

# Air Products turbomachinery

## Dense fluid expanders



### Features

- High efficiency turbo expander directly mounted to an integral gearbox.
- Custom designed precision helical gearing manufactured to AGMA Q12 / DIN Class 5 standards
- Horizontally split gearbox
- Adjustable zero clearance inlet guide vanes
- Fully skidded accessory system incorporates the motor-generator
- Proven high speed and high load tilt pad bearings handle steady state and transient thrust loads
- Electric actuator provides precision control of inlet guide vanes over a wide operating range
- Wear resistant material and coatings
- Robust impeller attachment and torque transmission design for high reliability
- Flexible disk low speed coupling for long life
- Motor mode start to eliminate potential for over-speed
- No lengthy pre-operational cool down procedures required

### Experience is the difference

Air Products has been building reliable and efficient turbomachinery for over 70 years to meet growing market demands and customer requirements. We have built over 1,600 expanders and compressors and have more than 1,100 units operating worldwide. No matter what your application for turbomachinery requirements, Air Products has the experience, technology, and solutions to meet your needs.

Our dense fluid expanders (DFE) deliver significant plant operating power savings in air separation and liquefaction plants by providing refrigeration and electrical power recovery. The DFE expands cryogenic liquid to extract energy from the process that can be converted into electricity or can be dissipated. Operability and maintainability have been optimized in our equipment design. Power recovery is achieved by directly mounting the expander on a gearbox and loading it with an electric generator. The DFE is also available in an oil loaded dissipative configuration for a lower cost alternative.

### Dense Fluid Turbo Expander Specifications

Nominal Unit Capacity	50 to 450 am <sup>3</sup> /hr
Pressure	53 to 84 barg
Inlet Expander Temperature	Down to -185°C
Refrigeration Power	Up to 800 kW
Expander Efficiency	Up to 88%
Expander Pressure Ratio	Up to 16:1
Speed	Up to 28,000 rpm
Fluids	Air            Oxygen Nitrogen    Hydrocarbons
Hazardous Area Design	Comply with NEC & IEC
Quality Assurance	ISO 9001 certified since 1997

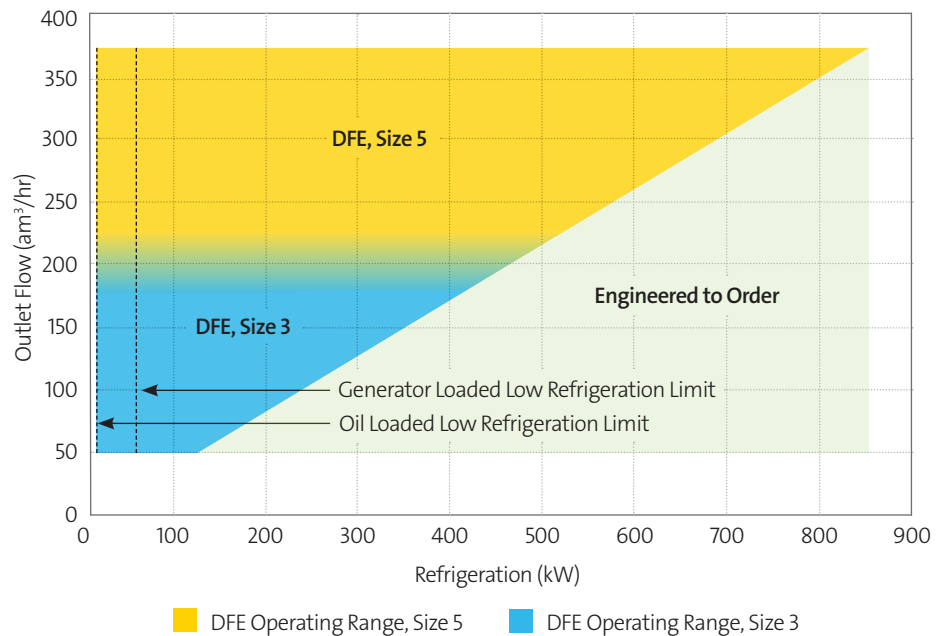
## Benefits

- Broad equipment operating ranges
- Equipment performance is consistently among the leaders in our industry
- Helical gearing design provide a long service life, with low vibration and low noise levels
- Expander/gearbox mounting configuration eliminates the need for high speed couplings and additional high speed bearings
- Adjustable guide vanes result in accurate flow and high efficiency
- Split gearbox design provides easy access to gears and bearings
- Equipment aerodynamically optimized for the customer's process
- Simplified motor mode startup and shutdown sequence allows for smooth machine operation

## Turbomachinery options

- Low cost energy-dissipating dense fluid expander option available
- Expander and gearbox spare assembly
- International code compliance
- API compliance
- Safe area or hazardous area location packages
- 50Hz or 60Hz
- Medium/low voltage motor options
- Package control system
- Purged enclosure
- Inlet strainers
- Inlet trip valve

## Product Operating Range



Engineered to order for higher flows and powers. This represents an overview of Air Products' turbomachinery capabilities. If your needs fall outside of these application ranges, please call for additional information.

For more information, please contact us at:

### Corporate Headquarters

Air Products and Chemicals, Inc.  
7201 Hamilton Boulevard  
Allentown, PA 18195-1501  
T 610-481-4911  
F 610-481-5900  
cpsinfo@airproducts.com

Air Products Asia, Inc.  
2 International Business Park  
#03-32 The Strategy  
Singapore 609930  
T +65-6494-2240  
F +65-6334-1005

### Regional Head Offices

Air Products PLC  
Hersham Place Technology Park  
Molesey Road  
Walton-on-Thames  
Surrey KT12 4RZ  
UK  
T +44-1932-249200  
F +44-1932-249565  
cpseurop@airproducts.com

Air Products and Chemicals (China)  
Investment Co. Ltd.  
East Wing, Floor 1  
Building #88, Lane 887  
Zu Chongzhi Road  
Zhangjiang Hi-Tech Park  
Shanghai, 201203  
P.R. China  
T +86-21-38962000  
F +86-21-50803191



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airproducts.com/cps