Building HVAC *(Equipment w/Factory-Installed Controls)*

19XR/XRV Hermetic Centrifugal Chiller

Single Centrifugal Chiller - Sequence of Operation

Hermetic Centrifugal Liquid Chiller
Size Range: 200 to 1500 tons (703 to 5275 kW)
Carrier Model Number: 19XR, XRV

NOTE: The following is a sample of a typical Sequence of Operation that may be adapted for each particular project. This is provided as a suggestion on how to write a Sequence of Operation. This sample assumes that the local mode has been selected by the operator. Consult your Carrier representative if the sample sequence requires alterations.

4.2.1 Single Centrifugal Chiller - Sequence Of Operation

A. Description:
Single centrifugal chiller, with dedicated chilled and condenser water pumps. Chiller communicates with and sends alarms to, the building automation network.

B. General:

1. Start-up:
When the Chiller's internal time schedule indexes the unit to the occupied mode, the PIC shall check its internal timers and if the timers have expired the PIC shall perform a pre-start check to verify that all pre-start alerts and safeties are within limits (i.e. number of starts in 12 hours, bearing temperature, motor temperature, compressor discharge temperature, evaporator refrigerant temperature, oil sump temperature, condenser pressure and line voltage). If all parameters are within acceptable limits, the ICVC shall display "startup in process" and the chilled water pump shall be energized. After a short time delay, the condenser pump and cooling tower fans shall be energized. After flow has been verified, the chilled water temperature shall be compared to the control point (plus deadband). If the temperature is less than or equal to the control point plus one-half of the chilled water dead band, the PIC shall turn off the condenser pump and cooling tower fans and go into a recycle mode, and display a "Recycle Restart Pending" alarm message at the ICVC. If the temperature is high enough, the start up sequence shall continue, provided that the guide vanes have closed to less than 4%. If the guide vanes are closed and the oil pressure is less than 4 psi, the oil pump shall be energized and 40 seconds (*this time is configurable in the field*) after oil pressure has been verified to be at least 18 PSI, the compressor shall start. Failure to verify any of the pre-start requirements shall result in a "Prestart Alert" abort and a display of such at the ICVC. Any failure after the compressor has started shall result in a safety shutdown, and an alarm message at the ICVC.

The compressor shall begin to ramp up based on an operator adjustable rate (*NOTE: If the chiller has been off for more than 3 hours, the chiller ramps at the lowest configurable temperature ramp loading rate*). When the ramping routine is complete the capacity control routine shall position the guide vane and set the VFD speed (*if applicable*) to maintain the temperature control point.

2. Shutdown:

A shutdown of the chiller shall occur if any of the following occurs:

- **A.** The stop button is pressed for at least one (1) second.
- **B.** A recycle condition is present.
- **C.** The time schedule has gone into unoccupied mode.
- **D.** A chiller protective limit is reached and the chiller goes into alarm.
- **E.** The start/stop status is overridden to stop from the CCN network or the ICVC/CVC.
- **F.** The remote start contact is opened.

When the PIC acknowledges the stop signal, it shall first deactivate the compressor and close the guide vanes. After the compressor has stopped, the oil pump and chilled water pumps shall be de-energized. The condenser pump and cooling tower shall stop when the refrigerant temperature is within its normal operating temperature range.

3. Abnormal Shutdown:

The following abnormal conditions shall alter the above sequence as follows:

If during the shutdown sequence the compressor motor load is greater than ten (10) percent after one (1) second has elapsed from the stop command or the starter contact remains energized after one (1) second has elapsed since the stop command, the oil pump and chilled water pump shall remain energized, an alarm shall occur and the shunt trip relay output shall be energized.

If the entering condenser water temperature is greater than 115°F at shutdown, the condenser pump and cooling tower shall be simultaneously stopped after the compressor is de-energized.

If the average line current is greater than 5% after shutdown, an alarm is displayed and the oil pump and chilled water pumps remain energized.

If the shutdown was due to low refrigerant temperature, the chilled water pump shall remain on until the leaving chilled water temperature is greater than the control point plus 5°F.

4. Safety Shutdown:

A safety shutdown shall be identical to a manual shutdown with the exception that the ICVC shall display the reason for the shutdown and an alarm light on the ICVC shall blink. A safety shutdown shall require the operator to push the reset button on the ICVC to clear the alarm, provided that the condition that caused the alarm has been resolved.