

Cooling Requirements for Copelametic™ and Copeland Discus™ Compressors

Introduction

In response to customer inquiries, both domestic and international, Emerson Climate Technologies has reviewed our application requirements for oil coolers and head fans applied on Copeland Discus™ compressors in the R-404A/R-507 low temperature applications. Product engineering has done extensive testing of various parameters, including unloading as well as fully loaded. The results were the basis for the application envelope shown in **Figure 1**.

The latest testing has shown that as long as the suction return gas is maintained below 65°F, Discus™ compressors can be operated down to -25°F evaporating on R-404A/R-507 without the requirement of a head fan or oil coolers. Additionally, head fans can be eliminated at even lower evaporating temperatures if return gas temperatures can be maintained at the lower values. Emerson Climate Technologies application engineering will approve these applications upon receipt of acceptable test data.

NOTE: If you remove the oil cooler, you must install the by-pass loop to maintain proper oil flow.

The cooling requirements for all other Copelametic motor-compressors and refrigerants are clearly defined below. Any deviation from these recommendations can result in failure of the compressor.

Air-Cooled Compressors

As the name implies, air-cooled compressors are totally dependent on heat transfer to the air to maintain proper temperatures.

Air-cooled compressors require constant airflow across the compressor for proper cooling. Merely drawing air through a compartment over the compressor is not adequate - direct impingement on the compressor from the fan discharge is necessary.

If the compressor is mounted in the fan discharge stream on a condensing unit, adequate cooling will be provided. When applied with a remote condenser, an auxiliary fan is required.

If compressor cooling is provided by the condenser fan, fan cycling for head pressure control is not acceptable unless auxiliary cooling is provided.

CAUTION

POE must be handled carefully and the proper protective equipment (gloves, eye protection, etc.) must be used when handling POE lubricant. POE must not come into contact with any surface or material that might be harmed by POE, including without limitation, certain polymers (e.g. PVC/CPVC and polycarbonate).

Water-Cooled Compressors

Some smaller Copelametic compressors are wrapped with water coils for application on water-cooled condensing units. If water is circulated through the coil wrapped around the compressor, adequate cooling will be provided.

Refrigerant-Cooled Compressors (Non Discus)

Refrigerant suction cooled compressors are adequately cooled by the refrigerant at evaporating temperatures above 0°F. If operated at evaporating temperatures below 0°F, auxiliary cooling is required.

At evaporating temperatures below 0°F, the compressor can be cooled adequately by the condenser fan discharge. Fan cycling for head pressure control is not acceptable unless auxiliary cooling is provided. Fan cycling for head pressure control for medium and high temperature applications is acceptable.

Vertical cooling fans are recommended for compressors 3 H.P. in size and larger when auxiliary cooling is required. A standard fan assembly developing 1000 CFM airflow is available, with interchangeable brackets to fit different model compressors.

Compressors designed for an oil cooler, (6RL, 6RT, 4RL) must be applied with an oil cooler and a vertical cooling fan.

Two Stage Compressors

All two stage compressors are provided with an interstage expansion valve, and adequate cooling is provided by the refrigerant. No auxiliary fan is required.

Table 1
Vertical Fan Assemblies
 (To be mounted on top of compressor)

Part Number	For Compressor Model	Description
998-0550-00	All	Fan assembly including 230-1-60/50 motor, fan blade, guard.
998-0550-01	All	Fan assembly including 440/380-1-60/50 motor, fan blade, guard.
998-0550-02	All	Fan assembly including 115-1-60/50 motor, fan blade, guard.
998-0574-00	L	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-01	M	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-02	N	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-03	4D-4R	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0584-16	4D*X, 4D*N ¹	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-04	6D-6R	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-18	6D*X, 6D*N ¹	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-05	6DL/T-6RL/T	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-06	9R Old Style Head	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-08	9D-9R New Style Head* 3D	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-11	2D	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-10	*3D Moduload/ Discus Digital	Mounting kit including bracket, studs, spacers, connectors, conduit.
998-0574-07	6DL/T-6RL/T	Mounting Kit and oil cooler assembly.
998-1123-00	6DL/T-6RL/T	Oil cooling assembly, including oil cooler, studs, spacers, and fittings.
998-1124-00	4DL/T-4RL/T	Oil cooling assembly, including oil cooler, studs, spacers, and fittings.

¹ Indicates 4D/6D Discus III models

Table 2
Vertical Cooling Fan Space Requirement

Compressor Model	Add to Compressor Height, Inches
L	8
N	8
M	8.5
9	8.5
4	9.5
4D*X,4D*N ²	7.3
6	10.25
6D*X,6D*N ²	9.5

² Overall Height is measured from the mounting point to the top of the Fan Guard

Table 3
Horizontal Fan Assemblies
 (To blow on compressor side)

Compressor HP	Minimum Air Flow (cfm)	Fan and Motor Assembly		Fan Space Requirement	
		Part Number	Electrical	Additional Height to Compressor (in.)	Additional Width to Compressor (in.)
1	650	998-0050-00	230V-1Ø-60/50 Hz	1.25	5.50
1 1/2	650	998-0050-00	230V-1Ø-60/50 Hz	1.25	5.50
2	650	998-0050-02	230V-1Ø-60/50 Hz	None	5.50
		998-0050-03	460V-1Ø-60/50 Hz	None	5.50

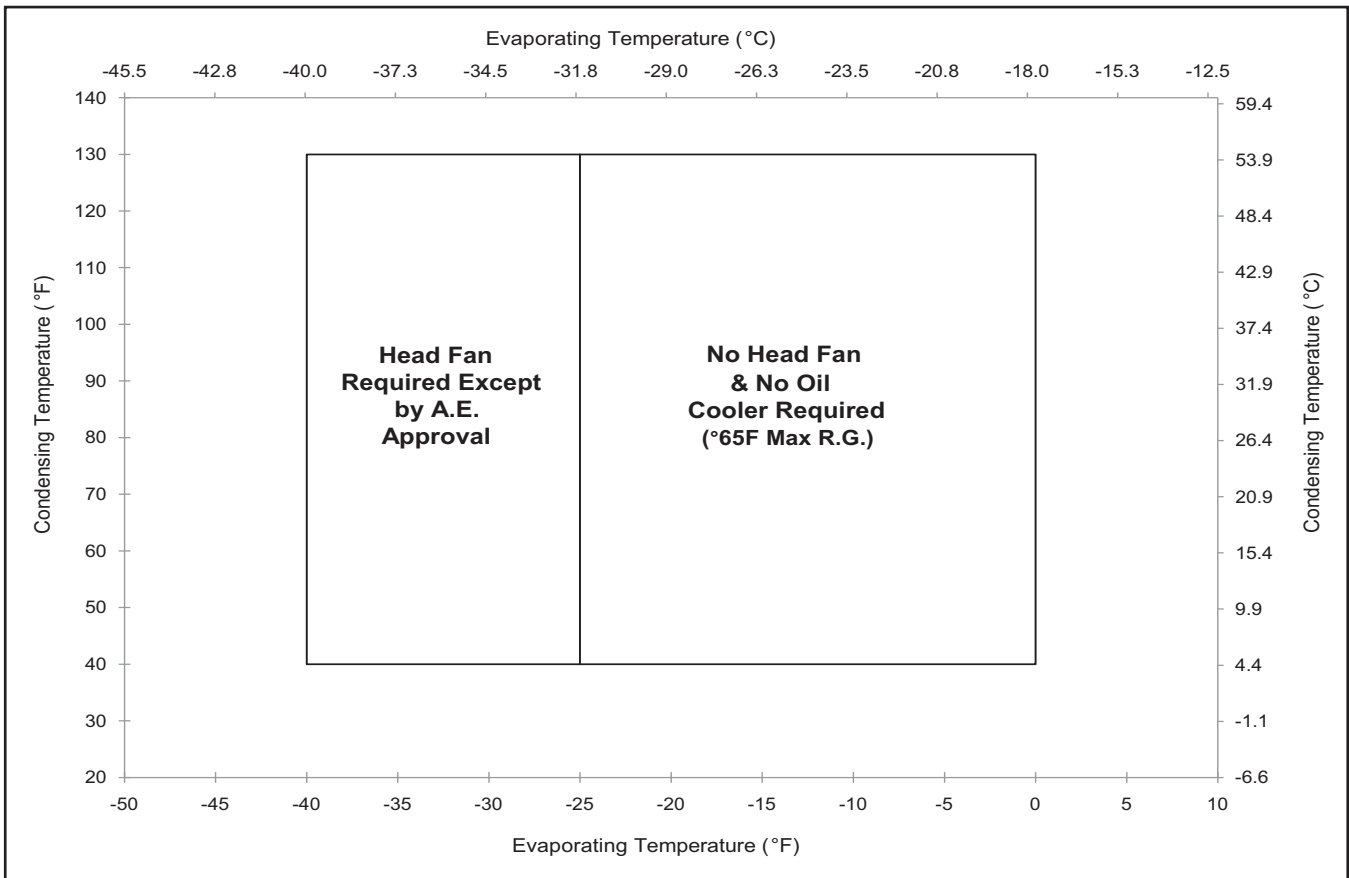


Figure 1
Discus™ Head Fan Requirements
R-404A, R-507



Discus™ Head Fan and Oil Cooler Requirements With Low Temperature R-407A and R-407C

Copeland Discus™ compressors are also approved for use with R-407A and R-407C in low temperature applications. Latest testing by Emerson Climate Technologies engineering has shown that as long as

the compressor is equipped with Copeland™ Demand Cooling™, a Copeland Discus compressor using R-407A or R-407C in low temperature applications does not require a head fan or an oil cooler. **Table 4** lists the low temperature compressor model numbers which Emerson has released without the oil cooler attached.

**Table 4
Nomenclature Scheme to Identify Copeland Discus™
Compressor Models without Oil Coolers**

Existing Model w/Oil Cooler	New Model (Standard) without Oil Cooler	New Model 1-Bank Unloader without Oil Cooler	New Model 2-Bank Unloader without Oil Cooler
4DA3F47Kx-TSK/TSE	SAME		
4DN3F47Kx-TSK/TSE		4DE3F47Kx-TSK/TSE	---
4DL3F63Kx-TSK/FSD/TSE	4DH3F63Kx-TSK/FSD/TSE		
4DP3F63Kx-TSK/FSD/TSE		4DK3F63Kx-TSK/FSD/TSE	---
4DT3F76Kx-TSK/FSD/TSE	4DJ3F76Kx-TSK/FSD/TSE		
4DS3F76Kx-TSK/FSD/TSE		4DR3F76Kx-TSK/FSD/TSE	---
6DL3F93Kx-TSK/FSD/TSE	6DH3F93Kx-TSK/FSD/TSE		
6DC3F93Kx-TSK/FSD/TSE		6DK3F93Kx-TSK/FSD/TSE	
6DD3F93Kx-TSK/FSD/TSE			6DP3F93Kx-TSK/FSD/TSE
6DT3F11Mx-TSK/FSD/TSE/ESX	6DJ3F11Mx-TSK/FSD/TSE/ESX		
6DE3F11Mx-TSK/FSD/TSE		6DR3F11Mx-TSK/FSD/TSE	
6DF3F11Mx-TSK/FSD/TSE			6DS3F11Mx-TSK/FSD/TSE

Note: Discus III models are not offered with oil coolers.

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