

3.0 – Capacity Control

3.1 Suction Cut-Off Capacity Control

Carlyle's compressor suction cut-off capacity control system has been approved for R-502, R-404A, and R-507 applications down to -40°F (-40°C) suction and for R-12, R-134a, and R-22 medium and high temperature applications, but the system designer must carefully consider certain system design criteria when applying this new feature.

3.2 Design for Proper Oil Return to Compressor

When the 06D/E compressors are unloaded, the compressor and system capacity are reduced by 1/3, 1/2, or 2/3 of full load capacity. These capacity reductions result in the same large percent reduction in refrigerant flow rates through the system piping. Oil that is entrained and carried with refrigerant requires a certain gas velocity to properly return it back to the compressor and as this refrigerant flow drops, this may not be possible. This is especially true of the sizing of the suction line where oil return is most critical.

All system piping, but especially the suction line, must consider both full load and part load capacities and refrigerant velocities when being sized. For complete details of good system piping practices, the Carrier System Design Manual (Part 3 - Piping Design) or the ASHRAE Manual (Systems Volume) is recommended.

To protect the compressor against possible oil return problems, all 06D and 06E refrigeration duty compressors applied with capacity control must utilize oil safety switch protection. This requirement may be waived by Carlyle Application Engineering for certain high temperature, single compressor circuit applications (contact Carlyle Application Engineering for approval).

3.3 Capacity Control Application Ranges

Low temperature R-502, R-404A, and R-507 Application: -40°F to 0°F (-40°C to -18°C) Saturated Suction Temperatures.

Condensing temperature limits:

For all 4-cylinder 06D and 06E compressors - See Figure 10. All 6-cylinder 06D and 06E compressors can be unloaded at all condensing

temperatures below 120°F (49°C) with 1 bank of capacity control. Do not unload more than 1 bank on 6-cylinder 06D or 06E compressors in this low temperature application.

Note: In low temperature booster applications see differential pressure limits (ΔP) (Table 4, Page 31) for minimum condensing pressures required to load up.

Medium Temperature R-12, R-134a, R-404A, R-502, and R-507 Application: 0°F to 40°F (-18°C to 4°C) Saturated Suction Temperatures.

Unloading application limits at saturated condensing temperatures below 130°F (54°C): Can unload 1 bank on any 4-cylinder 06D or 06E compressor. Can unload 1 or 2 banks on any 6-cylinder 06D or 06E compressor.

Note: With R-134a or R-12 see ΔP limits (Table 4, Page 31) for loading requirements.

Medium Temperature R-22 Applications: 0°F to 25°F (-18°C to -4°C) Saturated Suction Temperatures.

Unloading application limits at saturated condensing temperatures below 130°F (54°C): Can unload 1 bank on any 4 or 6-cylinder 06D or 06E compressor. Unloading more than 1 bank on any 6-cylinder 06D or 06E compressor in this medium temperature application is not recommended.

High Temperature R-22 Applications: 25°F to 55°F (-4°C to 13°C) Saturated Suction Temperatures.

Unloading application limits at SCT's below 145°F (63°C) and maximum superheat of 25°F (14°C). Can unload 1 bank on any 4-cylinder 06D or 06E compressor. Can unload 1 or 2 banks on any 6-cylinder 06D or 06E compressor per Figure 11.