

Water Cooled Centrifugal Chiller 170 - 400 RT



MagBoost Magnetic Bearing Centrifugal Chiller





Features

Options and Nomenclature

Specifications

Dimensions

MagBoost magnetic bearing centrifugal chiller is the latest generation of oil-free centrifugal chillers with fully-independent intellectual property rights and featuring Tasaki's core technologies. The series offers oil free, high efficient, stable, reliable, low-noise and wide range operation. It is eco-friendly and economical as well. It adopts many of the core technologies that Tasaki has spent years developing such as the aerodynamic technology, magnetic bearing control, micro-channel refrigerant-cooled VFD and high-efficiency permanent magnet synchronous motors. The series can be used in various buildings including airports, rail transit, hotels, businesses and new or reconstructed buildings, providing customers with efficient and energy-saving green building solutions.

Features

Oil-free and high efficiency

Aerodynamic design, making full-load operation more efficient; the magnetic bearing avoids friction, making partial load more efficient and providing the maximum IPLV of 12.11; the full series have passed the AHRI certification.

Stable and reliable

Dual protection of self-generation control mode + spare bearing, ensuring safe operation under multiple harsh conditions.

Wide-range operation

Multi-technology joint adjustment widens the unit operation range while ensuring optimal efficiency; the cooling load of a single compressor can be as low as 10%.

Environmentally friendly

Back-to-back two-stage compression + noise reduction structure, minimizing the operating noise to 70 dB(A); full falling film evaporation technology reduces the refrigerant charge amount and better protects the environment.

Cost-saving

Oil-free throughout its entire life cycle, avoiding efficiency attenuation caused by oil film and saving more electricity; the maintenance costs are further reduced because it is not necessary to replace the lubricating oil and filter.



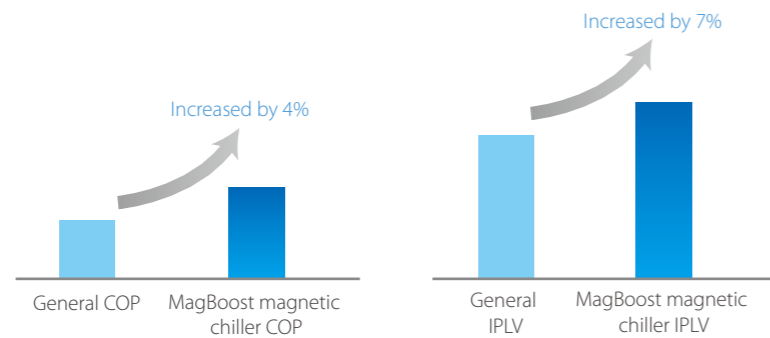
Certified in accordance with the AHRI Water-Cooled Water-Chilling and Heat Pump Water-Heating Packages Using Vapor Compression Cycle Certification Program, which is based on AHRI Standard 550/590 (I-P) and AHRI Standard 551/591 (SI). Certified units may be found in the AHRI Directory at: www.ahridirectory.org



- 1 Economizer
- 2 Control panel
- 3 VFD panel
- 4 Compressor
- 5 Condenser
- 6 Evaporator

Oil-free and High Efficiency

MagBoost magnetic bearing centrifugal chiller boasts magnetic bearing technology, aerodynamic technology, a permanent magnet synchronous motor and full falling film evaporation technology. It combines Tasaki unique back-to-back two-stage compression structure with higher energy efficiency as compared with the traditional magnetic bearing centrifugal chiller, improving the full-load energy efficiency by 4%* and improving the part-load energy efficiency by 7%*.

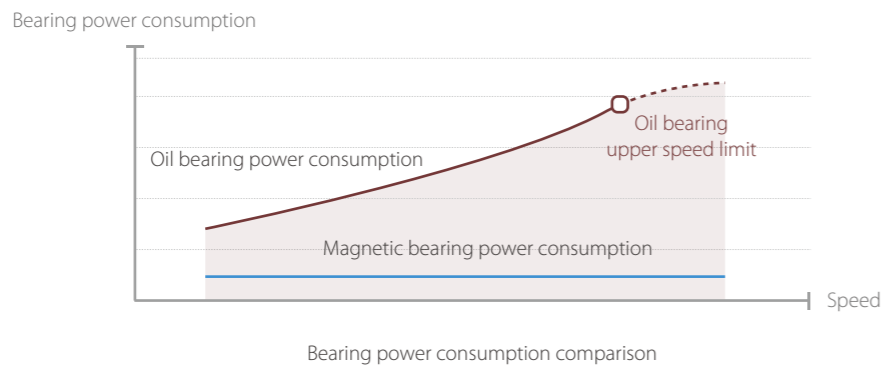
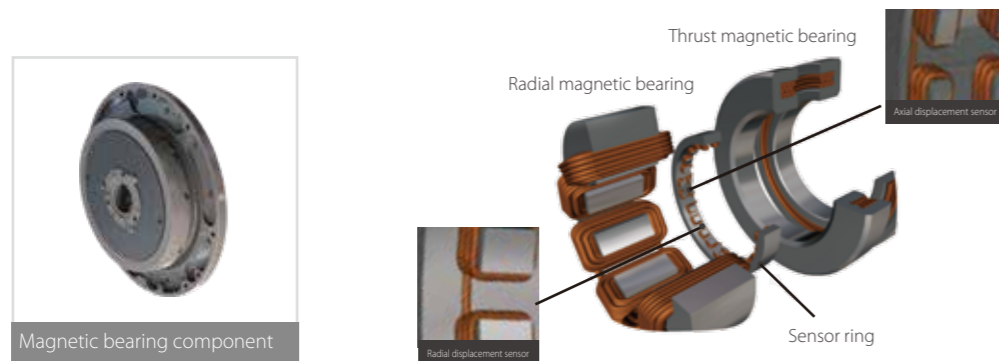


*The above data comes from the average energy efficiency comparison of Tasaki new and old magnetic chillers.

Magnetic bearing technology

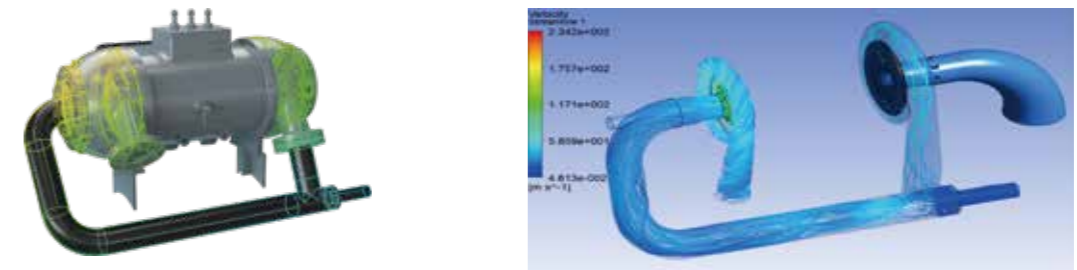
Industrial-level magnetic bearing assembly including the radial magnetic bearing, thrust magnetic bearing and position sensor, featuring low power consumption, high bearing capacity and high reliability.

- ❖ Power consumption less than 0.4kW, only 2% to 10% of that of conventional oil bearings.
- ❖ Breaks through the upper speed limits of conventional oil bearings, significantly reducing power consumption of the bearing at high speed: the higher the speed, the more energy efficient the magnetic bearing is compared to the oil bearing.



Aerodynamic technology

- ❖ Aerodynamic design optimizes the overall flow field efficiency and improves the compressor's isentropic efficiency.
- ❖ Back-to-back two-stage compression structure balances the thrust forces for longer life span and improves efficiency.
- ❖ Enclosed impeller design, reduced leakage and improved efficiency.
- ❖ 6% higher efficiency than single-stage compression.



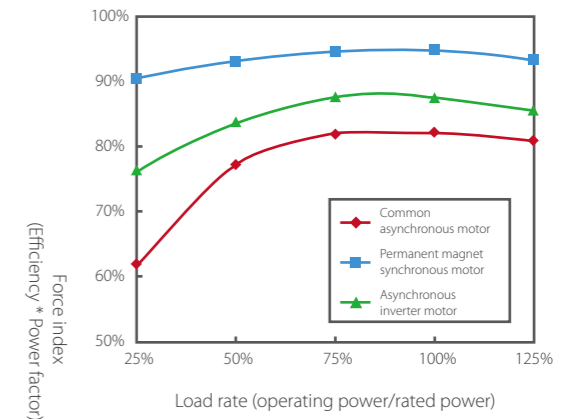
Back-to-back two-stage compression flow field analysis

Permanent magnet synchronous motor technology

- ❖ Motor efficiency exceeds 96% in the full operating range, with the highest efficiency of up to 97%.
- ❖ The space vector pulse width modulation (SVPWM) technology is used for speed regulation and driving. Accurate and efficient operation is achieved according to changes in the operating conditions. The startup current is small, the operating current is low, the operating electricity charge and distribution cost of the whole life cycle are low.
- ❖ The real-time monitoring system of stator temperature and rotor shaft elongation achieve precise, highly-reliable cooling of the motor.

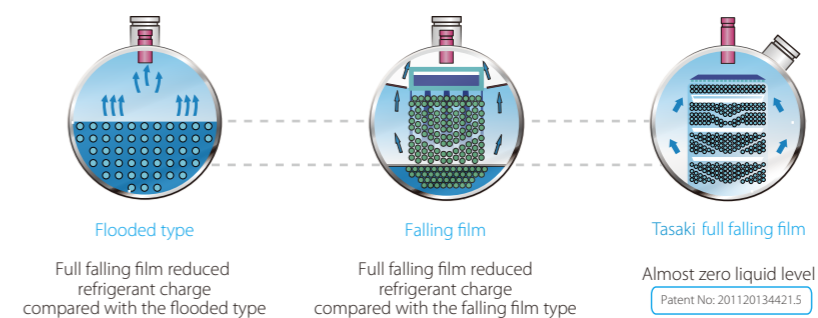


Permanent magnet motor



Full falling film evaporation technology

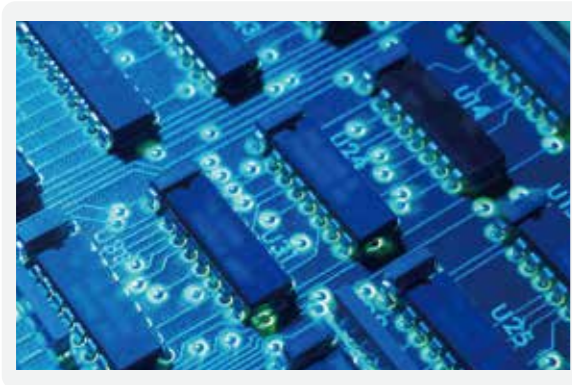
- ❖ First created the full falling film evaporator and adopted spray technology to achieve film evaporation on the surface of the heat exchange tube, greatly increasing overall heat transfer efficiency and reducing refrigerant charge.
- ❖ The patented refrigerant distributor can improve the homogeneity of the liquid to avoid local drying, fully showcasing the performance of the heat exchange tube and increasing unit efficiency.



Full falling film reduced refrigerant charge compared with the flooded type. Full falling film reduced refrigerant charge compared with the falling film type. Almost zero liquid level. Patent No: 201120134421.5

Stable and Reliable

- ❖ MagBoost magnetic bearing centrifugal chiller is equipped with a self-generating mode after power failure and features a long-life spare bearing, which can achieve accurate and safe control of the magnetic bearing and ensure the safety of the magnetic bearing to guarantee high efficiency.
- ❖ The micro-channel refrigerant-cooled VFD technology substantially improves the reliability and adaptability of the VFD.



How to ensure accurate position control of the magnetic bearing?

Accuracy: 20 kHz high frequency position monitoring, real-time correction output and position control precision at the μm level ensures accuracy of the shaft suspension position.

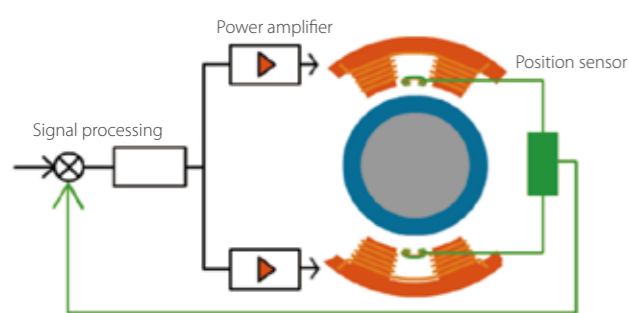


How does Tasaki ensure the safety of the bearing without lubricating oil after an unexpected power failure?

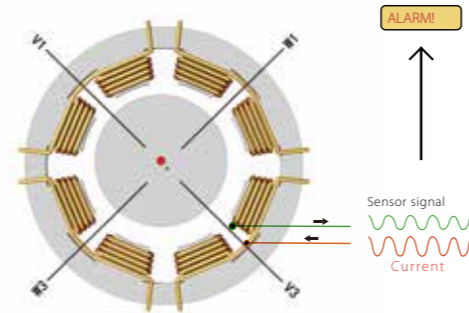
Safety: With dual protection of the self-generating mode and long-life spare bearing, a safe landing rate of spare bearing that is **10 times greater** can be achieved when the compressor operates at max. speed; when the speed drops below 10%, normal landing is achieved.

Bearing control technology

- ❖ The bearing control system adopts prospective vibration compensation technology, which detects and controls the position at a high frequency to effectively reduce the impact of vibration on the rotating shaft by the amount of imbalance.
- ❖ 20 kHz dynamic position scanning and adjustment and position control precision at the μm level ensure the accuracy of the shaft levitation position.



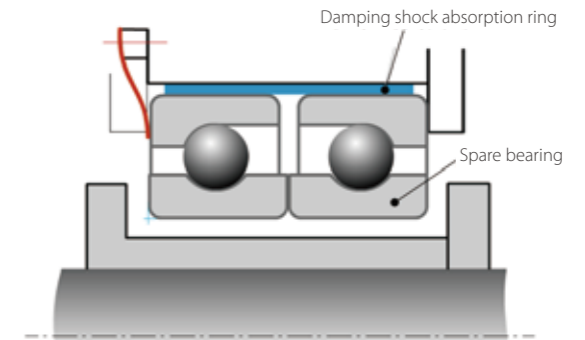
Prospective bearing control principle



Bearing control diagram

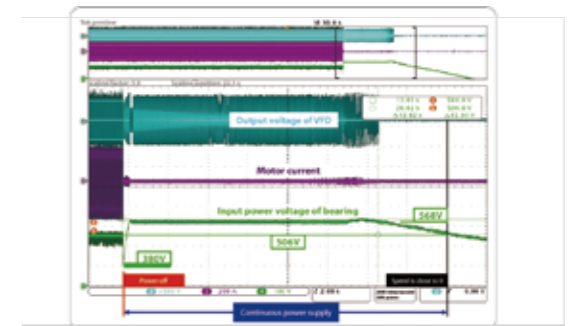
Long-life spare bearing

The spare bearing employs a set of high-strength rolling bearings and a damping shock absorption ring to effectively stop the rotor shaft during high-speed rotation if a magnetic bearing controller failure occurs, avoiding wear between the magnetic bearing, sensor and rotor and resulting in damage to the compressor.



Self-generation control technology

- ❖ Tasaki 's self-developed VFD control + permanent magnet motor technology can automatically switch the motor to the generator mode in the event of unexpected power failure to ensure the stability of the bus voltage and the 40-750 V wide voltage adaptability of the bearing is combined to ensure the power supply safety of the magnetic bearing.
- ❖ The self-generating mode guarantees continuous power supply of above 15 Hz to the unit's magnetic bearing, ensuring the bearing remains levitating.



Micro-channel refrigerant-cooled VFD technology

Tasaki 's independently-developed high-power VFD employs micro-channel refrigerant-cooled technology to fix problems such as high heat flux density, poor heat dissipation effects, tendency of liquid-cooled heat dissipation to form condensation, high network-side harmonic current, poor reliability of an abnormal power grid product, high stray inductance which easily damages IGBT, high temperature lack of temperature-reducing capacity, heavy air-cooled VFD and excessive noisiness of the high-power VFD, greatly improving reliability and adaptability of the VFD, enhancing the efficiency of the overall unit and greatly reducing noise.

High reliability motor cooling design and monitoring

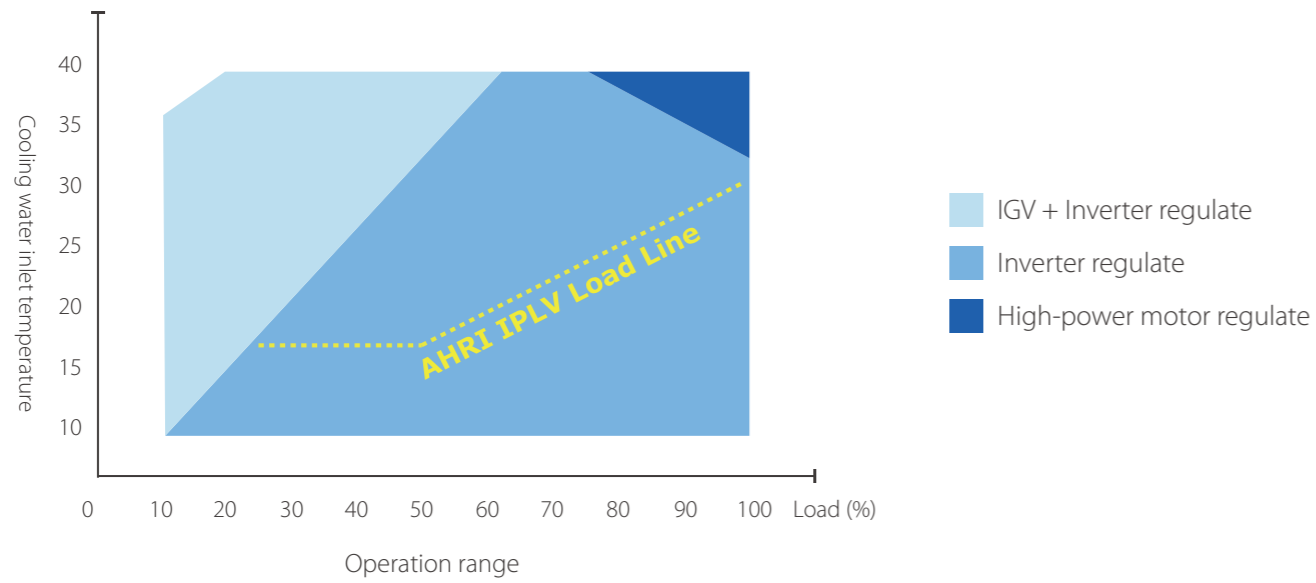
The whole flow field analysis and optimum design of the motor cooling channel is adopted to carry out real-time monitoring of the stator temperature and rotor elongation and to ensure operation reliability of the motor.



Multi-baffle 360° cooling

Wide-range Operation

Multi-technology bearing joint adjustment widens the unit operation range while ensuring optimal efficiency. The cooling load of a single compressor can be as low as 10% and the unit can operate normally when the cooling water drops to 12°C.



Joint regulation of multiple technologies

- ❖ MagBoost magnetic bearing centrifugal chiller adopts the inverter and Inlet Guide Vane (IGV) to jointly regulate the cooling capacity. In extreme operating conditions, the guide vane opening starts to be reduced when the load becomes 50%.
- ❖ When the load is above 15% under normal operating conditions, the load is regulated solely by changing the speed, thus avoiding the additional flow loss caused by reduced opening of the IGV.



Inlet guide vane (IGV)

Low ambient temperature operation control technology

The low ambient temperature operation control technology ensures stable operation at a low cooling water temperature and provides a minimum cooling water temperature of 12°C.



Eco-Friendly

With reference to AHRI standard 575, sound pressure ratings are as low as 70 dB(A)

- ❖ No physical contact between moving metal parts, very quiet and low vibration levels.
- ❖ The back-to-back impeller + external pipe-type reflux device structure of the compressor reduces the pneumatic noise of refrigerant while flowing.
- ❖ The specially-designed compressor body structure uses the solid-gas-solid interface to dissipate high-frequency noise and achieve ideal sound insulation and noise reduction effects.



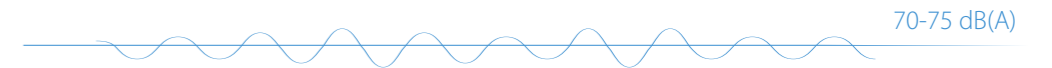
Traditional screw chiller



Traditional two-stage centrifugal chiller



MagBoost magnetic bearing centrifugal chiller



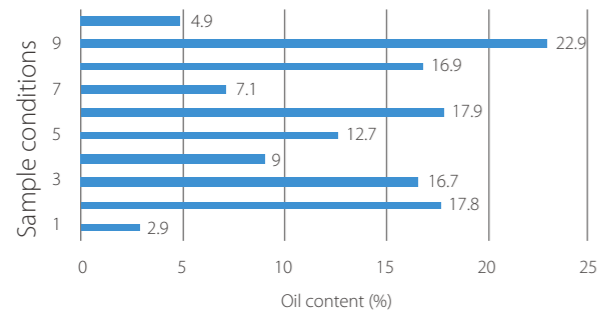
❖ LEED

R134a refrigerant has zero ozone depletion potential and has no elimination cycle for now. Full falling film technology reduces refrigerant charge which enables to qualify for maximum leadership in Energy and Environmental Design®(LEED) points for Enhanced Refrigerant Management. And with the chiller's high efficiency, you can also earn additional points for credits from Optimized Energy Performance (EAc1).

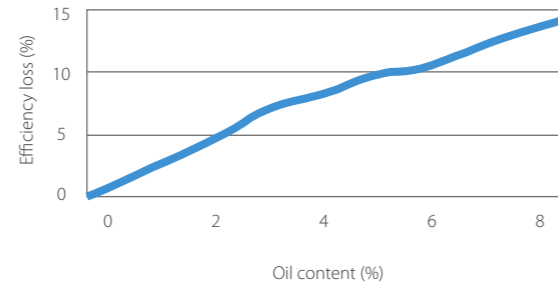


Cost-saving

No friction between moving metal parts, better part-load performance and efficient operation under all operating conditions. No oil system, no oil system fault and no need for regular maintenance.



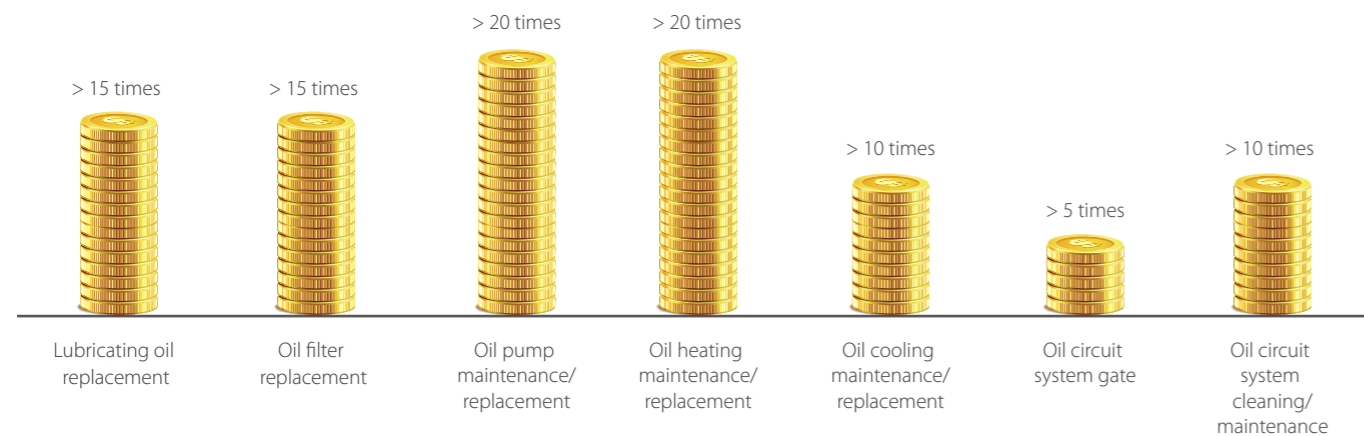
"The ASHRAE research report indicates that the oil content of most operating water chillers exceeds the standard", ASHRAE Research Report 601



Studies have shown that, when the oil content of unit heat exchanger is 3.5%*, the energy efficiency of the entire unit will be reduced by 8%*

* Data comes from the ASHRAE Research Report 601.

Part of maintenance items of centrifugal chiller with oil



Taking the project of three 250RT centrifugal chillers as an example:

Maintenance: In the 20-year service cycle, the magnetic centrifugal chiller can reduce the costs related to the oil circuit system by about 1 million RMB compared with conventional fixed-speed centrifugal chiller with oil.

Operating costs: Supposing that the operation duration is 12 hours a day and 6 months a year, the magnetic chiller can save approximately 8 million RMB in operation cost throughout its life cycle.

Note: The above data are for reference purposes only and accurate data are related to the actual application and management of each project. The magnetic centrifugal chiller also requires related maintenance items. The above description focuses on only some of the differences between units equipped with an oil system. Specific maintenance content is subject to the installation, operation and maintenance manual.

Options and Nomenclature

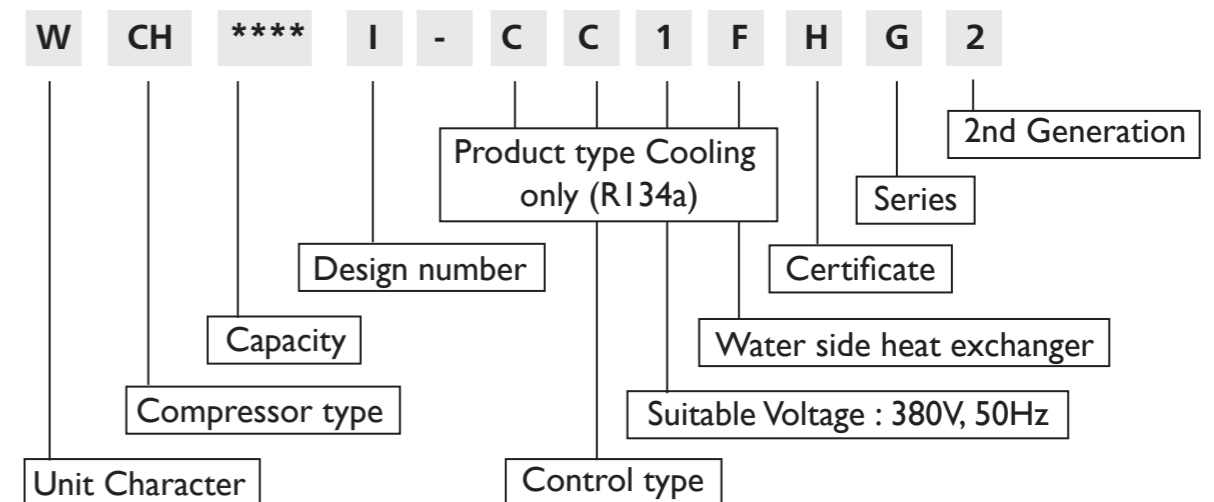
Optional applications

Items	Standard	Optional
Power supply	380V-3Ph-50Hz	380~460V, 50/60Hz
High pressure water box	1.0MPa	1.6MPa, 2.0MPa
Anti-vibration	Rubber pad	Spring isolator
Insulation	20mm	40mm
Refrigerant isolation valve	×	√
Flow switch	×	√
Knockdown shipment	×	√
Marine water box	×	√
Vessel code	GB	ASME, PED
Pressure vessel pass	2	1 or 3
Heat recovery	×	√
Witness performance testing	×	√
Tube automatic cleaning system	×	√
Tasaki Chiller Plant Control	×	√
Tasaki Smart Cloud platform	×	√
QuickView	×	√
Low total harmonic current distortion rate (THDI)	≤35% (full load)	≤5% (full load)

Lorem

Note: For other options, please contact with our engineers.

Nomenclature



Specifications

Model	WCH***I-CC1FHG2	170	200	230	250	270	300	350	
Cooling capacity	RT	170	200	230	250	270	300	350	
	kW	597.7	703.2	808.7	879.0	949.3	1055	1231	
	10 ⁴ kcal/h	51.41	60.48	69.55	75.60	81.65	90.72	105.8	
Power input	kW	93.43	107.7	122.3	134.3	143.7	161.0	189.8	
COP	W/W	6.398	6.532	6.610	6.547	6.606	6.551	6.485	
IPLV	W/W	10.20	10.56	11.11	11.36	11.79	10.69	11.24	
Motor configuration power	kW	150.0	150.0	150.0	150.0	150.0	280.0	280.0	
Rated current	A	152.6	175.9	199.0	219.3	234.8	263.0	310.0	
Max. operating current	A	167.9	193.5	218.9	241.2	258.3	289.3	341.0	
Evaporator	Water flow	m ³ /h	97.35	108.6	124.9	135.8	146.7	163.0	190.1
	Pressure drop	kPa	31.4	41.9	46.6	54.0	47.0	46.3	46.5
	Water pipe connection	mm	DN150	DN150	DN150	DN150	DN150	DN200	DN200
Condenser	Water flow	m ³ /h	114.7	135.1	155.0	168.8	182.6	202.5	236.6
	Pressure drop	kPa	26.8	35.8	38.0	44.3	38.6	45.7	49.4
	Water pipe connection	mm	DN150	DN150	DN150	DN150	DN150	DN200	DN200
Unit dimensions	Length	mm	3500	3500	3500	3500	3500	4150	4150
	Width	mm	1400	1400	1400	1400	1400	1650	1650
	Height	mm	1800	1800	1800	1800	1800	1850	1850
Shipping weight	kg	3110	3110	3225	3225	3350	4970	5100	
Running weight	kg	3660	3660	3735	3735	3940	5520	5705	

Model		CCWG	380	400
Cooling capacity		RT	380	400
		kW	1336	1406
		10 ⁴ kcal/h	114.9	121.0
Power input		kW	203.4	216.2
COP		W/W	6.568	6.506
IPLV		W/W	11.29	11.43
Motor configuration power		kW	280.0	280.0
Rated current		A	332.4	353.2
Max. operating current		A	365.6	388.5
Evaporator	Water flow	m ³ /h	206.4	217.3
	Pressure drop	kPa	49.0	47.1
	Water pipe connection	mm	DN200	DN200
Condenser	Water flow	m ³ /h	256.7	270.2
	Pressure drop	kPa	54.1	50.1
	Water pipe connection	mm	DN200	DN200
Unit dimensions	Length	mm	4150	4150
	Width	mm	1650	1850
	Height	mm	1850	1950
Shipping weight		kg	5140	5980
Running weight		kg	5765	6735

Note:

1. Performance and efficiency are based on AHRI 550/590.

Evaporator conditions: water inlet=54°F (12.22°C), water outlet=44°F (6.67°C), fouling factor=0.00010h-ft²-°F/Btu (0.0176m². °C/kW);

Condenser conditions: water inlet=85°F (29.44°C), water outlet=94.3°F (34.61°C), fouling factor=0.00025h-ft²-°F/Btu (0.0440m². °C/kW).

2. The design's max working pressure for both the evaporator and condenser are 1.0MPa, but higher pressure can be customized if required.

3. The model in the selection software is WCH***I-CC1FHG2 the production serial number and the actual product shall prevail.

4. As a result of the continuous improvement of the product, the above parameters may be changed, please refer to the software selection and the actual product.

