

PROCESS SYSTEMS

# Refrigeration and Gas Compression Drivelines



 **YORK**<sup>®</sup>

PROCESS SYSTEMS

## PROCESS SYSTEMS

# Worldwide leader in refrigeration and gas compression

### Performance counts

We are the leading manufacturer of refrigeration and gas compression systems worldwide.

With our unmatched application experience, you can depend on York® Process Systems, whether you require closed-cycle refrigeration or open-cycle gas compression.

For over a century, our equipment has run some of the most complicated processes in the most demanding industries.

Today, more than 8,000 of our packaged process systems and 17,500 of our drivelines are in operation around the world.



### We offer the largest range of screw compressors and centrifugal compressors in the world

With Frick® screw compressor models ranging in size from 72 CFM to 8,212 CFM, and York® multistage centrifugal compressor models ranging from 400 CFM to 26,000 CFM, York® Process Systems has the industry's largest fleet of available compressor driveline products to meet your refrigeration or gas compression needs. Whatever your application, we have the best-fitting compressor, from space-saving to energy-saving. Our advanced technology and conformance to API standards bring exceptional compressor reliability and efficiency, along with 150 years of industry-leading experience.

#### Markets We Serve:



Chemical & Petrochemical



Climate Test Chambers



Oil & Gas Processing



Industrial Gases



Pharmaceutical



Power Generation



Energy-Carbon Capture & Sequestration



Oil & Gas Transportation & Storage



## A world of experience

Engineering, equipment and service to handle the toughest applications



The **Frick® Screw Compressor** product line is engineered and manufactured to meet your heavy industrial refrigeration and gas compression requirements in accordance with API 619 standards. It is designed to assure reliability, accessibility and ease of service with over 14,500 in service. In addition, its advanced energy-saving features reduce operating costs significantly.

### Frick® Screw Compressors

- 72 to 8,212 CFM (122 to 13,952 m<sup>3</sup>/hr)
- Up to 6,000 hp (4,474kW)
- Electric motor, gas engine, steam turbine drive
- Slide valve for efficient capacity control
- Variable volume ratio (Vi) eliminates over/under compression
- Open-cycle gas compression and closed-cycle refrigeration service
- Hydrocarbons, natural gas, CO<sub>2</sub>, hydrogen, halocarbons, mixed gases, ammonia and others
- Designed in conformance with API 619

### Optional Features For Highly Critical Gas-Processing Applications

- Accelerometers for bearing monitoring
- Cast steel casings
- Sour gas bearing packages
- Tandem seals (wet inboard seals and dry-running outboard seals)
- High-efficiency oil removal systems



The **York® M TurboMaster** multistage centrifugal compressor is designed for heavy industrial use and has proven itself in over 3,000 demanding gas compression and refrigeration applications worldwide in the chemical, petrochemical, hydrocarbon processing and refining industries.

### The York® M TurboMaster Centrifugal Compressor

- Up to 26,000 ACFM (44,174 m<sup>3</sup>/hr)
- Up to 15,000 hp (11,185 kW)
- Over 3,000 in operation in process applications
- 800+ on hydrocarbon service
- 300+ gas turbine driven
- Onshore and offshore
- Built by York® for 50 years
- Open-cycle gas compression and closed-cycle refrigeration service
- Hydrocarbons, natural gas, CO<sub>2</sub>, hydrogen, halocarbons, mixed gases, ammonia and others

### Features

- Rugged between-the-bearings design
- One to eight stages
- Cast iron, nodular iron, cast steel casings
- Aluminum or stainless steel impellers
- Prerotation vanes for capacity control
- Modular lube systems

## PROCESS SYSTEMS

# Drivelines with Frick® screw compressors

Rotary screw compressor units are engineered and manufactured to meet the exacting requirements of the industrial refrigeration and gas compression markets, in accordance with API 619. All components have been designed and arranged to ensure reliability, accessibility and ease of service.

### Screw compressor technology – fewer moving parts and simple rotary motion mean:

- Less maintenance
- Lower noise and vibration levels
- Lower total repair costs

**Compressor:** The Frick® compressor has been designed around the latest technology to offer the most reliable and energy-efficient unit currently available. All screw compressor casings are designed and tested in accordance with the requirements of API 619 and ASHRAE 15 safety code. The rotors are manufactured from forged steel and use the latest asymmetric profiles.

**Capacity Control:** Capacity control is achieved by use of a slide valve, which provides fully modulating capacity control from 100% to approximately 15% of full load.

**Variable Volume Ratio Control:** The compressor includes a patented method of varying the internal volume ratio to match the system pressure ratio, eliminating the power penalty associated with overcompression or undercompression.

**Lubrication System:** The compressor is designed specifically for operation without an oil pump. All oil required for main oil injection and lubrication is provided by positive gas differential pressure.



Available in both vertical and horizontal orientations to meet specific design requirements.



**SuperFilter™II:** Efficient oil management leads to longer bearing life. SuperFilter™II makes oil cleaner than new. It captures 99% of particles 5 microns and larger.

**Dual Oil Filters:** Serviceability is serious business. Mount a second oil filter on your Frick® compressor package to ensure continuous operation during service of the primary filter. Isolation valves are included.

**External Oil Cooling:** Eliminate capacity and power penalties by using Frick® thermosyphon or water-cooled oil coolers. Both use the latest technology in plate design and are constructed according to ASME Section VIII, Division I. Air-cooled oil cooling is also available.

**Easy to Service:** Frick® keeps the service technician in mind. All critical package components for service and maintenance are easy to reach and are located on the same side of the package.





## Frick® screw compressors are designed and manufactured with antifriction roller bearings



### Save energy

Antifriction roller bearings in a screw compressor use less horsepower. For example: 300-hp Frick® screw compressor with antifriction roller bearings will consume 11 fewer horsepower than a conventional screw compressor using sleeve bearings.

### No oil pumps

Frick® screw compressors with antifriction roller bearings do not require oil pumps, as opposed to conventional screw compressors that use sleeve bearings.

### Higher efficiency

Antifriction roller bearings operate with tighter tolerances than conventional sleeve bearings. Frick® screw compressors with antifriction roller bearings have significantly tighter tolerances, resulting in superior efficiency.



## 408 Model Compressor

- Capacity up to 8,212 CFM
- Housings available in ductile iron and cast steel
- Frick® high-efficiency rotor design
- ANSI flange connections
- Variable capacity control from 100% down to 15%
- Volume ratio control, standard
- Roller-type radial and thrust bearings
- Available with sleeve-type radial bearings and tilting pad thrust bearings
- Externally accessible proximity probes and bearing RTDs
- Compliant with API 619 standards

Frick® is leading the industry in screw compressor development and our 408 mm compressor is the latest example!

# Typical screw compressor drivelines



Ammonia production, Europe



Chlorine liquefaction, Brazil



NGL plant, U.S.



Vapor recovery, Peru



Chlorine liquefaction, Brazil



Prime cooling, U.S.



Gas processing, Russia



Polysilicon production, China



General plant refrigeration, Southeast Asia



Steam turbine-driven driveline, Indonesia



# Typical multistage centrifugal drivelines



Gas processing, Trinidad



Bolt-up base to gas turbine drive, offshore platform, Malaysia



District cooling, U.S.



Distillation column heat pump, U.S.



Gas processing, U.S.



LNG peak shaving, U.S.



Propane refrigeration, Middle East



Propylene refrigeration, China

## Drivelines with York® centrifugal compressors



4,000-hp driveline in gas-processing application

Since 1955, York® has been the leader in building and supplying heavy-duty centrifugal compressors. We can provide one to eight stages of compression, in capacities from 400 to 26,000 ACFM, with 200 to 15,000 horsepower.

All compressors are built with a complete, self-contained, factory-tested control system and lubrication system. The driver can be an electric motor, gas turbine, steam turbine or reciprocating engine. York® compressors can be used in twin and tandem arrangements.

Hydrocarbons, halocarbons, process gases, air, ammonia, CO<sub>2</sub> and other gases can be compressed for applications including gas gathering, gas lift, hydrocarbon refrigeration, fuel gas compression, residue gas recompression, recycle gas and overhead compression in distillation and fractionation processes.

More than 3,000 York® compressors are in operation both onshore and offshore.



Steam Turbine Driving M Compressor





## York® TurboMaster compressors proven in action

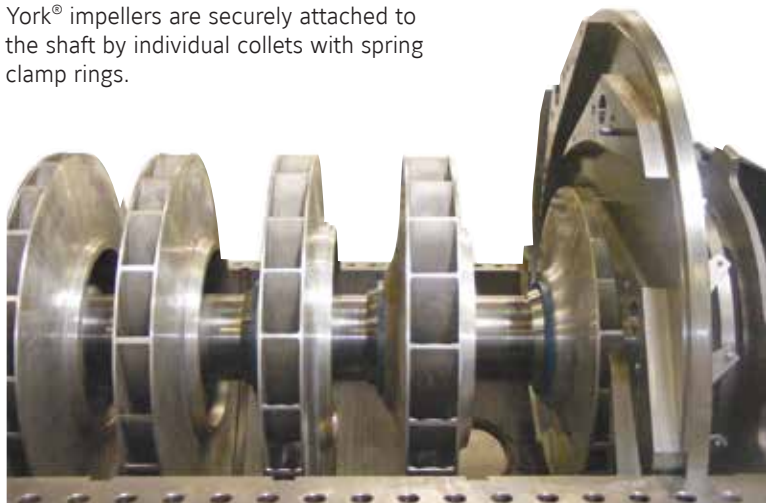


### Designed for 24-hour-a-day service to meet the demands of continuous production

York® TurboMaster “M” compressors are designed and built to deliver continuous service, hour after hour, day after day, year after year. They are centrifugal-type compressors, which means:

- Fewer moving parts; fewer wearing parts
- No valves, pistons, rings, connecting rods, wrist pins or similar parts that wear out and often create problems
- Impellers revolve on a common shaft to produce the required compression – a simple trouble-free mechanism

York® impellers are securely attached to the shaft by individual collets with spring clamp rings.



### Up to eight stages in one casing

York® multistage TurboMaster compressors are available with one to eight impellers in a single casing.

### Compact, lightweight design

York® engineering has designed an extremely compact machine. Lighter-weight, too!

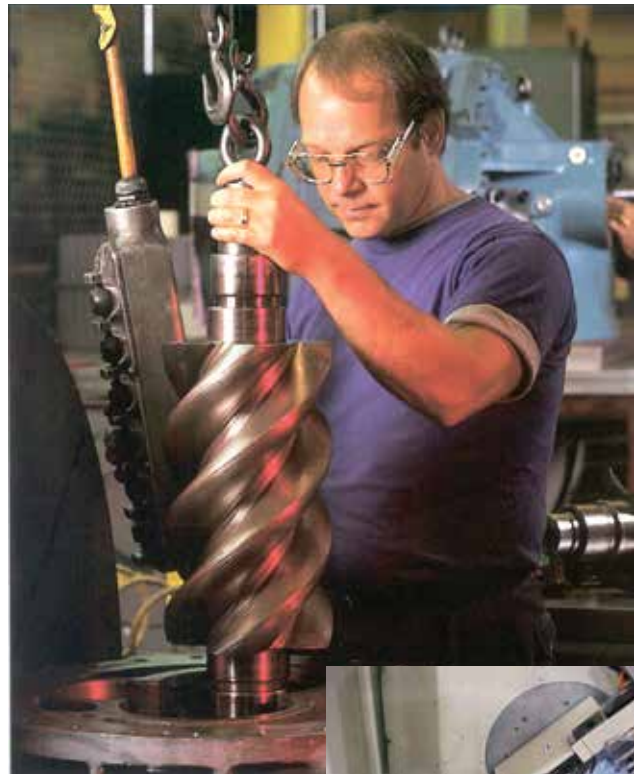
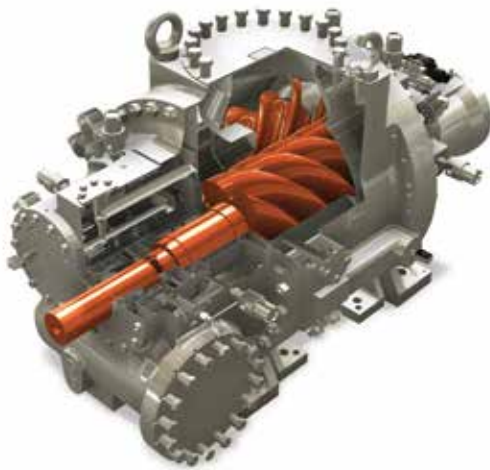
With a host of built-in performance and durability features, and with a wide choice of materials for seals, casings and impellers, the York® TurboMaster is tailored to your requirements, yet gives you the benefit of a standard product.

## PROCESS SYSTEMS

# 100 years of compressor manufacturing experience

We manufacture all our screw compressors in Waynesboro, PA, and all our multistage centrifugal compressors in York, PA. Both machines are designed and built by our company, including machining of housings and parts. Final assembly occurs under clean, temperature-controlled conditions.

They are high-speed precision rotor-cut and finished. Automated centers maintain the close tolerances required for maximum compressor efficiency and reliability.



Designed for durability. Built with precision.



## Control versatility



15" Touchscreen

### The Quantum™ HD Control Panel

The Quantum™ HD Control Panel is the easiest-to-use yet most powerful controller available today.

- On-screen calibration of all analog devices (input & output)
- Ethernet and Serial communications, including Allen-Bradley and Modbus protocols
- Real Time and Historical Trending
- Compressor sequencing (three suction levels with up to eight compressors per level).
- Condenser step control featuring VFD and floating-head pressure control).
- Field programmable digital output control (based on analog value).
- Field programmable digital and analog inputs (monitoring-only or monitoring with high and low value safeties).
- Compressor and motor bearing vibration monitoring
- Motor bearing and winding temperature monitoring.
- Eight field programmable Proportional and Integral control loops (modulating control based on analog input value).
- Field programmable Retransmitting Outputs (retransmits an analog input value to an external device)
- Field programmable analog input signal and range (ICTD, 0/4-20mA, 0/1-5vdc, Potentiometer, 0/2-10vdc)



### PhD™ Vibration Monitoring System

The PhD™ Vibration Monitoring System is specifically developed for screw compressors with antifriction bearings.

- Continuous onboard vibration monitoring system to detect the early stages of compressor bearing failure
- Accelerometers mounted over the bearing positions on both ends of the compressor
- Also effective for antifriction bearing motors (both accelerometers and bearing RTDs)
- Motor winding temperature can also be monitored on motors with embedded winding RTDs
- Output signals fed directly to the Quantum™ HD for monitoring pre-alarm and shutdown



### Custom PLC Panels

We design and build PLC panels for both centrifugal and screw compressor systems

- Custom-designed for the specific project requirements
- A typical architecture uses Allen-Bradley ControlLogix, SLC500 or PLC5 Series PLC and hardware (other manufacturers available)
- Available unit mounted or freestanding in carbon steel, stainless steel or fiberglass enclosures.



# Global Manufacturing Locations



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Rock solid reliability™



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