WATER-COOLED WATER CHILLERS WITH SCREW COMPRESSORS

WATER-WATER HEAT PUMPS WITH SCREW COMPRESSORS

WSH-2

WSHH-2

2.200-2.230-2.260-2.280-2.300-2.360-2.400-2.440-3.450-3.540-3.580-3.620-3.660

START-UP

CONTENTS:

ALL THE EQUIPMENT MUST BE STARTED BY AUTHORISED SERVICE CENTRES, IN ORDER TO VALIDATE THE CONTRACTUAL WARRANTY. THIS SERVICE ONLY INVOLVES THE START-UP OF THE SYSTEM AND NOT THE CONNECTIONS OR ANY OTHER WORK ON THE SYSTEM SUCH AS THE CONNECTION OF THE EXTERNAL ENABLING COMMANDS

PRELIMINARY CHECKS

CHECKING THE ELECTRICAL PARTS

IMPORTANT: Before performing the checks described below, make sure that the electrical power line to the unit is disconnected at the origin. Also make sure that the isolator device is padlocked or that a special sign warning against activating the switch is applied to the handle. Before performing the electrical connections, ensure that no voltage is present using a voltmeter or phase tester.

Checks to be performed when the power supply is disconnected:

- Move the main door lock isolator switch to position “0”.
- Check that the cross-section of the electrical power cables is suitable for the load of the entire unit (see the section on electrical connections in the manual).
- Check that the unit has been connected to the earth system (see the section on electrical connections in the manual).
- Check the screws fastening the wires to the electrical components in the panel so as to ensure adequate electrical contact (vibrations during handling and transport may have caused these to loosen).

At this point the unit can be powered by closing the isolator device upstream of the supply line.

IMPORTANT: Before performing this operation, check that all the cut-out devices on the unit have been reset.

- Move the handle of the main door lock isolator switch to position “1”.
- Check that the display on the interface terminal and the ENTER key light up (a few seconds after power up).
- Once the display shows the main screen, make sure that the unit is OFF (see the COTROL section in the manual).

Checks to be performed when the unit is powered:

- Check, using a voltmeter or tester, the mains voltage supplied to the unit:
  The voltage of the power supply must be equal to: 400V ±6%
  Check the unbalance of the phases. This must be lower than the maximum value of 2,5% (see calculation example).

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Calculation example:

L1 - L2 = 398 L2 - L3 = 405 L3 - L1 = 395

The average of the values measured is:

$$\frac{398+405+395}{3} = 399.3$$

The maximum deviation from the average is:

405-395=10V

The unbalance is therefore:

$$\frac{10}{399.3} X\ 100 = 2.5\%\ \text{(non acceptable)}$$

- Check the operation of the safety devices installed in the evaporator water circuit and that the wiring matches the diagrams supplied by Clivet.

NB: The water flow alarms (see terminal block **XC** on the wiring diagram supplied with the unit), are detected only if the control system requires the operation of the pump. When the unit is OFF the flow alarm is not detected. This can only be tested when the unit is on.

IMPORTANT: At this point the unit must remain powered but in OFF mode for at least 8 hours to heat the oil in the crankcase.
Make sure that the crankcase heaters are powered by measuring the voltage at the respective terminals and checking, by touching the compressor crankcase, that the temperature has increased.

CHECKING THE EVAPORATOR CIRCUIT

- Check that the return pipes from the system are connected to the exchanger inlet and that the outlet pipes are connected to the water outlet, as shown in the section on WATER CONNECTIONS.
- Check that the evaporator water circuit has been filled and pressurised.
- Check that there is no air in the circuit. If necessary, bleed the air through the vent valves.
- Check that the temperature of the fluid is lower than or equal to the max value allowed according to the information provided in the GENERAL section under the item “OPERATING LIMITS".
- Check that the shut-off valves in the circuit are in the "OPEN" position.
- Check that the pump is operating and that the flow-rate is sufficient to ensure that the WATER DIFFERENTIAL PRESSURE SWITCH or FLOW SWITCH is NOT activated.

CHECKING THE REFRIGERANT CIRCUIT

- Check that the oil level in the compressors before starting reaches at least half of the sight glass.

IMPORTANT

When starting the unit for the first time and after each period of extended shut-down, the elements heating the compressor crankcase oil MUST be powered for at least 8 hours before starting the compressor.

IMPORTANT:
DO NOT START THE COMPRESSOR UNLESS THE CRANKCASE OIL IS AT THE CORRECT OPERATING TEMPERATURE.
(THE TEMPERATURE ON THE BOTTOM OF THE COMPRESSOR CASING MUST BE AT LEAST 10°C HIGHER THAN THE OUTSIDE TEMPERATURE).

START-UP

After having strictly performed the above operations, the unit can be started:

- Check that the outlet valve is sealed.

The seal indicates that the valve is open.

- Open the valves on the dehydrator filters in the liquid line (the unit is delivered with the entire refrigerant charge accumulated in the condensers).
- Check the values of the various available parameters, referring to the CONTROL section of the manual.
- Release the mushroom-shaped “emergency” button by pulling it out.
- Move the compressor 1 enabling switch to “ON”.
- Reset, using the alarm button, any alarms present.
- **FOR WSHH UNITS ONLY:** Select the operating mode, Chiller or Heater.
- Open the valves in the evaporator and condenser water circuits.
- Use the ON-OFF key to turn the control system ON.
- After the pre-set safety times, compressor 1 will start.
- Check the evaporation and condensing pressures.
- Check the power input of the compressor, referring to the electrical data in the section on ELECTRICAL CONNECTIONS.

If the checks performed on the first compressor are successful repeat the same performance for compressors 2 and 3.

CHECKS DURING START-UP

CHECKS ON THE ELECTRICAL PARTS

- Check the power supply voltage, as previously described in point 1.1.

CHECKS ON THE WATER SYSTEM

Water flow-rate

Check that the difference between the evaporator water inlet and outlet temperature corresponds to the capacity, according to the formula:

unit cooling capacity (KW) x 860 = Δt (°C)x flow-rate (L/h)

The cooling capacity is defined in the tables on Cooling Performance in the TECHNICAL BULLETIN, according to:

- the unit size
- the condenser air intake temperature
- the evaporator fluid outlet temperature

Evaporator pressure drop

Determine the flow-rate of the water as follows:

Measure the pressure difference between the exchanger inlet and outlet and obtain the flow-rate value from the section on WATER CONNECTIONS, in the graph on **evaporator pressure drop, water side**

The pressure measurement is simplified if the pressure gauges "M", shown in the water connection diagram in the same section, are installed.

Checking the water differential pressure switch

(Installed on the unit as an accessory when required)

Close the ball valve installed downstream of the exchanger until the pressure switch is activated.

Read, on the pressure gauges "M" installed on the system, the difference between the exchanger inlet pressure gauge and the outlet pressure gauge.

- Note the pressure value at which the switch is activated and check that this falls within a field of values around 11kPa.
- Open the ball valve again.
- Note the pressure value at which the pressure switch is reset and check that the differential falls within a field of values around 3kPa.

Flow switch operation

(Supplied not installed as an accessory when required).

- Close the ball valve installed downstream of the exchanger until the flow switch is activated.
- Check that the unit stops when there is no flow.
- Open the ball valve again.

CHECKS ON THE REFRIGERANT CIRCUIT

- Perform a final check for leaks on the valve fittings and pressure test points on the system. Make sure that all the caps on the pressure test points and the valves are in position.
- Check, after a short operating period, the oil level in each compressor and the presence of bubbles, through the sight glass in the liquid line.
- Check the operating pressure using the pressure gauges connected (low pressure from 180KPa to 290Kpa, corresponding to 0°C -+8°C SST), and condensing temperature of around 4-6°C higher than the condenser outlet water temperature (typical values).

Checking superheating

Check the superheating, by calculating the difference between the temperature read on the low pressure gauge, and the temperature measured using a thermometer in direct contact with the inlet tubing upstream of the compressor. Values between 4 and 8 degrees reflect correct operation, while in the event of values that differ greatly from these tolerances, refer to the TROUBLESHOOTING section.

Checking subcooling

Check the subcooling, by calculating the difference between the temperature read on the high pressure gauge, and the temperature measured using a thermometer directly on the fluid line downstream of the condenser. Values of around 3/5 degrees with the unit at full load and at near stable operation are correct, otherwise see the section on Troubleshooting.

Checking the compressor discharge temperature

For correct analysis of the system, also check the compressor discharge temperature, which with the superheating and subcooling data indicated must be around 20/25° C higher than the condensing temperature.

If the temperature is greater than 80/90°C check:

- that the injection of liquid into the compressor screw is correct.
- that the solenoids for compressor liquid injection are energised.
- that there is no pressure drop in the dehydrator filter, signifying a clogged filter.

REDUCED LOAD OPERATION

The units are equipped with partialization steps and they can, therefore, operate with reduced loads.
Nevertheless, a constant and long operation of reduced loading with frequent stops and start-ups of the compressor/s can cause serious damage for the lack of oil return.
The above-described operations should be considered OUTSIDE the norm.
In the event of failure in the compressors, since the unit operates with the above-mentioned conditions, the guarantee WILL NOT BE VALID and Clivet spa can not be held responsible for it.
Periodically check the average times of operations and the frequency of the compressors pick ups: the minimum thermal load should be enough to ask the operation of a compressor for at least ten minutes.
In the event of average times close to this limit, take the proper corrective actions.