

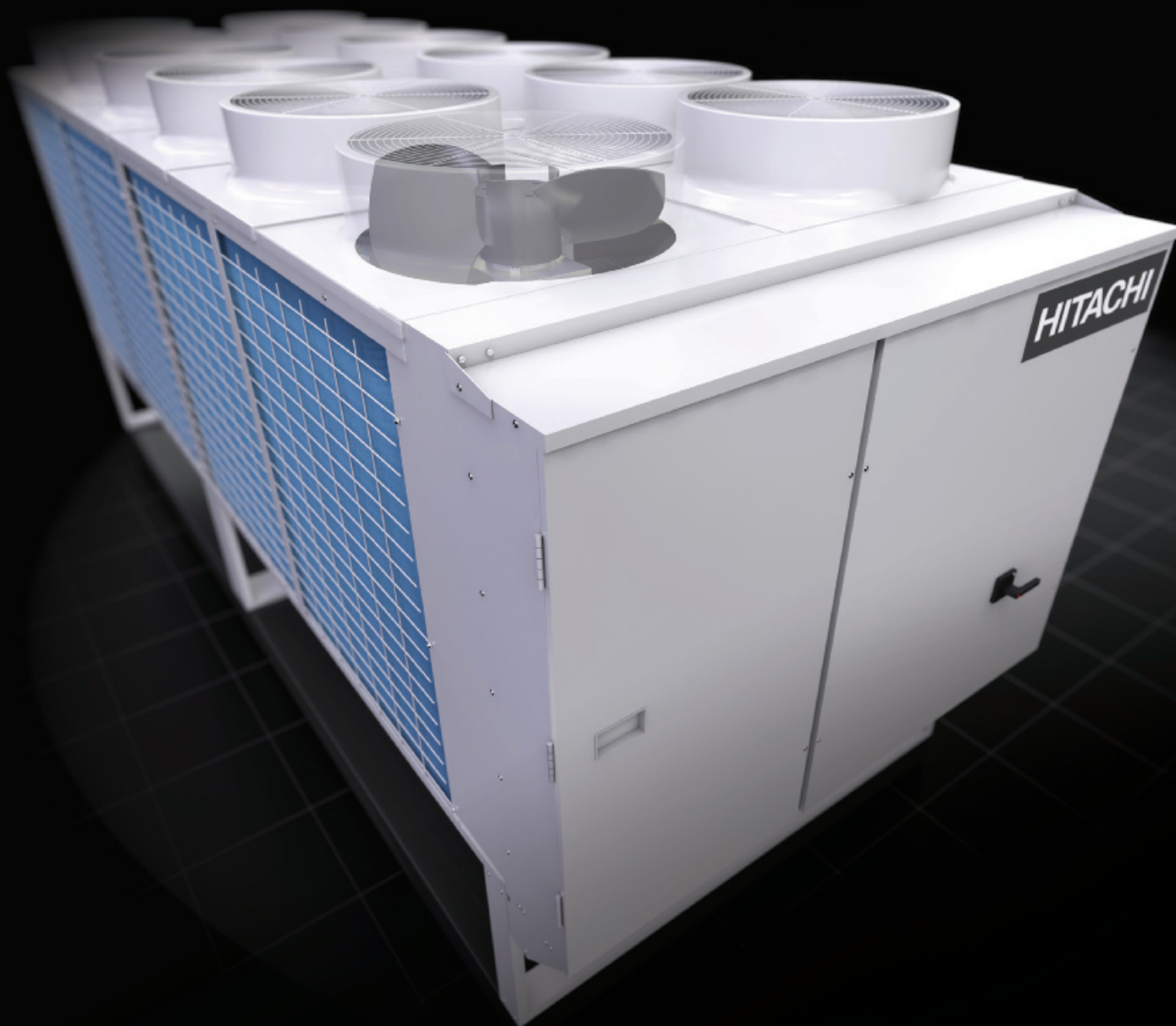
Hitachi Air Conditioning

Engineering for tomorrow. And the tomorrow after that.

Samurai



Samurai
Chiller



Samurai

Chillers for Industry and Commerce

HITACHI
Inspire the Next



STORES

Company profile

Small beginnings

The establishment of an electrical repair shop for a copper mining company in Japan marked the birth of Hitachi in 1910. Today it is evident that Hitachi Ltd., has grown tremendously, now being one of the largest industrial corporations worldwide.

Our corporate statement "Inspire the Next" is a declaration of our vow that the Hitachi brand will continue to meet the expectations of our customers and society in this age of information, knowledge and the empowered consumer.

This statement embodies Hitachi's commitment to continue to inspire coming generations with the latest products, systems and services, for a more vibrant society.

It is also an expression of our strong commitment to boldly face whatever new challenges the times bring us: whatever comes "Next."

Hitachi business groups

Hitachi Europe Ltd., is a wholly owned subsidiary of Hitachi Ltd., Japan, headquartered in Maidenhead, UK and comprises nine key business areas: air conditioning and refrigeration systems, digital media products, display products, European procurement and sourcing, industrial components and equipment, via mechanics, information systems, power and industrial systems, and rail.

Hitachi Air Conditioning

Hitachi prides itself on providing high quality, efficient and reliable air conditioning solutions across the globe. By investing heavily in research and development, Hitachi have been able to remain at the forefront of the industry, and with the opening of HAPE, a purpose-built factory in Barcelona, manufacturing and delivery procedures have become even more streamlined.



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Samurai

Chillers

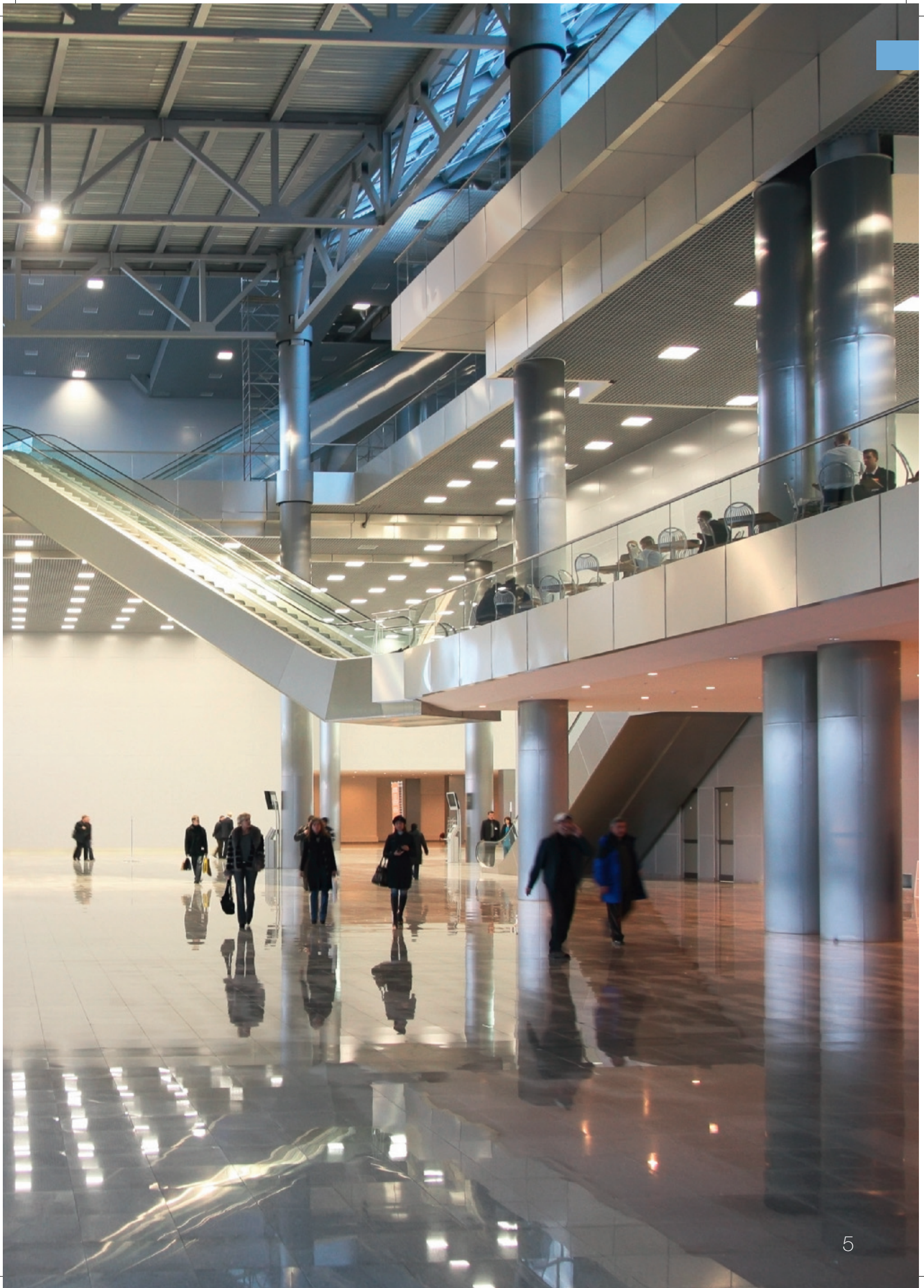
The solution for Industry and Commerce

The Hitachi Samurai range is available as air cooled, water cooled or condenserless models. They are used extensively in the manufacturing industry and in commercial applications such as large shopping centres and hotels.

Our Samurai cooling only or heat pump air-cooled chillers are one of the most efficient, quiet and reliable solutions currently available.


Similarly our water-cooled chillers are equally as effective and available in cooling only and with a heating option.

The key factor to their success is the use of Hitachi's own world-renowned twin screw compressor working in tandem with plate heat exchangers for both the condenser and evaporator circuits, providing world-class reliability.




Samurai Chillers


Air cooled, cooling only

Model	40	50	60	70	80	100	120	140	160	180	210	240	280	320	350	400
RCU2E-(xx)AG2 	Refrigeration capacity (kW)															
	112	130	156	178	206	260	312	356	412	468	534	618	712	824	890	1030


Air cooled, heat pump

Model	40	50	60	70	80	100	120	140	160	180	210	240
RHU2E-(xx)AG2 	Refrigeration capacity (kW)											
	106	123	148	169	195	246	296	338	390	444	507	585
	Thermal output capacity (kW)											
	110	127	152	185	185	254	304	370	370	456	555	555

Water cooled

Model	40	50	60	80	100	120	150	180	200	240
RCUE-(xx)WG2 	Refrigeration capacity (kW)									
	134	160	194	232	320	388	445	525	600	696
	Thermal output capacity (Optional) (kW)									
	161	192	234	275	385	468	527	622	720	824

Condenserless, cooling only

Model	40	50	60	80	100	120
RCUE-(xx)CLG2 	Refrigeration capacity (kW)					
	120	145	180	240	290	360

Based on nominal European Standards. See pages 16–22.

Samurai Chillers

Optional versions		AG2	WG2	CLG2
Noise	Low Noise (-2dB(A))	■	X	X
	Super Low Noise (-4dB(A))	■	X	X
Low water temperature	Outlet Temperature: 0 ~ 4°C (Low 1)	■	■	■
	Outlet Temperature: -1 ~ -5°C (Low 2)	■	■	■
	Outlet Temperature: -6 ~ -10°C (Low 3)	■	■	■
Control systems	Magnetic Circuit Breaker	■	■	■
	Magnetic Circuit Breaker for Fan	■	X	X
	Remote Controller - CSC-5S	■	■	■
	Remote Controller - CS Net Web	■	■	■
	LonWorks® BMS Control - HARC-70CE1 /OP	■	■	■
	ModBus BMS Control - HC-A32MB	■	■	■
	Power Meter Kit for CS Net Web	■	■	■
Condenser	Copper fin	■	X	X
	Blygold Coil treatment	■	X	X
Refrigerant cycle	Ball Valve in the Discharge Pipe (for the compressor)	■	■	Standard
	Ball Valve in the Suction Pipe (for the compressor)	■	■	■
	Compressor Safety Valve	■	■	■
	Dual Compressor Safety Valve	■	■	■
	Dual Pressure Relief Valve (Discharge Pipe)	■	■	■
	Suction Pressure Relief Valve	X	■	■
	Suction Pipe Insulation	■	Standard	Standard
	Heat Recovery (Plate Heat Exchanger Hot Gas)	■	X	X
Water cycle	PN16 Flange (with counter flange)	■	■	■
	Flange Connections (Welded version)	■	Standard	Standard
	Differential Water Pressure Switch (WT inlet/outlet)	■	■	■
	Water Flow Switch (Field Installation)	■	■	■
	Water Cooler Heater (Trace Heating for Heat Exchanger)	■	■	■
	Common Water Pipe (models with 2 or more Heat Exchanger)	■	■	X
	Stainless Steel water pipes (AISI 304)	■	X	X
	Water Pressure Port (not with PN16 Flanges or Common Water Pipe)	■	X	X
	Water Strainer	■	■	■
	Hydraulic Module (Only RCU2E/RHU2E 40 ~ 80AG2)	■	X	X
Special operation	Heat Pump Operation	■	■	X
	High Ambient Heating Operation (RHU2E-AG2)	■	X	X
Others	Factory Witness Test 1 (Visual inspection, factory tour - test already completed)	■	■	■
	Factory Witness Test 2 (Visual inspection of testing to customers conditions)	■ (3 cycles)	■	■
	Rubber Anti-Vibration Mats (shipped loose)	■	■	■
	Spring Anti-vibration Dampers (shipped loose)	■	■	■
	Control Panel mounted on opposite end to standard	■	X	X
	Wooden Crate for transport	X	■	■
	All Painted Chiller (Enhanced corrosion protection - request with Cu/Cu Fins or with Blygold Coil Treatment)	■	X	X
	Lower Guard Net	■	X	X
	Reinforced Heavy Transport (extra structural struts, flexible pipes, shock indicators)	■	X	X
	Double Packing	■	X	X

■ Optional accessories available
X Not available

See also 'Options in detail' - from page 25.

Features and benefits

Precise control of outlet water temperature

Precise control of the outlet water temperature with varying thermal load requirements, requires accurate continuous capacity control.

To achieve and control outlet water temperature to within $\pm 0.5^\circ\text{C}$ Samurai chillers use two essential components:

1. A sliding valve within the screw compressor changes the capacity of the compressor to match the required load.
2. A sophisticated electronic system based on control bands in which the aim is to maintain a constant outlet temperature.

There are four bands which can be configured:

- LOAD UP 1 BAND
- LOAD UP 2 BAND
- NEUTRAL BAND
- LOAD DOWN BAND

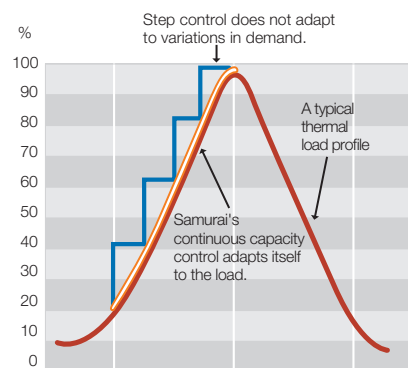
Given a load, and having selected a water outlet temperature, the electronic system compares the value measured by thermistors with the desired value. Depending on the measured value, and at one-minute intervals, a control signal is generated that varies the position of the sliding valve either to increase or to decrease the capacity as required.

The control signal is sent to the solenoid valves located in the compressor and those valves command the sliding valve's movements. The signal has a variable length therefore the slider repositioning will be variable according to the control band.

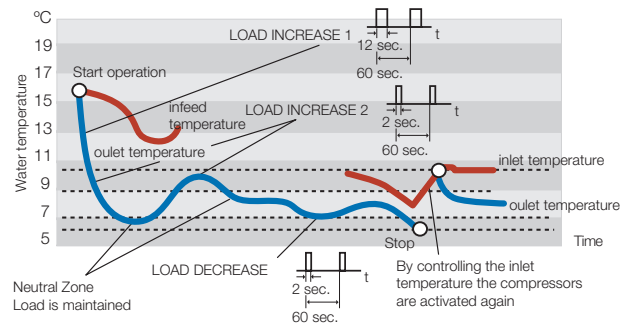
When the band LOAD UP 1 is selected, the signal will last for 12 seconds. When the band LOAD UP 2 or LOAD DOWN is selected, the signal will last 2 seconds. When the NEUTRAL BAND is selected, the slider will stay where it is, as will the capacity.

The advantage of this control banding is that each band has different characteristics so the unit can respond better to differing load requirements. When the measured temperature is very different from the desired temperature, the system can be programmed to respond quickly.

Thermal load profile



How does continuous capacity control work?



If the actual temperature is only slightly different to the required temperature, the program can respond with a precise adjustment of the system performance.

This system responds much faster than conventional PID controllers. The reaction in load increase area 1 is significantly quicker than with a PID system, which, in turn, leads to a more rapid adaptation.

As the system is so highly flexible, the response times or the precision of the specification can be adapted to a specific installation. This is done simply by programming the microswitches on the PCB (see the Technical Catalogue).

Electronic expansion valve

The Samurai is equipped with an electronic expansion valve, which allows precise control under all temperature conditions.

ESEER (Eurovent)

The ESEER (European Seasonal Energy Efficiency Ratios) are shown in the table below for the AG2 series. This indicates the average energy efficiency at part load as defined by Eurovent.

Model	40AG2	50AG2	60AG2	70AG2	80AG2	100AG2	120AG2	140AG2
ESEER	3.48	3.49	3.52	3.50	3.52	3.49	3.52	3.50
Model	160AG2	180AG2	210AG2	240AG2	280AG2	320AG2	350AG2	400AG2
ESEER	3.52	3.52	3.50	3.52	3.50	3.52	3.50	3.52

Excellent partial load performance

Through its continuous capacity control, the Samurai chiller matches the requested cooling capacity at all times. This enables the unit to control to within 0.5°C of the desired leaving water temperature. The design of the control system also enables excellent part load performance.

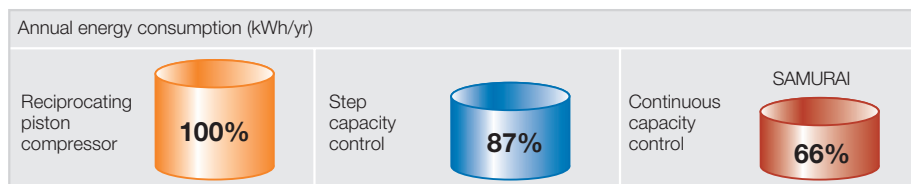
Hydraulic module option - single and dual pump models

Hitachi Hydraulic modules are a compact design and integrated inside the unit. They are assembled with all interconnecting piping and wiring during manufacture ready for installation. Available for Air-Cooled Cooling Only RCU2E (40~80) AG2 and Air Cooled Heat Pump RHU2E (40~80) AG2 models (single or dual pumps) with or without a buffer tank.

- Single or dual pumps
- Buffer tank (180 or 320L)
- Expansion vessel (12 or 18L)*
- Pressure gauges at water inlet side (0~6 bar), only an option with Buffer Tank
- Charge and drain valves, only an option with buffer tank
- Safety valve
- Check valve
- Easy pump maintenance due to carefully configured 'shut off' and 'check' valves

* Expansion vessel volume (site dependent).

Operating cost savings(*)



(*) Based on a typical thermal load for air conditioning applications. Comparison by Hitachi.

Features and benefits

Refrigeration cycle

All units have separate cooling circuits for each compressor.

On the liquid side each circuit is equipped as follows:

- Filter dryer
- Electronic expansion valve
- Stop valve
- Sight glass
- Economiser (depending on model)
- Receiver (HP models)
- 4-Way valve (HP models)

On the suction side:

- Stop valve (option)
- Safety valve
- 4-Way valve (HP models)
- Accumulator (HP models)

Compressor protection:

- High-pressure switch
- Low-pressure control
- Safety valve (option)
- Protection control

Reduced refrigerant quantity

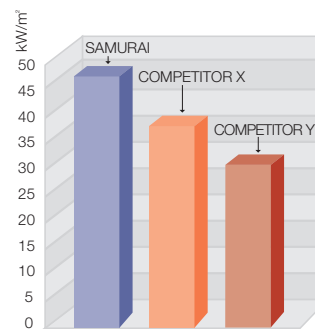
The Samurai chillers use a plate-type heat exchanger as an evaporator using much less refrigerant quantity than shell and tube heat exchangers. With the same capacity, they require much less refrigerant.

Small installation space

Often, the space available for the installation of a chiller is a critical factor. Obstacles and lack of space are usually a decisive factor when selecting equipment to be installed in HVAC facilities. Thanks to the careful design of each component, the Hitachi Samurai chillers achieve an exceptionally high cooling capacity value per square metre installed. All major components are easily accessible hence the required access area for maintenance and repair can be reduced to a minimum.

The illustration shows the value of cooling capacity per installation for the Hitachi model RCU2E 80 AG2 compared with similar competitor models.

Cooling capacity per m² footprint area



Maintenance space requirements:

Distance between devices: 2.000mm; To an obstacle: 1.200mm

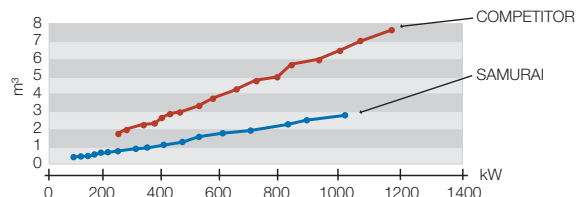
Minimum amount of water in the circuit

To avoid frequent stopping and starting of the compressor, which reduces its lifespan, the installation must have a minimum amount of water, so that the system reaches the required thermal inertia.

The minimum amount needed depends on how well the controls function and what the minimum capacity of the unit is. As Samurai chillers have a very wide capacity control range (15% - 100%), they require only a small amount of installed water.

With this optimisation, it is possible to reduce the minimum installation volume as follows:

Minimum amount of water in the circuit



Ideal starting system

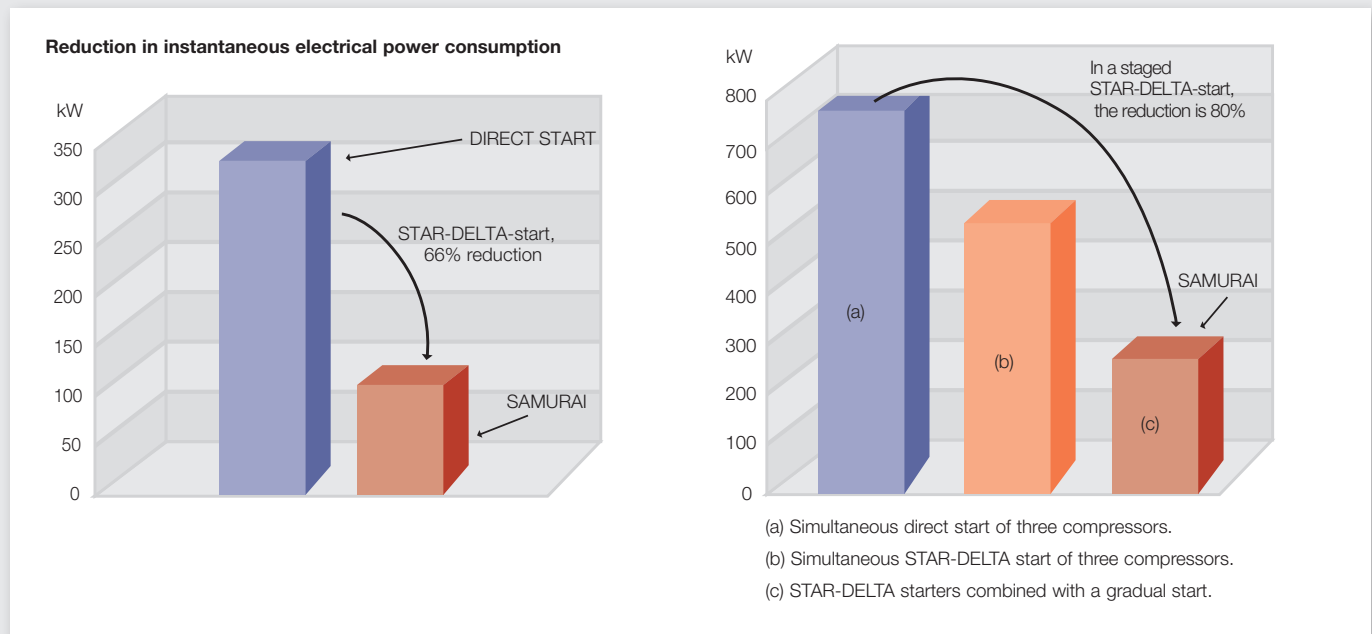
Due to the Samurai's electrical starting system, there is no need to install oversized wiring to accommodate the peak currents that are usually caused by conventional chillers.

The Samurai compressor's electrical motors have a STAR-DELTA starting system, which reduces the amount of power consumed at start up.

The Samurai chillers also employ a staged start-up process. If the system has more than one compressor, the start-up begins with the compressor that has worked the least number of hours.

This compressor is run at minimum load to keep the power consumption as low as possible. A minute later the second compressor is started. Both compressors continue to operate at minimum load, the third compressor starts and so on until all compressors are working at minimum load. After a 30 second safety delay, the machine then switches to normal running operation.

This staged start-up process has two main advantages. Firstly, the power consumption of a single compressor being switched on is much less than when multiple compressors are started simultaneously. Secondly, as start-up power is minimised, cable sizes can be reduced.



High power factor

Hitachi Samurai chillers have a high power factor – normally exceeding a value of 0.9 at full load. High power factor can significantly reduce electricity charges, CO₂ emissions, transformer and electrical equipment I²R losses and can provide heat reduction in components prolonging the lifespan of the chiller.

Features and benefits

The Samurai water chillers are compact, air-cooled, water cooled or condenserless and equipped with continuous capacity microprocessor controlled screw compressors.

They are delivered pre-charged with HFC R407C refrigerant. Cooling only and Heat Pump versions are available. All units undergo a complete commercial test, checking that all the components are operating correctly. It is therefore only necessary to make the electric and hydraulic connections at the installation site.

The new semi-hermetic screw compressor

The Semi-hermetic screw compressor has been designed to work with the refrigerant R407C. As it is directly connected to the electric motor it is not necessary to provide external electric motor connections which reduces the number of internal components.

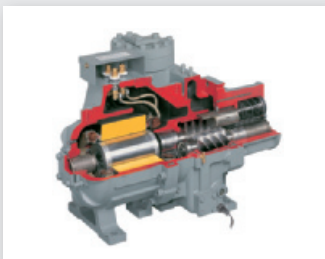
The compressors are mounted on antivibration rubber pads and are situated inside a sealed enclosure. This enclosure is patented by Hitachi and reduces noise due to acoustic insulating material (super low noise and low noise only).

Due to the pressure differential between the high-pressure chamber and the low pressure chamber, lubricating oil is continuously supplied to the mechanical parts and to the moving piston that provides continuous capacity control. This system removes the need for a mechanical oil pump, adjustment valves, and associated mechanisms.

The new cyclonic oil separator is located inside the casing of the compressor so there is no need for any external oil pipes which results in a compact design and high compressor reliability.

The compressors are equipped with:

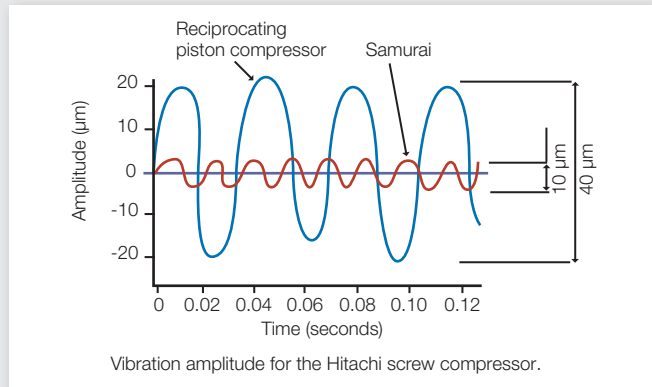
- Two pole electric motor with STARDELTA starting circuit (standard)
- Solenoid valves for continuous capacity control
- Electronic protection against high temperature, with centralised manual reset
- New cyclonic oil separator, oil level and sight glass
- Mechanical operating time counter
- Strainers.



Low noise level

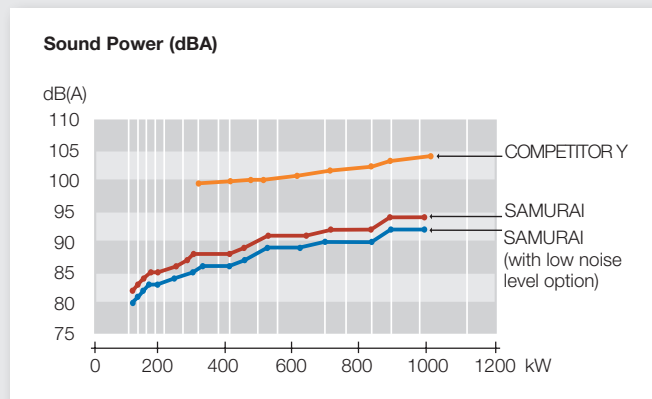
Sound levels and vibration are key factors when selecting a chiller. In many applications, it will be necessary to limit the noise to within locally-specified values.

Samurai chillers operate at low sound and vibration levels due to Hitachi's semi-hermetic screw compressors, precise mechanical development and meticulous assembly during the production process. The compressors are mounted on rubber pads, which protect the structure from vibrations - and provide an optimal performance.



Hitachi uses the latest technology for the quietest operation. The new fans with two, instead of four, blades reduce running noise, increase air volume and also minimise the power consumption. The compressor is installed in an enclosure lined with acoustic insulating material to keep noise levels as low as possible (low noise and super low noise versions only).

The AG2 Series is equipped with a DC Inverter Fan(s) to adjust the air flow more efficiently and control discharge pressure.



Water side heat exchanger

The Samurai chiller range uses plate heat exchangers. These exchangers allow the refrigerant volume to be reduced and achieves the maximum efficiency with the least possible amount of refrigerant. To avoid any corrosion, the heat exchanger is made from AISI-316 stainless steel plate.

Both refrigerant and water pass either side of profiled plates in contraflow, across which the heat exchange occurs. These plates are profiled to produce turbulence in both the water and refrigerant flow, to increase the efficiency and optimise the heat exchange process both in time and space.

With R407C, the cooling capacity of this type of exchanger is greater than traditional shell and tube type evaporators.

Air side heat exchanger

The air side heat exchangers are constructed from copper tubes and aluminium fins (copper fins are an option), to the Hitachi patented "Slit Fin" design. The high efficiency of the aluminium fins, combined with the internally grooved copper tubing, make it possible to achieve a high heat transfer rate and a very compact size.

The fins are epoxy coated as standard.

DC fan motor with outstanding efficiency

The DC fan motor enhances efficiency compared to conventional AC motors. Variable speed fans regulate air volume to maximise chiller efficiency.

PWM (pulse width modulation speed control)

The switching element switches back and forth at a frequency of several thousand kHz. The on-off rate per cycle is controlled and the voltage supplied to the fan for rotation speed is adjusted.

Power supply and control panel

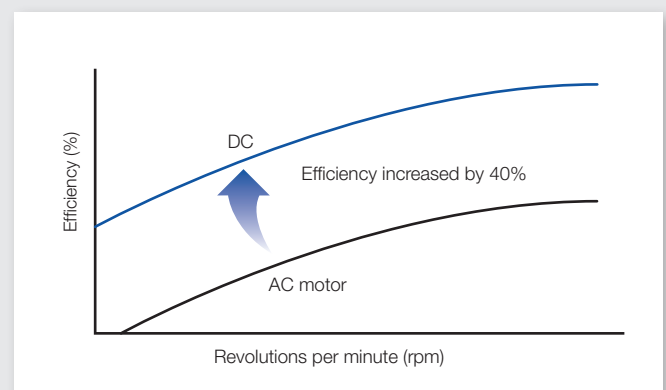
The chillers are equipped with ON / OFF switch, electrical power connection, operation and alarm LEDs; power supply and control panel with contactors and circuit breakers for the compressors and fans. The mains voltage conforms to the standard CEN-60204. The control panel inside the unit frame is fitted with a sealed door and is suitable for outdoor installation (air-cooled models).

The setting functions are located on the rear of the panel and are accessible by opening the control panel doors.

Microprocessor control

A sliding valve, located in the compressor, controls the compressor's capacity to adapt to the required load. This controls the leaving water temperature to within a range of +/- 0.5°C. The microprocessor monitors multiple points in the chiller and controls the individual refrigerant circuits based on characteristic variables.

The microprocessor operates with up to 24 protection codes, this guarantees safety during unit operation. The alarms are monitored via an interface and can be read on in-built LED displays. The control system includes all necessary operating parameters to protect the screw compressor and the electrical system.



Quality assurance

Hitachi Air Conditioning Products Europe SA (HAPE), the industrial division for air conditioning products in Europe, is dedicated to the manufacture of environmentally-friendly products of the highest quality. Proof of this is the certification of the company according to ISO 9002 and ISO 14001.

During the manufacturing process of the Samurai chillers, both 'work in progress' and finished products are submitted to various inspections to ensure they comply with all required specifications.

The checks can be divided into two categories:

- Electrical and operational tests
- Pressure and leakage tests

These tests are made on all of the assembled components at different stages during the production process and again on completion of the finished product.

Production line testing

Technical tests are performed at various stages of assembly. Firstly, the condition of the soldered joints is examined. Each set of finished copper pipes and each condenser is tested for refrigerant leaks at maximum design pressure, before installation in the unit. For this purpose, special test apparatus is used, that detects refrigerant concentrations of as little as 0.8 grams / year. Only when these components have been 100% tested, are they assembled.

Pre-delivery commercial testing

In this commercial test, the device is operated at standard power while the following is checked:

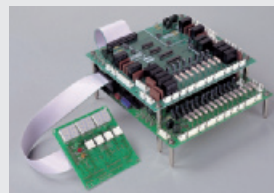
- The proper operation of the fan, the correct rotational direction
- The power consumption of the device in relation to the chilled water outlet temperature
- ON / OFF by the remote control
- Activation of the various safety devices that control the correct operation of the refrigerant circuit, simulating extreme operating conditions
- The ON / OFF switching of the chiller by the circuit pump.

During the commercial test, all the critical points and solder joints of the device are re-examined for possible refrigerant leaks. As a result of the test real-time data from all refrigerant cycles, the amount of water and the ambient temperature variables are recorded by means of a series of strategically-placed sensors (temperature, pressure, flow, power consumption and voltage).

All this data is processed by a control computer that constantly tracks the performance of the device. Once all the nominal values are achieved, a check is made to ensure that all the measured parameters meet the required specification (cooling capacity, power consumption, etc.). Only then is the unit declared ready for delivery.



All Samurai chillers are subject to commercial test which simulates real operating conditions.



Samurai electronic control system simulator used in training courses.

Easy programming

In the design and configuration of the Samurai chiller, Hitachi has developed a highly-flexible solution. This makes it easy to adapt them to all types of applications in the fields of HVAC and industrial (cold-water supply). All operating parameters of the device are fully configurable. Set up is achieved by adjusting a series of micro-switches located behind the control panel in the general electronic section. By setting these switches (ON / OFF) you can set the desired temperature, adjust the control range, etc.

It avoids complicated programming routines that, if not correctly performed, could cause serious operational problems. Hitachi has created this very simple programming system to be very precise and extremely reliable. It is ideal both for air conditioning systems, and demanding industrial processes.

Simple operation

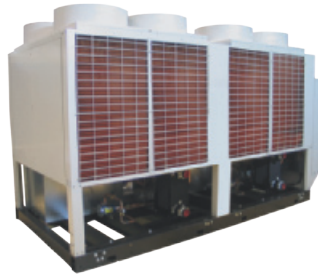
When you switch on the device you will see how easy to use Hitachi's electronic control system really is.

The control panel consists of:

- Two dual seven-segment LED displays
- Four selection buttons

This simple control panel gives you access to all the functions of the device. The "CHECK" button allows you to view the last 10 error codes, the status of the capacity control valve and the control variables (temperatures, pressures, etc.) of the refrigerant circuit. These can be read for each circuit individually.

Up to 24 different alarm signals, in the form of error codes, can be displayed to indicate different faults in the unit's operation. If the fault occurs in a single refrigerant circuit the display will indicate which one, making maintenance work easier. Should a fault occur, the operating parameters are saved (sensor unit).



RCU2E 40 ~ 140AG2

Samurai chillers

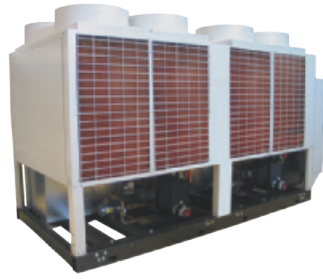
SAMURAI RCU2E		40AG2	50AG2	60AG2	70AG2	80AG2	100AG2	120AG2	140AG2
Cooling Capacity ¹	kW	112	130	156	178	206	260	312	356
Power Input	kW	38.6	44.7	53.0	61.0	70.0	89.4	106	122
EER		2.90	2.91	2.94	2.92	2.94	2.91	2.94	2.92
ESEER		3.48	3.49	3.52	3.50	3.52	3.49	3.52	3.50
Sound Power Level (Std/LN/SLN)	dB(A)	82/80/78	83/81/79	84/82/80	85/83/81	85/83/81	86/84/82	87/85/83	88/86/84
Sound Pressure Level (Std/LN/SLN) ²	dB(A)	52/50/48	53/51/49	54/52/50	55/53/51	55/53/51	55/53/51	56/54/52	57/55/53
Dimensions	Height	mm 2430							
	Width	mm 1900							
	Depth	mm 2190			mm 2790		mm 4090		mm 5290
Net Weight	Kg	1430	1470	1560	1760	1820	2830	3000	3420
Capacity Control	%	15 ~ 100							
Number of Circuits	-	1	1	1	1	1	2	2	2
Water Pipe Connection	inches	3" Victaulic (1 x Inlet / 1 x Outlet) per Circuit							
	inches	-						Common Water Pipe Connection Option available	
Leaving Water Outlet Temperature	°C	5 ~ 15 (-10 option)							
Ambient Temperature	°C	-15 ~ 46							

¹ The nominal cooling capacities are based on the European Standard EN14511.

Chilled Water Inlet / Outlet Temperature : 12 / 7°C.

Condenser Inlet Air Temperature : 35°C

² Sound Pressure level measured at 10m



RCU2E-160 ~ 400AG2

Samurai chillers

SAMURAI RCU2E		160AG2	180AG2	210AG2	240AG2	280AG2	320AG2	350AG2	400AG2
Cooling Capacity ¹	kW	412	468	534	618	712	824	890	1030
Power Input	kW	140	159	183	210	244	280	305	350
EER		2.94	2.94	2.92	2.94	2.92	2.94	2.92	2.94
ESEER		3.52	3.52	3.50	3.52	3.50	3.52	3.50	3.52
Sound Power Level (Std/LN/SLN)	dB(A)	88/86/84	89/87/85	91/89/87	91/89/87	92/90/88	92/90/88	94/92/90	94/92/90
Sound Pressure Level (Std/LN/SLN) ²	dB(A)	57/55/53	57/55/53	58/56/54	58/56/54	59/57/55	59/57/55	60/58/56	60/58/56
Dimensions Height	mm	2430							
Width	mm	1900							
Depth	mm	5290		7790		10,290		12,790	
Net Weight	Kg	3550	4450	5070	5250	6750	7000	8450	8750
Capacity Control	%	15 ~ 100							
Number of Circuits	-	2	3	3	3	4	4	5	5
Water Pipe Connection	inches	3" Victaulic (1 x Inlet / 1 x Outlet) per Circuit							
	inches	Common Water Pipe Connection Option available							
Leaving Water Outlet Temperature	°C	5 ~ 15 (-10 option)							
Ambient Temperature	°C	-15 ~ 46							

¹ The nominal cooling capacities are based on the European Standard EN14511.

Chilled Water Inlet / Outlet Temperature : 12 / 7°C.

Condenser Inlet Air Temperature : 35°C

² Sound Pressure level measured at 10m



RHU2E-40 ~ 100AG2

Samurai chillers

SAMURAI RHU2E		40AG2	50AG2	60AG2	70AG2	80AG2	100AG2
Cooling Capacity ¹	kW	106	123	148	169	195	246
Heating Capacity ²	kW	110	127	152	185	185	254
Power Input (Cooling)	kW	37.9	42.7	52	60	70	85.4
Power Input (Heating)	kW	40.7	44.5	54	68	68	89
EER		2.80	2.88	2.85	2.82	2.79	2.88
COP		2.70	2.85	2.81	2.72	2.72	2.85
ESEER		3.36	3.45	3.42	3.38	3.34	3.45
Sound Power Level	dB(A)	82/80/78	83/81/79	84/82/80	85/83/81	85/83/81	86/84/82
Sound Pressure Level (Std/LN/SLN) ³	dB(A)	52/50/48	53/51/49	54/52/50	55/53/51	55/53/51	55/53/51
Dimensions	Height	mm 2430					
	Width	mm 1900					
	Depth	mm 2190			mm 2790		mm 4090
Net Weight	Kg	1550	1600	1670	1880	1950	3050
Capacity Control	-	Continuous Capacity Control					
	%	15 ~ 100					
Number of Circuits	-	1	1	1	1	1	2
Water Pipe Connection	inches	3" Victaulic (1 x Inlet / 1 x Outlet) per Circuit					
	inches	-					
Leaving Water Outlet Temperature (Cool)	°C	5 ~ 15 (-10 option)					
Leaving Water Outlet Temperature (Heat)	°C	35 ~ 55					
Ambient Temperature	°C	-15 ~ 46 Cooling / -10 ~ 15.5 wb Heating					

¹ The nominal cooling capacities are based on the European Standard EN14511.
Chilled Water Inlet / Outlet Temperature : 12 / 7°C
Condenser Inlet Air Temperature : 35°C

² The nominal heating capacities are based on the European Standard EN14511.
Heated Water Inlet / Outlet Temperature : 40 / 45°C
Evaporator Air Inlet Temperature : 6°C wb

³ Sound Pressure level measured at 10m



RHU2E-120 ~ 240AG2

Samurai chillers

SAMURAI RHU2E		120AG2	140AG2	160AG2	180AG2	210AG2	240AG2
Cooling Capacity ¹	kW	296	338	390	444	507	585
Heating Capacity ²	kW	304	370	370	456	555	555
Power Input (Cooling)	kW	104	120	140	156	180	210
Power Input (Heating)	kW	108	136	136	162	204	204
EER		2.85	2.82	2.79	2.85	2.82	2.79
COP		2.81	2.72	2.72	2.81	2.72	2.72
ESEER		3.42	3.38	3.34	3.42	3.38	3.34
Sound Power Level	dB(A)	87/85/83	88/86/84	88/86/84	89/87/85	91/89/87	91/89/87
Sound Pressure Level (Std/LN/SLN) ³	dB(A)	56/54/52	57/55/53	57/55/53	57/55/53	58/56/54	58/56/54
Dimensions	Height	mm 2430					
	Width	mm 1900					
	Depth	mm 4090	mm 5290		mm 5990	mm 7790	
Net Weight	Kg	3250	3670	3780	4780	5440	5650
Capacity Control	-	Continuous Capacity Control					
	%	15 ~ 100					
Number of Circuits	-	2	2	2	3	3	3
Water Pipe Connection	inches	3" Victaulic (1 x Inlet / 1 x Outlet) per Circuit					
	inches	Common Water Pipe Connection Option available					
Leaving Water Outlet Temperature (Cool)	°C	5 ~ 15 (-10 option)					
Leaving Water Outlet Temperature (Heat)	°C	35 ~ 55					
Ambient Temperature	°C	-15 ~ 46 Cooling / -10 ~ 15.5 wb Heating					

¹ The nominal cooling capacities are based on the European Standard EN14511.
Chilled Water Inlet / Outlet Temperature : 12 / 7°C
Condenser Inlet Air Temperature : 35°C

² The nominal heating capacities are based on the European Standard EN14511.
Heated Water Inlet / Outlet Temperature : 40 / 45°C
Evaporator Air Inlet Temperature : 6°C wb

³ Sound Pressure level measured at 10m



RCUE-40 ~ 100WG2

Samurai chillers

SAMURAI RCUE		40WG2	50WG2	60WG2	80WG2	100WG2
Cooling Capacity ¹	kW	134	160	194	232	320
Heating Capacity ²	kW	161.1	192.3	233.9	274.7	384.7
Power Input (Cooling) ¹	kW	33.5	40.0	49.1	54.5	80.0
Power Input (Heating) ²	kW	39.8	47.5	58.3	64.7	95.0
EER		4.00	4.00	4.00	4.30	4.00
COP		4.00	4.00	4.00	4.20	4.00
ESEER		4.52	4.52	4.46	4.81	4.52
Sound Power Level	dB(A)	83	84	86	86	88
Sound Pressure Level	dB(A)	68	69	71	71	72
Dimensions	Height	mm	1520	1520	1520	1700
	Width	mm	1105	1105	1105	1105
	Depth	mm	850	850	850	850
Net Weight	Kg	750	765	830	950	1570
Capacity Control	-	Continuous Capacity Control				
	%	15 ~ 100				
Number of Circuits	-	1	1	1	1	2
Water Pipe Connection (Evaporator)	inches	3" Victaulic (1 x Inlet / 1 x Outlet)				
	inches	-				
Water Pipe Connection (Condenser)	inches	3" Victaulic (1 x Inlet / 1 x Outlet)				
	inches	-				
Leaving Water Outlet Temperature (Cool)	°C	5 ~ 15 (-10 option)				
Leaving Water Outlet Temperature (Heat)	°C	25 ~ 55				
Condenser Water Outlet Temperature ³	°C	22 ~ 45 (55* option)				

¹ The nominal cooling capacities are based on the European Standard EN12055.

Chilled Water Inlet / Outlet Temperature: 12 / 7°C
Cooling Water Inlet / Outlet Temperature: 30 / 35°C

² The nominal heating capacities are only for Heat Pump Operation Option and based on following conditions.

Chilled Water Inlet / Outlet Temperature: 12 / 7°C
Hot Water (Condenser) Inlet / Outlet Temperature: 40 / 45°C

³ () in case of high condensing option and heat pump operation option.



RCUE-120~240WG2

Samurai chillers

SAMURAI RCUE		120WG2	150WG2	180WG2	200WG2	240WG2
Cooling Capacity ¹	kW	388	445	525	600	696
Heating Capacity ²	kW	467.9	526.9	621.9	719.5	824.2
Power Input (Cooling) ¹	kW	98.2	104.5	123.5	148.5	163.5
Power Input (Heating) ²	kW	116.6	124.1	146.7	176.4	194.2
Efficiency EER		4.00	4.30	4.30	4.00	4.30
COP		4.00	4.30	4.30	4.00	4.30
ESEER		4.46	4.83	4.82	4.55	4.82
Sound Power Level	dB(A)	90	90	91	92	93
Sound Pressure Level	dB(A)	74	74	75	76	77
Dimensions	Height	mm	1700	1700	1580	1580
	Width	mm	1105	1105	1105	1105
	Depth	mm	1465	1465	2350	2350
Net Weight	Kg	1670	1770	2500	2580	2670
Capacity Control	-	Continuous Capacity Control				
	%	15 ~ 100				
Number of Circuits	-	2	2	3	3	3
Water Pipe Connection (Evaporator)	inches	3" Victaulic (1 x Inlet / 1 x Outlet)		3" Victaulic (3 x Inlet / 3 x Outlet)		
	inches	-		5" Victaulic (1 x Inlet / 1 x Outlet)		
Water Pipe Connection (Condenser)	inches	3" Victaulic (1 x Inlet / 1 x Outlet)		3" Victaulic (3 x Inlet / 3 x Outlet)		
	inches	-		5" Victaulic (1 x Inlet / 1 x Outlet)		
Leaving Water Outlet Temperature (Cool)	°C	5 ~ 15 (-10 option)				
Leaving Water Outlet Temperature (Heat)	°C	25 ~ 55				
Condenser Water Outlet Temperature ³	°C	22 ~ 45 (55* option)				

¹ The nominal cooling capacities are based on the European Standard EN12055.

Chilled Water Inlet / Outlet Temperature: 12 / 7°C

Cooling Water Inlet / Outlet Temperature: 30 / 35°C

² The nominal heating capacities are only for Heat Pump Operation Option and based on following conditions.

Chilled Water Inlet / Outlet Temperature: 12 / 7°C

Hot Water (Condenser) Inlet / Outlet Temperature: 40 / 45°C

³ () in case of high condensing option and heat pump operation option.



RCUE-40 ~ 120CLG2

Samurai chillers

SAMURAI RCUE		40CLG2	50CLG2	60CLG2	80CLG2	100CLG2	120CLG2
Cooling Capacity ¹	kW	120	145	180	240	290	360
Power Input	kW	34.4	42.4	52.1	68.8	84.8	104.2
EER		3.50	3.40	3.50	3.50	3.40	3.50
ESEER		4.32	4.32	4.28	4.32	4.23	4.28
Sound Power Level	dB(A)	83	84	86	86	88	90
Sound Pressure Level	dB(A)	68	69	71	71	72	74
Dimensions	Height	mm		1520		1720	
	Width	mm		1045		1104	
	Depth	mm		885		1471	
Net Weight	Kg	630	680	730	1200	1310	1380
Capacity Control	-	Continuous Capacity Control					
	%	15 ~ 100					
Number of Circuits	-	1	1	1	2	2	2
Water Pipe Connection (Evaporator)	inches	3" Victaulic (1 x Inlet / 1 x Outlet)					
Leaving Water Outlet Temperature	°C	5 ~ 15 (-10 option)					
Condensing Temperature	°C	30 ~ 65					

¹ The nominal cooling capacities are based on the following conditions:
 Chilled Water Inlet / Outlet Temperature : 12 / 7°C
 Condensing Temperature 45°C

Control systems - options

Remote control (CSC-5S)



Developed specifically for the Hitachi Samurai Chiller, the CSC-5S delivers individual control and monitoring. It checks and controls up to eight chillers, entirely customised to the needs of the customer. These functions can be conveniently monitored remotely from a control room. Unlike conventional controllers, no visit to the plant room to check the equipment is needed.

BMS Interface - ModBus (HC-A32MB)



Interface to allow any Modbus compatible building management system to control and monitor up to eight chillers.

BMS interface - LonWorks® (HARC70-CE1/OP)



Interface to allow integration of Hitachi H-LINK and LonWorks® BMS systems. Two options are available dependent on the level of control required.

HARC70-CE1

- Four setting points
- Seven monitoring points
- Connection of up to four chillers

HARC70-CE1/OP

- Four setting points
- Forty four monitoring points
- Connection to one chiller

For these functions, the interface HARC70-CE1 must be selected from the options list. Through this interface, the connection of up to four machines via H-LINK connection (Hitachi communication protocol) is possible. The communications protocol is LonWorks®.

CS Net Web



Hitachi's CS Net Web is a standalone control system that allows users to fully monitor and control their air conditioning from anywhere with web access. Up to eight chillers can be monitored from one central point and the user can ascertain the system performance at all times. CS Net Web also provides a ModBus output.

Optional touchscreen



Hitachi's touchscreen allows intuitive control of up to four CS Net Web central controllers. It can be mounted on either a wall or table with the supplied mounting bracket.

Options and accessories

Noise

Low noise (AG2)

The compressor housing is lined with polyurethane foam, reducing noise by about 2dB compared to the standard version.

Super Low Noise (AG2)

To achieve a -4dB noise level reduction compared to the standard model, the compressor housing is double insulated with Polyurethane Foam + Ethylene Propylene Diene M-class rubber.

Low water temperatures

The minimum cold water outlet temperature achievable with standard models is 5°C. For applications requiring temperatures below this, three options are available as follows:

- Low 1: +4~0°C
- Low 2: -1~-5°C
- Low 3: -6~-10°C

If the chiller is operated at an outlet temperature below 5°C, anti-freeze must be added.

Control system options

CSC-5S

Eight chillers and eight centralised CSC-5S remote addresses can be connected to an H-LINK. An external input connector is provided for a possible connection to a timer. Basic function, heating-cooling mode and temperature setting are displayed.

If an error occurs, an alarm code immediately provides detailed information. The alarms are divided into the following groups to facilitate maintenance work:

- Start / Stop
- Mode (cooling / heating)
- Temperature settings (cold / hot)

CS Net Web

The building control system, CS Net Web, can work with all devices remotely. All temperatures and system pressures can be viewed. It can be installed at any point in the building and is accessible from any computer on site that is connected to the same network and is configured appropriately. As an accessory, a touch screen for the centralised control of the building can be ordered. BMS connection (ModBus) is standard.

BMS interfaces HARC-70CE1/OP LonWorks®

ModBus HC-A32MB

To integrate the chiller into a building control system, you will require this interface. This system is easy to install, as only a two-core cable is used for the connection between the devices and the control unit via the HARC-70CE1. It will then be possible to turn the device on or off and select the required values for the chilled water outlet temperature. The following monitoring information is available:

- Device status (ON / OFF mode)
- Water outlet and inlet temperature and the actual value
- Error codes
- System pressures

Heat exchanger

Copper fins

For some special applications it may be necessary to use copper fins to prevent corrosion. In addition, the Samurai chiller structural components can be treated with anti corrosion paint.

Blygold coil protection

Contact your local sales representative to discuss this option.

Refrigeration cycle

Suction and discharge valves for the compressor

To shut off the refrigeration system directly at the compressor, ball valves can be installed. This simplifies the maintenance of the facility.

Additional compressor pressure relief valve

Single or double safety valve for the compressor (high pressure side).
Note: A simple safety valve in the hot gas line is installed as standard.

Dual safety valve

Two safety valves are installed in parallel in the pressure line but only one is operational. This allows a valve to be replaced without recovery of the refrigerant.

Suction pressure relief valve

An additional safety valve can be installed on the intake side (High temperature version).

Suction line insulation

To avoid condensation and loss of cooling capacity, the suction line can be insulated (with WG2 and CLG2 this option is standard).

Heat recovery (plate heat exchanger Hot Gas)

To recover the heat from the refrigeration process, an additional plate heat exchanger can be installed to enable generation of hot water for heating / domestic water supply.

- In the cooling mode, (depending on the model), 30 ~ 35% of "heat output" can be recovered
- 70°C flow temperature is achievable at maximum capacity.

Water cycle

PN16 flange (with counter flange)

The PN16 flange is required for the Victaulic screw connection.

Differential pressure switch (WT In-/Outlet)

This monitors the difference between inlet and outlet water pressure. If there is no water flow, the compressor is not started.

Water flow switch (on site mounting)

The flow switch is supplied loose with the E-box and needs to be installed on site. This must be built into the water pipe by the customer. If there is no water flow, the compressor is not started.

Plate heat exchangers trace heater

To protect the heat exchanger from freezing at low temperatures, an electric heater is installed. This is activated when the ambient temperature falls below 2°C.

Common water pipe (only one connection)

With this option it is possible to have only one inlet and one outlet connection for multiple plate heat exchanger units.

Water pipes made of stainless steel (AISI 304)

To prevent corrosion, the piping can be made in stainless steel (AISI 304).

Pressure tapping WT

(not with flange PN16 or a common water pipe)

To be able to measure the pressure difference, these connections can be installed.

Water filters

A water filter should be installed on the inlet side of the chiller. A 16 or 20 meshed filter is available as an option.

Hydraulic modules on request

(for RCU2E-40 ~ 80AG2 & RHU2E-40 ~ 80AG2).

For further details, see page 9 or contact your local sales representative.

Options and accessories

Special operations

Heat pump operation (WG2)

The Samurai WG2 has a factory fitted option for heating operation.

Heat Pump-operation at high outdoor temperatures

For the Heat pump (RHU2E AG2) units this allows operation at higher outdoor temperatures facilitating the production of hot water during the summer months.

- Maximum outdoor temperature 40°C
- Factory fitted option for heating operation

If the hot gas temperature is too high, coolant is injected through a solenoid valve into the compressor.

Miscellaneous

Witness test I and II

If the customer wishes to witness the testing of the machine in the factory. There are two different options:

Witness Test I: Eurovent conditions

Witness Test II: Customer-specified test conditions

Rubber anti-vibration pads

To reduce the vibration transmission, anti-vibration mats can be ordered. These are delivered with the cabinet.

Spring anti-vibration dampers

To reduce the vibration transmission, spring anti-vibration dampers can be ordered. These are delivered with the cabinet.

Opposite control panel position

If desired, the control panel can be installed on the opposite side of the chiller.

Shipped in wooden crate

For special delivery conditions, the chiller can be packed in a wooden box.

Enhanced corrosion protection of housing

To improve corrosion resistance, the main parts are coated with corrosion protection. In the case of a salty or corrosive environment, this should be ordered together with a copper/copper condenser coil.

Bottom guard

To protect the system components, a grid for the bottom of the machine can be ordered.

Increased transport model (struts)

The machine can be secured for long distance transportation under extreme conditions (cross-struts, flexible pipe connectors, special screw locks, etc.)

Double foil packaging for transport

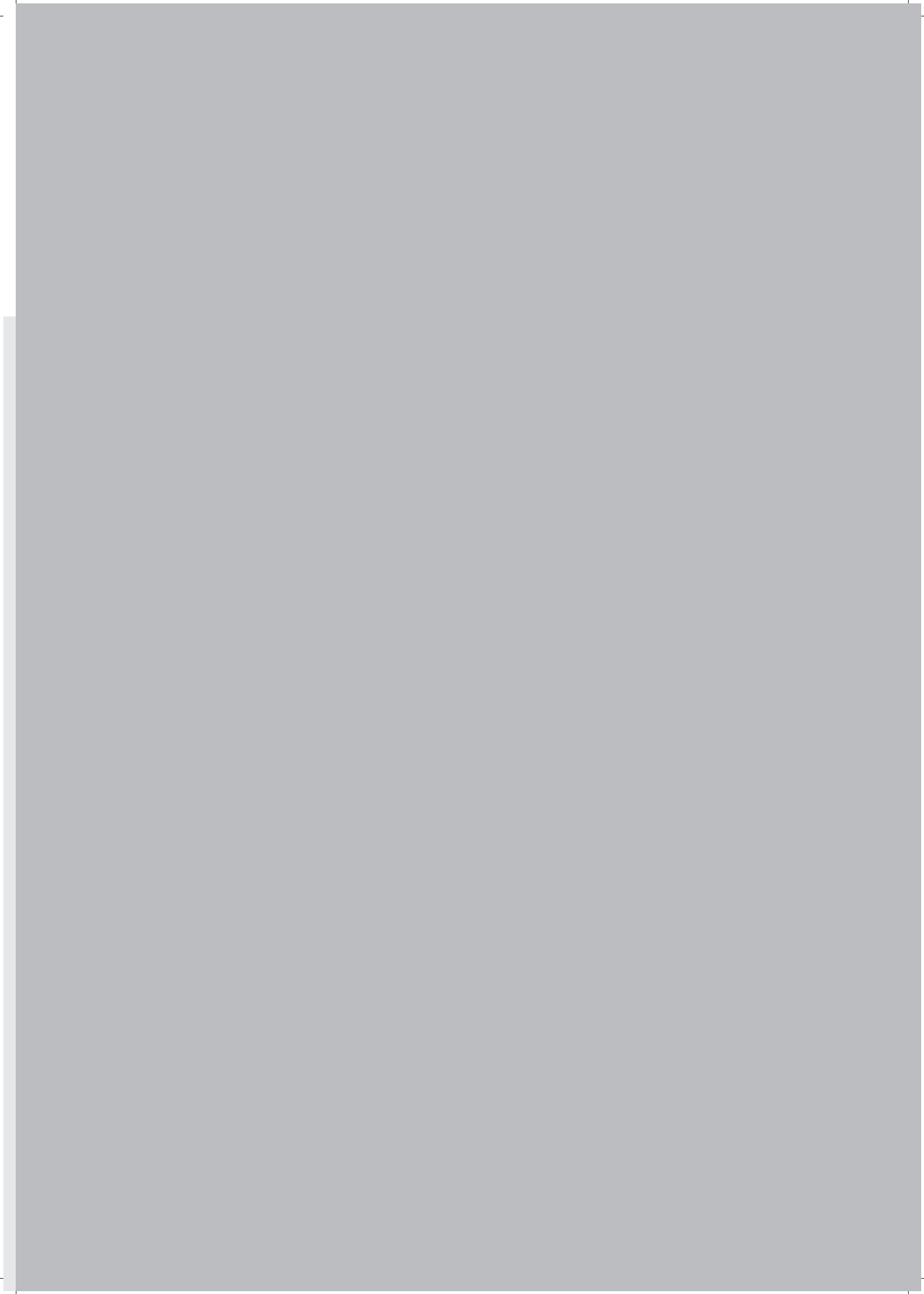
The cooling unit can be packed twice in plastic film.

Circuit breakers for each compressor

The standard fuses can be replaced with magnetic circuit breakers in the compressors. The circuit breakers allow the power circuit to be reset immediately, without replacing components (H fuse).

Circuit breakers per fan

For each fan, magnetic circuit breakers can be installed as overcurrent protection (fuse std.).



Specifications in this catalogue are subject to change without notice in order that Hitachi may bring the latest innovations to their customers, omitting typing errors.

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