

TROPICAL AIR-COOLED SCREW CHILLER



TRUST AIR CONDITIONING EQUIPMENT CO.
Prepared By: Engineering & R & D Department.

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توجه:

شرکت تراست حق تغییر مشخصات دستگاه ها را در جهت بهبود و ارتقای
کیفیت برای خود محفوظ می دارد.

2017

I. Installation

1. Unit installation

1).Lifting

Lifting unit

Container lugs should be inserted into the holes provided in the bottom of the frame rail.

Use spreader bars to avoid lifting chains hitting the chiller. Various methods of spreader bar arrangements may be used; keeping in mind the intent is to keep the unit stable and to keep the chains from hitting the chiller and causing damage.



CAUTION: Never lift the chiller using a forklift or by hooking to the top rails. Use only the lifting holes provided.



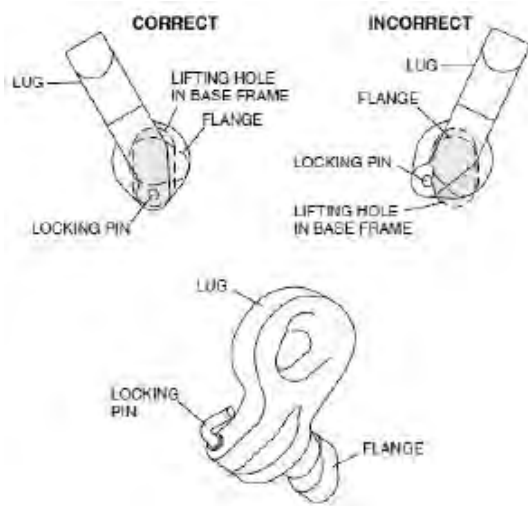
Removal from shipping container

1. Place a clevis pin into the holes provided at the end of each base rail on the unit. Attach chains or nylon straps through the clevis pins and hook onto a suitable lift truck for pulling the unit out of the container.
2. Slowly place tension on the chains or straps until the unit begins to move and then slowly pull the unit from the container. Be sure to pull straight so the sides do not scrape the container.
3. Place a lifting fixture on the forks of the lift truck and reattach the chain or strap. Slightly lift the front of the unit to remove some weight from the floor of the container. Continue pulling the unit with an operator on each side to guide the lift truck operator.
4. Pull the unit until the lifting locations are outside of the container. Place wooden blocks under the base rails of the unit. Gently rest the unit on the blocks and remove the chains and lift truck.
5. Attach lifting rigging from the crane and slowly complete the removal from the container then lift up and away. In order to ensure the smooth lifting unit, all rings are applied on both sides of the lifting rope and fixed crane hook.



Lifting using lugs

Units are provided with lifting holes in the base frame which accept the accessory lifting lug set as shown in the figure below. The lugs (RH and LH) should be inserted into the respective holes in the base frame and turned so that the spring loaded pin engages into the hole and the flanges on the lug lock behind the hole. The lugs should be attached to the cables/chains using shackles or safety hooks.



Lifting using shackles



The shackles should be inserted into the respective holes in the base frame and secured from the inside.

Use spreader bars to avoid lifting chains hitting the chiller. Various methods of spreader bar arrangements may be used, keeping in mind the intent is to keep the unit stable and to keep the chains from hitting the chiller and causing damage.

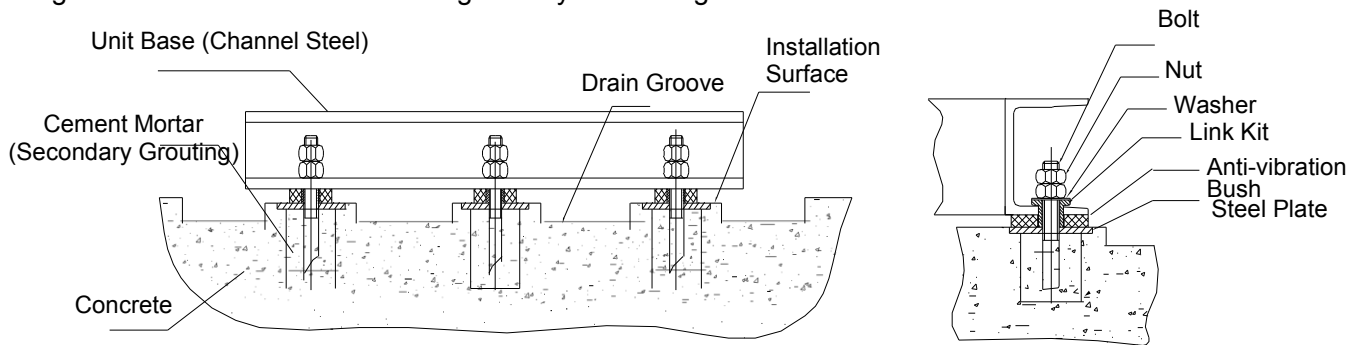
CAUTION: Never lift the chiller using a forklift or by hooking to the top rails. Use only the lifting holes provided.

2) Foundation

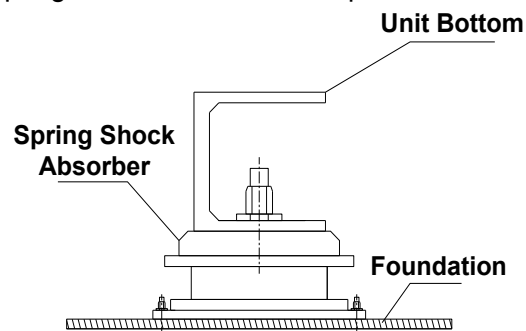
The installation foundation shall be designed by professionals according to the site conditions.

The installation foundation of the unit must be of a cement or steel structure, and shall bear the operating weight of the machine, and this face must be horizontal.

Please refer to the Diagram for Installation Foundation of Unit, place the steel plate and anti-vibration bush on the foundation accurately, and execute secondary grouting after installing the unit and foundation bolts together. The foundation bolts are generally 60 mm higher than the installation surface.



If the unit will be installed on the top of the building which vibration level should be restricted. It is recommended to use spring isolators as absorber, please refer to following diagram:

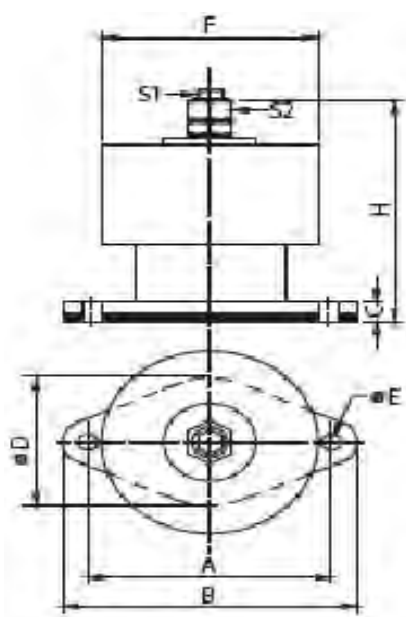


3) Dimensions & Vibration Isolators

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 isolators are level adjustable, spring and cage type isolators, mounted under the unit base rails. Deflection may vary slightly by application.



The housing of MHD series with aluminum-magnesium alloy material could prevent the vibration isolator from rustiness forever and enlarge the use life. The structure also has new improvement with an anti-side-force function for better stability and safety of unit. It can be freely adjusted as per balancing situation of unit to guarantee its work under all situations.



Technical data of MHD

MODEL	LOAD (kg)	LOAD (N)	DEFLECTION (mm)	VERTICAL (kg/mm)
MHD-850	850	8330	25	34.00
MHD-1050	1050	10290	25	42.00

MODEL	OUTER SIZE (mm)								
	A	B	C	ΦE	F	H	S1	S2	ΦD
MHD-850	165	200	13	12.5	147	165	M12*25	M20*60	104
MHD-1050	165	200	13	12.5	147	165	M12*25	M20*60	104

4). Spaces

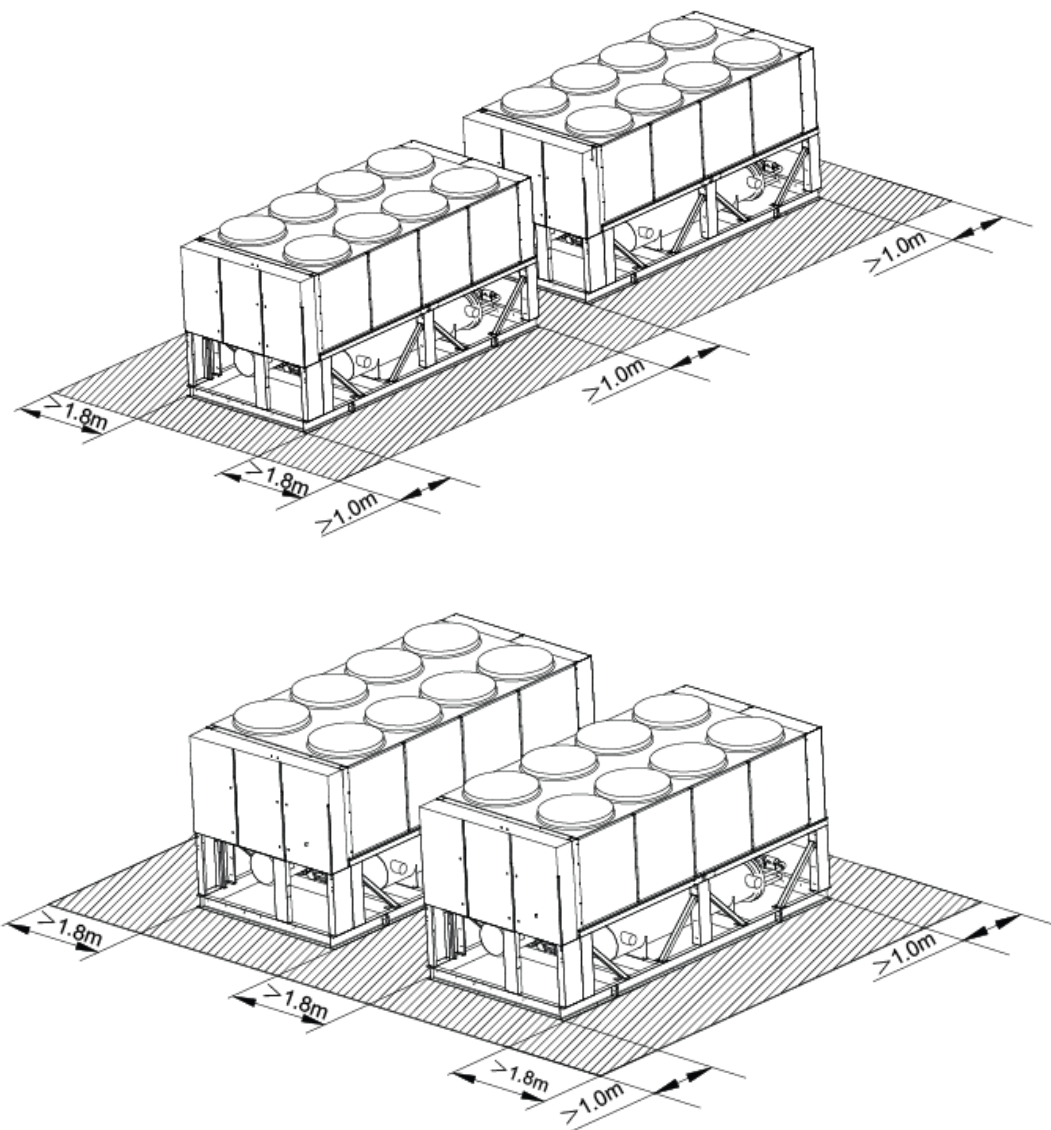
Reserve the spaces required for unit installation, operation and maintenance.

The installation place of the unit shall be free from the effects of fire, inflammables, corrosive gas or waste gas as much as possible; the ventilation space shall be reserved there; proper measures shall be taken to reduce noise and vibration whenever possible.

When the units are installed on the horizontal plane without obstacles, the longitudinal distance between the units shall be kept above 1m, the transverse distance between the units shall be kept above 1.8 m, and such distances shall be as large as possible; if there are obstacles at both sides of the unit, the distance between the unit and obstacles shall be kept above 1.8 m; if there are obstacles above the unit, the distance between the unit and obstacles shall be kept above 2.5 m.

The removable post for compressor service access must not be blocked at either side of the unit.

There must be no obstruction under the fans.



2. Water pipeline system installation

1) Water treatment

Use of untreated water or incorrect water makes unit operation low efficiency and could lead to heat exchanger damage. If the resulting from equipment scaling, corrosion, rust, produce the algae or siltation etc, must ask qualified water treatment engineering company or personnel to handle.

※ The recommended water quality standards is reference:

	Project	Unit	Water supplement	Chiller water	Tendency	
					corrosion	scaling
Basic project	PH (25℃)		6.5-8.0	6.5-8.0	0	0
	conductivity (25℃)	μS/cm	<200	<800	0	0
	Chlorine ion Cl ⁻	mg Cl ⁻ /L	<50	<200	0	
	Sulfuric acid root ion SO ₄ ⁻²	mg SO ₄ ⁻² /L	<50	<200	0	
	Acid consumption (PH4.8)	mgCaCO ₃ /L	<50	<100		0
	All the hardness	mgCaCO ₃ /L	<50	<200		0
Reference project	Iron (Fe)	mg Fe/L	<0.3	<1.0	0	0
	Sulfur ion (S ²⁻)	mgS ²⁻ /L	Check out	Check out	0	
	Ammonium ion (NH ₄ ⁺)	mgNH ₄ ⁺ /L	<0.2	<1.0	0	
	silica (SiO ₂)	mgSiO ₂ /L	<30	<50		0

2) Performance adjustment factors

The antifreeze must be required according to anyone condition as following:

1. The outlet water temperature is below 5℃;
2. The ambient temperature is below 0℃;
3. Don't start up the unit for a long time.
4. The power supply was cut off and needn't change the water in system.

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

Quality of glycol (%)	modification coefficient				Freezing point ℃
	Cooling capacity modification	Power modification	Water resistance	Water flow modification	
0	1.000	1.000	1.000	1.000	0
10%	0.993	0.997	1.013	1.019	-4
20%	0.984	0.994	1.149	1.051	-9
30%	0.975	0.989	1.343	1.092	-16
40%	0.969	0.984	1.624	1.145	-23
50%	0.961	0.978	2.026	1.213	-35

Propylene Glycol

Quality of glycol (%)	Modification coefficient				Freezing point °C
	Cooling capacity modification	Power modification	Water resistance	Water flow modification	
0	1.000	1.000	1.000	1.000	0
10%	0.99	0.992	1.029	1.013	-3
20%	0.979	0.983	1.167	1.035	-7
30%	0.964	0.975	1.364	1.063	-13
40%	0.95	0.967	1.648	1.098	-21
50%	0.925	0.96	2.056	1.145	-33

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 1800meters.

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 ² °C /kW		0.044m ² °C /kW		0.086m ² °C /kw		0.172m ² °C /kw	
	C	P	C	P	C	P	C	P
Sea level	1.000	1.000	0.988	0.992	0.960	0.973	0.938	0.968
600	0.986	1.009	0.973	1.001	0.946	0.982	0.925	0.977
1200	0.973	1.021	0.961	1.013	0.934	0.993	0.913	0.988
1800	0.960	1.031	0.947	1.023	0.921	1.003	0.900	0.998

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:

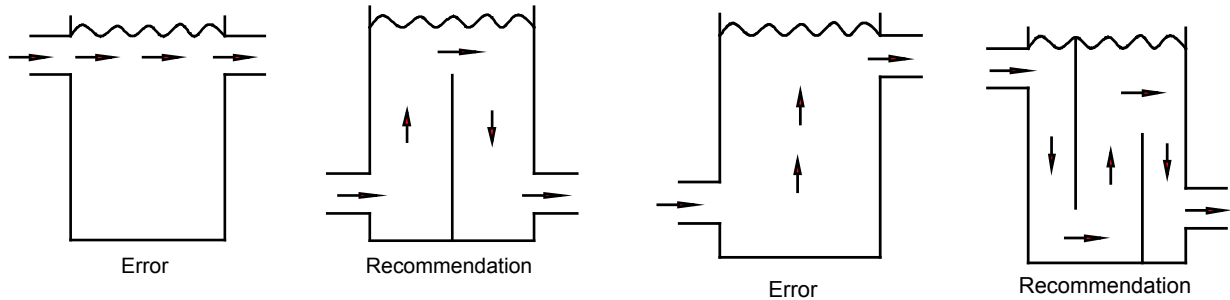
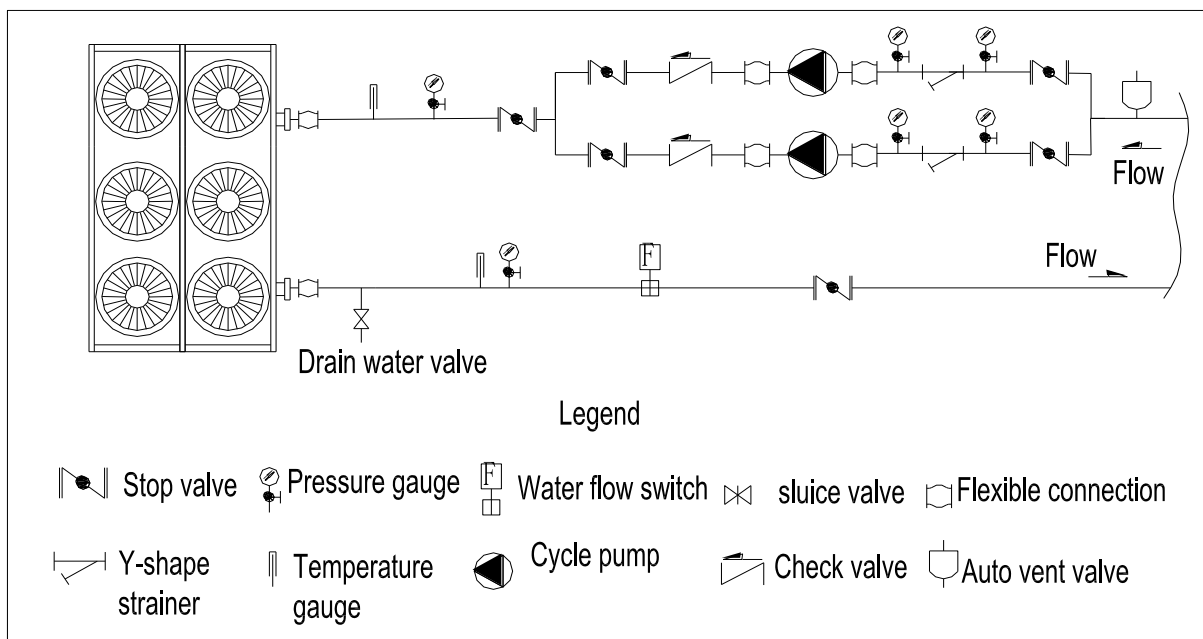


Fig. 4.4

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.



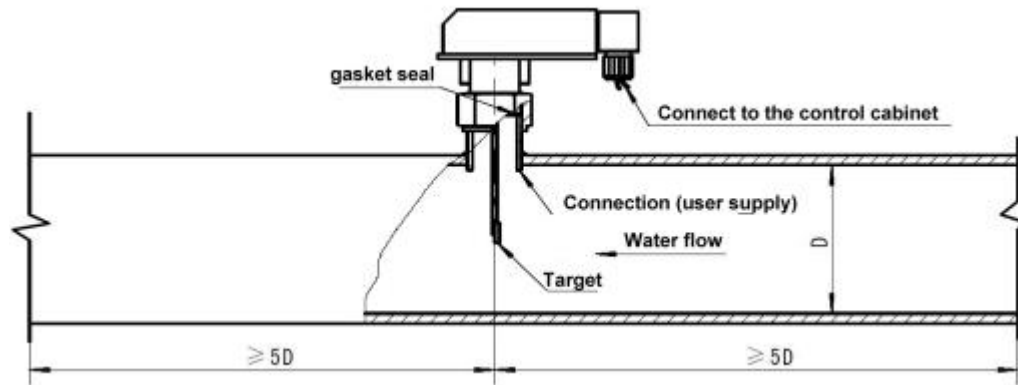
- 1) The water inlet pipeline and drain pipeline shall be connected according to the requirements of markings on the unit. Generally, the refrigerant pipe side of the evaporator is the chilled water outlet side.
- 2) The chilled water pipeline system must be provided with the soft connection, thermometer, 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) + Pipeline Resistance (length of the least favorable loop pipe * 0.05) + Local Resistance (length of the least favorable loop pipe * 0.05 * 0.5)) * (1.1 ~ 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) 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.
- 10) The drain connection is arranged on the evaporator cylinder. The drain outlet has been equipped with a 1/2" plug.
- 11) The auto discharge air valve is arranged between the high point of the pipeline and the expansion tank.
- 12) 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.

- 13) 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.
- 14) 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.
- 15) 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.
- 16) Any water piping to the unit must be protected to prevent freezing. There are reserved terminals for the auxiliary electrical heater. Logic in PLC will transmit ON/OFF signal by checking the leaving evaporator water temperature.
Note: The unit only supply ON/OFF signal, but not the 220V power. If a separate disconnect is used for the 220V supply to the cooler heating cable, it should be clearly marked so that it is not accidentally shut off during cold seasons
- 17) If the unit is used as a replacement chiller on a previously existing piping system, the system should be thoroughly flushed prior to unit installation and then regular chilled water analysis and chemical water treatment is recommended immediately at equipment start-up.
- 18) Power on the chilled water pump, and inspect its rotation direction. The correct rotation direction shall be clockwise; if not, re-inspect the wiring of the pump.
- 19) Start the chilled water pump to circulate water flow. Inspect the water pipelines for water leakage and dripping.
- 20) Commission the chilled water pump. Observe whether the water pressure is stable. Observe the pressure gauges at the pump inlet and outlet, and the readings of the pressure gauges and the pressure difference between the inlet and outlet change slightly when the water pressure is stable. Observe whether the operating current of the pump is within the range of rated operating current; inspect whether the resistance of the system is too large if the difference between the operating current and rated value is too big; eliminate the system failures until the actual operating current is satisfied.
- 21) Inspect whether the water replenishing device for the expansion tank is smooth, and the auto discharge air valve in the water system enables auto discharge. If the discharge air valve is a manual type, open the discharge valve of the chilled water pipeline to discharge all air in the pipeline.
- 22) Adjust the flow and inspect whether the water pressure drop of the evaporator meets the requirement of the unit's normal operation. The pressure at the chilled water inlet and outlet of the unit shall be kept at least 0.2MPa.
- 23) The total water quantity in the system should be sufficient to prevent frequent "on-off" cycling. A reasonable minimum quantity would allow for a complete water system turnover in not less than 15 minutes.

3. Wiring installation

WARNING:

In order to prevent any accident of injury and death during the site wiring, the power supply shall be cut off before the line is connected to the unit.

Wiring must comply with all applicable codes and ordinances. Warranty is voided if wiring is not in accordance with specifications. An open fuse indicates a short, ground, or overload. Before replacing a fuse or restarting a compressor or fan motor, the trouble must be found and corrected.

- (1) Copper wire is required for all supply lines in field connection to avoid corrosion and overheat at the connection of terminals. The lines and control cables shall be separately paved and equipped with protective pipes to avoid intervention of supply line in control cable.
- (2) Power section: It is required to connect the power supply cable to the control cabinet of the unit, when it arrives at the jobsite. The power supply cable is connected to the terminals of L1, L2, L3, N and PE and the terminals need to be fixed again after 24h running (the minimum allowed time). Please seal the entering wiring hole after users installed the main power wires, in order to avoid the dust entering into electric control cabinet.

Caution: it is suggested that to use appropriate tools to make sure there is a enough height to install the main power wires if the basement is higher than 200 mm.

- (3) Breaking isolation switches should be added between the power cord of users and the unit. The capacities of the breaking isolation switches recommended are as follows.
- (4) Attention: **refrigerant selection:** the previous software settings are replaced by the current hardware settings to avoid the possibility of improper operation of the software leading to wrongly selected refrigerant and damage to the unit.
- (5) Short circuit 1X: 35/1X: 36 on the wiring terminal 1X in the cabinet and set R22 refrigerant for the unit, or, R134a is used for the unit.
- (6) In order to avoid wrong control in field connection, the liquid control circuit (24 V) shall not be in the same conduit with the lead wire of the voltage higher than 24 V.
- (7) The control circuits of various units are all 220 V, and for the wiring ways of the control circuits, please refer to the wiring diagrams supplied along with the units.
- (8) A unit consists of master compressor and slave compressor communicating via shield wire protected by sleeve and separated from supply line.
- (9) The control output cable to be connected on site shall be AC250V-1mm², and 0.75mm² shield wire (24 V) shall be used for control signal line.
- (10) Attentions: Read the electrical wiring principle diagram and connect the wires strictly according to the wiring terminal diagram. Three-core shield cable (RVVP3×0.75mm²) shall be used for the connection of the temperature sensor. Common two-core cable (RVV2×0.75mm²) shall be used for the connection of flow switch to connect to the NO contact of the switch, i.e. the opening point when waterless. Two buttons can be connected to the external of remote start and stop.
- (11) If the customer desires the linked control of the water pump, connect the water pump as shown in the diagram, where an intermediate relay is required. If the function of linked control of water pump is not needed, ensure that the water pump is started before starting the machine.

CAUTION: An independent power supply box needs to be equipped with the power supply of the water pump.

(12) The wiring ports for remote start/stop, flow switch, cool/warm switch, water pump linked control, alarm indication, etc. are reserved in the electrical cabinet of the unit, with the numbers shown in the diagram below.

(13) Passive inching button is used for remote start and stop, and the flow switch must be connected to the NO contact, or the machine cannot be started.

Passive holding switch is used for cool/warm switch, e.g. common selection switch. Controls of large power electrical appliances such as water pump and user electric heating must be interfaced with a relay, or the PLC might be burned. Other outputs can be directly connected to indicator lamps or alarms.

II. Commissioning

1. Pre start-up

(1) Electrical system inspection

Inspect whether power distribution capacity is compliant with the power of the unit before the first start-up, and whether the diameter of the selected cable can bear the maximum working current of the master compressor.

The max economical conveying distance:

The max loading time in a year (h)	Copper core length(m)
<3000h	264
3000~5000h	294
>5000h	331

- 1) Inspect whether the electric mode is compliant with that of the unit, three-phase five-line (three phase lines, one zero line and one earth wire, 380V±10%).
- 2) Inspect whether the maximum phase voltage unbalance is compliant with the requirement, 2% for the maximum permissible phase voltage unbalance and 5% for the phase current balance. The machine must not be started up when the phase voltage unbalance exceeds 2%. If the measured unbalance% is excess, the power supply sector shall be informed of immediately.
- 3) Inspect whether the supply circuit is the compressor is firmly and properly connected, and tighten it if there is any looseness. The screws might be loose due to the factors such as long-distance transport and hoisting of the master compressor. Or, the electrical elements (e.g. air switch, AC contactor, etc.) in the control cabinet of the master compressor and the compressor might be damaged.
- 4) Carefully inspect all the electrical lines with multimeter, and whether the connections are properly installed. Carry out measurement in mega ohm and ensure that there is no short circuit at the shell. Inspect whether the earth wire is properly installed, and whether the insulation resistance to ground exceeds 2MΩ. And inspect whether the supply line meets the requirement of capacity.
- 5) Inspect whether disconnection switch is installed to the supply line of the supply unit.
- 6) Carry out complete inspect for all connections of the main circuit in the control cabinet and all external connections of the control circuit before power connection (e.g. oil heater, compressor electronic protection, circulatory water temperature sensor, target-type flow switch connection, water pump linked control, communication line connection, etc.); inspect the bolts of the wiring terminal for looseness. Inspect whether various electric meters and appliances are properly installed, complete and available. Inspect the interior and exterior of the electrical cabinet, especially various wiring ports, for cleanness. If the communication lines of the controller and control screen are damaged, refer to the diagram below.
- 7) After the inspection for all the above items is complete, connect the control cabinet and the supply indication lamp will light up, indicating that the oil heater is working. Observe whether the phase loss protection is in normal condition, if it is (green light on), close the single-pole switch (QF2) in the control cabinet, then the control circuit begins working, and the touch screen and controller are used

in operating.

(2) Refrigeration System Inspection

- 1) The discharge line valve and suction line valve of the compressor must be fully open (turn anticlockwise to open) and the cores shall be tightly locked to prevent leakage of refrigerant.
- 2) Inspect whether moisture content of the system exceeds the limit
Excessive moisture content in the refrigerant system of the unit might cause ice block, copper plating, etc. that would seriously affect the safety of the unit. Therefore, the dryness of the refrigerant system of the unit shall be inspected from the sight glass before and during operation of the unit, purple indicating dry, and pink moist, as shown in the below figure. When the color turns to red, the filter core in the unit shall be replaced with a dry one.
- 3) Sufficient lubricating oil in the oil tank (not lower than 1/2 of the oil level in the high oil immersion lens), and no deterioration (blackness).
Inspect the oil level and quality before start-up for the two factors have direct impact on the performance and reliability of the unit. There must be sufficient lubricating oil in the unit. And during the shutdown of the unit, the high oil immersion lens must be full of oil.
When the unit is in stable operation, the oil level in the high oil immersion lens should be at least above the 1/2 position. And there shall be no deterioration (blackness) of the lubricating oil, or else, qualified lubricating oil shall be changed before operating the unit.
- 4) Coil fin cooling fan shall rotate in correct direction without reverse rotation or shutdown.
Before operation of the unit, inspect whether the fan networks are deformed under stress, whether there is friction and collision between the networks and the blades, whether there are foreign matters in the network, and whether the fin is deformed or damaged caused by collision.

There should be no deformation of the fan guard or foreign matters in it



Operate the fans one by one before operating the unit, and inspect whether there is abnormal noise in the fan caused by poor lubrication of the bearing or friction of foreign matters, and whether the fan rotates reversely or does not rotate.

- 5) Inspect whether the directional elements such as one way valve, solenoid valve, electronic expansion valve, etc. are installed properly. The directions of the one way valve and solenoid valve are indicated on the valves. As for the thermostatic expansion valve and electronic expansion valve, if the valves are upward, the direction is generally high-in and low-out.
- 6) Inspect whether the pressure sensor stop valve, dry filter front/rear angle valve, liquid/air sampling stop valve and injection stop valve, etc. are all open.

When the unit stops, the high and low voltages shall be almost the same. After the start-up, the low voltage decreases, and the high voltage increases. If there is no voltage change certain time after

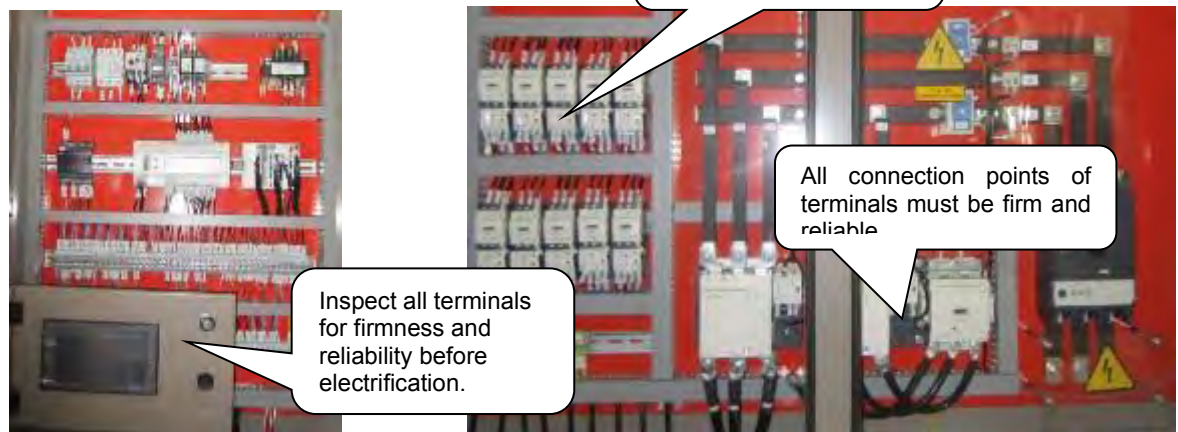
the start-up, inspect whether the liquid/air sampling stop valve is open.

- 7) After the unit is installed and before connected, it is required to tighten the connections in the electrical cabinet of the unit one by one.
- 8) Inspect the bolts of the unit for looseness.

After the unit is transported and installed, it is required to inspect whether the fixing bolts of the unit (e.g. fixing bolts at compressor base angle, at post and beam of the unit, and at pipe clamp, etc.) and of the electrical elements (e.g. fixing bolts of PLC and of insulating transformer, and connection bolts of upper/lower terminals of AC contactor, etc.) are firmly fixed.

- 9) Inspect the looseness of the connections in the electrical cabinet, especially the electric part in the cabinet. The parts connected by bolts might be loose due to transportation. If there is any looseness, tighten it to avoid burnout of circuit or element caused by poor contact.

Inspect the looseness of the terminals and poor contact caused by vibration and collision during transportation and installation (especially the electric terminals are firm and reliable before electrification).



Inspect whether there is poor contact and short circuit caused by dust, moisture, etc. in the electrical cabinet, and whether the values of all temperature sensors are normal. During the shutdown of the machine, the indicated temperatures of discharge, fin, and the environment shall be almost the same, and the entering and leaving chilled water temperatures shall be almost the same.

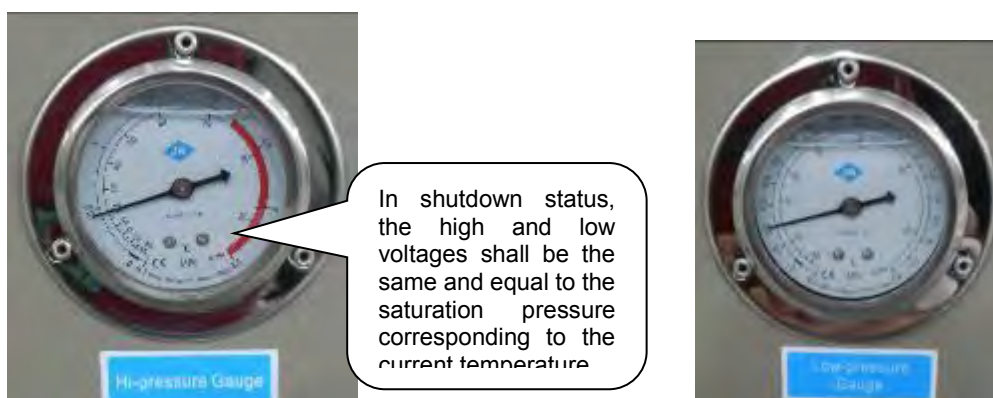
- 10) Before the unit leaves the factory, the control cabinet is well connected with main motor, electrical actuator, and sensor elements of pressure temperature, etc. Therefore, the wiring on site for the user is very simple. Only the chilled water flow switch line and chilled water pump linked control line (control contact is active) need to be connected. For the detailed connection way, please refer to the circuit wiring diagram in the operation manual for the unit. (The attached circuit diagram represents the case of air-cooled heat pump unit for user's reference, as for the details, the operation manual supplied with the unit shall be final.)
- 11) Target-type flow switch is set on the chilled water pipeline which shall be installed at the outlet of the chilled water. The NO contact of the target-type flow switch shall be connected to the control circuit as per the wiring diagram.
Note: Disordered water flow may lead to wrong action of the flow switch; therefore, the control cabinet will command the unit to stop after receiving continuous disconnection signals during 10 s.
- 12) The tube where the temperature sensing probe is installed shall be filled with lubricating oil or other grease that will not freeze at the temperature of the leaving chilled water for the convenience of heat

transfer. Thermostatic insulation and enclosing measures shall be taken for the temperature sensing device.

Inspect whether there is temperature deviation for the entering and leaving water temperature sensor caused by insufficient heat transfer oil in the thermostatic pipe.

2. Start-up

- 1) High/low voltage value of the system. In the case of the unit shut-down and waterless in a long time, the liquid and gas of the system shall be equivalent and close to the saturation pressure corresponding to the current ambient temperature. The correlation of saturation temperatures and pressures (the pressures in the list are gage pressures, among which, the atmospheric pressure is 0.1MPa) of R134a refrigerant is shown in appendix 1:



In the pressure gauge scale, taking the right figure for example: the outside values are pressure values (unit: bar), and the inside values indicate saturation temperatures of refrigerant R134a respectively under the relative pressure. The types of refrigerants indicated in different pressure gauges might differ. [Table 1]

Refrigerant temperature °C	R134a refrigerant pressure (Gage pressure) MPa	Refrigerant temperature °C	R134a Refrigerant pressure (Gage pressure) MPa
0	0.19	25	0.57
5	0.25	30	0.67
10	0.32	35	0.79
15	0.39	40	0.92
20	0.47		

If the high/low voltage deviates much from the saturation pressure corresponding to the current temperature (more than 2bar), maybe there is leakage or insufficient refrigerant in the system.

- 2) Inspect whether the oil heating of the unit is normal.

Before start-up, it is necessary to inspect whether the oil heating in the unit is available, and whether there is the condition that the oil heater does not work because of no power supply. It is particularly important in winter when the temperature is low and the failure of oil heating might lead to poor lubrication of the unit. The optimum working temperature for current types of lubricating oil is generally around 40°C.



Compressor oil heater is working when the unit is

- 3) Inspect whether there is alarm for trouble of the display screen. if there is, the trouble must be corrected.
- 4) Inspect the electronic expansion valve control module for alarm trouble.
- 5) Inspect whether various temperature points displayed on the display screen are within the normal range.

Before the operation of the unit, the showed temperatures of discharge、fin and the ambient temperature are close to the current actual ambient temperature, and whether the entering and leaving water temperatures are close to the water temperature at the user side. If there is any obvious deviation of the above temperatures, inspect whether the temperature sensor is in normal condition and whether the connection is firm and reliable.

TEMP. / PRES.		
EWT	0.0	℃
LWT	0.0	℃
Ambient Temp.	0.0	℃
1# Discharge Temp.	0.0	℃
1# Suction Pres.	0.0	Bar
1# Discharge Pres.	0.0	Bar
1# Saturated Temp.of Suction	0.0	℃
1# Saturated Temp. of Discharge	0.0	℃
1#	2#	
STATUS	TEMP./PRES.	INPUT OUTPUT MAIN

Values of various temperature and pressure points showed in the main page of the unit.

- 6) Start on pump. Inspect whether the flow in the water pump meets the requirements of the unit.
- 7) Inspect whether the power supply of the unit is stable.
- 8) Start on chiller.
- 9) Running parameters

The maximum range of parameters for normal operation of R134a refrigerant unit. See below table for the maximum range of performance parameters of R134a refrigerant:

Working Condition	Optimal range	Limit Range
Discharge temp. °C	60~80	<110
Suction temp. °C	3~12	--
Condensation temp. °C	46~51	<65
Evaporation temp. °C	-1~4	<15
Suction super-heating degree °C	4~8	~
Discharge pressure MPa	1.2~1.4	<1.8
Suction pressure MPa	0.28~0.38	<0.38
Discharge super-heating degree °C	10~30	
Super-cooling degree °C	2~8	

III. Maintenance

In order to ensure the long term safe operation, to extend the service life of unit, reduce the failure and repair, should be regularly maintained and checked on the unit

1. Daily maintenance

- 1). Switch machine daily by local and remote two modes, the local switch unit set see previous page 1 HMI operation local switch part, HMI key to open for local mode switch machine, electric control box on the door of the emergency stop switch used in machine repair, debugging or emergency shutdown, usually do not use.
- 2). During operation of the unit, should irregularly check the water temperature, oil level of compressor, high and low pressure, voltage, current and so on, such as abnormal timely find out the reasons, troubleshooting.

2. Maintenance

1).Schedule

Maintenance items		Maintenance frequency	Qualify standards (Settlement)	Note
I. General	Noise	Anytime	Judge whether there is abnormal sound by hearing;	Watch from one meter away from the center of the Chiller;
	Vibration	Anytime	Watch whether the swings of distribution pipes and components are too large	
	Voltage	Anytime	Rated voltage is within $\pm 10\%$	
II. Appearance	Clean	Anytime	Keep it clean anytime	
	rust	Anytime	using an iron brush to remove rust, besmear again the antirust paint	
	Calm	Anytime	Lock each snail	
	Insulation material flakes	Anytime	Using adhesives sticky	
	Water leak	Once/ Month	Check whether the exhaust water pipe is blocked	
III. Compressor	Noise	Anytime	Whether there is abnormal sound when starts up, runs or stops	
	Insulation resistance	Once/ Year	Above $5M\Omega$ is required when testing with DV500V high resistance meter	
	Shockproof rubber gets old	Once/ Year	Flexible when pressed with hands is qualified	
	Medium check	Once/3000 hours	Pay attention to the noise libation and oil level	
	Medium check	Once/6000 hours	Confirm the action of safety device and protection device	
IV. Fin heat exchanger	Fan	Anytime	Normal wind amount, high pressure within the normal range	
	Clean situation	Once/Month	Normal wind amount, high pressure within the normal range	
V. Shell-and-tube heat exchanger	Water flow of the user side	Anytime	Within $\pm 5\%$ of the standard	
	Temperature	Anytime	Within the standard	
	Antifreeze concentration	Once/Month	Make sure it is set above the set concentration	
	Water quality	Once/Month	Within the standard	Refer to water quality furring relations drawing
	Purity	Anytime	The low pressure is within the standard when refrigerating	

Maintenance items		Maintenance frequency	Qualify standards (Settlement)	Note
	Drainage	Anytime	Drain all the water if it is not used for a long time	Drain water in the distribution pipe
VI. High and low pressure switch	Action	Once/Month	Check according to 'Protection Devices Action Value'	Whether the match point is good
VII. Pressure Gauge	Finger	Once/ Half of a year	Compare with correct pressure gauge	
VIII. Globe valve	Action	Once/Month	Smooth action on globe valve switch	
IX. Refrigeration circle	Refrigeration media leak	Once/Month	Check whether there is refrigeration media leakage inside the Chiller or at the distribution pipe connecting points. Let out all the water inside the shell-and-tube heat exchanger, and check whether there is any leakage at the water inlet or outlet.	Use the electronic leak detector, or blowtorch leak detector, or soap water.
X. Electrical machine control	Insulation resistance	Once/Month	Above 5MΩ is required when testing with DV500V high resistance meter	
	Wire contact	Once/Month	Insulation layer of the wire must be under good contact condition, without damage, bolt well fixed.	
	Assistant relay	Once/Month	No abnormal action	
	Time-limited relay	Once/Month	Act according to the time set	

2). Please have the qualification of the after sale service engineer to check:

- (1).Inspection unit control and protection setting value.
- (2). Check the electrical wiring is or not loose, if loose to timely fastening
- (3). Check the reliability of electrical components, should be promptly replaced unreliable or failure parts
- (4).check compressor oil system.
- (5).check pump and water system.

3) Replacing dry filter

Before replacing dry filter core filter, directly close the angle valves at both ends to discharge the residual refrigerant in the dry filter. After the replacement, fix the end cover tight, extract vacuum, and then add 2~3kg refrigerant.

If only to clean the dry filter, but not to replace it, before removal of the filter, ensure that the refrigerant in the dry filter is completely discharged and the dry filter has remained not in use for a time (to ensure the temperature of the dry filter core is close to the ambient temperature) so that the removed dry filter core with low temperature would not cause the moisture in the air to immediately reach to the dew point to condense and absorb water. Protective measures shall be taken to the removed filter to prevent it from directly contacting with the air.



If the dry filter core is dirt or has absorbed too much moisture, it must be replaced with a dry one. During the operation, inspect whether the dry filter is blocked and whether the temperatures at the dry filter inlet and outlet are close in normal conditions. If there is obvious temperature difference (above 5°C) between the front and end of the filter, or even that frost exists at the end of the filter, it is likely to block the dry filter.



Seriously blocked dry filter must be cleaned or replaced.



If frost exists at the end, the dry filter is seriously blocked.



If the temperature difference between dry filter front and end exceeds 5°C, the dry filter is likely blocked.



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برند برتر در اولین جشنواره بین المللی
برترین نام و نشان های تجاری ایران

