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Semi-hermetic Centrifugal Compressors



Intelligent Solutions

Achieve the Maximum Outcome

Your Future starts here.



FS-ELLIOTT's Triton T500 Semi-hermetic Centrifugal Compressor

FS-ELLIOTT's compressors have a heritage of innovation, quality and reliability dating back nearly fifty years. Due to the dedication of our global employees, FS-ELLIOTT continues to grow as one of the world's leading centrifugal compressor manufacturers. In food and beverage processing, automotive manufacturing, electronic component fabrication, mining operations, pharmaceuticals and many other fields, FS-ELLIOTT's excellent reputation is well known. In addition, FS-ELLIOTT is



the leader in providing API 672 compressor packages. These compressors are located around the globe in gas production facilities, oil refineries, chemical and petrochemical plants.

The Triton T500 centrifugal refrigerant compressor is another example of our tradition. This innovative compressor was designed for long term operation, with advanced mechanical and aerodynamic features. The benefit to the end user is a machine with fewer components and subsystems that result in the highest operating efficiency and degree of reliability.

The package includes a two section centrifugal compressor driven by a semi-hermetically sealed electric motor. The compressor rotor assembly includes two impellers mounted on a single shaft. The rotor assembly is positioned in the radial and axial direction by high precision pressure lubricated journal and thrust bearings. The refrigerant HFC R134a path through the compressor begins at the optimized casing

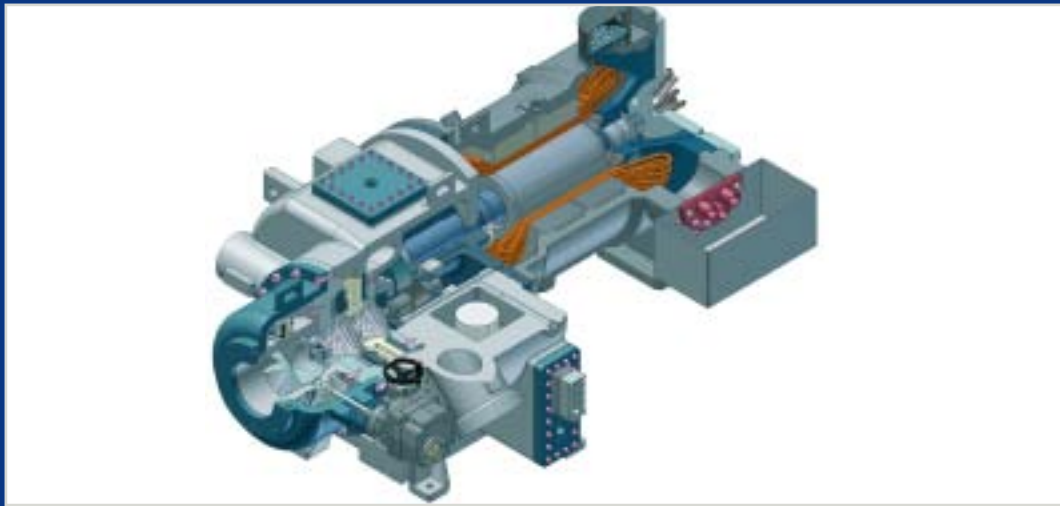
inlet section. Here the system flow is efficiently and accurately controlled by the adjustable inlet guide vane mechanism. Next, the flow enters the first compression section that includes a 3D impeller and diffuser. The state-of-the-art backward-leaning impeller design provides superior aerodynamic performance characteristics over the entire refrigeration system operating range. The system efficiency is increased by an economizer section that is located between the compressor's first



and second stage. The economizer's combination flow then proceeds through the second impeller and the process is repeated before being directed into the customized volute prior to the final discharge section. The electric motor drives the compressor through the bull gear. The motor and bull gear rotors are positioned in the radial and axial direction by lubricated journal and thrust bearings. The rotor dynamic characteristics have been meticulously analyzed to arrive at the ultimate design that assures smooth, reliable and lasting refrigeration system operation. The most sophisticated state-of-the-art software tools were utilized to derive the rotor system configurations.

Centrifugal refrigerant machines are well respected by their operators and maintenance individuals because they operate reliably for long periods of time with minimal maintenance. FS-ELLIOTTs equipment has a proven record for durability, quality and reliability. In fact, many of our machines are still in operation today - 20, 30 and 40 years after installation. This is made possible by a combination of features:

- **Aerodynamics**
 - 500 ton centrifugal chiller - HFC R134a
 - Two stage compressor
 - Optimized aerodynamic stage matching to maximize part-load efficiency
 - State-of-the-art COP - Based on ARI Data
- **Optimized Operational Efficiency**
 - Precision manufactured impellers and diffusers
 - State-of-the-art backward leaning impeller staging
 - Setting the standard for aerodynamic efficiencies



- One side-stream inlet port facilitates an economizer
- Designed for large turndown via inlet guide vane control
- **Rotor**
 - Exceptional rotor dynamics stability
 - Inherently low vibrations
 - No rubbing or direct wearing parts
 - Optimum clearances between rotating and stationary parts
 - No pulsating flows
- **Bearings**
 - Precision journal and thrust bearings
 - Conservatively sized to ensure stable operation through the operating load range
 - Long service life pressure lubricated designs
- **Lubrication System**
 - Self-contained lubrication system

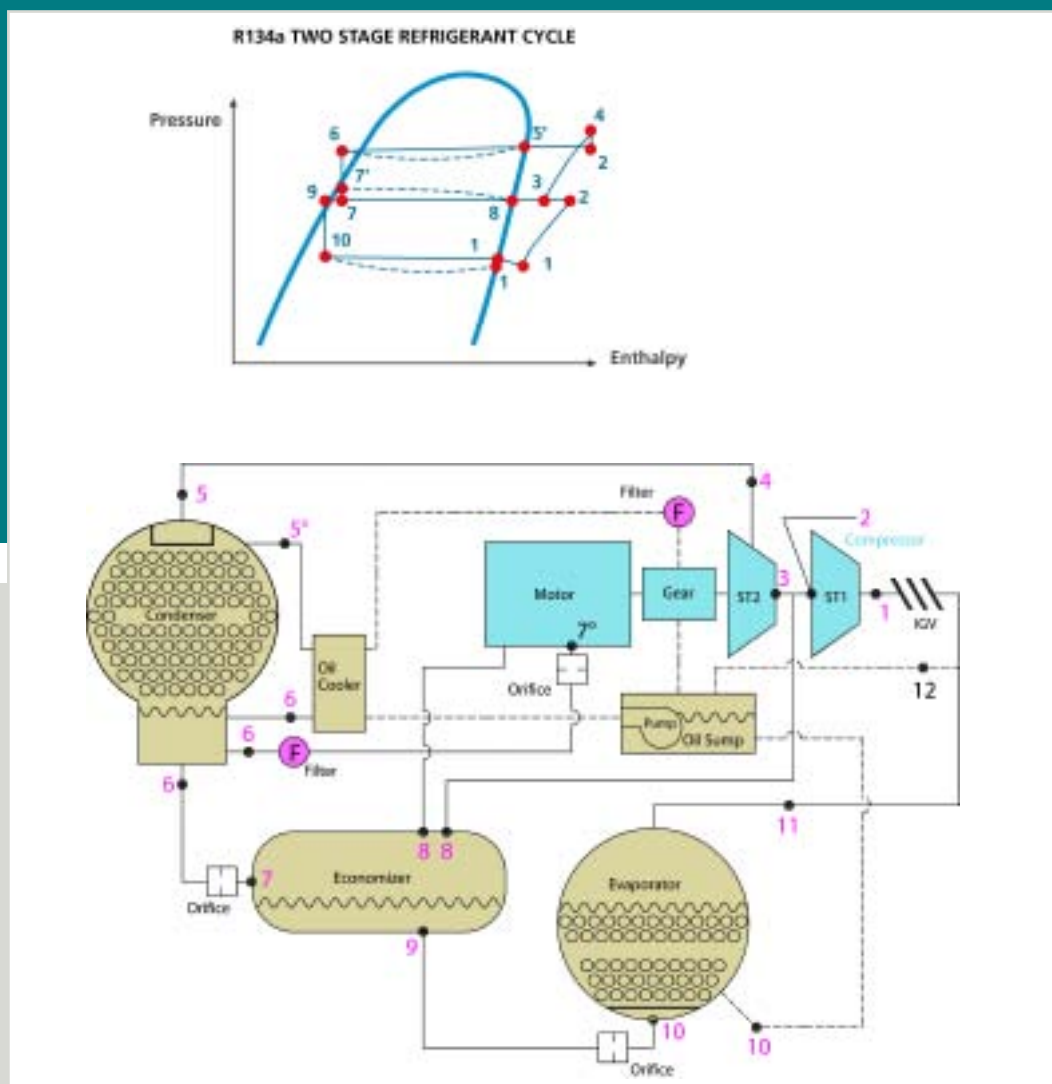
- Synthetic lubricant, lubricant is specially developed for compatibility with HFC R134a refrigeration
 - High precision - three micron absolute oil filtration
 - Optimized size cooler utilizing system refrigerant
 - Built-in demister for separation of oil vapor and refrigerant in gear case
 - O-ring face fittings utilized in lube system piping
- **Motor**
 - High efficiency induction motor
 - Semi-hermetically sealed
 - Drive is cooled by refrigerant - HFC R134a



- **Reliable Design**
 - Simple, compact and rugged mechanical structural design
 - Easily facilitates packaging with other chiller components i.e. condenser, evaporator, economizer etc.
 - Impellers and adjustable inlet guide vanes are coated for corrosion and erosion protection
- **Ease of Maintenance**
 - Bearing lube system designed for serviceability
 - Filter, cooler and relief valve are serviceable without draining the compressor sump
- **Quality**
 - Product design, manufacture and inspections governed by our ISO
 - ISO 9001:2000 Certified Quality Management System
- **Professional Service**
 - Reliable assistance available upon request
 - Global service network
 - Decades of professional service experience

Process Diagram and System Schematic

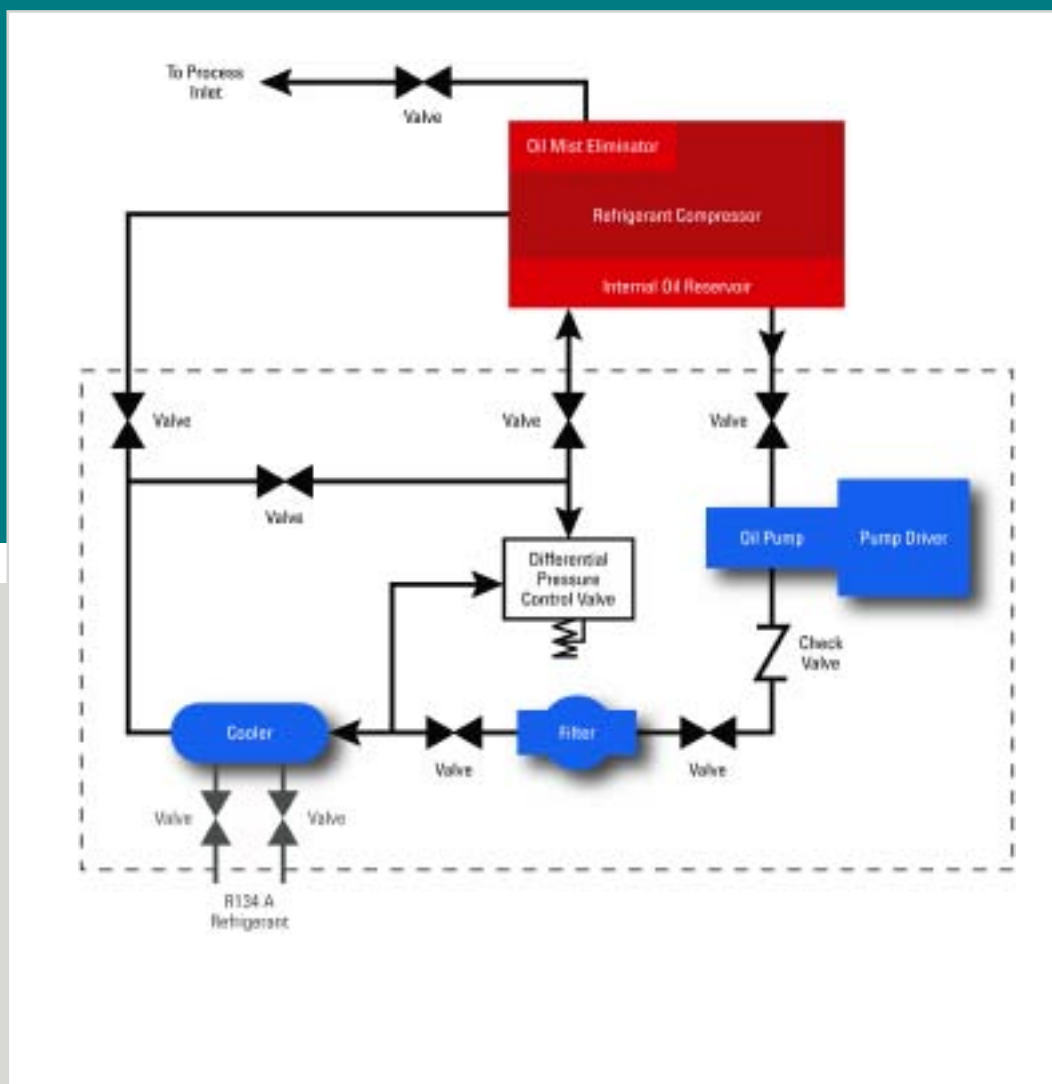
The following schematics depict a typical two-section refrigerant cycle design that incorporates one economizer. The bottom schematic contains a sequentially numbered path that illustrates the flow through the major refrigeration system components. The numbers are positioned at the key locations where thermodynamic state point changes occur within the process cycle. The top schematic is a type of Mollier diagram that displays the thermodynamic properties in regard to pressure and enthalpy for HFC R134a. This Mollier diagram includes the same numbered



flow path that is shown in the bottom schematic. The Mollier diagram is a unique means for presenting thermodynamic data and at the same time providing a visualization of the state point changes that are occurring within the refrigeration cycle. The compression process initiates at Point #1 and concludes at Point #4.

Lubrication System

Designing and building lubrication systems has been a long time tradition with our compressor packages. The lubrication system is self-contained within the package and is designed for reliability and maintainability. Each and every lubrication system is factory assembled and tested prior to shipment. This system provides for all of the package's needs, which includes continuous lubricant flow to the compressor and motor bearings. The system is simple and reliable. The basic elements include the reservoir, pump, cooler, filter and control valves. The reservoir is located within



the package frame with easily accessible lubricant fill and drain connections. The pump provides the motive force for the lubricant circulation through the system; first passing through the precision filter and then an efficient cooler. The system pressure is maintained by the differential pressure control valve.

Corona Turbo Ice™

The proper lubricant selection is the first step to ensuring long-term reliable compressor operation. Specialists with years of technical and operational experience in high-speed turbomachinery have taken the guesswork out of this decision-making process. FS-ELLIOTT recommends the use of our Corona Turbo Ice™ - the engineered lubricant for centrifugal refrigerant compressors. It is a premium 100% synthetic lubricant that is manufactured using only the highest quality polyolester base feed-



stock and state-of-the-art refining technology. Corona Turbo Ice™ is supplied with all new FS-ELLIOTT refrigerant compressors and is especially selected for this HFC R134a refrigerant application

- **This premium lubricant provides the following benefits:**
 - Extended lubricant life
 - Specially developed for compatibility with HFC refrigerants
 - Superior miscibility properties
 - Excellent wear protection
 - Longer equipment operating cycles
 - Reduced downtime

Performance Charts

The Triton T500 centrifugal chiller compressor can easily adjust to whatever load level is required by the local environmental conditions. The above charts provide a glimpse of the typical operational characteristics of the Triton T500 compressor. Exceptional performance levels are achieved at the full load point by setting the first stage variable inlet guide vanes at the 100% (neutral) position. Efficient, part load performance is obtained by the modulation of the airfoil style inlet guide

Type	Semi-Hermetic Centrifugal			
Gear System	Helical Gear and Pinion			
Capacity Control	Inlet Guide Vane			
Capacity	500 RT (1758 kW)			
Power	317 kW			
Condensing Temperature	96,8	°F	36	°C
Evaporating Temperature	43,7	°F	6,5	°C
Suction gas superheat	0,9	°F	0,5	°C
Liquid subcooling	5,4	°F	3	°C
Flowrate	1490	lbm/min	676	kg/min
Length	86	inch	2179	mm
Width	49	inch	1251	mm
Hight	42	inch	1059	mm
Weight	8000	lbm	3629	kg
Refrigerant	R134a			
Electrical Supply	380, 440, 3300, 6600V 50/60 Hz 3 Phase			
Motor Speed	3555 rpm / 60 Hz, 2960 rpm / 50 Hz			
Start Method	Star-Delta			

vanes to optimum angular positions. In this way, power consumption is kept to a minimum. There is also the additional option to slightly over rotate the inlet guide vanes on those days when slightly more refrigerant flow, and therefore more cooling capacity, is required.

Triton T500 Installation Drawing

