ENGINEERING
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Fact Sheet | Models TTS, TGS, TTH, TGH, VTT and VTX

The Danfoss Turbocor®
Portfolio of **Oil-Free Compressors**

Highly efficient compressors that reduce operating and maintenance costs.
Capacity range from 140 to 1600 kW / 40 to 450 tons.

Up to
40%
more efficient than equivalent compressors in their size range

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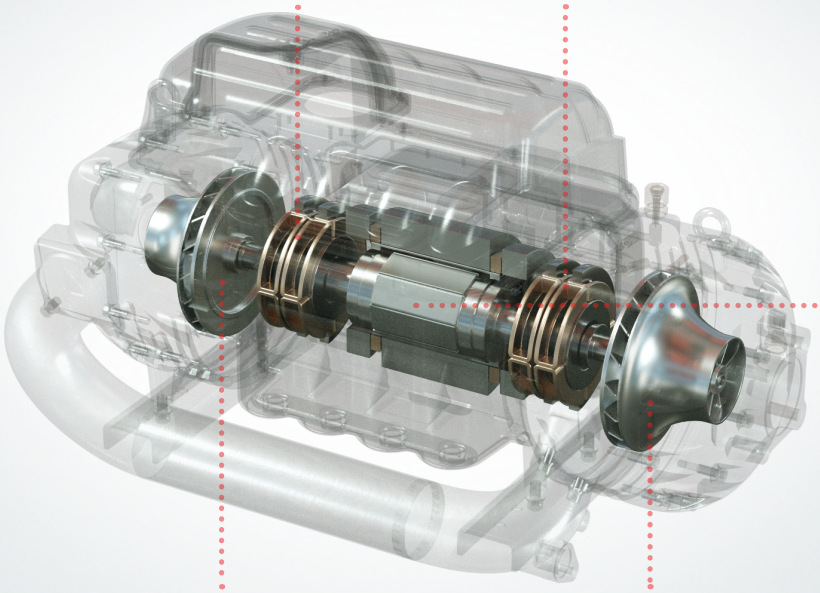
Oil-Free Performance Advantage

Oil-Free, magnetic bearing compressor technology eliminates complex oil and refrigerant lubrication management systems resulting in a simplified chiller design, increased reliability and reduced maintenance.

Oil-free, magnetic bearings and integrated variable speed drive delivers industry leading efficiency with no performance degradation over the life of the compressor.



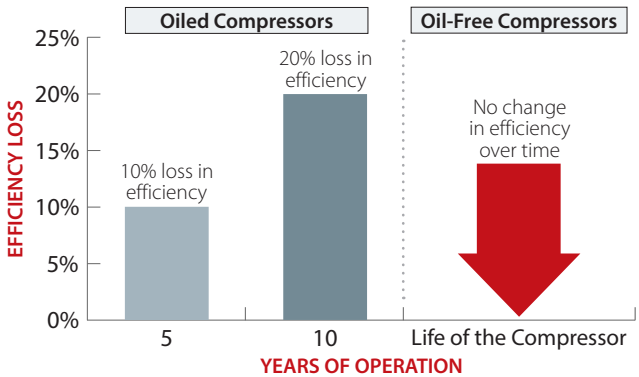
Permanent magnet synchronous motor provides high efficiency and enables compact design.

Two stage compression design provides flexibility to use for water-cooled and air-cooled chiller applications.

Zero Performance Degradation

Danfoss Turbocor® compressors have no oil in the system which means there is no performance degradation due to oil contamination. This, along with the contact-free operation enabled by magnetic bearings means the performance remains consistent over the life of the compressor.

Performance Degradation Over Time*



Source: Tsinghua University Study 2014

Reduced Maintenance

A chiller using oil-free technology has fewer mechanical parts and simpler design since all the components associated with the oil management system are eliminated. This results in reduced maintenance and higher reliability over the life of the chiller.

MAINTENANCE TASK	FREQUENCY	
	Oiled Chiller	Oil-Free Chiller
Check Oil Level	Daily	Not Required
Change Oil	$1,600 Annually	Not Required
Replace Oil Filter	$2,000 Annually	Not Required
Inspect Key Components	Weekly	Not Required
Oil Analysis	$50 Annually	Not Required

Total annual maintenance cost associated with the oil management system = $3,650
Lifetime maintenance cost associated with the oil management system = $83,950
Note: Based on 23 year chiller life expectancy per ASHRAE Handbook

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The Danfoss Turbocor® Portfolio of Oil-Free Compressors

Models TTS300, TTS350, TTS400, TTS450 and TTS700

The TTS Compressor

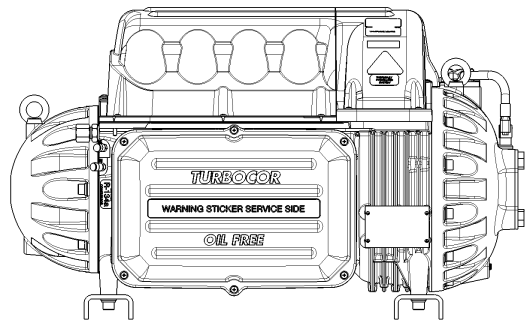
Efficient: Danfoss Turbocor® model TTS oil-free compressors are available in five different models ranging from 60 tons / 200 kW to 200 tons / 700 kW. The TTS compressor portfolio offers industry-leading efficiency with integrated part load values (IPLV) up to 40% better than a comparably sized screw chiller.

Flexible: All models are capable of operating under standard water-cooled and low lift chiller operation while the TTS300, TTS350 amd TTS450 have the ability to operate at high lift for air-cooled or heat recovery operation. In addition, the TTS300 has the ability to operate in medium evaporator temperature applications with a range of 0 and -10 °C (between 32 and 14 °F).

Quiet: The low sound levels of the TTS compressor reduces customer complaints in noise-sensitive applications and reduces the cost of expensive sound treatment typically required of noisy screw compressors. The TTS Series compressors have sound pressure levels as low as 70.0 dBA at 1.5m (5ft), resulting in up to 8 dBA lower than a typical screw compressor.

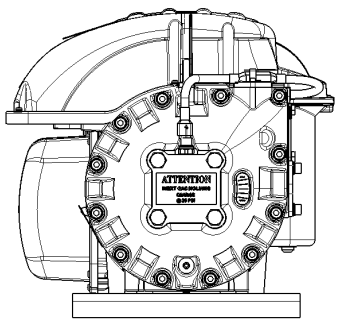
Low Global Warming Potential (GWP) refrigerant: All TTS compressor models are compatible with the non-flammable R-513A refrigerant with low GWP as standard. They are also available with HFC-134a with no Ozone Depletion Potential.

Model	TTS300	TTS350	TTS400	TTS450	TTS700
Refrigerants	R134a or R513A				
Capacity	60 to 90 tons	70 to 120 tons	90 to 150 tons	100 to 150 tons	130 to 200 tons
Operating map	Air- and Water-Cooled, Low Lift		Water-Cooled, Low Lift	Air- and Water-Cooled, Low Lift	Water-Cooled, Low Lift
Voltage	380 V, 400 V, 460 V, 575 V	380 V, 400 V, 460 V, 575 V	380 V, 400 V, 460 V, 575 V	380 V, 400 V, 460 V, 575 V	380 V, 400 V, 460 V, 575 V
Dimensions	788 mm (31.0 in) – 518 mm (20.4 in) – 487 mm (19.2 in)				
Weight	120 kg (265 lbs)	132 kg (290 lbs)	132 kg (290 lbs)	132 kg (290 lbs)	144 kg (318 lbs)



788 mm (31.0 in)

487 mm (19.2 in)



518 mm (20.4 in)

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The Danfoss Turbocor® Portfolio of Oil-Free Compressors

Models TGS230, TGS310, TGS380, TGS390 and TGS520

The TGS Compressor

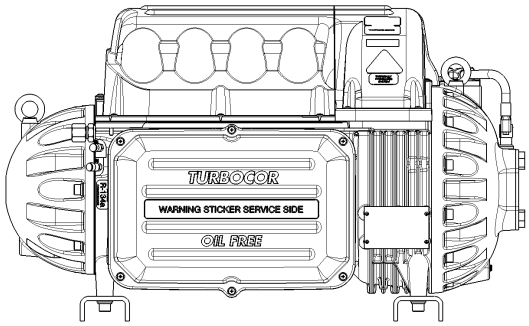
Efficient: Danfoss Turbocor® model TGS oil-free compressors are available in five different models ranging from 40 tons / 140 kW to 150 tons / 540 kW. The TGS compressor portfolio offers industry-leading efficiency with integrated part load values (IPLV) up to 40% better than a comparably sized screw chiller.

Flexible: All models are capable of operating under standard water-cooled and low lift chiller operation while the TGS230, TGS310 and TGS380 have the ability to operate at high lift for air-cooled or heat recovery operation. In addition, the TGS230 has the ability to operate in medium evaporator refrigerant temperature applications with a range of 0 and -10 °C or 32 and 14 °F.

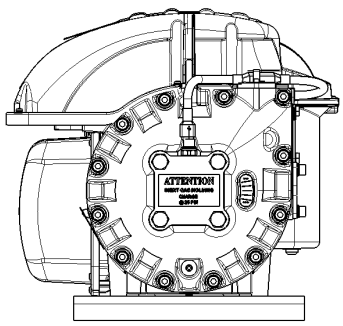
Quiet: The low sound levels of the TGS compressor reduces customer complaints in noise sensitive applications and reduces the cost of expensive sound treatment typically required of noisy screw compressors. The TGS Series compressors have sound pressure levels as low as 70.0 dBA at 1.5m (5ft), resulting in up to 8 dBA lower than a typical screw compressor.

Environmentally Friendly: As part of the Danfoss Turbocor® long term refrigerant strategy, the TGS compressor portfolio uses the next-generation refrigerant HFO-1234ze which features a Global Warming Potential GWP < 1 and zero Ozone Depletion Level (ODP). In addition, all TGS models can be used with low GWP R515B which has an ASHRAE A1 safety classification.

Model	TGS230	TGS310	TGS380	TGS390	TGS520
Refrigerants	HFO-1234ze or R515B				
Capacity	40 to 70 tons	60 to 90 tons	88 to 110 tons	70 to 120 tons	90 to 150 tons
Operating map	Air- and Water-Cooled, Low Lift		Air- and Water-Cooled, Low Lift	Water-Cooled, Low Lift	
Voltage	380, 400, 460, 575 V	380, 400, 460, 575 V	380, 400, 460, 575 V	380, 400, 460, 575 V	380, 400, 460, 575 V
Dimensions	788 mm (31.0 in)– 518 mm (20.4 in) – 487 mm (19.2 in)				
Weight	120 kg (265 lbs)	132 kg (290 lbs)	132 kg (290 lbs)	132 kg (290 lbs)	144 kg (318 lbs)



487 mm (19.2 in)



788 mm (31.0 in)

518 mm (20.4 in)

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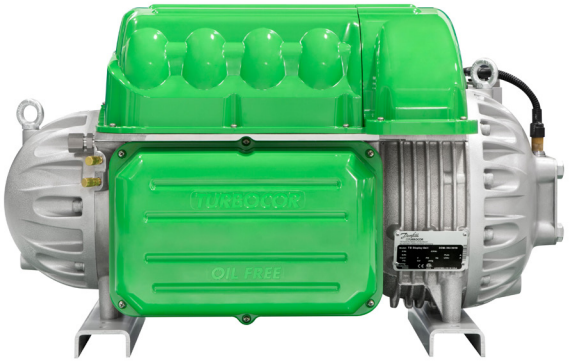
The Danfoss Turbocor® Portfolio of Oil-Free Compressors

Model TGS490

2020 AHR Expo Innovation Award



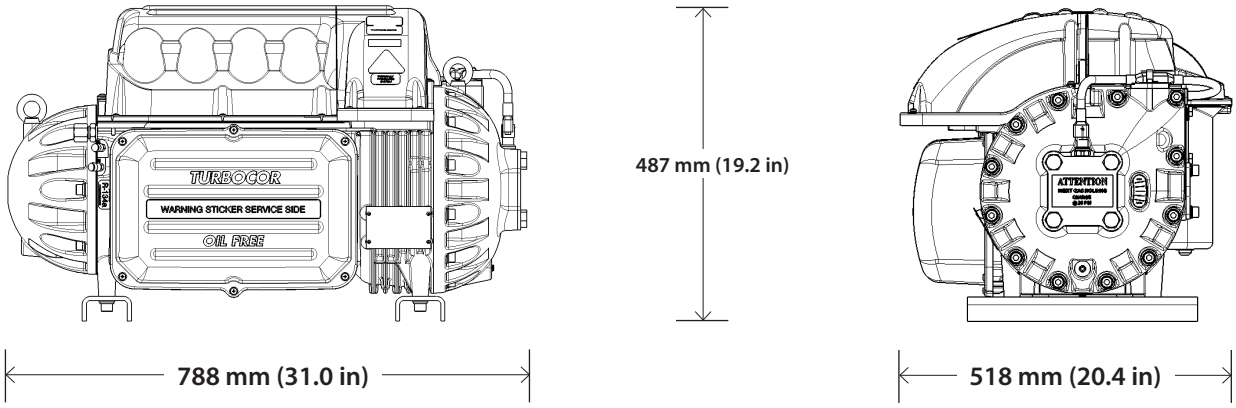
The TGS490 Compressor

Efficient: Danfoss Turbocor® model TGS490 oil-free compressor has a capacity range of 85 tons / 300 kW to 140 tons / 490 kW and can be used in air or water-cooled chiller applications. The TGS490 compressor offers industry-leading efficiency with integrated part load values (IPLV) up to 50% better than a comparably sized screw chiller.

Environmentally Friendly: The new TGS490 is the world's first oil-free, magnetic bearing centrifugal compressor that offers the flexibility to be used with either ultra low GWP HFO-1234ze or R-515B. R-515B has a GWP of 299 and an ASHRAE A1 safety classification - allowing users to be compliant with applicable refrigerant regulations and safety codes.

Lifecycle Cost Advantage: The new TGS490 features oil-free, magnetic bearing technology for industry-leading performance with up to 40% better part load efficiency versus fixed speed screw compressors and no mechanical wear or performance degradation over the life of the compressor. With a large capacity range up to 140 tons / 490 kW, the TGS490 can meet a 400 ton air-cooled chiller capacity requirement with only a three compressor configuration.

Model	TGS490
Refrigerants	HFO-1234ze or R-515B
Capacity	85 to 140 tons
Operating map	Air- or Water-Cooled
Voltage	380 V, 400 V, 460 V, 575 V
Dimensions	788 mm (31.0 in) - 518 mm (20.4 in) - 487 mm (19.2 in)
Weight	132 kg (290 lbs)



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The Danfoss Turbocor® Portfolio of Oil-Free Compressors

Models TTH375 and TGH285

2018 AHR Expo Product of the Year

The TGH and TTH Compressor

Wide Operating Map: The new Danfoss Turbocor® TTH and TGH compressors expands the benefits of oil-free technology into high lift applications with pressure ratios up to 6.2. High lift applications include air-cooled chillers in hot ambient climates, hot water for heat pump or heat recovery, and low-temps for thermal storage or low-temp process applications. The compressor can operate up to a maximum saturated discharge temperature (SDT) = 156°F / 69°C which allows for air-cooled chiller operation in extremely hot ambient climates and the ability to generate hot water for heating, domestic water or process heating.

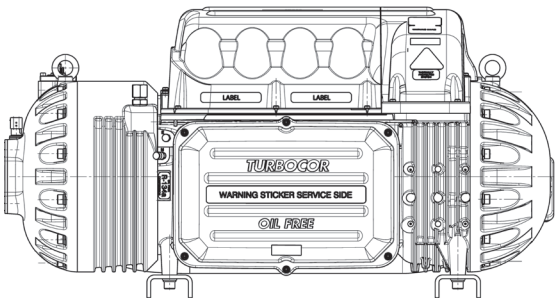
Efficient: Two models are available: TTH375 with a nominal capacity of 107 tons / 376 kW and TGH285 with a nominal capacity of 82 tons / 288 kW. The TTH and TGH compressor portfolio offers industry-leading efficiency with integrated part load values (IPLV) up to 40% better than a comparably sized screw chiller.

Quiet: The low sound levels of the TTH and TGH compressor reduces customer complaints in noise sensitive applications and reduces the cost of expensive sound treatment typically required of noisy screw compressors. The TTH / TGH compressor has sound pressure levels as low as 70.0 dBA at 1.5m (5ft), resulting in up to 8 dBA lower than a typical screw compressor.

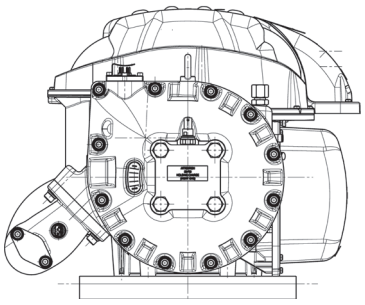
Model	TTH375	TGH285
Refrigerants	R134a or R513A	HFO-1234ze or R515B
Capacity	107 tons	82 tons
Operating map	Air- and Water-Cooled, High Lift	
Voltage	380, 400, 460, 575V	380, 400, 460, 575V
Dimensions	932 mm (36.7in) – 590 mm (23.2 in) – 487 mm (19.2 in)	
Weight	163 kg (360 lb)	

Environmentally Friendly: The TTH model is compatible with R134a and low GWP non-flammable R513A, while the TGH model uses next-generation refrigerant HFO-1234ze which offers a GWP < 1 or low GWP R515B which has an ASHRAE A1 safety classification.

Innovation: The Danfoss Turbocor® TTH / TGH compressor was the recipient of numerous awards including the Product of the Year at the 2018 AHR Expo, 2018 China Ref, and 2018 Mostra Convegno.



487 mm (19.2 in)



932 mm (36.7 in)

590 mm (23.2 in)

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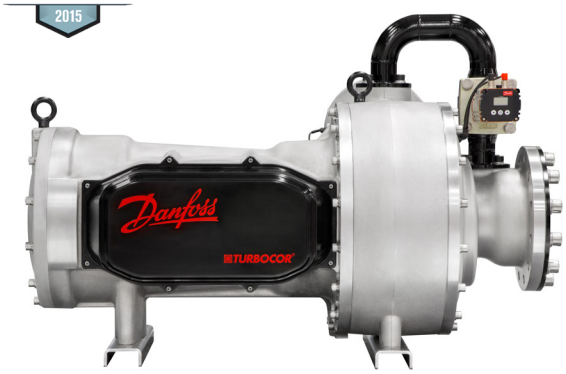
The Danfoss Turbocor® Portfolio of Oil-Free Compressors

Model VTT1200

2015 AHR Expo
Product of the Year



The VTT1200 Compressor

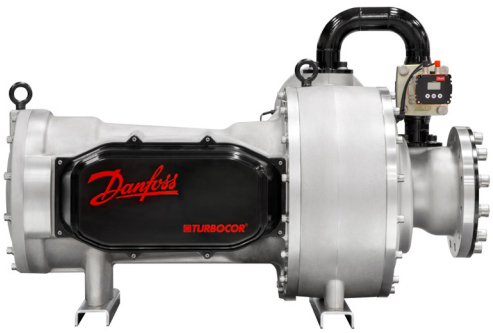
Efficient: The Danfoss Turbocor® VTT1200 (Variable Twin Turbo) oil-free compressor takes all the benefits of magnetic bearing technology into larger capacity ranges above the TTS / TGS models. Available up to 400 tons / 1430 kW capacity using an economizer, the VTT1200 offers outstanding full and part load performance.

Stable Operation: The VTT1200 compressor features the patented IntraFlow® technology which extends the stable operating range and increases the turn down capability of the chiller. The result is a compressor that minimizes the risk of surge while maintaining peak full and part load efficiency.

Flexible: Designed for water and evaporative cooled chiller applications in both single and multiple compressor configurations.

Environmentally Friendly: Winner of the prestigious 2015 AHR Expo Innovation Award in the Green Building category, 2015 Alliance to Save Energy Innovative Star of Energy Efficiency award, and the 2017 Edison Bronze Award for innovation and excellence in the development of new products and services, the VTT compressor is available with HFC-134a, with no Ozone Depletion Potential and no phase-out date per the Montreal Protocol.

Model	VTT1200
Refrigerants	R134a
Capacity	325 to 400 tons
Operating map	Water-Cooled
Sound	77 dBA at 1.5m (5´)
Voltage	380, 400, 460 V
Dimensions	1130.2 mm (44.5 in) – 683.9 mm (26.9 in) – 750.2 mm (29.5 in)
Weight	433 kg (977 lbs)



1130.2mm (44.5 in)

750.2 mm (29.5 in)

683.9 mm (26.9 in)

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The Danfoss Turbocor® Portfolio of Oil-Free Compressors

Model VTX1600

The VTX1600 Compressor

Efficient: The Danfoss Turbocor® VTX (Variable Twin Turbo) oil-free compressor takes all the benefits of magnetic bearing technology into larger capacity ranges above the TTS / TGS models. Available up to 450 tons / 1600 kW capacity using an economizer, the VTX1600 offers unparalleled performance for water-cooled chiller applications with full load efficiency = 0.52 kW / ton and IPLV - 0.32 kW / ton.

Stable Operation: The VTX1600 compressor uses an advanced impeller design and IGV to allow for extended unloading at standard AHRI conditions and constant pressure ratios.

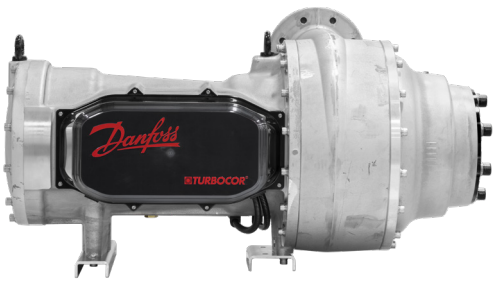
Flexible Design: The VTX compressor offers variable refrigerant discharge pipe connection orientations (0˚, 45˚, and 90˚) and power connection location options for either bottom or side entry to allow for more flexibility in the chiller design.

Horizontal Discharge Rotated 0˚ (Standard)

Angled Discharge Rotated 45˚

Downward Discharge Rotated 90˚

Model	VTX1600
Refrigerants	R134a, R513A, HFO-1234ze, or R515B
Capacity	375 to 450 tons
Operating map	Water-Cooled
Sound	77 dBA at 1.5m (5´)
Voltage	380, 400, 460 V
Dimensions	1108.2 mm (43.6 in) – 676.1 mm (26.6 in) – 596.0 mm (23.5 in)
Weight	375 kg (827 lbs)



596.1 mm (23.5 in)

1108.2mm (43.6 in)

676.1 mm (26.6 in)

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Environmentally Friendly

Danfoss encourages the use of low GWP refrigerants to help slow, and ultimately reverse, the process of global warming. Danfoss Turbocor® compressors are available with R134a and low-GWP, A1 non-flammable R513A, R515B and ultra-low GWP HFO R1234ze.

MODELS	R134a No flame propagation GWP = 1300	R513A No flame propagation GWP = 573	R515B No flame propagation GWP = 299	HFO1234ze No flame propagation GWP < 1
TTS / TTH	✓	✓		
TGS / TGH			✓	✓
VTT	✓			
VTX	✓	✓	✓	✓

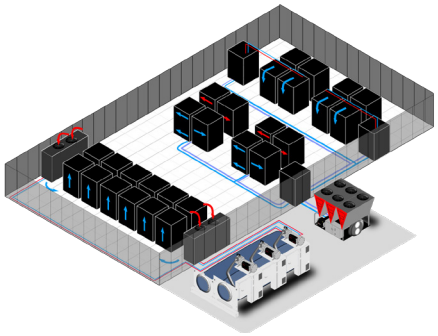
Benefits for **Data Center** Installations

Danfoss Turbocor® compressors offer features to save energy costs and maintain operation 24/7 to meet the needs of Data Center mission critical applications.

High SST Range enables leaving chilled water temperatures up to 28°C to reduce power consumption.

Low Lift Operating Range allows for cooling at low ambient temperatures, ensuring year round operation.

Fast Restart capability in less than 30 seconds after a power outage or voltage sag.



MODELS	APPLICATIONS				
	 Water- or Evaporative-Cooled Chillers	 Air-Cooled Chillers	 Thermal Storage / Low Temp Process	 Water-Water Heat Pumps / Heat Recovery	 Air-Water Heat Pumps
 TTS400 TTS700  TGS390 TGS520	✓				
 TTS300 TTS350, TTS450, TGS380, TGS490  TGS230 TGS310, TGS490	✓	✓	✓	✓	
 TTH375  TGH285	✓	✓ Up to 126˚F Ambient Temperature	✓	✓	✓
 VTT1200  VTX1600	✓				

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The Danfoss Turbocor® Portfolio of Oil-Free Compressors

Danfoss Mobile Apps

Turbotool® App

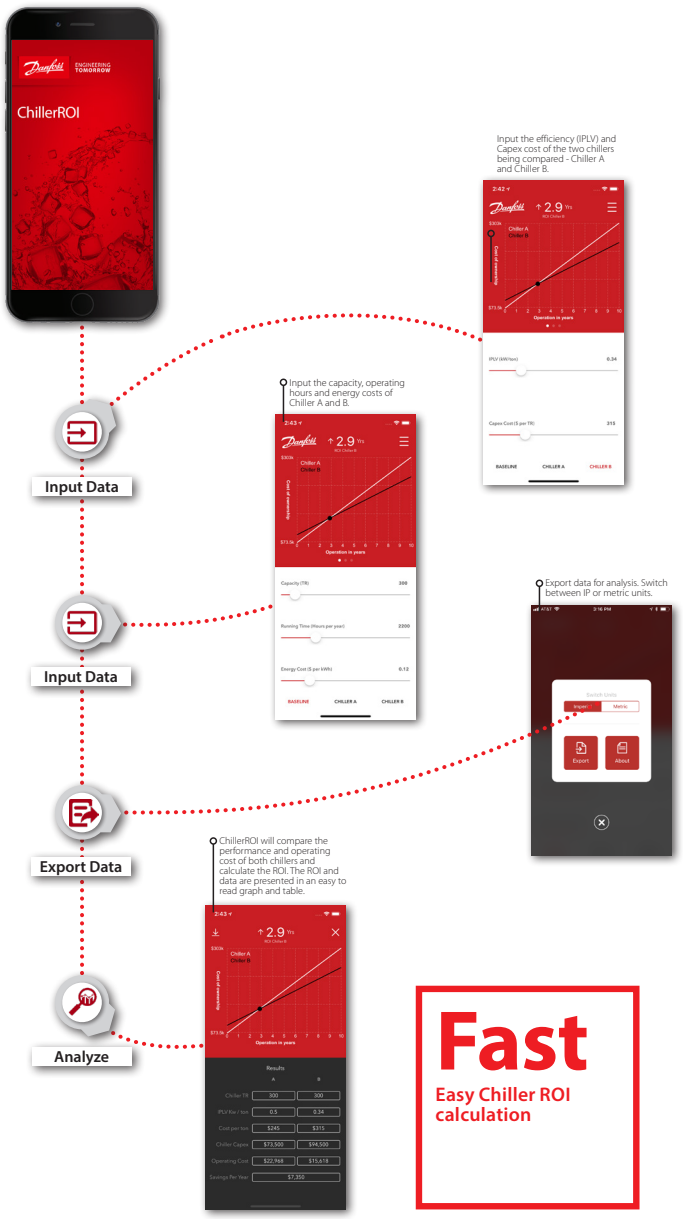
Quick Access to **Danfoss Turbocor® compressor** troubleshooting.

24/7

Access to all things Danfoss Turbocor® compressor troubleshooting on site

ChillerROI App

Simplify your **chiller decision making** by calculating the ROI quickly and easily.



Fast

Easy Chiller ROI calculation