



Application Engineering Bulletin

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APPLICATION GUIDELINES FOR TF OPEN DRIVE SCROLL COMPRESSORS

Introduction

The TF Scroll Compressor is an open drive scroll compressor that has been developed specifically for the truck refrigeration industry. This open drive scroll compressor has the following features that are unique and different from traditional hermetic scroll compressors.

- The scroll set and bearings are designed to operate at a range of all RPM's from 2300 to 4200.
- The compressor has a lightweight aluminum body to minimize the overall compressor weight.
- The compressor also utilizes a positive displacement oil pump to ensure adequate lubrication over the entire operating range of speeds.
- The design also utilizes a state-of-the-art shaft seal to eliminate any leakage.

These modifications result in a compressor that is suitable for the most demanding transport applications with efficiencies and reliabilities far better than traditional reciprocating compressors.

Nomenclature

The Open Drive model numbers include the Nominal Capacity of ARI rating conditions Please refer to Figure 1.

Refrigerant/Lubricants

The TF open drive compressors are only approved for use with R404A and Copeland approved POE lubricants. Copeland approved POE lubricants are Copeland Ultra 22CC, Mobil EAL Arctic 22CC, and Thermal Zone 22CC.

The oil charged as shipped is 50 oz. The oil level should be adjusted during operation to the mid-point of the sightglass.

Operating Envelope

The approved operating envelope is shown in Figure 2 below. To achieve extremely high pressure ratio operation, liquid injection will be required to avoid excessive discharge temperature.

Liquid Injection

The open drive TF scroll compressor is provided with an injection port suitable for connection to a source of liquid refrigerant. Internally, this port is connected to an inner pocket of the scroll mechanism. Since this pocket is separated from the suction inlet, no loss of capacity or mass flow results from injecting at this point.

The approved liquid injection device is the Sporlan desuperheater valve, one-ton size, rated at 250°F. The bulb must be installed on the discharge line within six inches of the compressor outlet, and the connection must be fully insulated. A minimum of 10°F liquid subcooling required for proper valve operation. There is a screen in the fitting on the compressor which can be cleaned in the field.

Discharge Temperature Protection

Discharge Temperature Protection is required for loss of charge and other system conditions where excessive discharge temperature can occur. A thermostat is supplied in the top cap for this reason. This thermostat has a cut-out temperature of 145 +/- 5°C and a cut-in temperature of 61 +/- 15°C. It is rated for up to 24 VAC.

Accumulators

An accumulator is required on any compressor system with a refrigerant charge over 9 lbs. Excessive liquid floodback or repeated flooded starts will dilute the oil in any compressor causing inadequate lubrication and bearing wear. Proper system design will minimize liquid floodback, thereby ensuring maximum compressor life.

Pressure Controls

Both high and low pressure controls are required with the following set points. The low pressure setting must be 10 PSIA or greater. High pressure controls must be set no higher than 468 PSIA.

Directional Dependency

Scroll compressors are directional dependent, i.e. they will compress in one direction only. Engine driven compressors are designed to only operate in the proper direction. When operated in the electric motor standby condition, the possibility exists that a 3-phase motor could be wired to operate in the wrong direction. The controller must be equipped with a phase sensing relay that will prevent operation in the wrong direction.

Although operation of the scroll in the reverse direction for brief periods of time is not harmful, continued operation could result in a failure.

The application requires the use of phase detection and correction device. Direction of rotation is shown by arrows cast onto the compressor body.

Deep Vacuum Operation

A low pressure control is required for protection against deep vacuum operation. (See the section on Pressure Controls for the proper set point.)

Operation in a deep vacuum will cause severe overheating and wear on the scroll members.

Shaft Seal

Maximum low-side pressure without leak or distortion (through the casting and gasket/seal joints) is 417 PSIG. Damage to the shaft seal may occur if a differential pressure of greater than 300 PSI is applied for longer than 60 seconds.

Belt Tension

Excessive belt tension can cause premature wear and result in leakage of the shaft seal. Premature wear and failure of the lower bearing (ball bearing) may also occur due to excessive belt loading. Therefore, the maximum belt tension should be such that a maximum of 200 lb. force is applied to the shaft. Refer to figure 3 for belt tension guidelines.

Mounting Consideration

Excessive tilting or leaning of the compressor will cause the oil pump to lose its ability to supply adequate lubrication. Therefore, the maximum tilt angle for the compressor is 20° from horizontal in any direction.

OPEN DRIVE SCROLL COMPRESSOR MODEL NOMENCLATURE

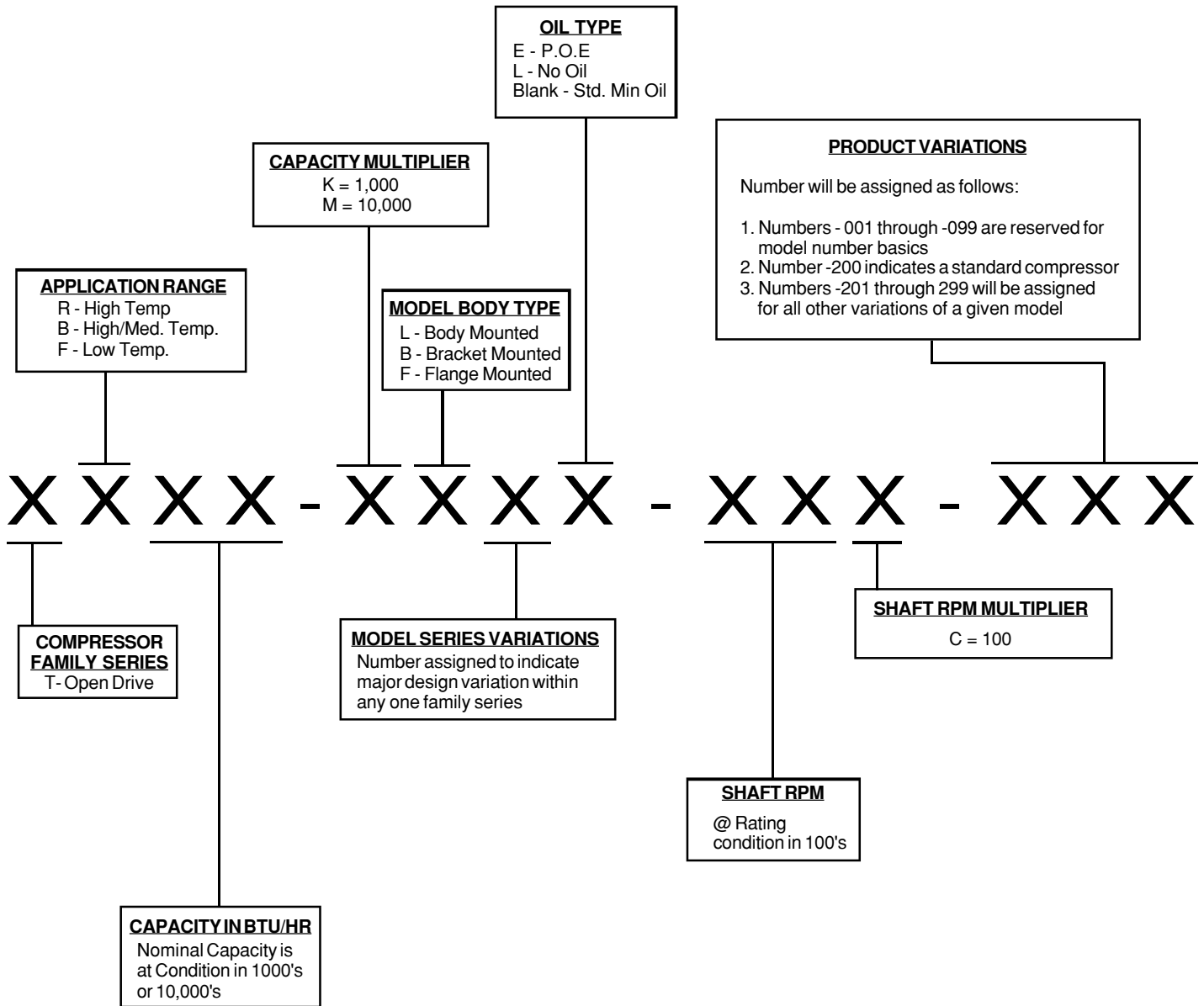
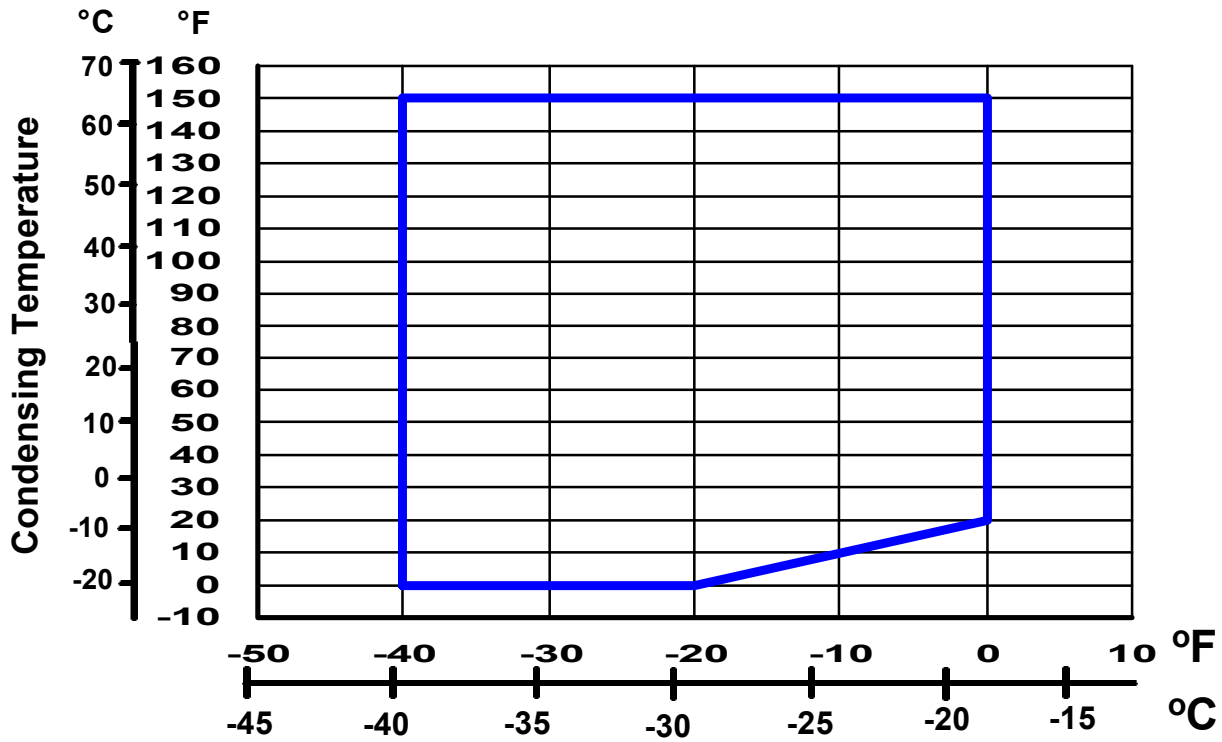


Figure 1

TF**KL2E-42C Application Envelope For R404A 4 - 6 HP



Evaporating Temperature
Figure 2

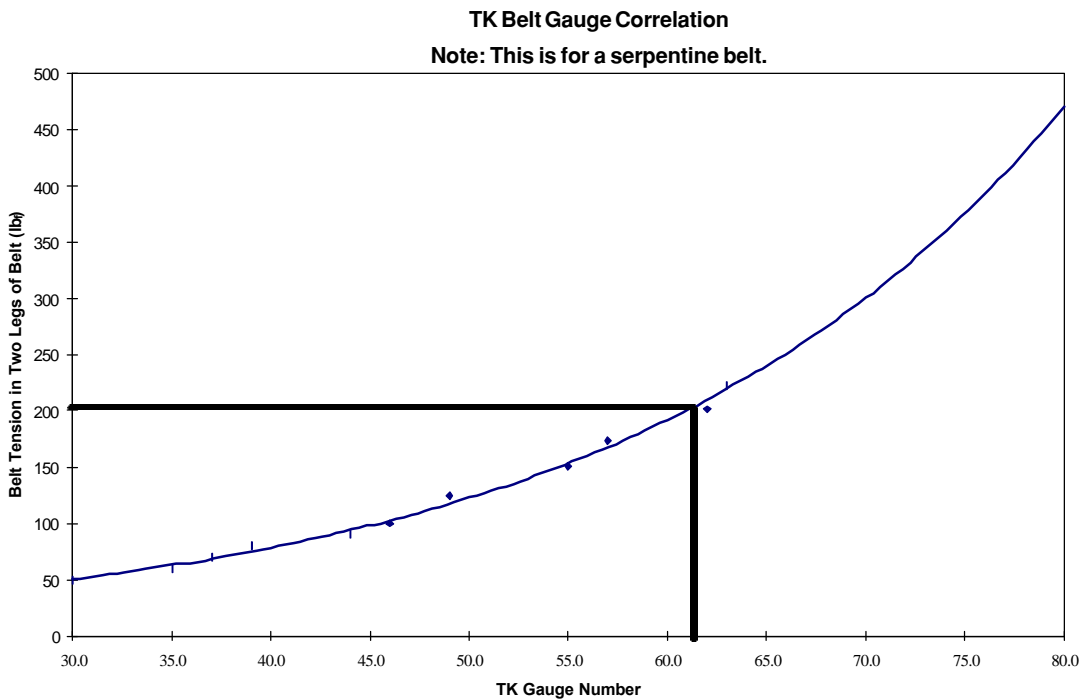


Figure 3