



aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



Parker Nitrogen Generation Systems

for the Oil and Gas Industry



Bulletin N2OG08

ENGINEERING YOUR SUCCESS.

The Parker Difference...

We grow with our customers, everywhere, around the world, creating application-focused products and system solutions.

A Fortune 500 corporation listed on the New York Stock Exchange, Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service.

Parker's geographic expansion is customer-driven. Parker has grown globally by following its customers and establishing operations, sales and service worldwide. No single competitor matches Parker's global presence, which includes:

10	Billion Sales
8	Groups
118	Divisions
250	Plants
3,100	Product Lines
1,200	Markets
8,600	Distributors
57,000	Employees
390,000	Customers

At Parker's Filtration and Separation Division, our mission is to provide you with premier customer service and high quality product solutions that ensure the quality of your products and operations, and save you downtime.

For over 30 years, our hallmark has been innovative technology and product reliability. Our Sales Professionals take the time to understand your needs to provide you with the most cost effective solutions to keep your operations running smoothly and efficiently.

Through an initiative called "Voice of the Customer", our Application Engineers listen to your concerns, evaluate your needs, then develop customized integrated solutions that help you address your most difficult challenges.

All our manufacturing facilities are ISO 9001 certified, industries' high standard of excellence. You can be assured that quality is built into every aspect of the product from design to delivery.

Our Manufacturing Teams are also dedicated to Lean Manufacturing and Continuous Improvement: an effort that has helped us achieve one of the best on-time delivery records

in the industry, from streamlined order entry processes to on-line shipment notifications. Our Customer Service team makes it easy to do business with us.

With service and distribution centers around the world, you'll get the support and products you need, when you need them, wherever you need them.

The Parker difference: Innovative technologies; customized, integrated solutions; top quality products; and premier customer service.

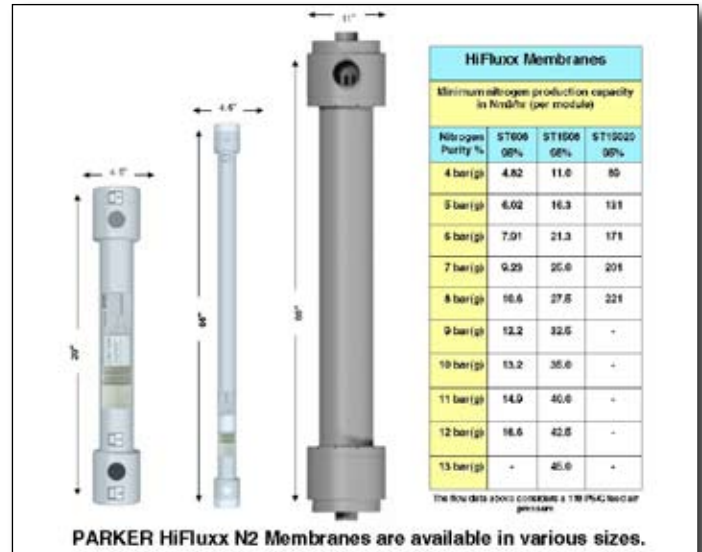


Nitrogen Membrane Technology

How is Nitrogen Generated from the Parker Membranes?

A reliable, high performance membrane module is the heart of a nitrogen gas generator. Customers around the world trust Parker Hannifin to provide reliable nitrogen gas generators that meet the specific needs of our customer applications.

Pressurized air is fed to one end of the hollow fiber membranes. The permeation rates of water vapor, CO₂, and oxygen contained in the air stream are faster than nitrogen and argon and will rapidly diffuse through the fiber walls. The slower diffused nitrogen molecules remain in the fiber bore and are collected as the nitrogen product gas. The air flow rate will determine how much undiffused oxygen remains with the nitrogen gas. The nitrogen product gas is extremely dry, with atmospheric dew points typically below -40° F. The membranes act like a filter with no moving parts and continuously generate nitrogen at selected flow and purity.



Why are Parker HiFlux® Membranes Unique from other Membrane Filters?

Simply stated, Parker HiFlux® membranes are the most permeable membranes in the world! High permeability means more nitrogen is produced in each fiber.

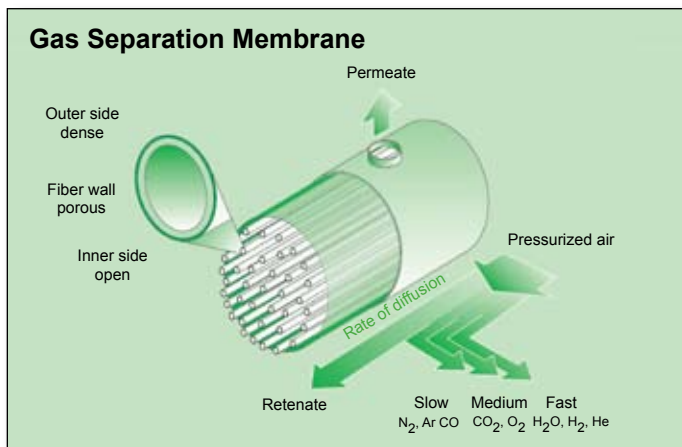
Fewer membranes are required, resulting in lower membrane investment and smaller membrane footprints vs. competitive systems

Excellent nitrogen production, even at low pressures, allows Parker membranes to operate directly from instrument or utility air systems or low pressure industrial compressors and still be compact and lightweight

Low pressure compressors operate with less energy, less noise, and less maintenance Parker fibers are robust and are less sensitive to particle contamination than competitors

No additional heating is required to improve membrane nitrogen production rates

N₂ production is extremely stable over time with little or no performance degradation



Relative size of Hollow Fibers

High Performance Bundle

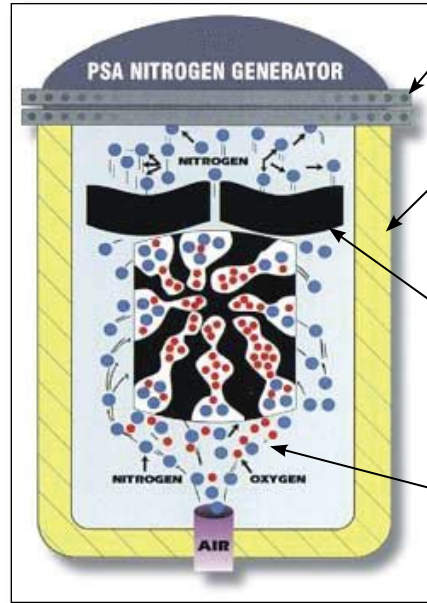
Pressure Swing Adsorption N2 Technology

Why are Parker PSA Systems Superior to Competing Suppliers?

Parker's nitrogen gas generators separate nitrogen from air, utilizing pressure swing adsorption technology. Air entering the generator consists of 21% oxygen and 78% nitrogen. The gas separation process preferentially adsorbs oxygen over nitrogen using carbon molecular sieve (CMS), thus enabling the N₂ to pass through as a product gas at pressure.

High performance and long bed life all start with good bed design, gas distribution and careful attention to air velocities and mechanical stresses on the carbon molecular sieves.

Both one and two bed units are specially charged with carbon molecular sieve (CMS). A solid state programmable controller simply operates the process valves on a cyclic basis, with built-in logic for automatic stop/start. Parker production and purity remain constant, regardless of the customer peak usage demands, by utilizing an automatic flow control valve. A continuous monitoring oxygen (O₂) analyzer, with alarms and shutdown, is standard equipment.

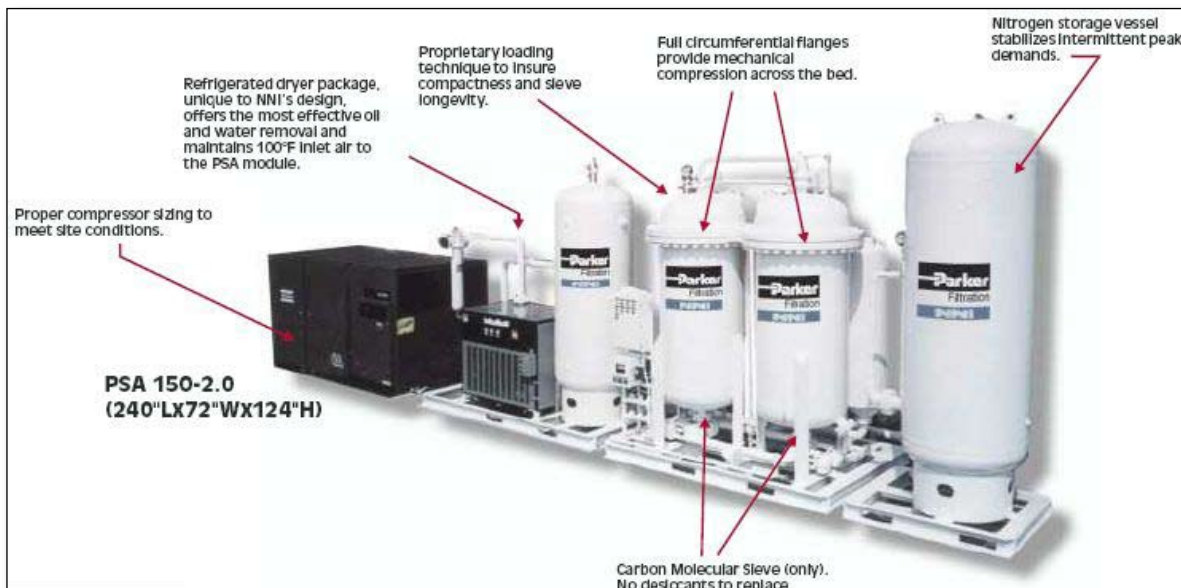


- Flanged Heads**
which allow for proprietary CMS bed filling.
- Proper length/diameter**
adsorbent vessel sizing to ensure low gas velocities during the normal nitrogen production cycle.
- Adsorbent beds**
are mechanically pre-loaded under compression to buffer differential pressures during normal cycling.
- Gas velocity control**
during high differential pressure cycles to eliminate fluidization of the CMS material.

All Parker systems include the key design elements shown on the illustration above as well as:

- High performance, high cycle switching valves for long, trouble-free operation
- Automatic alarm or shutdown feature tied to high feed air dew points.
- Optional Energy Efficiency Control System to automatically reduce feed air requirements during periods of low nitrogen consumption (25 TO 30%)
- Easy leak-testing of valves, even during on-stream operation

Parker Advantages



Portable Nitrogen Membrane Systems

Containerized Systems

All our products are engineered with the highest attention to detail. Parker provides the features you need and benefits you want. Parker nitrogen generators illustrate all aspects of engineering excellence.

Parker's HiFluXX® membranes are the ideal solution for large generators that must be compact and lightweight, such as trailer-mounted or containerized systems. All systems can be designed for low pressure feed air sources, giving the user the option of utilizing plant air or conventional single stage compressors. No other membrane system can offer the flexibility and feed air options for both onshore and offshore applications.



High flow 1500 scfm, 95% N2 system installed in a standard 20 ft ISO shipping container for operation in arctic conditions, ZONE II compliant.

Typical Applications for Portable Systems

Underbalanced Drilling	Work over applications with coiled tubing units
High Flow pipeline pigging/purging/inerting	LNG/chemical tanker systems
Pressure maintenance for depleted reservoirs	Portable gas lift systems
Gas lift operations-onshore or offshore	Offshore utility nitrogen

Standard Container Capacities

System operation at 116 psig inlet 95% N2 purity

Model	N2 Flow Rate (SCFM)	Weight (lbs.)
FB3-HFLX	400	7500
FB6-HFLX	800	8000
FB12-HFLX	1600	10,500
FB15-HFLX	2000	12,000

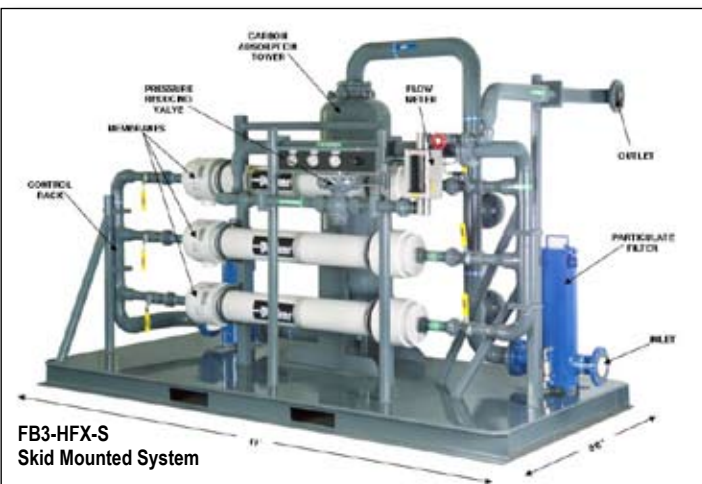
Note: Flow rates at standard conditions of 70°F at sea level.

Skidded and Truck-Mounted Systems

Parker HiFluXX® membranes can be configured to fit any installation because of their inherent compactness and high N2 productivity.



Typical Coiled Tubing Rig for Well Workovers



Inerting of LNG and Chemical Ocean Transport Tankers

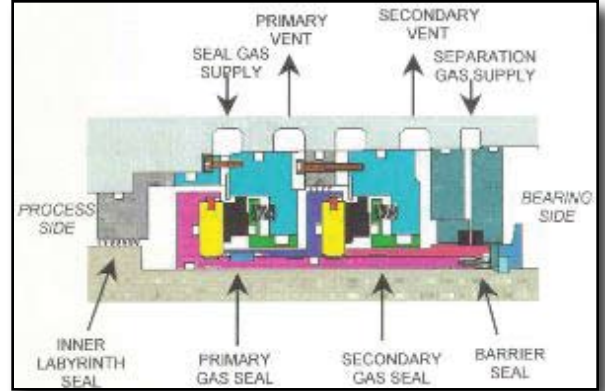
Dry Gas Seal N2 Systems

Standard Dry Gas Seal Systems



Model FB-608-1 with Membrane Dryer

Parker has developed a unique N2 generator for point-of-use applications that require a continuous supply of nitrogen where there is no electrical power supply or extremely hazardous conditions exist. These systems can also be equipped with Parker Balston membrane air dryer systems as well to treat high dew point or saturated feed air. All systems run automatically without operator attention.



A typical application is pressurizing dry gas seals on selected GAScompressor and turbine installations that need inert gas for lubricating and pressurizing dry seals designed to contain flammable, toxic, or hazardous process gases from leaking into the atmosphere.

	FB-608-1	FB-608-2	FB-1508-1	FB-1508-2	FB-1508-3	FB-1508-4
N2 Flow Rate (SCFM)	5	10	15	30	45	60

Note: Feed air pressure on all models is 110 psig, flow rates at standard conditions of 70°F at sea level.

Custom Packaging Capabilities

All dry gas seal systems can be equipped with integral high pressure boosters as well as high-pressure cylinders. High pressure gas storage systems provide back-up N2 as needed, or provide periodic higher N2 flows if nitrogen consumption is erratic or cyclical. All system operation is automatic and unmanned. Fully automated, 100% redundant packages ensure that the customer is never without nitrogen.



Right: Model FB-608-2 Gas Seal Unit with Cylinder N2 Backup

Far Right: Model SMD-FB-1508-4 Gas Seal Unit with Membrane Dryer

High Pressure N2 Systems

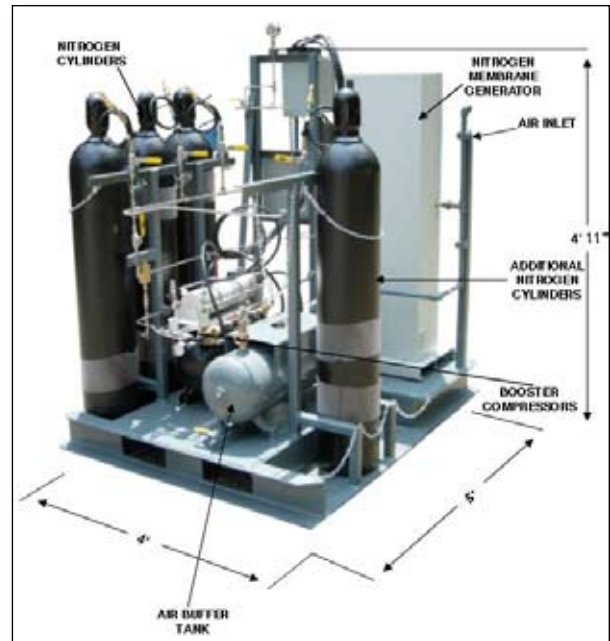


Nitrogen Gas Booster,
25 SCFM at 5,000 PSIG

Cylinder Filling Gas Boosters

Parker Hannifin offers a number of cost effective systems for generating high pressure N2 on site for delivery pressures up to 5,000 psig.

Typical applications include pressure-testing gas lines for deliver and piping systems, charging accumulators and gas cylinders, cleaning and pressure testing coiled tubing, and other N2 requirements in the field.



Custom Compression Systems

Parker Hannifin has OEM relationships with the leading suppliers of feed air and booster compressors to supply N2 systems that meet virtually any high flow requirement to client specifications. Parker will work closely with our equipment partners to ensure customer specifications are met and global service is provided on a turnkey basis.



Diesel Powered Nitrogen Gas Booster
• Capacity from 300 - 1,000 SCFM
• Outlet pressures from 350 - 5,000 PSIG



Diesel Powered Feed Air Compressor
• Typical 1,600 SCFM Unit at 145 PSIG to Parker Specifications

Oil Field N2 PSA Systems

Custom Designed PSA Systems

Parker's continuing in-house R&D has resulted in nitrogen generators that offer the best combination of economy and efficiency available today. With decades of experience in developing innovative products, Parker has set the standard for precision engineering, optimum performance, and customer satisfaction.

As nitrogen flow and purity requirements increase, quite often, the more cost effective on-site generation technology is pressure swing adsorption systems. Parker PSAs are the industry standard for high performance and longevity, ensuring years of stable, trouble-free performance with the lowest energy costs.



A single-bed technology with fewer moving parts is available in flow rates from 200 to 1,000 SCFH at 99.9%. Installation can be indoor or outdoor, and is available in an optional Class 1, Div. 2, Group D Configuration.



Large, Custom PSAs are available from nitrogen flow rates from 6,000 SCFH to 120,000 SCFH from purities of 98% to 99.99%

Typical Applications

- Pressure maintenance for depleted reservoirs
- Gas blending of high Btu pipeline gas
- Continuous gas lift operations at high purity
- Reservoir performance testing

Engineered PSA Systems

Parker has supplied custom engineered systems to accommodate hazardous environment installations, extreme weather conditions, redundancy considerations and unique application requirements. Parker-NNI's engineering and manufacturing staff has addressed and solved many challenging project requirements with the development of highly custom designed systems.

Let our dedicated, knowledgeable staff review your unique project requirements and offer an engineered generator designed and built to your exacting specifications.



Open, Containerized Package
Meets Class 1, Division 1, Groups C and D.
Engineered Package for FPSO: 3,000 SCFH at 3,500 PSIG, 99.5% Nitrogen

Custom Non-Cryogenic N2 Generators



100% Redundant Membrane Package with Auto Switch-Over for Hazardous Environments

Custom Engineering

What distinguishes Parker Hannifin from all other competitors is its willingness to build systems to detailed customer specifications, and the unwavering commitment to be the performance leader in both membrane and PSA technologies.



Aircraft Tire Filling Station with Gas Booster to 450 PSIG

Custom Designed Units

In addition to our standard product lines, mono-beds and dual-beds, Parker has many years of experience in the design and manufacture of custom packaged PSA nitrogen generating systems. Parker offers the most complete line of membrane and PSA nitrogen gas generators in the industry. Parker's nitrogen systems are manufactured with unsurpassed craftsmanship under one roof to meet all of your purity, flow, pressure, and application requirements.

Specific design features to accommodate hazardous environment installations, extreme weather conditions, redundancy considerations and unique application requirements are available. Parker's engineering and manufacturing staff has addressed and solved many challenging project requirements with the development of engineered design systems.

Parker has dedicated, knowledgeable staff ready to lend their support to identify and overcome unique project challenges. Our custom designed systems can be found worldwide, providing dependable on-site, on-demand nitrogen gas production to a wide variety of industries.



Interior View of Containerized System

Other Quality Products from Parker

Coalescing Compressed Air Filters



- Remove 99.99% oil, water, and solids from compressed air and other gases
- Eliminate costs associated with shutdown time, maintenance, and rejected product
- Low pressure drop
- Services flow ranges from a few standard cubic feet to 40,000

Sample Analyzer Filters



- Complete removal of solids and liquid impurities from gas samples
- Complete line of rugged housings in stainless steel, monel, PTFE and Kynar
- Fast loop sampling
- Inert, non-contaminating disposable filter element

Vacuum Pump Inlet & Exhaust Filters



- Completely eliminate oil mist and smoke from vacuum pump exhaust
- Prevent oil accumulation in ductwork
- Prevent oil backstreaming
- Prevent loss of valuable or hazardous materials

High Flow Rate Compressed Gas Filters



- Pressure rating to 1140 psig
- Meets U.S. and Canadian codes for natural gas filters
- Flow rates to 183 million standard cubic feet per day
- High efficiency removal of suspended liquid and solid impurities

Membrane Air Dryers



- Offer dewpoints as low as -100°F (-73°C)
- Model SMART Dryer offers dewpoints to 35°F (2°C) with energy saving technology
- Explosion-proof
- Provide clean, dry, compressed air to process instrumentation

Standard Membrane Nitrogen Generators



- Control your supply by providing the volume and purity required
- Eliminate the inconveniences and costs of cylinder gas supplies and dependence on outside vendors
- Produce up to 99.5% pure, commercially sterile nitrogen
- Dewpoints to -58°F (-50°C)

Standard PSA Nitrogen Generators



- Compact - frees up valuable floor space
- Offer dewpoints as low as -70°F (-21°C)
- Produce 99.95% pure compressed nitrogen
- Complete package with prefilters, final filters, and receiving tank

Gas Generators for Analytical Instrumentation



- Hydrogen generators for fuel and carrier gas applications
- Zero air generators for FIDs
- FID gas stations produce UHP zero air and 99.9995% hydrogen in one enclosure
- Ultra dry gas generators supply dry, purified compressed air to analytical instruments

Parker Hannifin Groups



AEROSPACE

- Flight control systems & components
- Thrust-reverse actuation
- Electrohydraulic servovalves
- Hydraulic systems & components
- Pumps
- Fuel systems & components
- Pneumatic controls & components
- Fluid metering, delivery & atomization devices
- Wheels & brakes
- Fuel manifolds
- Inert/oxygen generating systems
- Electromechanical actuation
- Couplings & valve fittings
- Hoses & rigid tubes



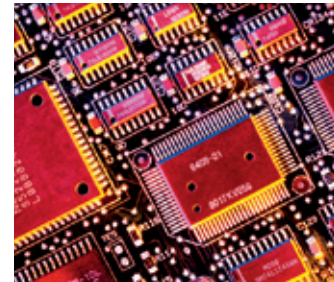
FILTRATION

- Hydraulic, lubrication & coolant filters
- Process, chemical, water & microfiltration filters
- Compressed air & gas purification filters
- Lube oil & fuel filters
- Fuel-conditioning systems
- Fuel filters/water separators
- Condition monitoring
- Aviation fuel filters
- Analytical gas generators
- Compressed air separation systems
- Nitrogen, hydrogen & zero air generators
- Engine air, fuel, oil filtration & systems



INSTRUMENTATION

- Medium/high pressure fittings & valves
- Instrumentation fittings
- High-purity fittings, diaphragm valves & regulators
- Instrumentation ball, plug, needle, check & manifold valves
- Diaphragm & bellows valves
- PFA & PTFE fittings, valves, pumps & regulators
- Regulators & transducers
- CGA gas cylinder connections
- Analytical solutions



AUTOMATION

- Pneumatic valves
- Linear motors
- Air preparation units
- Stepper & servo drives, controls
- Positioning tables
- Electric & pneumatic actuators
- Structural extrusions
- Vacuum products
- Pressure sensors
- Pneumatic logic
- Human-machine interface
- Gantry robots
- Multi-axis motion control products



FLUID CONNECTORS

- Rubber & thermoplastic hose
- Industrial hose
- Tube fittings & adapters
- Tubing & plastic fittings
- Brass fittings & valves
- Hose couplings
- Quick disconnects
- Check valves
- Expert systems
- Custom couplings & fittings



SEAL

- Elastomeric O-rings
- Homogeneous & inserted elastomeric shapes & diaphragms
- Metal & plastic retained composite seals
- Polymeric & plastic dynamic seals
- Rubber & plastic boots/bellows
- Extruded & precision-cut/fabricated elastomeric seals
- Thermoplastic engineered seals
- EMI shielding/grounding devices
- Thermal management products



CLIMATE & INDUSTRIAL CONTROLS

- Refrigeration & general-purpose solenoid valves
- Flow controls
- Pressure regulators
- Check, ball, shut-off & service valves
- Spun copper components
- Value-added assemblies
- Thermostatic & electronic expansion valves
- Accumulators, filter dryers & receivers
- Heater/air conditioning hose & hose assemblies
- Gerotors
- Process control valves



HYDRAULICS

- Hydraulic cylinders
- Accumulators
- Rotary actuators
- Hydraulic and lube oil filters
- Hydraulic valves
- Hydraulic motors & pumps
- Hydrostatic steering
- Power units
- Electrohydraulic systems
- Metering pumps
- Integrated hydraulic circuits
- Power take-offs



Parker Hannifin Corporation
Filtration and Separation Division
242 Neck Road, P.O. Box 8223
Haverhill, MA 01835-0723
Tel: 1-800-343-4048 US & Canada
Local: 1-978-858-0505
Fax: 1-978-858-0625
www.parker-nni.com