



High-Speed Permanent Magnet Motors and Drives for Air Separation - 0.5 to 1 MW System

Air separation plants are exploring more efficient and cost-effective practices to improve their daily processes, aiming to reduce their carbon footprint. An innovative solution with many advantages comes in the form of High-speed permanent-magnet motors and drives that enable air separation plants to reach their goals.

The compressors used in an air separation plant need to be managed through an efficient Motor and Drive. TPS are experts in the design and manufacture of high-speed permanent-magnet motors and associated drives to suit differing Centrifugal Compressor Systems used in the air separation plant.

Our Industrial Motor Drive systems comprise two distinct system configurations: 6-phase and 12-phase for differing power requirements. Our compact and lightweight permanent-magnet technology solutions provide a suite of benefits including improved efficiency, high reliability, longer operating life and reduced Total Cost of Ownership (TCO) compared to conventional systems.

Key Technical Features

- ✓ Speed Range: 10,800 to 17,400 rpm
- ✓ Power: 516 kW to 1041 kW
- ✓ Torque: 406 Nm to 950 Nm
- ✓ Scope of supply: Motor & Drive
- ✓ Motor type: Permanent-magnet
- ✓ Single or double ended high-speed compressor drive
- ✓ Direct coupling to centrifugal compressor
- ✓ Oil-free magnetic bearing system

Key Benefits to Air and Gas Distribution Operators

- ✓ Direct-drive system eliminates need for gearbox, improving system reliability, efficiency and noise
- ✓ Variable Speed control with permanent magnet motor enables very high efficiencies, even at part load and speed
- ✓ Frictionless, oil-free bearings enabling exceptionally high motor efficiency
- ✓ Significantly reduced footprint with up to 70% smaller and 90% lighter motor than equivalent geared system
- ✓ Dedicated High Speed Variable Frequency Drive, optimised for target system efficiency and operation
- ✓ Control configuration optimised for required motor phasing



Figure 1 – 500 kW Motor System

Figure 2 – 1 MW Motor System

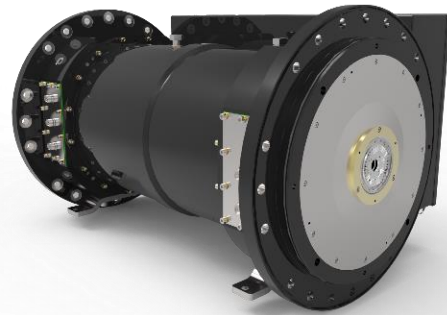
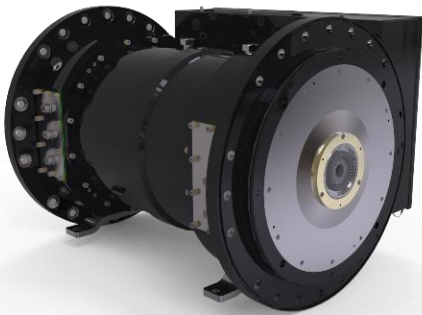


Figure 1.2 – Drive for 500 kW Motor

Figure 2.2 – Drive for 1MW Motor



Performance Table

MOTOR SPECIFICATION		
	500 kW	1 MW
Permanent Magnet	Surface mount 4 pole design, 6-phase	Surface mount 4 pole design, 12-phase
Motor dimensions	913 mm (Length) x 759 mm (Width) x 648 mm (Height)	1080 mm (Length) x 759 mm (Width) x 648 mm (Height)
Motor Mass	546 kg	687 kg
Nominal speed	17,319 rpm	16,314 rpm
Motor	Water cooling – 18 litre /min Pressure – 2-4 Bar (<1Bar differential) Rotor air – 50 g/s Pressure – 50 mbar	Water cooling – 36 litre /min Pressure – 2-4 Bar (<1Bar differential) Rotor air – 100 g/s Pressure – 50 mbar
Motor Phases	6	12
Nominal voltage	380 to 480 V (380V with optional auto-transformer)	
Over-speed capability	6%	
Efficiency	> 94% (at nominal speed and power)	
Control	Speed or Torque	
Safety functions	Overcurrent, Overvoltage, Over-speed, Over-temperature	
Insulation	Class H operated at Class F	
Coupling type	Hirth couplings at both ends	
Bearing type	Magnetic with double-acting thrust bearing	
Ingress Protection rating	IP 54	



VARIABLE FREQUENCY DRIVE (VFD)		
	500 kW	1 MW
Drive dimensions	2404 mm (L) x 779 mm (W) x 1644 mm (H)	4317 mm (L) x 779 mm (W) x 1644 mm (H)
Drive mass	1950 kg	3350 kg
Drive Power Rating	Ave ~ 287 kVA Peak ~ 516 kVA	Ave ~ 533 kVA Peak ~ 1041 kVA
Drive Supply THDi	7 %	2 %
Drive	Water cooling – 36 litre/min, Pressure – 2-4 bar (<1Bar differential)	Water cooling – 72 litre/min, Pressure – 2-4 bar (<1Bar differential)
Drive DC Link Voltage	650 V DC	
Drive Supply Power Factor	~ 0.95	
Drive Rated Motor Phase Current	Cyclic Operation 350 A	
Drive Overload Capability (% Sec)	1.05 x rated	
Drive Efficiency	96 %	
Drive Ambient Operating Temperature Range	-20 to +40 °C	
Enclosure Ingress Protection rating	IP 54	
Temperature	-40°C to +50°C	
Humidity	95% Relative Humidity	

Figure 3 – 500 kW Motor System cross-section layout

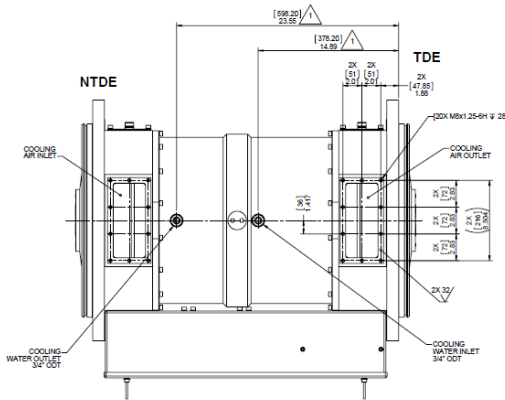
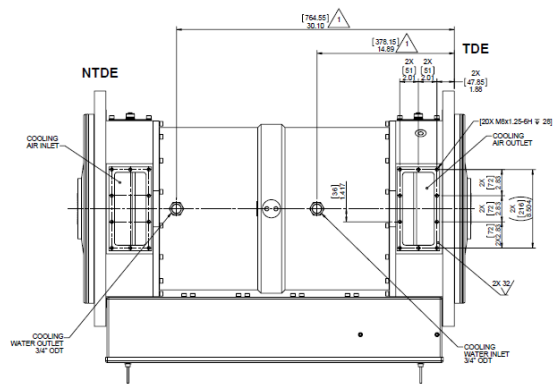


Figure 4 – 1 MW Motor System cross-section layout



TPS have the experience and capability to manufacture bespoke high performance permanent-magnet motors and drives to meet your challenging requirements in the air separation industry. With a proven track record of creating best in class high-speed machines, TPS utilise the latest in magnetic bearing technology to deliver frictionless, oil free and low vibration operation.

We will be happy to discuss your project or enquiries, please contact our marketing department at marketing@turbopowersystems.com to get in touch or ring us on +44 (0) 191 482 9288 / 9251 / 9278.



Turbo Power Systems Ltd

1 Queens Park | Queensway North | Team Valley Trading Estate | Gateshead | NE11 0QD | United Kingdom

T: +44 (0) 191 482 9200 | F: +44 (0) 191 482 9201

E: marketing@turbopowersystems.com | W: www.turbopowersystems.com