



# Midea R134a 50Hz I Flooded type water cooled screw chiller (PCB Control)

## Applicable Model:

MWSC340A-FB3	MWSC1080A-FB3
MWSC440A-FB3	MWSC1200A-FB3
MWSC540A-FB3	MWSC1385A-FB3
MWSC690A-FB3	MWSC1620A-FB3
MWSC805A-FB3	MWSC1780A-FB3
MWSC890A-FB3	



Midea reserves the right to discontinue, or change specification or designs at any time without notices and without incurring obligations.

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## I. Safety precautions

Before use, read through the operating instructions to ensure proper using. Please keep it well so that the professional technician can refer to it anytime.

### 1. Installation safety considerations

- (1) Access to the unit must be reserved to authorized personnel, qualified and trained in monitoring and maintenance. The access limitation device must be installed by the customer (e.g. cut-off, enclosure). After the unit has been received, when it is ready to be installed or reinstalled, and before it is started up, it must be inspected for damage. Check that the refrigerant circuit(s) is (are) intact, especially that no components or pipes have shifted (e.g. following a shock). If in doubt, carry out a leak tightness check and verify with the manufacturer that the circuit integrity has not been impaired. If damage is detected upon receipt, immediately file a claim with the shipping company. Midea strongly recommends employing a specialized company to unload the machine.
- (2) It is compulsory to wear personal protection equipment. Do not remove the skid or the packaging until the unit is in its final position. These units can be moved with a fork lift truck, as long as the forks are positioned in the right place and direction on the unit.
- (3) The units can also be lifted with slings, using only the designated lifting points marked on the unit. Use slings with the correct capacity, and always follow the lifting instructions on the certified drawings supplied with the unit. Safety is only guaranteed, if these instructions are carefully followed. If this is not the case, there is a risk of material deterioration and injuries to personnel. Never cover any safety devices. This applies to the relief valve(s) in the refrigerant circuit(s). Ensure that the valves are correctly installed, before operating the unit.
- (4) The relief valves are designed and installed to ensure protection against overpressure caused by fire. The relief valve must only be removed if the fire risk is fully controlled and after checking that this is allowed by local regulations and authorities. This is the responsibility of the operator. If the unit is installed in a room, the safety valves must be connected to discharge pipes.

#### **Note:**

These pipes must be installed in a way that ensures that people and property are not exposed to refrigerant leaks. These fluids may be diffused in the air, but far away from any building air intake, or they must be discharged in a quantity that is appropriate for a suitably absorbing environment. It is recommended to install an indicating device to show if part of the refrigerant has leaked from the valve. The presence of oil at the outlet orifice is a useful indicator that refrigerant has leaked. Keep this orifice clean to ensure that any leaks are obvious. The calibration of a valve that has leaked is generally lower than its original calibration. The new calibration may affect the operating range. To avoid a nuisance tripping or leaks, replace or re-calibrate the valve. Periodic check the relief valves. Ensure good ventilation, as accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions. Inhalation of high concentrations of vapour is harmful and may cause heart irregularities, unconsciousness, or death. Vapour is heavier than air and reduces the amount of oxygen available for breathing. These products cause eye and skin irritation. Decomposition products are hazardous.

## 2. Maintenance safety considerations

### 2.1 Engineers safety consideration

- (1) Engineers working on the electric or refrigeration components must be authorized, trained and fully qualified to do so. All refrigerant circuit repairs must be carried out by a trained person fully qualified to work on these units. He must have been trained and be familiar with the equipment and the installation. All welding operations must be carried out by qualified specialists.
- (2) The insulation must be removed and heat generation must be limited by using a wet cloth. Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorized engineer. These procedures must be carried out with the unit shut-down.

**NOTE:** During any handling, maintenance and service operations the engineers working on the unit must be equipped with safety gloves, glasses, shoes and protective clothing.

- (1) Never work on a unit that is still energized.
- (2) Never work on any of the electrical components, until the general power supply to the unit has been cut using the disconnect switch in the control box.
- (3) If any maintenance operations are carried out on the unit, lock the power supply circuit ahead of the machine.
- (4) If the work is interrupted, always ensure that all circuits are still deenergized before resuming the work.

**ATTENTION:** Even if the unit has been switched off, the power circuit remains energized, unless the unit or circuit disconnect switch is open. Refer to the wiring diagram for further details. Attach appropriate safety labels.

### 2.2 Operating checks:

Important information regarding the refrigerant used:

- Refrigerant type: R134a
- Periodic inspections for refrigerant leaks may be required depending on local legislation. Please contact your local dealer for more information.
- During the life-time of the system, inspection and tests must be carried out in accordance with national regulations.

### 2.3 Safety device checks:

- The safety devices and external overpressure devices (safety valves) must be checked on site regularly.
- At least once a year thoroughly inspect the protection devices (valves). If the machine operates in regularly carry out leak tests and immediately repair any leaks.
- Ensure regularly that the vibration levels remain acceptable and close to those at the initial unit start-up. Before opening a refrigerant circuit, purge and consult the pressure gauges.
- Change the refrigerant when there are equipment failures, following related regulations or carry out

a refrigerant analysis in a specialist laboratory.

- If the refrigerant circuit remains open for longer than a day after an intervention (such as a component replacement), the openings must be plugged and the circuit must be charged with nitrogen (inertia principle). The objective is to prevent penetration of atmospheric humidity and the resulting corrosion on the internal walls and on non-protected steel surfaces.

### 3. Repair safety considerations

**Note:** It is compulsory to wear personal protection equipment. The insulation must be removed and warming up must be limited by using a wet cloth. Before opening the unit always ensure that the circuit has been purged.

- All installation parts must be maintained by qualified and skilled technicians, in order to avoid material deterioration and injuries to people. Faults and leaks must be repaired immediately. The authorized technician must have the responsibility to repair the fault immediately. Each time repairs have been carried out to the unit, the operation of the safety devices must be re-checked.
- Comply with the regulations and recommendations in unit and installation safety standards. If a leak occurs or if the refrigerant becomes contaminated (e.g. by a short circuit in a motor) remove the complete charge using a recovery unit and store the refrigerant in mobile containers.
- Repair the leak detected and recharge the circuit with the total R134a charge, as indicated on the unit name plate. Certain parts of the circuit can be isolated. Only charge liquid refrigerant R134a at the liquid line. Ensure that you are using the correct refrigerant type before recharging the unit. Charging any refrigerant other than the original charge type (R134a) will impair machine operation and can even lead to a destruction of the compressors. The compressors operating with this refrigerant type are lubricated with synthetic oil.
- Do not use oxygen to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.
- Never exceed the specified maximum operating pressures. Verify the allowable maximum high- and low-side test pressures by checking the instructions in this manual and the pressures given on the unit name plate.
- Do not use air for leak testing. Use only refrigerant or dry nitrogen.
- Do not weld or flame cut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapor) has been removed from chiller. Traces of vapor should be displaced with dry air nitrogen. Refrigerant in contact with an open flame produces toxic gases.
- The necessary protection equipment must be available, and appropriate fire extinguishers for the system and the refrigerant type used must be within easy reach.
- Do not siphon refrigerant. Avoid spilling liquid refrigerant on skin or splashing it into the eyes. Use safety goggles. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.
- Never apply an open flame or live steam to a refrigerant container. Dangerous overpressure can result. If it is necessary to heat refrigerant, use only warm water.

- During refrigerant removal and storage operations follow applicable regulations. These regulations, permitting conditioning and recovery of halogenated hydrocarbons under optimum quality conditions for the products and optimum safety conditions for people, property and the environment.
- Any refrigerant transfer and recovery operations must be carried out using a transfer unit. The units must never be modified to add refrigerant and oil charging, removal and purging devices. All these devices are provided with the units. Please refer to the certified dimensional drawings for the units.
- Do not re-use disposable (non-returnable) cylinders or attempt to refill them. It is dangerous and illegal. When cylinders are empty, evacuate the remaining gas pressure, and move the cylinders to a place designated for their recovery. Do not incinerate.
- Do not attempt to remove refrigerant circuit components or fittings, while the machine is under pressure or while it is running. Be sure pressure is at 0 kPa before removing components or opening a circuit.
- Do not attempt to repair or recondition any safety devices when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism.
- If necessary, replace the device. Do not install safety valves in series or backwards.

**ATTENTION:**

No part of the unit must be used as a walkway, rack or support. Periodically check and repair or if necessary replace any component or piping that shows signs of damage. The refrigerant lines can break under the weight and release refrigerant, causing personal injury. Do not climb on a machine. Use a platform, or staging to work at higher levels.

- Use mechanical lifting equipment (crane, hoist, winch, etc.) to lift or move heavy components. For lighter components, use lifting equipment when there is a risk of slipping or losing your balance.
- Use only original replacement parts for any repair or component replacement.
- Do not drain water circuits containing industrial brines, without informing the technical service department at the installation site or a competent body first.
- Close the entering and leaving water shut off valves and purge the unit water circuit, before working on the components installed on the circuit (screen filter, pump, water flow switch, etc.).
- Do not close the water box bolts until the water boxes have been completely drained.
- Periodically inspect all valves, fittings and pipes of the refrigerant and hydronic circuits to ensure that they do not show any corrosion or any signs of leaks.
- It is recommended to wear ear defenders, when working near the unit and the unit is in operation.

## II. Product

### 1. General Information

#### 1) Product Line Up

Series	Model	Power Supply	Cooling Capacity (kW)	Quantity of Compressor
Single head	MWSC340A-FB3	380V/3Ph/50Hz	340	1
	MWSC440A-FB3	380V/3Ph/50Hz	440	1
	MWSC540A-FB3	380V/3Ph/50Hz	540	1
	MWSC690A-FB3	380V/3Ph/50Hz	690	1
Dual head	MWSC805A-FB3	380V/3Ph/50Hz	805	1
	MWSC890A-FB3	380V/3Ph/50Hz	890	1
	MWSC1080A-FB3	380V/3Ph/50Hz	1080	2
	MWSC1200A-FB3	380V/3Ph/50Hz	1200	2
	MWSC1385A-FB3	380V/3Ph/50Hz	1385	2
	MWSC1620A-FB3	380V/3Ph/50Hz	1620	2
	MWSC1780A-FB3	380V/3Ph/50Hz	1780	2

**3). External appearance**

**Single head(MWSC340A-FB3~ MWSC890A-FB3)**



**Dual head(MWSC1080A-FB3~ MWSC1780A-FB3)**

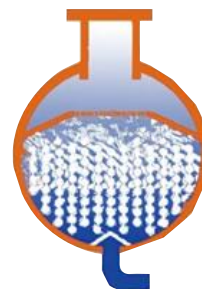




## 2. Features

### High efficiency

- High efficiency inner grooved copper pipe enhances the heat-exchange process, improves heat exchange efficiency and makes the evaporator more compact to save installation space.
- Significantly improve the evaporating temperature and reduce heat transferring temperature difference which directly improves heat-exchange efficiency, provide most cost effective & reliable solutions to all valuable customers.
- Supreme efficiency in partial load.



### Green chiller

- R134a environmental-friendly refrigerant  
Refrigerant of the Chlorine-free HFC with zero ODP (Ozone Depletion Potential).  
Very low GWP (Global Warming Potential).



### High reliability and excellent serviceability

Advanced twin-rotor screw compressor

#### Capacity adjustable valve

Four stage capacity adjustable or stepless adjustable.

#### Refrigerant discharge

Exhaust cavity with check valve, it can avoid compressor to reversal cause of stopping for long time.

#### Built-in oil separator

High precision filter, the oil separation efficiency up to 99.5%.

#### Motor direct drive

High mechanical efficiency, low speed of compressor, low noise.

#### Twin screw rotor

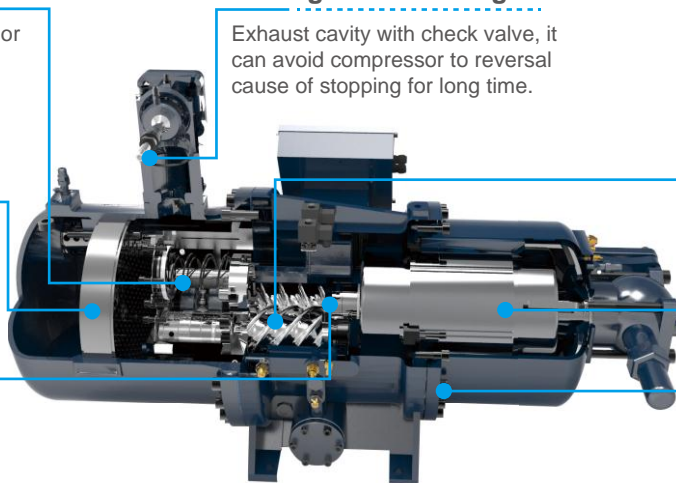
Patent type line design, high volumetric efficiency, smooth operation.

#### Hermetic motor

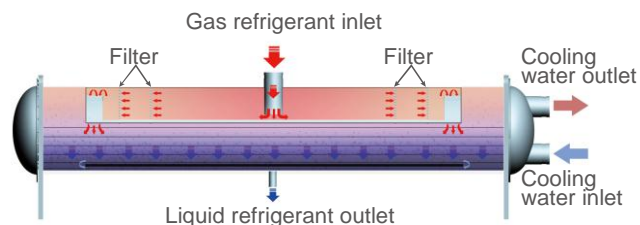
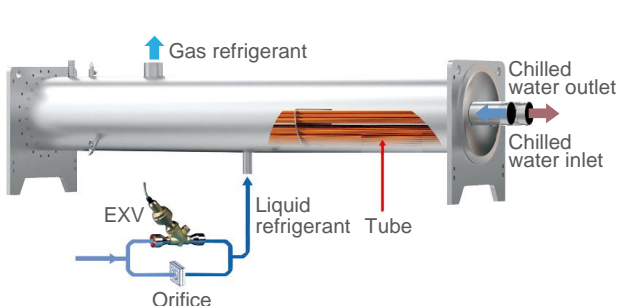
Cool motor with refrigerant, no heat send out in room.

#### Semi-hermetic structure

Semi-hermetic compressor, moveable bolts, easy to maintain.



### High efficiency heat exchange technology

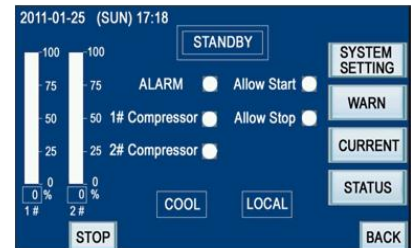


High efficiency shell and tube heat exchanger, 2 path, straight water pipe, easy to clean. End cover can be exchanged to meet customer's requirement for condenser.

- Flooded evaporator makes cleaning inside of pipes possible, and guarantees high reliability.
- Discharge cut-off valve and liquid line angle valve for simplified maintenance.
- Simplified field wiring for easy installation.

#### ✚ Optimized & user-friendly operating Interface

- Midea chiller adopts Midea Microprocessor which provides advanced algorithm and reliable control.
- Graphical display of the operating state, operation scheduling, malfunction inquiry, help menu for easy trouble shooting and other user-oriented functions.



#### ✚ Compressor bearing

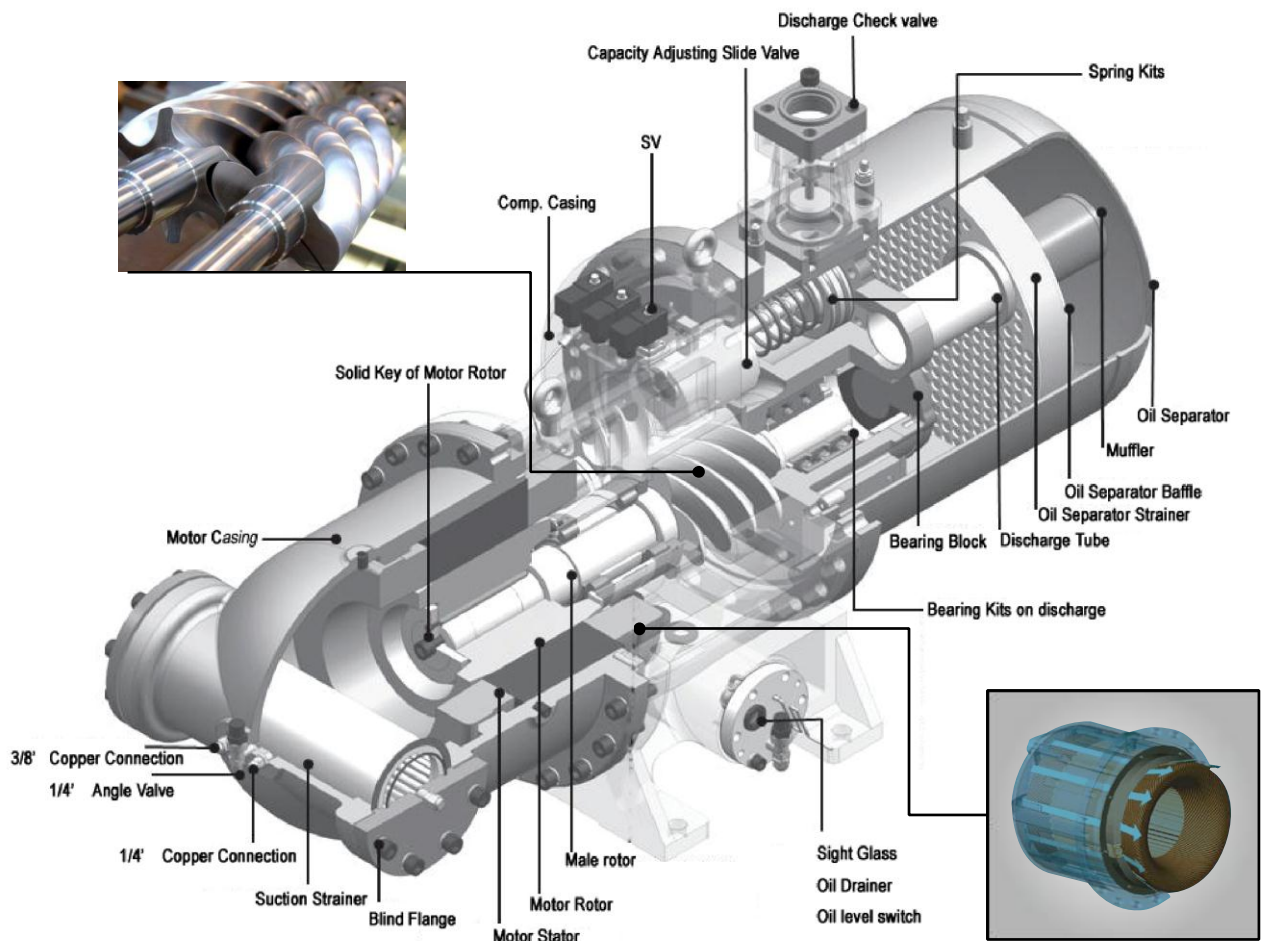
High-precision large-sized axial and radial bearings are selected to support the male and female rotors for long lasting life. With effective lubrication system, the bearing service life can be further extended. While the compressor is running, lubricant is injected into all bearings due to pressure difference.



SKF brand industry use bearing guarantees 60,000h continuous working

#### ✚ Advanced twin-rotor screw compressor

Midea® Screw Chiller equipped with the 3rd generation industrial Semi-hermetic Screw compressor that has the latest advanced 5-6 asymmetry dentiform rotors. The rotors are processed by high-precision CNC and each part is well-proportioned and none-gap matching, which minimize the friction resistance and clearance loss, guarantee quiet running and good duration.



- High-precision machining and measurement make rotor clearance reach  $\mu\text{m}$ -class, so it reduces the leakage between high and low pressure. Under continuous operation, the rotors still keep their best clearance and achieve highest efficiency.
- Semi-hermetic compressor with low running noise and well cooled down by refrigerant, low running temperature, no leakage potential compared with open compressor.
- Patented motor-cooling design in ducts of refrigerant flow encompassing stator provides best dissipation of heat and no requirement for computer room AC.
- To reach high operation efficiency, the casing is manufactured by precise machining centers and inspected by a coordinate measuring machine to make sure that the requested precision and quality can be retained in the compressor.

**✚ Three stages oil separation**

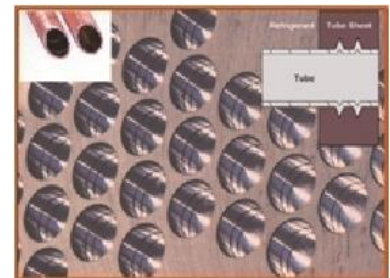
- The built-in oil separator utilizes three-stage filter mechanism with high-density filter element to achieve optimal oil separation effect and its efficiency is higher than 99.7%. Two oil separators cooperate together make the best oil separating effect.
- Detachable demister for cleaning.
- Oil supplied by pressure difference and no need of oil pump.

**✚ Dual compressors (Min. 1080 ~ Max.1780kW)**

- Large cooling capacity chillers have two truly independent refrigerant circuits, compact outline and superior partial load efficiency. Besides, when one of the compressors breaks down, the other one can work independently. So the chiller can provide much higher reliability and minimize the loss of user.

**Flooded-type evaporator**

- Evaporator is flooded type designed for 1MPa working pressure on the chilled water side (Higher pressure vessels can be customized). Replaceable integral finned copper tubes are mechanically bonded to steel tube sheets. The evaporator has been tested under extreme conditions. The 20MM thickness insulation covers all low temperature surfaces, including the evaporator, water boxes, oil return lines, chilled water flow switch piping, etc.



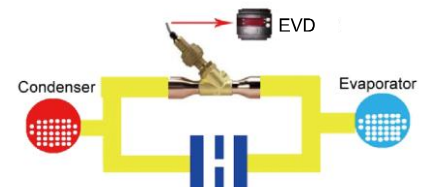
- Midea heat exchangers are designed by professional design software and pass rigorous tests. Double-grooved holes at tube support for tube expansion are designed to prevent leakage and increase the durability of heat exchanger.

**Condenser**

- Midea condenser has a specially designed baffle, in the entrance of condenser, to prevent direct impingement of high-velocity refrigerant gas on tube surface and thus eliminate the related vibration and noise. It has been tested under extreme conditions. Water side working pressure is designed for 1.0Mpa (Higher pressure vessels can be customized).

**Throttling device**

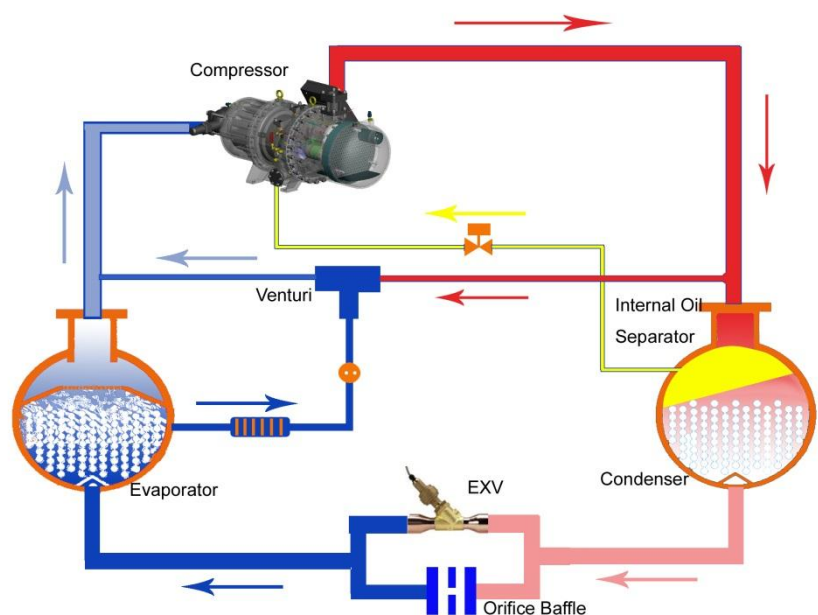
Orifice baffle without moving parts can guarantee high reliability and it cooperates with EXV ( Danfoss ) to throttle the high-pressure liquid refrigerant from condenser to evaporator. EXV which is controlled by EVD module provides high-precision adjustment and perfectly



matches the compressor load , both full load and partial load.

**Advanced oil system**

As the diagram shown, the low temperature and low pressure gas enters the compressor through suction port. Then refrigerant gas that entered the compressor is compressed to a high temperature and high pressure gas and enters the condenser to release heat to cooling water. The condensed liquid passes the throttling device, becomes the



**Dual head**

MWSC_A-FB3		1080	1200	1385	1620	1780
Cooling capacity	kW	1080	1200	1385	1620	1780
Power input	kW	186	206	238	278	306
EER	kW/kW	5.8	5.82	5.81	5.82	5.81
Semi-hermetic screw compressor						
Circuit A	Quantity	1	1	1	1	1
Circuit B	Quantity	1	1	1	1	1
Oil recharge						
Circuit A	L	23	28	28	40	40
Circuit B	L	23	28	28	40	40
Refrigerant	Type	R134a				
Circuit A	kg	170	180	190	210	220
Circuit B	kg	170	180	190	210	220
Control type		EXV+Orifice				
Evaporator	Type	Shell and tube flooded				
Water content	L	350	400	460	520	580
Water flow	m <sup>3</sup> /h	186	206	238	279	306
Pressure drop	kPa	78	79	79	75	76
Max. pressure	kPa	1000	1000	1000	1000	1000
Connection type		Victaulic coupling				
Water inlet/outlet pipe dim.	mm	200	200	200	200	200
Condenser	Type	Shell and tube				
Water content	L	350	400	460	520	560
Water flow	m <sup>3</sup> /h	232	258	298	348	383
Pressure drop	kPa	88	87	87	85	86
Max. pressure	kPa	1000	1000	1000	1000	1000
Connection type		Victaulic coupling				
Water inlet/outlet pipe dim.	mm	200	200	200	200	200
Unit length	mm	4600	4600	4600	4800	4800
Unit width	mm	1520	1520	1520	1620	1620
Unit height	mm	2035	2035	2035	2250	2250
Shipping weight	kg	6700	6900	7150	8350	8450
Running weight	kg	7250	7490	7820	9200	9350
Safety protection device	The following safety devices are equipped as standard. High pressure protection(High pressure switch & high pressure sensor) Low pressure protection(Low pressure switch & low pressure sensor) Compressor thermal protection High discharge temperature on the compressor Phase monitor; Star/Delta transition failed Low-pressure ratio; Low oil level protection Interrupter protection; Overload compressor protection Over-voltage & low- voltage protection Sensor malfunction protection Contactor malfunction protection Freeze protection					

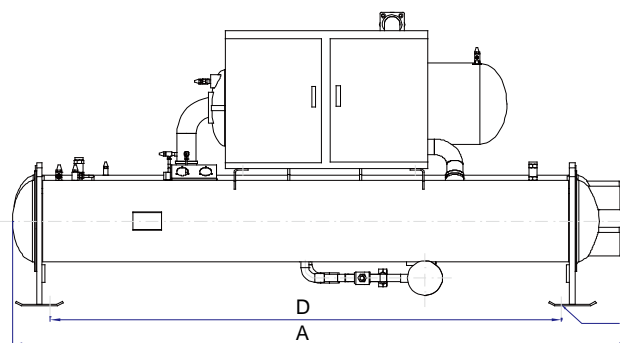
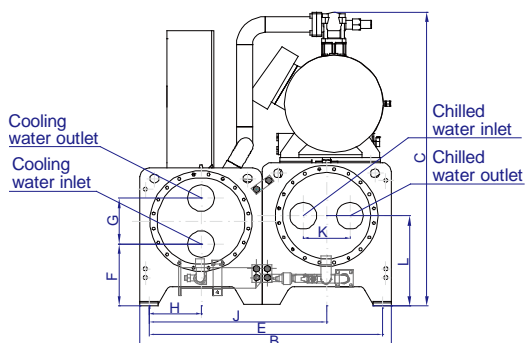
Note:

Nominal cooling capacities are based on following conditions: Chilled water inlet/outlet temperature 12/7 °C (53.6F/44.6F); Cooling water inlet/outlet temperature 30/35 °C (86F/96F).

The design fouling factor for both evaporator and condenser are 0.086m<sup>2</sup>·°C/kW (0.0005ft<sup>2</sup> F.hr/Btu).

## 4. Outline dimension

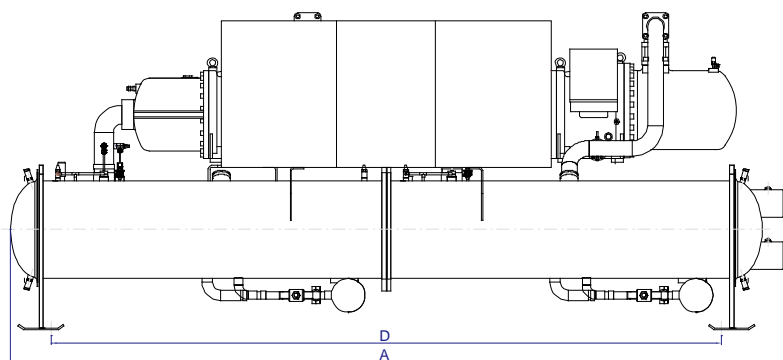
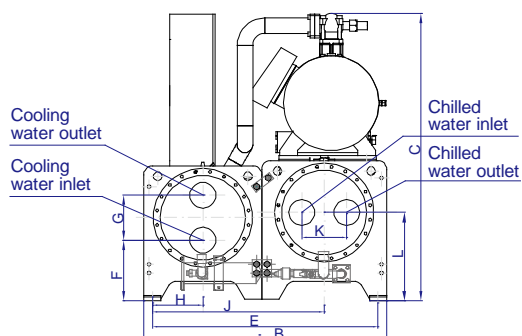
### Single head (MWSC340~890A-FB3)



Unit: mm

Model	A	B	C	D	E	F	G	H	J	K	L	Water inlet/outlet Dim.
MWSC340A-FB3	3550	1220	1730	2850	1100	411	260	250	850	260	541	DN150
MWSC440A-FB3	3550	1220	1800	2850	1100	411	260	250	850	260	541	DN150
MWSC540A-FB3	3550	1220	1900	2850	1100	411	260	250	850	260	541	DN150
MWSC690A-FB3	3600	1420	2000	2850	1300	451	280	300	1000	280	591	DN200
MWSC805A-FB3	3600	1440	2020	2850	1300	451	280	300	1000	280	591	DN200
MWSC890A-FB3	3600	1440	2020	2850	1300	451	280	300	1000	280	591	DN200

### Dual heads(MWSC1080~1780A-FB3)



Unit: mm

Model	A	B	C	D	E	F	G	H	J	K	L	Water inlet/outlet Dim.
MWSC1080A-FB3	4600	1520	2035	3850	1400	443	350	325	1075	350	618	DN200
MWSC1200A-FB3	4600	1520	2035	3850	1400	443	350	325	1075	350	618	DN200
MWSC1385A-FB3	4600	1520	2035	3850	1400	443	350	325	1075	350	618	DN200
MWSC1620A-FB3	4800	1620	2250	3850	1500	468	350	350	1150	350	643	DN200
MWSC1780A-FB3	4800	1620	2250	3850	1500	468	350	350	1150	350	643	DN200

**NOTE:** Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings supplied with the unit or available on request.

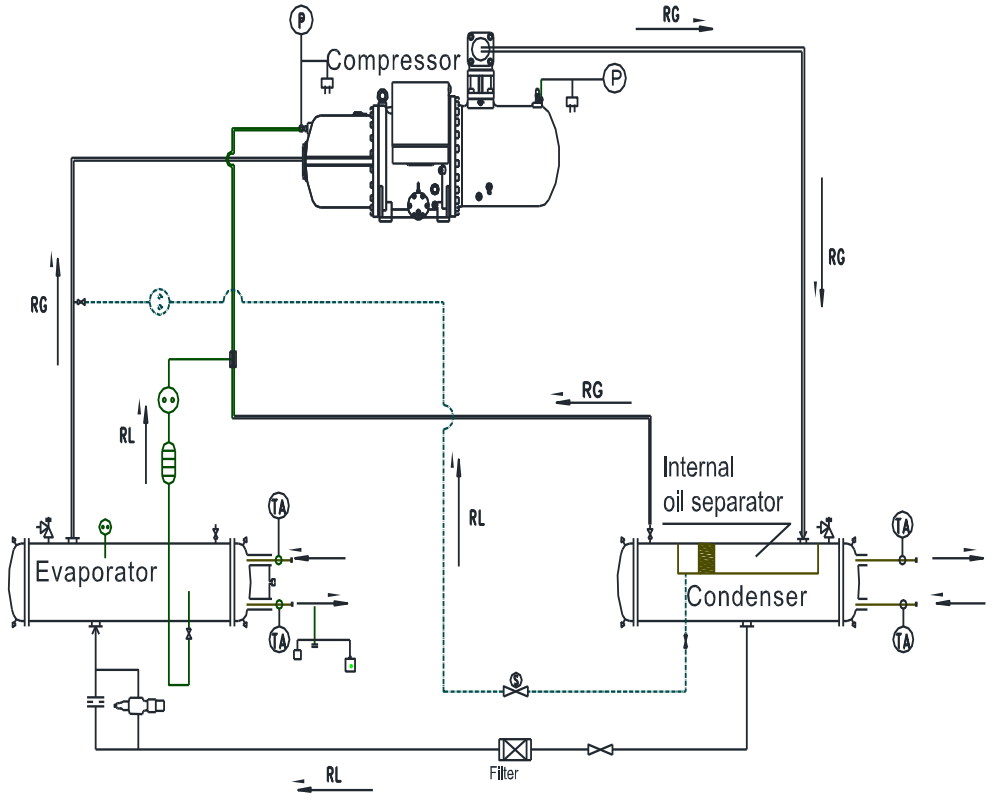
For the positioning of the fixing points, weight distribution and center of gravity coordinates please refer to the dimensional drawings.



### 5. Refrigeration system

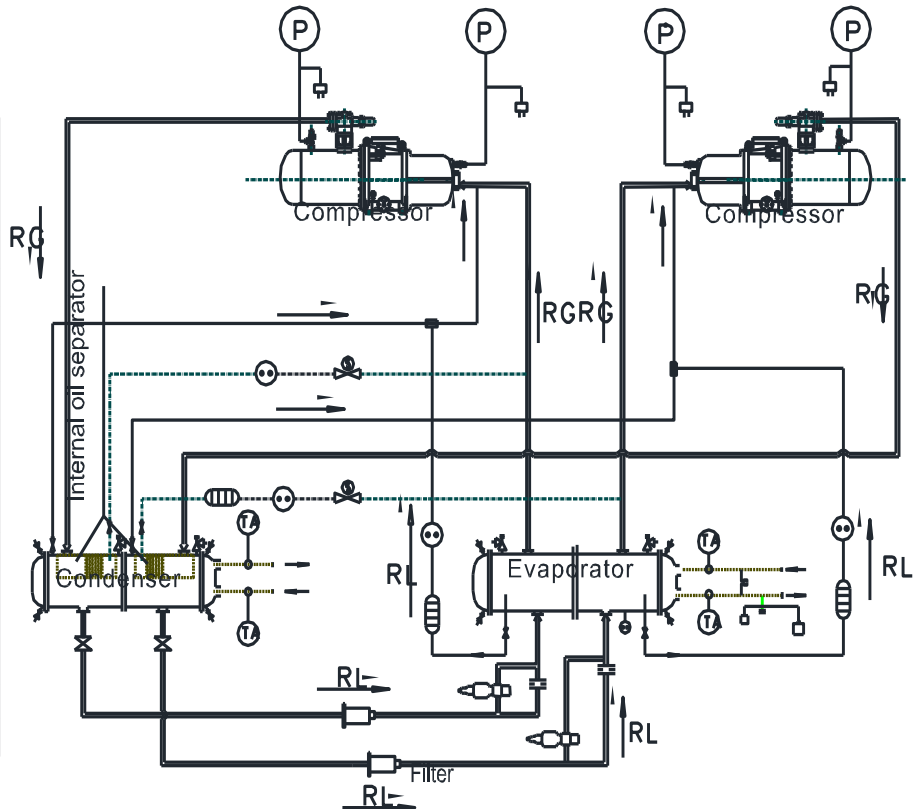
For single head unit( MWSC340~890A-FB3)

Code	Name
	Pressure Gauge
	Temperature Sensor
	Sight glass
	Filter
	Solenoid Valve
	Safety Valve
	Check Valve
	Shut-off Valve
	Refrigerant Gas Line
	Refrigerant Liquid Line
	Oil way
	Water way
	Throttle plate
	High/Low Pressure Switch
	Electric expansion valve
	Venturi Tube
	Pressure Difference Switch



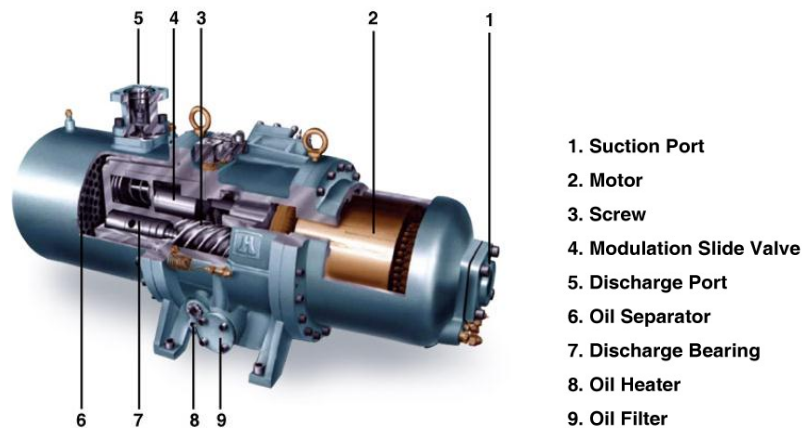
For dual heads unit (MWSC1080~1780A-FB3)

Code	Name
	Pressure Gauge
	Temperature Sensor
	Sight glass
	Filter
	Solenoid Valve
	Safety Valve
	Check Valve
	Shut-off Valve
	Refrigerant Gas Line
	Refrigerant Liquid Line
	Oil way
	Water way
	Throttle plate
	High/Low Pressure Switch
	Electric expansion valve
	Venturi Tube
	Pressure Difference Switch

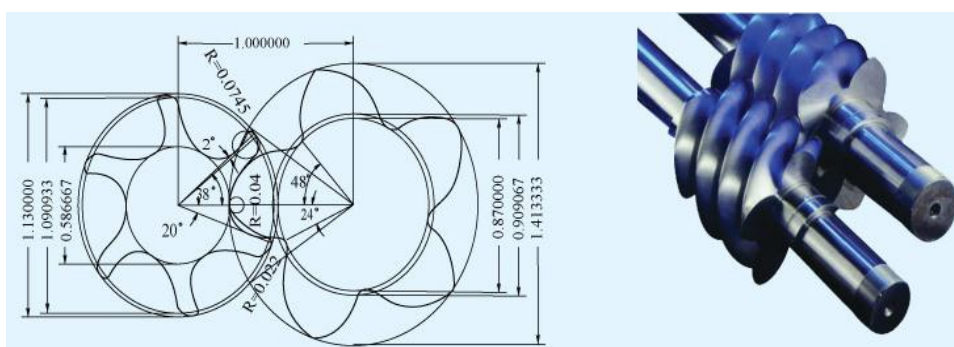


## 6. Major system components

### 6.1 Advanced twin screw compressor



- Midea screw chiller equipped with the 3rd generation industrial compressor that has the latest advanced 5-6 Asymmetry Dentiform Semi-hermetic Screw Rotors. The rotors are processed by high-precision CNC and each part is well-proportioned and none-gap matching, which minimizes the friction resistance and clearance lost, guarantees quiet running and good duration.
- MWSC\_A-FB3 Series units are provided with a high efficiency oil separator to maximize oil extraction.
- Compressors have a infinitely variable control down to 25% of its total capacity. This control is made by means of capacity slides controlled by microprocessors.
- Standard starter is star-delta type. Infinitely capacity control type is available (as option).
- With 5-6 asymmetry dentiform, the screw rotor gained patent by improving the shape of German rotor GHH, proved having good balance, small vibration, and low noise due to balance testing by special machine. Comparing with normal screw rotor with 4-6 dentiform, heat efficiency of the rotor with male and female rotor adopting 5-6 dentiform increase by 10-12% and energy saves by 25%, the rotor also gained British and American patent.



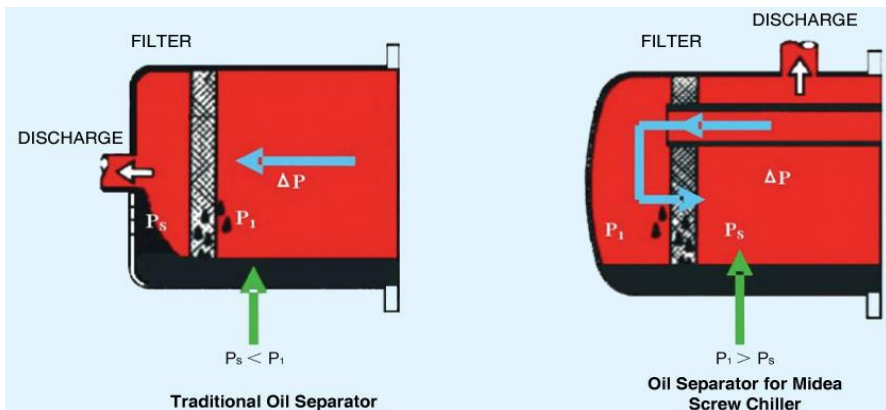
- The bearing of compressor is from SKF, Sweden, the long lifespan of which ensures screw-type main unit to run continuously more than 50,000 hours.





➤ Lubricant:

The lubricant is supplied automatically by pressure difference inside the compressor. It is unnecessary to add an extra lubricant pump.



The compressor is approved for use with the following lubricant:

HBR-B04 for R134a unit

- The Oil Separator comes from MANN of Germany and has reliable qualification. The oil content can be controlled below 3ppm (the oil content treated by oil-gas separator of common like screw-type air compressor is no less than 8-10ppm). The oil-gas separator amount is double of same kind of other products. The large oil filtering area reduces refrigerant flux speed, and has better separating affect and long lifespan by the secondary reflux technology adopted.

➤ Oil filter

The screw compressor has an independent oil filter.

## 6.2 Pressure vessels

### 6.2.1 General

Monitoring during operation, re-qualification, re-testing and re-testing dispensation:

- Follow the regulations on monitoring pressurized equipment.
- It is normally required that the user or operator sets up and maintains a monitoring and maintenance file.
- Follow the control programs.
- If they exist follow local professional recommendations.
- Regularly inspect the condition of the coating (paint) to detect blistering resulting from corrosion. To do this, check a non-insulated section of the container or the rust formation at the insulation joints.
- Regularly check for possible presence of impurities (e.g. silicon grains) in the heat exchange fluids. These impurities maybe the cause of the wear or corrosion by puncture
- Filter the heat exchange fluid check and carry out internal inspections as described in EN 378-2, annex C.
- In case of re-testing please refer to the maximum operating pressure given on the unit nameplate.
- The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.

### 6.2.2 Repair

Any repair or modification, including the replacement of moving parts:

- Must follow local regulations and be made by qualified operators and in accordance with qualified procedures, including changing the heat exchanger tubes.
- Must be made in accordance with the instructions of the original manufacturer. Repair and modification that necessitate permanent assembly (soldering, welding, expanding etc.) must be made using the correct procedures and by qualified operators.
- An indication of any modification or repair must be shown in the monitoring and maintenance file.

### 6.2.3 Corrosion allowances:

Gas side: 0 mm

Heat exchange fluid side: 1 mm for tubular plates in lightly alloyed steels, 0 mm for stainless steel plates or plates with copper-nickel or stainless steel protection.

### 6.2.4 Operating life

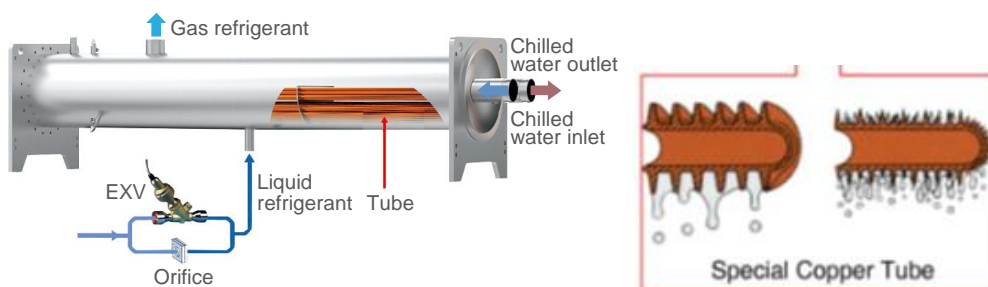
The evaporator and condenser are designed for: prolonged usage of 20 years for high-quality materials.

### 6.2.5 Security

The unit is equipped with safety valves. And ball valve is connecting safety valve to condenser (evaporator). The ball valve maintain full-state, it is closed only when safety valve is opening or replaced.

Ball valve can protect life and property because it can prevent refrigerant from flowing into the air when safety valve is opening or replaced.

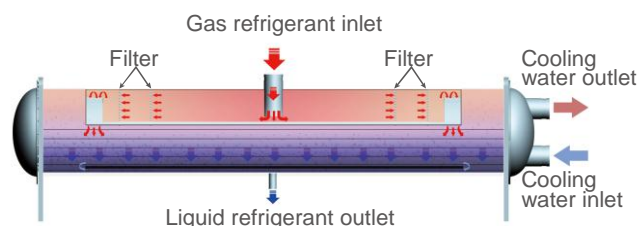
### 6.2.6 Evaporator



Flooded shell and tube evaporator operates with refrigerant in shell and water in tubes. Replaceable water tubes are fabricated from integral finned cooper and mechanically bonded to steel tube sheets. The evaporator is GB151-1999 (Chinese standard) designed, constructed, inspected and stamped. Water side working pressure is designed for 1.0Mpa. Shell and non-connection water head are insulated with 3/4" thick closed cell insulation.

### 6.2.7 Condenser

Shell and tube operates with refrigerant in shell and water in tubes. Replaceable water tubes are fabricated from integral finned cooper and mechanically bonded to steel tube sheets. The condenser is GB151-1999 (Chinese Standard) designed, constructed, inspected and stamped. Water side working pressure is designed for 1.0Mpa.



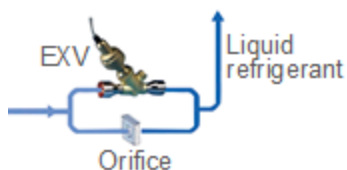
The condenser is used high-efficient tubes to enhance its transfer performance. Meanwhile, the system's COP can be increased largely by adding the subcooler.

### 6.2.8 Oil separator

The oil separator with unique structure separate oil from refrigerant high-efficiently. It is solve the oil recycle problem by ensure oil return to compressor normally.

### 6.2.9 Throttle parts

The unit achieves high-efficiency when full load and part load by parallel connecting orifice and EXV.



## 7. Water flow

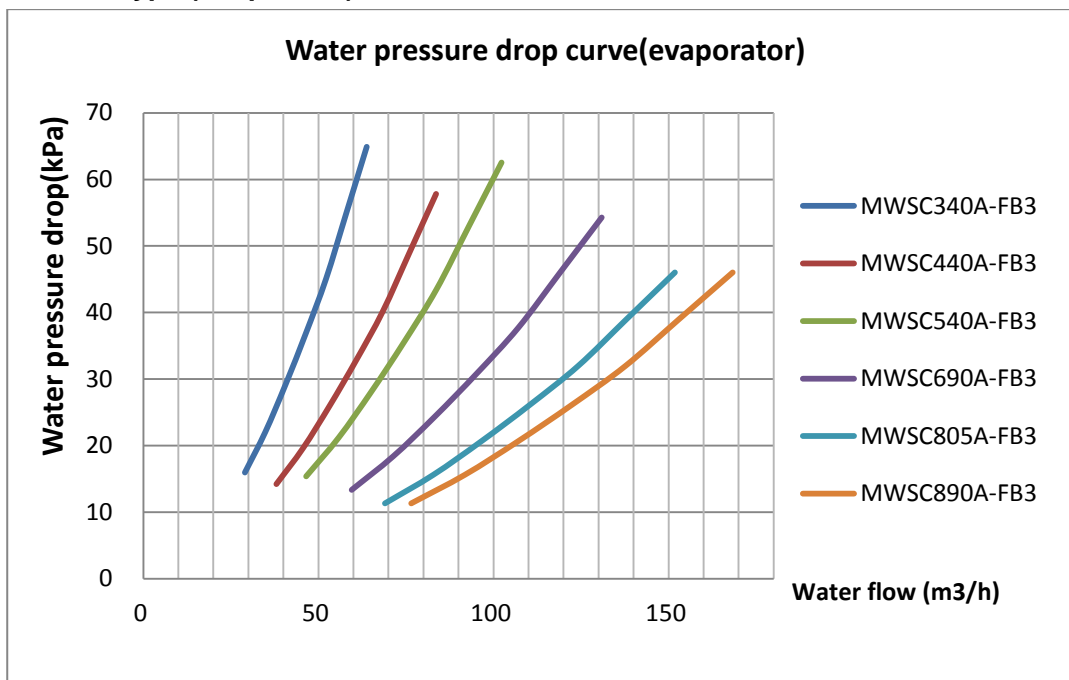
Balance the chilled water flow through the evaporator and the condenser water flow through the condenser. The flow rates must fall between the minimum and maximum values shown in the below table. Flow rates below the minimum values shown will result in laminar flow which will reduce efficiency, cause erratic operation of the electronic expansion valve and could cause low temperature cutouts. On the other hand, flow rates exceeding the maximum values shown can cause erosion on the heat exchanges water connections and tubes, even piping breaking.

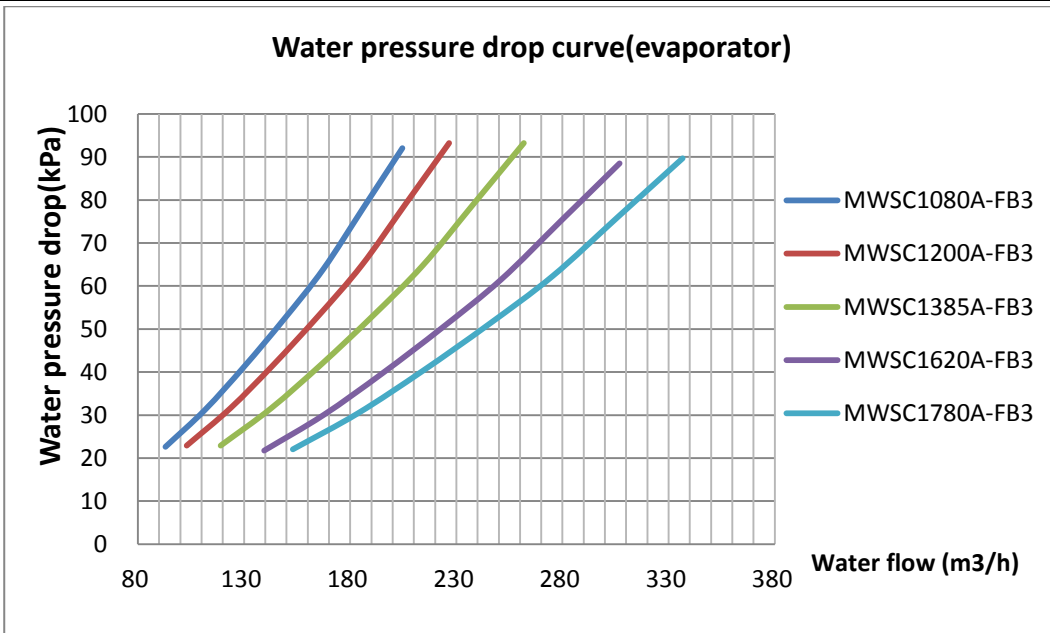
Variable chilled water flow through the heat exchanges while the compressor(s) are operating is not recommended. The chiller control set points are based upon a constant flow and variable temperature.

Model	Evaporator water flow rate m <sup>3</sup> /h			Condenser water flow rate m <sup>3</sup> /h		
	Rated	Minimum	Maximum	Rated	Minimum	Maximum
MWSC340A-FB3	58	29	64	73	37	80
MWSC440A-FB3	76	38	83	95	47	104
MWSC540A-FB3	93	46	102	116	58	128
MWSC690A-FB3	119	59	131	148	74	163
MWSC805A-FB3	138	69	152	173	87	190
MWSC890A-FB3	153	77	168	191	96	210
MWSC1080A-FB3	186	93	204	232	116	255
MWSC1200A-FB3	206	103	227	258	129	284
MWSC1385A-FB3	238	119	262	298	149	328
MWSC1650A-FB3	279	142	312	348	177	390
MWSC1780A-FB3	306	153	337	383	191	421

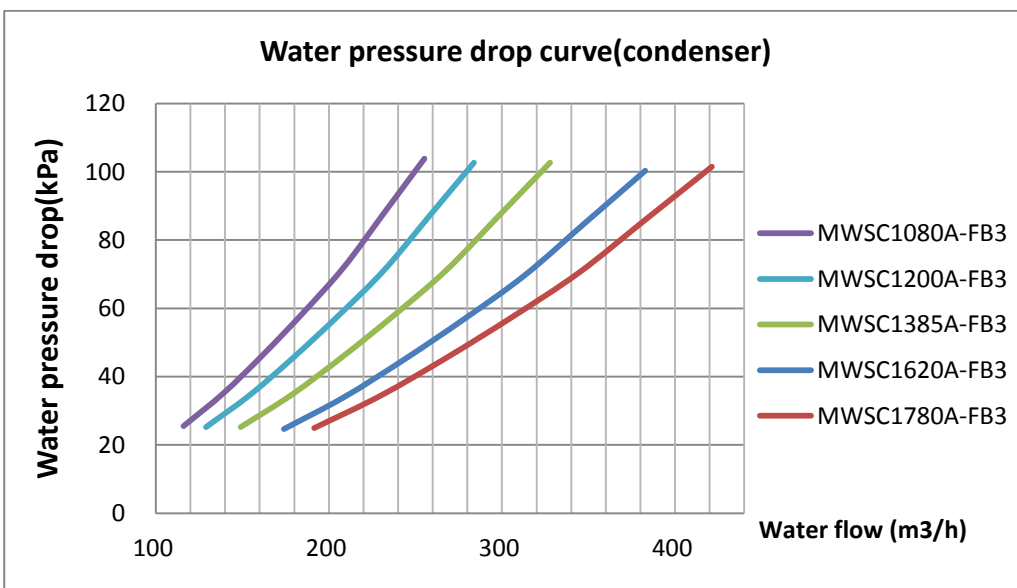
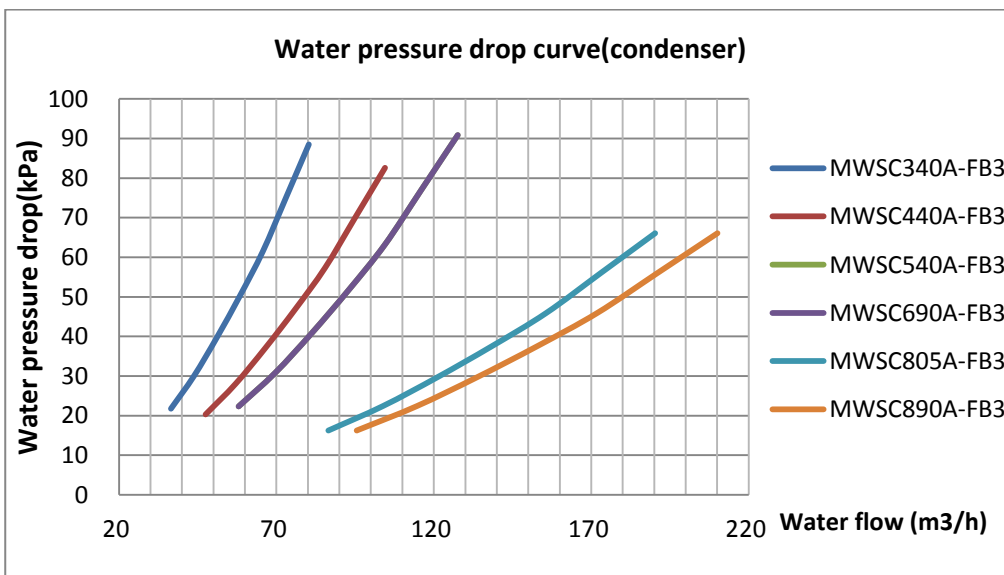
### Pressure drop

#### Flooded type (Evaporator)





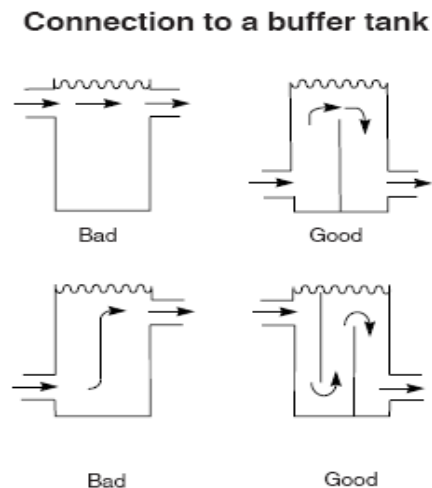
**Flooded type (Condenser)**



### System minimum water volume

Water volume is necessary for stable operation. It is often necessary to add a buffer water tank to the circuit in order to achieve the required volume. The tank must itself be internally baffled in order to ensure proper mixing of the liquid (water or brine). Water tank volume is large than 1 / 10 whole system water volume at least.

Refer to the examples below.



How to calculate minimum volume in pipeline system:

$$W = Q_g T / CP \Delta t$$

W — Minimum water volume (kg) ;

Q<sub>g</sub> — Total cooling/heating capacity of the terminal (kW) ;

T — Thermal stability time requirement, Take (8~10) ×60s;

CP — Water specific heat at constant pressure, 4.187kj/ (kg·°C) ;

Δt — Water temperature fluctuation required value, take 5°C.

For system, Q<sub>g</sub> is calculated according to the lowest load so that it operates steadily.

It can also calculated according to 0.5Q(50%). T takes 8 minutes, the shortest time that the unit running.

That is 480s. Cp=4.18kj/kg, Δt =5°C

According to the above formula, the result is as following:

$$W = 0.5Q * 480 / (4.18 * 5) = 11.48Q \text{ kg}$$

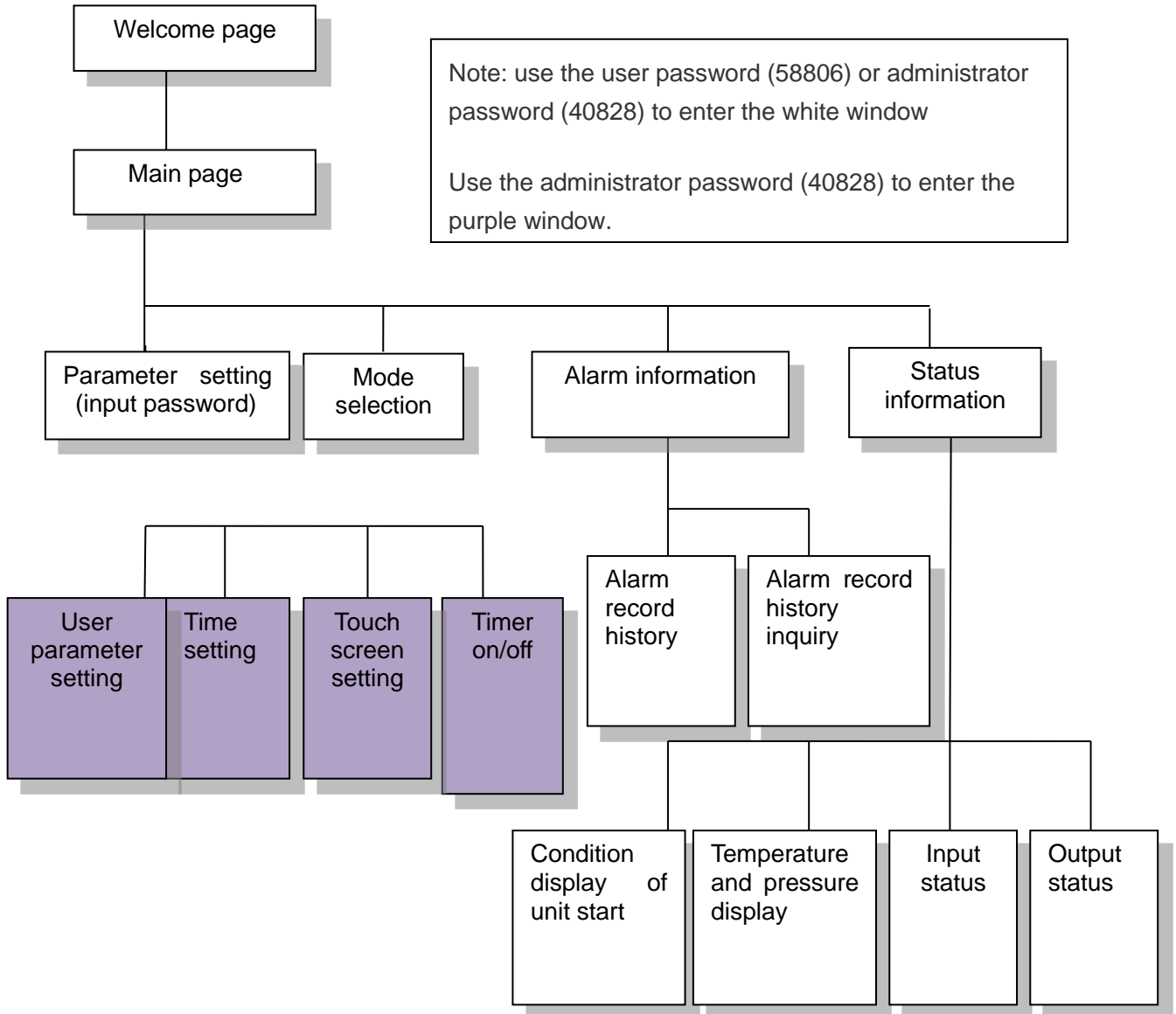
**Note:**

The above formula is only for reference, different factor should be adopted to suit for different condition.

PID: proportional gain	80	
PID: integration time	40	
PID: derivation time	1.5	
Minimum number of valve steps	350	
Maximum number of valve steps	3810	
Number of steps for valve closing	3970	
Valve rate	250	
LowSH protection: threshold	1	
LowSH protection: integration time	2.5	
LOP protection: threshold	-50	
LOP protection: integration time	4	
MOP protection: threshold	50	
MOP protection: integration time	10	
Low overheat degree alarm delay (LowSH, 0 = no alarm)	300	
Low evaporation temperature alarm delay (LOP, 0 = no alarm)	300	
High evaporation temperature alarm delay (MOP, 0 = no alarm)	600	
Low air suction temperature alarm threshold	-50	
Low air suction temperature alarm delay (0 = no alarm)	300	

## 6. Operation part

### 6.1 Unit operation flow chart





## 6.2 Operation part

The control system adopts touch screen, and all the operation is done on the screen directly. Take the unit with dual compressors and step control as example, the actual display of different product may have a little difference, but basically the operation is the same.

➤ Welcome page

The first welcome page as the figure 6.1

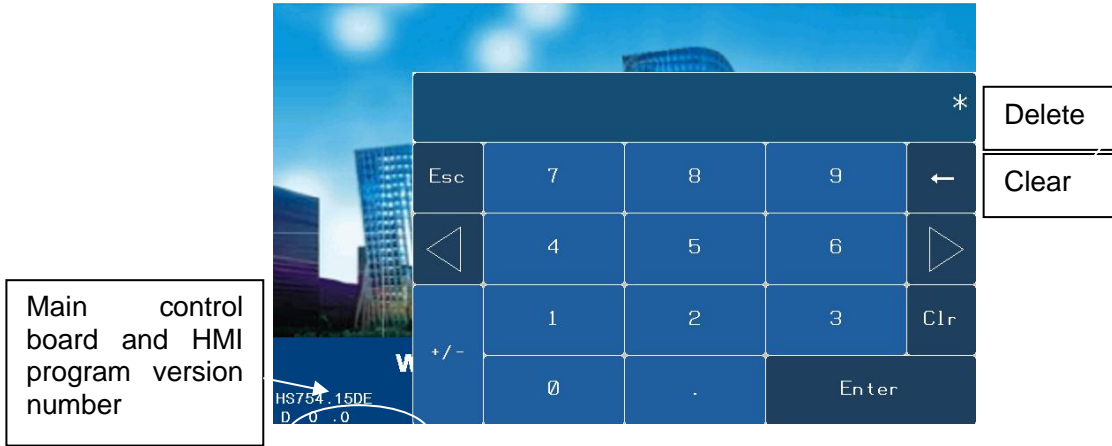


Figure 6.1

When press Enter button, password keyboard will appear. User input 58806/40828 and press Enter button to enter the main page.

Indicators explanation on the right are as following:

Yellow indicator is the power indicator. It keeps lighting under normal condition, if it is not light, please check if the power supply wiring is correct.

Green indicator is the touch screen operation indicator, under normal condition it flashes with low frequency.

Red indicator is communication indicator, under normal condition it flashes with high frequency, if not, please check if the communication wire connected with the main control board is connected properly and tightly.

➤ Main page

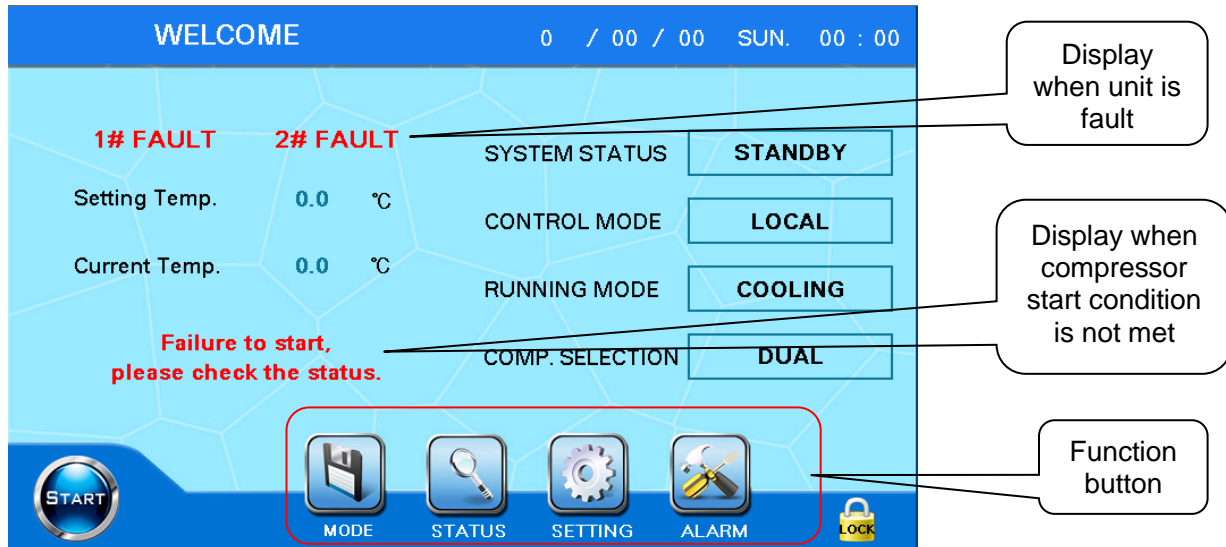


Figure 6.2

The main page displays the current status, control mode and operating mode of the unit.

Press **LOCK** button at the bottom right of the screen, and machine enters the initial screen, user needs to input password again to enter.

**Refers to the below table for the current status displaying and explanation of the unit::**

Standby	Machine is not operating, it can start normally.
Malfunction	Machine has malfunction and it cannot start. Please check from malfunction query page and confirm if the malfunction has been solved.
Operating	Machine is operating normally
Starting	Machine starts to normal operation
Shutting down	Unload, stop the compressor and stop the water pump are the necessary process during shutting down. If the minimum running time is not reached, it needs to wait until the minimum running time has been reached. Please inspect in the first page of status information if the minimum running time is satisfied. The shutting down process will be continued when minimum running time is satisfied.
Pause	<p>The compressor startup conditions are not satisfied. The compressor startup condition includes:</p> <ol style="list-style-type: none"> <li>1. Water temperature is not satisfy with compressor startup condition;</li> <li>2. Water temperature needs to be higher than compressor startup temperature in cooling mode, Water temperature needs to be lower than compressor startup temperature in heating mode, this temperature can be modified in the parameter settings page;</li> <li>3. Oil temperature of compressor is not satisfy with startup condition;</li> <li>4. The pausing time is too short, and it is not meet the requirements of the compressor starts intervals;</li> </ol> <p>The above information can be check in the first page of status information. The unit starts automatically when startup conditions are satisfied.</p>

1) Mode setting

Press **MODE** button and mode settings window will be pop-up, as shown in the below:

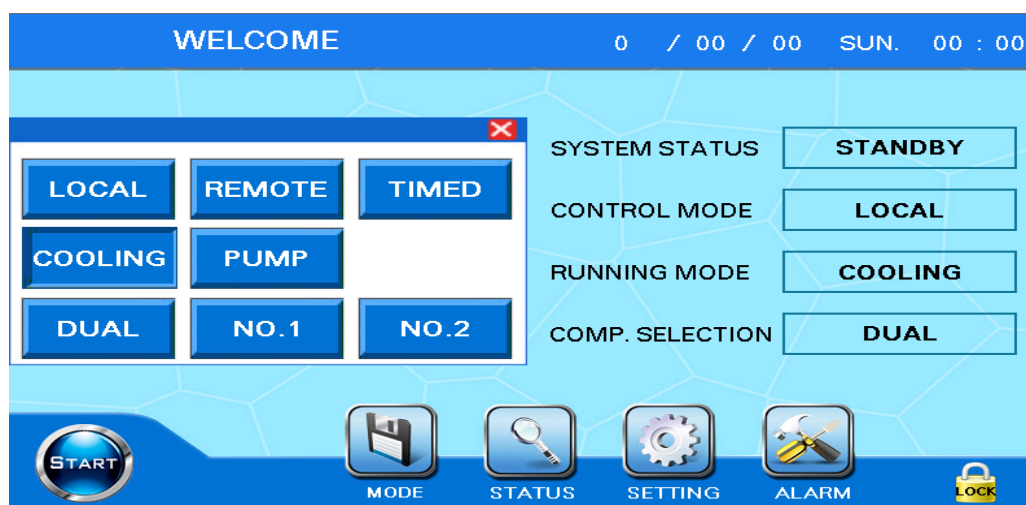


Figure 6.3

Set control mode(Local, remote, timer),operating mode(cooling, heating, pumping) and single or dual compressor(dual stage, 1#, 2#) in the pop-up window. After setting is finished, click the pop-up window

"X" at the top right to close the pop-up window.

- ① Only control mode can be switched during operating, other mode selection is invalid.
- ② The control mode is used as on/off mode choice. "Local" control mode can only be realized through the touch screen "on / off" button; "Remote" control mode can only be realized through the "remote start / remote stop" hardware interface; "the timer control mode", it can be only realized by setting the timer.
- ③ Heating mode is only available for the heat pump unit.

Note: under the "local" control mode, remote control and timer control are invalid; under the "remote" control mode, local control and timer control are invalid; under the "timed" control mode, local control and remote control are invalid.

## 2 ) Startup operation

It needs to confirm below before startup:

- ① Mode setting is correct. Operation mode (cooling, heating, pumping) and single/dual compressor ( dual stages、 1#、 2# ) cannot be set after startup.
- ② Current status of machine is standby, it cannot startup under malfunction status.
- ③ Please confirm if the oil heating is complete. If not, machine may stay in a pause state for a long time and compressor cannot start.

Press "start" button at bottom left of screen, pop-up window will appear. If confirm startup, please press "confirm"; if not, please click the pop-up window "X" at the top right to cancel startup.

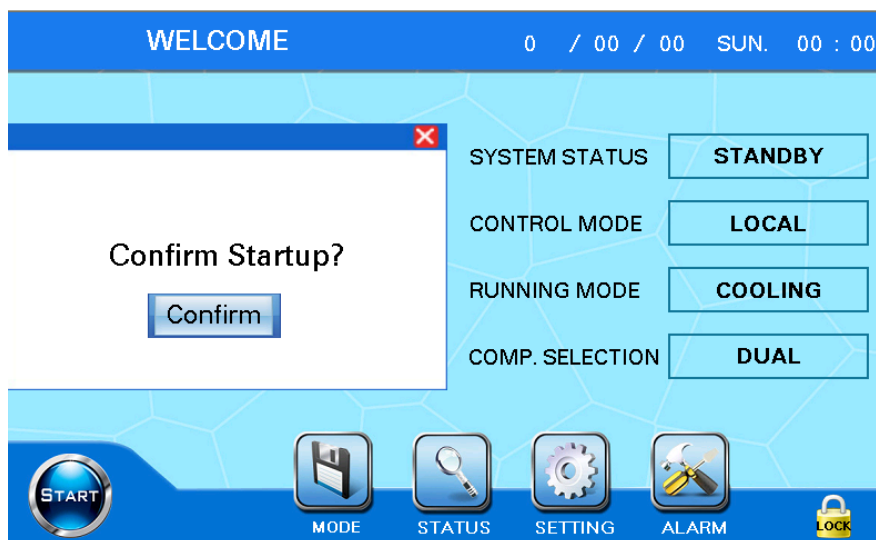


Figure 6.4

If the startup conditions are not satisfied, press "Start" button will display the prompt at the top of the pop-up boot window, it shows that "compressor start conditions are not met, please check status information". The compressor startup conditions include: temperature of oil temperature sensor, interval time of restart, startup temperature of compressor and so on. The startup can be confirmed right now, but unit will start until the compressor startup conditions are met, otherwise the main page will keep displaying that "compressor start conditions are not met, please check status information" . Please refers to the detailed explanation in the "4" for explanation of status information.

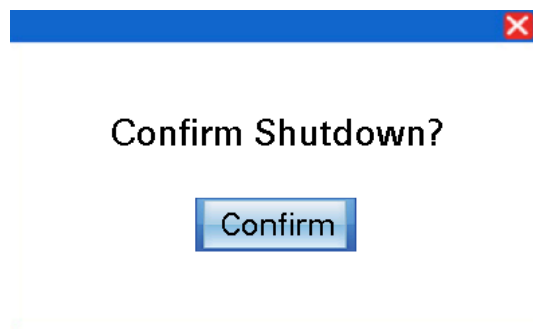
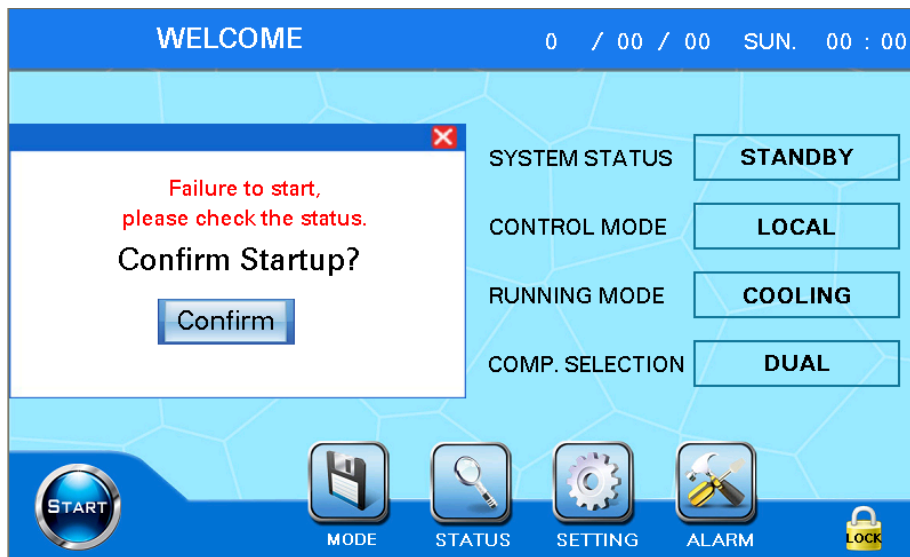


Figure 6.5

Startup operation: Press “startup” is not valid if unit is in malfunction state.

Press **START** button, and confirm in the pop-up window for startup, then unit can start.

If the compressor startup conditions are not satisfied, the unit goes into a pause state after running the water pump. The interface display "compressor start conditions are not satisfied, please check state information".

Shutdown operation:

Press the **STOP** button, pop-up window for shutdown confirmation will display. Press **Confirm** button, then unit status display "stop". After the unit is satisfied with the stop condition, it will carry out the shutdown process.

Standby status: machine is powered on, it will display “standby status” normally.

- ① Unit operation: the start-up of the unit is finished.
- ② Pause state: Control water temperature to be lower than water temperature of paused state. The unit enters “pause state” and compressor stops operating. Control water temperature to be higher than water temperature of compressor starting, compressor starts and enters “operating state”.
- ③ Shutting down : the unit enters “shutting down” state when carry out operation of shutdown to the unit. After shutdown is finished, unit enters “standby state”.
- ④ Unit protection : when the unit appears fault alarm, it enters “unit protection” state, and on the top of the screen will inform user which unit has malfunction.

Note:

Cooling mode: water temperature of paused state = setting chilled water temperature- temperature control range. When unit is in paused state, if temperature controlling is higher than compressor starting

temperature, compressor starts.

Heating mode: water temperature of paused state= setting chilled water temperature+ temperature control range. When unit is in paused state, if temperature controlling is lower than compressor starting temperature, compressor starts.

➤ Status information- operation query

Press **status** in the figure 6.5 and enter figure 6.6.

STATUS				
1#Comp. Running	0	H	1# Times for Comp.Start	0
2#Comp. Running	0	H	2# Times for Comp.Start	0
Pump Running	0	H		
1#ALARM	YES		1#Load State	0 %
2#ALARM	YES		2#Load State	0 %
1#Restart Delaying	YES		1#Load Limited	NO
2#Restart Delaying	YES		2#Load Limited	NO
1#Min. Running Time Elapsed	NO			
2#Min. Running Time Elapsed	NO			
Water Temp. Allow Compressor Start	NO			
STATUS	TEMP./PRES.	INPUT	OUTPUT	MAIN

Displaying of unit without oil temperature sensor

STATUS				
1#Comp. Running	0	H	1# Times for Comp.Start	0
2#Comp. Running	0	H	2# Times for Comp.Start	0
Pump Running	0	H		
1#ALARM	YES		1#Load State	0 %
2#ALARM	YES		2#Load State	0 %
1#Restart Delaying	YES		1#Load Limited	NO
2#Restart Delaying	YES		2#Load Limited	NO
1#Min. Running Time Elapsed	NO		1#Oil Temp. Allow Compressor Start	NO
2#Min. Running Time Elapsed	NO		2#Oil Temp. Allow Compressor Start	NO
Water Temp. Allow Compressor Start	NO			
STATUS	TEMP./PRES.	INPUT	OUTPUT	MAIN

displaying of unit with oil temperature sensor

Figure 6.6

Displaying contents of status information including the following:

- ① Display refrigerant type of the unit;
- ② Display operating time of compressor and water pump;
- ③ Display times that compressor starts;
- ④ You can check which state the unit operates in ( 25%、 50%、 75%、 100% ) ;
- ⑤ Display if unit has been set with a limit of maximum load;
- ⑥ Display if unit gives an alarm, and which unit head gives the alarm exactly;
- ⑦ Display if the compressor oil heating is finished. If compressor starts, It need to be satisfied that oil heating time is ' 0 'or oil temperature is satisfy with compressor start" is ' Y E S ';

- ⑧ Display if the starting temperature is satisfied, when compressor starts, it need to be satisfied that water temperature is satisfied with “compressor start” is ‘Y E S’;
- ⑨ Display if the delay restart is satisfy, when compressor starts, it need to be satisfied that “delay restart” is ‘N O’;
- ⑩ Display if the minimum operation time is satisfy, when compressor stops, it need to be satisfy that “Min. Running Time Elapsed” is ‘Y E S’.

Note: when the compressor has oil temperature sensor, it displays that the oil temperature is satisfied with compressor start. When it has no oil temperature sensor, it displays the remaining time of oil heating. It depends on the unit

It displays the refrigerant type on the top left of the screen.

To start the unit must meet the following conditions:

- ① “Delaying Restart” need to be “NO”, if it is “YES”, the delay time to start the unit is not reached.
- ② “Water Temperature Allow Compressor Start” need to be “YES”, if it is “NO”, that means the current water temperature is not satisfied with the startup condition of compressor.
- ③ “Oil Temp. Allow Compressor Start” need to be “YES”, if it is “NO”, that means the current oil temperature is not satisfy with the startup condition of compressor.

Shutdown must meet the following conditions:

“Min. Running Time Elapsed” need to be “YES”, if it is “NO”, the delay time of shutdown is not reached.

1) Status information- display of temperature and pressure

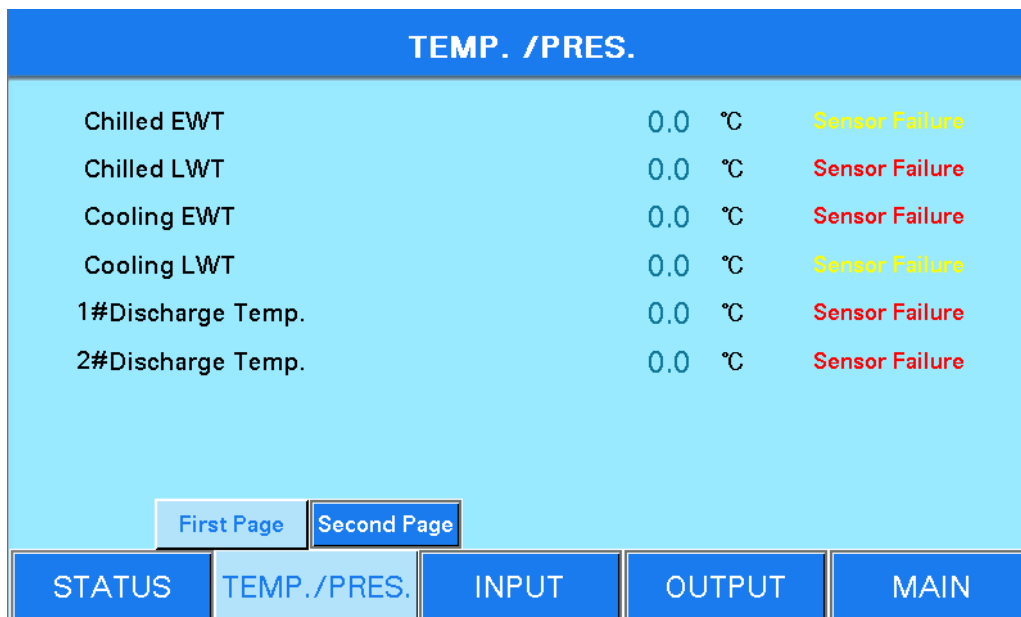


Figure 6.7

2) Status information-input status:

Input status page: “ON” represents the input point is closed, OFF represents the input point break. “Compressor overload protection switch”, when the machine is overload, “compressor overload protection switch” input state switches to “ON” and unit enters fault protection state. Normal state of compressor overload protection switch is “OFF”, and normal state of rest protections is “ON”.

INPUT			
Remote Start	ON	Chilled Water Switch	ON
Remote Stop	ON	Cooling Water Switch	ON
1#High Pres. Switch	ON	2#High Pres. Switch	ON
1#Low Pres. Switch	ON	2#Low Pres. Switch	ON
1#Motor Prot. Switch	ON	2#Motor Prot. Switch	ON
1#Oil Level Switch	ON	2#Oil Level Switch	ON
1#Contactor Prot.	ON	2#Contactor Prot.	ON
1#Comp. Overload Prot. Switch	ON	2#Comp. Overload Prot. Switch	ON
Power Prot. Switch	ON		

STATUS
TEMP./PRES.
INPUT
OUTPUT
MAIN

Figure 6.8 (Remark: subject to the actual principle diagrams)

- ① “Remote start/stop”, it displays the status of remote start or remote stop. User needs to install the point contact type control switch.
- ② “Chilling/Chilled water flow switch”, it outputs is OFF if water don’t flow, on the contrary, it outputs ON.
- ③ “Contactor protection”, the output switches from OFF to ON when the compressor operates and contactor has action.

3) Status information-output status

Output status page: ON represents the output point is powered on, OFF represents the input point is powered off.

When the unit is in a shutdown state, all state display is OFF. According to the startup / shutdown command, the relative switch action is activated.

OUTPUT			
Chilled Water Pump	OFF	Cooling Water Pump	OFF
1#Running	OFF	2#Running	OFF
1#ALARM	OFF	2#ALARM	OFF
1#Compressor	OFF	2#Compressor	OFF
1#25%SOL. Val.	OFF	2#25%SOL. Val.	OFF
1#50%SOL. Val.	OFF	2#50%SOL. Val.	OFF
1#75%SOL. Val.	OFF	2#75%SOL. Val.	OFF
1#Oil Return SOL. Val.	OFF	2#Oil Return SOL. Val.	OFF
Cooling Tower Fan	OFF		

STATUS
TEMP./PRES.
INPUT
OUTPUT
MAIN

Figure 6.9 (Remark: subject to the actual principle diagrams)

➤ User parameter setting- password interface

Press Parameter setting in the main page, then password input interface appears. Input the password ( 40828 ) and enter the user parameter setting interface. Password input interface is shown as figure 6.10.

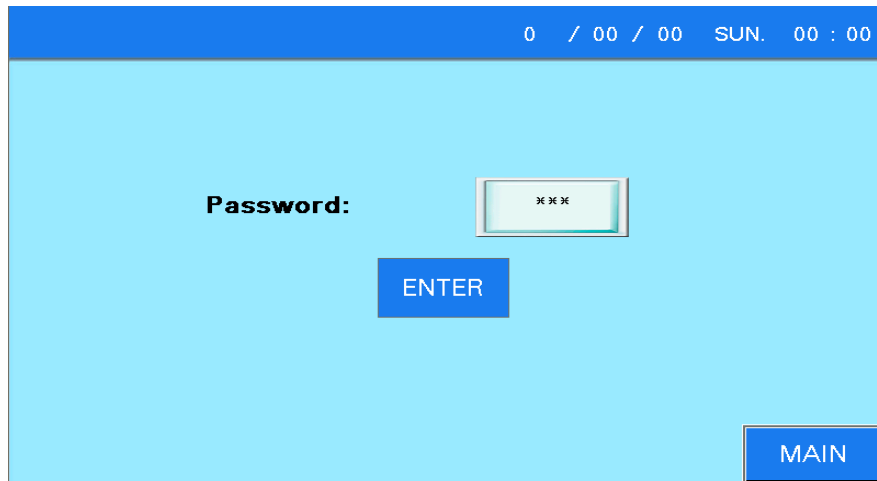


Figure 6.10

Dialog box like figure 6.11 appears if user inputs wrong password. Press **Confirm** button and go back to the input interface, then input password again.

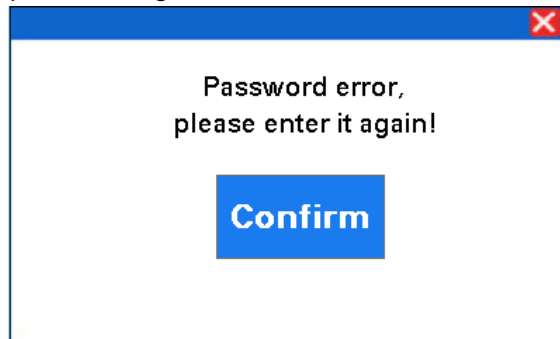
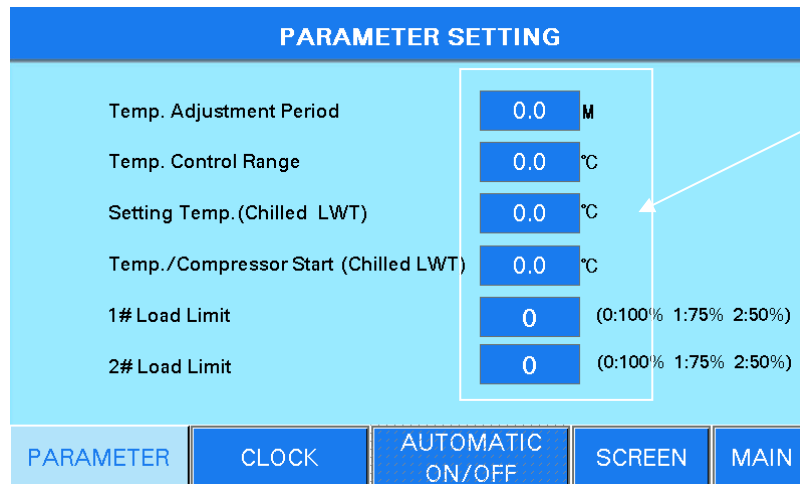


Figure 6.11

➤ User parameter setting-temperature setting

Input the password ( 40828 ) and enter the page as figure 6.12 as below:



Manual input is possible

Figure 6.12

“MAX” at the top left of setting window is upper limit of parameter setting, and “MIN” is lower limit of parameter setting (out of range is not accepted). Press **Enter** button to confirm input. Press **CLR** button to cancel input, then the keyboard for number input disappears.

Noun explanation



① The temperature adjustment cycle :it represents each execution cycle of the judgment of load or unload. If it is set to be 60S, that means every 60 seconds system judges the unit temperature and check if it needs to load or unload. If it is necessary, system will execute it immediately. After 60 seconds, system judges it again, and repeats the process like this;

② Temperature control range: it means the precision of temperature control, for example, the factory setting is 2℃,if temperature is within ±0.5℃ of control temperature, the unit does not execute the loading/unloading action;

③ The target value of temperature control: it represents the target value of water temperature control;

④ Temperature of compressor startup: it represents the control water temperature need to meet one condition when compressor starts;

⑤ In cooling mode, when control water temperature is higher than startup temperature, the compressor can start; in heating mode, when control water temperature is lower than startup temperature, the compressor can start;

⑥ Limit of load: the maximum load of unit can be set. 0-without limit of maximum load, 1- maximum load is up to 75%, 2- maximum load is up to 50%.

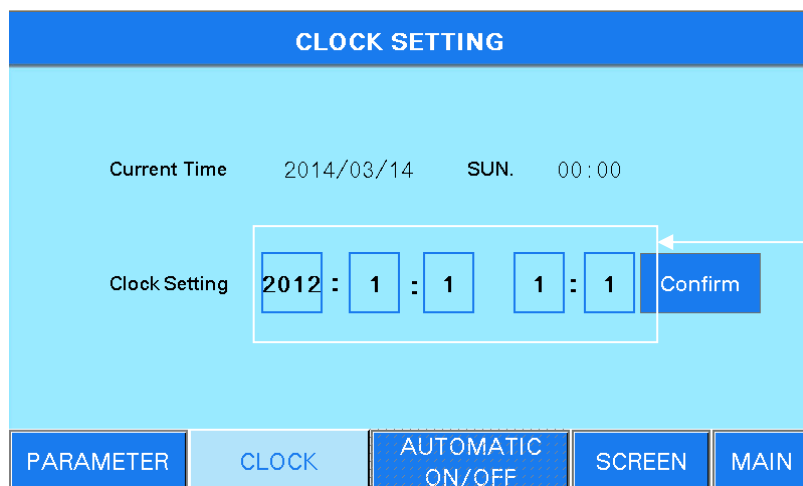
**Timer setting of startup or shutdown** Only when control mode is “timer”, it will display.

1)User parameter setting-mode selection

Press **Clock** and enter the clock setting page as figure 6.13.

Click the setting numerical keyboard, then the input numerical keyboard appears. Input the clock and press “ENT” to save the setting. “CLR” represents the input is canceled.

Press **Confirm** button after setting finish, check if the setting clock is the same with the current time. If it is different, press **Confirm** again.



Manual input is possible

Figure 6.13

Note: when setting date and clock, please note the non-existent date and clock cannot be set, otherwise we are not responsible for any consequences.

2) User parameter setting-touch screen setting

User setting- press **touch screen setting** in the mode setting interface, then the following figure 6.14 will

appear.

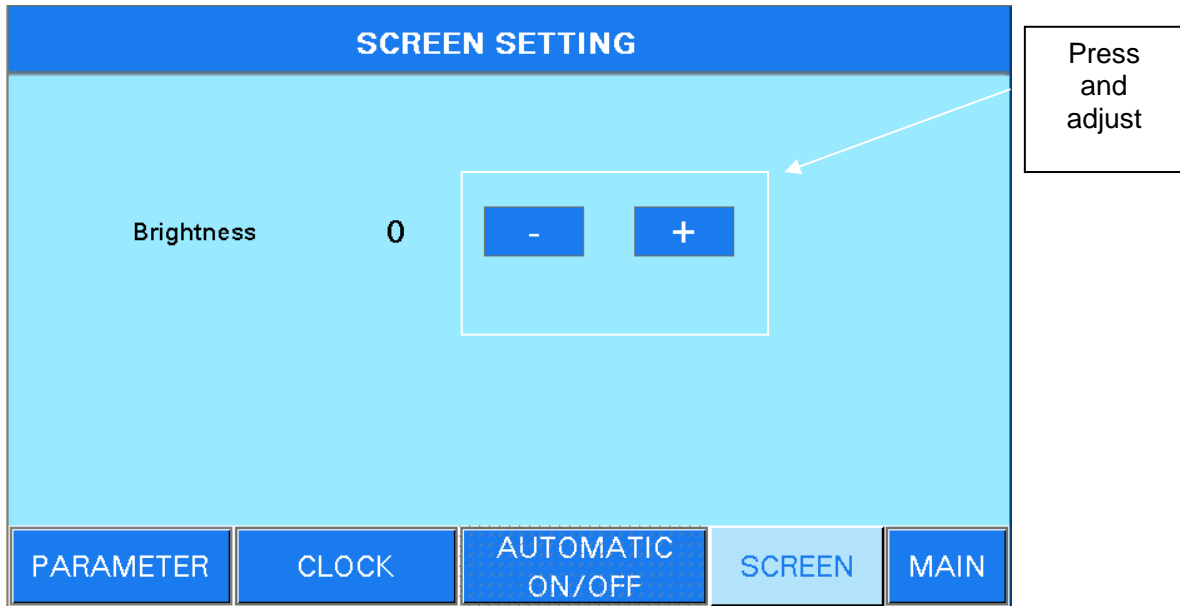


Figure 6.14

3) User parameter setting- Automatic On/Off

If user wants to use timer function of start or shutdown, it needs to choose "timer" in control mode of the figure 2 and enters user setting. Press **AUTOMATIC ON/OFF** and enter figure 6.15 as below:

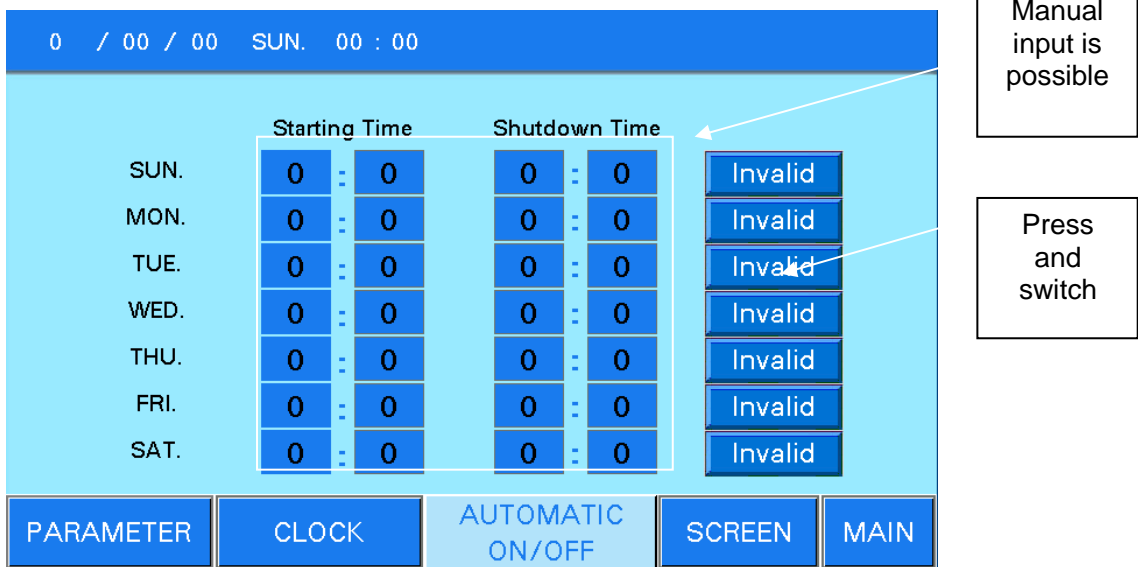


Figure 6.15

Timer of starting and shutdown in one week can be set, and unit will start or shutdown according to the timer setting. If the unit needs to continue running for a period, for example: start from Tuesday 10:00 and shutdown at 16:00 Thursday, user can set as 10:00 and switch the button from **Invalid** to **Valid** in the timer starting setting of Tuesday, then set as 16:00 and switch the button from **Invalid** to **Valid** in the timer shutdown setting of Thursday, rest timer buttons are set as **Invalid**.

Please check the system time when using timer function because the timer starting and shutdown is according to the system time.



## V. Installation

### Safety considerations

Access to the unit must be reserved to authorized personnel, qualified and trained in monitoring and maintenance. The access limitation device must be installed by the customer.

After the unit has been received, when it is ready to be installed or reinstalled, and before it is started up, it must be inspected for damage. Check that the refrigerant circuit(s) is (are) intact, especially that no components or pipes have shifted. If in doubt, carry out a leak tightness check and verify with the manufacturer that the circuit integrity has not been impaired. If damage is detected upon receipt, immediately file a claim with the shipping company.

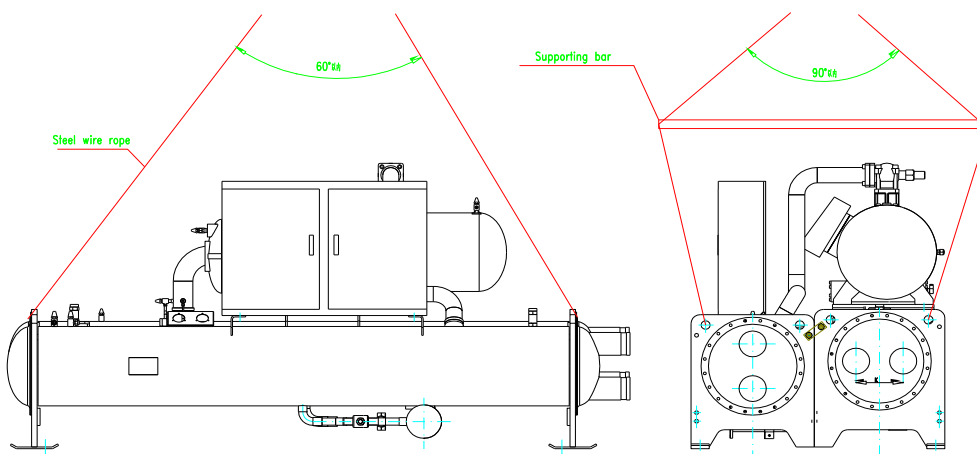
Strongly recommend employing a specialized company to unload the machine.

Safety is only guaranteed, if these instructions are carefully followed. If this is not the case, there is a risk of material deterioration and injuries to personnel.

### 1. Unit installation

#### 1).Lifting

- ① When transporting the unit, please make sure there is no any collision happens between the unit and other objects.
- ② Move the unit by placing a roller in the bottom of the unit to avoid damage.
- ③ Choose a suitable crane according to the unit's weight (Buy an insurance for it if it is convenient) ; Hoist the unit according to the following chart strictly. The steel rope shall wind the lifting hook one circle to prevent steel rope slipping and causing danger when the weight is unbalanced. Security guard circle should be set up when hoist the unit, and also abide by the local Safety Regulations when hoist the unit. Prohibit non-staff entering the job site or staying under the unit or the hoisting crane.

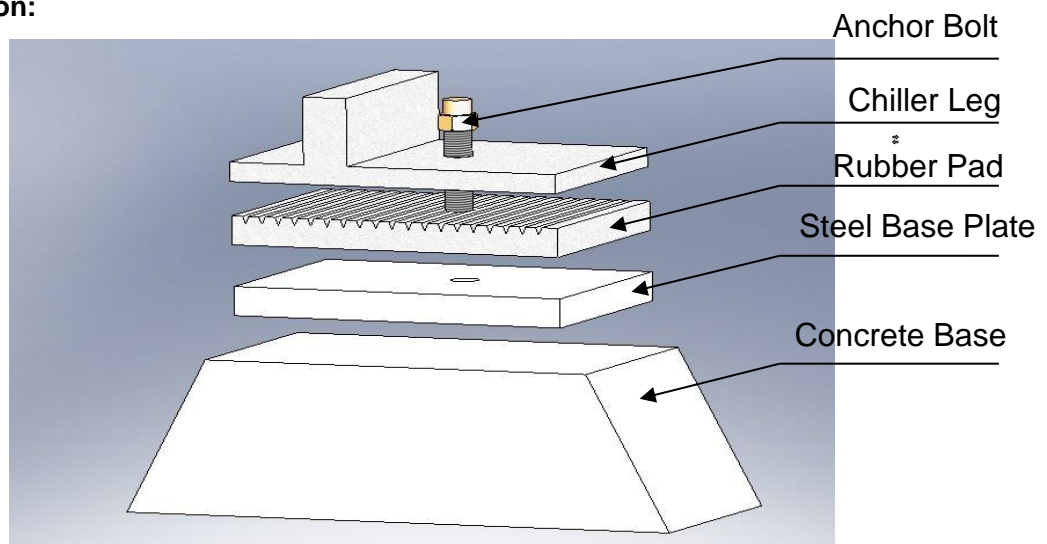


Any person is not allowed to stand below the unit when sling it.

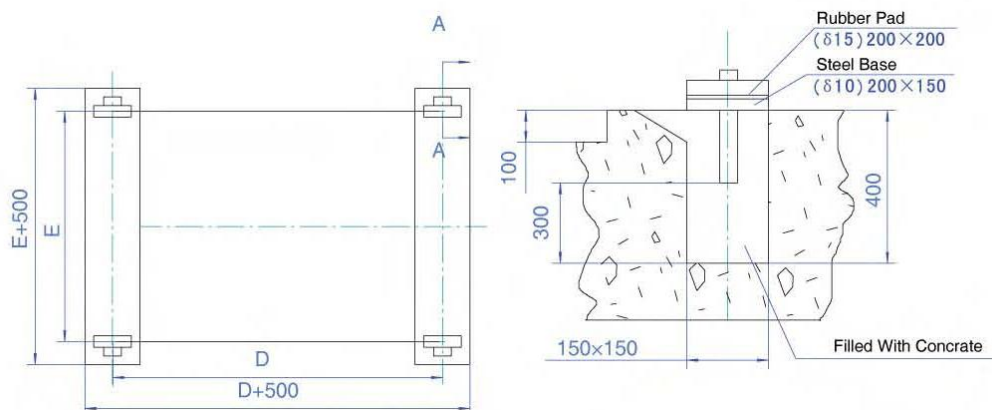
## 2) Foundation

- ① Please take into account the construction of installation foundation. Attention should be especially paid to the intensity of the floor and noise elimination when installing the unit in interlayer or on the top floor. It is suggested to consult the building designer before installation.
- ② For convenient drainage, gutter way should be made around the basement to ensure the drainage unblocked.
- ③ To eliminate the vibration and noise, put an absorber between the unit and basement and keep the unit in balance. Install a shockproof foundation when necessary.
- ④ Vibration isolators are recommended for all roof mounted installations or wherever vibration transmission is a consideration. Neoprene Isolation is optional, it is recommended for normal installations and provides good performance in most applications for the least cost. Spring isolator is level adjustable, spring and cage type isolators for mounting under the unit base rails. 1" nominal deflection may vary slightly by application.

### Typical Isolation:



### Foundation Dimensions

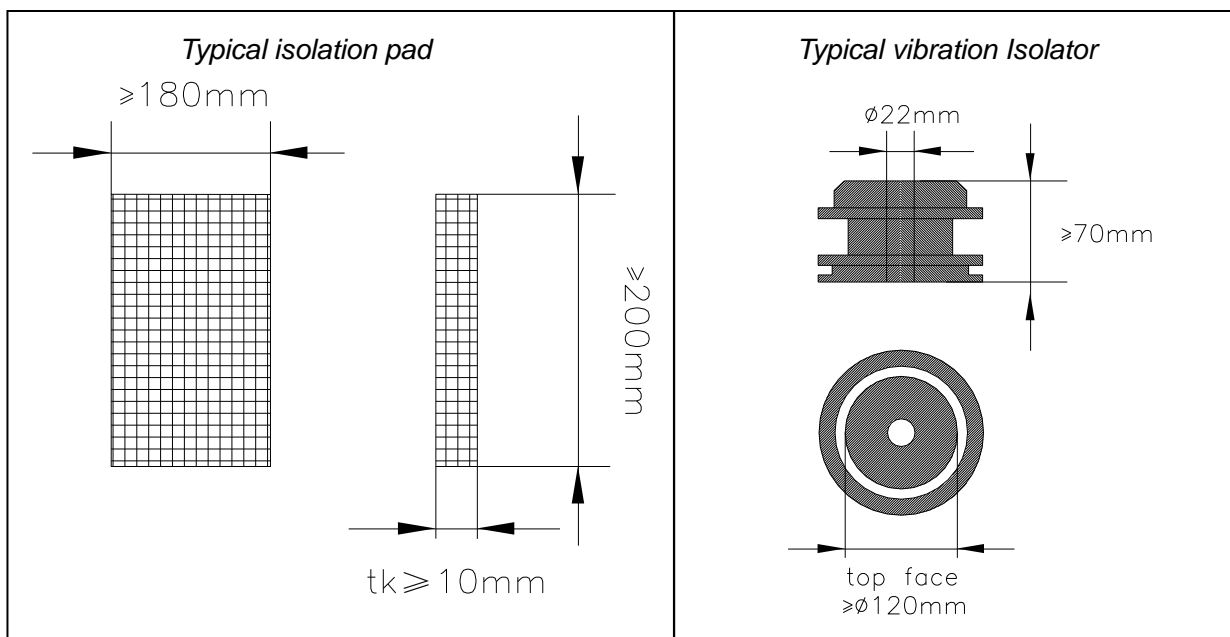


**Foundation Bolt Installation Dimension Table**

Model Dimension	MWSC***A-FB3										
	340	440	540	690	805	890	1080	1200	1385	1620	1780
D(mm)	2850	2850	2850	2850	2850	2850	3850	3850	3850	3850	3850
E(mm)	1100	1100	1100	1300	1300	1300	1400	1400	1400	1500	1500

**3) Vibration isolators**

Put the absorbers under unit saddles before final positioned the unit. The quantity of absorber used for each unit is always decided by the elasticity or durometer value of the absorber. Below please refer to the typical isolation pad and vibration isolator for selection.



Expected load bearing value listed below:

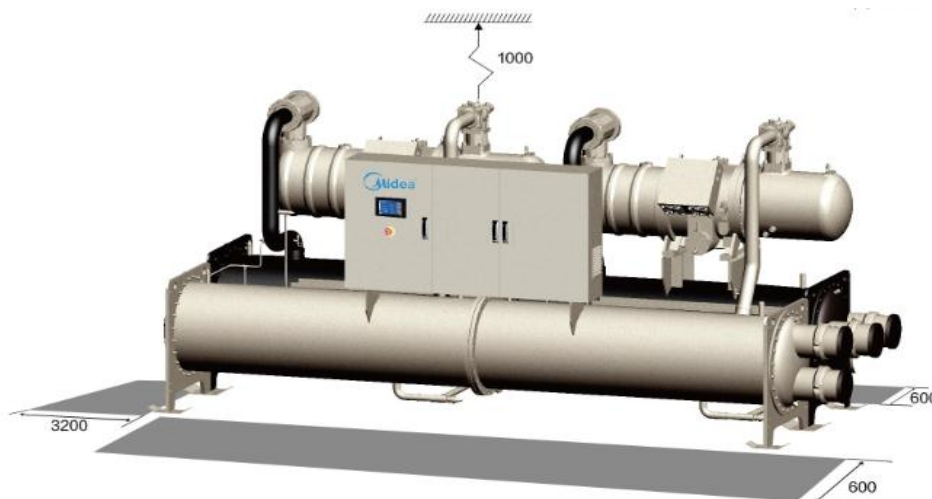
Model	Isolation pad		Vibration Isolator		Running weight(kg)
	Minimum load bearing (kg/EA)	Minimum Quantity	Minimum load bearing (kg/EA)	Quantity	
MWSC340A-FB3	900	4	900	4	2700
MWSC440A-FB3	1000	4	1000	4	2820
MWSC540A-FB3	1200	4	1200	4	3220
MWSC690A-FB3	1400	4	1400	4	3870
MWSC805A-FB3	1800	4	1800	4	4420
MWSC890A-FB3	1800	4	1800	4	4550
MWSC1080A-FB3	2000	4	2000	4	7250
MWSC1200A-FB3	2200	4	2200	4	7490
MWSC1385A-FB3	2200	4	2200	4	7820
MWSC1620A-FB3	2200	4	2200	4	9200
MWSC1780A-FB3	2200	4	2200	4	9350

Note:

- (1) Pads have to extend the full length of the saddle when isolation pad be used.
- (2) Level the unit to within 5mm over through it's length and width after absorbers installed.

**4).Spaces**

- ① Leave enough space above and around unit for operation and maintenance. For cleaning the copper pipes or exchanging pipes, there should be enough space reserved( for single compressor unit, it should be at least 3.5m, for dual compressor unit, it should be 5m), and the other end of the unit should have at least 2.0m space, use the hole on door or other holes with appropriate position; there should have the space of 0.7m in front of the unit (the side faces to the electric cabinet ) for operation; the space in front and back of the unit should not less than 0.6m .
- ② Do not install the unit at the place exposed to sunlight or other heat sources.
- ③ Near the power supply where it is convenient for wiring.
- ④ The floor is solid enough and the location should not easily bring about resonance or noise.
- ⑤ Put the unit indoors which should be well-ventilated with low humidity and little dust.



**2. Water pipeline system installation**

**1) Water quality control**

When industrial water is used as chilled water, little furring may occur; however, well water or river water, used as chilled water, may cause much sediment, such as furring, sand, and so on. Therefore, well water or river water must be filtered and softened in softening water equipment before flowing into chilled water system. If sand and clay settle in the evaporator, circulation of chilled water may be blocked, and thus leading to freezing accidents; if hardness of chilled water is too high, furring may occur easily, and the devices may be corroded. Therefore, the quality of chilled water should be analyzed before being used, such as PH value, conductivity, concentration of chloride ion, concentration of sulfide ion, and so on.

**※ Applicable standard of water quality for the unit**

PH value	Total hardness	Conductivity	Sulfide ion	Chloride ion	Ammonia ion	Sulfate ion	Silicon	Iron content	Sodium ion	Calcium ion
7~8.5	<50ppm	<20μV/cm(25°C)	No	<50ppm	No	<50ppm	<30ppm	<0.3ppm	No requirement	<50ppm

**2). Performance adjustment factors**

**Ethylene and Propylene Glycol Factors**

A glycol solution is required when the unit with condition as mentioned. The use of glycol will reduce the performance of the unit depending on concentration.

**Ethylene Glycol**

Ethylene glycol	Evaporator side					
	Quality of glycol (%)	Cooling capacity modification	Power modification	Water flow modification	Water resistance	Freezing point °C
	30	0.972	0.99	1.013	1.215	-16
	35	0.971	0.984	1.04	1.267	
	40	0.965	0.977	1.074	1.325	-23
	45	0.96	0.967	1.121	1.389	
	50	0.946	0.955	1.178	1.458	-35
Ethylene glycol	Condenser side					
	30	0.991	1.02	1.013	1.164	-16
	35	0.989	1.027	1.04	1.212	
	40	0.986	1.032	1.074	1.261	-23
	45	0.984	1.037	1.121	1.309	
	50	0.98	1.044	1.178	1.362	-35

Note: the freezing point not shown here, please calculate according to interpolation method.

**Propylene Glycol**

Propylene glycol	Evaporator side					
	Quality of glycol (%)	Cooling capacity modification	Power modification	Water flow modification	Water resistance	Freezing point °C
	30	0.968	0.969	1.01	1.16	-13
	35	0.964	0.955	1.028	1.287	
	40	0.955	0.937	1.05	1.4	-21
	45	0.945	0.914	1.078	1.502	
	50	0.929	0.89	1.116	1.604	-33
Propylene glycol	Condenser side					
	30	0.969	1.023	1.01	1.227	-13
	35	0.959	1.029	1.028	1.276	
	40	0.944	1.039	1.05	1.329	-21
	45	0.923	1.054	1.078	1.388	
	50	0.896	1.078	1.116	1.453	-33

Note: the freezing point not shown here, please calculate according to interpolation method.

Units operating with glycol solutions are not included in the ARI Certification Program.

**Altitude correction factors**

Performance tables are based at sea level. Elevations other than sea level affect the performance of the unit. The decreased air density will reduce condenser capacity and reduce the unit's performance. For performance at elevations other than sea level refer to below table Maximum allowable altitude is 1800 meters.



**Evaporator temperature drop factors**

Performance tables are based on a 5°C temperature drop through the evaporator. Adjustment factors for applications with temperature ranges from 3°C to 6°C in follow table. Temperature drops outside this range can affect the control system’s capability to maintain acceptable control and are not recommended.

**Fouling Factor**

ALTITUDE (m)	Fouling Factor							
	0.018m <sup>2</sup> °C /kW		0.044m <sup>2</sup> °C /kW		0.086m <sup>2</sup> °C /kW		0.172m <sup>2</sup> °C /kW	
	C	P	C	P	C	P	C	P
Sea level	1.042	1.028	1.029	1.020	1.000	<b>1.000</b>	0.977	0.995
600	1.027	1.037	1.014	1.029	0.986	1.009	0.964	1.004
1200	1.014	1.050	1.001	1.041	0.973	1.021	0.951	1.016
1800	1.000	1.060	0.987	1.052	0.960	1.031	0.938	1.026

C--Cooling capacity

P—Power

**3).Design of the store tank in the system**

a. kW is the unit for cooling capacity, L is the unit for (G) minimum water flow volume in the formula.

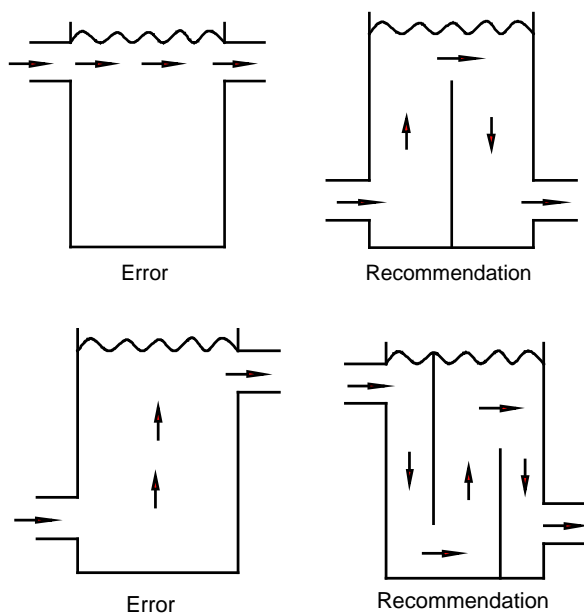
Comfortable type air conditioner

G= cooling capacity×2.6L

Process type cooling

G= cooling capacity×7.4L

b. In certain occasion (especially in manufacture cooling process), for conforming the system water content requirement, it’s necessary to mount a tank equipping with a cut-off baffle at the system to avoid water short-circuit, Please see the following schemes:



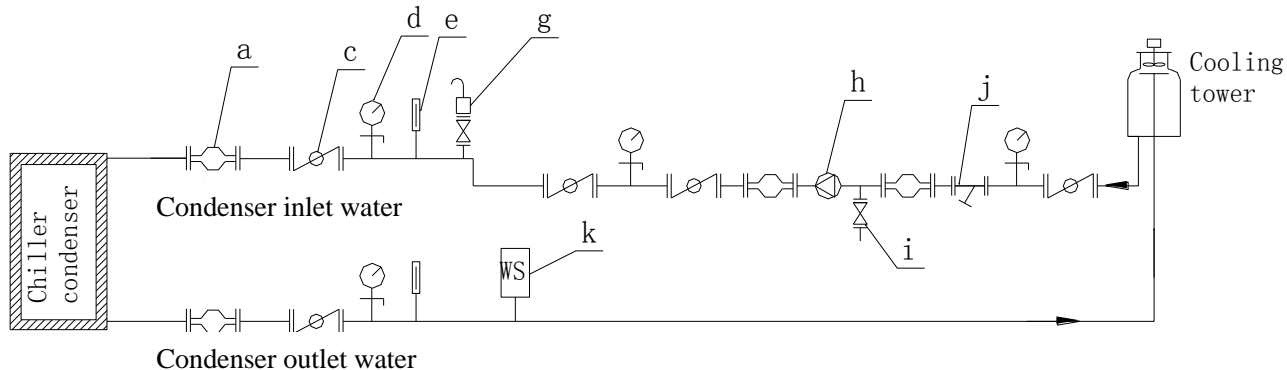
**4).Water pipeline installation**

Due to the variety of piping practices, it is advisable to follow the recommendations of local authorities. The installation and insulation of the water pipelines of the air conditioning system shall be designed and

guided by design professionals, and confirm to the corresponding provisions of the HVAC installation specifications.

Basically, the piping should be designed with a minimum number of bends and changes in elevation to keep system cost down and performance up.

1) Condenser, cooling water piping suggested piping as follow:

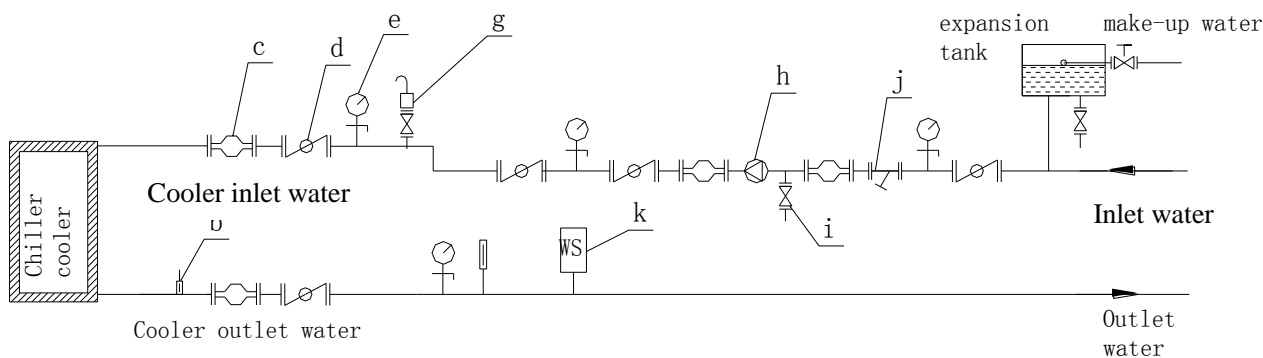


(Condenser, cooling water hose connection diagrammatic sketch)

a Shockproof joint	k Flow switch
c Butterfly valve	d Pressure gauge
e Thermometer	f Platinum resistance thermometer
g Air vent	h Water pump
l Drain valve	j Y- shape strainer

**Note:** All of water pipe accessories and flow switch is provide by user.

2) Chilled water piping suggested piping as follow:



(Chiller cooler piping diagrammatic sketch)

c Flex connection	b Pressure type temperature controller
e Pressure gauge	d Butterfly valve
g Air vent	h Water pump
i Drain valve	j Y- shape strainer
k Flow switch	

**Note:** All of water pipe accessories and flow switch is provide by user.

User must install flow switch in the outlet pipe of cooler and evaporator, it's two sides must be level straight pipe which length longer than five times of pipe diameter.

3) The water inlet pipeline and drain pipeline shall be connected according to the requirements of markings on the unit. Generally, the refrigerant pipe side of the evaporator is the chilled water

outlet side.

- 4) The chilled water pipeline system must be provided with the soft connection, thermometer, pressure gauge, water filter, electronic scale remover, check valve, target flow controller, discharge valve, drain valve, stop valve, expansion tank, etc.
- 3) The water system must be fitted with the water pump with appropriate displacement and head, so as to ensure normal water supply to the unit. The soft connection shall be used between the water pump, unit and water system pipelines, and the bracket shall be provided to avoid stress on the unit. Welding work for installation shall avoid damage to the unit.

(1) Determination of water pump flow:

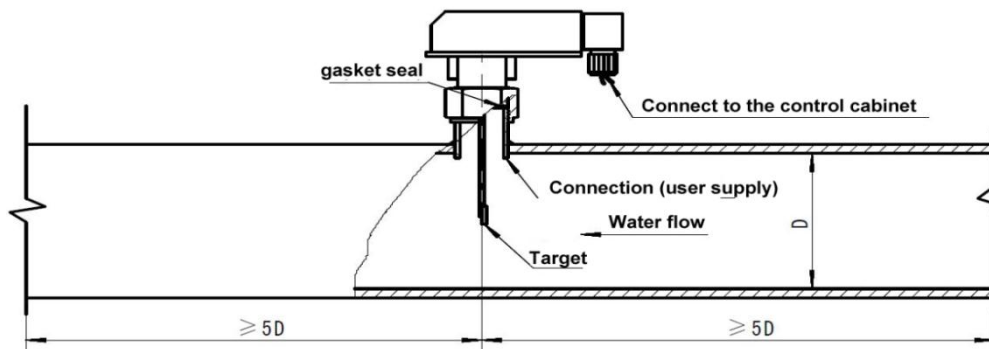
$$\text{Flow (m}^3\text{/h)} = (1.1 \sim 1.2) * \text{Unit Cooling Capacity (kW)} / 5.8$$

(2) Determination of water pump head:

$$\text{Head (m)} = (\text{Unit Resistance (see product parameters)} + \text{Resistance at Maximum End of Pressure Drop (see product parameters)} + \text{Pipeline Resistance (length of the least favorable loop pipe} * 0.05) + \text{Local Resistance (length of the least favorable loop pipe} * 0.05 * 0.5)) * (1.1 \sim 1.2)$$

- 4) The flow switch must be arranged on the drain pipe of the evaporator. The flow switch shall be interlocked with the input contact in the control cabinet. Its installation requirements are as follows:

- (1) The flow switch shall be installed on the pipe vertically.
- (2) The straight pipe section at each side of the flow switch shall have a length that is at least 5 times the pipe diameter; do not install it near the elbow, orifice plate or valve.



- (3) The direction of the arrow on the flow switch must be consistent with the direction of water flow.
- (4) In order to prevent vibration of the flow switch, remove all air in the water system.
- (5) Adjust the flow switch to keep it in open state when the flow is lower than the minimum flow (the minimum flow is 70% of the design flow). When the water flow is satisfied, the flow switch shall keep in closed state.
- 5) The water filter must be installed before the water inlet pipeline of the unit, which shall be provided with a 25-mesh screen. This will aid in preventing foreign material from entering and

decreasing the performance of the evaporator.

- 6) A strainer should be placed for enough upstream to prevent cavitation at the pump inlet (consult pump manufacturer for recommendations). The use of a strainer will prolong pump life and help maintain high system performance levels
- 7) The flushing and insulation of the water pipelines shall be carried out before it is connected with the unit, so as to prevent dirt from damaging the unit.
- 8) The design water pressure of the water chamber is 1.0Mpa. Use of the water chamber shall be not exceeding this pressure in order to avoid damaging the evaporator.
- 9) Do not load the weight of water pipe onto the unit. When water inlet/outlet are connected with corresponding water pipe, soft connection such as rubber joint should be used to avoid the transmission and inter-disturbance of vibration and noise to avoid the vibration which may be transmitted to indoor side.
- 10) In close loop water system, to diminish the impact on water pipe because of the expansion or contraction of water volume and to avoid the influence caused by supplementing water pressure, water return side should be fitted with an expansion water tank. The expansion tank shall be installed 1~1.5m higher than the system, and its capacity accounts about 1/10 of the water amount in the whole system.
- 11) The drain connection is arranged on the evaporator cylinder. The drain outlet has been equipped with a 1/2" plug.
- 12) In order to expel the air from water system, install an automatic discharge valve on the highest place of local water pipe and the horizontal pipe should be up tilted for about 1/250 degree.
- 13) The thermometer and pressure gauge are arranged on the straight pipe sections of the water inlet pipeline and drain pipeline, and their installation places shall be far away from the elbows. The pressure gauge installed shall be vertical to the water pipe, and the installation of the thermometer shall ensure that its temperature probe can be inserted into the water pipe directly.
- 14) Each low point shall be fitted with a drain connection so as to drain the remaining water in the system. Before operating the unit, connect the stop valves to the drain pipeline, respectively near the water inlet connection and drain connection. The by-pass pipeline shall be provided between the water inlet pipe and drain pipe of the evaporator, convenient for cleaning and maintenance. Use of flexible connections can reduce vibration transfer.
- 15) The chilled water pipeline and expansion tank shall be subjected to insulation treatment, and the maintenance and operation part shall be reserved on the valve connections.
- 16) After the air-tightness test is carried out, and the insulation layer is applied on the pipeline, so as to avoid heat transfer and surface condensation; the insulation layer shall be covered by moisture-proof seal.
- 17) Any water piping to the unit must be protected to prevent freezing. There are reserved terminals for the auxiliary electrical heater. Logic in PCB will transmit ON/OFF signal by