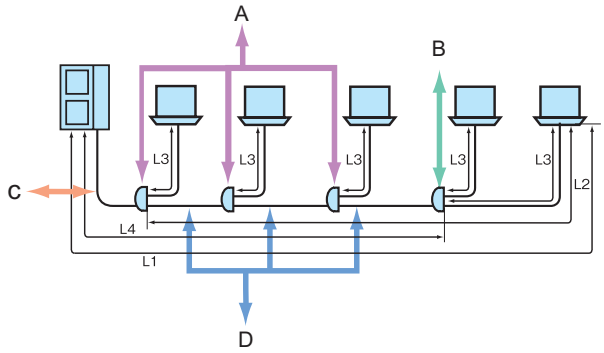
Indoor Unit capacity	Pipe Size (D, E, F, G)	
	Gas	Liquid
≤ 1.5 HP	Ø12.70	Ø6.35
1.8/2.0HP	Ø15.88	Ø6.35
≥ 2.3 HP	Ø15.88	Ø9.52
Connections including indoor units 8 and 10 HP are not possible		

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

NOTE

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

Line branch system



(mm)

Outdoor Unit HP	Pipe Size (C,D) (L4)		Multi-kit model A	Multi-kit model B
	Gas	Liquid		
3/4/5/6	Ø15.88	Ø9.52	E-102SN4	
8	Ø25.40	Ø9.52(1)	E-162SN4	
10 /12	Ø25.40	Ø12.70	E-162SN4	

(1) In case that total pipe length from the outdoor to the farthest indoor unit exceeds of 70m in 8 HP unit, please use a Ø12.7 pipe as a liquid pipe.

(mm)

Indoor unit capacity	Pipe Size (L3)	
	Gas	Liquid
≤ 1.5 HP	Ø12.70	Ø6.35
1.8/2.0HP	Ø15.88	Ø6.35
≥ 2.3 HP	Ø15.88	Ø9.52

Connections including Indoor Units 8 and 10 HP are not possible

9.3 Copper pipes, sizes and connection

9.3.1 Copper pipes and sizes

1 Prepare locally-supplied copper pipes.

2 Select the pipe size of a suitable thickness and material. Use the table below to select the required piping.

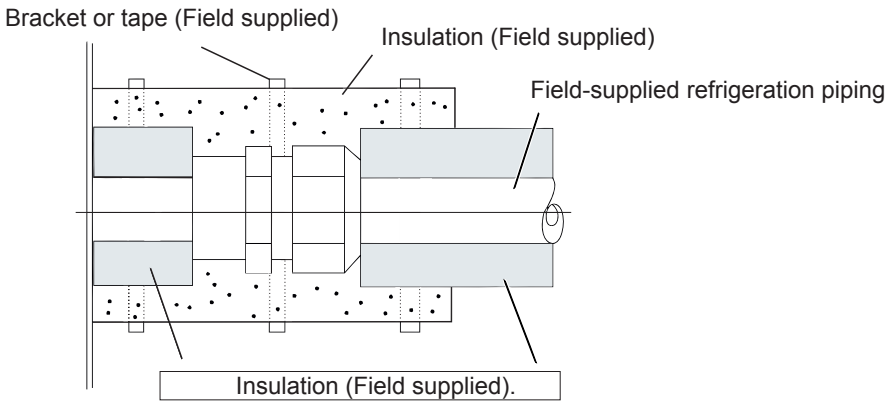
Nominal diameter (according to European Standards EN-12735-1)		Minimum thickness (mm)	Copper type
(mm)	(in.)		
Ø6.35	1/4	0.80	Coil (Soft)
Ø9.52	3/8	0.80	Coil (Soft)
Ø12.70	1/2	0.80	Coil (Soft)
Ø15.87	5/8	1.00	Straight lengths (half hard) / Coil (Soft)
Ø19.05	3/4	1.00	Coil (Soft)
Ø22.22	7/8	1.00	Coil (Soft)
Ø25.40	1	1.00	Straight lengths (half hard)
Ø28.57	1-1/8	1.00	Straight lengths (half hard)

NOTE

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

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

- *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).*

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.*

CAUTION

- *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, as it shown in the figure.*

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

9.3.2 Insulation

Attach insulation to Multikit branch (field-supplied or package with each one dependign on model) 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 10 mm for the liquid piping and from 15 mm to 20 mm for the gas piping is recommended.

CAUTION

Perform insulation work after the surface temperature decreases to the room temperature, If not, the insulation material may melt. If the ends of the piping system are open after finishing the installation work, securely attach caps or vinyl bags to the ends of the piping to prevent moisture or dust entering.

9.4 Refrigerant charge amount

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

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

ATTENTION

The procedure to follow for 1 to 1 system with UTOPIA IVX RAS-XH(V)NP(1)E series and DX-Interface series 2, is detailed in the Indoor Units Technical Catalogue and Complementary Systems, "DX-Interface refrigerant charge and piping length limits" chapter. The amount of refrigerant to be added to this system must be calculated according to pipe length and the volume of the heat exchanger (HEX), as well as the relation between these.

CAUTION

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

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

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

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

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

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

9.4.1 Refrigerant charge before shipment (W_0 (kg))

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

IVX Premium series

Model	Refrigerant charge before shipment (W_0 (kg))	Additional refrigerant charge (P) (g/m)	Maximum additional charge (kg)
RAS-2HVNP1	1.6	30	1.5
RAS-2.5HVNP1	1.6	30 (for 2 indoor units system: 24)	1.2
RAS-3HVNP1E	2.3	40	1.2
RAS-4HVNP1E	4.1	60	3.9
RAS-5HVNP1E	4.2	60	3.9
RAS-6HVNP1E	4.2	60	3.9
RAS-4HNP1E	4.1	60	3.9
RAS-5HNP1E	4.2	60	3.9
RAS-6HNP1E	4.2	60	3.9
RAS-8HNPE	5.7	(1)	10.3
RAS-10HNPE	6.2	(1)	12.1
RAS-12HNP	6.7	(1)	12.1

IVIVX Premium RAS-XH(V)NP(1)E series

Model	Refrigerant charge before shipment (W_0 (kg))	Additional refrigerant charge (P) (g/m)	Maximum additional charge (kg)
RAS-3XHVNP1E	2.3	(1)	1.2
RAS-4XHVNP1E	4.1	(1)	3.9
RAS-5XHVNP1E	4.2	(1)	3.9
RAS-6XHVNP1E	4.2	(1)	3.9
RAS-4XHNP1E	4.1	(1)	3.9
RAS-5XHNP1E	4.2	(1)	3.9
RAS-6XHNP1E	4.2	(1)	3.9
RAS-8XHNPE	5.7	(1)	10.3
RAS-10XHNPE	6.2	(1)	12.1

(1) need to be calculated as is detailed in the Indoor Units Technical Catalogue and Complementary Systems, "DX-Interface refrigerant charge and piping length limits" chapter.

IVX Standard series

Outdoor unit	Refrigerant charge before shipment (W_0 (kg))	Additional refrigerant charge (g/m)	Maximum additional charge (kg)
RAS-3HVNC1	1.9	40	1.2
RAS-4HVNC1E	3.2	40	1.6
RAS-5HVNC1E	3.2	60	2.7
RAS-6HVNC1E	3.2	60	2.7
RAS-4HNC1E	3.2	40	1.6
RAS-5HNC1E	3.2	60	2.7
RAS-6HNC1E	3.2	60	2.7
RAS-8HNCE	5.7	(1)	10.3
RAS-10HNCE	6.2	(1)	12.1
RAS-12HNC	6.7	(1)	12.1

(1) need to be calculated

9.4.2 Calculation method for the additional refrigerant charge (except RAS-XH(V)NP(1)E series)

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

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

Outdoor units have been charged with refrigerant for 30 m (20 m for RAS-3HVNC) of actual piping length: In systems with longer actual piping length, an additional refrigerant charge is required.

For all UTOPIA units except RAS-(8-12)HN(P/C)(E)

Use the following formula:

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

NOTE

(*): In case of RAS-3HVNC units, the unit is charged with refrigerant for 20 m. In these cases, the formula for calculating the additional refrigerant charge is:

$$W_1 = (L-20) \times P$$

L: Total piping length (m)

P: Additional refrigerant charge (kg/m) (Refer to the *"9.4.1 Refrigerant charge before shipment (W0 (kg))"* chaper)

For UTOPIA units RAS-(8-12)HN(P/C)(E)

The additional refrigerant charge for **RAS-(8-12)HN(P/C)(E)** 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 (Fill the table with the values)

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

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

When the outdoor 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 all UTOPIA units except RAS-(8-12)HN(P/C)(E)

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 UTOPIA units RAS-(8-12)HN(P/C)(E)

In case of RAS-(8-12)HN(P/C)(E), it must be used the following formula:

$$W = W_1 + W_2 - C$$

System example (W) =		+		–		=		kg

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

Model	Compensation value (C (kg))
RAS-8HN(P/C)E	1.6
RAS-10HN(P/C)E	2.0
RAS-12HN(P/C)	2.0

⚠ CAUTION

Do not exceed the allowed maximum additional charge.

◆ Step 4: Charging work

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

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

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

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

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

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

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

Total additional charge W ____ kg

Total refrigerant charge of this system ____ kg

Date of refrigerant charge work

Year ____ Month ____ Day ____

9.5 Caution in case of refrigerant leakage

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

9.5.1 Maximum permitted concentration of hydrofluorocarbon (HFC)

The refrigerant R410A, charged in the UTOPIA 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/m^3, according to EN378-1.

Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.44 kg/m^3, in case of leakage.

9.5.2 Calculation of refrigerant concentration

The room must have the following characteristics should there be a gas refrigerant leak:

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 (m^3)** of each room.
3 Calculate the refrigerant concentration **C (kg/m^3)** 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).

9.5.3 Countermeasure for refrigerant leakage

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

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

IVX Premium series

Model	Tonnes
RAS-2HVNP1	0.88
RAS-2.5HVNP1	1.14
RAS-3(X)HVNP1E	1.17
RAS-(4-6)(X)H(V)NP1E	2.27
RAS-8(X)HNPE	3.16
RAS-(10/12)(X)HNPE	4.11

IVX Standard series

Model	Tonnes
RAS-3HVNC1	1.35
RAS-4H(V)NC1E	1.65
RAS-(5/6)H(V)NC1E	2.30
RAS-8HNCE	3.16
RAS-(10/12)HNCE	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.

9.6 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 IVX Premium (except *IVX RAS-XH(V)NP(1)E series)* and IVX Standard series are compatible with those installations that have been operating with R22 or R407C. This allows installing the IVX Premium/Standard Outdoor Units, which operate with R410A, without having to change piping installation.

NOTE

- *For systems with several indoor units, branch pipes shall be changed to HITACHI-specified model for IVX Premium and Standard (R410A).*
- *Existing outdoor and indoor units for R22 or R407C can not be used.*

CAUTION

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

9.6.1 Installation procedure for existing pipes

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 (Outdoor and Indoor unit).

3 For the existing pipes, proceed with one of the following operations:
   - **a.** Clean the existing piping (see section *"Conditions to use existing pipes with cleaning process"*)
   - **b.** Install renewal kit (optional accessory) (see section *"Conditions to use existing pipes without cleaning process"*)

4 Install the new units of the UTOPIA IVX Premium/Standard series

5 Vacuum process.

6 Refrigerant charge (R410A)
   Follow the normal process described in order to determinate whether additional refrigerant charge is necessary.

◆ Conditions to use existing pipes with cleaning process

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

9.6.2 When existing Air-Conditioner is a product of another manufacturer

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

1 For systems with several indoor units, branch pipes shall be changed to HITACHI-specified model.

2 Please perform a pipe cleaning.

9.6.3 Permissible range for existing air-conditioning pipes (pipe length in the case of "without cleaning process"

IVX Premium series

Liquid (mm)	Ø6.35				Ø9.52					Ø12.70					Ø15.88		
Thickness (mm)	0.8				0.8					0.8					1.0		
Gas (mm)	Ø9.52	Ø12.70	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)	0.8	0.8	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			x	x						
Material drawn				x			x	x	x		x	x	x	x	x	x	x
Performance capacity																	(m)
2 HP	15 (1)	50	30	-	15 (3)	15 (3)	-	-	-	-	-	-	-	-	-	-	-
2.5 HP	-	50	30	-	20 (3)	20 (3)	-	-	-	-	-	-	-	-	-	-	-
3 HP	-	30 (1) (2)	30 (2)	-	30 (1)	50	-	-	-	-	-	-	-	-	-	-	-
4 - 5 - 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 - 12 HP	-	-	-	-	-	-	-	-	-	-	-	50 (1)	50	50	50 (1) (3)	50 (3)	50 (3)

(1) Reducing gas pipe size will lower 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 indoor unit relation with expansion valve capacity.

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

(4) When using Ø 19.05 gas pipe (soft-annealed), please switch ON DSW2-4# in the Outdoor Unit PCB.

Standard

IVX Standard series

Liquid Ø	Ø6.35				Ø9.52					Ø12.70					Ø15.88		
Thickness (mm)	0.8				0.8					0.8					1.0		
Gas	Ø9.52	Ø12.70	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)	0.8	0.8	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			x	x						
Material drawn				x			x	x	x		x	x	x	x	x	x	x
Performance capacity																	(m)
3 HP	-	30 (1) (2)	30 (2)	-	30 (1)	50	-	-	-	-	-	-	-	-	-	-	-
4 HP	-	-	5 (2)	5 (2)	40 (1)	50	50 (4)			30 (3)	30 (3) (4)	-	-	-	-	-	-
5 - 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 - 12 HP	-	-	-	-	-	-	-	-	-	-	-	50 (1)	50	50	50 (1) (3)	50 (3)	50 (3)

(1) Reducing gas pipe size will lower 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 indoor unit relation with expansion valve capacity.

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

(4) When using Ø 19.05 gas pipe (soft.annealed), please switch ON DSW2-4# in the Outdoor Unit PCB.

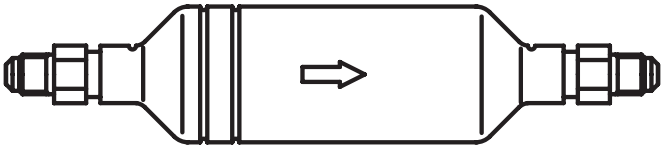
Standard

⚠ 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.

9.6.4 Renewal kit selection model

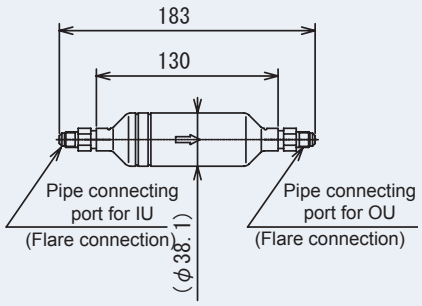
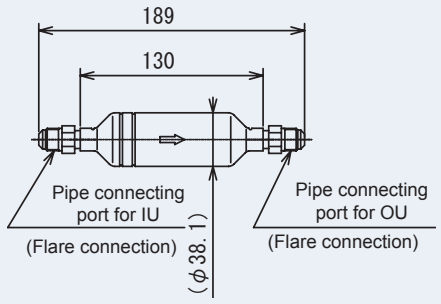
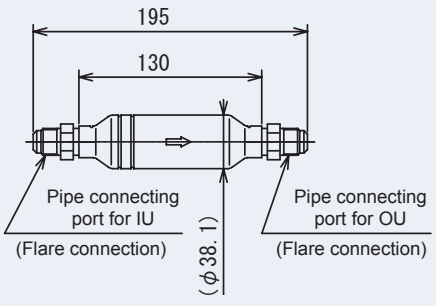
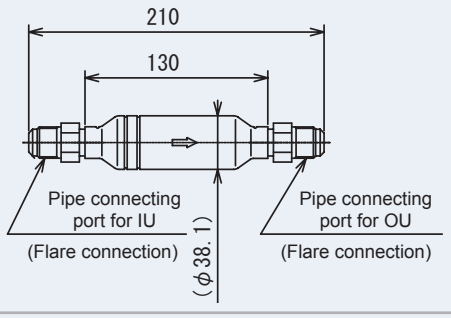
HITACHI offers, as an accessory, a renewal kit:

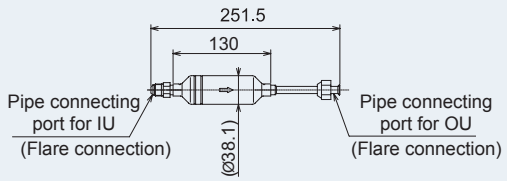
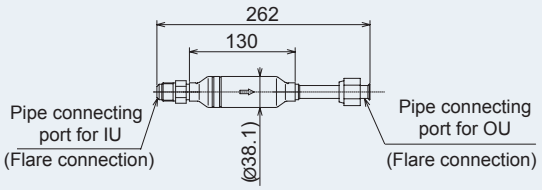


◆ Recommended renewal kit

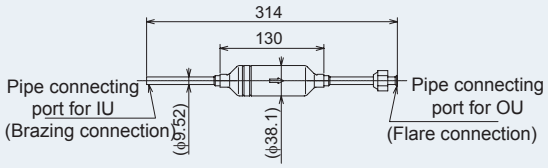
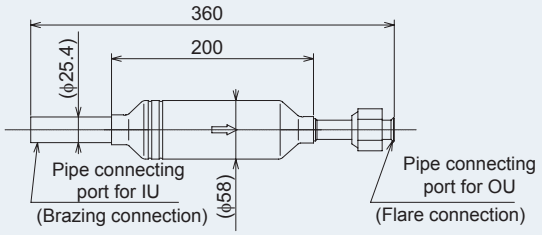
	Renewal Kit			Renewal Kit	
IVX Premium	External attachment to outdoor unit [Short pipe (local) + Kit + existing piping]	Internal attachment to outdoor unit [Kit + existing piping]	IVX Standard	External attachment to outdoor unit [Short pipe (local) + Kit + existing piping]	Internal attachment to outdoor unit [Kit + existing piping]
RAS-(2/2.5)HVNP	TRF-NP63S				
RAS-3HVNPE	TRF-NP160S		RAS-(3-6)H(V)NCE	TRF-NP160S	
RAS-(4-6)H(V)NPE	(TRF-NP160S)	TRF-NP160U			
RAS-8HNPE		TRF-NP280U	RAS-8HNCE		TRF-NP280U
RAS-(10/12)HNP(E)		TRF-NP335U1	RAS-(10/12)HNC(E)		TRF-NP335U1

◆ Details of renewal kit

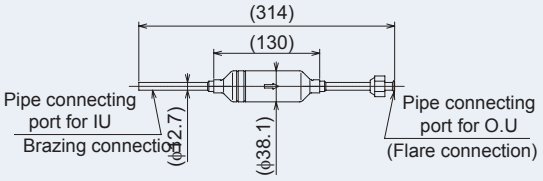
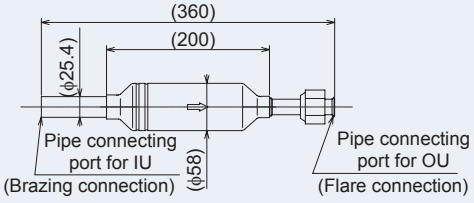
Pipe \ Model	TRF-NP63S	TRF-NP160S
For liquid pipe		
For gas pipe		
OU: Outdoor Unit IU: Indoor Unit		

Pipe \ Model	TRF-NP160U
For liquid pipe	
For gas pipe	

OU: Outdoor Unit
IU: Indoor Unit

Pipe \ Model	TRF-NP280U
For liquid pipe	
For gas pipe	

OU: Outdoor Unit
IU: Indoor Unit

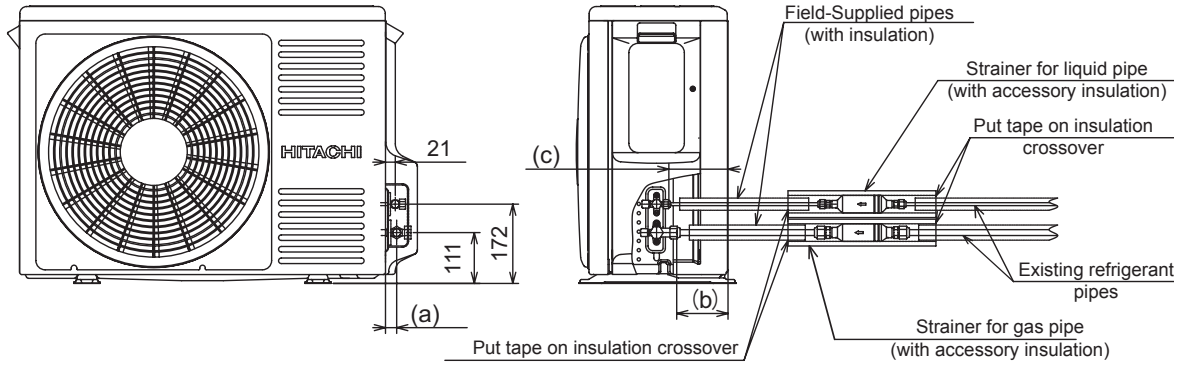
Pipe \ Model	TRF-NP335U1
For liquid pipe	
For gas pipe	

OU: Outdoor Unit
IU: Indoor Unit

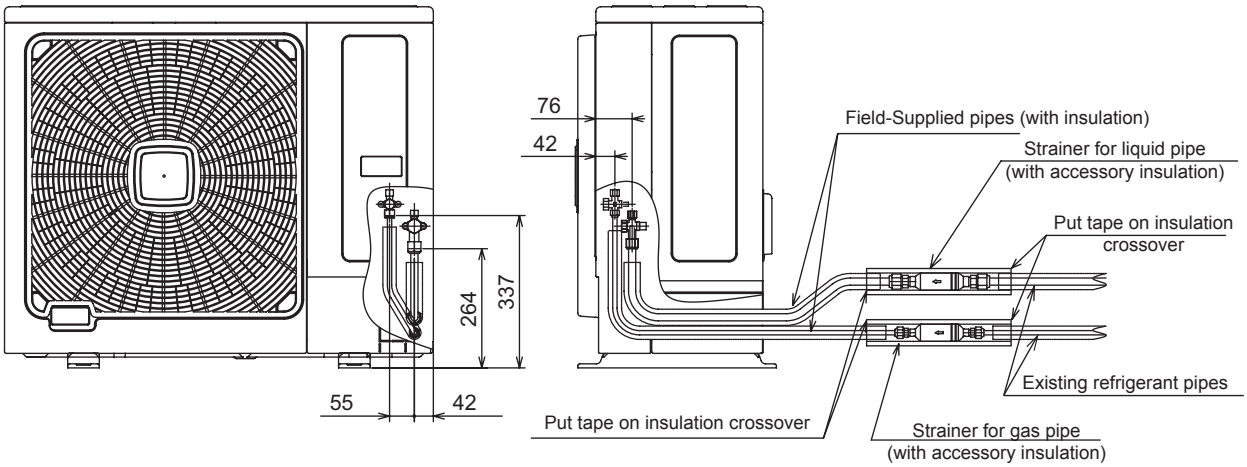
◆ Renewal kit installation (Example)

	RAS-(2/2.5)HVNP	RAS-3HVNC1	RAS-(4-6)H(V)NP1E	RAS-8HN(P/C)E	RAS-10HN(P/C)E	RAS-12HN(P/C)
a	22	26	581	596	578	580
b	109	103	491	497	497	521
c	129	127	329	282	264	266
d	--	--	229	137	137	161
e	--	--	46	47	--	--
f	--	--	96	98	--	--
g	--	--	81	69	--	--

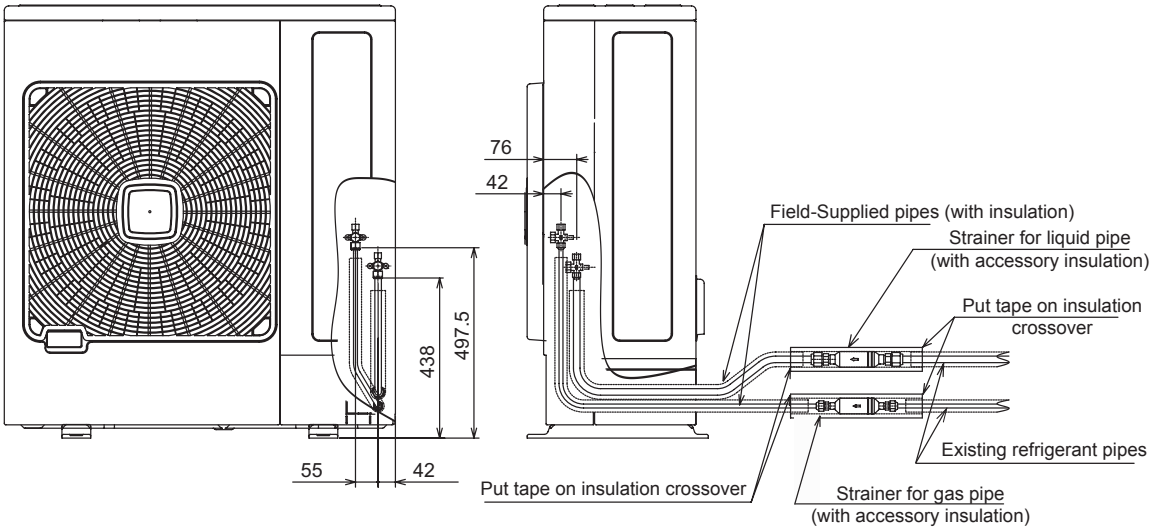
RAS-(2/2.5)HVNP - RAS-3HVN1C



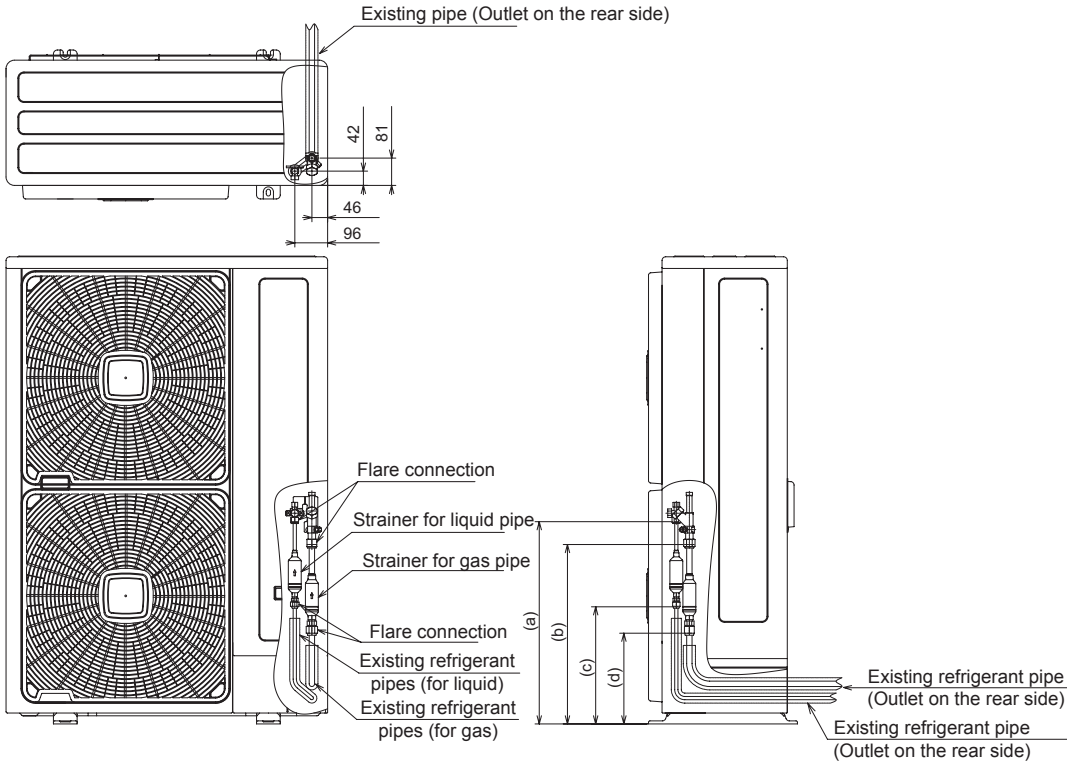
RAS-3HVNP1



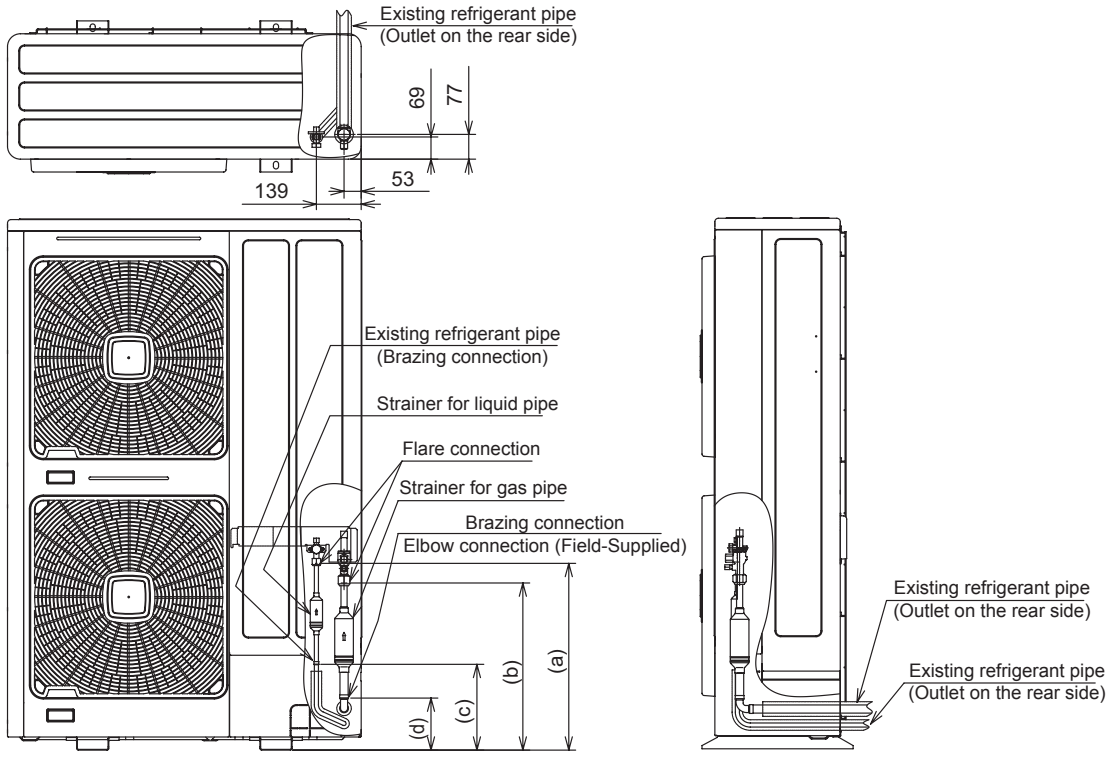
RAS-(4-6)H(V)NC1E



RAS-(4-6)H(V)NP1E - RAS-(8/10)HN(P/C)E



RAS-12HN(P/C)



NOTE

Sizes (a) to (g) depend on the outdoor unit model.

10. Electrical wiring

Index

10.1 General information

10.1.1 General notes

CAUTION

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

DANGER

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

NOTE

Fix the rubber bushes with adhesive when the outdoor unit ducts are not used.

10.1.2 General verifications

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

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

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

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

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

4 Check that the earth cable is correctly connected.

Electromagnetic compatibility

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

MODEL	Z_{max} (Ω)	MODEL	Z_{max} (Ω)
RAS-2HVNP1	-	-	-
RAS-2.5HVNP1	-	-	-
RAS-3(X)HVNP1E	-	RAS-3HVNC1	-
RAS-4(X)HVNP1E	-	RAS-4HVNC1E	-
RAS-5(X)HVNP1E	-	RAS-5HVNC1E	-
RAS-6(X)HVNP1E	-	RAS-6HVNC1E	-
RAS-4(X)HNP1E	-	RAS-4HNC1E	-
RAS-5(X)HNP1E	-	RAS-5HNC1E	-
RAS-6(X)HNP1E	-	RAS-6HNC1E	-
RAS-8(X)HNPE	-	RAS-8HNCE	-
RAS-10(X)HNPE	-	RAS-10HNCE	-
RAS-12HNP	-	RAS-12HNC	-

Harmonics

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

MODELS SITUATION REGARDING IEC 61000-3-2 and IEC 61000-3-12	MODEL
Equipment complying with IEC 61000-3-2 **NOTE** *(*) professional use*	RAS-2HVNP1
	RAS-2.5HVNP1
	RAS-3HVNC1
	RAS-4(X)HNP1E (*)
	RAS-5(X)HNP1E (*)
	RAS-6(X)HNP1E (*)
	RAS-4HNC1E (*)
	RAS-5HNC1E (*)
	RAS-6HNC1E (*)
Equipment complying with IEC 61000-3-12	RAS-3(X)HVNP1E
	RAS-4(X)HVNP1E
	RAS-5(X)HVNP1E
	RAS-6(X)HVNP1E
	RAS-4HVNC1E
	RAS-5HVNC1E
	RAS-6HVNC1E
Installation restrictions may be applied by supply authorities in relation to harmonics	RAS-8(X)HNPE
	RAS-8HNCE
	RAS-10(X)HNPE
	RAS-10HNCE
	RAS-12HNP
	RAS-12HNC

DANGER

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

10.2 DIP and RSW switches settings

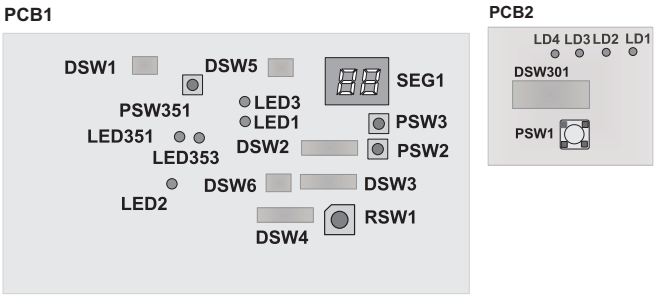
TURN OFF all power source before setting. Without turning OFF, the switches do not work and the contents of the setting are invalid.

Mark of “n” indicates the position of dip switches. Set the dip switches according to the figure below.

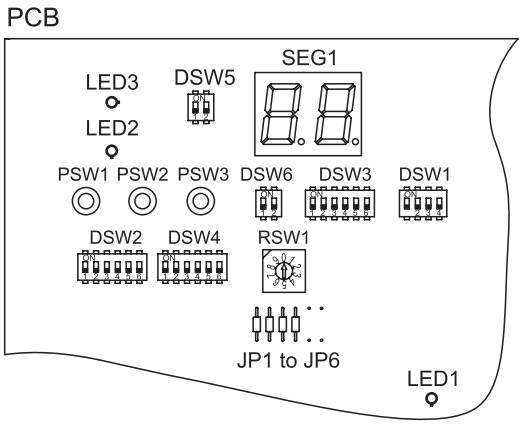
◆ Quantity and Position of DIP Switches

◆ RAS-(2/2.5)HVNP1 / RAS-3HVNC1

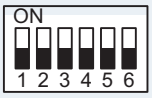
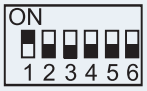
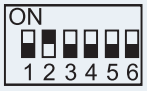
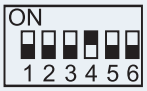
The PCB in the outdoor unit is operating with 7 types of DIP switches, and 4 push switch. The location is as follows:



◆ RAS-(3-12)(X)H(V)N(P/C)(1)(E)



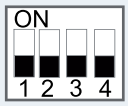
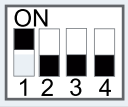
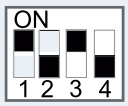
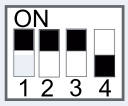
◆ DSW301 (Only RAS-(2/2.5)HVNP1 and RAS-3HVNC1 units): Test run mode

Setting before shipment	
Cooling	
Heating	
Forced stop of compressor	

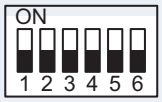
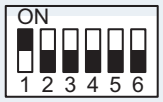
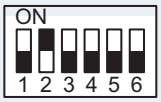
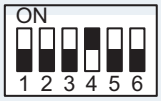
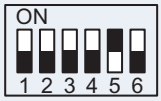
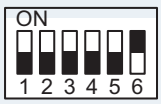
◆ DSW1 (Only RAS-(2/2.5)HVNP1 and RAS-3HVNC1 units): No setting is required

When set pin number 1 to ON, the electric current detection is cancelled. Pin number 1 should be set back to OFF after electrical work	

◆ DSW1 (RAS-(3-12)(X)H(V)N(P/C)(1)(E): For Test Run

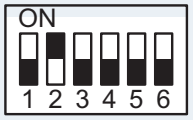
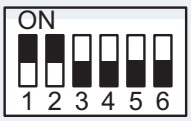
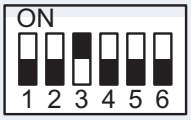
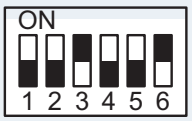
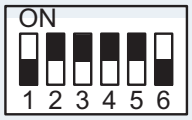
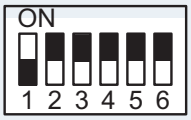
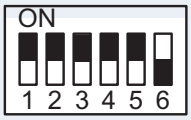
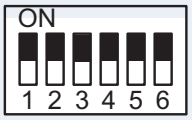
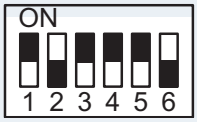
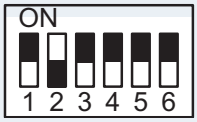
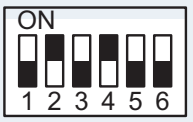
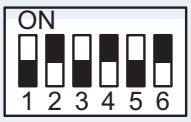
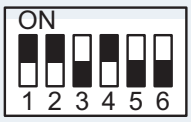
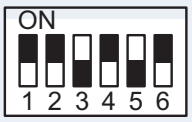
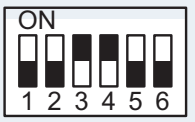
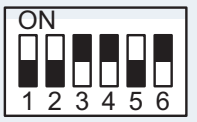
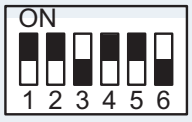
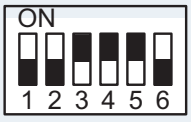
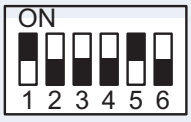
Factory setting	
Cooling	
Heating	
Cooling for intermediate season	
Heating for intermediate season	
Forced stop of compressor	

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

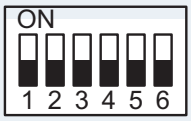
Pipe length setting should be performed as follows according to the on-site pipe length.	**Setting before shipment** 
	Pipe length (≤5m) 
	Pipe length (≥30m) 
Control to support existing pipes or when using Ø19,05 gas pipe (soft-annealed), switch ON DSW2 pin 4 in the outdoor unit PCB)	
Optional function setting mode (The optional function selection mode become available)	
External input/output setting mode (The input / output signals selection mode becomes avaliable).	

◆ DSW3: Capacity setting (no setting is required)

Factory setting

RAS-2HVNP1	RAS-2.5HVNP1	RAS-3(X)HVNP1E	RAS-3HVNC1		
					
RAS-4(X)HVNP1E	**RAS-4HVNC1E**	**RAS-5(X)HVNP1E**	**RAS-5HVNC1E**	**RAS-6(X)HVNP1E**	**RAS-6HVNC1E**
					
RAS-4(X)HNP1E	**RAS-4HNC1E**	**RAS-5(X)HNP1E**	**RAS-5HNC1E**	**RAS-6(X)HNP1E**	**RAS-6HNC1E**
					
RAS-8(X)HN(P/C)E	**RAS-10(X)HN(P/C)E**	**RAS-12(X)HN(P/C)**			
					

◆ DSW4 / RSW1: Refrigerant cycle number setting (Setting is required)

Setting for the tens digit (Factory setting)	
Setting position. Set by inserting slotted screwdriver into the groove (setting for the last digit)	

◆ DSW5: End terminal resistance (No setting is required)

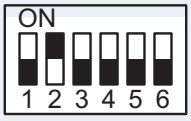
Factory setting	
Cancellation (Setting of end terminal resistance)	

Setting for transmission

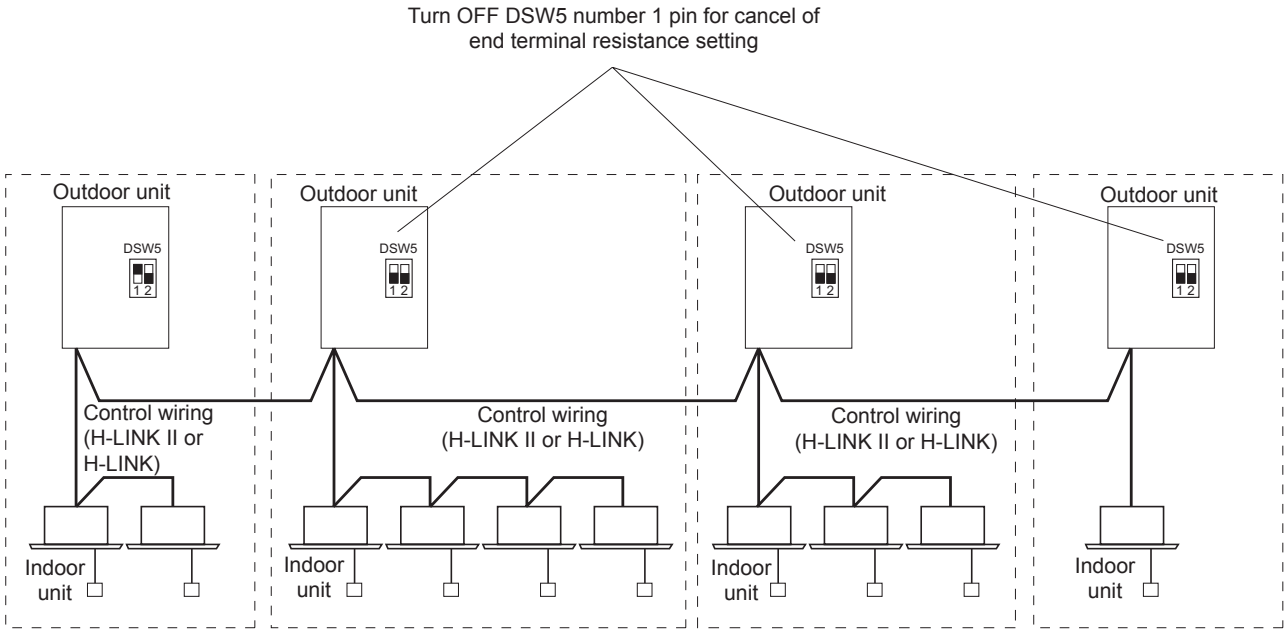
It is required to set the outdoor unit number refrigerant cycle and end terminal resistance for the H-LINK.

In the same refrigerant cycle, set the same refrigerant cycle number for the outdoor unit and the indoor units.

Example incase of setting before cycle number 25

DSW4: Turn ON pin number 2	
RSW1: set dial number 5	

In case that the outdoor units quantity in the same H-LINK II is 2 or more, set in the DSW5 the pin number 1 OFF side from the second refrigerant group outdoor units. If only one outdoor unit is used (in the same H-Link II system), no setting is required.

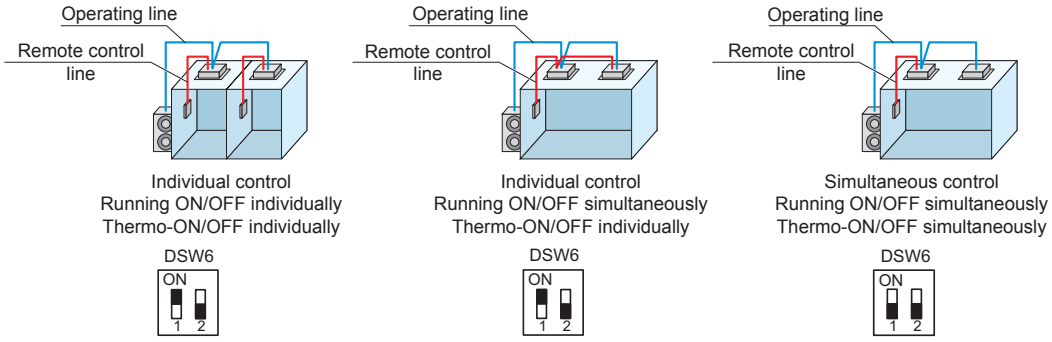


◆ DSW6: Setting of multiple indoor units operation (setting is required)

Optional function setting	For individual operation (factory setting)  For simultaneous operation  Set pin number 1 at OFF for simultaneous operation

Wiring example

Basic combinations
(In the case of twin combination)



10.3 System wiring diagram

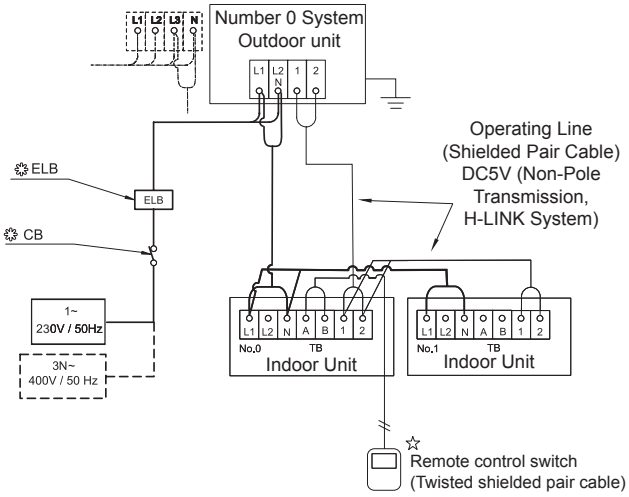
10.3.1 Outdoor and indoor unit electrical wiring

- Connect the electrical wires between the indoor unit and the outdoor unit as show in the figure.
- When installing the electrical wiring, follow local codes and regulations.
- The refrigerant piping and the control wiring are connected to the units in the same refrigerant cycle.
- Use twist pair wire (more than 0.75 mm^2) for operation wiring between the outdoor unit and indoor unit, and operation wiring between indoor unit and indoor unit.
- Use a 2-core wire for the operating line (do not use wire with more than 3 cores).
- Use shielded wires for intermediate wiring to protect the units from noise interference at lengths of less than 300 m. The size must comply with local code.
- Open a hole near the connection hole of power source wiring when multiple outdoor units are connected from a single power source line.
- The recommended breaker sizes are detailed in the *"10.3.2 Wire size"* section.
- In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the panel.
- All field wiring and equipment must comply with local and international codes.
- H-LINK twist pair shielded cable must be grounded in the outdoor unit side.

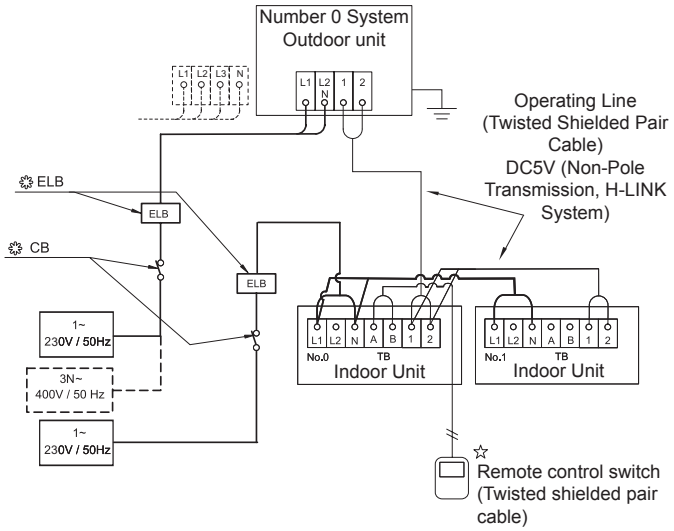
NOTE

Take care with the connection of the operating line. Incorrect connection may cause a failure of the PCB.

Power source from the outdoor unit to the indoor unit



Independent power source of outdoor unit and indoor unit



TB	Terminal board
CB	Circuit Breaker (field supplied)
ELB	Earthleakage Breaker (field supplied)
A	Power source from the outdoor unit to the indoor unit
___	Field Wiring
❁	Field supplied
☆	Optional Accessory

10.3.2 Wire size

Recommended minimum sizes for field provided wires:

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

Model	Power supply	Power source cable size	Transmitting cable size
		EN60 335-1	EN60 335-1
All Indoor Units	1~ 230V 50HZ	0.75 mm²	0.75 mm²
IVX Premium Series			
RAS-2HVNP1	1~ 230V 50HZ	2.5 mm²	
RAS-2.5HVNP1		4.0 mm²	
RAS-3(X)HVNP1E			
RAS-4(X)HVNP1E		6.0 mm²	
RAS-5(X)HVNP1E			
RAS-6(X)HVNPE			
RAS-4(X)HNP1E	3N~ 400V 50Hz	2.5 mm²	
RAS-5(X)HNP1E			
RAS-6(X)HNP1E			
RAS-8(X)HNPE		6.0 mm²	
RAS-10(X)HNPE			
RAS-12HNP			
IVX Standard Series			
RAS-3HVNC1	1~ 230V 50HZ	4.0 mm²	
RAS-4HVNC1E		6.0 mm²	
RAS-5HVNC1E			
RAS-6HVNC1E			
RAS-4HNC1E	3N~ 400V 50Hz	4.0 mm²	
RAS-5HNC1E			
RAS-6HNC1E			
RAS-8HNCE		6.0 mm²	
RAS-10HNCE			
RAS-12HNC			

NOTE

- *Follow local codes and regulations when selecting field wires, Circuit breakers and Earth Leakage breakers.*
- *Use the wires which are not lighter than the ordinary polychloroprene sheathed flexible cord (code designation 60245 IEC 57).*

10.4 H-LINK II system

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

The H-LINK II wiring system only needs:

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

CAUTION

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

10.4.1 Features

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

NOTE

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

10.4.2 Specifications

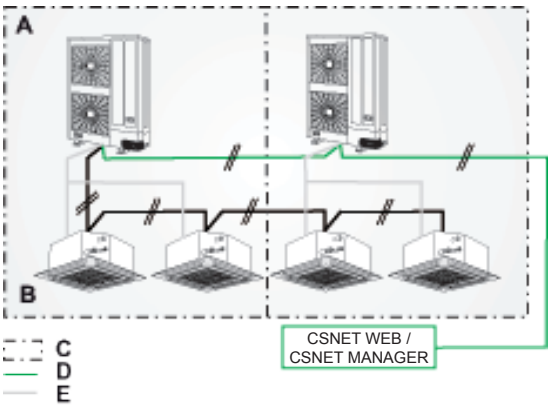
A: outdoor unit.

B: indoor unit.

C: refrigerant cycle.

D: transmission cables.

E: refrigerant piping.



- Transmission cable: 2-wire.
- Polarity of transmission cable: non-polar wire.
- The maximum number of units that can be connected is 64 outdoor units and 160 indoor units (including Utopia and/or Set Free models) per H-LINKII 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 mm^2 (Equivalent to KPEV-S).
- Voltage: 5 V DC.

CAUTION

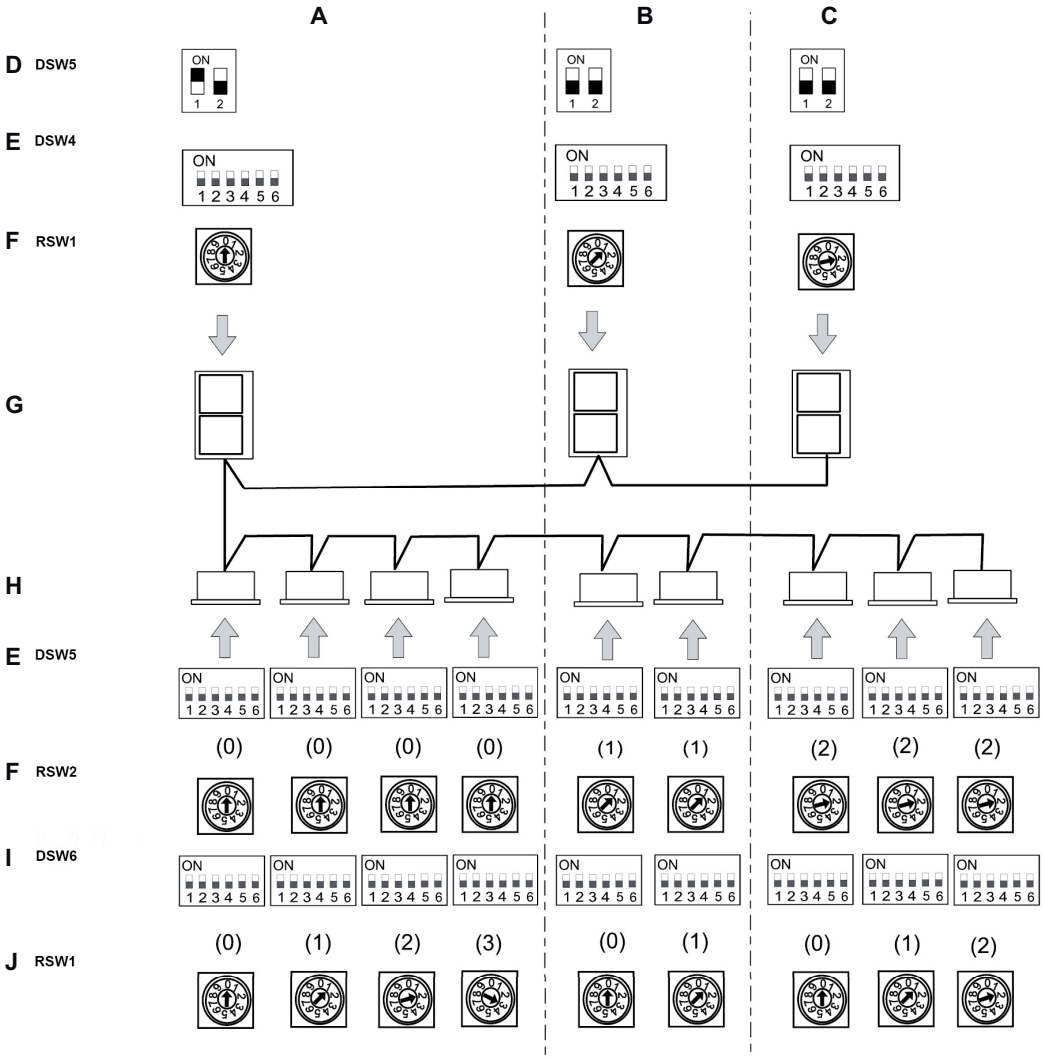
For the H-LINK II system must use twisted shielded pair cable or shielded pair cable.

10.4.3 DIP Switch setting for 2, 3 and 4 indoor units systems

Dip switch of indoor and outdoor unit PCB - H-LINK II

The DIP switches of all the indoor and outdoor units have to be set and the impedance of the transmission circuit adapted.

- Example of the setting of the DIP switches.



A: Cycle number 0.

B: Cycle number 1.

C: Cycle number 2.

D: Terminal resistance.

E: Number of refrigerant cycle (setting for the tens digit).

F: Number of refrigerant cycle (setting for the last digit).

G: Outdoor units.

H: Indoor units.

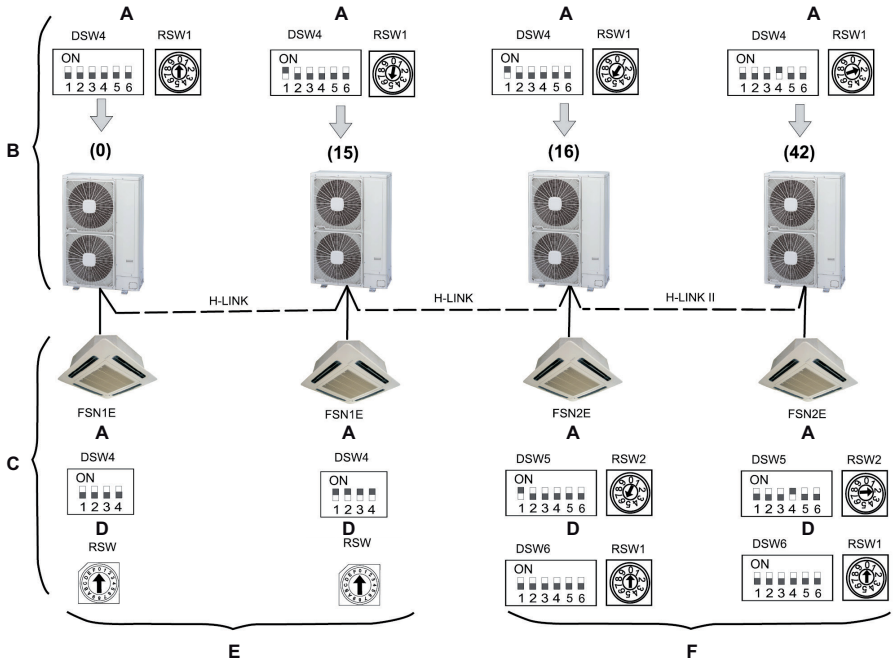
I: Address of the indoor unit (setting for the tens digit).

J: Address of the indoor unit (setting for the tens digit).

Unit	Name of DIP switch	Ref.	Setting before the Shipment	Function
Outdoor Unit	Refrigerant cycle	DSW4 RSW1	DSW4 ON 1 2 3 4 5 6 RSW1	For setting the refrigerant cycle address of the outdoor unit. Set the DSW4 and RSW1 to overlap the setting of other outdoor units in the same H-LINK system.
	Resistance of terminal	DSW5	ON 1 2	To adapt the impedance of the transmission circuit, adjust DSW5 according to the number of outdoor units of the H-LINK system.
Indoor Unit	Refrigerant cycle	DSW5 RSW2	DSW5 ON 1 2 3 4 5 6 RSW2	For setting the refrigerant cycle address of the indoor unit. Set the DSW5 and RSW2 corresponding to the address of outdoor unit in the same refrigerant cycle.
	Address of the indoor unit	DSW6 RSW1	DSW6 ON 1 2 3 4 5 6 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.)

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

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



A: Refrigerant cycle.

B: Outdoor unit.

C: Indoor unit.

D: Indoor unit address.

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

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

NOTE

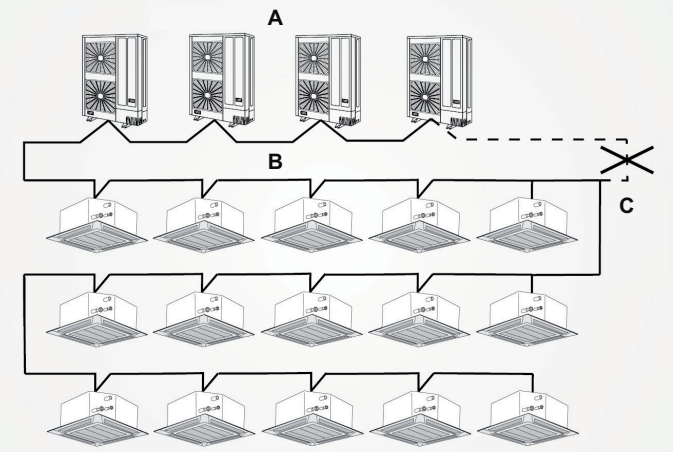
- *The maximum number of indoor units than an H-LINK II can control is 160.*
- *If you use PSC-5S and the CSNET WEB 2.0 (systems only compatible with H-LINK) bear in mind that it will only recognize 16 indoor and 16 outdoor units.*

10.4.5 Examples of H-LINK II system

Two cases:

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

- Line connection with all units

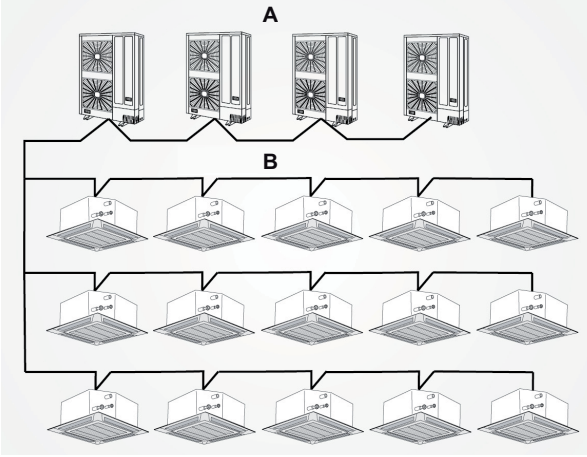


A: Outdoor units.

B: Indoor units.

C: Do not install wiring in a loop.

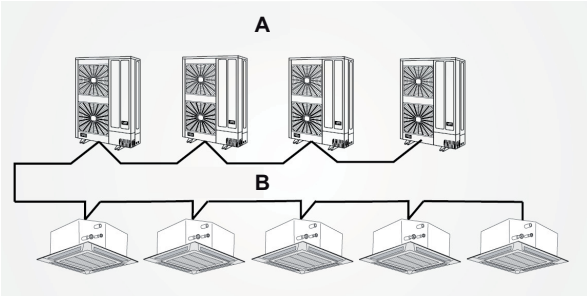
- Line connection for each floor.



A: Outdoor units.

B: Indoor units.

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



A: Outdoor units.

B: Indoor units.

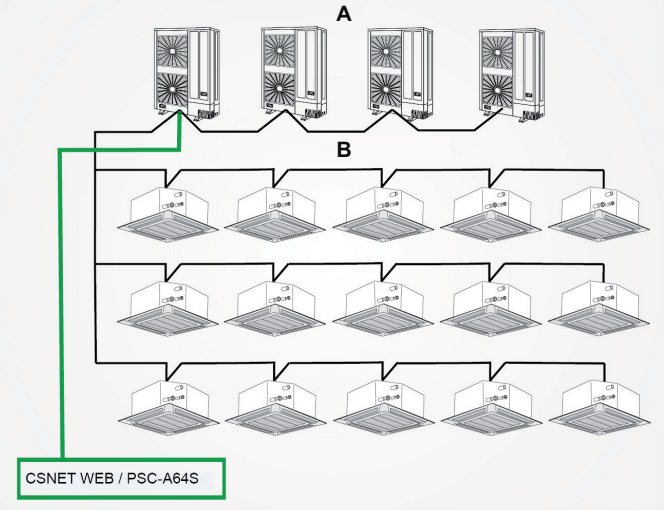
10

⚠ CAUTION

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

2. Using the H-LINK II system for air conditioning systems with a central control device (Either Centralised remote controls or Building air conditioning control)

- 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: Outdoor units.

B: Indoor units.

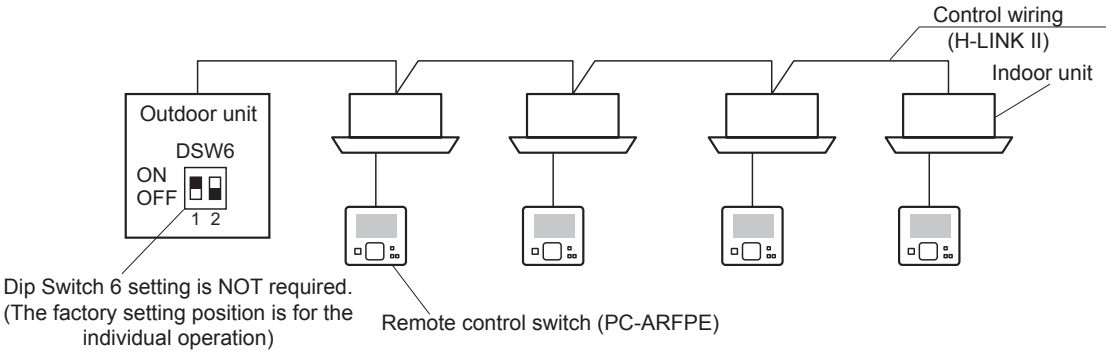
- If the central control device is not used when electrical wiring is carried out, you must connect the H-LINK II wiring to all the systems. The easiest method is usually to connect the outdoor units.

NOTE

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

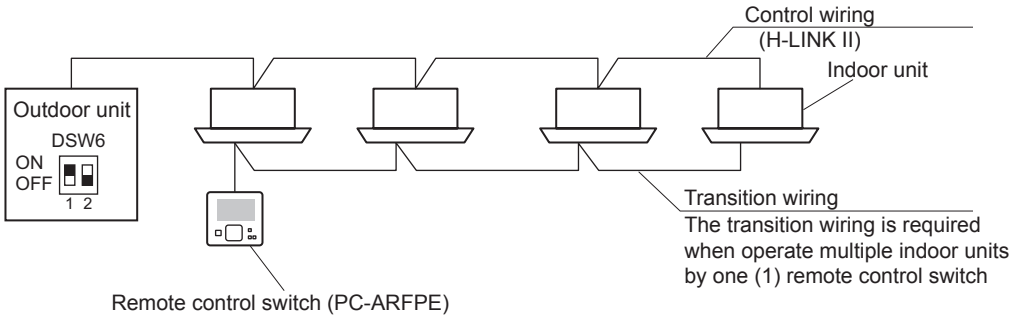
10.5 System Control

10.5.1 Individual Operation



◆ Individual Thermo ON/OFF Operation

The individual Thermo ON/OFF is available to be controlled each indoor unit even if multiple indoor units are controlled simultaneously by one remote control switch.

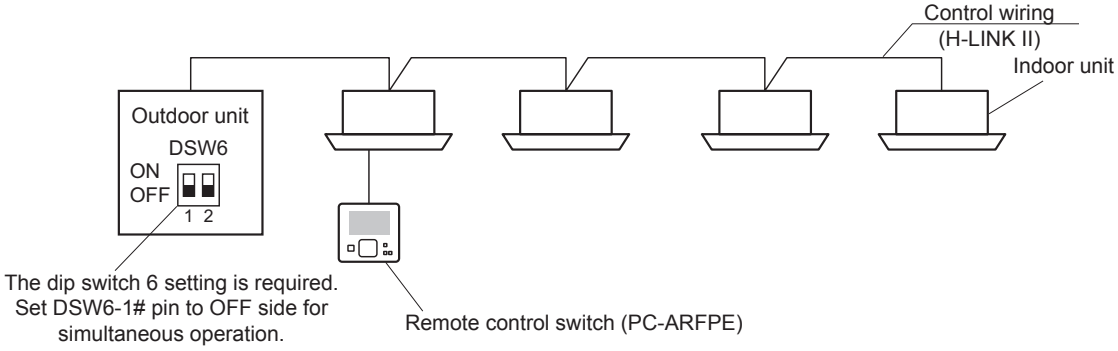


Control Method		by each optional remote control switch	
Operation Method		by one group	
(1)	ON/OFF	Yes	
(2)	Setting of Operation Mode	Yes	*1)
(3)	Room Temperature Setting	Yes	
(4)	Fan Speed Setting	Yes	
(5)	Timer Setting	Yes	
(6)	ON/OFF by Timer Control	Yes	
(7)	Operation Indication	Yes	
(8)	Alarm Indication	Yes	
(9)	Self-Checking	Yes	
(10)	Test Mode	Yes	
(11)	Individual Louver Setting	Yes	*2)
(12)	Motion Sensor Setting	Yes	*3)
Yes:	Available		
*1):	Cooling and heating can not be operated simultaneously.		
*2):	Only for RCI-FSN3 series with PC-ARFPE		
*3):	Only for RCI-FSN3 + P-AP160NAE + PC-ARFPE Do not mix other indoor unit, air panel (P-AP160NA1) and remote control switch (PC-ART) if set from one remote control switch		

10.5.2 Simultaneous Operation

This unit can be operated simultaneously with 2, 3 and 4 indoor units combinations.

One remote control switch (PC-ARFPE) can control without transition wiring up to 4 units of FSN2 series or later model types (H-LINK II supported models) simultaneously (Available if it is with the transition wiring.)



Control Method		by one optional Remote Control Switch	
Operation Method		by one group	
(1)	ON/OFF	Yes	
(2)	Setting of Operation Mode	Yes	*1)
(3)	Room Temperature Setting	Yes	
(4)	Fan Speed Setting	Yes	
(5)	Timer Setting	Yes	
(6)	ON/OFF by Timer Control	Yes	
(7)	Operation Indication	Yes	
(8)	Alarm Indication	Yes	
(9)	Self-Checking	Yes	
(10)	Test Mode	Yes	
(11)	Individual Louver Setting	Yes	*2)
(12)	Motion Sensor Setting	Yes	*3)
Yes:	Available		
*1):	Only if all units in one group are connected to the same outdoor unit.		
*2):	Only for RCI-FSN3 series with PC-ARFPE		
*3):	Only for RCI-FSN3 + P-AP160NAE + PC-ARFPE Do not mix other indoor unit, air panel (P-AP160NA1) and remote control switch (PC-ART) if set from one remote control switch.		

11. Troubleshooting

Index

11.1 On-screen displays during abnormal operation

Abnormal operation can be produced due to the following reasons:

- **Malfunction**

The RUN (red) indicator flashes.

The ALARM indicator appears on the liquid crystal display.

The screen also displays the following items:

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

Write down the indications and contact your HITACHI service supplier.

- **Power supply failure**

All displays disappear.

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

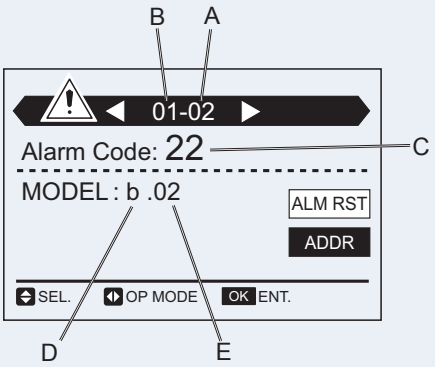
If the power failure lasts less than 2 seconds, the unit will start again automatically.

- **Electrical noise**

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

NOTE

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



(PC-ARFPE example)

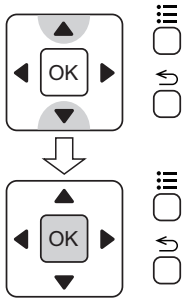
Model code	
Indication	**Model**
H	Heat pump
P	Inverter
F	Multi (SET-FREE)
C	Cooling only
E	Other
b	IVX, individual operation
L	KPI

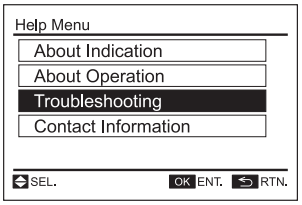
◆ PC-ARFPE Troubleshooting help menu

PC-ARFPE remote controller have a Troubleshooting function in Help Menu.

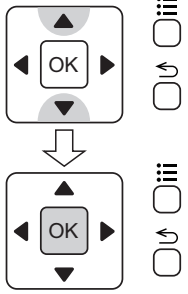
Make sure that the troubleshooting is read carefully before requesting for repairs.

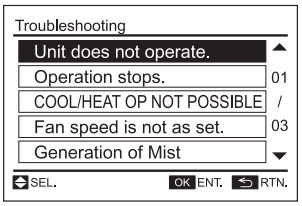
Select “Troubleshooting” from the help menu and press “OK”. The list of troubleshooting will be displayed.



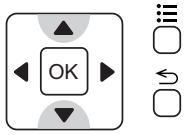


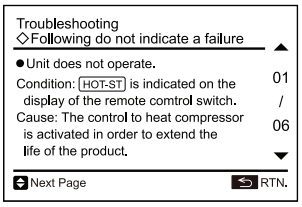
1 Select a problem from the list by pressing “△” or “▽” and press “OK”. The details of the selected problem will be displayed.



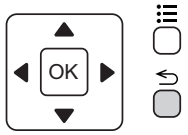


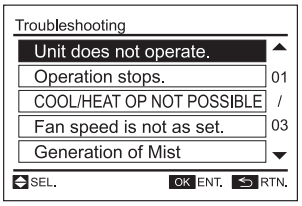
2 Press “△” or “▽” to scroll the text up and down.





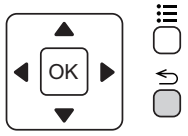
3 Press “⮌” (return). The screen will return to the list of troubleshooting.

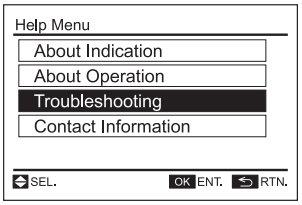




4 Press “⮌” (return). The screen will return to the help menu.

To return to the normal mode, press “⮌” (return) again.





11.2 Alarm codes

Code number	Category	Abnormality	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	Outdoor unit	Activation of protection device (high pressure cut)	Activation of PSH, locked motor, abnormal operation in the power supply phase. Failure of fan motor, drain discharge, PCB, relay, float switch activated. (Pipe clogging, excessive refrigerant, inert gas mixing, fan motor locking at cooling operation)
3	Transmission	Abnormal transmission between outdoor and indoor units	Incorrect or disconnect wiring. Loose terminals, Failure of PCB (control or inverter). Tripping of fuse. Power supply OFF.
4		Abnormal transmission between inverter PCB (DIP-IPM) and outdoor unit PCB (PCB1)	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 (Abnormal power source)	Power source with abnormal wave pattern. Main power supply phase is reversely connected or one phase is not connected. (Units with power supply 3N~ 400V 50Hz only)
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 (TdSH)	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 units 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 (liquid temperature)	
14		Gas piping thermistor	
16		Remote thermistor	
17		Thermistor of RCS	
19	Fan motor	Activation of the protection device for the indoor fan motor	Failure of fan motor
20	Outdoor unit sensor	Compressor-top thermistor	Incorrect wiring, disconnected wiring, broken cable, short circuit.
21		High pressure sensor	
22		Thermistor for outdoor ambient temperature (THM7)	
23		Thermistor for discharge gas temperature (THM9)	
24		Thermistor for evaporating temperature (THM8)	Incorrect wiring, disconnected wiring, wire breaking, short circuit, fan motor locking at heating operation.
29		Low pressure sensor	Incorrect wiring, disconnected wiring, broken cable, short circuit.
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 anoher Indoor Unit in the same Refrigerant Cycle (Failure of Power Source, Abnormality of PCB)
35		Incorrect indoor unit number setting (incorrect IU addressing)	Duplication of indoor unit number, number of indoor units over specifications.
36		Incorrect indoor unit combination.	"Indoor unit is designed for other refrigerant (R22 or R407C)."
38		Abnormality of picking up circuit for protection (outdoor unit)	Failure of indoor unit PCB, incorrect wiring, connection to PCB in indoor unit.

Code number	Category	Abnormality	Cause
41	Pressure	Cooling overload (possible activation of high pressure device)	OU pipe thermistor temperature is higher than 55 ºC and the compressor top temperature is higher than 95 ºC, OU protection device is activated.
42		Heating overload (high-pressure device may be activated)	If IU freeze protection thermistor temperature is higher than 55 ºC and compressor top temperature is higher than 95 ºC, OU protection device is activated.
43		Activation of the safety device from compression ratio decrease	Abnormal compress (compressor, Inverter damage)
44		Activation of the safety device from excessively high suction pressure	Overload during cooling, high temperature with heating, locked expansion valve
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) (low pressure decrease prevention)	Shortage or leakage of refrigerant, piping clogging, expansion valve locked at open position (loose connector), fan motor locked. Outdoor fan motor locking at heating operation.
48		Activation of overcurrent protection	Overload, overcurrent. Failure of DIP IPM, IPM or PCB2, heat exchanger clogged, locked compressor. EVI/EVO failure. Cycle abnormality. Excessive refrigerant.
51	Inverter	Abnormal operation of the current sensor	Overload Operation (Heat Exchanger Clogging) Incorrect wiring of current sensor. Failure of control PCB, DIP IPM, IPM or PCB2.
53		Activation of Transistor Module Protection Device	Abnormality of Inverter (Overload, Overcurrent, Abnormality of Rotation, Activation Failure), Compressor Failure Inverter module (IPM, DIP-IPM) and PCB2 abnormality. Failure of compressor, clogging of heat exchanger.
54		Abnormality of inverter fin temperature	Heat exchanger clogging. Abnormal Fin Thermistor Failure. Fan motor failure
55		Abnormality of inverter module (not working)	Failure of DIP-IPM, IPM or PCB2.
57	Outdoor fan	Fan Motor abnormality	Disconnected wire of incorrect wiring between control PCB and inverter PCB. Incorrect wiring or fan motor abnormality.
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	IU 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
b7	Transmission	Transmission Failure between Indoor Unit and Fan PCB (for 2 Fan)	No Reply, Discrepancy of Telegraph, Disconnected Wire, Abnormality of Transmission

When the RUN indicator flashes every 4 seconds, there is an transmission failure between the indoor unit and the remote control switch (Loose connector, Incorrect Wiring, Disconnected Wire, Broken Wire).

HITACHI

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ISO 14001 of AENOR Spain for its Environmental Management systems accordance with the standard

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