

TFM[®] Series

Air-cooled Magnetic Levitation Variable Speed Centrifugal Chiller

Cooling capacity: 1000-2200kW



CLIMAVENETA

Air-cooled Oil-free Centrifugal Chiller

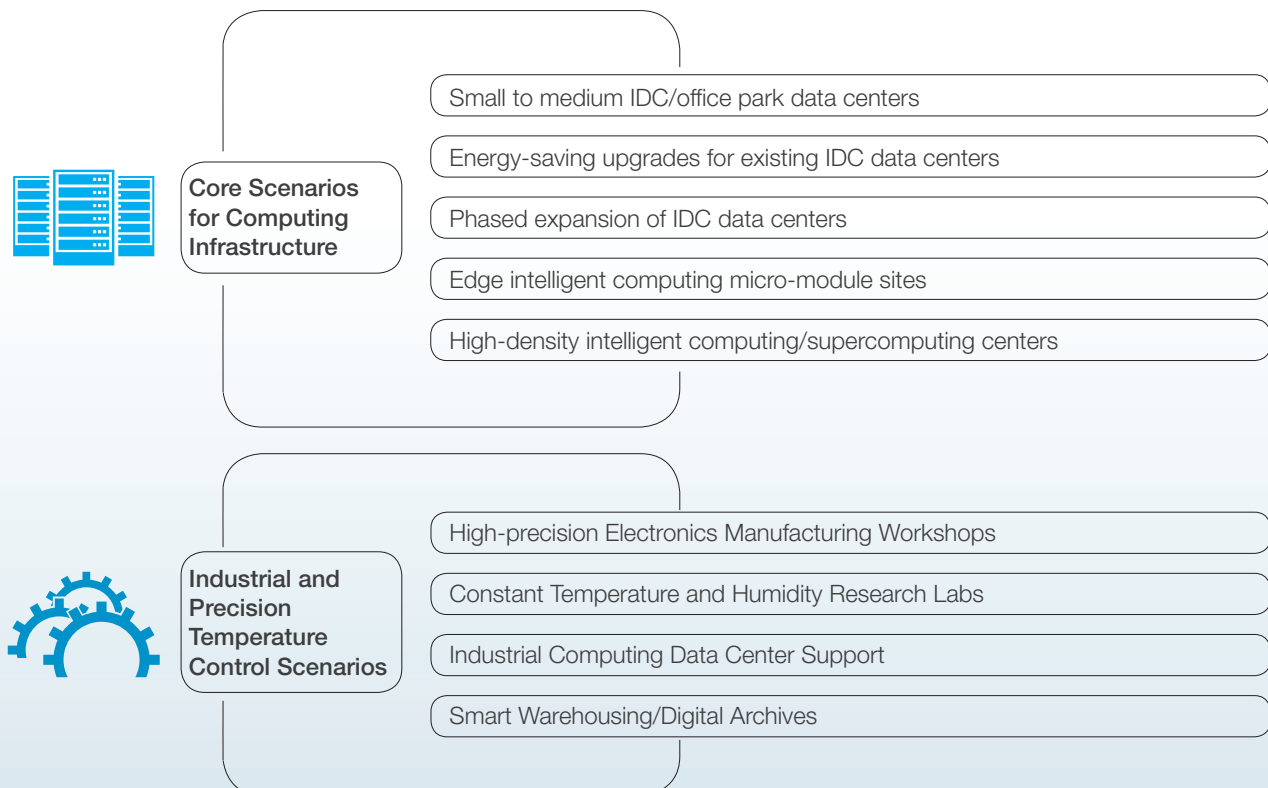
Product Introduction

The Climaveneta TFM series air-cooled magnetic levitation chillers are specifically designed to meet the high-density computing needs of data centers, covering a cooling capacity range of 1000~2200kW. Through modular stacking, they can flexibly adapt to diverse deployment needs—from edge micro-compute nodes to large-scale AIDC clusters. They utilize multiple high-efficiency energy-saving technologies, including magnetic levitation compressor technology, multi-stage coolant cooling, and intelligent monitoring, significantly improving the energy efficiency of the air conditioning system.

Comprehensive product advantages covering key AIDC construction pain points:

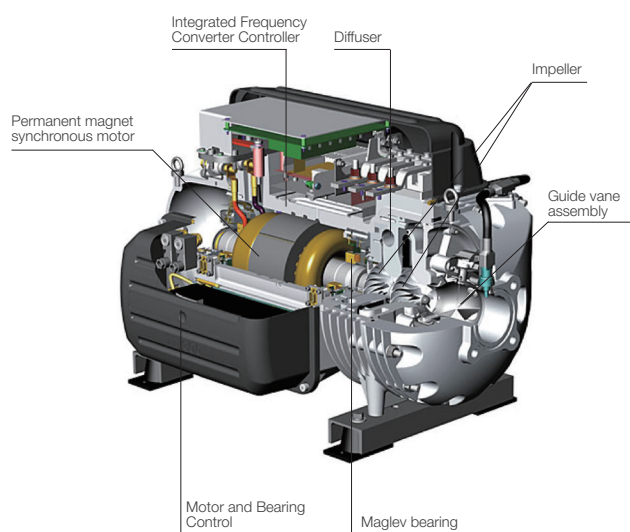
- High efficiency across all operating conditions: TFM delivers exceptional full-load and part-load efficiency, and under AIDC's year-round variable-load operation, its overall efficiency far surpasses that of conventional air-cooled chillers.
- Wide temperature range with low degradation: Fully variable frequency intelligent adjustment allows stable operation in an extra-wide environmental range of 10°C~46°C. Cooling capacity degradation is kept under 8% in extreme high temperatures, suitable for global AIDC deployment.
- High reliability and easy maintenance: Magnetic levitation compressors operate oil-free, with core moving parts experiencing almost no wear, and performance hardly degrades over the entire lifecycle. The oil-free system also eliminates complex maintenance processes, greatly reducing maintenance and replacement costs for AIDC cooling sources.
- Modular and water-free: Compact air-cooled modular layout requires no auxiliary facilities like cooling towers. The design fits containers and is globally deployable, consuming no water, requiring no cooling water system, and is easy to integrate and maintain.

application scenarios

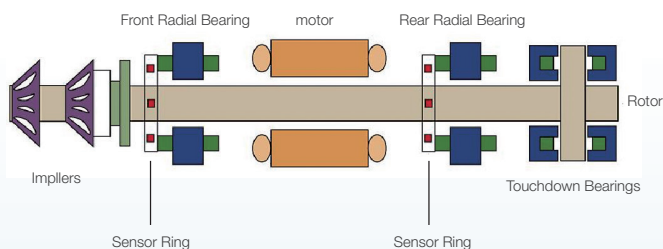


Product Features

Maglev oil-free variable frequency centrifugal compressor Highly integrated compression technology



- High-efficiency magnetic levitation oil-free centrifugal compressor with variable frequency drive: Features efficient two-stage centrifugal technology and magnetic levitation bearing technology optimized through aerodynamic design, along with a high-performance PWM permanent magnet synchronous motor whose speed automatically adjusts with the load, ensuring the unit operates at its best under all conditions and runs efficiently at both full and partial loads.



- Oil-free lubricated magnetic levitation bearings, with no contact friction and no need for an oil lubrication system, and no heat exchanger oil film resistance, can improve evaporation and condensation heat transfer efficiency by more than 15%, boosting the efficiency of the centrifugal unit. They also significantly increase unit reliability and are easy and convenient to maintain.
- Built-in inverter allows the compressor to run at variable speeds under partial load, achieving high efficiency at partial load and reducing operating costs.
- The permanent magnet synchronous motor uses liquid coolant spray for cooling, making it run efficiently.

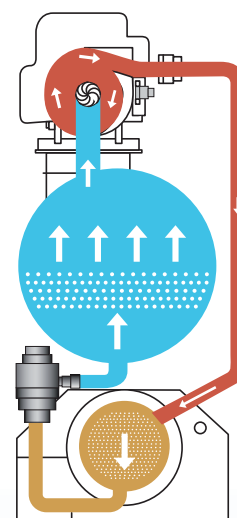
- The compressor rotor and impeller float in the magnetic system while running. Sensors on the magnetic bearings keep sending real-time data to the bearing control system, which adjusts the bearings as needed. This ensures the rotor stays perfectly centered and runs in the best condition, allowing oil-free operation.
- Oil-free lubricated magnetic levitation bearings make the compressor run quietly and reliably. Running without oil eliminates the need for complex oil systems, reduces operational maintenance issues and costs, and improves the unit's reliability and economy.

Ultra-low noise and vibration

The main shaft of the magnetic levitation compressor spins at high speed without any mechanical contact with the bearings. Whether the unit is running at partial load or full load, the noise and vibration of the unit are very low.

High-efficiency full-liquid evaporator

Efficiently reinforced low-thread evaporator tubes, with surface strengthening. The seams form the refrigerant vaporization core, improving the heat exchange efficiency on the outside of the tube.



Electronic expansion valve

- Make sure the evaporator is always in the best heat transfer condition under any working condition.
- Precisely control the unit's refrigerant flow to ensure it runs efficiently at both full and partial load.

Green and eco-friendly

- Uses HFC-134a environmentally friendly refrigerant, which does not harm the ozone layer, with an ODP value of 0.
- Excellent cooling performance, saving power consumption, reducing CO2 emissions, and improving unit efficiency
- Optional R513A/R1234ze refrigerants to meet stricter GWP requirements

Air-cooled Oil-free Centrifugal Chiller

Ultra-low startup current

With variable frequency start, the unit's starting current is as low as 2A, which reduces the impact on the power grid, decreases thermal stress on the motor stator, and also lowers distribution costs.

Stable and reliable

- When the unit suddenly loses power, the high-speed rotating compressor motor acts as a generator, supplying current to the coils to create magnetic force, supporting the bearings until it stops and gently rests on the ceramic bearing, ensuring the unit's safety and stability.
- The casing protection meets the GB4208-2017 standard.
- The unit is strictly designed, manufactured, and tested according to international and domestic standards such as AHRI, EN, UNI, JIS, and GB/T18430.1, ensuring reliable quality.
- The electrical system is built according to IEC60204-1/GB5226.1 standards, and the unit's electrical system complies with EMC electromagnetic compatibility requirements.
- All units undergo rigorous performance testing before leaving the factory to ensure reliability and meet strict customer requirements.

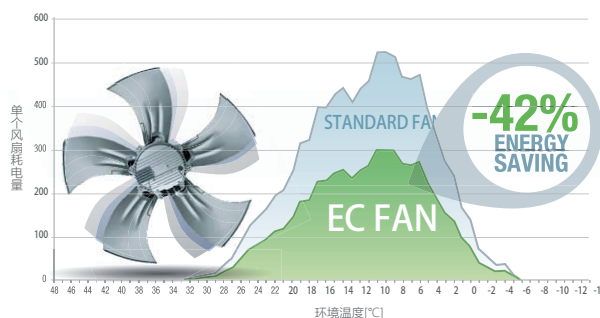
Modular design

- Designed with standard container sizes for easy transport, accessible worldwide
- On-site, just connect water and power to get started
- Quick delivery and flexible expansion to meet AIDC rapid deployment needs



Standard EC fan

Because EC fans are more efficient, they can save 42% more energy compared to regular fans.

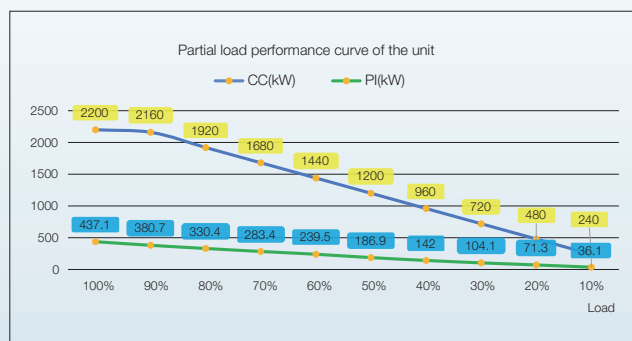
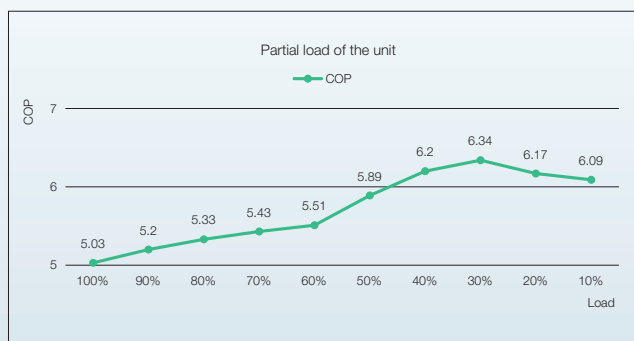


Excellent partial load performance

- Using magnetic levitation variable frequency compression technology, the unit adjusts the load demand with variable frequency and speed, and it doesn't need any lubrication system. Compared with conventional centrifugal or screw units, this unit not only keeps the high-load, high-efficiency advantage but also improves overall energy efficiency by 60%, while saving on maintenance costs like oil changes.
- Using magnetic levitation bearings, variable frequency drive high-efficiency centrifugal technology, and oil-free enhanced heat transfer technology, the unit's efficiency significantly improves when temperatures drop in the transition seasons, saving more energy and reducing costs for users.

Partial load performance analysis (DBT=40°C, LWT=20°C)

Load	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
CC(kW)	2200	2160	1920	1680	1440	1200	960	720	480	240
Pl.(kW)	437.1	380.7	330.4	283.4	239.5	186.9	142.0	104.1	71.30	36.10
COP	5.03	5.20	5.33	5.43	5.51	5.89	6.20	6.34	6.17	6.09



Line Reactor(STD)

To reduce the current harmonic interference generated by the inverter and improve the imbalance of the three-phase power supply, the unit is equipped with a dedicated incoming line reactor. It can limit voltage spikes from the grid or current surges caused by grid operations. It smooths out sharp pulses in the power supply voltage or voltage defects produced during rectifier circuit commutation, which not only blocks interference from the grid but also reduces the impact of harmonic currents produced by the rectifier on the grid.

Harmonic Filter (OPT)

A harmonic filter can improve the efficiency of power transmission and utilization in the unit, further reduce local parallel or series resonance and noise in the electrical system, enhance the capacity of components like transformers, circuit breakers, and cables, and ensure the safe operation of electrical protection and automation devices.

The above configuration meets the requirements of IEEE-519 and GB/T 14594: total harmonic distortion THDI is less than 5%, and the automatic power factor correction during unit operation reaches above 0.95.

Automatic Transfer Switch (OPT)

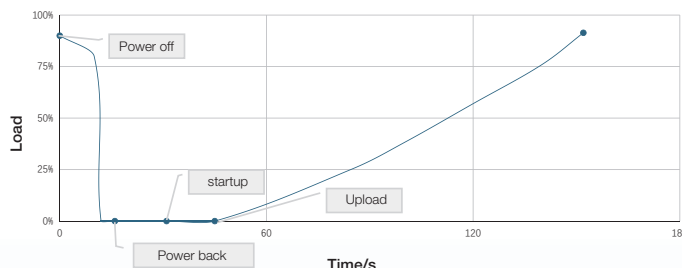
The dual-power seamless switching protection module customized for AIDC scenarios serves as the core redundant configuration enabling 99.99% operational availability of the unit.

Millisecond-level dual-power mutual switching for uninterrupted computing power: It supports two independent power supply inputs. In the event of power flicker, voltage drop or fault on the main circuit, the device can complete power switching within ≤ 0.2 seconds with zero power interruption gap throughout the process. It effectively prevents unit shutdown protection triggered by short-term power fluctuations and ensures zero interruption of cold source supply for high-density AI computing clusters.

Quick start + dedicated UPS (OPT)

A high-speed cooling response module specially designed for AIDC computing power scenarios, completely solving the pain points of traditional chillers starting slowly and delayed cooling supply during sudden computing load spikes.

- Ultra-fast cooling response
- Automatic recovery after power outage with zero wait
- Smooth load ramp-up without impact
- Dedicated adaptation for intelligent computing scenarios



Condenser Spray Cooling (OPT)

Energy efficiency enhancement upgrade solution engineered for extreme high-temperature operating conditions. It breaks the ambient temperature limitation via the air-cooling side and fundamentally addresses the pain point of unit performance degradation under high temperatures.

Targeted precision spraying to resolve high-temperature challenges: Equipped with a high-pressure micro-fog nozzle array, the system activates automatically once the air inlet temperature of the condenser exceeds the threshold. Ultra-fine fog droplets are atomized, which vaporize instantly on the condenser surface to absorb heat and rapidly reduce the temperature on the air intake side.

Anti-corrosion protection on Condenser coil (OPT)

Long-term corrosion protection upgrade option customized for complex industrial and coastal AIDC scenarios, which extends the unit's full-lifecycle reliability starting from core heat exchange components.

The fins adopt hydrophilic aluminum foil with double-layer coating of thickened epoxy resin, forming a dense anti-corrosion barrier on the surface. It can resist erosion by various corrosive media including salt spray, industrial dust and sulfides. No obvious corrosion occurs after more than 1,500 hours of Neutral Salt Spray (NSS) testing, meeting the deployment requirements of computing power stations in coastal regions with high humidity and salt spray and surrounding heavy industrial zones.

Air-cooled Oil-free Centrifugal Chiller

Nomenclature

TFM-1 C T-E-P0-100 2

Compressor Number
Cooling capacity: 100:1000kW
Power Supply: 380V/3Ph/50Hz Default
P0:400V/3Ph/50Hz
Version: E:High Efficiency
Compressor Code
Application: Datacenter Default, C:Comfort
Refrigerant: 1: R134a, 4: R1234ze
Maglev Centrifugal Air-Cooled Chiller

TFM-1T-E-P0-1002

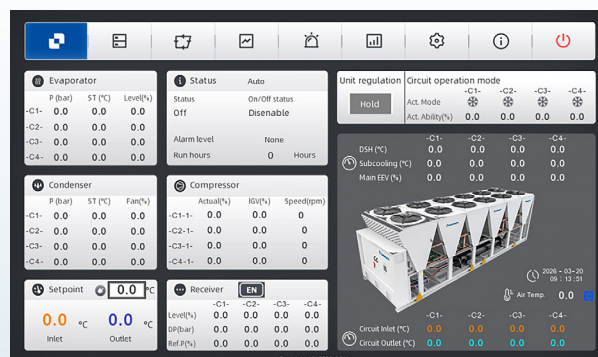
Means the air-cooled high efficiency HFC-134a oil free centrifugal chiller; unit number is 1002; configured with 2 compressors; power supply 400V/3ph/50Hz.

C3000 New Control System

It uses a new control system with a good human-machine interface, excellent control adjustment functions, strong expandability, monitoring and management capabilities, and very high compatibility.

Color LCD Control Panel

- Industrial-grade PLC 10-inch True Color Touchscreen: Uses a Clement industrial-grade PLC and comes with a 10-inch 16-million-color true color touchscreen. The interface is simple and intuitive, making operation flexible and convenient.
- Graphical Dynamic Monitoring: Displays the unit's operating status and key parameters in real-time with graphical dynamic visuals.
- Operation Data and Fault Records: Automatically stores operational data and records detailed fault information, making maintenance easier.
- Remote Linkage Control: Supports remote power on/off and can control peripheral devices like water pumps.
- Secure Password Management: Three levels of password permissions ensure safe authorized operation and prevent unauthorized use.



Unit Control and Operation Management

The advanced C3000 microcomputer intelligent control system comes with Climaveneta's specially designed control algorithms, highlighting the unit's energy efficiency and reliability: FIFO compressor runtime balance function extends overall unit life; automatic load adjustment output function; works with the compressor's load reduction system to achieve stepless adjustment, allowing operation parameters to be tuned and set to suit different environmental applications; multiple expansion accessories add remote and group control features.

Network Communication and Building Control

Supports building control connections, including common communication protocols like MODBUS and BACNET through RS485 serial interface.

Fault Protection, Alarm, and Analysis Capabilities

The microcomputer intelligent controller has comprehensive fault protection, alarm, recording, and analysis functions. It includes protections for high- and low-pressure switches, phase loss, reverse phase, overload, overcurrent, overheating, exhaust temperature, water flow, and antifreeze. It also records faults and displays alarms so problems can be diagnosed and quickly resolved, improving technical support efficiency. By connecting to Clement's remote service program, potential faults can be detected early and preventive measures taken before issues arise.

Microprocessor Control Features

Microprocessor	C3000	Microprocessor	C3000
Remote on/off with external volt-free contact	√	Energy limit function	OPT
Multi-language menu	√	Manual control	√
Phase sequence relay	√	ModBus communication protocol	OPT
Cumulative fault alarm	√	BACnet communication protocol	OPT
Alarms code function	√	Pump control	OPT
Self-test when power on	√	Backup pump control	OPT
NTP	OPT	Water temp. regulation by external signal (4-20mA)	OPT
Evaporator inlet/outlet water temp. display	√	Remote relay control	OPT
Compressor/unit alarms display	√	Local/remote network monitor (FWS)	OPT
General unit alarms display	√	Remote secondary temp. control	OPT
Entering water temp. ratio control	√	Set-point regulation from external signal (0-5V)	OPT
Start/stop operating timer	Par.	Compressor run-timer, time balance & FIFO	√
Double set-point timer	Par.	Compressor start scheduling	√
Pump-Down when stopped	√		

√ Standard OPT available on request Par. available by modifying a value of the configuration parameters

Air-cooled Oil-free Centrifugal Chiller

Technical Parameters

TFM-1T-E-P0-		1002	1202	1403	1603	1803	2004	2204
Cooling capacity	kW	1000	1200	1400	1600	1800	2000	2200
Input power	kW	197.6	239.8	276.4	317.7	359.8	399.1	437.1
COP _c	kW/kW	5.06	5.00	5.07	5.04	5.00	5.01	5.03
Evap. water flow	m ³ /h	86.4	103.7	121.0	138.2	155.5	172.8	190.1
Evap. water flow	l/s	24.00	28.80	33.60	38.40	43.20	48.00	52.80
Evap. water press. drop	kPa	43.2	61	24.3	31.3	39.1	38.4	46
Evap. connection size	inch	5	5	8	8	8	8	8
Circuit	n	2	2	3	3	3	2	2
Load range	%	20~100		13.3~100			10~100	
No. of compressors	n	2	2	3	3	3	4	4
Compressor power	kW	172.40	210.40	238.60	279.90	317.80	348.70	382.50
Number of fans	n	12	14	18	18	20	24	26
Single fan power	kW	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Fan power	kW	25.2	29.4	37.8	37.8	42	50.4	54.6

Note:

1. Conditions: chilled water inlet temperature 30℃, outlet temperature 20℃, ambient temperature 40℃.
2. Water-side connection type: clamp connection, flange connection can be customized.
3. Water-side pressure: designed for 1.6MPa, can be customized to 2.0MPa.
4. The parameters in the table are based on AHRI-certified selection software. If you need other operating parameters, please contact Climaveneta.
5. Climaveneta's products and technology are continuously updated and optimized, so the above parameters may change. Please refer to the latest software selection and actual products.

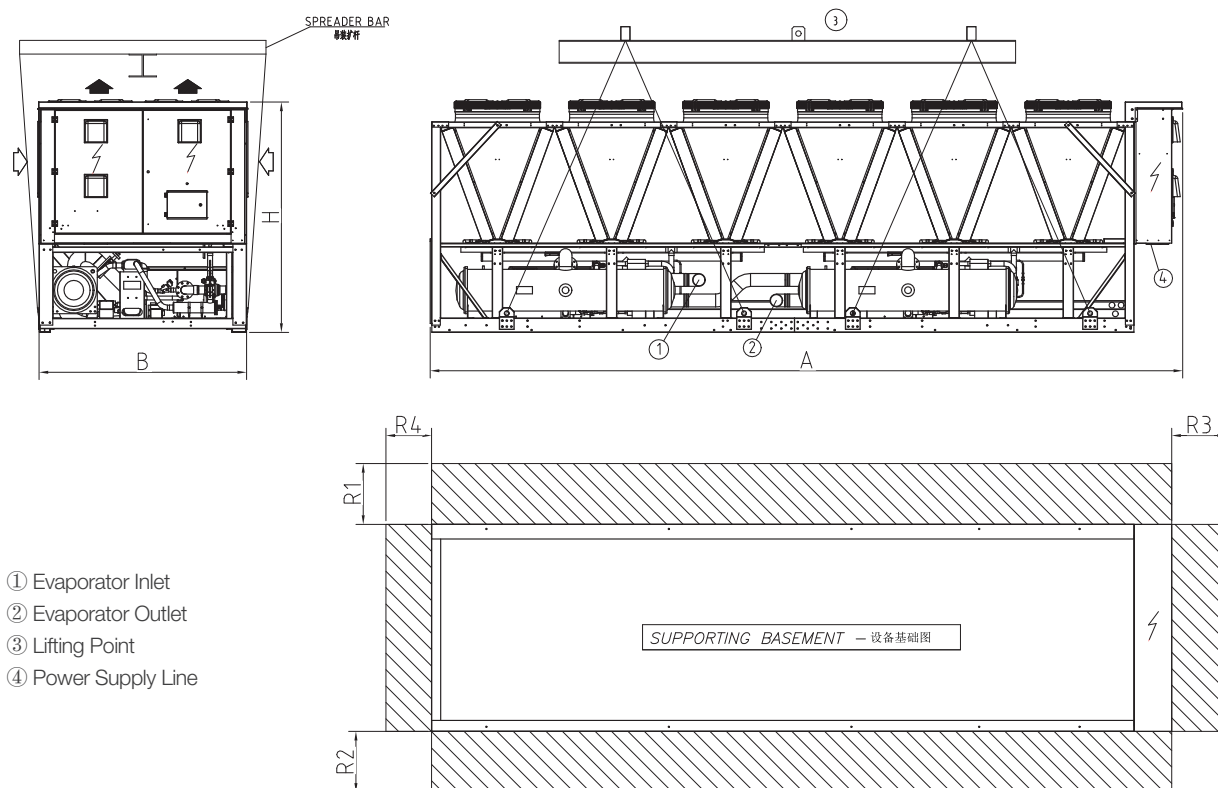
Electrical Parameters

TFM-1T-E-P0-	Compressor(Single)		Fan(Single)		Total Unit	
	F.L.I(kW)	F.L.A(A)	F.L.I(kW)	F.L.A(A)	F.L.I(kW)	F.L.A(A)
1002	132	207	3.15	4.87	301.8	472
1202	132	207	3.15	4.87	308.1	482
1403	134/132	210/207	3.15	4.87	456.7	715
1603	132	207	3.15	4.87	452.7	709
1803	132	207	3.15	4.87	459.0	718
2004	134/132	210/207	3.15	4.87	605.6	948
2204	132	207	3.15	4.87	609.9	955

Note:

F.L.I. is input power. F.L.A. is input current. power supply type 400V-3Ph-50Hz.
 Voltage allowable fluctuation range $\pm 10\%$. Three-phase voltage unbalance range $\pm 3\%$.
 The maximum value comes from the theoretical limit and is only for distribution reference.

Dimension



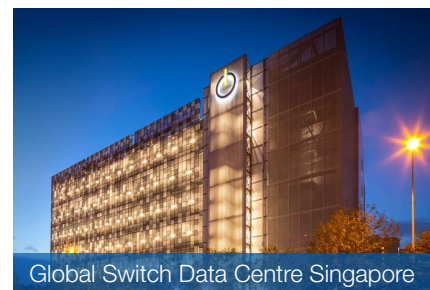
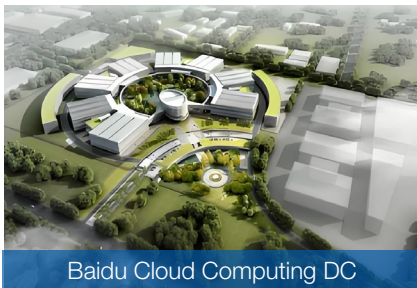
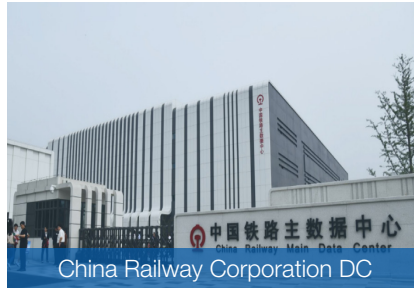
TFM-1T-E-P0-		1002	1202	1403	1603	1803	2004	2204
Length	mm	8220	9470	11975	11975	13225	16455	17705
Width	mm	2310	2310	2310	2310	2310	2310	2310
Height	mm	2555	2555	2555	2555	2555	2555	2555
R1	mm	2000	2000	2000	2000	2000	2000	2000
R2	mm	2000	2000	2000	2000	2000	2000	2000
R3	mm	1500	1500	1500	1500	1500	1500	1500
R4	mm	1500	1500	1500	1500	1500	1500	1500
Evap. connection size	inch	5	5	8	8	8	8	8
Transport weight	kg	6120	6490	8800	8785	9220	11060	11560
Operating weight	kg	6305	6690	9120	9120	9545	11400	11900

Note:

Climaveneta products and technology are constantly being improved and updated, so the above parameters may change. Please refer to the final drawings.

Air-cooled Oil-free Centrifugal Chiller

Data Center Industry Cases



Our Partners



Note: The ranking is not in order, just for display



Mitsubishi Electric Hydronic & IT Cooling Systems S.p.A

Head Office: Via Caduti di Cefalonia 1 - 36061 Bassano del Grappa (VI) - Italy

Tel: (+39) 0424 509 500 - Fax (+39) 0424 509 509

Website1: <https://www.melcohit.com>

Website2: <https://www.climaveneta.com>

Climaveneta Chat Union Refrigeration Equipment (Shanghai) Co., Ltd.

Head Office: No.88 Baiyun road, Xinghuo development zone, Fengxian district, Shanghai, China

Tel: +86 21 5750 5566 - FAX: +86 21 5750 5797

Website: <http://www.climaveneta.com.cn/>

Climaveneta Chat Union Refrigeration Equipment Vietnam Co., Ltd

Address: Factory B1, Road No. 1, Phuc Long industrial park, Long Hiep Ward, Ben Luc district, Long An province, Vietnam

Tel: +84 272 398 6866

Website: <http://climaveneta.vn/>