

NEW High Efficiency  
HITACHI AIR-COOLED  
CHILLERS

ICHIBAN

**HITACHI**

 Hitachi Air Conditioning Systems Co., Ltd.

URL : <http://www.hitachiacs.co.jp>

Specifications in this catalogue are subject to change without notice in order that HITACHI may bring the latest innovations to their customers.

Distributed By :

# New High Efficiency — HITACHI Air-Cooled Chillers

Hitachi screw chiller unit widely used for air conditioning and industrial purposes Newly released, equipped with a new screw compressor realizing drastic energy saving and great functionality

**ICHI BAN**

Top class high

**COP 3.41 =**

(RCUP75AU / 50Hz)

New screw compressor

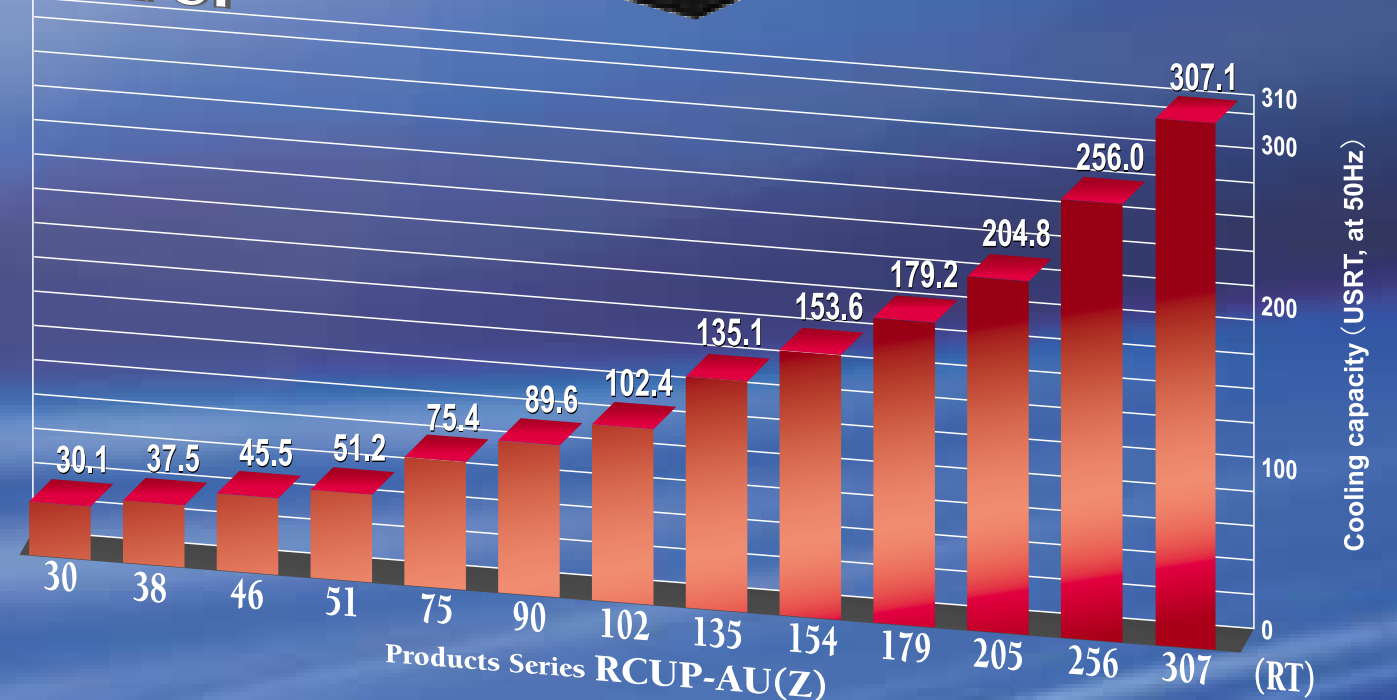
High-efficiency cooling cycle

New plate heat exchanger

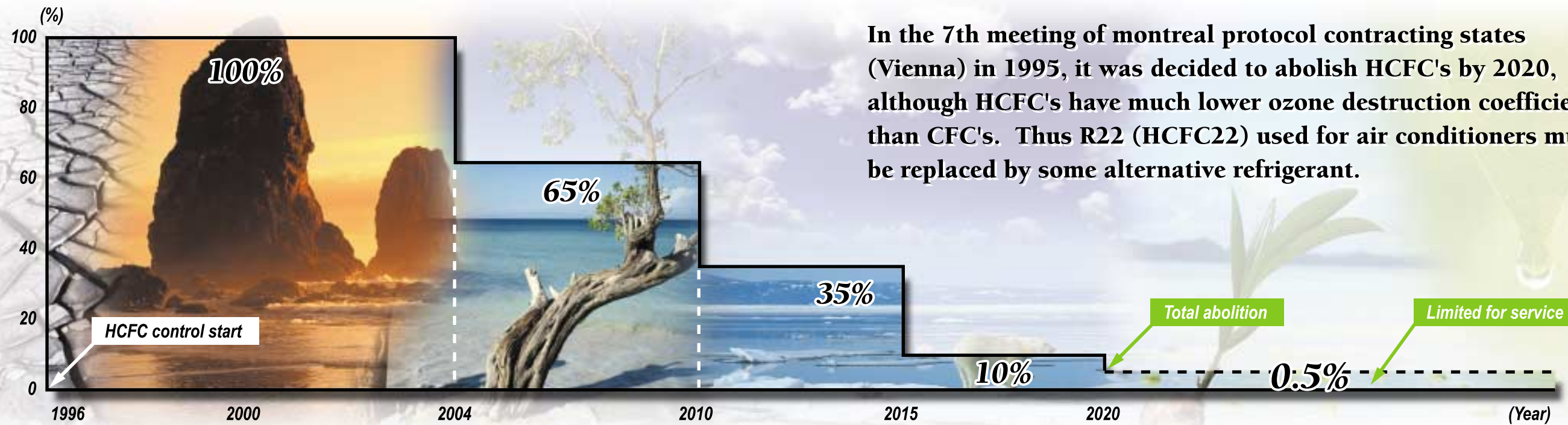
Capacity control technology



## LINE UP



# Designed to reduce the impact on the environment compared to R22 units



In the 7th meeting of montreal protocol contracting states (Vienna) in 1995, it was decided to abolish HCFC's by 2020, although HCFC's have much lower ozone destruction coefficient than CFC's. Thus R22 (HCFC22) used for air conditioners must be replaced by some alternative refrigerant.

## Refrigerant characteristics

Ozone destruction point (ODP) of R407C = 0

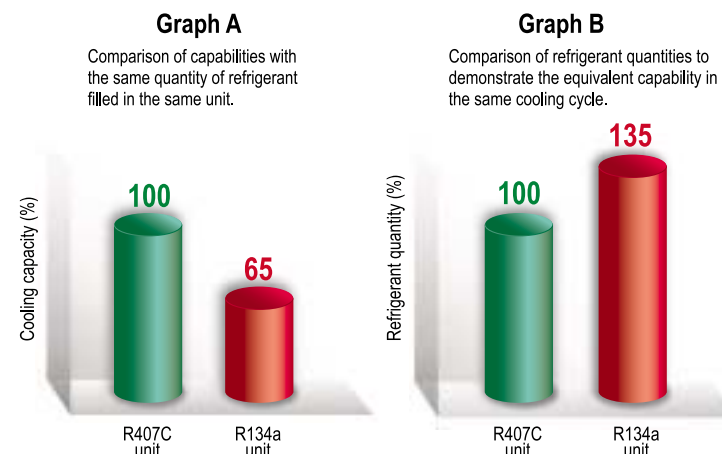
Item/Refrigerant		R22	R407C	R134a
Structure	wt%	HCFC22	HFC32/125/134a	HRC134a
Composition ratio (wt%)	-	100	23/25/52	100
ODP (Ozone Destruction Point)	-	0.055	0	0
GWP (Global Warming Point)	-	1,700	1,530	1,300
Combustibility	-	Non-flammable	Non-flammable	Non-flammable
Refrigerant safety degree (ASHRAE34)	-	*A1	*A1/A1	A1

\* Mixed refrigerant safety evaluation A1/A1  
 Safety evaluation for changed refrigerant composition under the worst conditions of cooling machine operation.  
 Safety evaluation for standard composition.

Source : The Japan Refrigeration And Air Conditioning Industry Association, Installation of HFC - refrigerant Equipment, September 1997

Graph A compares the capabilities in the same unit. Graph B compares the quantities of refrigerant to demonstrate the same capability in the same cooling cycle. These two graphs show that for R134a unit, to obtain the equivalent capability with the same quantity of refrigerant and to increase the quantity of refrigerant to avoid noise by increasing the speed, the cooling cycle must be enlarged and the machine itself enlarged as well. In this case, R134a has a lower GWP. As 135% refrigerant is necessary to obtain the same capability, this gives  $GWP1300 \times 135\% = GWP1755$ .

### Comparison between R407C and R134a sealed in the same component



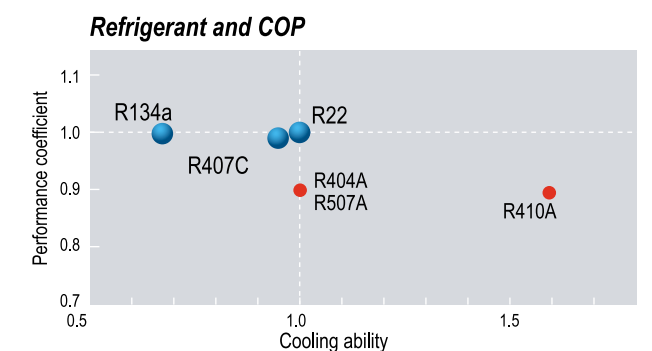
## Why use plate heat exchangers ?

Hitachi uses less refrigerant to help protect the environment, such as by using plate heat exchangers. As the drawing shows, the quantity of refrigerant is minimized in case of leakage, thus minimizing the impact on the environment.

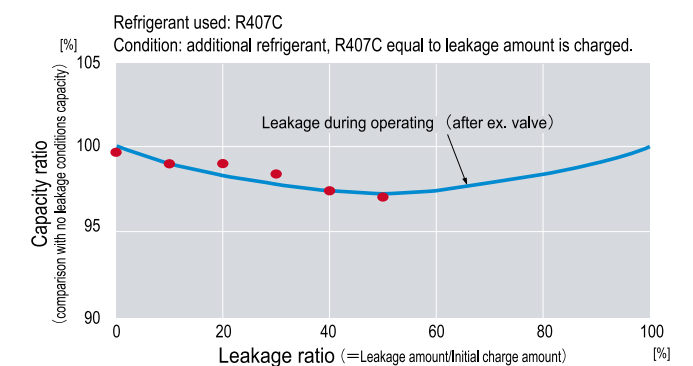


## Hitachi uses R407C because ...

As shown in the table below, R22 and R407C have similar cooling performance, so R407C can be used in Hitachi's existing chillers without design change.



The figure right shows the results of an in-plant experiment. It shows the reduction in cooling performance when R407C is taken out of the working chiller and resealed in it – there's a drop of only 3% or less.



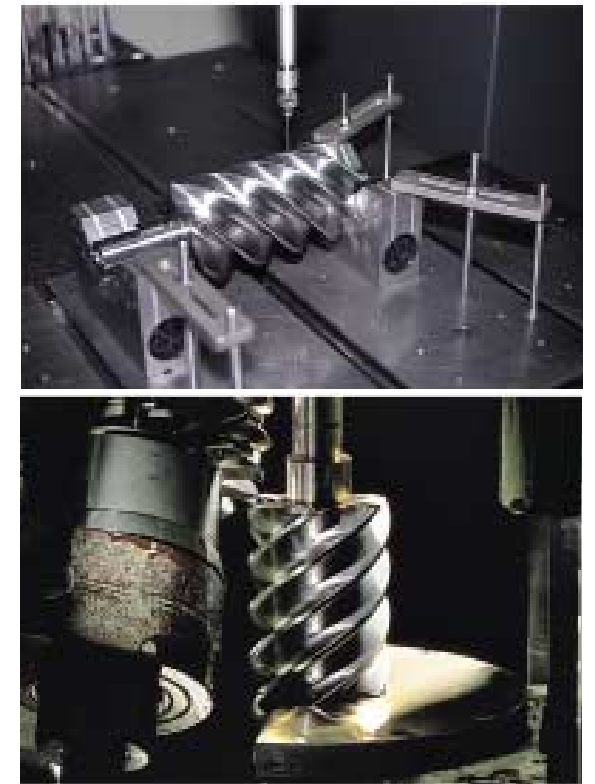
# Hitachi's new screw compressor

In Hitachi's new screw compressor, inside leakage is decreased to the minimum with the higher-accuracy rotor processing technology. By using cyclone oil separation system other than demister oil separation system, oil separation efficiency is largely improved. Also, heat transmission efficiency is greatly improved, pressure loss is reduced by smaller oil flow into the cooling pipe, sealing ability is improved by the changed chiller oil and chilling efficiency is substantially improved. As a result COP is increased to 25%, the largest number in the series.

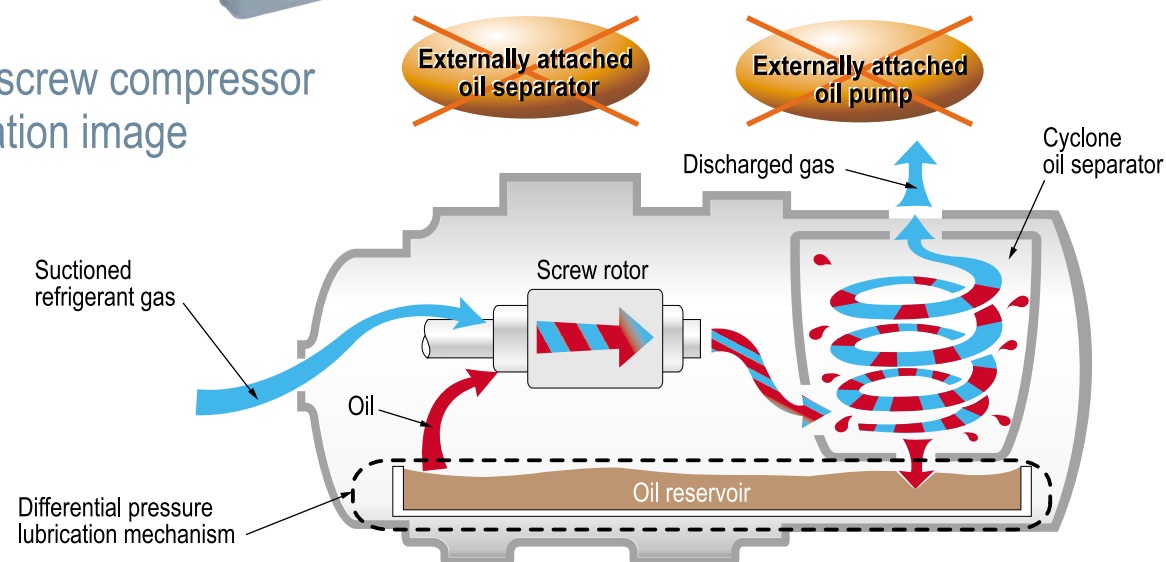


## Screw processing technology

Shimizu Works has secured ISO 9001 certification on quality managements system. All its products are subjected to strict testing under diverse environmental conditions. At Hitachi, quality control plays a vital role in every aspect of production from raw material processing to the final dispatching of products.



## New screw compressor operation image



## Simple structure with a small number of parts

Whereas the number of main parts for the casing, compression mechanism and capacity control mechanism of a reciprocating compressor is **268**, that of a screw compressor is only **27**, just one tenth of the number! A structure with so few parts offers high reliability and easy maintenance.



## Low vibration level

No exclusive vibration control equipment is necessary by using low-vibration screw compressor.

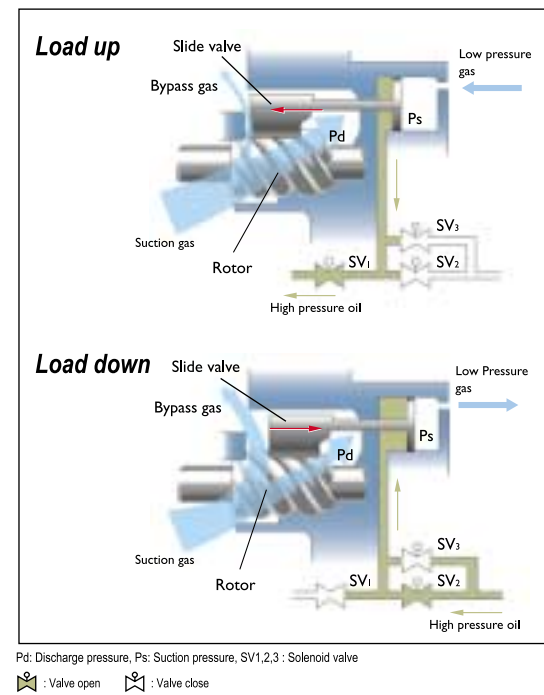
## Vibration comparison

Type	Reciprocating	Screw
Comp. speed (rpm) 50/60Hz	1,430/1,720	2,880/3,470
Full amplitude	At leg of comp.	20-30
	At base frame	20
Vib. frequency	At leg of comp.	48.5/57.8
	At base frame	23.8/28.7
Acceleration energy	Screw: 1/5 of reciprocating type	

## Hitachi's high-accuracy continuous capacity control technology for industrial applications

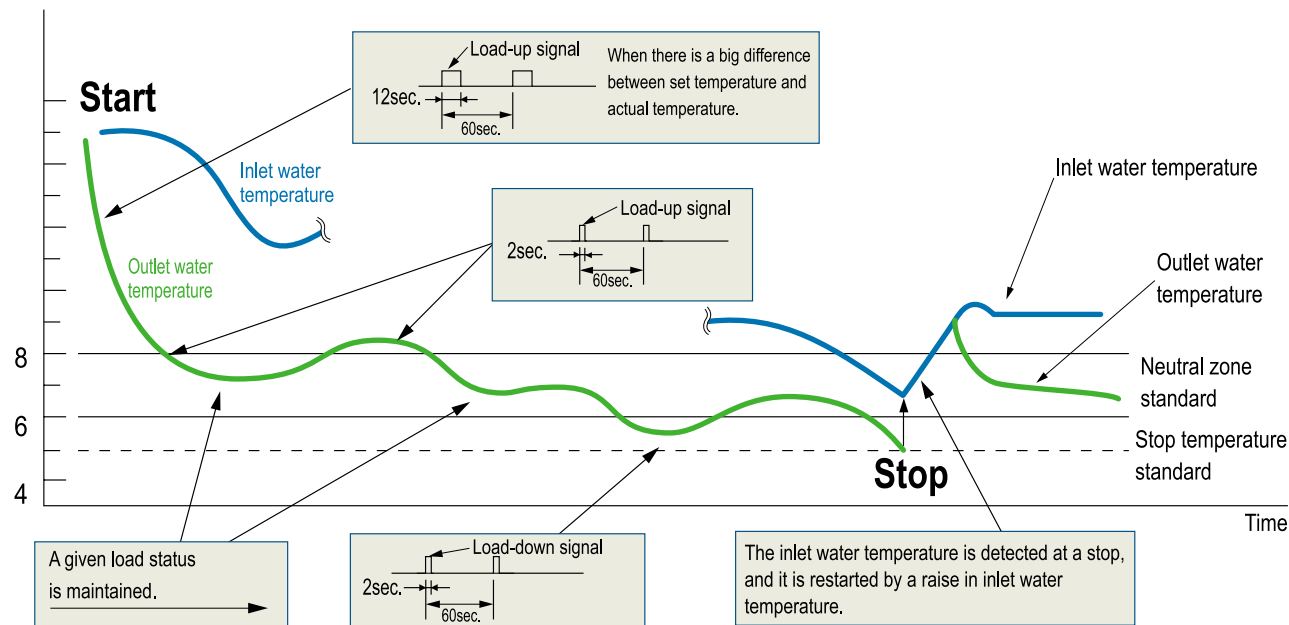
Hitachi's unique continuous capacity control technology using slide valve is further advanced. A wide range from the conventional 25% (33%) to 15% of capacity control is realized with highly-accurate water temperature control realized.

Thus, in the industrial use in which accurate water temperature control is required, highly-efficient production can be maintained as it is unnecessary to operate at a temperature lower than the temperature necessary for overheat prevention.

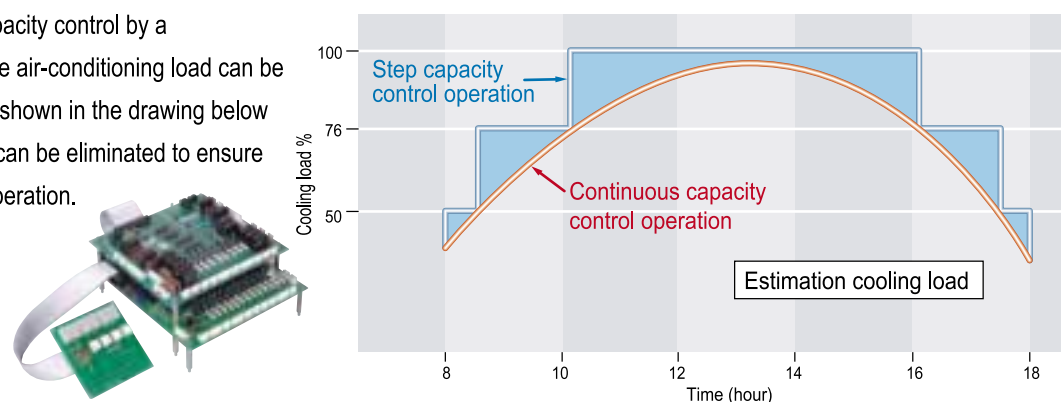


### Continuous capacity control image

High accuracy ( $\pm 1^\circ\text{C}$ ) and certain level of moisture can be provided by continuous water temperature control.



By continuous capacity control by a microcomputer, the air-conditioning load can be finely adjusted as shown in the drawing below and extra energy can be eliminated to ensure energy-efficient operation.



## Power consumption comparison

In the new model series of Hitachi's high-efficient screw compressor, power consumption is reduced by 14% in average over the current model series due to newly-designed high-efficiency cooling cycle and newly-aligned high-efficiency plate heat exchange. Also, COP is largely increased from 2.8 in average of the current model series to 3.2 in the new model series.

### Power consumption comparison between RCUP 75AU and RCUP 100AX



<b>RCUP100AX</b>	
<b>COP</b>	<b>2.73</b>
<b>Cooling Capacity (kW)</b>	<b>265</b>
<b>Total Power Input (kW)</b>	<b>97.1</b>

\* The RCUP75AU-equivalent cooling capacity is:

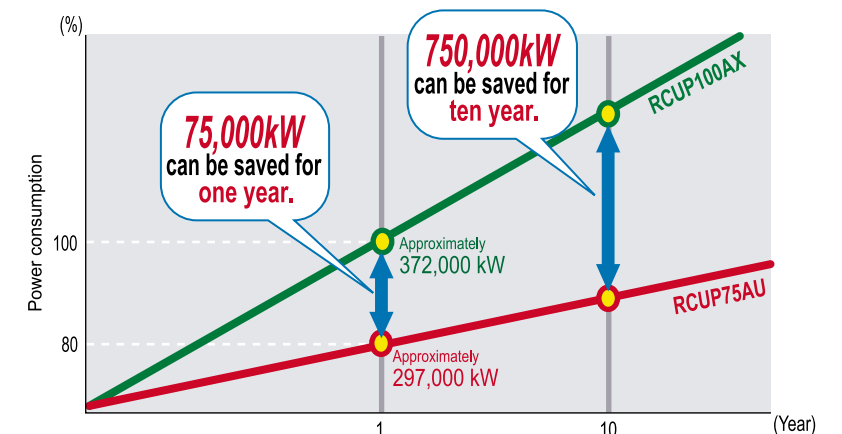


<b>RCUP75AU</b>	
<b>COP</b>	<b>3.41</b> <b>125% UP!!</b>
<b>Cooling Capacity (kW)</b>	<b>265</b>
<b>Total Power Input (kW)</b>	<b>77.6</b> <b>20% DOWN!!</b>

## Running cost comparison

The drawing on the right shows the difference of power consumption between the current series and new model series over operation time.

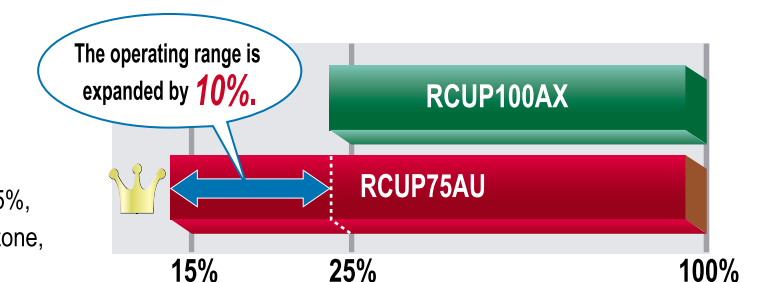
- <Trial Calculation Conditions>
- Operating hours / day : 15 hours
  - Operating rate (%) : 70 %
  - Total operating hours : 3,830 hours
- Note: This is a typical operation example, and it may differ from the actual airconditioning load.



## Expansion of capacity control range

(continuous control specifications)

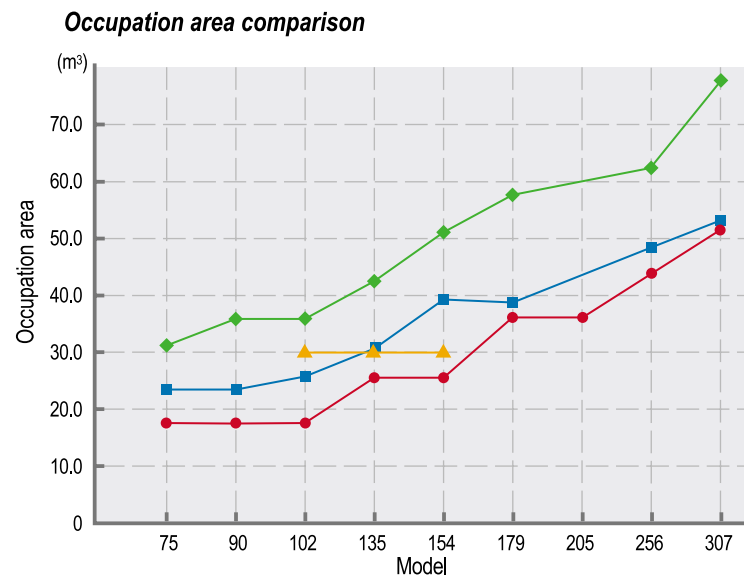
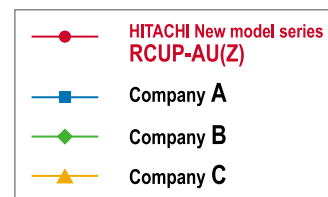
As the capacity control range is expanded up to 15%, the compressor will not stop even in the low load zone, thus stable water temperature can be supplied.



# Other characteristics

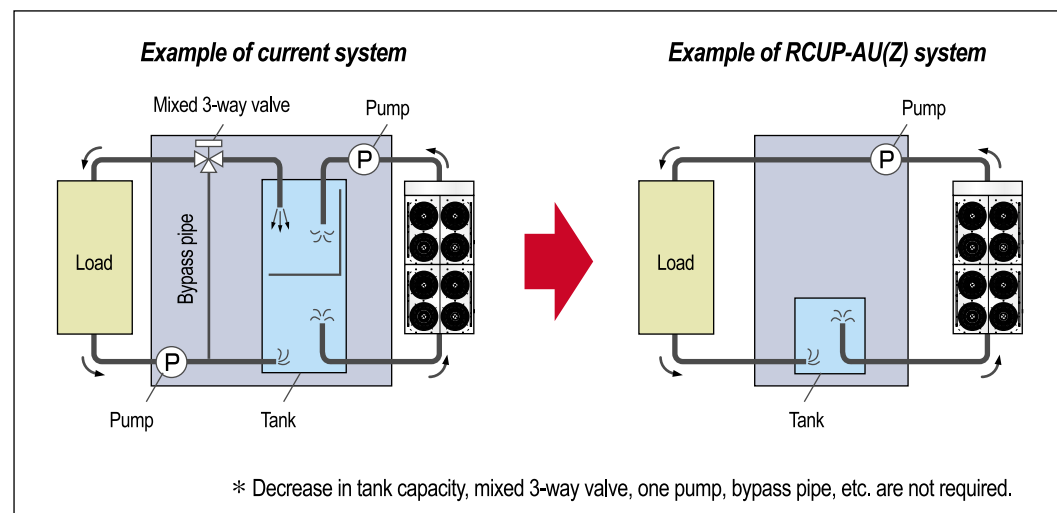
## Compact, Space-saving

To plan the installation of equipment, the service space is important in addition to the unit size. Hitachi's new chiller is the most compact, requiring the smallest occupation area including the chiller size and the service space among the competitors' products.



## Less holding water quantity

Chiller system requires to keep some water inside to maintain certain frequency of turning ON and OFF. Hitachi's new chiller realized a water reduction by 35% over the conventional model by expanding the control range due to improved capacity control technology. As a result, Hitachi's new model chiller can contribute to cost cutting as shown in the right drawing.



## Other functions

### Automatic recovery at power failure

In the conventional model, automatic recovery was functioned for instantaneous power failure (13m second - 2 seconds) only, while the new mode can be recovered automatically from the power failure for 2 seconds or more. This function is available when it is stopped during operation only. If power failure occurs when it is OFF, operation will not be started by power recovery. (This function will be a selection by dip switch.)

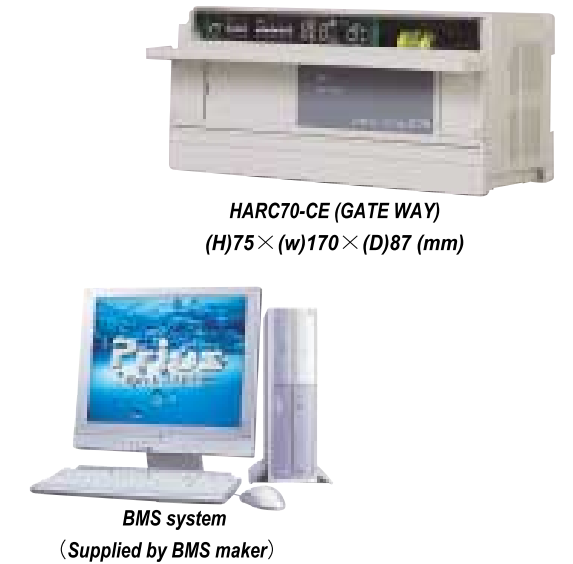
### Alarm data holding function

If the chiller unit is stopped by an alarm, each sensor data immediately before stop can be recorded and segment displayed. Thus the unit operation status during the alarm stop can be grasped easily. The data (only one data generated immediately before stop) is maintained until the power is turned OFF. Alarm generation history is not be erased when the power is turned OFF, unlike the conventional models.

# System application

## BMS Application — HARC 70-CE

BMS is now very popular. Hitachi's screw chiller is connected to BMS with LONWORKS. Hitachi's Gate Way HARC70-CE has the standard type and the optional type. In the standard type, one HARC unit can be connected to up to 4 chillers, and the function of chiller ON/OFF and chilled water temperature settings (inlet and outlet) can be remote controlled. Chiller ON/OFF status, chilled water temperature settings (inlet and outlet), current inlet and outlet chilled water temperatures and alarm code can be monitored. In the optional type, one HARC can be connected to one chiller. In addition to the functions of the standard type, the outlet gas pressure, inlet gas pressure, outlet gas temperature for each cycle and ambient temperature can be monitored and the detailed operation status can be grasped.



\* LONWORKS™ LONMARK™ are trademarks of Echelon Corporation registered in the United States and other countries.

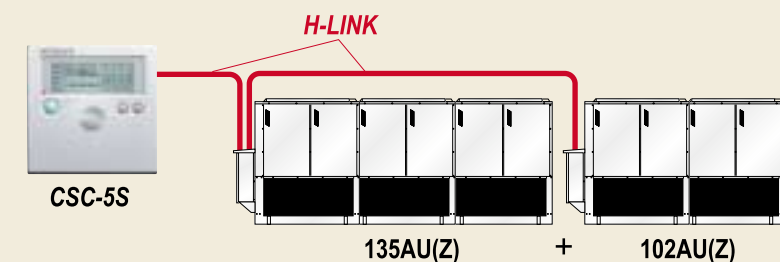
## System controller — CSC-5S

CSC-5S, which is Hitachi's central station system newly developed for the Hitachi screw chiller, provides individual control, quantity control and monitoring. It can be used for up to 8 chillers and installed according to the customer's air-conditioning environment. By remote control, the functions can be checked from the control room, so there's no need to go out or to the machine room for checking, unlike conventional machines. As the main functions, operation/stop and chilled water temperature setting (inlet and outlet) can be remote controlled. Also operation/stop status, chilled water temperature setting (inlet and outlet), current outlet chilled water temperature and alarm code can be monitored. By using this system controller, this system enables various functions to be combined. (For more detailed product specifications, contact a Hitachi screw chiller agent.)

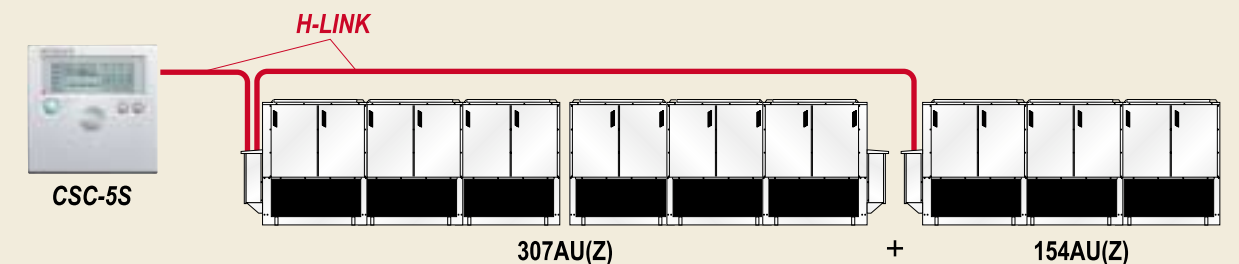


### Example of CSC-5S use

#### Combination in 237RT



#### Combination in 461RT



# General data

Model	Step Control Type	R407C	RCUP30AU	RCUP38AU	RCUP46AU	RCUP51AU	RCUP75AU	RCUP90AU		RCUP102AU	RCUP135AU	RCUP154AU	RCUP179AU	RCUP205AU	RCUP256AU	RCUP307AU
	Continuous Control Type	R407C	RCUP30AUZ	RCUP38AUZ	RCUP46AUZ	RCUP51AUZ	RCUP75AUZ	RCUP90AUZ		RCUP102AUZ	RCUP135AUZ	RCUP154AUZ	RCUP179AUZ	RCUP205AUZ	RCUP256AUZ	RCUP307AUZ
Cooling Capacity	50Hz	kW*1	106	132	160	180	265	315		360	475	540	630	720	900	1,080
		USRT*1	30.1	37.5	45.5	51.2	75.4	89.6		102.4	135.1	153.6	179.2	204.8	256.0	307.1
		kcal/h*1	91,160	113,520	137,600	154,800	227,900	270,900		309,600	408,500	464,400	541,800	619,200	774,000	928,800
		Btu/h*1	362,000	450,000	546,000	614,000	904,000	1,075,000		1,228,000	1,621,000	1,842,000	2,150,000	2,457,000	3,071,000	3,685,000
	60Hz	kW*1	118	150	180	200	300	355		400	530	600	710	800	1,000	1,200
		USRT*1	33.6	42.7	51.2	56.9	85.3	101.0		113.8	150.7	170.6	201.9	227.5	284.4	341.3
		kcal/h*1	101,480	129,000	154,800	172,000	258,000	305,300		344,000	455,800	516,000	610,600	688,000	860,000	1,032,000
		Btu/h*1	403,000	512,000	614,000	682,000	1,024,000	1,211,000		1,365,000	1,808,000	2,047,000	2,423,000	2,730,000	3,412,000	4,094,000
Capacity Control (%)	Step Control Type		100, 75, 50, 0				100, 75, 50, 25, 0			100, 75, 50, 25, 0	100, 66, 33, 17, 0		100, 75, 50, 38, 25, 13, 0		100, 80, 60, 50, 30, 10, 0	100, 83, 66, 50, 33, 17, 0
	Continuous Control Type*2		100~15, 0				100~15, (5), 0			100~15, (5), 0	100~15, (5), 0		100~15, (7.5), 0		100~15, (6), 0	100~15, (7.5), 0
Dimension	Height		2,150	2,150	2,150	2,150	2,150	2,150		2,150	2,150	2,150	2,150	2,150	2,150	2,150
	Width		1,900	1,900	1,900	1,900	1,900	1,900		1,900	1,900	1,900	1,900	1,900	1,900	1,900
	Depth		2,300	2,300	2,300	2,300	4,200	4,200		4,200	6,100	6,100	8,500 (min.)	8,500 (min.)	10,400 (min.)	10,400 (min.)
Refrigerant		R407C (Operating Charged)								R407C (Operating Charged)						
Flow Control		Electrical Expansion Valve								Electrical Expansion Valve						
Number of Circuits		1	1	1	1	2	2		2	3	3	2 X 2	2 X 2	3 + 2	3 + 3	
Compressor Type		Semi-Hermetic Screw Type								Semi-Hermetic Screw Type						
	Step Control Type	R407C	30ASCP-H	40ASCP-H	50ASCP-H	60ASCP-H	40ASCP-H	50ASCP-H		60ASCP-H	50ASCP-H	60ASCP-H	50ASCP-H	60ASCP-H	60ASCP-H	60ASCP-H
	Continuous Control Type	R407C	30ASCP-Z	40ASCP-Z	50ASCP-Z	60ASCP-Z	40ASCP-Z	50ASCP-Z		60ASCP-Z	50ASCP-Z	60ASCP-Z	50ASCP-Z	60ASCP-Z	60ASCP-Z	60ASCP-Z
Heat Exchanger Condenser		Multi-Pass Cross Finned Type								Multi-Pass Cross Finned Type						
Condenser Fan		Direct Drive Propeller Fan								Direct Drive Propeller Fan						
Motor		0.9	0.9	0.9	0.9	0.9	0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9	
	Quantity	4	4	4	4	8	8		8	12	12	16	16	20	24	
Water Cooler		Plate Type								Plate Type						
Type of Control System		Micro-Processor Control								Micro-Processor Control						
Safety Device		Thermal Overcurrent Relay(R,T Phase), Internal Thermostat for Compressor, High Pressure Switch, Low Pressure Control, Oil Heater, Fusible Plug, Freeze Protection Control, Reverse Phase Protection Device, Discharge Gas Thermistor and Operation-Hour meter								Thermal Overcurrent Relay(R,T Phase), Internal Thermostat for Compressor, High Pressure Switch, Low Pressure Control, Oil Heater, Fusible Plug, Freeze Protection Control, Reverse Phase Protection Device, Discharge Gas Thermistor and Operation-Hour meter						
Connections		Victaulic Type								Victaulic Type						
Chilled Water Inlet / Outlet		3B	3B	3B	3B	2 x 3B	2 x 3B		2 x 3B	3 x 3B	3 x 3B	4 x 3B	4 x 3B	5 x 3B	6 x 3B	
Net Weight (kg)	R407C	1,400	1,530	1,600	1,650	2,850	3,000		3,060	4,700	4,790	2 x 3,000	2 X 3,060	4,790 + 3,060	2 X 4,790	
Chilled Water Outlet Temperature	Standard	5 ~ 15° C								5 ~ 15° C						
	Option	—								—						
Condenser Air Inlet Temperature (DB)	Standard	5 ~ 43° C								5 ~ 43° C						
	Option	-15 ~ 43° C (Up to 154AU)								-15 ~ 43° C (Up to 154AU)						

## NOTES:

- The nominal capacities are based on the following conditions.\*1  
Chilled Water Inlet/Outlet Temperature: 12 / 7° C  
Condenser Air Inlet Temperature: 35° C (DB)
- Power Source : Main (AC 3 φ ) 380 / 415V 50Hz, 440V 60Hz  
: Control (AC 1 φ ) 220 / 240V 50Hz, 220V 60Hz
- The units greater than 179AU including 179AU consist of two modules and are separately shipped.
- AU(Z) Series:  
The common chilled water piping (field-supplied) between each water cooler shall be directly connected at site.  
(The water coolers in the same unit shall be connected to the same common piping)
- It is required to connect electrical control wires between No.1 and No.2 units for the unit greater than 179AU including 179AU.
- ( ) marked with\*2 is available by selection switch.
- Specifications in this sheet are subject to change without notice, in order that HITACHI may bring the latest innovations to their customers.
- For the details of the connection of in-between units other than the above models and piping direction, contact your Hitachi screw chiller dealer.

## Standard accessories

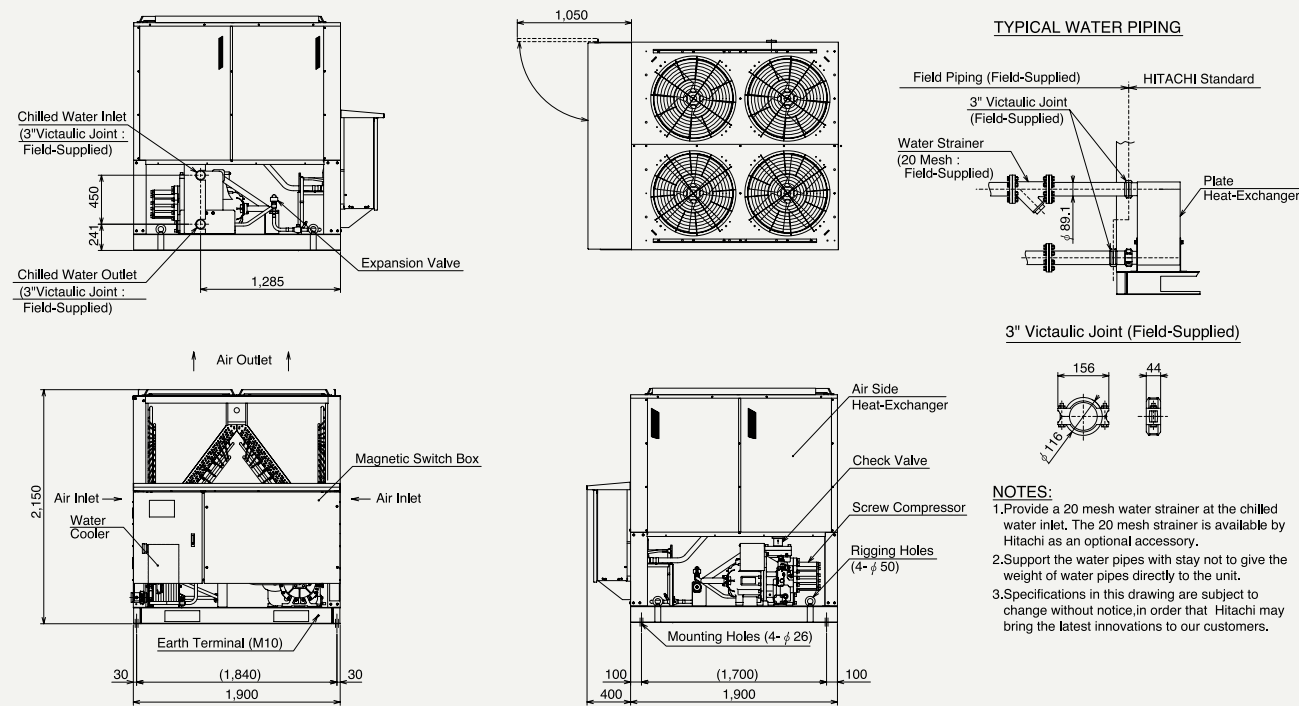
- Foundation bolt
- Nut
- Washer
- Bushing
- Vibration-proof rubber mat

## Optional accessories

- Anti-corrosion treatment is available
- HARC70-CE for BMS, GATE WAY
- CSC-5S
- Water strainer
- High external pressure type fan

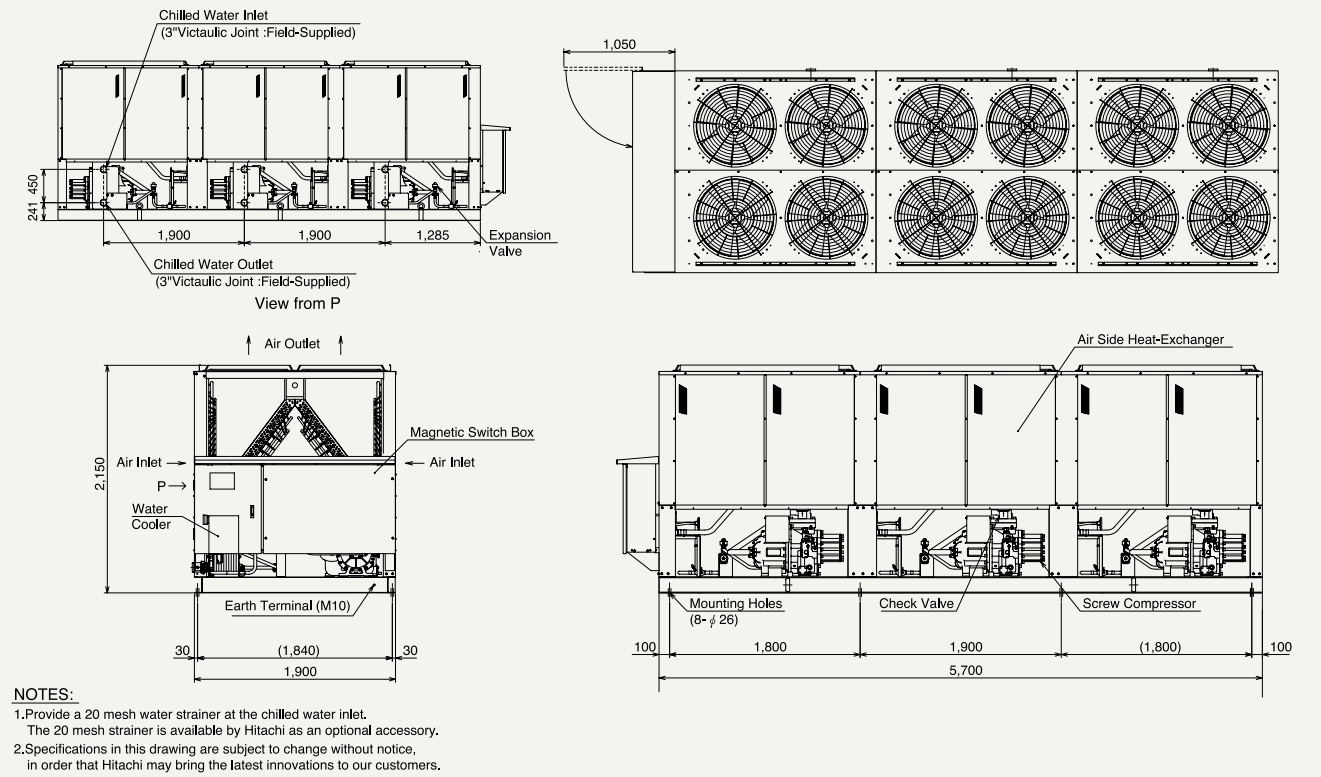
## RCUP30AU(Z), 38AU(Z), 46AU(Z) and 51AU(Z)

unit : mm



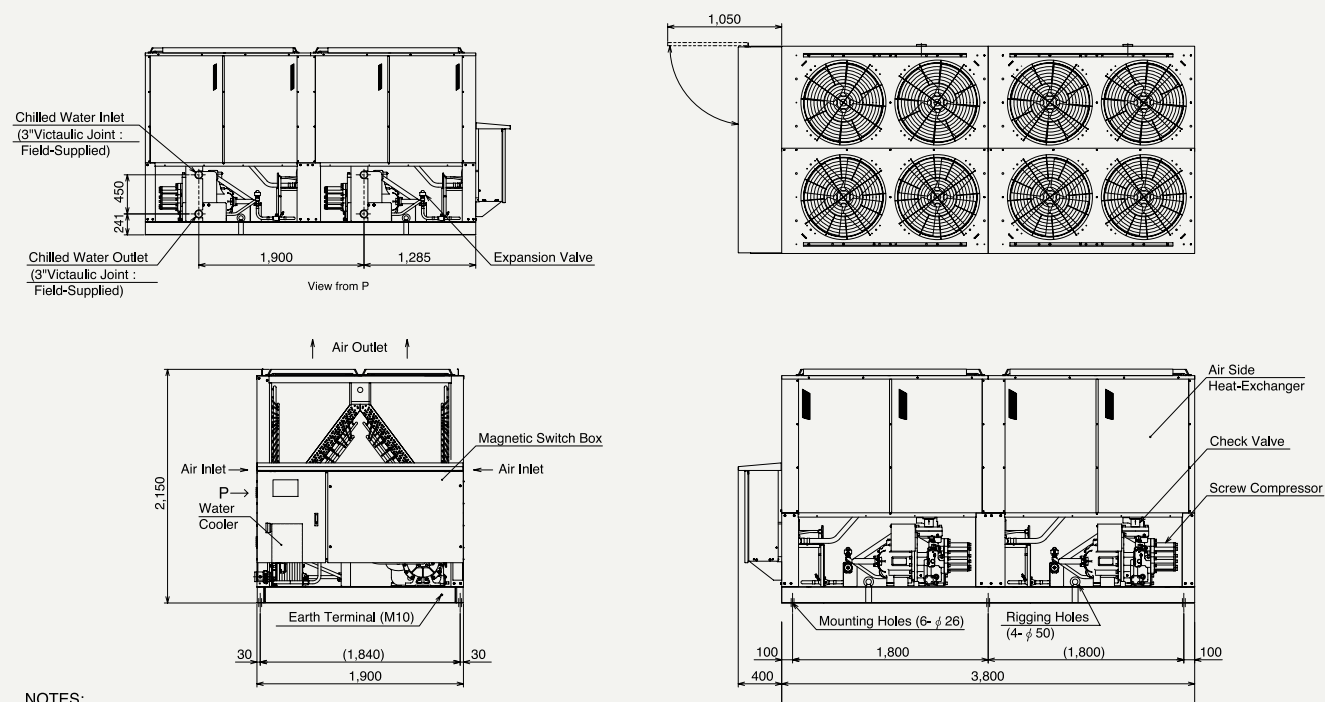
## RCUP135 and 154AU(Z)

unit : mm



## RCUP75, 90 and 102AU(Z)

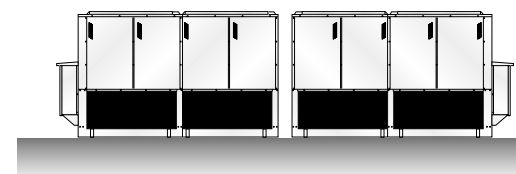
unit : mm



## Combination of main unit & sub unit [ RCUP179~307AU(Z) ]

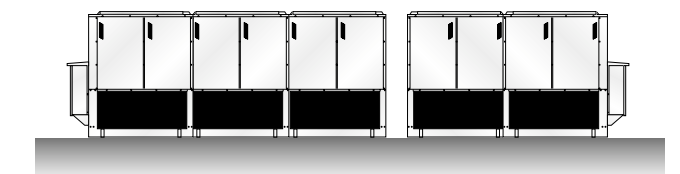
### RCUP179AU(Z)

90AU(Z) (Main unit) + 90AU(Z) (Sub unit)



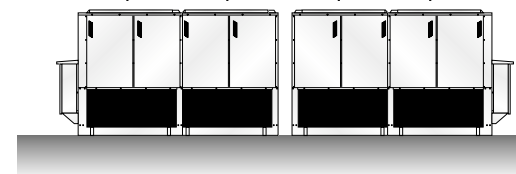
### RCUP256AU(Z)

154AU(Z) (Main unit) + 102AU(Z) (Sub unit)



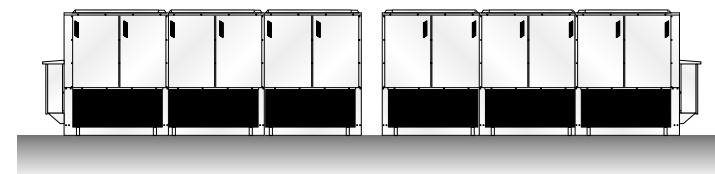
### RCUP205AU(Z)

102AU(Z) (Main unit) + 102AU(Z) (Sub unit)



### RCUP307AU(Z)

154AU(Z) (Main unit) + 154AU(Z) (Sub unit)



\* For other combinations, contact a Hitachi screw chiller dealer.