



TWSF

TICA®
www.ticachina.com



WATER-COOLED FLOODED SCREW CHILLER

TICA CENTRAL AIR-CONDITIONING

NANJING TICA AIR-CONDITIONING CO.,LTD.
Add: No.6 Hengye Road, Development Zone, Nanjing, China
Post: 210046
Tel: +86-25-85328977
E-mail: ticaorc@ticachina.com
Website: www.ticachina.com

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CA-TWSF-201609V01



TICA is a hi-tech enterprise specialized in R&D, manufacturing, sales and services of air-conditioning and refrigeration products. Established in 1991, it has developed into one of the top four Chinese air-conditioning brands, with factories in Nanjing, Tianjin and Guangzhou, and a network of over 70 sales and service filiales around the world.

TICA has invested up to RMB 600 million in the first phase to build the top notch central air-conditioning R&D and production base, credited as the state enterprise R&D center. Certified by CNAS, it serves as a national R&D public service platform.

TICA produces over 30 series of products, covering AHUs, VRFs, screw chillers and centrifugal chillers, diverse enough to meet various requirements with regards to comfort and manufacturing processing application.

TICA is a strong competitor in chillers and commercial air conditioning products. It is the largest producer of AHUs in China for five consecutive years and covers over 40% of the market share as the supplier to such industries as micro-electronics, surgery operation room equipment and biopharmaceuticals.

TICA has established a global strategic joint venture with United Technologies Corporation (UTC) whose businesses include the world's most advanced Pratt & Whitney Aircraft Engines, the largest air-conditioning company Carrier and the biggest elevator company Otis.

The giant UTC transfers such global cutting-edge core technologies as large centrifugal chillers, screw chillers, and ORC systems to TICA, thrusting TICA 20 years ahead of its Chinese counterparts in terms of centrifuge technology and 30 years ahead in cryogenic power generation technology. Meanwhile, TICA and UTC will integrate global resources to create a brand-new international market pattern.

Meanwhile, the company has also provided energy-saving air-conditioning system integration solutions to both domestic and foreign users like Zhongnanhai, the Great Hall of the People, Beijing Bird's Nest stadium, the Water Cube, the Wukesong Indoor Stadium, Petro China, Sinopec, State Grid, Nanjing Panda, Hangzhou Xiaoshan Airport, Hainan Airlines Group, Shangri-La Hotel, Manila Ocean Park, Abu Dhabi Al Muneera, SM City in Philippines and Unilever, etc.



Nanjing Headquarter



Tianjin Base



Guangzhou Base

DIRECTORY

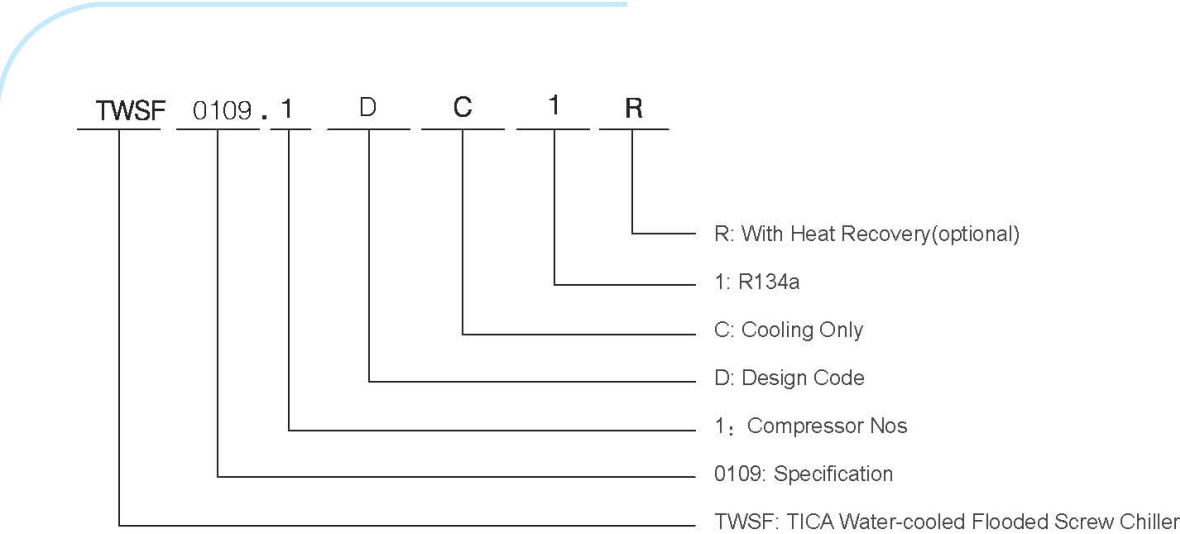
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PRODUCT INTRODUCTION



TICA water-cooled flooded screw chiller has a compact design, using flooded evaporator and twin semi hermetic screw comperssor. Also, it is combined with high efficient heat exchanger and microcomputer control technology. With continuous improvement of products, it has excellent quality, such as great stablity, high efficient operating and low noise. It is widely used in all kinds of comfortable and technological occasions, its cooling capacity ranges from 106RT to 509 RT.

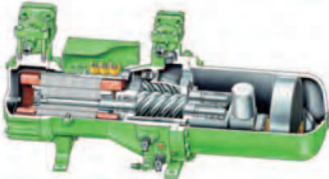
Nomenclature



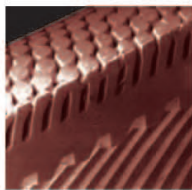
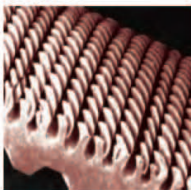
FEATURES

High Efficiency And Energy Saving

- The highly efficient semi-enclosed twin-screw compressor adopts the world-class latest generation 5:6 patented asymmetric tooth-type rotor to greatly improve the adiabatic efficiency. This type of high-efficiency motor with large capacity can significantly enhance the energy efficiency.
- The compressor motor directly connects to the rotor with no gearbox involved, which avoids energy loss caused by gear transmission; moreover, fewer moving parts can ensure lower noise and a more reliable operation.
- The high-precision filter screen built in the compressor increases the oil separation efficiency up to 99.5%.
- The unit adopts the semi-enclosed twin-screw compressor and air suction cooling motor to ensure that the motor is fully cooled.
- The compressor adopts the slide valve for adjustment. A single compressor can precisely match 25% – 100% load changes, and dual-compressor up to 12.5% – 100% load changes, which reduces operating expenditure to the greatest extent.
- EEV design makes both full load and partial load running with good performance and high precision.



- Doubly enhanced heat exchanger optimizes heat transfer efficiency and reduces losses caused by flowing pressure. In this way, it can reduce energy consumption.



Protection

Protection is provided for refrigerant system. electrical system and water system to ensure safe operation and to provide easy assessment of errors through effective alarm system. Examples of protections are compressors'motor over-current, unusual phase sequence, low oil position. High discharge temperature, high pressure ,low pressure,freezing, power down, etc.



Intelligent

The system is controlled through PLC and user is able to monitor and change the system setting through user friendly touch screen panel. Connected to BMS through Ethernet, wired or wireless is possible through different type of gateways; Thus, providing the capability to monitor system operation and performance remotely.

Control system
Advanced control system

TICA water-cooled flooded screw chiller uses TM218 series PLC as a microcomputer controller, which has high reliability and good anti-interference ability. Well-design and advanced micocomputer program can achieve accurate control and perfect protection for units, ensuring units run more efficiently, stably and safely. In order to meet the growing needs of users, it provides a flexible and powerful information exchange way, which can connect with various building control system (BAS) easily and perfectly .

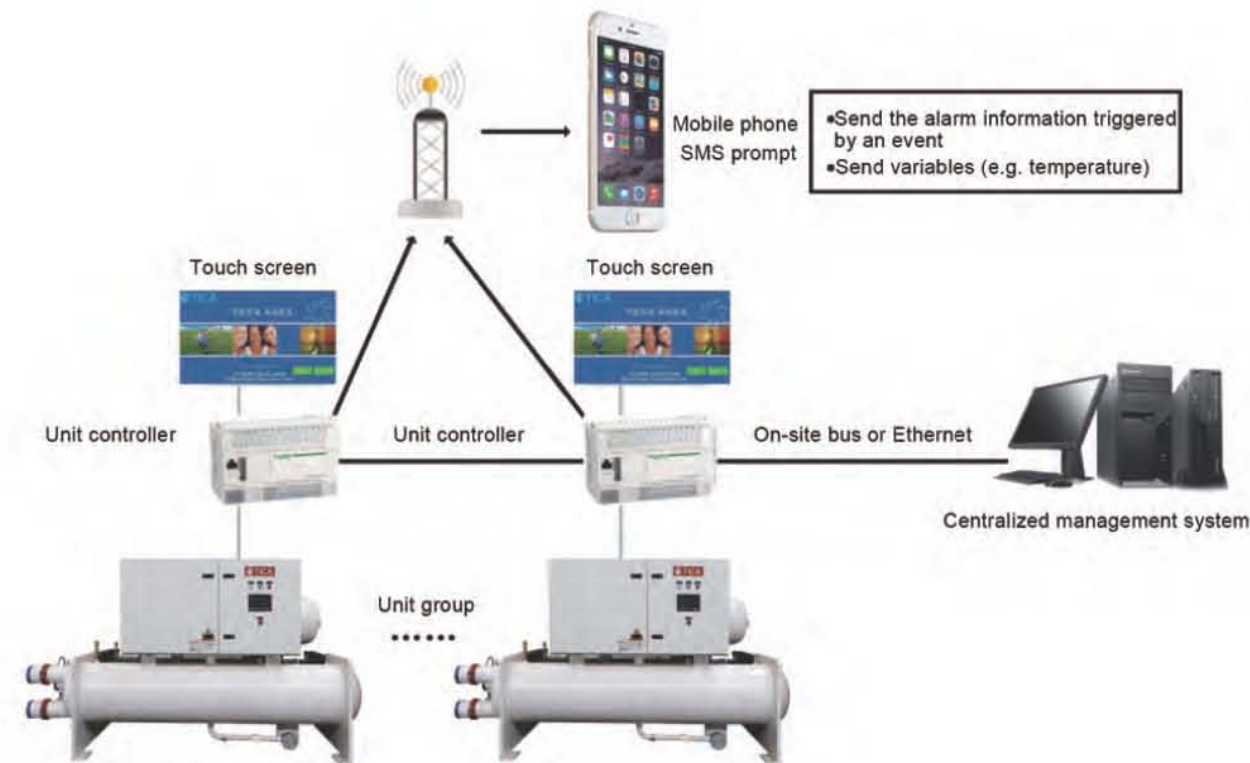


Friendly interface

Unit uses advanced and colorful LCD touch screen technology. Users can control unit operation entirely by press touch screen according to the prompt information ,rather than refer to intricacy and heavy manual. The operation is more convenient, and the display is more intuitive.

- ◇Temperature of chilled water inlet and outlet
- ◇Temperature of cooling water inlet and outlet
- ◇Environment temperature
- ◇Suction and exhaust pressure of the compressor
- ◇Working current of the compressor
- ◇Unit operating load
- ◇Condition of water pressure difference switch
- ◇Fault state of the unit and alarm record
- ◇Exhaust temperature and exhaust over-heat of compressor
- ◇Total operating time of the compressor
- ◇Total start times for each compressor
- ◇Time clock





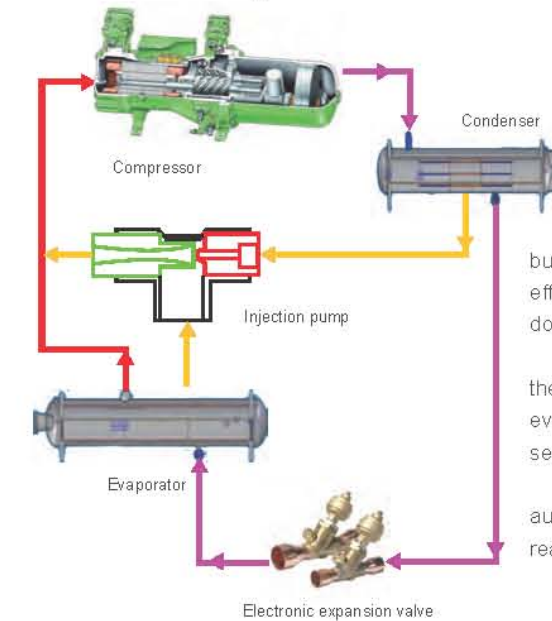
Flexible and convenient group communication

Standard RS485 interface and MODBUS RTU protocol are provided, and the unit is connected to the building automation system (BAS), which implements centralized control and remote monitoring of the unit and control of other attached devices according to the controlling requirement of the BAS.

Creative wireless communication technology (optional)

The configured wireless communication module provides Ethernet connection and supports wireless short message prompt function. Users can access the unit parameters by sending short messages. The unit can automatically send short messages to the specified end-number when an alert is generated. In this way, users can access the running condition of the unit anytime anywhere.

Oil Return System

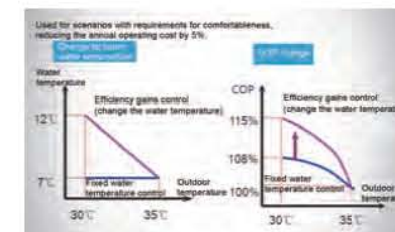


The build-in level-3 oil separation filter in the compressor, combined with the build-in high efficiency oil separator in the condenser, increases the oil separation efficiency up to 99.9%, which ensures normal oil level in the compressor. And the double-circle oil return for oil separation increases the oil return efficiency.

TICA's original technologies of continuous oil return – oil injected by oil – adopt the cutting-edge specially designed injection pump to inject the 0.1% oil in the evaporator into the compressor by using the high-pressure oil separated by secondary oil separation.

With TICA's patented technology of automatic oil injection, the system will automatically start oil-injection control program when the oil level in the compressor reaches the low limit, to end the problem of low oil level in the compressor.

System Energy Saving Technology



Efficiency gains technology:

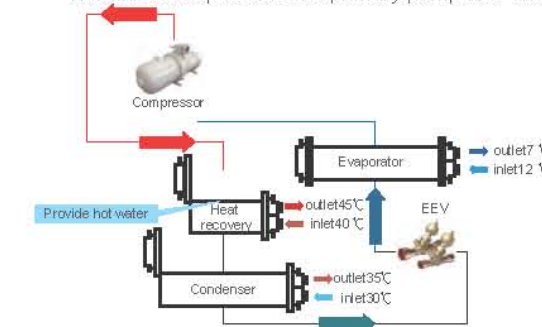
The optimal outlet water temperature of the unit can be set based on the outdoor temperature and the return water temperature of the air-conditioning system, and the set value of outlet water temperature can be automatically adjusted, which substantially reduces the power consumption of the compressor and lowers the unit operating cost while maintaining proper indoor cooling and heating performance and comfortableness.

Stable low water-temperature running technology:

Under the condition of start-up in low-temperature or transitional seasons, the condensate pressure control valve used with the unit can automatically reduce the water flow based on the system pressure parameters to create pressure difference and decrease power consumption of the water pump, which ensures the start-up of the unit.

Flow changing technology:

The unit is adaptable to the primary pump flow-changing system, which makes the air-conditioning system more energy-saving.



Large temperature difference and small flow technology (optional)

The unit of large temperature difference can be customized according to specific application situation, which reduces the initial investment and system operating cost.

Heat recycling technology (optional)

The unit can effectively recycle the condensation heat to meet the usage requirement of warm water supply for domestic use of clients.

Ice-storage technology (optional)

With the peak-valley electricity price difference to "store ice at night, and melt the ice during the day", the unit can switch between the operating conditions of air-conditioning and ice making to meet the cooling requirement.

SPECIFICATIONS

Standard Efficiency Series

Model: TWSF-DC1		0109.1	0134.1	0149.1	0169.1	0199.1	0219.1	0239.1	0264.1	0279.2	0299.2
Cooling Capacity	RT	106	129	145	167	197	213	235	258	275	291
	10 ⁴ kcal/h	32	39	44	50	59	64	71	78	83	88
	kW	371	455	509	586	691	748	828	908	966	1023
	COP	5.80	5.83	5.85	5.80	5.81	5.84	5.83	5.82	5.82	5.85
Power Input(kW)		64	78	87	101	119	128	142	156	166	175
Running Current (A)		118	136	140	163	212	215	233	259	291	293
Max.Running Current (A)		214	245	245	280	363	363	398	433	490	490
Starter Current (A)		378	415	415	479	650	650	683	845	660	660
Power Supply		380V 3N~50Hz									
Refrigerant		R134a									
Energy Control		Stepless Control									
Compressor Quantity		1	1	1	1	1	1	1	1	2	2
Evaporator	Designed Water Pressure	MPa	1.0								
	Water Flow Rate	m³/h	64	78	88	101	119	129	142	156	166
	Water Pressure Drop	kPa	66	71	58	56	66	54	58	69	84
	Pipe Diameter DN		150	150	150	150	150	150	150	200	200
Condenser	Design Water Pressure	MPa	1.0								
	Water Flow Rate	m³/h	75	92	103	118	139	151	167	183	195
	Water Pressure Drop	kPa	64	65	66	64	64	64	63	64	76
	Pipe Diameter DN		150	150	150	150	200	200	200	200	200
Unit Dimension	Length	mm	3097	3097	3097	3097	3124	3124	3124	4854	4854
	Width	mm	1530	1530	1530	1530	1660	1660	1660	1660	1670
	Height	mm	1820	1820	1820	1820	1920	1920	1920	2070	2070
Unit Weight	shipping Weight	kg	2770	3220	3250	3325	3735	3780	3905	4020	6460
	Operating Weight	kg	2960	3410	3470	3575	4035	4080	4205	4320	6870

- Note:
1. Nominal cooling capacity condition: Chilled water inlet/outlet temp is 12/7 ℃.Cooling water inlet/outlet temp is 30/35℃
 2. If there is non-standard working conditions technical data please contact TICA each branch.
 - 3.Start mode of max. starting current :Y- △
 - 4.The allowable voltage fluctuation is ±10℃.
 5. 1.6MPa and 2.0MPa water pressure drop for option.
 6. TICA reserver the right to make changes to the above without notice.

Model: TWSF-DC1		0324.2	0349.2	0369.2	0389.2	0409.2	0429.2	0449.2	0464.2	0494.2	0509.2
Cooling Capacity	RT	314	338	367	391	408	425	441	460	486	506
	10 ⁴ kcal/h	95	102	111	118	123	129	133	139	147	153
	kW	1103	1190	1290	1375	1435	1495	1550	1618	1710	1780
	COP	5.84	5.86	5.84	5.85	5.88	5.86	5.85	5.84	5.86	5.87
Power Input(kW)		189	203	221	235	244	255	265	277	292	303
Running Current (A)		305	325	355	386	388	420	445	468	495	520
Max.Running Current (A)		525	560	644	685	685	726	761	796	831	866
Starter Current (A)		724	759	828	972	972	1013	1048	1081	1243	1278
Power Supply		380V 3N~50Hz									
Refrigerant		R134a									
Energy Control		Stepless Control									
Compressor Quantity		2	2	2	2	2	2	2	2	2	2
Evaporator	Designed Water Pressure	MPa	1.0								
	Water Flow Rate	m³/h	190	205	222	237	247	257	267	278	294
	Water Pressure Drop	kPa	73	68	86	85	78	75	83	83	82
	Pipe Diameter DN		200	200	200	200	200	200	200	200	200
Condenser	Design Water Pressure	MPa	1.0								
	Water Flow Rate	m³/h	222	240	260	277	289	301	312	326	344
	Water Pressure Drop	kPa	72	72	75	73	73	74	72	73	73
	Pipe Diameter DN		200	200	200	200	200	200	200	200	200
Unit Dimension	Length	mm	4854	4854	4854	4854	4854	4854	5024	5024	5024
	Width	mm	1670	1670	1800	1800	1800	1800	1800	1800	1800
	Height	mm	2070	2070	2250	2250	2250	2250	2250	2250	2250
Unit Weight	shipping Weight	kg	6564	6646	7016	7064	7130	7238	7362	7474	7640
	Operating Weight	kg	6994	7076	7466	7524	7610	7728	7972	8094	8260

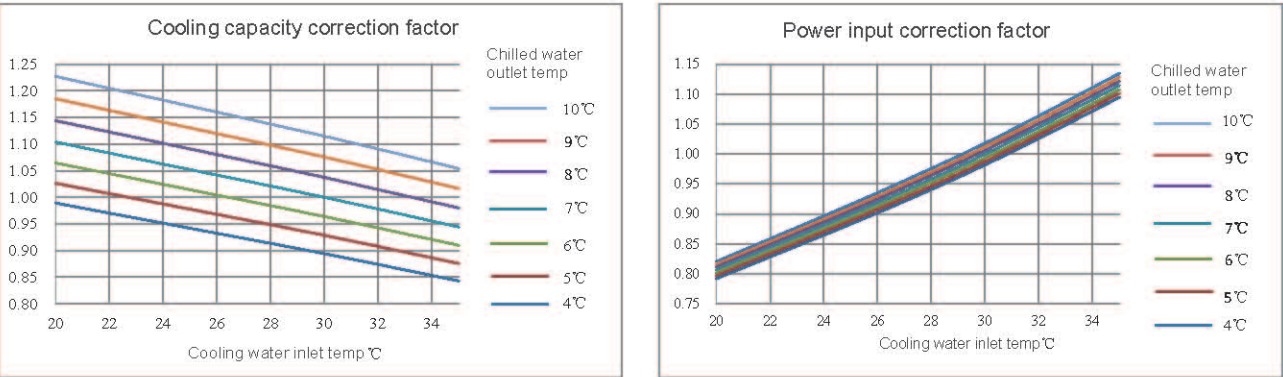
High Efficiency Series

Model: TWSF-DC1			0110.1	0135.1	0150.1	0170.1	0200.1	0220.1	0240.1	0265.1	0280.2	0300.2
Cooling Capacity	RT		106	129	145	167	199	215	237	260	277	293
	10 ⁴ kcal/h		32	39	44	50	60	65	72	79	84	89
	kW		382	455	510	587	698	755	835	915	973	1030
	COP		5.90	5.91	5.93	5.93	5.87	5.90	5.92	5.90	5.97	6.06
Power Input(kW)			63	77	86	99	119	128	141	155	163	170
Running Current (A)			117	135	138	161	212	215	232	258	290	292
Max.Running Current (A)			214	245	245	280	363	363	398	433	490	490
Starter Current (A)			378	415	415	479	650	650	683	845	660	660
Power Supply			380V 3N~50Hz									
Refrigerant			R134a									
Energy Control			Stepless Control									
Compressor Quantity			1	1	1	1	1	1	1	1	2	2
Evaporator	Designed Water Pressure	MPa	1.0									
	Water Flow Rate	m³/h	64	78	88	101	120	130	144	157	167	177
	Water Pressure Drop	kPa	52	55	44	43	50	42	44	53	64	59
	Pipe Diameter DN		150	150	150	150	150	150	150	150	200	200
Condenser	Design Water Pressure	MPa	1.0									
	Water Flow Rate	m³/h	75	92	103	118	141	152	168	184	195	206
	Water Pressure Drop	kPa	50	50	50	49	49	49	48	49	59	58
	Pipe Diameter DN		150	150	150	150	200	200	200	200	200	200
Unit Dimension	Length	mm	3097	3097	3097	3097	3124	3124	3124	3124	4854	4854
	Width	mm	1530	1530	1530	1530	1660	1660	1660	1660	1670	1670
	Height	mm	1820	1820	1820	1820	1920	1920	1920	1920	2070	2070
Unit Weight	shipping Weight	kg	2800	3260	3300	3385	3805	3855	3990	4115	6528	6570
	Operating Weight	kg	2990	3450	3520	3635	4105	4155	4290	4415	6938	6980

- Note:
1. Nominal cooling capacity condition: Chilled water inlet/outlet temp is 12/7 ℃.Cooling water inlet/outlet temp is 30/35℃
 2. If there is non-standard working conditions technical data please contact TICA each branch.
 - 3.Start mode of max. starting current :Y-△
 - 4.The allowable voltage fluctuation is ±10℃.
 5. 1.6MPa and 2.0MPa water pressure drop for option.
 6. TICA reserver the right to make changes to the above without notice.

Model: TWSF-DC1			0325.2	0350.2	0370.2	0390.2	0410.2	0430.2	0450.2	0465.2	0495.2	0510.2
Cooling Capacity	RT		316	340	367	392	409	425	441	461	486	507
	10 ⁴ kcal/h		95	103	111	119	124	129	133	139	147	153
	kW		1110	1197	1292	1379	1438	1495	1551	1620	1710	1782
	COP		6.00	6.03	6.01	6.05	6.04	6.10	6.08	6.07	6.09	6.08
Power Input(kW)			185	198	215	228	238	245	255	267	281	293
Running Current (A)			303	322	353	383	385	416	440	464	490	516
Max.Running Current (A)			525	560	644	685	685	726	761	796	831	866
Starter Current (A)			724	759	828	972	972	1013	1048	1081	1243	1278
Power Supply			380V 3N~50Hz									
Refrigerant			R134a									
Energy Control			Stepless Control									
Compressor Quantity			2	2	2	2	2	2	2	2	2	2
Evaporator	Designed Water Pressure	MPa	1.0									
	Water Flow Rate	m³/h	191	205	222	237	247	257	267	279	294	307
	Water Pressure Drop	kPa	57	52	66	65	60	57	63	63	63	62
	Pipe Diameter DN		200	200	200	200	200	200	200	200	200	200
Condenser	Design Water Pressure	MPa	1.0									
	Water Flow Rate	m³/h	223	239	259	276	288	299	311	325	342	357
	Water Pressure Drop	kPa	56	55	57	56	56	56	59	61	60	62
	Pipe Diameter DN		200	200	200	200	200	200	200	200	200	200
Unit Dimension	Length	mm	4854	4854	4854	4854	4854	4854	5024	5024	5024	5024
	Width	mm	1670	1670	1800	1800	1800	1800	1800	1800	1800	1800
	Height	mm	2070	2070	2250	2250	2250	2250	2250	2250	2250	2250
Unit Weight	shipping Weight	kg	6679	6771	7146	7204	7275	7388	7522	7644	7757	7820
	Operating Weight	kg	7109	7201	7596	7664	7755	7878	8132	8264	8477	8440

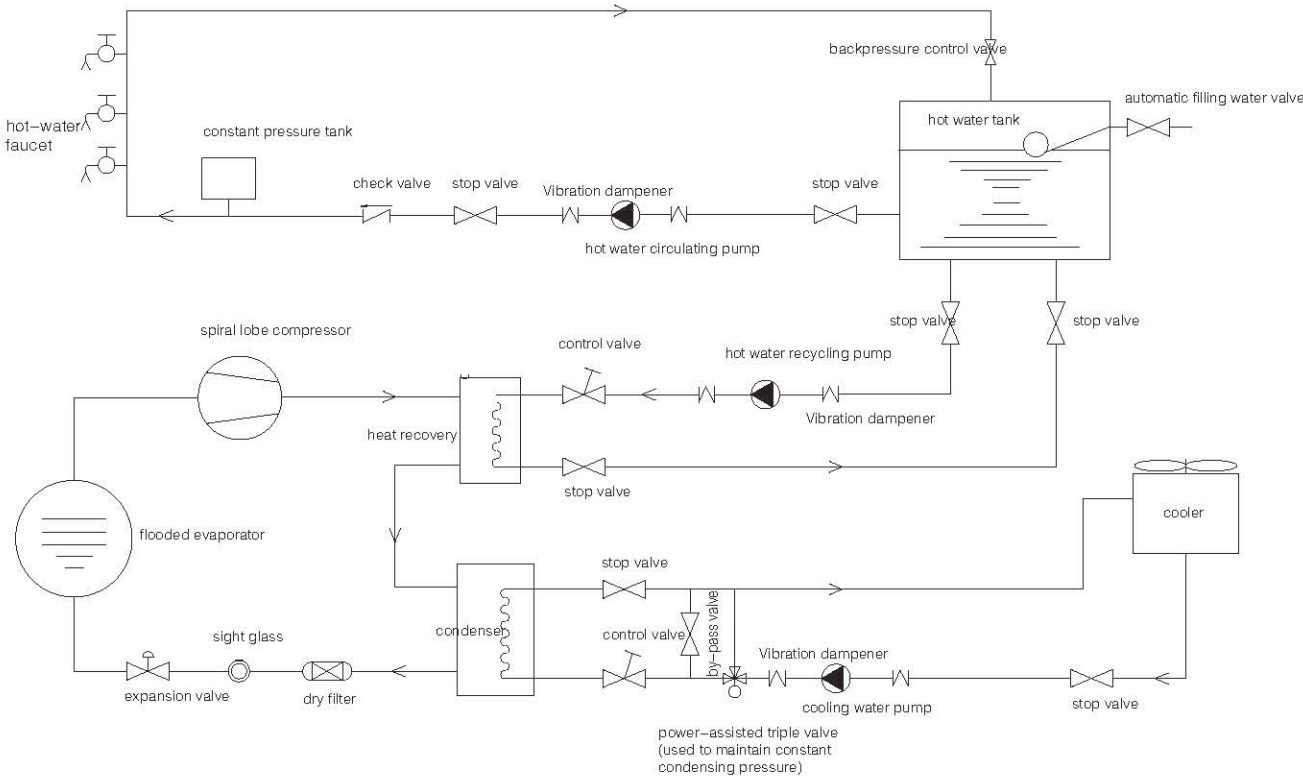
CORRECTION FACTOR(VARIABLE WORKING CONDITION)



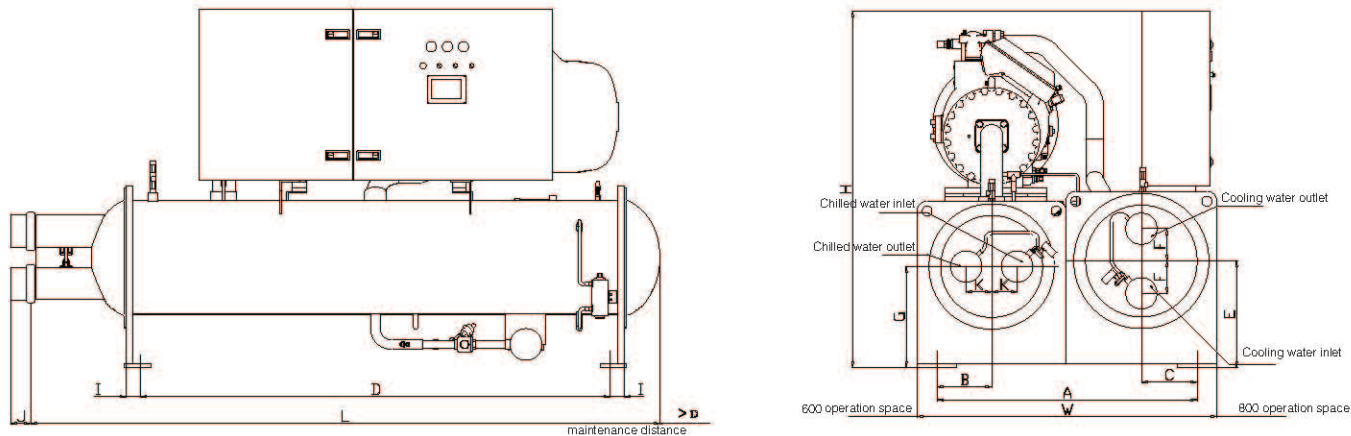
HEAT RECOVERY (OPTIONAL)

The condenser heat recovery in chiller means to recyle the waste heat of condenser in the refrigerating system with heat exchanger. The high temperature refrigerant discharged by the compressor first enter the heat recovery section, exchange heat with the running water for residential or industry use, and then enter the condenser for heat exchange, This method not only provides hot water but also improve operating condition, greatly reducing the operation cost.

The following is a flow diagram of the heat recovery system of domestic hot water



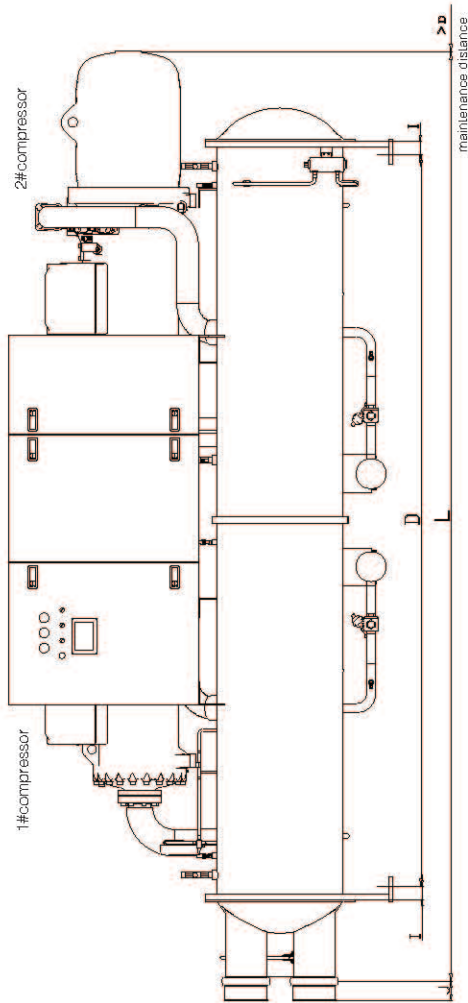
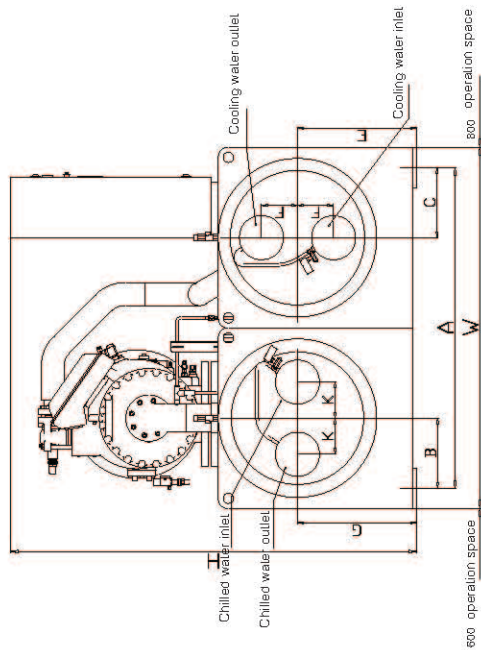
UNIT DIMENSION-SINGLE COMPRESSOR



Model		Evaporator Pipe	Condenser Pipe	A	B	C	D	E	F	G	L	W	H	K	I	J
Standard type	High efficiency type															
0109.1DC1	0110.1DC1	DN150	DN150	1330	280	285	2330	535	165	507	3097	1530	1820	130	70	180
0134.1DC1	0135.1DC1	DN150	DN150	1330	280	285	2330	535	165	507	3097	1530	1820	130		
0149.1DC1	0150.1DC1	DN150	DN150	1330	280	285	2330	535	165	507	3097	1530	1820	130		
0169.1DC1	0170.1DC1	DN150	DN150	1330	280	285	2330	535	165	507	3097	1530	1820	130		
0199.1DC1	0200.1DC1	DN150	DN200	1460	280	350	2330	585	180	507	3124	1660	1920	130		
0219.1DC1	0220.1DC1	DN150	DN200	1460	280	350	2330	585	180	507	3124	1660	1920	130		
0239.1DC1	0240.1DC1	DN150	DN200	1460	280	350	2330	585	180	507	3124	1660	1920	130		
0264.1DC1	0265.1DC1	DN150	DN200	1460	280	350	2330	585	180	507	3124	1660	1920	130		

Note :
1. Pipes of evaporator and condenser should be supported to avoid the external force exerted on the unit;
2.Space of machine room should be big enough to matian the evaporator and condenser.

UNIT DIMENSION-TWIN COMPRESSORS



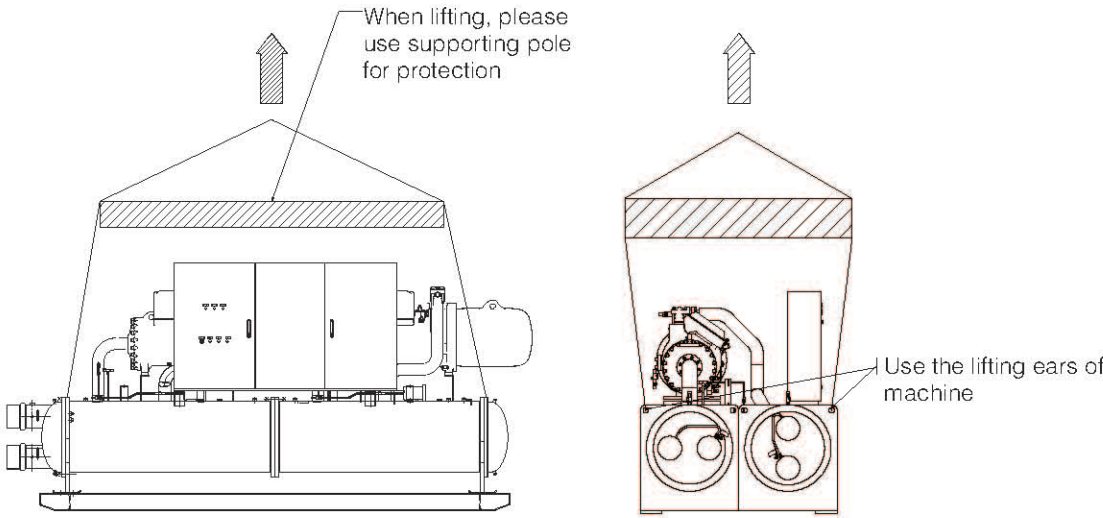
Model		Evaporator Pipe	Condenser Pipe	A	B	C	D	E	F	G	L	W	H	K	I	J
Standard type	High efficiency type	DN200	DN200	1470	350	285	3860	535	165	585	4854	1670	2070	180		
0279.2DC1	0280.2DC1	DN200	DN200	1470	350	285	3860	535	165	585	4854	1670	2070	180		
0299.2DC1	0300.2DC1	DN200	DN200	1470	350	285	3860	535	165	585	4854	1670	2070	180		
0324.2DC1	0325.2DC1	DN200	DN200	1470	350	285	3860	535	165	585	4854	1670	2070	180		
0349.2DC1	0350.2DC1	DN200	DN200	1470	350	285	3860	535	165	585	4854	1670	2070	180		
0369.2DC1	0370.2DC1	DN200	DN200	1600	350	350	3860	585	180	585	4854	1800	2250	180		
0389.2DC1	0390.2DC1	DN200	DN200	1600	350	350	3860	585	180	585	4854	1800	2250	180		
0409.2DC1	0410.2DC1	DN200	DN200	1600	350	350	3860	585	180	585	4854	1800	2250	180		
0429.2DC1	0430.2DC1	DN200	DN200	1600	350	350	3860	585	180	585	4854	1800	2250	180		
0449.2DC1	0450.2DC1	DN200	DN200	1600	350	350	4060	585	180	585	5024	1800	2250	180		
0464.2DC1	0465.2DC1	DN200	DN200	1600	350	350	4060	585	180	585	5024	1800	2250	180		
0494.2DC1	0495.2DC1	DN200	DN200	1600	350	350	4060	585	180	585	5024	1800	2250	180		
0509.2DC1	0510.2DC1	DN200	DN200	1600	350	350	4060	585	180	585	5024	1800	2250	180		

Note :

1. Pipes of evaporator and condenser should be supported to avoid the external force exerted on the unit;

2. Space of machine room should be big enough to maintain the evaporator and condenser;

SCHEMATIC PLOT FOR LIFTING ASSEMBLY

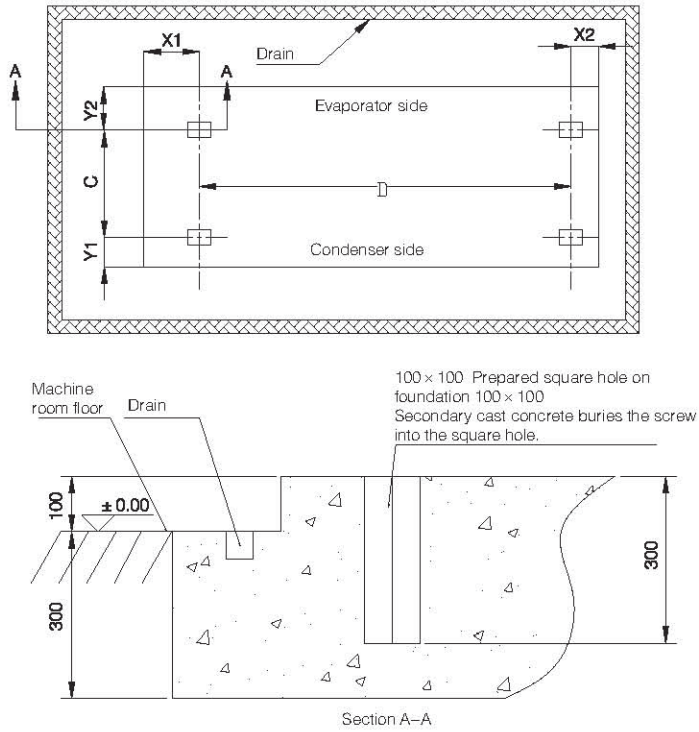


Notes:

1. This is merely a schematic plot. Please refer to related unit data for specific type size.

2. The external size of the unit may vary, but this lifting method is suitable for any TICA water-cooled flooded chiller.

FOUNDATION DRAWING



TWSF-Satndard	TWSF-High Efficiency	D	C	X1	X2	Y1	Y2
0109.1DC1	0110.1DC1	2330	1330	850	530	150	200
0134.1DC1	0135.1DC1	2330	1330	850	530	150	200
0149.1DC1	0150.1DC1	2330	1330	870	550	150	200
0169.1DC1	0170.1DC1	2330	1330	870	550	150	200
0199.1DC1	0200.1DC1	2330	1460	870	550	150	200
0219.1DC1	0220.1DC1	2330	1460	870	550	150	200
0239.1DC1	0240.1DC1	2330	1460	870	550	150	200
0264.1DC1	0265.1DC1	2330	1460	870	550	150	200
0279.2DC1	0280.2DC1	3860	1470	890	570	150	200
0299.2DC1	0300.2DC1	3860	1470	890	570	150	200
0324.2DC1	0325.2DC1	3860	1470	890	570	150	200
0349.2DC1	0350.2DC1	3860	1470	890	570	150	200
0369.2DC1	0370.2DC1	3860	1600	890	570	150	200
0389.2DC1	0390.2DC1	3860	1600	890	570	150	200
0409.2DC1	0410.2DC1	3860	1600	890	570	150	200
0429.2DC1	0430.2DC1	3860	1600	890	570	150	200
0449.2DC1	0450.2DC1	4060	1600	890	570	150	200
0464.2DC1	0465.2DC1	4060	1600	890	570	150	200
0494.2DC1	0495.2DC1	4060	1600	890	570	150	200
0509.2DC1	0510.2DC1	4060	1600	890	570	150	200

MACHINE OPERATION CONTROL

Start/Stop water pump

The operation and stop of the cooling water pump/chilled pump/submerged pump should be carried out by the operators according to starting requirement.The operation of the chilled water pump is decided by the outlet water temperature from the evaporator. When it is below0℃, the pump should be started. Also, the controller regulates other actions according to the signal of whether the pump is in operation.

The possible setting range of temperature controller.

The refrigerant conditions of the outlet water temperature of CHW:4-15℃

Take the equalizing running conditions of compressors into condensation, when several compressors are required, the less running time one start first.

Start/stop water chiller

When switched on and operation command deployed, all the conditions are met, the machine will start.

A: The input of protection device are on.(Normal)

B: Emergency stop switch is ON

The stop conditions of water pump

During operation, when any of the following conditions occurs, the machine stops.

A.Receiving the stop instruction, the unit stops; receiving reset instruction, the unit initializes all the protection devices and then restart the unit.

B.When processing the abnormal shut down caused by abnormality (such as high temperature of the motor, low suction pressure, high discharge pressure), the contactor will cut off power and stop the motor.

C.The emergency stop switch on the control cabinet panel is OFF.

Installation and maintenance

The installation and maintenance of the units should be carried out by professionals who have received professional training, having a good knowledge of local standards and rules and enjoying practical experience and qualification towards chiller plants. The first running should be conducted by professional service departments or the quality of the units can not be guaranteed.

Inspection of incoming merchandise

When the equipment arrives, please check whether all the items are included according to the packing list and whether the components are damaged in the process of transportation. Please contact the forwarding agent and claim for damages in writing once the components are damaged. Before installation, check the suitability of local supply voltage and frequency. TICA will not assume compensation liability of any damage after the acceptance of goods.

Lifting of the unit

When lifting the units, the mooring rope or chain that can ensure the bearing should be firmly frapped into the lifting hole and professionals must lift in strict accordance with the schematic plot for lifting and ensure that the control cabinet and other parts of the units are intact. (You can refer to the previous schematic plot of lifting)

Environmental requirements

The units is available indoors and the surrounding temperature is above 4℃, the relative humidity≤90%. The floor it requires should be horizontal and have enough strength or enhancing methods are needed. (You can refer to the groundwork drawing and maintenance space diagram of the units)

Water quality requirement

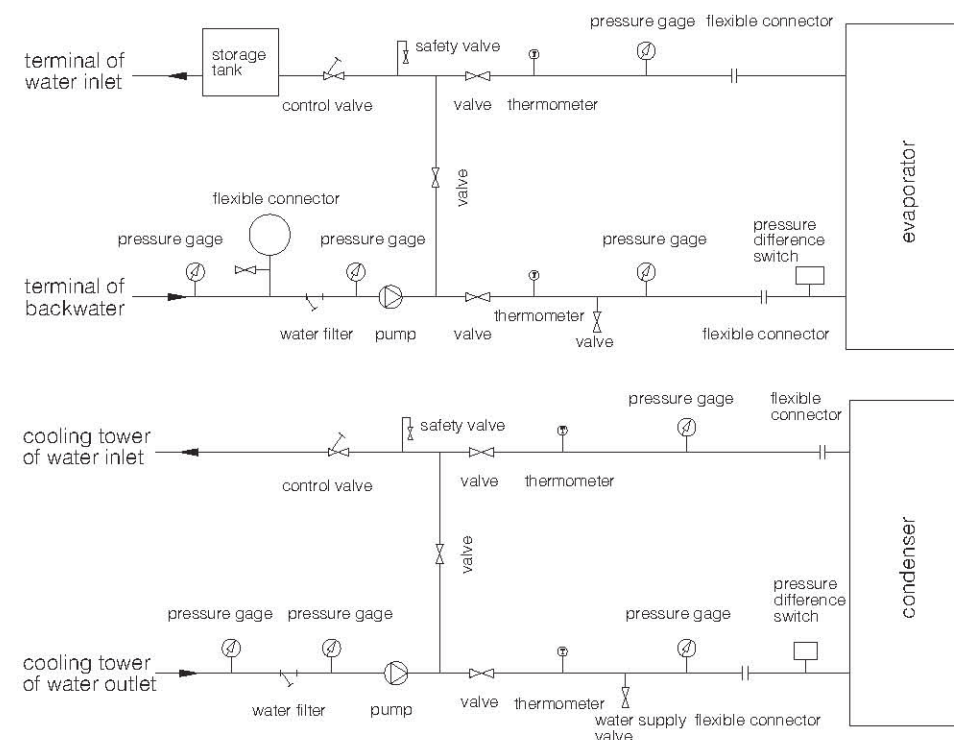
The water composition varies with regions. If use any water that is not ordinary (such as industrial sewage or underground water), you should check the water quality before it enters heat-exchanging unit. If it can not meet the requirements of water for air conditioners, water treatment is needed. Related water treatment can consult Industrial circulating cooling water treatment design specification or other related standards. The data in the following table can be used as reference index.

items	Unit	chilled water requirements	cooling water requirements
		permissible value	permissible value
suspended matter	mg/L	<10	<20
PH(25℃)	mg/L	6.5~8.0	6.5-8.0
electrical conductivity(25℃)	μS/L	<800	<800
methyl orange alkalinity	mg/L	<150	<500
acid consumption(PH=4.8)	mg/L	<100	<100
full hardness CaCO ₃	mg/L	<200	<200
Fe ²⁺	mg/L	<1.0	<1.0
Cl ⁻	mg/L	<200	<200
SO ₄ ²⁻	mg/L	<200	<200
SiO ₂	mg/L	<50	<50
NH ⁺	mg/L	<1.0	<1.0
S ²⁻	mg/L	negative	negative

Installation of pipes

Stop valves must be installed in the inlet and outlet of the unit for the sake of routine maintenance of the water system. It's suggested that thermometer and pressure gage are installed in the heat-exchanging device's water inlet and outlet for the purpose of routine check and maintenance. Water filter should be installed in the water inlet of the water pump so that impurities will not enter water pump and heat-exchanging device. Check the sealing of the pipes before the pipes are insulated and water injected into the unit. All the pipes connected with the unit should be installed with damping device. Acceptable flow controllers such as water switches should be installed. When sewage discharge devices are to be installed, they should avoid the water pipes of the water inlet and outlet of the heat-exchanging device or the operation of the unit will be abnormal.

Schematic plot of the external water pipe of the unit



Introduction to the design and installation of the pipe line

- ◆ The design of water-cycling system should be as concise as possible, avoiding too many bent pipes and putting straight pipe lines on the same level as possible.
- ◆ Pay attention to the water inlet and outlet of condenser and evaporator and avoid connection error.
- ◆ Install manual or automatic vent valves on all the highest points of the water-cycling system.
- ◆ The expansion tank which should be anti-corrosive and anti-rust must installed on the highest points of the whole pipe line.
- ◆ Thermometer and pressure gage should be installed in both cool water and cooling water inlet and outlet.
- ◆ Drainage valves should be installed in the bottom of all local bent pipes in order to drain the water of the whole system.
- ◆ Stop valve should be installed in the pipe line of chilled water and cooling water which connects the heat-exchanging device and service pipe.
- ◆ By-pass valve should be installed in the heat-exchanging device's water inlet and outlet pipe line for the sake of inspection and flush of pipe line.
- ◆ Install flexible connector to reduce the vibration of pipe line.
- ◆ Since the impurities of the water system will lead to the scaling of the heat-exchanging device, a water filter should be installed before the pump.
- ◆ To enhance the effect of cooling (or heating), and save energy, the pipe line should be very insulated.
- ◆ To prevent the unit from tripping off due to low load, it's advisable to install storage tank.
- ◆ The water flow should never excess the max flow of the unit (30% above the fixed water flow).
- ◆ It should be easy to dismantle the pipe line and connectors that are directly related to the content for the sake of cleaning and external check of the connectors of the heat-exchanging device.

SELECTION OF WATER SYSTEM COMPONENTS

1. Stop valve: Select the size of the valve according to the diameter of the pipe.
2. Strainer: Use 60 mesh and above.
3. Check valve: Installed at the pump outlet to avoid damage of the pump due to backflow of the water. Select according to the joint diameter.
4. By-pass valve: Installed between the pipe connected inlet and outlet of the chiller, open it before pipe cleaning.
5. Thermometer: For chiller overhaul, maintenance, and operation observation. Range between 0-100℃
6. Water pump: Water pump flow rate is chosen according to the parameters of chiller water flow.
 Water pump flow rate = $L * 1.1$ (L - chiller water flow rate)
 Water pump head = {Chiller water pressure drop +
 Pipe Pressure Drop (Highest pressure drop path) +
 Fan Coil Unit Pressure Drop (Highest pressure drop path)} * 1.1
7. Auto air vent: To release air in the water system, install at the highest point of the system
8. Expansion tank: To stabilize the pressure of the water system by storing and replenishing water. Installed at the return water pipe and above the piping path in the water system. The volume is calculate as below:
 Volume of expansion tank, $V = (0.03 \sim 0.034) V_c$ Where,
 V_c - Water volume of the system
9. Water tank: To regulate the system capacity and act as storage of energy. It will reduce the number of time the chiller cycling between ON and OFF due to changing of load. Increase the efficiency of the chiller and at the same time enhances the lifespan. The calculation of volume of water tank is as following:
 $V = (Q/27.9n) - V_s$
 Where,
 V = Water tank volume (m^3)
 Q = cooling capacity (kW)
 n = number of chiller
 V_s = Volume of water for internal piping and heat exchanger

Caution:

1. Pressure used for pipeline pressure testing should be more than 1.25 times of working pressure and not less than 0.6MPa. Pressure have to be held for 5 minutes and pressure decay should not be more than 0.02MPa. Water system can only be approved if no leakage is found.
2. Water pressure testing: Cannot be conducted when the temperature is lower than 5℃. Used only approved pressure gauge with appropriate precision. The maximum pressure scale should be 1.5 ~ 2 times of pressure to be tested.
3. During pressure testing, water should be added from lower point and air to be drawn out at higher point. Water need to be added slowly and constantly. Stop the pump after the test pressure level is reached and commence the pressure test. No work is allowed when the piping system is pressurised.
4. After qualifying the pressure test, the water piping need to be clean thoroughly until the water is clear and free from impurities like soil or metal debris.

PRE-START CHECKING ITEMS

- Water system

Check all the water system pine line. Ensure that the evaporator and condenser are correctly connected and the water flow direction is right. Check whether the water inlet and outlet pipes of the heat-exchanging device are correctly connected and then open all the valves and related pumps. Flush the pumps to ensure that the water system is clean. Check whether all the pipes and connectors are in sound condition and then exhaust the air in evaporator and condenser. The water system should be free from rust stains. Detect the water side resistance loss of evaporator and condenser and check the water quantity. Make sure the temperature sensor is correctly connected.
- Control circuit

Disconnect the isolator and check all the bootstrap circuit and control circuit of the control cabinet. Make sure all the switches are off and check the power of the supply unit, whose fluctuation should be within 10% of the rated voltage that is marked on the Name board of the compressor and voltage unbalance should be within 2%. Make sure the necessary electric power is enough to meet the start and full-load operation of the unit. Ensure that all the wires and safety fuses are suitable to the operation of the unit and finish all the chain control circuits in line with related circuit drawing. Make sure the normal operation of accessory equipment and control devices and have enough cooling capacity to meet the needs of the first operation.
- Unit

Make sure the oil heater of the compressor has been powered on for over 3 hours. Observe the oil level through sight glass; if the level is not seen, oil should be filled. Completely open the exhaust stop valve and then back half a circle clockwise, opening liquid supply valve. Start accessory devices—condensate pump and chilled water pump. Check whether all the safety control devices in initial state and the correctness of their setting. More details checking items can refer to Table 1.
- Safety device

The unit is equipped with safety protection device to ensure its safe operation. When one safety device is in operation, if MIL is on, this section stops working while others are still normal. We suggest to shut down the machine and check even if one part is abnormal lest it should cause more serious accidents. (Table 2)

OPERATION CHECK LIST

Frequency	Item	Checking Method	Requirement (R134a)
Daily	1.Discharge line pressure	Check the discharge line pressure	0.6–1.2MPa
	2.Suction line Pressure	Check the discharge line pressure	0.1–0.3MPa
	3.Superheat	Check the superheat value	12–20° C
	4.Power supply	Check with voltmeter	Nominal Value ± 10%
	5.Cooling water outlet temperature	Check with thermometer	30–45° C
	6.Chilled water outlet temperature	Check with thermometer	5–10° C
	7.Viration and Noice	Touch and listen	No unusual vibration and sounds
	8.Room temperature	Check with thermometer	≤40° C
Monthly	1.Main loop joint	Spanner, wrench	All the joints are held firmly and not loosening
	2.Contactor joint	Self test	Not seriously corroded, smooth surface
Quaterly	1.Refrigerant injection	Check the refrigerant piping	No gas bubbles
	2. Oil injection	Check the oil level	Within specified area

PROTECTIONS AND POSSIBLE CAUSES

Protection	Possible causes
High pressure protection	1.Cooling water not circulating or water level too low.
	2. Leaving water temperature for cooling water is too high.
	3.Condensor Scaling.
	4. Presence of non condensable gas.
Anti freeze protection	1. Temperature of chilled water is too low.
	2. Setting temperature is too low.
Discharge temperature protection	1. Lack of refrigerant due to leakages.
	2. Solenoid valve at the compressor cooling pipelines failed and closed.
	3. Stop valve at condenser outlet.
Motor overheat protection (Compressor motor protection)	1. Same as high pressure protection.
Low pressure protection	1. Expansion valve faulty and closed.
	2. Stop valve at condenser outlet closed.
	3. Chilled water flow rate not enough.
	4. Scaling of evaporator.
Reverse phase protector	1. Wrong wiring.
Over–current relay (Compressor motor)	1. Same as high pressure protection.
Safety valve	1. Refrigerant system high pressure.

Unit should be located at indoor with ambient temperature above 0 °C and relative humidity <95%. Installation site should be level and strong enough to support the operating weight of the unit (Please refer to foundation diagram and maintenance space diagram)

	Standard operation	Start up	Operating
Cooling water entering temperature ° C	30	16 ~ 40	
Chilled water leaving temperature° C	7	16 ~ 25	4 ~ 16

RECOMMENDED MAINTENANCE SCHEDULE

	1000 hr	2500 hr	5000 hr	20000 hr	40000 hr
Bearing					○
Motor		△	△	△	△
Liquid Injection Control Valve				△	△
Electronic Valve				△	△
Suction filter	△	△	△	△	
Oil filter	△	△	△	△	○
Liquid Line Filter-Drier	△			△	△
Lubricant					○

☒ Check ☐ Replace

[illegible]