MagBoost Apex

Magnetic Bearing Centrifugal Chiller

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AHRI Standards 550/590 and 551/591

Magnetic Bearing Centrifugal Chiller

MagBoost Apex is Midea's next generation oil-free centrifugal chiller, utilizing patented magnetic bearing technology. In addition to being highly efficient, stable and reliable, MagBoost Apex features a wide operating range and quiet operation. The system incorporates an array of Midea core technologies including aerodynamic technology, magnetic bearing control, micro-channel refrigerant-cooled VFD, and high-efficiency permanent-magnet synchronous motors. The system is highly flexible and adaptable making it ideal for a variety of applications including airports, rail transit, hotels and new or renovated buildings, providing customers with an efficient and energy-saving green building solution.

Product Features

Core Advantages

The compressor features integrated mechanical and electrical controls with enhanced ingress protection (IP67). With a new thermal management system, it significantly boosts the reliability, durability, and operational stability of the unit.

Back-to-back two-stage compression design, combined with noise reduction technologies, reduces operating noise to as low as 70 dB(A). The unit operates using R134a refrigerant, with an optional upgrade to R1234ze(E). Additionally, the heat exchanger is optimized to require a lower refrigerant charge, minimizing the system's environmental impact.

Leveraging aerospace aerodynamic design technology, our centrifugal chillers achieve higher efficiency at full load. Additionally, the system maintains exceptional efficiency under partial loads thanks to frictionless magnetic bearings, delivering an IPLV of up to 11.63.

30-year lifespan compressor design.

With the dual protection of self-generation control and long-life spare bearings, the compressor can achieve more than 300 spare operations at the highest speed. When the speed drops below 10%, normal landing is achieved.

The chiller system is designed for easy transport, allowing it to be moved in and out of a standard 3-ton freight elevator using a forklift. Its modular design enables the combination of up to 16 units. With the Master & Slave control function, it eliminates the need for an additional group control system.

The compressor supports fast maintenance on site. The spare bearing can be rapidly disassembled and replaced on site, and maintenance can be completed within one to two days.

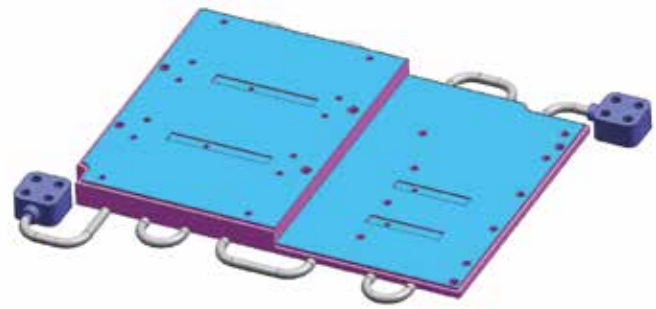
Reliability & Durability

Mechanical and electrical control integration

- The magnetic bearing compressor, motor, bearing control, and VFD are combined into a single, unified design, reducing the chiller system's overall size by 50% compared to conventional systems.
- The compressor features IP67 protection, ensuring it is safeguarded against water, fire, corrosion, and dust.

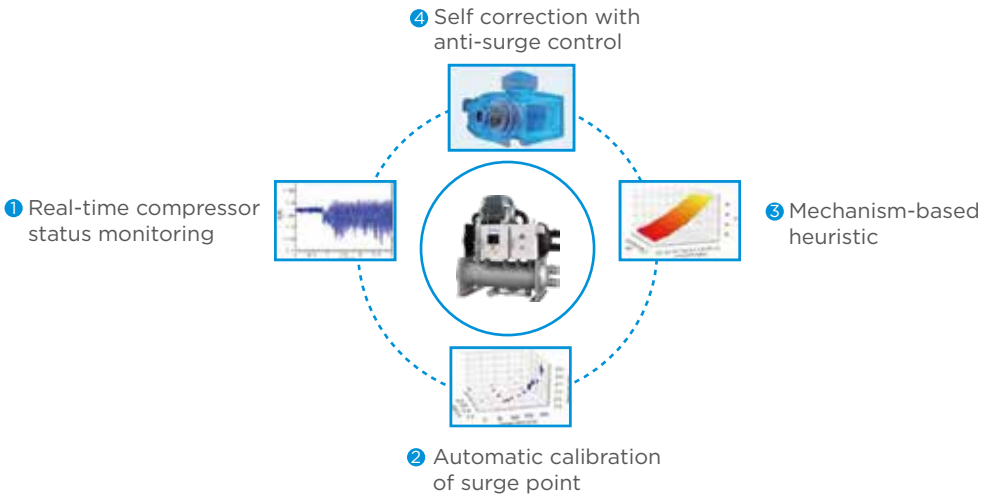
Advanced 3D Refrigerant-Cooled Technology

- This cutting-edge technology eliminates the need for fan cooling, ensuring zero power loss. It effectively addresses common issues associated with high-powered VFDs, such as high heat flow density, inadequate heat dissipation, frequent condensation, and excessive noise. Additionally, it enhances the reliability of inverter control.



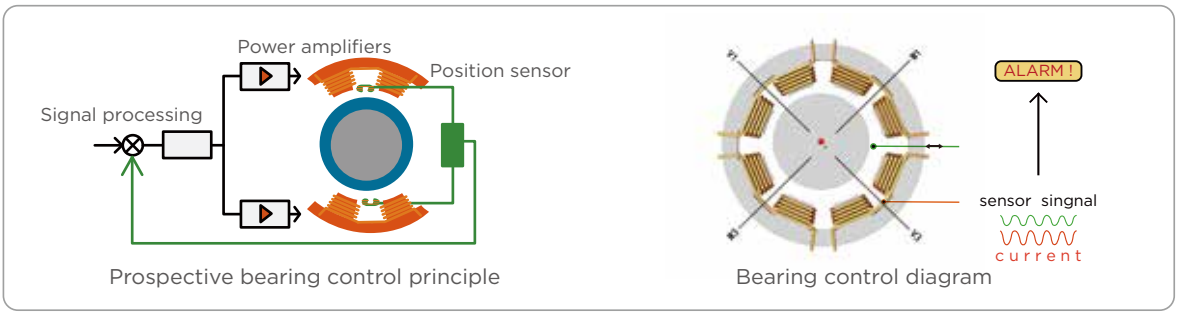
Intelligent and Super Anti-Surge Technology

- The magnetic bearing system utilizes nonlinear model disturbance tracking control technology to prevent compressor damage.
- By reducing the current to the bearing controller by 90%, the system's control reliability is significantly improved.
- The super anti-surge protection allows the system to endure up to 500 continuous surges.



High-precision magnetic bearing control technology

- The bearing control system adopts smart vibration compensation technology through high-frequency position detection and control, effectively reducing the impact of unbalance on shaft vibration.
- The magnetic bearing is aided by location control technology with 5 degrees of freedom and 20 kHz position dynamic scanning and adjustment.
- With a small bearing clearance of just 75 μm, the rotor's displacement precision reaches 0.5 μm in static levitation.

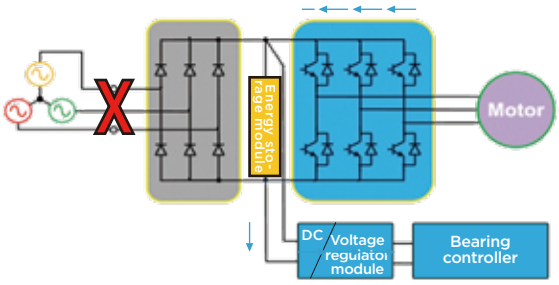


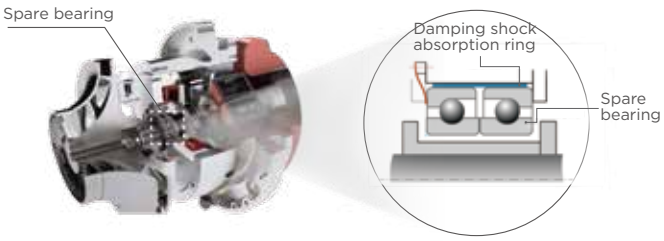
Prospective bearing control principle

Bearing control diagram

Power-off dual protections

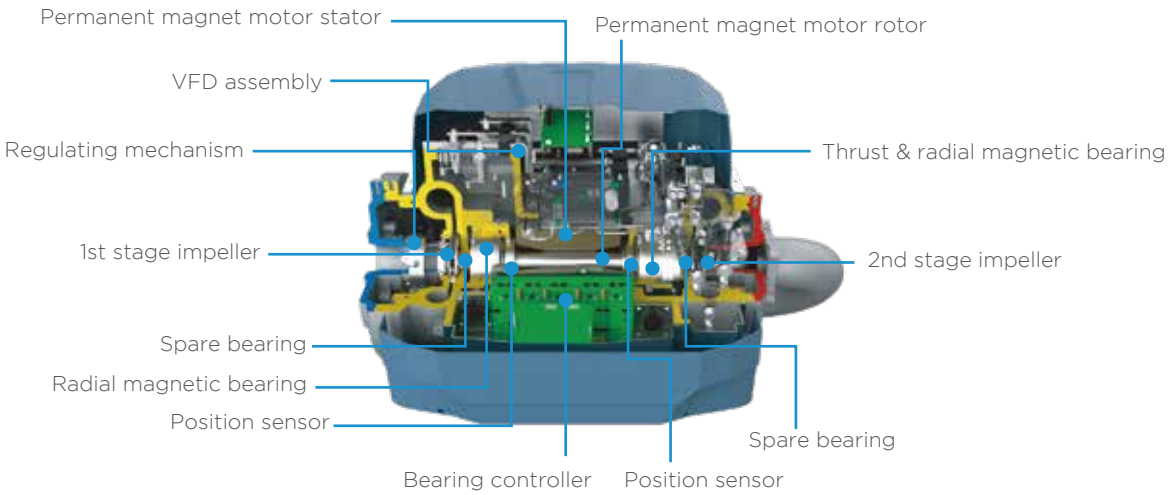
- Continuous self-generation mode: switches to generator mode, continuously supplying power to the magnetic bearings. This ensures the rotor lands smoothly, preventing damage.
- Ultra-long-life double-row spare bearing: The compressor can continue operating normally and stably, even after enduring over 300 consecutive hard drops of the rotor shaft from high speeds.





Advanced Longevity through Patented Core Technologies

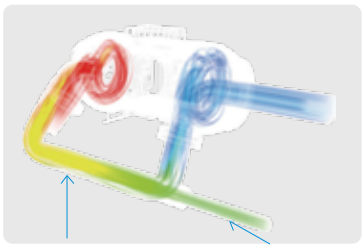
Our compressors are built with hundreds of proprietary, patented core technologies, ensuring a long lifespan of up to 30 years.

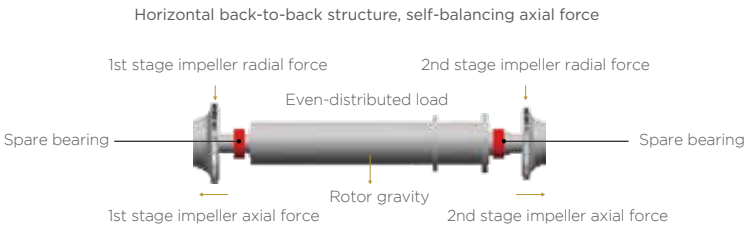


High efficiency with superior energy savings

Aerodynamic technology

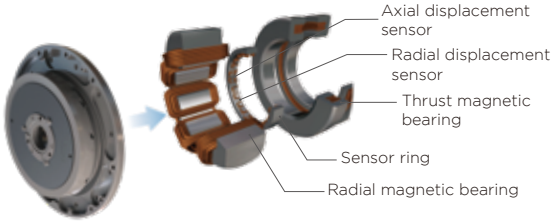
- The three-dimensional enclosed impeller design ensures evenly distributed axial gas inflow into the second-stage impeller, with full flow field optimization for enhanced compressor efficiency.
- The pipe-type reflux device optimizes gasflow for smoother delivery, while the economizer enables more even gas distribution. This optimized flow field improves adaptability with smaller cooling capacities while increasing efficiency under partial loads.
- Innovative, industry-first back-to-back compression reduces axial force by 90%.



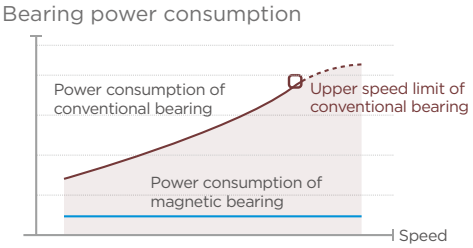


Magnetic bearing technology

- Our industrial-grade magnetic bearing assembly is designed with radial and thrust magnetic bearings, along with position sensors. It features low power consumption, high bearing capacity, and exceptional reliability.
- Magnetic bearing power consumption is less than 0.2 kW, only 2%-10% of that of conventional oil bearings. Breaks through the upper speed limits of conventional oil bearings, significantly reducing power consumption at high speed: Unlike oil bearings, magnetic bearings become more efficient as speed increases.



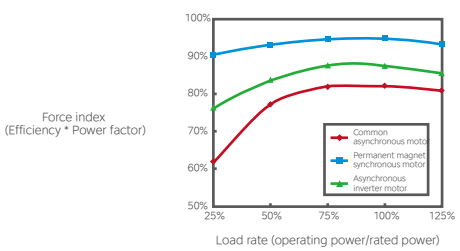
Magnetic bearing component



Power consumption comparison of bearings

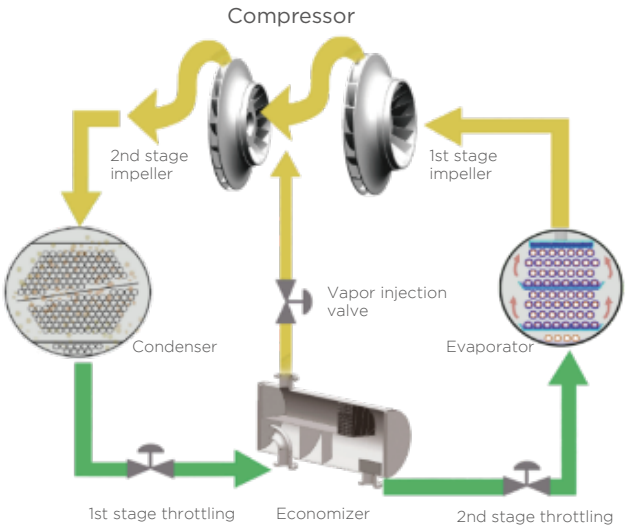
Permanent magnet synchronous motor technology

- Motor efficiency exceeds 96% in the full operating range, with highest efficiency of up to 97%.
- Space Vector Pulse Width Modulation (SVPWM) technology is employed for precise speed regulation and motor control, allowing the system to quickly adapt to changing operating conditions. This technology ensures low startup and operating current, leading to reduced electricity costs and distribution cost over the unit's lifespan. Additionally, an innovative vapor injection valve adaptively adjusts to optimize the vapor injection process for maximum efficiency.



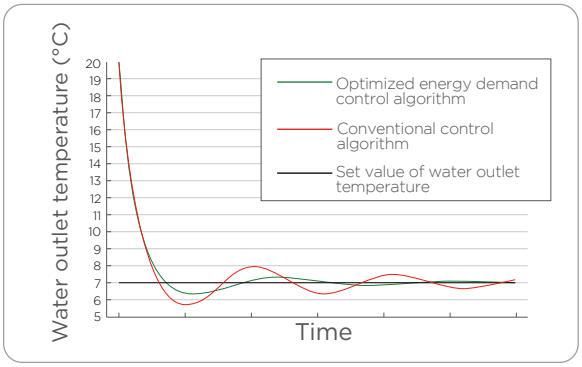
Two-stage compression, enhanced vapor injection technology

- Two-stage compression with enhanced vapor injection technology is 6% more efficient than single-stage compression.



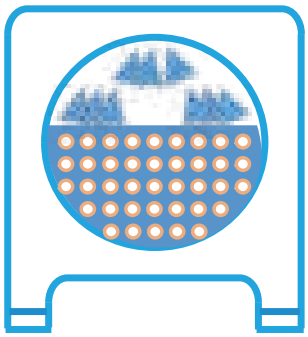
Adaptive Load Management and Efficiency Enhancement Technology

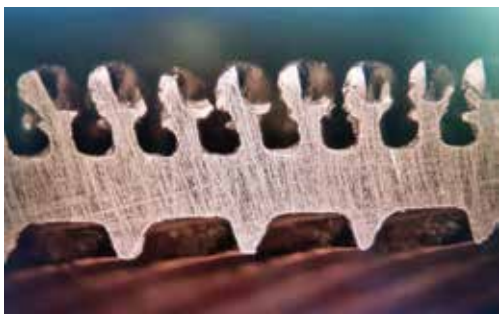
- Utilizing multi-dimensional cooperative control technology, the unit automatically responds to environmental and other factors to accurately control outlet water temperature fluctuation to under ±0.1 °C.
- Innovative technologies such as virtual load measurement and water-system capacity identification reduce the frequency of startups and stops, increasing efficiency under partial load conditions by 2% to 12%.

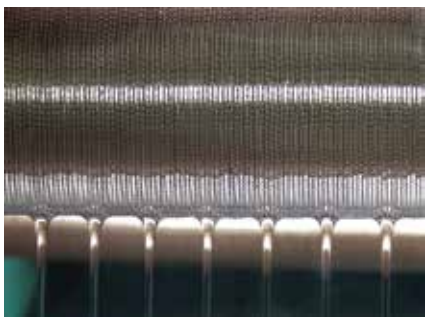


High-efficiency shell-and-tube heat exchanger technology

- Flooded evaporator reduces the required refrigerant volume while boosting heat exchange performance by 25% to 30%.
- The condenser features an innovative pin-fin tube design, micro-scale composite reinforced tubes, and flow field uniformization technology, which increase the heat-exchange surface area, accelerate condensate shedding, and improve heat exchange efficiency.







Compact size, modular design

- Compact size makes it easy to load into a standard 3-ton freight elevator. Modular design lets you combine up to 16 units, making it easy to expand the chiller as needs change. It is ideal for retrofit as well as small installation space project.
- Master & Slave control function eliminates the need for an additional group control system.

Intelligent, intuitive control systems

User-friendly HMI and control

Midea's microcomputer control system offers a user-friendly interface. It provides easy access to common control functions, including intelligent operation, safety protection, and interlocking control, ensuring safe startup and shutdown, efficient performance, and intelligent system management.

Interface display

- 10" true color graphic display
- Home screen
- Historical data query function
- Unit operation data and status
- Condenser interface
- Throttling system interface
- Pre-alarm/alarm display and record
- Compressor interface
- Evaporator interface
- Parameter setting interface

Operation control

- Independent setting capability of chilled water outlet temperature
- Automatic loading and unloading
- Soft loading
- Independent start/stop function
- Timed power-on/off
- Detailed unit status query
- Pause operation function

Interlocking control

- Compressor anti-surge interlocking
- Water pump pre-operation/ post-operation
- Reserved upper computer port
- Interlocking starter panel control
- Pre-alarm interlocking control
- Pre-startup safety check
- Frequency control (loading, unloading and anti-surge)
- Pause and shutdown guide vane interlocking
- Superheat degree monitoring (suction and discharge)

Specifications

Model			CCWG130EV(X)	CCWG150EV(X)	CCWG170EV(X)	CCWG180EV(X)	CCWG200EV(X)
Cooling capacity		RT	130	150	170	180	200
		kW	457.1	527.4	597.7	632.9	703.2
		10^4kcal/h	39.3	45.4	51.4	54.4	60.5
Power input		kW	70.66	81.86	94.04	95.90	107.8
COP		W/W	6.469	6.443	6.356	6.599	6.522
IPLV		W/W	11.12	11.32	11.46	11.42	11.63
Motor configuration power		kW	110	110	110	120	120
Rated current		A	115.4	133.7	153.6	156.7	176.1
Max. operating current		A	126.9	147.1	169.0	172.4	193.7
Evaporator	Water flow	m^3/h	70.62	81.48	92.4	97.8	108.6
	Pressure drop	kPa	65.3	65.2	65.3	65.3	65.1
	Water pipe connection	mm	DN150	DN150	DN150	DN150	DN150
Condenser	Water flow	m^3/h	87.49	101.2	115.3	121.4	135.1
	Pressure drop	kPa	68.1	68.2	68.7	67.9	68.1
	Water pipe connection	mm	DN150	DN150	DN150	DN150	DN150
Unit dimensions	Length	mm	2250	2250	2250	2250	2250
	Width	mm	1100	1100	1100	1100	1100
	Height	mm	2200	2200	2200	2200	2200
Shipping weight (with refrigerant)		kg	2350	2399	2446	2471	2520
Running weight		kg	2650	2739	2806	2851	2920

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=0.00010 h-ft²-°F/Btu (0.0176 m². °C/kW);
Condenser conditions: water inlet=85 °F (29.44 °C), water outlet=94.3 °F (34.61 °C), fouling factor=0.00025 h-ft²-°F/Btu (0.0440 m². °C/kW).
2. The design's max working pressure for both the evaporator and condenser are 1.0 MPa, but higher pressure can be customized if required.
3. The model in the selection software is CCW****#. # is the production serial number and the actual product shall prevail.
4. The standard unit is not charged with refrigerant by default, and units charged with refrigerant before delivery require customization.
5. 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.

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