MULTISTACK®

MSCW SERIES

Modular Water Cooled Screw Chiller

We are the creator and advocator of energy efficient chillers and the pioneer of magnetic levitating technology in refrigeration industry.

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MULTISTACK MSCW 11.2015 V02

CONTENTS

World's First Oil-free Magnetic Levitating Centrifugal Compressor

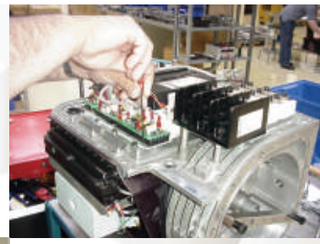
2005 Oil-free magnetic levitating centrifugal chillers were first manufactured in Panyu China and put into operation in Singapore.

1999 TURBOCOR was upgraded to an international project, moving from Melbourne Australia to Montreal City, Quebec, Canada.

1998 The first experimental magnetic levitating chiller was run-tested in MULTISTACK.

1993 The TURBOCOR research group was established by Mr. Ron Conry for the study of oil-free magnetic levitating centrifugal compressor.

1985 Modular chiller was invented in Australia by Mr. RON CONRY, the founder of MULTISTACK in 1986.



INTRODUCTION

MULTISTACK created the first modular chiller in Melbourne, Australia in 1985. This is a great invention riding the wave of industrial design of the 20th century, featuring energy saving, reliability and flexibility. Users all over the world benefit greatly from MULTISTACK's modular air conditioning technology. For decades, MULTISTACK continues to provide reliable products and professional services. We are undoubtedly the inventor and leader of modular magnetic levitating technology.

Features of MULTISTACK modular chillers:

ENERGY SAVING Automatic scheduling of the compressors allows the chiller to match the fluctuating cooling loads and conserve energy with each individual unit running at its peak efficiency. This is much more economical when compared to a traditional large single unit running at part load.

RELIABLE Every module works as an independent refrigeration circuit, with adjacent modules operating independently. In the event of a malfunction in the system, the computer controller selects the next available standby module to provide back up. One failed module will not disrupt the other modules or system, giving you total piece of mind.

EASY INSTALLATION AND ADD-ON FLEXIBILITY Chillers could be field-assembled without the aid of a large lifting machine and dedicated doorways. Chilled/cooling water headers can be easily dismantled if necessary for easy transportation to the rooftop or basement through elevators. When larger cooling capacity is needed, just add on new modules to increase unit capacity without any complicated change to the equipment room, piping system and control system.

INTELLIGENT CONTROL SYSTEM MULTISTACK's original modular control system is based on micro-process control technology, combining modules to form a complete and integrated unit. Each module runs smoothly with peak efficiency based on system load demand. The control system features optimized compressor running, pro-long service life and automatic capacity control.

DESIGN FEATURES

STRUCTURE
MULTISTACK water cooled screw chillers are designed and constructed with modular technology patent. A chiller bank consists of a number of modules connected in parallel to operate as a large complete unit. Same type or different type of modules can be combined together as an independent refrigeration system, giving you full flexibility to increase the capacity as your needs increase.
Each module contains a screw compressor, evaporator, condenser, and sophisticated control and protection devices. Each module operates as a completely independent refrigeration circuit. When total load demand changes, the controller will change the chiller's capacity by either controlling the number of modules in operation or by adjusting the capacity of the last start up compressor.
The chiller is enclosed within a pleasant-looking and sturdy frame with removable doors for easy access and convenience for maintenance and service. The doors can be lined with acoustic insulation (optional), which further silences the chiller.

COMPACT AND FLEXIBLE
The compact size of each module means easy access via standard doorways and elevators. You no longer need special access to install the chiller.
In comparison to conventional water cooled chillers you can gain up to 40% more space, meaning larger capacity chiller can be easily installed in confined and small places.

SAFE AND RELIABLE
Every module works as an independent refrigeration circuit, with adjacent modules operating independently. In the event of a malfunction in the system, the computer selects the next available standby module to provide back up, giving you adequate redundancy. One failed module will not disrupt the other modules or system.

ADD-ON FLEXIBILITY
As your needs for cooling increases, MULTISTACK has the solution. Being a modular chiller, it has never been easier to expand the system as larger cooling capacity is needed to meet increased building load demands, with no complicated changes to the room, piping system or control system, and all work can be done quite easily. Just add on new modules to increase unit capacity.

PEAK EFFICIENCY AT ALL LOADS
Efficiency of compressors in conventional single circuit chillers will decrease dramatically in part load conditions. However, MSCW modular chillers can automatically schedule the compressors and make sure each individual module run at its peak efficiency at all loads.

INTERNAL WATER STRAINER
Internal water strainer is made with MULTISTACK's patent technology, and made from stainless steel. Internal water strainers are supplied and fixed inside both chilled water header pipes and condenser water header pipes for each module. It can be easily dismantled and removed. The internal water strainer can prevent particles contained in water from getting into the heat exchanger.
Together with another patent product is a header pipe stub (optional) which connects to the end of the condenser pipe, which enables the user to flush, clean and drain the condenser water system very conveniently.

SCREW REFRIGERATION COMPRESSOR
Each module contains a high efficiency semi-hermetic screw compressor. The refrigerant drawn into the compressor flows evenly over the motor sealed inside the compressor case, and cools down the motor thoroughly. This ensures that the motor is always working at the ideal temperature condition. The built-in protection part continually monitors the coil temperature via 6 PTC temperature sensors pre-fix in the coil. The compressor will shut down if abnormal temperature is detected.

The compressor has three stage capacity controls: 50%, 75%, 100%. This is accomplished through a slide valve regulating mechanism. Among all the compressors in operation, the last actuated compressor will run at a three stage capacity control mode to meet the load demand more precisely and keep the chiller running at peak efficiency.

There is also a built in pressure relief feature inside the compressor to by-pass pressure to the low-pressure section whenever the discharge pressure is abnormal.
This feature will protect the chiller from being damaged and avoid refrigerant loss caused by leakage.

CONDENSER AND EVAPORATOR
Condenser and evaporator are highly efficient, compact and corrosion resistant MTB brazed plate heat exchangers, which is manufactured from AISI316 stainless steel. The heat exchangers definitely meet the requirements of the chiller for cleanliness, dryness and leak tightness.

Special structure design of the heat exchanger plates allows for turbulence flowing through the internal channels, improving heat transfer rate and slowing down the formation of scales.

MV7 COMPUTER CONTROLLER

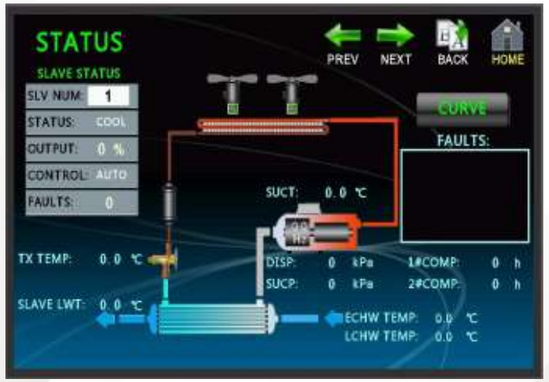
Mv7 is a powerful computer control system with 64-bit CPU for modular chillers. With this system and based on fuzzy mathematics, MULTISTACK develops an optimal solution for load regulation for a safe, precise and stable control of the chiller.

1. COMPOSTIONS

The control system consists of slave controllers and a master controller with a touch screen and on-board 64-bit micro processor. Slave controllers can either operate independently or communicate with the master controller via RS485 serial port to make up an online control system. This system is controlled through a touch screen, a master controller and a number of slave controllers via RS485 communication cables.

2. DISPLAY

The controller's 7" (optional 10'' or 15'') touch screen provides you with direct access to information enquiry interface. There are 5 sub-menus under the MAIN MENU, displaying operation data and variables such as running status, operation records, fault log, parameter setting and service information.



3. TEMPERATURE CONTROL

For a modular chiller, the compressor load of each module depends on the cooling capacity required by the system. The required compressor working load is determined by MV7 control system by calculating the temperature difference between actual leaving/entering water and set points.

4. MODULAR CAPACITY CONTROL

MV7 controller is capable of controlling maximum 56 capacity levels based on actual demand and provides the users with comprehensive and flexible energy-efficient solutions.

5. FAULT PROTECTION

The computer continuously and comprehensively monitors the total operation of all modules in the chiller bank. It will also shut down individual module or the entire chiller system in the event that a fault occurs.
System faults include: low chilled/condenser water flow (for water-cooled chillers only), low chilled water leaving temperature, high hot water leaving temperature and external interlock fault/ protection, etc.

VARIABLE WATER FLOW (VWF)

The applications below are for MSCWV series only. For model selection, please consult your local MULTISTACK.

MSCW-V

MSCW210V and MSCW485V chillers are specially designed for variable water flow system. VWF patent technology enables the system to not only change cooling capacity based on system heat load but also regulate chilled and/or cooling water working flow for best energy efficiency so that power consumption is greatly reduced. Besides, a simple primary flow system is adopted for both chilled and cooling water circulation instead of using secondary pump water system.

Generally at least four modules are involved in the chiller under the VWF mode.

FLOW REGULATION VALVE

Flow regulation valves are installed between chilled/cooling water headers and evaporator/condenser to regulate water circulation of each module synchronously.
The flow regulation valves are open when compressors are working and closed when compressors are off-work. The linear on-off design avoids water hammer as well as rapid change of system pressure. A differential pressure switch is used to prevent the compressors from operating when the flow regulation valves are closed.

WATER DIFFERENTIAL PRESSURE TRANSDUCER

Three differential pressure transducers are provided by MULTISTACK to detect the chiller leaving/entering pressure difference of chilled and cooling water as well as pressure difference of chilled water on load side. Differential pressure transducers for the leaving/entering chilled water on load side could be installed at any proper location, including the water loop with the greatest flow resistance. These three transducers are used to monitor water flow changes so that the computer controller can regulate water pump output frequency on demand.

VARIABLE FREQUENCY WATER PUMP CONTROL

MV7 plus controller not only dominates chiller operation but also monitors chilled/cooling water flow changes through the 3 differential pressure transducers. By way of PID control, frequency signals are transmitted to the VFDs of chilled/cooling water pumps so that the working flows are in accordance with system load demand and energy is saved ultimately.

MV7 Plus controller is connected to a thermal switch and cooling tower fan controller to adjust the entering cooling water temperature and reduce power consumption.

MODEL NUMBER DESIGNATION

MSCW	485	V	F	A	A	--	6
1	2	3	4	5	6		7

Model Number Identification:

1——Modular Screw Water Cooled

2——Model Number 210 or 485

3——Chiller Type

Default for constant water flow

V: Variable Water Flow

4——Refrigerant Type

F: R22

R: R407C

E: R134a

5——Electrical Specifications

A: AC380-420V/50Hz/3Ph

B: AC440-480V/60Hz/3Ph

6——Development Index

Default for standard chiller

7——Number of modules per chiller

Constant: MSCW210 1~15

MSCW485 1~8

VWF: MSCW210V 4~15

MSCW485V 4~8

Example:

1.A constant water flow chiller consisting of 6 MSCW210 modules, with AC380V/50Hz/3Ph power supply and R22 refrigerant is marked as

MSCW210FA – 6

2.A variable water flow chiller consisting of 4 MSCW485V modules and 1 MSCW210V module, with AC380V/50Hz/3Ph power supply and R22 refrigerant is marked as

MSCW485(210)VFA - 4(1)

TECHNICAL PERFROMANCE DATA PER MODULE

Model		MSCW210			MSCW485	
Refrigerant		R22	R407C	R134a	R22	R407C
Nominal Cooling Capacity (kW)		206	203	181	484	479
Nominal Power Input (kW)		47.2	46.8	38.6	100.8	99.8
Refrigerant Charge (Kg)		23	20	16	47	42
Compressor	Type	Semi-hermetic Screw Refrigeration Compressor				
	Number	1				
	Capacity Control Stages	0 , 50% , 75% , 100%				
	Power Supply	AC380V/50Hz/3Phase				
	Nominal Working Current (A)	82	81	73	175	170
	Max. Working Current (A)	128	128	124	264	264
	Startup Current (A)	290	290	290	680	680
Chilled Water	Rated Water Flow (l/s)	10	9.7	8.6	23.1	22.9
	Rated Water Pressure Drop (kPa)	58	56	56	58	56
	Fouling Factor (m2k/kW)	0.018				
	Connection Size	DN200				
Condenser Water	Rated Water Flow (l/s)	12.3	11.9	10.5	27.8	27.6
	Rated Water Pressure Drop (kPa)	55	53	53	55	53
	Fouling Factor (m2k/kW)	0.044				
	Connection Size	DN200				
Physical Dimensions L×W×H (mm)		550×2030×1895			950×2030×1895	
Operating Weight (kg)		1240			2250	
Number of Modules per Chiller* (N)		1~15 (4~15)			1~8 (4~8)	

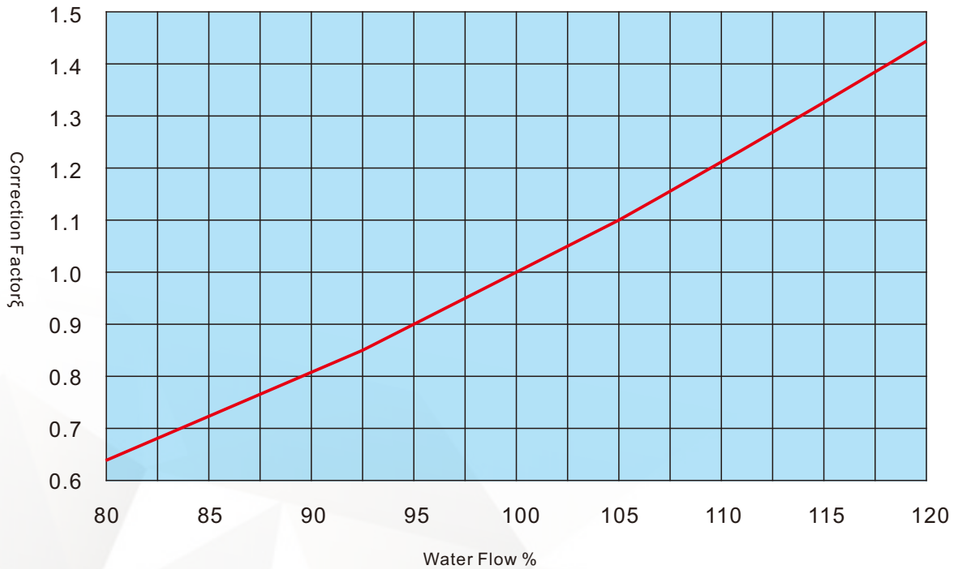
Note:

(1) Nominal Condition: condenser water entering/leaving temperature 30℃/35℃; chilled water entering/leaving temperature 12℃/7℃;

(2) N refers to the number of modules per VWF chiller.

WATER PRESSURE DROP CORRECTION

Water Pressure Drop Correction Factor for heat exchanger under various water flows



Water Pressure Drop Correction Factor (K) in regard to the total number of modules (N) per chiller

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MSCW210	1.00	1.00	1.01	1.01	1.02	1.02	1.03	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.11
MSCW485	1.00	1.00	1.01	1.02	1.03	1.05	1.07	1.10	-	-	-	-	-	-	-

Notes:

1. Calculation of water pressure drop:

$$\text{Water Flow \%} = \frac{\text{Actual water flow}}{\text{Rated water flow}} \times 100\%$$

Actual water pressure drop(heat exchanger) per module = rated water pressure drop (heat exchanger)× ξ

Total chiller water pressure drop = actual water pressure drop (heat exchanger) per module × K

2. Chiller minimum working water flow

(1) Constant water flow system: Minimum water flow of chiller ≥ 80% of total rated water flow of chiller

(2) Variable water flow system: minimum water flow may vary according to the type of chiller and water pumps, but shall be no less than 80% of rated water flow of the largest module in chiller bank.

LOW-TEMPERATURE COOLING PERFORMANCE CORRECTION

MSCW series modular air cooled screw chillers can work at minimum -10℃ leaving water temperature, suitable for ice-making operation or manufacturing process control in industrial production. When operating at low temperature, glycol or other solutions with low freezing points are used to carry refrigerant. Do not use brine or other solutions which are corrosive to copper or stainless steel to prevent damage on the plate heat exchangers. For low temperature application, corrections should be applied to the cooling capacity, operating power input and heat exchanger water pressure drop.

(1) Actual cooling capacity = Nominal cooling capacity×C1×C2

(2) Actual operating power input = Nominal operating power input×C3×C4

(3) Actual water pressure drop (with glycol)= Actual water pressure drop (without glycol) x C5

Glycol Concentration Table

Glycol weight concentration%	0	5	10	15	20	25	30	35
Freezing point temperature ℃	0	-1.4	-3.2	-5.4	-7.8	-10.7	-14.1	-17.9
Minimum working temperature℃	5.0	4.0	2.0	0.0	-2.0	-5.0	-8.0	-12.0
Cooling performance correction factor C1	1.000	0.997	0.992	0.988	0.985	0.982	0.980	0.978
Operating power Input correction factor C3	1.000	0.999	0.997	0.996	0.995	0.994	0.993	0.993
Evaporator water pressure drop correction factor C5	1.00	1.050	1.102	1.220	1.305	1.423	1.536	1.740

Cooling Capacity Correction Factor C2 and Operating Power Input Correction Factor C4

Leaving Condenser Water Temperature ℃	Leaving Chilled Water Temperature ℃							
	-10	-8	-6	-4	-2	0	2	4
	Cooling Capacity Correction Factor C2							
30	0.521	0.566	0.614	0.663	0.726	0.794	0.883	0.962
35	0.484	0.531	0.580	0.632	0.688	0.732	0.861	0.916
40	0.462	0.505	0.553	0.607	0.658	0.714	0.791	0.869
45	0.433	0.480	0.528	0.577	0.624	0.672	0.732	0.822
	Operating Power Input Correction Factor C4							
30	0.727	0.754	0.781	0.805	0.833	0.852	0.876	0.902
35	0.778	0.805	0.831	0.858	0.884	0.903	0.932	0.992
40	0.820	0.851	0.892	0.923	0.954	0.987	1.107	1.112
45	0.866	0.879	0.936	0.980	1.011	1.196	1.204	1.231

PERFORMANCE CORRECTION TABLE

MSCW210

R22

Leaving Condenser Water Temperature℃	Leaving Chilled Water Temperature ℃											
	5		6		7		8		10		12	
	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI
30	199.6	42.4	207.1	42.9	218.8	43.4	226.8	43.8	239.2	44.5	256.4	45.6
35	187.4	46.3	194.7	46.7	206	47.2	213.8	47.5	225.8	48.2	242.6	46.0
37	182.1	48.1	189.3	48.4	200.5	48.8	208.2	49.3	220.0	49.8	236.6	50.7
40	173.9	50.8	181.0	51.1	191.9	51.5	199.4	52.0	211.0	52.5	227.1	53.4
45	159.3	55.7	166.1	56.0	176.6	56.5	183.7	56.9	194.8	57.4	210.3	58.3

R407C

Leaving Condenser Water Temperature℃	Leaving Chilled Water Temperature ℃											
	5		6		7		8		10		12	
	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI
30	196.4	41.5	204.2	41.8	216.2	42.3	224.5	42.6	237.5	43.2	255.6	44.0
35	184.0	46.1	191.5	46.4	203.0	46.8	211.0	47.1	223.5	47.6	240.9	48.2
37	178.8	48.1	186.1	48.4	197.5	48.8	205.4	49.0	217.6	49.5	234.7	50.1
40	170.7	51.3	177.8	51.6	188.9	52.0	196.6	52.2	208.5	52.7	225.2	53.2
45	156.2	57.3	163.1	57.5	173.7	58.0	181.1	58.2	192.5	58.6	208.4	59.1

R134a

Leaving Condenser Water Temperature℃	Leaving Chilled Water Temperature ℃											
	5		6		7		8		10		12	
	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI
30	173.5	34.5	180.7	34.9	191.9	35.4	199.7	35.8	211.8	36.3	228.8	37.2
35	163.3	37.7	170.2	38.1	181.0	38.6	188.4	39.0	200.1	39.6	216.4	40.3
37	159.1	39.2	165.9	39.5	176.4	40.0	183.8	40.4	195.2	41.0	211.2	41.8
40	152.6	41.4	159.2	41.7	169.5	42.2	176.6	42.6	187.7	43.2	203.2	44.0
45	141.4	45.6	147.7	45.9	157.4	46.4	164.2	46.8	174.7	47.4	189.5	48.2

CAP Cooling Capacity (kW)

PI Compressor Power Input (kW)

PERFORMANCE CORRECTION TABLE

MSCW485

R22

Leaving Condenser Water Temperature℃	Leaving Chilled Water Temperature ℃											
	5		6		7		8		10		12	
	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI
30	468.4	90.0	485.5	90.8	512.0	92.1	530.2	93.0	558.3	94.5	597.5	96.5
35	441.8	99.0	458.4	99.7	484.0	100.8	501.6	101.6	528.8	102.9	566.7	104.9
37	430.7	102.7	447.0	103.6	472.2	104.7	489.6	105.4	516.4	106.7	553.6	108.6
40	413.4	108.9	429.4	109.6	454.0	110.7	471.0	111.4	497.1	112.6	533.4	114.4
45	383.0	119.6	398.3	120.3	422.1	121.4	438.3	122.2	463.4	123.3	498.2	124.9

R407C

Leaving Condenser Water Temperature℃	Leaving Chilled Water Temperature ℃											
	5		6		7		8		10		12	
	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI
30	462.9	87.6	481.3	88.5	509.6	90.3	529.2	91.2	559.5	92.7	602.2	94.8
35	434.1	97.1	451.8	97.8	479.0	99.8	497.8	100.5	527.0	101.9	567.8	104.0
37	421.9	101.1	439.2	101.9	466.0	103.8	484.4	104.7	513.1	106.0	553.2	108.0
40	402.7	107.6	419.6	108.3	445.6	110.3	463.5	111.1	491.3	112.5	530.3	114.4
45	368.7	118.1	384.8	119.1	409.5	121.1	426.5	121.9	453.0	123.2	489.9	124.8

CAP Cooling Capacity (kW)

PI Compressor Power Input (kW)

Note: MSCW485 chillers with R134a are not available.

CHILLER SELECTION

SELECT WATER COOLED CHILLERS ACCORDING TO THE FOLLOWING CONDITIONS:

1.Chilled water entering temperature CHWE.T=12.5℃;
2.Chilled water leaving temperature CHWL.T=7℃;
3.Chilled water flow CHWF=440m3/h=122.2 l/s;
4.Condenser water entering temperature CWE.T=30℃;
5.Condenser water leaving temperature CWL.T=35℃;
6.Refrigerant R22;
7.Power source AC380V/50Hz/3Ph;
8.Constant water flow system;

CALCULATION

1.Determine cooling capacity required (kW)
Cooling Capacity = CHWF×Cp×（CHWE.T-CHWL.T）
=122.2×4.187×（12.5-7）
=2814 kW

2.Determine module type and module number
When CHWL.T is 7.0℃ and CWL.T is 35℃, we could get 484kW cooling capacity per module for MSCW485FA and 210kW for MSCW210FA; the chiller is mainly composed of MSCW485FA modules and supplemented by MSCW210FA if more capacity is needed.

(1)Determine required number of modules for MSCW485FA
2814÷484=5.8
Select 5 modules of MSCW485FA. Supplementary cooling capacity is:
2814-5×484=394kW

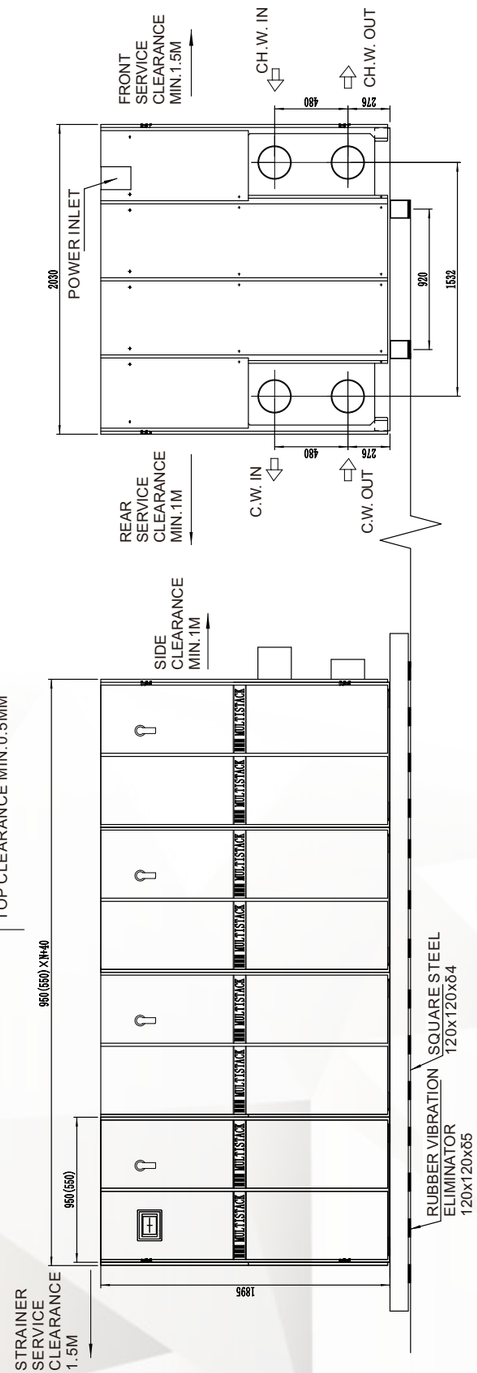
(2)Add on 2 more MSCW210FA modules for supplemental cooling capacity 394 kW

(3)Chiller model
MSCW485(210)FA-5(2)
Chiller total cooling capacity
5×484+2×210=2840kW
Chiller redundancy = (2880-2840)÷2814×100%= 1.5%

3.Chilled water pressure drop calculation
(1)Rated chilled water flow = 5×21.3+2×9.8
=135.1 l/s
Chilled water pressure drop for rated water flow per module is 58kPa;
(2)Actual water pressure drop
Actual chilled water flow % = 122.2÷137.8=90%
Use the chart “Water Pressure Drop Correction Factor for heat exchanger under various water flows”. The correction factor ξ is 0.80 when water flow percentage is 90%
Use the table “Pressure Drop Correction Factor (K)”, k = 1.03 when MSCW485 module number is 5
Actual chilled water pressure drop is
0.80×58×1.03=47.8 kPa

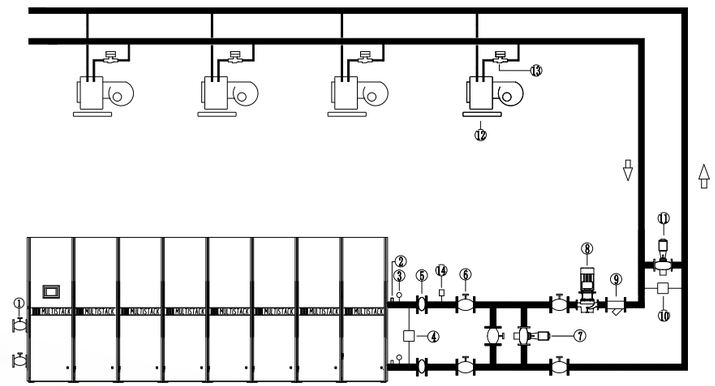
4.Condenser water flow and pressure drop calculation:
(1)Condenser water flow
5×27.8+2×12.1=163.2 l/s=587.52m3/h
(2)Condenser water pressure drop
Condenser water pressure drop for rated water flow per module is 55kPa.
Use the table “Pressure Drop Correction Factor (K)”, k = 1.03 when MSCW485 module number is 5
Actual condenser water pressure drop is
55×1.03 =57 kPa

PHYSICAL DIMENSIONS



WATER PIPING SYSTEM

CHILLED WATER PIPING SYSTEM



Fittings for Chilled Water Pipelines

No.	Item	Qty	Remark
1	Drain valve DG50	2	
2	Chilled water temperature sensor	2	Supplied with chiller
3	Pressure gauge	2	
4	Chiller side differential pressure transducer	1	Supplied with chiller and for VWF* only
5	Vibration eliminator	2	
6	Isolating valve	5	
7	Chiller side differential pressure by-pass valve	1	For VWF* only
8	Water pump		
9	Water strainer	1	
10	Load side differential pressure transducer	1	Supplied with chiller and for VWF* only
11	Load side differential pressure by-pass valve	1	
12	Terminal AHU		
13	Motorized valve		
14	Water flow switch	1	Not for VWF

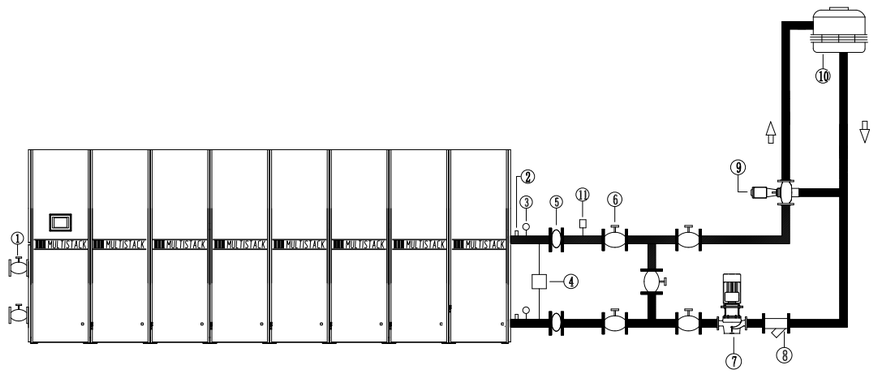
*VWF——Variable water flow system

Notes:

1.Fittings are prepared by users unless otherwise stated.
2.For VWF system, chiller side differential pressure by-pass valve (7) is installed based on system demand. Valve (if installed) opening pressure setpoint should be 100kPa.
3.For VWF system, load side differential pressure by-pass valve (11) opening pressure setpoint is recommended as below:
Load side differential pressure control setpoint +50kPa.
4.For VWF system, load side differential pressure transducer (10) is installed as required by the system design. It is recommended to install on the water loop with the greatest flow resistance.
5.During the installation of pipelines, all isolating valves should be closed. They are not allowed to open until the installing, leak check and cleaning are completed.
6.External pipes and valves shall have proper support so that their weights would not bear on the chiller to guarantee good sealing of pipe joints.
7.After the temperature sensors are inserted to the sensor wells, grease should be applied into the sensor wells to protect the temperature probes from being damaged by water accumulation inside the sensor well.

WATER PIPING SYSTEM

CONDENSER WATER PIPING SYSTEM



Fittings for Condenser Water Pipelines

No.	Item	Qty	Remark
1	Drain valve DG50	2	
2	Condenser water temperature sensor	2	Supplied with chiller
3	Pressure gauge	2	
4	Chiller side differential pressure transducer	1	Supplied with chiller and for VWF* only
5	Vibration eliminator	2	
6	Stop valve	5	
7	Water pump		
8	Water strainer	1	
9	Condenser water by-pass proportional valve	1	Optional
10	Cooling tower		
11	Water flow switch	1	Not for VWF

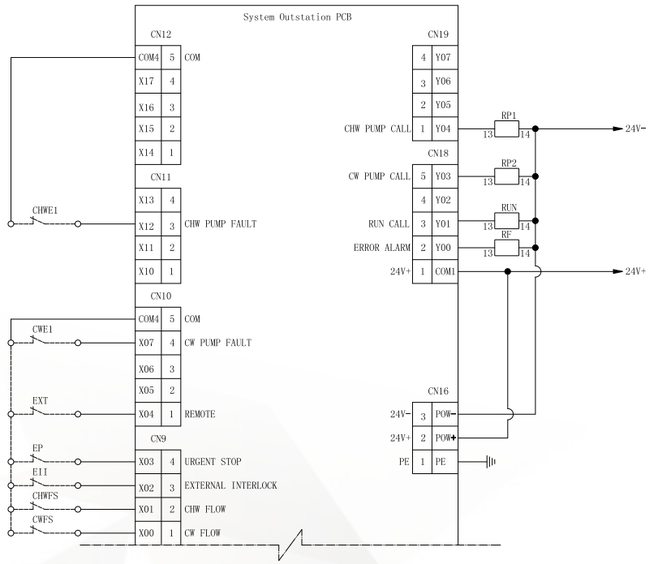
*VWF——Variable water flow system

Notes:

1.Fittings are prepared by users unless otherwise stated.
2.Condenser water by-pass proportional valve would be unnecessary if the cooling tower fan is under the control of entering condenser water temperature.
3.The condenser water can be controlled by the cooling tower fan or condenser water by-pass valve. The leaving temperature should be ≮ 25% to prevent the compressor from operating at low pressure.
4.During the installation of pipelines, all isolating valves should be closed. They are not allowed to open until the installing, leak check and cleaning are completed.
5.External pipes and valves shall have proper support so that their weights would not bear on the chiller to guarantee good sealing of pipe joints.
6.After the temperature sensors are inserted to the sensor wells, grease should be applied into the sensor wells to protect the temperature probes from being damaged by water accumulation inside the sensor well.

ELECTRICAL WIRING

Electrical wiring diagram for MV7 system outstation PCB and external control circuit



NOTES:

CHWF— Interlock contacts in series for chilled water flow switch and water pump contact auxiliary (VWF system is free of flow switch)

CWF — Interlock contacts in series for condenser water flow switch and water pump contact auxiliary (VWF system is free of flow switch)

EXT1 — External remote on/off input

EXT2 — External emergency stop input

R — Chiller running status output

CWP — Condenser water pump running output

CAR — Fault alarm output

CPR — Compressor running status output

CE — Communication error alarm output

WIRING NOTES

— Control wire minimum section 1mm^2;

— Over bridge terminals T3&T5 if EXT1 is not utilized;

— Over bridge terminals T4&T5 if EXT2 is not utilized;

— Passive contacts maximum current 5A;

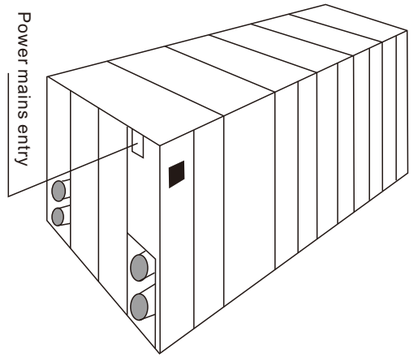
— Flow switch and external interlock device are prepared by users or bought from MULTISTACK;

— VWF system is free of flow switch;

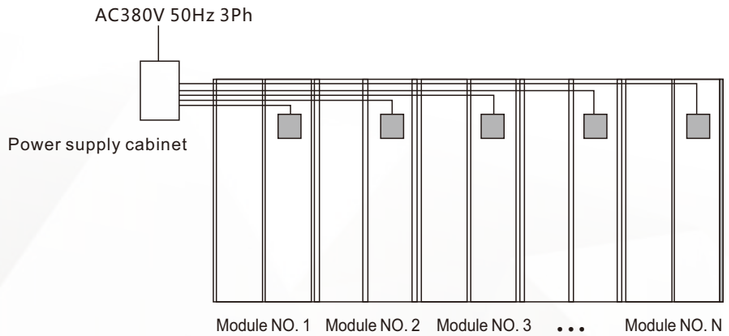
— Solid lines for factory wiring and dotted lines for field wiring.

POWER CONNECTION

Power Mains Wiring



Power mains entry is on either side of the chiller.
Power cables are conducted along cable ducts in the chiller.



Power supply cabinet provided by the user should distribute branch lines into each module.

Notes:

1.When starting the chiller, the compressor will start stage by stage. Chiller startup current is equal to the total current of operating compressors plus the startup current of the compressor(s) being actuated.

2. Each module has its own power circuit. Power mains entry is on either side of the chiller. Power cables are conducted along cable ducts in the chiller.

3.The selection of main cables should base on the voltage, MRC, allowable voltage drop and local electrical codes. The cables to the chiller should be flexible copper cord.