Nitrogen generation for the aerospace industry

Parker

ENGINEERING YOUR SUCCESS.

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Filtration, purification and separation is our business

Parker is a world leader in the filtration, purification and separation of compressed air and gases.

Parker specialises in purification and separation technologies where compressed air and gas purity, product quality, technological excellence and global support are paramount. It designs and manufactures compressed air treatment products, gas generators and ancillary equipment for many key industries where safety, ease of integration, low cost of ownership and energy savings can make a real difference.

Nitrogen Gas Generation

Parker manufactures both hollow-fibre membrane and Pressure Swing Adsorption (PSA) nitrogen gas generationtechnologies.

Nitrogen gas is used extensively for tyre inflation and inert gas suppression within both civilian and military aircraft.

Unlike compressed air that contains over 20% oxygen, nitrogen is mostly inert and will not support combustion.

Because nitrogen is also a relatively “slow” gas, it doesn’t permeate as readily through materials such as rubber tyre walls. This means that tyres inflated with nitrogen maintain their correct pressure for longer, throughout the extreme ranges of ambient temperature and pressure experienced on take-off, landing and cruising altitude.

Other related applications include aircraft oleo strut maintenance (nitrogen prevents oil ‘dieseling’ under heavy compression) and aircraft escape slide inflation systems.

Nitrogen is also widely used as an inerting gas for fuel tank vapours and other flammable or explosive compounds.

A dedicated solution for aviation applications where safety is a major issue

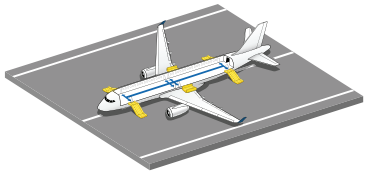
Parker offers a dedicated range of nitrogen gas generation solutions for civil and military aviation applications.

Aircraft Tyre Inflation

Tyres are generally inflated with nitrogen gas to prevent gradual deflation caused by oxygen permeating through the tyre wall and also, to reduce the risk of fire. Undercarriage and tyre manufacturing/maintenance facilities also use nitrogen gas.

Oleo Strut Shock Absorbers

Undercarriage oleo struts are basically oil/compressed gas shock absorber springs which are required to damp aircraft landing loads. Nitrogen is the inert choice for the gaseous component of the spring, as unlike compressed air, it will not promote oil 'dieseling' under compression.

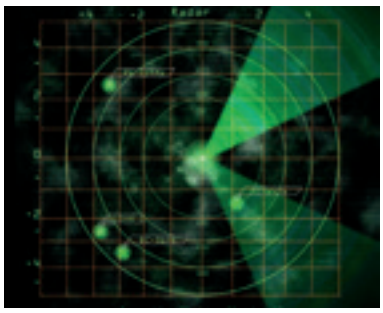


Escape Slide Inflation Systems

For inflation systems, escape slides and life-rafts use nitrogen gas due to its inert, non-explosive properties.

Fuel Tank Inerting Systems

Fuel tank inerting is an industry-recognised solution that significantly decreases the risk of flammability in aircraft fuel tanks. The Parker Aerospace Fluid Systems Division uses the patented technology of Parker's Filtration Separation Division to deliver nitrogen-enriched air to fuel tanks, providing a much safer, inert gaseous environment.

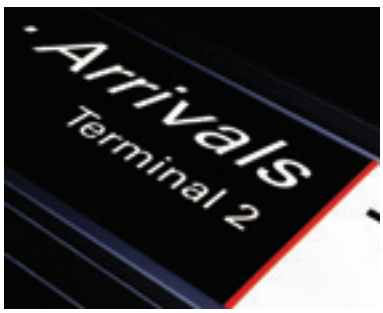













Arrivals
Terminal 2



Aircraft tyre inflation

Many regulatory agencies require the use of nitrogen when inflating tyres.

Nitrogen provides a stable, inert inflation gas, whilst also eliminating the introduction of moisture into the tyre cavity. Nitrogen will not sustain combustion and limits degradation of the tyre material and oxidation of the wheel assemblies.

The majority of in-flight tyre bursts have been attributed to the tyres being weakened by foreign object damage or scuffing, creating a rapid release of pressure. Such failures are usually experienced after the undercarriage has been retracted for some time combining the effects of brake heat transfer, internal tyre temperature and differential pressure.

It is also possible for a tyre to fail explosively during flight without any significant prior degradation. A tyre inflated with air when subjected to excessive heating, can trigger a chemical reaction resulting in the release of volatile gases.

This chemical reaction in the presence of the oxygen may result in an in-flight fire or an explosive tyre decompression in the landing gear bay. This is due to the fact that conventional pressure relief devices are unable to respond adequately to rapid increases in gas pressure and temperature which can occur with auto-ignition.

Testing shows that the risk of auto-ignition can be reduced by using an inert gas for tyre inflation during servicing.

Using nitrogen can deliver other potential benefits as it will tend to reduce wheel corrosion, tyre fatigue and the risk of fire from fusible plugs melting due to brakes overheating.

Nitrogen is used both airside during aircraft turnaround as well as in the wheel and brake shop during maintenance overhaul.

Parker NITROSource PSA with 300barg nitrogen booster system for portable nitrogen cart cylinder filling, within airline maintenance bay

Oleo strut maintenance

An oleo strut, is a hydraulic device used as a shock absorber in the landing gear of aircraft, consisting of an oil-filled cylinder fitted with a hollow, perforated piston into which oil is slowly forced when a compressive force is applied to the landing gear.

Many shock absorbers contain compressed nitrogen which optimises the damping efficiency of the undercarriage.

So much heat is produced in the oleo strut on landing a large aircraft, that if oxygen was present, it could cause 'dieseling' of the hydraulic oil under extreme temperature and pressure.

There are other benefits of using nitrogen, firstly, it is a clean, dry gas, so there is no moisture to cause corrosion. Secondly, any possibility of nitrogen permeation through seals is reduced when compared to air containing 21% oxygen.

Therefore, nitrogen is the effective choice of compressed gas used in oleo struts and the refilling of the gas is an essential part of the maintenance process.

Escape slide inflation systems

For inflation systems, escape slides and life-rafts use nitrogen gas due to its inert, non-explosive properties.

The FAA requires evacuation of the entire aircraft in 90 seconds using 50% of the available evacuation exits. The inflation system usually consists of a pressurised cylinder, a regulating valve, two high pressure hoses and two aspirators. The cylinder can be from 100 to about 1000 cubic inches, filled to about 3000 psi with either gaseous nitrogen, or a mixture of gaseous CO_2 and nitrogen. CO_2 is used to slow down the rate at which the valve expends the gases.

Fuel tank inerting systems

Parker fuel tank inerting systems use nitrogen to reduce the risk of flammability.

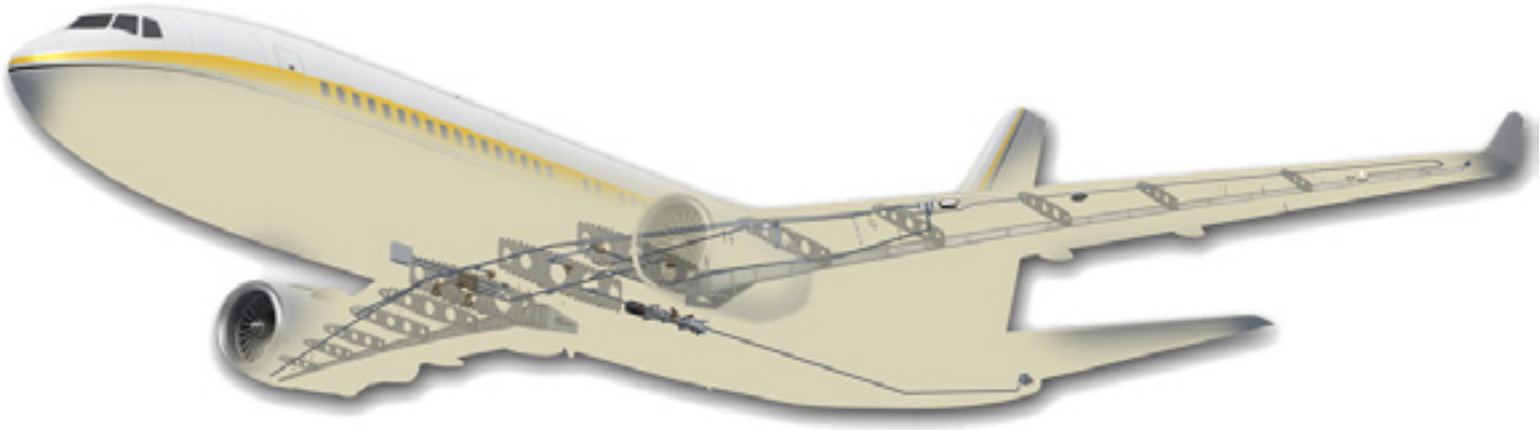
Fuel tank inerting is an industry-recognised solution that significantly decreases the risk of flammability in aircraft fuel tanks. The Parker Aerospace Fluid Systems Division uses the patented technology of Parker's Filtration Separation Division to deliver nitrogen-enriched air to fuel tanks, providing a much safer, inert gaseous environment.

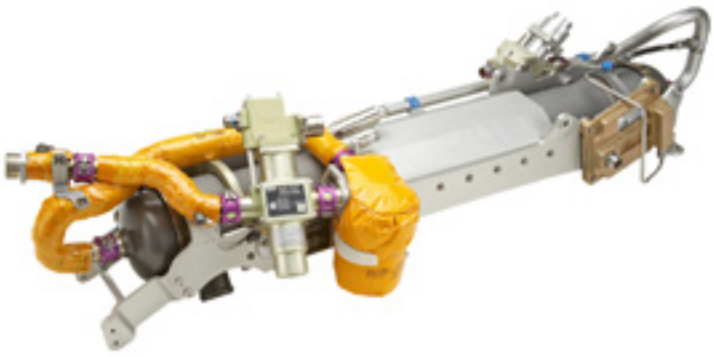
Permeable membrane bundles remove oxygen from air, producing nitrogen-enriched air that is much less combustible in aircraft fuel tanks. Designed into most new commercial aircraft being built in the Western world, Parker's fuel tank inerting systems are also being added to much of the existing global fleet, for enhanced safety.

Four decades of experience

The world leader in fuel tank inerting systems, Parker aerospace has more than 45 years of flight-proven inerting experience in both military and commercial aircraft applications. No other aerospace company can offer either the depth or breadth of Parker's proven inerting and fuel system pedigree. The company's unmatched expertise in the design, manufacture, integration, and support of fuel systems enables Parker to bring fuel tank inerting systems to market quickly and cost effectively. By approaching fuel tank inerting from a fuel system perspective, Parker has developed extensive analytical and test capabilities and integrated system solutions.

It is the kind of expertise that makes Parker a low-risk, high-value partner.





A Parker air separation pallet sub-assembly is used on a large commercial transport aircraft.

The benefits of generating your own nitrogen

Nitrogen gas is an essential part of aircraft maintenance, operation and turnaround.

Parker is a world leader in filtration, purification and separation technologies and is universally known for developing high quality products, technical innovation and partnerships with customers.

It is a major supplier to a number of the world's leading airlines and ground support companies who rely on its global experience and support and already realise the benefits of on-site gas generation.

Nitrogen Purity

Parker nitrogen systems deliver the purity and pressure your aviation operation needs. Minimum purity limits for nitrogen gas in the aviation industry are specified under Federal Specification (A-A-59503A TYPE 1 GRADE A or B). Additionally, major airlines and tyre manufacturers also stipulate other critical specifications.

The system is designed to exceed these specifications and to provide a consistent high purity gas on demand.

The system design also allows for data capture of gas purity for future traceability.

Energy saving technology

Parker NITROSource PSA nitrogen gas generators are equipped with innovative energy saving technology to match inlet air consumption with nitrogen output demand. This energy saving technology, (EST), ensures that regardless of your nitrogen flow profile, the amount of compressed air consumed will be reduced to the absolute minimum. This minimises electricity usage and hence overall carbon dioxide emissions.

Maximum uptime and gas availability

The reliability and simplicity designed into Parker nitrogen gas generators ensures that they have only minimal needs for servicing and maintenance; generally, just a few hours per annum.

This means that nitrogen gas will always be available to keep aircraft in the air and not stuck on the ground while awaiting deliveries and refills of cylinders and liquid supplies of nitrogen.

Convenient Supply

With the Parker nitrogen systems, nitrogen is available on demand, 24 hours a day, eliminating the risks from gas running out. In addition, as gas is produced airside, it eliminates any security concerns relating to moving cylinders on and off the airfield through security.

Costs

The cost of generating your own gas airside can be up to 90% less than the on-going purchase of cylinder gas with the elimination of rental, re-fill, delivery, handling and order processing costs.

Time

By generating your own gas, you can save time and money by removing the need for handling cylinders on and off airfield through security which can be very labour intensive and time consuming. Spent cylinders are simply returned to the filling station for re-fill.

Flexible

The unique modular gas generator design means that your system can be easily expanded as future airfield nitrogen requirements increase.


N2 NITROSource
COMPACT PSA NITROGEN GENERATOR
N2 NITROSource
PSA NITROGEN GAS GENERATOR
SMARTFLUXX
SMARTFLUXX

Pressure Swing Adsorption (PSA) and Membrane technologies

Parker manufactures both PSA (pressure swing adsorption), and hollow-fibre membrane nitrogen gas generation technologies.

PSA nitrogen generators

The Parker NITROSource and NITROSource Compact ranges, use a principle known as Pressure Swing Adsorption (PSA) to produce a continuous stream of nitrogen from compressed air.

The modular gas generator consists of pairs of extruded aluminium columns, which are filled with carbon molecular sieve (CMS). Pre-treated compressed air is fed into the bottom of the 'on-line' column and flows up through the CMS, which preferentially adsorbs (captures) oxygen and other trace gases, but allows nitrogen to pass through. After a pre-set time, the on-line column automatically switches to the regenerative mode, venting contaminants from the CMS and allowing the process to begin again.

Whilst using CMS for air separation is not a new idea, the radical design and control system employed on the Parker nitrogen generators has maximised gas output and reduced compressed air consumption to achieve even higher levels of efficiency than previously possible.

Membrane nitrogen generators

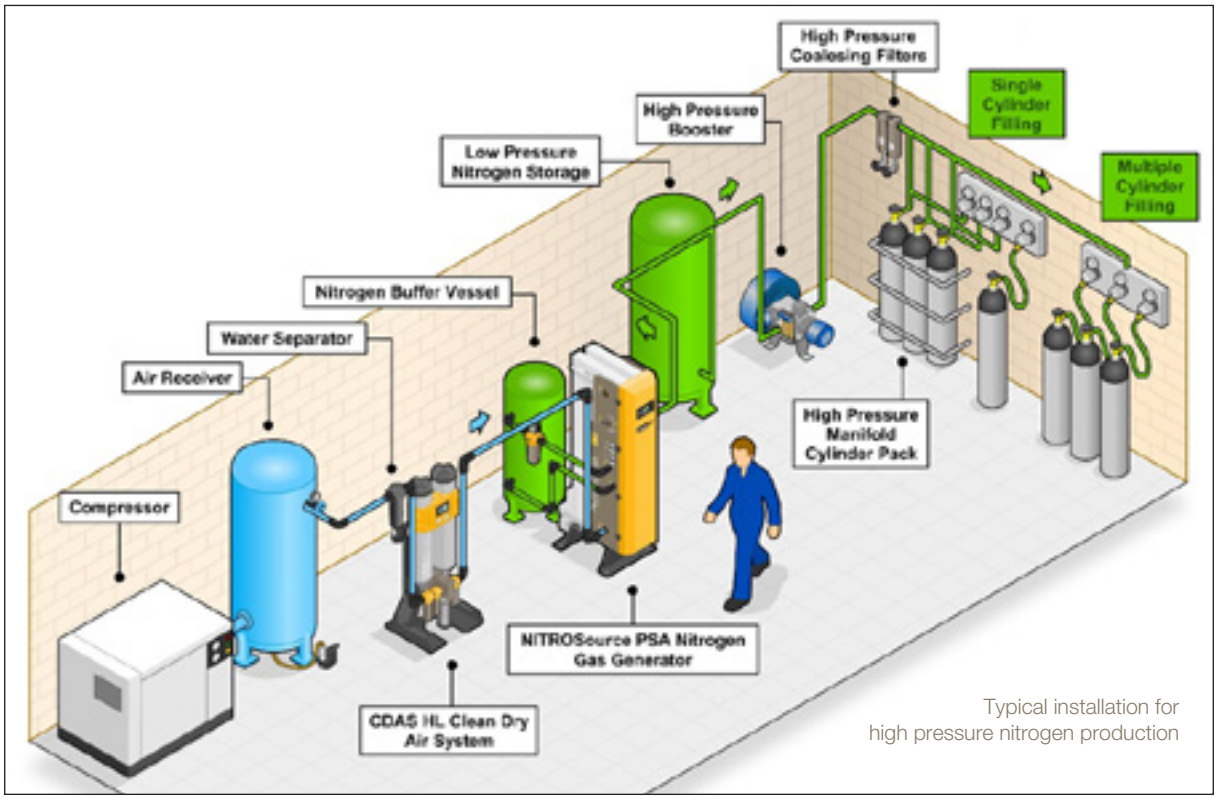
SMARTfluxx and HIGHfluxx modules use hollow-fibre membrane technology to selectively separate the component gases within air. The generator comprises tubes containing bundles of hollow-fibres, each approx 0.5mm diameter. Air is fed through the centre of the membrane fibres where medium to fast gases such as oxygen, carbon dioxide and water vapour dissipate through the wall of the fibre and are vented to atmosphere. Nitrogen gas is retained within the fibre and is fed through to the application. The Parker membrane is extremely robust, highly permeable and durable, ensuring a very long trouble-free service life with low cost of ownership.

Carbon molecular sieve

Bundle of hollow-fibre membranes

Typical high pressure PSA system (40-350 bar g)

Parker nitrogen gas generation systems are designed to deliver high purity, high pressure nitrogen gas, eliminating the need for delivery of costly, high pressure cylinders. Packages can be either skid mounted or free standing depending on local requirements.



Typical installation for high pressure nitrogen production

How it works

Nitrogen gas is used in a number of ground support operations and for logistics purposes it is stored and transported in high pressure cylinders.

Commonly, cylinder gas is brought into the airfield from outside, however this is costly, labour intensive and can raise security and safety concerns.

The high pressure nitrogen package can be skid mounted or free standing. It will generate nitrogen gas from compressed air, which can then be stored or used directly in ground support or maintenance operations.

Compressed air is purified using Parker dryers and filters to ensure the highest quality compressed air supply. The nitrogen generator removes the oxygen from the compressed air supply to produce a consistent high purity low pressure nitrogen gas. The gas is then boosted to its working pressure using a high pressure booster. Final filtration follows before storage in high pressure receivers. The system can be designed for small or large airfield operation, can operate 24/7 and the modular concept allows for future gas generator expansion.

NITROSource

PSA Nitrogen Generators

Advanced on-site nitrogen generation technology delivering lowest cost, energy efficient nitrogen gas on demand.

ON-SITE NITROGEN GAS GENERATION

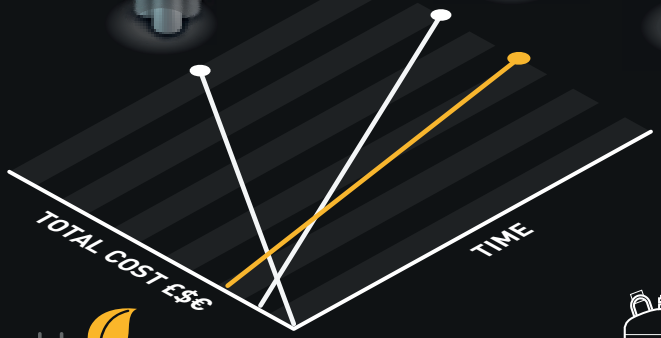
UP TO 90% COST SAVINGS

Typical capital payback is achievable in 12-24 months.

CYLINDERS
Low initial cost but high on-going cost

LIQUID N2 MINI TANKS
Higher initial cost but lower on-going cost

NITROGEN GAS GENETRATORS
Highest initial cost but lowest on-going gas cost



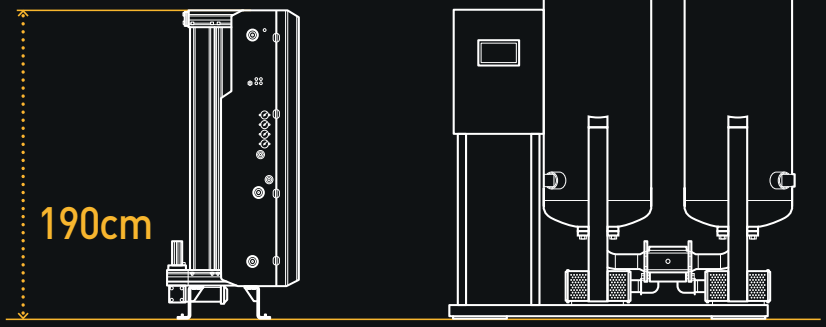
ENERGY SAVING

Low energy consumption, reduces environmental impact and saves on operational costs.

MODULAR CONSTRUCTION

60%

the size and weight of more conventional designs.



THE TRUE COST OF TRADITIONAL GAS SUPPLY

Based on approximately 10m³ / hour for 4000 hours / year using cylinders or manifold cylinder packs.

100 HOURS of order administration

800 TONNES of metal to be distributed by road

100 HOURS receiving, checking & moving cylinders

2500 delivery truck miles travelled

4500 compressed gas cylinders

3.5 TONNES of CO_2 emitted delivering gas

10% returned unused

Parker's Motion & Control Technologies

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 00800 27 27 5374.

AEROSPACE

Key Markets
- Aircraft engines
- Business & general aviation
- Commercial transports
- Land-based weapons systems
- Military aircraft
- Missiles & launch vehicles
- Regional transports
- Unmanned aerial vehicles

Key Products
- Flight control systems & components
- Fluid conveyance systems
- Fluid metering delivery & atomization devices
- Fuel systems & components
- Hydraulic systems & components
- Inert nitrogen generating systems
- Pneumatic systems & components
- Wheels & brakes

CLIMATE CONTROL

Key Markets
- Agriculture
- Air conditioning
- Food, beverage & dairy
- Life sciences & medical
- Precision cooling
- Processing
- Transportation

Key Products
- CO2 controls
- Electronic controllers
- Filter driers
- Hand shut-off valves
- Hose & fittings
- Pressure regulating valves
- Refrigerant distributors
- Safety relief valves
- Solenoid valves
- Thermostatic expansion valves

ELECTROMECHANICAL

Key Markets
- Aerospace
- Factory automation
- Food & beverage
- Life science & medical
- Machine tools
- Packaging machinery
- Paper machinery
- Plastics machinery & converting
- Primary metals
- Semiconductor & electronics
- Textile
- Wire & cable

Key Products
- AC/DC drives & systems
- Electric actuators
- Controllers
- Gantry robots
- Gearheads
- Human machine interfaces
- Industrial PCs
- Inverters
- Linear motors, slides and stages
- Precision stages
- Stepper motors
- Servo motors, drives & controls
- Structural extrusions

FILTRATION

Key Markets
- Food & beverage
- Industrial machinery
- Life sciences
- Marine
- Mobile equipment
- Oil & gas
- Power generation
- Process
- Transportation

Key Products
- Analytical gas generators
- Compressed air & gas filters
- Condition monitoring
- Engine air, fuel & oil filtration & systems
- Hydraulic, lubrication & coolant filters
- Process, chemical, water & microfiltration filters
- Nitrogen, hydrogen & zero air generators

FLUID & GAS HANDLING

Key Markets
- Aerospace
- Agriculture
- Bulk chemical handling
- Construction machinery
- Food & beverage
- Fuel & gas delivery
- Industrial machinery
- Mobile
- Oil & gas
- Transportation
- Welding

Key Products
- Brass fittings & valves
- Diagnostic equipment
- Fluid conveyance systems
- Industrial hose
- PTFE & PFA hose, tubing & plastic fittings
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects

HYDRAULICS

Key Markets
- Aerospace
- Aerial lift
- Agriculture
- Construction machinery
- Forestry
- Industrial machinery
- Mining
- Oil & gas
- Power generation & energy
- Truck hydraulics

Key Products
- Diagnostic equipment
- Hydraulic cylinders & accumulators
- Hydraulic motors & pumps
- Hydraulic systems
- Hydraulic valves & controls
- Power take-offs
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects

PNEUMATICS

Key Markets
- Aerospace
- Conveyor & material handling
- Factory automation
- Food & beverage
- Life science & medical
- Machine tools
- Packaging machinery
- Transportation & automotive

Key Products
- Air preparation
- Compact cylinders
- Field bus valve systems
- Grippers
- Guided cylinders
- Manifolds
- Miniature fluidics
- Pneumatic accessories
- Pneumatic actuators & grippers
- Pneumatic valves and controls
- Rodless cylinders
- Rotary actuators
- Tie rod cylinders
- Vacuum generators, cups & sensors

PROCESS CONTROL

Key Markets
- Chemical & refining
- Food, beverage & dairy
- Medical & dental
- Microelectronics
- Oil & gas
- Power generation

Key Products
- Analytical sample conditioning products & systems
- Fluoropolymer chemical delivery fittings, valves & pumps
- High purity gas delivery fittings, valves & regulators
- Instrumentation fittings, valves & regulators
- Medium pressure fittings & valves
- Process control manifolds

SEALING & SHIELDING

Key Markets
- Aerospace
- Chemical processing
- Consumer
- Energy, oil & gas
- Fluid power
- General industrial
- Information technology
- Life sciences
- Military
- Semiconductor
- Telecommunications
- Transportation

Key Products
- Dynamic seals
- Elastomeric o-rings
- EMI shielding
- Extruded & precision-cut, fabricated elastomeric seals
- Homogeneous & inserted elastomeric shapes
- High temperature metal seals
- Metal & plastic retained composite seals
- Thermal management

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