

HITACHI

**NEW High Efficiency
HITACHI AIR-COOLED
CHILLERS**

ICHIBAN

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 =

(RCUP75AUZ / 50Hz)

New screw compressor

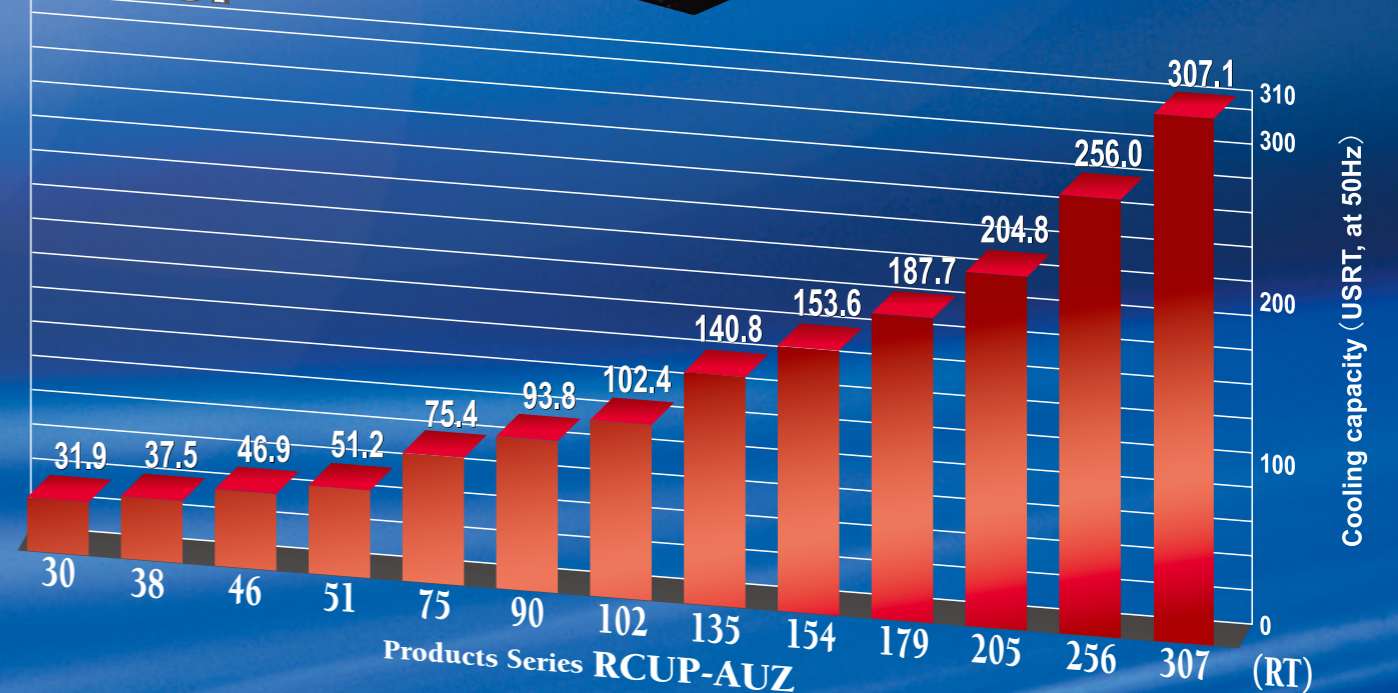
High-efficiency cooling cycle

New plate heat exchanger

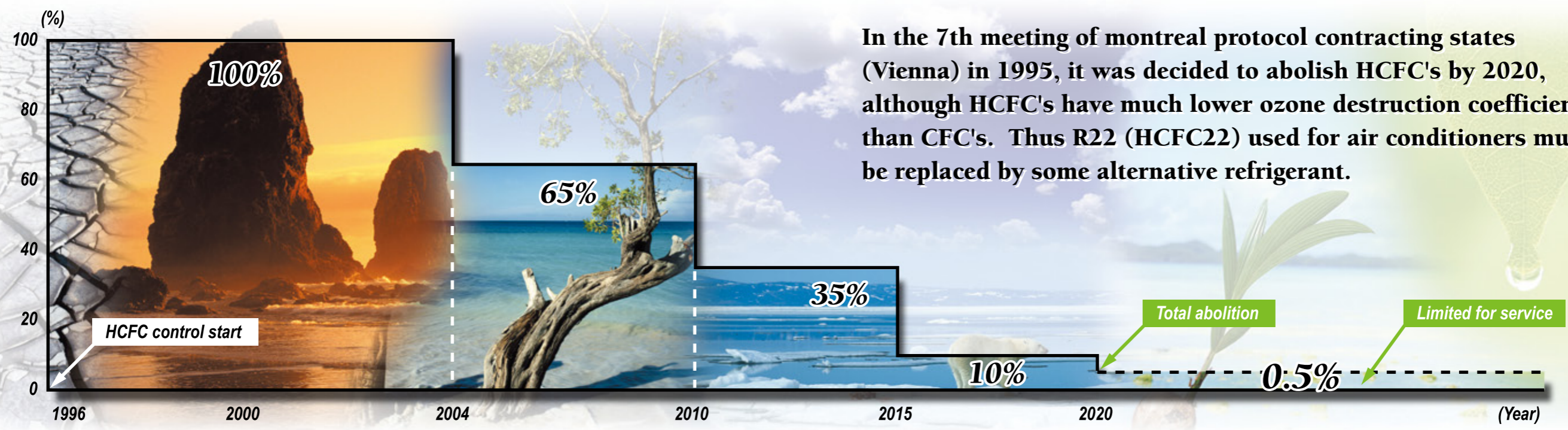
Capacity control technology



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 Depression Potential (ODP) of R407C = 0

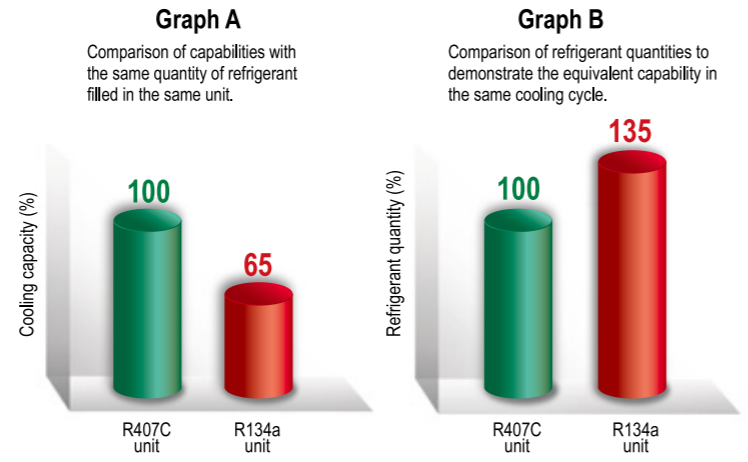
Item/Refrigerant		R22	R407C	R134a
Structure	wt%	HCFC22	HFC32/125/134a	HFC134a
Composition ratio (wt%)	-	100	23/25/52	100
ODP (Ozone Depression Potential)	-	0.055	0	0
GWP (Global Warming Potential)	-	1,700	1,530	1,300
Combustibility	-	Non-flammable	Non-flammable	Non-flammable
Refrigerant safety degree (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

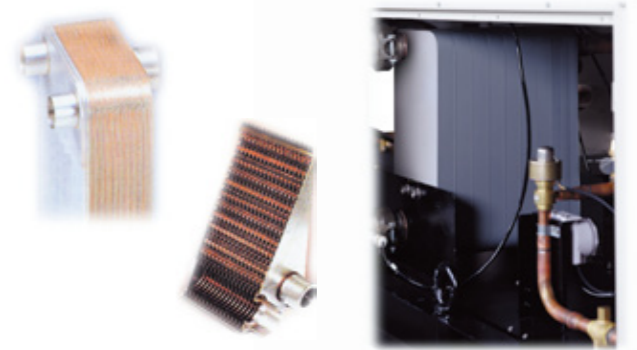
Graph A compares the capabilities in the same unit. Graph B compares the quantities of refrigerant to demonstrate the same capability in the same cooling cycle. These two graphs show that for R134a unit, to obtain the equivalent capability with the same quantity of refrigerant and to increase the quantity 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 $GWP_{1300} \times 135\% = GWP_{1755}$.

Comparison between R407C and R134a sealed in the same component



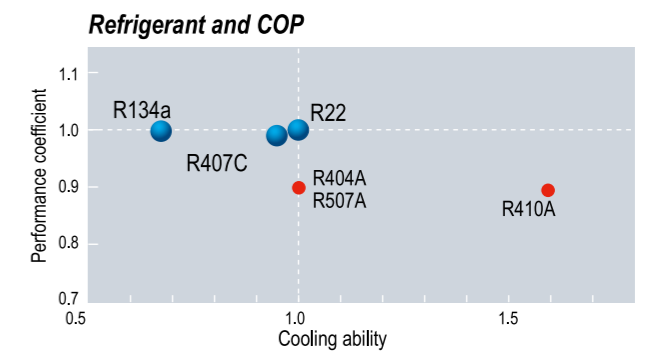
Why use plate heat exchangers ?

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.

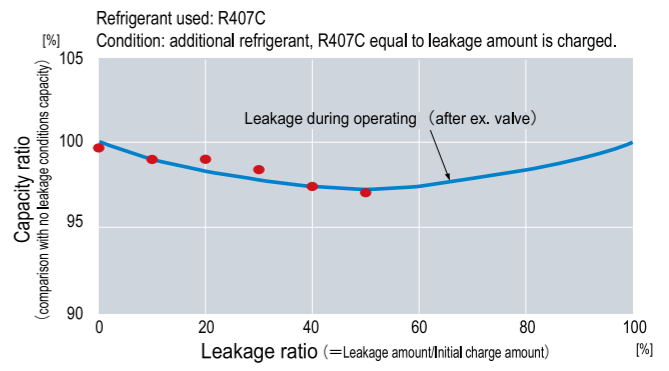


Hitachi uses R407C because ...

As shown in the right table, refrigerant R22 and R407C can provide similar cooling performance. Compact sizing is available by adopting R407C when compared with R134a refrigerant.

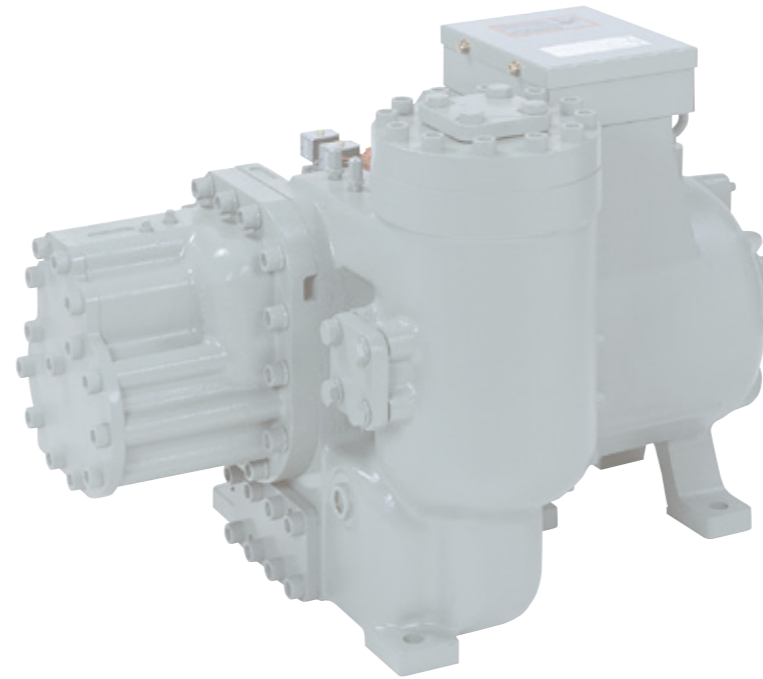
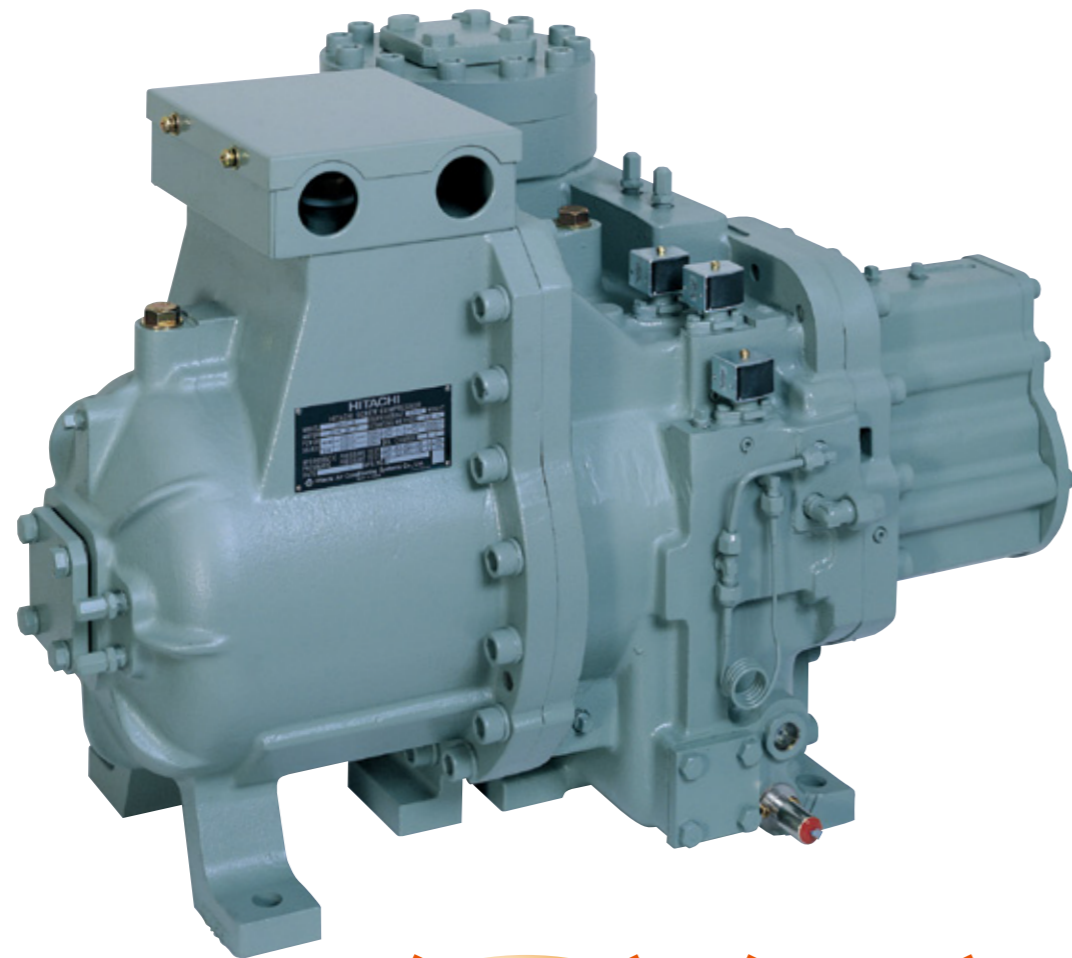


The figure right shows the results of an in-plant experiment. It shows the reduction in cooling performance when R407C is taken out of the working chiller and resealed in it – there's a drop of only 3% or less.



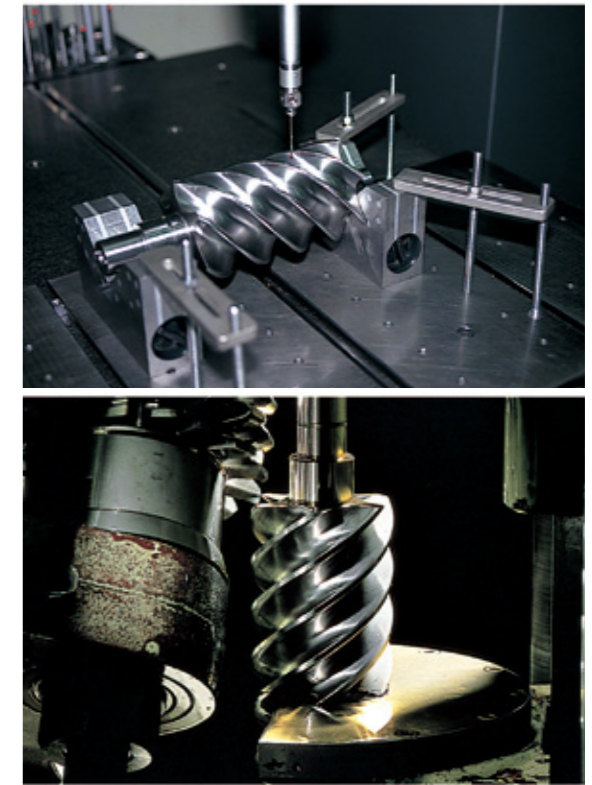
Hitachi's new screw compressor

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.



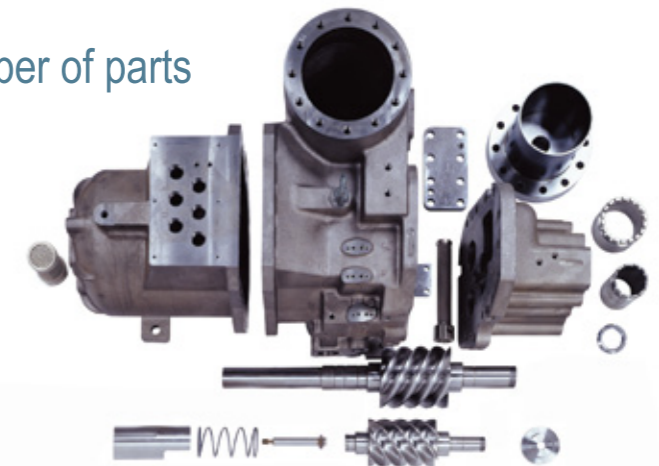
Screw processing technology

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.

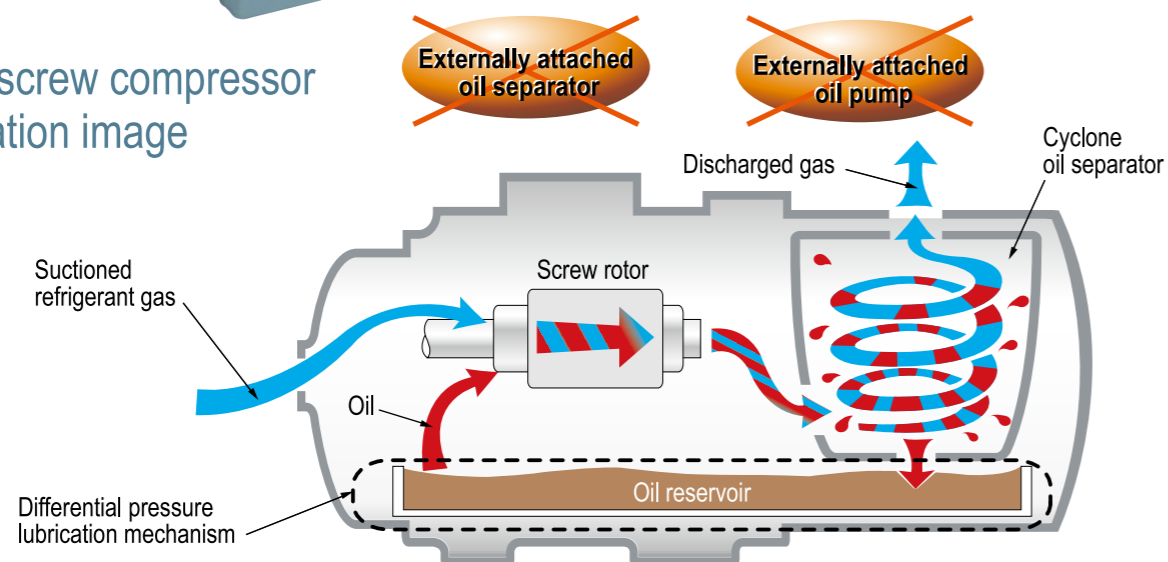


Simple structure with a small number of parts

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.



New screw compressor operation image



Low vibration level

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

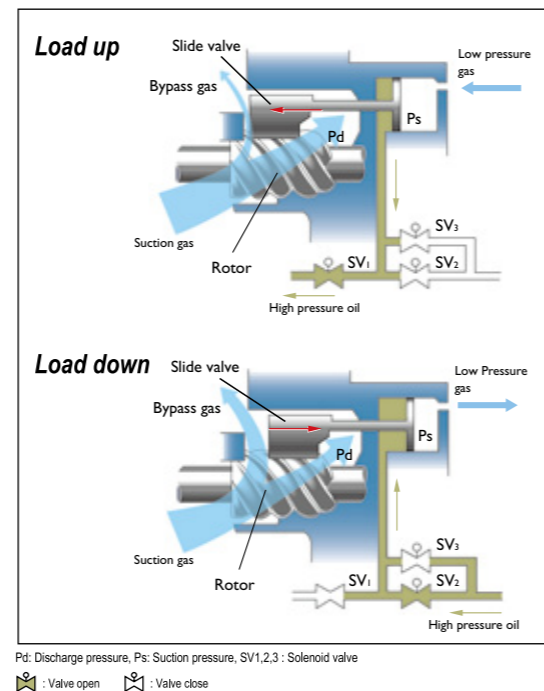
Vibration comparison

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.	5-8
	At base frame	Less than 10
At leg of comp.	23.8/28.7	48.5/57.8
At base frame	23.8/28.7	48/57.8
Acceleration energy	Screw: 1/5 of reciprocating type	

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

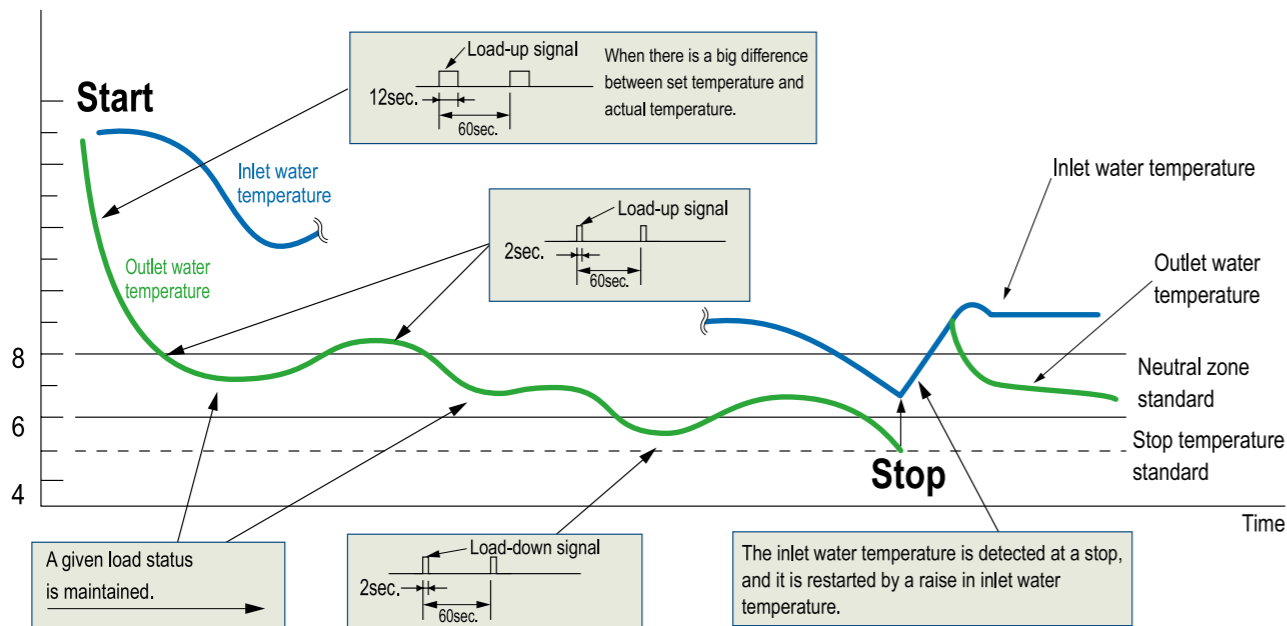
Hitachi's unique continuous capacity control technology using slide valve is further advanced. A wide range from the conventional 25% (33%) to 15% of capacity control is realized with highly-accurate water temperature control realized.

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.

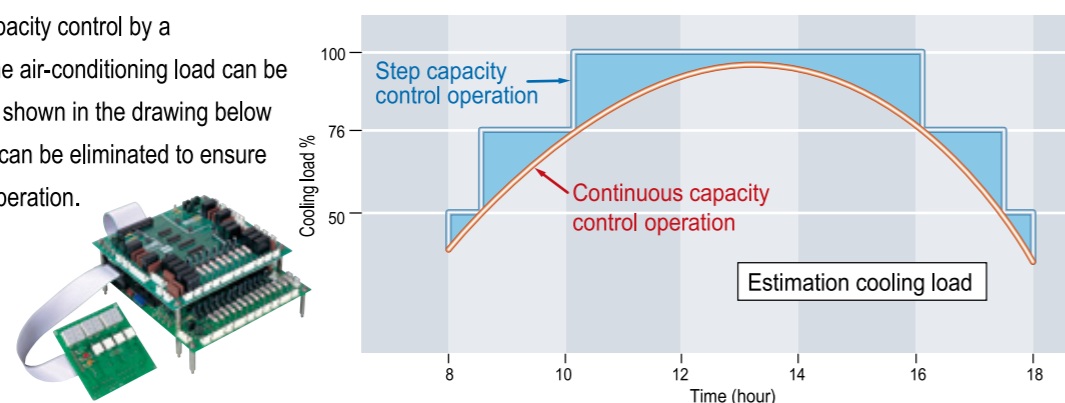


Continuous capacity control image

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 75AUZ and RCUP 100AX



■ RCUP100AX	
COP	2.73
Cooling Capacity (kW)	265
Total Power Input (kW)	97.1

* The RCUP75AU-equivalent cooling capacity is:



■ RCUP75AUZ	
COP	3.41 125% UP!!
Cooling Capacity (kW)	265
Total Power Input (kW)	77.6 20% DOWN!!

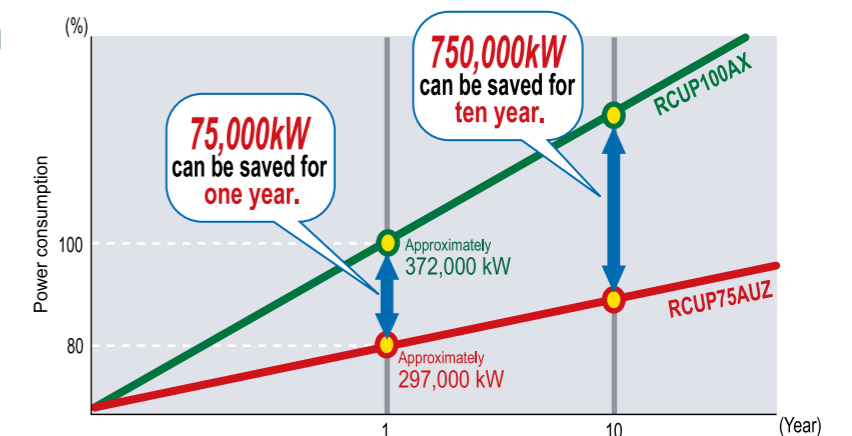
Running cost comparison

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>

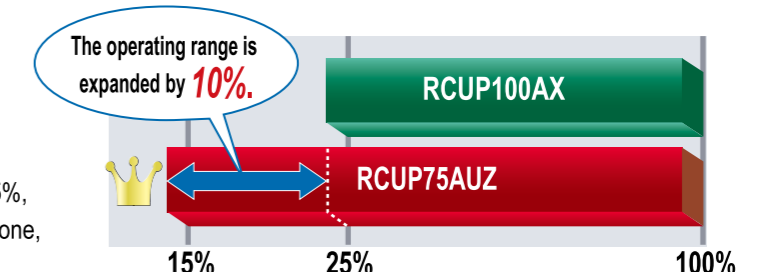
- Operating hours / day : 15 hours
- Operating rate (%) : 70 %
- Total operating hours : 3,830 hours

Note: This is a typical operation example, and it may differ from the actual airconditioning load.



Expansion of capacity control range (continuous control specifications)

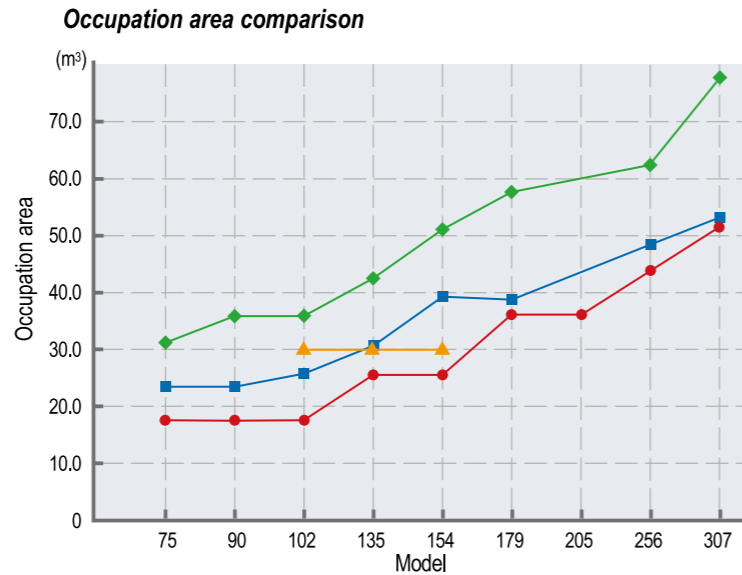
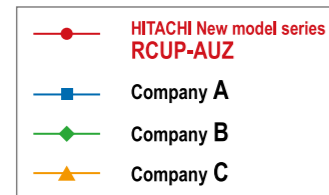
As the capacity control range is expanded up to 15%, the compressor will not stop even in the low load zone, thus stable water temperature can be supplied.



Other characteristics

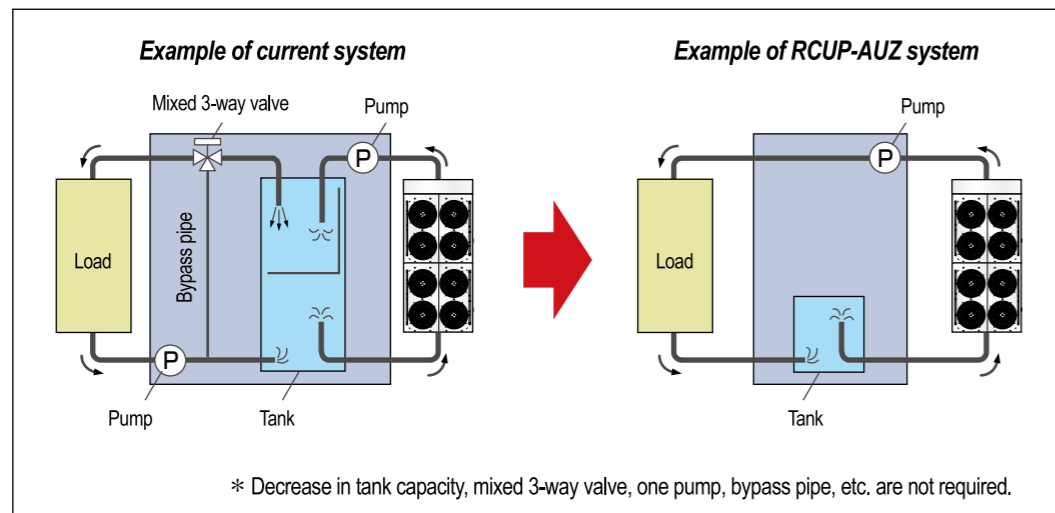
Compact, Space-saving

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 model 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

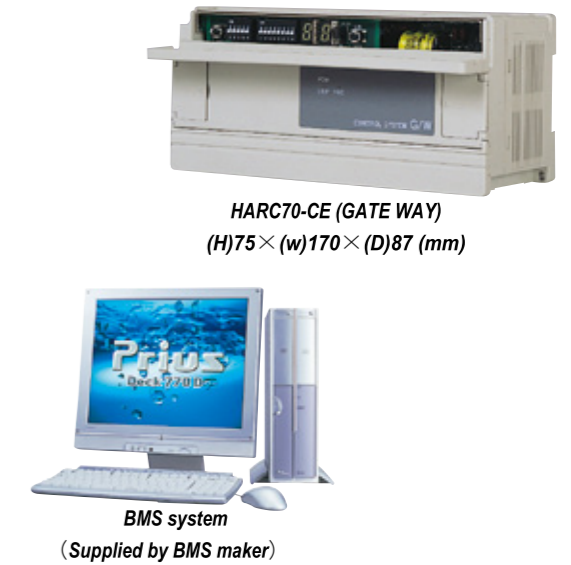
If the chiller unit is stopped by an alarm, each sensor data immediately before stop can be recorded and segment displayed. Thus the unit operation status during the alarm stop can be grasped easily. The data (only one data generated immediately before stop) is maintained until the power is turned OFF. 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.



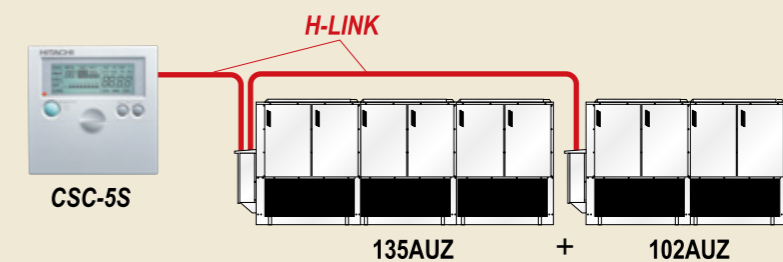
System controller — CSC-5S

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.)

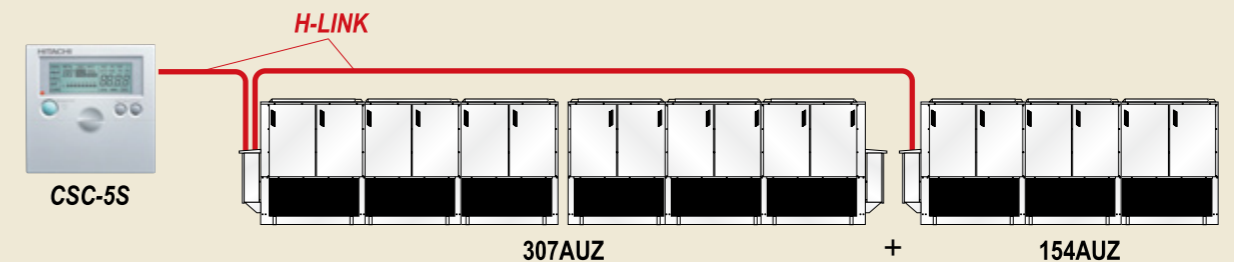


Example of CSC-5S use

Combination in 237RT



Combination in 461RT



General data

Model	Continuous Control Type	R407C	RCUP30AUZ	RCUP38AUZ	RCUP46AUZ	RCUP51AUZ	RCUP75AUZ	RCUP90AUZ		RCUP102AUZ	RCUP135AUZ	RCUP154AUZ	RCUP179AUZ	RCUP205AUZ	RCUP256AUZ	RCUP307AUZ	
Cooling Capacity	50Hz	kW*1	112	132	165	180	265	330		360	495	540	660	720	900	1,080	
		USRT*1	31.9	37.5	46.9	51.2	75.4	93.9		102.4	140.8	153.6	187.7	204.8	256.0	307.1	
		kcal/h*1	96,320	113,520	141,900	154,800	227,900	283,800		309,600	425,700	464,400	567,600	619,200	774,000	928,800	
		Btu/h*1	382,000	450,000	563,000	614,000	904,000	1,126,000		1,228,000	1,689,000	1,842,000	2,252,000	2,457,000	3,071,000	3,685,000	
	60Hz	kW*1	130	150	187	200	300	375		400	562	600	750	800	1,000	1,200	
		USRT*1	37	43	53	57	85	107		113.8	160	170.6	213	227.5	284.4	341.3	
		kcal/h*1	111,800	129,000	160,820	172,000	258,000	322,500		344,000	483,320	516,000	645,000	688,000	860,000	1,032,000	
		Btu/h*1	444,000	512,000	638,000	682,000	1,024,000	1,280,000		1,365,000	1,918,000	2,047,000	2,559,000	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.)	12,300 (min.)	
Refrigerant		R407C (Operating Charged)								R407C (Operating Charged)							
Flow Control		Electronic Expansion Valve								Electronic 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 (Pre-coated Fin : Standard)*3								Multi-Pass Cross Finned Type (Pre-coated Fin : Standard)*3							
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 for Compressor (R,T Phase), Internal Thermostat for Compressor, Thermal Overcurrent Relay for Fan Motor, 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 for Compressor (R,T Phase), Internal Thermostat for Compressor, Thermal Overcurrent Relay for Fan Motor, 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		1,350	1,400	1,470	1,510	2,550	2,700		2,780	4,360	4,480	2 x 2,700	2 x 2,780	4,480 + 2,780	2 x 4,480	
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 179AUZ including 179AUZ consist of two modules and are separately shipped.
- AUZ 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 179AUZ including 179AUZ.
- () 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.
- Acrylic-resin-coated fins are equipped to standard model.*3

Standard accessories

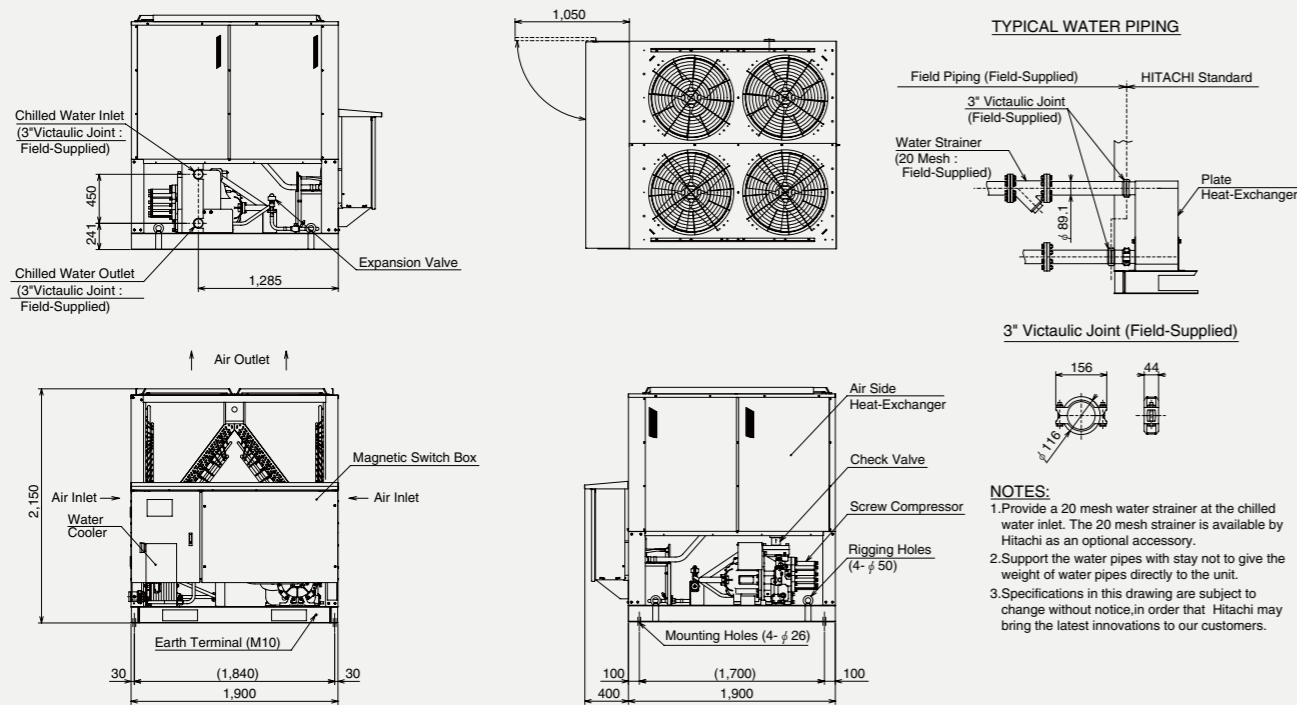
- Foundation bolt
- Nut
- Washer
- Bushing
- Vibration-proof rubber mat

Optional accessories

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

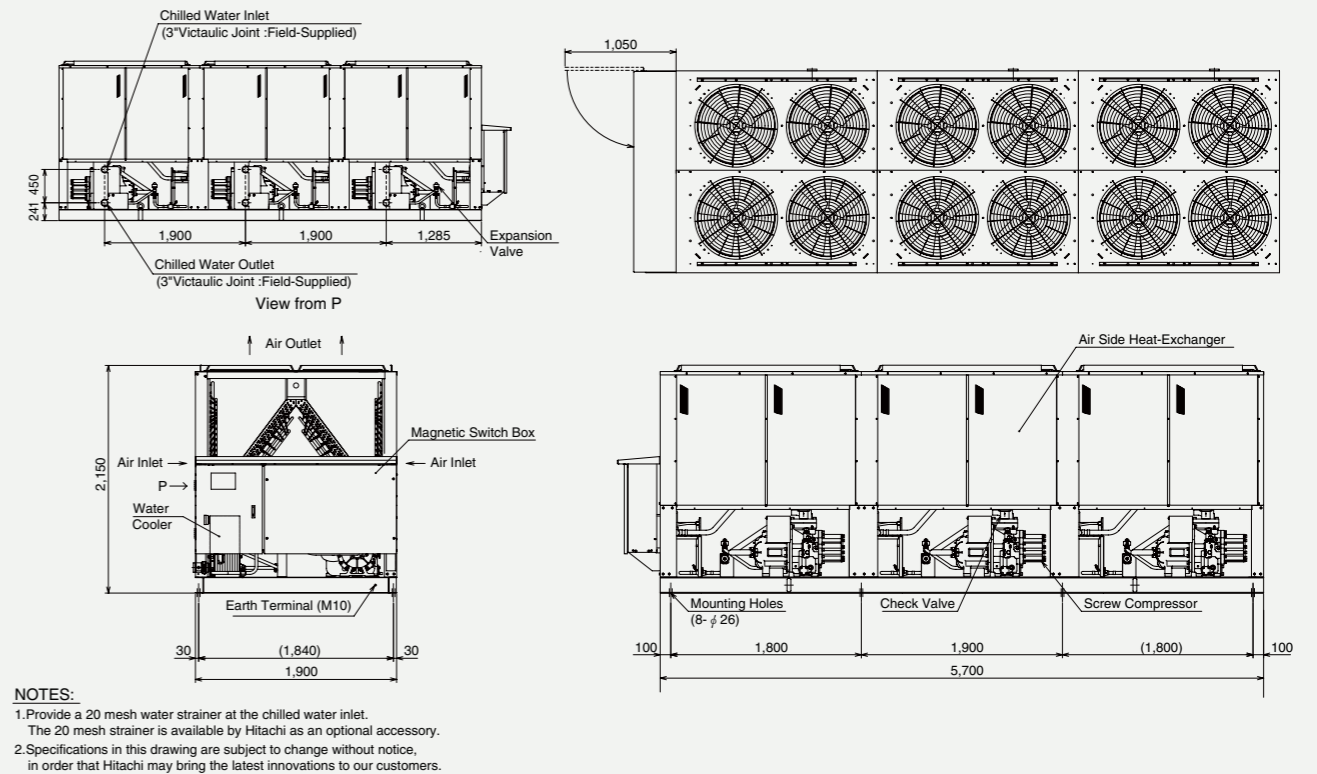
RCUP30AUZ, 38AUZ, 46AUZ and 51AUZ

unit : mm



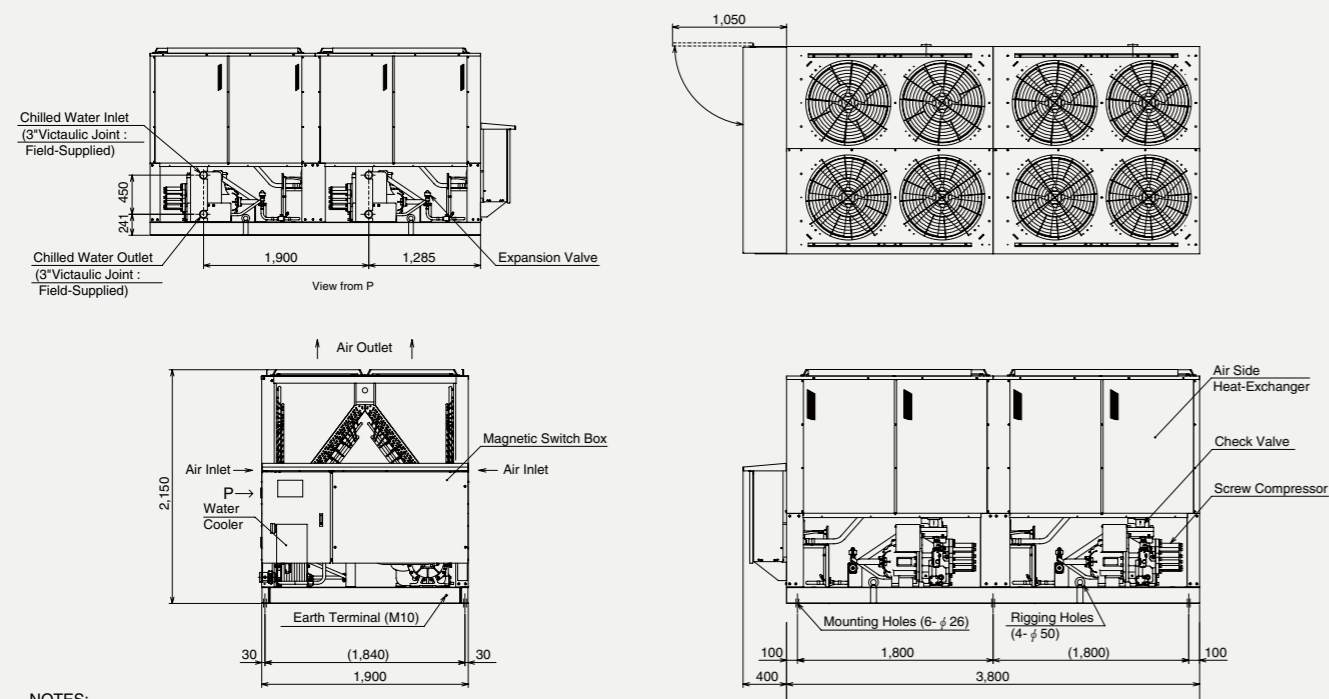
RCUP135 and 154AUZ

unit : mm



RCUP75, 90 and 102AUZ

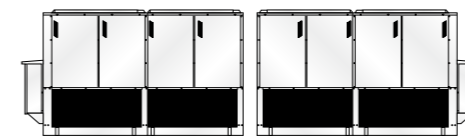
unit : mm



Combination of main unit & sub unit [RCUP179~307AUZ]

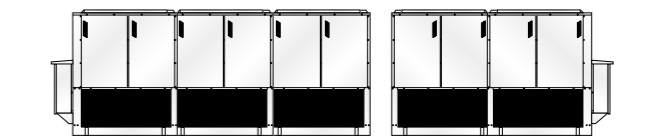
RCUP179AUZ

90AUZ (Main unit) + 90AUZ (Sub unit)



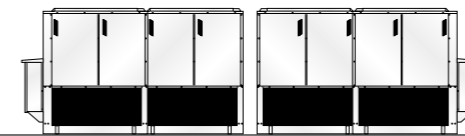
RCUP256AUZ

154AUZ (Main unit) + 102AUZ (Sub unit)



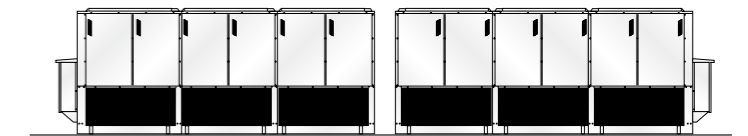
RCUP205AUZ

102AUZ (Main unit) + 102AUZ (Sub unit)



RCUP307AUZ

154AUZ (Main unit) + 154AUZ (Sub unit)



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

Johnson Controls-Hitachi Air Conditioning

<http://www.jci-hitachi.com>

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