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| 1/12/2018 | 23XRV Carrier Specifications | CCS Chiller Marketing |
| Bulletin Number | Product Model Number(s) | 23XRV |

# 23XRV Carrier Specifications

## HCFC – 123 Chillers (10/15)

1. A vapor activated alarm system consisting of all alarms, sensors, safeties, and ventilation equipment as required by ANSI/ASHRAE Standard 15 Safety Code for Mechanical Refrigeration (latest edition) with the quotation. System shall be capable of responding to HCFC-123 levels of 10ppm Allowable Exposure Limit (AEL).
2. High efficiency purge unit limiting refrigerant loss to 0.02 pounds of refrigerant per pound of air.
3. Back-up (re-seatable type) relief valves in series with rupture disks to prevent the loss of the entire refrigerant charge. Field installed reseating relief valves can satisfy this requirement.
4. Chiller pressurizing system (evaporator blanket) shall be factory installed and tested to prevent leakage of non-condensable gases into chiller during shutdown periods.
5. Chillers utilizing HCFC-123 shall include the following in the base price for a period of 5 years (all parts and labor shall be included): (1) Inspection of the purge unit and replacement of the filter for drier core and cleaning and calibrating of liquid level float valve/sensors. (2) Leak test entire chiller every month. Tighten all connections, replace gaskets as required and add refrigerant and oil as required and as recommended by manufacturer.
6. Manufacturers proposing chillers that utilize HCFC-123 shall include (with their quotation) a warranty for availability and pricing of HCFC-123 for a period of 25 years to protect the owner from unacceptable price increases as HCFC refrigerants are phased out. The contractor shall submit the proposed pricing and availability of HCFC-123 to the owner for approval prior to selecting a supplier for the chillers.

7. Chillers utilizing HCFC-123 or chillers that have not included isolation valves shall provide a freestanding refrigerant storage tank and pump-out unit. The storage vessels shall be designed per ASME Section VIII Division 1 code with 300 psig (2068 kPa) design pressure. Double relief valves per ANSI/ASHRAE 15, latest edition, shall be provided. The tank shall include a liquid level gage and pressure gage. The pump-out unit shall utilize compressor with water-cooled condenser. Condenser water piping, 3-phase motor power, and 115-volt control power shall be installed at the job site by the installing contractor.

**Open Drive Chillers (10/05)**

1. Chillers utilizing open drive with ODP motors shall have included in the bid price the price: (1) Clean air filters and passages quarterly (per motor manufacturers' recommendations) for a period of 5 years. Rotor ends, windings, and fan blade passages shall be inspected and cleaned semi-annually (per motor manufacturers' recommendations) for a period of 5 years. (2) Replace any shaft seals that may be leaking. (3) Replace and reclaim oil and refrigerant that may have leaked out from the seal. All parts and labor shall be included for a period of 5 years. An annual inspection shall be performed and a report shall be furnished to the owner regarding the above.
2. Compressor motor shall be of the hermetic, liquid refrigerant cooled, squirrel cage, induction type suitable for voltage shown on the equipment schedule. If open drive compressor is used, then a Totally Enclosed Water Air Cooled Motor (TEWAC) shall be used to prevent motor heat being released into the mechanical room. In addition, the manufacturer shall provide a five-year parts and labor warranty on the coupling and against shaft seal leakage. Contractor shall include all piping, valves, thermometer, and valved bypass, etc. in the base bid.

   See "**TEWAC Motor Specification**" in **LIBRARY** of the *AquaEdge® E-CAT selection program*.

3. If open drive chiller is utilized, then the contractor shall provide additional cooling for the mechanical room. The cooling capacity of the additional unit shall be 5% minimum of the chiller motor's total rated input kW. Contractor shall be responsible for the design and installation of the unit. Include all auxiliary piping, ductwork, controls (integration into building's BMCS), etc. The design and the cooling unit shall be submitted for approval.

$$\text{cfm} = \frac{(\text{Full Load Motor kW}) \times (0.05) \times (3413)}{(104 - 95) \times (1.08)}$$

4. The chiller shall have a 5 year refrigerant warranty against leaks of over 0.1% of the original refrigerant charge. Owner shall have the option to extend coverage of the refrigerant warranty for the entire life of the chiller.

## Variable Frequency Drive (03/15)

For chillers in the capacity range of 300 – 575 tons, the unit mounted variable frequency drive shall be cooled by liquid refrigerant supplied from the chiller. A standard orifice shall maintain proper heat sink temperature of drive at all load conditions. System water-cooled VFD's shall be provided with a cleanable plate & frame type heat exchanger to discourage the buildup of deposits from condenser water.

At lower chiller capacities (175 – 300 Tons), the heat rejected by the chiller's VFD is not significant. For such applications, an air cooled VFD is sufficient.

The 23XRV (all-sizes) utilizes a semi-hermetic motor. Experience has shown that the heat rejected by an air-cooled VFD is a fraction (1/3 – 1/2) of that rejected by an open drive motor. In typical chilled water plant mechanical rooms, the chiller is installed in the same area as chilled water & condenser water pumps and any associated pump VFDs. The heat of rejection of the VFD of a semi-hermetic, 175 - 300 ton chiller is similar to the heat of rejection commonly associated with such pump motors & VFDs.

## Factory Testing (07/14)

*Chillers operate at 100% (design condition) only 1% of the time per AHRI 550/590 (current version). So what's the point of testing a chiller at 100% load? What does that prove? If an engineer/owner wants a chiller to be tested, then the test should simulate real world conditions.*

1. The chiller shall be tested at the following four points in the order as stated below:
    A. 25% point with 65 degrees F entering condenser water for a period of 2 hours.
    B. 50% point with 65 degrees F entering condenser water for a period of 2 hours.
    C. 75% point with 75 degrees F entering condenser water for a period of 2 hours.
    D. 100% point with 85 degrees F entering condenser water for a period of 2 hours.

    The chiller shall be started with 65 degrees F entering condenser water to simulate startup at off peak conditions. The test shall be performed in accordance with AHRI 550/590 (current version).
2. The chiller shall be started up with 55 degrees F entering condenser water. The chiller shall operate at 100% load for a period of one hour and then shutoff. The chiller shall be re-started after 5-10 minutes and then operate for another one hour period. The above should be repeated four times (4 hour test period). The test shall be performed in accordance with AHRI 550/590 (current version).

## Power Factor (10/05)

Chillers shall operate at 0.95 power factor or greater at all operating conditions. If chiller power factor is less than 0.95, then factory installed power factor correction capacitors shall be provided in the chiller starter. Calculations shall be submitted showing the proper kVAR of correction for the specific chiller being bid.

## Mag Bearing Chillers (12/17)

The GSA Proving Ground Program developed a head-to-head test of two (2) 275-ton water-cooled chillers; 'mag bearing' centrifugal (MBC) and a Carrier variable-speed screw chiller (VSS). These chillers were evaluated in a side-by-side comparison in the Sidney Yates Building, Washington, DC.

Data was collected on both chillers over a two (2) year period of time (2015 & 2016) in an effort to evaluate variable speed screw compressor technology versus the baseline recommended GSA technology: mag bearing compressor technology.

After data collection and evaluation, the overview of the results were as follows:

- **Efficiency:** VSS was 11% on average more efficient.
    - Equal submittal data → 11% improvement on actual job
- **Range:** VSS able to operate at a wider operating envelope with 55° and 95°F ECdWT
- **Cost:** VSS > 30% lower cost.
- **Sound:** Comparable on both machines.

Final conclusion from the GSA Proving Ground program is as follows: **VSS is now recommended as end-of-life replacement across all climate zones**[1].

The findings in this study should be utilized to allow capability to offer the 23XRV chiller whenever a mag bearing chiller (MBC) is requested.

[1] GPG-031, Updated November 2017, Variable Speed Direct Drive Screw Chiller, Summary Report, Page 4.