Danfoss Turbocor Compressors

• Agenda
  – Introduction
  – The Turbocor portfolio
  – Chiller design considerations
  – Typical chiller EER/ESEER
  – Danfoss Turbocor with HFO refrigerants
  – Summary
  – Question and answer session
Introduction to Danfoss Turbocor

- Inverter speed control
- Synchronous brushless DC motor
- 2-stage centrifugal compressor
- Soft-Starter
- Pressure/temperature sensors
- Inlet guide vanes
- Motor and bearing control
Typical compressor maps

- Saturated Suction Temperature SST [°C]
- Saturated Discharge Temperature SDT [°C]

- Turbocor TT300
- Turbocor TT350
- Turbocor TT400
- Turbocor TT500
- Turbocor TT300 MT

- Air cooled or water cooled
- Water cooled

Atic for HVAC professionals
Danfoss Turbocor Compressor family

Danfoss Turbocor Compressor Portfolio

Refrigeration Capacity (Tons)

0 200 400 600 800 1000 1200 1400

TG Series
TG520 90-15 TR
TG390 70-120 TR
TG310 60-90 TR
TG230 40-70 TR

TT Series
TT700 130-200 TR
TT400 90-150 TR
TT350-70 120 TR
TT300-60 90 TR

VTT Series
VTT880 Up to 250 TR
VTT1000 Up to 300 TR
VTT1200 Up to 350 TR
Oil free reduces complexity

Typical screw chiller

Typical oil-free chiller

- Simple
- Fewer connections
- Higher efficiency
- Less maintenance
- Higher reliability
Heat exchanger technology

• Evaporator
  – Falling film – reduced refrigerant charge
Heat exchanger technology

• Condenser
  – Shell and tube (water cooled). Multi compressors. Single or dual circuit.
  – Spray plate (water cooled). Single circuit, single compressor for modular chiller design
  – Fin and tube (air cooled)
  – Micro channel (air cooled)
Economiser options

- Plate heat exchanger
- Open flash tank
  - Choice between increasing cooling capacity or increasing efficiency (or mixture of both)
  - Most OEMs offer chillers with or without economiser
Oil free enables multiple compressor benefit

Multiple oil-free compressors improve energy efficiency at low load operation

![Graph showing chiller efficiency vs. chiller load for different types of compressors. The graph indicates that multiple oil-free compressors improve energy efficiency at low load operation.](image)
Typical chiller EER and ESEER

- Typical EER for air cooled chillers 3.45 to 3.84
- Typical ESEER 5.55 to 5.82
- Available with free cooling option
- Typical EER for water cooled 5.25 to 5.5
- Typical ESEER >8.0
Danfoss Turbocor with HFO refrigerants

Phase down controlled by a quota allocation system

Declining supply of HFC

Increasing refrigerant prices weighted on GWP value

2018 = a critical year

-37%

2024

-69%

2030

-79%
Danfoss Turbocor with HFO refrigerants

- Extremely lightweight and compact
- Soft startup with low in-rush current
- Available for 380 – 460 Volt applications
- Nominal capacity: 230kW, 310 kW, 390kW, and 520 kW
- Fastest restart time in the industry of less than 30 seconds without the use of an external universal power supply.
- High efficiency at full load and extraordinarily high efficiency at part load conditions
Summary

• Industry leading part load efficiency
• Low maintenance
• Overall life cycle cost savings compared to other compressor technologies
• Options for ultra low GWP refrigerants
• Suitable for data centre cooling, commercial building air conditioning and industrial applications.
• Questions?