Water Cooled Screw Chiller

Technical Service Manual

Climate solution for green environment

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Controls Start-Up, Operation, Service and Troubleshooting

1.SAFETY CONSIDERATIONS

1.1 Installation safety considerations

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

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

Strongly recommend employing a specialized company to unload the machine.

The units can be lifted with slings, using only the designated lifting points marked on the unit.

Use slings with the correct capacity, and always follow the lifting instructions on the certified drawings supplied with the unit.

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

Ensure that the valves are correctly installed, before operating the unit. In certain cases the relief valves are installed on isolating valves. These valves are factory-supplied lead-sealed in the open position. This system permits isolation and removal of the relief valves for checking and replacing. The relief valves are designed and installed to ensure protection against overpressure caused by fire. Ensure good ventilation, as accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions.

Inhalation of high concentrations of vapour is harmful and may cause heart irregularities, unconsciousness, or death. Vapour is heavier than air and reduces the amount of oxygen available for breathing. These products cause eye and skin irritation. Decomposition products are hazardous.

1.2 Maintenance safety considerations

Engineers working on the electric or refrigeration components must be authorized, trained and fully qualified to do so.All refrigerant circuit repairs must be carried out by a trained person, fully qualified to work on these units. He must have been trained and be familiar with the equipment and the installation. All welding operations must be carried out by qualified specialists.

Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorized engineer. These procedures must be carried out with the unit shut-down.

NOTE:

The unit must never be left shut down with the liquid line valve closed, as liquid refrigerant can be trapped between this valve and the expansion device. (This valve is situated on the liquid line before the filter drier box.)

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

Never work on a unit that is still energized. Never work on any of the electrical components, until the general power supply to the unit has been cut using the disconnect switch(es) in the control box(es).

If any maintenance operations are carried out on the unit, lock the power supply circuit in the open position ahead of the machine.

If the work is interrupted, always ensure that all circuits are still deenergized before resuming the work.

ATTENTION:

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

At least once a year thoroughly inspect the protection devices (valves). If the machine operates in a corrosive environment, inspect the protection devices more frequently.

1.3 Repair safety considerations

All installation parts must be maintained by the personnel in charge, in order to avoid material deterioration and injuries to people. Faults and leaks must be repaired immediately.The authorized technician must have the responsibility to repair the fault immediately. Each time repairs have been carried out to the unit, the operation of the safety devices must be re-checked.

If a leak occurs or if the refrigerant becomes contaminated remove the complete charge using a recovery unit and store the refrigerant in mobile containers.

Repair the leak detected and recharge the circuit with the total R-134a charge, as indicated on the unit name plate polyolester oil.

Do not use oxygen to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.

Never exceed the specified maximum operating pressures. Verify the allowable maximum high- and low-side test pressures by checking the instructionsin this manual and the pressures given on the unit name plate.

Do not unweld or flamecut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) has been removed from chiller. Traces of vapour should be displaced with dry air nitrogen. Refrigerant in contact with an open flame produces toxic gases.

The necessary protection equipment must be available, and appropriate fire extinguishers for the system and the refrigerant type used must be within easy reach.

Do not siphon refrigerant.Avoid spilling liquid refrigerant on skin or splashing it into the eyes. Use safety goggles. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.

Never apply an open flame or live steam to a refrigerant container. Dangerous overpressure can result. If it is necessary to heat refrigerant, use only warm water.

Do not re-use disposable (non-returnable) cylinders or attempt to refill them. It is dangerous and illegal. When cylinders are empty, evacuate the remaining gas pressure, and move the cylinders to a place designated for their recovery. Do not incinerate.

Do not attempt to repair or recondition any safety devices when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism.

If necessary, replace the device. Do not install safety valves in series or backwards.

Ensure that you are using the correct refrigerant type before recharging the unit.Charging any refrigerant other than the original charge type (R-134a) will impair machine operation and can even lead to a destruction of the compressors. The compressors operating with this refrigerant type are lubricated with a synthetic

ATTENTION:

No part of the unit must be used as a walkway, rackor support. Periodically check and repair or if necessary replace any component or piping that shows signs of damage.

The refrigerant lines can break under the weight and release refrigerant, causing personal injury.

Do not climb on a machine. Use a platform, or staging to work at higher levels.

Use mechanical lifting equipment (crane, hoist, winch, etc.) to lift or move heavy components. For lighter components, use lifting equipment when there is a risk of slipping or losing your balance.

Use only original replacement parts for any repair or component replacement. Consult the list of replacement parts that corresponds to the specification of the original equipment.

Do not drain water circuits containing industrial brines, without informing the technical service department at the installation site or a competent body first.Close the entering and leaving water shutoff valves and purge the unit water circuit, before working on the components installed on the circuit (screen filter, pump, water flow switch, etc.).

Do not loosen the water box bolts until the water boxes have been completely drained.

Periodically inspect all valves, fittings and pipes of the refrigerant and hydronic circuits to ensure that they do not show any corrosion or any signs of leaks.

It is recommended to wear ear defenders, when working near the unit and the unit is in operation.

2.MAJOR SYSTEM COMPONENTS

2.1Programmable Logic Controller (PLC)

Communication with the PLC, the unit used to display operating status, set the unit operating mode, operating parameters and control unit.

2.2Electronic Expansion Valve (EXV) drive module

Connected through a module above the temperature sensor and pressure sensor to calculate the compressor is running in the suction superheat, suction superheat to adjust through the electronic expansion valve opening, so that the unit run at a steady state energy.

2.3Compressor Protection module

Compressor winding test temperature and exhaust temperature, if the temperature is too high, it will protect and alarm.

2.4Emergency Stop Switch

Downtime in the event of an emergency, you can press this button to immediately stop.

3.OPERATION DATA

3.1Electronic Expansion Valve (EXV)

• EXV OPERATION

High evaporation temperature alarm delay(MOP)

High condensing temperature alarm delay(HiTcond)

Low suction temperature alarm threshold

Low suction temperature alarm delay

EEV minimum number of steps

EEV Maximum number of steps

EEV step off

Rated speed of EEV

Rated current EEV

EEV quiescent current

EEV duty

Open simultaneous localization

Closed simultaneous localization

Compressor Protection Module

• OUTPUTS

220V, Machine protection switch, Exhaust temperature thermal switch

• INPUTS

Three-phase power (380V/3P/50Hz)

Star-Delta Startup

Reduce the starting current, to avoid the high current motor start transient impact.

3.2Alarms/Alerts

Evap. flow alarm

Freeze Alarm

High-pressure alarm

Low-pressure alarm

Delta-pre. alarm

Compressor fault

Oil level alarm

Oil press diff

Contactor fault

Compressor overload

Power Failure

Exhaust temp. high

Fin temp. high

Water-out sensor fault

Water-in sensor fault

Fin sensor fault

Environmental sensor fault

Exhaust sensor fault

Suction sensor fault

Suction Pressure Fault

Discharge Pressure Fault

4.Protection items and Troubleshooting

4.1Protection items and Troubleshooting items

Protection	Purpose
High pressure / low pressure protection of compressor	Ensures the compressor runs in normal range and ensures its work life.
Converse phase, lack of phase	Protects the compressor from damage because of converse phase or lack of phase

protection	of power.
Anti-freezing protection during refrigeration	Protects the key components such as evaporator, condenser and water pipe etc. from damage because of the expanse caused by the water becomes into ice
Overload protection	Protects the compressor from burn due to overload running.
Over current protection of compressor	Protects the compressor from burn due to over current running under bad conditions.
Internal protection	Makes the compressor run safely under permitted conditions.
Anti-overheating protection of system	Protects the compressor from burn because of running lack of refrigerant or lubricating oil.
Water flow switch protection	Protects the compressor and the water pump motor from burn because there is lack of cooling water or chilled water.
Protection of sensor fault	Ensures the data from sensor is correct to prevent the system from wrong action.
Oil level and oil pressure difference protection	Ensures the compressor to run normally.
High discharge temperature protection	Makes the compressor run safely under permitted conditions.

Failure display	Causes	Solutions
Compressor can not work	No power; Switch works (over current); Starting switch failure; The fuse is melted; Interlocking device does not work; 6High/low pressure switch work	Switch on the power after checking; Find out the cause. Replace the switch or adjust the voltage. Examine and replace it Replace it Check if the fan of cooling tower and all the water pump work, if not, make them run. Adjust the pressure.
The unit stops Immediately after starting	High/low pressure switches work	Insufficient cooled water in condenser. Add water into it.

		Expel the incondensable air from condenser. Clean the expansion pipe or replace it if it is damaged. Clean the cooled water strainer.
3)Discharge pressure is too low	Insufficient refrigerant; High degree of superheat of expansion valve; Excessive cooled water or the water temp. is too low; Drying strainer is blocked.	Check the leakage and add the refrigerant into the unit. Adjust it. Adjust the water volume. Replace and clean the filter.
Over high discharge pressure	1) Excessive refrigerant; Incondensable air inside; Bad effect of cooling tower; Water pump is damaged; Pipes of condenser are dirty; High-pressure gauge can not indicate precise figure; Insufficient cooled water; Strainer of cooled water is blocked.	Expel some refrigerant. Expel the air. Check it and do reparation. Repair it. Do cleaning. Replace a new gauge. Replenish the water. Do cleaning.
Suction pressure is too high	Chilling overload; Low degree of superheat of expansion valve; Excessive refrigerant.	Adjust the load. Adjust it. Expel some refrigerant.
Suction pressure is too low	Insufficient refrigerant; Blocked by desiccant; Chilling load is too low;	Check the leakage and add the refrigerant into the unit.

	Insufficient chilled water; Strainer of chilled water is blocked.	Replace and clean the filter. Adjust the load. Replenish the water. Do cleaning.
Capacity adjusting device failure	Thermostat failure; Solenoid valve is damaged; Capillary tube is blocked.	Replace it with a new one. Replace it with a new one. Do cleaning.
Compressor overheat	Defective bearing of compressor; Over high pressure on liquid side; Temp. and pressure of refrigerant on gas side is too high; Electromotor is overheated.	Replace the compressor. Refer to item 4. Adjust the pressure on gas side and the unfolding degree of solenoid valve. Refer to item 10.
NFB Escape	Short circuit of wiring. Wiring is grounded. Electromotor of compressor failure.	Measure the insulation resistance. Ditto. Measure the grounding insulation resistance and phase insulation resistance.
Over loading relay of compressor electromotor works	NFB jumps, unit runs with single phase power; Voltage too high or too low, unbalanced voltage; Defective solenoid switch cause the unit run with single phase power; Defective electromotor; Temp. inside distribution box is too high; Over high running pressure; Compressor starts frequently; Insufficient chilled engine oil in compressor.	Check it. Check the distribution box. Repair or replace it. Repair or replace it; if it is burnt, clean the refrigerant pipelines. Keep the temp. below 40℃. Refer to item 4 and 5. Check all the automatic device. Clean the oil filter.

4.2.EXV Troubleshooting

Problem	Reason	Solution
Measured superheat value is incorrect	Measured superheat value is incorrect	Check that the measured pressure and temperature sensors correctly and the correct position.
	Set the wrong type of refrigerant	Check on the drive set minimum and maximum pressure pressure sensor parameter with the range of pressure sensors installed in line. Check sensor electrical wiring is correct.

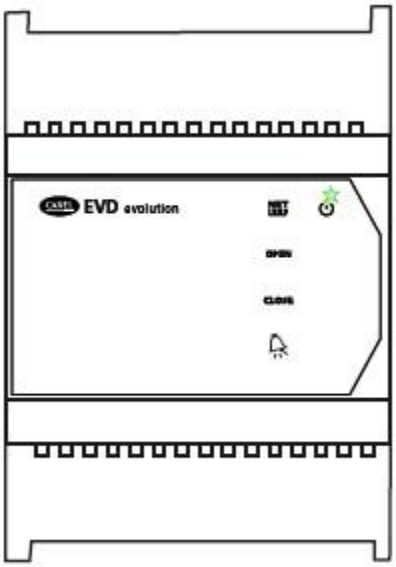
liquid back to the compressor during the control	Valve type setting error	Check and correct valve type parameters
	Valve connection error (rotation in the opposite direction) and is open	And manual control valve is completely closed or open, to check the valve rotation. A fully open valve Superheat can be decreased, and vice versa so that the superheat values have increased. If the valve is rotating in the opposite direction, check electrical wiring.
	Superheat setting is too low	Check superheat setting. Beginning to set 12 °C, check to make sure there is no return of liquid. Then gradually reduce the set value, but always returning to ensure that no liquid.
	Low superheat protection is invalid	If low superheat value of long duration and the valve closes slowly, then increase the degree of protection of low superheat threshold and / or protection to lower superheat integration time. The beginning of the threshold value is set lower than the superheat setting 3 °C, points time is set to 3-4 seconds. Low heat and then gradually reduce the threshold and increase the integration time, check to make sure the under any operating conditions there was no return of liquid.
	Valves damaged or connected incorrectly the stator	The stator and the valve and disconnect the cable connection, with ordinary measuring coil resistance tester. Two coil resistance should be around 36 Euro. Otherwise, replace the stator. Finally, check the connection of electric drive cable wiring.
	Valve can not close	Always check the superheat value is too low (<2 °C) and the valve position is always 0 step. If the above situation, the valve is set to manual control and completely shut down. If the superheat value is always low, check the electrical wiring and / or replacement the valve.
	Often to control the settings in the refrigerated cabinet set "Start at the valve opening degree control" parameter too High (only for composite refrigerated cabinet)	In all uses are reduced" began to control the valve opening degree" parameter values, make sure to control the temperature will not be affected
Liquid only during the defrosting returned to the compressor (only applicable to composite refrigerating cabinet)	Defrosting control after the pause time is too short	Increasing the " defrosting valve control delay" parameter values
	Defrosting and reaches operating conditions before drive the measured degree of superheat temperature is very low, and continued for a few minutes	Check and confirm the LowSH threshold is higher than the measured value of the superheat, and activate the corresponding protection function (integration time > 0 seconds). When necessary, reduced integration time
	Drive the measured degree of superheat temperature is not low, but there is still liquid flows back to the compressor unit	Setting a more sensitive parameter, so that the valve can be closed: the proportion coefficient increases to 30, integral time increased to 250 seconds, differential time increased to 10 seconds
	A plurality of refrigerator and defrosting	Stagger the defrosting start time. If unable to stagger, in the absence of the first two issues in the case, will involve the refrigerated cabinet superheat setpoint and at least 2 ℃ LowSH threshold increase
	The valve is too large	The replacement for the smaller valves
Liquid only at start controller (closed) when	Parameter "start control valve opening degree" set too high	Reference to the evaporator cooling capacity and rated capacity of the valve than check this parameter value; necessary to reduce this value

returning to the compressor		
Superheat value is about swing around the set value, and larger than 4 °C	Condensing pressure instability	Check the controller condenser settings, set the parameter to the more "moderate" values (such as increasing the proportion with or increasing the integration time). Note: the need for stability, including + / -0.5 bar changes. If this does not work or can not change the settings,In the "oscillation" system used in electronic expansion valve control parameters
	Even if the valve is set to manual control (mean value in the corresponding position with the work), the value remains stable superheat	Check the cause of instability (such as the refrigerant charge is less) and try to solve. If not feasible, in the "oscillation" system used in the electronic expansion valve control parameters
	Will set the manual control valve (in the position corresponding to the average work), the superheat value is no longer swing	First try to reduce the scale factor (30% to 50%) and then increasing the integration time by the same proportion. In any case, the recommended use of stable system parameters
	Superheat setting is too low	Increase the superheat setting, check to make sure superheat swing has been reduced or disappeared. Set the start of 13 ° C,and then gradually reduce the set value, to ensure that the system does not swing again and the device temperature can be set to control value
In the evaporating temperature higher start-up phase, the evaporation pressure is too high	MOP protection disabled or invalid	The MOP threshold is set to require saturated evaporation temperature (high evaporation temperature limit compressor) and MOP integration time set between the National Cheng Kung University in 0 (recommended for 4 seconds) to activate the MOP protection. To make the protection more sensitive, down MOP integration time low
	Start system or transient conditions, excess refrigerant charge (for refrigerator)	A "soft start", a time to start a facility or a group. If this method is not feasible to reduce all the facilities of the MOP threshold
Low start-up phase protection function activated (only comes with the compressor equipment)	Parameter "start control valve opening degree" set too low	Reference to the evaporator cooling capacity and rated capacity of the valve than check this parameter value; increase this value if necessary
	tLAN or pLAN drive configured not begin to control the valve remains closed	Check tLAN / pLAN wiring. Check that the drive to connect with the pCO application (if equipped) properly manage the drive start signal. Check that the drive is not in standalone mode
	Configured as a stand-alone mode, the drive does not begin to control the valve remains closed	Check the digital input terminal. Check that when the control signal input correctly when closed. Check that the drive is in stand-alone mode
	LOP protection disabled	The LOP integration time is set to greater than 0 seconds
	LOP protection invalid	Ensure that the needs of the LOP protection threshold in the saturation temperature of evaporation (evaporation temperature and the rated voltage corresponding to the temperature scale switch between) and reduce the LOP integration time
	Solenoid valve block	Check the solenoid valve opens correctly, check the electrical wiring and relay operation
	Lack of refrigerant	Check expansion valve upstream of the observation hole no bubbles. To ensure proper cooling temperature (greater than 5 °C); or refrigerant filling

	Valve connection error (rotation in the opposite direction) and is open	And manual control valve is completely closed or open, to check the valve rotation. Once the valve is fully open to allow heat decreased, and vice versa so that the superheat values have increased. If the valve is rotating in the opposite direction, check the electrical wiring
	Valves damaged or connected incorrectly the stator	The stator and the valve and disconnect the cable connection, with ordinary measuring coil resistance tester. Two coil resistance should be around 36 Euro. Otherwise, replace the stator. Finally, check the cable connection to connect the drive
	Valve can not open	Started using the manual control valve fully open. If the superheat value is still high, check the electrical wiring and / or replace the valve
Control process equipment due to low and off (only comes with the compressor equipment)	LOP protection disabled	The LOP integration time is set to greater than 0 seconds
	LOP protection invalid	Ensure that the needs of the LOP protection threshold in the saturation temperature of evaporation (evaporation temperature and the rated voltage corresponding to the temperature scale switch between) and reduce the LOP integration time
	Solenoid valve block	Check the solenoid valve opens correctly, check the electrical wiring and relay operation
	Lack of refrigerant	Check expansion valve upstream of the observation hole no bubbles. To ensure proper cooling temperature (greater than 5 °C); or refrigerant filling
	Valve is too small	Replaced with a larger valve
	Valves damaged or connected incorrectly the stator	The stator and the valve and disconnect the cable connection, with ordinary measuring coil resistance tester. Two coil resistance should be around 36 Euro. Otherwise, replace the stator. Finally, check the cable connection to connect the drive
	Valve can not open	Started using the manual control valve fully open. If the superheat value is still high, check the electrical wiring and / or replace the valve
Even if the valve is fully opened, refrigerated cabinets also reach the set temperature (only for composite refrigerated cabinet)	Solenoid valve block	Check the solenoid valve opens correctly, check the electrical wiring and relay operation
	Lack of refrigerant	Check expansion valve upstream of the observation hole no bubbles. To ensure proper cooling temperature (greater than 5 °C); or refrigerant filling
	Valve is too small	Replaced with a larger valve
	Valves damaged or connected incorrectly the stator	The stator and the valve and disconnect the cable connection, with ordinary measuring coil resistance tester. Two coil resistance should be around 36 Euro. Otherwise, replace the stator. Finally, check the cable connection to connect the drive
	Valve can not open	Started using the manual control valve fully open. If the superheat value is still high, check the electrical wiring and / or replace the valve
Freezers reach the set temperature, and the valve position is always 0 step (only for composite refrigerated	tLAN or pLAN drive configured not begin to control the valve remains closed	Check tLAN / pLAN wiring. Check that the drive to connect with the pCO application (if equipped) properly manage the drive start signal. Check that the drive is not in standalone mode
	Configured as a stand-alone mode, the drive does not begin to control the valve remains closed	Check the digital input terminal. Check that when the control signal input correctly when closed. Check that the drive is in stand-alone mode

cabinet)		

4.3EXV operation and wiring
Display

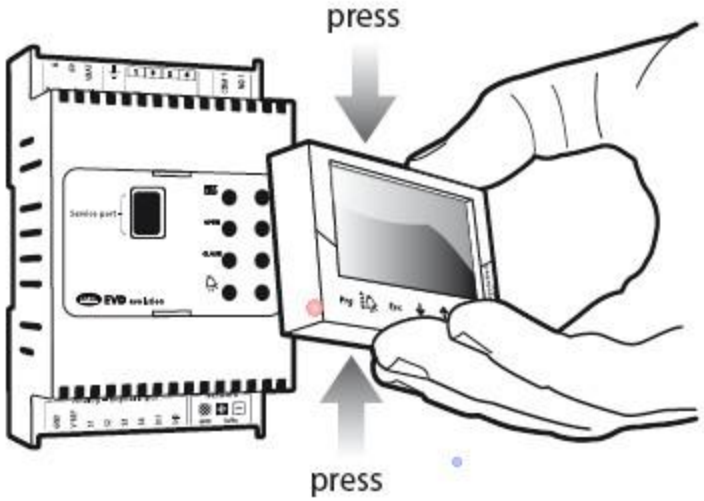


User interface consists of five components of the LED display operating status, the table below

LED	Light	Extinguish	Flicker
NET	Can be connected to the network	Not connected	Communication failure
OPEN	Open the valve	-	Disable the drive
CLOSE	Close the valve	-	Disable the drive
	Activate the alarm	-	-
	Drive power	The drive is not connected to power supply	-

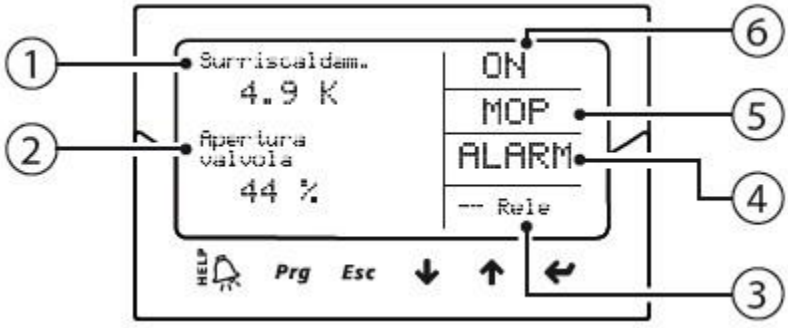
Display board installed (optional)
Screen after installation, can be used to configure the drive and its programming. The display shows the operating status, drive type of control is being performed (such as superheat control), alarm, digital input and relay output status of the state of important parameters. Finally, it can save the configuration parameters of a drive and copy to another drive transfer
Installation steps:

- Press and hold fastening fastener, remove the cover;
- Install screen, as shown;
- The display will show the contents and, if you are debugging drivers, will begin to display configuration-oriented program.



Warn: If you did not complete the configuration process, the drive will not start. Front panel display and keypad, keypad has 6 buttons, drive all the configuration and programming available through a separate press a button or press a few buttons to complete.

Display and keypad
Graphical display with two kinds of system variables, the drive control of the state, protection function is activated, and the alarm and relay output status



Note:

1	Display first kinds of variables
2	Display second kinds of variables
3	Relay output status
4	Alarm
5	Start of the protection
6	Control state

Display

	Control state		Type of protection running
ON	Run	LowSH	Low superheat protection
OFF	Standby	LOP	Low evaporation temperature protection
POS	Locate	MOP	High evaporation temperature protection

WAIT	Wait	HiTcond	High condensing temperature protection
CLOSE	Close		

Keypad

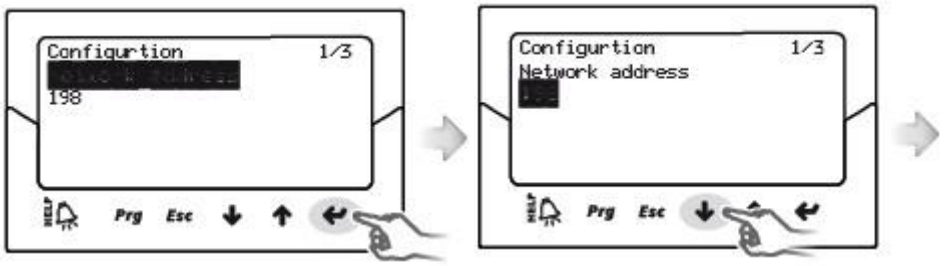
Button	Function
Prg	Open the display screen, enter the password to enter the programming mode
HELP	• In the alarm state, the display alerts the queue; • When the "producer" level under the rolling parameters, the display shows the interface
Esc	• To exit the programming (maintenance / producer) and display mode; • set a parameter, the exit without saving changes
↓ / ↑ UP/DOWN	• Display screen navigation; • Increase / decrease the value
↵ Enter	• from the parameter setting mode, the display switches to • Confirm the list of parameters and return the value

OPERATION EXAMPLE

Debugging

Complete electrical wiring and connect the power, need to debug the operation of the drive depends on the interface, but basically only four parameters to set: refrigerant, valves, pressure sensors S1 type and the type of main control

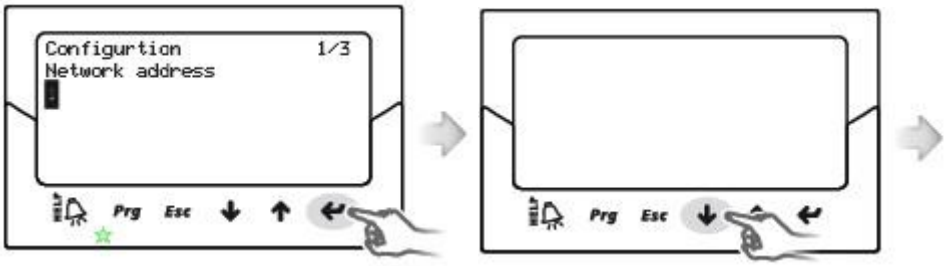
After installation of the display



1.shows the first parameter: Network Address

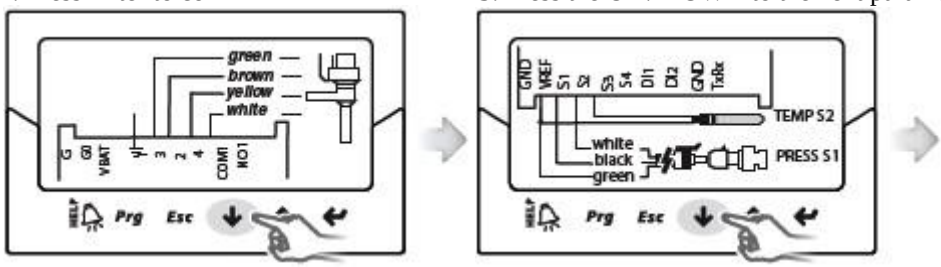
2.Press Enter to move to the parameter values

3.UP / DOWN button to modify the value

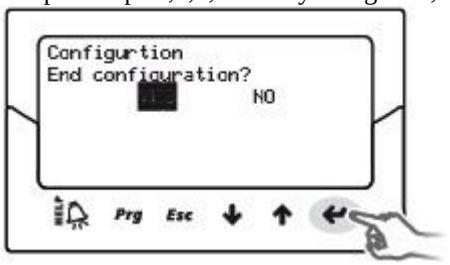


4. Press Enter to confirm

5. Press the UP / DOWN to the next parameters: refrigerant



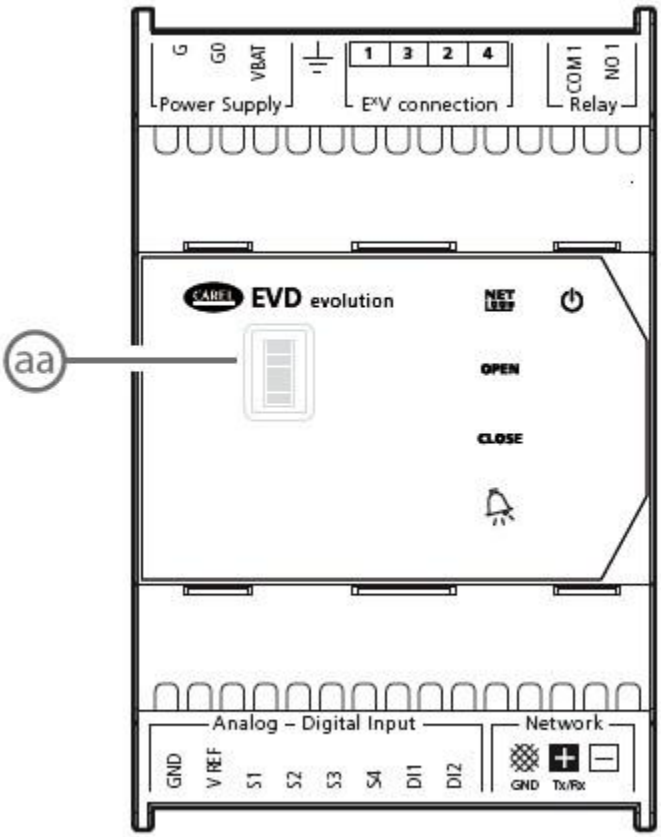
6.Repeat steps 2,3,4,5 modify refrigerant, valves, pressure sensors S1 and the main control parameters;



7.Check the electrical wiring is correct;
8. When properly configured, exit the program, or select NO to return to step 2;
To simplify debugging, avoid failure, the drive before the completion of the following configuration parameters will not start:
1 network address;
2 refrigerant;
3 types of electronic expansion valve;
4 pressure sensor S1;
5 main control type, which is the use of superheat control device type.

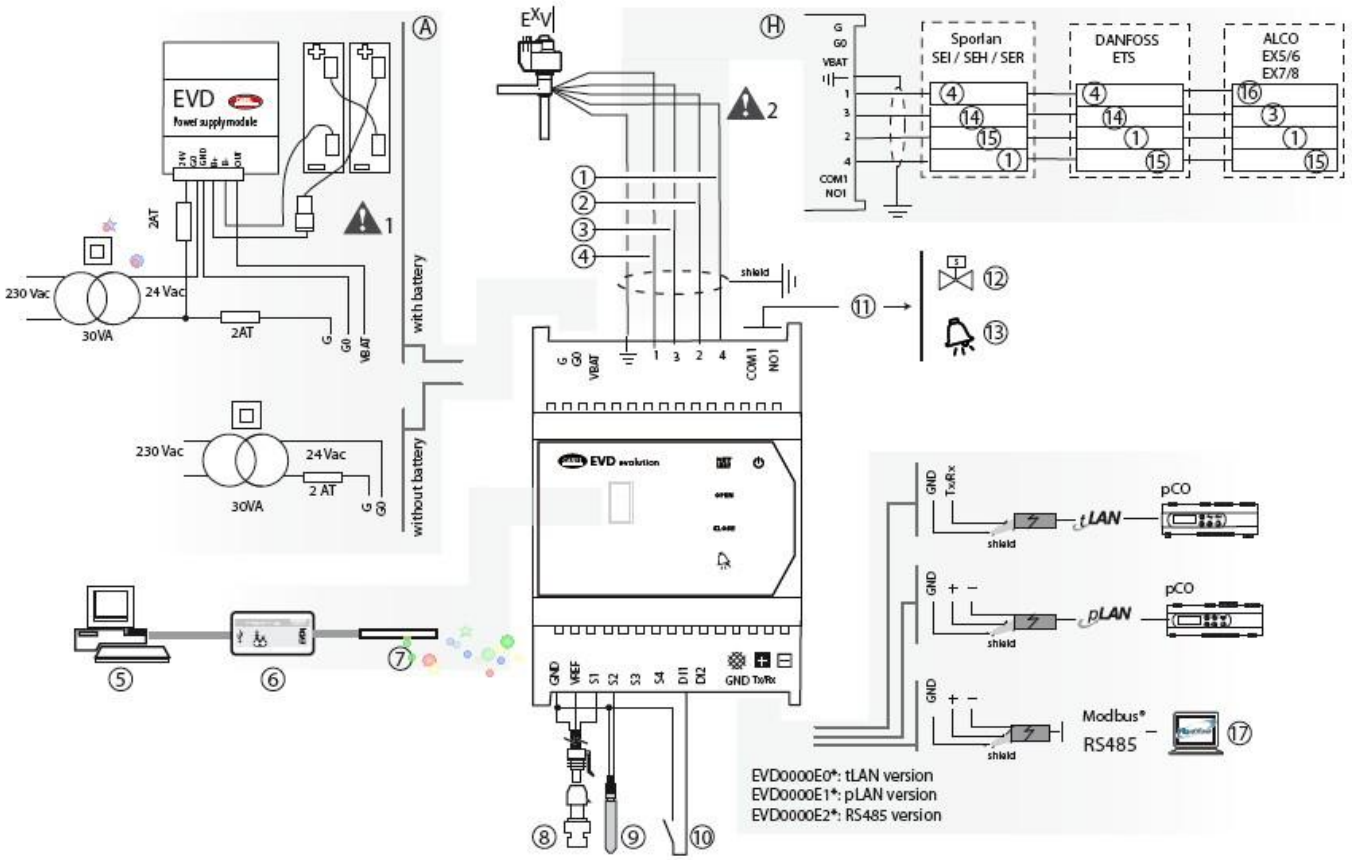
Inspection after commissioning
Finished debugging, you should:
• Check that the valve can be closed to complete a full cycle for calibration;
• If necessary, repair or manufacturer in programming mode, set the superheat setting (or, as the use of recommended values CAREL reserves) and the protection threshold (LOP, MOP, etc.). See Chapter 7, "protection."

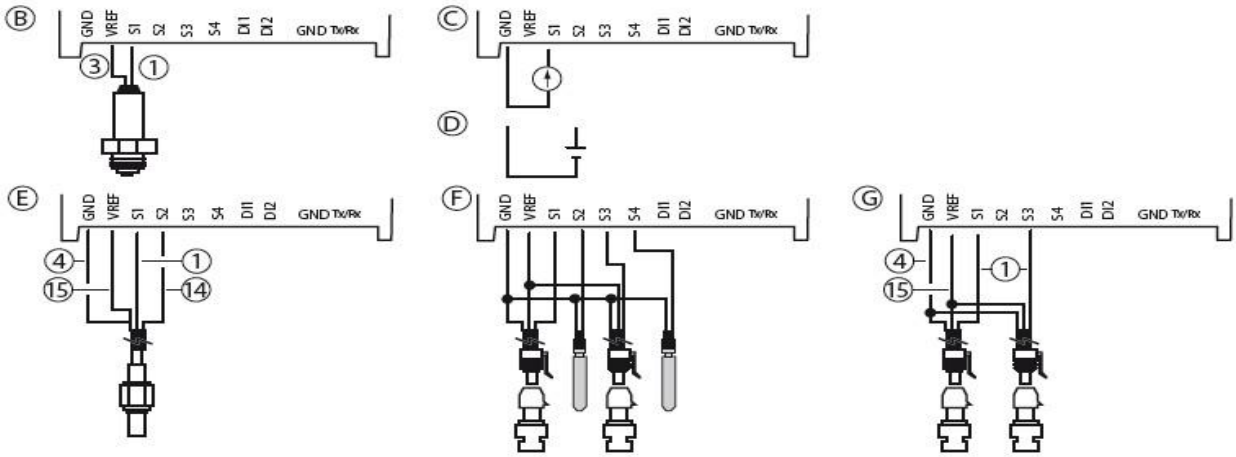
General wiring diagram

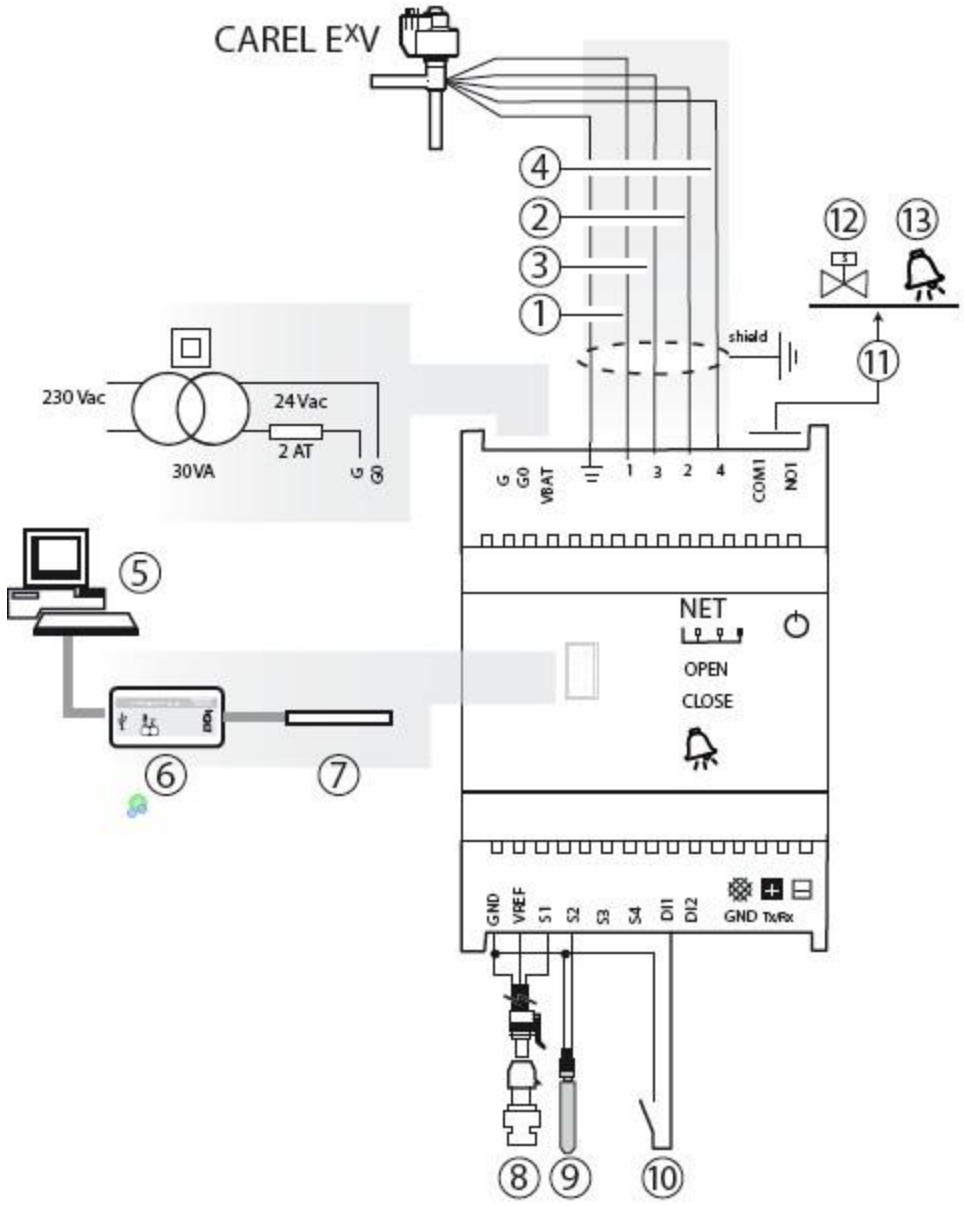


Terminal	E**xplanation**

G\G0	Power supply
VABT	Emergency Power Supply
⏚	Functional ground
1,2,3,4	Stepper motor power supply
COM1,NO1	Alarm Relay
GND	Signal Ground
VREF	Sensor power supply
S1	Sensor 1 (pressure) or an external signal 4 to 20mA
S2	Sensor 2 (temperature) or 0 to 10V external signal
S3	Sensor 3 (pressure)
S4	Sensor 4 (temperature)
DI1	Digital input 1
DI2	Digital input 2
▩	Connection tLAN, pLAN, RS485, Modbus ® terminal
⊞	Connection tLAN, pLAN, RS485, Modbus ® terminal
⊟	Connection pLAN, RS485, Modbus ® terminal
aa	Service port, after removal of the cover need to be connected LED




Ⓑ
GND VREF S1 S2 S3 S4 DI1 DI2 GND Tx/Rx
3
1
Ⓒ
GND VREF S1 S2 S3 S4 DI1 DI2 GND Tx/Rx
Ⓓ
Ⓔ
GND VREF S1 S2 S3 S4 DI1 DI2 GND Tx/Rx
4
15
1
14
Ⓕ
GND VREF S1 S2 S3 S4 DI1 DI2 GND Tx/Rx
Ⓖ
GND VREF S1 S2 S3 S4 DI1 DI2 GND Tx/Rx
4
15
1


CAREL EXV
4
2
3
1
12
13
11
shield
230 Vac
24 Vac
2 AT
30VA
G G0 VBAT 1 3 2 4 COM1 NO1
5
NET
OPEN
CLOSE
6
7
GND VREF S1 S2 S3 S4 DI1 DI2 GND Tx/Rx
8
9
10

Note:

1	Green
2	yellow
3	Brown
4	white
5	sets of personal computers
6	USB / tLAN converter
7	Adapter
8	ratio of pressure sensor - evaporation pressure
9	NTC suction temperature
10	start-controlled digital input 1
11	free contacts (up to 230Vac)
12	solenoid valve
13	warning signs

4.4.Safety Considerations

Installing, starting up, and servicing this equipment can be hazardous due to system pressures, electrical components, and equipment location (roof, elevated structures, etc.). Only trained, qualified installers and service mechanics should install, start up, and service this equipment.

When working on this equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply. Follow all safety codes. Wear safety glasses and work gloves. Use care in handling, rigging, and setting this equipment, and in handling all electrical components.

Warning

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation and service. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

Caution

This unit uses a PLC-based electronic control system. Do not use jumpers or other tools to short out components, or to bypass or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

Warning

To prevent potential damage to heat exchanger tubes always run fluid through heat exchangers when adding or removing refrigerant charge or when the equipment is exposed to temperatures below 32 F (0° C). DO NOT VENT refrigerant relief valves within a building. Outlet from relief valves must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigeration and Air Conditioning Engineers) 15 (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation. Provide adequate ventilation in enclosed or low overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness or death. Misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

Warning

DO NOT attempt to cut factory joints when servicing this equipment. Compressor oil is flammable and there is no way to detect how much oil may be in any of the refrigerant lines. Cut lines with a tubing cutter as required when performing service. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to system. DO NOT re-use compressor oil. Do NOT leave refrigerant system open to air any longer than necessary. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed.

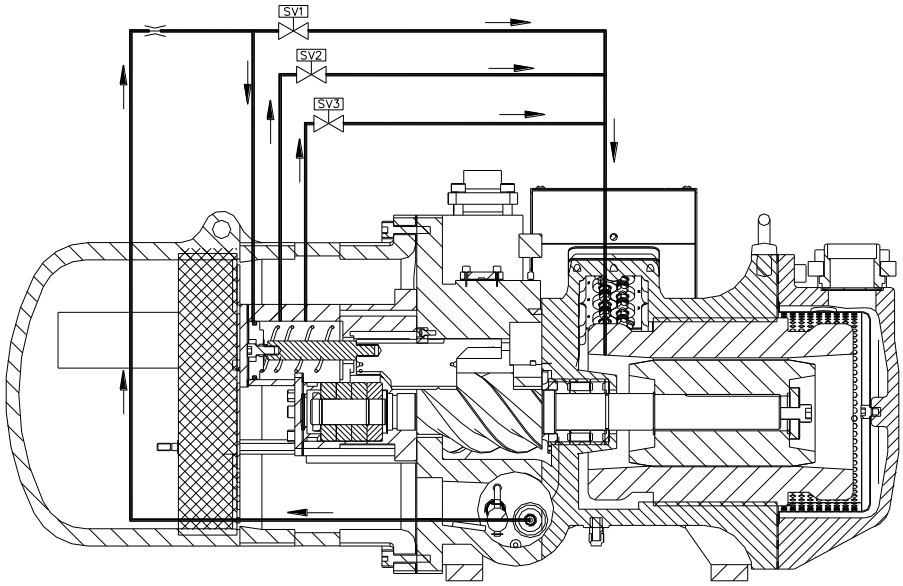
5. Control

5.1Capacity Control

The unit operation load is controlled by leaving chilled water. The capacity output of the unit is determined by the valid length of slide valve which is controlled by 3 solenoid valves. The control system cycles compressors, loaders, and minimum load control valves to maintain the user configured leaving chilled water temperature set point. Temperature sensors transfer temperature signals to PLC which will calculate the optimum time to add or subtract capacity stages. Special algorithm programmed in PLC will try to maintain the Control Point at the desired set point.

- 4-stage control (50%~100%)

The 4-step capacity control system is made of one slider, three NC solenoid valves and one piston with adjustable range of 25%, 50%, 75% and 100%. The principle of capacity control is by moving the slider to allow partial refrigerant to bypass back to the intake and regulate the refrigerant flow.



Solenoid valve activating table of four-stage capacity control

SV / Status	SV1 (NC)	SV2 (NC)	SV3 (NC)
100%	OFF	OFF	OFF
75%	OFF	OFF	ON
50%	OFF	ON	OFF
25%(startup)	ON	OFF	OFF

ON: energize, OFF: de-energize

1. Startup: 25% loading

For easier startup of compressor, the loading must be minimized. Therefore, SV1 is energized to bypass oil to the low-pressure side directly. The slider does not move and keep the maximum opening in suction end to bypass the refrigerant. After the completion of startup the compressor then can increase loading gradually by de-energizing the SV1 solenoid valve. It is recommended to run compressor at 25% loading for about 30 seconds before starting to increase loading.

2. Partial load: 50% Operation

With the same principle as stated in 25% loading, SV2 is engergized and others are de-energized to achieve 50% loading.

3. Partial load：75% Operation

Receiving a feedback from system demanding for lower capacity, the SV3 is energized to allow oil to flow back to the low-pressure side through the valve channel. The piston returns to the outlet of SV3 oil passage and the slide

block moves to let part refrigerant flow back to the low-pressure side through bypass opening. This action would reduce the discharge volume and make the compressor operating at 75% loading

4. Full load: 100% operation

After the completion of startup, SV1, SV2 and SV3 are de-energized and oil flows straight to cylinder and pushes piston forward, driving the slider to gradually reduce bypass opening. When the opening is closed completely, the compressor is running at 100% loading.

Operation progress of stage control

Take standard condition (leaving chilled water temp. 7 ℃/entering cooling water temp. 35 ℃) for example. There are 6 sections of capacity adjusting progress (loading area/fuzzy loading area/stable area/fuzzy unloading area/unloading area/shut down).

Abbreviation:

Ts=leaving chilled water temp. set point

Tout=actual leaving chilled water temp.

To=temperature setting range

In fuzzy loading area, PLC judges the temperature changing trend, if it rises up, execute the loading progress. Else, stay in initial state.

Similarly, in fuzzy unloading area, PLC judges the temperature changing trend, if it goes down, execute the unloading progress. Else, stay in initial state.

For dual heads unit, when executing capacity control program, one compressor keeps full load while another one unloads to 50% load. Then unload the full load one until it unloads to 50% and shut the compressor of both 50% load which has run for a longer time. If the running compressor loads to 100% again, start another one.

When chilled water temperature gets lower than 4 ℃, chiller will stop. When it rises up to 13 ℃, chiller restarts. If both the compressors are stopped, when restarting, first on unit must meets requirement of reset temperature set point. If Tout>=9 ℃ and first compressor is in full load, the other compressor will start.

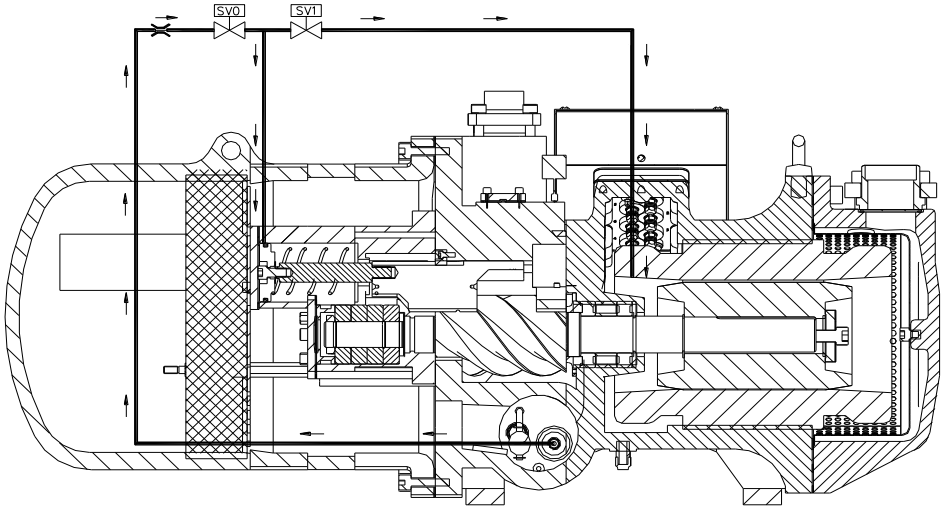
When dual compressor unit is in suspending state and Tout>=18 ℃, the unit will start according to first time operation program after both compressors meet the min. stopping interval.

When both compressors operating in 50% load is in loading area and fuzzy loading area, the compressor which has run for less time loads first.

When both compressors operating in 50% load is in unloading area and fuzzy unloading area, the compressor which has run for longer time unloads first.

Notes: all parameters in this part are based on standard condition (leaving chilled water temp. 7 ℃/entering cooling water temp. 35 ℃).

- Stepless control (25%~50%)



Solenoid valve activating table of stepless control

SV / Status	SV0 (NC)	SV1 (NC)
Startup	OFF	ON
Loading	ON	OFF
Unloading	OFF	ON
Holding	OFF	OFF

ON: energize, OFF: de-energize

The principle of linear capacity control system is same as four-step one, except that the control logic of solenoid valve varies. The four-step capacity-control needs three NC (normal close) solenoid valves, whereas the linear one uses two NC (normal close) solenoid valve to control the increase or decrease of loading.

When starting compressor, SV1 is energized to bypass the oil in hydraulic cylinder back to the low-pressure suction end while SV0 is de-energized. Slider remains in its initial position due to the spring force, and then the compressor can be sure to start at 25% loading. Once the startup process is completed, SV0 is energized while SV1 is de-energized to increase the loading up to 100%.

To keep compressor running in steady state, SV0/SV1 is de-energized continuously to maintain the stable refrigeration capacity output. Once loading has been changed, the system energizes de-energizes of SV0 and SV1 to adjust output of compressor in order to fit actual loading requirement.

When loading increases, SV0 energizes shortly to allow small amount of oil to flow into hydraulic cylinder and force slider to move in the direction of increasing refrigeration capability. If loading decreases, SV1 energizes shortly to allow small amount of oil to flow out of hydraulic cylinder and cause slider to move in the direction of decreasing the refrigeration capability.

5.2Head Pressure Control

• General

For Midea screw chiller, it adopts professional PLC controller to maintain the saturated condensing temperature to a configurable set point. Cooling tower fan is controlled by the return water temperature. During compressor startup and operating progress, cooling tower fan is OFF when entering cooling water temperature <25 ℃. When entering cooling water temperature >27 ℃, cooling tower fan is ON. When entering cooling water temperature is between 25~27 ℃, cooling tower fan keeps in initial state.

5.3.Pump control

Water pump mode

When user has selected water pump mode, PLC receives operation signal and turn on chilled/cooling water pump without starting the compressor. Chilled/cooling water flow switch is valid and its detection method is the same with normal startup procedure.

In pump mode, if user chooses cooling mode when chilled water temperature is low and not enough to start the chiller, both chilled/cooling water pumps keep on running until leaving chilled water temperature condition gets satisfied.

Note: In pump mode, it can transfer to cooling mode directly; in cooling mode, it needs to stop the unit and pumps first, then transfer to pump mode.

When accumulative total running time reaches 3,600,000s, remind user servicing water system and performing scheduled cleaning work.

5.4Cooler and Condenser Pump Control

Midea chillers can be configured for cooler and condenser pump control. Inputs for a cooler pump interlock and condenser flow switch or interlock are provided. Refer to appendix for details.

- **Cooler pump control**

Proper configuration of the cooler pump control is required to prevent possible cooler freeze-up. A cooler flow switch must be installed on the outlet of chilled water to prevent operation without flow through the cooler. The chiller is also interlocked with the chiller water pump starter to provide additional protection. See appendix of the Field Wiring section for proper connection of the cooler pump interlock.

All chiller cooler pump control is utilized unless the chilled water pump runs continuously or the chilled water system contains a suitable antifreeze solution. It is recommended that the cooler pump should be interlocked with the unit unless there're other antifreeze solutions.
When the cooler pump control is "ON," the cooler pump relay will be energized when the chiller enters an "ON" mode. The cooler pump relay will remain energized for 10 min after all compressors stop due to off command in order to prevent freeze-up. In the event a freeze protection alarm is generated, the cooler pump relay will be energized whether cooler pump control is configured "ON" or "OFF." The cooler pump relay is also energized anytime a compressor is started as well as when certain alarms are generated. The cooler pump relay should be used as an override to the external pump control if cooler pump control is not utilized.

IMPORTANT: If the cooler pump control relay output is not wired to control or override the operation of the chilled water pump. An OFF DELAY of 10 minutes must be provided after the chiller is disabled to maintain cooler water flow during the pump down period.

If the chilled water flow switch/interlock does not close within 5 minutes after the unit is enabled and in an "ON" mode when cooler pump control is turned "OFF" or "ON", water flow loss alarm will be generated.
No matter water pump is "OFF" or "ON", if water flow switch opens for 5s continuously, the unit will not start or stop immediately.

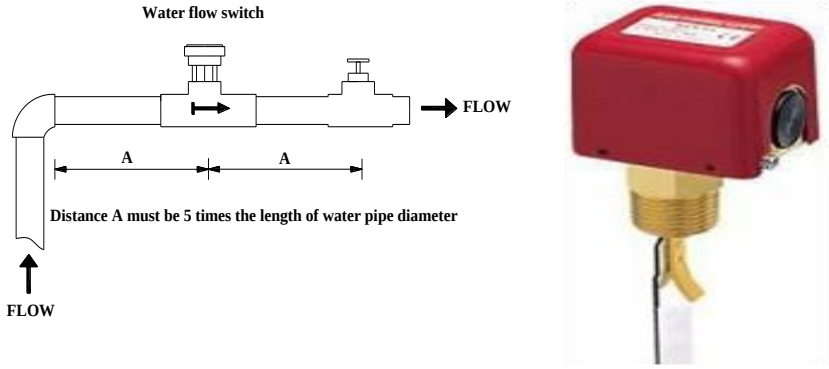
- **Condenser pump control**

The condenser pump can be controlled in the way like the cooler pump. It is turned on whenever the machine is in an "ON" mode and turned off 60 seconds after all compressors stop. When configured for a condenser flow switch/interlock, an alarm of cooling water flow loss is generated if the input does not close after unit starts for 2 min and fault will be displayed on the operation interface.

Flow Sensor

Water flow protection

All water pipe kits and water flow switches are provided. Water flow switch must be installed on the outlet of both the Condenser and Evaporator and the length A of water flow switch should be 5 times the length of the pipe diameter. Adjust the target of water flow switch according to the water pipe specification (Refer to the manufacturing manual). Water flow switch is connected to the terminals in control cabinet; refer to the electrical wiring diagram for details.



When power is supplied to the device, PLC control begins to detect water flow after water pumps running for 3 minutes. If water flow switch keeps open for 5s, the chiller will stop. It needs manually reset. Perform the steps below to solve the problem.
1. Check to confirm that all strainers are clean, valves are open and pumps are running. For the case of VFD controlled pumps, ensure that the minimum frequency set point has not been changed.
2. Measure the pressure drop across the heat exchangers (Read the difference of pressure gauges installed on the inlet and outlet) and using Appendix water pressure drop curves, calculate the flow and compare this to the system requirements.

3. If the measured flow rate through the heat exchanger agrees with the system requirements. Possible reason of the malfunction may be wrong installation direction of the switch, inadequate depth of the target, broken switch or wiring looseness, etc. New switch must be replaced if problem is switch itself.

5.5Oil Heater Control

I n unit shutdown period, oil heater is energized to keep normal oil temperature. When unit starts, it is turned off.

Oil heating time limits

1) When cooling water inlet temperature >= 35 ℃ (real time value), oil heating time for first startup is 0.5h. If power down happens during operation and downtime is less than 8hrs, no heating time delay is needed when unit restarts. If it exceeds 8hrs, 0.5h heating time is need.
2) When cooling water inlet temperature >= 30 ℃ (real time value), oil heating time for first startup is 1h. If power down happens during operation and downtime is less than 5hrs, no heating time delay is needed when unit restarts. If it exceeds 5hrs, 1h heating time is need.
3) When cooling water inlet temperature >= 25 ℃ (real time value), oil heating time for first startup is 2hrs. If power down happens during operation and downtime is less than 3hrs, no heating time delay is needed when unit restarts. If it exceeds 3hrs, 0.5h heating time is need. If it exceeds 5hrs, 2hrs heating time is need.
4) When cooling water inlet temperature >= 20 ℃ (real time value), oil heating time for first startup is 4hrs. If power down happens during operation and downtime is less than 1h, no heating time delay is needed when unit restarts. If it exceeds 1h, 2hrs heating time is need. If it exceeds 5hrs, 3hrs heating time is need. If it exceeds 8hrs, 4hrs heating time is need.
5) When cooling water inlet temperature < 20 ℃ (real time value), oil heating time for first startup is 8hrs. If power down happens during operation and downtime is less than 1h, no heating time delay is needed when unit restarts. If it exceeds 1h, 3hrs heating time is need. If it exceeds 5hrs, 5hrs heating time is need. If it exceeds 8hrs, 8hrs heating time is need.

Demand Limit

• Auto unload control function

For step control unit: When compressor continuously operates at chilled water temperature > 12 ℃ more than 30 mins, unload to 50%; regain 100% load after 10 mins later.

For stepless control unit: When compressor continuously operates at chilled water temperature > 12 ℃ more than 30 mins, unload to 50%; regain 100% load after 10 mins later.

• Operation current limit control

During unit running, it will unload immediately when the current reach 95% of set point and will not execute capacity increase action. Stop unloading until compressor unloads to 50%. After unloading operation for 10mins and the current value <=70% of set point and the unit meets loading condition, the unit will reload step by step.

5.6Protection Items And Troubleshooting

Midea screw chiller has many protection measures and devices. There're many features to aid in troubleshooting. By using the alarm information, DI/O, AI/O and operating conditions of the chiller during chiller operation, it's convenient to find the possible problem. Verify that the chiller is properly configured, including options and/or accessories.

Self diagnosis of malfunction and protection

When malfunction and protection occurs, compressor and other devices are all shut down. Water pump will keep on running if it's not the problem of water system. One compressor failure does not affect the other one. Some malfunction and protection has configurable time delay set point to avoid protection switch fluctuation.

Low pressure alarm: 3s
Oil level alarm: 60s
Water flow switch trip: 5s

Reset of water flow fault on screen is invalid, interface restart is required. Otherwise, press reset button on screen to restart for other fault and protection trip.

After fault and protection trip occurs, confirmation on screen is required. Unit stops according to abnormal shutdown program.

Fault and protection detection

- Phase reversal/phase loss (phase protection)
  Power supply A/B/C should exist simultaneously and differ from each other by 120 °phase angle. If not, Phase reversal or phase loss fault will occur and be displayed on screen. Before unit start when Phase reversal or phase loss fault occurs, the chiller won't start; when Phase reversal or phase loss fault occurs during chiller operating, the chiller will stop according to protective stop program. Both compressors are shut down and water pumps and cooling tower fan stops in accordance with normal shutdown procedure. When fault record gets cleared and both temperature and time condition gets satisfied, the chiller can restart.
- Water flow failure (both chilled water and cooling water)
  PLC controller begins to detect chilled/cooling water flow switch after water pumps get energized 180s. The switch will disconnect if water flow less than set point and water flow loss signal will generate if it lasts for 5s. During chiller operation (including dual heads unit), any flow switch disconnects for 5s continuously, Unit stops according to protective stop program.
  If chilled water flow fails, chilled water pump stops after 30s delay; cooling water pump and cooling tower stops after 60s delay.
  If cooling water flow fails, cooling water pump and cooling tower stops after 60s delay; chilled water pump stops after 600s delay.
  Note: fault can be cleared after power re-energized and it needs to be confirmed manually, then when both temperature and time condition gets satisfied, the chiller can restart.
- Temperature sensor failure
  Entering chilled water temperature sensor short circuit/open circuit, display entering chilled water temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
  Leaving chilled water temperature sensor short circuit/open circuit, display leaving chilled water temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
  Entering cooling water temperature sensor short circuit/open circuit, display entering cooling water temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
  Leaving cooling water temperature sensor short circuit/open circuit, display leaving cooling water temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
  Discharge temperature sensor short circuit/open circuit, display discharge temperature fault and chiller stops according to abnormal shutdown program. After the sensor reset, fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
- Over/under voltage
  When power supply voltage is less than 90% or more than 110%, corresponding alarm over voltage or under voltage occurs. The chiller will stop immediately according to abnormal shutdown program. Fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
- High/low pressure protection
  Alarm as soon as high pressure switch trips and stop the chiller immediately according to abnormal shutdown program. It is one kind of NC switch and needs manual reset of the red reset button when fault happens. Fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
  When suction pressure is lower than the protective low pressure set point (effective for time delay), stop according to abnormal shutdown program. After the switch reset, fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
- Anti-freeze protection
  Over low leaving chilled water temperature
  When leaving chilled water temperature gets lower than 4 ℃, perform low water temperature protection and stop according to abnormal protective shutdown program. Cooling water pump/chilled water pump/cooling tower fan

keeps on running. When leaving chilled water temperature gets higher than 13℃, unit resets. When both temperature and time condition gets satisfied, the chiller can restart.

Mechanical antifreeze switch

The switch trips when leaving chilled water temperature <= 3℃ and chiller stops according to abnormal protective shutdown program. Reset at 10℃ and fault on screen must be cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

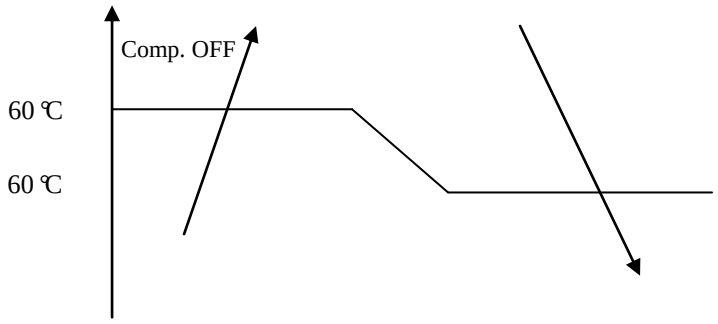
- Compressor protection module

  Alarm when compressor protection module trips. Perform abnormal protective shutdown program immediately. Fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
- Compressor overload protection

  Thermal overload relay trips when heat storage reaches trip point. Faulted compressor will stop immediately to abnormal protective shutdown program and other normal system will keep on running. After the switch reset, fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
- Oil level protection

  During unit running, if oil level keeps on lower than set point for 60s, the unit will stop immediately according to abnormal protective shutdown program. After the switch reset, fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart
- High discharge temperature protection

  Discharge temp.>=60℃, perform high discharge temperature protection. Faulted compressor stops immediately to abnormal protective shutdown program and other normal system will keep on running. The protection resets when temperature gets lower than 45℃ and should be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.



- Overhigh leaving cooling water temp.

  When leaving cooling water temp. is higher than 45℃ during unit operating, the chiller will stop immediately according to abnormal protective shutdown program. Reset at 38℃ and it needs to be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
- Overcurrent protection of compressor

  The protection trips when compressor current > set point. Faulted compressor will stop immediately to abnormal protective shutdown program and other normal system will keep on running. After the switch reset, fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.
- Current transducer protection

  When current transducer open circuit or short circuit happens, compressor will stop immediately to abnormal protective shutdown program and current transducer fault is displayed on screen. Other normal system will keep on running. After the switch reset, fault on screen must be confirmed and cleared manually; when both temperature and time condition gets satisfied, the chiller can restart.

Note: Refer to APPENDIX A for detailed troubleshooting. All these work must be done by professional technicians who are qualified to do so

6.Service

6.1Servicing Evaporator And Condensers

- **TUBEPLUGGING**

In order to do maintenance when convenient, a leaky tube can be plugged until retubing can be done if damaged tubes are not too many. The number of tubes plugged determines how soon the evaporator must be retubed. Plugging tubes will result in loss of capacity and efficiency as well as increased pump power. Failed tubes should be replaced as soon as possible. Up to 10% of the total number of tubes can be plugged before retubing is necessary. If the problem is much more serious, contact your local Midea or your local representative for assistance.

Caution

Use extreme care when installing plugs to prevent damage to the tube sheet section between the holes.

- **RETUBING**

Retubing must be done by qualified personnel experienced in boiler maintenance and repair. Most standard procedures can be followed when retubing the evaporators.

Place one drop of Loctite or equivalent on top of tube prior to rolling. This material is intended to "wick" into the area of the tube that is not rolled into the tube sheet, and prevent fluid from accumulating between the tube and the tube sheet. New tubes must also be rolled into the center tube sheet to prevent circuit to circuit leaks.

- **TIGHTENING COOLER/CONDENSER HEAD BOLTS**

When reassembling the evaporator head, always check the condition of the O-rings first. The O-ring should be replaced if there are visible signs of deterioration, cuts or damage. Apply a thin film of grease to the O-ring before installation. This will aid in holding the O-ring in the groove while the head is installed. Torque all bolts in sequence as shown in Fig.:6.2.1

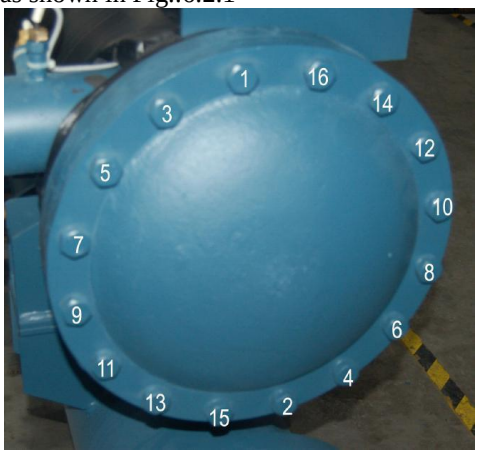


Fig.:6.2.1

Bolt specifications	Torque rang (N.m)	
	Max.	Min.
M10	16	24
M12	45	68
M16	95	122
M20	142	210

Fig. 6.2.2

1. Install all bolts finger tight.
2. Bolt tightening sequence is outlined in Fig. 6.2.2. Follow the numbering or lettering sequence so that pressure is evenly applied to O-ring.
3. Apply torque in one-third steps until required torque is reached. Load *all* bolts to each one-third step before proceeding to next one-third step.
4. No less than one hour later, retighten all bolts to required torque values.
5. After refrigerant is charged to system, check for refrigerant leaks using halogen detector or other recommended industry practices.
6. Replace evaporator insulation.

6.2Inspecting/Cleaning Heat Exchangers

Check the chiller tightness and whether there's leak of heat exchange tubes. It is necessary to do nondestructive inspection for the principal weld (longitudinal and circumferential weld of evaporator/condenser barrel) of pressure vessel. Inspect and clean cooler tubes at the end of the first operating season. Tube condition in the exchanger will determine the scheduled frequency for cleaning, and will indicate whether water treatment is adequate in the water circuit. Too much scale will cause big loss of capacity and efficiency.

Refer to the following pressure-temperature curve for condition in heat exchangers:
High pressure-cooling water temperature (high pressure beyond 0.6~1.2MPa is abnormal)

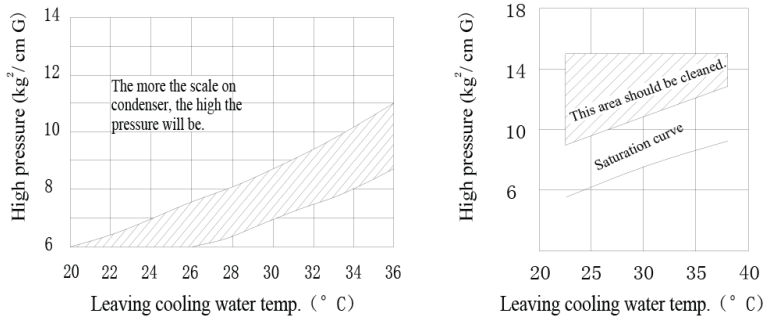


Fig.26 High pressure at full load (standard unit)

Low pressure-chilled water temperature (low pressure beyond 0.14~0.37MPa is abnormal)

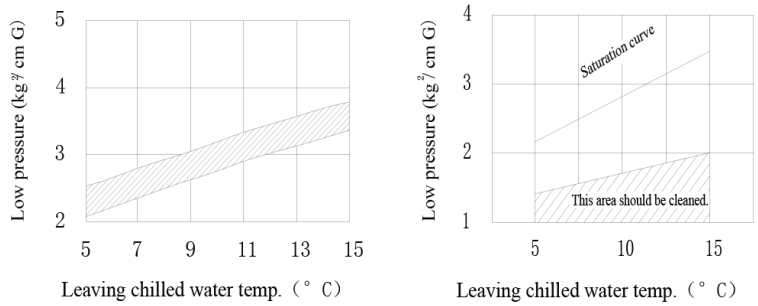


Fig.27 Low pressure at full load (standard unit)

Cleaning work must be done when too much scale found. Physical and chemical cleaning can be chosen according to the device you have. Generally, chemical cleaning is much easier to carry out. Methods are as below and the services of a qualified water treatment specialist should be obtained to develop and monitor a treatment program.

a) Cycle under normal temp. (A):
(Volume of condenser+ volume of pipes+ volume of container)×1/3
Note: concentration of detergent ——33%
b) Cycle under normal temp. (B):
(Volume of cooling tower flume + volume of condenser+ volume of pipes)×1/10
Note: concentration of detergent ——10%
Warning: When doing cleaning with unit stops, volume of cooling tower flume can be 1/2 or 1/3 of rated value; but if doing cleaning with unit is runs, the volume of cooling tower flume should keep rated value. Midea assumes no responsibility for pressure vessel damage resulting from untreated or improperly treated water.
c) Precautions of chemical cleaning
▲When doing cleaning please wear rubber gloves and do not expose your skin or your clothes to the detergent. In case of touching the detergent, please wash with clean water immediately.
▲The container for detergent should be made of plastic or glass rather than lead.
▲The used detergent should be neutralized with lime or soda before draining.
▲Detergent is harmful to human body; please keep it away from children.
▲Turn on the unit to check the effect after cleaning work done. If necessary, please do cleaning again.

6.3Water Treatment

Before every start-up, clean and flush the cooling water circuit. Make sure tower blow-down or bleed-off is operating. It should be recognized that atmospheric air contains many contaminants that increase the need for proper water treatment. The use of untreated water can result in corrosion, erosion, sliming, scaling or algae formation. Midea assumes no responsibility for the results of untreated or improperly treated water.

See appendix for water quality requirements.

6.4Refrigerant Circuit

- **Leak testing**

Units are factory-charged with refrigerant R-134a (Refer to the Physical Data tables supplied in the IOM manual book). Leak test must be done under sufficient pressure. This can be done by charging enough refrigerant into the system to build the pressure up to approximately 70 kPa and adding sufficient dry nitrogen to bring the pressure up to a maximum of 850 kPa. Leak test with an electronic leak detector. Water flow through the vessels must be maintained anytime refrigerant is added or removed from the system. If any leaks are found in welded or brazed joints, or it is necessary to replace a gasket, relieve the test pressure in the system before proceeding. Brazing is required for copper joints. After leaks are repaired, system must be evacuated and dehydrated.

- **Evacuation**

After it has been determined that there are no refrigerant leaks, the system must be evacuated using a vacuum pump with a capacity that will reduce the vacuum to at least 130Pa (=1mmHg). A mercury manometer, or an electronic or other type of micron gauge, must be connected at the farthest point from the vacuum pump. For readings below 130Pa, an electronic or other micron gauge must be used. The triple evacuation method is recommended and is particularly helpful if the vacuum pump is unable to obtain the desired 130Pa of vacuum. The system is first evacuated to approximately 660Pa (=5mmHg). Dry nitrogen is then added to the system to bring the pressure up to zero.

Then the system is once again evacuated to approximately 230Pa(=2mmHg). This is repeated three times. The first pulldown will remove about 90% of the noncondensables, the second about 90% of that remaining from the first pulldown and, after the third, only 0.2% noncondensables will remain.

- **Checks on refrigerant charge**

To verify if the unit is operating with the correct refrigerant charge, perform the following checks.

1. Run the unit at maximum operating load.
2. Check the leaving chilled water temperature to be between 6~8 ℃.
3. Check the entering cooling water temperature to be between 25 and 32 ℃.
4. Under the above mentioned conditions verify the following items.

a) The discharge superheating to be between 8 and 15 ℃

b) The sub-cooling to be between 4 and 6 ℃

c) The difference between leaving water temperature and evaporating temperature to be in 0.5~4 ℃ range.

d) The difference between condensing temperature and condenser leaving water temperature to be in 0.2~3 ℃ range.

e) The evaporator refrigerant level slightly laps last tubes row by checking the sight glass installed on each evaporator for a visual inspection.

f) The condenser refrigerant level to be included between the condensing and the sub-cooling sections by checking the sight glass installed on each condenser for a visual inspection.

5. Verify the sight glass on the liquid piping to be fully charged. If one of the above parameters exceeds the limits, unit may require an additional refrigerant charge.

Note: Refrigerant removing and drain operation must be performed by qualified personnel using correct material. Inappropriate maintenance could lead to refrigerant or pressure loss. Do not discharge the refrigerant or the lubricant oil into the environment. Always use a proper recovery system.

Refer to Physical Data tables supplied in the IOM manual book). Immediately ahead of orifice baffle (see Fig.) is a factory-installed liquid line service angle valve. Each angle valve has a1 5/8-in. threaded connection for charging liquid refrigerant. Connect the refrigerant drum to the gauge port on the liquid line shutoff valve and purge the charging line between the refrigerant cylinder and the valve. Then open the valve to the mid-position.

Turn on both the cooling tower water pump and chilled water pump and allow water to circulate through the condenser and the chiller.

IMPORTANT: When adding refrigerant to the unit, circulate water through evaporator continuously to prevent freezing and possible damage to the evaporator. Do not overcharge, and never charge liquid into the low-pressure side of system.

If the system is under a vacuum, stand the refrigerant drum with the connection up, and open the drum and break the vacuum with refrigerant gas to a saturated pressure above freezing.

With a system gas pressure higher than the equivalent of a freezing temperature, invert the charging cylinder and elevate the drum above the condenser. With the drum in this position, valves open, water pumps operating, liquid refrigerant will flow into the condenser. Approximately 75% of the total requirement estimated for the unit can be charged in this manner.

After 75% of the required charge has entered the condenser, reconnect the refrigerant drum and charging line to the service valve on the bottom of the evaporator. Again purge the connecting line, stand the drum with the connection up, and place the service valve in the open position.

6.5Compressor Oil System

Each compressor/circuit has its own oil system which includes an oil filter, oil solenoid valve, Venturi tube, oil separator heater, and an oil shut-off valve. A typical oil system is shown in Fig. 34. See Table 33 for oil charge Quantities.

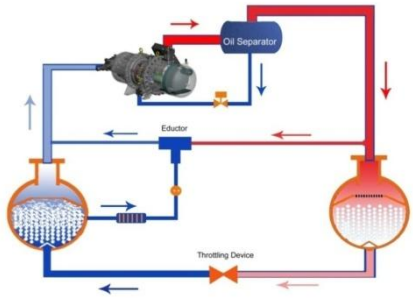


Fig. 34.

Each screw compressor is connected to a tank (oil separator) separating and collecting the oil from discharge gas. The discharge gas pressure pushes the oil back into the compressor for compressor seal and lubrication of all moving parts. During the compression, the oil joints the discharge gas before being conveyed again into the oil separator and re-start the cycle. The oil flow is granted by the pressure difference created between the condenser and the evaporator. This difference depends on the cooling water and evaporator water temperatures. During the start-up it is vital to establish rapidly the appropriate temperature difference, by checking the right cooling water temperature. The head of cooling water pump at zero flow rate should not exceed the maximum working pressure of condenser and plant water side.

6.6Oil recovery system

Each compressor includes a system to recover the oil accumulated inside the evaporator during the normal operation. This system consists of a jet pump able to collect continuously all the oil from the evaporator preventing from the accumulation due to the low speed refrigerant gas. The high-pressure discharge gas feeds the jet pump that creates a depression, which allows the suction of the oil refrigerant mixture from the evaporator into the compressor to re-establish the oil level inside the lubrication system. On the oil recovery piping a sight glass allows to check the oil-gas mixture flow to the compressor. If flow is insufficient or if the unit continuously stops for “Low Oil Level” alarm, verify the correct operation of the corresponding circuit.

6.7Oil Charging/Low Oil Recharging

- Pre-cautions in changing of oil

1. Use only qualified oil and do not mix different brand of oil together. Different kinds of refrigerant should match different kinds of oil, note that some synthetic oil is incompatible with mineral oil.
2. When using the synthetic oil for the chiller system, be sure not to expose the oil to atmosphere for a long time, it is also necessary to vacuum the system completely when installing the compressor.
3. In order to ensure no moisture inside the system, it is suggested to clean the system by charging it with dry Nitrogen and then vacuum the system repeatedly as long as possible.
4. It is essential to change for new oil especially after the motor burns out; the acidity debris still remain inside the system so clean work must be done to overhaul the system. Check the oil acidity after 72 hours of operation and then change it again until the oil acidity is in the standard value.
5. Contact local distributor/agent for concerning unqualified oil to be used.

- Oil change

1. Change oil periodically: Check the lubrication oil for every 10,000 hours of continuous running. For the first operation of the compressor, it is recommended to change oil and clean oil filter after running at 2,000 hours. Check the system whether clean or not and then change the oil every 20,000 hours or after 3 years of continuous running while the system is operated under good condition.
2. Avoid the debris or swarf clogging oil filter, this may caused bearings failure. The oil pressure differential switch will trip when the oil pressure differential reaches the critical point (default: 150kPa). The compressor will automatically shut down to prevent the bearings from getting damaged due to the lack of lubricating oil.

Caution

Compressor oil is pressurized. Use proper safety precautions when relieving pressure.

- Additional oil charge to lubrication systems

1. If the unit shuts off repeatedly on Low Oil Level, this may be an indication of inadequate oil charge. It could also mean simply that there may be problems in the process of being reclaimed from the low-side of the system. Adjust the valves of high pressure side and evaporator side; make sure oil reclaiming process effective. If problem still persists, additional oil charge is needed.
2. Make sure that the unit is not running when adding oil, as this will make the oil charging process easier. Because the system is under pressure even when the unit is not running, it will be necessary to use a suitable pump (hand pump or electric pump) to add oil to the system.
3. Use a suitable pump to add appropriate Synthetic ester compressor oil (absolutely no substitutes are approved) to the system. Make sure that the oil level safety switch is NOT tripped, and allow the unit to restart and run normally. Do not exceed maximum oil change. See Table 33 for the quantity of oil charge.

Table 33 — Unit Oil Quantities

Unit model	Oil charge (Liters)	Unit model	Oil charge (Liters)
LSBLG340	34	LSBLG915	78
LSBLG400	36	LSBLG1000	82
LSBLG455	36	LSBLG1110	82
LSBLG540	39	LSBLG1200	92
LSBLG690	46	LSBLG1300	92
LSBLG720	46	LSBLG1385	92
LSBLG825	72	LSBLG1450	92

6.8Oil Filter Maintenance

Each compressor has its own internal oil filter and each circuit also has an in-line external filter located under the external oil separator. The internal oil filter pressure drop should be checked and filter changed (if necessary) after the initial 2000 hours of compressor operation. Oil line pressure loss is monitored by the control and reported for each compressor as the oil filter pressure drop.

Normally the pressure differential (discharge pressure minus oil pressure) is typically less than 150kPa for a system with clean internal and external filters. To determine the oil pressure drop due to the oil lines and external filter only, connect a gage to the oil pressure bleed port. Compare this value to the discharge pressure read at the touch screen. If this value exceeds 150 kPa, replace the external filter.

6.9Compressor Change out Sequence

Compressor service requires metric tools and hardware. Change compressors according to the following procedure:

1. **Compressor removal procedure**

- Cut off all main and control circuit power supply of the machine.
- Close the discharge valve, suction valve, and evaporator inlet line service angle valve, oil line shutoff valve for circuit to be changed. Disconnect the oil inlet line from the compressor.

- Remove any remaining refrigerant in the compressor and refrigerant lines by proper reclaiming devices. All of the refrigerant that is in the evaporator must be removed if there is no suction service valve installed on the evaporator.
  IMPORTANT: Cooling and chilled water pumps must be energized. There must be water flowing through heat exchangers whenever adding or removing charge.
- Remove junction box cover of compressor to be changed. Check main power leads for marked numbers. If no numbers are visible on leads, mark leads with appropriate numbers to match those printed on the ends of the terminal lugs. This is extremely important as power leads MUST be installed on the exact terminals from which they were removed.
- Disconnect main power leads from compressor terminal lugs. Mark remaining control circuit wires (connected together with wire nuts) for ease of reconnecting later.
- Remove the capacity adjustment SV and oil solenoid valve and high-pressure switch from compressor.
  Caution: The next steps involve compressor unbolting and removal. Compressor seals are made using O-rings. Use care when removing bolts and disconnecting flanges. The O-rings must NOT be re-used. New O-rings are provided with the replacement compressor. Be sure that an appropriate lifting cart or hoist is used to avoid injury.
- See Fig. 31 for lifting methods of screw compressor. Make sure compressor is properly rigged before unbolting. Move lifting apparatus into place and attach to the 2 lifting rings on the compressor. When lifting the compressor, it is recommended to use a steel chain or steel cable as shown in the figure below, and also a safety rope can also be used provided it has loading capacity of 2000kgf. Make sure that the chains, cables, ropes or other lifting equipment are properly positioned so as to avoid damage to compressor or its accessories. Keep the compressor in horizontal position when lifting, and avoid the compressor to crash or fall on the ground; hit the wall or any other event that may damage it or its accessories.

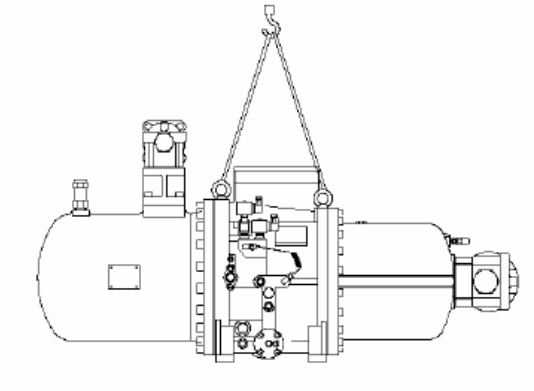


Fig. 21 Lifting the compressor with steel chain or steel cable

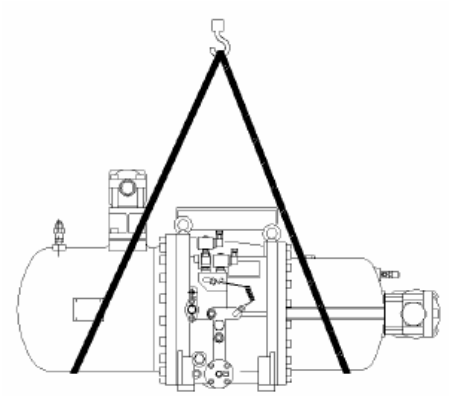


Fig. 22 Lifting the compressor with safety ropes

- Remove the M14 bolts securing the discharge line flange located between compressor and oil separator.
  In the same way, remove the bolts securing the suction line flange between evaporator and compressor if there is no suction service valve. If there is suction service valve, remove the bolts securing the suction valve to compressor.

- Save all the hardware as it will be needed to install the replacement compressor. When there's no interfere with compressor, remove compressor from evaporator.

2. Compressor reinstallation

- Install the new compressor to the mounting bracket; connect all the accessories removed before back to the new compressor, including gas pipes, oil pipes, pressure switches, power cables and control cables, etc. All these must be reinstalled to the same place as per uninstallation procedure.
  IMPORTANT: the power cable must be connected to compressor correctly as per marks on the cables. Wrong connection may cause reversal rotation and serious damages.
- Leak check the compressor and refrigerant lines with nitrogen. Repair any leaks found. Remove nitrogen from system. Evacuate compressor and refrigerant lines. Refer to the Refrigerant Charging/Adding Charge and Oil Charging/Low Oil Recharging sections on pages for recharging procedures.
- Open all shutoff valves and leak check the circuit and all fittings and joints. Repair any leaks found.

- Restore main and control power to the machine. Confirm all the possible alarms and reset on the screen alarm page.

Moisture-Liquid Indicator

Clear flow of liquid refrigerant indicates sufficient charge in the system. Note, however, that bubbles in the sight glass do not necessarily indicate insufficient charge. Moisture in the system is measured in parts per million (ppm), changes of color of indicator are:
Green—moisture is below 80 ppm;
Yellow-green (chartreuse)—80 to 225 ppm (caution);
Yellow (wet)—above 225 ppm.
Change filter drier at the first sign of moisture in the system.

IMPORTANT: Unit must in operation for at least 12 hours before moisture indicator can give an accurate reading. With the unit running, the indicating element must be in contact with liquid refrigerant to give true reading.

Liquid Line Service Valve

This valve is located ahead of the filter drier and provides a 1/4-in. Schrader connection (30GXN,R only) for field charging. In combination with compressor discharge service valve, each circuit can be pumped down into the high side for servicing.

Thermistors

For PTC thermistors, resistances vary with various temperatures.

Location

Motor thermistor locates in the motor winding and is connected to the compressor protection module which will cut off the main power when motor winding temperature exceeds 110 ℃. Water temperature thermistors are installed in wells on chilled water inlet/outlet and cooling water inlet/outlet. Refer to the electric control wiring diagram for detail connection information.

- **Thermistor replacement**

To Replace Thermistors RT1, RT2, RT3, RT4, RT5, or RT6 (Entering/Leaving chilled Water; Entering/Leaving cooling Water; Discharge Gas Temperature) — Disconnect appropriate connector from the PLC controller. New thermistors should be spliced to existing wiring close to the connector unless new connectors are required. Remove thermistor cable from harness. Remove and discard original thermistor from well. Insert new thermistor in well body to its full depth. Add a small amount of thermal conductive grease to thermistor probe and well. Tighten the screw to prevent thermistors from slipping out of the well.

- **To Service Compressor Motor Thermistors**

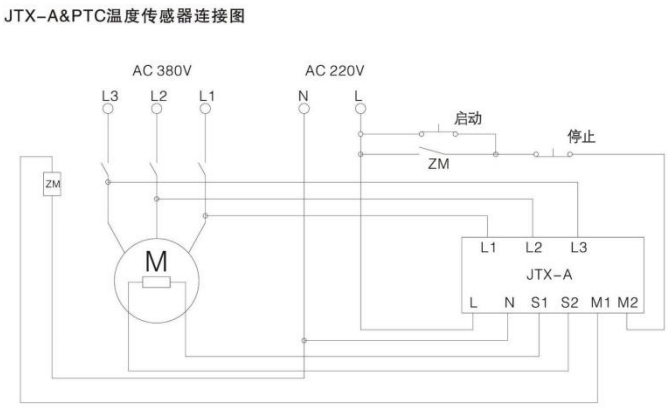
A thermistor is factory installed in each compressor. Connections for the thermistors are located in the compressor wiring box. 2 terminals are reserved for the thermistor: S1 and S2. Motor temperature is measured by leads connected to S1 and S2 terminal. The thermistors are not serviceable in the field. If the compressor motor thermistor fails, compressor replacement is required.

6.10Safety Devices

- **Compressor protection module (INT69 HBY/ JTX-A)**

The units are equipped with compressor protection modules built in the wiring cabinet of compressor. INT69 HBY and JTX-A module is designed to detect the motor winding temperature, phase sequence and phase loss. The detecting signal of JTX-A is voltage type. When motor winding temperature reaches set point, the module will cut off control circuit immediately. The module with phase sequence control can prevent motor reversal due to the

adverse consequences. When any one phase loses, the module will cut off main power after a short delay to protect the motor from burning. When phase unbalance happens, it cuts the power immediately. In order to avoid interference and discriminate between false voltage drop and malfunction as phase loss or phase unbalance during motor operating, JTX-A will cut off main power after 3-5s delay.



- **Thermal overload relay**

Each compressor is equipped with one thermal overload relay to protect the compressor against overcurrent. Bypass the current transducers or make any changes to the factory default set points is forbidden. The configuration of the module defines the Must Trip Amps (MTA) at which the thermal overload relay will turn the compressor off.

- **High/low pressure switch**

All compressors have factory-installed high/low-pressure switches. See Table.6.10

Table – High/low-pressure switch settings

UNIT	High-pressure switch setting		Low pressure switch setting	
	psig	MPa	psig	MPa
LSBLG***	145	1	29	0.2

Table.6.10

If the high pressure switch continuously opens for 3s during operation, the compressor will be shut down. A manual reset of the control is required to restart the compressor. If the low pressure switch continuously opens for 1s during operation, the compressor will be shut down. It will reset automatically when malfunction gets solved and cleared on the malfunction record page of touch screen. Sometimes if the malfunction cannot be solved by reset, consider replace the pressure switches.

- **Oil separator heaters**

Each oil separator circuit has a heater located under the bottom of oil separator. The heater is energized with control circuit power. Oil heaters are energized when unit is shut off and deenergized when unit starts. Make sure the refrigerating oil has been heated for enough time, normally It's 2~8 hours. The default heating time is 4 hours; if the heating time is less than 4 hours, the unit won't start. So please energize in advance, make sure there's 4 hours heating time at least (The heating time of refrigerant oil is different in accordance with the ambient temperature; heating time is as longer as ambient temperature lower).

➢ **Evaporator protection-Low Water Temperature**

PLC is programmed to shut the chiller down if the leaving water temperature drops below 4 ℃. When water temperature rises up to 13° C, the safety resets and the chiller restarts. Besides, the chillers are equipped with antifreeze switch which located on the outlet of chilled water. If leaving water temperature continuously keeps lower than 3 ℃ for 3s during operation, the chiller will be shut down. When water temperature rises up to 10 ℃, the chiller resets, but it needs manually reset on the touch screen.

IMPORTANT: If unit is installed in an area where ambient temperature may fall below 32 F (0 ° C), a suitable corrosion-inhibited antifreeze solution or auxiliary electric heater must be used in the chilled water circuit.

Relief Devices

➢ **Pressure relief valves**

Relief valves are installed on evaporator, condenser and oil separator. These valves are designed to relieve if an abnormal pressure condition arises. Relief valves on evaporator relieve at 220 psi (1517 kPa). Relief valves on condenser relieve at 220 psi (1517 kPa). Relief valves on oil separators relieve at 320 psi (2206 kPa). These valves should not be capped. If a valve relieves, it should be replaced. If not replaced, it may relieve at a lower pressure compared to the set point, or leak due to trapped dirt from the system which may prevent resealing.

Control Modules

• Main base board (mbb), screwcompressor Board (scb), expansion valve board (exv), Energy management module (emm), Comfortlink™compressor protection Board (ccp), and the navigator
• Red led
• Green led
• Yellow led

Replacing Defective PLC Controller

For Midea screw chiller, it adopts special refrigeration PLC controller. The program and data is written into the memory by Midea in the replacement module. When ordering any replacement module, specify the model of unit and information of user (Name/Country/Installation time of unit). Return the faulted module to Midea.

Caution

Electrical shock can cause personal injury. Disconnect all electrical power before servicing.

1. Check that all power to unit is off. Carefully disconnect all wires from the defective module by unplugging its connectors. Remove the defective module by removing its mounting screws with a Phillips screwdriver, and removing the module from the electric control box. Save the screws in an appropriate place for later use.
2. Package the defective module in the carton of the new module for return to Midea.
3. Install the new module in the unit's control box using a Phillips screwdriver and the screws saved before.
4. Reinstall all module connectors and communication wire. Carefully check all wiring connections before restoring power. Make sure the connectors are installed at the right place.
5. Restore control power. Verify all configuration information, settings, set points and schedules.

7.Maintenance

7.1Operation checks

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, complete the Start-Up Checklist for Liquid Chillers on pages APPENDIX(cont) . This Checklist assures proper start-up of the chiller, and provides a record of unit condition, application requirements, system information and operation at initial start-up. Keep it properly with the job file for future reference.

- **System inspection before startup**

a) Valves on all circuits

Confirm whether the valves on suction/discharge pipe, oil return pipe, and feed pipe are open or not, and whether the pipes are clear. Make sure the ball valves of relief valves are open. All water valves (maybe butterfly valves) are correctly open.

b) Check oil heating time

Judge whether the refrigerating oil has been heated for enough time, normally It's 2~8 hours. The default heating time is 4 hours; if the heating time is less than 4 hours, the unit won't start. So please energize in advance, make sure there's 4 hours heating time at least(The heating time of refrigerant oil is different in accordance with the ambient temperature; heating time is as longer as ambient temperature lower).

c) Check the pressure gauges

Check the main unit whether its pressure is normal. Normally, when indoor temperature is 25℃~28℃, high/low pressure is 0.7~1MPa.

Check the quantity of water

Check whether there is enough water or not in chilled water circle system and cooling water circle system, and keep an eye on water supply valve whether it is open.

d) Check accessory components

Gaskets and packing normally relax by the time the machine arrives at the jobsite due to vibration in the process of transportation. Tighten all gasketed joints to ensure a leak-tight chiller. Check electrical distribution cabinet switches and components if there is abnormal phenomenon.

e) Check the power

Check the power supplies (its voltage, phase, frequency) whether they are normal or not.

f) Inspect the water piping

Check the piping to the evaporator and condenser .

Use proper fluids and consult Midea's recommendations on heat exchange fluids.

- **Annual Startup**

This is a good time to check all the motor winding resistance to ground. Semi-annual checking and recording of this resistance will provide a record of any deterioration of the winding insulation. All new units have well over 100 MΩ resistances between any motor terminal and ground.

1. The control circuit must be energized at all times, except during service. If the control circuit has been off and oil is cool, energize oil heaters and allow 8 hours for heater to remove refrigerant from the oil before starting.
2. Check and tighten all electrical connections.
3. Replace the drain plug in the cooling tower pump if it was removed at shutdown time the previous season.
4. Install fuses in main disconnect switch (if removed).
5. Reconnect water lines and turn on supply water. Flush condenser and check for leaks.

- **Annual Shutdown**

Where the chiller can be subject to freezing temperatures, the condenser and chiller must be drained of all water. Dry air blown through the condenser will aid in forcing all water out and decreasing the corrosion. Water permitted to remain in the piping and vessels can rupture these parts if subjected to freezing temperature.

If the chiller is used in areas where the ambient temperature will fall below 0℃, forced circulation of antifreeze through the water circuits is one method of avoiding freeze up.

1. Take measures to prevent the shutoff valve in the water supply line from being accidentally turned on.
2. If a cooling tower is used, and if the water pump will be exposed to freezing temperature, be sure to remove the pump drain plug and leave it out so any water that can accumulate will drain away.
3. Open the compressor disconnect switch, and remove the fuses.
4. Check for corrosion and clean and paint rusted surfaces.

5. Clean and flush water tower for all units operating on a water tower. It should be recognized that atmospheric air contains many contaminants that increase the need for proper water treatment. The use of untreated water can result in corrosion, erosion, sliming, scaling or algae formation. It is recommended that the service of a reliable water treatment company be used.
6. Remove condenser heads at least once a year to inspect the condenser tubes and clean if required.

7.2Recommended maintenance schedule

This chapter shows the preventive maintenance of Midea screw chiller. Correct maintenance and timely service will make the chiller in the best condition and with best performance, beside, it can prolong the lifespan of chiller.

The customer has responsibility to appoint qualified equipment management engineer and specially-assigned operator to do the daily and scheduled maintenance. The repair work should be done by big maintenance agency that is qualified to do the job. It's better to make maintenance agreement with local customer service centre of Midea after chiller out of warranty, to keep the chiller always under effective service and guarantee reliable operation.

Note: Repair work caused by incorrect maintenance within warranty will lead to extra charges.

- **Daily maintenance**

The basic work of unit maintenance is to truly record the operation parameters of unit at certain intervals (e.g. 2hours) everyday. Fill the operation parameter table which contains such key parameters as high/low pressure, suction/discharge temperature, degree of sub-cooling/overheat degree. True and complete records of operation parameters are useful for analyzing and forecasting the trend of unit operation. It's good for finding and forecasting the problem that may occur and taking measures in time.

For example, by analyzing the record of a whole month, you may find that the temperature difference of condensing temperature and leaving cooling water temperature may become bigger. It means that the cooling water is dirty or water hardness is big, and it is scaling constantly. So it's compulsory to perform softening process or clean the tubes.

Note: Keeping the normal operation parameters of initial unit commissioning is very useful. It can be used for comparative analysis to find out the trend of problem.

- **Scheduled maintenance**

General

Take notice of the noise at any time by standing 1m from the unit. Watch the vibration amplitude at all times to see whether it's within permitted. Check the voltage of power supply whether it's within ±10% of rated voltage at any time.

Visual inspection

Keep the unit clean, if there's rust, do scaling with iron brush and cover it with antirust paint. Pay attention to the oil traces (sign of a refrigerant leak) and water traces on pipeline. Check the threaded connection joints carefully, fasten any loose screw in time. Any time seeing the insulating material flakes off, stick them with adhesive.

Compressor

For insulation resistance, check it yearly and it should be over 5MΩ when measuring with ohmmeter of DC 500V. When touching the shockproof rubber, it should be elastic, or it means the rubber gets ageing. Every 3000 hours, make middle inspection of vibration and oil level; every 6000 hours, check the safety device and protective device to guarantee the normal operation.

Important: The normal oil level is at the middle of sight glass. Adding lubricating oil if the oil level decline obviously. Inspect the oil quality monthly to see if there's dirt or deterioration, otherwise, replace the oil and filter core if necessary by specialized technicians. Make chemical analysis of the lubricating oil, if emulsification phenomenon occurs, change the oil of same brand.

Heat exchangers

Adjust the water flow to keep the high/low pressure within normal range (high pressure 0.6~1.2MPa/low pressure 0.1~0.4,If the temperature difference between leaving cooling water temperature and refrigerant temperature in condenser is larger than 6 ℃, it means the condenser is scaling and cleanness work is in urgent need. When the chiller stops for a long time, water in heat exchangers and pipe system should be drained thoroughly. For newly installed chiller, the filters in water system should be cleaned after running for 24 hours and then clean the filters quarterly.

Valves and pressure controllers

▲ Safety valves

Inspect the integrity and performance of valves every year. The maintenance of safety valves should be done by specialized technicians. Take apart the connecting pipe of safety valve, and check it to see whether there is corrosion, rust, scaling, leakage phenomenon internal (if necessary, replace the safety valve). And also check other operating valves to see whether it's smooth when opening or closing them.

▲ High/low pressure switch

Check their performance whether they are in good condition according to “performance of protection device” monthly, and change the broken one in time. Or the chiller may get damaged when over high pressure or too low pressure happens.

7.3Chilled water cycling

Seek the possible leakage on the unit and the pipe joint with leak detector. Expel the water from condenser and evaporator to see whether there’s leakage on water inlet and outlet. Leak can be found with electronic detector, torch detector or soap water. The work looking for refrigerant leakage should be carried out at least once/month.

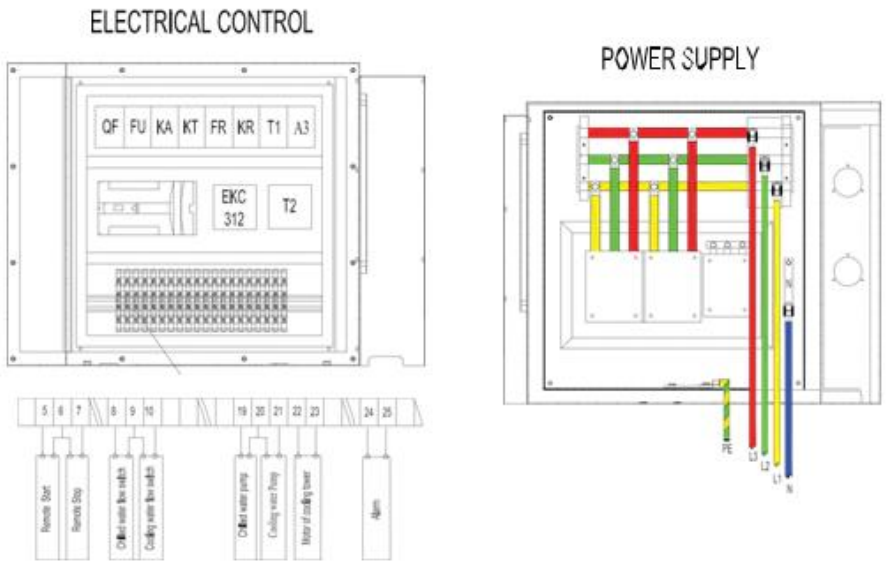
7.4Electrical control system

For insulation resistance, check it monthly and it should be over 1MΩ when measuring with ohmmeter of 500VDC. Check the running current and compare with the rated value (refer to Table.9). Check the conductibility of wire and verify whether it’s intact and well connected. Fasten the loose bolts. Check other components such as electromagnetic contactor, rotary switch, auxiliary relay, time relay and thermostat whether they are all normal monthly.

8.APPENDIX A

8.1Field wiring

LSBLG340MCF1—LSBLG720MCF1



LSBLG825MCF1—LSBLG1450MCF1

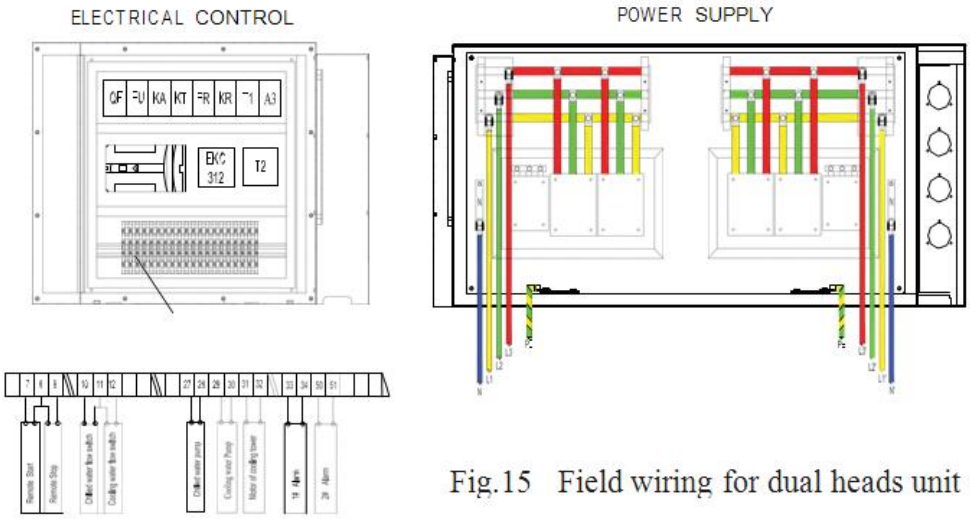


Fig.15 Field wiring for dual heads unit

APPENDIX A

8.2Trouble shooting

Symptom	Cause	Troubleshooting
I. Compressor does not work	No power (power cut off);	Check and deliver power;
	Switch action (current overload);	Find out the reason for current overload. If the switch volume is too small, change the switch in time. If the pressure is too low, try to improve it;
	Trouble of startup switch;	Examine and change;
	Fuse of the control circuit power source burnt out;	Change;
	Chain control part does not run;	Check whether the water pump of the chain control runs, if not, make it run;
	High and low pressure switch action;	Check the set pressure and regulate;
II. Stop soon after it starts up	High and low pressure switch action;	Ambient temperature is too high; exclude the incondensable gas; if the expansion valve blocks, clean it, if it is damaged, change it; clean away the dust on the fin heat exchanger;
III. Discharge pressure too low (refrigerating status)	Refrigerant not enough;	Add Refrigerant;
	Super heat of expansion valve too high ;	Regulate it;
	Ambient temperature too low;	Check the ambient temperature, if necessary, turn off some fans;
	Inspiration pressure too low;	Refer to VI.
IV. Discharge pressure too high (refrigerating status)	Too much Refrigerant;	Draw out proper amount of Refrigerant;
	Incondensable gas enters;	Exhaust the gas;
	Fin heat exchanger is dirty;	Clean the fin heat exchanger;
	Temperature of the fin heat exchanger is high;	Check the ambient temperature of fin heat exchanger and whether there is some obstacles affect the supply air rate;
	Supply air not enough for the fin heat exchanger;	Check the operation status of the Fan;
	High pressure gauge not accurate;	Change a new high pressure gauge
	Suction pressure too high;	Refer to V;

V. Suction pressure too high (refrigerating status)	Refrigeration load too large	Regulate it;
	Super heat of expansion valve too low ;	Regulate it;
	Too much refrigeration;	Draw out proper amount of refrigeration media;
VI. Suction pressure too low (refrigerating status)	Refrigeration media not enough;	Add refrigeration media;
	Dry filter blocks;	Clean it or change another filter sieve;
	Refrigeration load too small;	Regulate it;
	Cooling water not enough;	Regulate it;
	Cooling water filter blocks;	Clean it;
	Hot water flow too large or water temperature too low;	Regulate the water volume;
VII. Automatic capacity adjustment device does not work	Thermoregulation device trouble;	Change a new one;
	Magnetic valve power off;	Change a new one;
	Capillary pipe blocks;	Clean (by professional)
VIII. Compressor overheat	Compressor bearing not good;	Renew the compressor;
	Pressure of the high pressure side is too high;	Refer to IV;
	Temperature of the refrigerant at the low pressure side too high	Regulate the pressure of low pressure side and the width of expansion valve;
	Motor overheat;	Refer to XV;
IX. NFB tripping	Layout short trouble;	Measure the insulation resistance;
	Layout grounding;	As above
	Compressor motor trouble;	Measure the grounding insulation resistance of the compressor motor and phase to phase insulation resistance;
X. Compressor motor overload relay action	Single-phase running due to NFB tripping;	Check it;
	The voltage too high or too low or without balance;	Check the electric power distribution status;
	Single-phase running due to bad magnetic itch;	Repair it or change a new one;
	Motor not good;	After regulating, repair it or change a new one; if damaged, refrigeration media circuit must be cleaned;
	Temperature inside the electric power distribution cabinet is too high;	Remain below 60℃, find out the reason for overheating, and eliminate the trouble;
	Running pressure too high;	Refer to “IV” and “V” for refrigerating status, refer to “VIII” and “IX” for heating status;
	Compressor starts up too frequently;	Check each automatic adjustment device;
	Refrigerator oil in the compressor not enough;	Clean the filter sieve.

APPENDIX C (cont)

Model **Items**			**LSBLG 340**	**LSBLG 400**	**LSBLG 455**	**LSBLG 540**	**LSBLG 690**	**LSBLG 720**	**LSBLG 825**
Nominal Cooling Capacity		RT	96.7	113.8	129.4	154.2	196.2	204.8	234.6
		kW	340	400	455	542	690	720	825
		kCal/h	292,400	344,000	391,300	466,120	593,400	619,200	709,500
Electrical data	Power input	kW	64.0	72.1	84.7	99.0	121.1	126.0	152.6
	Rated current	A	107.6	121.2	142.4	166.4	203.6	211.8	256.5
	Power supply		380~415V-3P-50Hz						
Capacity control			Automatic						
Capacity steps		%	25-50-75-100 or stepless as option						
Compressor	Type		Semi-hermetic twin screw compressor						
	Starting mode		Y-Δ						
	Quantity		1	1	1	1	1	1	2
	Rotate speed	rpm	2950						
Refrigerant	Type		R134a						
	Charge	kg	210	240	240	240	250	250	360
	No. of circuits		1	1	1	1	1	1	2
	Refrigerant control		Orifice baffle + EXV						
Condenser	Type		Shell and tube						
	Pass No.		3	3	3	3	3	3	2
	Water flow rate	m^3/h	69	81	93	110	140	146	168
	Water pressure drop	kPa	55	58	60	62	65	68	68
	Water side working pressure	MPa	1MPa (Higher pressure can be customized)						
	Pipe connections	mm	DN125	DN125	DN125	DN150	DN150	DN150	DN150
		in	5	5	5	6	6	6	6
Evaporator	type		Flooded type						
	Pass No.		3	3	3	3	3	3	2
	Water flow rate	m^3/h	58	69	78	93	119	124	142
	Water pressure drop	kPa	50	55	58	60	62	65	65

	Water side working pressure	MPa	1MPa (Higher pressure can be customized)						
	Pipe connections	mm	DN125	DN125	DN125	DN150	DN150	DN150	DN150
		in	5	5	5	6	6	6	6
Dimension	Length	mm	3500	3500	3500	3600	3600	3600	4500
	Width	mm	1400	1400	1400	1500	1500	1500	1600
	Height	mm	1750	1750	1750	2000	2000	2000	1900
Shipping weight		kg	3000	3200	3300	3800	4000	4100	5500
Operating weight		kg	3300	3550	3650	4200	4450	4550	6000

Specifications of LSBLG screw chiller

Model **Items**			**LSBLG 915**	**LSBLG 1000**	**LSBLG 1110**	**LSBLG 1200**	**LSBLG 1300**	**LSBLG 1385**	**LSBLG 1450**
Nominal Cooling Capacity		RT	260.0	284.4	315.7	341.3	369.7	393.9	412.4
		kW	914	1000	1110	1200	1300	1385	1450
		kCal/h	786,040	860,000	954,600	1,032,000	1,118,000	1,191,100	1,247,000
Electrical data	Power input	kW	64.0	162.3	177.3	200.9	210.0	232.1	243.4
	Rated current	A	107.6	272.8	298.1	337.7	353.0	390.2	409.2
	Power supply		380~415V-3P-50Hz						
Capacity control			Automatic						
Capacity steps		%	25-50-75-100 or stepless as option						
Compressor	Type		Semi-hermetic twin screw compressor						
	Starting mode		Y-Δ						
	Quantity		2	2	2	2	2	2	2
	Rotate speed	rpm	2950						
Refrigerant	Type		R134a						
	Charge	kg	380	400	400	420	440	440	440
	No. of circuits		2	2	2	2	2	2	2
	Refrigerant control		Orifice baffle + EXV						
Condenser	Type		Shell and tube type						
	Pass No.		2	2	2	2	2	2	2
	Water flow rate	m^3/h	185	202	225	243	264	280	293

	Water pressure drop	MPa	70	72	75	78	80	82	85
	Water side working pressure	kPa	1MPa (Higher pressure can be customized)						
	Pipe connections	mm	DN150	DN200	DN200	DN200	DN200	DN200	DN200
		in	6	8	8	8	8	8	8
	Type		Flooded type						
Evaporator	Pass No.		2	2	2	2	2	2	2
	Water flow rate	m^3/h	157	172	191	206	224	238	249
	Water pressure drop	kPa	68	70	72	75	77	80	82
	Water side working pressure	MPa	1MPa (Higher pressure can be customized)						
	Pipe connections	mm	DN150	DN200	DN200	DN200	DN200	DN200	DN200
		in	6	8	8	8	8	8	8
Dimension	Length	mm	4500	4600	4600	4600	4600	4600	4600
	Width	mm	1600	1700	1700	1700	1700	1700	1700
	Height	mm	1900	2100	2100	2100	2100	2100	2100
Shipping weight		kg	6000	6600	6800	7000	7200	7400	7500
Operating weight		kg	6500	7150	7350	7600	7850	8050	8150

Notes: 1. All parameters are under standard condition: Entering / leaving chilled water temperature: 12 / 7 ℃; Entering /leaving cooling water temperature: 30/35 ℃; Fouling factor is 0.086 $m^2 \cdot ℃ / kW$.

2. Specifications are subject to change with product improvement, please take chiller nameplate as final.

APPENDIX D (cont)
I/O summary sheet
Signal inputs:

Code	Description	Type	Function	Remarks
DI 00	Remote start	Inching/NO	For remote control	Provided by user
DI 01	Remote stop	Inching/NO	For remote control	Provided by user
DI 02	Chilled water flow protection	NC	Lacking of water protection	Open circuit 5s/activate
DI 03	Cooling water flow protection	NC	Lacking of water protection	Open circuit 5s/activate
DI 04	Anti-freeze protection	NC	Protect the evaporator	real-time detection
DI 10	1# High pressure protection	NC	Discharge pressure protection	Delayed malfunction detection
DI 11	1# Low pressure protection	NC	Suction pressure protection	Delayed malfunction detection
DI 12	1# Compressor protection	NC	Protection of phase loss/phase unbalance/phase reversal/over high discharge temp.	Open circuit 1s/activate
DI 13	1# Oil level protection	NC	In case of lacking of oil	Open circuit 3s/activate
DI 14	1# Overload protection	Determine by electric control	Overcurrent protection	Delayed malfunction detection
DI 15	1＃Phase protection	NC	Power protection	Delayed malfunction detection
DI 20	2# High pressure protection	NC	Discharge pressure protection	Delayed malfunction detection
DI 21	2# Low pressure protection	NC	Suction pressure protection	Delayed malfunction detection
DI 22	2# Compressor protection	NC	Protection of phase loss/phase unbalance/phase reversal/over high discharge temp.	Delayed malfunction detection
DI 23	2# Oil level protection	NC	In case of lacking of oil	Open circuit 3s/activate
DI 24	2# Overload protection	Determine by electric control	Discharge pressure protection	Delayed malfunction detection
DI 25	2＃Phase protection	NC	Power protection	Delayed malfunction detection
DI 30	Reserved			
AI 01	Entering chilled water temp.	Analog	Sub-cooling/capacity control	0-50℃，precision 0.1℃
AI 02	Leaving chilled water temp.	Analog	Capacity control	0-50℃，precision 0.1℃
AI 03	Entering cooling water temp.	Analog	Temp. detection	0-50℃，precision 0.1℃
AI 04	Leaving cooling water temp.	Analog	Temp. detection	0-50℃，precision 0.1℃
AI 05	Discharge 1	Analog	Temp. detection	0—150℃，precision 0.1℃
AI 06	Discharge 2	Analog	Temp. detection	0—150℃，precision 0.1℃
AI 07	Current transducer 1	Analog	Current detection	0—500A，only for stepless unit

AI 08	Current transducer 2	Analog	Current detection	0—500A，only for stepless unit
AI 09	Oil temperature 1	Analog	Temp. detection(reserved)	0—100℃，precision 0.1℃
AI 10	Oil temperature 2	Analog	Temp. detection(reserved)	0—100℃，precision 0.1℃

Output signal:

Code	Description	Type	Function	Remarks
DO 00	Chilled water pump	Valid for ON	Control chilled water pump	
DO 01	Chilled water pump	Valid for ON	Control cooling water pump	
DO 02	Cooling tower fan	Valid for ON	Improve the cooling effect	
DO 10	1＃alarm	Valid for ON	Alarm when protection or fault occurs	
DO 11	1# start-stop control	Valid for ON	start-stop control of compressor	
DO 12	1# 25% SV	Valid for ON	Control 25% SV	Startup SV for stepless unit
DO 13	1# 50% SV	Valid for ON	Control 50% SV	Unload SV for stepless unit
DO 14	1# 75% SV	Valid for ON	Control 75% SV	Load SV for stepless unit
DO 15	1# oil supply SV	Valid for OFF	Close # 1 oil slip	
DO 16	1# throttle bypass valve	Valid for ON	Open Road 1 # fluid	
DO 17	1# operating indicator	Valid for ON	1# operating indicator of compressor	
DO 20	2# start-stop control	Valid for ON	start-stop control of compressor	
DO 21	2# 25% start-stop control	Valid for ON	Control 25% SV	Startup SV for stepless unit
DO 22	2# 50% start-stop control	Valid for ON	Control 50% SV	Unload SV for stepless unit
DO 23	2# 75% start-stop control	Valid for ON	Control 75% SV	Load SV for stepless unit
DO 24	2# oil supply SV	Valid for OFF	Close # 2 oil slip	
DO 25	2# throttle bypass valve	Valid for ON	Open Road 2 # fluid	
DO 26	2# operating indicator	Valid for ON	2# operating indicator of compressor	
DO 27	2＃alarm	Valid for ON	Alarm when protection or fault occurs	
DO 30	reserved			

APPENDIX E (cont)
Configurable parameters

4-stage control unit:

Description	Default	Setting range	Remarks
User parameters			
Leaving chilled water set point /Ts	7℃	7～12℃	User parameter
Control range /To	2℃	1～3℃	User parameter
Temperature control cycle of step control	3min	3～5min	User parameter
Mode selection	Cooling	Cooling/pump	User parameter
Compressor parameters			
Min. shut down interval of comp.	15min	10～15min	Commissioning parameter
Min. running time of comp.	15min	10～15min	Commissioning parameter
Startup interval of comp.	25min	25～30min	Commissioning parameter
Oil heating time	30min	0～120min	Commissioning parameter
Alarm parameters			
Low pressure protection delay	3s	0～6s	Plant parameter
Oil level alarm delay	60s	0～120s	Plant parameter
1＃ compressor over load current	Depending on unit model	100～500A	Plant parameter
2＃compressor over load current	Depending on unit model	100～500 A	Plant parameter
Discharge temp. protection point（R134a）	60℃	60～75℃	Commissioning parameter
Discharge temp. protection reset point（R134a）	45℃	40～55℃	Commissioning parameter
High leaving cooling water temp. protection point	45℃	40～45℃	Commissioning parameter
High leaving cooling water temp. protection reset point	38℃	35～40℃	Commissioning parameter
Anti-freeze protection point	4.0℃	3.5～5℃	Plant parameter
Anti-freeze protection reset point	13℃	13～15℃	Plant parameter
Cooling tower parameters			
Cooling tower fan- ON temp.	27	18～27℃	Commissioning parameter
Cooling tower fan- OFF temp.	25	18～25℃	Commissioning parameter
Oil supply SV			
Time delay of oil return SV ON	2s	1～5s	
Time delay of oil return SV OFF	300s	200～5000	

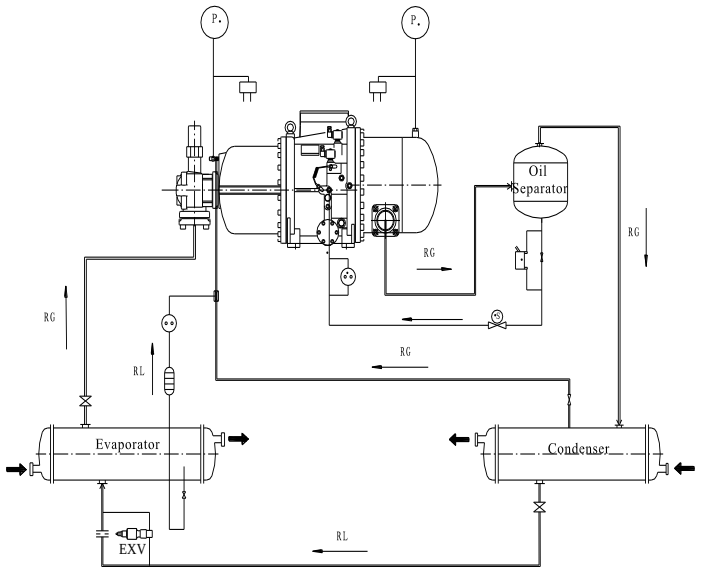
Stepless control unit:

Description	Default	Setting range	Remarks
User parameters			
Leaving chilled water set point /Ts	7℃	7～10℃	User parameter
Mode selection	Cooling	Cooling/pump	User parameter

Compressor parameters			
Min. shut down interval of comp.	15s	10～15s	Commissioning parameter
Min. running time of comp.	15s	10～15s	Commissioning parameter
Startup interval of comp.	25s	25～30s	Plant parameter
Oil heating time	30s	0～120s	Commissioning parameter
Capacity adjusting parameters			
Unload SV ON time	1.0s	0.5～1.5s	Plant parameter
Unload SV OFF time	15s	10～20s	Plant parameter
Load SV OFF time	1.5s	0.5～2s	Plant parameter
Load SV ON time	15s	10～20s	Plant parameter
Alarm parameters			
Low pressure protection delay	3s	0～6s	Plant parameter
Oil level alarm delay	60s	0～120s	Plant parameter
1＃ compressor over load current	Depending on unit model	100～500A	Plant parameter
2＃compressor over load current	Depending on unit model	100～500 A	Plant parameter
Discharge temp. protection point（R134a）	60℃	60～75℃	Commissioning parameter
Discharge temp. protection reset point（R134a）	45℃	40～55℃	Commissioning parameter
High leaving cooling water temp. protection point	45℃	40～45℃	Commissioning parameter
High leaving cooling water temp. protection reset point	38℃	35～40℃	Commissioning parameter
Low entering cooling water temp. protection point	14℃	14～20℃	Commissioning parameter
Low entering cooling water temp. protection reset point	38℃	18～22℃	Commissioning parameter
Anti-freeze protection point	4.0℃	3.0～5℃	Plant parameter
Anti-freeze protection reset point	13℃	10～15℃	Plant parameter
Cooling tower parameters			
Cooling tower fan- ON temp.	27℃	18～27℃	Commissioning parameter
Cooling tower fan- OFF temp.	25℃	18～25℃	Commissioning parameter
Oil supply parameter			
Time delay of oil return SV ON	2s	1～5s	Plant parameter
Time delay of oil return SV OFF	300s	200～5000s	Plant parameter
Display			
1＃Full load current of compressor	Depending on unit model	50～500A	Commissioning parameter
2＃Full load current of compressor	Depending on unit model	50～500A	Commissioning parameter

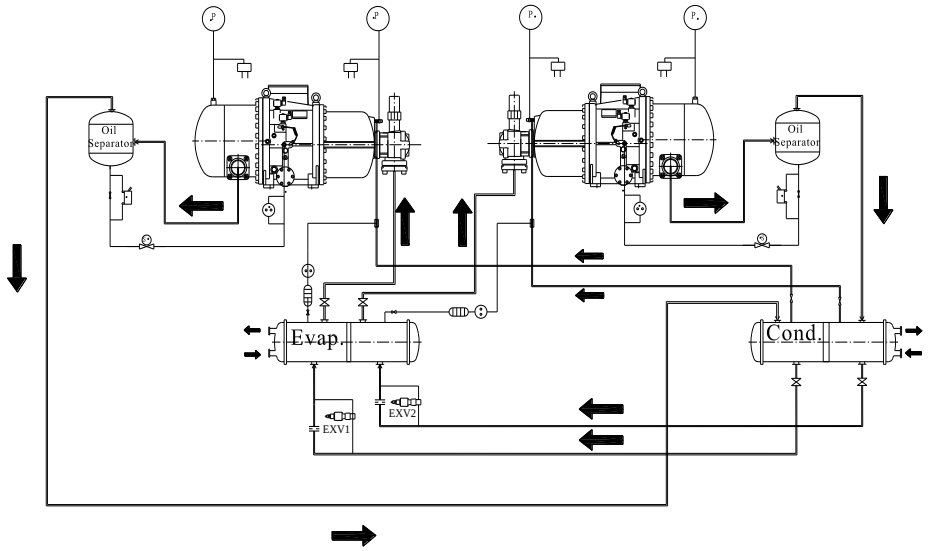
APPENDIX F (cont)

8.3Typical refrigerant cycle system (for single head unit)



Code	Name
P	Pressure gauge
TA	Temperature sensor
	Sight glass
	Filter
S	Solenoid valve
	Ejector
	Cut valve
	Throttling orifice
	High/low press. switch
	High/low pressure switch
	EXV

8.4Typical refrigerant cycle system (for double head unit)



APPENDIX G

8.5Midea’s recommendations on heat exchange fluids

1. No NH4+ ammonium ions in the water, they are very detrimental for copper. This is one of the most important factors for the operating life of copper piping. A content of several tenths of mg/l will badly corrode the copper over time.
2. Cl- Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. If possible, keep below <50ppm.
3. SO42- sulphate ions can cause perforating corrosion. If possible keep below <50ppm.
4. No fluoride ions (<0.1 mg/l).
5. If possible keep Calcium ion below <50ppm.
6. No Fe2+ and Fe3+ ions with non negligible levels of dissolved oxygen must be present. Dissolved iron < 5mg/l with dissolved oxygen < 5 mg/l. If possible keep below <0.3ppm.
7. Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 30ppm.
8. Water hardness: Total hardness <50ppm can be recommended. This will facilitate scale deposit that can limit corrosion of copper. A total alkali metric titer (TAC) below 100 is desirable.
9. Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encourages destabilization of copper hydroxides and enlargement of particles.
10. Specific resistance – electric conductivity: the higher the specific resistance, the slower the corrosion tendency. Conductivity <20μV/cm (25℃) are desirable. A neutral environment favors max. specific resistance values. For electric conductivity values in the order of 200-6000S/cm can be recommended.
11. PH: Ideal case pH neutral at 20-25℃ 7 < pH < 8.5.

CAUTION: Water must be within design flow limits, clean, and treated to ensure proper chiller performance and reduce the potential of tube damage due to corrosion, scaling, erosion, and algae. Carrier assumes no responsibility for chiller damage resulting from untreated or improperly treated water.

Operator Initials / Date/ Time	Circuit	% Capacity Per Circuit	Cooler						CONDENSER						COMPRESSOR				
			Refrigerant		Water				Refrigerant		Water				No.	Discharge Gas Temp.	Oil		Motor
			Suction Pressure	Sat. Suct. Temp	Pressure		Temp.		Discharge Pressure	Sat. Cond. Temp	Pressure		Temp.				Oil Pres. Diff.	Oil Pres.	Temp.
					In	Out	In	Out			In	Out	In	Out					
	1#														1#				
	2#														2#				
	1#														1#				
	2#														2#				
	1#														1#				
	2#														2#				
	1#														1#				

	2#														2#				
	1#														1#				
	2#														2#				

APPENDIX H
Midea LSBLG Water Cooled Screw Chiller Maintenance Data Log

PLANT _____ CHILLER MODEL NO. _____ CHILLER SERIAL NO. _____

Remarks: Any other operation such as repairs made, accessory parts changed, oil or refrigerant added or removed (including amounts).

APPENDIX I

8.6Start-Up Checklist for Midea Screw Chiller

I. Project Information

Job Name _____

Address _____

City _____State _____ Zip _____

Installing Contractor _____

Sales Office _____

Start-up Performed By _____

Design Information

	Capacity	EWT	LWT	Fluid type	Flow Rate	
Cooler						
Condenser						

Equipment **Model** _____ **Serial** _____ **Compressors** **1# Model** _____ **Serial** _____ **2# Model** _____ **Serial** _____ **Cooler** **Model** _____ **Serial** _____	**Equipment** **Model** _____ **Serial** _____ **Compressors** **1# Model** _____ **Serial** _____ **2# Model** _____ **Serial** _____ **Cooler** **Model** _____ **Serial** _____

Condenser	Condenser
Model _____	Model _____
Serial _____	Serial _____

II. Preliminary Equipment Check (to be completed by installing contractor)

Is there any physical damage? Yes__No__

Description _____

_____

1. Unit is installed level as per the installation instructions.	Yes__No__
2. Power supply agrees with the unit nameplate.	Yes__No__
3. Correct control voltage _____vac.	Yes__No__
4. Electrical power wiring is installed properly.	Yes__No__
5. Unit is properly grounded.	Yes__No__
6. Electrical circuit protection has been sized and installed properly.	Yes__No__
7. All terminals are tight.	Yes__No__
8. All plug assemblies are tight.	Yes__No__
9. All cables and thermistors have been inspected for crossed wires.	Yes__No__
10. All thermistors are fully inserted into wells.	Yes__No__
11. Mechanical room maintained above 50 F (10 C).	Yes__No__
12. Relief valve vent piping installed per local codes.	Yes__No__

NOTE: Required for unit operation where winds of 5 mph (2.2 m/s) or

greater are anticipated at outdoor ambient temperatures below 32 F (0 °C).

Chilled Water System Check

1. All chilled water valves are open.	Yes__No__
2. All piping is connected properly.	Yes__No__
3. All air has been purged from the system.	Yes__No__
4. Chilled water pump is operating with the correct rotation.	Yes__No__
5. Chilled water pump starter interlocked with chiller.	Yes__No__
6. Inlet piping to cooler includes a water strainer.	Yes__No__
7. Water loop volume greater than 3 gal/ton for air conditioning or 6 gal/ton for process cooling and low ambient operation.	Yes__No__
8. Proper loop freeze protection provided to ____ ℉ (℃).	Yes__No__

Antifreeze type_____ Concentration _____%.

(If antifreeze solution is not utilized on 30GX machines and the minimum outdoor ambient is below 32 F (0 °C) then items 9-11 have to be completed to provide cooler freeze protection to 0 °F. Refer to Installation Instructions for proper cooler winterization procedure.)

9. Outdoor piping wrapped with electric heater tape.	Yes__No__
10. Cooler heaters installed and operational.	Yes__No__
11. Cooler heads and tube sheets are insulated.	Yes__No__

Cooling Water System Check

1. All condenser water valves are open.	Yes__No__
2. All piping is connected properly.	Yes__No__
3. All air has been purged from the system.	Yes__No__
4. Condenser water pump is operating with the correct rotation.	Yes__No__
5. Condenser water pump controlled by chiller.	Yes__No__
6. Inlet piping to condenser includes a water strainer.	Yes__No__
7. Cooling water flow switch has been installed.	Yes__No__
8. Cooling water flow switch has been configured and operational.	Yes__No__
9. Cooling water control valve has been installed.	Yes__No__

III. Unit Start-Up

1. All liquid line valves are open.	Yes__No__
2. All discharge valves are open.	Yes__No__
3. All suction service valves are open (if equipped).	Yes__No__
	Yes__No__
	Yes__No__

4. All oil line valves are open.

5. Chilled water flow switch is operational.

6. Leak check unit. Locate, repair and report any refrigerant leaks. Yes__No__

7. Voltage is within unit nameplate range. Yes__No__

8. Check voltage imbalance: A-B_____ A-C_____B-C_____

Average voltage = _____ (A-B + A-C + B-C)/3

Maximum deviation from average voltage = _____

Voltage imbalance = _____% (max. deviation/average voltage) ×100 Voltage imbalance less than 2%.

(DO NOT start chiller if voltage imbalance is greater than 2%. Contact local Utility for assistance.)

9. Verify cooler flow rate (maximum and minimum)

Entering chilled water pressure _____ psig (kPa)

Leaving chilled water pressure _____ psig (kPa)

Chilled water pressure drop _____ psig (kPa)

Psig × 2.31 ft/psi = _____ ft of water

kPa × 0.334 m/psi = _____ m of water

Maximum chilled water flow rate _____ gpm (l/s)

Minimum chilled water flow rate _____ gpm (l/s)

III. Unit Start-Up (cont)

Verify condenser flow rate.

Entering cooling water pressure _____ psig (kPa)

Leaving cooling water pressure _____ psig (kPa)

Cooling water pressure drop _____ psig (kPa)

Psig × 2.31 ft/psi = _____ ft of water

kPa × 0.334 m/psi = _____ m of water

Cooling water flow rate _____ gpm (l/s)

Start and operate machine. Complete the following:

1. Complete component test.

2. Check refrigerant and oil charge. Record charge information.

3. Record compressor motor current.

4. Record two sets of operational log readings.

5. Provide operating instructions to owner's personnel. Instruction time _____ hrs.

Refrigerant Charge Circuit A_____ Circuit B_____

Additional charge required _____ _____

Oil Charge

Additional charge required _____ _____

Comments:

_____

Signatures:

Start-up Technician_____ Customer Representative _____

Date_____ Date_____