HITACHI
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UTOPIA
RASC-G8 SERIES

Technical Catalog

Outdoor Units: 5, 10 HP

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Units Code List

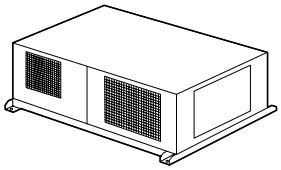
NOTE:

MODELS CODIFICATION

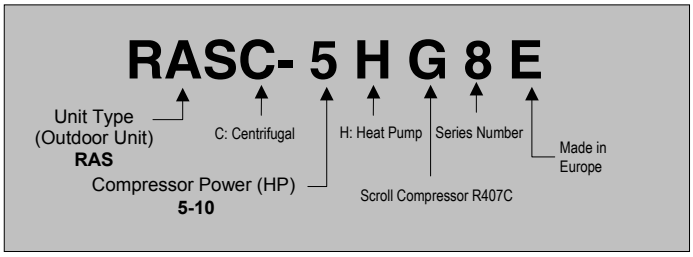
Please check, according to the model name, which is your air conditioner type and how it is abbreviated and refered to in this technical catalogue.
This Technical Catalogue provides data concerning to ducted G8 Outdoor Unit. For Indoor Units data refer Technical Catalogue TCGB0033 Utopia G8.
For Installation, Operation and Maintenance data, refer to Service Manual SMGB0033 Utopia G8.

OUTDOOR UNIT	INDOOR UNIT (HP)			
	TWIN		TRIPLE	QUAD
RAS-5HG8E	**2.5/2.5**	**3.0/2.0**	**2.0/1.5/1.5**	
RAS-10HG8E	**5.0/5.0**	**6.0/4.0**	**3.0/3.0/4.0**	**2.5/2.5/2.5/2.5**

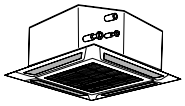
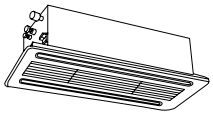
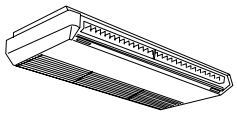
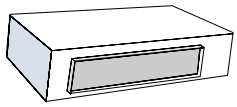
■ **OUTDOOR UNIT**

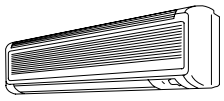
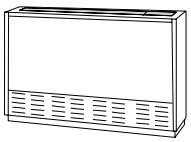
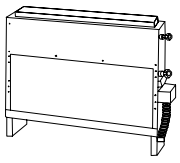
OUTDOOR UNIT	
Heat Pump	
Model	**Code**
RASC-5HG8E	70874441
RASC-10HG8E	70874443
3~ R407C	
	

■ **Model Meaning for Outdoor Unit**

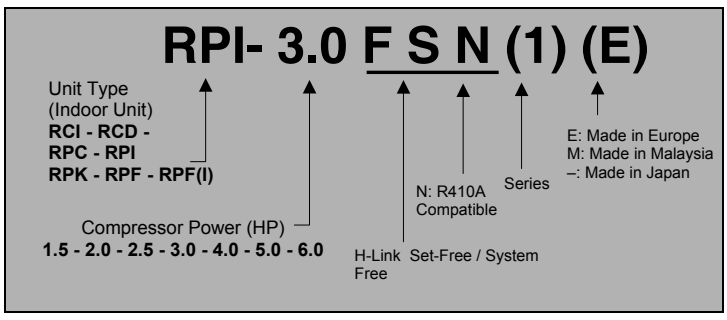


■ INDOOR UNITS

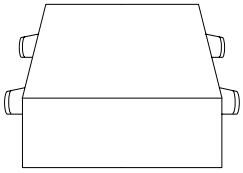
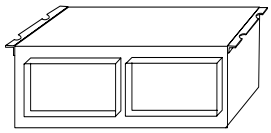
INDOOR UNITS FSN(E/M)							
4-Way-Cassette		**2-Way-Cassette**		**Ceiling**		**In-The-Ceiling**	
Unit	**Code**	**Unit**	**Code**	**Unit**	**Code**	**Unit**	**Code**
RCI–1.5FSN1E	7E861619	**RCD–1.5FSN**	60277814	**–**	–	**RPI–1.5FSNE**	7E877304
RCI–2.0FSN1E	7E861621	**RCD–2.0FSN**	60277815	**RPC–2.0FSNE**	7E872055	**RPI–2.0FSNE**	7E872024
RCI–2.5FSN1E	7E861620	**RCD–2.5FSN**	60277816	**RPC–2.5FSNE**	7E872030	**RPI–2.5FSNE**	7E872025
RCI–3.0FSN1E	7E871770	**RCD–3.0FSN**	60277817	**RPC–3.0FSNE**	7E872058	**RPI–3.0FSNE**	7E872031
RCI–4.0FSN1E	7E871780	**RCD–4.0FSN**	60277818	**RPC–4.0FSNE**	7E872059	**RPI–4.0FSNE**	7E872032
RCI–5.0FSN1E	7E871790	**RCD–5.0FSN**	60277819	**RPC–5.0FSNE**	7E872060	**RPI–5.0FSNE**	7E872033
RCI–6.0FSN1E	7E871794	**–**	–	**RPC–6.0FSNE**	7E872061	**RPI–6.0FSNE**	7E872034
–	**–**	**–**	**–**	**–**	**–**	**RPI-10HG7E**	70786733
							
RCI		**RCD**		**RPC**		**RPI**	

INDOOR UNITS FSN(E/1M)					
Wall		**Floor**		**Floor Concealed**	
Unit	**Code**	**Unit**	**Code**	**Unit**	**Code**
RPK–1.5FSN1M	60277867	**–**	**–**	**–**	**–**
RPK–1.5FSNM	60277825	**RPF–1.5FSNE**	7E877716	**RPFI–1.5FSNE**	7E877720
RPK–2.0FSNM	60277826	**RPF–2.0FSNE**	7E877309	**RPFI–2.0FSNE**	7E877311
RPK-2.5FSNM	60277844	**RPF–2.5FSNE**	7E877310	**RPFI–2.5FSNE**	7E877312
RPK-3-0FSNM	60277845	**–**	**–**	**–**	**–**
RPK-4-0FSNM	60277847	**–**	**–**	**–**	**–**
					
RPK		**RPF**		**RPFI**	

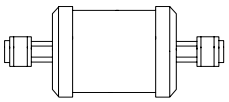
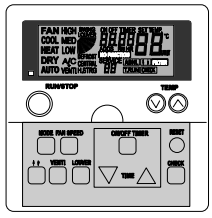
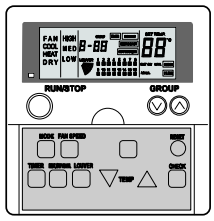
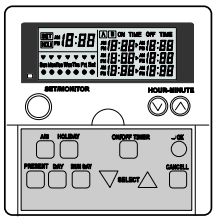
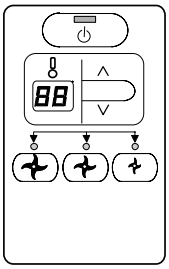
■ Model Meaning for Indoor Unit

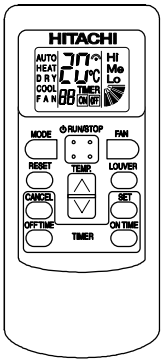
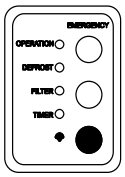
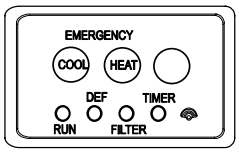
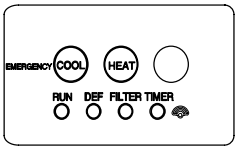
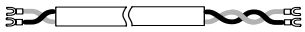
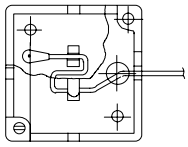
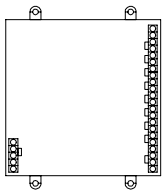
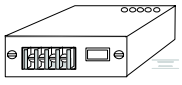
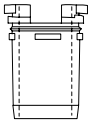


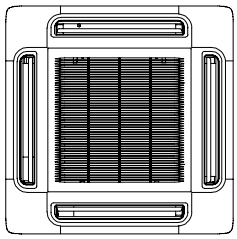
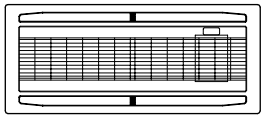
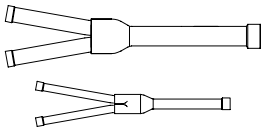
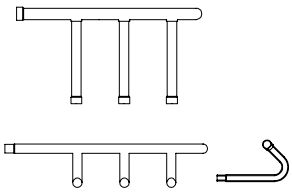
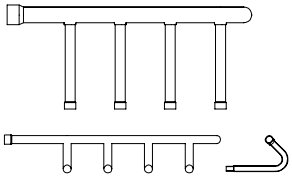
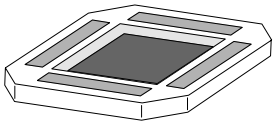
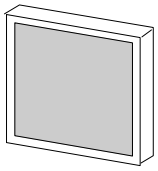
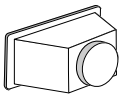
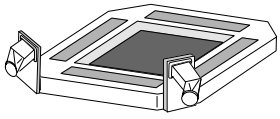
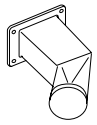
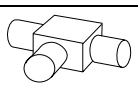
COMPLEMENTARY SYSTEMS

Accessory	Name	Code	Figure
KPI-2521	Total Heat Exchanger	60277481	
KPI-5021	Total Heat Exchanger	60277482	
KPI-8021	Total Heat Exchanger	60277483	
KPI-10021	Total Heat Exchanger	60277484	
EF-5GE	Econofresh Kit	7E774148	

ACCESSORIES CODE LIST

Accessory	Name	Code	Figure
D-2AVE	Drier R407C	7E799901	
D-2HVE	Drier R407C	7E799902	
D-10AVE	Drier R407C	7E799903	
D-10HVE	Drier R407C	7E799904	
PC-P1HE	Remote Control Switch	7E799954	
PSC-5S	Central Station	60291050	
PSC-5T	7 Day Timer	60291052	
PC-P5H	Optional Remote Controller	60290879	

Accessory	Name	Code	Figure
PC-LH3A	Wireless Control Switch	60291056	
PC-RLH11	Receiver Kit (for RCI ,RCD, RPC, RPI, RPK,RPF(I) – on the wall–)	60291109	
PC-RLH8	Receiver kit (for RCI-FSN1E –on the panel–)	60299961	
PC-RLH9	Receiver Kit (2-Wires) (for RCD –on the panel–)	60291107	
PSC-5HR	H-LINK Relay	60291105	(not shown)
PCC 1A	Optional Function Connector	60199286	(not shown)
PRC-10E1	2P Extension Cord	7E790211	
PRC-15E1	2P-Extension Cord	7E790212	
PRC-20E1	2P-Extension Cord	7E790213	
PRC-30E1	2P-Extension Cord	7E790214	
THM-R2AE	Remote Sensor (THM4)	7E799907	
HARC-BXE (A) HARC-BXE (B)	Interface	60290874 60290875	
CS-NET (HARC-40E)	CS-NET + Interface	6E191922	
DBS-26	Drain Discharging Boss	60299192	

Accesory	Name	Code	Figure
P-G23WA2	Air Panel	60290534	
P-G23DWA1	Air Panel	60299570	
P-G46DWA1	Air Panel	60299571	
TE-56	Distributors	6E200002	
TE-10	Distributors	7E700004	
TRE-06	Distributors	7E700005	
TRE-10	Distributors	7E700008	
QE-810	Distributors	7E700006	
B-23H4	Adopter for deodorant filter	60199790	
F-23L4-K	Anti bacteria filter	60199791	
F-23L4-D	Deodorant filter	60199793	
F-46L4-D	Deodorant filter	60199794	
PDF-23C3	Duct connection flange	60199795	
PDF-46C3	Duct connection flange	60199796	
OACI-232	Fresh air intake kit	60199797	
PD-75	Fresh air intake kit	60199798	
PI-23LS5	3 Way outlet parts	60199799	
PSP-23W3	Space panel for replace 4-6HP	60199800	(not shown)
TKCI-232	T duct connecting kit	60199801	

1 FEATURES AND BENEFITS

This chapter describes the features and benefits of the new Hitachi G8 series outdoor unit, which through its system flexibility and modularity will provide you with the complete solution for your building air conditioning requirements.

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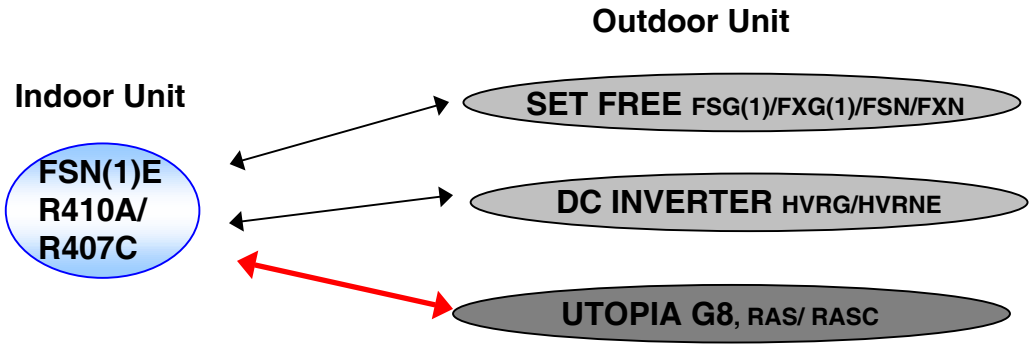
1.1. System description

To help you quickly discover all the features and benefits of the system, this section provides an overview of the system, the choice of compatible indoor units, a description of the various unit combinations, and details concerning the benefits of the electronic expansion valve that the system uses.

1.1.1. General overview

Hitachi is proud to announce the introduction of the new UTOPIA G8 series outdoor unit with its combination of SYSTEM FREE indoor units. This combination allows the interconnection of the same indoor units in all the systems. In achieving this Hitachi has effectively started a NEW GENERATION of AIR CONDITIONING.



The system provides effortless selection, easy control, logical zoning, and trouble-free installation. Through its modularity the system delivers maximum flexibility and consequently offers increased benefits for both customers and installers.

1.1.2. Combination flexibility

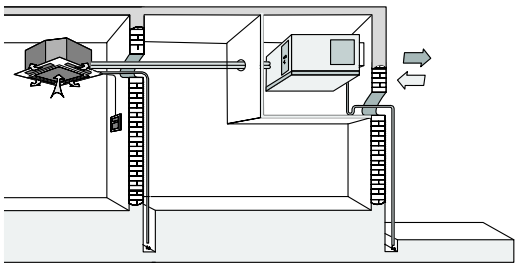
With its modular design the new Utopia RASC-5/10 G8 series outdoor unit provides a totally flexible air conditioning solution. This offers not only standard cooling functions but, in addition, heating (for Heat Pump models), dry and fan operation for all environments.

The systems are offered in the following combinations:

- Single, twin, triple and quad with the Centrifugal UTOPIA outdoor unit

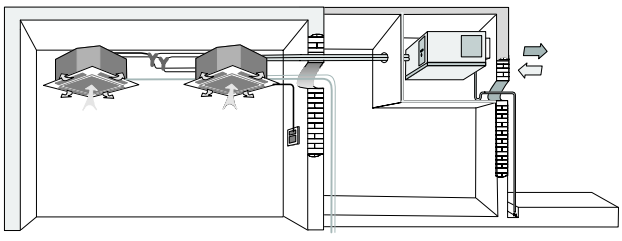
Examples of the various combinations:

Single with Centrifugal Utopia Unit

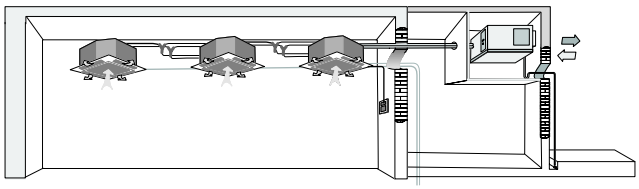


Twin, Triple and Quad configurations are suitable for large standard-shaped room areas. These combinations deliver air conditioning from several units to obtain a smooth and even airflow. This would be very difficult to achieve using a single standard large-sized unit.

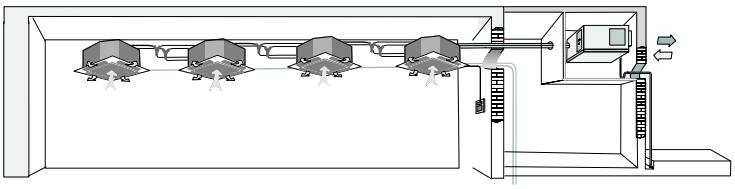
Twin with Centrifugal Utopia Unit



Triple with Centrifugal Utopia Unit



Quad with Centrifugal Utopia Unit

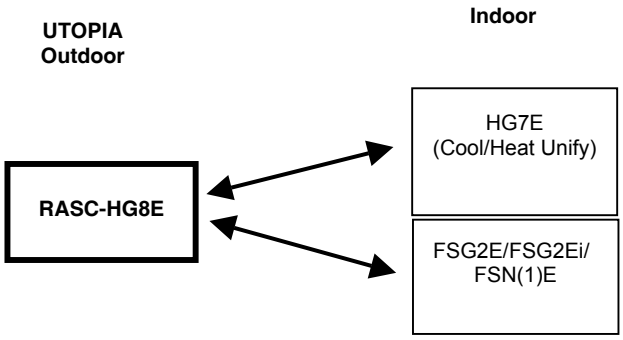


■ Compatibility

According to the table on the right, the compatibility between different systems remains as it follows:

- The New Outdoor Units G8 Series will be accepted with the Set Free Indoor Units (System Free).
- The connection between Utopia Outdoor Units G8 Series and Utopia Indoor Units G7 Series is accepted.
- The connection between Utopia Outdoor Units G8 Series and Utopia Indoor Units G5 Series is not accepted.

Compatibility Indoor and Outdoor Unit



1.2. Installation advantages

This section details the enhancements that have been made to the new UTOPIA RASC G8 series outdoor units to simplify their installation.

■ Location

This unit can be installed in indoor or outdoor locations. Usually is used in some places that is impossible to place the outdoor unit outside the building.

■ Carefree maintenance

Easy maintenance access is assured without the need to move or disconnect any of the outdoor units thanks to the conveniently located front access panel.

■ Operational to -8ºC

The outdoor heat pump temperature, can be safely and effectively operated in external temperatures as low as -8°C.

1.2.1. Electrical wiring

The electrical control wiring is greatly simplified through the use of the H-LINK wiring system.

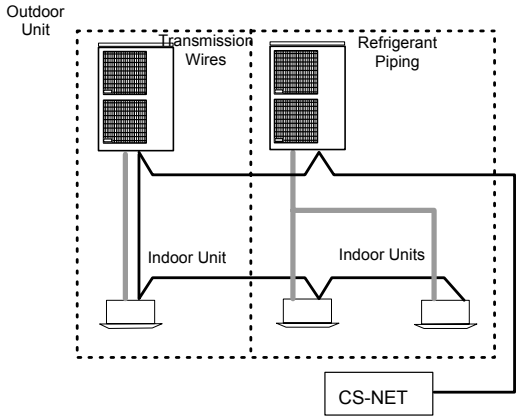
■ H-Link system

The H-LINK wiring system requires only two transmission wires for connecting each outdoor unit to its indoor units (to control up to 16 refrigerant cycles). Both outdoor units and indoor units require connecting wires in series.

The H-LINK system provides the following advantages:

- Trouble-free and adaptable installation.
- No polarity requirements.
- Freely combinable.
- CS-Net connection via indoor or outdoor unit
- Up to 64 indoor units
- Up to cable run length: 1000 m

Example of H-LINK system



1.2.2. Easy service and commissioning

To provide more efficient sevicing and comissioning the systems are equipped with on-board test, trial operation, and self-diagnosis functions.

■ Test run

- An automatic test run function is available to aid commissioning using the outdoor unit dip switch or the indoor unit remote control switch.

- The system is equipped with an identification system that can be used to confirm which series the connected outdoor units are members of (for example: single or multi). This is controlled with a remote control switch.

- An automatic address coding system is also provided. This automatically gives a unit number to individual Indoor Units (Indoor Units can also be manually allocated with a unit number using their rotary type dip switches).

■ Trial operation and self diagnosis

The new remote control switch provides highly efficient control functions. A new self-diagnosis function, which enables quick checking of operation conditions in the Indoor Units and Outdoor Unit, has been implemented. Furthermore, alarm data can be stored in the memory of an on-board microcomputer when an abnormality occurs.

- Data memory in the remote control switch
  If an abnormality occurs, the remote control switch LCD will indicate an alarm code so that quick diagnosis is available at the site.
- Optional function setting by remote control switch
  Cancellation of a 4 degree shift in heating mode or fan speed increasing setting, are set via Remote Control Switch.
  Then, multiple Indoor Units can be set, at the same time.The configuration can also be easily changed, even after installation is completed.

■ Service checker

A Service Checker to monitor installation conditions and the operational status of air conditioning systems through a desktop or laptop-type computer is available. You can also easily create test run records (A service checker system consists of a special interface unit and a field-supplied desktop computer).

2 GENERAL DATA

For Indoor Units data refer to TCGB0033 about Hitachi Utopia G8 Series.

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2 GENERAL DATA 1
2.1. General Data for RASC-5/10HG8E 2
2.2 Component data for RASC-5/10HG8E 3
2.3. Name of parts 4
2.3.1. RASC-5HG8E 4
2.3.2. RASC-10HG8E 4

2.1. GENERAL DATA FOR RASC-5/10HG8E

Model RASC			RASC-5HG8E	RASC-10HG8E
Nominal Cooling Capacity		kW	12.50	25.00
Nominal Heating Capacity		kW	14.00	28.00
Cabinet Colour			Soft Grey (RAL 9002)	Soft Grey (RAL 9002)
Sound Pressure Level (1*)		dB (A)	53	60
Outer Dimensions	Height	mm	555	640
	Width	mm	1312	2050
	Depth	mm	835	928
Net Weight		Kg	175	310
Refrigerant Charge		Kg	4.5	4.5
Refrigerant			R407C (Factory Charged for 10 meters) (2*)	R407C (Factory Charged for 10 meters) (2*)
Compressor	Type		Hermetic (Scroll)	Hermetic (Scroll)
	Model		G500DH	G1000EL
	Quantity		1	1
Fan Motor	Type		Centrifugal Fan	Centrifugal Fan
	Output	W	550	1100
	Quantity		1	1
Nominal Static Pressure		mmAq	5	5
Maximum Static Pressure		mmAq	13	13
Connections			Service Valves with Flare Nut connection	Service Valves with Flare Nut connection/ Flange connection
Refrigerant Piping	Liquid Line	mm (in)	9.53 (3/8)	15.88 (5/8)
	Gas Line	mm (in)	19.05 (3/4)	28.6 (1 1/8)
Drain Piping (Outer diameter)		mm	22	22 (two locations)
Packing Measurements		m^3	0.60	0.88

NOTE:

(1). The Sound Pressure Level is based on following conditions:*

- 3 m from the unit front surface

The above data was measured in an anechoic chamber so that reflected sound should be taken into consideration in the field.
In case of Night Shift conditions, the noise level decreases about 2 dB (A)

(2). The outdoor unit is charged with refrigerant before shipment. The charged volume is the equivalent of a refrigerant piping of 10 meters, when combining to HITACHI standard indoor unit.*

AVAILABLE POWER SUPPLY VOLTAGES:

The available voltages for the different units are shown in the following table.

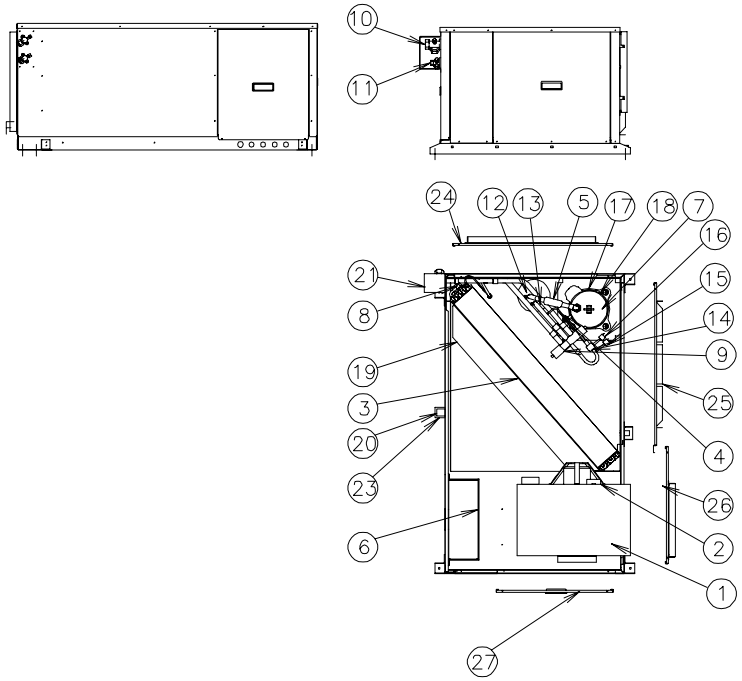
Model	Power Supply		
	Voltage (V)	Phase	Frequency (Hz)
RASC-5HG8E	380-415	3	50
RASC-10HG8E	380-415	3	50

2.2. COMPONENT DATA FOR RASC-5/10HG8E

Model RAS			Units	RASC-5HG8E	RASC-10HG8E
Heat Exchanger	Heat Exchanger Type			Multi-Pass Cross Finned Tube	Multi-Pass Cross Finned Tube
	Tube	Material		Copper Tube	Copper Tube
		Outer Diameter	mm	9.53	9.53
		Rows		5	5
	Fin	Material		Aluminium	Aluminium
		Pitch	mm	2	2
	Frontal Area		m2	0,52	0,87
	Maximum Operating Pressure		Kg/cm2 G MPa	33.0 3.30	33.0 3.30
	Number of Heat Exchanger/Unit			1	1
Fan Unit	Fan	Type		Centrifugal Fan	Centrifugal Fan
		Number/Unit		1	1
		Outer Diameter	mm	320	320
		Revolutions	rpm	950	875
		Nominal Air Flow/Fan	m³/min	60	98
	Fan Motor	Type		Drip-Proof Type Enclosure	Drip-Proof Type Enclosure
		Starting Method		Permanent Split Capacitor	Permanent Split Capacitor
		Nominal Output	kW	0,55	1,10
		Quantity		1	1
		Insulation Class		B	F
Compressor	Model			G500 DH-80D1	G1000EL-160D3
	Revolutions 50Hz		rpm	2880	2880
	Displacement 50Hz		mm	13,82	13,82
	Capacity Steps			0-100	0 – 100
	Air Tight Pressure Discharge		Kg/cm² G MPa	33.0 3.30	33.0 3.30
	Motor Type	Starting Method		Direct-on-line Starting	Direct-on-Line Starting
		Poles		2	2
		Insulation		E	E
	Oil	Type		Ether Oil IDEMUTSU FVB68D	
		Charge	liters	1,8	3.5

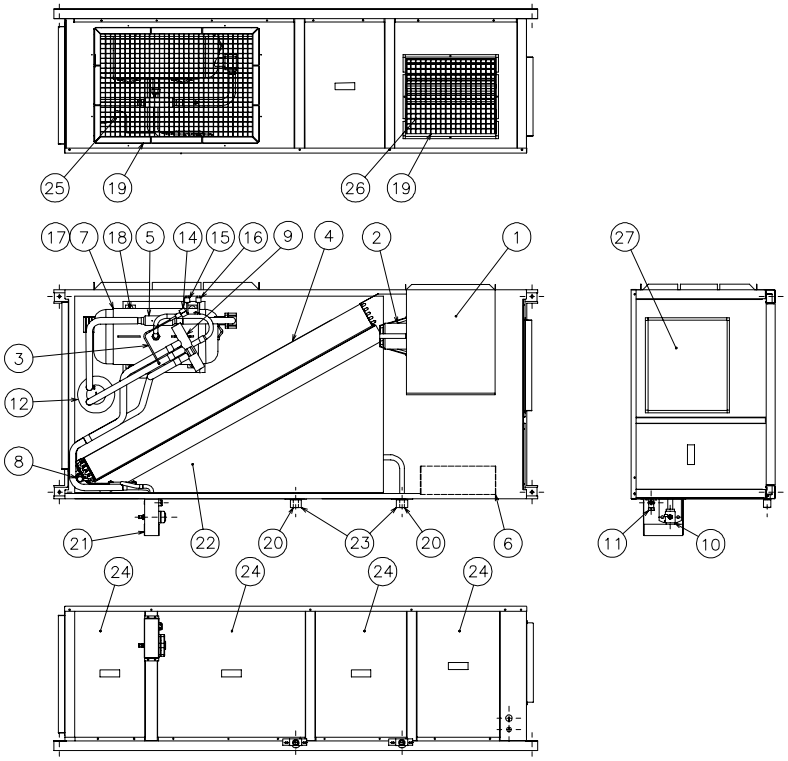
2.3. NAME OF PARTS

2.3.1. RASC-5HG8E



No.	Part Name
1	Fan
2	Fan Motor
3	Heat Exchanger
4	Capillary tube for Gas By-pass
5	Strainer
6	Electric Control Box
7	Compressor
8	Check Valve
9	Reversing Valve
10	Stop Valve for Gas Line
11	Stop Valve for Liquid Line
12	Accumulator
13	Check Joint
14	Solenoid Valve for Gas By-pass
15	High-Pressure Switch
16	Pressure Switch
17	Oil Heater
18	Vibration Isolation Rubber
19	Protector Net
20	Drain Pipe
21	Stop Valve Protector
22	Drain Pan
23	Drain Pipe Protector
24	Cycle Service Panel
25	Air Inlet Panel
26	Air Outlet Panel
27	Fan Service Panel

2.3.2. RASC-10HG8E



No.	Part Name
1	Fan
2	Fan Motor
3	Heat Exchanger
4	Capillary tube for Gas By-pass
5	Strainer
6	Electrical Box
7	Compressor
8	Header
9	4-Way Valve
10	Stop Valve for Gas Line
11	Stop Valve for Liquid Line
12	Accumulator
13	Check Joint
14	Solenoid Valve for Gas By-pass
15	High-Pressure Switch
16	Pressure Switch
17	Oil Heater
18	Vibration Isolation Rubber
19	Protector Net
20	Drain Pipe
21	Stop Valve Protector
22	Drain Pan
23	Drain Pipe Protector
24	Service Panel
25	Air Inlet Panel
26	Air Outlet Panel
27	Fan Service Panel

3. DIMENSIONAL DATA

For Indoor Units data refer to TCGB0033 about Hitachi Utopia G8 Series.

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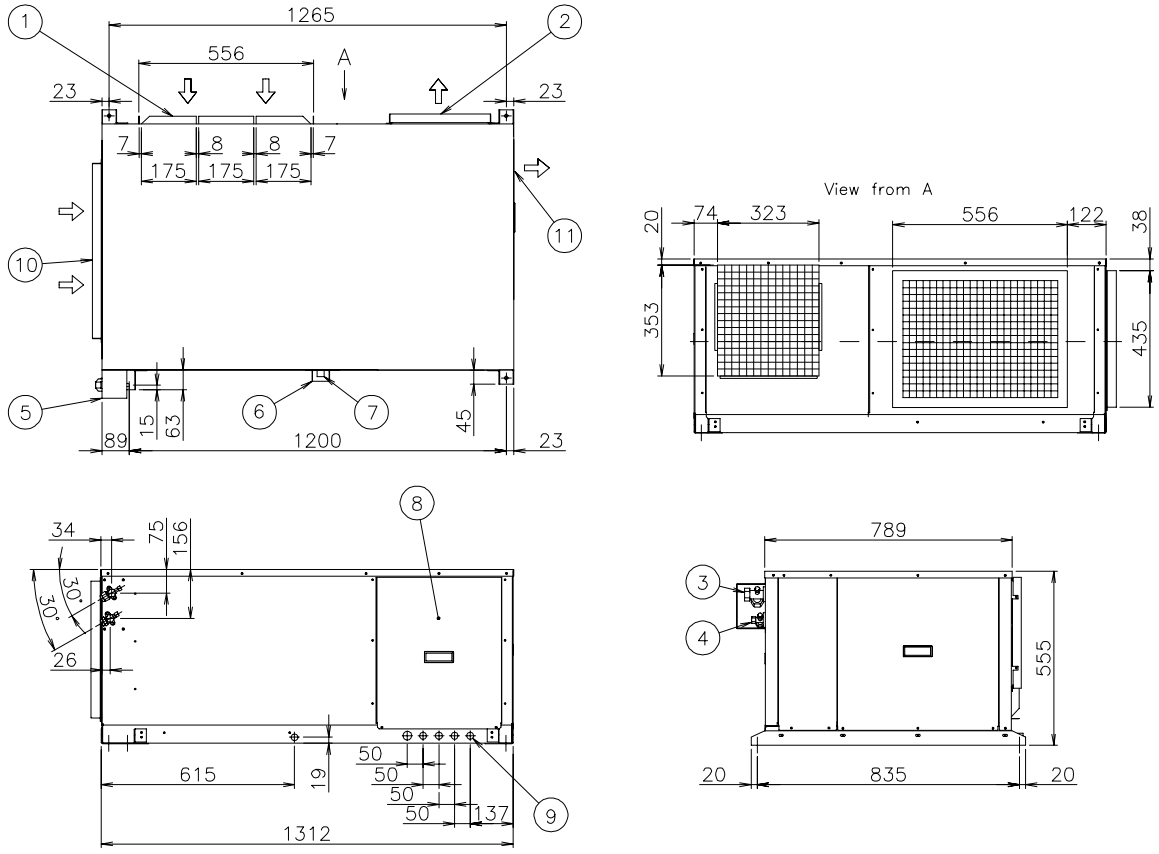
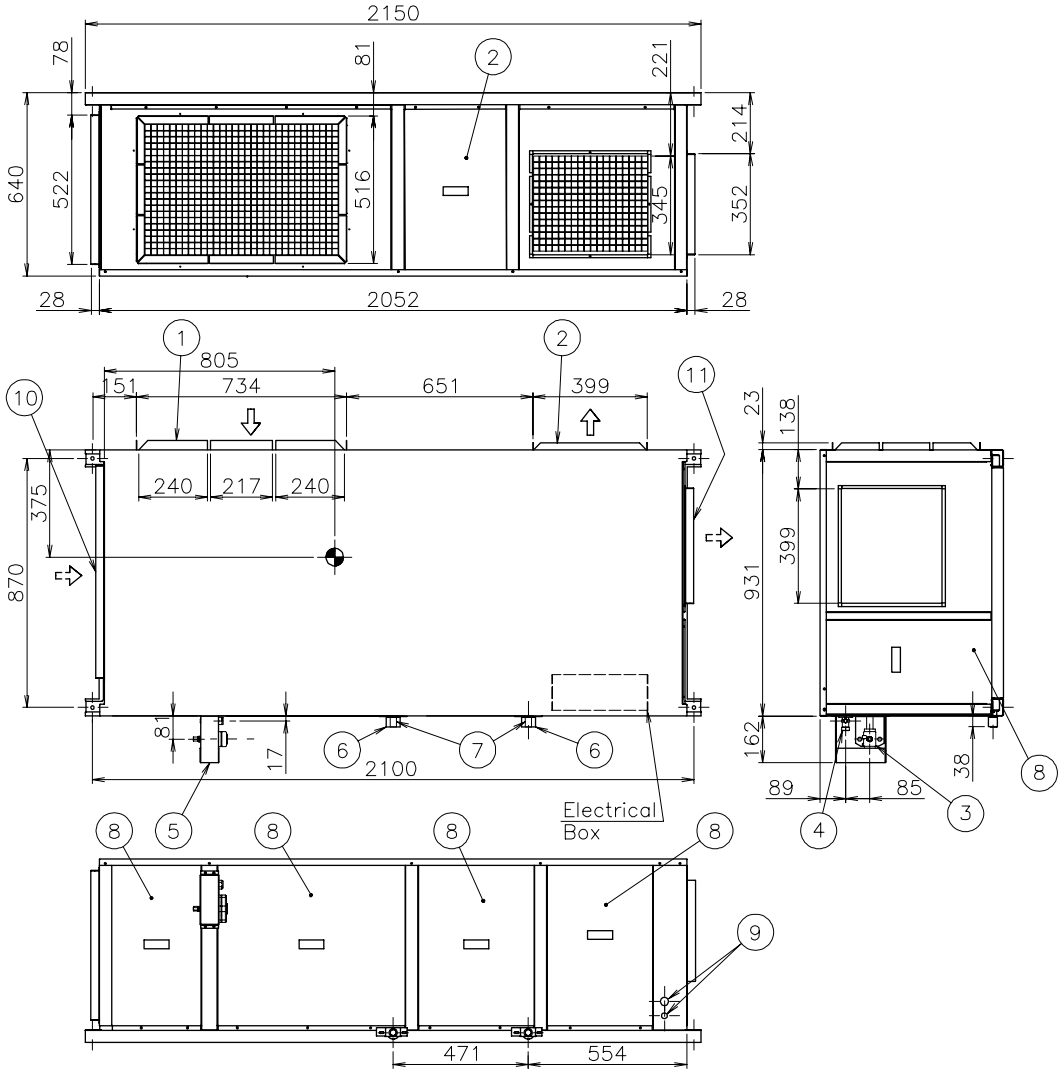
3.1. RASC–5HG8E



Mark	Name	Remarks
1	Air Inlet	
2	Air Outlet	
3	Refrigerant Gas Line	∅ 19.05 Flange
4	Refrigerant Liquid Line	∅ 9.53 Flare Nut
5	Valve Protector	
6	Drain Pipe Protection	
7	Drain Pipe	
8	Service Panel	
9	Holes for Wiring connection	Electrical Box Access
10	Alternatie Air Inlet	
11	Alternative Air Outlet	

3.2. RASC–10HG8E



Mark	Name	Remarks
1	Air Inlet	
2	Air Outlet	
3	Refrigerant Gas Line	∅ 28.6 Flange
4	Refrigerant Liquid Line	∅ 15.88 Flare Nut
5	Valve Protector	
6	Drain Pipe Protection	
7	Drain Pipe	
8	Service Panel	
9	Holes for Wiring connection	Electrical Box Access
10	Alternative Air Inlet	
11	Alternative Air Outlet	

4 CAPACITIES AND SELECTION DATA

This chapter is a guide for selecting the most suitable units for your requirements and shows you the performance details of each unit.

CONTENTS

4 CAPACITIES AND SELECTION DATA 1

4.1. System Selection Procedure 2

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4.6.2. Sensible Heat Factor 8

4.7. Fan Performance Curve 9

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4.1. SYSTEM SELECTION PROCEDURE

This chapter shows how to select a suitable model for certain requirements.

4.1.1. HOW TO USE THE DATA FROM THE CHAPTER

When your requirements are defined (load, working temperatures and installation requirements) is necessary to select the most suitable units.

To calculate the suitable units use the following information:

From chapter 4:

- Combinability from subchapter 4.2
- Cooling capacity data from subchapter 4.4
- Heating capacity data from subchapter 4.5
- Piping length and lift correction factor from subchapter 4.6
- Sensible heat factor from subchapter 4.6.2
- Noise data from subchapter 4.8
- Operation Space from subchapter 4.9

Use also the following data:

- General data from Chapter 2
- Electrical Data from Chapter 6

Outdoor Unit could be installed using ducts at Inlet and Outlet air. The fan performance for duct calculation should be considered, as Subchapter 4.7. shows.
Next examples of selection unit for Cooling Load and Heating Load will use the following units type, selected after consider above indications.

4.1.2. SELECTION EXAMPLE FOR COOLING LOAD

In order to show how to select the units characteristics, we define the following requirements:

☛ **Step 0: System requirements**

Cooling load:
Total cooling load: 10.5 kW
Sensible heat load: 8.0 kW
Outdoor Air inlet Dry Bulb temperature: 35.0 ºC
Indoor Air inlet Dry Bulb Temperature: 26.0 ºC
Indoor Air inlet Wet Bulb Temperature: 18.0 ºC

Installation restrictions:
Power source: 380 V, 3~, 50 Hz.
Outdoor unit under indoor unit: 15.0 meters.
Piping Length: 27.0 meters

Indoor units type:
In this case Twin system with an RPK-FSNM and RPC-FSNE indoor units is required.

☛ **Step 1: Select outdoor unit capacity performance**

Pre-select an outdoor unit according to required the cooling load at defined temperatures (outdoor air inlet dry Bulb and indoor air inlet wet bulb). Selected unit must have a bigger cooling capacity than the cooling capacity required.

Use cooling capacity data from subchapter 4.4.

	CR	Outdoor Air Inlet DB (°C)	Indoor air inlet web bulb (°C) / dry bulb (°C)			
			16/23		18/25	
			CAP	$IPT_{o/u}$	CAP	$IPT_{o/u}$
RASC-5HG8E	0,61	10	12,77	4,68	13,62	4,16
		15	12,40	4,31	13,23	4,39
		21	12,25	4,57	13,13	4,67
		25	12,13	4,81	12,88	4,91
		30	11,75	5,00	12,50	5,14
		35	11,38	5,24	12,13	5,33
		40	10,75	5,53	11,50	5,67

Table 1 -Cooling Capacity Data-

Apply a correction factor according to piping length and lift (subchapter 4.6) to the cooling capacity

System cooling capacity = cooling capacity x correction factor = 12,13 x 0,9 = **10,91 kW**

We conclude that the most suitable Outdoor unit for the system requirements is **RASC-5HG8E**.

☛ Step 2: Indoor unit capacity performance

Select the indoor units according to your specific requirements. In this case Twin system using a RPK and RPC unit is required. See combinability from subchapter 4.2 for allowed indoor units.

In this case outdoor unit selected (step 1) is a RASC-5HG8E (allows to be combined with RPK-3.0FSNM and RPC-2.0FSNE indoor units).

Once outdoor unit and indoor units have been selected is necessary to adjust the indoor unit nominal capacity to the system.

A. Outdoor unit fix the system cooling capacity.

B. Get, for each indoor unit, the nominal capacity from chapter 2 in TCGB0033.

C. Define indoor unit capacity distribution for each unit based on total system indoor unit capacity.

D. To calculate indoor unit capacity apply the indoor unit distribution ratios to the system cooling capacity.

		RASC-5HG8E	RPC-2.0FSNE	RPK-3.0FSNM
A	cooling capacity	10,91 kW		
B	nominal capacity		5,0 kW	7,1 kW
C	distribution		=5,0/(5,0+7,1) =0,41	=7,1/(5,0+7,1) =0,59
D	unit performance capacity		=10,91x0,41 =4,47kW	=10,91x0,59 =6,43kW
SYSTEM CAPACITY		**10,91 kW**	**4,47 kW**	**6,43 kW**

☛ Step 3: Sensible heat capacity (SHC)

System requirements specify a sensible heat load equal to 8kW. When unit performance capacity is defined is possible to calculate sensible heat capacity for each indoor unit.

From subchapter 4.6.2 get Sensible heat factor SHF for high fan speed.

Calculate sensible heat corrected factor for all indoor units using the formula:

SHC = unit performance capacity x SHF

SHC_{RPC} *= 4,47 x 0,72 = 3,22 kW*
SHC_{RPK} *= 6,43 x 0,72 = 4,62 kW*

Difference between system required indoor air inlet dry bulb temperature (26 °C) and cooling capacity data indoor air inlet dry bulb temperature (25º) makes necessary to adjust the sensible heat corrected for each indoor unit. Use the following formula:

$SHC_c = SHC + CR \times (DB_r - DB)$

where
SHC_c *corrected sensible heat capacity (kW).*
SHC sensible heat capacity (kW).
CR correction ratio (from subchapter 4.4).
DB_r *evaporator dry bulb temp (ºC).*
DB evaporator dry bulb temp (ºC) or interpolated for each WB in the table.

For the example system:

$SHCc_{RPC} = 3,22 + 0,61x(26-25) = 3,83$ *kW*
$SHCc_{RPK} = 4,62 + 0,61x(26-25) = 5,23$ *kW*

System sensible heat capacity is:

$SHCc = SHCc_{RPC} + SHCc_{RPK}$ = 3,83 + 5,23 =9,06

SHCc = 9,06 kW

☛ Step 4: IPT calculation

Use cooling capacity data from subchapter 4.4. to get outdoor unit input at required temperatures.

	CR	Outdoor Air Inlet DB (ºC)	Indoor air inlet web bulb (ºC) / dry bulb (ºC)			
			16/23		18/25	
			CAP	$IPT_{o/u}$	CAP	$IPT_{o/u}$
RASC-5HG8E	0.61	10	12,77	4,08	13,62	4,16
		30	11,75	5,00	12,50	5,14
		35	11,38	5,24	12,13	5,33
		40	10,75	5,53	11,50	5,67

Table 2 -Cooling Capacity data-

Get indoor unit input from chapter 6 Electrical data.

IPT = IPTo/u + Σ IPTi/u
IPT= IPTo/u + IPT_{RPC} + IPT_{RPK} = 5,33 + 0,14 + 0,09 =5,56

IPT =5,56 kW

☛ Step 5: EER calculation

To calculate EER use the following formula:

EER = Cooling capacity / IPT
EER = 10,91 / 5,56 = 1,96

EER =1,96

4.1.3. SELECTION EXAMPLE, HEATING LOAD

In order to show how to select system units characteristics, we define the following requirements:

☛ **Step 0: System requirements**

Heating load:
Total heating load: 11 kW
Outdoor Air inlet Wet Bulb Temperature: 0ºC
Indoor Air inlet Dry Bulb Temperature: 18ºC

Installation restrictions:
Power source: 380 V, 3~, 50 Hz.
Outdoor unit under indoor unit: 15.0 metres.
Piping Length: 27.0 meters

Indoor units type:
In this case Twin system with an RPK-FSNM and RPC-FSNE indoor units is required.

☛ **Step 1: Select outdoor unit capacity performance**

Pre-select an outdoor unit according to required the heating load at defined temperatures (outdoor air inlet and indoor air inlet wet bulb). Selected unit must have a bigger heating capacity than the heating capacity required.

Use heating capacity data from subchapter 4.5.

	Outdoor Air Inlet WB (ºC)	Indoor air inlet dry bulb (ºC)			
		16		18	
		CAP	IPT o/u	CAP	IPT o/u
RASC-5HG8E	-7	8,82	4,66	8,95	4,61
	-5	10,36	4,59	10,50	4,54
	0	11,76	4,87	11,90	4,78
	5	13,30	5,20	13,44	5,11
	10	14,70	5,49	14,84	5,44
	15	16,24	5,82	16,38	5,77

Table 3 -Heating Capacity data-

Apply a correction factor according to piping length and lift (subchapter 4.6) to the heating capacity.

System heating capacity = heating capacity x correction factor = 11.90 x 1.0 = **11.90 kW**

We conclude that the most suitable Outdoor unit for the system requirements is **RASC-5HG8E**.

☛ **Step 2: Indoor unit performance capacity**

Select the indoor units according to your specific requirements. In this case Twin system using a RPK and RPC unit is required. See combinability from subchapter 4.2 for allowed indoor units.

In this case outdoor unit selected (step 1) is an RAS-5HG8E (allows to be combined with RPK-3.0FSNM and RPC-2.0FSNE indoor units).

Once outdoor unit and indoor units have been selected is necessary to adjust the indoor unit nominal capacity to the system.

A. Outdoor unit fix the system cooling capacity.
B. Get, for each indoor unit, the nominal capacity from chapter 2 in TCGB0033.
C. Define indoor unit capacity distribution for each unit based on total system indoor unit capacity.
D. To calculate indoor unit capacity apply the indoor unit distribution ratios to the system cooling capacity.

		RASC-5HG8E	**RPC-2.0FSNE**	**RPK-3.0FSNM**
A	cooling capacity	11,90 kW		
B	nominal capacity		5,60 kW	8,00 kW
C	distribution		=5,6/(5,6+8,0)	=8,0/(5,6+8,0)
			=0,41	=0,59
D	unit performance capacity		=11,90x0,41 =4,88kW	=11,90x0,59 =7,02kW
SYSTEM CAPACITY		**11,90 kW**	**4,88 kW**	**7,02 kW**

☛ **Step 3: IPT calculation**

Use heating capacity data from subchapter 4.4. to get outdoor unit input at required temperatures.

	Outdoor Air Inlet WB (ºC)	Indoor air inlet cry bulb (ºC)			
		16		18	
		CAP	IPT o/u	CAP	IPT o/u
RASC-5HG8E	-7	8,82	4,66	8,95	4,61
	-5	10,36	4,59	10,50	4,54
	0	11,76	4,87	11,90	4,78
	5	13,30	5,20	13,44	5,11
	10	14,70	5,49	14,84	5,44
	15	16,24	5,82	16,38	5,77

Table 4 -Heating capacity data-

Get indoor unit input from chapter 6 Electrical data.

IPT = IPTo/u + Σ IPTI/U
IPT= IPTo/u + IPT_{RPC} + IPT_{RPK} = 4,78 + 0,14 + 0,09 = 5,01

IPT= 5,01 kW

☛ **Step 4: EER calculation**

To calculate EER use the following formula:

EER = Heating capacity / IPT
EER = 11,90 / 5,01 = 2,37

EER = 2,37

4.2. COMBINABILITY

The new UTOPIA Centrifugal G8 series, allows increase the flexibility of installation. It allows the connection between the different types and horse power Indoor Units with the same Outdoor Units.
The differents possible combinations are indicated in the table below

Indoor Units possible Combinations

Outdoor Unit	Combinations	RCI-1.5 RCD-1.5 RPI-1.5 RPK-1.5 RPF-1.5 RPFI-1.5	RCI-2.0 RCD-2.0 RPC-2.0 RPI-2.0 RPK-2.0 RPF-2.0 RPFI-2.0	RCI-2.5 RCD-2.5 RPC-2.5 RPI-2.5 RPK-2.5 RPF-2.5 RPFI-2.5	RCI-3.0 RCD-3.0 RPC-3.0 RPI-3.0 RPK-3.0	RCI-3.5 RPC-3.5 RPI-3.5 RPK-3.5	RCI-4.0 RCD-4.0 RPC-4.0 RPI-4.0	RCI-5.0 RCD-5.0 RPC-5.0 RPI-5.0	RCI-6.0 RPC-6.0 RPI-6.0	RPI-8	RPI-10
RASC-5HG8E	Single	-	-	-	-	-	-	1	-	-	-
	Twin	-	-	2	-	-	-	-	-	-	-
		-	1	-	1	-	-	-	-	-	-
	Triple	2	1	-	-	-	-	-	-	-	-
RASC-10HG8E	Single	-	-	-	-	-	-	-	-	-	1
	Twin	-	-	-	-	-	-	2	-	-	-
		-	-	-	-	-	1	-	1	-	-
	Triple	-	-	-	2	-	1	-	-	-	-
	Quad	-	-	4	-	-	-	-	-	-	-

***NOTE**:*
RPF(I):can not be connected with another unit in twin, triple or quad combination

4.3. STANDARD COOLING AND HEATING CAPACITY TABLES

Outdoor Unit	Type	Indoor Unit	Input Power [kW] (Cooling)	Cooling Output [kW]	EER	Cooling Performance	Input Power [kW] (Heat)	Heat Output [kW]	COP	Heating Performance
RASC-5HG8E	Cooling+ Heating	RCI-5.0FSN1E	5,57	12,50	2,24		5,20	14,00	2,69	
		RPC-5.0FSNE	5,66	12,50	2,21		5,29	14,00	2,65	
		RPI-5.0FSNE	5,66	12,50	2,21		5,29	14,00	2,65	
		RCD-5.0FSN	5,61	12,50	2,23		5,26	14,00	2,66	
RASC-10HG8E	Cooling+ Heating	RPI-10HG7E	11,21	25,00	2,23		9,86	28,00	2,84	
		RCI-5.0FSN1Ex2	11,13	25,00	2,25		9,78	28,00	2,86	
		RPC-5.0FSNEx2	11,31	25,00	2,21		9,96	28,00	2,81	
		RPI-5.0FSNEx2	11,31	25,00	2,21		9,96	28,00	2,81	
		RCD-5.0FSNx2	11,23	25,00	2,23		9,88	28,00	2,83	

NOTE:
Defrost factor is included
The nominal cooling and heating capacity is the combined capacity of the HITACHI standard split system, and are based on the ISO13253 for RPI Type and ISO 5151 for the rest of the models.

Operation Conditions	Cooling	Heating
Indoor Air Inlet Temperature	27.0 °C DB	20.0 °C DB
	19.0 °C WB	
Outdoor Air Inlet Temperature	35.0 °C DB	7.0 °C DB
		6.0 °C WB
Piping Length: 7.5 meters **DB:** Dry Bulb; **WB:** Wet Bulb		

For more information about capacities, see Chapter 4.4.

Performance Class	Multi-split conditioner	
	Cooling	Heating
A	3.20 < EER	3.60 < COP
B	3.20 ≥ EER > 3.00	3.60 ≥ COP > 3.40
C	3.00 ≥ EER > 2.80	3.40 ≥ COP > 3.20
D	2.80 ≥ EER > 2.60	3.20 ≥ COP > 2.80
E	2.60 ≥ EER > 2.40	2.80 ≥ COP > 2.60
F	2.40 ≥ EER > 2.20	2.60 ≥ COP > 2.40
G	2.20 ≥ EER	2.40 ≥ COP

4.4. COOLING CAPACITY TABLE

	CR	Outdoor Unit Inlet air DB (ºC)	Indoor Unit Inlet air WET BULB temperature (ºC) / DRY BULB temperature (ºC)							
			16/23		18/25		20/27		22/30	
			Capacity	IPTo/u	Capacity	IPTo/u	Capacity	IPTo/u	Capacity	IPTo/u
RASC-5HG8E	0,61	10	12,77	4,08	13,62	4,16	14,32	4,27	14,83	4,39
		15	12,40	4,31	13,23	4,39	13,93	4,50	14,44	4,61
		21	12,25	4,57	13,13	4,67	13,88	4,76	14,38	4,86
		25	12,13	4,81	12,88	4,91	13,63	5,00	14,13	5,14
		30	11,75	5,00	12,50	5,14	13,13	5,24	13,75	5,33
		35	11,38	5,24	12,13	5,33	12,88	5,48	13,38	5,53
		40	10,75	5,53	11,50	5,67	12,25	5,72	12,75	5,86
RASC-10HG8E	0,61	10	25,50	7,97	27,25	8,14	28,75	8,38	29,75	8,63
		15	24,68	8,45	26,38	8,63	27,84	8,86	28,88	9,10
		21	23,69	9,02	25,33	9,22	26,74	9,43	27,83	9,63
		25	23,03	9,53	24,63	9,73	26,01	9,93	27,13	10,24
		30	22,20	9,93	23,75	10,24	25,10	10,44	26,25	10,65
		35	21,38	10,44	22,88	10,65	24,19	10,95	25,38	11,05
		40	20,55	11,05	22,00	11,36	23,28	11,46	24,50	11,77

CR: Correction ratio

$IPT_{O/U}$: Input power of outdoor unit (indoor unit input power can be read on chapter 6)

4.5. HEATING CAPACITY TABLE

	Outdoor Unit Inlet air WB (ºC)	Indoor Unit Inlet air DRY BULB temperature (ºC)											
		16		18		20		22		24		26	
		Capacity	IPT o/u	Capacity	IPT o/u	Capacity	IPT o/u	Capacity	IPT o/u	Capacity	IPT o/u	Capacity	IPT o/u
RASC-5HG8E	-7	8,82	4,66	8,95	4,61	8,95	4,46	9,07	4,41	9,20	4,31	9,32	4,21
	-5	10,36	4,59	10,50	4,54	10,64	4,40	10,78	4,26	10,78	4,21	10,92	4,16
	0	11,76	4,87	11,90	4,78	12,04	4,73	12,18	4,59	12,32	4,54	12,46	4,44
	5	13,30	5,20	13,44	5,11	13,58	5,01	13,72	4,97	13,72	4,82	13,86	4,78
	10	14,70	5,49	14,84	5,44	14,98	5,34	15,12	5,25	15,26	5,20	15,40	5,06
	15	16,24	5,82	16,38	5,77	16,52	5,58	16,66	5,53	16,80	5,44	16,80	5,39
RASC-10HG8E	-7	17,64	8,76	17,92	8,66	18,00	8,38	18,28	8,28	18,56	8,10	18,84	7,91
	-5	18,70	8,61	18,98	8,52	19,07	8,25	19,35	7,99	19,63	7,90	19,91	7,81
	0	21,36	9,14	21,64	8,97	21,73	8,88	22,01	8,61	22,29	8,52	22,57	8,34
	5	24,02	9,77	24,30	9,59	24,39	9,41	24,67	9,32	24,95	9,05	25,23	8,97
	10	26,68	10,30	26,96	10,21	27,05	10,03	27,33	9,86	27,61	9,77	27,89	9,50
	15	29,34	10,92	29,62	10,84	29,71	10,48	29,99	10,39	30,27	10,21	30,55	10,12

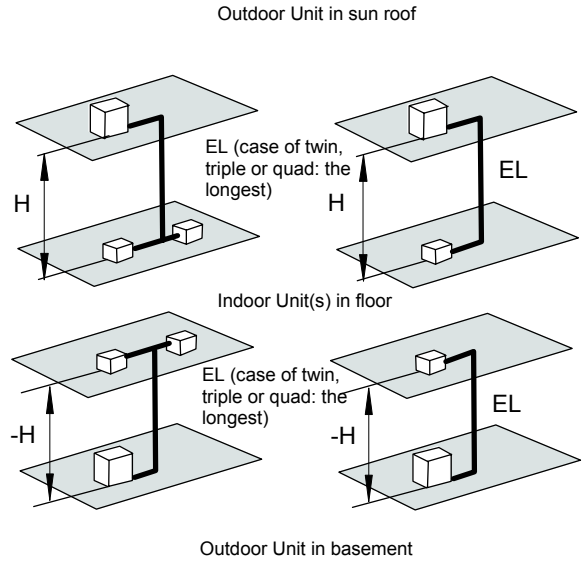
$IPT_{O/U}$: Input power of outdoor unit (indoor unit input power can be read on chapter 6)

NOTE:
Defrost factor is included.

4.6. CORRECTION FACTORS

4.6.1. CORRECTION FACTORS DUE TO PIPING LENGTH

Correction Factor is based on the equivalent piping length in meters (EL) and the vertical distance between Indoor and Outdoor Unit in meters (H).



H: Vertical Distance between Indoor Unit and Outdoor Unit in Meter (m).

NOTE:

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).

EL: Equivalent Total Distance between Indoor Unit and Outdoor Unit in Meter (Equivalent one-way Piping Length L (m)).

NOTE:

One 90° elbow is equivalent to 0.5m.

One 180° bend is equivalent to 1.5m.

One distributor branch is the equivalent to 0,5 m

For twin, Triple and Quad connection:

L= the longest distance.

■ For cooling capacity

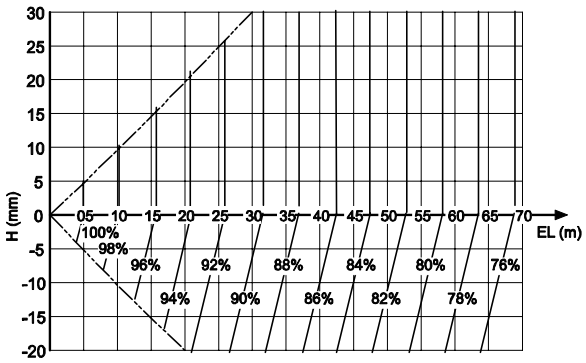
The cooling capacity should be corrected according the following formula:

TCA= Capacity x F

TCA: Actual Corrected Cooling Capacity (kW).

Capacity: Cooling Capacity in the Cooling Capacity table (kW).

F: Correction Factor based on the Equivalent Piping Length (in %).



■ For Heating Capacity

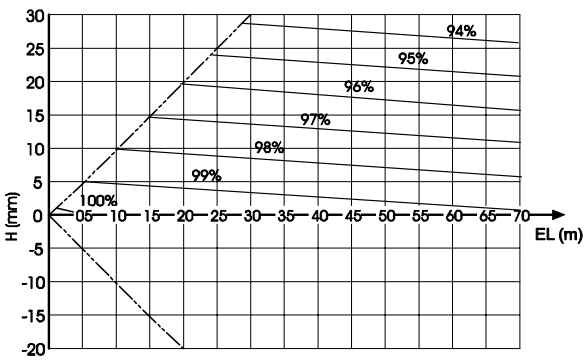
The heating capacity should be corrected according to the following formula:

THA= Capacityx F

THA: Actual Corrected Heating Capacity (kW)

Capacity: Heating Capacity in the Performance table (kW)

F: Correction Factor Based on the equivalent Piping Length (in %).



4.6.2. SENSIBLE HEAT FACTOR

The sensible heat factor of Indoor Units at each fan speed (Hi, Me, Lo) based on the JIS Standard B8616, is given below:

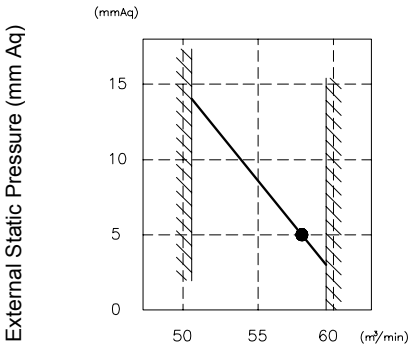
Indoor Unit Model	SHF		
	Hi	Me	Lo
RCI-1.5FSN1E	0.77	0.75	0.73
RCI-2.0FSN1E	0.78	0.76	0.75
RCI-2.5FSN1E	0.73	0.71	0.69
RCI-3.0FSN1E	0.79	0.76	0.72
RCI-4.0FSN1E	0.78	0.75	0.72
RCI-5.0FSN1E	0.74	0.70	0.68
RCI-6.0FSN1E	0.73	0.69	0.68
RCD-1.5FSN	0.73	0.69	0.66
RCD-2.0FSN	0.75	0.67	0.65
RCD-2.5FSN	0.74	0.67	0.65
RCD-3.0FSN	0.74	0.67	0.65
RCD-4.0FSN	0.73	0.67	0.65
RCD-5.0FSN	0.69	0.67	0.65
RPC-2.0FSNE	0.72	0.70	0.67
RPC-2.5FSNE	0.72	0.70	0.67
RPC-3.0FSNE	0.72	0.70	0.67
RPC-4.0FSNE	0.72	0.70	0.67
RPC-5.0FSNE	0.72	0.70	0.67
RPC-6.0FSNE	0.72	0.70	0.67
RPK-1.5FSN1M	0.73	0.72	0.70
RPK-0.8FSNM	0.73	0.72	0.70
RPK-1.0FSNM	0.73	0.72	0.70
RPK-1.5FSNM	0.73	0.72	0.70
RPK-2.0FSNM	0.72	0.72	0.70
RPK-2.5FSNM	0.72	0.72	0.70
RPK-3.0FSNM	0.72	0.71	0.70
RPK-4.0FSNM	0.72	0.71	0.70
RPI-0.8FSNE	0.81	0.69	0.69
RPI-1.5FSNE	0.73	0.69	0.65
RPI-2.0FSNE	0.76	0.75	0.74
RPI-2.5FSNE	0.76	0.74	0.72
RPI-3.0FSNE	0.75	0.71	0.67
RPI-4.0FSNE	0.73	0.71	0.65
RPI-5-0FSNE	0.72	0.68	0.64
RPI-6.0FSNE	0.72	0.69	0.67
RPF-1.5FSNE	0.73	0.69	0.65
RPF-2.0FSNE	0.73	0.69	0.65
RPF-2.5FSNE	0.73	0.69	0.65
RPFI-1.5FSNE	0.73	0.69	0.65
RPFI-2.0FSNE	0.73	0.69	0.65
RPFI-2.5FSNE	0.73	0.69	0.65

4.7. FAN PERFORMANCE CURVE

Outdoor unit could be installed using ducts at inlet and outlet air.
Refer to fan performance curve, in order to ensure that the air volume is within working range.

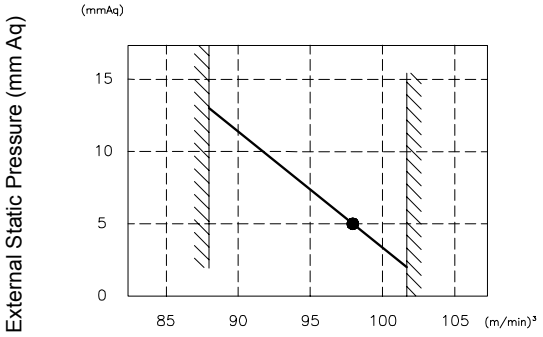
It's assumed that unit will be installed using supply and return air ducts. Find below fan performance curve to decide which ducts are suitable

RASC-5HG8E



Air flow (m³/min)
• Nominal Point

RASC-10HG8E



Air flow (m³/min)
• Nominal Point

NOTE:

- When design a duct, check to ensure that the Air volume is within working range as indicate "Fan Performance Curve"
- If the Air volume is set outside working range, water-carry-over (drop in the ceiling or into the room), noise increases, fan motor damaged (high temperature), insufficient Cooling/Heating capacity, phenomena can occur.
- Therefore design ducts and select the correct fan speed in order to keep the unit running in the accepted working range selected.

■ Specific installation comment for **RASC-5HG8E**:

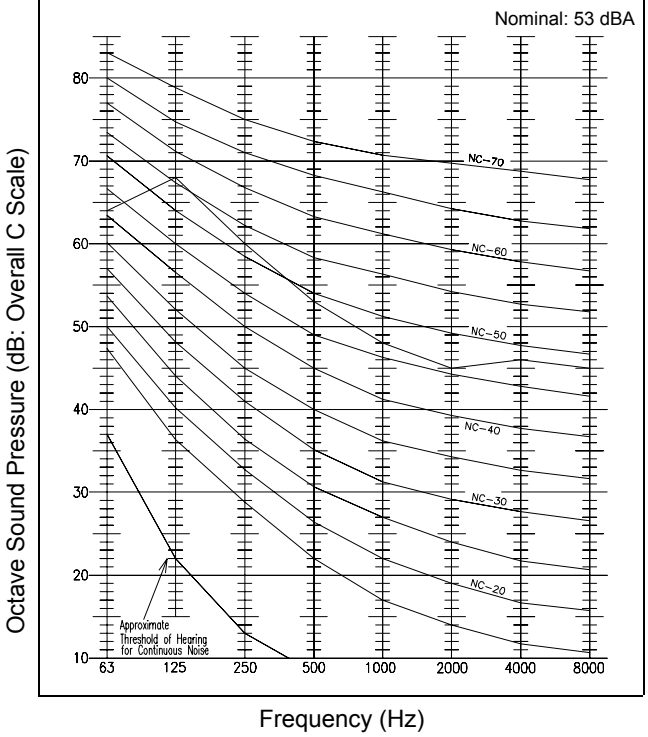
- It's recommended to set up ducting work in order to keep static pressure around 10mmAq. If measuring static pressure or airflow is not available, measuring ampers can give and idea of working point. As a reference, at Pst = 0mmAq is 5.4 A, and at Pst = 10mmAq is 4.65 A approximately (only approximated since motor temperature, voltage will affect Amps measurement).

  If installation requires short and straight ducts (Pst ≤3mmAq) installation, whistle air sound could appear. in order to avoid this situation it's advisable to close suction air inlet on outdoor unit (half of suction air inlet closed, for example)

4.8. SOUND DATA

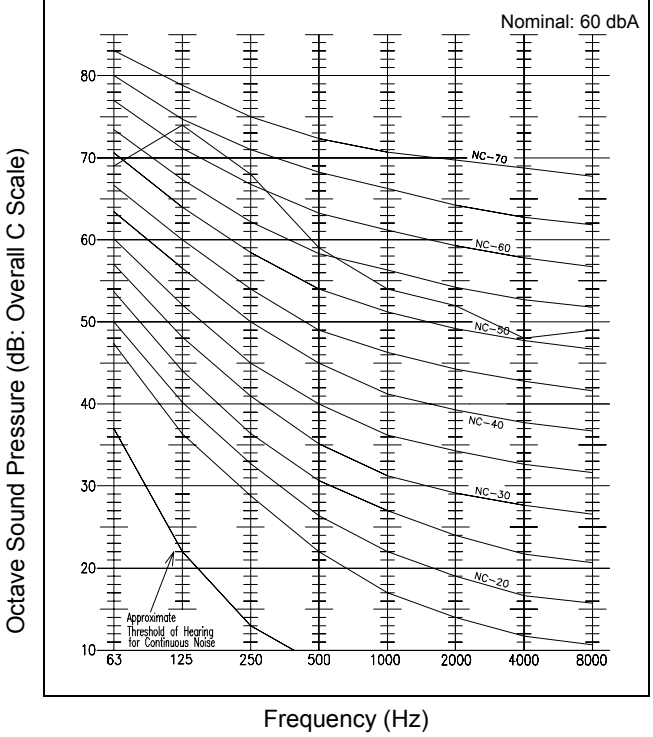
Model: RASC-5HG8E	**Power supply:** 400V 50Hz
Measurement point: 3 Meter from the unit front surface	

Noise Criteria Curve

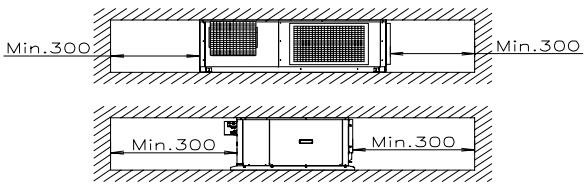


Model: RASC-10HG8E	**Power supply:** 400V 50Hz
Measurement point: 3 Meter from the unit front surface	

Noise Criteria Curve



4.9. OPERATION SPACE



NOTE:
For more information about operation space see the Chapter – Units Installation.

5 WORKING RANGE

For Indoor Units data refer to TCGB0033 about HITACHI UTOPIA G8 Series.

CONTENTS

5 WORKING RANGE 1
5.1. Power supply 2
5.2. Temperature Range 2
5.3. Refrigerant Piping Length 3

5.1. POWER SUPPLY

Working Voltage	90% to 110% of the Rated Voltage
Voltage Imbalance	Within a 3% Deviation from Each Voltage at the Main Terminal of Outdoor Unit
Starting Voltage	Higher than 85% of the Rated Voltage

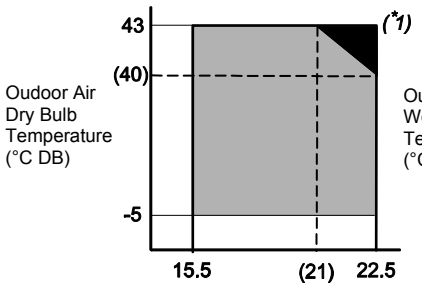
Following the Council Directive 89/336/EEC and its amendments 92/31/EEC and 93/68/EEC, relating to electromagnetic compatibility, next table indicates maximum permissible system impedance Z_{max} at the interface point of the user's supply, in accordance with EN61000-3-11.

MODEL	Zsource (Ω)
RASC-5HG8E	0.21
RASC-10HG8E	0.12

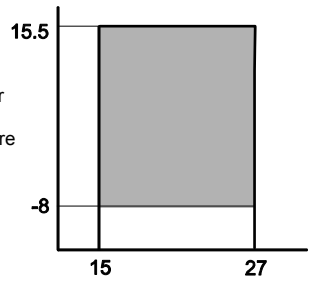
5.2. TEMPERATURE RANGE

		Cooling Operation	Heating Operation
Indoor Temperature	Minimum	21 ºC DB / 15.5 ºC WB	15ºC DB
	Maximum	32 ºC DB / 22.5 ºC WB	27ºC DB
Outdoor Temperature	Minimum	-5 ºC DB	-8 ºC WB
	Maximum	43 ºC DB	15.5 ºC WB

Cooling Operation



Heating Operation



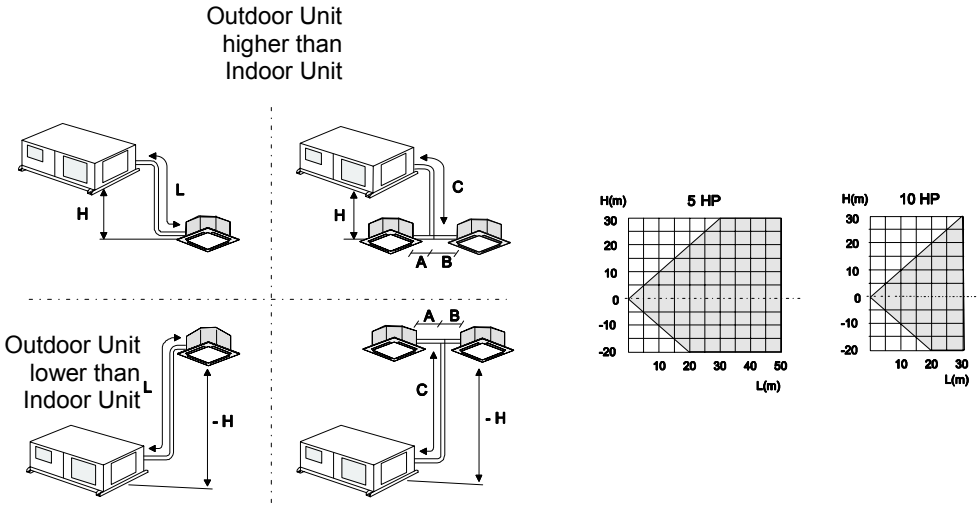
NOTE:

- *If the RASC-10 unit Ducts are designed for working over 9mmAq. External Static Pressure, cooling operation in shadowed area (*1) is out of working range.*
- *In the case of combining the RASC-10 unit with a RPI-10HP unit, design indoor Ducts for working over 15mmAq. External Static Pressure (do not use indoor unit High Static Pressure setting), otherwise cooling operation in shadowed area (*1) is out of working range.*

5.3. REFRIGERANT PIPING LENGTH

The refrigerant piping length between the Indoor Unit and the Outdoor Unit must be designed according to Chapter 9.5.1

The graphic indicates the maximum distances in height (H) and length (L) between Indoor and Outdoor Units according to the Outdoor Unit Power.



Distance between Indoor and Outdoor Units

6 ELECTRICAL DATA

For Indoor Units data refer to TCGB0033 about Hitachi Utopia G8 Series.

CONTENTS

6 ELECTRICAL DATA _____ 1
6.1. Electrical data for RASC-5/10-HG8E _____ 2

6.1. ELECTRICAL DATA FOR RASC-5/10-HG8E

Model	Unit Main Power			Applicable Voltage		Compressor Motor						Outdoor Fan Motor		Maximum Current	
	U	PH	HZ	Max.	Min.	PH	STC	Cooling Operation		Heating Operation		$RNCF_F$	$IPTF_F$	Cool (A)	Heat (A)
								RNC_C	$IPTC_C$	RNC_C	$IPTC_C$				
RASC-5HG8E	400	3	50	457	342	3	67	7.8	4.63	7.3	4.36	5.7	0.86	10.5	9.9
RASC-10HG8E							109	17.3	9.82	13.3	7.52	6.3	1.20	23.4	17.9

U: Supply Voltage (V)
Hz: Frequency (Hz)
STC: Starting Current (A)
RNCc: Running Current Compressor (A)
RNCF: Running Current Fan (A)
IPTc: Input Power Compressor (kW)
IPTF: Input Power Fan (kW)
PH: Phase (Φ)

NOTE:
This data is based on the same conditions as the nominal capacity conditions. Refer to the notes of the Unit General Data.
Specifications in these tables are subject to change without notice in order that HITACHI may bring the latest innovations to their customers.

7 ELECTRICAL WIRING DIAGRAMS

For Indoor Units data refer to TCGB0033 about Hitachi UTOPIA G8 Series.

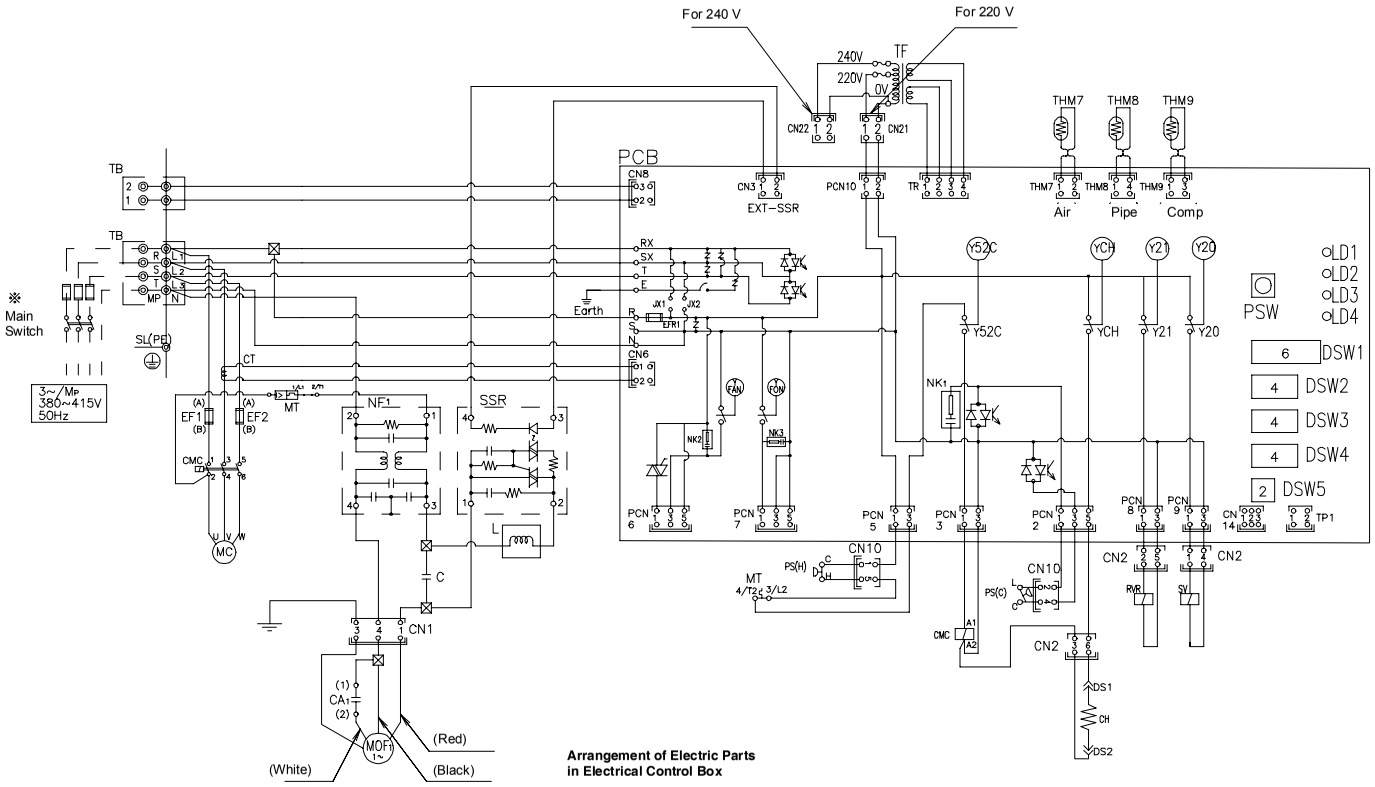
CONTENTS

7 ELECTRICAL WIRING DIAGRAMS _____ 1

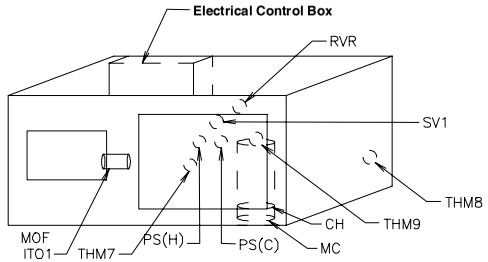
7.1 Electrical Wiring Diagram for RASC-5HG8E_____ 3

7.2 Electrical Wiring Diagrams for RASC-10HG8E_____ 4

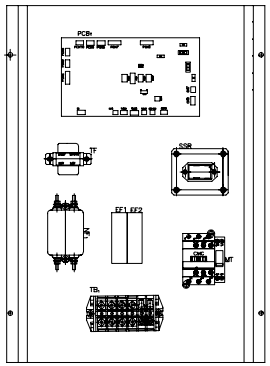
7.1. ELECTRICAL WIRING DIAGRAM FOR RASC-5HG8E



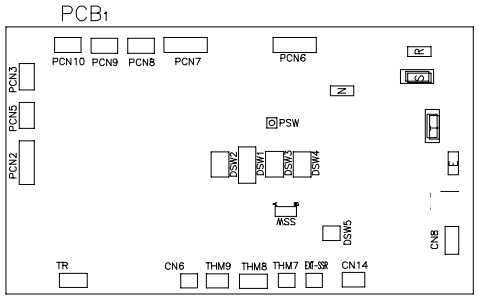
Arrangement of Electric Parts in Electrical Control Box



Arrangement of Electric Parts in Electrical Control Box



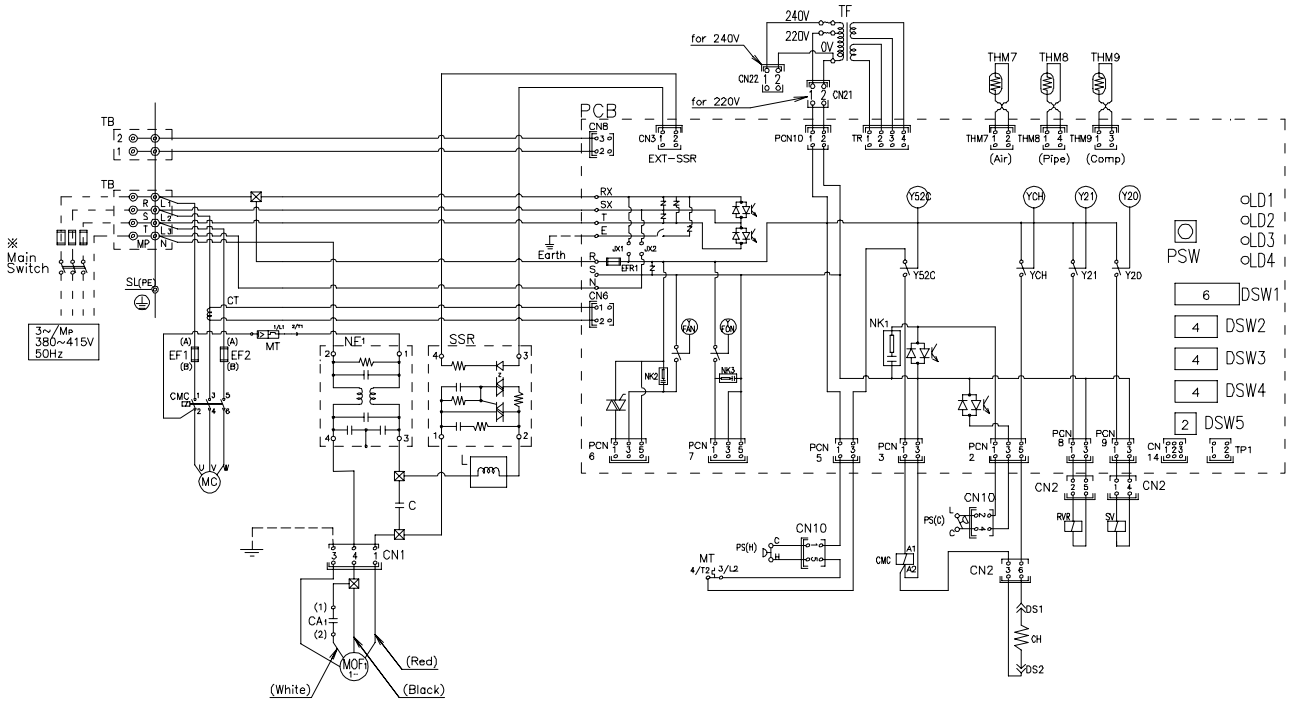
Location of connectors on PCB



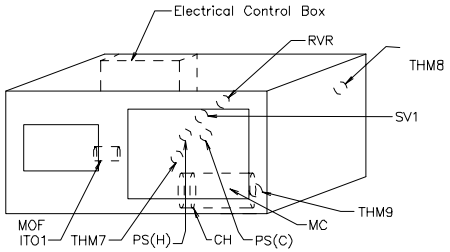
Mark	Part Name	Remarks
CA 1	Capacitor for Outdoor Fan	
CH	Crankcase Heater	
CMC	Contactor for Compressor Motor	
CN 20~22	Connector	
DS 1,2	Inserting Type Connector	
DSW1	Test Operation an Option Function Settings	On PCB
DSW2	Factory Fixed Settings	On PCB
DSW3	Capacity Settings	On PCB
DSW4	Refrigerant Cycle no. Settings	On PCB
DSW5	Transmitting Settings	On PCB
EF 1,2	Fuses	
ITO 1	Internal Thermostat for Outdoor Fan Motor	Built in MOF 1
LED 1~4	Alarm Code LEDs -See subchapter 9.2.1- LEDs	4-bits
MC	Motor Compressor	
NF1	Noise Filter	
MOF 1	Motor for Outdoor Fan	
PCB	Printed circuit board	
PS(C)	Pressure Switch (Control)	
PS(H)	Pressure Switch (High)	
PSW	Unconditional Defrosting Dwitch (Push Switch)	On PCB
R	Resistor	
RVR	Reversing valve Relay	Heat Pump Only
SV	Solenoid Valve for Gas By-pass	
TB	Terminal Board	
TF	Transformer	
THM7	Thermistor for Outdoor Unit	
THM8	Thermistor for piping	
THM9	Thermistor for Upper Part of Compressor	
Y52C	Auxiliary Relay for Compressor	DC Coil
YCH	Auxiliary Relay for Heater	DC Coil
Y21	Auxiliary Relay for Reversing valve Relay	DC Coil
Y20	Auxiliary Relay for Solenoid Valve	DC Coil
MT	Magnetic and thermal circuit Breaker	
	Terminals	
	Closed-end Connector	
	Field Supplied	
— · · — · ·	Field Wiring	
- - - - - -	Earth Wiring	
———	Factory Wiring	

***NOTE**: All the field wiring equipment must comply with local codes*

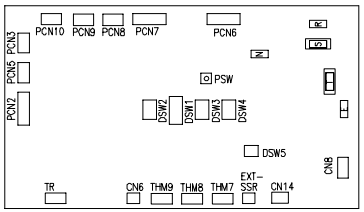
7.2. ELECTRICAL WIRING DIAGRAM FOR RASC-10HG8E



Arrangement of Electric Parts in Electrical Control Box

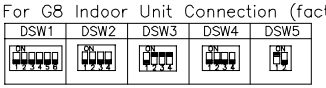


Location of connectors on PCB



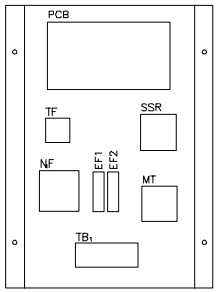
Setting Position of Dip Switch DSW1, DSW2, DSW3, DSW4 and DSW5

For G8 Indoor Unit Connection (factory setting)



This side of the maked ■ indicates the DIP Switch Position.

Arrangement of Electric Parts in Electrical Control Box



Mark	Part Name	Remarks
CA 1	Capacitor for Outdoor Fan	
CH	Crankcase Heater	
CMC	Contactor for Compressor Motor	
CN 20~22	Connector	
DS 1,2	Inserting Type Connector	
DSW1	Test Operation an Option Function Settings	On PCB
DSW2	Factory Fixed Settings	On PCB
DSW3	Capacity Settings	On PCB
DSW4	Refrigerant Cycle no. Settings	On PCB
DSW5	Transmitting Settings	On PCB
EF 1,2	Fuses	
ITO 1	Internal Thermostat for Outdoor Fan Motor	Built in MOF 1
LED 1~4	Alarm Code LEDs -See subchapter 9.2.1- LEDs	4-bits
MC	Motor Compressor	
NF1	Noise Filter	
MOF 1	Motor for Outdoor Fan	
PCB	Printed circuit board	
PS(C)	Pressure Switch (Control)	
PS(H)	Pressure Switch (High)	
PSW	Unconditional Defrosting Dwitch (Push Switch)	On PCB
R	Resistor	
RVR	Reversing valve Relay	Heat Pump Only
SV	Solenoid Valve for Gas By-pass	
TB	Terminal Board	
TF	Transformer	
THM7	Thermistor for Outdoor Unit	
THM8	Thermistor for piping	
THM9	Thermistor for Upper Part of Compressor	
Y52C	Auxiliary Relay for Compressor	DC Coil
YCH	Auxiliary Relay for Heater	DC Coil
Y21	Auxiliary Relay for Reversing valve Relay	DC Coil
Y20	Auxiliary Relay for Solenoid Valve	DC Coil
MT	Magnetic and thermal circuit Breaker	
	Terminals	
	Closed-end Connector	
※	Field Supplied	
— · · — · ·	Field Wiring	
- - - - - -	Earth Wiring	
———	Factory Wiring	

NOTE: *All the field wiring equipment must comply with local codes*

8 REFRIGERANT CYCLE

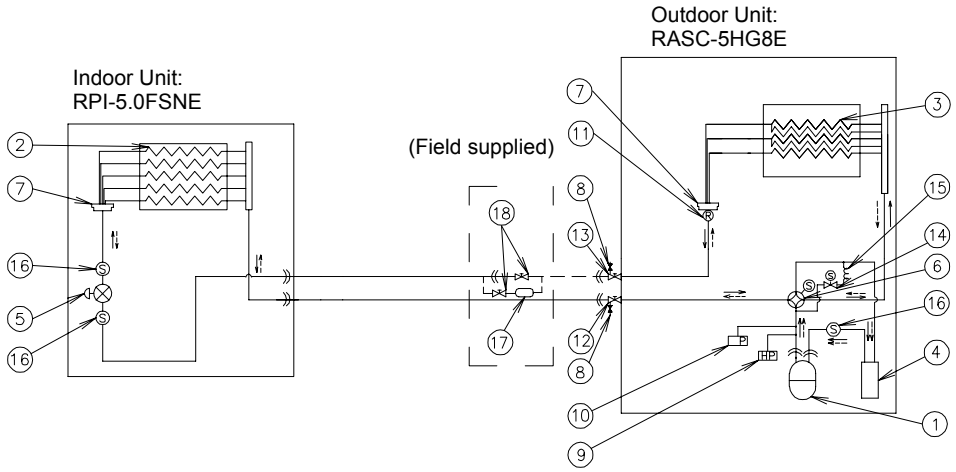
This chapter describes the Refrigerant Cycle and shows the main parts of the system for the possible configurations of the new Hitachi UTOPIA G8 Series.

CONTENTS

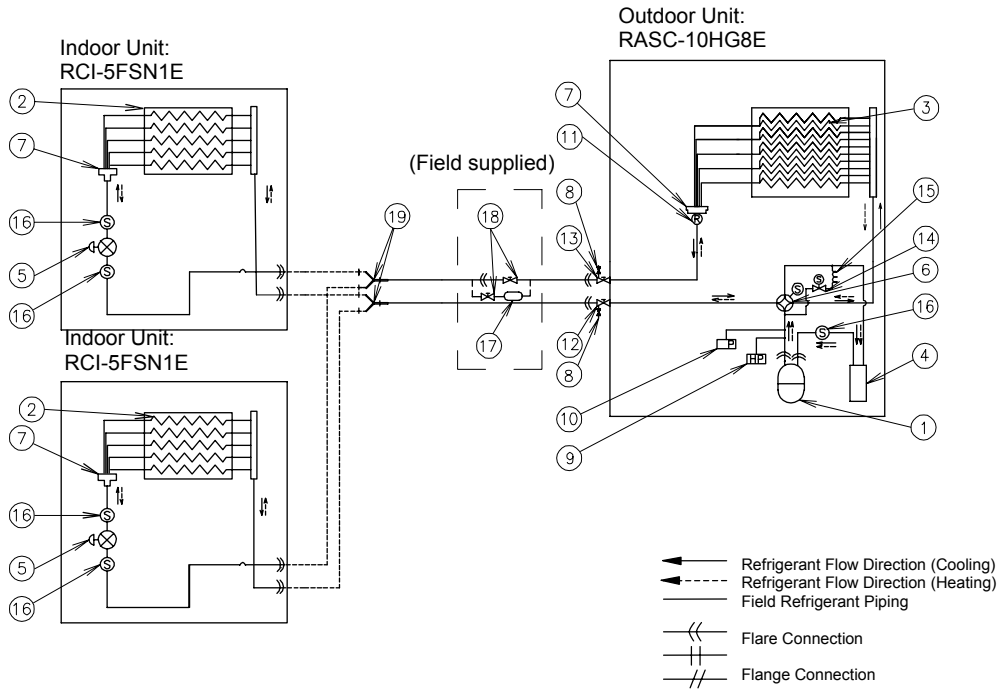
8 REFRIGERANT CYCLE _____ 1
8.1. Refrigerant Cycle RASC-5/10HG8E _____ 2

8.1. REFRIGERANT CYCLE RASC-5/10HG8E

■ SINGLE UNIT



■ TWIN UNITS



No.	Part Name
1	Compressor
2	Indoor Heat Exchanger
3	Outdoor Heat Exchanger
4	Accumulator
5	Expansion valve
6	Reversing Valve
7	Distributor
8	Check Joint
9	Pressure Switch (High)
10	Pressure Switch (Gas Bypass)

No.	Part Name
11	Restrictor
12	Stop Valve (Gas Line)
13	Stop Valve (Liquid Line)
14	Solenoid Valve (Gas Bypass)
15	Capillary Tube (Gas Bypass)
16	Strainer
17	Filter dryer (Field Spplied)
18	Ball Valve (Field Supplied)
19	Branch Pipe

9 REFRIGERANT PIPING AND REFRIGERANT CHARGE

This chapter describes the way to connect and to change the refrigerant quantity in the system. For Indoor Units data refer to TCGB0033 about Hitachi Utopia G8 Series.

CONTENTS

9 REFRIGERANT PIPING AND REFRIGERANT CHARGE 1
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9.2. Three principles on Refrigerant Piping Work 3
9.3. Suspension of Refrigerant Piping 4
9.4. Piping connection for RASC-5/10HG8E 4
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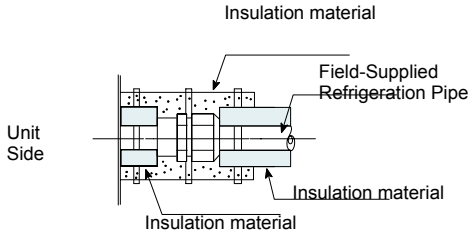
9.1. PIPING MATERIALS

1. Prepare locally-supplied copper pipes.
2. Select the piping size with the correct thickness and correct material which can have sufficient pressure strength, considering that R407C pressure is higher than R22. The sub-chapter 10.13 shows the required pipe.
3. Select clean copper pipes. Make sure there is not dust and moisture inside. Blow the inside of the pipes 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 Knockout hole and refrigerant pipes by using insulation material as shown bellow:
5. It is recomended Insulate the unions and flare-nuts at the piping connections completely. Cover the liquid piping and gas piping with field-supplied thermal insulator completely to avoid decreasing of performance and dewing on the surface of the pipe.

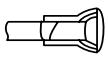


NOTE:

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

CAUTION:

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

Correct	Incorrect
	

- *If piping installation is not completed until next day or over a longer period of time, braze off the ends of the piping and charge with oxygen free nitrogen through a Schrader valve type access fitting to prevent moisture and particle contamination.*
- *Do not use insulation material that contents NH3 because can damage cooper pipe material and can be a source of future leakage*

9.2. THREE PRINCIPLES ON REFRIGERANT PIPING WORK

In case of the refrigeration cycle with new refrigerant R407C, refrigeration oil should be of synthetic type. Therefore, the oil absorbs moisture quickly when compared with R22 systems and it will cause sludge and oxidation of the oil.

Due to this reason, pay much careful attention to basic piping work control to avoid infiltration of moisture or dusts during refrigerant piping work.

Three Principles	Cause of failure	Presumable Failure	Preventive Action
1. Dry Keep good dryness	Water Infiltration due to insufficient protection at pipe ends. Dewing inside of Pipes Insufficient Vacuum Pumping Time	Icing Inside Tube at Ex. Valve (Water Choking) + Generation of Hydration and Oxidation of Oil ⇩ Clogged Strainer, etc., Insulation Failure and Compressor Failure	Pipe Protection ⇩ 1 Pinching 2 Taping Flushing ⇩ Vacuum Drying One gram of water turns into gas (approx. 1000 lrs) at 1 Torr. Therefore, it takes long time to vacuum-pump by a small vacuum pump
2. Clean No dusts Inside of Pipes	Infiltration of Dusts, etc. from Tube Ends Oxidation Film during Brazing without Blowing Nitrogen Insufficient Flushing by Nitrogen after Brazing	Clogging of Ex. Valve, Capillary Tube and Filter ■ Oxidation of Oil ■ Compressor Failure ⇩ Insufficient Cooling or Heating Compressor Failure	Pipe Protection ⇩ 1 Mounting Caps 2 Taping 3 Pinching Flushing
3. No leakage No leakage shall exist	Brazing Failure Failed Flaring Work and Insufficient Torque of Squeezing Flare Insufficient Torque of Squeezing Flanges	Refrigerant Composition Change, Refrigerant Shortage ■ Performance Decrease ■ Oxidation of Oil ■ Overheating of Compressor ⇩ Insufficient Cooling or Heating Compressor Failure	Careful Basic Brazing Work ⇩ Basic Flaring Work ⇩ Basic Flange Connecting Work ⇩ Air Tight Test ⇩ Holding of Vacuum

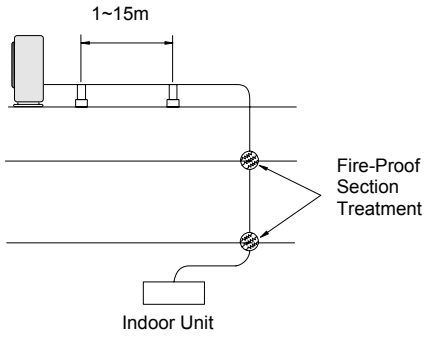
⚠ ***ATTENTION:***

It is recomended to use drier filter for more safety. The filter will absorve the remaining moisture inside refrigerant cycle after finish all vacuum process indicated in this chapter

Install the field supplied filter drier in the liquid line.

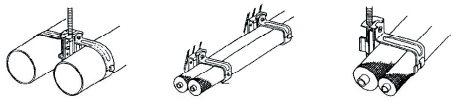
9.3. SUSPENSION OF REFRIGERANT PIPING

Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching the weak part of the building such as wall, ceiling, etc…
(If touched, abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length).



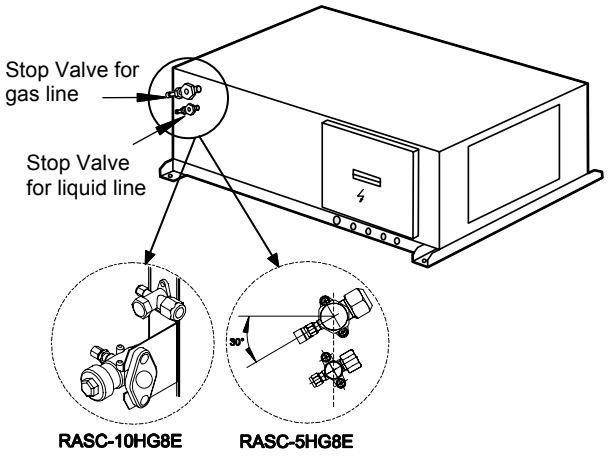
Do not fix the refrigerant piping directly with the metal fittings (The refrigerant piping may expand and contract).
Some examples for suspension method are shown below.

For Suspending Heavies | For Piping Along The Wall | For Instant Installation Work

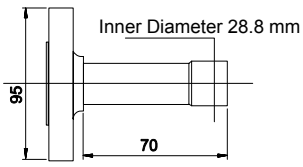


9.4. PIPING CONNECTION FOR RASC-5/10HG8E

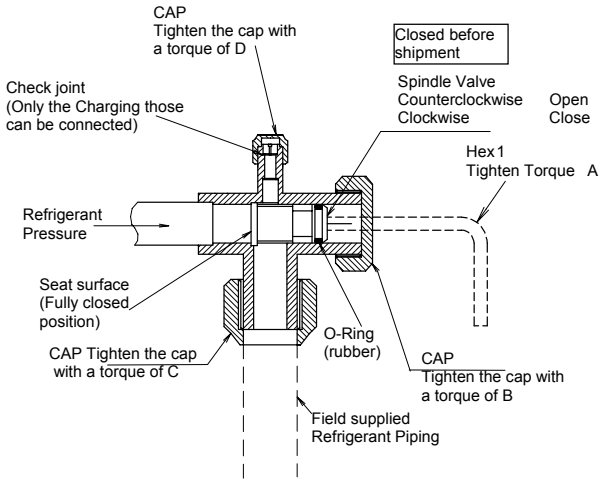
1. Stop Valve are located on rear exterior side of unit. Before connecting refrigerant piping, the protection cover of stop valve must be removed.



2. If the field-supplied piping is connected with stop valves directly, it is recommended to use a tube bender.
3. For gas pipe connection use the factory supplied Flange Pipe (Only for RASC-10HG8E).



3. Operation of stop valve should be performed according to the figure below:



See tighten torque in the next table

Valve (RASC-)		Tighten torque (N.m)				Size (mm)
		A	B	C	D	1
Liquid	5 HP	4	5	34	-	4
	10 HP	13	52	80	6	5
Gas	5 HP	34	6	82	-	6
	10 HP	25	25	-	25	10

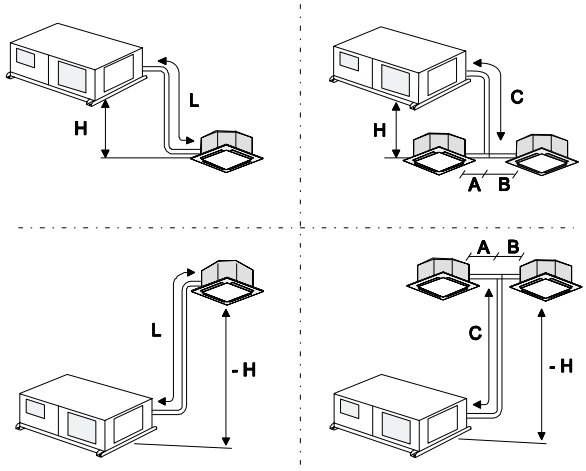
⚠ ***CAUTION:***
- *Do not apply force to the spindle valve at the end of opening (5 N.m or smaller). The back seat construction is not provided.*
- *At the test run, fully open the spindle. If not fully opened, the devices will be damaged.*

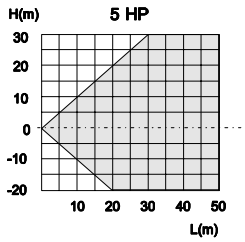
9.5. PIPING AND REFRIGERANT CHARGE

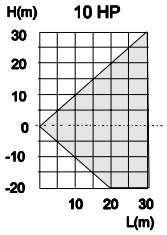
9.5.1. REFRIGERANT PIPING LENGTH

The refrigerant piping between the indoor unit and the outdoor unit should be designed using the following chart. Keep the design point within the dark area of the chart, wich is showing the applicable height difference according to piping length.
Piping length specification

■ The possible combination between Outdoor Unit and Indoor Unit are the following:







	Mark	Maximum Piping Length	
		RASC-5HG8E	RASC-10HG8E
All Units	L(*)	Actual piping length ≤ 50 m Equivalent piping length ≤ 70 m	Actual piping length ≤ 30 m Equivalent piping length ≤ 45 m
Only Twin	A and B	≤ 10 m	≤ 10 m
	A - B	≤ 8 m	≤ 8 m

(*) For twin system: L = C + A or C + B, the longest one.

NOTE:

For twin system install the branch pipe at the location from where the piping length to the indoor units is of equal distance (A = B). However, when different piping lengths from the branch pipe to the indoor units, due
to building construction are required, the difference between the two pipes should be as indicate in above table.

9.5.2. REFRIGERANT PIPING SELECTION

- 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

- Piping connection size of Outdoor Unit, Indoor Unit & Distributor

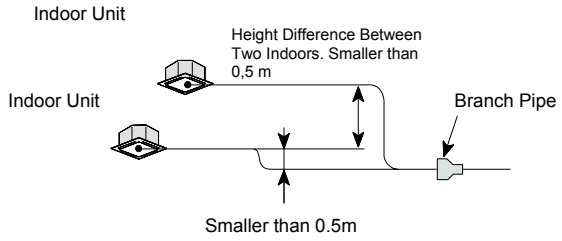
Outdoor Unit HP	Gas piping Size "C" (mm)	Liquid piping Size "C" (mm)	Distributor		
			Twin	Triple	Quad
5	19.05 (3/4)	9.53 (3/8)	TE-56	TRE-06	-
10	28.6 (1-1/8)	15.88 (5/8)	TE-10	TRE-10	QE-810

9.5.3. TWIN, TRIPLE AND QUAD SYSTEM INSTALLATION

■ Height Difference Between Indoor Units and Distributor

Install all indoor units at the same height. When the height difference between the indoor units due to building construction is necessary, this should be less than 0,5 meters. Install the branch pipe at the same height of indoor units or lower, but never higher.

Sample: Twin system

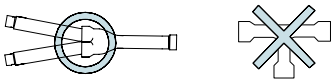


■ Installing Distributor

1. Install the Distributor supplied by HITACHI on request

A tee can not be installed instead of a branch pipe.

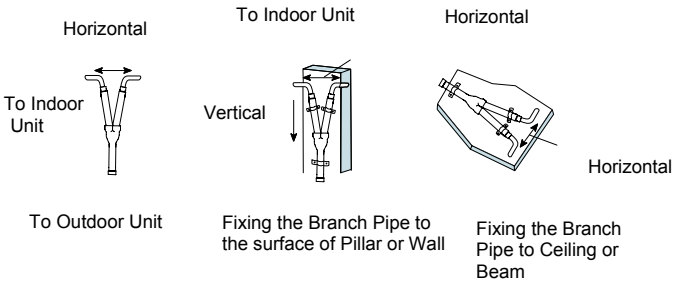
Sample: Twin System



2. Installing the Distributor.

Fix the branch pipe horizontally to the pillar, wall or ceiling. Piping must not be fixed rigidly to the wall as thermal expansion and contraction can cause pipe fracture.

Sample: Twin System

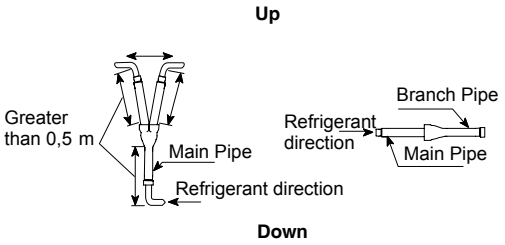


NOTE:

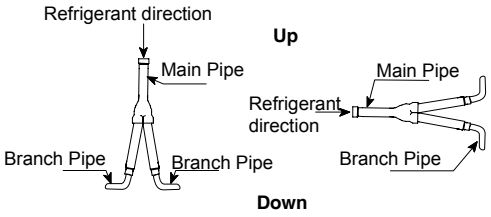
Fix the piping from outside of insulation or inserting absorber between the pipe and a fixing metal.

3. Correct position of twin distributor

▪ This is the correct position of twin Branch Pipe:



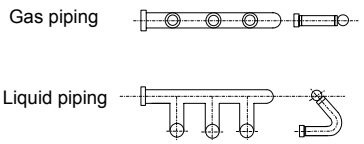
▪ This is wrong position.



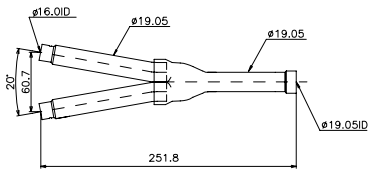
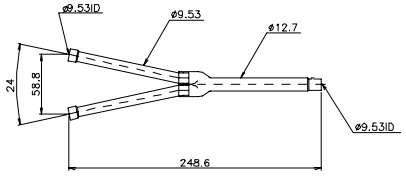
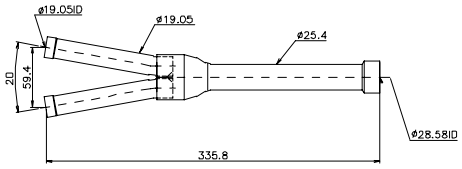
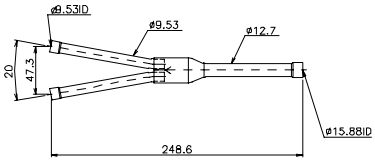
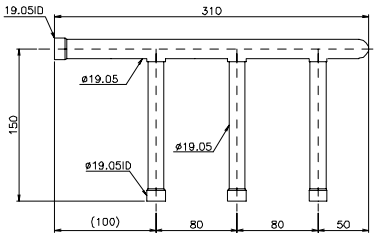
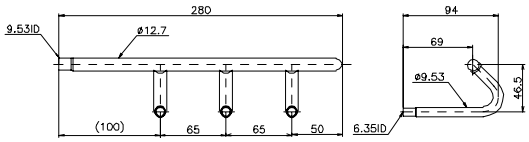
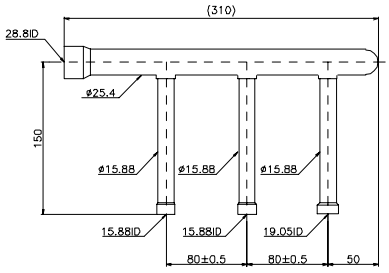
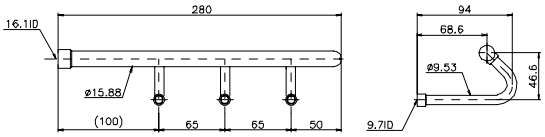
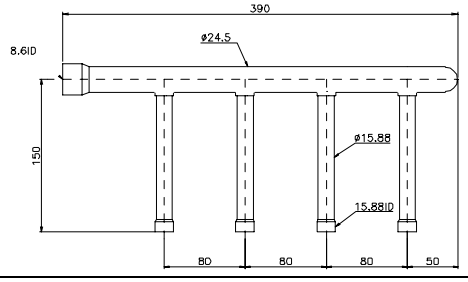
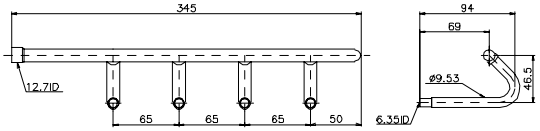
4. Correct position of Triple and Quad Distributor.

▪ Install the header horizontally

Sample: Triple Branch pipe



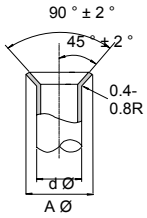
9.5.4. BRANCH PIPES

	GAS LINE	LIQUID LINE
TE-56		
TE-10		
TRE-06		
TRE-10		
QE-810		

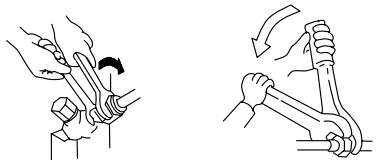
9.5.5. TIGHTENING FLARE NUTS

1. Flaring connections (smaller than a diameter of Ø19.05) are generally used. However, if incorrect flaring is performed, it will cause serious refrigerant leakage.
2 Shape after Flaring, it should be rectangular and flat, and no uneven thickness, cracks and scratches should exist.

Nominal Dia.	Tube Dia. Ød	Dimension A $^{+0.0}_{-0.4}$
1/4	6.35	9.00
3/8	9.52	13.00
1/2	12.70	16.20
5/8	15.88	19.40
3/4	19.05	23.30



When tightening the flare nuts, use two spanners, as shown in the figure.

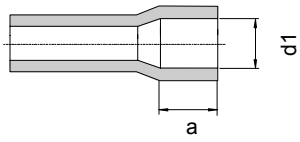


The required tightening torque is as follows:

Pipe Size	Tightening Torque (Nm)
Ø 6.35 mm	20
Ø 9.53 mm	40
Ø 15.88 mm	80
Ø 19.5 mm	100

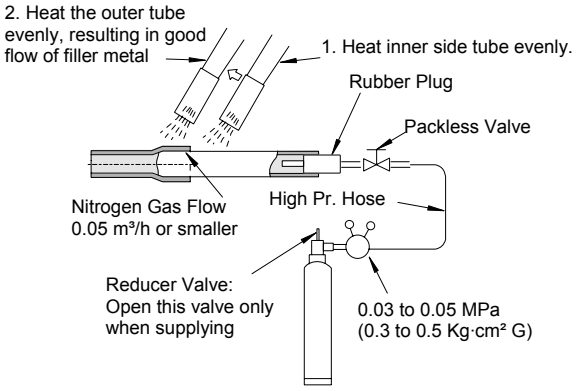
9.5.6. BRAZING WORK

1. The most important work in the refrigerant piping work is brazing work. If leakage due to careless mistakes hydration generation accidentally occurs, it will cause clogged capillary pipes or serious compressor failure.
2. Pipe Dimensions after Expanding.It is important to control the clearance of the pipe fitting portion as shown below. In the case that a cooper tube expansion jig is used, the following dimensions should be secured.



Cooper Tube Size	Ø d1	Gap	a	Cooper Tube Size	Ø d1	Gap	a
$^{+0.08}_{-0.08}$ Ø6.35	$^{+0.1}_{0}$ Ø6.5	0.33 / 0.07	6	$^{+0.09}_{-0.09}$ Ø22.22	$^{+0.1}_{0}$ Ø22.42	0.39 / 0.11	10
$^{+0.08}_{-0.08}$ Ø9.53	$^{+0.1}_{0}$ Ø9.7	0.35 / 0.09	8	$^{+0.12}_{-0.12}$ Ø25.4	$^{+0.1}_{0}$ Ø25.6	0.42 / 0.08	12
$^{+0.08}_{-0.08}$ Ø12.7	$^{+0.1}_{0}$ Ø12.9	0.38 / 0.19	8	$^{+0.12}_{-0.12}$ Ø28.58	$^{+0.1}_{0}$ Ø28.78	0.42 / 0.08	12
$^{+0.09}_{-0.09}$ Ø15.88	$^{+0.1}_{0}$ Ø16.1	0.41 / 0.13	8	$^{+0.12}_{-0.12}$ Ø31.75	$^{+0.1}_{0}$ Ø32.0	0.47 / 0.13	12
$^{+0.09}_{-0.09}$ Ø19.05	$^{+0.1}_{0}$ Ø19.3	0.44 / 0.16	10	$^{+0.12}_{-0.12}$ Ø38.1	$^{+0.1}_{0}$ Ø38.3	0.52 / 0.18	14

A basic brazing method is shown below.

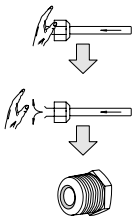


ATTENTION:

- *Use nitrogen gas for blowing during pipe brazing. If oxygen, acetylene or fluorocarbon gas is used, it will cause an explosion or poisonous gas.*
- *A lot of oxidation film will occur inside of tubes if no nitrogen gas blowing is performed during brazing work. This film will be flecked off after operation and will circulate in the cycle, resulting in clogged expansion valves, etc. This will cause bad influence to the compressor.*
- *Use a reducer valve when nitrogen gas blowing is performed during brazing. The gas pressure should be maintained within 0.03 to 0.05 Mpa. If a excessively high pressure is applied to a pipe, it will cause an explosion.*

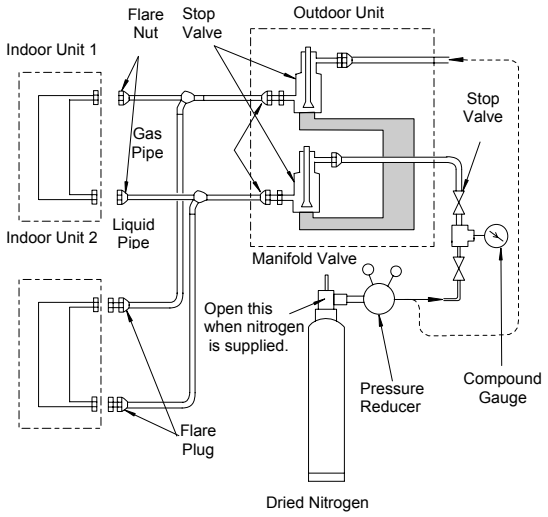
9.5.7. FLUSHING REFRIGERANT PIPES

It is required to remove Oxidation Film, Moisture or Dusts in case of insufficient Nitrogen Blow during Brazing, or Careless Handling of Tubes.



Release the pressure at a time after the hand can not close due to the pipe and pressure.

Attach a flare plug and close the end until flushing work is completely performed.



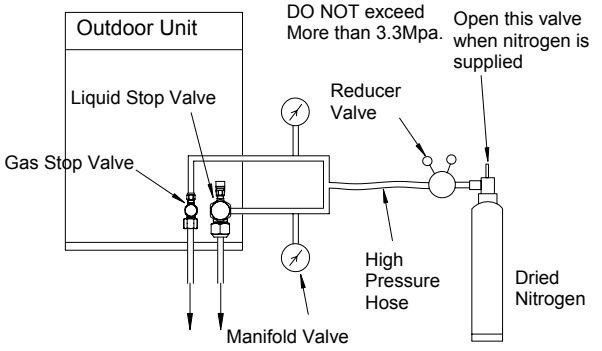
- Open the stop valve of a nitrogen cylinder and increase the pressure up to 5 bar through a reducer valve.
- Check to ensure that nitrogen gas is discharged from de service port in the outdoor unit.
- FLUSHING: Perform flushing work for the pipes to the indoor units one by one
- Close the outlet of the pipe by hand. Release the pressure at a time after the hand can not close the pipe end due to pressure. (first flushing).
- Release the pressure at a time after the hand can not close the pipe end due to pressure. (second flushing).
- Check the contents and quantity of dusts by applying cloth at the end of the pipe at flushing. If slight water is detected, perform a vacuum drying to remove moisture completely.
- Perform the same work for gas piping after liquid piping.

9.5.8. AIR TIGHT PRESURE TEST

After perform the piping work, brazing work and before to change new refrigerant R407C, it is required to check that brazing is completely performed without any leakage after refrigerant pipe brazing. In particular, the new refrigerant R407C, operates in a higher pressures than R22. Therefore, it needs more careful brazing work.

1. Connect a manifold gauge to the check joint an the liquid side and gas side stop valves. Gradually increase the pressure step by step without opening the stop valves.

Step 1	0.5 MPa (~5 kg·cm²)	5 min or over	⇨	able to find small leakage
Step 2	1.5 MPa (~15 kg·cm²)	5 min or over		
⇩				
Step 3	3.3 MPa (~33 kg·cm²)	24 h or over	⇨	able to find fine leakage



Nitrogen gas should be used for an air tight test. If accidentally oxygen or acetylene or fluorocarbon gas is used, it will cause an explosion or poisonous gas.

2. Perform an air tight test with a pressure of 3.3 MPa (= 33 kg·cm²) for R407c holding for 24 hours. If no pressure decrease is observed, it is judged that no leakage exist. If a pressure decrease is observed, check for leakage. However, in the case that there is ambient temperature difference between the pressure applying time and the final check time, perform the following temperature correction, since pressure are different according to an ambient temperature by approx. 0.01 MPa (=0.1 kg·cm²) per 1°C.

   Correction:

   Temp at Pressure Applying Time – (Temp. at Checking Time) x 0.01 MPa (or 0.1 kg·cm²)

Example:

	Pressure	Temperature
When pressure is applied	3.3 MPa (33 kg·cm²) R407c	28°C
After 24 hours	3.25MPa (32.5 kg·cm²) R407c	23°C
Correction	(28-23) x { 0.01=0.05 MPa / 0.1=0.5 kg·cm²	5°C

3. If any leakage is detected locate it as follows:

Check by Listening: Listen to sound from a leakage portion
Check by touching: Check for a leakage portion by touching
Check by foaming agent: Apply foaming agent

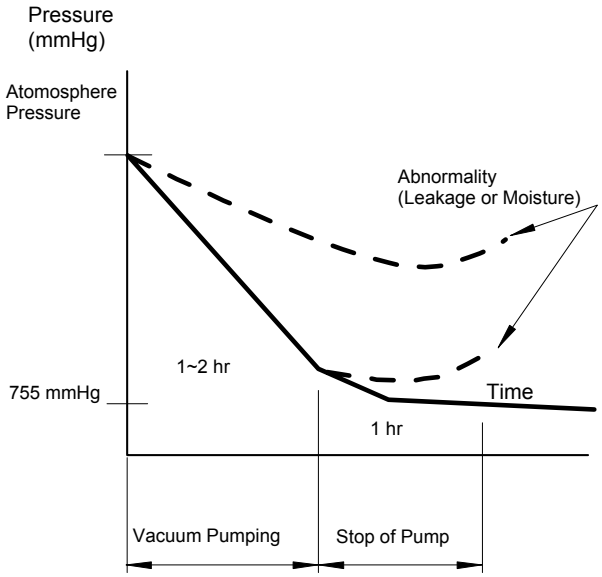
9.5.9. VACUUM DRYING

The purpose of vacuum drying is to dry inside of the refrigeration cycle by decreasing pressures, evaporating moisture and discharging moisture and air from the refrigeration cycle. It is requires to strictly perform vacuum pumping work, due to its characteristics of the refrigerant R407C and lubrication oil. If moisture remains inside of the refrigerating cycle, will cause hydration, resulting in abnormal pressure due to clogging in the refrigeration cycle, also oxidation reaction with synthetic oil will cause insulation deterioration of the compressor motor.

- Perform vacuum pumping until an appropriate vacuum degree is obtained due to its high absorption.
- Use a good vacuum pump, which provides a high vacuum degree performance
- Use a new manifold valve and a charging hose only for the new refrigerant

  Perform vacuum pumping work according to the following procedures.
  1. Check to ensure that the liquid and gas stop valves are completely closed.
  2. Connect a manifold valve, a vacuum pump, a vacuum gauge for the new refrigerant to stop valves.
  3. Operate the vacuum pump for more than 2 hours until.

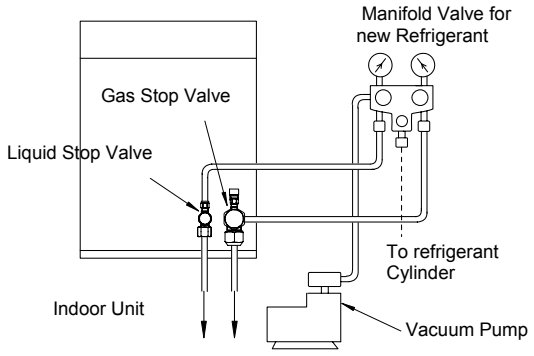
- In the case that the vacuum degree of –755 mmHg is not available, check for any leakage, since a leakage or existence of moisture is suspected.
  After the check, operate the vacuum pump more than one hour.



- **Evaporation of water**

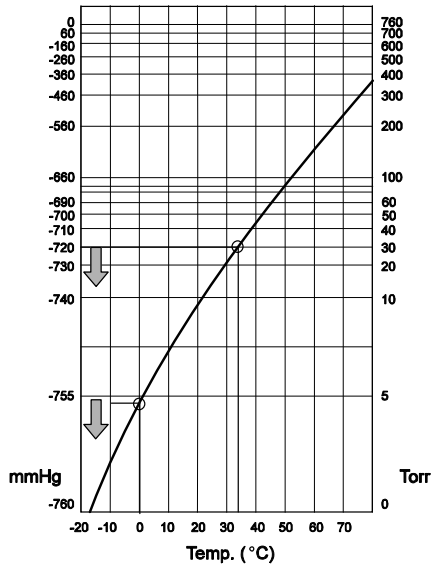
  Water boiling temperature is 100 °C under atmosphere. However, boiling point decreases when vacuum degree is increased.
  Therefore, the higher vacuum degree is, the higher vacuum drying is available.

  In the case that dewing inside piping is suspected, it is not easy to obtain the high vacuum degree due to dew evaporation and it requires to control the degree strictly. It is preferable to obtain a vacuum degree of –755 mmHg (5 to 2 Torr).



■ Check of vacuum degree

The vacuum degree should be checked by a vacuum gauge. However, vacuum degree reading is not available by the gauge connected to the manifold valve. It is recommended that a digital type vacuum gauge be used.



9.5.10. REFRIGERANT CHARGE PROCEDURE

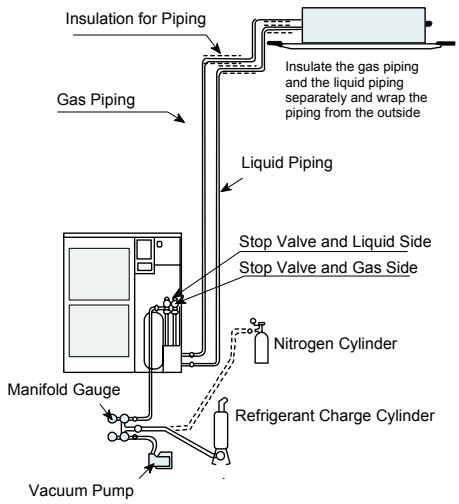
After finish the sumarized evaucation procedure, refrigerant charging procedure should be performed according to the next instructions:

1. The stop valves have been closed before shipment, however, ensure that the stop valves are closed completely.
2. Connect the indoor unit and the outdoor unit with field-supplied refrigerant tubes.
3. Connect the gauge manifold using charging hoses to a vacuum pump, a refrigerant charging cylinder and a nitrogen cylinder to the check joint of the liquid line stop valve.
4. Check for any gas leakage at the flare nut connection, by using oxygen free nitrogen gas to increase the pressure inside of the field-supplied tubes.
5. Operate the vacuum pump until the pressure decreases lower than a pressure of -756 mm Hg in vacuum.
6. Charge refrigerant (only if necessary according to data in chapter 9.12) by opening the gauge manifold valve. If the required quantity cannot be charged, follow procedures (7) to (9). Otherwise proceed step (10).

NOTE:
An excess or a shortage of refrigerant is the main cause of trouble to the units. Charge the correct refrigerant quantity as indicated in chapter 13.12.

7. Fully open the gas line stop valve
8. Slightly open the liquid line stop valve
9. Charge the required refrigerant by operating the system (Setting the remote control switch at cool)
10. Fully open the liquid line stop valve after completing refrigerant charge.

CAUTION:
- *Do not charge OXYGEN, ACETYLENE, or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an airtight test. These types of gases are extremely dangerous, because an explosion can occur. It is recommended that oxygen free nitrogen be charged for these types of tests.*
- *Insulate the unions and flare-nuts at the piping connection part completely.*
- *Insulate the liquid piping completely to avoid a decrease of performance; if not, it will cause sweating on the surface of the pipe.*
- *Charge refrigerant correctly. Overcharging or insufficient charging could cause a compressor failure.*
- *Check for refrigerant leakage in detail. If a large refrigerant leakage occurred, it would cause difficulty with breathing or harmful gases would occur if a fire were being used in the room.*



Insulation for Piping:
Gas and liquid piping must be separately insulated

Insulation for Connection Parts:
The connection part must be insulated by the field supplied insulation materials.

Nitrogen:
For Leakage Test and Brazing

9.6. REFRIGERANT CHARGING QUANTITY

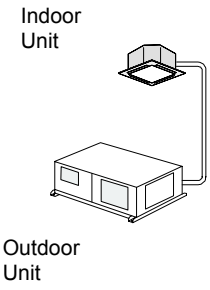
Refrigerant has been charged into this unit for 10 m of length pipe. It is required that additional refrigerant be charged according the piping length if it is higher than 10 m

1. Determine an additional refrigerant quantity according to the following procedure, and charge it into the system.
2. Record the additional refrigerant quantity to facilitate service activities thereafter.

⚠ ***CAUTION:***
When charging refrigerant accurately measure refrigerant to be charged.
Overcharging or undercharging of refrigerant can cause compressor trouble

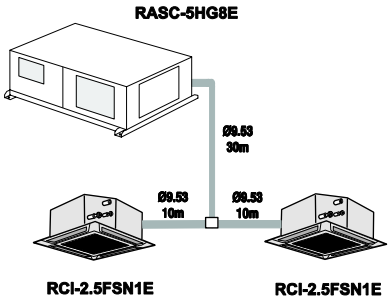
9.6.1. SINGLE SYSTEM

Model	Indoor Unit	RCI-5.0FSNE RPI-5.0FSNE RPC-5.0FSNE RCD-5.0FSNE	RPI-10FSNE
	Outdoor Unit	RASC-5HG8E	RASC-10HG8E
Actual total Piping Length (m)		0-50	0-30
Piping size for gas line	Out. Dia. (mm)	19.05	28.60
	Thickness (mm)	1.0	1.0
Piping size Liquid Line	Out. Dia. (mm)	9.53	15.88
	Thickness (mm)	0.8	1.0
Factory charged Quantity in Outdoor unit (kg)		4.5	8.0
Additional Charging Quantity For more than 10m		70 g/m	195 g/m



9.6.2. TWIN, TRIPLE AND QUAD SYSTEM

■ **Twin sample**

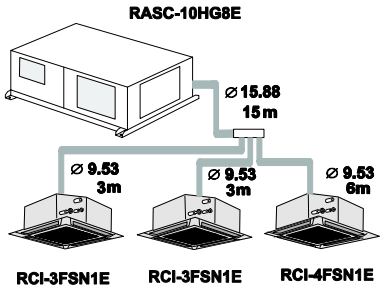


■ Additional Refrigerant Charge Calculation for liquid piping (W1 Kg). See examples and fill in the following table:

Pipe Diameter	Total Piping Length	Additional Charge (kg)
Ø 12.7	0	× 0.120 = 0
Ø 9.53	10+10+30	× 0.065 = 3.25
Ø 6.35	0	× 0.026 = 0
10 m Factory Charge		W (10m)= -0.65
Example	Additional Charge	W_1 Total = 2.60 (kg)

Total Additional Charge W1:	2.60	kg
Outdoor Unit Factory Charge Wo:	4.50	kg
Total Ref. Charge of this System:	7.10	kg
Year	Month	Day

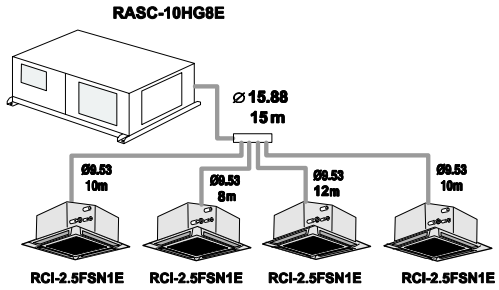
■ **Triple sample**



Pipe Diameter	Total Piping Length	Additional Charge (kg)
Ø 15.88	15	× 0.195= 2.92
Ø 12.7	0	× 0.120 = 0
Ø 9.53	(3+3+6)	× 0.065 = 0.78
Ø 6.35	0	× 0.026 = 0
10 m Factory Charge		W (10m)= -1.95
Example	Additional Charge	W_1 Total = 1.75 (kg)

Total Additional Charge W1:	1.75	kg
Outdoor Unit Factory Charge Wo:	8	kg
Total Ref. Charge of this System:	9.75	kg
Year	Month	Day

■ Quad sample



Pipe Diameter	Total Piping Length	Additional Charge (kg)	
Ø 15.88	15	× 0.195=	2.92
Ø 12.7	0	× 0.120 =	0
Ø 9.53	(10+8+12+10)	× 0.065 =	2.60
Ø 6.35	0	× 0.026 =	0
10 m Factory Charge		W (10m)=	-1.95
Example	Additional Charge	W_1 Total =	3.57 (kg)

Total Additional Charge W1:	3.57	kg
Outdoor Unit Factory Charge Wo:	8.0	kg
Total Ref. Charge of this System:	11.57	kg

Year Month Day

■ Outdoor Unit Factory Charge

HP	W_0: Ref. Charge kg	W (10m) Kg
5	4.5	0.65
10	8.0	1.95

10 DRAIN PIPING

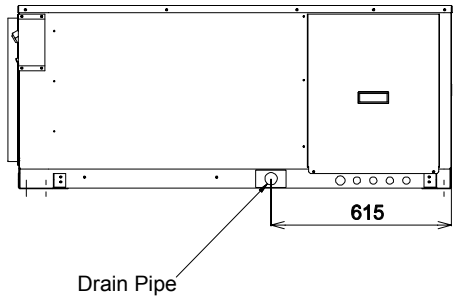
CONTENTS

10 DRAIN PIPING _____ 1
10.1. Drain Piping RASC-5/10HG8E _____ 2

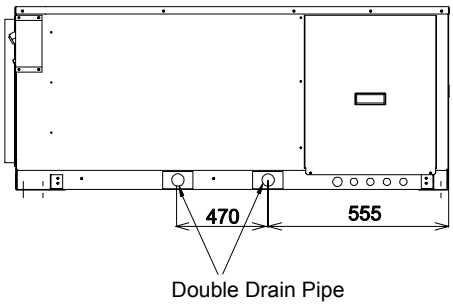
10.1. DRAIN PIPING RASC-5/10HG8E

1. Outdoor unit is equiped with a drain piping. Its position is shown in figure below

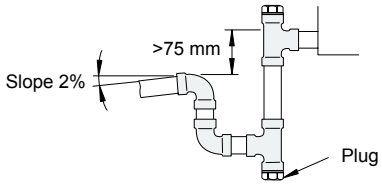
▪ **RASC-5HG8E**



▪ **RASC-10HG8E**

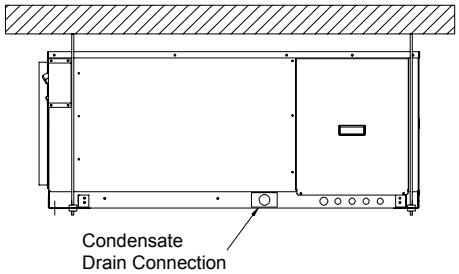


2. Prepare a polyvinyl chloride pipe with 22 mm outer diameter
3. Fasten the tube to the drain hose with an adhesive and the field-supplied clamp. The drain piping must be performed with a DOWN-SLOPE pitch of 1/25 to 1/100
4. Connect a siphon, as shown in figure below



■ Drain Pan Level

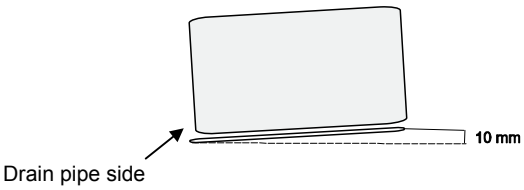
- Check to ensure that the foundation is flat, taking into account the maximum foundation gradient



- Tighten the nuts of the suspension bolts with the suspension brackets after adjustment is completed. Special plastic paint must be applied to the bolts in order to prevent them from loosening.

WARNING:

- Unit must be installed with a 1/100 down slope as figure indication



11 ELECTRICAL WIRING

This chapter describes the Electrical Wiring Connection and shows how to set the Dip Switches and the H-Link System.
For Indoor Units data refer to TCGB0033 about Hitachi UTOPIA G8 Series

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11 ELECTRICAL WIRING 1
11.1 General Check 2
11.2 Electrical Wiring Connection for RASC-5/10HG8E 2
11.2.1 Setting of DIP Switches for Outdoor Unit 3
11.3 Common Wiring 3
11.3.1 Electrical Wiring between Indoor Unit and Outdoor Unit 3
11.3.2 Wire Size 4
11.3.3 H-LINK System 5
11.3.4 Single, Twin, Triple and Quad Dip Switch Setting 6

11.1 GENERAL CHECK

1. Ensure that the field-supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated. Make sure that they comply with national and regional electrical codes.
2. Check to ensure that the power supply voltage is within +/-10% of the rated voltage.
3. Check to ensure that power supply has an impedance low enough to warranty not reduce the starting voltage more than 85% of the rated voltage.
4. Check to ensure that the ground wire is connected.
5. Connect a fuse of specified capacity.

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

NOTE:

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

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

MODEL	Z_{max} (Ω)
RASC-5HG8E	0,21
RASC-10HG8E	0,12

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

11.2 ELECTRICAL WIRING CONNECTION FOR RASC-5/10HG8E

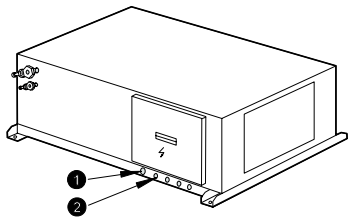
The electrical wiring connection for the outdoor unit as shown below:

Table for Terminal Connection:

Wiring	[Connection (Connection of Terminals)]
Power Supply	[O.U.-O.U.(L1-L1, L2-L2, L3-L3, N-N)]
	[I.U.-I.U.(L1-L1, N-N)]
Operating	[O.U.-I.U., I.U.-I.U.(1-1, 2-2)]
Remote Controller	R, CS-IV, IV-IV, A-A. B-B

O.U.: Outdoor Unit, I.U.: Indoor unit

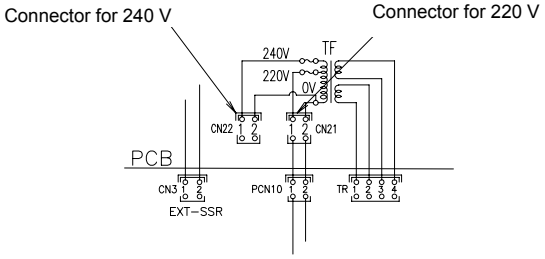
1. Connect the power supply wires to L1, L2, L3 and NP, for the three phase units on the terminal board and ground wires to the terminals, in the electrical control box.
2. Connect the wires between the Outdoor and Indoor units, Master units only for twin system, to terminals 1 and 2 on the terminal board. If the indoor unit power source wires are connected with the outdoor unit connect also them to terminals L and N to the terminal board.
3. Tightly secure the wires inside the outdoor unit with a band.



❶ Power source Wiring

❷ Operation wiring between Outdoor and Indoor Unit

4. Check the item below before turning ON the main switch. In case the power source is 415V (nominal voltage), change CN22 (connector) to CN21 of transformer (TF1) in the electrical control box as shown in figure below.

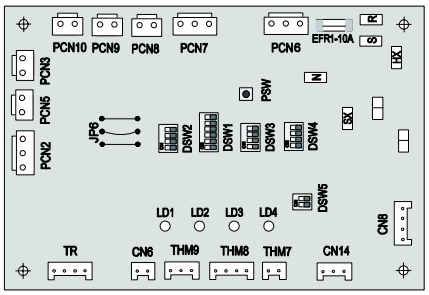


5. Use factory supplied rubber bushes in order to protect wires from damages produced by hole edges ❶ and ❷

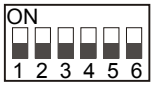
11.2.1 SETTING OF DIP SWITCHES FOR OUTDOOR UNIT

■ Quantity and position of DIP Switches

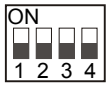
The PCB in the Outdoor Unit is operating with 5 types of DIP Switches, 1 Single Switch and 1 Push Switch. The location is as follows:



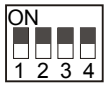
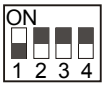
■ DSW1: Test Operation and Option functions settings

Before shipment	

■ DSW2 Factory fixed settings

Normal Operation	

■ DSW3: Capacity Settings

	5HP	10HP
Setting position		

■ DSW4: Refrigerant Cycle no. settings

Before shipment	

■ DSW5 Transmitting settings

Before shipment	

■ PSW: Manual Defrost

Press for Manual Defrost

11.3 COMMON WIRING

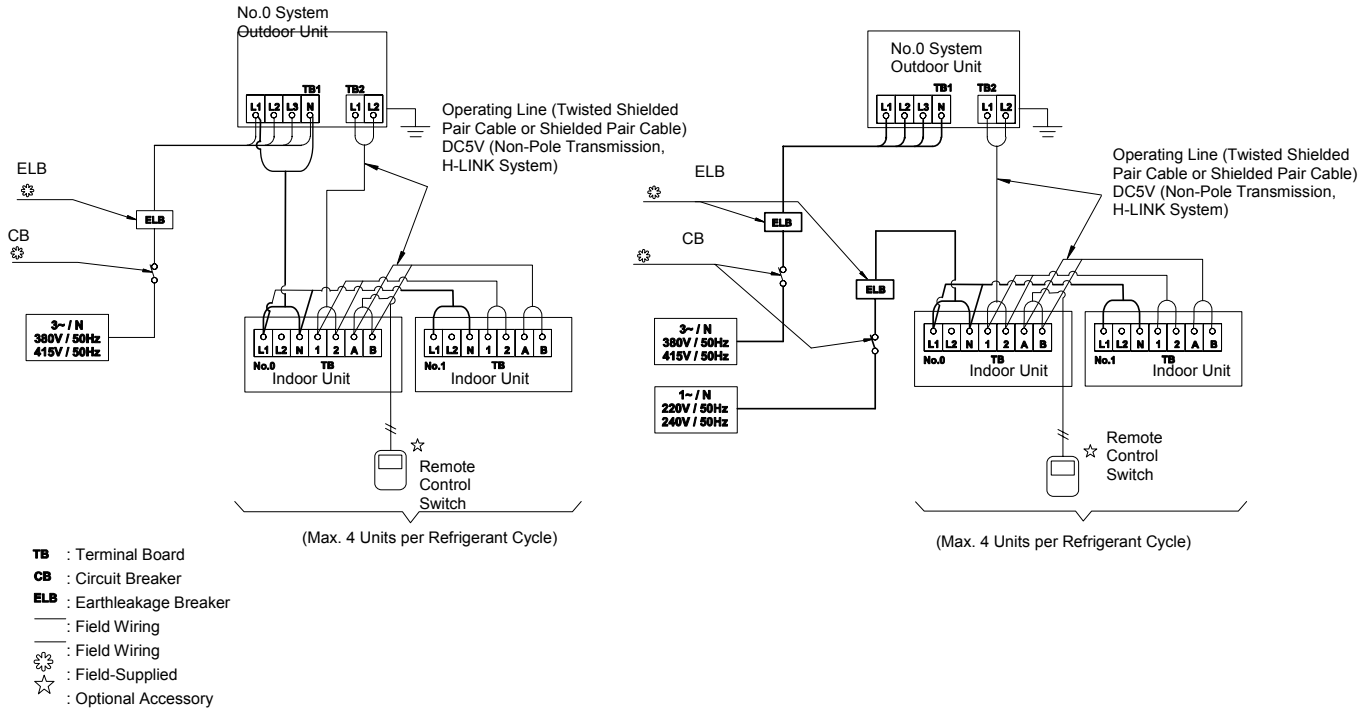
⚠ ***CAUTION:***
All the field wiring and electrical components must comply with local codes.

11.3.1 ELECTRICAL WIRING BETWEEN INDOOR UNIT AND OUTDOOR UNIT

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

- Follow local codes and regulations when performing electrical wiring.
- If 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 mm²) for operation wiring between outdoor unit and indoor unit, and operation wiring between indoor unit and indoor unit.
- Use 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 obstacle at length of less than 300 m and size complied with local code.
- Open a hole near the connection hole of power source wiring when multiple outdoor units are connected from one power source line.
- The recommended breaker sizes are shown in Table of electrical data and recommended Wiring, Breaker Size/1 O.U.
- In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the panel.
- All the field wiring and equipment must comply with local and international codes.

ATTENTION:
Pay attention to the connection of the operating line. Incorrect connection may cause the failure of PCB.



11.3.2 WIRE SIZE

■ Recomended minimum sizes for field provided wires:

Model	Power Source	Max. Current	Power Source Cable Size		Transmitting Cable Size	
			EN60 335-1 ❶	MLFC ❷	EN60 335-1 ❶	MLFC ❷
All Indoor Units	220-240V/1ϕ/50Hz	5 A	0.75 mm²	0.5 mm²	0.75 mm²	0.5 mm²
RASC-5HG8E	380-415V/3ϕ/50Hz	15 A	4 mm²	2 mm²		
RASC-10HG8E	380-415V/3ϕ/50Hz	28 A	6 mm²	5.5 mm²		

- The above wire sizes marked with ❶ are selected at the maximum current of the unit according to the European Standard, EN60 335-1.
- The above wire sizes marked with □ are selected at the maximum current of the unit according to the wire, MLFC (Flame Retardant Polyflex Wire) manufactured by HITACHI Cable Ltd. Japan.
- In case that the power cables are connected in series, add each unit maximum current and select according to the next table.

Selection according to EN60 335-1		Selection according to MLFC (at cable Temp. Of 60 ºC)	
Current i (A)	Wire Size (mm²)	Current i (A)	Wire Size (mm²)
I ≤ 6	0.75	I ≤ 15	0.5
6 < i ≤ 10	1	15 < i ≤ 18	0.75
10 < i ≤ 16	1.5	18 < i ≤ 24	1.25
16 < i ≤ 25	2.5	24 < i ≤ 34	2
25 < i ≤ 32	4	34 < i ≤ 47	3.5
32 < i ≤ 40	6	47 < i ≤ 62	5.5
40 < i ≤ 63	10	62 < i ≤ 78	8
63 < i	❸	78 < i ≤ 112	14
		112 < i ≤ 147	22

❸ *In case that current exceeds 63 A do not connect cables in series*

NOTE:
- *Follow local codes and regulations when selecting field wires, Circuit breakers and Earth Leakage breakers*
- *Use the wires which are not lighter than the ordinary polychloroprene sheathed flexible cord (code designation H05RN-F)*

■ Select the main switches in according to the next table :

Model	Power Source	Max. Current	CB(A)	ELB no. poles/A/mA
All Indoor Units	220-240V/1ϕ/50Hz	5 A	6	4/40/30
RASC-5HG8E	380-415V/3ϕ/50Hz	25A	32	
RASC-10HG8E	380-415V/3ϕ/50Hz	28A	32	

ELB: Earthleakage Breaker; CB: Circuit Breaker

11.3.3 H-LINK SYSTEM

1. Application

The new H-LINK wiring system requires only two transmission wires connecting each indoor unit and outdoor unit for up to 16 refrigerant cycles, and connecting wires for all indoor units and all outdoor units in series.

NOTE:

The H-LINK system can not be applied to the cycle with the old model unit or the unit with old transmission

This H-LINK system can be applied to the following models.

Indoor Unit	Outdoor Unit
RCI-OOOFSNE RCD-OOOFSNE RPC-OOOFSNE RPI-OOOFSNE RPK-OOOFSNM/FSN1M RPF-OOOFSNE RPFI-OOOFSNE	RASC-OOOHG8E

2. Features

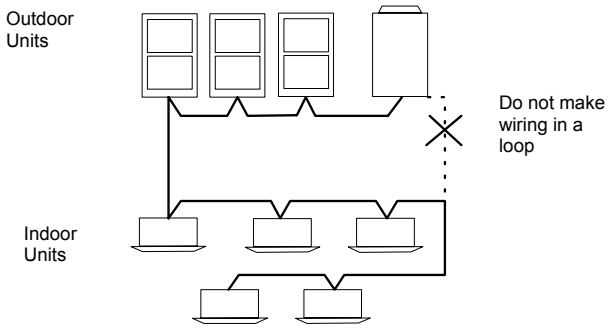
The H-LINK has the following features and specifications:

■ Features:
- The tota/ wiring length is remarkably reduced.
- Only one connection is required for the wiring between the indoor unit and outdoor unit.
- Easy wiring connection to the central controllers

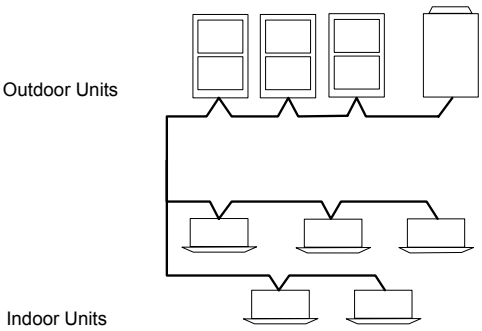
■ Specifications:
- Transmission Wire: 2-Wire
- Polarity of Transmission Wire: Non-Polar Wire
- Maximum Outdoor Units To Be Connected: 16 Units per H-LINK system.
- Maximum Indoor Units To Be Connected: 16 Units per cycle and 64 Units per H-LINK system
- Maximum Wiring Length: Total 1000m (including CS-NET)
- Recommended Cable: Twist Pair Cable with Shield, over 0.75mm2 (Equivalent to KPEV-S)
- Voltage: DC5V

3. System Example of H-LINK
Using H-LINK System For Only Air Conditioners:
There are two typical cases of using H-LINK system;
(1) Using H-LINK System For Only Air Conditioners, and
(2) Using H-LINK System For Air Conditioners With Central Control Device, and the system examples are as shown below

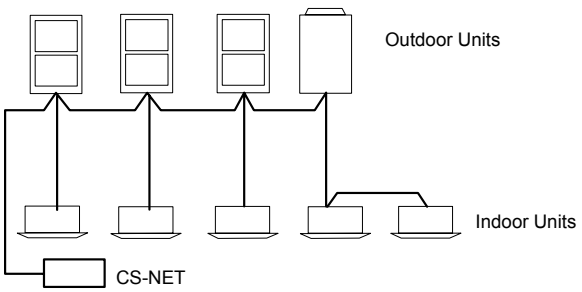
■ Line Connection with All units



■ Line Connection for Each Floor



- In case that H-LINK is not applied when electrical wiring is performed



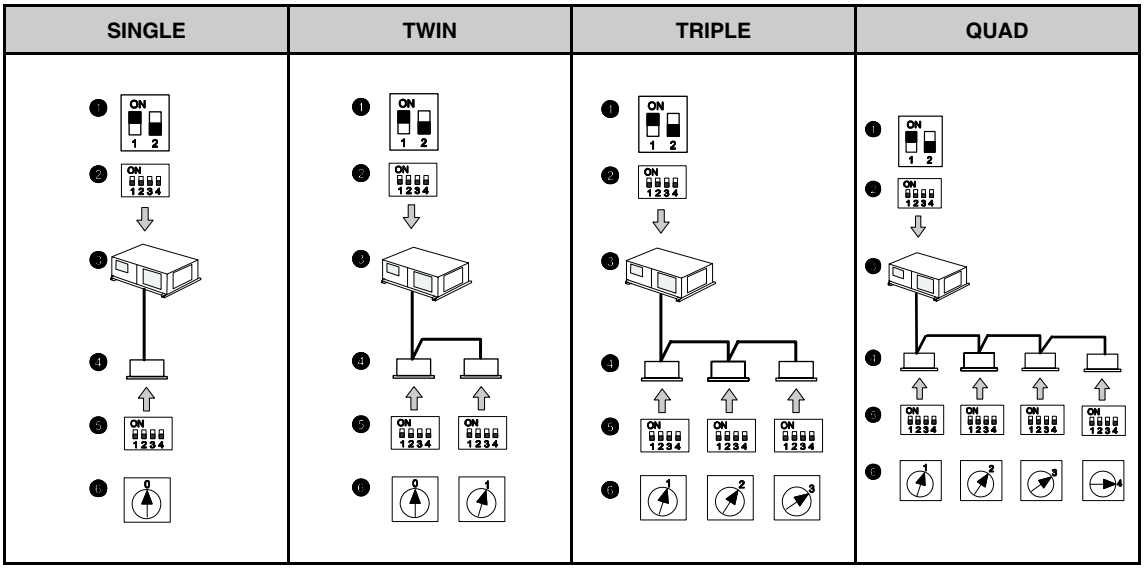
NOTE:

Do not make a wiring in a loop.
In the case that H-LINK is not applied after the when electrical wiring is performed as shown above, H-LINK is applied after the instrument wiring is completed. Therefore, the dip switches are required to be set according to "Setting of Dip Switches on PCB".

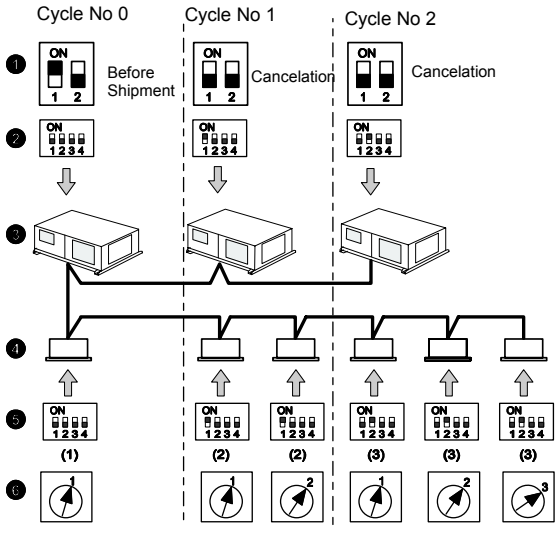
4. Dip Switch Setting of Indoor PCB and Outdoor PCB.
   It is required to set dip switches of every indoor unit and outdoor unit

11.3.4 SINGLE, TWIN, TRIPLE AND QUAD DIP SWITCH SETTING

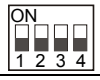
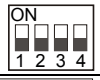
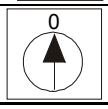
– Dip Switch Setting (No H-Link example:)



– Dip switch setting (H-Link example)



Mark	Description
❶	DSW5 (End Terminal Resistance)
❷	DSW4 (Refrigerant Cycle)
❸	Outdoor Unit
❹	Indoor Units
❺	DSW5 (Refrigerant Cycle)
❻	RSW (Indoor Unit Address)

Unit	Name of Dip Switch	Mark	Setting Before Shipment	Function
Outdoor Unit	Refrigerant Cycle	DSW4		For setting refrigerant cycle address of outdoor unit. Set the DSW4 not to overlap the setting of other outdoor units in the same H-LINK system
	End Terminal Resistance	DSW5-1P		For matching impedance of transmission circuit. Set the DSW5 according to the quantity of outdoor units in the H-LINK system. Setting of End Terminal Resistance Before shipment, No.1 pin of DSW5 is set at the “ON” side. In the case that the outdoor units quantity in the same H-link is 2 or more, set No.1 pin of DSW5 at the “OFF” side from the 2nd unit. If only one outdoor unit is used, no setting is required.
Indoor Unit	Refrigerant Cycle	DSW5		For setting refrigerant cycle address of indoor unit. Set the DSW5 corresponding to the address of outdoor unit in the same refrigerant cycle.
	Indoor Unit Address	RSW		For setting indoor unit address. Set the RSW not to overlap the setting of other indoor units in the same refrigerant cycle.

12 AVAILABLE OPTIONAL FUNCTIONS

This chapter gives a brief explanation of the available optional functions, for Indoor Units and Remote Controllers available functions refer to TCGB0033 about Hitachi UTOPIA G8 Series.

CONTENTS

12 Available Optional Functions_____ 1
12.1. RASC-5/10HG8E Available Optional Functions _____ 2

12.1. RASC-5/10HG8E AVAILABLE OPTIONAL FUNCTIONS

Optional function	Useful explanation
Demand thermo off	When this function is activated the compressor is stopped and the indoor units are put under Thermo-OFF condition.
Defrosting Condition Change Over	This function changes the defrosting operation conditions. It is specially interesting for cold areas.
Release ambient temperature Limit	This function allows to increase the limit outdoor temperature in heating mode and cooling mode.
Defrost indoor unit fan speed	This function activates the Indoor fans as a cycle (2 min ON, 6 min OFF) in order to reduce the unpleasent aspects of Indoor Thermo-OFF working conditions.

13 TROUBLESHOOTING

This chapter provides you with a concise description of the most common alarm codes of the Hitachi UTOPIA G8 Series. For more information about Troubleshooting data refer chapter 8 of SMGB0033.

CONTENTS

13 TROUBLESHOOTING _____ 1
13.1. Alarm Codes _____ 2

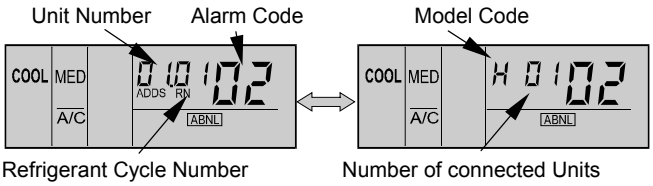
13.1. ALARM CODES

If RUN lamp flashes for 2 seconds, there is a failure in transmission between Indoor Unit and Remote Control Switch. Possible causes are:

- Remote Cable broken
- Contact Failure in Remote Control Cable
- IC or Microcomputer defective

In any case, ask your contractor for service

If RUN lamp flashes 6 times (5 seconds) with unit number and alarm code displayed, note the alarm code (see table below) and ask your contractor for service.



■ Alarm Codes

Code	Category	Contents of Abnormality	Leading Cause
01	Indoor unit	Safety Device of the Indoor Unit is tripped	Failure Float Switch PCB
02	Outdoor Unit	Safety device of outdoor unit is tripped	High pressure Switch, failure of fan Motor
03	Transmission	Abnormality between Indoor and Outdoor Unit (or Indoor)	Incorrect wiring, failure of PCB, tripping of Fuse. Power supply off.
05		Abnormality of Power source wiring	Reverse phase incorrect wiring
08	Cycle	Abnormality high temperature in the top of comp.	Insufficient Refrigerant. Ref-leakage, clogging capillary
11	Sensor on Indoor Unit	Inlet Air Thermistor	Failure of Thermistor, sensor, connection
12		Outlet Air Thermistor	
13		Freeze protection Thermistor	
15		Fresh Outdoor Air Thermistor (Econofresh)	
19		Tripping of Protection Device for Fan Motor	Failure of Fan Motor
20	Sensor on Outdoor Unit	Top Compressor Thermistor	Failure of Thermistor, sensor, Connection
22		Outdoor Air Thermistor	
24		Evaporating thermistor (defrosting)	
31	System	Incorrect Setting of Outdoor and Indoor Unit	Incorrect Setting of Capacity Code.
35		Incorrect Setting in Indoor/Outdoor Unit No.	Existence of the same Indoor Unit No. in the same refrigerant cycle
38		Abnormality of Protective Circuit in Outdoor Unit	Failure of Indoor Unit PCB. Incorrect Wiring Connection to PCB in Outdoor Unit.
39		Abnormality of Running Current at Compressor	Overcurrent, Melted Fuse or failure of current sensor.
41	Pressure	Excessive Overload during Cooling Operation	Heat Exchanger Airflow obstacle, short circuit and locked fan motor.
42		Excessive Overload during Heating Operation	Heat Exchanger Airflow obstacle, short circuit.
47		Low pressure Decrease Protection Activating	Insuficient refrigerant. Refrigerant Leak (Hex Lock).
96	Sensor on the KPI Unit	Room temperature thermistor	Failure of Thermistor, Sensor ,Connection.
97		Outdoor temperature thermistor	

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TCGB0037 - rev.0-12/05 - Printed in Spain