



AIR-COOLED WATER  
CHILLER

# WSAT-2

2.230-2.260-2.280-2.300  
2.360-2.400-2.440-3.450-3.540-  
3.580-3.620-3.660-4.720

## START-UP

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ALL THE UNITS MUST BE STARTED UP BY AN AUTHORISED SERVICE CENTRE FOR THE CONTRACTUAL GUARANTEE TO APPLY. THE SERVICE PROVIDED IS LIMITED TO THE START-UP ITSELF AND DOES NOT INCLUDE ANY CONNECTIONS OR OTHER WORK REGARDING THE PLANT AS A WHOLE.

#### PRELIMINARY CHECKS

##### ELECTRICAL SYSTEM

**WARNING:** Before performing the following checks, be sure that the unit is disconnected from the mains. Be sure that the mains isolator switch is locked with a padlock and that on its handle a proper warning notice is hung. Before working on the electrical connection check the absence of tension with a voltmeter or a phase detector.

The following checks can be carried out in absence of tension:

- Turn the mains isolator switch to its "0" position.
- Check that the main cables are of a section proper to bear the unit electrical load (see the ELECTRICAL CONNECTION section).
- Check that the unit has been connected to earth (see the ELECTRICAL CONNECTION section)
- Check the correct tightening of the screws which fix the cables to the electrical components in the board in order to offer a proper electrical contact (Vibration during transport could have caused them to loosen )
- Check that the switches which enable the compressors' operation are in their "OFF" position (see circuit diagram).

After having checked the above, it is possible to feed the unit by turning on the mains isolator switch which is placed upstream the mains line.

**WARNING:** Before performing this operation be sure that all the panels and guards have been replaced.

- Turn the mains isolator switch to its "1" position".

- Control that the interface terminal display and its ENTER key are lit up (it takes few seconds from the moment the unit is put under tension).
- Once the main mask appears on the display, that the unit is in the OFF condition (see CONTROLS section).

The following must be checked when the unit is under tension:

- Check with a voltmeter or with a tester, the value of the voltage supplying the unit: **the supply tension must be equal to: 400V ±6%**
- Check the phase unbalance. It must be less than a maximum of 2% (see example).

Calculation example:

$$L1 - L2 = 398$$

$$L2 - L3 = 405$$

$$L3 - L1 = 395$$

The mean of the values measure is obtained by:

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

The maximum deviation of the mean is obtained by:

$$405 - 395 = 10V$$

The unbalance is obtained by:

$$\frac{10}{399.3} \times 100 = 2,5\% \text{ (non accettabile)}$$

- Check the correct operation of the safety devices on the evaporator water system and that the wiring corresponds to the wiring diagrams supplied by Clivet.

**N.B.:** The water flow alarms are signalled only if the control system needs the pump operation. When the unit is turned OFF, the flow alarm, is not signalled. The same alarm condition can be detected only when the unit is started-up.

**WARNING:** At this point of the procedure the unit must be left under tension but in the OFF condition in order to allow the heating of the crankcase oil.

Check that the crankcase oil heaters are supplied (see circuit diagram) supplied by measuring the voltage and checking the rise of the crankcase temperature (place a hand on it).

#### EVAPORATOR CIRCUIT CONTROL

- Check that the pipe coming from the installation is connected to the inlet of the exchanger and that the discharge pipe is connected to water outlet as indicated on the WATER CONNECTIONS section.
- Check that the water circuit, of the evaporator has been filled and is under pressure.
- Check that there is no air in the circuit, bleeding it through the bleed valves if necessary.
- Check that the chilled water temperature is lower than or equal to the maximum admissible value specified in the section entitled GENERAL under the heading " OPERATING RANGE ".
- Check that the on-off valves in the circuit are in their "ON" position.
- Check that the water pump is operating and that the flow rate is sufficient to at least ensure that the DIFFERENTIAL CHILLED WATER PRESSURE SWITCH or FLOW SWITCH is NOT tripped.

#### REFRIGERANT CIRCUIT CONTROL

- Before starting-up the unit, check that the oil level reaches 1/3 of the sight glass at least.

#### **IMPORTANT:**

**It is ABSOLUTELY ESSENTIAL to switch on the crankcase heater for at least 8 hours before starting the compressor for the first time after the unit has been unused for long periods.**

#### **WARNING:**

**NEVER START THE COMPRESSOR BEFORE THE OIL HAS REACHED THE CORRECT TEMPERATURE.**

**(THE TEMPERATURE AT THE BOTTOM OF THE CRANKCASE MUST BE AT LEAST 10°C HIGHER THAN THE OUTDOOR TEMPERATURE).**

#### **START-UP**

After having carefully performed the above, it is possible to start-up the unit:

Check that the outlet tap is open.

- Open the filter dryer valves on the liquid line (when the unit is shipped, the refrigerant charge is stored in the air condensers).
- Check the value of the accessible parameters by consulting the CONTROL section.
- Pull the emergency keylock button in order to unblock it.
- Turn the compressor 1 switch to its ON position.
- Push the ALARM button in order to reset the possible current alarm conditions.
- Turn on the control system by pressing the ON/OFF key.
- The compressor 1 will start (after the programmed safety time has been passed).
- Control evaporation and condensing pressures.
- Check the compressor absorption with reference to the data shown in the table on the ELECTRICAL CONNECTIONS section.
- Check the fans absorption with reference to the table above.
- Check the correct rotation of the fans

The fans will only reach the specified flow-rate if they rotate in the direction that is clearly indicated on the appliance.

Check and if necessary change the direction of rotation, by intervening on the motor terminal block

If the checks on the first compressor have been successful:

- Turn the compressor 2 switch to its ON position.
- Wait a few seconds and the second compressor will start-up.

Repeat the same checks as for the compressor 1.

## CHECKS DURING THE START-UP

### ELECTRICAL SYSTEM

- Check the supply tension as on point 1.1.

### WATER SYSTEM

#### Water flow

Check that the temperature difference between the exchanger water inlet and outlet is linked to the capacity as in the following formula:

unit refrigeration capacity (kW)x860 =  $\Delta t$  (°C) x flow (L/h)

The refrigeration capacity can be determined from the COOLING PERFORMANCE tables in the TECHNICAL BULLETIN using the following parameters:

- unit size
- condenser air inlet temperature
- evaporator water outlet temperature

#### Evaporator pressure drop

Check the water flow rate following these instructions:

Measure the difference of pressure between the inlet and the outlet of the exchanger and calculate the flow rate from the graph **Evaporator pressure drop** in the WATER CONNECTIONS section.

It will be easier to measure the pressures if the system has been fitted with the pressure gauges marked "M" in the WATER SYSTEM CONNECTION DIAGRAM in the same section.

#### Differential pressure switch check

- Close the ball valve fitted downstream of the exchanger to trip the pressure switch.
- Using the pressure gauges "M" installed in the system, obtain the difference between the reading on the exchanger inlet pressure gauge and the reading on the exchanger outlet pressure gauge.
- Note the pressure at which the pressure switch was tripped and check that it falls in a range of values close to 11kPa.
- Open the ball valve again.
- Note the pressure at which the pressure switch trips open and check that the differential falls within a range of values close to 3kPa.

#### Operation of flow switch

(Supplied NON installed when requested as accessory)

- Close the ball valve installed downstream of the exchanger to trip the flow switch.
- Check that the unit stops when the flow stops.
- Open the ball valve again.

### REFRIGERANT CIRCUIT

- Check possible leaks on the installation in correspondence of the connections for check valves and pressure gauges. After these checks, all the caps of the pressure gauge plugs and those of the cocks must be replaced.
- After a short period of operation check the oil level of every compressor.

#### Superheating

Check the superheating by calculating the difference between the temperature value which corresponds to the pressure which is read on the low pressure gauge (refer to the refrigerant Dew Point values) and the value which is read, by a contact thermometer, on the suction pipe upstream of the compressor. If the difference is between 4°C/8°C at standard working conditions the operation is correct. If the value is undoubtedly different from these tolerance limits, find the cause with the aid of the TROUBLESHOOTING section of this manual.

#### Subcooling

Check the subcooling by calculating the difference between the temperature value which corresponds to the pressure read on the high pressure refer to the refrigerant Bubble Point values) and the value which is read, by a contact thermometer, on the liquid line downstream of the condenser. If the difference is between 3°C/5°C at standard working conditions the operation is correct. If the value is undoubtedly different from these tolerance limits, find the cause on the TROUBLESHOOTING section of this manual as above.

#### Compressor discharge temperature

In order to carry out a complete analysis of the installation, check also the compressor discharge temperature. If the superheating and subcooling values are correct, it must 30°C /40°C higher than the condensing temperature.

If the temperature is higher than 90°C check the correct liquid injection in the compressor screw (if present).

## 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.