MULTISTACK
THAILAND

Oil Free Modular Chiller

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The pioneer and creator of modular chillers and magnetic chiller technology

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Content

Company Profile

Back in 1985, Multistack was well known worldwide for the invention of modular chiller, ushering a new age in the HVACR industry. Nowadays, as an international air-conditioning and refrigeration equipment supplier, Multistack continues to provide reliable products and a package of professional services including system design, products development, installation and maintenance for a diverse range of clients, covering business, industrial and government sections, etc.

With a global network of users in Australia, New Zealand, North America, Europe, Asia and etc, we have attracted customers worldwide not only by the visual appeal of our products but also by our high energy-saving, efficiency and quality standard.

Please choose Multistack, if there is a demand for higher energy efficiency, unbeatable reliability and redundancy, and at the same time a limited installation space and budget is available, as we are the creator and leader of modular chillers!

Customers of Multistack Magnetic Levitating Chillers

SCHOOL

BloomingtonMiddle School

Durham University

Okanagan College Lab Building

Okanagan College Canteen

Georgia Dunes University

Medford Memorial School

Nathan hale school

Theological Seminary Library

Sam Della Middle School

Pomona College

Roosevelt University Academic Building

Buffalo University

Capital Normal University

University of Ontario Insititute, Phase I & II

Cooking Central School

Worcester North High School

GOVERNMENT

Mier Postultnomah County Justice Center

VA Medical Center - Tomah

Bellevue city hall

New Bern Office

Community Center

Yakima Courthouse

HOSPITAL

Cabrini Medical Building

Campbell River Hospital

Lakeview Health Center

Cabrini Medical Center

Stirling Medical Center

Community Health Center

Campbellsa Hospital

Vibharamamta Hospital

HOTEL

Crowne Plaza Hotel

Stern bay city Center hotel

Booker spirit City Center

Four Season Hotel-SHF

OFFICE BUILDING

US International Organization Building

US Northeast Office Building

Local Cooling Tower

Executive Mansion

Washington Data Office Building

50 Milk Street

Bureau of Prisons, Building I & II

Houses of Parliament, Phase I

OTHERS

Marion GM Car Plant

Gaithersburg Tree-lined Cathedral 4104

Holy Lake Clay National Bank

Sears Coquitlam

Vic Factory Northen Telecom, Phase II

Block 76, City Center

Oral-B Production Base III

New Meida Building

Hainan Telecom

Federal Bank Settlement Center, Melbourne, Australia

Modular magnetic levitating centrifugal chiller

Cooling Capacity: 1800ton (2005)

US Embassy in Japan, Tokyo

Modular magnetic levitating centrifugal chiller

Cooling Capacity: 1600ton (2007)

Houses of Parliament, Singapore

Modular magnetic levitating centrifugal chiller

Cooling Capacity: 1800ton (2006)

Bangkok Hospital, Thailand

Modular magnetic levitating centrifugal chiller

Cooling Capacity: 1200ton (2014)

Technical Background

Birth of the first oil free centrifugal compressor in the world by Multistack;

1985

Modular chiller was invented by Mr. RON CONRY in Australia, founding the company Multistack in 1986 ;

1993

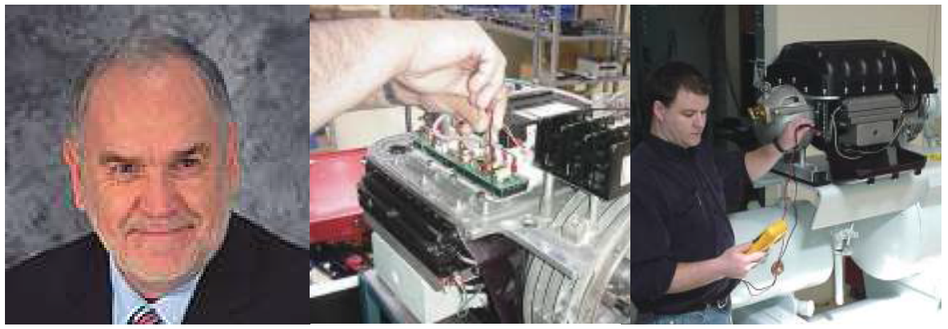
The TURBOCOR research group was established by Mr. RON CONRY for the study of the oil free centrifugal compressor;

1998

Test run of the first experimental magnetic levitating chiller of Multistack;

1999

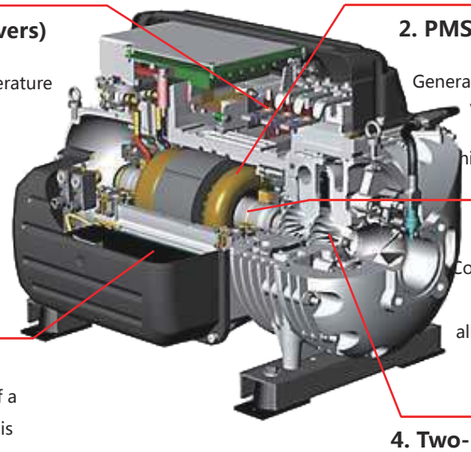
TURBOCOR was upgraded as an international project, moving from Melbourne, Australia to Montreal City, Quebec, Canada.



Compressors Technical Advantages

1. VFDs (Variable Frequency Drivers)
Energy can be saved by slowing down the compressor speed when condenser temperature and heat load are reduced.

The internal IGBT acts as an inverter to convert DC power into three-phase AC power, therefore adjusting the motor’s rotation speed. Mechanical energy is transformed to electric energy under the engine control mode, which also ensures a safe rotor stop during power failure.



2. PMSM (Permanent Magnet Synchronous Motor)
Generated by PWM power supply,the variable frequency high-speed motor has the advantage of high-efficiency, compact design and soft starting.

3. Magnetic Bearing
Compressors feature a patented magnetic bearing system that allows rotor shaft and impellers to levitate during rotation, eliminating vibration.

4. Two-stage Centrifugal Compressor
An economizer has been provided in the middle of suction port.
The capacity is controlled using motor frequency control.

5. 100% Digital Control
In one of the first real intelligent design of a compressor, a digital electronic controller is utilized for the optimum performance and maximum energy efficiency.

Why oil free magnetic levitating bearings are adopted?

Conventional compressors and chillers usually consume more energy owing to the heat transfer block of lubricating oil. Even chillers with only 4% lubricating oil can consume 9% more energy (see Table 1). Excessive oil is the major reason to reduce the actual energy efficiency (see Table 2). However, the utilization of modern magnetic bearings enables a Friction-less operation with the one and only moving part (rotor shaft and impellers) levitated during rotation by a digitally controlled magnetic bearing system, therefore it can save on extra operating and maintenance costs. The bearing sensor will monitor the position of the rotor shaft 100,000 times per second to ensure its precise positioning.

Table 1: percertage of efficierly loss

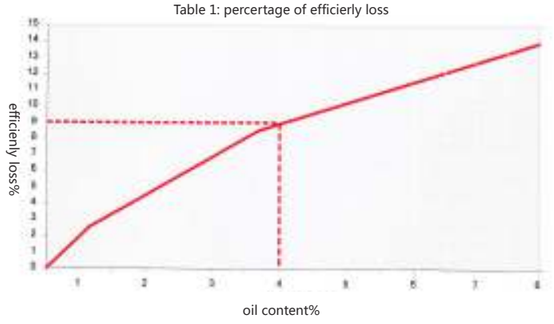
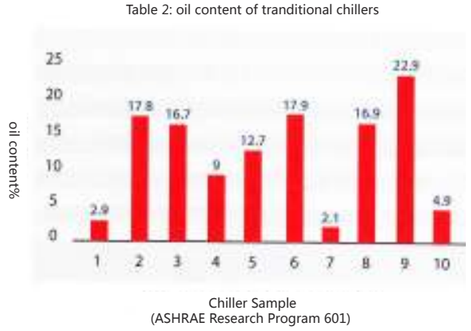


Table 2: oil content of tranditional chillers



Principal Parts

1. Electronic Expansion Valve

Electronic Expansion Valves are adopted for refrigerant flow control between evaporator and condenser,which guarantees reasonable refrigerant supply, minimum superheat degree and maximum efficiency under various loading condition.

2. Individual Breaker

Isolation of each compressor by individual breakers allows for one compressor to be in service while others in operation, ensuring better serviceability and redundancy.

3. Independent Control Power Supply

High voltage components are isolated from all control components for increased safety during service. This feature prevents electrical interference from the high voltage electrical to the system and compressor controls, which increases reliability.

4. Differential Pressure Flow Switch (Optional)

Multistack MTW chillers come with factory installed differential pressure switch on the evaporator and condenser. The switch are wired into the control system to decrease field installation requirements. Differential pressure switch are used for protection in place of flow switch, which can flutter when used in variable flow application and causing annoying faults.

5. Brazed Plated Heat Exchanger

Brazed plated heat exchangers are used as evaporator and condenser. Its compact design and high efficiency of heat transfer helps to reduce the installation space and related costs for users.

Features of Modular Chillers

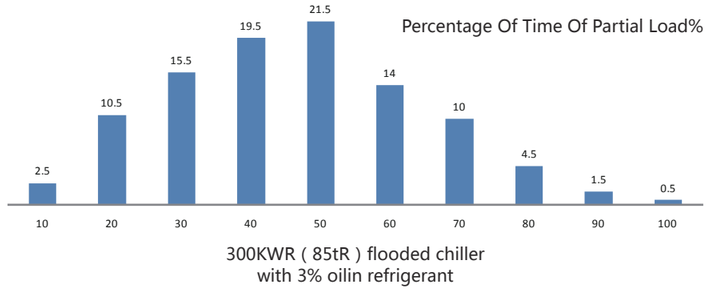
1. Ultra-high Energy Efficiency

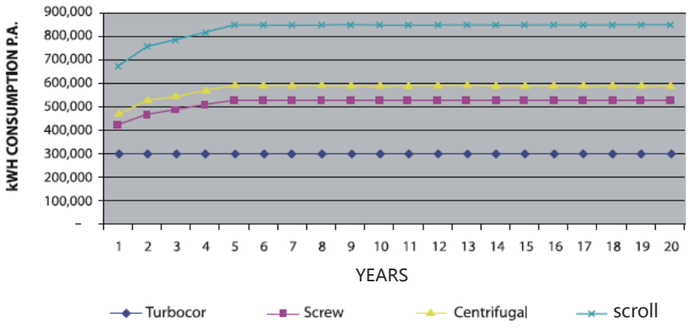
Magnetic levitating compressor

Digital variable frequency control technology

No-lubricating oil operation

Integrated control system

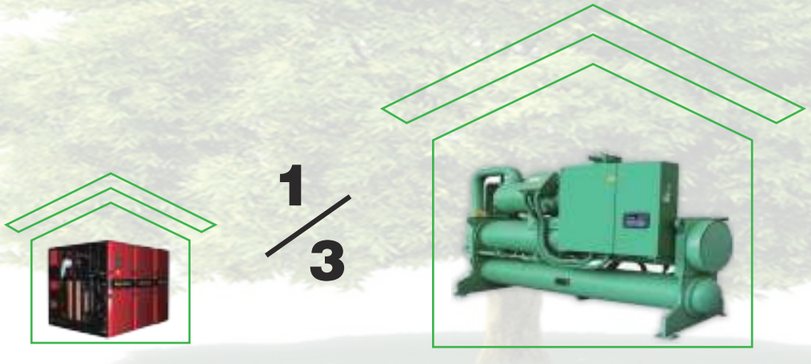




2. Compact Design

Solid state electronic components are used as compressor rotation parts, avoiding lubrication and metal contacts.

Modular chillers only occupy one-third installation space compared with conventional stand-alone chillers.

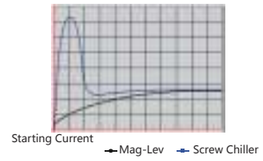


3. Oil-Free operation

The system is simple without lubricating oil, which reduces faults and maintenance fee, increasing service efficiency.

4. Low Starting Current

Soft starting is combined with variable frequency starting, lowering the current to 5A in case of impulse current impact.

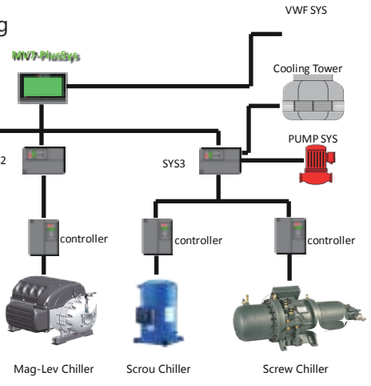


5. Environment-friendly

Green refrigerant R134a, reduces the GWP (Global Warming Potential) and has an Ozone depletion value of zero.

6. Low Vibration and Noise

Self-diagnosis function is use in the digital control system, detecting the shaft 6 million times per minute for a reliable operation of the compressor. The noise of the chiller is kept to a sound pressure level of less than 73db(A) with virtually no structural borne vibration.



7. Advanced Intelligent Control System

MV7 Plus integrated intelligent control

8. Primary Pump VWF System

Chilled/Cooling water pump VSD control (Optional)

One water pump system is shared by both the main and slave chillers for easy VSD control. Water flow range is 10~100%, saving pumping energy by more than 50%.

9. Remote Control

Remote control is realized by mobile terminal or internet.

Power Consumption Comparison Between Magnetic & Screw Chillers

Project Background: Total Cooling Capacity 300 RT

Case One: Two MTW 500 (magnetic); Cooling Capacity is 300RT

Case Two: Two 150RT (screw); Cooling Capacity is 300RT

Comparison:

The heat load of chillers changes with ambient temperature, sunlight, usage and etc. It is proved by HAVR industry that almost in 94.33% of the operation time chillers are under 60% load; those under 50% load take 88% of the operation time -- the average loading percentage is only 31%.

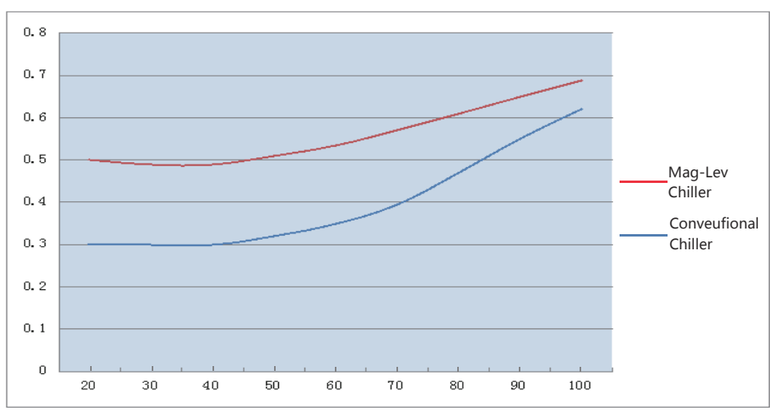
See toad profile statistical data from tyical installations as below:

LOAD PROFILE

Load%	Hours	P%
00--05	77	2.67
05--09	519	18.02
10--19	649	22.53
20--29	565	19.62
30--39	454	15.76
40--49	277	9.62
50--59	176	6.11
60--69	108	3.75
70--79	43	1.49
80--89	10	0.35
90--100	2	0.07

As for conventional screw chillers, the cooling capacity is adjusted by compressor unloading, which inevitably causes low efficiency under low loading.

However, the magnetic levitating chillers applied variable frequency control technology on compressors for capacity change, combined with flooded evaporator to achieve excellent energy efficiency at various loading state.



The above chart compares the efficiency between MTW and conventional chillers under ARI550/590-2003 condition. The curve indicates minor difference when under full load, while the MTW chillers achieves higher efficiency than the conventional ones under partial load.

Operation time for cooling counts May, June, July, August, September, October, totally 4320 hours (presuming 30 days a month).

Case One: Annual Power Consumption Prediction for MTW

System Load Demand%	Running Hours	MTW			System power consumption
	H	System Operation load RT	1#Chiller Operation load%	2#Chiller Operation load%	KW.H
0-9	894	30	25%	-	8046
10-19	974	60	40%	-	17532
20-29	846	90	30%	30%	22842
30-39	680	120	40%	40%	24480
40-49	414	150	50%	50%	19872
50-59	264	180	60%	60%	16632
60-69	162	210	70%	70%	13268
70-79	66	240	80%	80%	7445
80-89	16	270	90%	90%	2376
90-100	4	300	100%	100%	744
Total					133237

Case Two: Annual Power Consumption Prediction for Screw Chillers

System Load Demand%	Running Hours	Screw chillers 150RT			System power consumption
	H	System Operation load RT	1#Chiller Operation load%	2#Chiller Operation load%	kw.h
0-9	894	30	50%	-	34196
10-19	974	60	50%	-	37256
20-29	846	90	75%	-	56153
30-39	680	120	100%	-	69360
40-49	414	150	100%	-	42228
50-59	264	180	100%	50%	37026
60-69	162	210	100%	50%	22721
70-79	66	240	100%	70%	11113
80-89	16	270	100%	100%	3264
90-100	4	300	100%	100%	816
Total					314132

The above comparison shows that application of MTW will save ¥ 180894.00 of energy cost, assuming unit cost is ¥1.00/kw.h.

Note: the above case comparison is only for reference.

Model Number Designation

M	T	W	500	V	E	A	--	4.0
1	2	3	4	5	6	7		8

1 -- Multistack Modular Series

2 -- Magnetic Levitating Compressor

3 -- Water Cooled Chiller

4 -- Model Number

5 -- Water System V: Variable Water Flow

6 -- Refrigerant E: R134a

7 -- Power Supply A: AC380V/50Hz/3Ph
B: AC400V/50Hz/3Ph

8 -- Quantity of Modular Units

Example:

1. A chiller consisting of 4 MTW500 modular units, with AC380V/50Hz/3Ph power supply and R134a refrigerant is marked as MTW500EA - 4.0.

Selection Example:

Selected chillers should meet the following requirements:

1. CHWE.T = 12℃
2. CHWL.T = 7℃
3. W.F=97 I/s
4. CWE.T=30℃
5. CWL.T=35℃
6. W.C=m3/h=114I/s
7. Refrigerant: R134a
8. Power Supply: AC380V/50Hz/3Ph

Selection Calculation

1. Calculation of Cooling Capacity:

Cooling Capacity =

2. Calculation of Quantity and Model of Modular Units

MTW500 modular chiller is selected as the unit cooling capacity is 526kW under conditions of CHWL.T = 7℃, CWL.T=35℃.

Quantity of modular units: 2030÷526=3.86. (So the quantity should be 4)

Total Cooling Capacity: 526×4=2104kW

The selected chiller, MTW500EA-4.0, meets the require-ments.

3. Calculation of Chilled Water Resistance

1) Rated chilled water flow = 25.1×4=100.4 I/s

Resistance under rated water flow: 50kPa

2) Actual chilled water flow percentage=97.0÷100.4=96.6%

Find the resistance correction coefficient through the curve chart

-- when actual chilled water flow percentage is 96.6%, the coefficient is 0.92.

The K value table shows that when module quantity is 4 of MTW500, K value is 1.02.

The actual chilled water resistance is 0.92×50×1.02=47kPa

4. Calculation of Cooling Water Flow and Resistance

1) Cooling water flow 4×29.6=118.4 I/s

Resistance under rated water flow: 80kPa

2) Actual water resistance

Actual cooling water flow percentage=114.0÷118.4=96.3%

Find the resistance correction coefficient from the curve chart -- when actual chilled water flow percentage is 96.3%, the coefficient is 0.91.

The K value table shows that when module quantity is 4 of MTW500, K value is 1.02.

The actual chilled water resistance is 0.91×80×1.02=74kPa

Technical Data

Model			MTW500			
Nominal capacity		Ton	150	300	450	600
Nominal capacity		kW	526	1052	1578	2104
Nominal power input		kW	94	188	282	376
IPLV		kW/Ton	0.37			
Compressor	Type		Oil free centrifugal compressor			
	Starting mode		Soft start			
	Quantity		1	2	3	4
	Power supply	AC	400V/50Hz或380V/50Hz/3Ph			
	FLA	A	170	170	170	170
	RLA	A	160	160	160	160
	LRA	A	187	187	187	187
	Startup current/each	A	5	5	5	5
Modular cooling capacity control range %			30%-100%	15%-100%	10%-100%	7.5%-100%
Refrigerant			R134a			
Refrigerant charge		kg	75	75*2	75*3	75*4
Refrigerant throttling				EEV		
Control System				MV7 Plus		
Evaporator	Type		AISI316 flooded stainless steel brazed PHE			
	Flow rate	l/s	25.1	50.2	75.3	100.4
	Pressure drop	kPa	78	78	78	78
	Fouling factor	m^2k/kW	0.018			
	Connections		10"			
Condenser	Type		AISI316 stainless steel brazed PHE			
	Flow rate	l/s	29.6	59.2	88.8	118.4
	Pressure drop	kPa	95	95	95	95
	Fouling factor	m^2k/kW	0.043			
	Connections		10"			
Dimensions	W	mm	900	1800	2700	3600
	L	mm	2240	2240	2240	2240
	H	mm	2080	2080	2080	2080
Weight	Shipping	kg	1280	2560	3840	5120
	Operating	kg	1320	2640	3960	5280

Nominal values based on:

Cooling water entering/leaving temperature 30℃/35℃

Chilled water entering/leaving temperature 12℃/7℃

Control System

MV7 Plus Control System:

- MV7 Plus control system provides powerful control and vast information service to meet user’s requirements. It can not only adjust the chiller capacity output according to load demand but also keep the compressor away from unsafe operation conditions.
- MV7 Plus control system consists a core part—a 32 bit CPU, and a 9.7” TFT LCD colorful touch screen with 800×480 solution, to provide powerful data processing capability and abundant graphic and text display. It allows users fully access to chiller information, conducting comprehensive analysis and diagnostics. Chiller operation can also be scheduled and appointed.
- MV7 Plus control system automatically controls the compressor(s)’ operation in accordance with system demand, and ensures the chiller capacity output perfectly match up the demand.
- MV7 Plus control system monitors the following faults and protects the compressor or system whenever faultoccurs, and sends out alarms accordingly.
  ——High discharge pressure
  ——Low suction pressure
  ——insufficient water flow
  ——Compressor overload
  ——Low chilled water temperature
  ——Compressor internal fault output

- MV7 Plus can record the latest 6000 fault records, including all information related each fault such as fault type, fault occurance time, running parameters of the faulty module. The fault profile provides operation and service personnel with valuable and necessary information, allowing them to make accurate analysis and take correct action.
- MV7 Plus control system set two-level password access to parameter settings, including customer level, service level, factory level. Only authorized personnel are allowed to enter and conduct modification.
- MV7 Plus provides RS485 serial port, allows for remote monitoring and chiller control.

VWF (Variable Water Flow)

MTW-V

The magnetic levitating chillers are designed for variable water flow, which can not only change cooling capacity but also adjust chilled/cooling water working flow for maximum energy efficiency. Besides, the simple primary flow system is adopted for both chilled and cooling water circulation. Generally at least two modular units are involved in the chiller under the VWF mode.

Flow Regulation Valve

Flow regulation valves are installed between chilled/cooling water pipe and evaporator/condenser to regulate water circulation of each unit synchronously. The flow regulation valve is turned on when compressors are working while turned off when compressors are off-work. Its linear on-off design prevents water hammer as well as rapid change of voltage. And the differential switch protects the compressor from operation with valve off.

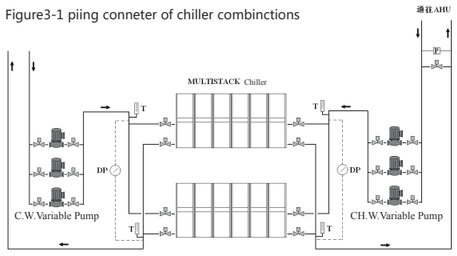
Water System Differential Sensor

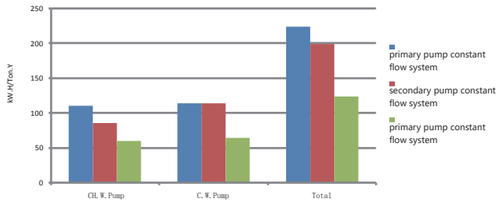
Three differential sensors are provided by Multistack to test chillers leaving/entering pressure difference of chilled and cooling water as well as pressure difference of chilled water worst loop. These three sensors are used to monitor the water flow change so that the computer controller can regulate water pump output frequency on demand.

Variable Frequency Pump Control System

MV7 Plus controller not only dominates chillers operation but also regulates the flow change of chilled/cooling water through differential sensors. Working flow is kept in accordance with load demand by PID control mode and output control signal from chilled/cooling water pump, saving energy ultimately.
MV7 Plus controller is connected to a thermal switch and cooling tower fan controller to adjust the cooling water entering temperature for power efficiency.

Figure3-1 piing conneter of chiller combinctions





Notes : 1050 Centrifugal pump
1050 Centrifugal pump
1100 Common pump

Performance Correction Curve (per unit)

The data below is based on nominal conditions

1. Performance Correction Curve of Cooling Capacity

Cooling water entering temperature

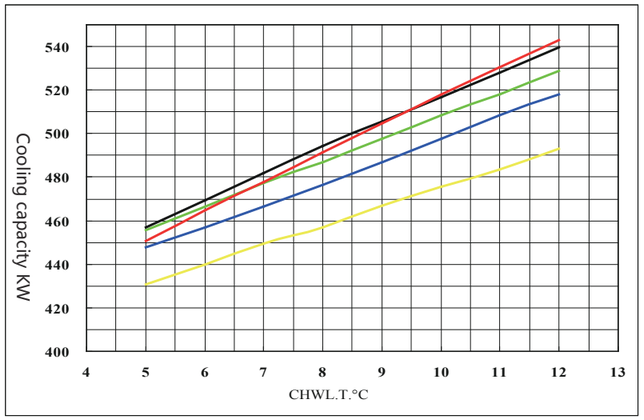
15 ℃

20 ℃

25 ℃

30 ℃

35 ℃



2. Performance Correction Curve of Input Power

Cooling water entering temperature

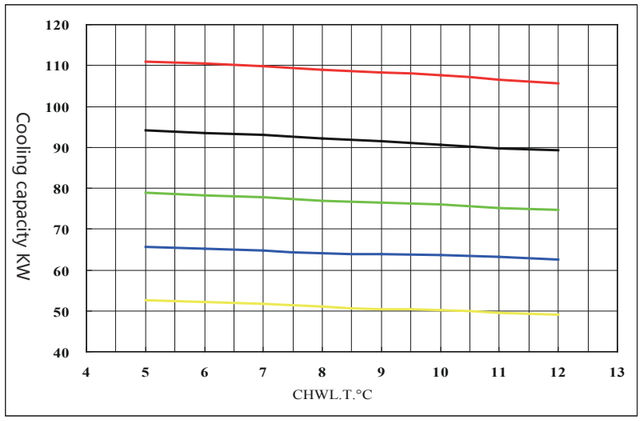
15 ℃

20 ℃

25 ℃

30 ℃

35 ℃



3. Kw/TR Performance Correction Curve

Cooling water entering temperature

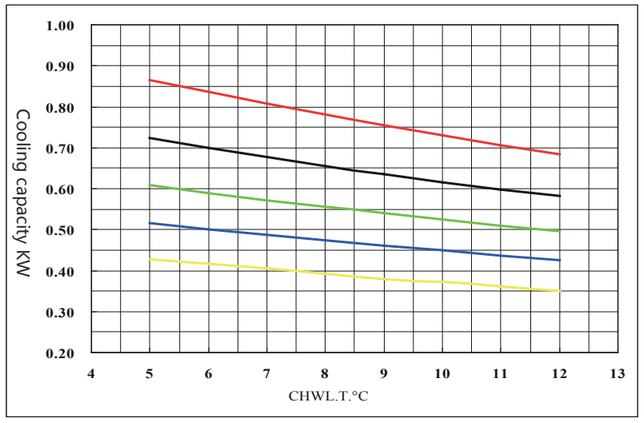
15 ℃

20 ℃

25 ℃

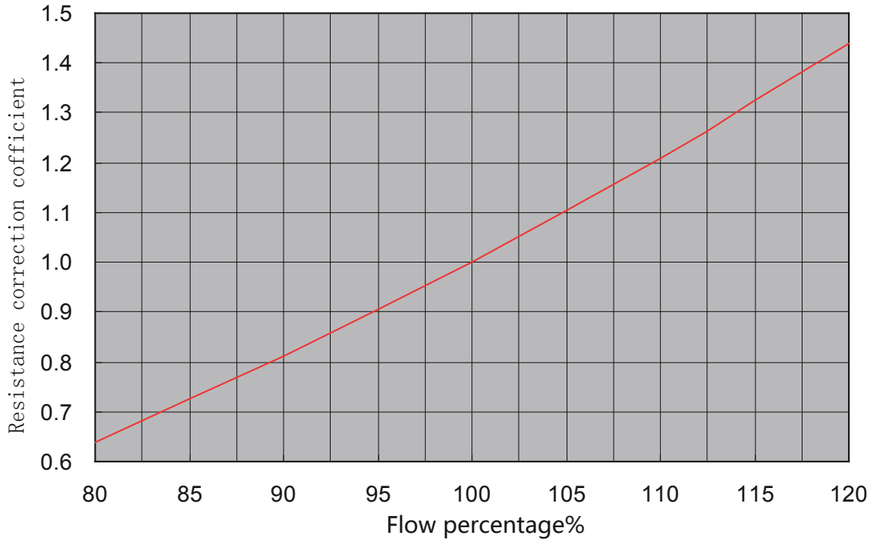
30 ℃

35 ℃



Water Resistance Correction

Resistance Correction Curve of Heat Exchanger Flow (per unit)



Flow percentage = Actual flow/Rated Flow × 100%

Resistance Correction Coefficient relating to modules number

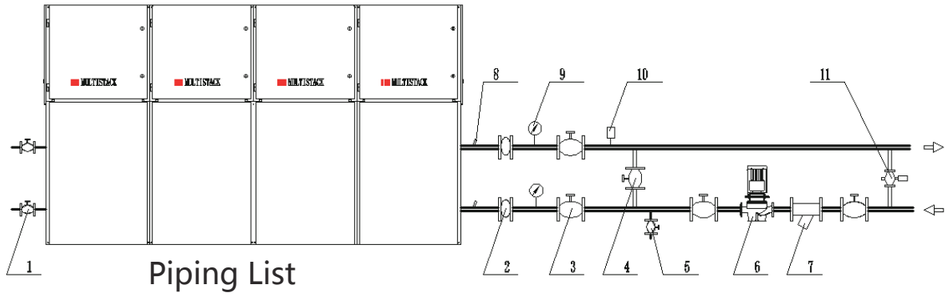
N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MTW500	1.00	1.00	1.00	1.00	1.00	1.01	1.01	1.01	1.02	1.02	1.02	1.03	1.03	1.04	1.05

N -- Number of modular units

Calculation of Actual Water Resistance (Heat Exchanger):

Actual Water Resistance (Heat Exchanger) = k×ζ×water resistance under rated flow

Chilled Water Piping



Chilled Water Piping

No.	Item	Description	Qty	Remark
1	Drain valve	DG50	2	required
2	Vibration eliminator	Refer to design	2	required
3	Shut off valve		2	required
4	Bypass valve	≥DG100	1	required
5	Drain valve		1	required
6	Water pump	Refer to design		
7	Strainer*	Refer to design	1	required
8	Sensor socket	3/8”	2	required
9	Pressure		2	required
10	Flow switch		1	required
11	Pressure differential bypass valve	Refer to design	1	

*VWF -- Variable water flow system
Electronic bypass valve is used for VWF system

Notes:

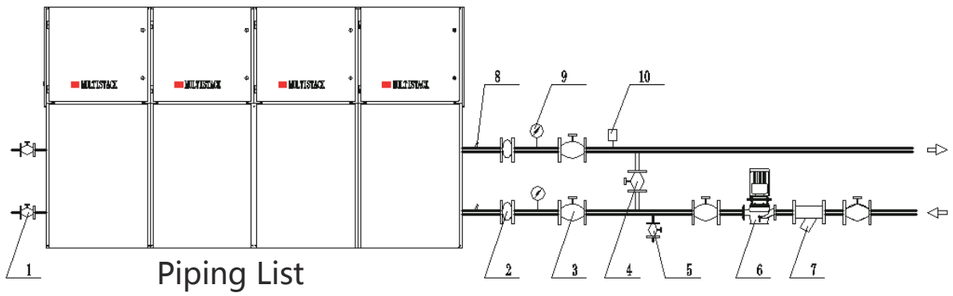
1. All piping components are prepared by users themselves except those have been marked.
2. As for VWF system, the chiller bypass valve (4) is optional, and the bypass pressure should be set at 100kPa once installed.
3. As for VWF system, differential pressure should be set at +50kPa when pressure differential bypass valve on load is turned on.
4. As for VWF system, the pressure differential bypass valve on load is recommended to be installed at the worst loop.
5. The isolation valve should be turn off until leak detection and cleaning finished after installation.
6. The outside pipes shall have suitable supporters in case weight on chiller’ s body will impair the pipe joints sealing.
7. Conductive paste shall be put before temperature probe is inserted into the pipe to avoid probe damage from inside water.

*Strainer :

In case A, the mesh number of the strainer should be 25 per square inch to avoid floating particles being taken to the unit and block the heat exchanger. At the same time, the strainer should have enough strength to bear high water flow pressure in the event of strainer partly blocked.

In case B, the mesh number of the strainer can be chosen according to the normal standard.

Cooling Water Piping



Cooling Water Piping

No.	Item	Description	Qty	Remark
1	Drain valve	DG50	2	required
2	Vibration eliminator	Refer to design	2	required
3	Shut off valve		2	required
4	Bypass valve	≥DG100	1	required
5	Drain valve		1	required
6	Water pump	Refer to design		
7	Strainer*	Refer to design	1	required
8	Sensor socket	3/8”	2	required
9	Pressure		2	required
10	Flow switch		1	required

*VWF -- Variable water flow system
Electronic bypass valve is used for VWF system

Notes:

1. All piping components are prepared by users themselves except those have been marked.
2. The bypass ratio regulator can be skipped if cooling tower is controlled by entering cooling water temperature.
3. The entering cooling water temperature should be kept below 25℃ to avoid low-pressure operation.
4. The isolation valve should be closed until leak detection and cleaning is finished after installation.
5. The outside pipes shall have suitable supports in case weight on chiller’ s body will impair the pipe joints sealing.
6. Conductive paste shall be charged before temperature probe inserted into the pipe to avoid probe damage from inside water.

*Strainer :

In case A, the mesh number of the strainer should be 25 per square inch to avoid floating particles being taken to the unit and block the heat exchanger. At the same time, the strainer should have enough intensity to bear high water flow pressure in the event of strainer partly blocked.

In case B, the mesh number of the strainer can be chosen according to the normal standard.

Power Mains Connection

Power Mains

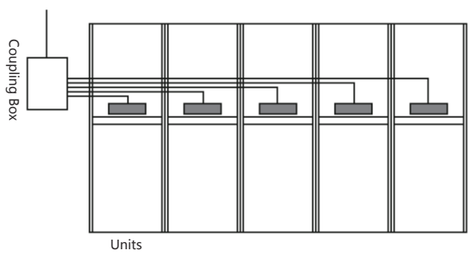
1. Types of power supply and switch are chosen according to different MRC, voltage, allowable voltage drop, ambient temperature and the local electrical specification.

2. As shown on the right, the main inlet cable is connected to the chiller from side.

3. Each power supply branch is supplied for one module only and its cable is connected with main circuits switch inside the electrical box of each module.

电气性能参数

Mode	MTW500		
Power	AC380 ±10%V 50Hz/3Ph AC400 ±10%V 50Hz/3Ph		
Refrigeran	R134A		
Compressor Working Current	FLA	RLA	LRA
	170	160	187
Compressor Starting Mode	Direct		



FLA -- Maximum Running Current
RLA -- Nominal Running Current
LRA -- Overload Protection Current

Transport and Handling

1.1 Chiller information

Project	Unit	Parameter	Remarks
Type	Modular	MTW500	
Net Weight	KG	1300	Per module
Dimension LxWxH	mm	900x2240x2080	Per module

1.2 Center of Gravity

A:450mm	B:1020mm	C:1000mm

1.3 Use of fork lifts

Multistack products are equipped with floor-clearance feet to allow unloading and handling by fork lifts.

1.4 Attention

The gravity center of modular unit is located on the upper part. Please make sure to balance the unit during handling in case of tip over.

1.5 Use of Chains and Sling

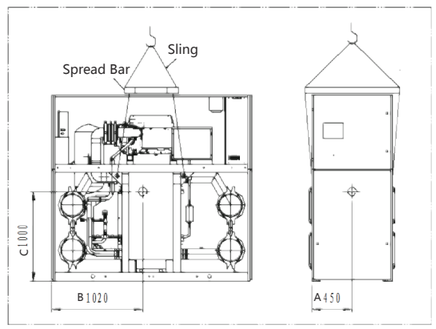
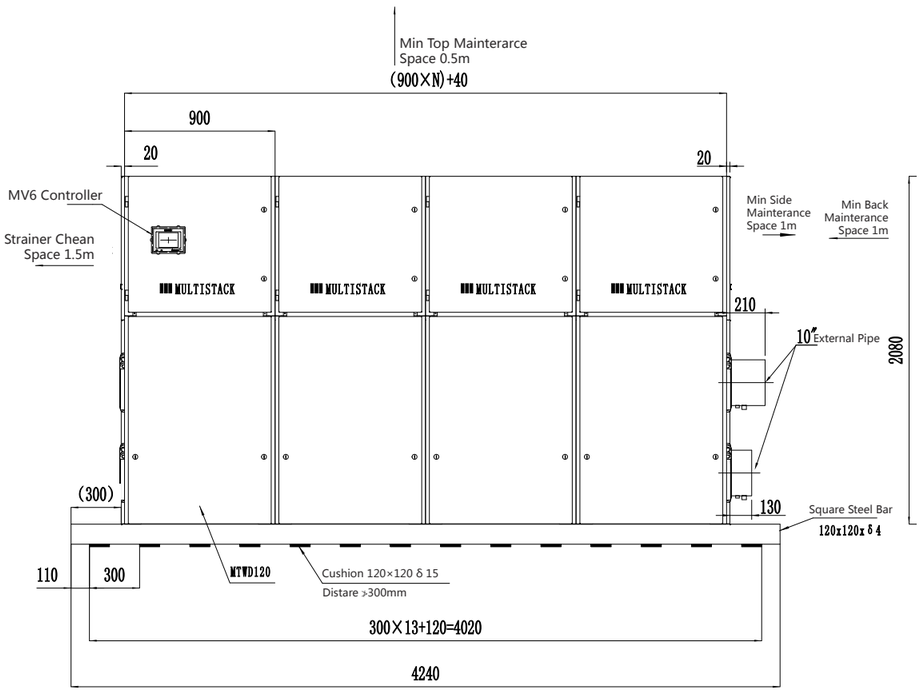


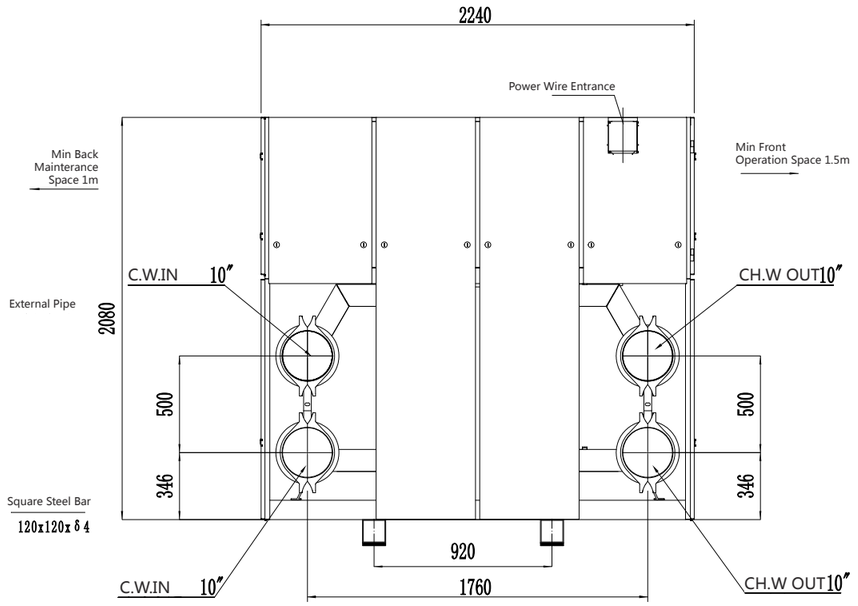
Figure1-1

1.6 Handling for accessories

The type and quantity of accessories will be different due to different installation and orders, the accessories are contained in specially prepared installation pack, separated from the main module. Do not unpack the accessories during handling unless they are needed for installation.

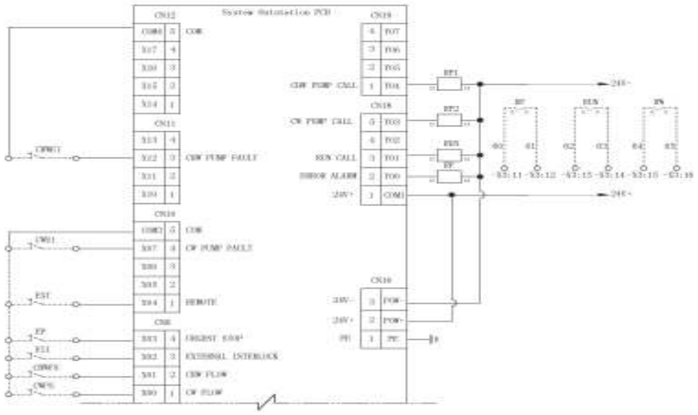
Physical Dimensions





Electrical System Wiring

Computer control panel & external wiring



External Interlock:

CHWFS connected with chilled water flow switch for flow control;

CWFS connected with cooling water flow switch for flow control;

CHWE1 fault signal of chilled water bump;

CHWE2 fault signal of cooling water bump;

EII external interlock input;

EP external emergency pause

EXT external remote on/off input

Passive Output Points:

5 passive output points are provided by the system panel on demand:

RF fault status output

RUN running status output

RP1 running output of chilled water bump

RP2 running output of cooling water bump

Wiring Instructions:

-- cross section of control wires should be no less than 1mm²;

-- signal terminal X02, X03, X04 and COM³ should be short circuit as shown on the right diagram, if no EII, EP and EXT is used as indicated

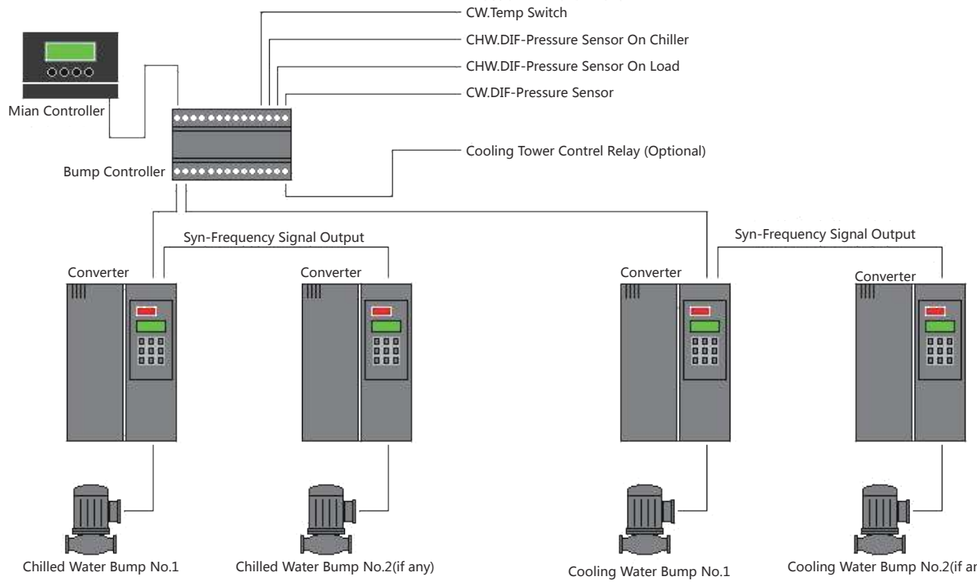
-- the maximum current of passive output point is 5A;

-- flow switches and external interlocks are prepared by users or purchased from Multistack;

-- solid line on the diagram is factory wiring while dashed line is field wiring;

Electrical System Wiring

VWF Water pump Control System Diagram (Only for VWF)



Notes:

1. Converters and water pumps are prepared by users;

2. Analog frequency signal output of pump controller and converter is DC0-10V;

3. Shielded wire is adopted for all signal line;

4. Connection length of DIF-pressure sensor and pump controller should not exceed 30m, otherwise signal-amplifier (optional) should be installed;

5. If more than one chilled/cooling water pump is installed, synchronous frequency control between each converter is applied to ensure the same working frequency.

6. The chiller DIF-pressure control value is set by factory, while the chilled water load DIF-pressure control value is set by field.