



**Application Engineering Bulletin**  
**AE-1276-R2**

**October 1, 1987**

**CR\*4 COMPRESSOR APPLICATION  
 CONSIDERATIONS**

The latest CR compressor design, the CR\*4, has improved flooded start capability over previous CR compressors, especially in heat pump applications. As a result, the requirements for crankcase heaters and accumulators have been relaxed.

Due to significant changes in the management of suction gas, extensive system tests were conducted under those conditions where crankcase heat and accumulators are normally applied to protect the compressor. Measured stress levels were within safe limits for the rods, crankcase, pistons, and valve reeds, even when starting with as much as six pounds of refrigerant in the shell. As a result of these tests, the following guidelines were developed for the CR\*4. (See Figure 1)

**CR\*4 Crankcase Heater**

A crankcase heater is not required for heat pump or air conditioning applications with a total system charge of six pounds or less. This should include the majority of systems in the 1 to 2-1/2 ton range. Where the charge exceeds six pounds, off-cycle capacitor motor heat is recommended and U.L. approved. Table 1 provides a list of minimum and maximum run capacitor sizes approved for each compressor model. For application and wiring, see Application Engineering Bulletin 22-1230.

CR\*4 compressors manufactured after early 1988 will have provisions for an immersion type PTC sump heater similar to those found on other CR compressors. These heaters will be available as an option for those customers desiring them.

For those customers desiring a wrap-around heater, the following Springfield Wire crankcase heaters are available. Heaters are rated 240 volts, 40 watts.

SWI 230-29	36 In. leads
SWI 230-37	18 In. leads
SWI 230-38	24 In. leads

**Table 1**

MODEL	Capacitor For Off Cycle Heat		Standard Capacitor	
	Min. MFD	Max. MFD	MFD	VOLTS
CRZ4-0125-PFV	20	25	25	370
CRA4-0150-PFV	20	25	25	370
CRB4-0150-PFV	20	25	25	370
CRC4-0175-PFV	20	30	30	370
CRD4-0200-PFV	20	35	35	370
CRE4-0225-PFV	20	35	35	370
CRF4-0250-PFV	20	35	35	370

**Accumulators**

- **Non-bleed TXV Valves:** No accumulator is required on heat pump systems with a basic refrigerant charge of eight pounds or less which employs a non-bleed TXV on the outdoor coil. Non-bleed TXV heat pump systems with a charge greater than eight pounds require an accumulator, unless approved otherwise by the Copeland Application Engineering Department. Air conditioning systems with non-bleed TXV's do not require accumulators at any charge limit.

• **CR\*4 Bleed Type TXV'S, Fixed Orifices, and Capillary Tubes - Air Conditioning**

On air-conditioning systems using capillary tubes, orifices, or equalizing type expansion devices, it is impossible to make a blanket statement on the use of accumulators. We have seen a trend toward large refrigerant charges in high efficiency systems. In some cases, depending on condenser coil volume, ambient, line sizes, charge and expansion device characteristics, it is possible to force most of the system charge back to the compressor during the off cycle.

If length of the off cycle is short, dangerous slugs can occur on start up. Crankcase heaters do little to retard slugging during short off cycles. We, therefore, recommend all systems with a total charge greater than six pounds and with equalizing type expansion devices be tested to determine if an accumulator is needed. In absence of testing, use of an accumulator is required in air-conditioning systems with a charge greater than six pounds.

• **Accumulator Test**

To determine if an accumulator is required, obtain a sample compressor with a calibrated sight glass.

Elevate the evaporator five feet above the condensing unit, and use 25 foot line lengths. If the system is factory charged, use the nominal refrigerant charge. On field charged systems, we recommend conducting this test with a 20 percent overcharge.

Operate the condensing unit for one hour in a 95°F outdoor and 70°F indoor ambient. Shut the compressor and condenser fan off. Keep the evaporator fan running. Observe the compressor sight glass after a five minute off cycle.

If the liquid level rises above a predetermined point, (obtained from Copeland Application

Engineering) an accumulator is required. This test should be repeated several times in order to ensure the liquid never rises above the designated maximum level in the compressor.

Accumulators for long line applications should be considered separately.

• **CR\*4 Capillary Tube Heat Pumps:**

Accumulators are still required on ALL Equalizing type (including fixed orifices, bleed-type TXV'S, and capillary tube) heat pump systems, unless approved otherwise by the Copeland Application Engineering Department.

To waive the accumulator requirement, appropriate slugging and defrost tests under low ambient and defrost conditions need to be run with a properly instrumented compressor.

• **Other Type Systems**

Accumulator elimination on other type systems normally requiring an accumulator, will require Application Engineering approval regardless of the amount of refrigerant charge. Example: Ice makers with hot gas defrost.

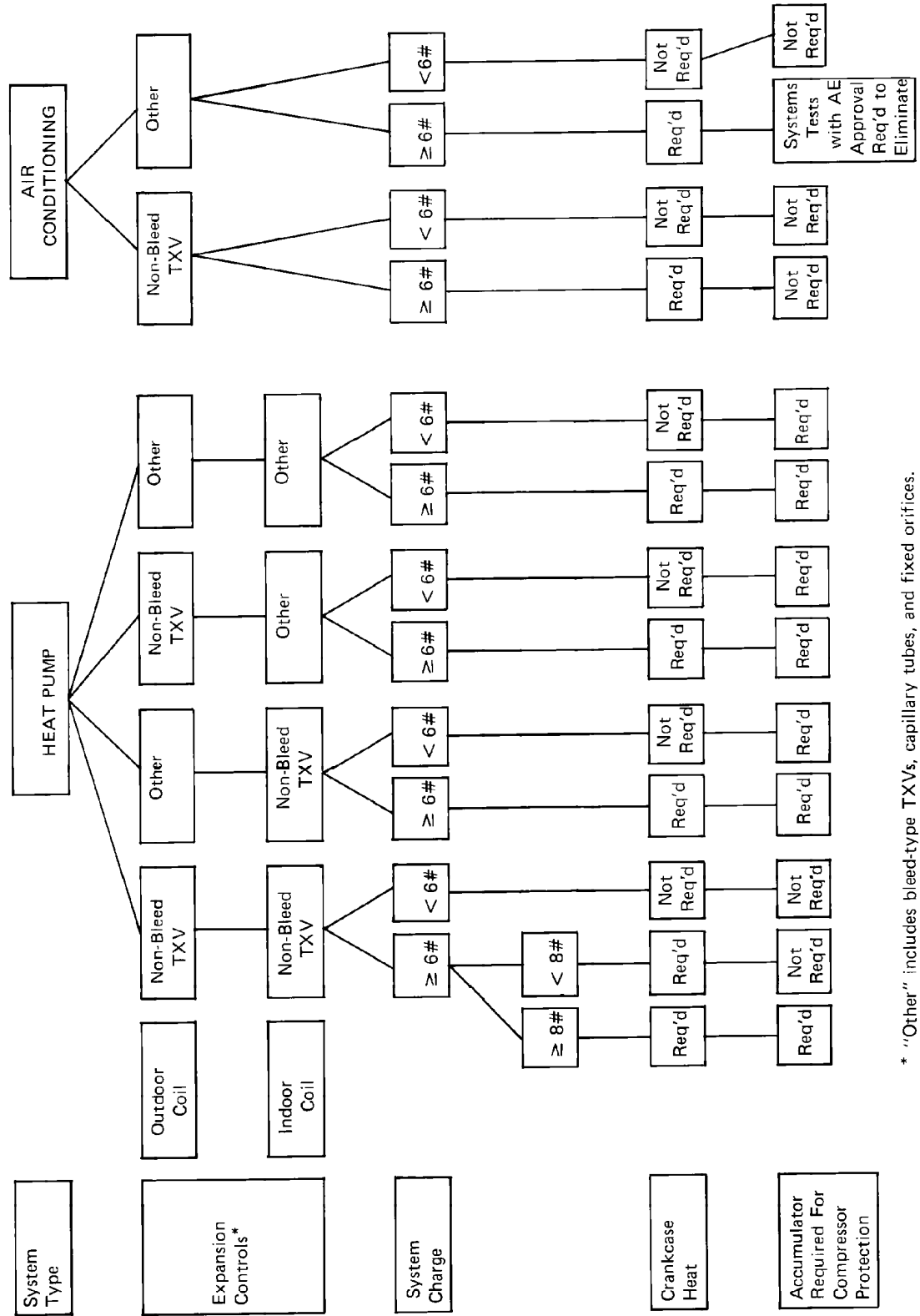
**Oil**

Calumet RO-15, 150 viscosity oil, will be used in the CR\*4. Witco 3GS is an approved alternate. The initial oil charge is 40 ounces. CR\*1 and CR\*3 compressors formerly used 200 viscosity white oil in heat pump bills of material. The change to 150 viscosity oil may require a slight decrease in heat pump accumulator orifice sizing. NOTE: Effective January, 1987, all CR production has been converted to Calumet RO-15 oil.

For additional information on liquid refrigerant control and accumulators, see Application Engineering Bulletins 11-1247, 17-1243, and 22-1182.

Figure 1

CR\*4 Application Diagram



\* "Other" includes bleed-type TXVs, capillary tubes, and fixed orifices.

