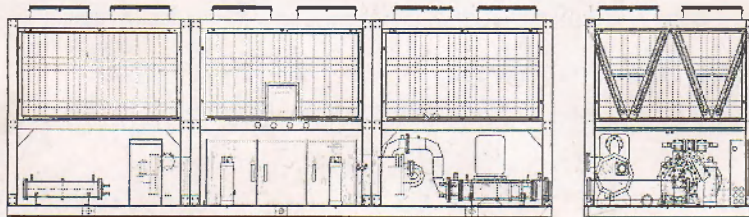




Stars (Guangzhou) Refrigerating
Equipment Manufacturing Co., Ltd.

40STE-A & AH Series Air Cooled Screw-Type (Heat Pump) Chiller

Operation Manual



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Catalogue

Company Introduction-----P3

Product Introduction-----P3-5

Section I Installation-----P4-12

1.1 Pre-Installation

1.2 Swing and Placement

1.3 Pipe Connection

1.4 Refrigerant Charging

1.5 Electricity Connection

Section II Operation-----P13-25

2.1 Pre-inspection

2.2 Unit Operation

2.3 Operation Control

2.4 Operation Guidance and Stop Notice

Section III Maintenance and Fault Processing-----P25-32

3.1 Summarize

3.2 Maintenance

3.3 Water Quality Management

3.4 Fault Processing

Operator should be completely familiar with the operation manual and other necessary files before initial installation and debugging of the water cooled screw-type chiller. To assure the correct installation and the unit runs in the optimum conditions, please read this manual carefully and know the relevant installation, debugging, maintenance and requirement.

Company Introduction:

Established in 1992, Stars (Guangzhou) Refrigerating Equipment Manufacturing Co., Ltd. was invested by a foreign company. Our company specializes in producing Central air-conditioning equipment, industrial chillers, S&T heat exchangers, air handling units, fan coil units and whole refrigerating system solutions.

Since the establishment, we have been focusing on product quality to meet customers' requirements. Moreover, our company has been creating value-added services. Our system aims at energy saving, clean and environmentally friendly aspect.

Based on more than 10 years' professional experiences, our company has been one of the biggest AC equipment suppliers in China. Furthermore, our marketing network has covered all big cities in domestic market.

We have attained ISO9001:2000 and CE (PED) certifications. Moreover, we also enjoy high praise from our clients.

Our company will go on moving forwards based on continuous research & development to build "Comfortable Environment" for all the end-users. For more information about us, you can visit our website of www.chillermaker.com & www.gzuar.com.

Product Introduction:

40STE series air cooled (heat pump) chillers make use of semi-hermetic screw type compressors of Taiwan Hanbell and forced-convection air heat exchanging coils. It is made of effective copper tubes, manufactured with CNC working centre and auto-welding machine, equipped with imported components and electrical elements, assembled with advanced machines. It has types of single circuits and double circuits with dozens of models, featured with compact structure, elegant exterior, easy to install, operate and maintain. Its performance is safe and reliable, and heat pump can supply chilled water temperature in 7 to 12 °C and hot water in 40 to 45 °C for living use. With two functions of warming and cooling, particularly suit for use of air conditioning in large and middle scale hotels, restaurants, supermarkets and office buildings, being an ideal choice of customers'.

Microcomputer control makes operation and maintenance to units more convenience and realizes full-automatic control. PCO programmable controller makes it possible to change setting of parameters; To use audio and screen display indicate emergency states. All operation states and measured parameters are on display. Function key state is on display. Data setting is by numeral key, periodically and instantly print alerting content and running state (only on condition of printer being installed) . Micro-computer setting system is protected by password in case of unexpected modification. It makes operation and control to the chiller unit convenient, flexible, safe and

reliable.

1. Unit name plate---see left side of the control box

2. Component

2.1 Compressor

Equipped with semi-hermetic double screw-type compressor, differential-pressure type feeds for lubrication system and it no needs lubricant pump. Piston valve is the multi-stage capacity control. The engine adopts three phases & two poles motor, and the cooling way is by refrigerant. Phase sequence protection is setted to assure the screw rotation way right.

2.2 Condenser

It applies high efficient copper tube around hydrophile aluminum fins condenser. Window shaped slots are clashed on aluminum foil so as to enhance heat exchanging effect of air side. Use compact good looking V shaped condenser, easily for cleaning and maintenance.

2.3 Evaporator

Shell & tube-type with internal screw thread copper, to let the refrigerant go into the copper tube evenly and improve the efficiency, refrigerant distributary is setted inside. To the cases that one chiller has one more compressor, each compressor will match evaporator and condenser which make one single cooling system. For the multi-chiller, each compressor with evaporator and condenser is the single system. For multi-evaporator circuit, the water goes through all the circuits, while the refrigerant is in the separate circuit. For the reason of structure, the water in the two evaporators is connected, but the refrigerant is separately. To prevent the heat losing, evaporator should have heat insulation covers outside.

2.4 Expansion Valve

High quality expansion valve has been introduced to the units to enhance the stability and assure the accuracy for whole system.

2.5 Heat Recovery

The hot water comes from the energy exchange between the refrigerant and the water, which is a good solution for energy saving. And it is popular in different countries, especially in America.

2.6 Other Assembly Parts

The main components such as magnetic valve, thermal relay and contactor are all with excellent quality and durable property.

Section I Installation

1. 1 Pre-installation

1.1.1 Unit has been tested strictly before the shipment, can be used by user to simply install and connect to a right water circulation piping system and the power as required.

1.1.2 Unit can be installed on a well-ventilated ground or a right roof, avoid sun exposure, far away the boiler flue and the air environment which will take corrosion for aluminum, copper and other metal. If unauthorized personnel close to the unit location, where quarantine measures should be taken, such as installing protective barrier.

1.1.3 Unit should be installed on the I-beam frame of not less than 30cm, the damper can be installed when required; and set drainage to discharge defrosting water. Protect the air heat exchanger when carrying.

1.1.4 If the installation location has frequent big snow or prolonged freezing cold weather, if necessary, use windshield to protect the unit, but the shield shall not affect the unit ventilation.

1.1.5 The top of the unit can not have shelter materials, or will cause the unit cooling fan ventilation capacity.

1.1.6 If necessary, a short wall can be setted around the unit, and its height shall not exceed unit height, unit shall away from the wall not less than 2.5m, the space between the units shall not less than 3.6m. If the unit installed in the room, the room must have adequate ventilation, unit exhaust duct leads to outdoor applications to prevent a return flow in the indoor and affect unit efficiency.

1.1.7 Rational design and install the water recycling system in order to get excellent unit performance.

a. Install the inlet/outlet water pipe correctly, and install the flexible joints, pressure gauges, thermometers and so on, install water flow switches at the outlet.

b. Configure the appropriate cold (hot) water pump, to avoid impurities into the heat exchanger, install filters at the entrance of the pump to ensure the pumps work normally.

c. To reduce the pressure loss, try to shorten the pipeline and avoid or reduce unnecessary direction changes to the pipeline (in particular variable to the vertical direction); Install pressure bypass valve at the main return pipe; Install expansion tank at the highest point of the water system; Install manual or automatic air release valve at the highest point of the system and install water release valve at the lowest point of the system.

d. Hose pipe will be used to connect the water pipe and equipments to avoid Vibration transfer, all the returned water pipe will be equipped with insulation material.

1.1.8 The unit should equipped with electric devices, please do not share the electricity with other appliance.

1.1.9 Please don't change any electric circuit as the protective electricity circuit has been installed and inspected.

1.1.10 The chiller should be installed by professional engineers.

Notice: The manufacture has no responsibility for the warranty of the unit if any changes or modifications to the unit without manufacture's written agreement!

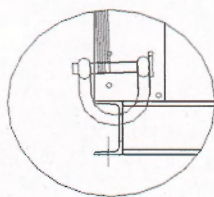
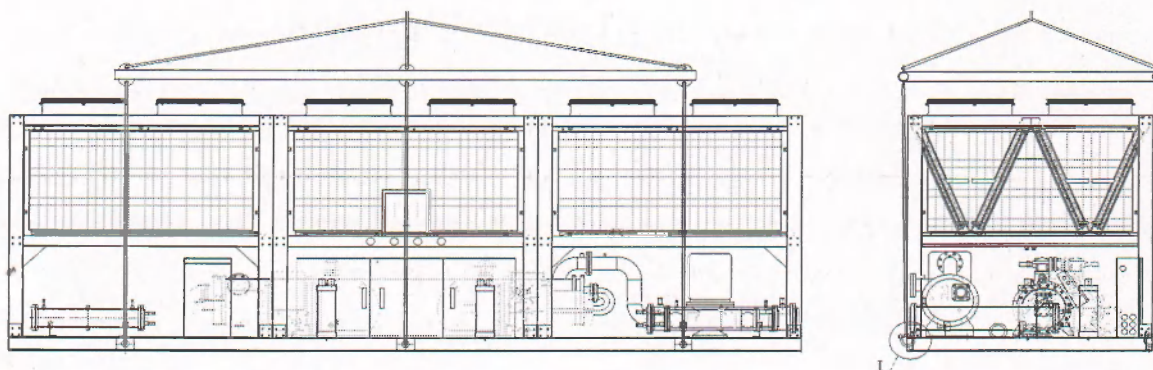
1.2 Swing and Placement

1.2.1 We strong recommend swing by crane

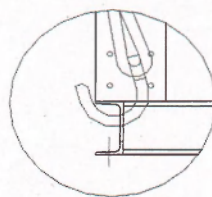
1.2.1.1 The unit has been strictly inspected and firmly packaged before the transportation. The installer and the transporter shall protect the units carefully and operate correctly to avoid any damaging, especially on the angle valves and pipes, which can cause the refrigerant leakage.

1.2.1.2 The unit should keep horizontal when moved by the crane. There has earhole in the bottom as mark. The sling and the unit shall be separated by the supporting things. Be sure the sling is capable enough to lift the unit, or the unit will be damaged and the installer will be hurting. Do not use the forklift and some other moving machine to lift the unit!

1.2.1.3 If the unit can not been lifted by uprightness, the horizontal way shall be adopted. Using the jack to lift the unit in the same height of the two sides, putting the skid under the supporting seat of the slipping mat and then roll the unit into the destination place, taking out the slipping mat at last. The force point for pushing must be on the skid or slipping mat of unit, and it should never been on the unit.



I放大
正确



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错误

Notice: The skid would never be removed until the units lift to position. Be sure do not damage the unit! The unit should be lifted by the crane or on the slipping mat.

1.3 Pipe Connection

After the completion of unit installation, the water pipe system installation will proceed. Then

connect the water pipe with evaporator and condenser.

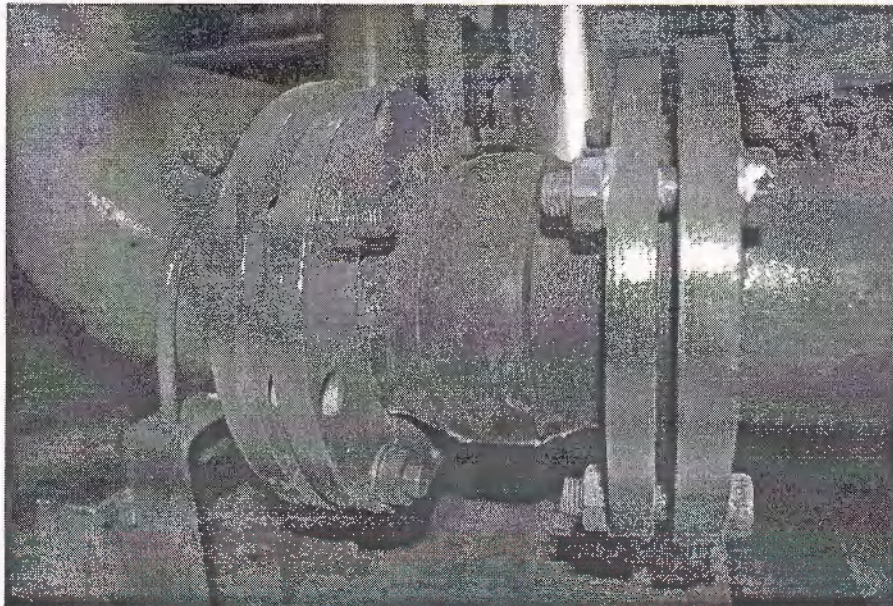
1.3.1 General requests

1.3.1.1 The installation and insulation to whole water circle system should be operated and according to the HVAC installation regulation by the professional engineer's design and conduct.

1.3.1.2 The connection of inlet and outlet water pipe should follow the mark on the unit.

Normally, when you are facing the control box, the left side is chilled water inlet and the right is outlet.

1.3.1.3 To provide the water normally for the system, choosing a suitable water pump on the water flow and water height is important. The connection between the water pump and the water pipe adopts soft and shock absorption connector, and one self-supporting bracket is in need to let the unit running stable. The connection can refer to the following drawing, and the welding work should avoid damaging the units.



1.3.1.4 The water flow switch should be installed on the water outlet of evaporator and condenser. Then connect the switch with the control box. The installation as per the followings:

- * Water flow switch should be vertically installed on the outlet pipe.
- * The distance from the bend to the water flow switch is at least five times diameter of pipe, the installing place of the switch should not close to the bend & valve etc.
- * The signal of water flow direction on pipe should be the same as the switch arrow direction.
- * To avoid the shock of the water flow switch, the air in the water circuit pipe must be released.

* By adjusting the water flow switch, when the water flow is below the minimum (40% of designed water flow), the switch is in separating status, and when the water flow reaches to the designing requirement, the switch is in the close status.

1.3.1.5 The water filter should be installed in ahead of water inlet, and the filter net should be at least 16 meshes.

1.3.1.6 To avoid the damage, the cleaning and insulation for the pipe should be before the

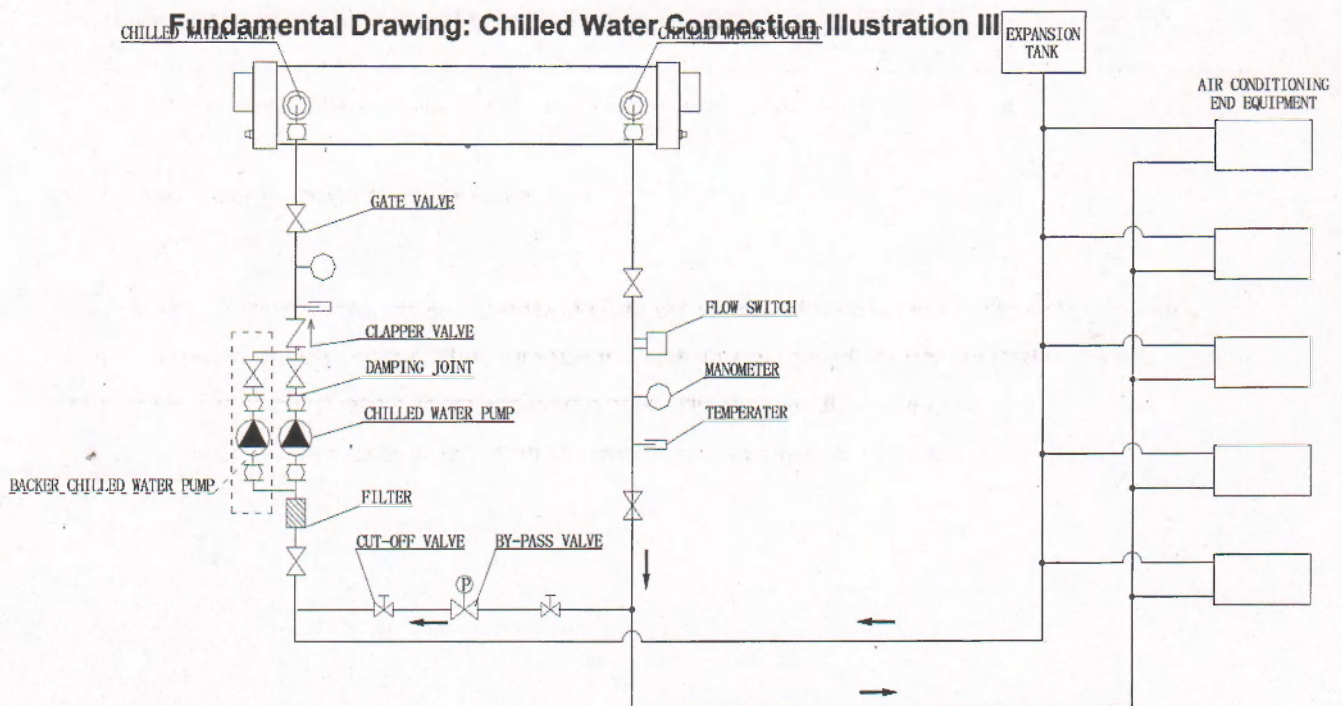
connection.

1.3.3.1.7 The designed water pressure of evaporator is 1.0Mpa. To prevent the damage of evaporator, the operation pressure is not allowed to exceed the above. If water pressure has any special request, please contact the manufacture.

Notice: The water pipe should be cleaned before connecting to the unit.

1.3.3 Pipe Connection of Evaporator

1.3.3.1 The chilled water circle system should have anti-vibration hose connector, temperature meter, pressure meter, water filter, electronic scale-borer, target meter controller, exhaust valve, drain valve, stop valve and expansion water tank. Please see illustration III.



1.3.3.2. Expansion water tank should be installed at 1-1.5 meter over the highest of the whole system point, the volume of the tank is approximate one tenth of the whole system's water capacity.

1.3.3.3. The evaporator tube has the water-out connecter for drainage, 3/4 brass ball valve for drainage has been installed on the water outlet.

1.3.3.4. Manual or automatic exhaust valves should be installed between the high level of the pipe and expansion tank, the pipe vertical direction shall avoid any direction changes.

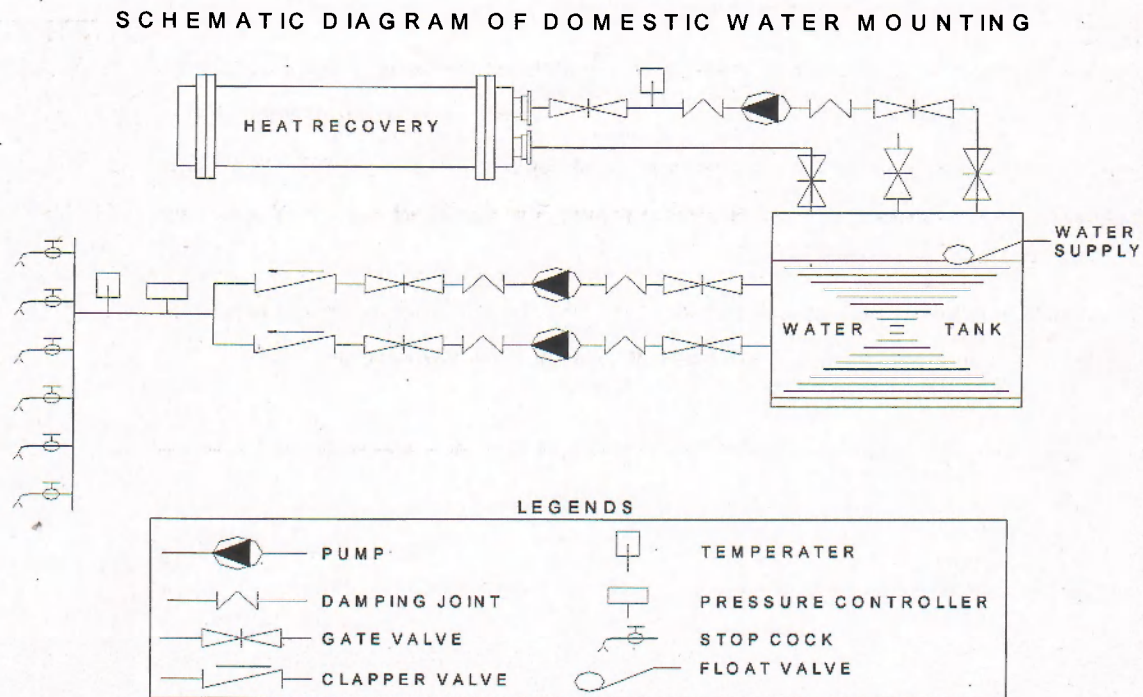
1.3.3.5. Thermometer and pressure meter shall be installed on the straight length of inlet and outlet pipes, instead of the places near the bend. To drain the relict water, each low water place

should set a discharge joint. Between the inlet and outlet of the evaporator, there should be a by-pass line to clean, maintenance and water flow adjusting. The flexible joint can reduce the vibration.

1.3.3.6. Heat insulation is necessary to the chilled water pipes and expansion tank, the valve joints should remain some places for maintenance.

1.3.3.7. To avoid heat transfer and sweating, there should enwind the insulating courses on the pipe after air tightness test, and the insulating courses should have dampproof confinement.

1.3.4 Pipe Connection of Heat Recovery (only for unit having the heat recovery device)
Heat water installation illustration



1.3.4.1 The circle system need install the insulation water tank and pumps to keep the water temperature at 50°C-60°C

1.3.4.2 The water tank needs to be covered by the insulation. The volume of tank should follow the engineer's request.

1.3.4.3 The pump needs open in a long time or prepare the backup pumps to keep the circling water in right temperature.

1.3.4.4 The hot water system must install two pumps or more, whose water flow and height will be designed according to the requirement and controlled by the pressure controller in 24 hours automatically.

1.3.4.5 This system provides the lowest cost hot water to the users, but the volume of the hot water relates to the season request and units capacity, it also needs to install a hot water assistant system together.

1.4 Refrigerant Charging

Due to the installation or maintenance request, the refrigerant needs to fill on site. The operation as follows:

*The air in the interior circuit system of unit needs to be extracted out by the vacuum pump till below one bar (refers to the unit pressure table) and the pressure is indicated by meter, which keeps 12 hours without any changes, means the vacuum pressure test is qualified.

*After the vacuum pressure test is approved, open the chilled water pump and make the chilled water in flowing status in the evaporator, then filling the requested refrigerant into the condenser valve which is located under the condenser.

1.5 Electricity Connection

All the connecting cable should be copper cable to avoid heat and eroding in the connection. The control cable and power cable should be separated by protective sleeve respectively to prevent the interfering with each other. The unit must have earth cable connection. And the cable connection which are applied on the site, should avoid to put the low voltage control cable (below 24V) and high voltage cable (over 24V) in the one sleeve.

Notice: Prior to the cable connection completed, the unit should cut off with the supplying power, which can prevent unexpected accident happening!

1.5.1 Power Supplying

1.5.1.1 The power supply cable input point is on the top of control box and the supplying power cable must higher than the unit one meter above. And the control box can not support any weights. After the power cable links to connecting points R.S.T.N for 24 hours (the min. time allowed) running, the cable needs permanent connection.

Notice: Water pump needs the separated power distributor box.

1.5.1.2 The power supply cabinet has the following parts: the copper connector for general power, Y-Δ start device for compressor.

1.5.1.3 Power of unit is 3N~, AC380v, 50Hz. The power supply must follow the unit request and the general cable comes through the back of cabinet to connect the socket.

1.5.1.4 All the installation method for the power supplying route should comply with the manufacture standards.

1.5.1.5 Cable connecting refers to the RLA on the nameplate. Main power voltage capacity are 1.25~1.3 times than the unit's request. The cable capacity should larger than the maximum current of the unit and plus the affection of the environment. User's self-contained power supply needs earth cable and automatic cut-out device in the control cabinet. If the unit requires large quantity power supply, it should apply the double circuit power supply, the cable for the each circuit must

keep the same as each other.

1.5.2 Control Elements

Air cooled (heat pump) screw type chiller with heat recovery has touch control screen to monitor the running status of unit.

1.5.2.1 Control panel had been installed the defaults indicator, electrical relay, connector point, computer language controller.

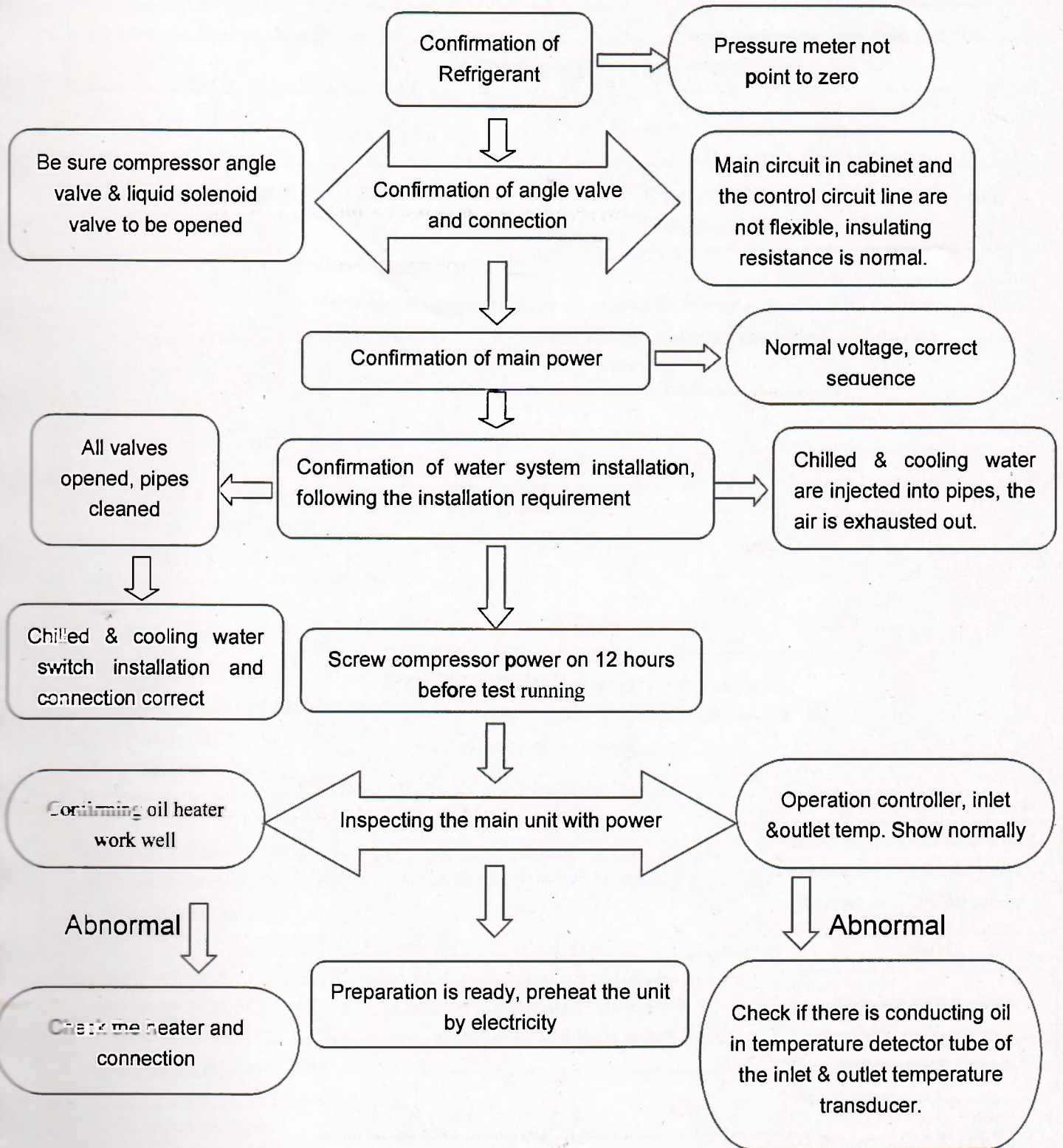
1.5.2.2 Cable connection work must comply with the relevant standard. Each unit of the control circuit is 220 V power supply. The relative connection way can refer to the diagram along with the unit.

1.5.2.3 If the units are consisted by main unit and secondary unit, the cable to connect the two units must be shielding cable enclosed by protective sleeves and separated with power cable.

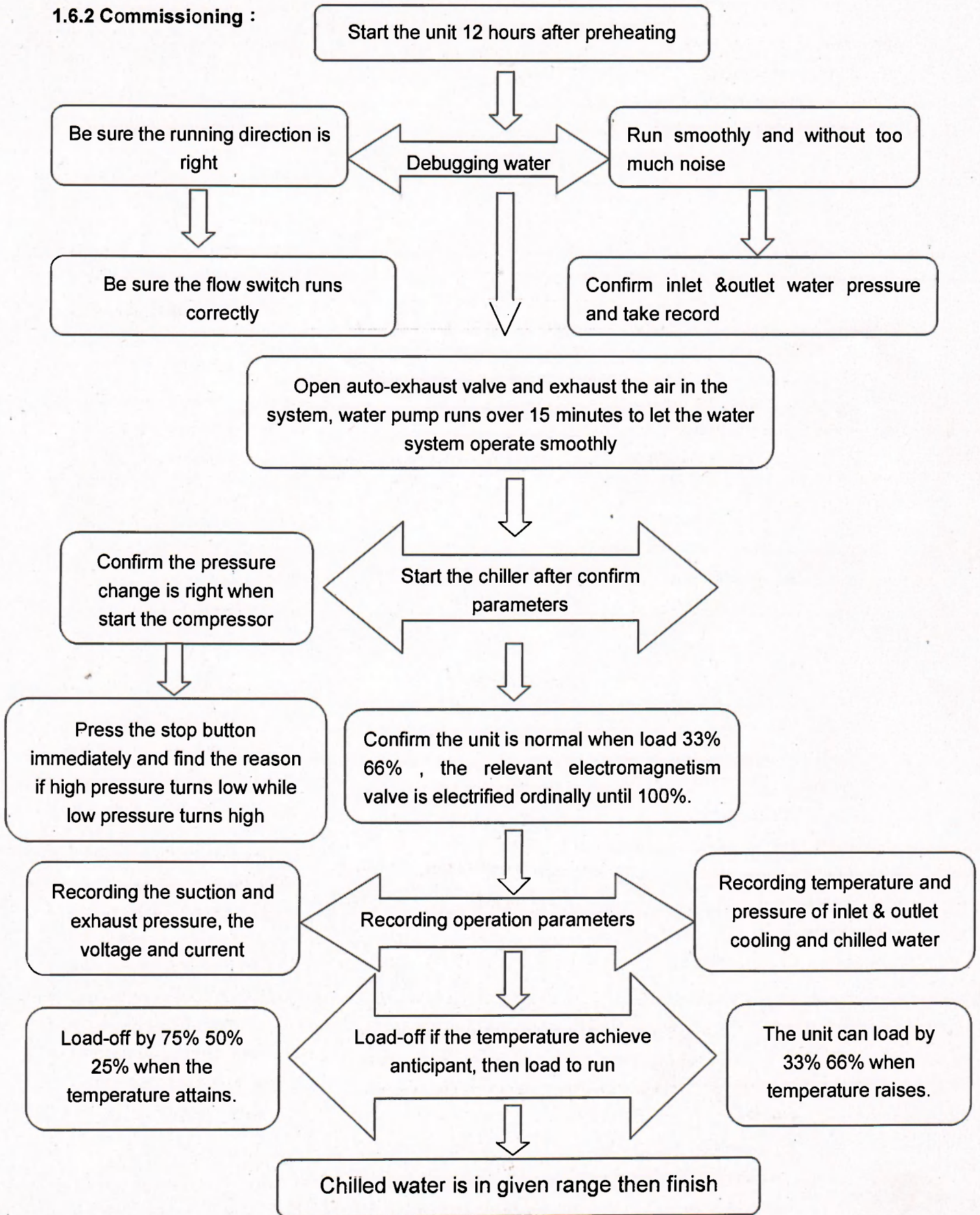
1.5.2.4 The cable setted on the site should satisfy the requirement of AC250V-1mm² (24V).

1.6 Screw-type Water Chiller Commissioning Process

1.6.1 Preparation for pre-commissioning :



1.6.2 Commissioning :



◆ Section II Operation

Inspection instrument preparation

- * Refrigerating normal instrument
- * Digital voltage meter /ohmmeter (DVM)
- * Clipped-on meter
- * Absolute voltage gauge or wet bulb vacuum indicator
- * 500V insulated tester (MΩ)

Operation Modes

Cooling Mode: High pressure steam gas is discharged from compressor, through four-way change valve (not suit for single circuit chiller) going into air heat exchange coil unit (herein to be condenser), making heat exchange with air. After condensing of coil unit high pressure, liquid refrigerant goes through liquid storage tank (not suit for single circuit chiller), drying filter, unilateral valve (not suit for single circuit chiller), into thermal expansion valve, and then changes into steam liquid mixture with low temperature and low pressure. It evaporates in shell and tube heat exchanger (herein to be evaporator), and after making heat exchange with chilling water turns into low pressure overheated refrigerant steam. Then it passes again through four-way change valve (not suit for single circuit chiller) and steam liquid separator (not suit for single circuit chiller), then goes into compressor.

Heat Pump Mode: High pressure overheated refrigerant steam discharged from compressor goes through four-way change valve into shell and tube heat exchangers(herein to be condenser), conducting heat to hot return water so as to heat water. Meanwhile, refrigerant being condensed into liquid goes through liquid storage tank, dry-filter, unilateral valve into air heat exchange coil units (herein to be evaporator) to evaporator. After heat exchange with air, it changes into refrigerant steam. Then it passes again through four-way change valve (not suit for single circuit chiller) and steam liquid separator (not suit for single circuit chiller), then goes into compressor.

Heat Pump Defrosting Mode: When chiller unit being running, temperature of air heat exchange fins is approaching 0 °C, because of air humidity leading to frost on surface of fins and worsening heat exchange, to defrost turns to be necessary. As defrosting inspection system shows Defrosting needs to be executed(temperature of coil tubes drops to setting value to starting to defrost), four-way change valve changes to cooling mode, defrost by making use of hot gas discharged from compressor. While temperature of coil tubes rises up to setting value to end defrosting, control system will instruct four-way valve change again, and recover heat pump mode.

2.1 Pre-inspection

2.1.1 Inspection On Power Supply and Meter System

2.1.1.1 Checking if the power capacity of unit comply with the power supply and whether the cable is suitable with the power request.

2.1.1.2 Checking if the power supply and the cable is three phase and five sub cable (one earth cable $380V \pm 10\%$, one null cable, three phase cables)

2.1.1.3 Checking if the compressor supply cable has connected well, since the screw may loose in the transportation and winching.

2.1.1.4 Check all electrical wire carefully by multi-meter and be sure the connection is in the right points. Checking if there has any possibility of short circuit by the 500V insulated tester ($M\Omega$), and the earth cable resistivity should be larger than $2M\Omega$, the capacity of power supply cable must comply with the request.

2.1.1.5 Ensuring the power supply cable are installed the switch.

2.1.1.6 The every connecting point and controller must be inspected according to the indicated diagram before start the unit (cycle water temperature sensor, switch connection, water pump joint control).

2.1.1.7 Checking if outer system of the chiller comply with the start condition (Cooling and chilled water pump is external control or main-interlock; external control should start the water pump before run the main unit)

2.1.2 Compressor and Refrigerating Pipe Circuit System Inspection

2.1.2.1 The compressor oil needs to be checked and the oil should reach in the middle of the inspection mirror.

2.1.2.2 The magnetic loop of compressor needs to be checked and the capillary tube should not be damaged.

2.1.2.3 All the valves (such as the condenser outlet angle valve, the compressor suction & exhaust valve) in the refrigerating circuit should be opened.

2.1.2.4 The compressor oil needs to be pre-heated more than 8 hours before starting and the oil should reach to at least 23°C before running.

2.1.2.5 Checking if the compressor connection cable is right. Start the compressor then shut down immediately to review the system pressure reflection. Be sure the exhaust air pressure is rising and the return air pressure is declining. Otherwise, the compressor is running reversely, the connection cable needs to be adjusted anew.

2.1.2.6 Testing the unit when main circuit is disconnected, checking if the load is in right order. The right order is: put through the power, star AC contactor closes after pressing the start button 3 minutes, then the Star AC contactor breaks short time later, delta contactor closes, the unit starts to running, then loads progressively.

2.1.3 Water Circuit System Inspection

2.1.3.1 Checking the chilled water route pipe, which must be cleaned and without any of stuff in

the pipe.

2.1.3.2 Checking the connection of pressure meter with temperature meter, and the pressure meter should be installed vertically with water pipe, the temperature sensor should keep touch with the running water directly.

2.1.3.3 Checking the flow switch for cooling water and chilled water, and confirming the flow switch with control panel have been correctly connected.

2.1.3.4 Starting the chilled water pump and cooling water pump to check the pump running direction, the right direction is clockwise, otherwise, please check the pump connection.

2.1.3.5 Starting the chilled water pump and cooling water pump to make the water running in the pipe then check if there have any leakage problems.

2.1.3.6 Starting the chilled water pump and cooling water pump to check whether the water pressure is stable or not and check the current is in the rated load or not.

2.1.3.7 Checking if the return water device of expanded water tank and the automatic exhausted valve are normal, if the exhausted valve is manual, the operator needs to open the chilled water exhausted valve to eject the air.

2.1.3.8 Adjusting the water flow quantity to check the water pressure discrepancy of chilled water inlets and outlets for the evaporator could meet the unit normal running requirements (the discrepancy should keep below 1MPa)

2.1.3.9 **Notes:** The density of carrying refrigerant must be checked for the low temperature chiller, the carrying refrigerant freezing point should below user's expected temperature to prevent the damage for the pipe.

2.1.4 Checking the terminal equipments, and confirm all the water & fan valves are opened. Terminal equipments can run without failure and abnormal noises. Blow area and wind speed comply with the design requirements.

2.1.5 Adjusting the Chilled Water Temperature

(for the special request unit, the chilled water temperature needs to be identified separately.)

After setting the return water temperature according to operation instruction, the unit can run automatically according to the settings. Once the chilled return water temperature reaches to the settled temperature, the compressor will adjust the cooling capacity automatically to reduce the cooling capacity till the unit stops.

Notice: the chilled water temperature is not allowed to be too low, which could decline the cooling efficiency and enlarge the loss of cooling capacity in the pipe circuit system even cause the surface of the copper pipe freezing in the evaporator.

Base on satisfying the normal user request, the chilled water temperature can be setted as higher as you can.

Recommending chilled water temperature scale:

The allowed lowest chilled water temperature is 5°C when exiting the evaporator, and the highest return chilled water temperature is 20°C. The recommending chilled water outlet temperature range is 7~12°C (temperature discrepancy 5°C).

2. 2 Unit operation

2.2.1 Start of the unit

2.2.1.1 Daily start

- a. The chilled water pump is controlled by the unit cabinet. For the multi- unit, be sure the water flow and volume for each unit follow the requirements.
- b. Check or reset each setting in the cabinet according to using requirement (normally, no need to change, it has been setted to optimality)
- c. After the chilled water pump's relay connected to the cabinet, then start the chilled water pump before starting the unit.
- d. Make sure there is no abnormal vibration or noise to the compressor after the unit started, otherwise stop it and check or contact the after service.
- e. When the unit is operating, check every operating current by clip-style ammeter to see if it satisfies the design requirement.

2.2.1.2 Unit Seasonal Desterilization

- a. Maintenance inspection shall according to manufacturer's operating procedure for water pump and other assistant equipment
- b. Shut off the water system discharge valve (or spin the plug screw), open the main water circuit stop valve and exhaust valve, charge the required water for the water system, then close the exhaust valve after air exhausted
- c. Check if any components on the electric circuit is flexible, if the conductor works well and insulated wrap damage, and sweep the dust.
- d. Close the main power switch to start cabinet, confirm the compressor's lubricant oil has warm-up over eight hours
- e. Start and run the unit under the daily procedure.

2.2.2 Units Stop

2.2.2.1 Units Daily Stop

- a. Press the normal stop button on the touch screen, the compressor will stop after the unit unload, then electrify the oil heater. When stop, 25% energy of compressor will run for 30 seconds before it stops, one minute later stop the cooling water pump, two minutes later stop the chilled water pump. If rotate the key on cabinet to emergency stop, the unit will stop the compressor

immediately in spite of load condition. Do not use this way usually.

b. If the chilled water pump didn't interlock with the control cabinet, close the chilled water pump manually after the compressor stopped a while.

2.2.2.2 Unit Seasonal Stop

a. Close the water system stop valve which closes to the unit after the water pump stopped.

b. Shut off compressor suction & exhaust stop valve.

c. Turn on the exhaust & discharge valve on the water system, discharge all water in the system. To prevent the water pipe corrosion, inject the nitrogen(the pressure is a little higher than the atmosphere) into possible section to lustrate the air, and then tighten both valves to avoid rust.

d. Maintain the unit and system

2.3 Unit Operation Control

Control system contains the compressor start part and control part.

Compressor starting adopts star delta style for standard station, this way can effectively avoid current transfer peak in start.

2.3.1 Unit Start Process Control

Step One: Electrify the control cabinet to warm-up the compressor oil heater, the unit can be started only after warm-up over eight hours (no need to electrify the control circuit under this situation)

Step Two: Start the chilled water pump.

Step Three: For the single compressor unit, press the start button directly after the chilled water pump system circulated.

Step Four: Check if the inlet & outlet temperature of chilled water system is correct (the inlet temperature is higher than the outlet in cooling station). Check if the operating current is in the standard range.

Step Five: Stop the unit by pressing the stop button directly, 25% energy of the compressor will run for 30 seconds before compressor stop; then stop the chilled water pump 2 minutes later.

2.3.2 Unit load/unload process control

2.3.2.1 Load process

a. The unit will start-up when connection time of the control device over designed time -- compressor shortest stop time, and the chilled water outlet temperature is higher than the setting value and temperature difference value 【normally setting value is 7°C, temperature difference value can set among 1.0°C~5.0°C】. The unit will choose the shortest time operate compressor to start-up automatically.

b. Interval time between each compressor start and stop is at least 5 minutes.

2.3.2.2 Unload process

- a. The unit will unload when the chilled water outlet temperature is lower than the setting value, it will unload the longest time operated compressor first; After satisfy the unload interval and the chilled water outlet temperature is still lower than the setting value, then it will continue to unload.
- b. For sudden stop by failure or the unit stop, the unit will unload fast, after 25% energy of each compressor operate 30 seconds, it stops.
- c. The compressor will stop if failure happened, after removing the failure, press the reset button to operate again.

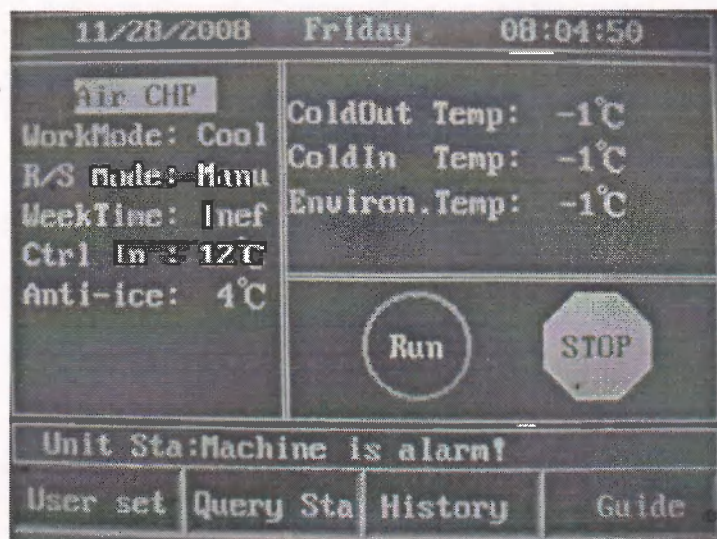
2.3.3 Illustrating on computer operational control

2.3.3.1 Starting up interface



Note: Press the central of the lowest line for 3 seconds if no response when pressing the button, then adjusts the touch screen by clew. The showing model is setted by the manufacturer.

2.3.3.2 Start/Stop Unit



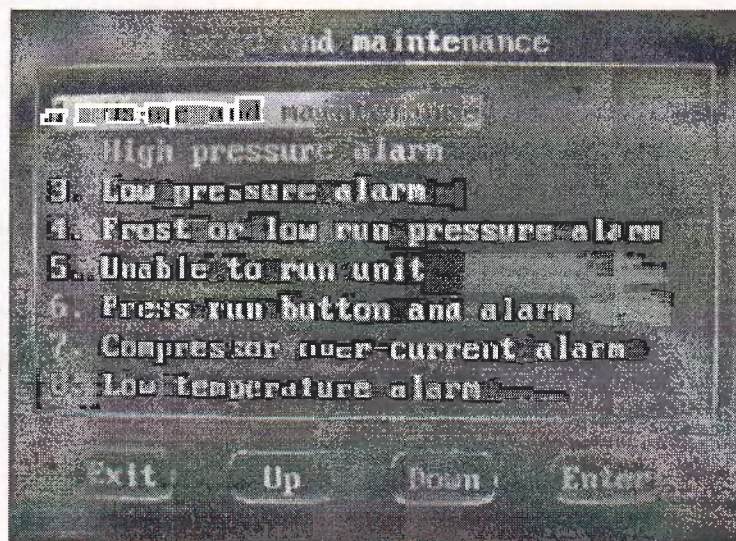
Main operating interface

The unit can be "Start", "Stop" by pressing the relevant button on main interface. The water cooled chiller shows "Outlet °C" and "Return °C", air cooled chiller and heat pump unit show "Outlet °C", "Return °C" and "Environment °C".

The left five lines show: "Work mode": cooling or heating; "R/S mode": "Manual" or "timing"; "Control Inlet": the temperature here is the control temperature, if the temperature is selected the water outlet, it will show "control water outlet"; "WeekTime" shows "inefficacy" or "efficacy"; It shows "Anti-ice" when cooling and shows "Anti-heat protection" when heating.

2.3.3.3 User setting

Press the "User setting" on the main operating interface, input the correct password then enter into the user setting interface, as showed below, press the "Up", "Down" button to change the setting item, press "Enter" enter into the setting item.



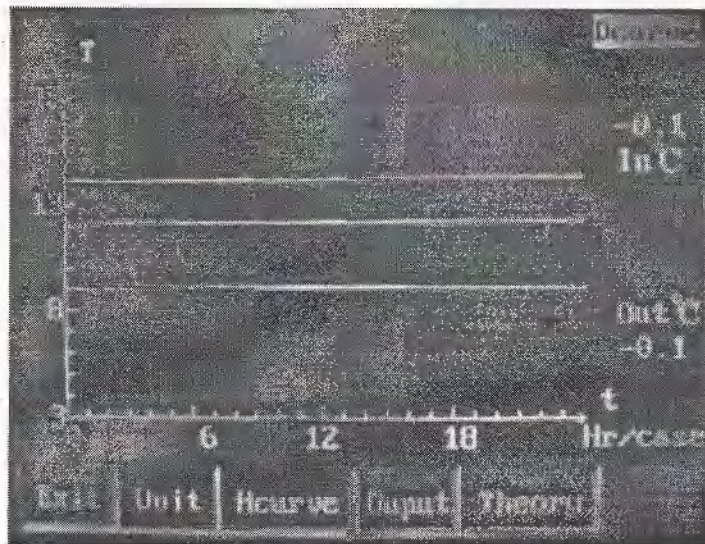
User setting interface

Note: Item 8 -- "Manual action" can be showed under condition: when heating for the air cooled heat pump unit, it can defrost forcibly.

2.3.3.4 Query Status

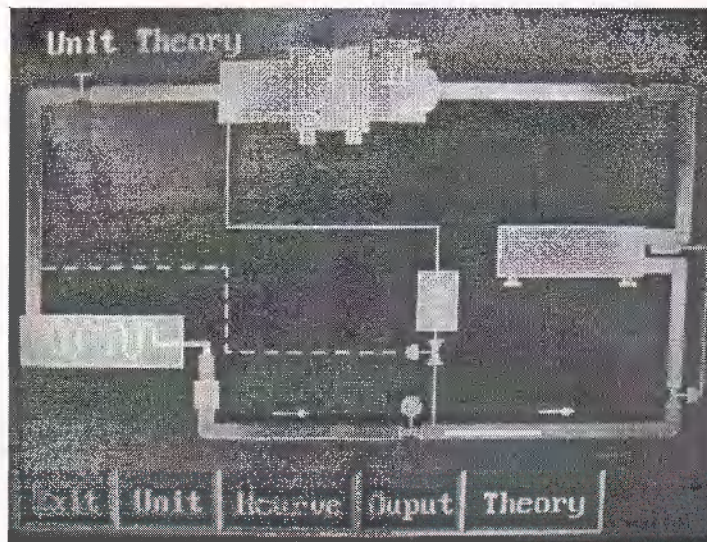
Enter the query status interface by pressing "Query Status" button, as showed below. Press "H curve" to check the outlet and inlet water temperature curve line within one hour. Press "D curve" to check the outlet and inlet temperature curve line within a day. Press "Unit" to see all compressor status and temperature. Press "Input" to enter into the switch input query interface, shows each backboard's 24 input lines name and status. Press "Output" to enter into the relay output query interface, shows each backboard's 16 output lines name and status. Press "Theory" to see the unit theory drawing (Note: "H curve" and "D curve" share the same button)

Query Status interface as showed below:



Temperature curve interface

Note: Different model shows different status, and it relates to the temp. probe setting.

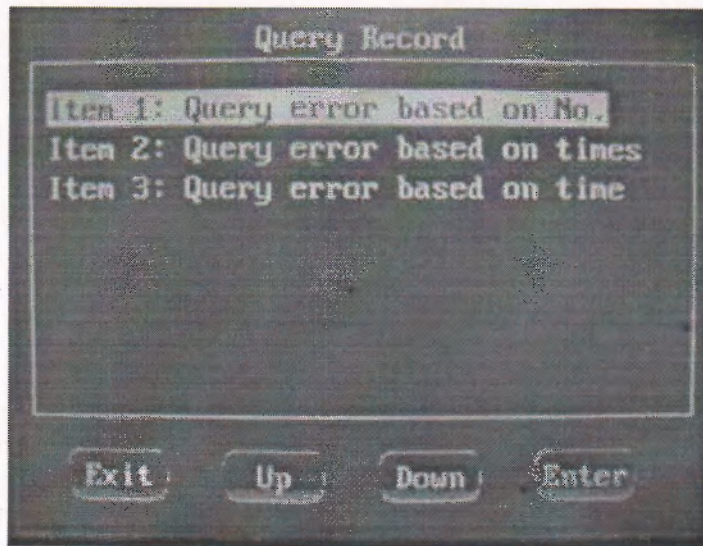


Unit theory

It is air cooled heat pump, air cooled chiller theory drawing

2.3.3.5 Historical record

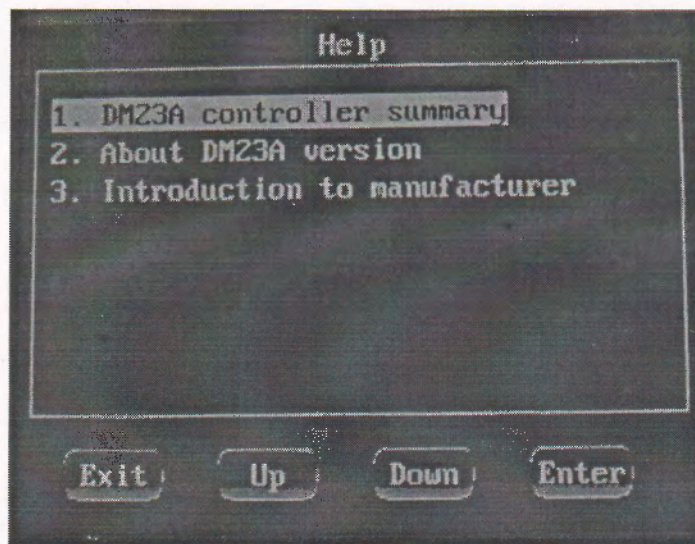
Enter into the history query interface by pressing "History", it contains Query errors and compressor work time query, as showed below, press "Up""Down" to change query items, Press "Enter" to enter into the selected item.



History Interface

2.3.3.6 Guide

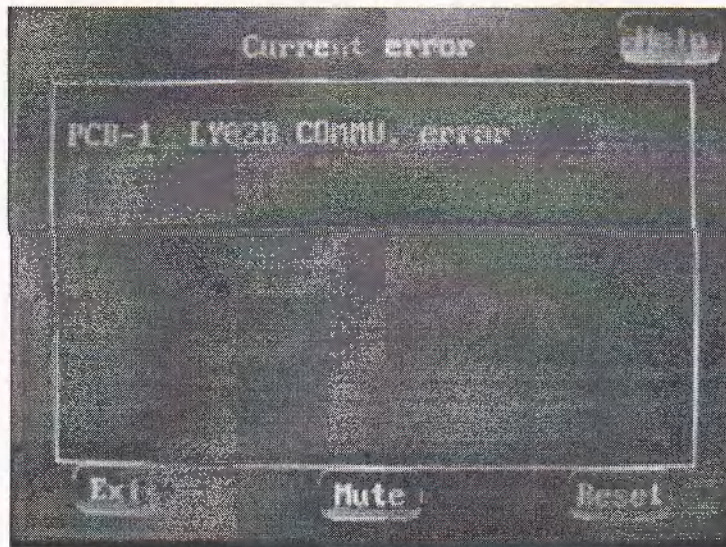
Enter into the direction on Main operating interface by pressing "Guide", including DM23 brief introduction. As showed below for DM23A version:



Guide interface

2.3.3.7 Query Error

The Query Error will not present in normal condition. When new error happens, "Query Error" will flash and alarm in main interface, then enter into the Query error interface as showed below. Stop the alarm by pressing "Mute", press the "Reset" to reset the unit if confirm the error has been removed.



Error interface

Note:

- a. Number after "PCB-" is the backboard number.
- b. If stop error happened like "Temperature probe error" when the unit is running, the unit will stop and switch to the main interface.

2.3.4 User Setting

Press User setting on main interface, enter into it by pressing the correct password. Manufacturer, debug personnel and user have the right to set all parameters. General user can use the default by manufacturer supplied and no need to set again.

2.3.4.1 User Parameters Setting

Setting Item	Content	Explanation
Work mode	Cool	see control logic for details, not available while unit running.
Control in water	12°C	heat/cool will switch to default temperature automatically
Week timing	Inefficiency	valid when set to available week timing control
Timing setting	Unset	refer to annotation

Note: For the timing setting, ready to set a valid start or stop time, if the unit is running nonce, then this setting is the timing stop time, if the unit is stop, then this setting is the timing start time.

2.3.4.2 Week Timing Setting

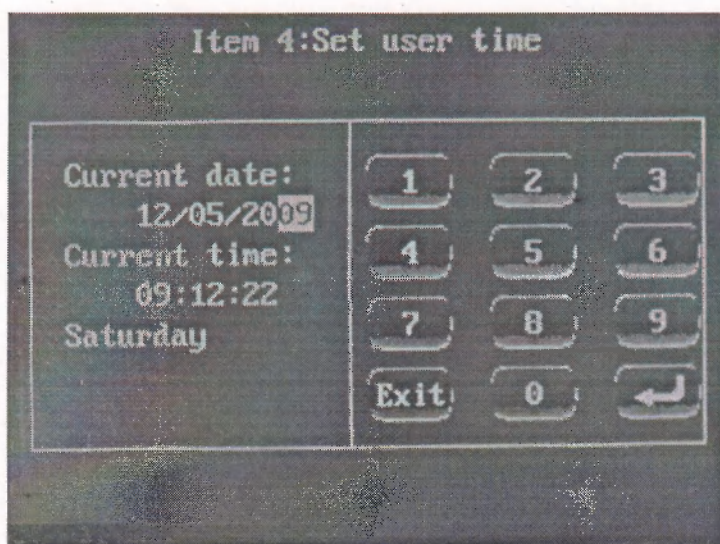
Refer to timing logic of control logic for details

2.3.4.3 Use Setting

Setting item	Content	Explanation
#1 compressor	use	omit
#2 compressor	use	omit
#1 Electrical heater	use	omit
#2 Electrical heater	use	omit

Note: When one compressor is setted to “Unuse”, then this compressor is forbid to start. If this compressor is running, it will stop immediately. If one compressor can meet the cooling requirement when full-load, other compressors can be setted to unuse. While the default is “use”.

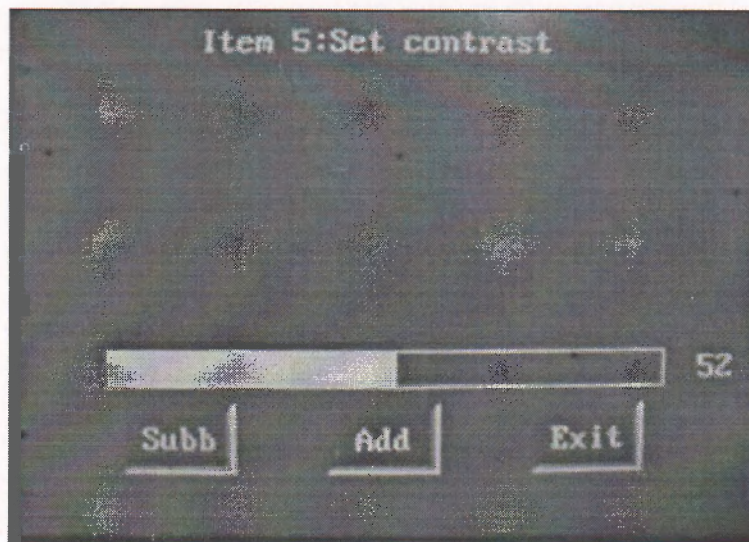
2.3.4.4 Time Setting



user time setting interface

Here the user time is the time showed on interface, this setting will not affect the system time. Set double figure each time, press two numbers continuously can finish the setting, set the next item by pressing “Enter”. Save the setting and return by pressing “Return”.

2.3.4.5 Contrast setting



Contrast setting interface

Contrast setting interface: User can adjust the contrast at any time; Press "Add" and "Subb" to adjust; Press "Exit" confirm and exit.

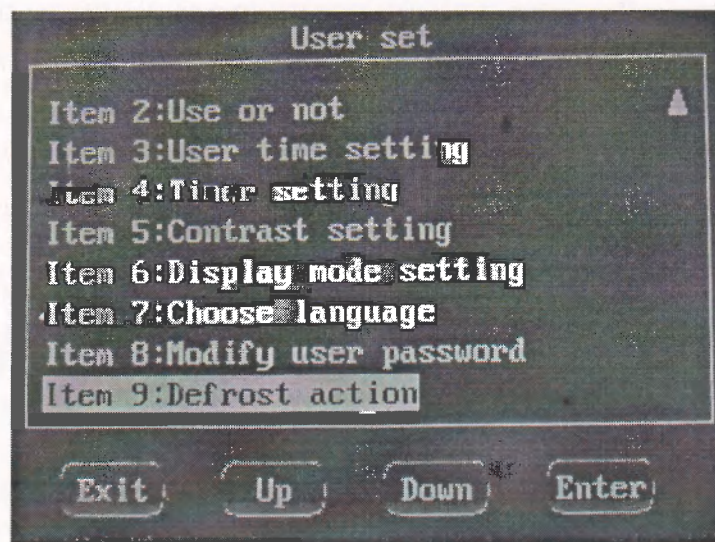
2.3.4.6 Display Setting

Multi-elective foreground and background, user can change it through user set interface.

2.3.4.7 User Password Modification

User password: 1234

2.3.4.8 Defrost Action



The user can choose to defrost or stop the action to the compressor forcibly.

Note: This action is only for the air cooled heat pump when heating.

2.4 Operation Management and Notice for Stop

2.4.1 Screw-type air cooled chiller operation management and notice

2.4.1.1 Start/stop of the unit should strictly according to each step of manufacturer's operation instructions.

2.4.1.2 Take a record for parameters timely and correctly while the unit is running.

2.4.1.3 Notify the maintenance man to inspect the unit prompt if alarm stop occurred, and contact the manufacturer if fault can't be removed.

2.4.1.4 To avoid freezing the water pipes, water flow switch is prohibited to jump out 短接 when running the unit,

2.4.1.5 Special person should take in charge of the machine room, other irrelevant people is prohibited to enter into the room and operate the unit.

2.4.1.6 The machine room should have safe guarding and maintenance devices, for instance pressure gauge, thermometer and so on. And put these tools in the fixed place.

2.4.2 Screw-type air cooled chiller Stop Notice

2.4.2.1 Cut off the main power switch after stopping the unit.

2.4.2.2 To prevent corrosion, all chilled/cooling water in the system should be discharged when the unit has a long time shutdown, and the tube end cover should be tighten.

2.4.2.3 Maintain the unit while long time shutdown.

2.4.2.4 To avoid dust, cover all the unit while stop.

2.4.2.5 Keep the irrelevant people away from the unit while stop.

◆ Chapter III: Maintenance and Fault Processing

3.1 Summary

This chapter introduces the maintenance and defaults rectification. Proper maintaining and defaults curing on time can create the good working condition for units and prolong the working life of unit and also can enhance the efficiency of unit.

Customers should have professional maintainer to maintain the units before and after faults emerging according to this chapter of this instruction book. After servicing as per the warranty term, the customer can sign a maintenance agreement with local customer service section of our company in order to get right and timely maintenance.

Notice: Due to the improper maintenance operation by the customer manufacture will take extra charge for rectification.

It is essential to record running parameters of the units rightly in a proper time distance everyday, for example, one hour. Real record of running parameters can be used to forecast future run and fault.

For example, analyzing one-month record of running parameters, it may be found that the gap between condensation temperature and that of cooling water at outlet is growing, it is suggests that cooling water may be dirty or has larger rigidity, so the inside wall of heat-exchanging tubes is scaling. At this time, it is need to intenerate cooling water or clean tubes.

Notice: It is very useful to keep and save the records of running parameters for future to estimate the tendency of normal running situation.

3.2 Maintenance

3.2.1 Daily maintenance

- * Start and stop the unit according to the rule of the instruction everyday.
- * Record the running parameters of the units rightly in a proper time distance everyday.
- * After running 24 hours, clean the filters for both chilled water and cooling water.
- * Check the pressures inside the evaporator and condenser by reading the pressure meter on the control cabinet. Check the temperature difference between the evaporation and the chilled water outlet, and also between the condensation and the cooling water outlet. Pay attention to their temperature change trend. Generally, the evaporation pressure should be in the range of 380~500KPa, and the condensation pressure should be in the range of 1300~1600KPa. Temperature

difference should be in the range of 1~3°C

Notice: The evaporation pressure and condensation pressure will vary with the temperature of chilled water and cooling water outlet.

* Check the dry-filter of refrigerant. If there has frost at the dry-filter outlet, it means jam may be inside. And this case often emerges along with too low evaporation pressure and the increase of temperature difference between evaporation and chilled water outlet. Pay attention to replace the filter core in time.

* Check the deepness of oil in the tank, normal condition level should be in the half of the oil watch mirror. If the deepness is much low, the oil should be increased in time.

* Any fault caused the stop of unit should be stressed and analysed carefully. It will help to solve the problem that analyse the condition according to this instruction book before our customer service arrival.

3.2.2 Termly Maintenance

Notice: To avoid any accident, turn off the main power switch before check and hang a sign which shows "No turning on power switch " near the power switch.

Termly maintenance can be done weekly, monthly, quarterly and yearly. It is helpful to make the units run well that establish a scientific "Termly maintenance plan" which refers to the following content.

A. Weekly Maintenance

* Check and analyse the record of running parameters

B. Monthly maintenance

* Check and analyse the record of running parameters

* Check the fastening bolt of the power connection

* Make sure all components have no noise and run well

* Make sure the high and low pressures of the refrigerating system are normal

* Make sure the current and insulation resistance are normal

* Make sure dry-filter and viewing mirror are normal, if the outlet of dry-filter is freezing, the inside of filter must be jammed and dirty. At this time, filter gauze should be cleaned, and if humidity indication is found in the viewing mirror(shows red), filter core should be replaced .

* Make sure compressor's lube is enough, if it lacks too much, don't replace or add the lube at once. Please contact our after-service section in time

Notice: Be sure the specification of the lube is right before replacement or addition. Otherwise the units might be damaged.

C. Quarterly Maintenance

- * Check and analyse the record of running parameters
- * Check the deepness of the oil in the compressor
- * Clean the water filter of evaporator
- * Check the refrigerant's temperature drop in the dry-filter when the units operate at full load
- * Check the surface of fin condenser, if it is dirty, clean it, or it will affect the cooling efficiency.

D. Half-yearly Maintenance

- * Check and analyse the record of running parameters
- * Do physical and chemical analyse to the cold oil to estimate the moisture content and acidity.
- * Make sure the control cabinet, start-up cabinet and all electrical connections are fastened.

E. Yearly Maintenance

- * Check and analyse the record of running parameters.
- * Check the deepness of the cold oil in the compressor and do physical and chemical analyse to the cold oil. If the oil has been emulsified, there should replace the same kind of oil.
- * Replace the filter of cold oil when needed, and it should be done by professional maintainer.

Take apart the connection tube of safety valve, check the valve clearly to make sure there is no corruption, rust, scale deposition and leakage. If the above problems happened, replace the safety valve. It should be done by professional maintainer.

- * Check the insulation resistance of compressor motor. It should be done by professional maintainer.

F. Three Yearly Maintenance

- * According to the above yearly maintenance's operation.
- * Let the professional maintainer to make a fully checking and maintenance for the unit, especially for the vibration of compressor to ensure all components of compressor are in order. Check and make sure there is no leak in copper tubes. Do non-destructive checking for main welding lines (longitudinal weld and ring weld of evaporator and condenser) when needed, to make sure safety; Check the electrical operation and safety control, make sure all electric parts run well.

Notice: Three yearly maintenance can be shortened when needed according to using scene, especially in scene where unit stop may result in serious problems.

3.3 Water Quality Management

Bad chilled and cooling water quality will not only scale in heat transfer pipe, but also affect the heat exchange efficiency, reduce the chiller's performance, and will bring corrosion to the heat transfer pipe and cause major failure. Use the softening water for closed system. Make sample analysis for the cooling water periodically during the chiller running, the water quality should coincide with table 3-3 requirement. Do water disposal if it is unable to meet the table 3-3 requirement.

Basic Item	Item	Unit	Charging water	Chilled & cooling water	propensity	
					Corrosion	Scaling
Basic Item	PH (25°C)		6.5-8.0	6.5-8.0	0	0
	conductivity (25°C)	μS/cm	<200	<800	0	0
	Chloride ion Cl-	mg Cl-/L	<50	<200	0	
	Sulfate ion SO-2	mg SO-2/L	<50	<200	0	
	Acerbity consumption (PH4.8)	mgCaCO3/L	<50	<100		0
	whole hardness	mgCaCO3/L	<50	<200		0
Referenc e Item	Iron (Fe)	mg Fe/L	<0.3	<1.0	0	0
	Sulfide (S2-)	mgS2-/L	Unable	Unable	0	
	Ammonium fixation(NH4+)	mgNH4+/L	<0.2	<1.0	0	
	Silicon dioxide (SiO2)	mgSiO2/L	<30	<50		0

Table 3-3 water quality

Notice: Manufacture will not be responsible for any corrosion, scouring or bad performance due to untreated or mistreated water.

3.4 Fault Treatment

Fault	Description	Solution
1 . High pressure alarm	Condenser fan flow not enough	Clear the obstacles around the unit which would affect the cooling air flow.
	Condenser fin dirty	If the temperature difference is less than 3 °C between condenser air inlet and air outlet at full load, it shows condenser copper dirty and affect the heat transfer, It needs cleaning.
	Overfull refrigerant	Release refrigerant appropriately.
	Has other air in the system,	Vacuumize the system again
	Condenser fan fault	Check the fan
2 . Low pressure alarm	Evaporator refrigerant shortage	Increase refrigerant (contact manufacturer)
	Chilled water flow shortage	Check vessel's pressure drop, water pump and filter
	Lack of refrigerant	Leak hunting, find the reason
	Chilled water side scaling	Check chilled water quality

	Excessive oil in system	Release proper chilled oil (contact the manufacturer)
3 . Chiller cannot start-up	Lack of electricity	No power supply pressure or fuse for main circuit breakup
	Power pressure abnormal	Check three phase power according with this chiller's standard
	Wrong setting	Check setting value and run mode
4 . High exhaust temp.	Expansion valve opened too narrow	Extend expansion valve
	little refrigerant in system	Inject more refrigerant
	Under feeding refrigerant	Check if filter works well, magnetic valve opened
5 . Exhaust temp. too low	Condenser dirty (oversized feeding)	cleanout condenser
	Expansion valve opened too large	Turn down properly
	Excessive refrigerant in system cause bad evaporate	Release proper refrigerant
	Bad evaporation	Check chilled water flow, if water pump be evacuated or air exists in system
6. Low temp. alarm	Protection trip due to chilled water outlet temperature too low	Check if the control temperature setting is too low
	Chilled water flow problem	Check the temperature difference between the chilled water outlet and inlet(standard is 3-5 degree) and see if the water flow and pump is normal.
7. Compressor over-current alarm	Check if filter jammed and water charging system can work	Clean filter and charge enough chilled water
	Check if the power voltage meet the chiller request	Extend wire diameter and decrease the pressure drop
	Check if any failure happened to the compressor	Repair winding and clean lubricate system, decrease friction energy loss (contact the manufacturer)
8. Compressor oil level alarm	Check chiller's working condition and make sure the high & low pressure is in range.	Check the chilled & cooling water flow
	The unit leakage	Chase leaks, resolve it and charge chilled oil (contact the manufacturer)
	Over feeding refrigerant	Adjust the feeding flow, ensure the suction superheat temp. and oil return clear.

9. Compressor frosts, run pressure is too low and alarm.	Bad evaporation	1.insufficient anti-freeze fluid concentration 2.chilled water system failure
	Chilled water system failure	Air in the water system, should exhaust the air and choose the right water pump head.

Stars chiller screen operation interface:

The three display lights - power light(red), run light(green), failure light(yellow) are on the top left corner of the screen. Power light and run light are on when regular running, failure light uninterrupted blinks when failure happens, the screen will also show the failure, press the failure query can find the failure description.

Display fault and solution:

fault	Solution	Note
1. No display	1) check the transformer output AC9.8V	
	2) check the socket connector	
	3) check the connection	
	4) check if any adust smell or trail	
	5) check if water goes inside	
	6) check if connection flexible	
2. Touch screen response only after pressing several times	1) confirm press strength and position	
	2) go into menu adjust touch screen	
3. Display shows dim	1) check the transformer output AC9.8V	
	2) go into adjust reduced property	
4. Stop without reason	1) confirm voltage is fluctuate within reasonable range	
	2) check if button damage or distortion	
5. Compressor cannot load or unload	1) if the unit pause when temp. is reached	
	2) confirm the point for outlet water or return water	
	3) confirm the time delay for compressor protection	
	4) confirm temp. probe without fault and temperature shows normal	

6. Communication fault	1) check touch screen and backboard power supply, and power light is on	
	2) check if backboard skipped wire	
	3) check touch screen parameter setting	
	4) check the communication wire	
	5) check if backboard fuse blow-out	
7. Many faults shows at the same time, but the unit can run after reset	1) bad contact	
	2) confirm connection right	
	3) confirm connection lines and heavy-current are separated	
	4) Let connection line far away from the heavy-current wire	
	5) adopt connection line with shield	
	6) power output adopts filter and contact coil with pressure sensitive resistance.	
8. Input fault alarm	1) check if chiller's switch status is the same setting as computer	
	2) check input point relevant indicator light is on or off	
	3) reset fault	
9. No output	1) check if unit is started	
	2) check if any output showed on screen	
	3) check if output relay is normal (use multi-meter)	
	4) check if backboard fuse is blow-out	
	5) check common output voltage	
10. Screen dazedly	1) check if any damage happened	
	2) re-electrify	
	3) initialize parameter	

Attachment I Plastic insulated wire safe current carrying capacity(Ampere)

Section (square millimeter)	Open wire		Steel tube wire						Plastic tube wire						Sheath wire				Flexible wire		
			Two wire		Three wire		Four wire		Two wire		Three wire		Four wire		Twin core		Three or four core				
	cop per	alu min um	cop per	alu min um	cop per	alu min um	cop per	alu min um	cop per	alu min um	cop per	alu min um	cop per	alu min um	cop per	alu min um	cop per	alu min um	cop per	alu min um	Single core
0.5																7				8	7
0.75																				13	10.5
0.8																11		9		14	11
1.0	17		12		11		10		10		10		9		13		9.6		17	13	
1.5	21	16	17	13	15	11	14	10	14	11	13	10	11	9	17	13	10	8	21	17	
2.0															19		13		25	18	
2.5	28	22	23	17	21	16	19	13	21	16	18	14	17	12	23	17	17	14	29	21	
4	37	28	30	23	27	21	24	19	27	21	24	19	22	17	30	23	23	19			
6	48	37	41	30	36	28	32	24	36	27	31	23	28	22	37	29	28	22			
10	65	51	56	42	49	38	43	33	49	36	42	33	38	29	57	44	45	35			
16	91	69	71	55	64	49	56	43	62	48	56	42	49	38							
25	120	91	93	70	82	61	74	57	82	63	74	56	65	50							
35	147	113	115	87	100	78	91	70	104	78	91	69	81	61							
50	187	143	143	108	127	96	113	87	130	99	114	88	102	78							
70	230	178	177	135	159	124	143	110	160	126	145	113	128	100							
95	282	216	216	165	195	148	173	132	199	151	178	137	160	121							

120		324	246	250	190	224	168	198	148	233	173	207	155	185	138				
150		371	281	285	216	259	194	229	173	263	198	237	179	216	160				
185		423	328	328	296	294	220	259	198	307	229	268	203	242	183				
240																			
300																			
40																			
500																			

Attachment II Stars chiller operation data form

Model:

Serial No:

Time	1# compressor						2# compressor						Chilled water system		Cooling system	
	load %	current A	Oil level %	High pressure kgf/cm2	Low pressure kgf/cm2	Exhaust temp. °C	load %	Current A	Oil level %	High pressure kgf/cm2	Low pressure kgf/cm2	Exhaust temp. °C	Inlet °C	outlet °C	Fan Inlet °C	Fan outlet °C